Lockheed Martin Corporation 6801 Rockledge Drive MP: CCT-246 Bethesda, MD 20817 Telephone (301) 548-2227



April 1, 2016

VIA PRIVATE CARRIER

Mr. James R. Carroll
Program Administrator
Land Restoration Program
Land Management Administration
Maryland Department of the Environment
1800 Washington Boulevard, Suite 625
Baltimore, Maryland 21230

Subject: Transmittal of the Bulkhead Soil-Retention Geotechnical Investigation,

Lockheed Martin Middle River Complex,

2323 Eastern Boulevard Middle River, Maryland

Dear Mr. Carroll:

For your information, please find enclosed two hard copies with CD of the above-referenced document. This report presents the results of a geotechnical and subsurface investigation of the Dark Head Cove bulkhead at the Lockheed Martin River Complex in Baltimore County, Middle River, Maryland.

Please let me know if you have any questions. My office phone is (301) 548-2227.

Sincerely,

Lynnette Drake

Remediation Analyst, Environmental Remediation

Enclosures:

cc: (via email without enclosure)

Lynnettet Diale

Gary Schold, MDE Mark Mank, MDE

Tom Blackman, Lockheed Martin Christine Kline, Lockheed Martin Norman Varney, Lockheed Martin

Dave Brown, MRAS Michael Martin, Tetra Tech Cannon Silver, CDM Smith

cc: (via mail with CD enclosure) Jann Richardson, Lockheed Martin Scott Heinlein, LMCPI cc: (via mail with enclosure)
Tom Green, LMCPI
Mike Musheno, LMCPI
Justin Tetlow, MRAS
Doug Mettee, Lockheed Martin MST
John Morgan, LMCPI

Bulkhead Soil-Retention Geotechnical Investigation Lockheed Martin Middle River Complex 2323 Eastern Boulevard Middle River, Maryland

Michael Byle, P.E., D.GE, F.ASCE Geotechnical Project Manager

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ACRONYMS

AASHTO American Association of State Highway and Transportation Officials

ASCE American Society of Civil Engineers

ASTM ASTM International

bpf blows per foot

CL lean clay (Unified Soil Classification)
CL-ML silty clay (Unified Soil Classification)

CME Central Mine Equipment Co.

CU consolidated undrained
GPS global positioning system

Lockheed Martin Corporation (Lockheed Martin)

MDE Maryland Department of the Environment

MRC Middle River Complex

N standard penetration test N-value NAD83 North American Datum of 1983

NAVD88 North American Vertical Datum of 1988

PAH polycyclic aromatic hydrocarbon

PCB polychlorinated biphenyl
PP pocket penetrometer

SC-SM clayey sand with silt (Unified Soil Classification)

SEI Structural Engineering Institute

SPT standard penetration test

Tetra Tech, Inc.

USCS Unified Soil Classification System

USDOT United States Department of Transportation

UU unconsolidated undrained

WH weight of hammer
WR weight of rod

 $g_{n} \hspace{1cm} \text{moist unit-weight of soil} \\$

g saturated unit-weight of soil

c' effective cohesion/drained cohesion
c total cohesion/undrained cohesion

f ' effective internal-friction angle of soil

f total internal-friction angle of soil

Section 1 Introduction

On behalf of Lockheed Martin Corporation (Lockheed Martin), Tetra Tech, Inc. (Tetra Tech) has prepared this data report presenting the results of a geotechnical and subsurface investigation of the Dark Head Cove bulkhead. The existing bulkheads along the Dark Head Cove adjacent to Tax Blocks D, D Panhandle, and F at the Lockheed Martin Middle River Complex (MRC) facility are in poor condition and are considered structurally deficient. A substantial portion of the steel surface has completely corroded away, creating large openings through which soil carried by runoff from upland areas is being transported to the cove. A new sheet-pile wall has been proposed to limit migration of possibly impacted soil into the cove. More data were needed before the new bulkhead design could be completed. The results of this geotechnical subsurface-exploration program provide geotechnical parameters that will be used to design the new sheet-pile wall.

This study evaluates subsurface conditions pertinent to the design and construction of the proposed bulkhead. Data from this investigation will be used to develop soil parameters for the bulkhead design. An additional study of the storm-drain system, using a closed-circuit television camera and test-pit excavations, was made coincident with this study; those results will be reported in a separate document. Specific tasks performed during this investigation include:

- exploring/evaluating soil stratigraphy along the existing bulkhead
- developing suitable bulkhead design parameters
- providing geotechnical engineering recommendations relevant to the new bulkhead and storm drain system

Figures and tables follow the text at the end of each section. This report is organized as follows:

<u>Section 2—Site Background</u>: Briefly describes the site and where detailed background information and reports of previous investigations can be found.

<u>Section 3—Investigation Approach</u>: Describes the field activities performed during this investigation.

<u>Section 4— Results</u>: Presents the investigation results.

<u>Section 5—Conclusions</u>: Summarizes the investigation findings.

<u>Section 6—References</u>: Cites references used to compile this report.

Section 2 Site Background

The Lockheed Martin Corporation (Lockheed Martin) Middle River Complex (MRC) at 2323 Eastern Boulevard in Middle River, Maryland is part of the Chesapeake Industrial Park, approximately 11.5 miles northeast of Baltimore. The MRC comprises approximately 161 acres and includes 12 main buildings, an active industrial area and yard, perimeter parking lots, an athletic field, a vacant concrete lot, trailer storage areas, and numerous grassy spaces along its perimeter. The MRC is bounded by Eastern Boulevard (Route 150) to the north, Martin State Airport to the east, Dark Head Cove to the south, and Cow Pen Creek to the west.

Numerous environmental investigations have been conducted at the MRC. Relevant to this geotechnical study of the bulkhead, soils and offshore sediments have been found to be impacted by a range of contaminants, most notably polycyclic aromatic hydrocarbons (PAHs), polychlorinated biphenyls (PCBs), and some heavy metals. The existing bulkhead no longer effectively controls the potential migration of soils to the offshore sediments due to significant degradation of the sheet pile; measures must be taken to control this migration pathway.

The MRC was previously entered into the Maryland Department of the Environment (MDE) Voluntary Cleanup Program. Remediation of impacted media at the MRC is now being conducted under the MDE Controlled Hazardous Substances regulatory framework, under an "Administrative Consent Order and Settlement Agreement" effective December 2015, which allows both on- and off-site issues to be addressed under the same program.

2.1 CURRENT SITE CONDITIONS

Various studies of the bulkhead and storm-drain system have been conducted to meet a range of project objectives. The most pertinent information derived from these studies is summarized and referenced in this section. The project area extends southwestward along the shoreline of Dark Head Cove. The site is bounded by Wilson Point Road on the north, Dark Head Cove Road to the

northwest, and Chesapeake Park Plaza to the southwest. The ground surface of the investigation area is fairly level. In Block F, the ground surface slopes slightly to moderately down to the bulkhead, while grades are flatter in Block D.

Historical site plans and as-built drawings of the existing bulkhead appear to indicate that significant fill was placed behind the bulkheads at Blocks D and F, though it appears that the more extensive fill was in Block D (Tetra Tech, 2012). Ground elevations along the top of the existing bulkhead are approximately 4.0–5.0 feet. The typical tide range in this area is about two feet, although the range can vary significantly according to wind direction, atmospheric pressure, and other variables.

The Dark Head Cove shoreline along the MRC consists of two steel bulkhead walls and riprap with a concrete-overlay shoreline. The steel bulkhead has two sections: one adjoins the concrete seaplane ramp at the southern end of the cove in Block F, and one is in Block D at the northern end of Dark Head Cove. Both steel bulkheads are severely corroded. This corrosion resulted in a complete loss of a substantial portion of the bulkhead's steel surface, creating large openings through which soil from the upland areas is transported to Dark Head Cove (Tetra Tech, 2015). A general site plan of the project site is in Appendix A.

A concrete cap and walkway run along the top of the existing bulkhead. Depressions in soil along the upland side of the bulkheads indicate that soil has eroded and been lost through openings in the bulkhead. Depressions in the soil surface over storm drains indicate that soil might have been washed through openings in these drains, or could indicate storm drains that have collapsed. The sizes of the soil depressions vary, from a few feet to more than 10 feet long.

The existing sheet-pile bulkhead is anchored by steel rods connected to timber-pile-supported wales on the upland side of the wall. These anchors will not be used for the new bulkhead due to concerns over their condition, and due to the extent of upland disturbance that would be necessary to incorporate them into a replacement structure. A wall without anchors has the additional benefit of being faster to construct, which will facilitate completion of a new wall before completing additional dredging associated with sediment remediation.

Regulatory permits restrict any in-water construction associated with bulkhead replacement or dredging to occur only between October 15 and February 15. The current projected construction

sequencing and schedule is to address the bulkhead before dredging and to do the work during the 2016/2017 construction work-window, if all permits can be obtained in time. Therefore, construction of a cantilevered sheet-pile wall in front of the existing deteriorated bulkhead will likely be proposed as a means to prevent future migration of impacted upland soil into Dark Head Cove.

We anticipate that the height of the proposed cantilevered sheet-pile wall will (at most) be 15 feet above the proposed dredge line in the northern bulkhead area, and 19 feet above the proposed dredge line in the southern bulkhead area. The timber bulkhead for Dark Head Cove at the southern end of the MRC is also deteriorating. No plans have been made to replace or modify this wall, but borings adjacent to the timber bulkhead were also advanced during this investigation to gather information about this wall for use in the design, if needed.

2.2 GEOLOGY

According to the Maryland Geological Survey's *Geologic Map of Maryland* (1968), the project site is mapped within the Potomac Group, which consists of interbedded quartzose gravels; protoquartzitic to orthoquartzitic argillaceous sands; and white, dark gray, and multicolored silts and clays. The thickness of the Potomac Group varies from 0–800 feet deep. The Potomac Group consists of three formations: the Raritan and Patapsco Formation, the Arundel Clay, and the Patuxent Formation. The Raritan and Patapsco Formations consist of gray, brown, and red variegated silts and clays; lenticular, cross-bedded, argillaceous, sub-rounded sands; and minor gravel. The thickness of the Raritan and Patapsco varies from 0–400 feet. The Arundel Clay consists of dark-gray and maroon lignitic-clays, with thickness varying from 0–100 feet. The Patuxent Formation consists of white or light-gray to orange-brown, moderately sorted, cross-bedded, argillaceous, angular sands, and sub-rounded quartz gravels with silts and clays. The thickness of the Patuxent soil varies from 0–250 feet.

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¹Composed of clay particles.

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Section 3 Investigation Approach

Tetra Tech, Inc. (Tetra Tech) developed a subsurface exploration program that included 12 land borings (TTDHCB-1 through TTDHCB-12) and seven marine borings (TTDHC-1 through TTDHC-7). These borings were used to conduct standard penetration tests (SPTs), and groundwater levels in the borings were recorded. Samples of disturbed and undisturbed soil were also collected. Field operations started on September 29, 2015 and ended on October 9, 2015. The field investigation was conducted in accordance with ASTM standards, including ASTM D 420—"Standard Guide to Site Characterization for Engineering, Design, and Construction Purposes," ASTM D 4220—"Standard Practices for Preserving and Transporting Soil Samples," the geotechnical assessment and work plan for the bulkhead (Tetra Tech, 2015), and the health and safety plan.

3.1 SOIL BORINGS

Labor, equipment, utility-clearance coordination, and permits for the drilling were provided by Uni-Tech Drilling, Inc. Two drilling rigs (models CME-55LC and CME-45C) were used to advance these borings using the mud-rotary drilling method. All land borings were advanced using a CME-55LC skid-mounted drill rig employing hollow-stem auger and mud-rotary sampling techniques. Marine borings were advanced using a CME-45C skid-mounted drill rig on a 30- by 20-foot barge. Drilling locations for these borings were surveyed and positioned using global positioning system (GPS) equipment before installation. Drilling locations were maintained by lowering spuds² to the cove floor to keep the barge on station.

The land and marine borings were spaced along the shoreline on both sides of the existing bulkhead. Eight of the 12 land borings were drilled to 40 feet below the ground surface, and four of the 12 were drilled to 70 feet deep. Marine borings were advanced to 50 feet below the mudline.

 $^{^2}$ A pointed leg or stake used to stay or support dredging or earth-boring machinery.

Except where undisturbed tube-samples were taken, two-foot disturbed (split-barrel) soil samples were taken continuously to a depth of 20 feet, and at five-foot intervals thereafter until terminus. The number of blows applied for each six-inch increment was recorded, unless one of the following occurred:

- 50 blows had been applied during any one of four six-inch increments
- 150 blows had been applied
- no observed advance of the sampler was noted after 10 successive blows of the hammer
- the sampler advanced to 24 inches (two feet) without reaching the blow-count limit

As-drilled coordinates for landside and marine borings are shown in Table 3-1. As-drilled boring locations are in Appendix B, and soil boring logs are in Appendix C. Note that the soil strata boundaries shown on the logs in Appendix C are approximate, and are intended to demark general changes in the composite layer (e.g., the predominant soil type and stiffness) and other properties, as interpreted from the samples taken within each boring.

To avoid the downhole transport of contaminated sediment in the marine borings, a steel casing was placed in the top five feet of each boring to contain cuttings and maintain mud circulation during drilling. The casing was driven through standing water into the top five feet of sediment. The length of casing used ranged between 15 and 25 feet, depending on the water depth. The first soil sample from each marine boring was collected five to seven feet below the mudline. Samples were taken continuously to a depth of 25 feet and at five-foot intervals thereafter.

Most soil samples were obtained using a two-inch outside-diameter and 1½-inch inside-diameter standard penetration test (SPT) split-barrel samplers driven 24 inches into the soil. SPT sampling was done in accordance with ASTM D 1586—"Standard Test Method for Penetration Test and Split-Barrel Sampling of Soil." The sampler was driven by successive blows of a 140-lb automatic trip-hammer dropped from a height of 30 inches. All disturbed samples were visually classified in the field by a Tetra Tech geotechnical engineer using the Unified Soil Classification System (USCS) for soil identification.

Representative portions of each disturbed sample were labeled and preserved in glass jars for later review and possible laboratory testing. Where cohesive soils were encountered,

three-inch-diameter thin-walled (Shelby tube) samples were attempted. Each undisturbed soil sample was retained in a stainless steel thin-walled tube (having been obtained using a piston-sampling device) and sealed with wax. The Shelby tube was pressed into the soil by a continuous thrust of hydraulic rams on the drilling rig. Samples were observed and classified by the field engineer, who recorded this information in field logs.

After drilling, each hole was completely backfilled using a bentonite-cement grout, tremied (i.e., funneled in) from the bottom of the borehole. Soil cuttings from drilling were collected and placed in United States Department of Transportation (USDOT)-approved 55-gallon drums that were later collected by the drilling contractor and deposited at a controlled location on-site for later disposal at an appropriately permitted off-site landfill approved by Lockheed Martin.

3.2 LABORATORY TESTING

The geotechnical engineer reviewed each sample on-site and selected samples for geotechnical laboratory analyses. The selected soil samples were delivered to Tetra Tech's geotechnical testing laboratory to verify the soil classification recorded in the field, and to provide specific soil parameters for use in design. Shelby-tube samples were packaged, handled, and delivered in accordance with ASTM D1587 and laboratory specifications, including shipping each tube in a vertical orientation with minimal disturbance. Geotechnical laboratory testing was performed by Ardaman & Associates, Inc. (a Tetra Tech company).

Laboratory test results are in Appendix D. Laboratory tests were performed in general accordance with applicable ASTM test procedures. ASTM test designations used for these tests include:

- visual classification (ASTM D2488)
- Atterberg limits (ASTM D4318)
- unconsolidated undrained (UU)
- consolidated undrained (CU)
- · corrosivity (ASTM D2976)

- moisture content (ASTM D2216)
- sieve analysis (ASTM D422)
- triaxial compression (ASTM D2850)
- triaxial compression (ASTM D4767)
- organic content (ASTM D2974)

3.3 INVESTIGATION-DERIVED-WASTE MANAGEMENT

Soil cuttings and drilling muds from advancement of the geotechnical borings were collected in 55-gallon drums and staged on-site during the investigation. Drum contents were characterized

and disposed of in accordance with all applicable laws and regulations. Characterization and waste management documentation are in Appendix E.

Table 3-1 **Soil Boring Locations**

| Boring No. Location | | Globa | al coordinates (ft) | Ground | | | |
|--|---------|-------------|---------------------|-----------------|--|--|--|
| | | Northing | Easting | elevation* (ft) | | | |
| Land borings | | | | | | | |
| TTDHCB-1 | Block D | 605630.7943 | 1475169.5397 | +4.14 | | | |
| TTDHCB-2 | Block D | 605704.9278 | 1475059.7013 | +4.32 | | | |
| TTDHCB-3 | Block D | 605612.4834 | 1474865.4765 | +4.98 | | | |
| TTDHCB-4 | Block D | 605516.9785 | 1474770.6305 | +4.59 | | | |
| TTDHCB-5 | Block D | 605414.8629 | 1474670.9438 | +5.09 | | | |
| TTDHCB-6 | Block F | 604871.2328 | 1473853.6657 | +5.02 | | | |
| TTDHCB-7 | Block F | 604794.5472 | 1473729.9770 | +4.68 | | | |
| TTDHCB-8 | Block F | 604680.4520 | 1473602.9321 | +9.00 | | | |
| TTDHCB-9 | Block F | 604542.2869 | 1473578.7008 | +7.56 | | | |
| TTDHCB-10 | Block F | 604429.0408 | 1473578.8936 | +5.52 | | | |
| TTDHCB-11 | Block F | 604265.0466 | 1473441.1996 | +4.76 | | | |
| TTDHCB-12 | Block F | 604266.6051 | 1473373.4247 | +5.19 | | | |
| Marine borings | | | | | | | |
| TTDHC-1 | Block D | 605675.47 | 1475119.68 | -3.00 | | | |
| TTDHC-2 | Block D | 605592.81 | 1474909.09 | -7.60 | | | |
| TTDHC-3 | Block D | 605405.34 | 1474702.34 | -4.30 | | | |
| TTDHC-4 | Block F | 604854.13 | 1473871.31 | -6.20 | | | |
| TTDHC-5 | Block F | 604666.67 | 1473652.01 | -6.10 | | | |
| TTDHC-6 | Block F | 604446.27 | 1473611.30 | -12.30 | | | |
| TTDHC-7 | Block F | 604244.30 | 1473385.82 | -5.30 | | | |
| Notes: Horizontal datum in NAD83; vertical datum in NAVD88 *Ground elevation of marine borings = mudline elevation | | | | | | | |

Section 4 Results

4.1 STRATIGRAPHY

Subsurface soil conditions at the site generally correspond to the soil composition of Potomac Group soil in the Atlantic Coastal Plain, which consists of unconsolidated sediment including gravel, sand, silt, and clay. A summary of site soil characteristics and stratigraphy in the investigation area is presented below.

Soil strata at this site tend to be comprised of interlayered deposits with highly variable materials. We have tried to characterize these by strata based on composite properties. Note that the soil classification is often borderline with fines content near 50% and liquid limits near 50%. Variations of less than five percent in fines content or liquid limits are within the normal accuracy range in laboratory tests, and can radically change the initial Unified Soil Classification System (USCS) soil classification recorded in the field.

Natural soils are generally similar despite widely varying classifications. This makes the soil classification less important to the evaluation, because most site soils consist of sandy clays with medium plasticity. Therefore, for the purposes of this report, the strata have been subdivided into "probable fill," "upper fluvial deposits," "lower fluvial deposits," and "deep fluvial deposits," as described below.

Stratum A—probable fill—Stratum A is comprised of apparently human-placed fill materials. Stratum A consists of light brown to reddish-brown silt and clay with varying amounts of fine sand and gravel in the northern portion of the site, and brownish-red to reddish-brown silty-clayey sand in the southern part of the site. Stratum A extends to a depth of approximately 10 to 20 feet below grade. Soil materials generally have medium stiffness, with standard penetration test (SPT) N-values ranging from weight-of-hammer to 14 blows per foot (bpf), except at the depth of 10–14 feet below grade in boring TTDHCB-5. Soil materials in this boring were cemented and

ironized (i.e., contained precipitated iron), with SPT N-values ranging from 20 to 26 bpf. Organic soil was typically observed at shallower depths (less than 10 feet below grade) within this stratum. Soil with organic materials is generally dark gray. This stratum is uncontrolled fill, and was possibly placed during or after construction of the existing bulkhead.

Stratum B—upper fluvial deposits—Stratum B soil underlies Stratum A soil. Stratum B is similar to Stratum A, but appears to be of natural origin, as indicated by the interstratified nature typical of the Potomac Group deposits. Stratum B is composed of interlayered silty clay with varying amounts of fine sand and silt. The thickness of Stratum B, where encountered, ranged from five to 11 feet. This stratum is generally stiff to very stiff (SPT N-values of 7–27 bpf), except in the southern part of the site near borings TTDHCB-3 and TTDHCB-4, where the soil is generally soft to medium-stiff (SPT N-values 1–9 bpf).

Stratum C—lower fluvial deposits—Stratum C is predominantly interstratified fine silty and clayey sand, with infrequent clay and silt layers. The interlayers are thin, ranging from a few inches to two feet. Stratum C is approximately 20–25 feet thick. For concise logging, composite soil is classified as medium clayey sand, but contains interlayers and lenses of varying gradation and classification, including sand, silt, and clay. SPT N-values in Stratum C generally range from 10–30 bpf.

Stratum D—deep fluvial deposits—Stratum D is similar to Stratum C, except that, in general, Stratum D is more consistently very stiff and dense (SPT N-values 17–32). These deeper interstratified deposits have 30–60% fines, and a liquid limit of approximately 30–52%. Stratum D generally extended to the maximum depth explored in Borings TTDHC-5, TTDHC-6, and TTDHC-7, indicating its thickness exceeds 20–32 feet.

Stratum E—deep over-consolidated fluvial deposits—The composition of Stratum E is similar to Stratum D, except it is significantly more stiff, and Stratum E is generally harder and more dense (SPT N-values greater than 32). The deeper interstratified deposits in Stratum E are over-consolidated, with 30–60% fines and a liquid limit of 30–52%. In general, Stratum E extended to the maximum depth explored, indicating its thickness exceeds 20–32 feet.

4.2 SEISMIC CLASSIFICATION

The liquefaction potential for site soil was estimated using the results of the field and laboratory tests conducted for this project, a review of the available geologic mapping, and the site class definitions shown on Figure 4-1 (which is Table 20.3-1 from *Minimum Design Loads for Buildings and Other Structures* [ASCE/SEI 7-10, 2011]). Site soil was assessed as "not liquefiable" due to its significant cohesion. Accordingly, the project site can be classified as Site Class D, "stiff soil," because, except for the upper 10–15 feet (where mean blow-counts generally exceed 15), no soft-clay lenses greater than 10 feet thick were identified.

We recommend that the bulkhead be designed in accordance with American Association of State Highway and Transportation Officials (AASHTO) specifications, which indicate a seven percent probability of exceedance in 75 years (approx. 1000-year return period) for the designed earthquake. Table 4-1 contains the relevant seismic design-factors for this project based on the AASHTO 2010 specifications.

4.3 GROUNDWATER ELEVATIONS

All soil borings were drilled using the mud rotary-drilling method. This method does not permit groundwater measurement during drilling, because the borehole is filled with drilling mud at all times. Groundwater levels were estimated based on moisture observed and by visually estimating the saturation of SPT samples collected. Therefore, groundwater levels presented herein should be considered rough approximations. Groundwater levels can be measured in surrounding monitoring wells, but confined or semiconfined conditions are common at the Middle River Complex, so equilibrated levels are typically higher than the elevation at which saturated conditions are observed in boreholes. The estimated depth to groundwater from this geophysical study is summarized in Table 4-2. Each borehole was grouted immediately after completion of drilling, as a preventive measure against vertical migration of contamination within the hole. Therefore, groundwater readings after 24 hours of drilling were not taken.

Accurately predicting subsurface-water fluctuations is difficult when based upon relatively short-term observations. Groundwater conditions are subject to change, with variations in climatic conditions and tidal influences. Depth to groundwater will be affected by changes in seasonal moisture conditions, site drainage, and other factors, particularly after periods of intense or

sustained precipitation. Groundwater, when present, is typically contained within the pore spaces of overburden soil and within pore spaces. Actual depth to groundwater may vary from the estimated levels herein.

Near the bulkhead, groundwater appears to be at roughly the same level as the water level in the cove. Small movements indicating tidal influence are not observed when estimating the groundwater level by moisture. As such, groundwater fluctuations near the bulkhead are expected to vary with the tide.

4.4 CORROSIVITY

One sample of the Stratum B soil was tested for corrosivity. Results indicate that this soil is "strongly aggressive" to "very strongly aggressive" to buried metal, on a scale that ranges from "virtually nonaggressive" to "slightly aggressive" to "moderately aggressive" to "aggressive" to "strongly aggressive" to "very strongly aggressive." This, coupled with the tidal fluctuation and splash zone effects in Dark Head Cove, indicates that steel sheet-piling must be protected from corrosion. Thickness loss of unprotected steel due to corrosion is expected to exceed 0.5 inches over a 75-year life span (Knöfel, D., 1978). Available drawings indicate that the existing sheet piling was installed between 1945 and 1971. The original half-inch-thick sheet piling, after 40–70 years, has been corroded completely through, indicating that the above estimated corrosion rate is reasonable. However, note that when the piling was actually penetrated is unknown, so the corrosion rate could be higher and should be accounted for when material specifications are made during future design.

Table 4-1
Seismic-Design Coefficients and Factors

| Parameter (abbreviation) | Value of coefficient or factor | AASHTO reference |
|--|--------------------------------|-------------------|
| Peak ground-acceleration coefficient (PGA) | 5% | Figure 3.10.2.1-1 |
| 0.2 second spectral-acceleration coefficient (S_s) | 10% | Figure 3.10.2.1-2 |
| 1.0 second spectral-acceleration coefficient (S_I) | 3% | Figure 3.10.2.1-3 |
| Site factor (F_{pga}) | 1.6 for Site Class D | Table 3.10.3.2-1 |
| Short-period site factor (F_a) | 1.6 for Site Class D | Table 3.10.3.2-2 |
| Long Period Site Factor (F_v) | 2.4 for Site Class D | Table 3.10.3.2-3 |

Table 4-2
Estimated Depth to Groundwater in Soil Borings While Drilling

| Boring No. | Estimated depth to groundwater while drilling (feet) |
|------------|--|
| TTDHCB-1 | 6–8 |
| TTDHCB-2 | 2–4 |
| TTDHCB-3 | 8–10 |
| TTDHCB-4 | 8–10 |
| TTDHCB-5 | 6–8 |
| TTDHCB-6 | 4–6 |
| TTDHCB-7 | 6–8 |
| TTDHCB-8 | 6–8 |
| TTDHCB-9 | ±6 |
| TTDHCB-10 | 6–8 |
| TTDHCB-11 | 10–2 |
| TTDHCB-12 | 8–10 |

Figure 4-1 Site-Classification Table with Standard Minimum Design-Loads for Construction

Table 20.3-1 Site Classification

| Site Class | \overline{v}_s | \overline{N} or \overline{N}_{ch} | \overline{S}_{u} |
|---|---|---------------------------------------|------------------------------|
| A. Hard rock | >5,000 ft/s | NA | NA |
| B. Rock | 2,500 to 5,000 ft/s | NA | NA |
| C. Very dense soil and soft rock | 1,200 to 2,500 ft/s | >50 | >2,000 psf |
| D. Stiff soil | 600 to 1,200 ft/s | 15 to 50 | 1,000 to 2,000 psf |
| E. Soft clay soil | <600 ft/s | <15 | <1,000 psf |
| | Any profile with more that —Plasticity index $PI > 20$ —Moisture content $w \ge 4$ —Undrained shear strengt |), 0%, | e following characteristics: |
| F. Soils requiring site response analysis in accordance with Section 21.1 | See Section 20.3.1 | | |

Source: ASCE Standard Minimum Design-Loads for Building and Other Structures (ASTM, 2011)

Section 5 Conclusions

5.1 SUBSURFACE CONDITIONS

Subsurface soil conditions at the site generally correspond to the soil composition of Potomac Group soil in the Atlantic Coastal Plain, consisting of unconsolidated sediment, including gravel, sand, silt, and clay. Profiles of these conditions are in Appendix F. Based on the subsurface conditions at this site, and the location and height of the proposed new bulkhead and walls, we recommend that the design be based on a critical soil-profile. The recommended soil properties for each stratum are summarized on Figures 5-1 and 5-2.

5.2 LIMITATIONS

Subsurface conditions found during this study and at the Middle River Complex vary. Statements about site-wide subsurface variations in this report are estimations only, and are based on the data obtained at specific boring locations, as presented in this report. Tetra Tech strives to perform our services in a manner consistent with the level of care and skill ordinarily exercised by local (i.e., near the site) professionals currently practicing under similar conditions. No other representation, expressed or implied, nor warranty or guarantee is included or intended in this report, nor in any addendum, opinion, document, or other instrument of service.

The results, conclusions, and recommendations in this report are within the scope of work contained in the agreement executed by Tetra Tech and its client. This report is not intended for any other purpose. Tetra Tech makes no claim or representation concerning any activity or condition falling outside the specified purposes of this report as defined by the scope of work. Inquiries regarding our scope of work, or concerning any activity or condition not specifically contained therein, should be directed to Tetra Tech for evaluation and, if necessary, further investigation.

Figure 5-1
Recommended Soil Properties for Bulkhead Construction in Block D
(Cross-Section by Stratum)

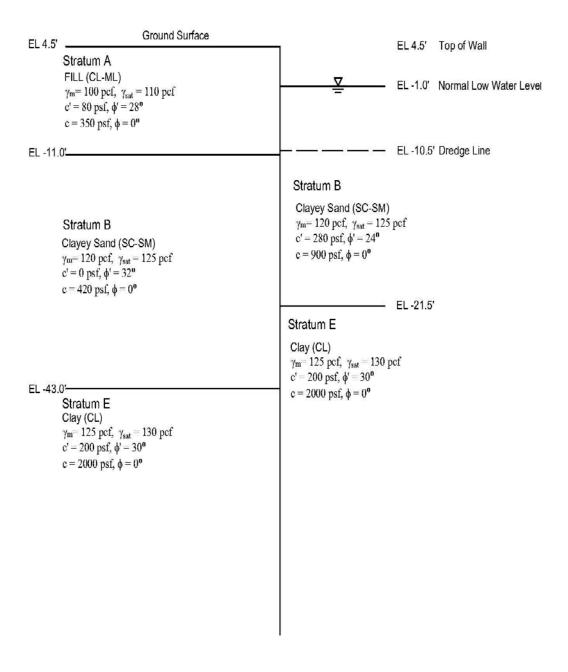
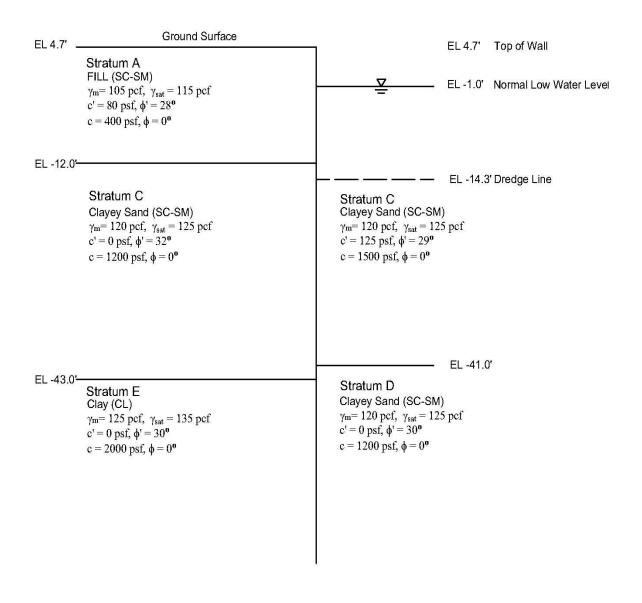


Figure 5-2
Recommended Soil Properties for Bulkhead Construction in Block F
(Cross-Section by Stratum)



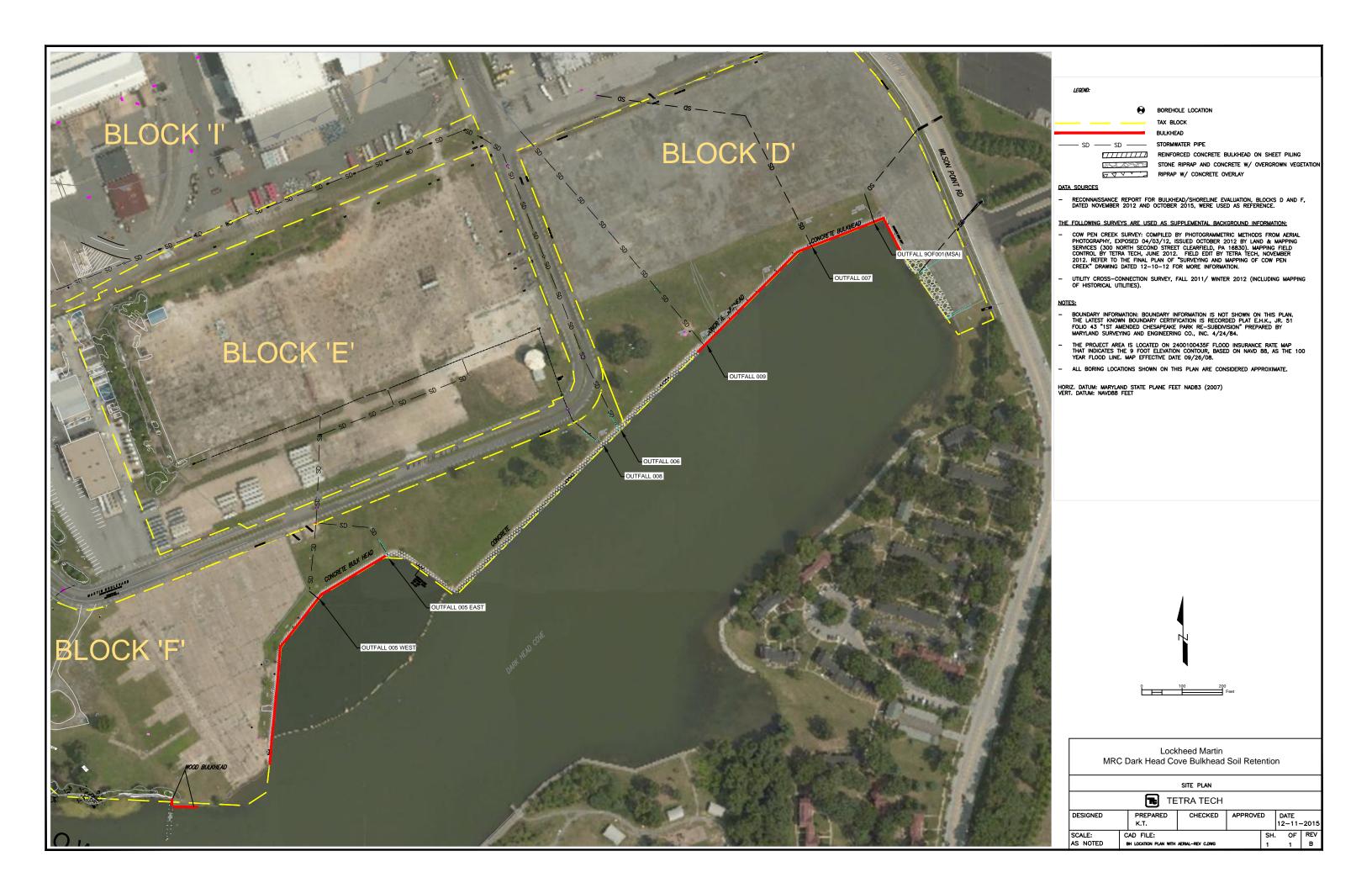
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Section 6 References

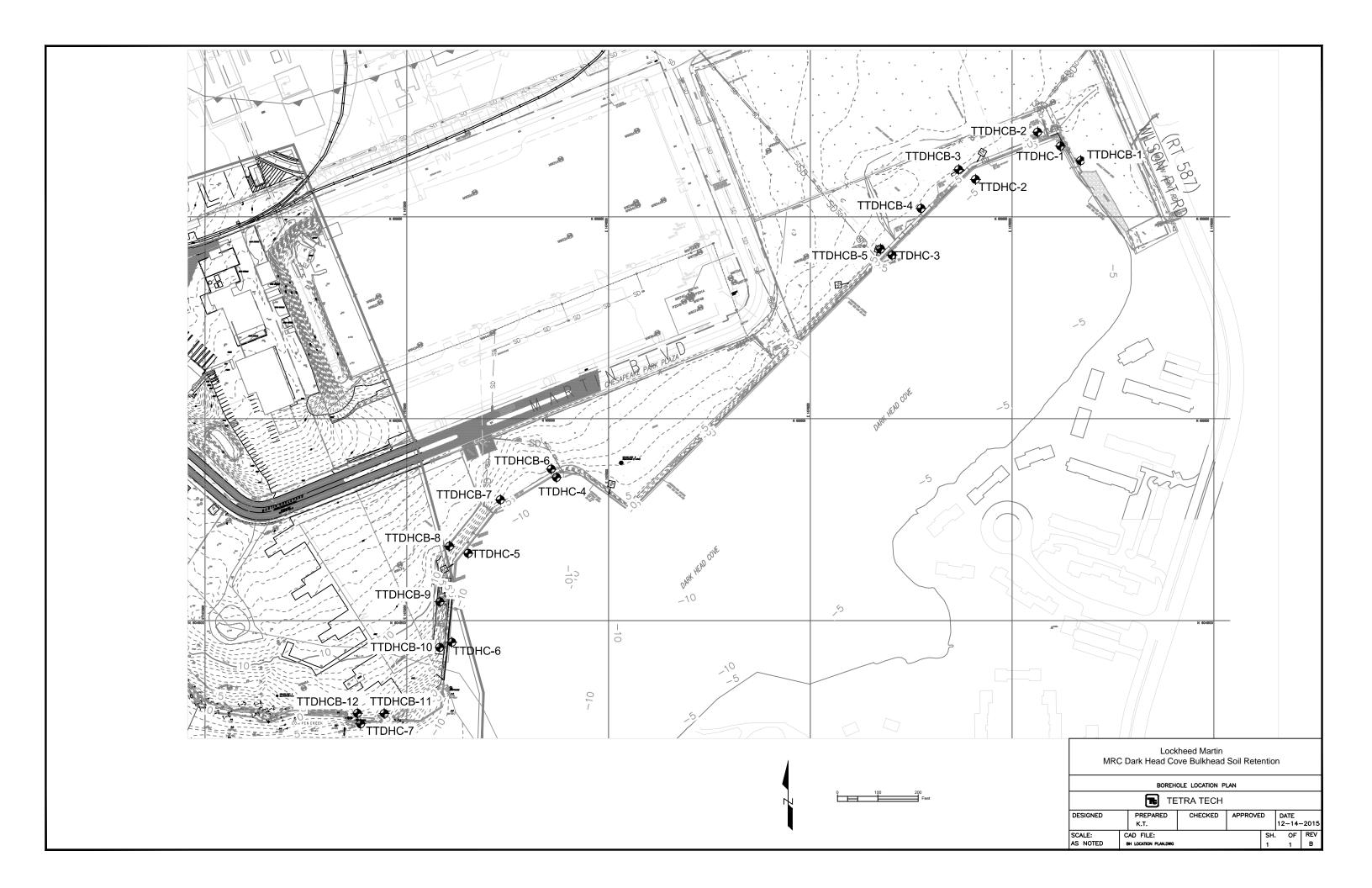
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- 10. Tetra Tech, Inc. (2015). *Bulkhead and Storm-Drain Assessment, Blocks D and F, Lockheed Martin Middle River Complex, 2323 Eastern Boulevard, Middle River, Maryland.* Prepared by Tetra Tech, Inc., Germantown, Maryland for Lockheed Martin Corporation, Bethesda, Maryland. November.

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APPENDIX A—SITE PLAN



APPENDIX B—BOREHOLE LOCATION PLAN



APPENDIX C—SOIL BORING LOGS

TETRA TECH Hole No. TTDHC-1 CLIENT PROJECT NUMBER SHEET **DRILLING LOG** Lockheed Martin Corporation 194-8711 3 OF SHEETS 1. PROJECT 10. DRILLING METHOD Mud Rotary Lockheed Martin MRC 11. DATUM FOR ELEVATION SHOWN (TBM or MSL) 2. LOCATION (Coordinates or Station)
Middle River, MD N 605,675.4700 E 1,475,119.6800 MSL 12. MANUFACTURER'S DESIGNATION OF DRILL 3. DRILLING AGENCY UniTech 13. TOTAL NO. OF SOIL SAMPLES TAKEN DISTURBED UNDISTURBED 4. HOLE NO. (As shown on drawing title and 0 file number) TTDHC-1 14. TOTAL NUMBER CORE BOXES 5 NAME OF DRILLER 15. ELEVATION GROUND WATER C. Lopez COMPLETED STARTED 6. DIRECTION OF HOLE 16. DATE HOLE 10/8/2015 10/9/2015 ☐ INCLINED DEG. FROM VERT 17. ELEVATION TOP OF HOLE -6.77. THICKNESS OF OVERBURDEN 18. TOTAL CORE RECOVERY FOR BORING 8. DEPTH DRILLED INTO ROCK 19. GEOLOGIST 9. TOTAL DEPTH OF HOLE 50.0 R. Lama Tamang BOX OR SAMPLE NO. REMARKS (Drilling time, water loss, depth weathering, etc., if significant) CLASSIFICATION OF MATERIALS **ELEVATION** DEPTH LEGEND RECOV-ERY (Description) d -6.7 0.0 UNSAMPLED 5.0 -11.7SILTY SAND (SM) with trace of organics, BLOWCOUNT SS-1 WR-WR-WR-WR N = WR, PP = 0.0 tsf 5.0 7.0 N=WR & WH, very soft, brownish gray to dark gray (SM) with organics SS-2a SS-2b 67 BLOWCOUNT WH-WH-WH-5 7.0 9.0 N = WH(SM) -15.2 Poorly-graded SAND with SILT (SP-SM), 10<N<57, dense to very dense, yellowish brown to light whiteish gray 79 SS-3 **BLOWCOUNT** 21-24-33-43 N = 57 9.0 11.0 (SP-SM) BLOWCOUNT SS-4 79 11.0 18-18-15-18 13.0 N = 33(SP-SM) SS-5a SS-5b 67 **BLOWCOUNT** 5-5-5-9 13.0 15.0 N = 10(SM) (CH) 15 83 **BLOWCOUNT** SS-6a SS-6b 15.0 5-9-15-21 N = 24 Top 12" (SP-SM) -22.7 16.0 Bottom 12" (CL-ML) with sand Interstratified with CLAY (CL) and SILTY CLAY (CL-ML), trace of sand, 41<N<65, hard, yellowish brown to reddish brown SS-7 17.0 BLOWCOUNT 9-18-23-25 88 N = 41, PP > 4.0 tsf (CL-ML) with sand 19.0 **BLOWCOUNT**

92

SS-8 19.0 21.0

Lockheed Martin MRC

14-27-38-54/5" N = 65

20

HOLE NO. TTDHC-1



| ROJECT | LOG (| 2 2 0 | neet) -6.7 | | | | |
|---------|----------|--------------------|---|------------------|------------------------------|---|------------|
| ockheed | Martin N | /IRC | | | I DOV CT | of 3 s | 2 HEETS |
| EVATION | DEPTH | LEGEND | CLASSIFICATION OF MATERIALS (Description) | % CORE RECOV- | BOX OR SAMPLE | REMARKS (Drilling time, water loss, depth | |
| а | b | c www.ww | d | ERY e | NO. f | weathering, etc., if significant) | |
| | | | Interstratified with CLAY (CL) and SILTY CLAY (CL-ML), trace of sand, 41 <n<65, hard,<="" td=""><td></td><td></td><td></td><td></td></n<65,> | | | | |
| | = | | yellowish brown to reddish brown (continued) | | | | |
| | | | | 100 | SS-9 21.0 | BLOWCOUNT 5-13-28-32 | |
| | = | | | | 23.0 | N = 41 | |
| | | | | | | (CL-ML) with sand | |
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| -29.7 | 23.0 | | | | | | |
| | | | CLAYEY SAND (SC), 33 <n<49, and<="" brown="" brown,="" colors="" dense,="" in="" td="" varying="" yellowish=""><td>100</td><td>SS-10 23.0</td><td>BLOWCOUNT 10-16-17-19</td><td></td></n<49,> | 100 | SS-10 23.0 | BLOWCOUNT 10-16-17-19 | |
| | | | whitish gray | | 25.0 | N = 33, PP > 4.5 tsf (SC-SM) | |
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| | | | | 100 | SS-11 28.0 | BLOWCOUNT 11-20-29-38 | |
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| | | | | 400 | 00.12 | DI OMOCULAT | |
| | | | | 100 | SS-12 33.0 | BLOWCOUNT 4-19-22-24 | |
| | _ | | | 35.0 | N = 41, PP > 4.5 tsf (SC) | | |
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| | | | | 100 SS | SS-13 BLOWCO | BLOWCOUNT | |
| | | | | | 38.0 | 11-14-21-25 | |
| -45.7 | 39.0 | | | | 40.0 | N = 35, PP > 4.5 tsf Top 10" (SC) | |
| | | | CLAY (CL), trace of sand, 29 <n<35, brown<="" hard,="" reddish="" stiff="" td="" to="" very=""><td></td><td></td><td>Bottom 14" (CL) with sand</td><td></td></n<35,> | | | Bottom 14" (CL) with sand | |
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| | | | | 100 | 00.44 | DI OMCOUNT | |
| | | | | 100 | SS-14 43.0 | BLOWCOUNT 17-11-18-24 | |
| | - | | | Ī | 45.0 | N = 29 (CL) with sand | |



| DRILLING | G LOG (| (Cont S | heet) | -6.7 | TOP OF HOLE | | | | Hole No. TTI | DHC-1 | | |
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| PROJECT Lockheed Martin MRC | | | | | INSTALLA | | | | SHEET 3 OF 3 SHEETS | | | |
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| а | b | c | CLAY (| CL), trace of | d sand, 29 <n<35 wn <i>(continued)</i></n<35 | , very stiff | e | f | g | | _ | |
| | _ | | to hard | , reddish bro | wn (continued) | | | | | | Ė, | |
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| | _ | | | | | | 100 | SS-15 48.0 | BLOWCOUNT 13-15-20-36 | | | |
| | | | | | | | | 50.0 | N = 35, PP > 4.5 tsf (CL) with sand | | | |
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| -56.7 | 50.0 | | END O | F BORING | | | | | | | 5 | 50 |
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1836-A Lockheed Martin MRC JUN 67



Hole No. TTDHC-2

| DRILLI | NG LOG | | ENT .ockheed Martin Corporation | | T NUMBER | | SHEET OF 3 | 1 SHEETS | |
|----------------------------|---|------------------|--|---|-----------------------|--------------------|-----------------------------------|--------------|--|
| 1. PROJECT | | 1 - | .comicca martin Corporation | 194-8711 OF 3 SHEETS 10. DRILLING METHOD Mud Rotary | | | | | |
| | Martin MRC | | | 11. DATUM FOR ELEVATION SHOWN (TBM or MSL) | | | | | |
| 2. LOCATION (Middle Ri | Coordinates or Siver, MD N 6 | tation) 805.5 | 92.8100 E 1,474,909.0900 | MSL 12. MANUFACTURER'S DESIGNATION OF DRILL | | | | | |
| 3. DRILLING A | | ,,, | . , | | | | | | |
| | As shown on drav | wing tit | | | L NO. OF SOPLES TAKEN | | DISTURBED UNDISTUR | | |
| file number) | | | TTDHC-2 | 14. TOTA | L NUMBER | CORE BOX | | | |
| 5. NAME OF DI C. Lopez | KILLER | | | 15. ELEV | ATION GRO | UND WATE | | | |
| 6. DIRECTION | | | | 16. DATE | HOLE | ST | ARTED COMPLETED 9/29/2015 9/29/20 | 115 | |
| ⊠ VERTICA | | | DEG. FROM VERT. | | ATION TOP | OF HOLE | -3.5 | ,,,, | |
| | OF OVERBURD | | | | | | OR BORING | % | |
| 9. TOTAL DEP | LED INTO ROC | K | 50.0 | 19. GEOL | OGIST | рі | ama Tamana | | |
| | | | CLASSIFICATION OF MATERIAL | _S | % CORE | BOX OR | Lama Tamang REMARKS | | |
| ELEVATION | | SEND | (Description) | | RECOV- ERY | SAMPLE NO. f | weathering, etc., if significant | th t) | |
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| | | | SILTY CLAY (CL-ML) with sands, trace organics, N = WR, very soft, gray to determine the same of the sa | ce of lark grav | 4 | SS-1 5.0 | BLOWCOUNT WR-WR-WR | E | |
| | | | , | J. ~J | | 7.0 | N = WR | E | |
| | | | | | | | (CL-ML) with sand | | |
| | | | | | | | | E | |
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| | | | | | 58 | SS-2 7.0 | BLOWCOUNT WR-WR-WR-1 | E | |
| | | | | | | 9.0 | N = WR | E | |
| | | | | | | | (CL-ML) with sand | | |
| | | | | | | | | E | |
| -12.5 | 9.0 | | | | | | | Ē | |
| | | | CLAYEY SAND (SC/SC-SM) with thir of silty clay and little amont of silt, 10- | n layers <n<20< td=""><td>71</td><td>SS-3 9.0</td><td>BLOWCOUNT 4-5-5-9</td><td>E</td></n<20<> | 71 | SS-3 9.0 | BLOWCOUNT 4-5-5-9 | E | |
| | | | N=4 @ 21' to 23', medium dense, ligh | nt | | 11.0 | N = 10 | | |
| | | 111 | yellowish brown, reddish brown and v | vnitisn | | | (SC-SM) | | |
| | | | | | | | | E | |
| | | | | | | | | E | |
| | | 1 | | | 75 | SS-4 11.0 | BLOWCOUNT 4-6-6-8 | E | |
| | | 111 | | | | 13.0 | N = 12 | E | |
| | | | | | | | (SC-SM) | E | |
| | | 111 | | | | | | E | |
| | | | | | | | | E | |
| | | | | | 50 | SS-5 13.0 | BLOWCOUNT 7-9-11-12 | E | |
| | | 111 | | | | 15.0 | N = 20 | F | |
| | | | | | | | (SC) | F | |
| | | | | | | | | F | |
| | | 111 | | | | | | <u> </u> | |
| | | | | | 83 | SS-6a SS-6b | BLOWCOUNT 5-6-8-15 | E | |
| | <i> </i> | | | | | 15.0 | N = 14 | F | |
| | | 111 | | | | 17.0 | (SC) | F- | |
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| | | 111 | | | | <u>L</u> | | F | |
| | | 111 | | | 63 | SS-7 | BLOWCOUNT | | |
| | <i></i> | | | | | 17.0 19.0 | 3-6-6-8 N = 12 | F | |
| | |] | | | | | (SC-SM) | <u> </u> | |
| | | | | | | | | F | |
| | <i> \ \ \ \ \ \ \ \ \ \ \ \ \ </i> | 111 | | | | | | F | |
| | |] | | | 46 | SS-8 | BLOWCOUNT | <u> </u> | |
| | | | | | | 19.0 21.0 | 4-4-5-4 N = 9 | F | |
| ENC FORM | <u> </u> | 111 | | | PROJECT | | (SC-SM) | <u> </u> | |
| ENG FORM MAR 71 | NG FORM 1836 PREVIOUS EDITIONS ARE OBSOLETE. MAR 71 | | | | | | in MRC | NO. DHC-2 | |



ELEVATION TOP OF HOLE **DRILLING LOG (Cont Sheet)** -3.5 Hole No. TTDHC-2 INSTALLATION SHEET 2 Lockheed Martin MRC 3 OF SHEETS BOX OR SAMPLE NO. f REMARKS CLASSIFICATION OF MATERIALS ELEVATION DEPTH LEGEND (Drilling time, water loss, depth weathering, etc., if significant) RECOV-ERY (Description) CLAYEY SAND (SC/SC-SM) with thin layers of silty clay and little amont of silt, 10<N<20, N=4 @ 21' to 23', medium dense, light yellowish brown, reddish brown and whitish gray (continued) **BLOWCOUNT** 58 SS-9 21.0 23.0 2-2-2-5 N = 4 (SC-SM) BLOWCOUNT 3-4-8-10 N = 12 (SC-SM) SS-10 23.0 67 25 28.0 <u>-31.5</u> CLAYEY SAND (SC) with little amuonts of silt, 31<N<48, dense, light reddish brown to brown SS-11 **BLOWCOUNT** 100 28.0 30.0 9-15-20-30 N = 35 30 SS-12a SS-12b 33.0 35.0 BLOWCOUNT 10-11-28-41 N = 39 Top 12" (SP-SM) Bottom 12" (SC) 100 35 BLOWCOUNT 10-13-18-26 100 SS-13 38.0 40.0 N = 31 (SC) 96 SS-14 **BLOWCOUNT** 43.0 45.0 22-21-27-31 N = 48

ENG FORM 1836-A

Lockheed Martin MRC



| DRILLING | G LOG (| (Cont S | heet) | ELEVATIO -3.5 | N TOP OF H | IOLE | | | | Hole No. | TTDH | C-2 | | |
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| PROJECT Lockheed | Martin I | MRC | | | | | INSTALLA | | | | OF | HEET 3 3 SHEETS | | |
| ELEVATION | DEPTH | LEGEND | | | ATION OF N | | 6 | % CORE RECOV- ERY | BOX OR SAMPLE NO. f | F (Drilling tim weathering | REMARKS ne, water los g, etc., if sig | ss, depth Inificant) | | |
| а | b | c | CLAYE | Y SAND (S | d SC) with litt light reddis | le amuoni | ts of silt, | е | f | | g | <u> </u> | \vdash | - |
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| | = | | | | | | | | | | | | E | |
| ENG FORM JUN 67 | 1836- | A | <u> </u> | | | | | PROJECT Lockhe | eed Marti | n MRC | | HOLE NO. TTDHC-2 | | - |



Hole No. TTDHC-3

| DRILLI | NG LOG | | ENT Lockheed Martin Corporation | PROJECT 194-8 | ΓNUMBER | | SHEET 1 OF 3 SHE | | |
|----------------------------|-----------------------------------|-----------------------|--|---|--------------------------|--------------------|---|-----------|--|
| 1. PROJECT | | | Lockileed Martin Corporation | | ING METHO | DD | Mud Rotary | E13 | |
| | Martin MRC | | | 11. DATU | | | HOWN (TBM or MSL) | | |
| 2. LOCATION (Middle Ri | Coordinates or St ver, MD N 60 | ation) 05.4 |) .05.3400 E 1,474,702.3400 | MSL 12. MANU | JEACTURES | R'S DESIGN | IATION OF DRILL | | |
| 3. DRILLING A | | | , , , : | | | | | | |
| UniTech 4. HOLE NO. (A | As shown on draw | ing ti | tle and | | L NO. OF SO LES TAKEN | | DISTURBED UNDISTURBED 15 1 | | |
| file number) | | | TTDHC-3 | 14. TOTA | L NUMBER | CORE BOX | | | |
| 5. NAME OF D C. Lopez | RILLER | | | 15. ELEVATION GROUND WATER | | | | | |
| 6. DIRECTION | | | | 16. DATE HOLE STARTED COMPLETED 9/30/2015 10/1/2015 | | | | | |
| | | | DEG. FROM VERT. | 17. ELEVATION TOP OF HOLE -7.1 | | | | | |
| | OF OVERBURDI | | | 18. TOTAL CORE RECOVERY FOR BORING | | | | | |
| 9. TOTAL DEP | LLED INTO ROCK | | 50.0 | 19. GEOL | .OGIST | R I | Lama Tamang | | |
| ELEVATION | | -ND | CLASSIFICATION OF MATERIAL | S | % CORE | BOX OR | REMARKS | | |
| a | DEPTH LEGI | | (Description) | | RECOV- ERY e | SAMPLE NO. f | (Drilling time, water loss, depth weathering, etc., if significant) g | | |
| -7.1 | 0.0 | | UNSAMPLED | | | ' | 9 | | |
| | | | | | | | | E | |
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| | | | | | | | | | |
| | | | | | | | | E | |
| -12.1 | 5.0 | | | | | | | - - 5 | |
| -12.1 | 5.0 | | CLAY (CL), WH <n<14, soft="" sti<="" td="" to="" very=""><td>iff, gray</td><td>0</td><td>SS-1</td><td>BLOWCOUNT</td><td></td></n<14,> | iff, gray | 0 | SS-1 | BLOWCOUNT | | |
| | | | | | | 5.0 7.0 | WH-WH-WH N = WH | E | |
| | | | | | | | (CL) | <u> </u> | |
| | | | | | | | | | |
| | | | | | | | | | |
| | | | | | 63 | SS-2 | BLOWCOUNT | | |
| | | | | | | 7.0 9.0 | 3-4-5-6 N = 9 | | |
| | | | | | | 0.0 | (CL) | _ | |
| | | | | | | | | | |
| | | | | | | | | | |
| | | | | | 83 | ST-1 | Shelby tube | | |
| | | | | | | 9.0 10.5 | (CL) | F | |
| | | | | | | | | 1 | |
| | | | | | | | | F | |
| | | | | | 58 | SS-3 10.5 | BLOWCOUNT 4-5-9-10 | F | |
| | | | | | | 12.5 | N = 14 | <u> </u> | |
| | | | | | | | (CL) | F | |
| | | | | | | | | <u> </u> | |
| -19.6 | 12.5 | | 011 774 0 44 17 17 27 27 27 27 | | | | | F | |
| | | | SILTY SAND (SC-SM) with some amount silt and clay, 15 <n<23, dense<="" medium="" td=""><td>ounts of e, brown.</td><td>58</td><td>SS-4 12.5</td><td>BLOWCOUNT 6-6-9-14</td><td>F</td></n<23,> | ounts of e, brown. | 58 | SS-4 12.5 | BLOWCOUNT 6-6-9-14 | F | |
| | | | reddish brown, and whitish gray | , | | 14.5 | N = 15 (SC-SM) | E | |
| | | | | | | | (55 5) | E | |
| | | | | | | | | | |
| | | | | | 63 | SS-5 | BLOWCOUNT | F | |
| | | | | | US | 14.5 | 26-11-12-11 | | |
| | | 1 | | | | 16.5 | N = 23 (SC-SM) | F | |
| | | | | | | | | E | |
| | | | | | | | | | |
| | | 11 | | | 92 | SS-6 | BLOWCOUNT | F | |
| | | | | | 32 | 16.5 | 6-8-11-15 | | |
| | | 11 | | | | 18.5 | N = 19 (SC-SM) | F | |
| | | | | | | | | E | |
| | | 11 | | | | | | | |
| | | | | | 67 | 00.7 | PLOWCOUNT | E | |
| | | $\ \cdot\ $ | | | 67 | SS-7 18.5 | BLOWCOUNT 6-7-10-10 | E | |
| | | | | | | 20.5 | N = 17 (SC-SM) | E | |
| | | | | | | | | E. | |
| ENG FORM | 1926 555 | VIC | IS EDITIONS ARE ORGOLETE | | PROJECT | 1 | HOLE NO. | 2 | |
| MAR 71 | 1836 PRE | VIOL | JS EDITIONS ARE OBSOLETE. | | Lockh | eed Mart | in MRC HOLE NO. | C-3 | |



| | G LOG (Cont S | 7.1 | II ATIO: | | Hole No. TTDHC | -3 | |
|--------------------|---------------|--|------------------------------|------------------------------|---|----|--|
| ROJECT Lockheed | d Martin MRC | INSTA | LLATION | | SHEET 2 OF 3 SHEET | | |
| ELEVATION a | DEPTH LEGEND | CLASSIFICATION OF MATERIALS (Description) d | % CORE RECOV- ERY e | BOX OR SAMPLE NO. f | REMARKS (Drilling time, water loss, weathering, etc., if signif | | |
| | | SILTY SAND (SC-SM) with some amounts of silt and clay, 15 <n<23, (continued)<="" and="" brown,="" browneddish="" dense,="" gray="" medium="" td="" whitish=""><td>f</td><td>SS-8 20.5 22.5</td><td>BLOWCOUNT 5-8-15-18 N = 23 (SC-SM)</td><td></td></n<23,> | f | SS-8 20.5 22.5 | BLOWCOUNT 5-8-15-18 N = 23 (SC-SM) | | |
| -29.6 | 22.5 | CILT CAND (CC CM) with some amounts of | 06 | 88.0 | DI OWCOLINT | | |
| | | SILT SAND (SC-SM) with some amounts of silt, 42 <n<52, 29.5'="" 31.5',="" @="" brown="" brown<="" colors="" dense="" dense,="" in="" mediul="" n="24" reddish="" td="" to="" varying="" very=""><td>n </td><td>SS-9 22.5 24.5</td><td>BLOWCOUNT 9-16-26-32 N = 42 (SC-SM)</td><td></td></n<52,> | n | SS-9 22.5 24.5 | BLOWCOUNT 9-16-26-32 N = 42 (SC-SM) | | |
| | | | 96 | SS-10 24.5 26.5 | BLOWCOUNT 13-22-30-39 N = 52 (SC-SM) | | |
| | | | | | | | |
| -38.1 | 31.0 | SILTY SAND (SM) with trace of clay, 28 <n<37, dense="" dense,="" light<br="" medium="" to="">reddish brown to reddish brown</n<37,> | 100 | SS-11 29.5 31.5 | BLOWCOUNT 14-20-32-36 N = 24 Top 21" (SC-SM) Bottom 3" (SM) | | |
| | | | 100 | SS-12 34.5 36.5 | BLOWCOUNT 11-15-22-36 N = 37 (SM) | | |
| | | | | | (JW) | | |
| | | | 100 | SS-13 39.5 | BLOWCOUNT 14-15-15-19 | | |
| | | | | 41.5 | N = 30 (SM) with trace of clay | | |
| | | | | | | | |
| | | | | | | | |

PROJECT Lockheed Martin MRC



| PROJECT | S LOG (Cont S | neet) -7.1 | INSTAL | LATION | | Hole No. TTDHC-3 | | | |
|----------|------------------|--|------------------------|-------------------------|------------------------------|---|----------------------------------|--|--|
| | Martin MRC | | | | | | OF 3 SHEETS | | |
| LEVATION | DEPTH LEGEND b c | CLASSIFICATION OF (Description | | % CORE RECOV- ERY | BOX OR SAMPLE NO. f | REMARK (Drilling time, water weathering, etc., if | S loss, depth significant) | | |
| а | b c - | SILTY SAND (SM) with trace | e of clay, | е | T | <u>g</u> | | | |
| | | SILTY SAND (SM) with trace 28 <n<37, brown="" brown<="" dense="" medium="" reddish="" td="" to=""><td>own <i>(continued)</i></td><td>100</td><td>SS-14</td><td>BLOWCOUNT</td><td></td></n<37,> | own <i>(continued)</i> | 100 | SS-14 | BLOWCOUNT | | | |
| | | | | | 44.5 46.5 | 10-12-16-19 N = 28 | | | |
| | | | | | | (SM) | | | |
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| | | | | 100 | SS-15 48.0 | BLOWCOUNT 8-12-18-26 N = 30 | | | |
| | | | | | 50.0 | N = 30 (SM) | | | |
| | | | | | | | | | |
| -57.1 | 50.0 | | | | | | | | |
| -57.1 | - | END OF BORING | | | | | | | |
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| IG FORM | 1836-A | I | | PROJECT | and Mart | 1 | HOLE NO. | | |

PROJECT Lockheed Martin MRC

TETRA TECH Hole No. TTDHC-4 CLIENT PROJECT NUMBER SHEET **DRILLING LOG Lockheed Martin Corporation** 194-8711 OF 3 SHEETS 1. PROJECT Mud Rotary 10. DRILLING METHOD Lockheed Martin MRC 11. DATUM FOR ELEVATION SHOWN (TBM or MSL) 2. LOCATION (Coordinates or Station)
Middle River, MD N 604,854.1300 E 1,473,871.3100 MSL 12. MANUFACTURER'S DESIGNATION OF DRILL 3. DRILLING AGENCY UniTech 13. TOTAL NO. OF SOIL SAMPLES TAKEN DISTURBED UNDISTURBED 4. HOLE NO. (As shown on drawing title and file number) TTDHC-4 14. TOTAL NUMBER CORE BOXES 5. NAME OF DRILLER 15. ELEVATION GROUND WATER C. Lopez COMPLETED STARTED 6. DIRECTION OF HOLE 16. DATE HOLE 10/5/2015 10/5/2015 ☐ INCLINED DEG. FROM VERT. 17. ELEVATION TOP OF HOLE -11.8 7. THICKNESS OF OVERBURDEN 18. TOTAL CORE RECOVERY FOR BORING 8. DEPTH DRILLED INTO ROCK 19. GEOLOGIST R. Lama Tamang
OR REMARKS
PLE (Drilling time, water loss, depth 9. TOTAL DEPTH OF HOLE 50.0 CLASSIFICATION OF MATERIALS ELEVATION DEPTH LEGEND

| ELEVATION | DEPTH | LEGEND | CLASSIFICATION OF MATERIALS (Description) | RECOV- ERY | SAMPLE NO. f | (Drilling time, water loss, depth weathering, etc., if significant) | |
|-----------|------------------|---|--|---------------|--------------------|--|----------|
| -11.8 | 0.0 _ | С | d UNSAMPLED | е | f | g | +- |
| 11.0 | 5.5 _ | 1 | ONOMIVII ELD | | | | F |
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| | _ | | | | | | F |
| -16.8 | 5.0 | | | 07 | 00.4 | DI OMOGUNIT | 5 |
| | _ | | SANDY CLAY (CLS) with varying amounts of sand and occasional clay layers, 15 <n<34,< td=""><td>67</td><td>SS-1 5.0</td><td>BLOWCOUNT 4-8-9-12</td><td></td></n<34,<> | 67 | SS-1 5.0 | BLOWCOUNT 4-8-9-12 | |
| | _ | | very stiff to hard, light brown and yellowish | | 7.0 | N = 17 | |
| | | | brown | | | (CLS) | |
| | | | | | | | \vdash |
| | = | V////// | | | | | F |
| | | | | 100 | ST-1 | Shelby tube | |
| | | | | | 7.0 8.5 | PP = 2.5 tsf (CL) | F |
| | | | | | | , , | |
| | | | | | | | E |
| | _ | | | 58 | SS-2 | BLOWCOUNT | E |
| | | | | | 8.5 10.5 | 4-10-13-15 N = 23, PP = 0.5-2.0 tsf | |
| | _ | | | | | (CL) | F |
| | _ | | | | | | F 1 |
| | | | | | | | |
| | _ | | | 63 | SS-3 | BLOWCOUNT | |
| | | | | | 10.5 | 1-5-10-11 | |
| | | | | | 12.5 | N = 15 (CLS) | E |
| | _ | | | | | (==) | E |
| | | | | | | | |
| | _ | | | | | | F |
| | _ | | | 100 | SS-4 12.5 | BLOWCOUNT 8-15-19-29 | F |
| | | | | | 14.5 | N = 34, PP = 0.75-4.5 tsf | |
| | _ | | | | | Top & Bottom 7" (CLS) Middle 10" (SM) | |
| | | | | | | , , | |
| -26.3 | 14.5 | | | | | | E |
| _0.0 | - 1.0 | | CLAY (CL) with trace of sand, 44 <n<69,< td=""><td>100</td><td>SS-5</td><td>BLOWCOUNT</td><td>E</td></n<69,<> | 100 | SS-5 | BLOWCOUNT | E |
| | | | N=81/8" @ 18.5' to 20.5', hard, brown to reddish brown | | 14.5 16.5 | 12-16-28-42 N = 44, PP = 0.75-4.5 tsf | <u> </u> |
| | | | reducti stemi | | 10.0 | (CL) | F |
| | | | | | | | F |
| | | | | | | | |
| | | (///// | | 100 | SS-6 | BLOWCOUNT | F |
| | | | | 100 | 16.5 | 13-21-48-49 | E |
| | | | | | 18.5 | N = 69, PP = 3.0-4.5 tsf (CL) | E |
| | = | <i>\\\\\\</i> | | | | | F |
| | | | | | | | F |
| | | | | | | | F |
| | | \ //////////////////////////////////// | | 58 | SS-7 | BLOWCOUNT | F |
| | | | | | 18.5 20.5 | 18-31-50/2"-x N = 81/8", PP = 2.5-4.5 tsf | |
| | _ | | | | | (CL) | E |
| | | | | | | | |
| NG FORM | 1836 | PREVIOL | JS EDITIONS ARE OBSOLETE. | PROJECT | and Maret | HOLE NO. | |
| MAR 71 | | | | LOCKNE | eed Mart | in MRC TTDHC- | 4 |



ELEVATION TOP OF HOLE DRILLING LOG (Cont Sheet) -11.8 Hole No. TTDHC-4 PROJECT INSTALLATION SHEET 2 Lockheed Martin MRC 3 OF SHEETS REMARKS CLASSIFICATION OF MATERIALS ELEVATION DEPTH LEGEND SAMPLE NO. f (Drilling time, water loss, depth weathering, etc., if significant) RECOV-ERY (Description) а d -32.3 20.5 SS-8 20.5 22.5 SANDY SILT (MLS), 29<N<36, very stiff to **BLOWCOUNT** 14-15-21-38 N = 36 hard, brown to reddish brown (MLS) SS-9 22.5 24.5 BLOWCOUNT 100 13-12-17-24 N = 29, PP = 1.0-3.5 tsf (MLS) SS-10 24.5 26.5 BLOWCOUNT 9-18-13-28 N = 31 100 25 (MLS) 28.0 -39.8 CLAYEY SAND (SC-SM) with varying amounts of silt and clay, 32<N<51, N=51/6" @ 39.5' to 41.5', N=89/10" @ 44.5' to 46.5' dense to very dense, varying colors in brown, reddish brown and dark brown BLOWCOUNT 100 SS-11 29.5 31.5 18-16-16-15 N = 32 30 SS-12 34.5 36.5 BLOWCOUNT 12-14-37-31 N = 51 100 35 (SC-SM) BLOWCOUNT 29-51/6"-x-x N = 51/6", PP > 4.5 tsf (SC) SS-13 39.5 41.5 50

ENG FORM 1836-A PROJECT Lockheed Martin MRC TTDHC-4



| MISTALLATION SITEST 3 | DRILLING | G LOG (| (Cont S | heet) | -11.8 | | | | Hole No. TTDHC-4 | |
|--|-----------|------------|---------|-------------------|---|-------------------|-------|-------------------------|---|----|
| Section Depth Listing Chercipions Section Se | | l Martin I | MRC | | | INSTALLA | ATION | | SHEET 3 OF 3 SHEETS | |
| CLAYET SAND (30 S.S.M) with varying Clayer (30 s.S.M) with varying G.S.M. Clayer (30 s.M. Cl | ELEVATION | DEPTH | LEGEND | | (Description) | _S | ERY | BOX OR SAMPLE NO. | REMARKS (Drilling time, water loss, depth weathering, etc., if significant) | |
| 48.0 (27-38-20-24 | a | | c | @ 39.5 dense t | Y SAND (SC-SM) with varying ts of silt and clay, 32 <n<51, n<br="">of to 41.5', N=89/10" @ 44.5' to to very dense, varying colors in</n<51,> | 46.5' n brown, | | SS-14 44.5 | BLOWCOUNT 15-39-50/4"-x N = 89/10", PP > 4.5 tsf | 4! |
| | -61.8 | 50.0 | | | | | 100 | 48.0 | 27-18-20-24 N = 38, PP > 4.5 tsf | |
| | -01.8 | | | ENDO | F BORING | | | | | |

Lockheed Martin MRC

TTDHC-4



Hole No. TTDHC-5

| DRILLI | | ENT ockheed Martin Corporation | PROJECT NUMBER SHEET 1 194-8711 OF 3 SHEETS | | | | | | | | |
|-------------------------------|---------------------------------------|-----------------------------------|---|---|---|---|--------------------|--------------------------------------|---------------------|----------|--|
| 1. PROJECT | | <u> </u> | | Sourious Martin Corporation | 10. DRILLING METHOD Mud Rotary | | | | | | |
| 2. LOCATION | d Martin M (Coordinates | or Statio | on) |) | 11. DATUM FOR ELEVATION SHOWN (TBM or MSL) MSL | | | | | | |
| Middle Ri | ver, MD | N 604 | ·,6 | 66.6700 E 1,473,652.0100 | | JFACTUREF | R'S DESIGN | ATION OF DRILL | | \dashv | |
| UniTech | | | | | 13. TOTAL NO. OF SOIL DISTURBED UNDISTURBED | | | | | | |
| 4. HOLE NO. (file number) | As shown on | drawing | g tit | tle and TTDHC-5 | | SAMPLES TAKEN 15 0 14. TOTAL NUMBER CORE BOXES | | | | | |
| 5. NAME OF D | | | | | | ATION GRO | | | | | |
| C. Lopez 6. DIRECTION | | | | | 16. DATE | | | ARTED C | OMPLETED | | |
| ∨ERTIC | AL | INCLINE | ΞD | DEG. FROM VERT. | | ATION TOP | OE HOLE | 10/6/2015 | 10/6/2015 | | |
| 7. THICKNESS | | | | | | L CORE RE | | | | % | |
| 8. DEPTH DRI | | | | 50.0 | 19. GEOL | OGIST | Б.1 | T | | | |
| 9. TOTAL DEP | | | _ | CLASSIFICATION OF MATERIAL | .S | % CORE | BOX OR | _ama Tamang REM/ | | | |
| ELEVATION | DEPTH b | LEGEN c | ן ט | (Description) d | | RECOV- ERY | SAMPLE NO. f | (Drilling time, w weathering, etc | c., if significant) | | |
| -12.8 | 0.0 | C | | UNSAMPLED | | е | <u> </u> | <u> </u> | <u> </u> | 丰 | |
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| | | | | | | | | | | E | |
| -17.8 | 5.0 | //// | J. 1 | | | | | | | E | |
| | | | | SILTY SAND (SM), CLAYEY SAND (SANDY SILT (MLS), 27 <n<34, mediu<="" td=""><td>SC) and um</td><td>63</td><td>SS-1 5.0</td><td>BLOWCOUNT 6-16-15-16</td><td></td><td>E</td></n<34,> | SC) and um | 63 | SS-1 5.0 | BLOWCOUNT 6-16-15-16 | | E | |
| | | | | dense to dense, varying colors in light to yellowish brown | t brown | | 7.0 | N = 31, PP = 3.5 tsf (SM) | | F | |
| | | | | to yellowish brown | | | | (SIVI) | | F | |
| | | | | | | | | | | F | |
| | | | | | | 100 | 66.0 | BLOWCOUNT | | F | |
| | | | | | | 100 | SS-2 7.0 | 9-13-19-19 | | F | |
| | | | | | | | 9.0 | N = 32 (MLS) | | F | |
| | | | | | | | | | | F | |
| | 7 | | | | | | | | | F | |
| | | | | | | 88 | SS-3 | BLOWCOUNT | | E | |
| | | | | | | | 9.0 11.0 | 8-12-15-18 N = 27 | | E | |
| | | | | | | | 11.0 | (SM) | | E | |
| | | | | | | | | | | F | |
| | | | | | | | | | | F | |
| | | | | | | 96 | SS-4 | BLOWCOUNT | | F | |
| | | | | | | | 11.0 13.0 | 4-14-20-26 N = 34 | | F | |
| | | | | | | | | (SC-SM) | | F | |
| | | | | | | | | | | E | |
| -25.8 | 13.0 | <u>/////</u> | | | | | | | | E | |
| | | | | SANDY SILT (MLS), 36 <n<49, brown<="" gray="" hard,="" light="" td="" to=""><td>whitish</td><td>100</td><td>SS-5 13.0</td><td>BLOWCOUNT 16-25-22-26</td><td></td><td>上</td></n<49,> | whitish | 100 | SS-5 13.0 | BLOWCOUNT 16-25-22-26 | | 上 | |
| | ===================================== | | | | | | 15.0 | N = 47 (MLS) | | F | |
| | | | | | | | | (WLO) | | F | |
| | ===================================== | | | | | | | | | F | |
| | | | | | | 100 | SS-6 | BLOWCOUNT | | F | |
| | 7 | | | | | 100 | 15.0 | 10-17-19-22 | | F | |
| | | | | | | | 17.0 | N = 36 (MLS) | | E | |
| | | | | | | | | | | E | |
| | | | | | | | | | | E | |
| | | | | | | 100 | SS-7 | BLOWCOUNT | | F | |
| | | | | | | | 17.0 19.0 | 12-21-28-36 N = 49, PP > 4.5 tsf | | E | |
| | | | | | | | .5.5 | (CL=ML) with sand | | E | |
| | ===================================== | | | | | | | | | F | |
| -31.8 | 19.0 | | | | | | | | | F | |
| 01.0 | 13.5 | | П | CLAYEY SAND (SC-SM) with varying | J | 100 | SS-8 | BLOWCOUNT | | F | |
| | 7 | | | amounts of silt, 17 <n<29, (25',="" dense="" dense,="" medium="" n='66/11"' red<="" td="" to="" very=""><td>ي عن ۵ Idish</td><td></td><td>19.0 21.0</td><td>3-7-22-25 N = 29, PP > 4.5 tsf</td><td></td><td>F</td></n<29,> | ي عن ۵ Idish | | 19.0 21.0 | 3-7-22-25 N = 29, PP > 4.5 tsf | | F | |
| | ı → | /// | | brown and brownish red | | 1 | | (SC-SM) | | | |



| Continue Martin MRC Classification De Matienhals Clas | ROJECT | S LOG (Cont S | -12.8 INSTALI | ATION | | HC-5 SHEET 2 | |
|--|--------|---------------|---|---------------|--------------------|--------------------------|-----------------------------|
| D CLAYEY SAND (SC. SM) with varying amounts of all. 17-8x-20, N=0011* (Sp. 21 to 20 to | | | CLASSIFICATION OF MATERIALS | % CORE | BOX OR | | OF 3 SHEETS |
| CANYER SAND (3C SM) with varying amounts of sill. T-level 20, 150 (3C SM) SS-9 SLOWCOUNT S1-15-16 S1-16 S1-15-16 S1-15-16 S1-15-16 S1-15-16 S1-15-16 S1-15 | | | (Description) | RECOV- ERY | SAMPLE NO. f | weathering, etc., if s | loss, depth significant) |
| 100 SS-11 BLOWCOUNT SS-13 BLOWCOUNT SS-13 SS-34 | u | | CLAYEY SAND (SC-SM) with varying | | | 9 | |
| 100 SS-10 SLOWCOUNT 71 SS-10 SLOWCOUNT 100 SS-11 SLOWCOUNT 100 SS-11 SLOWCOUNT 100 SS-11 SLOWCOUNT 100 SS-11 SLOWCOUNT 100 SS-12 SLOWCOUNT 100 SS-13 SLOWCOUNT 100 SS-13 SLOWCOUNT 100 SS-14 SLOWCOUNT 100 SS-15 SLOWCOUNT 100 SS-16 SLOWCOUNT 100 SS-17 SLOWCOUNT 100 SS-18 SLOWCOUNT | | | 25', medium dense to very dense, reddish brown and brownish red (continued) | | | | |
| 23.0 N = 28, FP = 1.5 lsf (SC-SM) 71 | | | (| 100 | SS-9 | BLOWCOUNT | |
| 71 SS-10 BLOWCOUNT 6-15-515-3 (S-15-3) N-2 (| | | | | 23.0 | N = 29, PP = 1.5 tsf | |
| 23.0 & 1.55.15* × N = 66.11* (SC SM) 100 SS-11 BLOWCOUNT 17.7-10-10 SS-13 SS-13 SC SM) 100 SS-13 BLOWCOUNT (SC SM) 100 SS-13 BLOWCOUNT (SC SM) 100 SS-14 BLOWCOUNT 18.1 SS-13 SS-13 SS-13 SS-13 SC SM) | | | | | | (30-311) | |
| 23.0 & 1.55.15* × N = 66.11* (SC SM) 100 SS-11 BLOWCOUNT 17.7-10-10 SS-13 SS-13 SC SM) 100 SS-13 BLOWCOUNT (SC SM) 100 SS-13 BLOWCOUNT (SC SM) 100 SS-14 BLOWCOUNT 18.1 SS-13 SS-13 SS-13 SS-13 SC SM) | | | | | | | |
| 100 SS-12 BLOWCOUNT (SC-SM) | | | | 71 | SS-10 | BLOWCOUNT | |
| 100 SS-11 BLOWCOUNT (0-12-15-23 N = 27 (SC-SM)) 100 SS-12 SS-13 (SC-SM) 100 SS-13 | | | | | 23.0 25.0 | N = 66/11" | |
| 28.0 10-12-15-23 N = 27 (SC-SM) 100 SS-12 SLOWCOUNT 77-10-19 N = 17, PP = 1.0-1.5 tef (SC-SM) 100 SS-13 SLOWCOUNT N = 17, PP = 1.0-1.5 tef (SC-SM) 100 SS-14 SC-SM) SC-SM) 100 SS-14 SC-SM) SC-SM) | | | | | | (SC-SM) | |
| 28.0 10-12-15-23 N = 27 (SC-SM) 100 SS-12 SLOWCOUNT 77-10-19 N = 17, PP = 1.0-1.5 tef (SC-SM) 100 SS-13 SLOWCOUNT N = 17, PP = 1.0-1.5 tef (SC-SM) 100 SS-14 SC-SM) SC-SM) 100 SS-14 SC-SM) SC-SM) | | | | | | | |
| 100 SS-12 BLOWCOUNT 77-10-19 (SC-SM) 100 SS-12 (SC-SM) 100 SS-13 BLOWCOUNT 77-10-19 (SC-SM) 100 SS-13 BLOWCOUNT 79-12-21 (SC-SM) 100 SS-14 BLOWCOUNT 79-12-21 (SC-SM) | | | | | | | |
| 100 SS-12 BLOWCOUNT 77-10-19 (SC-SM) 100 SS-12 (SC-SM) 100 SS-13 BLOWCOUNT 77-10-19 (SC-SM) 100 SS-13 BLOWCOUNT 77-12-11 (SC-SM) | | | | | | | |
| 100 SS-12 BLOWCOUNT 77-10-19 (SC-SM) 100 SS-12 (SC-SM) 100 SS-13 BLOWCOUNT 77-10-19 (SC-SM) 100 SS-13 BLOWCOUNT 79-12-21 (SC-SM) 100 SS-14 BLOWCOUNT 79-12-21 (SC-SM) | | | | | | | |
| 100 SS-12 BLOWCOUNT 77-10-19 (SC-SM) 100 SS-12 (SC-SM) 100 SS-13 BLOWCOUNT 77-10-19 (SC-SM) 100 SS-13 BLOWCOUNT 77-12-11 (SC-SM) | | 3// | | | | | |
| 28.0 10-12-15-23 N = 27 (SC-SM) 100 SS-12 SLOWCOUNT 77-10-19 N = 17, PP = 1.0-1.5 tef (SC-SM) 100 SS-13 SLOWCOUNT N = 17, PP = 1.0-1.5 tef (SC-SM) 100 SS-14 SC-SM) SC-SM) 100 SS-14 SC-SM) SC-SM) | | | | | | | |
| 28.0 10-12-15-23 N = 27 (SC-SM) 100 SS-12 SLOWCOUNT 77-10-19 N = 17, PP = 1.0-1.5 lsf 100 SS-13 SLOWCOUNT N = 17, PP = 1.0-1.5 lsf 100 SS-14 SLOWCOUNT N = 21 100 SS-15 | | | | | | | |
| 100 SS-12 BLOWCOUNT 77-10-19 (SC-SM) 100 SS-12 (SC-SM) 100 SS-13 BLOWCOUNT 77-10-19 (SC-SM) 100 SS-13 BLOWCOUNT 79-12-21 (SC-SM) 100 SS-14 BLOWCOUNT 79-12-21 (SC-SM) | | | | 100 | 00 11 | BLOWCOUNT | |
| 100 SS-12 BLOWCOUNT 77-10-19 SS-13 SLOWCOUNT 78-17.PP = 1.0-1.5 tsf (SC-SM) 100 SS-13 BLOWCOUNT 78-12-21 (SC-SM) 100 SS-14 BLOWCOUNT 78-12-21 (SC-SM) | | | | 100 | 28.0 | 10-12-15-23 N = 27 | |
| 33.0 7-7-10-19 N=17.PP = 1.0-1.5 tsf (SC-SM) 100 SS-13 38.0 7-9-12-21 N=21 (SC-SM) 100 SS-14 43.0 8-9-12-14 N=21 N=21 N=21 N=21 N=21 N=21 N=21 N=21 | | | | | 30.0 | (SC-SM) | |
| 33.0 7-7-10P 1.0-1.5 tsf (SC-SM) 100 SS-13 38.0 7-9-12-21 7-9-12-21 (SC-SM) 100 SS-14 40.0 SS-14 43.0 43.0 8-9-12-14 8-9 | | | | | | | |
| 33.0 7.7-10-19 N=17.PP = 1.0-1.5 tsf (SC-SM) 100 SS-13 38.0 40.0 SS-14 (SC-SM) 100 SS-14 43.0 8-9-12-14 N=2-1 | | | | | | | |
| 33.0 7-7-10-19 N=17.PP = 1.0-1.5 tsf (SC-SM) 100 SS-13 38.0 7-9-12-21 N=21 (SC-SM) 100 SS-14 40.0 SS-14 8-9-12-14 N=21 N=21 N=21 N=21 N=21 N=21 N=21 N=21 | | | | | | | |
| 100 SS-13 38.0 (SC-SM) 100 SS-13 38.0 7-7-19-19 N = 1.0-1.5 tsf (SC-SM) 100 SS-13 (SC-SM) 100 SS-14 (SC-SM) 100 SS-14 43.0 8-9-12-14 N N = 21 | | | | | | | |
| 100 SS-13 38.0 (SC-SM) 100 SS-13 38.0 7-7-19-19 N = 1.0-1.5 tsf (SC-SM) 100 SS-13 (SC-SM) 100 SS-14 (SC-SM) 100 SS-14 43.0 8-9-12-14 N N = 21 | | | | | | | |
| 100 SS-13 38.0 (SC-SM) 100 SS-13 38.0 7-7-19-19 N = 1.0-1.5 tsf (SC-SM) 100 SS-13 (SC-SM) 100 SS-14 (SC-SM) 100 SS-14 43.0 8-9-12-14 N N = 21 | | | | | | | |
| 33.0 7-7-10-19 N=17.PP = 1.0-1.5 tsf (SC-SM) 100 SS-13 38.0 7-9-12-21 N=10 N=10 N=10 N=10 N=10 N=10 N=10 N=1 | | | | | | | |
| 33.0 7-7-10-19 N=17.PP = 1.0-1.5 tsf (SC-SM) 100 SS-13 38.0 7-9-12-21 N=21 (SC-SM) 100 SS-14 40.0 SS-14 (SC-SM) | | 4/1 | | | | | |
| 100 SS-13 BLOWCOUNT 7-9-12-21 (SC-SM) 100 SS-14 43.0 8-12-14 100 SS-14 N-21 (SC-SM) | | | | 100 | 33.0 | 7-7-10-19 | |
| 100 SS-13 BLOWCOUNT 7-9-12-21 N = 21 (SC-SM) 100 SS-14 43.0 8-9-12-14 8-9-12-14 | | | | | 35.0 | N = 17, PP = 1.0-1.5 tsf | |
| 38.0 40.0 7-9-12-21 N = 21 (SC-SM) 100 SS-14 43.0 8-9-12-14 N = 21 | | | | | | , | |
| 38.0 40.0 7-9-12-21 N = 21 (SC-SM) 100 SS-14 43.0 8-9-12-14 N = 21 | | | | | | | |
| 38.0 40.0 7-9-12-21 N = 21 (SC-SM) 100 SS-14 43.0 8-9-12-14 N = 21 | | | | | | 1 | |
| 38.0 40.0 7-9-12-21 N = 21 (SC-SM) 100 SS-14 43.0 8-9-12-14 N = 21 | | | | | | | |
| 38.0 40.0 7-9-12-21 N = 21 (SC-SM) 100 SS-14 43.0 8-9-12-14 N = 21 | | | | | | | |
| 38.0 40.0 7-9-12-21 N = 21 (SC-SM) 100 SS-14 43.0 8-9-12-14 N = 21 | | | | | | | |
| 38.0 40.0 7-9-12-21 N = 21 (SC-SM) 100 SS-14 43.0 8-9-12-14 N = 21 | | | | | | | |
| 38.0 40.0 7-9-12-21 N = 21 (SC-SM) 100 SS-14 43.0 8-9-12-14 N = 21 | | | | | | | |
| 100 SS-14 43.0 BLOWCOUNT 43.0 8-9-12-14 N = 21 | | | | 100 | SS-13 | BLOWCOUNT | |
| 100 SS-14 43.0 45.0 BLOWCOUNT 8-9-12-14 N = 21 | | | | | 38.0 40.0 | N = 21 | |
| 43.0 8-9-12-14 45.0 N = 21 | | | | | | (SC-SM) | |
| 43.0 8-9-12-14 45.0 N = 21 | | | | | | | |
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| 43.0 8-9-12-14 45.0 N = 21 | | 4/ | | | | | |
| 43.0 8-9-12-14 45.0 N = 21 | | | | | | | |
| 45.0 N = 21 | | | | 100 | 43.0 | 8-9-12-14 | |
| G FORM 1926 A PROJECT HOLE NO. | | | | | 45.0 | | HOLE NO. |

PROJECT Lockheed Martin MRC



| | G LOG (Cont S | sheet) ELEVATION TOP OF HOLE -12.8 | | | Hole No. TTDHC-5 | |
|---------------------|---------------|--|--------------|------------------------------|---|---|
| PROJECT Lockheed | I Martin MRC | | INSTALLATION | | SHEET 3 OF 3 SHEETS | |
| ELEVATION | DEPTH LEGEND | CLASSIFICATION OF MATERIALS (Description) d | ERY | BOX OR SAMPLE NO. f | REMARKS (Drilling time, water loss, depth weathering, etc., if significant) | |
| a | b c | CLAYEY SAND (SC-SM) with varying amounts of silt, 17 <n<29, (continued)<="" 25',="" @="" and="" brown="" brownish="" dense="" dense,="" medium="" n='66/11"' red="" td="" to="" very=""><td>e 23' to</td><td>Ť</td><td>g -</td><td></td></n<29,> | e 23' to | Ť | g - | |
| | | | 100 | SS-15 48.0 | BLOWCOUNT 7-8-11-17 | |
| -62.8 | 50.0 | | | 50.0 | N = 19 (SC-SM) | |
| | | END OF BORING | | | | |
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PROJECT Lockheed Martin MRC

TETRA TECH Hole No. TTDHC-6 PROJECT NUMBER SHEET 3 OF SHEETS Mud Rotary

DRILLING LOG Lockheed Martin Corporation 194-8711 1. PROJECT 10. DRILLING METHOD Lockheed Martin MRC 11. DATUM FOR ELEVATION SHOWN (TBM or MSL) 2. LOCATION (Coordinates or Station)
Middle River, MD N 604,446.2700 E 1,473,611.3000 MSL 12. MANUFACTURER'S DESIGNATION OF DRILL 3. DRILLING AGENCY UniTech 13. TOTAL NO. OF SOIL SAMPLES TAKEN DISTURBED UNDISTURBED HOLE NO. (As shown on drawing title and file number) TTDHC-6 14. TOTAL NUMBER CORE BOXES 5 NAME OF DRILLER 15. ELEVATION GROUND WATER C. Lopez COMPLETED STARTED 6. DIRECTION OF HOLE 16. DATE HOLE 10/5/2015 10/5/2015 ☐ INCLINED DEG. FROM VERT 17. ELEVATION TOP OF HOLE -8.5 7. THICKNESS OF OVERBURDEN 18. TOTAL CORE RECOVERY FOR BORING 8. DEPTH DRILLED INTO ROCK 19. GEOLOGIST R. Lama Tamang

COR REMARKS

MPLE (Drilling time, water loss, depth
O. weathering, etc., if significant)

g 9. TOTAL DEPTH OF HOLE 50.0 BOX OR SAMPLE NO. % CORE CLASSIFICATION OF MATERIALS **ELEVATION** DEPTH LEGEND RECOV-ERY (Description) d -8.5 0.0 UNSAMPLED -13.5 5.0 SILTY CLAY (CL-ML), 8<N<15, stiff, reddish **BLOWCOUNT** SS-1 3-5-10-9 N = 15, PP = 2.6-3.5 tsf 5.0 7.0 brown and brownish red (CL) with organics SS-2 7.0 83 **BLOWCOUNT** 3-3-5-9 N = 8, PP = 1.2-2.0 tsf (CL-ML) with sand 9.0 79 SS-3 **BLOWCOUNT** 6-6-8-11 N = 14, PP = 1.5-2.0 tsf 9.0 11.0 (CL-ML) -19.5 11.0 CLAY (CL) interbedded with varying amonts of silt, 26<N<35, N=15 @ 17' to 19' stiff to hard, brown to reddish brown SS-4 BLOWCOUNT 71 11.0 6-11-15-17 N = 26, PP = 2.5-3.0 tsf 13.0 (CL) 96 ST-1 Shelby tube 13.0 (CL) 15 **BLOWCOUNT** 96 SS-5 15.0 17.0 9-11-24-29 N = 35, PP > 4.5 tsf (CL) SS-6 17.0 BLOWCOUNT 3-5-10-13 N = 15 100 19.0 Top 20" (CL) Bottom 4" (CL-ML) **BLOWCOUNT** 100 SS-7 19.0 21.0 13-16-19-20 N = 35, PP > 4.5 tsf 20 HOLE NO. TTDHC-6

Lockheed Martin MRC

CLIENT



| DRILLING | G LOG (Cont S | heet) ELEVATION TOP OF HOLE -8.5 | | | | Hole No. TT | DHC-6 |
|-----------|---------------|---|-----------|-------------------------|------------------|---|---------------------|
| PROJECT | I Martin MRC | | INSTALLA | TION | | | SHEET 2 OF 3 SHEETS |
| ELEVATION | DEPTH LEGEND | CLASSIFICATION OF MATERIAL | _S | % CORE RECOV- ERY | BOX OR SAMPLE | REMAF (Drilling time, wat weathering, etc., | RKS |
| а | b c | (Description) d | ament- | ERY e | NO. f | weathering, etc., | if significant) |
| | | CLAY (CL) interbedded with varying a of silt, 26 <n<35, (continu<="" 17'="" 19'="" @="" brown="" hard,="" n="15" reddish="" sill="" td="" to=""><td>tiff to</td><td></td><td></td><td></td><td></td></n<35,> | tiff to | | | | |
| -29.5 | 21.0 | CLAYEY SAND (SC-SM) with varying | | 100 | SS-8 | BLOWCOUNT | |
| | | amounts of silt, 30 <n<34, brown="" de="" dense,="" gray<="" light="" medium="" td="" to="" whitish=""><td>ense to</td><td>100</td><td>21.0 23.0</td><td>10-14-16-21 N = 30, PP = 4.0 tsf</td><td></td></n<34,> | ense to | 100 | 21.0 23.0 | 10-14-16-21 N = 30, PP = 4.0 tsf | |
| | | donos, light oromi to million gray | | | 20.0 | (SC-SM) | |
| | | | | | | | |
| | | | - | 100 | SS-9 | BLOWCOUNT | |
| | | | | | 23.0 25.0 | 9-18-22-25 N = 30, PP = 3.0 tsf | |
| | | | | | | (SC-SM) | |
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| | | | | 100 | SS-10 28.0 | BLOWCOUNT 16-16-18-20 | |
| | | | | | 30.0 | N = 34, PP = 3.0 tsf (SC-SM) | |
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| -41.0 | 32.5 | CANDY OF AV (OF O) with a series a series | | | | | |
| | | SANDY CLAY (CLS) with varying ame silt, 16 <n<32, hard,="" stiff="" to="" varying<br="" very="">in reddish brown to brown</n<32,> | ng colors | 100 | SS-11 | BLOWCOUNT | |
| | | in reducin brown to brown | | 100 | 33.0 35.0 | 10-11-11-17 N = 22, PP = 0.5 tsf | |
| | | | | | | Top 12" (SC-SM) Bottom 12" (CLS) | |
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| | | | | 100 | SS-12 38.0 | BLOWCOUNT 7-8-8-11 | |
| | | | | | 40.0 | N = 16 (CLS) | |
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| | | | - | 100 | SS-13 | BLOWCOUNT | |
| | | | | 100 | 43.0 45.0 | 8-9-8-14 N = 17 | |
| G FORM | \/////// | | | PROJECT | | (CLS) | HOLE NO. |

Lockheed Martin MRC



| DRILLING | LOG | (Cont S | heet) | -8.5 | ION TOP O | F HOLE | | | | Hole No. TTI | OHC-6 | |
|---------------------|-------------|-------------|----------------------|----------------------------------|----------------------------|--|----------------|-------------------------|------------------------------|---|---------------------|----------|
| PROJECT Lockheed | l Martin I | MRC | | - | | | INSTALL | | | | SHEET 3 OF 3 SHEETS | |
| ELEVATION | DEPTH | LEGEND | | CLASSIF | ICATION C | F MATERIAL | .S | % CORE RECOV- ERY | BOX OR SAMPLE NO. f | REMARI (Drilling time, wate weathering, etc., i | ŔS | |
| а | b | c | SAND | CLAY (| d | | ounts of | e | f f | g | - Significant) | _ |
| | _ | | silt, 16- in redd | <n<32, v<br="">ish browi</n<32,> | ery stiff to n to brown | varying ame hard, varyir (continued) | ng colors) | | | | | E |
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| | | | | | | | | | | | | E |
| | _ | | | | | | | 100 | SS-14 48.0 | BLOWCOUNT 11-16-16-26 | | F |
| | | | | | | | | | 50.0 | N = 32 (CLS) | | E |
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| -58.5 | 50.0 | | FND C | F BORIN | IG. | | | | | | | <u> </u> |
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| ENG FORM JUN 67 | 1836- | ·A | ı | | | | | PROJECT Lockhe | eed Mart | in MRC | HOLE NO. TTDHC-6 | _ |



Hole No. TTDHC-7

| DRILLI | NG LOG | | Lockheed Martin Corporation | 1 | 8711 | | | OF 3 SHEETS | |
|-------------------------------|---------------------------------|---------|--|--|----------------------|------------------|----------------------------|-----------------|--|
| 1. PROJECT | Mortin MDC | | · | 10. DRILLING METHOD Mud Rotary 11. DATUM FOR ELEVATION SHOWN (TBM or MSL) | | | | | |
| 2. LOCATION | Martin MRC (Coordinates or S | tation |) | 11. DAT | | VATION SH | HOWN (TBM or MSL) | | |
| Middle Ri 3. DRILLING A | ver, MD N 6 | 04,2 | 244.3000 E 1,473,385.8200 | | | 'S DESIGN | IATION OF DRILL | | |
| UniTech | | | | 13. TOTA | AL NO. OF SO | OIL | | UNDISTURBED | |
| 4. HOLE NO. (file number) | As shown on drav | ving ti | itle and TTDHC-7 | | IPLES TAKEN | | 14 | 2 | |
| 5. NAME OF D | RILLER | | | _ | AL NUMBER VATION GRO | | | | |
| C. Lopez 6. DIRECTION | OF HOLE | | | 16. DATE HOLE STARTED COMPLETED 10/8/2015 10/8/2015 | | | | | |
| | AL INCL | INED | DEG. FROM VERT. | 17. ELEVATION TOP OF HOLE -5.8 | | | | | |
| | OF OVERBURD | | | 18. TOTAL CORE RECOVERY FOR BORING | | | | | |
| 9. TOTAL DEP | LLED INTO ROCE | | 50.0 | 19. GEO | LOGIST | R I | Lama Tamang | | |
| ELEVATION | | END | CLASSIFICATION OF MATERIAL | .S | % CORE RECOV- | BOX OR SAMPLE | REMAR | | |
| a | | | (Description) d | | ERY | NO. f | weathering, etc., | if significant) | |
| -5.8 | 0.0 | | UNSAMPLED | | | | | E | |
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| | _ = = | | | | | | | F | |
| -10.8 | 5.0 | | Interstratified with CLAYEY SAND (So | C-SM) | 71 | SS-1 | BLOWCOUNT | <u> </u> | |
| | | | with varying amonts of silt and SILTY (CL-ML) with varying amount of sand | CLAY | | 5.0 7.0 | 10-11-8-9 N = 19 | | |
| | | | 7 <n<19, bro<="" dense,="" loose="" medium="" td="" to=""><td>wn to</td><td></td><td>7.0</td><td>(SC-SM) with gravel</td><td>_</td></n<19,> | wn to | | 7.0 | (SC-SM) with gravel | _ | |
| | | | reddish brown | | | | | | |
| | | | | | | | | F | |
| | | | | | 79 | SS-2 | BLOWCOUNT 3-3-4-6 | _ | |
| | | | | | | 7.0 9.0 | N = 7 | F | |
| | | | | | | | (CL-ML) with sand | | |
| | | | | | | | | | |
| | | | | | 400 | 00.0 | DI OMOGUNIT | <u> </u> | |
| | | | | | 100 | SS-3 9.0 | BLOWCOUNT 4-4-5-5 | E | |
| | | | | | | 11.0 | N = 9 (CL-ML) with sand | E | |
| | | | | | | | | _ | |
| | | | | | | | | E | |
| | | | | | 75 | ST-1 | Shelby tube | E | |
| | | | | | | 11.0 13.0 | | F | |
| | | | | | | .5.5 | | <u> </u> | |
| | | | | | | | | F | |
| | _ <i>=\ //</i> / | | | | | | | F | |
| | | | | | 100 | SS-4 13.0 | BLOWCOUNT 5-3-4-8 | E | |
| | | | | | | 15.0 | N = 7 (SC-SM) | E | |
| | | | | | | | (SC-SIVI) | <u> </u> | |
| | | | | | | | | F | |
| -20.8 | 15.0 | | CILTY CAND (CM) with little received | of class | 100 | SS-5 | BLOWCOUNT | <u> </u> | |
| | | 1 | SILTY SAND (SM) with little mounts of 6 <n<9, be<="" brown="" light="" loose,="" reddish="" td="" to=""><td>orown</td><td>100</td><td>15.0</td><td>3-4-5-6</td><td>F</td></n<9,> | orown | 100 | 15.0 | 3-4-5-6 | F | |
| | | | | | | 17.0 | N = 9 (SM) | F | |
| | | | | | | | | E | |
| | 34 | | | | | | | E | |
| | | | | | 83 | SS-6 | BLOWCOUNT | E | |
| | | | | | | 17.0 19.0 | 4-4-4-4 N = 8 | F | |
| | | | | | | .5.5 | (SM) | <u> </u> | |
| | | | | | | | | þ | |
| | | | | | | | | F | |
| | | | | | 50 | SS-7 | BLOWCOUNT | | |
| | <u> </u> | | | | | 19.0 21.0 | 3-3-3-18 N = 6 | F | |
| 1 | | | 1 | | 1 | 1 | (SM) | - | |



| | S LOG (Cont S | 0.0 | | | | Hole No. TTD | HC-7 |
|--------------------|--|--|-----------------|-------------------------|------------------|--|---------------------|
| ROJECT Lockheed | Martin MRC | | INSTALLATI | ION | | | SHEET 2 OF 3 SHEETS |
| ELEVATION | DEPTH LEGEND | CLASSIFICATION OF MATERIALS | 6 | % CORE RECOV- ERY | BOX OR SAMPLE | REMARK | S |
| а | b c | (Description) | | ERY e | NO. f | (Drilling time, water weathering, etc., if g | significant) |
| | | SILTY SAND (SM) with little mounts of 6 <n<9, brown="" by<="" light="" loose,="" reddish="" td="" to=""><td>r ciay, rown</td><td></td><td></td><td></td><td></td></n<9,> | r ciay, rown | | | | |
| -26.8 | 21.0 | (continued) | ad . | 07 | 00.0 | DI OMOOUNT | |
| | | SILTY CLAY (CL-ML) with trace of san 15 <n<24, colors="" in="" re<br="" stiff,="" varying="" very="">brown to brownish red</n<24,> | na, eddish | 67 | SS-8 21.0 | BLOWCOUNT 6-10-14-16 | |
| | | brown to brownish red | | | 23.0 | N = 24 (CL-ML) with sand | |
| | | | | | | | |
| | | | | | | | |
| | | | | 67 | SS-9 23.0 | BLOWCOUNT 6-9-12-16 | |
| | | | | | 25.0 | N = 21 (CL-ML) | |
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| | | | | | | | |
| | | | | 75 | SS-10 28.0 | BLOWCOUNT 5-7-8-10 | |
| | | | | | 30.0 | N = 15 (CL-ML) | |
| | | | | | | (OL WL) | |
| 35.0 | 30.0 | | | | | | |
| -35.8 | 30.0 | CLAY (CL), 32 <n<38, 32'="" 3<="" @="" n="18" td="" to=""><td>34',</td><td>67</td><td>ST-2</td><td>Shelby tube</td><td></td></n<38,> | 34', | 67 | ST-2 | Shelby tube | |
| | \\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\ | hard, gray to dark gray | | | 30.0 32.0 | (CL) | |
| | | | | | | | |
| | | | | | | | |
| | | | | 79 | SS-11 | BLOWCOUNT | |
| | ¥////// | | | | 32.0 34.0 | 5-7-11-15 N = 18 | |
| | <u> </u> | | | | | (CL) | |
| | ¥////// | | | | | | |
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| | ¥////// | | | | | | |
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| | ¥////// | | | | | | |
| | <u> </u> | | | 96 | SS-12 | BLOWCOUNT | |
| | ¥////// | | | | 38.0 40.0 | 10-16-21-24 N = 37 | |
| | | | | | | (CL) | |
| | <i>\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\</i> | | | | | | |
| | <u> </u> | | | | | | |
| | <u> </u> | | | | | | |
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| | ¥////// | | | | | | |
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| | | | | | | | |
| | ¥////// | | | | | | |
| | | | | 100 | SS-13 43.0 | BLOWCOUNT 10-17-15-19 | |
| | 3///// | | | | 45.0 | N = 32 (CL) | |
| G FORM | 1836-A | 4 | P | ROJECT | ed Marti | | HOLE NO. |

Lockheed Martin MRC

TTDHC-7



| DRILLING | G LOG | (Cont S | heet) | -5.8 | ON TOP OF I | HOLE | | | | Hole No. TTI | OHC-7 | |
|---------------------|------------|---------|---------|------------|---------------------------|------------|----------|-------------------------|------------------------------|--|---------------------|----------|
| PROJECT Lockheed | l Martin I | MRC | | | | | INSTALLA | | | | SHEET 3 OF 3 SHEETS | |
| ELEVATION | DEPTH | LEGEND | | CLASSIFI | CATION OF (Description | | S | % CORE RECOV- ERY | BOX OR SAMPLE NO. f | REMAR (Drilling time, wate weathering, etc., i | KS | 1 |
| а | b | c | CLAY | (CL), 32<1 | d N<38. N=18 | 3 @ 32' to | 34', | e | f f | g g | r signincarity | \vdash |
| | _ | | hard, g | ray to dar | k gray <i>(con</i> | tinued) | | | | | | E |
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| | _ | | | | | | | 100 | SS-14 48.0 | BLOWCOUNT 9-19-19-22 | | |
| | | | | | | | | | 50.0 | N = 38 (CL) | | E_ |
| | | | | | | | | | | | | |
| -55.8 | 50.0 | | FND C | F BORIN | G | | | | | | | <u> </u> |
| | = | - | 5 | 23.411 | - | | | | | | | Ē |
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| ENG FORM JUN 67 | 1836- | ·A | 1 | | | | | PROJECT Lockhe | eed Mart | in MRC | HOLE NO. TTDHC-7 | |



Hole No. TTDHCB-1

| DRILLI | NG LOG | 1 - | ENT | PROJECT NUMBER SHEET 1 pration 194-8711 OF 2 SHEET | | | | | | |
|-----------------------------|---------------------------------------|-------------|---|--|-------------------------|-------------------------|---|----------|--|--|
| . PROJECT | | <u> </u> | Lockheed Martin Corporation | | | | | | | |
| | l Martin MR | C | | | | | HSA/Mud Rotary IOWN (TBM or MSL) | \dashv | | |
| LOCATION (| (Coordinates or | Station |) | MSL | WIT OIL ELL | ************* | ievivi († 2m er mez) | | | |
| Middle Ri | | 605,6 | 30.7943 E 1,475,169.5397 | 12. MANU | JFACTURER | S'S DESIGN | ATION OF DRILL | | | |
| UniTech | | | | | L NO. OF SO | | DISTURBED UNDISTURBED | \dashv | | |
| HOLE NO. (/ file number) | As shown on dr | awing ti | tle and TTDHCB-1 | | PLES TAKEN | | 15 0 | 4 | | |
| NAME OF D | RILLER | | 1101001 | | L NUMBER | | | 4 | | |
| D. Evans | 0511015 | | | | ATION GRO | | R -2.9 ARTED COMPLETED | \dashv | | |
| DIRECTION VERTICA | | CLINED | DEG. FROM VERT. | 16. DATE HOLE 9/29/2015 9/29/2015 | | | | | | |
| <u> </u> | OF OVERBUR | | DEG. PROW VERT. | 17. ELEV | ATION TOP | OF HOLE | +4.1 | \Box | | |
| | LED INTO RO | | | 18. TOTAL CORE RECOVERY FOR BORING | | | | | | |
| | TH OF HOLE | CIC | 40.0 | 19. GEOL | OGIST | | K. Tu | - 1 | | |
| _EVATION | DEPTH LE | GEND | CLASSIFICATION OF MATERIAL (Description) | .S | % CORE RECOV- ERY | BOX OR SAMPLE NO. | REMARKS (Drilling time, water loss, depth weathering, etc., if significant) | | | |
| +4.1 | 0.0 | С | Approx. 3" asphalt | | e 0 | f N/A | g | + | | |
| +3.6 | 0.5 | ×××× | Approx. 3" subgrade | | 44 | 0.0 | BLOWCOUNT | Ŀ | | |
| | | XXX | PROBABLE FILL, mixed material, predominantly SILTY CLAY (CL-ML) | with | 44 | SS-1 | 6-8-6 | ╌ | | |
| | | | occasional silty sand and trace of gra | vel, | | 0.5 | N = 14 3" Asphalt | F | | |
| | 🕌 | XXX | moist, 3 <n<14, co<br="" soft="" stiff,="" to="" varying="">light brown to brown and reddish brow</n<14,> | | | 2.0 | (SP-SM) with gravel | F | | |
| | | >>> | | | | 00.0 | DI OMOQUINIT | þ | | |
| | 🕸 | XXX | | | 0 | SS-2 2.0 | BLOWCOUNT 4-4-4-4 | þ | | |
| | | \ggg | | | | 4.0 | N=8 | Ŀ | | |
| | - | XXX | | | | | No recovery | F | | |
| | | XXX | | | | | | F | | |
| | 🕸 | \ggg | | | | | | | | |
| | 📆 | | | | 46 | SS-3 | BLOWCOUNT | ŀ | | |
| | | XXX | | | | 4.0 | 2-2-2-2 | \perp | | |
| | 🕸 | \ggg | | | | 6.0 | N = 4 (CL-ML) with sand and trace of gravel | F | | |
| | 🗮 | XXX | | | | | , | þ | | |
| | 🕸 | \ggg | | | | | | þ | | |
| | ₩ | XXX | | | | | | ŀ | | |
| | | XXX | | | 75 | SS-4 | BLOWCOUNT | F | | |
| _ | L ⊐X | \ggg | | | | 6.0 8.0 | 2-1-2-1 N = 3 | þ | | |
| | | \ggg | | | | | (CL-ML) with sand | ŀ | | |
| | [| XXX | | | | | | F | | |
| | 🕌 | XXX | | | | | | F | | |
| -3.9 | 8.0 | XXX | CLAVEV CAND (CC CM) | | 00 | 00.5 | PLOWCOLNT | þ | | |
| | | | CLAYEY SAND (SC-SM) with varying amounts of silt, moist, 14 <n<34, med<="" td=""><td>) lium</td><td>96</td><td>SS-5 8.0</td><td>BLOWCOUNT 3-6-8-10</td><td>þ</td></n<34,> |) lium | 96 | SS-5 8.0 | BLOWCOUNT 3-6-8-10 | þ | | |
| | | <i>4</i> 11 | dense to dense, light brown to reddis | | | 10.0 | N = 14 | E | | |
| | | 4 I I | | | | | Interstratified in colors of brown and reddish brown | ╌ | | |
| | = = = = = = = = = = = = = = = = = = = | 4 11 | | | | | (SC-SM) | F | | |
| | \(\display\) | | | | | | | þ | | |
| | | 11 1 | | | 100 | SS-6 | BLOWCOUNT | E | | |
| | | | | | | 10.0 | 4-7-11-13 | ╌ | | |
| | | 4H | | | | 12.0 | N = 18 (SC) | F | | |
| | | | | | | | <u>`</u> | þ | | |
| | \(\frac{1}{2}\/\) | | | | | | | þ | | |
| | | 311 | | | | | | E | | |
| | | | | | 92 | SS-7 12.0 | BLOWCOUNT 3-9-11-11 | F | | |
| | 1// | | | | | 12.0 | N = 20 | þ | | |
| | | % | | | | | Trace of yellowish brown | þ | | |
| | ±1//. | | | | | | (SC) | E | | |
| | <u>-</u> {// | | | | | | | ŀ | | |
| | -\ | | | | | | - | F | | |
| | 4// | | | | | | | þ | | |
| | \(\display\) | 311 | | | 83 | SS-8 | BLOWCOUNT 8-11-15 | þ | | |
| | <u> </u> | | | | | 14.5 16.0 | N = 19 | ŀ | | |
| | <i>-\//</i> | | | | | | (SC-SM) | F | | |
| | 4// | 311 | | | | | | F | | |
| | | | | | 100 | SS-9a | BLOWCOUNT | ļ | | |
| | | | | | | SS-9b 16.0 | 10-16-14-18 N = 30 | ŀ | | |
| | | | | | | 18.0 | Top 12" Sandy (CL-ML) | F | | |
| | | | | | | | Bottom 12" (SC-SM) | þ | | |
| | \(\frac{1}{2}\/\) | | | | | | | ŀ | | |
| | <u>-</u> // | 311 | | | | | | ŀ | | |
| | | | | | 100 | SS-10 | BLOWCOUNT | F | | |
| | = = = = = = = = = = = = = = = = = = = | | | | | 18.0 20.0 | 5-9-8-11 N = 17 | ļ | | |
| | | 111 | | | | | (SC) | Ŀ | | |
| | | 311 | | | | | | F | | |
| | = | <i>a</i> | | | | | | F | | |
| | | | | | | | | ╌ | | |



ELEVATION TOP OF HOLE **DRILLING LOG (Cont Sheet)** Hole No. TTDHCB-1 INSTALLATION SHEET 2 Lockheed Martin MRC OF SHEETS REMARKS BOX OR SAMPLE NO. f CLASSIFICATION OF MATERIALS ELEVATION DEPTH LEGEND (Drilling time, water loss, depth weathering, etc., if significant) RECOV-ERY (Description) CLAYEY SAND (SC-SM) with varying amounts of silt, moist, 14<N<34, medium dense to dense, light brown to reddish brown (continued) SS-11 23.0 25.0 BLOWCOUNT 11-15-19-19 N = 34 100 Alternate layers of brown and reddish brown (SC-SM) 25 100 SS-12 **BLOWCOUNT** 28.0 30.0 5-9-12-18 N = 21 (SC-SM) 30 -28.9 SS-13 33.0 35.0 BLOWCOUNT 17-26-35-40 N = 61 CLAYEY SAND (SC), 53<N<61, very dense, 100 light brown to reddish brown (SC) 35 BLOWCOUNT 16-24-29-33 N = 53 (SC) 100 SS-14 38.0 40.0 -35.9 END OF BORING

ENG FORM 1836-A

Lockheed Martin MRC



Hole No. TTDHCB-2

| DRILLI | NG LO | ~ | ENT Lockheed Martin Corporation | PROJECT | T NUMBER | | SHEET 1 OF 2 SHEE | TS TS | | |
|-------------------------------------|-----------------|--------------|--|------------------------------------|------------------------------|------------------------------|---|------------|--|--|
| 1. PROJECT | 1 N 1 = mt; = 1 | | 200Kiloda Martin Corporation | 10. DRILLING METHOD HSA/Mud Rotary | | | | | | |
| Lockheed 2. LOCATION (| Coordinate | s or Station |) | 11. DATU MSL | IM FOR ELE | VATION SH | IOWN (TBM or MSL) | | | |
| Middle Ri 3. DRILLING A | | N 605,7 | 04.9278 E 1,475,059.7013 | 12. MANU | JFACTURER | 'S DESIGN | ATION OF DRILL | | | |
| UniTech | | | | | L NO. OF SO | | DISTURBED UNDISTURBED | | | |
| 4. HOLE NO. (<i>i</i> file number) | As shown o | n drawing ti | TTDHCB-2 | | L NUMBER | | 17 2 ES | _ | | |
| 5. NAME OF D D. Evans | | | | 15. ELEV | | | | | | |
| 6. DIRECTION | | | | 16. DATE | HOLE | STA | ARTED COMPLETED 9/30/2015 9/30/2015 | | | |
| | |] INCLINED | DEG. FROM VERT. | 17. ELEV | ATION TOP | OF HOLE | +4.3 | | | |
| 7. THICKNESS 8. DEPTH DRII | | | | | L CORE RE | COVERY F | OR BORING | % | | |
| 9. TOTAL DEP | | | 40.0 | _ 19. GEOL | 19. GEOLOGIST K. Tu | | | | | |
| ELEVATION a | DEPTH b | LEGEND c | CLASSIFICATION OF MATERIAL (Description) d | .S | % CORE RECOV- ERY e | BOX OR SAMPLE NO. f | REMARKS (Drilling time, water loss, depth weathering, etc., if significant) | | | |
| +4.3 | 0.0 | | PROBABLE FILL, CLAY (CL) with sai | nd, | 54 | SS-1 | BLOWCOUNT | + | | |
| | = | | occasional silt and organic materials, very moist, 1 <n<8, mediu<="" soft="" td="" to="" very=""><td>m stiff,</td><td></td><td>0.0 2.0</td><td>1-4-4-4 N = 8</td><td>F</td></n<8,> | m stiff, | | 0.0 2.0 | 1-4-4-4 N = 8 | F | | |
| | | | varying colors in reddish brown, dark gray and white | gray to | | | (CLS) Trace of gravel | | | |
| | | | | | | | Trace of organics | F | | |
| | | | | | 07 | 00.0 | DI OMOGUNT | | | |
| | = | | | | 67 | SS-2 2.0 | BLOWCOUNT 1-3-3-3 | F | | |
| \ | _ | | | | | 4.0 | N = 6 (CLS) | F | | |
| | _ | | | | | | Trace of organics | E | | |
| | | | | | | | | E | | |
| | _ | | | | 0 | SS-3 | BLOWCOUNT | | | |
| | _ | | | | | 4.0 6.0 | 2-1-2-2 N = 3 | F | | |
| | | | | | | | No recovery | 5 | | |
| | | | | | | | | E | | |
| | | | | | | | | E | | |
| | _ | | | | 75 | SS-4 6.0 | BLOWCOUNT 1-2-1-2 | | | |
| | _ _ | | | | | 8.0 | N = 3 Top 12" (CL) in gray | F | | |
| | | | | | | | Bottom 12" (CL-ML) in reddish brown 8 | 3 <u> </u> | | |
| | _ | | | | | | white | F | | |
| | | | | | 89 | ST-1 | Shelby tube | | | |
| | | | | | | 8.0 9.5 | PP = 1.0 tsf (CL) with sand | E | | |
| | _ | | | | | 9.5 | (CL) with sailu | | | |
| | _ | | | | | | | F | | |
| | _ _ | | | | 100 | SS-5a, SS-5b | BLOWCOUNT WH-WH-1-2 | F 10 | | |
| | | | | | | 9.5 11.5 | N = 1 Bottom 12" (CL-ML) with sand | F-'` | | |
| | | | | | | 11.5 | Trace of organics | E | | |
| | | | | | | | | | | |
| | _ | | | | 94 | ST-2 | Shelby tube | | | |
| | | | | | 34 | 11.5 | PP = 0.5 tsf | | | |
| | | | | | | 13.0 | (CL) with sand | F | | |
| | = | | | | | | | E | | |
| | | | | | 75 | SS-6 13.0 | BLOWCOUNT WH-WH-1-WH | E | | |
| | | | | | | 15.0 | N = 1 (CL-ML) with sand | F | | |
| | _ | | | | | | (OL-IVIL) WILLI SALIU | | | |
| | = | | | | | | | F | | |
| | | | | | 100 | SS-7a, | BLOWCOUNT | 15 | | |
| | _ | | | | 100 | SS-7b | WR-WH-2-4 N = 2 | E | | |
| | | | | | | 15.0 17.0 | Trace of organics with woods | E | | |
| | _ | | | | | | Top 12" (CL) in gray Bottom 12" (CL-ML) in light brown | F | | |
| -12.7 | 17.0 — | | | | | | | F | | |
| -12.1 | - 17.0 | | CLAYEY SAND (SC-SM) with silt, 3< | N<10, | 100 | SS-8a, | BLOWCOUNT | | | |
| | _ | | very loose to dense, varying colors in brown to brown, light red to brownish | ııght white | | SS-8b 17.0 | 6-2-4-3 N = 6 | F | | |
| | | | and reddish brown | | | 19.0 | Top 12" (SC-SM) in light brown to yellowish brown | | | |
| | | | | | | | Bottom 12" (SM) in reddish light brown | E | | |
| | | | | | | 00.5 | DI OMOGLINIT | | | |
| | | | | | 83 | SS-9 19.0 | BLOWCOUNT 3-2-1-1 | F | | |
| | = | | | | | 21.0 | N = 3 (SC-SM) | | | |



| DRILLING | G LOG (| Cont | t Si | neet) ELEVATION TOP OF HOLE 4.3 | | HCB-2 | | | |
|--------------------|----------|------|------|--|-----------|-------------------------|------------------|---|---------------------|
| ROJECT Lockheed | Martin M | MRC | | | INSTALLAT | ION | | | SHEET 2 OF 2 SHEETS |
| ELEVATION | DEPTH | LEGE | ND | CLASSIFICATION OF MATERIAL (Description) | S | % CORE RECOV- ERY | BOX OR SAMPLE | REMARK (Drilling time, water weathering, etc., if | (S |
| а | b | c | | d CLAYEY SAND (SC-SM) with silt, 3< | N<10, | e | NO. f | Thin interbeds of white, | |
| | _ | | | very loose to dense, varying colors in brown to brown, light red to brownish | liaht | | | brown fine sand | |
| | | | | and reddish brown (continued) | | | | | |
| | | | | | | | | | |
| | | | | | | | | | |
| | | | | | | | | | |
| | = | | | | | | | | |
| | | | | | | 92 | SS-10 | BLOWCOUNT | |
| | | | | | | | 23.0 25.0 | 3-5-5-7 N = 10 | |
| | | | | | | | | (SC-SM) Thin interbeds of white, | red & reddish |
| | _ | | | | | | | brown fine sand | |
| | | | | | | | | | |
| | | | | | | | | | |
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| | _ | | | | | 100 | SS-11 | BLOWCOUNT | |
| | | | | | | 28.0 30.0 | 6-4-4-2 N = 8 | | |
| | | | | | | | (SC) | | |
| | | | | | | | | | |
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| | | | | | | | | | |
| | | | | | - | 92 | SS-12a, | BLOWCOUNT | |
| -29.4 | 33.8 | | | | | | SS-12b 33.0 | 3-3-5-10 N = 8 | |
| | | | | CLAYEY SAND (SC-SM) with varying amounts of silt, 15 <n<23, de<="" medium="" td=""><td>ense.</td><td></td><td>35.0</td><td>Fine content variable w</td><td></td></n<23,> | ense. | | 35.0 | Fine content variable w | |
| | _ | | | light brown to reddish brown | , | | | Top 9" (SC) with varyin Bottom 15" (SC-SM) | g amount of clay |
| | | | | | | | | , | |
| | | | | | | | | | |
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| | | | | | | | | | |
| | _ | | | | | 100 | SS-13 | BLOWCOUNT | |
| | | | | | | | 38.0 40.0 | 9-9-14-18 N = 23 | |
| | | | | | | | | (SC-SM) | |
| | _ | | | | | | | | |
| -35.7 | 40.0 | | | END OF BORING | | | | | |
| | _ | | | END OF BOILING | | | | | |
| | | | | | | | | | |
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PROJECT Lockheed Martin MRC



Hole No. TTDHCB-3

| DRILLI | NG LO | 3 | IENT Lockheed Martin Corporation | | ΓNUMBER | | SHEET 1 OF 4 SHEE | те | | |
|-------------------------------|-------------|------------|--|---|---------------|---------------|---|----------------|--|--|
| 1. PROJECT | | | Lockneed Martin Corporation | 194-8711 OF 4 SHEETS 10. DRILLING METHOD HSA/Mud Rotary | | | | | | |
| Lockheed | d Martin N | /IRC | | | | | HOWN (TBM or MSL) | - | | |
| 2. LOCATION | | | | MSL | | | | | | |
| 3. DRILLING A | | N 605,6 | S12.4843 E 1,474,865.4765 | 12. MANU | JFACTUREF | R'S DESIGN | ATION OF DRILL | | | |
| UniTech | | | | | L NO. OF S | | DISTURBED UNDISTURBED | | | |
| 4. HOLE NO. (A file number) | As shown on | drawing ti | tle and TTDHCB-3 | | PLES TAKEN | | 19 2 | | | |
| 5. NAME OF D | RILLER | | : ITDHCB-3 | | L NUMBER | | | | | |
| D. Evans | | | | 15. ELEV | ATION GRO | | *** | _ | | |
| 6. DIRECTION | | | | 10/1/2015 10/1/2015 | | | | | | |
| | | INCLINED | DEG. FROM VERT. | 17. ELEVATION TOP OF HOLE +5.0 | | | | | | |
| 7. THICKNESS | | | | 18. TOTA | OR BORING | % | | | | |
| 8. DEPTH DRII 9. TOTAL DEP | | | 70.0 | 19. GEOL | .OGIST | | V To | | | |
| 9. TOTAL DEP | | | CLASSIFICATION OF MATERIAL | <u> </u> | % CORE | BOX OR | K. Tu REMARKS | _ | | |
| ELEVATION | DEPTH | LEGEND | (Description) | 3 | RECOV- ERY | SAMPLE NO. | (Drilling time, water loss, depth weathering, etc., if significant) | | | |
| +5.0 | 0.0 | с >>>> | d PROBABLE FILL, mixed materials, | | e 83 | f SS-1 | BLOWCOUNT | | | |
| 13.0 | | | predominantly SILTY CLAY (CL - ML) | with | 03 | 0.0 | 1-1-1-1 | | | |
| | | | occasional sand and trace of organics to very moist, 2 <n<5, med<="" soft="" td="" to="" very=""><td>s, moist lium</td><td></td><td>2.0</td><td>N = 2 (SM)</td><td>F</td></n<5,> | s, moist lium | | 2.0 | N = 2 (SM) | F | | |
| | | | stiff, very loose to loose, varying color | s in light | | | Trace of gravel | | | |
| | | | brown to dark brown and reddish brow | vn. | | | | E | | |
| | | | | | | | | | | |
| | | | | | 100 | SS-2 2.0 | BLOWCOUNT 1-2-3-2 | L | | |
| | | | | | | 4.0 | N = 5 | F | | |
| | | | | | | | (SM) | F- | | |
| | | XXXX | | | | | | F | | |
| | | | | | | | | F | | |
| | | | | | 75 | SS-3 | BLOWCOUNT | | | |
| | | | | | | 4.0 6.0 | 2-2-2-3 N = 4 | E | | |
| | | | | | | 0.0 | (CL-ML) with sand | - ₅ | | |
| | | | | | | | Trace of organics | F_ | | |
| | | | | | | | | F | | |
| | | | | | - 00 | 00.4 | DI OMOGUNIT | | | |
| | | | | | 83 | SS-4 6.0 | BLOWCOUNT WH-1-1-2 | | | |
| | | | | | | 8.0 | N = 2 | L | | |
| | | | | | | | (SC-SM) with sand and trace of organi | lcs | | |
| | | | | | | | | F | | |
| 1 | | | | | | | | | | |
| - - | | | | | 71 | SS-5 | BLOWCOUNT | | | |
| | | | | | | 8.0 10.0 | WH-1-1-2 N = 2 | | | |
| | | | | | | 10.0 | (CL-ML) with sand | | | |
| | | | | | | | | | | |
| | | | | | | | | H | | |
| | | | | | 33 | ST-1 | Shelby tube | 10 | | |
| | | | | | 33 | 10.0 | PP = 0.5 tsf | F | | |
| | | | | | | 12.0 | 8" recovery | F | | |
| | | | | | | | | | | |
| | | | | | | | | E | | |
| | | | | | | | | | | |
| | | | | | 77 | ST-2 12.0 | Shelby tube | E | | |
| | | | | | | 14.0 | 18.5" recovery (CL) | F | | |
| | | | | | | | | <u> </u> | | |
| | | | | | | | | F | | |
| 0.0 | 14.0 | | | | | | | E | | |
| -9.0 | 14.0 | | SILTY CLAY (CL - ML) with sand, 3< | N<9, soft | 83 | SS-6 | BLOWCOUNT | | | |
| | | | to stiff, dark brown to reddish brown | | | 14.0 16.0 | WH-WH-3-5 N = 3 | E | | |
| | | | | | | 10.0 | (CL-ML) with sand | 15 | | |
| | | | | | | | | F_ | | |
| | | | | | | | | F | | |
| | | | | | | 00 - | DI OMOOUNIT | <u> </u> | | |
| | | | | | 83 | SS-7 16.0 | BLOWCOUNT 2-4-5-7 | E | | |
| | | | | | | 18.0 | N = 9 | E | | |
| | | | | | | | (CL) with sand | <u> </u> | | |
| | | | | | | | | F | | |
| -13.0 | 18.0 | | | | | | | F | | |
| -10.0 | 10.0 | | CLAYEY SAND (SC-SM) with silt, 10- | <n<19,< td=""><td>100</td><td>SS-8</td><td>BLOWCOUNT</td><td></td></n<19,<> | 100 | SS-8 | BLOWCOUNT | | | |
| | | | medium dense, reddish brown | | | 18.0 20.0 | 3-6-7-9 N = 13 | E | | |
| | | | | | | 20.0 | (SM) with varying amount of silt/clay | | | |
| | | | | | | | | E | | |
| | | | | | | | | F | | |
| | | /// | 1 | | | | | 20 | | |



| RILLING | LOG (Cont S | Sheet) ELEVATION TOP OF HOLE | | | Hole No. TTDUOD 0 | \Box |
|----------------|--------------------------|--|------------------------------|-----------------------|---|--------|
| ROJECT | | 0.0 | NSTALLATION | | Hole No. TTDHCB-3 | |
| | Martin MRC | CLASSIFICATION OF MATERIALS | % CORE | BOX OR SAMPLE | OF 4 SHEE | TS |
| ELEVATION a | DEPTH LEGEND b c | (Description) | % CORE RECOV- ERY e | NO. | (Drilling time, water loss, depth weathering, etc., if significant) g | |
| | | CLAYEY SAND (SC-SM) with silt, 10 <n (continue<="" brown="" dense,="" medium="" reddish="" td=""><td></td><td></td><td>Ü</td><td></td></n> | | | Ü | |
| | | mediam dense, readism brown (continue | ,,,, | | | |
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| | | | 100 | SS-9 | BLOWCOUNT | ŀ |
| | | | | 23.0 25.0 | 6-8-8-8 N = 16 | |
| | | | | | (SC) | ŀ |
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| | | | 100 | SS-10 26.0 | BLOWCOUNT 5-7-7-7 | |
| | _=\// | | | 28.0 | N = 14 (SC-SM) | |
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| | | | 100 | SS-11 | BLOWCOUNT | ı |
| | | | 1.00 | 33.0 35.0 | 10-8-11-16 N = 19 | |
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| | | | 100 | SS-12 38.0 | BLOWCOUNT 6-4-6-9 | |
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| -38.0 | 43.0 | CLAYEY SAND (SC) 20 <n<30 medium<="" td=""><td>n 100</td><td>SS-12</td><td>BLOWCOLINT</td><td></td></n<30> | n 100 | SS-12 | BLOWCOLINT | |
| -38.0 | 43.0 | CLAYEY SAND (SC), 29 <n<39, brown<="" dense="" dense,="" medium="" reddish="" td="" to=""><td>n 100</td><td>SS-13 43.0 45.0</td><td>BLOWCOUNT 10-13-16-20 N = 29</td><td></td></n<39,> | n 100 | SS-13 43.0 45.0 | BLOWCOUNT 10-13-16-20 N = 29 | |



| RILLING | LOG | (Cont S | heet) | ELEVATION TOP OF HOLE 5.0 | 100000 | TICS | | Hole No. TTDHCB-3 | |
|---------------------------------|---------|---------|-----------------------------------|--|-----------------------------------|-------------------|----------------------------------|--|----|
| ROJECT Lockheed | Martin | MRC | | | INSTALLA | | | SHEET 3 OF 4 SHEE | TS |
| LEVATION | DEPTH | LEGEND | | CLASSIFICATION OF MATERIA (Description) | LS | % CORE RECOV- | BOX OR SAMPLE | REMARKS | |
| a a | DEPTH b | C | CLAYE | (Description) d EY SAND (SC), 29 <n<39, (con<="" brown="" dense,="" me="" reddish="" td="" to=""><td>dium</td><td>RECOV- ERY e</td><td>SAMPLE NO. f</td><td>(Drilling time, water loss, depth weathering, etc., if significant) g BLOWCOUNT 10-17-22-26 N = 39 (SC)</td><td></td></n<39,> | dium | RECOV- ERY e | SAMPLE NO. f | (Drilling time, water loss, depth weathering, etc., if significant) g BLOWCOUNT 10-17-22-26 N = 39 (SC) | |
| -49.0 | 54.0 | | CLAYE poorly dense brown | EY SAND (SC) with varying ar graded sand with silt, 41 <n<¢ to very dense, varying colors</n<¢ | mounts of 53/9", in reddish | 100 | SS-15a SS-15b 53.0 55.0 | BLOWCOUNT 13-13-15-25 N = 28 Top 14" reddish brown (SC-SM) Top 10" red (SP-SM/SP-SC) | |
| | | | | | | 100 | SS-16 58.0 60.0 | BLOWCOUNT 17-16-25-32 N = 41 Top 12" (SP-SM) Bottom 12" (SC) | |
| | | | | | | 63 | SS-17 63.0 65.0 | BLOWCOUNT 12-13-50/3"-x N = 63/9" (SC) | |
| -63.0 5 FORM JN 67 | 68.0 | -A | | | | PROJECT Lockhe | and Marri | n MRC HOLE NO. TTDHCE | |



| DRILLING | LOG (| (Cont S | heet) | ELEVATIO 5.0 | N TOP OF | HOLE | | | | Hole No. | TTC | HCB-3 | |
|---------------------|----------|---------|-----------------|-----------------|----------------|-------------|---------|-------------------------|------------------------------|------------------------------|------------|---------------------------------------|-----------|
| PROJECT Lockheed | Martin I | MRC | | | | | INSTALL | ATION | | | | SHEET 4 OF 4 SHEETS | |
| ELEVATION | DEPTH | LEGEND | | | | F MATERIA | LS | % CORE RECOV- ERY | BOX OR SAMPLE NO. f | R (Drilling tim | FMARK | (S r loss, depth f significant) | 1 |
| а | b | С | | | (Description d | | | е | NO. f | | , etc., if | significant) | <u> </u> |
| | = | | FAT Cl brown | LAY (CH), | N = 88/1 | 1.5", hard, | reddish | 73 | SS-18 68.0 | BLOWCOUNT 23-38-50/5.5"-x | | | E |
| | | | | | | | | | 70.0 | N = 88/11.5" (CH) | | | <u> </u> |
| | | | | | | | | | | | | | E |
| -65.0 | 70.0 | | | | | | | | | | | | 70 |
| | _ | | END C | F BORING | 3 | | | | | | | | |
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| ENG FORM JUN 67 | 1836- | A | l . | | | | | PROJECT Lockhe | eed Marti | n MRC | | HOLE NO. | _ |



Hole No. TTDHCB-4

| DRILLI | NG LO | G | | ENT ockheed Martin Corporation | PROJECT NUMBER SHEET 1 OF 4 SHEETS | | | | | | |
|---------------------------|------------|-------------------|-----------|---|--|--|------------------------------|---|-----------------|--|--|
| 1. PROJECT | | | _ | Sourced Martin Corporation | 10. DRILLING METHOD HSA/Mud Rotary | | | | | | |
| Lockheed 2. LOCATION (| | | ation) | <u> </u> | 11. DATU MSL | M FOR ELE | VATION SH | OWN (TBM or MSL) | | | |
| Middle Ri | ver, MD | N 60 |)5,5 | 16.9785 E 1,474,770.6305 | | JFACTUREF | R'S DESIGN | ATION OF DRILL | | | |
| 3. DRILLING A UniTech | GENCY | | | | 13 TOTA | L NO. OF SO | OII | DISTURBED UNDIST | TURBED | | |
| 4. HOLE NO. (A | As shown o | n drawi | ing tit | | | PLES TAKEN | | 19 | 1 | | |
| 5. NAME OF D | RILLER | | | TTDHCB-4 | 14. TOTAL NUMBER CORE BOXES | | | | | | |
| D. Evans | | | | | | 15. ELEVATION GROUND WATER -3.4 STARTED COMPLETED | | | | | |
| 6. DIRECTION | | INCLI | NED | DEG. FROM VERT. | 16. DATE | 16. DATE HOLE 10/5/2015 COMPLETED 10/5/201 | | | | | |
| 7. THICKNESS | | | | | | ATION TOP | | +4.6 | | | |
| 8. DEPTH DRII | LED INTO | ROCK | | | 18. TOTA 19. GEOL | | COVERY FO | OR BORING | % | | |
| 9. TOTAL DEP | TH OF HOL | LE | | 70.0 | | | | | | | |
| ELEVATION a | DEPTH b | LEGE | | CLASSIFICATION OF MATERIAL (Description) d | S | % CORE RECOV- ERY e | BOX OR SAMPLE NO. f | REMARKS (Drilling time, water loss, weathering, etc., if signifi g | depth icant) | | |
| +4.6 | 0.0 _ | | \bowtie | PROBABLE FILL, predominantly CLA SAND (SC-SM) with occasional silt ar | YEY | 75 | SS-1 0.0 | BLOWCOUNT 4-3-5-5 | | | |
| | _ | | \bowtie | of gravel, moist to very moist, 1 <n<8,< td=""><td>very</td><td></td><td>2.0</td><td>N = 8</td><td>E</td></n<8,<> | very | | 2.0 | N = 8 | E | | |
| | | | XX | loose to medium dense, varying color to reddish gray and reddish brown | s in gray | | | (CL-ML) with creosote smell Trace of gravel | | | |
| | _ | | \bowtie | | | | | | | | |
| | | | \bowtie | | | 12 | 66.0 | DI OMCOLINIT | | | |
| | _ | | \bowtie | | | 13 | SS-2 2.0 | BLOWCOUNT 5-3-4-4 | | | |
| | = | | \bowtie | | | | 4.0 | N = 7 (SC-SM) with creosote smell | F | | |
| | | | \bowtie | | | | | Trace of gravel | | | |
| | | \longrightarrow | \bowtie | | | | | | E | | |
| | | | \bowtie | | | 100 | SS-3 | BLOWCOUNT | | | |
| | | | \bowtie | | | | 4.0 6.0 | 4-4-4-4 N = 8 | | | |
| | | | \bowtie | | | | 0.0 | (SC) | 5 | | |
| | | | XX | | | | | Trace of gravel | | | |
| | = | | \bowtie | | | | | | | | |
| | | | XX | | | 42 | SS-4 | BLOWCOUNT | | | |
| | _ | | \bowtie | | | | 6.0 8.0 | 2-3-2-2 N = 5 | | | |
| | | | \bowtie | | | | 0.0 | (SC) | | | |
| | | | \bowtie | | | | | | | | |
| _ | 7 = | | \bowtie | | | | | | | | |
| <u> </u> | | | \bowtie | | | 75 | SS-5 | BLOWCOUNT | _ | | |
| | = | | XX | | | | 8.0 10.0 | 1/12"-1-1 N = 1 | F | | |
| | | | \bowtie | | | | | (SC-SM) | _ | | |
| | | | \bowtie | | | | | | | | |
| | | \bowtie | \bowtie | | | | | | 10 | | |
| | | | XX | | | 50 | SS-6 10.0 | BLOWCOUNT 1/12"-1-1 | | | |
| | _ | | \bowtie | | | | 12.0 | N = 1 | | | |
| | | | \bowtie | | | | | (SC) Trace of gravel | | | |
| | _ | | XX | | | | | | | | |
| | | | \bowtie | | | 75 | OT 4 | Challes total | _ | | |
| | = | | \bowtie | | | 75 | ST-1 12.0 | Shelby tube PP = 2.5 tsf | F | | |
| | = | | \bowtie | | | | 14.0 | 18" recovery | F | | |
| | _ | | \bowtie | | | | | | F | | |
| | | | \bowtie | | | 42 | SS-7 | BLOWCOUNT | F | | |
| -9.4 | 14.0 | | | SILTY CLAY (CL - ML) with sand, 1 <n< td=""><td>N<2,</td><td></td><td>13.5 15.5</td><td> WH-WH-1-3 N = 1</td><td><u> </u></td></n<> | N<2, | | 13.5 15.5 | WH-WH-1-3 N = 1 | <u> </u> | | |
| | | | | very soft, brownish red and gray | , | | | (CL-ML) with sand | E | | |
| | _ | | | | | | | | 15 | | |
| | = | | | | | | | | E | | |
| | | | | | | | | | E | | |
| | _ | | | | | 96 | SS-8 | BLOWCOUNT | <u> </u> | | |
| | _ | | | | | | 16.0 18.0 | 1-1-1-1 N = 2 | E | | |
| | | | | | | | | (CLS) | _ | | |
| | _ | | | | | | | | F | | |
| -13.4 | | | | | | | | | F | | |
| 10.7 | | | | CLAYEY SAND (SC), 8 <n<19, loose<="" td=""><td>to</td><td>100</td><td>SS-9</td><td>BLOWCOUNT</td><td><u> </u></td></n<19,> | to | 100 | SS-9 | BLOWCOUNT | <u> </u> | | |
| | = | | | medium dense, varying colors in light to reddish brown and dark gray | nword | | 18.0 20.0 | 2-4-4-6 N = 8 | F | | |
| | | | | , , , , , , , , , , , , , , , , , , , | | | | (SC) | _ | | |
| | _ | 1/// | | | | | | | F | | |
| | | | | | | | | | 20 | | |



| DRILLING | G LOG (| Cont S | heet) | ELEVATION TOP OF HOLE 4.6 | | | | Hole No. TTD | HCB-4 | | |
|-----------|--------------|--------|-------------|---|-------------------|-------------------------|------------------|---|--------------|--|--|
| PROJECT | l Martin M | IDC | | | INSTALLA | ATION | | SHEET 2 OF 4 SHEETS | | | |
| ELEVATION | | LEGEND | | CLASSIFICATION OF MATERI | IALS | % CORE RECOV- ERY | BOX OR SAMPLE | REMARK | S | | |
| a | b | С | | (Description) d | | ERY | NO. f | (Drilling time, water weathering, etc., if g | significant) | | |
| | | | CLAYE | EY SAND (SC), 8 <n<19, colors="" dense,="" in="" lig<="" loos="" m="" td="" varying=""><td>se to</td><td></td><td></td><td></td><td></td></n<19,> | se to | | | | | | |
| | | | to redd | lish brown and dark gray (co | ntinued) | | | | | | |
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| | | | | | | | | | | | |
| | | | | | | | | | | | |
| | | | | | | 92 | SS-10 | BLOWCOUNT | | | |
| | | | | | | | 23.0 25.0 | 3-4-5-4 N = 9 | | | |
| | | | | | | | | (SC) | | | |
| | | | | | | | | | | | |
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| | | | | | | 100 | SS-11 | BLOWCOUNT | | | |
| | # | | | | | | 28.0 30.0 | 4-4-5-8 N = 9 | | | |
| | | | | | | | | (SC) | | | |
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| | | | | | | 100 | SS-12 33.0 | BLOWCOUNT 10-10-9-11 | | | |
| | | | | | | | 35.0 | N = 19 | | | |
| | | | | | | | | (SC) | | | |
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| | | | 1 | | | | | | | | |
| | | | 1 | | | 100 | SS-13 38.0 | BLOWCOUNT 7-10-9-10 | | | |
| | | | | | | | 40.0 | N = 19 | | | |
| | | | | | | | | (SC) | | | |
| | | |] | | | | | | | | |
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| -38.4 | 43.0 | | | | | | | | | | |
| | | | CLAYE | EY SAND (SC-SM) with varyits of silt, 29 <n<39, @<="" n="73" td=""><td>ing 53' to 55'</td><td>100</td><td>SS-14 43.0</td><td>BLOWCOUNT 9-13-16-22</td><td></td></n<39,> | ing 53' to 55' | 100 | SS-14 43.0 | BLOWCOUNT 9-13-16-22 | | | |
| | ı | /// | dense | to very dense, vellowish brow | wn to | | 45.0 | N = 29 | | | |
| | _ <i>Y</i> . | /// | no al -11 1 | n brown | WITTO | | 75.0 | (SC) | 1 | | |



| DRILLING | LOG | (Cont S | heet) | ELEVATION TOP OF HOL 4.6 | .E | | | | Hole No. TTDHC | |
|---------------------|----------|----------|----------------|--|-----------------|------------------|-------------------------|------------------------------|---|---------------------|
| PROJECT Lockheed | d Martin | MRC | | | | INSTALL | | | SHE OF | ET 3 4 SHEETS |
| ELEVATION | DEPTH | LEGEND | | CLASSIFICATION OF MAT (Description) | TERIAL | S | % CORE RECOV- ERY | BOX OR SAMPLE NO. f | REMARKS (Drilling time, water loss weathering, etc., if signi | |
| а | b | c | CLAYE | d | arying | | e | f | g g | |
| | _ | | amoun dense | Y SAND (SC-SM) with v ts of silt, 29 <n<39, n="73<br">to very dense, yellowish</n<39,> | 3 @ 53 brown | s' to 55', to | | | | F |
| | | | reddish | brown (continued) | | | | | | <u> </u> |
| | _ | | | | | | | | | E |
| | | | | | | | | | | - |
| | _ | | | | | | | | | E |
| | _ | | | | | | | | | E |
| | _ | | | | | | | | | E |
| | | | | | | | 100 | SS-15 48.0 | BLOWCOUNT 9-13-17-24 | E |
| | _ | | | | | | | 50.0 | N = 30 (SC-SM) | E |
| | _ | | | | | | | | | F |
| | | | | | | | | | | E |
| | _ | | | | | | | | | E |
| | | | | | | | | | | E |
| | _ | | | | | | | | | E |
| | | | | | | | | | | E |
| | _ | | | | | | | | | F |
| | | | | | | | 100 | SS-16 | BLOWCOUNT | <u> </u> |
| | _ | | | | | | | 53.0 55.0 | 13-23-50-x N = 73 | E |
| | | | | | | | | | (SC-SM) Thin layer of light brown sar | ıd |
| | _ | | | | | | | | | E |
| | | | | | | | | | | E |
| | _ | | | | | | | | | E |
| | | | | | | | | | | E |
| | _ | | | | | | | | | E |
| | _ | | | | | | | | | F |
| | _ | | | | | | 100 | 20.15 | D. 0.000.00.T | E |
| | _ | | | | | | 100 | SS-17 58.0 60.0 | BLOWCOUNT 15-14-17-20 N = 31 | E |
| | | | | | | | | 60.0 | (SM) | E |
| | _ | | | | | | | | | E |
| | | | | | | | | | | E |
| | = | | | | | | | | | F |
| | | | | | | | | | | E |
| | _ | | | | | | | | | E |
| | | | | | | | | | | F |
| | _ | | | | | | | | | E |
| | | | | | | | 100 | SS-18 63.0 | BLOWCOUNT 19-17-22-28 | F |
| | = | | | | | | | 65.0 | N = 39 (SM) | F |
| | | | | | | | | | , | E |
| | | | | | | | | | | E |
| | = | | | | | | | | | F |
| | | | | | | | | | | E |
| | _ | | | | | | | | | F |
| | _ | | | | | | | | | E |
| | _ | | | | | | | | | E |
| ENG FORM | _ | <u> </u> | : | | | | PRO IECT | | | OLE NO |
| ENG FORM JUN 67 | 1836- | -A | | | | | PROJECT Lockhe | eed Mart | in MRC | OLE NO. TTDHCB-4 |



| DRILLING | G LOG | (Cont S | heet) | ELEVATION TOP OF 4.6 | HOLE | | | | Hole No. | TTDHCB-4 | |
|---------------------|----------------------------|----------|-------|---|---|-----------------|-------------------------|------------------------------|--|---|----------|
| PROJECT Lockheed | l Martin I | MRC | | • | | INSTALLA | ATION | | | SHEET 4 OF 4 SHE | |
| ELEVATION | DEPTH | LEGEND | | CLASSIFICATION OF (Descriptio | | S | % CORE RECOV- ERY | BOX OR SAMPLE NO. f | RE (Drilling time, weathering, (| MARKS water loss, depth etc., if significant) | |
| a | b | С | dense | d EY SAND (SC-SM) w ts of silt, 29 <n<39, n<br="">to very dense, yellow n brown (continued)</n<39,> | vith varying N=73 @ 53 vish brown | ' to 55', to | <u>e</u> 75 | f SS-19 68.0 70.0 | BLOWCOUNT 15-12-19-N/A N = 31 (SC-SM) | g | |
| -65.4 | 70.0 | | FND C | F BORING | | | | | | | 70 |
| -65.4 | 70.0 | | | of BORING | | | | | (SC-SM) | | |
| | | | | | | | | | | | |
| | - - - - - - | | | | | | | | | | 90 |
| | | | | | | | | | | | F |
| ENG FORM JUN 67 | 1836- | <u> </u> | | | | | PROJECT Lockhe | eed Mart | n MRC | HOLE NO. | CB-4 |



| | | | | | TETRA TECH Hole No. TTDHC | | | | | |
|--|------------|------------------|--|------------------------------|---------------------------|------------------|--|----------|--|--|
| DRILLING LOG CLIENT Lockheed Martin Corporation | | | | PROJEC ⁻ 194-8 | ΓNUMBER | | SHEET 1 OF 2 SHEE | \neg | | |
| . PROJECT | | | Lockineed Martin Corporation | | ING METHO |)D | HSA/Mud Rotary | .13 | | |
| Lockheed LOCATION (| | | 1) | 11. DATU MSL | M FOR ELE | VATION SH | HOWN (TBM or MSL) | | | |
| | ver, MD | | 114.8629 E 1,474,670.9438 | | JFACTURER | 'S DESIGN | ATION OF DRILL | | | |
| UniTech | | | | | L NO. OF SO | | DISTURBED UNDISTURBED | \dashv | | |
| HOLE NO. (A file number) | As shown o | n drawing t | itle and TTDHCB-5 | | PLES TAKEN | | 15 0 | | | |
| S. NAME OF DI | | | | | L NUMBER | | | _ | | |
| D. Evans | | | | 16. DATE | | | ARTED COMPLETED | | | |
| ∨ERTICA | AL |] INCLINED | DEG. FROM VERT. | | ATION TOP | OF HOLF | 9/30/2015 9/30/2015 +5.1 | \dashv | | |
| . THICKNESS | | | | | | | OR BORING | % | | |
| DEPTH DRILLED INTO POCK | | | | 19. GEOL | .OGIST | | K. Tu | | | |
| ELEVATION | DEPTH | LEGEND | CLASSIFICATION OF MATERIAL | .S | % CORE RECOV- | BOX OR SAMPLE | REMARKS (Drilling time, water loss, depth | | | |
| a | b | C | (Description) | | ERY | NO. f | weathering, etc., if significant) | | | |
| +5.1 | 0.0 | | PROBABLE FILL, predominantly SIL ⁻ (CL - ML) with occasional sand and tr | TY CLAY | 83 | SS-1 | BLOWCOUNTNT 2-3-3-4 | T | | |
| | = | | organics, moist, 5 <n<26, medium="" stif<="" td=""><td>f to very</td><td></td><td>0.0 2.0</td><td>N = 6</td><td>Ī</td></n<26,> | f to very | | 0.0 2.0 | N = 6 | Ī | | |
| | | | stiff, varying colors in brown to reddis | משסומ וו | | | (CL-ML) with sand and gravel Trace of organics | ŀ | | |
| | _ | | | | | | | ŀ | | |
| | | | | | 75 | SS-2 | BLOWCOUNT | ļ | | |
| | _ | | | | 13 | 2.0 | 2-3-2-4 | ļ | | |
| | _ | | | | | 4.0 | N = 5 (CL-ML) with sand in color of light brow | wn | | |
| | = | | | | | | | ŀ | | |
| | = | | | | | | | ļ | | |
| | _ | | | | 92 | SS-3 4.0 | BLOWCOUNT 3-3-5-7 | ļ | | |
| | _ | | | | | 6.0 | N = 8 | ŀ | | |
| | _ | | | | | | (CL-ML) Trace of organics | - | | |
| | _ | | | | | | - | ŀ | | |
| _ | | | | | 75 | 00.4 | DI CIMOCINIT | | | |
| | _ | | | | 75 | SS-4 6.0 | BLOWCOUNT 3-5-9-8 | ŀ | | |
| | _ | | | | | 8.0 | N = 14 (CL-ML) with sand | ŀ | | |
| | | | | | | | | Ī | | |
| | _ | | | | | | | | | |
| | | | | | 92 | SS-5 | BLOWCOUNT | ŀ | | |
| | _ | | | | | 8.0 10.0 | 7-9-11-15 N = 20 | ŀ | | |
| | | | | | | | (CL-ML) with sand | ŀ | | |
| | | | | | | | | ŀ | | |
| | | | | | | | | | | |
| | _ | | | | 100 | SS-6a SS-6b | BLOWCOUNT 7-8-12-13 | ŀ | | |
| | _ _ | | | | | 10.0 12.0 | N = 20 (CL-ML) | ŀ | | |
| | | | | | | | Thin layers of ironized (CL-ML) Top 12" in reddish brown | | | |
| | | | | | | | Bottom 12" in reddish black | | | |
| | | | | | 100 | SS-7 | BLOWCOUNT | ŀ | | |
| | = | | | | | 12.0 14.0 | 7-11-15-11 N = 26 | ŀ | | |
| | | | | | | | Cemented (CL-ML) | ļ | | |
| | _ | | | | | | | ŀ | | |
| | | | | | | | | ŀ | | |
| | | | | | 100 | SS-8 14.0 | BLOWCOUNT 3-7-9-9 | ŀ | | |
| | <u> </u> | | | | | 16.0 | N = 16 (CL-ML) | ŀ | | |
| | | | | | | | \ ···-/ | | | |
| | | | | | | | | ļ | | |
| -10.9 | 16.0 | | LEAN CLAY (CL) with varying amoun | ts of | 100 | SS-9 | BLOWCOUNT | ŀ | | |
| | _ | | sand, 11 <n<16, gray<="" stiff,="" td=""><td>-</td><td></td><td>16.0 18.0</td><td>4-5-6-9 N = 11</td><td>ŀ</td></n<16,> | - | | 16.0 18.0 | 4-5-6-9 N = 11 | ŀ | | |
| | | | | | | 10.0 | (CL) | ŀ | | |
| | = | \ /////// | | | | | | ŀ | | |
| | = | \ ////// | | | | | | | | |
| | _ | | | | 100 | SS-10 18.0 | BLOWCOUNT 4-5-6-8 | ı | | |
| | _ | | | | | 20.0 | N = 11 | ŀ | | |
| | | | | | | | (CL) | F | | |
| | <u> </u> | \ ////// | | | | | | ŀ | | |
| NO FORM | _ | <u> </u> | | | DDO ITOT | | LIOLENO | _ | | |
| NG FORM MAR 71 | 1836 | PREVIO | US EDITIONS ARE OBSOLETE. | | PROJECT Lockhe | eed Mart | in MRC HOLE NO. | 3-5 | | |



| RILLING | LOG (C | ont S | heet) ELEVATION TOP OF HOL | E | | | Holo No. TTD:// | , , , , |
|-----------|-----------|-------------|--|-----------------|-------------------------|------------------|---|------------|
| ROJECT | Martin MF | | , j 5.1 | INSTALLA | TION | | | 2 SHEETS |
| ELEVATION | | EGEND | CLASSIFICATION OF MAT (Description) | ERIALS | % CORE RECOV- ERY | BOX OR SAMPLE | REMARKS (Drilling time, water los weathering, etc., if sign | |
| а | b | c ////// | d LEAN CLAY (CL) with varying a sand, 11 <n<16, <i="" gray="" stiff,="">(cont</n<16,> | imounts of | e e | NO. f | weathering, etc., ii Sigi g | iiiiCarit) |
| | | | sand, 11 <n<16, (cont<="" gray="" stiff,="" td=""><td>inued)</td><td></td><td></td><td></td><td></td></n<16,> | inued) | | | | |
| | | | | | | | | |
| | | | | | | | | |
| | | | | | | | | |
| | | | | | | | | |
| | | | | | 100 | SS-11 | BLOWCOUNT | |
| | | | | | | 23.0 25.0 | 3-6-10-1 N = 16 | |
| | | | | | | | (CL) with sand | |
| | | | | | | | | |
| | | | | - | | | | |
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| | | | | | | | | |
| | | | | | | | | |
| | | | | | | | | |
| -22.9 | 28.0 | | | | | | | |
| -22.9 | 28.0 | | SILTY CLAY (CL-ML) with sand stiff, light brown | i, N = 18, very | 92 | SS-12 28.0 | BLOWCOUNT 4-9-9-10 | |
| | | | Sun, ngrit brown | | | 30.0 | N = 18 (CL-ML) with sand | |
| | | | | | | | (OE ME) With Sand | |
| | | | | | | | | |
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| | | | | | | | | |
| | | | | | | | | |
| -27.9 | 33.0 | | | | | | | |
| | | | CLAYEY SAND (SC-SM), 33 <n brown<="" dense,="" reddish="" td="" very=""><td><43, dense to</td><td>100</td><td>SS-13 33.0</td><td>BLOWCOUNT 8-14-19-28</td><td></td></n> | <43, dense to | 100 | SS-13 33.0 | BLOWCOUNT 8-14-19-28 | |
| | | | | | | 35.0 | N = 33 (SC-SM) | |
| | | | | | | | , | |
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| | | | | | | | | |
| | | | | | 100 | SS-14 38.0 | BLOWCOUNT 13-18-25-27 | |
| | | | | | | 40.0 | N = 43 (SC) | |
| | | | | | | | | - |
| -34.9 | 40.0 | | END OF BODING | | | | | |
| | | | END OF BORING | | | | | |
| | | | | | | | | |
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| | ı I | | 1 | | | İ | | |



Hole No. TTDHCB-6

| DRILLING LOG CLIENT Lockheed Martin Corporation | | PROJECT NUMBER SHEET 1 OF 2 SHEETS | | | | | | | |
|---|---|------------------------------------|-----------------------------|---|----------------------|------------------------------|------------------------------|--|------------|
| 1. PROJECT | 1 N A - 41 - | | | | 10. DRIL | LING METHO | | HSA/Mud Rotary | |
| Lockheed 2. LOCATION | | | on) | | 11. DATU | JM FOR ELE | VATION SH | IOWN (TBM or MSL) | |
| Middle Ri | ver, MD | N 604 | ,8 | 71.2328 E 1,473,853.6657 | | UFACTURER | R'S DESIGN | ATION OF DRILL | |
| 3. DRILLING A UniTech | GENCY | | | | 13. TOTA | AL NO. OF SO | OIL | DISTURBED UNDISTURBED | _ |
| 4. HOLE NO. (| 4. HOLE NO. (As shown on drawing title and file number) TTDHCB-6 | | | | | | 1 | 15 1 | |
| 5. NAME OF D | RILLER | | | : IIDUCB-0 | | AL NUMBER | | | |
| D. Evans | | | | | | ATION GRO | | R 0.0 ARTED COMPLETED | _ |
| 6. DIRECTION VERTIC | | INCLINE | ΞD | DEG. FROM VERT. | 16. DATE | HOLE | | 10/6/2015 10/6/2015 | _ |
| 7. THICKNESS | | • | | | | ATION TOP | | +5.0 | |
| 8. DEPTH DRI | | | | | 18. TOTA 19. GEOI | AL CORE RE | COVERY F | OR BORING | % |
| 9. TOTAL DEP | TH OF HOL | E | | 40.0 | 10. 0201 | | | K. Tu | |
| ELEVATION a | DEPTH b | LEGEN c | D | CLASSIFICATION OF MATERIAL (Description) d | S | % CORE RECOV- ERY e | BOX OR SAMPLE NO. f | REMARKS (Drilling time, water loss, depth weathering, etc., if significant) g | |
| +5.0 | 0.0 | | \boxtimes | PROBABLE FILL, CLAYEY SAND (Swith silt and trace of gravel and organ | C-SM) | 50 | SS-1 0.0 | BLOWCOUNT 2-1-3-2 | |
| | | | \otimes | moist to very moist, 3 <n<5, loos<="" td="" very=""><td>e to</td><td></td><td>2.0</td><td>N = 4</td><td>E</td></n<5,> | e to | | 2.0 | N = 4 | E |
| | | | \bigotimes | loose, varying colors in light brown to brown and gray | reddish | | | (SM) with trace of organics Trace of gravel | Ē |
| | | | \boxtimes | 5 , | | | | | Е |
| | | | $\langle \! \rangle$ | | | _ | | | |
| | | | \otimes | | | 75 | SS-2 2.0 | BLOWCOUNT 2-2-2-2 | |
| | | | \bigotimes | | | | 4.0 | N = 4 (SC-SM) | F |
| | | | \boxtimes | | | | | (GC-GW) | |
| | | | \bigotimes | | | | | | F |
| | | | $\langle\!\langle\!\langle$ | | | 83 | SS-3 | BLOWCOUNT | <u> </u> |
| | | | \bigotimes | | | 63 | 4.0 | 1-1-2-2 | F |
| 1 | | | \bigotimes | | | | 6.0 | N = 3 (SC) | 5 |
| - | | | \boxtimes | | | | | | |
| | | | \otimes | | | | | | Е |
| | | | \otimes | | | 100 | SS-4a | BLOWCOUNT | <u> </u> |
| | _ | | \otimes | | | | SS-4b 6.0 | 4-2-3-2 N = 5 | E |
| | | | \boxtimes | | | | 8.0 | Top 18" (SC) | |
| -2.5 | 7.5 — | | \otimes | | | | | Bottom 6" Sándy (SC-SM) | |
| | = | | 7 | CLAYEY SAND (SC), 8 <n<14, dense,="" gray<="" loose="" medium="" td=""><td>to</td><td></td><td></td><td></td><td>F</td></n<14,> | to | | | | F |
| | | | | medium dense, gray | | 75 | SS-5 | BLOWCOUNT | |
| | | | | | | | 8.0 10.0 | WH-3-5-6 N = 8 | F |
| | | | | | | | | (SC) | |
| | | | | | | | | | F |
| | = | | | | | | | | F 10 |
| | | | | | | 83 | SS-6 10.0 | BLOWCOUNT 4-6-8-10 | E |
| | | | | | | | 12.0 | N = 14 | Е |
| | | | | | | | | (SC) | |
| | _ | | | | | | | | F |
| | | | | | | | 0.5 | DI OMOO! "IT | |
| | | | | | | 100 | SS-7 12.0 | BLOWCOUNT 3-5-6-7 | F |
| | _ | | | | | | 14.0 | N = 11 (SC) | E |
| | _ | | | | | | | | F |
| | _ | | | | | | | | F |
| | | | | | | 83 | SS-8 | BLOWCOUNT | |
| | | | | | | 03 | 14.0 | 4-5-7-10 | F |
| | _ | | | | | | 16.0 | N = 12 (SC) | F 15 |
| | | | | | | | | | E |
| | _ | | | | | | | | E |
| | | | | | | 100 | SS-9 | BLOWCOUNT | Ē |
| | _ | | | | | | 16.0 18.0 | 3-5-7-7 N = 12 | E |
| | | | | | | | 10.0 | (CL) | |
| | | | | | | | | | F |
| 40.0 | | | | | | | | | E |
| -13.0 | 18.0 | | 11 | CLAYEY SAND (SC-SM), 18 <n<22, i<="" td=""><td>medium</td><td>108</td><td>ST-1</td><td>Shelby tube</td><td></td></n<22,> | medium | 108 | ST-1 | Shelby tube | |
| | | | | dense, reddish brown | | | 18.0 19.5 | PP = 1.5 tsf Top 11" (CL) with sand | F |
| | | | | | | | | Bottom 3.5" (SC) | <u> </u> |
| | | | | | | | | | F |
| | _ | | | | | 90 | SS-10 19.5 | BLOWCOUNT 9-9-9-9 | <u></u> 20 |
| ENG FORM | 1836 | PREVI | OU | S EDITIONS ARE OBSOLETE. | | PROJECT | eed Mart | HOLE NO. | |
| IVIAK / I | | | | | | LOCKIN | ocu iviait | v | |



| RILLING | LOG (Cont | Sheet) ELEVATION TOP OF HOLE 5.0 | | | Holo No. TTDUCE 6 | |
|----------|--------------------------|--|---------------------------|------------------|--|-----------|
| ROJECT | | , l 9.0 | INSTALLATION | | Hole No. TTDHCB-6 | \exists |
| Lockheed | Martin MRC DEPTH LEGENI | CLASSIFICATION OF MATERIAL | S % CORE RECOV- ERY | BOX OR SAMPLE | OF 2 SHEETS REMARKS (Drilling time, water loss, depth | s |
| a | b c | (Description) | e | NO. f | weathering, etc., if significant) g | \perp |
| | | CLAYEY SAND (SC-SM), 18 <n<22, (continued)<="" brown="" dense,="" r="" reddish="" td=""><td>nedium</td><td>21.5</td><td>N = 18 (SC)</td><td>ŀ</td></n<22,> | nedium | 21.5 | N = 18 (SC) | ŀ |
| | | | | | | F |
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| | | | | | | F |
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| | | | 83 | SS-11 23.0 | BLOWCOUNT 5-9-13-13 | F |
| | | | | 25.0 | N = 22 (SC-SM) | þ |
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| | 3// | | | | | F |
| | | | 83 | SS-12 | BLOWCOUNT | ŧ |
| | | | | 28.0 30.0 | 5-8-11-15 N = 19 | ŀ |
| | | | | | (SC) | ŀ |
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| | | A: 1. 2. | | | | F |
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| | | | | | | ŀ |
| | | | | | | ŀ |
| -28.0 | 33.0 | CLAYEY SAND (SC-SM), 47 <n<71, td="" v<=""><td>ery 100</td><td>SS-13</td><td>BLOWCOUNT</td><td>ŀ</td></n<71,> | ery 100 | SS-13 | BLOWCOUNT | ŀ |
| | | dense to dense, reddish brown | | 33.0 35.0 | 27-21-50-x N = 71 | þ |
| | | | | | (SC-SM) | Ė |
| | | | | | | ŀ |
| | | A. | | | | ŀ |
| | | | | | | F |
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| | | | | | | F |
| | | | | | | ŀ |
| | | | | | | F |
| | | | 100 | SS-14 | BLOWCOUNT | þ |
| | | | 100 | 38.0 40.0 | 15-20-27-37 N = 47 | F |
| | | | | | (SC) | |
| | | | | | | F |
| -35.0 | 40.0 | END OF BORING | | | | þ |
| | | FIAD OF BOILING | | | | þ |
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| | \exists | | | | | þ |
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| | | | | | TETRA TECH Hole No. TTDHO | | | | | |
|----------------------------|---|-------------|---|-----------------|---------------------------|------------------|---|----------|--|--|
| DRILLI | DRILLING LOG CLIENT Lockheed Martin Corporation | | | | T NUMBER | | | 1 | | |
| . PROJECT | | • | Lookiicea Martin Corporation | 10. DRILL | LING METHO | | HSA/Mud Rotary | ILLIO | | |
| Lockheed | | | n) | 11. DATU MSL | JM FOR ELE | VATION SH | IOWN (TBM or MSL) | | | |
| | ver, MD | | 794.5472 E 1,473,729.9770 | | JFACTURER | 'S DESIGN | ATION OF DRILL | | | |
| UniTech | | | | | L NO. OF SO | | DISTURBED UNDISTURBE | D | | |
| HOLE NO. (A file number) | As shown o | n drawing t | itle and TTDHCB-7 | | PLES TAKEN | | 22 1 | | | |
| NAME OF D | | | | | L NUMBER ATION GRO | | | | | |
| D. Evans | | | | 16. DATE | | | ARTED COMPLETED | _ | | |
| ∨ERTICA | AL |] INCLINED | DEG. FROM VERT. | | ATION TOP | OF HOLF | 10/6/2015 10/6/2015 +4.7 | <u> </u> | | |
| 7. THICKNESS OF OVERBURDEN | | | | | L CORE RE | | | % | | |
| DEDTH DDILLED INTO DOCK | | | | 19. GEOL | OGIST | | K. Tu | | | |
| ELEVATION | DEPTH | LEGEND | CLASSIFICATION OF MATERIAL | S | % CORE RECOV- | BOX OR SAMPLE | REMARKS (Drilling time, water loss, depth | | | |
| a | b | C | (Description) | | ERY e | NO. f | weathering, etc., if significant) | | | |
| +4.7 | 0.0 | | PROBABLE FILL, POORLY GRADED WITH CLAY (SP-SC), moist to very m | | 83 | SS-1 0.0 | BLOWCOUNT 1-1-2-2 | | | |
| | | | 0 <n,3, colors="" gr<br="" in="" loose,="" varying="" very="">dark gray, brownish gray and redish b</n,3,> | ray to | | 2.0 | N=3 | | | |
| | _ | | uark gray, brownish gray and redish b | n OWI l | | | (SC-SM) | | | |
| | = | | | | | | | | | |
| | | | | | 83 | SS-2 | BLOWCOUNT | | | |
| | | | | | | 2.0 | 2-1-2-1 N = 3 | | | |
| | _ | | | | 455 | | (SP-SC) | | | |
| | = | | | | 100 | SS-15 3.0 | BLOWCOUNT 6-9-12-14 | | | |
| | _ | | | | | 5.0 | N = 21 (SC-SM) | | | |
| | _ | | | | 100 | SS-3 4.0 | BLOWCOUNT | | | |
| | | | | | | 6.0 | N = 2 | | | |
| | | | | | | | (SP-SC) | | | |
| _ | _ | | | | | | | | | |
| _ | | | | | 100 | SS-4 | BLOWCOUNT | | | |
| | _ | | | | 100 | 6.0 | 1-2-1-2 | | | |
| | _ | | | | | 8.0 | N = 3 (SP-SC) | | | |
| | _ | | | | | | | | | |
| | _ _ | | | | | | | | | |
| | | | | | 50 | SS-5 | BLOWCOUNT | | | |
| | _ | | | | | 8.0 10.0 | 1-1-1-1 N = 2 | | | |
| | | | | | | | (SP-SC) | | | |
| | _ | | | | | | | | | |
| | _ | | | | 400 | 00.0 | DI OMOQUINT | | | |
| | _ | | | | 100 | SS-6 10.0 | BLOWCOUNT 1-1-1-1 | | | |
| | _ | | | | | 12.0 | N = 2 (SP-SC) | | | |
| | _ | | | | | | | | | |
| | <u>-</u> | | | | | | | | | |
| | _ | | | | 100 | SS-7 | BLOWCOUNT | | | |
| | | | | | | 12.0 14.0 | WH-WH-WH-1 N = WH | | | |
| | | | | | | | SP-SC | | | |
| | | | | | | | | | | |
| | | | | | 63 | 00.0 | PLOWCOLINT | | | |
| | = | | | | 03 | SS-8 14.0 | BLOWCOUNT WH-WH-2-1 | | | |
| | | | | | | 16.0 | N = 2 Top 12" (SP-SC) | | | |
| | = | | | | | | Bottom 12" (SC-SM) | | | |
| -11.3 | | | | | | | | | | |
| -11.3 | 10.0 | | STILY CLAY (CL-ML) with varying am | ounts of | 100 | SS-9 | BLOWCOUNT | | | |
| | = | | sand, 10 <n<27, brown<="" light="" reddish="" stiff="" stiff,="" td="" to="" very=""><td>prown to</td><td></td><td>16.0 18.0</td><td>2-4-6-9 N = 10</td><td></td></n<27,> | prown to | | 16.0 18.0 | 2-4-6-9 N = 10 | | | |
| | | | | | | | (CL-ML) with sand | | | |
| | _ | | | | | | | | | |
| | | | | | | | | | | |
| | | | | | 75 | SS-10b | BLOWCOUNT 4-7-7-9 | | | |
| | <u>-</u> | | | | | 18.0 | N = 14 (CL-ML) | | | |
| | | | | | | | \/ | | | |
| | = | | | | | | | | | |
| NG FORM | 4000 | | LIC EDITIONS ARE ORGAN ETF | | PROJECT | | HOLE NO | | | |
| MAR 71 | 1836 | rkeviU | US EDITIONS ARE OBSOLETE. | | Lockhe | eed Mart | in MRC HOLE NO | ICB-7 | | |



| OJECT | | 4.7 INSTALL | ATION | | Hole No. TTDHCB-7 | | | |
|--------------|----------------|--|--------------------|--|---|---|--|--|
| | Martin MRC | CLASSIFICATION OF MATERIALS | % CORE | BOX OR | OF 4 SHEET | s | | |
| EVATION a | DEPTH LEGEND c | (Description) | RECOV- ERY e | BOX OR SAMPLE NO. f | (Drilling time, water loss, depth weathering, etc., if significant) | | | |
| ŭ | | STILY CLAY (CL-ML) with varying amounts of sand, 10 <n<27, (continued)<="" brown="" light="" reddish="" stiff="" stiff,="" td="" to="" very=""><td></td><td></td><td>9</td><td></td></n<27,> | | | 9 | | | |
| | | | 100 | SS-11 | BLOWCOUNT | | | |
| | | | | 23.0 25.0 | 9-11-16-18 N = 27 (CL-ML) with sand | | | |
| | | | | | | | | |
| | | | | | | | | |
| 23.3 | 28.0 | CLAYEY SAND (SC-SM) with silt, 13 <n<24, brown<="" colors="" desne,="" in="" light="" medium="" td="" varying=""><td>100</td><td>SS-12 28.0</td><td>BLOWCOUNT 10-7-12-17</td><td></td></n<24,> | 100 | SS-12 28.0 | BLOWCOUNT 10-7-12-17 | | | |
| | | medium desne, varying colors in light brown to reddish brown and red to brownish red | | 30.0 | N = 19 (SC-SM) | | | |
| | | | 100 | ST-1 | Shelby tube | | | |
| | | | 33 | 30.0 30.3 SS-13a 30.3 32.3 | PP = 2.0-3.0 tsf 3" recovery (SC) BLOWCOUNT 3-7-9-9 N = 16 (SC) | | | |
| | | | 100 | SS-14 | BLOWCOUNT 5-6-7-8 | | | |
| | | | | 33.0 35.0 | N = 13 (SM) | | | |
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| | | | | | | | | |
| | | | 100 | SS-16 43.0 45.0 | BLOWCOUNT 8-10-14-17 N = 24 (SC-SM) with thin layers of CL-ML | | | |



ELEVATION TOP OF HOLE **DRILLING LOG (Cont Sheet)** Hole No. TTDHCB-7 INSTALLATION SHEET 3 Lockheed Martin MRC OF SHEETS BOX OR SAMPLE NO. f REMARKS CLASSIFICATION OF MATERIALS ELEVATION DEPTH LEGEND (Drilling time, water loss, depth weathering, etc., if significant) RECOV-ERY e (Description) CLAYEY SAND (SC-SM) with silt, 13<N<24, medium desne, varying colors in light brown to reddish brown and red to brownish red (continued) 45 -43.3 48.0 Interbedded CLAYEY SAND (SC-SM) and SILTY CLAY (CL-ML), 35<N<42, N=79 @ 63' to 65', medium dense and hard, varying colors in brownish red to red and gray BLOWCOUNT 17-18-17-33 N = 35 (SC-SM) 100 SS-17 48.0 50.0 SS-18 53.0 55.0 **BLOWCOUNT** 8-16-21-38 N = 37 (CL-ML) 55 BLOWCOUNT 14-19-23-26 N = 42 (SC-SM) SS-19 58.0 100 60.0 60 BLOWCOUNT 13-39-40-50/5" N = 79 96 SS-20 63.0 65.0 Cemented (CL-ML) 65 HOLE NO. TTDHCB-7 **ENG FORM**

1836-A

Lockheed Martin MRC



| DRILLING | G LOG (| Cont S | heet) | ELEVATI 4.7 | ON TOP | OF HOLE | | | | Hole N | o. TTI | рнсв-7 | |
|---------------------|------------------|--------|---------|----------------|--------------------|---|-------------|-------------------------|------------------------------|-----------------------|----------------------|--|----|
| PROJECT Lockheed | l Martin I | MRC | | | | | INSTALL | ATION | | | | SHEET 4 OF 4 SHEETS | |
| ELEVATION | DEPTH | LEGEND | | CLASSIF | ICATION (Descri | OF MATERIA | ALS | % CORE RECOV- ERY | BOX OR SAMPLE NO. f | (Drilling weathe | REMARI time, wate | KS or loss, depth f significant) | |
| а | b | c | Interbe | dded CL | d AYEY S/ | AND (SC-SN 5 <n<42, n="</th"><th>M) and</th><th>100</th><th>SS-21</th><th>BLOWCOUN</th><th>g</th><th></th><th></th></n<42,> | M) and | 100 | SS-21 | BLOWCOUN | g | | |
| | _ | | to 65', | medium (| dense ar | nd hard, var | ying colors | | 68.0 70.0 | 17-18-24-32 N = 42 | | | |
| | | | in brow | nish red | to red ar | nd gray (con | tinued) | | | (CL) | | | |
| | = | | | | | | | | | | | | E |
| -65.3 | 70.0 | | END C | F BORIN | IG | | | | | | | | 70 |
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| ENG FORM JUN 67 | 1836- | A | | | | | | PROJECT Lockhe | eed Mart | in MRC | | HOLE NO. TTDHCB-7 | 7 |



Hole No. TTDHCB-8

| DRILLI | NG LOG | CLIE | NT ockheed Martin Corporation | PROJECT 194-8 | NUMBER | | | SHEET 1 OF 2 SHEETS |
|---------------------------|-------------------|-----------|---|------------------|----------------------|------------------------------|--|---------------------------------|
| 1. PROJECT | | [| ockileed Martin Corporation | | ING METHO | | HSA/Mud Rotary | OF Z SHEETS |
| | Martin MRC | | | 11. DATU | | | HOWN (TBM or MSL) | |
| | Coordinates or St | | 30.4520 E 1,473,602.9321 | MSL 12. MANU | JFACTURFF | R'S DESIGN | ATION OF DRILL | |
| 3. DRILLING A | | , | , -, | | | | | |
| UniTech 4. HOLE NO. (A | As shown on draw | ing title | e and | | L NO. OF SOLES TAKEN | | DISTURBED UI | NDISTURBED 1 |
| file number) | | | TTDHCB-8 | 14. TOTA | L NUMBER | CORE BOX | * | <u> </u> |
| 5. NAME OF D D. Evans | | | | 15. ELEV | ATION GRO | UND WATE | ER 3.0 | |
| 6. DIRECTION | OF HOLE | | | 16. DATE | HOLE | ST | | PLETED 10/8/2015 |
| | | | DEG. FROM VERT. | 17. ELEV | ATION TOP | OF HOLE | +9.0 | 10/0/2010 |
| | OF OVERBURDI | | | | | | OR BORING | % |
| 9. TOTAL DEP | LLED INTO ROCK | | 40.0 | 19. GEOL | OGIST | | K. Tu | |
| | | | CLASSIFICATION OF MATERIALS | S | % CORE | BOX OR | REMARK | |
| ELEVATION | DEPTH LEGI | | (Description) | | RECOV- ERY | SAMPLE NO. f | (Drilling time, water weathering, etc., if | loss, depth significant) |
| a +9.0 | 0.0 | | d PROBABLE FILL, CLAYEY SAND (So to very moist, 2 <n<7, and="" brown="" brownish="" colors="" go="" gray<="" in="" loo="" loose="" reddish="" td="" to="" varying="" very=""><td>ose,</td><td>42</td><td>SS-1 0.0 2.0</td><td>BLOWCOUNT x-x-7-25 N = 7 8" dirt 4" concrete slab 12" base materials</td><td></td></n<7,> | ose, | 42 | SS-1 0.0 2.0 | BLOWCOUNT x-x-7-25 N = 7 8" dirt 4" concrete slab 12" base materials | |
| | | | | | 63 | SS-2 2.0 4.0 | BLOWCOUNT 2-1-2-1 N = 3 (SC-SM) | |
| | | | | | 67 | SS-3a SS-3b 4.0 6.0 | BLOWCOUNT 2-2-1-1 N = 3 Top 8" (SC) Bottom 8" (CLS) | E |
| | | | | | 92 | SS-4 6.0 8.0 | BLOWCOUNT WH-1-1-1 N = 2 (CLS) | |
| | | | | | 100 | SS-5 8.0 10.0 | BLOWCOUNT 1-2-3-5 N = 5 (SC) | |
| | | | | | 54 | SS-6 10.0 12.0 | BLOWCOUNT 5-4-3-3 N = 7 (SC) with gravel | |
| -3.0 | 12.0 | | SILTY CLAY (CL-ML) with occasional 7 <n<15, l<="" medium="" reddish="" stiff="" stiff,="" td="" to=""><td>sand, brown</td><td>50</td><td>SS-7 12.0 14.0</td><td>BLOWCOUNT 2-4-7-7 N = 11 (CL-ML) with sand</td><td> </td></n<15,> | sand, brown | 50 | SS-7 12.0 14.0 | BLOWCOUNT 2-4-7-7 N = 11 (CL-ML) with sand | |
| | | | | | 100 | ST-1 14.0 16.0 | Shelby tube 24" recovery | |
| | | | | | 63 | SS-8 16.0 18.0 | BLOWCOUNT 6-8-7-8 N = 15 (CL-ML) | - - - - - - |
| | | | | | 54 | SS-9 18.0 20.0 | BLOWCOUNT 3-3-4-6 N = 7 (CLS) | |
| ENG FORM MAR 71 | 1836 PRE | VIOUS | S EDITIONS ARE OBSOLETE. | | PROJECT Lockho | eed Mart | in MRC | HOLE NO. TTDHCB-8 |



| או ו ווסר | 2100 | Conto | hast | ELEVATION TOP OF HOLE | | | 16 | | |
|-----------|----------|---------|---|---|------------|---------------|------------------------------|---|---|
| PROJECT | LOG (| Cont S | neet) | 9.0 | INSTALLAT | ION | | Hole No. 1 | TDHCB-8 SHEET 2 |
| Lockheed | Martin I | MRC | | | | % CORE | DOV OD | DEA | OF 2 SHEETS |
| ELEVATION | DEPTH | LEGEND | | CLASSIFICATION OF MATERIAL (Description) | _S | RECOV- ERY | BOX OR SAMPLE NO. f | (Drilling time, weathering, e | water loss, depth tc., if significant) |
| а | b | | SILTY | d CLAY (CL-ML) with occasiona | ıl sand. | е | f | | 9 |
| | _ | | 7 <n<1< td=""><td>5, medium stiff to stiff, reddish</td><td>brown</td><td></td><td></td><td></td><td></td></n<1<> | 5, medium stiff to stiff, reddish | brown | | | | |
| | | | (COTILITIE | ucu) | | | | | |
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| -14.0 | 23.0 | | CLAYE | EY SAND (SC-SM) with silt and | trace of | 96 | SS-10 | BLOWCOUNT | |
| | = | | organic | cs, 12 <n<20, and<="" brown="" ratified="" reddish="" stiff="" stiff,="" td="" to="" very="" with=""><td>2 1.000 0.</td><td></td><td>23.0 25.0</td><td>4-7-5-7 N = 12</td><td></td></n<20,> | 2 1.000 0. | | 23.0 25.0 | 4-7-5-7 N = 12 | |
| | | | brownis | sh red | | | 25.0 | (SC-SM) | |
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| | _ | | | | | 100 | SS-11 | BLOWCOUNT | |
| | _ | | | | | | 28.0 30.0 | 5-6-7-9 N = 13 | |
| | | | | | | | | Top 12" (SC-SM) ir Bottom 12" (CL-ML | ı brown) in reddish brown |
| | | | | | | | | Bottom 12 (OL IVIL | , iii roddioir brown |
| | | | | | | | | | |
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| | | | | | | 100 | SS-12 33.0 | BLOWCOUNT 6-8-12-13 | |
| | = | | | | | | 35.0 | N = 20 (CLS) | |
| | | | | | | | | Trace of decompos | ed timber |
| | = | | | | | | | | |
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| -29.0 | 38.0 | | LEAN | CLAY (CL) with sand. N = 40 | hard. | 100 | SS-13 | BLOWCOUNT | |
| | | | interstr | CLAY (CL) with sand, N = 40, I ratified with reddish brown and sh red in color | | . = • | 38.0 40.0 | 8-16-24-28 N = 40 | |
| | _ | | 2.5Wills | 100 111 00101 | | | 40.0 | (CL) | |
| | _ | | | | | | | | |
| -31.0 | 40.0 | | | | | | | | |
| 31.0 | | <i></i> | END O | F BORING | | | | | |
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ENG FORM 1836-A

PROJECT Lockheed Martin MRC

HOLE NO. TTDHCB-8



Hole No. TTDHCB-9

| DRILLI | NG LO | G | CLIEI L o | NT ockheed Martin Corporation | PROJEC ⁻ 194-8 | T NUMBER | | SHEET OF 2 | 1 SHEETS |
|-------------------------------|--------------|------------|--------------|---|------------------------------|-------------------------|-------------------------|---|-----------------|
| 1. PROJECT | I N 4 =t.: N | 400 | | onineed Martin Corporation | 10. DRILL | ING METHO | | HSA/Mud Rotary | OHEETO |
| Lockheed 2. LOCATION (| Coordinates | s or Stati | ion) | | 11. DATU MSL | IM FOR ELE | VATION SH | IOWN (TBM or MSL) | |
| Middle Ri 3. DRILLING A | | N 604 | 1,54 | 2.2869 E 1,473,578.7008 | 12. MANU | JFACTURER | 'S DESIGN | ATION OF DRILL | |
| UniTech | | | | • : | | L NO. OF SO | | DISTURBED UNDISTU | |
| 4. HOLE NO. (a file number) | As shown o | n drawin | g title | TTDHCB-9 | | L NUMBER | | | 1 |
| 5. NAME OF D D. Evans | RILLER | | | | | ATION GRO | | | |
| 6. DIRECTION | | | | | 16. DATE | HOLE | ST | ARTED COMPLETED 10/8/2015 10/8/2 | |
| VERTIC | | INCLIN | | DEG. FROM VERT. | 17. ELEV | ATION TOP | OF HOLE | +7.6 | .010 |
| 7. THICKNESS 8. DEPTH DRII | | | 1 | | | | COVERY F | OR BORING | % |
| 9. TOTAL DEP | TH OF HOL | .E | | 40.0 | . 19. GEOL | | | K. Tu | |
| ELEVATION | DEPTH | LEGEN | ID | CLASSIFICATION OF MATERIAL (Description) | S | % CORE RECOV- ERY | BOX OR SAMPLE NO. | REMARKS (Drilling time, water loss, de weathering, etc., if significa | |
| a +7.6 | b 0.0 | c ×××× | × 1 | d d PROBABLE FILL, mixed material, | | e 83 | SS-1 | BLOWCOUNT | |
| 17.0 | 0.0 _ | | ı KXX | predominantly SANDY CLAY (CL), m | | 63 | 0.0 | 3-1-3-2 N = 4 | |
| | | | | very moist, 1 <n<4, a="" and="" are="" brown="" color,="" loose,="" loose.<="" reddish="" soft="" th="" to="" varying="" very=""><th></th><th></th><th>2.0</th><th>N = 4 (MLS)</th><th></th></n<4,> | | | 2.0 | N = 4 (MLS) | |
| | _ | | | | | | | | F |
| | <u>=</u> | | | | | | | | F |
| | | | | | | 75 | SS-2 2.0 | BLOWCOUNT 2-2-1-2 | |
| | | | | | | | 4.0 | N = 3 (SC-SM) | E |
| | | | | | | | | (30-3WI) | <u> </u> |
| | <u> </u> | | | | | | | | F |
| | | | | | | 92 | SS-3 | BLOWCOUNT | <u> </u> |
| | | | | | | "- | 4.0 6.0 | 1-1-1-1 N = 2 | E |
| | _ | | | | | | 0.0 | (CLS) | 5 |
| | _ | | | | | | | | F |
| 1 | 7 – | | | | | | | | F |
| | | | | | | 83 | SS-4 6.0 | BLOWCOUNT WH-WH-1-1 | E |
| | _ | | | | | | 8.0 | N = 1 (CLS) | |
| | _ | | | | | | | (CLS) | |
| | _ | | | | | | | | F |
| | _ | | | | | 63 | SS-5a | BLOWCOUNT | |
| | _ | | | | | | SS-5b 8.0 | WR-1-2-3 N = 3 | E |
| | | | | | | | 10.0 | Top 11" (SP-SM) Bottom 4" (CL-ML) | |
| | _ | | | | | | | Bottom 4 (CE-IVIE) | F |
| -2.4 | 10.0 | | | | | | | | 10 |
| | | | | SILTY CLAY (CL - ML), 16 <n<25, stif<br="">stiff, reddish brown</n<25,> | f to very | 100 | SS-6 10.0 | BLOWCOUNT 5-7-9-13 | |
| | _ _ | | | , | | | 12.0 | N = 16 PP = 2.0-4.0 tsf | - |
| | _ | | | | | | | (CL-ML) | <u> </u> |
| | _ | | | | | | | | F |
| | _ | | | | | 100 | ST-1 | Shelby tube | |
| | <u> </u> | | | | | | 12.0 13.0 | PP = 4.0-4.5 tsf 12" recovery | þ |
| | | | | | | 100 | SS-7a | (CL) BLOWCOUNT | <u> </u> |
| | | | | | | 100 | SS-7b | 6-10-15-17 N = 25 | E |
| | | | | | | | 13.0 15.0 | Top 12" (CL-ML) | E_ |
| | _ | | | | | | | Bottom 12" (CLŚ) | F |
| -7.4 | 15.0 — | | | | | | | | - - 15 |
| | | | | CLAYEY SAND (SC) with varying amount of the community of | ounts of | 63 | SS-8 15.0 | BLOWCOUNT 7-13-20-23 | E |
| | | | | stiff, brown to reddish brown | o, voiy | | 17.0 | N = 33 | E |
| | _ | | | | | | | (SC) | <u> </u> |
| | <u> </u> | | | | | | | | F |
| | | | | | | 100 | SS-9 | BLOWCOUNT | |
| | | | | | | | 17.0 19.0 | 4-7-9-8 N = 16 | E |
| | | | | | | | 10.0 | (SC) | |
| | = | | | | | | | | F |
| | | | | | | | | | F |
| | | | | | | 63 | SS-10 19.0 | BLOWCOUNT 4-6-4-4 | E |
| | <u>-</u> | | | | | | 21.0 | N = 10 (SC) | - - 20 |
| ENG FORM | 1836 | PREVI | IOUS | S EDITIONS ARE OBSOLETE. | | PROJECT Lockhe | eed Mart | HOLE | |
| MAR 71 | | | | | | LUCKIR | ou iviai l | vii.\\\ | ביםטוום |



ELEVATION TOP OF HOLE **DRILLING LOG (Cont Sheet)** Hole No. TTDHCB-9 INSTALLATION SHEET 2 Lockheed Martin MRC OF SHEETS REMARKS BOX OR SAMPLE NO. f CLASSIFICATION OF MATERIALS ELEVATION DEPTH LEGEND (Drilling time, water loss, depth weathering, etc., if significant) RECOV-ERY e (Description) CLAYEY SAND (SC) with varying amounts of silt, 10<N<33, medium dense to dense, very stiff, brown to reddish brown (continued) SS-11 23.0 25.0 BLOWCOUNT 4-7-9-11 N = 16 100 Sandy (SC-SM) 25 -20.4 28.0 SILTY CLAY (CL - ML), 36<N<39, hard, 100 SS-12 **BLOWCOUNT** 28.0 30.0 11-17-22-27 N = 39 PP > 4.5 tsf reddish brown (CLS) 30 BLOWCOUNT 10-16-22-27 N = 38 (CL-ML) SS-13 33.0 35.0 100 35 BLOWCOUNT 9-15-21-30 N = 36 (CL-ML) 100 SS-14 38.0 40.0 -32.4 ENG FORM JUN 67 HOLE NO. TTDHCB-9 1836-A Lockheed Martin MRC



Hole No. TTDHCB-10

| DRILLI | NG LO | · | ENT .ockheed Martin Corporation | PROJEC* | T NUMBER | | SHEET OF 2 SH | 1 |
|-------------------------------|--|--------------|---|--|-----------------------|--------------------------------|---|---------------------------------|
| 1. PROJECT | | | Cockneed Martin Corporation | _ | LING METHO | OD | HSA/Mud Rotary | IEE 13 |
| Lockheed | | | | 11. DATU | | | HOWN (TBM or MSL) | |
| 2. LOCATION (Middle Ri | | |) 29.0408 E 1,473,578.8936 | MSL 12 MANI | JEACTI IREE | R'S DESIGN | ATION OF DRILL | |
| 3. DRILLING A | | | | _ IZ. WAIN | JI ACTORES | V3 DESIGN | ATION OF DIVILLE | |
| UniTech 4. HOLE NO. (A | As shown or | n drawing ti | tle and | | L NO. OF SOPLES TAKEN | | DISTURBED UNDISTURBED 17 1 | D |
| file number) | | | TTDHCB-10 | 14. TOTA | L NUMBER | CORE BOX | | |
| 5. NAME OF D D. Evans | | | | | ATION GRO | | | |
| 6. DIRECTION | | | | 16. DATE | HOLE | ST | ARTED COMPLETED 10/7/2015 10/7/2015 | |
| | AL | INCLINED | DEG. FROM VERT. | 17. ELEV | ATION TOP | OF HOLE | +5.5 | <u>'</u> |
| 7. THICKNESS | | | | | | | OR BORING | % |
| 8. DEPTH DRII 9. TOTAL DEP | | | 40.0 | 19. GEOL | OGIST | | V Т | |
| | | | CLASSIFICATION OF MATERIAL | .s | % CORE | BOX OR | K. Tu | |
| ELEVATION | DEPTH | LEGEND | (Description) | | RECOV- ERY | SAMPLE NO. f | weathering, etc., if significant) | |
| a +5.5 | 0.0 | c | PROBABLE FILL, CLAYEY SAND (So trace of organics, moist to very moist, very loose to loose, varying colors in r brown and brownish gray to gray | 3 <n<7,< th=""><th>67</th><th>SS-1 0.0 2.0</th><th>BLOWCOUNT 2-2-4-5 N = 6 (SC-SM) with sand, trace of organic</th><th>cs</th></n<7,<> | 67 | SS-1 0.0 2.0 | BLOWCOUNT 2-2-4-5 N = 6 (SC-SM) with sand, trace of organic | cs |
| | | | | | | 00.0 | DI OMO OLINIT | |
| | —————————————————————————————————————— | | | | 83 | SS-2 2.0 4.0 | BLOWCOUNT 2-2-3-4 N = 5 (CLS) with sand | |
| | | | | | 92 | SS-3a SS-3b 4.0 6.0 | BLOWCOUNT 4-2-5-4 N = 7 (CLS) Top 15" in reddish brown Bottom 7" in gray Creosote small | 5 |
| <u>-</u> | —————————————————————————————————————— | | | | 100 | SS-4 6.0 8.0 | BLOWCOUNT 1-1-2-1 N = 3 (SC) with organics | |
| | | | | | 100 | SS-5 8.0 10.0 | BLOWCOUNT 1-1-1-1 N = 2 (SC) with organics and trace of timb | E |
| -6.0 | 11.5 | | CLAY (CL-CH) with varying amounts | of sand | 75 | SS-6a SS-6b 10.0 12.0 | BLOWCOUNT WH-2-3-4 N = 5 Top 18" (SC) Bottom 6" (CL-ML) | 1 |
| | | | and thin layers of silty clay, 9 <n<30, s<br="">very stiff, brownish red</n<30,> | stiff to | 83 | SS-7 12.0 14.0 | BLOWCOUNT 3-4-5-6 N = 9 (CL-ML) | |
| | | | | | 92 | SS-8 | BLOWCOUNT | |
| | | | | | | 14.0 16.0 | 8-9-10-14 N = 19 (CH) | - - - - - - |
| | | | | | 83 | SS-9 16.0 18.0 | BLOWCOUNT 4-4-7-8 N = 11 (CH) | |
| | | | | | 0 | ST-1 18.0 20.0 | Shelby tube No recovery | |
| ENG FORM MAR 71 | 1836 | PREVIOL | JS EDITIONS ARE OBSOLETE. | | PROJECT Lockho | eed Mart | in MRC HOLE NO | CB-10 |



| | LOG (Cont S | 0.0 | | | Hole No. TTDHCB-10 | |
|--------------------|--|--|-----------------------|------------------|--|---------------|
| ROJECT Lockheed | Martin MRC | . IN | STALLATION | | SHEET 2 OF 2 SHEET | _{IS} |
| ELEVATION | DEPTH LEGEND | CLASSIFICATION OF MATERIALS | % COR RECOV ERY | BOX OR - SAMPLE | REMARKS | ١٥ |
| a | b c | (Description) d | ı e | NO. f | weathering, etc., if significant) g | |
| | | CLAY (CL-CH) with varying amounts of s and thin layers of silty clay, 9 <n<30, stiff<br="">very stiff, brownish red (continued)</n<30,> | sand 100 | SS-10 20.0 | BLOWCOUNT 4-7-12-14 | |
| | | very stiff, brownish red (continued) | 10 | 22.0 | N = 19 | ŀ |
| | | | | | (CH) | ŀ |
| | | | | | | ŀ |
| | | | | | _ | ŀ |
| | | | | | | ŀ |
| | | | | | | þ |
| | | | 100 | SS-11 | BLOWCOUNT | ŀ |
| | | | | 23.0 25.0 | 5-8-12-13 N = 20 | F |
| | | | | | (CL) | E |
| | | | | | | ŀ |
| | | | | | | ŀ |
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| | | | | | | ŀ |
| | | | | | | ŀ |
| | | | 100 | SS-12 28.0 | BLOWCOUNT 5-11-19-19 | E |
| | | | | 30.0 | N = 30 | ŀ |
| | | | | | (CL) with sand | ŀ |
| | | | | | | ŀ |
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| | | | | | | þ |
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| | | | | | | ŀ |
| | | | | | | F |
| | | | | | | F |
| | | | | | | E |
| | | | | | | ŀ |
| | | | 92 | SS-13a SS-13b | 5-13-18-24 | ŀ |
| | | | | 33.0 35.0 | N = 31 Top 15" (CH) | þ |
| | | | | 00.0 | Bottom 7" (SC) | þ |
| -29.0 | 34.5 | CLAYEY SAND (SC), N = 30, dense, red | ldish | | | ŀ |
| | | brown. | | | - | F |
| | 3///// | | | | | E |
| | <i></i> | | | | | ŀ |
| | ¥///// | | | | | ŀ |
| | 4//// | | | | | ŀ |
| | | | | | | þ |
| | 4//// | | | | | ŀ |
| | | | 100 | SS-14 | BLOWCOUNT | F |
| | ¥///// | | 100 | 38.0 | 10-15-15-16 | F |
| | | | | 40.0 | N = 30 (SC) | F |
| | <i>\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\</i> | | | | | E |
| 24.5 | 40.0 | | | | | F |
| -34.5 | 40.0 - ////// | END OF BORING | | | - | ŀ |
| | \exists | | | | | ŀ |
| | | | | | | þ |
| | \exists | | | | | þ |
| | \exists | | | | | þ |
| | \exists | | | | | þ |
| | \exists | | | | | F |
| | $\overline{}$ | | | | | F |
| | \exists | | | | | F |
| | | | 1 | 1 | T. Control of the Con | - 1 |

ENG FORM 1836-A

Lockheed Martin MRC

TTDHCB-10



Hole No. TTDHCB-11

| DRILLI | NG LO | $oldsymbol{c}$ | IENT | | T NUMBER | | SHEET | 1 |
|-----------------------------|------------|----------------|--|-------------|---------------|---------------|---|------------|
| 1. PROJECT | | | _ockheed Martin Corporation | 194-8 | ING METHO | <u> </u> | HSA/Mud Rotary | SHEETS |
| Lockheed | Martin | MRC | | | | | IOWN (TBM or MSL) | |
| 2. LOCATION (| | | | MSL | | | | |
| 3. DRILLING A | | N 604,2 | 265.0466 E 1,473,441.1996 | 12. MANU | JFACTUREF | R'S DESIGN | ATION OF DRILL | |
| UniTech | OLIVOT | | | 13. TOTA | L NO. OF SO | OIL | DISTURBED UNDISTUR | BED |
| 4. HOLE NO. (A file number) | As shown o | n drawing ti | | | PLES TAKEN | | 22 1 | |
| 5. NAME OF D | RILLER | | TTDHCB-11 | | L NUMBER | | | |
| D. Evans | | | | 15. ELEV | ATION GRO | | - | |
| 6. DIRECTION | | , | | 16. DATE | HOLE | SI | ARTED COMPLETED 10/7/2015 10/7/20 | 015 |
| ⊠ VERTICA | |] INCLINED | DEG. FROM VERT. | 17. ELEV | ATION TOP | OF HOLE | +4.8 | |
| 7. THICKNESS | | | | 18. TOTA | L CORE RE | COVERY F | OR BORING | % |
| 8. DEPTH DRIL | | | 40.0 | 19. GEOL | OGIST | | И.Т., | |
| 9. TOTAL DEP | | | CLASSIEICATION OF MATERIAL | <u> </u> | % CORE | BOX OR | K. Tu REMARKS | |
| ELEVATION | DEPTH | LEGEND | (Description) | .0 | RECOV- ERY | SAMPLE NO. | (Drilling time, water loss, dep weathering, etc., if significan | th t) |
| +4.8 | 0.0 _ | c ×××××× | d PROBABLE FILL, predominantly CLA | VEV | e 83 | f | BLOWCOUNT | <u></u> |
| +4 .0 | 0.0 _ | | SAND (SC) with varying amounts of s | ilt and | 83 | SS-1 0.0 | BLOWCOUNT 2-6-3-6 | |
| | _ | | and traces of organic materials, moist 9 <n<13, and<="" dense="" loose="" medium="" td="" to=""><td>t, ctiff</td><td></td><td>2.0</td><td>N = 9 (CLS/MLS)</td><td>E</td></n<13,> | t, ctiff | | 2.0 | N = 9 (CLS/MLS) | E |
| | | | varying color, light brown to brown an | | | | (CES/IVIES) | |
| | _ | | reddish brown. | | | | | \vdash |
| | _ | | | | | | | F |
| | | | | | 100 | SS-2 | BLOWCOUNT | F |
| | _ | ***** | | | | 2.0 4.0 | 4-5-5-3 N = 10 | F |
| | | | | | | | (SC) with organics | <u> </u> |
| | | | | | | | | E |
| | <u> </u> | | | | | | | E |
| | | | | | 100 | SS-3 | BLOWCOUNT | <u> </u> |
| | _ | | | | 100 | 4.0 | 5-5-8-12 | F |
| | _ | | | | | 6.0 | N = 13 (SC) | F 5 |
| | | | | | | | (66) | |
| | _ | | | | | | | |
| | | | | | | | | |
| | _ | | | | 100 | SS-4 | BLOWCOUNT | \vdash |
| | _ | | | | | 6.0 8.0 | 2-2-7-8 N = 9 | F |
| | | | | | | | (SC) | |
| | _ | | | | | | | |
| 0.0 | _ | | | | | | | |
| -3.2 | 8.0 | | CLAYEY SAND (SC) with thin (<2") I | avers of | 100 | SS-5 | BLOWCOUNT | <u> </u> |
| | _ | | silty clay, 11 <n<28, b<="" dense,="" medium="" td=""><td>rownish</td><td></td><td>8.0</td><td>11-11-13-13</td><td>\vdash</td></n<28,> | rownish | | 8.0 | 11-11-13-13 | \vdash |
| | _ | | red to reddish brown | | | 10.0 | N = 24 (SC-SM) | F |
| | | | | | | | | |
| | _ = | | | | | | | |
| | | | | | | | | 10 |
| | _ | | | | 100 | SS-6 10.0 | BLOWCOUNT 5-6-9-9 | |
| | _ | | | | | 12.0 | N = 15 | H |
| | | | | | | | (SC) with thin layer of CL | |
| | | | | | | | | F |
| | _ | | | | | | | F |
| | | | | | 100 | SS-7 | BLOWCOUNT | |
| | _ | | | | | 12.0 14.0 | 16-15-13-11 N = 28 | E |
| | _ | | | | | 1-4.0 | (SC-SM) | |
| | _ | | | | | | | \vdash |
| | _ | | 1 | | | | | F |
| | | | | | 100 | 00.0 | PLOWCOUNT | _ |
| | | | | | 100 | SS-8 14.0 | BLOWCOUNT 7-9-11-11 | E |
| | _ | | | | | 16.0 | N = 20 | - - 15 |
| | | | | | | | (SC) | <u> </u> |
| | _ | | | | | | | \vdash |
| | _ | | | | | | | F |
| | | | | | 100 | SS-9 | BLOWCOUNT | |
| | _ | | | | | 16.0 18.0 | 7-10-13-15 N = 23 | |
| | | | | | | 10.0 | (SC) | E |
| | | | 1 | | | | | |
| | _ | V//// | | | | | | F |
| | | | | | | 00.10 | DI OMCOUNT | <u> </u> |
| | | | | | 92 | SS-10 18.0 | BLOWCOUNT 6-7-10-12 | |
| | _ | | | | | 20.0 | N = 17 | E |
| | | | | | | | (SC-SM) | |
| | _ | | | | | | | F |
| | | | | | | | | F 20 |



| DRILLING | sheet) | 4.8 | | | | | Hole No. | . TTDHCB-11 | | | |
|---------------------|------------|--------|-------------|---|---------------|------------|------------------------------|------------------------------|-----------------------------------|---|-----|
| PROJECT Lockheed | I Martin I | MRC | | | | INSTALLA | | | | SHEET 2 OF 4 SHEETS | s |
| ELEVATION | DEPTH | LEGEND | | CLASSIFICATION OF N (Description) | | 3 | % CORE RECOV- ERY e | BOX OR SAMPLE NO. f | R (Drilling time weathering | EMARKS e, water loss, depth , etc., if significant) | 1 |
| а | b | c | CLAYE | d d Y SAND (SC) with th | | vers of | e | f f | weathering | g g | + |
| | | | silty clay | y, 11 <n<28, medium<br="">eddish brown <i>(continu</i></n<28,> | dense, br | ownish | | | | | ŀ |
| | | |) icu to it | eddisii biowii (comm | ucu) | | | | | | ŀ |
| | _ | | | | | | | | | | ŀ |
| | | | | | | | | | | | ŀ |
| | _ | | | | | | | | | | ŀ |
| | | | | | | | | | | | ŀ |
| | _ | | | | | | 100 | SS-11 23.0 25.0 | BLOWCOUNT 6-9-10-11 | | ŀ |
| | _ | | | | | | | 25.0 | N = 19 (SC) | | ŀ |
| | _ | | | | | | | | | | ŀ |
| | | | | | | | | | | | ŀ |
| | | | | | | | | | | | F |
| | = | | | | | | | | | | - |
| | | | | | | | | | | | ŀ |
| | <u>-</u> | | | | | | | | | | ŀ |
| | | | | | | | | | | | İ |
| | | | | | | | | | | | f |
| | | | | | | | 100 | SS-12a SS-12b | BLOWCOUNT 7-8-13-15 | | ŀ |
| -23.9 | 28.7 | | LEAN | CLAY (CL) with varvin | ig amount | s of | | 28.0 30.0 | N = 21 | | F |
| | | | sand, 1 | CLAY (CL) with varyin 6 <n<32, i<br="" stiff="" to="" very="">o brownish red</n<32,> | hard, redd | lish | | 30.0 | Top 8" (SC) Bottom 16" (CL) | | ļ |
| | | | S.OWII (| o prowingit ieu | | | | | | | ŀ |
| | | | | | | | | | | | ŀ |
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| | _ | | | | | | | | | | ŀ |
| | | | | | | | | | | | ŀ |
| | | | | | | | | | | | ŀ |
| | _ | | | | | | 83 | SS-13 | BLOWCOUNT | | ŀ |
| | _ | | | | | | | 33.0 35.0 | 4-6-10-12 N = 16 | | ŀ |
| | _ | | | | | | | | (CL) | | ŀ |
| | _ _ | | | | | | | | | | ŀ |
| | | | | | | | 0 | ST-1 | Shelby tube | | F |
| | <u> </u> | | | | | | | 35.0 37.0 | No recovery | | ŀ |
| | | | | | | | | | | | F |
| | _ | | | | | | | | | | - |
| | | | | | | | | | | | ŀ |
| | <u> </u> | | | | | | | | | | ŀ |
| | | | | | | | 100 | SS-14 | BLOWCOUNT | | ŧ |
| | | | | | | | | 38.0 40.0 | 8-13-19-28 N = 32 | | F |
| | | | | | | | | | (CL) | | ŧ |
| | | | | | | | | | | | F |
| | | | | | | | | | | | ļ |
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| | = | | | | | | | | | | ļ |
| | | | | | | | | | | | ŀ |
| -37.7 | 42.5 — | | | | | | | | | | ŀ |
| | _ | | clayey s | CLAY (CLS) with a t sand @ 48', 20 <n<56< td=""><td>6, very stiff</td><td>of f to</td><td></td><td></td><td></td><td></td><td>ŀ</td></n<56<> | 6, very stiff | of f to | | | | | ŀ |
| | | | | ownish red to reddish | | | 100 | SS-15 43.0 | BLOWCOUNT 6-8-12-17 | | F |
| | | | | | | | | 45.0 | N = 20 (CLS) | | J |
| NG FORM JUN 67 | 1836- | A | | | | | PROJECT Lockhe | eed Marti | in MRC | HOLE NO. TTDHCB- | .11 |



ELEVATION TOP OF HOLE **DRILLING LOG (Cont Sheet)** Hole No. TTDHCB-11 INSTALLATION SHEET 3 Lockheed Martin MRC of 4 SHEETS BOX OR SAMPLE NO. f REMARKS CLASSIFICATION OF MATERIALS ELEVATION DEPTH LEGEND RECOV-ERY e (Drilling time, water loss, depth weathering, etc., if significant) (Description) SANDY CLAY (CLS) with a thin layer of clayey sand @ 48', 20<N<56, very stiff to hard, brownish red to reddish brown (continued) 45 BLOWCOUNT 18-20-21-30 N = 41 Top 12" (SC) Bottom 12" (CL) with sand SS-16 48.0 100 50.0 SS-17a SS-17b 53.0 55.0 **BLOWCOUNT** 6-7-18-22 N = 25 (CLS) BLOWCOUNT 8-29-27-29 N = 56 (CLS) SS-18 58.0 60.0 100 60 BLOWCOUNT 12-19-24-38 N = 43 100 SS-19 63.0 65.0 (CLS) 65 ENG FORM JUN 67 PROJECT Lockheed Martin MRC HOLE NO. TTDHCB-11 1836-A



| DECEMBER MARTIN MRC CLASSIFICATION OF MATTRIALS REVAIN (REVAIN AND CLASSIFICATION OF MATTRIALS SHOOL DISCOURT) REVAIN (REVAIN AND CLASSIFICATION OF MATTRIALS SHOOL DISCOURT) REVAIN (REVAIN AND CLASSIFICATION OF MATTRIALS SHOOL DISCOURT) REVAIN (REVAIN AND CLASSIFICATION OF MATTRIALS SHOOL DISCOURT) REVAIN (REVAIN AND CLASSIFICATION OF MATTRIAL SHOOL DISCOURT) REVAIN AND CLASSIFICATION OF MATTRIAL SHOOL DISCOURT) REVAIN AND CLASSIFICATION OF MATTRIAL SHOOL DISCOURT OF MATTRIAL SHOOL DISCOURT OF MATTRIAL SHOOL DISCOURT OF MATTRIAL SHOOL DISCOURT OF MATTRIAL SHOOL DISCOURT OF MATTRIAL SHOOL DISCOURT OF MATTRIAL SHOOL DISCOURT OF MATTRIAL SHOOL DISCOURT OF MATTRIAL SHOOL DISCOURT OF MATTRIAL SHOOL DISCOURT OF MATTRIAL SHOOL DISCOURT OF MATTRIAL SHOOL DISCOURT OF MATTRIAL SHOOL DISCOURT OF MATTRIAL SHOOL DISCOURT OF MATTRIAL SHOOL DIS | DRILLING | G LOG (| (Cont S | heet) | 4.8 | | | | Hole No. TTDHCB-11 | |
|--|---------------------|------------|---------|-------------------|--|----------|-------------------------|------------------------|-------------------------|----------|
| ELPH/TON DEPTH EGDD CLASSIFICATION OF MATERIALS SQUARE | PROJECT Lockheed | l Martin N | MRC | | | INSTALLA | ATION | | SHEET 4 | TS |
| 3 ANDOY CLAY (CLS) with a thin taper of page 100 Sept 17 17 22 25 Touch browning in set to necides brown continues of cont | | | | | | LS | % CORE RECOV- FRY | BOX OR SAMPLE NO | REMARKS | |
| SS.2 70.0 ENIO OF BORING | а | b | c | SAND | d | r of | e e | | BLOWCOUNT | + |
| SS.2 70.0 ENIO OF BORING | | | | clayey hard, b | sand @ 48', 20 <n<56, sign<="" th="" very=""><th>tiff to</th><th></th><th>68.0</th><th> 11-17-22-26 N = 39</th><th>E</th></n<56,> | tiff to | | 68.0 | 11-17-22-26 N = 39 | E |
| ENO OF BORING ENO OF | | | | (contin | ued) | | | | (CLS) | |
| ENO OF BORING ENO OF | | | | | | | | | | E |
| | -65.2 | 70.0 | | END O | E BODING | | | | | <u> </u> |
| | | | | LIND | DORING | | | | | E |
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ENG FORM 1836-A

Lockheed Martin MRC

TTDHCB-11



Hole No. TTDHCB-12

| DRILLI | NG LOG | CLIE | ENT ockheed Martin Corporation | PROJECT 194-8 | NUMBER | | SHEET 1 OF 2 SHEE | | | | |
|--------------------|--------------------|-----------------|--|------------------|-----------------|---------------|---|----------|--|--|--|
| . PROJECT | | <u> </u> | ockileed Martin Corporation | | ING METHO | OD | HSA/Mud Rotary | E18 | | | |
| Lockheed | d Martin MRC | | | 11. DATU | | | OWN (TBM or MSL) | \dashv | | | |
| LOCATION (| (Coordinates or St | ation) | 66 6051 E 1 472 272 4247 | MSL | | | | | | | |
| DRILLING A | | 04,2 | 66.6051 E 1,473,373.4247 | 12. MANU | IFACTUREF | R'S DESIGN. | ATION OF DRILL | | | | |
| UniTech | | | | | L NO. OF S | | DISTURBED UNDISTURBED | \dashv | | | |
| HOLE NO. (/ | As shown on draw | ing tit | Ite and TTDHCB-12 | | PLES TAKEN 16 1 | | | | | | |
| NAME OF D | RILLER | | 110110012 | | L NUMBER | | | _ | | | |
| D. Evans | | | | | ATION GRO | | R -2.8 ARTED COMPLETED | \dashv | | | |
| DIRECTION VERTICA | | INED | DEG. FROM VERT. | 16. DATE | HOLE | 317 | 10/7/2015 10/7/2015 | | | | |
| | | | DEG. FROM VERT. | 17. ELEV | ATION TOP | OF HOLE | +5.2 | | | | |
| | S OF OVERBURD | | | | | COVERY FO | OR BORING | % | | | |
| | TH OF HOLE | | 40.0 | 19. GEOL | OGIST | | K. Tu | | | | |
| | | | CLASSIFICATION OF MATERIAL | .S | % CORE | BOX OR | REMARKS | \dashv | | | |
| LEVATION | DEPTH LEGI | | (Description) | | RECOV- ERY | SAMPLE NO. | (Drilling time, water loss, depth weathering, etc., if significant) | | | | |
| +5.2 | 0.0 | ; | d PROBABLE FILL, predominantly CLA | YFY | е | f | 9 | + | | | |
| . 0.2 | | \bowtie | SAND (SC) with occasional clay and | trace of | | | | F | | | |
| | | \bowtie | organics, moist, 4 <n<10, and="" colors="" dense="" graying<="" in="" loose="" me="" stiff,="" td="" to="" varying=""><td>dium ish</td><td>0</td><td>SS-1 0.5</td><td>BLOWCOUNT x-3-4-2</td><td>F</td></n<10,> | dium ish | 0 | SS-1 0.5 | BLOWCOUNT x-3-4-2 | F | | | |
| | | XX | brown to reddish brown | | | 2.5 | N = 7 | F | | | |
| | | \bowtie | | | | | 6" concrete slab No recovery | | | | |
| | | \bowtie | | | | | | E | | | |
| | | \bowtie | | | 75 | SS-2 2.0 | BLOWCOUNT 2-2-2-3 | E | | | |
| | - | \bowtie | | | | 4.0 | N = 4 | F | | | |
| | | \bowtie | | | | | (SC) | F | | | |
| | | \bowtie | | | | | | F | | | |
| | | \bowtie | | | | | | þ | | | |
| | | \bowtie | | | 100 | SS-3 | BLOWCOUNT | F | | | |
| | | \bowtie | | | | 4.0 6.0 | 3-3-3-3 N = 6 | F | | | |
| | | \bowtie | | | | 0.0 | (SC-SM) | F | | | |
| | | \bowtie | | | | | | F | | | |
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| | | \bowtie | | | 400 | 00.1 | D. 0.00 | F | | | |
| | | \bowtie | | | 100 | SS-4 6.0 | BLOWCOUNT 3-4-6-8 | E | | | |
| | | \bowtie | | | | 8.0 | N = 10 | E | | | |
| | | \bowtie | | | | | (CLS) | H | | | |
| | | \bowtie | | | | | | | | | |
| -2.8 | 8.0 | \bowtie | | | | | | þ | | | |
| -2.0 | 0.0 | | SANDY CLAY (CLS), 6 <n<11, mediu<="" td=""><td>m stiff to</td><td>63</td><td>SS-5</td><td>BLOWCOUNT</td><td>F</td></n<11,> | m stiff to | 63 | SS-5 | BLOWCOUNT | F | | | |
| | | | stiff, brown to reddish brown and brow | vnish red | | 8.0 10.0 | 3-4-3-4 N = 7 | | | | |
| | | | | | | 10.0 | (CLS) | E | | | |
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| | | | | | | | | F | | | |
| | | | | | 50 | SS-6 | BLOWCOUNT | F | | | |
| | | | | | 50 | 10.0 | WH-1-5-7 | | | | |
| | | | | | | 12.0 | N = 6 (CLS) | F | | | |
| | | | | | | | (CLS) | E | | | |
| | | | | | | | | L | | | |
| | <i></i> | | | | | | | F | | | |
| | | | | | 75 | SS-7 | BLOWCOUNT | F | | | |
| | \\ | | | | | 12.0 14.0 | 6-5-4-5 N = 9 | F | | | |
| | | | | | | | (CLS) | þ | | | |
| | <i>\\\\\\\\</i> | | | | | | | E | | | |
| | | | | | | | | F | | | |
| | | | | | 100 | SS-8 | BLOWCOUNT | F | | | |
| | <i> </i> | | | | | 14.0 | 6-5-4-8 | F | | | |
| | | | | | | 16.0 | N = 9 (CLS) | F | | | |
| | | | | | | | | F | | | |
| | <i>\\\\\\\</i> | | | | | | | þ | | | |
| | | | | | | | | E | | | |
| | <i>-\ ///</i> | | | | 100 | SS-9 16.0 | BLOWCOUNT 3-4-4-4 | F | | | |
| | <i> </i> | | | | | 18.0 | N = 8 | F | | | |
| | | | | | | | (CLS) | F | | | |
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| | <u> </u> | | | | | | | E | | | |
| | <i>-\\\\\\</i> | | | | 100 | SS-10 | BLOWCOUNT | F | | | |
| | 1///// | | | | 100 | 18.0 | 5-5-6-6 | F | | | |
| | | //// | | | | | | | | | |
| | | | | | | 20.0 | N = 11 (CL) | F | | | |
| | | | | | | 20.0 | N = 11 (CL) | E | | | |
| | | | | | | 20.0 | | | | | |
| | | | | | | 20.0 | | | | | |



| DRILLING | LOG (Cont S | heet) ELEVATION TOP OF HOLE 5.2 | | | Hole No. TTDHCB-12 | |
|---------------------|--|---|-------------------------|------------------|---|----------|
| PROJECT Lockheed | Martin MRC | | TALLATION | | SHEET 2 OF 2 SHEE | |
| ELEVATION | DEPTH LEGEND | CLASSIFICATION OF MATERIALS | % CORE RECOV- ERY | BOX OR SAMPLE | REMARKS | <u> </u> |
| а | b c | (Description) d | l e | NO. f | (Drilling time, water loss, depth weathering, etc., if significant) g | |
| | | SANDY CLAY (CLS), 6 <n<11, and="" brown="" brownish<="" medium="" reddish="" sti="" stiff,="" td="" to=""><td>ff to red</td><td></td><td></td><td></td></n<11,> | ff to red | | | |
| | | (continued) | | | | |
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| | | | 100 | SS-11a | BLOWCOUNT | l |
| | | | | SS-11b 23.0 | 3-4-4-4 N = 8 | l |
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| | ¥////// | | 100 | SS-12 28.0 | BLOWCOUNT 2-3-4-5 | l |
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| -27.8 | 33.0 | LEAN CLAY (CL), 11 <n<22, st<="" stiff="" td="" to="" very=""><td>tiff, 75</td><td>SS-13</td><td>BLOWCOUNT</td><td>ŀ</td></n<22,> | tiff, 75 | SS-13 | BLOWCOUNT | ŀ |
| | | brownish red | | 33.0 35.0 | 2-4-7-9 N = 11 | ŀ |
| | | | | | (CL) | |
| | | | | | | |
| | | | 4 | ST-1 | Chalby tuba | ŀ |
| | | | 4 | 35.0 | Shelby tube PP = 3.0 tsf | ŀ |
| | | | | 37.0 | 24" recovery (CL) | |
| | | | 92 | SS-14 36.0 | BLOWCOUNT 9-11-11-17 | ŀ |
| | | | | 38.0 | N = 22 (CL) | ŀ |
| | | | | | | |
| | = | | | | | |
| | | | 100 | SS-15 38.0 | BLOWCOUNT 6-8-14-15 | ļ |
| | ¥////// | | | 40.0 | N = 22 (CL) | ŀ |
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| 64.5 | 3////// | | | | | İ |
| -34.8 | 40.0 | | | | | ŀ |
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ENG FORM 1836-A

Lockheed Martin MRC

TTDHCB-12

APPENDIX D—LABORATORY TEST RESULTS

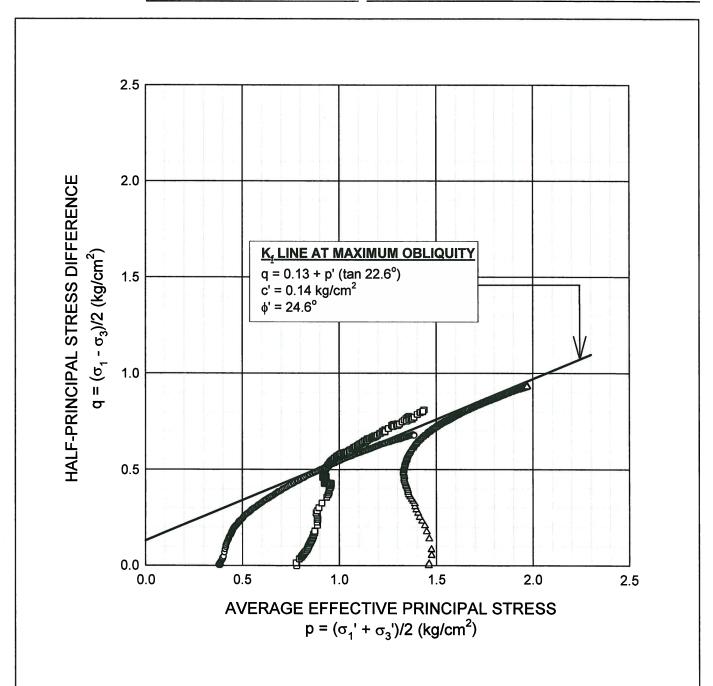
| | SUMMARY OF LABORATORY TEST RESULTS - MARINE BORINGS | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|------------------|---|-------------|---|------------------|-----------------------|--------------------|--------|----------------------------|---------|-------------------------|--|----------------|----------|---------|--|-----------------------|---------------------------------------|---|--------------------------|--|--|----------|--------------|---------|---------|---------------|------------|------------|-----------|----------------|-------|-----------------------|--------------|---------------|
| | | Depth of | | | | | Att | erberg Limits | | - | UU Triaxia | al Compression | n | | | | | CU Triaxial Com | npressio | n | Corrosivity | | | | Part | cle-Size Dis | tribution | | | | T | Partic | le Size | |
| Marine Boring | Sample | Sample | Description | Water Content | Su [PP] * (lb/ft²) | Organic Content | Liquid | Plastic Plast | city I | D | ν. | a Su | [UU] ε | -200 | | D | | | | , φ ε, | ctivity s/cm) s/cm) s/cm) s/cm) ide ag(/l) ag(/l) tivity cm) | Dry Mass | | | | Fraction Fine | by Dry Mas | s (%) | | | | Fraction by [| Ory Mass (%) | |
| Dorling | | (ft) | | (%) | (ID/IT) | (%) | Limit | Plastic Plast Limit Ind | ex (cm) | (cm) W _c (%) | (lb/ft ³) | (lb/ft²) | /ft²) (% | 5) (%) | L (cm) (c | cm) W _c (% | %) γ _t (lb/ft ³ | σ _c (lb/ft²) (lb/f | /ft ²) (degr | ees) c (lb/ft²) | Chlor Chlor Cl (m Sulfi SO ₄ (r Chm) | (grams) | 3/4-inch 3/8 | inch No | . 4 No. | 0 No. 20 | No. 40 | No. 60 No. | o. 100 No | o. 140 No. 200 | | Coarse Med Sand Sa | | |
| | 2A & 2B | 7 - 8.5 | Brown sandy lean clay [CL] | 33.1 | | | 34.0 | 15.0 19. | 0 | | | | | | | | | | | | | 81.5 | | | | | | | | | | | 9.6 28.4 | 61.0 |
| | 3 | 9 - 11 | Light brown to orange sand with silt [SP-SM] | 19.1 | | | | | | ' | | | | | | | | | | | | 164.4 | 100.0 10 | | | .3 97.3 | | | | 8.5 6.9 | | | | |
| | 5A | 13 - 15 | Light brown silty sand [SM] | 18.6 | | | | | | ' | | | | | | | | | | | | 177.2 | 100.0 | 7.5 9 | 7.5 95 | .6 91.6 | 49.3 | 20.3 | 17.3 1 | 16.4 15.6 | 2.5 | 1.9 46 | 33.7 | 15.6 |
| TTDHC-1 | 5B | | Brown sandy fat clay [CH] | 21.1 | | | | 22.0 31. | | | | | | | | | | | | | | | | | | | | ++ | | | ++ | | | |
| | 8 | | Orangish-brown sandy lean clay [CL] | 15.1 | | | 32.0 | 15.0 17. | 0 | | | | | | | | | | | | | .== 0 | | | | | | | | | | | | |
| | 10 | | Light brown to orange clayey sand [SC] Orangish-brown lean clay [CL] | 18.2 14.5 | | | 00.0 | 20.0 16. | ^ | ' | | | | | | | | | | | | 1/5.3 | 100.0 10 |).0 10 | 0.0 100 | .0 100.0 | 99.8 | 95.6 | 70.5 | 50.4 37.2 | 0.0 | 0.0 0 | 0.2 62.6 | 37.2 |
| - | | | Brown silty sand [SM] | 21.2 | | | | Von-plastic | J | | - | | _ | _ | | - | - | + | _ | | | 06.7 | 100.0 10 | 0.0 10 | 100 | 0 00 0 | 00.6 | 97.2 | 44.4 | 20.5 26.7 | - 00 | 0.0 | 0.4 72.9 | 26.7 |
| TTDHC-2 | 6A | 9-11 | Dark brown clayey sand [SC] | 21.2 | | | | NOTI-plastic | | -+- | | | | | | | | | _ | | | | | | | | | | | | | | .3 64.9 | |
| | 2 | | Dark brown lean clay [CL] | 24.1 | | - | 25.0 | 20.0 15 | n | | _ | | | | | _ | _ | + | _ | | | 175.4 | 100.0 | 7.0 10 | 7.0 100 | .0 100.0 | 50.7 | 01.0 | 30.2 | +1.4 33.0 | 0.0 | 0.0 | .5 04.5 | 33.0 |
| | | | Dark brown to dark gray lean clay [CL] | 23.1 | | | | 20.0 14 | | -+- | | | | | | | | | | | | | | | | | | + | | | ++ | | | |
| | | 10.5 - 12.5 | Daik blown to daik gray lean day [CL] | 29.3 | | | 34.0 | 20.0 14 | J | -+- | | | | | l | | | | | <u> </u> | | | | | | | | + | | | ++ | | | |
| TTDHC-3 | | | | 21.6 | 3,400 | | | | | . ' | | | | | 7.1 3 | 3.6 22.9 | 9 128.2 | | | | 4.9 704.0 60.0 42.0 880.0 | | | | | | | | | | | | | ı I |
| | ST-1 | 9 - 10.5 | Brown lean clay [CL] | 21.0 | | | | | | , | | | | | 7.1 3 | 3.6 24.8 | 8 125.6 | 1,598.0 | 5.0 24. | 6 983.0 13.7 14.9 | | | | | | | | | | | 1 | | | |
| | | | | | | | | | | i | | | | | | | | 2,991.0 | | 15.1 | | | | | | | | | | | | | | |
| | 12 | 34.5 - 36.5 | Dark brown silty sand [SM] | 23.3 | | | | | | , | | | | | | | | | | | | 164.6 | 100.0 10 | 0.0 10 | 0.0 100 | .0 100.0 | 100.0 | 99.8 | 80.3 | 51.4 30.4 | 0.0 | 0.0 | 0.0 69.6 | 30.4 |
| | | | | 31.8 | | | | | 7.1 | 3.6 20.9 | 131.2 | 800.0 1,1 | 12.0 14 | .8 76.7 | | | | | | | | | | | | | | | | | T | | | $\overline{}$ |
| | ST-1 | 7 - 8.5 | Reddish-brown lean clay with sand [CL] | 19.0 | 4,500 | | | | 7.1 | 3.6 18.4 | 136.3 1 | 1,600.0 3,8 | 66.0 5. | 8 75.1 | | | | | | | | | | | | | | | | | | | | |
| TTDHC-4 | - | | | 16.6 16.6 | 4,500 2,700 | | | | 7.1 | 3.6 15.6 | 138.4 | 3.000.0 3.5 | 00.0 14 | .8 71.4 | | | | | | | | | | | | | | | | | 1 | | | |
| TIDHC-4 | 7 | 185-205 | Dark brown to light brown lean clay [CL] | 21.6 | | | 49.0 | 22.0 27 | | | | ., | | | | | | | | | | | | | | | | + | | | + | | | |
| | | | Dark brown sandy silt | 19.7 | | | 10.0 | ZZ.O Z7 | | | | | | | | | | | | | | 182 6 | 100.0 10 | 0.0 10 | 100 | 0 100.0 | 99.9 | 97 1 | 796 6 | 64.1 51.8 | 0.0 | 0.0 / |).1 48.1 | 51.8 |
| | | | Dark reddish-brown lean clay [CL] | 17.6 | | | 36.0 | 18.0 18. | 0 | | | | | | | | | | | | | 102.0 | 100.0 | 5.0 | 7.0 | 100.0 | 00.0 | - 07 | 70.0 | 01.0 | - 0.0 | 0.0 | | 01.0 |
| TTDHC-5 | 6 | 15 -17 | Dark brown sandy silt | 19.4 | | | | | | , | | | | | | | | | | | | 177.6 | 100.0 10 | 0.0 10 | 0.0 100 | .0 100.0 | 99.9 | 99.8 | 96.2 | 30.5 60.8 | 0.0 | 0.0 | 0.1 39.1 | 60.8 |
| | 3 | | Reddish-brown to yellowish-brown lean clay [CL] | 21.2 | | | 43.0 | 17.0 26 | 0 | , | | | | | 7.1 3 | .6 18.1 | 1 132.3 | 1,004.0 | | | | | | | | | | | | | | | | |
| | | | | 19.3 | 1,650 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | | | 15.7 | 4,500 | | | | | . ' | | | | | 74 . | | 4 400 0 | 4.540.0 | | | | 282.0 | 100.0 10 | | 0.5 | 07.4 | 94.1 | 72.9 | 40.7 | 36.0 31.1 | 0.5 | 1.6 | 00.0 | 31.1 |
| | ST-1 | 13 - 15 | Reddish-brown sandy lean clay to lean clay [CL] in upper 45.5 | 17.5 | 4,500 | | | | | . ' | | | | | 7.1 | 3.6 15.1 | 1 138.2 | 2 1,516.0 286 | 6.7 24 | .0 4,098.0 0.0 14.8 | | 282.0 | 100.0 | 0.0 9 | 9.5 97 | .9 97.1 | 94.1 | 72.9 | 46.7 | 36.0 31.1 | 0.5 | 1.6 | 3.8 63.0 | 31.1 |
| TTDHC-6 | 31-1 | 13 - 15 | cm over brown clayey sand [SC] in lower 7.5 cm | 15.3 | 4,400 | | | | | . ' | | | | | | | | | | | | | | | | | | | | | | | | 1 |
| | | | | 15.4 | 4,000 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | | | 18.2 | 3,600 | | | | | ' | | | | | 7.1 3 | 3.6 17.0 | .0 136.1 | 3,053.0 | | | | | | | | | | \bot | | | + | | | |
| | - 6 | 17 10 | Reddish-brown to vellowish-brown lean clay [CL] | 38.5 | | | 26.0 | 17.0 19. | 2 | ' | | | | | | | | | | | | | | | | | | + | | | + | | | - |
| | 6 12 | | Reddish-brown to yellowish-brown lean clay [CL] Reddish-brown sandy clay | 21.1 | | | 30.0 | 17.0 19. | U | -+- | 1 | | | _ | 1 | | - | + + | | | | 160.2 | 100.0 10 | 10 | 100 | 0 100.0 | 100.0 | 00.7 | 01.0 | 72.4 51.4 | 0.0 | 0.0 | 0.0 48.6 | E1 / |
| - | 12 | | | 40.0 | | | | | | -+- | | | | + | | - | + | + | - | | | | | | | | | | | | | | | |
| | 2 | | Dark brown sand with silt, wood and and trace organics [SP-SM] | 42.4 | | 8.5 | | | | | | | | | | | | | | | | 133.7 | 100.0 | 8.2 9 | 7.1 95 | 5.5 91.6 | 72.9 | 34.0 | 15.9 | 17.1 9.8 | 3 2.9 | 1.6 22 | 2.6 63.1 | 9.8 |
| TTDUC - | 4 | 13 - 15 | Dark brown lean clay [CL] Reddish-brown silty sand [SM] | 26.4 21.3 | | | 42.0 | 20.0 22 | U | | | | | | | | | | _ | | | 1011 | 100.0 10 | 20 40 | 100 | 0 100.0 | 00.7 | 87.1 | FO 4 1 | 27.2 | - 00 | 0.0 | 0.3 70.2 | 20.5 |
| TTDHC-7 | 5 | | Dark brown to light gray lean clay[CL] | 21.7 | | | 42.0 | 19.0 23 | n . | -+-' | + + | | | _ | 1 | | - | + + | | + + + + + | | 184.4 | 100.0 10 | J.U 10 | 100 | .0 100.0 | 99.7 | 87.1 | ou.4 3 | 37.3 29.5 | 0.0 | 0.0 0 | 1.3 /0.2 | 29.5 |
| | 9 | | | 16.0 | 3,750 | | 42.0 | 19.0 23 | | 3.5 22.2 | 121 7 4 | 1 900 0 4 4 | 26.0 | 6 06 0 | 1 | | - | + + | | + + + + + | | 1 | | | | _ | + | ++ | | | ++ | - | _ | $\overline{}$ |
| | ST-2 | 30 - 32 | Reddish-brown lean clay [CL] | 20.1 | 2,200 | | | | | 3.6 21.1 | | | | | | | | | | | | | | | | | | | | | | 世 | | |

SUMMARY OF LABORATORY TEST RESULTS - LAND BORINGS

| | | Depth of | | | | | Atte | rberg Limi | its | | U | U Triaxial (| Compres | ssion | | | CU | Triaxial (| Compress | sion | | | | | | Particle- | Size Distr | ibution | | | | | | Par | ticle Size | |
|--|------------|----------------------|---|--------------------------------------|----------------------------|-----------------|-----------------|------------------|---------------------|-------------------------------|---------------------------|--------------------------------------|---------|-------------------------------|--|--------------|--|---|---------------------------------|----------------|---------------------------------|--|-------------------|--------------------|--------------------|---------------------|---------------------|---------------------|----------------------|----------------------|--|----------------------|-------------------|-------------------|--------------------|----------------------------------|
| Land | Sample | Sample | Description | Water Content | Su [PP] | Organic Content | | | | | | | | | | | | | | | 4 | | | | | Fract | ion Finer I | by Dry Mas | ss (%) | | | <u> </u> | | Fraction b | by Dry Mass | (%) |
| Boring | Gample | Interval (ft) | Description | (%) | (lb/ft ²) | (%) | Liquid Limit | Plastic Limit | Plasticity Index | L (cm) (c | D m) w _c (% | (lb/ft ³) (lb | | $[UU]$ ϵ_f $(\%)$ | -200 (%) | (cm) | D (cm) W _c (%) (lb/ft ³) | σ _c (lb/ft ²) (| c' lb/ft ²) (deg | φ' (lb/ | $f(t^2)$ $(degre es)$ $(f(t^2)$ | Dry Mass (grams) | 3/4-inch | 3/8-inch | No. 4 | No.10 | No. 20 | No. 40 | No. 60 | No. 100 | No. 140 | No. 200 | Gravel | Coarse N | | ne Clay & |
| TTDHCB-1 | 6 | 10 - 12 | Gray and brown clayey sand [SC] | 15.7 | | | 33 | 14 | 19 | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| TIBLIOD I | 10 | 18 - 20 | Tan and gray clayey sand [SC] | 14.4 | | | | | | | | | | | | | | | | | | 163.48 | 100 | 100 | 100 | | | 77.2 | | | | 29.0 | 0.0 | | | 3.2 29.0 |
| | 2 ST-1 | 2 - 4 8 - 9.5 | Reddish-brown sandy clay Reddish-brown sandy lean clay to lean clay [CL] | 19.4 21.3 27.6 27.5 30.9 | 250 250 | | 32 | 13 | 19 | 6.66 3. 6.92 3. 7.06 3. | 56 16.1 | 128.4 7 133.5 1, 2 127.3 2, | 400 2 | 88 13.8 95 14.6 97 13.8 | 71.4 | | | | | | | 125.33 | 100 | 97.7 | 95.5 | 93.8 | 91.9 | 89.1 | 82.8 | 70.1 | 63.5 | 58.2 | 4.5 | 1.7 | 4.7 30 | 0.9 58.2 |
| TTDHCB-2 | ST-2 | 11.5 - 13 | Reddish-brown clayey sand [SC] to sandy lean clay [CL] | 24.6 27.1 22.8 21.7 | 500 250 400 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | 8A & 8B | | Reddish-brown silty sand [SM] | 20.4 | | | | | | | | | | | | | | | | | | 154.67 | 100 | 100 | 100 | | 99.2 | | 23.8 | 17.5 | | 14.5 | 0.0 | | 23.0 62 | |
| | 11 | 28 - 30 | Brown clayey sand [SC] | 24.1 | | | 05 | 40 | 40 | | | + | | | | _ | | 1 | | | | 95.34 | 100 | 100 | 100 | 100 | 100 | 99.8 | 84.6 | 40.5 | 27.9 | 22.2 | 0.0 | 0.0 | 0.2 77 | 7.6 22.2 |
| | 12A | 33 - 35 | Brown clayey sand [SC] | 24.4 62.9 | 250 | | 25 | 12 | 13 | | | | _ | | | 1 | | 1 | | _ | | | | | | | | | | | | | | | | +- |
| | ST-2 | 12 - 14 | Dark gray sandy lean clay to lean clay [CL] | 59.8 50.1 21.0 | 250 250 250 1,000 | | 40 | | | 7.08 3. | 56 61.0 | 3 101.4 1, 0 103.8 2, 110.9 3, | 000 4 | 08 7.1 41 7.8 14 8.6 | 75.8 | | | | | | | | | | | | | | | | | | | | | |
| TTDHCB-3 | 7 | 16 - 18 | | 29.3 | | | 40 | 18 | 22 | | | + | | - | | | | - | | | | 454.00 | 400 | 400 | 400 | 00.0 | 00.4 | 00 | 45.0 | 20.4 | 22.5 | 24.0 | 0.0 | 0.0 | 2.0 7. | 1 01.6 |
| · | 9 | 18 - 20 23 - 25 | Dark brown and brown silty sand [SM] Gray clayey sand [SC] | 19.6 16.9 | | - | | | | _ | | +-+ | | | <u> </u> | + | +-+- | + | _ | | | 154.82 135.33 | 100 100 | 100 100 | 100 100 | 99.8 100 | 98.4 100 | 96 99.3 | | 26.1 47.3 | 23.5 | 21.6 30.2 | 0.0 | 0.2 | 3.8 74 0.7 69 | 1.4 21.6 9.1 30.2 |
| | 14 | 48 - 50 | Brown clayey sand [SC] | 17.4 | | | ŀ | | | | - | + + | _ | | | 1 | | + + | | 1 | + + | 133.33 | 100 | 100 | 100 | 99.5 | 98.1 | 99.3 | | 57.6 | | 49.9 | 0.0 | 0.5 | 6.0 43 | |
| | 16 | 58- 60 | Brown sand with silt [SP-SM] | 23.6 | | | 1 | | | - | - | + + | | | 1 | 1 | | + + | - | - | | 127.82 | 100 | 100 | 100 | | 100 | | 47.8 | | | 11.1 | | | 2.5 86 | |
| • | 18 | 68 - 70 | Brown to gray fat clay with sand [CH] | 19.2 | | | 51 | 21 | 30 | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | 3 | 4 - 6 | Reddish-brown clayey sand with gravel [SC] | 14.5 15.1 | | 1.9 | | | | | | | | | | | | | | | | 113.37 | 100 | 89.4 | 83.3 | 79.3 | 74.0 | 68.8 | 60.1 | 46.7 | 39.8 | 35.6 | 16.7 | 4.0 | 10.5 33 | 35.6 |
| TTDUOD 4 | 5 | 8 - 10 10 - 12 | Brown and gray silty sand with trace organics [SM] Reddish-brown clayey sand with gravel [SC] | 14.7 15.5 14.7 | | 1.3 | | lon-plastic | 28 | | | | | | | | | | | | | 133.28 | 100 | 100 | 100 | 98.4 | 96.0 | 81.0 | 53.8 | 41.3 | 37.4 | 34.7 | 0.0 | 1.6 | 17.4 46 | 34.7 |
| TTDHCB-4 | 10 | 23 - 25 | Brown silty sand [SM] | 20.5 | | | | lon-plastic | 20 | | | - | - | | | 1 | | + | | | | 103.93 | 100 | 100 | 100 | 100 | 100 | gg g | 91.6 | 39.4 | 30.3 | 27.6 | 0.0 | 0.0 | 0.1 72 | 2.3 27.6 |
| - | 11 | 28 - 30 | Brown clavev sand [SC] | 20.6 | | | i | on plastic | | | | + + | | | 1 | 1 | | 1 1 | | - | | 182.38 | 100 | 100 | 100 | 100 | 100 | | | | 32.8 | 30.9 | 0.0 | 0.0 | | 1.3 30.9 |
| | 15 | 48 - 50 | Reddish-bown and tan sandy clay [CL] | 14.2 | | | 32 | 14 | 18 | | | | | | | 1 | | | | | | | | | | | | | | | | | | | | |
| | 18 | 63 - 65 | Brown silty sand [SM] | 22.1 | | | | | | | | | | | | | | | | | | 193.80 | 100 | 99.3 | 98.6 | 97.6 | 96.4 | 92.0 | 61.4 | 22.5 | 18.5 | 16.3 | 1.4 | 1.0 | 5.6 75 | 5.7 16.3 |
| TTDHCB-5 | 8 | 14 - 16 | Brown lean clay [CL] | 23.3 | | | 40 | 19 | 21 | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| TTDHCB-6 | 3 ST-1 | 4 - 6 | Gray and brown clayey sand [SC] Reddish-brown lean clay with sand [CL] in upper 27.8 cm of sample and clayey sand [SC] within lower | 20.5 22.4 23.3 20.2 | 4,500 4,500 | | 28 | 17 | 11 | | | | | | | | | | | | | 248.19 161.74 270.81 | 100 100 100 | 99.7 100 100 | 98.4 100 100 | 96.8 100 99.9 | 87.4 100 99.9 | 71.7 100 92.6 | 58.0 99.8 71.0 | 51.5 97.8 61.7 | 45.6 90.0 49.0 | 45.1 74.7 39.9 | 1.6 0.0 0.0 | 1.6 0.0 0.1 | | 5.6 45.1 5.3 74.7 2.7 39.9 |
| | 11 | 23 - 25 | 8.7 cm of sample Brown and tan sandy lean clay [CL] | 16.7 16.4 | 3,750 | | 37 | 14 | 23 | | | | | | | | | | | | | 270.01 | 100 | 100 | 100 | 33.3 | 33.3 | 92.0 | 71.0 | 01.7 | 49.0 | 39.9 | 0.0 | 0.1 | 7.5 52 | .7 39.9 |
| | _ | | | | | | | | | | | | | | | | | | | | | | | | | | | | ļ | <u> </u> | | | | | | |
| TTDHCB-7 | 5 6 | | Dark gray sand with silt [SM] Gray sand with clay and organics [SP-SC] | 31.1 | | | | | | | _ | + | _ | | - | 1 | | + | | | | 130.97 191.45 | 100 100 | 100 99.2 | 97.7 98.6 | | | | 34.3 35.7 | | | | 2.3 1.4 | | 30.2 55 24.2 62 | 5.3 9.0 2.8 9.4 |
| TIDHCB-/ | 18 | | Brown lean clay [CL] | 32.9 16.2 | | | 40 | 22 | 18 | | - | + + | | | | 1 | | + + | | | + + | 191.45 | 100 | 99.2 | 90.0 | 90.4 | 91.9 | 12.2 | 35.7 | 0.01 | 11.7 | 9.4 | 1.4 | 2.2 | 24.2 62 | .0 9.4 |
| | 4 | 6 - 8 | Gray sandy clay with organics | 50.9 | | | +∪ | | 10 | | | | | | | | | | <u> </u> | | | 144.68 | 100 | 100 | 100 | 98.6 | 97.1 | 89.4 | 75.9 | 65.7 | 60.9 | 55.1 | 0.0 | 1.4 | 9.2 34 | 1.3 55.1 |
| TTDHCB-8 | 9 | | Brown lean clay [CL] | 16.3 | | | 41 | 18 | 23 | | 1 | 1 1 | | | | | | 1 1 | | | | | | | | | | | | | | | | | | |
| | | | 1 1 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| TTDHCB-9 | 10 ST-1 | 19 - 21 12 - 13.5 | Brown clayey sand [SC] Reddish-brown lean clay [CL] | 19.9 32.0 17.5 | 2,250 | | 40 | 22 | 18 | | | | | | | 7.07 | 3.58 23.2 127 | | 200 | 2.2 | 100 | 239.25 | 100 | 100 | 100 | 100 | 100 | 99.4 | 81.5 | 53.7 | 44.7 | 38.8 | 0.0 | 0.0 | 0.6 60 | 0.6 38.8 |
| | 40 | 20, 20 | Drawn and the lane slav CU | 20.7 21.4 | 1,800 2,000 | | 47 | | - | | | | | | | | 3.57 16.6 135 3.57 17.3 134 | 1516 | 266 3 | 3.3 54 | | | | | | | | | | | | | | | | |
| | 12 | 20 - 30 | Brown and tan lean clay CL] | 19.9 | | | 4/ | 19 | 28 | | - | + | | | | 1 | | 1 | | | | | | + | - | | - | 1 | } | + | | + | H | | | +- |
| | 5 | 8 - 10 | Gray clayey sand with organics [SC] | 45.8 | | | | | | | - | + | | | | 1 | | 1 1 | <u> </u> | 1 | | 173.55 | 100 | 100 | 100 | 97.9 | 94.9 | 87.9 | 75.9 | 59.9 | 46.8 | 32.2 | 0.0 | 2.1 | 10.0 55 | 5.7 32.2 |
| TTDHCB-10 | | | Brown fat clay [CH] | 25.1 | | | 52 | 21 | 31 | | 1 | 1 1 | | | | | | 1 1 | | | | | | | | | | 1 | 1 | 1 | | | | | | |
| | 11 | | Brown clayey sand [SC] | 20.2 | | | | | | | | | | | | | | | ı İ | | | 233.29 | 100 | 100 | 100 | 100 | 100 | 99.8 | 89.9 | 52.0 | 39.5 | 34.2 | 0.0 | 0.0 | 0.2 65 | 5.6 34.2 |
| TTDHCB-11 | 14 | | Brown lean clay [CL] | 18.7 | | | 48 | 19 | 29 | | | 1 1 | _ | | 1 | | | 1 1 | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| TTDHCB-12 | 6 9 | | Brown lean clay with sand clay [CL] Brown sandy clay | 21.9 | | | 39 | 20 | 19 | | | | | | | | | | | | | 203.32 | 100 | 100 | 100 | 100 | 96.9 | 96.2 | 95.0 | 86.5 | 69.8 | 50.9 | 0.0 | 0.0 | 3.8 45 | 5.3 50.9 |
| | ST-1 | 35 - 37 | Reddish-brown lean clay [CL] | 27.8 21.6 | 1,650 | | 39 | 18 | 21 | | | | | | | | | | | | | 163.87 | 100 | 100 | 100 | 100 | 99.9 | 99.4 | 98.4 | 97.6 | 97.2 | 96.3 | 0.0 | 0.0 | 0.6 | 3.1 96.3 |
| <u> </u> | | 1 | | 21.0 | 1,000 | | | | | | | 1 1 | | | | | <u> </u> | | | | | | | | | | <u> </u> | 1 | | 1 | <u> </u> | | <u> </u> | | | |

ARDAMAN & ASSOCIATES, INC. GEOTECHNICAL TESTING LABORATORY CONSOLIDATED UNDRAINED TRIAXIAL COMPRESSION TEST EFFECTIVE STRESS PATHS

| CLIENT: LOCKHEED MARTIN | INCOMING SAMPLE NO. | · |
|---------------------------------|----------------------|------------------------|
| PROJECT: MRC LABORATORY TESTING | BORING: TTDHC-3 | |
| FILE NO.: 15-13-0120 | DEPTH: 9 - 11 | |
| | LABORATORY IDENTIFIC | CATION NO.: 150120/HC3 |
| DATE SAMPLE RECEIVED: 10/19/15 | SAMPLE DESCRIPTION: | Brown lean clay |
| DATE TEST SET-UP: 10/31/15 | | |
| DATE REPORTED: 11/24/15 | | |



The test data and all associated project information presented hereon shall be held in confidence and disclosed to other parties only with the authorization of the Client. Physical and electronic records of each project are kept for a minimum of 7 years. Test samples are kept in storage for at least 10 working days after mailing the test report, prior to being discarded, unless a longer storage period is requested in writing and accepted by Ardaman & Associates, Inc.

Checked By:

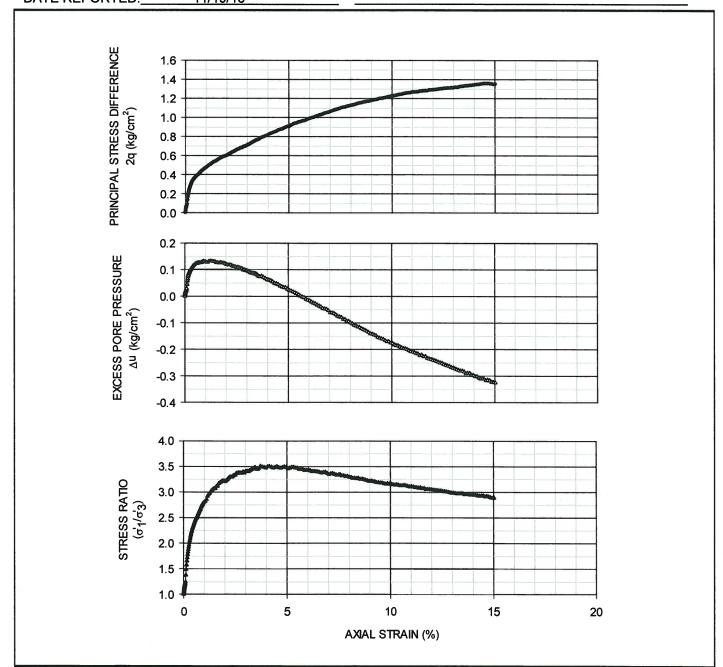
Date: 112419

| CLIE | NIT. | LOCK | HEED | MADTU | | | | | INICOMI | NO CAMI | | | | | | | | |
|--|-------------------------------------|-----------------------|-------------------------|----------------------------|---------------------------------|---|----------------------|------------------|--------------------------------|--|-------------------------|------------------------|-------------------------|-----------------------|---|-----------------|--|--|
| | | | | MARTII RATOR | | STING | | | | NG SAMI B: TT | | | ΔМРІ | F· S | T-1 | | | |
| | NO.: | | | | | <u>-01114G</u> | | | | 9 - | | | CIVII L | | | ft; \square m | | |
| | | | | /ED: 1 | 0/19/ | /15 | | | | ATORY IE | | ICATIO | N NC | O.: 150 | | | | |
| | ETEST | | | |)/31/ | | | | | E DESCR | | | | | | | | |
| DATE | REPO | DRTE | D: | 1: | /19/ | 15 | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | |
| Specim | en Dimer | nsions | Initia | al Conditio | ns | | Te | est Cor | nditions | | Pre-shear Conditions | | | | | | | |
| H (cm) | D (cm) | H/D | ₩ _c (%) | Y _d (lb/ft³) | S (%) | u _b (kg/cm²) | | oc' cm²) | έ (%/hour) | B-Factor (%) | ε _{vol} (%) | H _c (cm) | A _c (cm²) | W _c (%) | Y _d (Ib/ft ³) | S (%) | | |
| 7.11 | 3.55 | 2.0 | 22.9 | 104.3 | 100 | 12.0 | 0. | 39 | 1.0 | 98 | 1.3 | 7.08 1 | 0.09 | 23.6 | 103.0 | 100 | | |
| | | | | | | | | | | | TES | ST PRO | CEDU | RE: | ASTM D | 4767 | | |
| | 1.5 | | | | | | | | | | Specin Method | nen Mou d : | unting | | y Method et Method | | | |
| erence | . | | | | | | | | | | | | | | : □ Yes e: □ Yes | | | |
| s Diffe a/cm² | 1.0 | | | | | | | | | | A _c Met | hod: I | ■ Meti | nod A | ☐ Metho | d B | | |
| Half Principal Stress Difference α=(σ,-σ,)/2 (kα/cm²) | | | | | | | | | | | w _c dete | ermined | from: | | ntire Spec rimmings | cimen | | |
| rincip =(σ,- | | | | | | | | | | | | | SAMP | LE TY | PE | | | |
| lalf P. | 0.5 | | | | | | | | | | | Туре | | | Diameter | (inch) | | |
| | | | | | | | | | | | ⊠ Und | isturbed | l | | 3 | | | |
| | | | | | | | | | | | □ Con | npacted | | | | | | |
| | 0.0 | | 0.5 | | 1.0 | 1 1 1 1 1 1 1 | 1.5 | | 2.0 | 2.5 | □ Tam | ped Un | iform L | .ifts: No | o. of Lifts: | | | |
| | | | | | | ctive Princ σ' ₃)/2 (kg | | ress | | | ☐ Kne | ading: E | Blows p | | Spring | lb | | |
| | | | | | | | | | | | G _s : 2. | 70 | _⊠ Ass | sumed | ☐ Meas | ured | | |
| | | | | Stresses a | nd St | rains at Fa | ilure | | | | | F | AILUR | E SKE | тсн | | | |
| Fai Criteria | lure | | :a %) | Δu (kg/cm²) | (kį | σ ₁ ' g/cm²) | σ₃' (kg/cm | ²) (| p' (kg/cm²) | q (kg/cm²) | ☑ Diag | gonal Pla | ane | | | | | |
| [σ ₁ - | σ ₃] _{max} | 14 | 1.7 | -0.32 | 2 | 2.06 | 0.71 | | 1.38 | 0.68 | | nbinatio | n | | \ <u>i</u> | \\ | | |
| [σ ₁ ' / | σ ₃ '] _{max} | 3. | 72 | 0.08 | 1 1 | 1.10 | 0.32 | | 0.71 | 0.40 | | - | | | | للـــ | | |
| urticle-Size Analysis U.S. Standard Sieve Gravel | | | | | | Coarse Sand | Med Sa | | | | Fin San | | | | | | | |
| ASTM ASTM | D1140 Method B | | No. 4 | _ | No. 20 | No. 40 | No. 60 | 0 N | o. 100 | No. 140 | No. 200 | | | | | | | |
| Ory Mass (g) 117.90 Soil Passing (%, dry mass basis) | | | | | | | | | | | | | | 99.6 | | | | |
| lient. Ph | ysical and | l electror | ic record | is of each pr | oject a | re kept for | ı minimi | um of 7 | years. Test | ence and disc samples are accepted by | kept in sto | age for a | t least | 10 worki | | | | |
| Vhere: | stress; ἐ area; ε _a : | = Vertic = Axial s | al displad train; ∆u | ement rate; | ε _{vol} = \ ore pre | Volume cha ssure; σ ₁ ' = | nge(- de Major e | enotes of | consolidation principal str | $\gamma_d = Dry dens$ α_1 , + denotes s α_3 = Mino | welling); H | = Conso | olidated | height; | A _c = Conso | lidated | | |

Date:____

ARDAMAN & ASSOCIATES, INC. GEOTECHNICAL TESTING LABORATORY CONSOLIDATED UNDRAINED TRIAXIAL COMPRESSION TEST STRESS - STRAIN CURVES

CLIENT: LOCKHEED MARTIN INCOMING SAMPLE NO .: _ PROJECT: MRC LABORATORY TESTING BORING_ TTDHC-3 SAMPLE: ST-1 FILE NO.: 15-13-0120 **DEPTH**: 9 - 11 ☑ ft: □ m LABORATORY IDENTIFICATION NO.: 150120/HC3/ST1B3 DATE SAMPLE RECEIVED: SAMPLE DESCRIPTION: Brown clay 10/19/15 DATE TEST SET-UP: 10/31/15 Effective Isotropic Consolidation Stress = 0.39 kg/cm² DATE REPORTED: 11/19/15

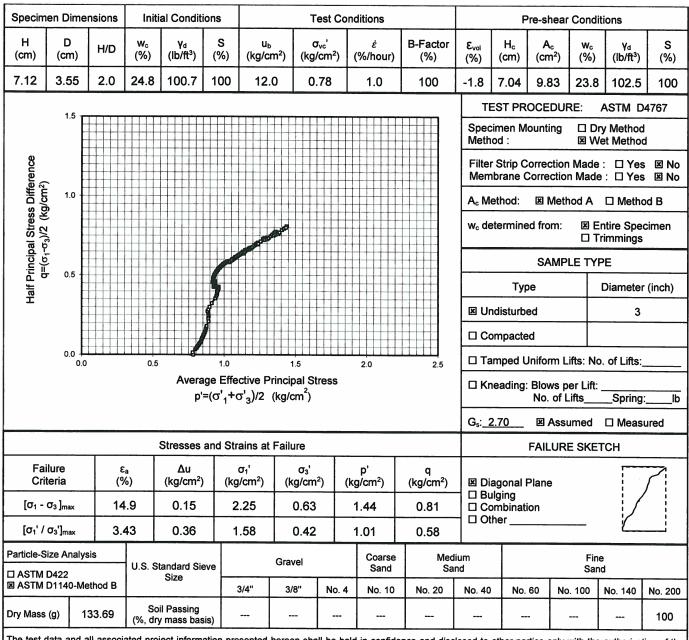


The test data and all associated project information presented hereon shall be held in confidence and disclosed to other parties only with the authorization of the Client. Physical and electronic records of each project are kept for a minimum of 7 years. Test samples are kept in storage for at least 10 working days after mailing the test report, prior to being discarded, unless a longer storage period is requested in writing & accepted by Ardaman & Associates, Inc.

Where: Δu = Excess pore pressure; σ₁' = Major effective principal stress; and σ₃'= Minor effective principal stress.



| CLIENT: <u>LOCKHEED MAR</u> | <u> TIN </u> | INCOMING | SAMPLE NO.: | | - |
|-----------------------------|--|----------|---------------|---------------|------------------|
| PROJECT: MRC LABORATOR | RY TESTING | BORING:_ | TTDHC-3 | SAMPLE: | ST-1 |
| FILE NO.: 15-13-0120 | | DEPTH: | 9 - 11 | | ⊠ ft; □ m |
| DATE SAMPLE RECEIVED: | 10/19/15 | LABORATO | RY IDENTIFICA | ATION NO.: 15 | 0120/HC3/ST1B2 |
| DATE TEST SET-UP: | 10/31/15 | | ESCRIPTION: E | | |
| DATE REPORTED: | 11/19/15 | | | | |



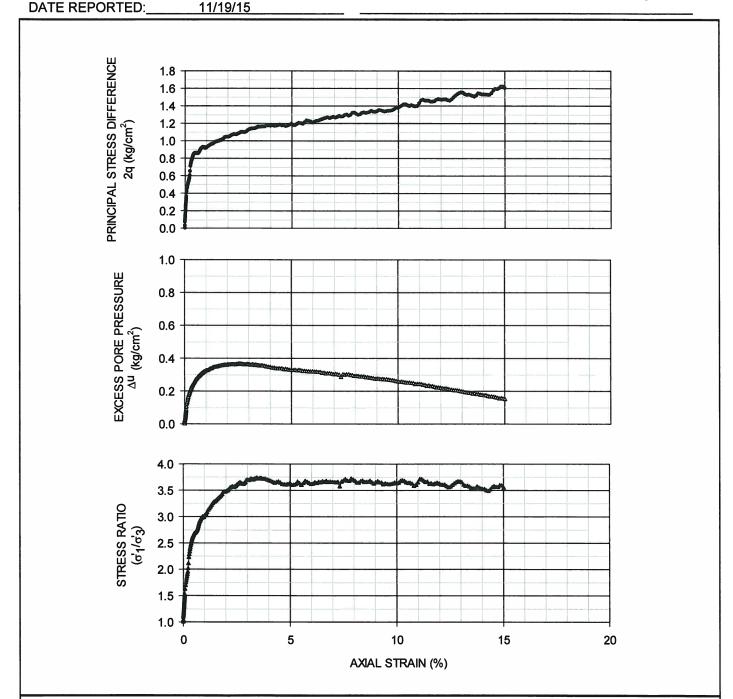
The test data and all associated project information presented hereon shall be held in confidence and disclosed to other parties only with the authorization of the Client. Physical and electronic records of each project are kept for a minimum of 7 years. Test samples are kept in storage for at least 10 working days after mailing the test report, prior to being discarded, unless a longer storage period is requested in writing & accepted by Ardaman & Associates, Inc.

H = Specimen height; D = Specimen diameter; w_c = Water content (ASTM D2216); γ_d = Dry density; S = Saturation; σ_c ' = Isotropic effective confining stress; $\dot{\varepsilon}$ = Vertical displacement rate; ε_{vol} = Volume change(- denotes consolidation, + denotes swelling); H_c = Consolidated height; A_c = Consolidated area; ε_a = Axial strain; Δu = Excess pore pressure; σ_1 = Major effective principal stress; σ_3 '= Minor effective principal stress; ρ = Average effective principal stress; ρ = Half principal stress difference; and ρ = Specific gravity.

Checked By: Date: Male

ARDAMAN & ASSOCIATES, INC. GEOTECHNICAL TESTING LABORATORY CONSOLIDATED UNDRAINED TRIAXIAL COMPRESSION TEST STRESS - STRAIN CURVES

CLIENT:_ **LOCKHEED MARTIN INCOMING SAMPLE NO.:** PROJECT: MRC LABORATORY TESTING BORING: TTDHC-3 SAMPLE: ST-1 FILE NO.: 15-13-0120 DEPTH: 9 - 11 図 ft; □ m LABORATORY IDENTIFICATION NO.: 150120/HC3/ST1B2 DATE SAMPLE RECEIVED: 10/19/15 SAMPLE DESCRIPTION: Brown clay 10/31/15 DATE TEST SET-UP:____ Effective Isotropic Consolidation Stress = 0.78 kg/cm²

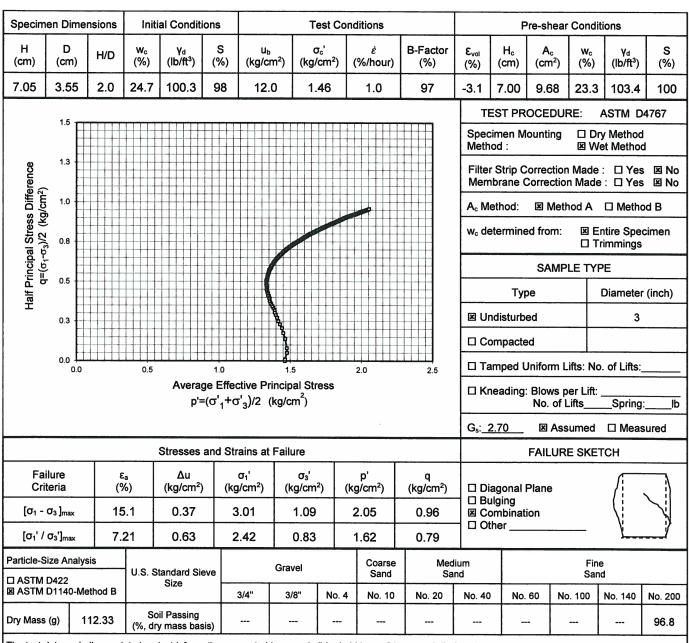


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Where: $\Delta u = \text{Excess pore pressure}$; $\sigma_1' = \text{Major effective principal stress}$; and $\sigma_3' = \text{Minor effective principal stress}$.



| CLIENT: LOCKHEED MARTIN | INCOMING SAMPLE NO.: |
|---------------------------------|---|
| PROJECT: MRC LABORATORY TESTING | BORING: TTDHC-3 SAMPLE: ST-1 |
| FILE NO.: 15-13-0120 | DEPTH: 9 - 11 |
| DATE SAMPLE RECEIVED: 10/19/15 | LABORATORY IDENTIFICATION NO.: 150120/HC3/ST1B1 |
| DATE TEST SET-UP: 10/31/15 | SAMPLE DESCRIPTION: Brown clay |
| DATE REPORTED: 11/19/15 | |



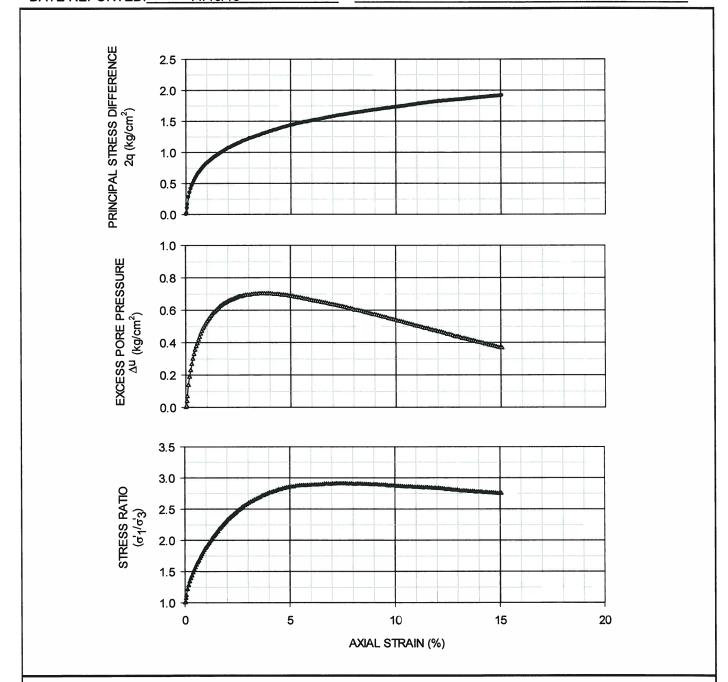
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re: H = Specimen height; D = Specimen diameter; w_c = Water content (ASTM D2216); γ_d = Dry density; S = Saturation; σ_c' = Isotropic effective confining stress; ἐ = Vertical displacement rate; ε_{vol} = Volume change(- denotes consolidation, + denotes swelling); H_c = Consolidated height; A_c = Consolidated area; ε_a = Axial strain; Δu = Excess pore pressure; σ₁' = Major effective principal stress; σ₃'= Minor effective principal stress; p' = Average effective principal stress; q = Half principal stress difference; and G_s = Specific gravity.

Checked By: 1M Date: 11/19/19

ARDAMAN & ASSOCIATES, INC. GEOTECHNICAL TESTING LABORATORY CONSOLIDATED UNDRAINED TRIAXIAL COMPRESSION TEST STRESS - STRAIN CURVES

CLIENT: LOCKHEED MARTIN INCOMING SAMPLE NO .: PROJECT: MRC LABORATORY TESTING SAMPLE **ST-1** BORING: TTDHC-3 FILE NO.: 15-13-0120 DEPTH:__ 9 - 11 ☑ ft; □ m LABORATORY IDENTIFICATION NO.: 150120/HC3/ST1B1 DATE SAMPLE RECEIVED: 10/19/15 SAMPLE DESCRIPTION: Brown clay Effective Isotropic Consolidation Stress = 1.46 kg/cm² DATE TEST SET-UP:___ 10/31/15 DATE REPORTED: 11/19/15



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Where: $\Delta u = \text{Excess pore pressure}$; $\sigma_1' = \text{Major effective principal stress}$; and $\sigma_3' = \text{Minor effective principal stress}$.

Checked By: Date: 11/9/19

ARDAMAN & ASSOCIATES, INC. GEOTECHNICAL TESTING LABORATORY CONSOLIDATED UNDRAINED TRIAXIAL COMPRESSION TEST EFFECTIVE STRESS PATHS

CLIENT: LOCKHEED MARTIN

PROJECT: MRC LABORATORY TESTING

FILE NO.: 15-13-0120

DATE SAMPLE RECEIVED: 10/19/15

DATE TEST SET-UP: 11/04/15

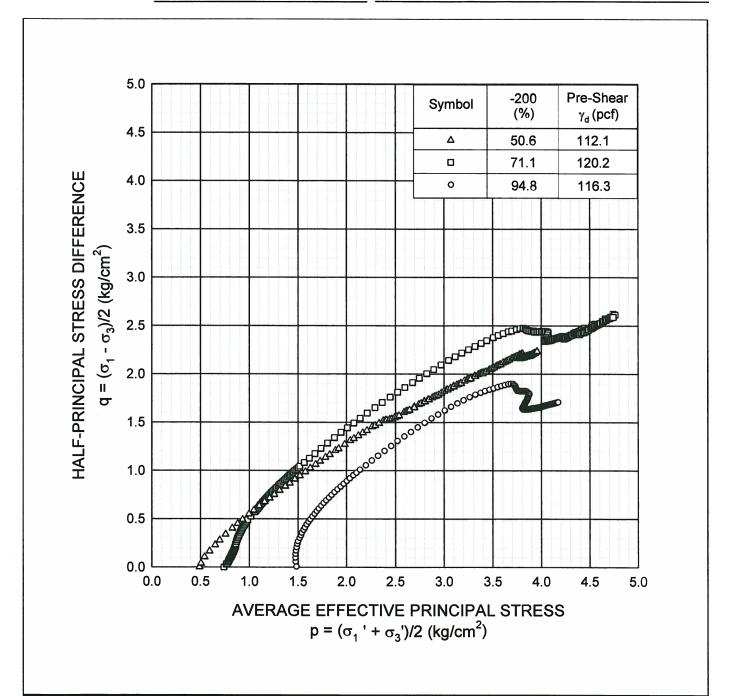
DATE REPORTED: 11/24/15

INCOMING SAMPLE NO.: ----
BORING: TTDHC-6

SAMPLE: ST-1

LABORATORY IDENTIFICATION NO.: 150120/HC6

SAMPLE DESCRIPTION: Reddish-brown lean clay to sandy lean clay

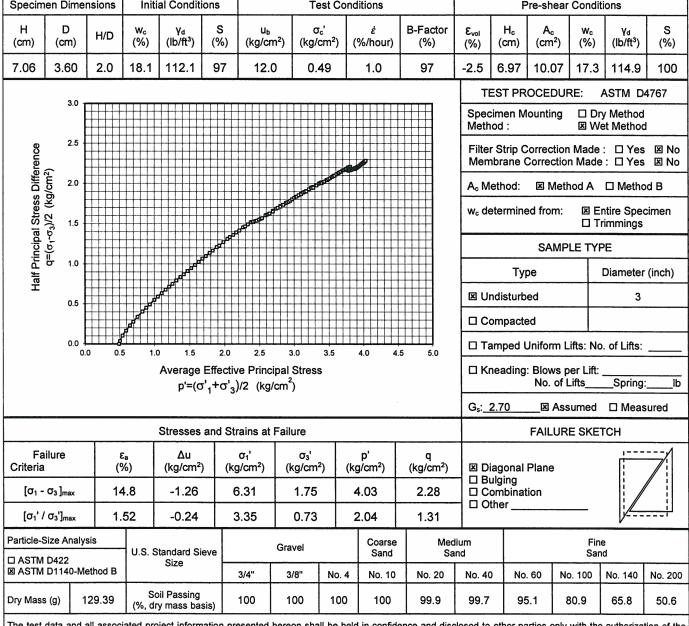


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Checked By: _______

Date: 112415

| CLIENT: LOCKHEED MARTIN PROJECT: MRC LABORATORY FILE NO.: 15-13-0120 DATE SAMPLE RECEIVED: 10/ DATE TEST SET-UP: 11/04 DATE REPORTED: 11/23/ | 9/15 /15 | BORING:_ DEPTH: LABORAT | SAMPLE NO.: TTDHC-6 13 - 15 ORY IDENTIFIC DESCRIPTION: | SAMPLI |).: <u>150120</u> | _図 ft; //HC6/S | T1B1 |
|---|-------------|-------------------------------|--|-----------|-------------------|-------------------|------|
| pecimen Dimensions Initial Conditions | Test C | onditions | | Pre-shear | Conditions | | |



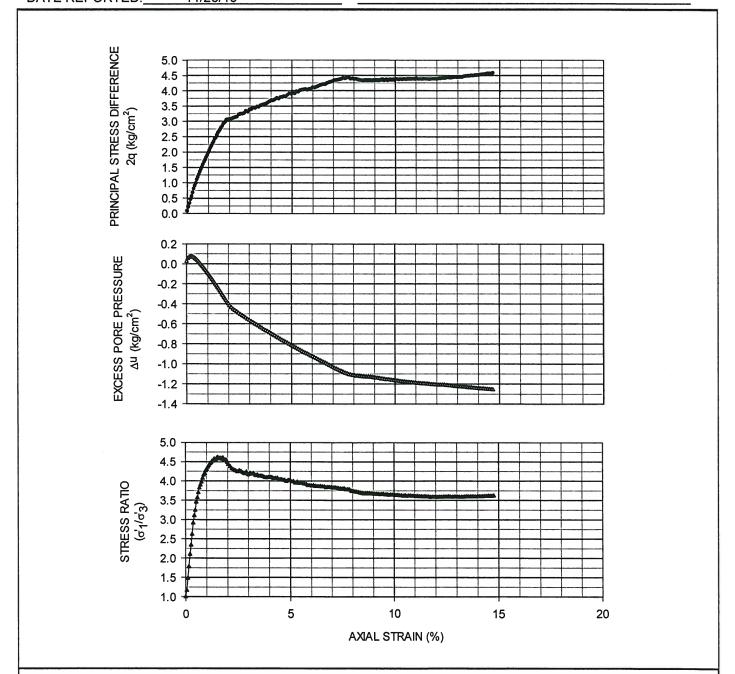
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Where: H = Specimen height; D = Specimen diameter; w_c = Water content (ASTM D2216); γ_d = Dry density; S = Saturation; σ_c' = Isotropic effective confining stress; ἐ = Vertical displacement rate; ε_{vol} = Volume change(- denotes consolidation, + denotes swelling); H_c = Consolidated height; A_c = Consolidated area; ε_a = Axial strain; Δu = Excess pore pressure; σ₁' = Major effective principal stress; σ₃'= Minor effective principal stress; p' = Average effective principal stress; q = Half principal stress difference; and G_s = Specific gravity.

| Checked By: | M | Date:_ | 11 | 23 | 19 | |
|-------------|---|--------|----|----|----|--|
| | | | | | | |

ARDAMAN & ASSOCIATES, INC. GEOTECHNICAL TESTING LABORATORY CONSOLIDATED UNDRAINED TRIAXIAL COMPRESSION TEST STRESS - STRAIN CURVES

CLIENT: LOCKHEED MARTIN **INCOMING SAMPLE NO.:** PROJECT: MRC LABORATORY TESTING BORING: TTDHC-6 FILE NO.: 15-13-0120 DEPTH: 13 - 15 ☑ ft; □ m LABORATORY IDENTIFICATION NO.: 150120/HC6/ST1B1 DATE SAMPLE RECEIVED:_ 11/04/15 SAMPLE DESCRIPTION: Reddish-brown sandy lean clay DATE TEST SET-UP:_ 11/04/15 Effective Isotropic Consolidation Stress = 0.49 kg/cm² 11/23/15 DATE REPORTED:

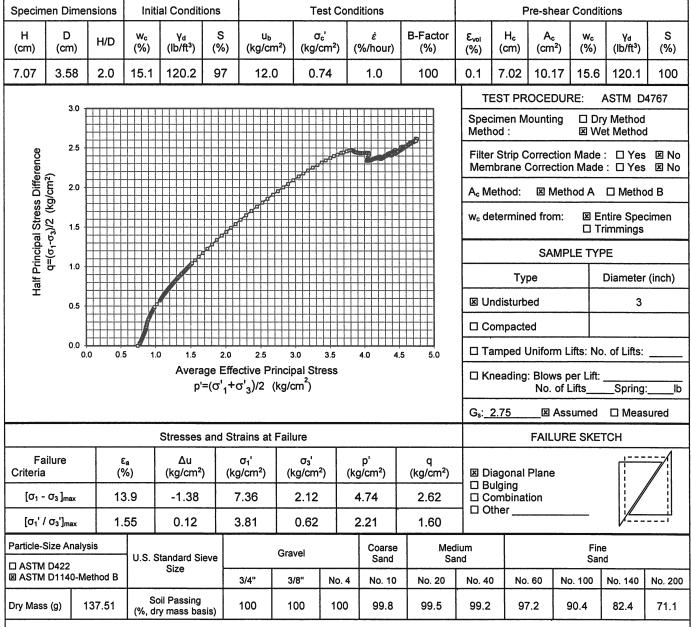


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Where: $\Delta u = \text{Excess pore pressure}$; $\sigma_1' = \text{Major effective principal stress}$; and $\sigma_3' = \text{Minor effective principal stress}$.



| CLIENT: LOCKHEED MARTIN | INCOMING SAMPLE NO.: |
|---------------------------------|--|
| PROJECT: MRC LABORATORY TESTING | BORING: TTDHC-6 SAMPLE: ST-1 |
| FILE NO.: 15-13-0120 | DEPTH: 13 - 15 ☑ ft; ☐ m |
| DATE SAMPLE RECEIVED: 10/19/15 | LABORATORY IDENTIFICATION NO.: 150120/HC6/ST1B2 |
| DATE TEST SET-UP: 11/04/15 | SAMPLE DESCRIPTION: Reddish-brown lean clay with |
| DATE REPORTED: 11/23/15 | sand |



The test data and all associated project information presented hereon shall be held in confidence and disclosed to other parties only with the authorization of the Client. Physical and electronic records of each project are kept for a minimum of 7 years. Test samples are kept in storage for at least 10 working days after mailing the test report, prior to being discarded, unless a longer storage period is requested in writing & accepted by Ardaman & Associates, Inc.

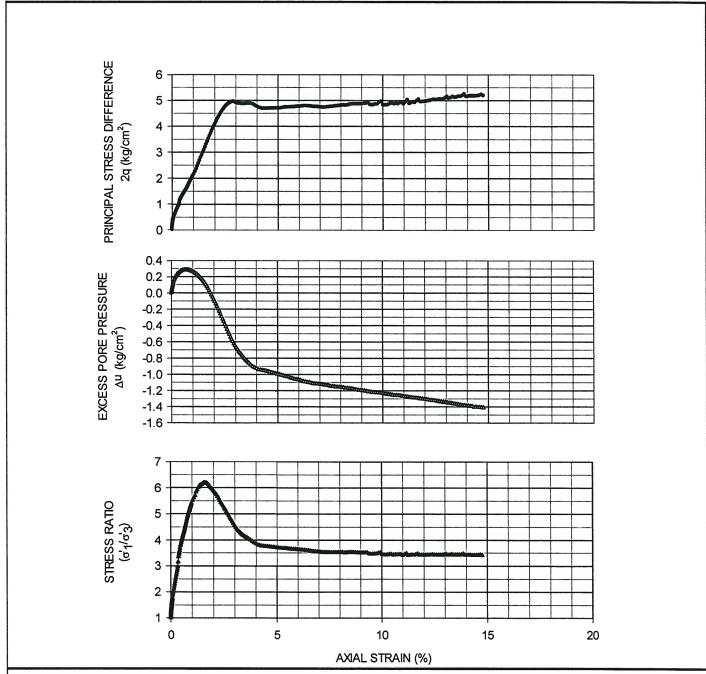
/here: H = Specimen height; D = Specimen diameter; w_c = Water content (ASTM D2216); γ_d = Dry density; S = Saturation; σ_c' = Isotropic effective confining stress; ἐ = Vertical displacement rate; ε_{vol} = Volume change(- denotes consolidation, + denotes swelling); H_c = Consolidated height; A_c = Consolidated area; ε_s = Axial strain; Δu = Excess pore pressure; σ₁' = Major effective principal stress; σ₃'= Minor effective principal stress; p' = Average effective principal stress; q = Half principal stress difference; and G_s = Specific gravity.

Checked By: 1M Date: 1/123/19

ARDAMAN & ASSOCIATES, INC. GEOTECHNICAL TESTING LABORATORY CONSOLIDATED UNDRAINED TRIAXIAL COMPRESSION TEST STRESS - STRAIN CURVES

CLIENT: LOCKHEED MARTIN
PROJECT: MRC LABORATORY TESTING
FILE NO.: 15-13-0120

DATE SAMPLE RECEIVED: 10/19/15
DATE TEST SET-UP: 11/04/15
DATE REPORTED: 11/23/15



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Where: $\Delta u = \text{Excess pore pressure}$; $\sigma_1' = \text{Major effective principal stress}$; and $\sigma_3' = \text{Minor effective principal stress}$.

| CLIENT: LOCKHEED MARTIN | INCOMING SAMPLE NO.: |
|---------------------------------|---|
| PROJECT: MRC LABORATORY TESTING | BORING: TTDHC-6 SAMPLE: ST-1 |
| FILE NO.: 15-13-0120 | DEPTH: 13 - 15 |
| DATE SAMPLE RECEIVED: 10/19/15 | LABORATORY IDENTIFICATION NO.: 150120/HC6/ST1B3 |
| DATE TEST SET-UP: 11/04/15 | SAMPLE DESCRIPTION: Reddish-brown lean clay |
| DATE REPORTED: 11/23/15 | |

| Specim | nen Dim | ensions | Init | ial Conditi | ons | | Те | st Cor | ditions | | Pre-shear Conditions | | | | | | | | |
|---|---|---------|-----------------------|----------------------------|----------|--------------------------------------|----------------------------|--------|----------------|-----------------|---|------------------------|-------------------------|-----------------------|----------------------------|----------------|--|--|--|
| H (cm) | D (cm) | H/D | W _c (%) | Ya (lb/ft³) | S (%) | u _b (kg/cm² | σ _c 2) (kg/c | | έ (%/hour) | B-Factor (%) | ε _{vol} (%) | H _c (cm) | A _c (cm²) | w _c (%) | Y _d (lb/ft³) | S (%) | | | |
| 7.06 | 3.58 | 2.0 | 17.0 | 116.3 | 98 | 12.0 | 1.4 | 19 | 1.0 | 100 | 0.8 | 7.05 | 10.16 | 17.7 | 115.3 | 100 | | | |
| 8 | 3.0 2.5 | | | | | | | | | | Spec | imen M | OCEDU | □ Di ⊠ W | ASTM Downson | | | | |
| Half Principal Stress Difference | Membrane A _c Method: w _c determin | | | | | | | | | | etermined from: ☐ Entire Specimen ☐ Trimmings | | | | | | | | |
| rincipa | in cipal | | | | | | | | | | | SAMPLE TYPE | | | | | | | |
| laff P | 5 1.0 | | | | 6500 | | | | | Ту | ре | | Diameter | (inch) | | | | | |
| | 0.5 | | | <i>A</i> | 8 | | | | | | ⊠ Uı | ndisturb | ed | | 3 | | | | |
| | | | | | | | | | | | СС | ompact | ed | | | | | | |
| | 0.0 | | .5 1. | 0 1.5 | 2.0 | 2.5 | 3.0 | 3.5 | 4.0 4 | .5 5.0 | ☐ Tamped Uniform Lifts: No. of Lifts: | | | | | | | | |
| | | | | | | ctive Prir ວ່ ₃)/2 (k | | ess | | | ☐ Kneading: Blows per Lift: | | | | | | | | |
| | | | | | | | | | | | G₅: 2.75 ■ Assumed □ Measured | | | | | | | | |
| | | | | Stresses | and St | rains at F | ailure | | | | | | FAILU | RE SKE | тсн | | | | |
| Fa Criteria | ilure | (| ε _a %) | Δu (kg/cm²) | (k | σ ₁ ' g/cm²) | σ₃' (kg/cm² |) (1 | p' kg/cm²) | q (kg/cm²) | | ☑ Diagonal Plane | | | | | | | |
| [σ_1 - σ_3] _{max} | | 3 | .97 | -0.31 | | 5.64 | 1.80 | | 3.72 | 1.92 | □ Bulging □ Combination | | | | | | | | |
| [\sigma_1' / \sigma_3']_max 2.94 0.04 | | | | 0.04 | 4 | 1.89 | 1.45 | | 3.17 | 1.72 | | iner | | | 1/ | - \ | | | |
| Particle-S | Size Ana | lysis | | Standard C: | | (| Gravel | | Coarse | | lium | | | Fir | | | | | |
| | □ ASTM D422 図 ASTM D1140-Method B | | | Standard Sie Size | ,ve | 3/4" | 3/8" | No. 4 | Sand No. 10 | No. 20 | nd No. 40 | No | . 60 | Sai No. 100 | No. 140 | No. 200 | | | |
| Dry Mass | s (g) | 132.61 | | oil Passing ry mass bas | is) | 100 | 100 | 100 | 100 | 100 | 99.9 | | 9.7 | 98.7 | 97.2 | 94.8 | | | |
| The test data and all associated project information presented bereon shall be held in confidence and disclosed to other parties only with the authorization of the | | | | | | | | | | | | | | | | | | | |

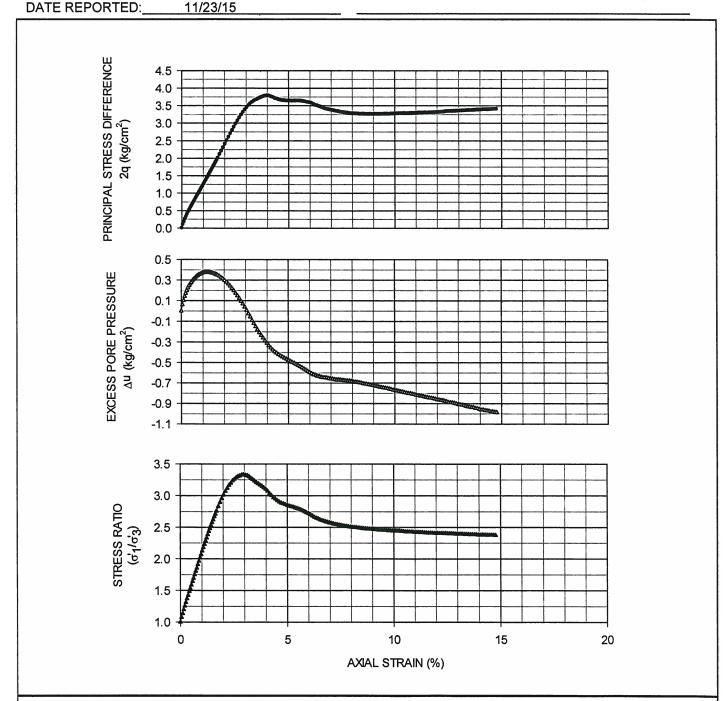
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here: H = Specimen height; D = Specimen diameter; w_c = Water content (ASTM D2216); γ_d = Dry density; S = Saturation; σ_c' = Isotropic effective confining stress; ε' = Vertical displacement rate; ε_{νοl} = Volume change(- denotes consolidation, + denotes swelling); H_c = Consolidated height; A_c = Consolidated area; ε_θ = Axial strain; Δu = Excess pore pressure; σ₁' = Major effective principal stress; σ₃'= Minor effective principal stress; p' = Average effective principal stress; q = Half principal stress difference; and G_s = Specific gravity.

Checked By: 14 Date: 11/23/19

ARDAMAN & ASSOCIATES, INC. GEOTECHNICAL TESTING LABORATORY CONSOLIDATED UNDRAINED TRIAXIAL COMPRESSION TEST STRESS - STRAIN CURVES

CLIENT: **LOCKHEED MARTIN INCOMING SAMPLE NO.:** PROJECT: MRC LABORATORY TESTING BORING: TTDHC-6 ST-1 FILE NO.: 15-13-0120 13 - 15 DEPTH: ☑ ft: □ m LABORATORY IDENTIFICATION NO.: 150120/HC6/ST1B3 SAMPLE DESCRIPTION: Reddish-brown lean clay DATE SAMPLE RECEIVED: 10/19/15 11/04/15 Effective Isotropic Consolidation Stress = 1.49 kg/cm² DATE TEST SET-UP:

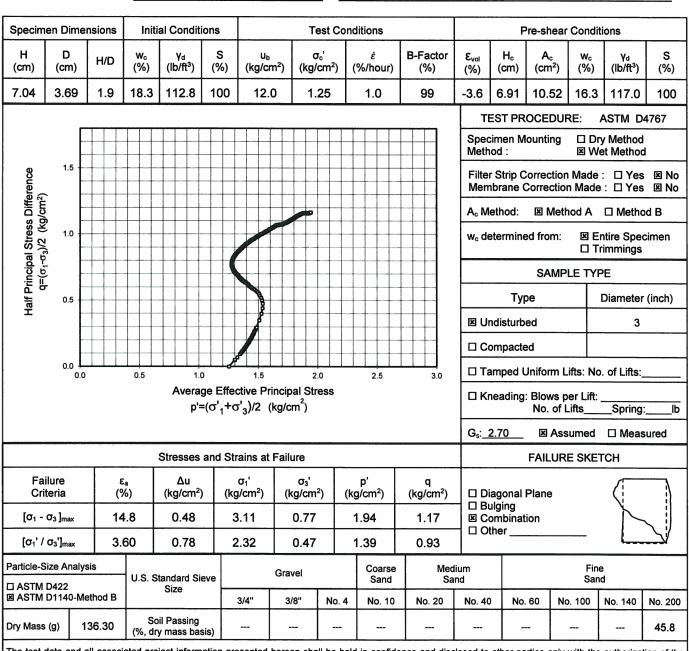


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Where: $\Delta u = \text{Excess pore pressure}$; $\sigma_1' = \text{Major effective principal stress}$; and $\sigma_3' = \text{Minor effective principal stress}$.



| CLIENT: LOCKHEED MARTIN | INCOMING SAMPLE NO.: |
|---------------------------------|---|
| PROJECT: MRC LABORATORY TESTING | BORING: TTDHCB-2 SAMPLE: ST-2 |
| FILE NO.: 15-13-0120 | DEPTH: 11.5 – 13.5 |
| DATE SAMPLE RECEIVED: 10/19/15 | LABORATORY IDENTIFICATION NO.: 150120/HB3/ST2B1 |
| DATE TEST SET-UP: 11/16/15 | SAMPLE DESCRIPTION: Reddish-brown clayey sand (SC |
| DATE REPORTED: 12/0/15 | |



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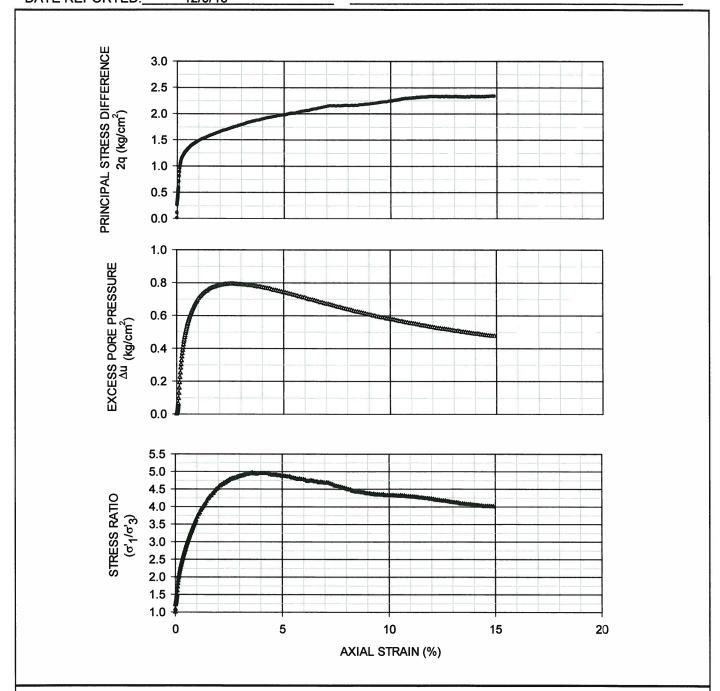
the test report, prior to being discarded, unless a longer storage period is requested in writing & accepted by Ardaman & Associates, Inc.

H = Specimen height; D = Specimen diameter; w_c = Water content (ASTM D2216); γ_d = Dry density; S = Saturation; σ_c' = Isotropic effective confining stress; & = Vertical displacement rate; &vol = Volume change(- denotes consolidation, + denotes swelling); Ho = Consolidated height; Ao = Consolidated area; ε_a = Axial strain; Δu = Excess pore pressure; σ₁' = Major effective principal stress; σ₃'= Minor effective principal stress; p' = Average effective principal stress; q = Half principal stress difference; and G_s = Specific gravity.

Checked By:_ Date: 2/09/19

ARDAMAN & ASSOCIATES, INC. GEOTECHNICAL TESTING LABORATORY CONSOLIDATED UNDRAINED TRIAXIAL COMPRESSION TEST STRESS - STRAIN CURVES

LOCKHEED MARTIN CLIENT: **INCOMING SAMPLE NO.:** PROJECT: MRC LABORATORY TESTING SAMPLE: BORING: TTDHCB-2 ST-2 FILE NO.: 15-13-0120 11.5 - 13.5DEPTH: **図** ft; □ m LABORATORY IDENTIFICATION NO.: 150120/HB3/ST2B1 DATE SAMPLE RECEIVED: 10/19/15 SAMPLE DESCRIPTION: Reddish-brown clayey sand (SC) DATE TEST SET-UP: 11/16/15 Effective Isotropic Consolidation Stress = 1.25 kg/cm² DATE REPORTED: 12/9/15



The test data and all associated project information presented hereon shall be held in confidence and disclosed to other parties only with the authorization of the Client. Physical and electronic records of each project are kept for a minimum of 7 years. Test samples are kept in storage for at least 10 working days after mailing the test report, prior to being discarded, unless a longer storage period is requested in writing & accepted by Ardaman & Associates, Inc.

Where: $\Delta u = \text{Excess pore pressure}$; $\sigma_1' = \text{Major effective principal stress}$; and $\sigma_3' = \text{Minor effective principal stress}$.

Checked By: Date: 12/09/15

ARDAMAN & ASSOCIATES, INC. GEOTECHNICAL TESTING LABORATORY CONSOLIDATED UNDRAINED TRIAXIAL COMPRESSION TEST EFFECTIVE STRESS PATHS

CLIENT: LOCKHEED MARTIN

PROJECT: MRC LABORATORY TESTING

FILE NO.: 15-13-0120

DATE SAMPLE RECEIVED: 10/19/15

DATE TEST SET-UP: 11/16/15

DATE REPORTED: 12/9/15

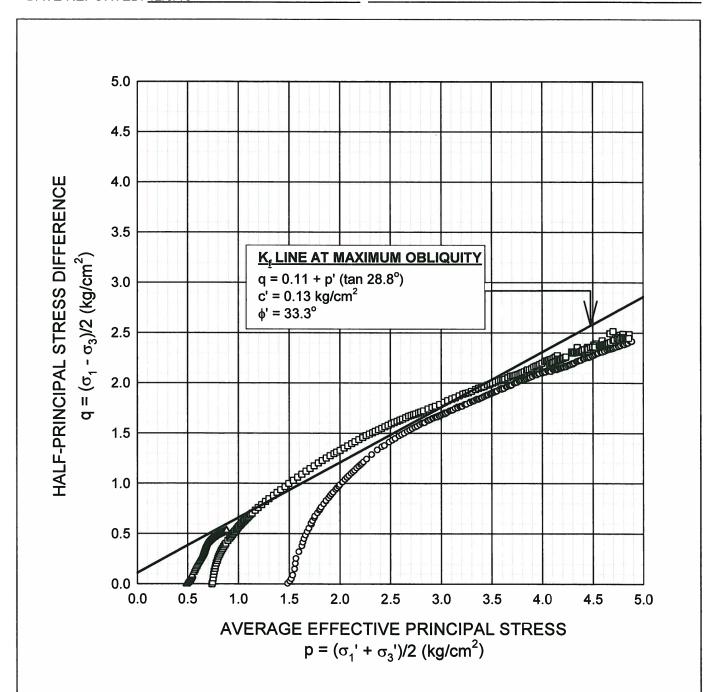
INCOMING SAMPLE NO.: ----
BORING: TTDHCB-9

SAMPLE: ST-1

DEPTH: 12.0 − 14.0

LABORATORY IDENTIFICATION NO.: 150120/HB9

SAMPLE DESCRIPTION: Reddish-brown lean clay (CL)

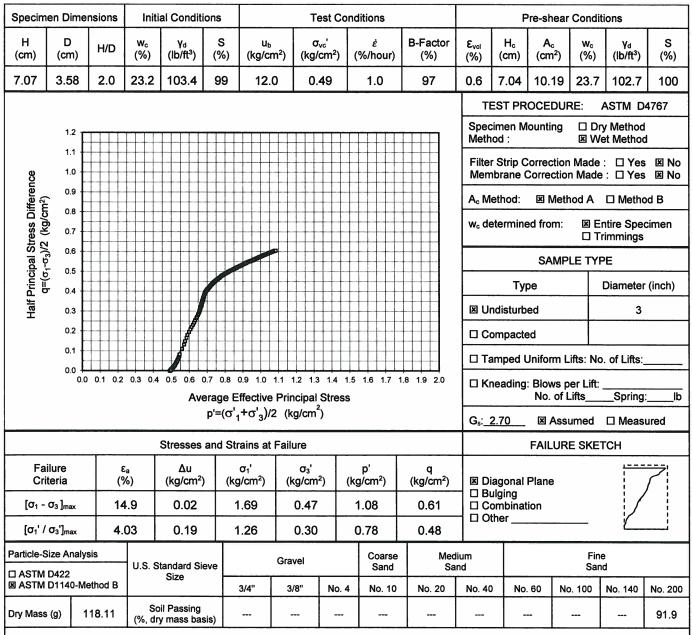


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Checked By: ________

Date: 12/09/19

| CLIENT: LOCKHEED MARTIN | INCOMING SAMPLE NO.: |
|---------------------------------|--|
| PROJECT: MRC LABORATORY TESTING | BORING: TTDHCB-9 SAMPLE: ST-1 |
| FILE NO.: 15-13-0120 | DEPTH: 12.0 – 14.0 🗵 ft; 🗆 m |
| DATE SAMPLE RECEIVED: 10/19/15 | LABORATORY IDENTIFICATION NO.: 150120/HB9/ST1B1 |
| DATE TEST SET-UP: 11/16/15 | SAMPLE DESCRIPTION: Reddish-brown lean clay (CL) |
| DATE REPORTED: 12/9/15 | |



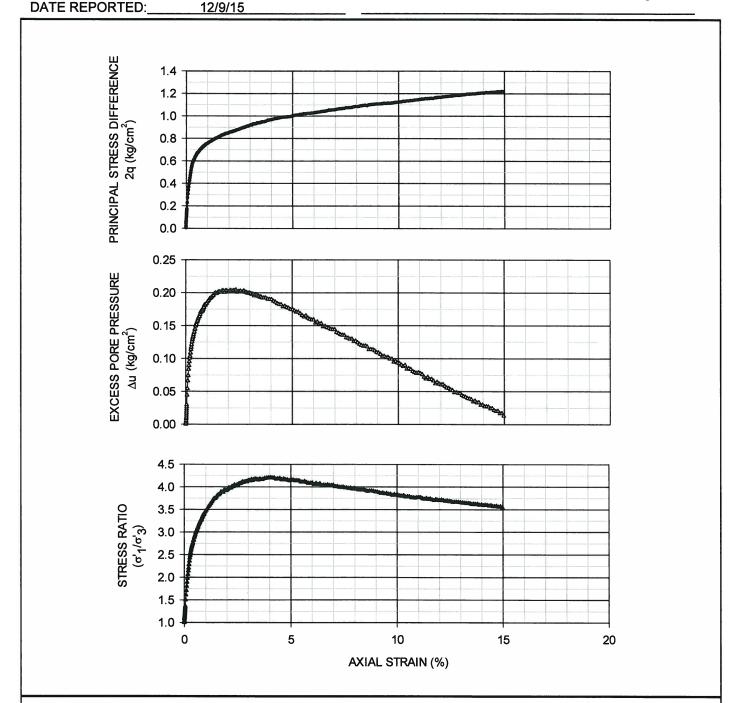
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H = Specimen height; D = Specimen diameter; w_c = Water content (ASTM D2216); γ_d = Dry density; S = Saturation; σ_c' = Isotropic effective confining stress; ἐ = Vertical displacement rate; ε_{vol} = Volume change(- denotes consolidation, + denotes swelling); H_c = Consolidated height; A_c = Consolidated area; ε_a = Axial strain; Δu = Excess pore pressure; σ₁' = Major effective principal stress; σ₃'= Minor effective principal stress; p' = Average effective principal stress; q = Half principal stress difference; and G_s = Specific gravity.

| Checked By: | m | Date: | 2 | 109 | 119 | |
|-------------|---|-------|---|-----|-----|--|
| · (100) | | | - | | | |

ARDAMAN & ASSOCIATES, INC. GEOTECHNICAL TESTING LABORATORY CONSOLIDATED UNDRAINED TRIAXIAL COMPRESSION TEST STRESS - STRAIN CURVES

CLIENT: LOCKHEED MARTIN **INCOMING SAMPLE NO.:** PROJECT: MRC LABORATORY TESTING **BORING: TTDHCB-9** SAMPLE: **ST-1** FILE NO.: 15-13-0120 DEPTH: 12.0 - 14.0**図** ft; □ m LABORATORY IDENTIFICATION NO.: 150120/HB9/ST1B1 DATE SAMPLE RECEIVED:_ 10/19/15 SAMPLE DESCRIPTION: Reddish-brown lean clay (CL) 11/16/15 DATE TEST SET-UP: Effective Isotropic Consolidation Stress = 0.49 kg/cm²

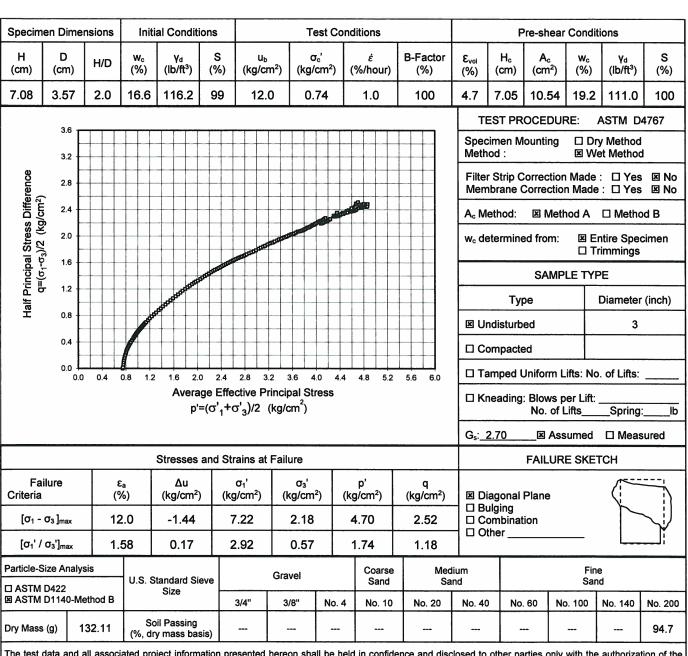


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Where: $\Delta u = \text{Excess pore pressure}$; $\sigma_1' = \text{Major effective principal stress}$; and $\sigma_3' = \text{Minor effective principal stress}$.

Checked By: Date: 20919

| CLIENT: LOCKHEED MARTIN | INCOMING SAMPLE NO.: |
|---------------------------------|--|
| PROJECT: MRC LABORATORY TESTING | BORING: TTDHCB-9 SAMPLE: ST-1 |
| FILE NO.: 15-13-0120 | DEPTH: 12.0 – 14.0 |
| DATE SAMPLE RECEIVED: 10/19/15 | LABORATORY IDENTIFICATION NO.: 150120/ HB9/ST1B2 |
| DATE TEST SET-UP: 11/16/15 | SAMPLE DESCRIPTION: Reddish-brown lean clay (CL) |
| DATE REPORTED: 12/9/15 | |



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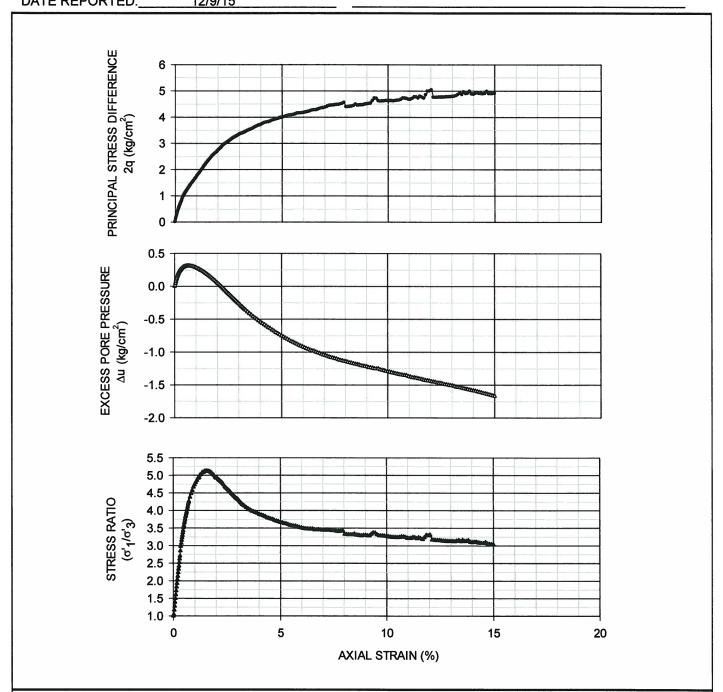
the test report, prior to being discarded, unless a longer storage period is requested in writing & accepted by Ardaman & Associates, Inc.

H = Specimen height; D = Specimen diameter; w_c = Water content (ASTM D2216); γ_d = Dry density; S = Saturation; σ_c' = Isotropic effective confining stress; ε = Vertical displacement rate; ε_{vol} = Volume change(- denotes consolidation, + denotes swelling); H_c = Consolidated height; A_c = Consolidated area; ε_a = Axial strain; Δu = Excess pore pressure; σ₁' = Major effective principal stress; σ₃'= Minor effective principal stress; ρ' = Average effective principal stress; q = Half principal stress difference; and G_s = Specific gravity.

Checked By: Date:

ARDAMAN & ASSOCIATES, INC. GEOTECHNICAL TESTING LABORATORY CONSOLIDATED UNDRAINED TRIAXIAL COMPRESSION TEST STRESS - STRAIN CURVES

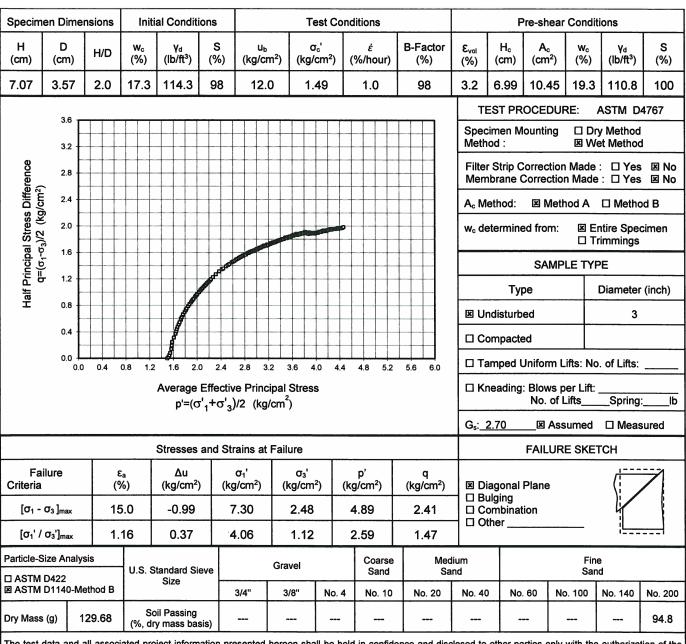
CLIENT: LOCKHEED MARTIN **INCOMING SAMPLE NO.:** PROJECT: MRC LABORATORY TESTING SAMPLE: BORING TTDHCB-9 ST-1 FILE NO.: 15-13-0120 12.0 - 14.0DEPTH: ☑ ft; □ m LABORATORY IDENTIFICATION NO.: 150120/HB9/ST1B2 DATE SAMPLE RECEIVED: 10/19/15 SAMPLE DESCRIPTION: Reddish-brown lean clay (CL) 11/16/15 Effective Isotropic Consolidation Stress = 0.74 kg/cm² DATE TEST SET-UP: DATE REPORTED: 12/9/15



The test data and all associated project information presented hereon shall be held in confidence and disclosed to other parties only with the authorization of the Client. Physical and electronic records of each project are kept for a minimum of 7 years. Test samples are kept in storage for at least 10 working days after mailing the test report, prior to being discarded, unless a longer storage period is requested in writing & accepted by Ardaman & Associates, Inc.

Where: $\Delta u = \text{Excess pore pressure}$; $\sigma_1' = \text{Major effective principal stress}$; and $\sigma_3' = \text{Minor effective principal stress}$.

| CLIENT: LOCKHEED MARTIN | INCOMING SAMPLE NO.: |
|---------------------------------|--|
| PROJECT: MRC LABORATORY TESTING | BORING: TTDHCB-9 SAMPLE: ST-1 |
| FILE NO.: 15-13-0120 | DEPTH: 12.0 – 14.0 ☑ ft; □ m |
| DATE SAMPLE RECEIVED: 10/19/15 | LABORATORY IDENTIFICATION NO.: 150120/ HB9/ST1B3 |
| DATE TEST SET-UP: 11/16/15 | SAMPLE DESCRIPTION: Reddish-brown lean clay (CL) |
| DATE REPORTED: 12/9/15 | |



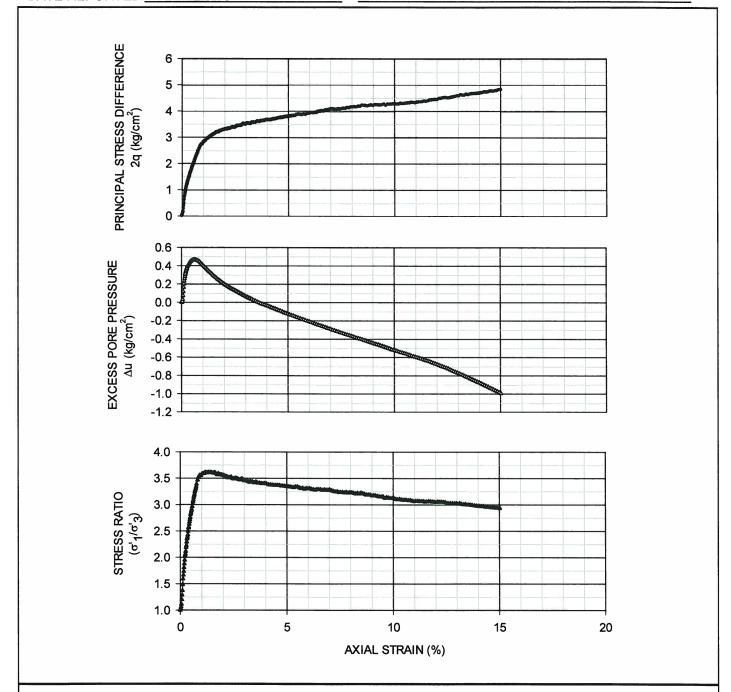
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re: H = Specimen height; D = Specimen diameter; w_c = Water content (ASTM D2216); γ_d = Dry density; S = Saturation; σ_c' = Isotropic effective confining stress; ε' = Vertical displacement rate; ε_{vol} = Volume change(- denotes consolidation, + denotes swelling); H_c = Consolidated height; A_c = Consolidated area; ε_a = Axial strain; Δu = Excess pore pressure; σ₁' = Major effective principal stress; σ₃'= Minor effective principal stress; p' = Average effective principal stress; q = Half principal stress difference; and G_s = Specific gravity.

Checked By: ______ Date: _______

ARDAMAN & ASSOCIATES, INC. GEOTECHNICAL TESTING LABORATORY CONSOLIDATED UNDRAINED TRIAXIAL COMPRESSION TEST STRESS - STRAIN CURVES

CLIENT: **LOCKHEED MARTIN INCOMING SAMPLE NO.:** PROJECT: MRC LABORATORY TESTING BORING: TTDHCB-9 SAMPLE: **ST-1** FILE NO.: 15-13-0120 12.0 - 14.0DEPTH: ☑ ft; □ m LABORATORY IDENTIFICATION NO.: 150120/HB9/ST1B3 DATE SAMPLE RECEIVED:_ 10/19/15 SAMPLE DESCRIPTION: Reddish-brown lean clay (CL) 11/16/15 Effective Isotropic Consolidation Stress = 1.49 kg/cm² DATE TEST SET-UP: DATE REPORTED: 12/9/15



The test data and all associated project information presented hereon shall be held in confidence and disclosed to other parties only with the authorization of the Client. Physical and electronic records of each project are kept for a minimum of 7 years. Test samples are kept in storage for at least 10 working days after mailing the test report, prior to being discarded, unless a longer storage period is requested in writing & accepted by Ardaman & Associates, Inc.

Where: Δu = Excess pore pressure; σ_1 ' = Major effective principal stress; and σ_3 '= Minor effective principal stress.



| PROJ | IT: <u> L</u> ECT: <u>M</u> NO.: <u> 1</u> | IRC LA | BORA | TORY T | | | BORIN DEPTH | l: 7 - 9 | C-4 | _SAMPLE:_S | | : ft; 9 m | | | |
|--------------------------------------|--|---------------------------|-----------------------|--------------------------------|--|----------------------------|----------------|------------------------|-----------------------|--|-------------------|-----------|--|--|--|
| DATE DATE DATE | SAMPI TEST S REPOR | _E REC SET-UI RTED: | CEIVEI | D: <u>10/1</u> 10/2 11/1 | 19/15 28/15 19/15 | | | E DESCR | | FICATION NO. N: Reddish-bro | | | | | |
| Specin | nen Dime | nsions | ı | nitial Condit | tions | | Test Conditio | ns | | at (σ ₁ -σ ₃ | 3) _{max} | | | | |
| H (cm) | D (cm) | H/D | w _c (%) | Y _d (lb/ft³) | S (%) | σ _c (kg/cm²) | Displacem | ent Rate, έ (%/minute) | ε _a (%) | | | | | | |
| | | | | | | | 0.074 | 4.0 | 14.8 | 0.54 | 1.48 | 0.39 | | | |
| 7.08 | 3.57 | 2.0 | 20.9 | 108.5 | 97 | 0.39 | 0.071 | 1.0 | Memb | Membrane Correction Made: ☐ Yes | | | | | |
| | | | | | | | | | Т | TEST PROCEDURE: ASTM D | | | | | |
| | 1.20 | | | | | | | | | SAMPLE TYPE | | | | | |
| 2 | | | | ••••• | ·************************************* | •••• | | 1 | L | Type Diameter | | | | | |
| J/cm | 1.00 | , | | ,o*ooo** | | | | | × | Undisturbed | | 3 | | | |
| E (k | | | , | | | | | | | Rock Core | | | | | |
| INC. | 0.80 | | | | | | | | | Compacted | | | | | |
| IFFER | | | | | | | | | | Tamped Unifor No. of Lifts: | | | | | |
| PRINCIPAL STRESS DIFFERENCE (kg/cm²) | 0.60 | : | | | | | | | | Kneading No. of Lifts: | | | | | |
| STE | 0.40 | • | | | | | | | | Spring: Blows per Lift:_ | | ID. | | | |
| NCIPAL | | | | | | | | | G | s: <u>2.78</u> | ✓ Assu ✓ Mea | | | | |
| PR | 0.20 | * | | | | | | | | FAILURE | SKETCH | 1 | | | |
| | 0.00 | 0 | 5 | | 0 XIAL STRA | 15 AIN (%) | 20 | 25 | | Diagonal Plane Bulging Combination Other | | | | | |
| Partic | le-Size Ana | alysis | U.S. S | tandard | C | Gravel | Coarse | Medi Sar | | | Fine Sand | | | | |

Sieve Size ☑ ASTM D1140-Method B No. 200 No. 40 No. 60 No. 100 No. 140 No. 10 No. 20 3/4" 3/8" No. 4 Soil Passing 76.7 122.68 Dry Mass (g) (%, dry mass basis)

The test data and all associated project information presented hereon shall be held in confidence and disclosed to other parties only with the authorization of the Client. Physical and electronic records of each project are kept for a minimum of 7 years. Test samples are kept in storage for at least 10 working days after mailing of the test report, prior to being discarded, unless a longer storage period is requested in writing and accepted by Ardaman & Associates, Inc.

Where: H = Specimen height; D = Specimen diameter; w_c = Water content (ASTM D2216); y_d = Dry density; S = Saturation; σ_c = Isotropic confining stress; $\dot{\varepsilon}$ = Vertical displacement rate; ε_a = Axial strain; σ_1 = Major principal stress; σ_3 = Minor principal stress; and G_s = Specific gravity.



| | ORATORY TESTING | | SAMPLE: ST-1 |
|---------------------------------------|-----------------------------|-----------------|---|
| DATE SAMPLE RECE DATE TEST SET-UP: | EIVED: 10/19/15 10/28/15 | | : ft; 9 m NTIFICATION NO.: <u>150120/C4S1B</u> FION: <u>Reddish-brown lean clay</u> |
| DATE REPORTED: Specimen Dimensions | 11/19/15 Initial Conditions | Test Conditions | at (σ ₁ -σ ₃) _{max} |

| Specin | nen Dim | nensions | lr | itial Con | ditions | | | Test | Condition | าร | | | а | at (σ ₁ -σ ₃) _{max} | | | | |
|--------------------------------------|----------|-----------|-------------------------|---------------------|---------------|----------|------------------|--------|----------------|----------------|--------|--------------------------------------|-------------------|---|--------------------|-------------|--|--|
| н | D | | w _c | Yd | s | | $\sigma_{\rm c}$ | D | isplaceme | ent Rate, έ | ε, | | Undra She | | σ_1 | σ_3 | | |
| (cm) | (cm) | H/C | (%) | (lb/ft ^s | | | kg/cm²) | (cm | n/minute) | (%/minute) | (% | | Stren (kg/c | gth | (kg/cm²) | (kg/cm²) | | |
| 7.06 | 3.56 | 2.0 | 18.4 | 115. | 1 10 | , | 0.78 | ١, | 0.071 | 1.0 | 5. | 8 | 1.8 | 9 | 4.56 | 0.78 | | |
| 7.06 | 3.30 | 2.0 | 10.4 | 115. | 1 10 | ,0 | 0.76 | | J.U7 I | 1.0 | Mer | mbrar | ne Corre | ction Ma | ade: □ Ye | s 🗷 No | | |
| | 4.00 | | | | | | | | | | | TES | T PROC | EDURE | : ASTM | D2850 | | |
| | 4.00 | | | ***** | | | | | | | L | | S | AMPLE | TYPE | | | |
| m²) | 3.50 | , [| | ***** | | | | | | | | | Туре | | Diamete | er (inch) | | |
| kg/cr | | | | | | | | | | | | X U | ndistur | bed | 3 | 3 | | |
|) EC | 3.00 |) | | | | ****** | | | | | | □ Rock Core | | | | | | |
| ÄEN. | 2.50 | | | | | | | | | | | ☐ Compacted | | | | | | |
| IFFEF | 2.50 | | | | | | | | | | | ☐ Tamped Uniform Lifts No. of Lifts: | | | | | | |
| o SS | 2.00 | | | | | | | | | | | No. of Lifts: | | | | | | |
| Z. | 1.50 | | | | | | | | | | | No | | | | lb. | | |
| L S. | 1.50 | | | | | | | | | | | BI | ows pe | r Lift: | | 10. | | |
| PRINCIPAL STRESS DIFFERENCE (kg/cm²) | 1.00 | | | | | | | | | | | Gs: _ | 2.78 | | _ ⊠ Assu □ Meas | | | |
| PR | 0.50 | | | | | | | | | | | | FAI | LURE | SKETCH | | | |
| | 0.0 | | | | | | | | | | | | iagonal ulging | Plane | [| | | |
| | 0.00 | 0 | 5 | A | 10 AXIAL S | | 15 I (%) | | 20 | 25 | | | ombina | tion | | | | |
| Particle | e-Size A | nalysis | U.S. Sta | | | Grav | el | | Coarse Sand | Medi Sar | | | | Fine Sand | | | | |
| ☑ ASTM | D1140-l | Method B | Sieve | oize | 3/4" | 3/8" | ' No | . 4 | N o. 10 | No. 20 | No. | . 40 | No. 60 | No. 100 No. 140 No. 2 | | | | |
| Dry Mass | (g) | 129.96 | Soil Pas (%, dry mas | | | | | - | | | _ | | 75. | | | | | |
| The test of | data and | all assoc | ated project | informatio | n presente | ed hered | on shall be | e held | in confide | nce and disclo | sed to | othe | r parties o | only with | the authoriz | ation of th | | |

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Where: H = Specimen height; D = Specimen diameter; w_c = Water content (ASTM D2216); γ_d = Dry density; S = Saturation; σ_c = Isotropic confining stress; $\dot{\varepsilon}$ = Vertical displacement rate; ε_a = Axial strain; σ_1 = Major principal stress; σ_3 = Minor principal stress; and G_s = Specific gravity.

Checked By:
Date:
Form SR-3A Rev. 1.6ocx

| CLIENT: LOCKHEED MARTIN PROJECT: MRC LABORATORY TESTING | INCOMING SAMPLE NO.: BORING: TTDHC-4 SAMPLE: ST-1 |
|--|---|
| FILE NO.: 15-13-0120 | DEPTH: 7 - 9 : ft; 9 m |
| DATE SAMPLE RECEIVED: 10/19/15 DATE TEST SET-UP: 10/28/15 | LABORATORY IDENTIFICATION NO.: 150120/C4S1C SAMPLE DESCRIPTION: Reddish-brown lean clay with sand |
| DATE REPORTED: | |

| Specim | nen Dime | nsions | Ir | nitial Condi | tions | | | Test | Condition | าร | | at (σ ₁ -σ ₃) _{max} | | | | | |
|--------------------------------------|---------------------|--------------|-------------------------|-----------------------|---------|-----------|--------------------------|------|----------------|----------|-------|---|--------------------------------------|----------|--------------|---|--|
| Н | D | | T | | s | | ~ | Di | splaceme | ent Rate | , έ | | Undra | | σ 1 | α. | |
| (cm) | (cm) | H/D | (%) | (lb/ft ³) | (% | | σ _c g/cm²) | (cm | /minute) | (%/min | nute) | ε _a (%) | She Stren (kg/c | igth | (kg/cm²) | σ ₃ (kg/cm ²) | |
| 7.07 | 3.57 | 2.0 | 15.6 | 119.7 | 96 | , | 1.46 | , ا | 0.071 | 1.0 | | 14.8 | 1.7 | ′1 | 4.88 | 1.46 | |
| 7.07 | 3.57 | 2.0 | 15.6 | 119.7 | 90 | , | 1.40 | | 7.071 | 1.0 | | Membrar | ne Corre | ction Ma | ade: □ Ye | s 🗷 No | |
| | 4.00 | | | | | | | | | | | TES | T PROC | EDURE | : ASTM | D2850 | |
| | 4.00 | | | | | | | | | | | | S | AMPLE | TYPE | | |
| [2] | 3.50 | | | | | | | | - | | | | Туре | | Diamete | r (inch) | |
| g/cm | | | | | 2000000 | ********* | | | | | | ⊠ Uı | ndisturt | oed | 3 | | |
| я Š | 3.00 | ┡ | | | ••• | | | | □ Rock Core | | | | | | | | |
| ENC | 0.50 | • | | ****** | | | | | | | | ☐ Compacted | | | | | |
| PRINCIPAL STRESS DIFFERENCE (kg/cm²) | 2.50 | | | | | | | | | | | □ Ta | ☐ Tamped Uniform Lifts No. of Lifts: | | | | |
| 3S | 2.00 | | ! | | | | | | | | | | neading | | | | |
| STRE | 1.50 | 1 | | | | | | | | | | S | o. of Lif oring: ows pe | | | lb. | |
| IPAL | 1.00 | | | | = | | | | | | | | 2.78 | | ≝Assun | ned | |
| INC. | | i i | | | | | | | | | | | | | □ Meas | | |
| R. | 0.50 | / | | | | | | | | | | | FA | ILURE | SKETCH | | |
| ; | 0.00 | <u>L</u> | | | | | | | | | | ■ B | iagonal ulging | | |) | |
| | | 0 | | | | | | | | | | | | | | | |
| Particle | e-Size Anal D422 | ysis | U.S. Sta | | | Grave | ıl | | Coarse Sand | | | ledium Fine Sand Sand | | | | | |
| | D1140-Me | thod B | Sieve | Size | 3/4" | 3/8" | No | . 4 | No. 10 | No. | 20 | | | | | No. 200 | |
| Dry Mass | (g) 13 | 86.79 | Soil Pas (%, dry mas | | | | | - | | | - | | | | the gutheriz | 71.4 | |

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Where: H = Specimen height; D = Specimen diameter; w_c = Water content (ASTM D2216); γ_d = Dry density; S = Saturation; σ_c = Isotropic confining stress; $\dot{\varepsilon}$ = Vertical displacement rate; ε_a = Axial strain; σ_1 = Major principal stress; σ_3 = Minor principal stress; and G_s = Specific gravity.



| PROJI FILE N DATE DATE | ECT: M IO.: 1! SAMPL TEST S | RC LA 5-13-0 E REC SET-UF | 120 EIVED: | ORY TE 10/19 10/28 | 9/15 3/15 | 3 | E [| ORING DEPTH: ABOR | 3: <u>T</u> : <u> 3(</u> ATOF | TDHC 0 - 32 RY ID | ENTIFI | SAMPL | E: <u>ST-</u> | : 50120/0 | 24S1A |
|--------------------------------------|--------------------------------------|------------------------------------|----------------------|--------------------------|--------------|---------------------------------------|--------|-------------------------|--|-------------------------|-----------------------|-----------------------------|---|---------------------------|------------|
| Specim | nen Dimer | sions | Init | ial Condition | ons | | Test | Condition | ns | | | at | (σ ₁ -σ ₃) _{ma} | эх | |
| | | | | | | | Dis | splaceme | ent Raf | te, έ | | Undrai | | σ. | σ_3 |
| H (cm) | D (cm) | H/D | (%) | Ya (lb/ft³) | (%) | σ _c (kg/cm ² | (cm/ | /minute) | (%/m | inute) | ε _a (%) | Shea Streng (kg/cn | gth (l | σ ₁ (g/cm²) | (kg/cm²) |
| | | V | | | 404 | 0.00 | | 074 | 1 | .0 | 6.6 | 0.58 | 3 | 2.05 | 0.88 |
| 7.08 | 3.55 | 2.0 | 22.2 | 107.8 | 101 | 0.88 | 0 | .071 | ' | .0 | Membra | ne Correc | ction Mad | le: 🗆 Yes | s ⊠ No |
| | | | | | | | | - | | | TE | ST PROC | EDURE: | ASTM | D2850 |
| | 1.40 | | | | | | | | | | | SA | AMPLE | TYPE | |
| (2 | | | | | | | | | | | | Туре | | Diamete | r (inch) |
|)/cm | 1.20 | | | ***** | ******* | , , , , | | | | | X (| Jndisturb | ed | 3 | |
| Э <u>ў</u> | 4.00 | | J | | | | | | | | | Rock Cor | e | | |
| ENC. | 1.00 | | | | | | | | | | | Compact | ed | | |
| PRINCIPAL STRESS DIFFERENCE (kg/cm²) | 0.80 | | | | | | | | | | | Tamped I | | | |
| SS D | - | | | | | | | | | | | Kneading | ! | | |
| L KES | 0.60 | | | | | | | | | 1 | | No. of Lift Spring: | | | lb. |
| L ST | | 1 | | | | | | (40) | | | | Blows pe | r Lift: | | |
| NCIPA | 0.40 | | | | | | | | | | Gs | 2.78 | | ☑ Assu ☐ Meas | |
| PRII | 0.20 | 1 | | | | | | | | 1 | | FA | ILURE S | SKETCH | |
| | | | | | | | | | | | | Diagonal | Plane | 1 | 7 |
| | 0.00 | 0 | 5 | 10 AXI | | 15 RAIN (%) | | 20 | : |] 25 | | Bulging Combina Other | ition | | |
| Partic | le-Size Ana | alysis | | | | Gravel | | Coarse | | Med | | | | Fine Sand | |
| ☐ ASTN | /I D422 /I D1140-M | ethod B | U.S. Star Sieve S | | 3/4" | 3/8" | No. 4 | Sand No. 10 | | Sa No. 20 | No. 40 | No. 60 | No. 100 | | No. 200 |

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96.8

Where: H = Specimen height; D = Specimen diameter; w_c = Water content (ASTM D2216); y_d = Dry density; S = Saturation; σ_c = Isotropic confining stress; $\dot{\varepsilon}$ = Vertical displacement rate; ε_a = Axial strain; σ_1 = Major principal stress; σ_3 = Minor principal stress; and G_s = Specific gravity.



Dry Mass (g)

120.79

Soil Passing

(%, dry mass basis)

| CLIENT: LOCKHEED MARTIN PROJECT: MRC LABORATORY TESTING | INCOMING SAMPLE NO.: BORING: _TTDHC-7 SAMPLE: _ST-2 |
|---|--|
| FILE NO.: 15-13-0120 | DEPTH: 30 - 32 : ft; 9 m |
| | LABORATORY IDENTIFICATION NO.: 150120/C4S1B |
| DATE SAMPLE RECEIVED: 10/19/15 | SAMPLE DESCRIPTION: Reddish-brown lean clay |
| DATE TEST SET-UP: 10/28/15 | |
| DATE REPORTED: 11/19/15 | |
| | |

| Specim | en Dimer | nsions | Ini | tial Conditio | ons | | Test Condition | ns | | at (σ ₁ -σ ₃) _{max} | | | | |
|--------------------------------------|----------|--------|----------------|---------------|-------|------------------|----------------|-------------|-----|---|-----------------------------|------------|-----------|--|
| н | D | | W _c | ν. | s | $\sigma_{\rm c}$ | Displaceme | ent Rate, έ | | ε _a | Undrained Shear | σ_1 | σ₃ | |
| (cm) | (cm) | H/D | (%) | (lb/ft³) | (%) | (kg/cm²) | (cm/minute) | (%/minute) | 1 / | %) | Strength (kg/cm²) | (kg/cm²) | (kg/cm²) | |
| | | | | 400.0 | 404 | 4.05 | 0.074 | 1.0 | | 7.8 | 1.60 | 5.16 | 1.95 | |
| 7.09 | 3.56 | 2.0 | 21.1 | 109.9 | 101 | 1.95 | 0.071 | 1.0 | Me | embra | ne Correction M | fade: □ Ye | es 🗷 No | |
| | 0.50 | | | | | | | | | TES | T PROCEDUR | E: AST | / D2850 | |
| | 3.50 | | | | | | | | | | SAMPL | E TYPE | | |
| | 3.00 | | • | ··········· | | | | | | | Туре | Diamet | er (inch) | |
| /cm ² | 3.00 | | | | ***** | 20 | | | | ВL | Indisturbed | | 3 | |
| (kg | 2.50 | | | | | *** | | | | | Rock Core | | | |
| | | - | | | | | | | | | Compacted | | | |
| ER. | 2.00 | , | | | | | | | | ַ דַ בַּ | amped Unifor | m Lifts | | |
| | | | | | | | | | | | (neading | | | |
| ESS | 1.50 | | | | | | | | | N | lo. of Lifts: | | | |
| STR | | | | | | | | | | E | Spring: Blows per Lift:_ | | lb. | |
| PRINCIPAL STRESS DIFFERENCE (kg/cm²) | 1.00 | | | | | | | | | \vdash | 2.78 | | umed | |
| | 0.50 | | | | | | | | | | FAILURE | SKETCH | 4 | |
| | • | | | | | | | | | × | Diagonal Plane | e 1/2 | | |

| Particle-Size Analysis ASTM D422 ASTM D1140-Method B | | U.S. Standard | Gravel | | | Coarse Sand | Medi San | | Fine Sand | | | |
|--|--|-------------------------------------|--------|------|-------|----------------|-------------|--------|--------------|---------|-----------------|------|
| | | Sieve Size | 3/4" | 3/8" | No. 4 | No. 10 | No. 20 | No. 40 | No. 60 | No. 100 | No. 100 No. 140 | |
| Dry Mass (g) 124.26 | | Soil Passing (%, dry mass basis) | | | | | | | | | | 96.6 |

15 AXIAL STRAIN (%)

10

20

25

□ Bulging □ Combination

□ Other

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 $H = Specimen \ height; \ D = Specimen \ diameter; \ w_c = Water \ content \ (ASTM \ D2216); \ \gamma_d = Dry \ density; \ S = Saturation; \ \sigma_c = Isotropic \ confining \ stress; \ S = Saturation; \ \sigma_c = Isotropic \ confining \ stress; \ S = Saturation; \ \sigma_c = Isotropic \ confining \ stress; \ S = Saturation; \ \sigma_c = Isotropic \ confining \ stress; \ S = Saturation; \ \sigma_c = Isotropic \ confining \ stress; \ S = Saturation; \ \sigma_c = Isotropic \ confining \ stress; \ S = Saturation; \ \sigma_c = Isotropic \ confining \ stress; \ S = Saturation; \ \sigma_c = Isotropic \ confining \ stress; \ S = Saturation; \ S = S$ $\dot{\varepsilon}$ = Vertical displacement rate; ε_a = Axial strain; σ_1 = Major principal stress; σ_3 = Minor principal stress; and G_s = Specific gravity.



| | CT: <u>M</u> | IRC L | ABOR | RATORY | | NG | | BORIN DEPTH | G: _ T | TDHO | CB-2 | _ SAMF | LE: ST | '-1 ⊠ | ft; 🗆 m |
|--------------------------------------|--------------|--------|----------------|------------------------|-------------------------------|---------------|-------------------------|----------------|---------------|-------------|-----------------------|-----------------------|---|---------------------------|----------------|
| | AMPL | .E RE | CEIVE | ED: <u>1(</u> | 0/19/15 1/12/15 1/19/15 | | | LABOR | RATO LE DE | RY ID | ENTI | FICATIO N: Redd | N NO.: <u>1</u> | 50120/ | 32S1A |
| Specimen | n Dimer | nsions | | Initial Cor | nditions | | Т | est Condition | ons | | | | at (σ ₁ -σ ₃) _n | nax | |
| H (cm) | D (cm) | H/D | W ₀ | | S (% | | o _c (cm²) | Displacem | | | ε _a (%) | Undra She Strei | ear | σ ₁ kg/cm²) | σ₃ (kg/cm²) |
| (0111) | (0) | | 1 | (.5 | | , (9 | , , | (cm/minute) | (%/m | inute) | | (kg/d | cm²) | | |
| 6.66 | 3.73 | 1.8 | 20. | .4 106 | .6 90 | 0. | .34 | 0.071 | 1 | .1* | 13.8 Memb | 0.0 | | 0.52 de: □ Ye | 0.34 |
| | | | | 1 | | | | | 1 | | T | EST PRO | | | D2850 |
| | 0.20 | | | | | | | | | 1 | | S | SAMPLE | TYPE | |
| | 0.18 | | | | | ••••• | | | | | | Туре | | Diamete | r (inch) |
| /cm ² / | 0.16 | | | | | | | | | | × | Undistur | bed | 3 | |
| : (kg | | | | ••• | | | | | | | | Rock Co | re | | |
| NCE INCE | 0.14 | | | | | | | | | | | Compac | ted | | |
| PRINCIPAL STRESS DIFFERENCE (kg/cm²) | 0.12 | | , | •• | | | | | | | | Tamped No. of Li | | Lifts | |
| SS DII | 0.10 | | 1 | | | | | | | | | Kneadin | | | |
| JAE | 0.08 | | | | | | | | | 1 | | No. of Li Spring:_ | | | lb. |
| .S ⊣ | 0.06 | | | | | | | | | $\{$ | | Blows pe | | | |
| VCIP/ | 0.04 | | | • | | | | | | | G | s: <u>2.78</u> | | ☑ Assur ☐ Meas | |
| PR | 0.02 | j | | | | | | | | | | FA | ILURE S | SKETCH | |
| | 0.02 | | | | | | | | | | | Diagona Bulging | | | |
| | (| 0 | 5 | | 10 XIAL ST | 15 RAIN (% | () | 20 | ; | 25 | | Combina Other | auon | | / |
| Particle-Si | | ysis | | Standard | | Gravel | | Coarse Sand | | Medi Sar | | | | Fine Sand | |
| ☑ ASTM D1 | 140-Me | thod B | Sie | ve Size | 3/4" | 3/8" | No. 4 | 4 No. 10 | N | o. 20 | No. 4 | 0 No. 60 | No. 100 | No. 140 | No. 200 |
| Dry Mass (g) | 12 | 23.75 | | Passing mass basis) | | | | | | | | | | | 72.7 |

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Where: $H = Specimen \ height; D = Specimen \ diameter; \ w_c = Water \ content (ASTM D2216); \ \gamma_d = Dry \ density; \ S = Saturation; \ \sigma_c = Isotropic \ confining \ stress; \ \dot{\varepsilon} = Vertical \ displacement \ rate; \ \epsilon_a = Axial \ strain; \ \sigma_1 = Major \ principal \ stress; \ \sigma_3 = Minor \ principal \ stress; \ and \ G_s = Specific \ gravity.$



| PROJECT: FILE NO.: DATE SAMF DATE TEST | MRC LAE 15-13-01 PLE RECI SET-UP | EIVED: 10/1 | 9/15 2/15 | | INCOMING SAMI BORING: <u>TTDH</u> DEPTH: <u>8</u> - LABORATORY II SAMPLE DESCR with sand | CB-2 10 DENTIFI | SAMPLE: S | : <u>150120/</u> | : ft; 9 m /B2S1B clay |
|---|---|-----------------|--------------|----|---|-----------------------|------------------------|------------------|-----------------------------|
| | | | | | | | -1/ | ` | |
| Specimen Dim | ensions | Initial Conditi | ons | Te | est Conditions | | at (σ₁-σ₃ Undrained | 3)max | |
| 1 | 1 1 | 1 | 1 1 | | Displacement Rate, $\dot{\varepsilon}$ | 1 | Unidialited | l | 1 |

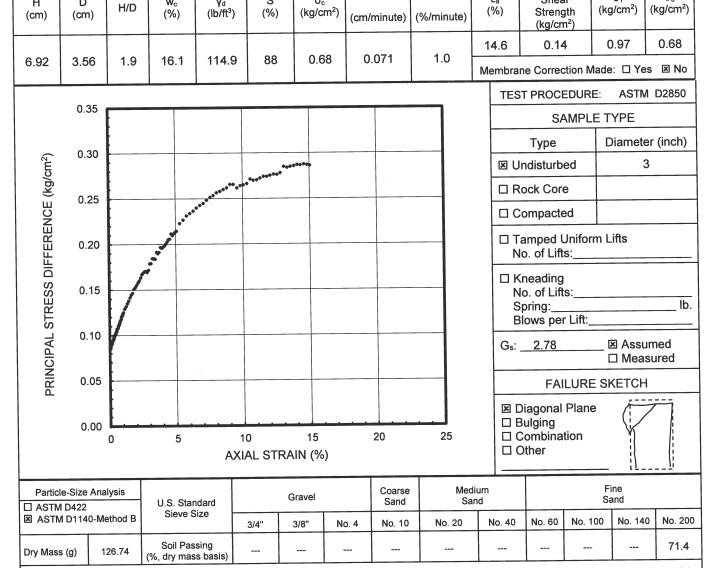
S

 σ_{c}

 $\sigma_{\scriptscriptstyle 1}$

Shear

 σ_3



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H = Specimen height; D = Specimen diameter; w_c = Water content (ASTM D2216); γ_d = Dry density; S = Saturation; σ_c = Isotropic confining stress; Where: $\dot{\varepsilon}$ = Vertical displacement rate; ε_a = Axial strain; σ_1 = Major principal stress; σ_3 = Minor principal stress; and G_s = Specific gravity.



Н

D

| PROJ FILE I | IT: LO ECT: M NO.: 1 SAMPL TEST S REPOR | IRC L 5-13- E RE | ABOF 0120 CEIVI | RATORY ED: 1 | 7 TESTI 0/19/15 | | | _ _ _ | | G: <u>TTI</u> :8 ATOR\ | DHC 3 - 1 / ID | 0 ENT | Σ | SAMP | LE:_ S T | | |
|--------------------------------------|--|------------------------|-----------------------|---------------------|--------------------|--------|--------------------------|-----------------|-----------|------------------------------|-----------------------------|----------|-------------|---------------------------|-------------------------------------|--------------------|------------|
| Specin | nen Dimer | nsions | | Initial Co | onditions | | | Test | Conditio | ns · | | | | а | t (σ ₁ -σ ₃) | max | |
| Н | D | | | | | s | <i>a</i> | Di | isplaceme | ent Rate, | έ | - | | Undra | | σ ₁ | σ_3 |
| (cm) | (cm) | H/D | (% | (Ib/ | | %) (k | σ _c g/cm²) | (cm | n/minute) | (%/minu | ıte) | ε (% | | She Stren (kg/c | gth | (kg/cm²) | (kg/cm²) |
| 7.06 | 3.54 | 2.0 | 26 | 2 10 | 0.9 1 | 01 | 1.22 | , ا | 0.071 | 1.0 | | 13 | 8.8 | 0.1 | 9 | 1.61 | 1.22 |
| 7.00 | 0.04 | 2.0 | | .2 10 | 0.0 | | 1.22 | L` | | 1.0 | | Mei | mbrar | ne Corre | ction Ma | ıde: □ Ye | s 🗷 No |
| | 0.45 | | | | | | | | | | | | TES | T PROC | EDURE | : ASTM | D2850 |
| | 0.45 | | | | | | | | | | | | | S | AMPLE | TYPE | |
| | 0.40 | | | | | ****** | • | | | | | | | Type | | Diamete | er (inch) |
| ·m²) | | | | | ***** | ***** | | | | | | | ⊠ Uı | ndisturb | ed | 3 | 3 |
| (kg/c | 0.35 | | | | | | | | | | | | □ R | ock Cor | e | | |
| CE (| 0.30 | _ | | ••• | | | | | | | | | □С | ompact | ed | | |
| FEREN | 0.25 | | | | | | | | | | | | | | Uniform | | |
| DIFI | 0.20 | / | | | | | | | | | | Ī | | neading | | - | |
| ESS | 0.20 | / | | | | | | | | | | 1 | | o. of Lif oring: | ts: | | lb. |
| STR | 0.15 | | | | | | | | | | | | | | r Lift: | | |
| PRINCIPAL STRESS DIFFERENCE (kg/cm²) | 0.10 | | | | | | | | | | | | Gs: _ | 2.78 | | _ ⊠ Assu □ Meas | |
| N N | 0.05 | | | | | | | | | | | | | FA | ILURE | SKETCH | |
| | 0.00 | | | | | | | | | | | ſ | | iagonal | Plane | 1 | |
| | 0.00 | 0 | | 5 | 10 AXIAL | STRAIN | 15 (%) | • | 20 | 2 | 5 | | | ulging Combina ther | ation | | |
| Particle | e-Size Anal | ysis | | | | Grave | ı | | Coarse | | Medi | | | | | Fine | |
| ☐ ASTM ☑ ASTM | D422 D1140-Me | thod B | | Standard ve Size | | | | | Sand | <u> </u> | San | | | N SS | | Sand | N. aast |
| | | | | | 3/4" | 3/8" | No | . 4 | No. 10 | No. 2 | .0 | No | . 40 | No. 60 | No. 100 | No. 140 | No. 200 |

Dry Mass (g) 112.73 Soil Passing (%, dry mass basis) --- --- --- 93.5

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here: $H = Specimen height; D = Specimen diameter; w_c = Water content (ASTM D2216); \gamma_d = Dry density; S = Saturation; \sigma_c = Isotropic confining stress; <math>\dot{\epsilon} = Vertical displacement rate; \epsilon_a = Axial strain; \sigma_1 = Major principal stress; \sigma_3 = Minor principal stress; and <math>G_8 = Specific gravity$.

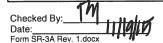


| PROJ FILE N DATE DATE | ECT: M NO.: 1 SAMPL TEST S | IRC L 5-13- .E RE SET-U | ABOR 0120 CEIVE JP: | MARTIN NATORY ED: 10 | 7ESTII 0/19/15 1/12/15 | | | . . | BORING DEPTH LABOR | ING SAM G: <u>TTDH</u> : 12 ATORY I E DESCR | - 14 DE | 3-3 4 NTIFIC | SAMP | LE:_ ST N NO.: <u>1</u> | ⊠ 50120/ | ft; □ m B3S2A |
|--------------------------------------|-------------------------------------|----------------------------------|------------------------------|----------------------------|------------------------------|---------------|----------------|----------|--------------------------|---|------------|--------------------|--------------------------|--|----------------|------------------|
| Specim | nen Dimer | sions | | Initial Cor | nditions | | 7 | Γest | Condition | ns | | | a | t (σ ₁ -σ ₃) _π | nax | |
| Н | D | | w _c | c Yd | 5 | | o _c | Di | splaceme | ent Rate, έ | | ε _a | Undra She | | σ ₁ | σ_3 |
| (cm) | (cm) | H/D | (% | | | | /cm²) | (cm | /minute) | (%/minute | | (%) | Stren (kg/ci | gth (| kg/cm²) | (kg/cm²) |
| 7.05 | 3.57 | 2.0 | 64. | .3 61. | 8 9 | 9 0 | .49 | C | 0.071 | 1.0 | | 7.1 | 0.2 | 5 | 0.99 | 0.49 |
| 7.00 | 0.57 | 2.0 | | .0 01. | | | . 10 | | | | N | /lembrai | ne Corre | ction Ma | de: □ Ye | s 🗷 No |
| | | | | | | | | | | | | TES | T PROC | EDURE: | ASTN | D2850 |
| | 0.60 | | | | | | | | | | | | S | AMPLE | TYPE | |
| | | | | | | | | | | | | | Туре | | Diamete | er (inch) |
| :m²) | 0.50 | _ | | \$ ************* | ***** | | | | | | | ⊠ U | ndisturb | ed | 3 | 3 |
| (kg/c | | | | | | | | | | | | □R | ock Cor | е | | |
| SE SE | 0.40 | | _ | | | | | | | | | ОС | ompact | ed | | |
| FEREN | | | | | | 4 | | | | | | | amped I | Uniform | Lifts | |
| DIF | 0.30 | | | | | - | | | | | | | neading | | | |
| ESS | | | | | | | | | | | | N ₁ | o. of Lift | ts: | | lb. |
| STR | 0.20 | ! | | | | | | | | | | B | oring: ows pe | r Lift: | | ID. |
| PRINCIPAL STRESS DIFFERENCE (kg/cm²) | | | | | | | | | | | | Gs: _ | 2.75 | | Assu Meas | |
| NIR | 0.10 | | | | | | | | | | | | FAI | LURE S | KETCH | |
| ш | | | | | | | | | | | | | iagonal | Plane | | 7:7 |
| | 0.00 | 0 | | 5 | 10 AXIAL S | 1: TRAIN (| | • | 20 | 25 | | | ulging ombina ther | tion | - \ | |
| | -Size Analy | /sis | 11.0 | Standard | | Gravel | | | Coarse | | dium |) | | | Fine Sand | |
| ☐ ASTM ☑ ASTM | D422 D1140-Met | hod B | | ve Size | 3/4" | 3/8" | No. | 4 | Sand No. 10 | No. 20 | and | No. 40 | No. 60 | No. 100 | T | No. 200 |
| | | | | | J 5/7 | 1 5/0 | 1,40. | | ., | 1 | + | | | | 1.3 10 | 1.3.230 |

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85.6

Where: $H = Specimen \ height; D = Specimen \ diameter; \ w_c = Water \ content \ (ASTM \ D2216); \ \gamma_d = Dry \ density; \ S = Saturation; \ \sigma_c = Isotropic \ confining \ stress; \ \dot{\varepsilon} = Vertical \ displacement \ rate; \ \epsilon_a = Axial \ strain; \ \sigma_1 = Major \ principal \ stress; \ \sigma_3 = Minor \ principal \ stress; \ and \ G_s = Specific \ gravity.$



69.38

Dry Mass (g)

Soil Passing

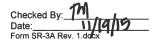
(%, dry mass basis)

| PROJ | ECT: N | IRC L | | | ΓESTING | | | | ING SAMI G: <u>TTDH</u> | | : SAMPLE:_ S | ST-2 | |
|--------------------------------------|-------------|----------------|--------------------|----------------------------|-------------|----------------------------|---------|----------------|--|-----------------------|---|----------------------------|----------------|
| DATE DATE | TEST S | .E RE SET-U | CEIVED | 11/ | /12/15 | | LA | BOR | ATORY IE | ENTIFIC | CATION NO Dark gray o | :150120/ | |
| DATE | REPOR | RTED | : | 11/ | 19/15 | | - = | | | | | - | |
| Specim | nen Dimer | nsions | In | itial Cond | itions | | Test Co | ondition | ıs | | at (σ ₁ -σ | 3) _{max} | |
| H (cm) | D (cm) | H/D | W _c (%) | Y _d (lb/ft³) | S (%) | σ _c (kg/cm²) | | | ent Rate, $\dot{\varepsilon}$ (%/minute) | ε _a (%) | Undrained Shear Strength (kg/cm²) | σ ₁ (kg/cm²) | σ₃ (kg/cm²) |
| 7.00 | 0.50 | | 04.0 | 0.4.5 | 404 | 0.00 | | 74 | 4.0 | 7.8 | 0.22 | 1.41 | 0.98 |
| 7.08 | 3.56 | 2.0 | 61.0 | 64.5 | 101 | 0.98 | 0.0 | 71 | 1.0 | Membra | ne Correction N | lade: □ Ye | s 🗷 No |
| | 0.50 | | | | | | | 1 | | TES | T PROCEDUR | E: ASTN | D2850 |
| | 0.45 | | | | | | | | | | SAMPL | E TYPE | |
| ر | | ' [_ | | | ***** | | | | | | Туре | Diamet | er (inch) |
| /cm | 0.40 | | | - | | ****** | | | | ⊠U | ndisturbed | ; | 3 |
| ш Я | 0.35 | , — | -/ | | | | | | | □R | ock Core | | |
| S | 0.30 | | | | | | | | | □ C | ompacted | | |
| FFERE | 0.30 | | | | | | | | | | amped Unifor | m Lifts | |
| PRINCIPAL STRESS DIFFERENCE (ka/cm²) | 0.20 | | | | | | | | | N S | neading o. of Lifts: pring: lows per Lift: | | lb. |
| N N | 0.15 ! | ì | | | | | | | | | 2.75 | ✓ Assume | mod |
| NC IP | 0.10 | | | | | | | | | Os. | 2.13 | _ □ Meas | |
| PR | 0.05 | 5 | | | | | | | | | FAILURE | SKETCH | |
| | 0.00 | 0 | 5 | | 10 AXIAL | 15 STRAIN (| | 20 | 25 | B B □ C | piagonal Plane sulging combination other | | |
| | -Size Analy | ysis | U.S. Star | ndard | C | Gravel | | Coarse Sand | Med Sa | | | Fine Sand | |
| ☐ ASTM | D422 | - 1 | U.G. Stat | iudiu | | | - 1 | Janu | l Sa | iiu | 1 | Janu | |

| Particle-Size ☐ ASTM D422 | | U.S. Standard Sieve Size | | Gravel | | Coarse Sand | Medi San | | | | ne and | |
|----------------------------|------------|-------------------------------------|------|--------|-------|----------------|-------------|--------|--------|---------|-----------|---------|
| I⊠ ASTM D114 | 0-Method B | Sieve Size | 3/4" | 3/8" | No. 4 | No. 10 | No. 20 | No. 40 | No. 60 | No. 100 | No. 140 | No. 200 |
| Dry Mass (g) | 74.60 | Soil Passing (%, dry mass basis) | | | | | | | | | | 75.8 |

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Where: $H = Specimen height; D = Specimen diameter; w_c = Water content (ASTM D2216); y_d = Dry density; S = Saturation; \(\sigma_c = Isotropic confining stress; \(\delta = Vertical displacement rate; \(\epsilon_a = Axial strain; \sigma_1 = Major principal stress; \(\sigma_3 = Minor principal stress; \) and \(G_s = Specific gravity.$



| PROJ FILE N DATE DATE | ECT: NO.:_ SAM TES | MRC 15-1 MPLE I | 3-0 RE | ABORAT 0120 CEIVED P: | : 10 | 7ESTIN 0/19/15 1/12/15 | | | - - E - [| BORING DEPTH _ABOR | ING SAMI G: <u>TTBH</u> : 12 - ATORY II E DESCR | CB - 14 DEN | -3 NTIFIC | SAMP | LE:_ ST N NO.: <u>1</u> | ⊠ 50120/ | |
|--------------------------------------|-----------------------------|-----------------------|-----------|--------------------------------|--------------|------------------------------|---------|-------------------------|-----------------|--------------------------|---|-------------------|-----------------------|--------------------------------|--|---------------|----------------------------|
| Specim | nen Di | mensio | ns | In | itial Cor | nditions | | • | Test | Condition | ns | | | а | t (σ ₁ -σ ₃) _n | nax | |
| H (cm) | D (cm | | ł/D | w _c (%) | Y⊲ (Ib/fi | S (% |) (kg. | σ _c /cm²) | | | ent Rate, έ (%/minute) | | ε _a (%) | Undra She Stren (kg/c | ar gth (| σ₁ kg/cm²) | σ ₃ (kg/cm²) |
| 7.08 | 3.5 | 4 2 | 2.0 | 43.0 | 77. | 6 98 | 3 1 | .46 | 0 |).071 | 1.0 | \vdash | 8.6 | 0.2 | | 1.86 | 1.46 |
| | | | | | | | | | _ | | | М | lembrar T | ne Corre | ction Ma | de: □ Ye | s 🗷 No |
| | | - | | | | | | | | | | | TES | T PROC | EDURE: | ASTM | D2850 |
| | 0.4 | * [| - | | | | | | | | | | | S | AMPLE | TYPE | |
| m^2) | 0.4 | ю :— | | 40 | , | ********** | **** | | | | | | | Туре | | Diamete | r (inch) |
| kg/c | | _ | , | age of the | | | | | | | | | ⊠ U | ndisturb | ed | 3 | |
| CE (| 0.3 | 35 | | 1 | | | | | | | | | □R | ock Cor | e | | |
| Ĕ | 0.3 | 30 | | | | | | | | | | | ОС | ompact | ed | | |
| PRINCIPAL STRESS DIFFERENCE (kg/cm²) | 0.2 | 25 — | | | | | | | | | | | | | Uniform | | |
| ESS I | 0.2 | 20 | | | | | | | | | | | □ Ki | neading | J ts: | | |
| L STF | 0.1 | 15 | | | | | | | | | | | S | oring: lows pe | | | lb. |
| NCIPA | 0.1 | - 1/ | | | | | | | | | | | Gs: _ | 2.75 | | ☑ Assu | |
| PRI | 0.1 | | | | | | | | | | | | | FΔ | II LIRE 9 | KETCH | |
| | 0.0 |)5 , | | | | | | | | | | | | iagonal | | FEE | |
| | 0.0 | 00 0 | | 5 | | 10 | 15 | | | 20 | 25 | | ⊠B | ulging ombina | | \ \ | |
| | | | | | A | XIAL ST | HAIN (% | (o) | | | | | | | | _ | <u>i</u> |
| Particle | | Analysis | - | U.S. Sta | | | Gravel | | | Coarse Sand | | dium ınd | | | | Fine Sand | |
| ☑ ASTM | | -Method | В | Sieve S | Size | 3/4" | 3/8" | No. | 4 | No. 10 | No. 20 | | No. 40 | No. 60 | No. 100 | No. 140 | No. 200 |
| Dry Mass | (g) | 86.33 | | Soil Pas (%, dry mas | | | | | | | | | | | | | 67.8 |

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Where: $H = Specimen height; D = Specimen diameter; w_c = Water content (ASTM D2216); y_d = Dry density; S = Saturation; \(\sigma_c = Isotropic confining stress; \) \(\bar{\varepsilon} = Vertical displacement rate; \(\varepsilon_a = Axial strain; \) \(\sigma_1 = Major principal stress; \) \(\sigma_3 = Minor principal stress; \) and \(G_8 = Specific gravity. \)$



| APPENDIX E—INVESTIGATION-DERIVED-WAS | STE DOCUMENTATION |
|--------------------------------------|-------------------|
| | |
| | |
| | |
| | |
| | |
| | |
| | |
| | |
| | |
| | |
| | |

| Ple | ase pr | int or type. (Form designed for use on elite (12-pitch) typewriter.) | 2462 | S | CPPW: | 12/4/20 | 15 | Form A | proved. Of | /IB No. 20 | 050-0039 |
|---------------------|---|--|-------------------------------|----------------------------|--|--|-----------------------|---------------------------|----------------|-------------|---|
| 1 | UNI | FORM HAZARDOUS IN General Minuter 524413 | 2. Page 1 o | | ency Respons 483-37 | | | Fracking Number 19024 | er | | LE |
| | Local 196 Brill General 196 6. Tri | cherotor's Name and Mailing Address kheed Martin i Chesapeake Park Plaza timora, MD 21220 erator's Phon@101666-4012 ATTN:Mike Musheno ansporter 1 Company Name an Harbors Environmental Service, Inc. | | 10109 | 's Site Address | धाः स्तावर्ष | U.S. EPA ID N | Sad- le (iv. lumber | OR, M | 08 | 4 |
| | Clea 330 Cha | asignated Facility Name and Site Address as Harbors Chattanoega LLC 00 Cummings Road ettanoega, TH 37419 itys Phone: 423) 821-8926 | . 1 | | | | U.S. EPAID N | S 2 1 4 | 1392 | | |
| | 9a. HM | 9b. U.S. DOT Description (including Proper Shipping Name, Hazard Class, ID Number, and Packing Group (if any)) | - | F | 10. Conta No. | iners Type | 11. Total Quantity | 12. Unit Wt./Vol. | 13. Wa | ste Codes | |
| GENERATOR - | | NON D.O.T. REGULATED, (SOIL, WATER) | ı | | | DM | 24,000 | P | | | *************************************** |
| GEN | = | NON HAZARDOUS, NON D.O.T. REGULATED | | | -8 | DM | 500 | P- | | | |
| | | 3. | 5 | | | | | | | , V. | |
| | 44.6 | pecial Handling Instructions and Additional Information | | | | | | | | | |
| | 15. | H1103341 H582299 SX 55 DM | consignmen | nt are fully and | d accurately de | escribed above | by the proper shi | pping name, ar | d are classifi | ed, packaç | ged, |
| \ | | marked and labeled/placarded, and are in all respects in proper condition for transport acc Exporter, I certify that the contents of this consignment conform to the terms of the attache I certify that the waste minimization statement identified in 40 CFR 262.27(a) (if I am a large trator's/Offeror's Printed/Typed Name | d EPA Acknor e quantity ge | wledament o | f Consent. b) (if I am a smi | all quantity ger | - | If export shipm | Month | Day | Year |
| R INT'L | Trans | ternational Shipments Import to U.S. sporter signature (for exports only): ansporter Acknowledgment of Receipt of Materials | Export from | | Port of en | | | | | | |
| TR ANSPORTER | Trans | porter 1 Printed/Typed Name Printed/Typed Name Printed/Typed Name | | gnature | The second secon | religionalis and reported by the proposition of some distribution of the sound of t | and the same of | | Month Month | Day | Year /5 Year |
| → TRA | 18. D | screpancy | | | | · | | | | | |
| | 18a. (| Discrepancy Indication Space Quantity Type | | | Residue | | Partial Reje | ection | | Full Reject | tion |
| ACILITY | | Alternate Facility (or Generator) | | Man | ifest Reference | Number: | U.S. EPA ID N | umber | | | |
| DESIGNATED FACILITY | 18c. S | y's Phone: ignature of Alternate Facility (or Generalor) | | | | | <u></u> | | Month | Day | Year |
| - DESI | 19, Ha 1. 11:1. | azardous Waste Report Management Method Codes (i.e., codes for hazardous waste treat 2. 11.41. | ment, disposa | ar, and recycl | ing systems) | | 4. | | | | |
| | | esignated Facility Owner or Operator: Certification of receipt of hazardous materials covered d/Typed Name | | nifest except a gnature | as noted in Item | n 18a | <u>-</u> - | | Month | Day | Year |

| Plea | ase print or type. (Form desig | gned for use on elite (12-pitch) typewriter.) | | | 1 | | Form | Approved. O | MB No. 2 | 050-0039 |
|---------------------|---|---|--|--|---|--------------------|------------------------------|-------------------------------------|---|--------------|
| 1 | UNIFORM HAZARDOUS | 1. Generator ID Number | 2. Page 1 of | 3. Emergency Respons | e Phone | 4. Manifest | | | | . |
| Ш | WASTE MANIFEST | MOROSOBRAYIS | 1 | | | UU | 8/5 | 0748 | | LE |
| | 5. Generator's Name and Maili | ng Address Mart Park Plazes Historie Md (21000) | ATTN NICHAEI IGUSH | Generator's Site Address | i (if different the | n mailing addres | is) | - JA - JA | | , |
| | Generator's Phone: 6. Transporter 1 Company Nan | ne No Start | 10 656 HO12 | MARIL | KINA | U.S. EPA ID N | امر از کسی Number | A Q - | | |
| | 7. Transporter 2 Company Nan | a class End San Com | MC | | | U.S. EPA ID N | | 2225 | Spile | |
| | 8. Designated Facility Name ar | nd Site Address | | | | U.S. EPA ID N | Number | | | |
| | Grand Acres | in a field to the | r 70 - Xa3- | 7.173 | | AC | 106 | 9748 | 16/2 | 3 |
| $\ $ | | ion (Including Proper Shipping Name, Hazard Class, ID | | 10. Conta | T | 11. Total | 12. Unit | 13. Wa | ste Codes | <u> </u> |
| <u>₩</u> | 1 | Horzantania constat, Cope | and vide | No. | Туре | Quantity | Wt./Vol. | DØ34 | | |
| GENERATOR | 1 Acrosto | roatherent, is I | | T same | MO | 200 | P | | | |
| - GEN | 2. | • | | | | , | | | | |
| | 3. | | | | | , | | | 1 | |
| | | | | | | | | | | |
| | 4. | | 1 | | | | | | Н | |
| | 14. Special Handling Instruction | ns and Additional Information | = 5 \ AA | 1 | | | | | | |
| | 1. 4111343 | | The state of the s | | | | | | | |
| | marked and labeled/placa Exporter, I certify that the | OR'S CERTIFICATION: I hereby declare that the context proded, and are in all respects in proper condition for transicontents of this consignment conform to the terms of the himization statement identified in 40 CFR 262.27(a) (if I is | sport according to applicate attached EPA Acknowle | able international and na adgment of Consent. | tional governme | ental regulations. | ipping name If export shi | , and are classif pment and I am | ed, packa the Prima | ged, ry |
| | Generator's/Offeror's Printed/Ty | /ped Name | | Much (| 2000 | Law | | Month | Day | Year |
| IN | 16. International Shipments Transporter signature (for expo | Import to U.S. | Export from U | | ntry/exit: | | | | -11 | |
| RTER | 17. Transporter Acknowledgmen Transporter 1 Printed/Typed Na | · | Sign | ature | | | | Month | Day | Year |
| TR ANSPORTER | Transporter 2 Printed/Typed Na | Meseraldie | Sign | ature | anagan ayara _m a da maganta i s ^{a anagan} Maganta ya ma ⁿ a maganta maganta na masa ma Maganta ya maganta maganta na masa maganta na masa maganta maganta maganta maganta na maganta maganta na maganta | | | Month | Day | Year |
| TRA | | , and | | | · | | · | | <u> </u> | |
| | 18. Discrepancy 18a. Discrepancy Indication Spa | ace Quantity T | уре | Residue | <u> </u> | Partial Reje | ection | | Full Rejec | tion |
| | , | | | Manifest Reference | e Number: | | | | | · |
| DESIGNATED FACILITY | 18b. Alternate Facility (or Gener | ator) | | | | U.S. EPA ID N | umber | | | |
| ED FA | Facility's Phone: 18c. Signature of Alternate Facil | lity (or Generator) | | | | | | Month | Day | Year |
| IGNAT | 19 Hazardous Waste Report M | anagement Method Codes (i.e., codes for hazardous wa | asta traatment disposal | and requires material | | | | | | |
| DES | 1. | 2. | 3. | and recycling systems) | | 4. | | <u>.</u> | | |
| | 20. Designated Facility Owner o | r Operator: Certification of receipt of hazardous material | ls covered by the marife | et event se anted in It- | n 18a | | | | | |
| | Printed/Typed Name | | Signa | | 100 | | | Month | Day | Year |
| Ţ] | , , , , , , , , , , , , , , , , , , , | | | | | | | | نــــــــــــــــــــــــــــــــــــــ | |



Land Disposal Restriction Notification Form

Page: 1 of 1

Printed Date: Dec 16, 2015

| FORMATION | | | | | |
|-----------------|---|---|--|---|--|
| tor: Lockheed | Martin | | | | |
| | MD 21220 | | | 008750748 FL | E |
| # MDRO | 00524413 | | Sal | les Order No: 150409246 | 32 |
| IFORMATION | | | | II. | |
| Page No: | Profile No: | Treatability Group | : | LDR Disposal Category | |
| - | CH1109336 | NON-WASTEWA | TER | 2 (This is subject to LDR | .) |
| ode | h | L | EPA Wa | ste SubCategory | |
| | | , , , , , , , , , , , , , , , , , , , | NONE | H | |
| | <u>Ce</u> | rtification | | | Applies to Manifest Line Items |
| 0 CFR 268.7(a), | I hereby notify that t | his shipment contain | s waste res | stricted under 40 CFR | 1. |
| Mil | LD Durlen | Print Nan | - | | hÒ |
| | tor: Lockheed ess: 2323 & a Baltimore, #: MARO FORMATION Page No: 1 ode CFR 268.7(a), is data, where a | tor: Lockheed Martin ess: 2323 Eastern Blud. Baltimore, MD 21220 #: M3/2000 534413 IFORMATION Page No: Profile No: CH1109336 Ode Ce Ce Cockheed Martin Cass: 2323 Eastern Blud. Cass: 24413 CH1109336 Ce Cockheed Martin Cass: 2323 Eastern Blud. Cass: 24413 Ch1109336 Ce Cockheed Martin Cass: 2323 Eastern Blud. Cass: 24413 Cass: | tor: Lockheed Martin Pass: 2323 Eastern Blad. Baltimore,MD 21220 #: MOROCO 534413 FORMATION Page No: Profile No: Treatability Group 1 CH1109336 NON-WASTEWA ode Certification Certification is data, where available, is attached. Market Martin Print Name Print Na | tor: Lockheed Martin Pass: 2323 Eastorn Blud. Baltimore,MD 21220 O#: M30000 534413 SaliFORMATION Page No: Profile No: Treatability Group: 1 CH1109336 NON-WASTEWATER Ode EPA Wanone Certification O CFR 268.7(a), I hereby notify that this shipment contains waste resided at a where available, is attached. Manual Manual Contains Waster estimated. Print Name | tor: Lockheed Martin Bass: 2323 Eastern Blad. Baltimore,MD 21220 The Moroco 534413 Sales Order No: 150409246 FORMATION Page No: Profile No: Treatability Group: LDR Disposal Category CH1109336 NON-WASTEWATER Description Certification Certification Certification Certification Certification Print Name Manifest Tracking In Do 8150 148 FL Con 8150 1 |



WASTE MATERIAL PROFILE SHEET

ZIP/POSTAL CODE

21220

Clean Harbors Profile No. CH1109336

MDR000524413 A. GENERAL INFORMATION **Lockheed Martin** GENERATOR NAME GENERATOR EPA ID #/REGISTRATION # MDR000548760 STATE/PROVINCE MD CITY Baltimore GENERATOR CODE (Assigned by Clean Harbors) LO2553 PHONE: (610) 656-4012 ADDRESS 701 Wilson Point Road 2323 EASTERN BLUD **CUSTOMER NAME** Tetra Tech Inc TF0740 CUSTOMER CODE (Assigned by Clean Harbors) STATE/PROVINCE CITY Germantown ADDRESS 20251 Century Boulevard Suite 200 B. WASTE DESCRIPTION

ZIP/POSTAL CODE 20874 WASTE DESCRIPTION: Solids/Water with PCE Demolition and support of remedial activity PROCESS GENERATING WASTE IS THIS WASTE CONTAINED IN SMALL PACKAGING CONTAINED WITHIN A LARGER SHIPPING CONTAINER? C. PHYSICAL PROPERTIES (at 25C or 77F) COLOR VISCOSITY (If liquid present) NUMBER OF PHASES/LAYERS PHYSICAL STATE 1 - 100 (e.g. Water) SOLID WITHOUT FREE LIQUID TOP 0.00 varies POWDER 101 - 500 (e.g. Motor Oil) MIDDLE 0.00 % BY VOLUME (Approx.) MONOLITHIC SOLID 501 - 10,000 (e.g. Molassos) воттом 0.00 LIQUID WITH NO SOLIDS LIQUID/SOLID MIXTURE > 10,000 % FREE LIQUID 25.00 - 75.00 ODOR TOTAL ORGANIC CARBON MELTING POINT "F ("C) BOILING POINT °F (°C) % SETTLED SOLID 25.00 - 75.00 NONE % TOTAL SUSPENDED SOLID <= 95 (<=35) MILD < 140 (<60) SLUDGE <= 1% 95 - 100 (35-38) STRONG GAS/AEROSOL 140-200 (60-93) 1-9% 101 - 129 (38-54) > 200 (>93) Describe >= 10% >= 130 (>54) BTU/LB (MJ/kg) SPECIFIC GRAVITY ASH FLASH POINT "F ("C) рΗ < 2,000 (<4.6) < 0.8 (e.g. Gasoline) < 73 (<23) <= 2 > 20 < 0.1 2,000-5,000 (4.6-11.6) 0.8-1.0 (e.g. Ethanol) 73 - 100 (23-38) 2.1 - 6.9 Unknown 0.1 - 1.05,000-10,000 (11.6-23.2) 1.0 (e.g. Water) 101-140 (38-60) 7 (Neutral) 1.1 - 5.0> 10,000 (>23.2) 1.0-1.2 (e.g. Antifreeze) 141 -200 (60-93) 7.1 - 12.45.1 - 20.0 > 1.2 (e.g. Methylene Chloride) > 200 (>93) >= 12.5 D. COMPOSITION (List the complete composition of the waste, include any inert components and/or debns. Ranges for individual components are acceptable. If a trade name is used, UOM MAX CHEMICAL 39000.0000 PPB 39000,00000 **PERCHLOROETHANE** 00 000 25.0000000 75.0000000 SOIL % 75.0000000 25.0000000 WATER DOES THIS WASTE CONTAIN ANY HEAVY GAUGE METAL DEBRIS OR OTHER LARGE OBJECTS (EX., METAL PLATE OR PIPING >1/4" THICK OR NO YES >12" LONG, METAL REINFORCED HOSE >12" LONG, METAL WIRE >12" LONG, METAL VALVES, PIPE FITTINGS, CONCRETE REINFORCING BAR OR PIECES OF CONCRETE >3")? If yes, describe, including dimensions NO VES DOES THIS WASTE CONTAIN ANY METALS IN POWDERED OR OTHER FINELY DIVIDED FORM? DOES THIS WASTE CONTAIN OR HAS IT CONTACTED ANY OF THE FOLLOWING; ANIMAL WASTES, HUMAN BLOOD, BLOOD PRODUCTS, BODY FLUIDS, MICROBIOLOGICAL WASTE, PATHOLOGICAL WASTE, HUMAN OR ANIMAL DERIVED SERUMS OR PROTEINS OR ANY OTHER ✓ NO YES acknowledge that this waste material is neither infectious nor does it contain any organism known to be a threat to human health. This certification is based on my knowledge of the material. Select the answer below that applies NO YES The waste was never exposed to potentially infectious material YES NO Chemical disinfection or some other form of sterilization has been applied to the waste NO YES LACKNOWLEDGE THAT THIS PROFILE MEETS THE CLEAN HARBORS BATTERY PACKAGING REQUIREMENTS NO YES ACKNOWLEDGE THAT MY FRIABLE ASBESTOS WASTE IS DOUBLE BAGGED AND WETTED

SPECIFY THE SOURCE CODE ASSOCIATED WITH THE

WASTE

G39

SPECIFY THE FORM CODE ASSOCIATED WITH THE WASTE

W301



Clean Harbors Profile No. CH1109336

E. CONSTITUENTS

Are these values based on testing or knowledge?

✓ Knowledge

If based on knowledge, please describe in detail, the rationale applied to identify and characterize the waste material. Please include reference to Material Safety Data Sheets (MSDS) when applicable. Include the chemical or trade-name represented by the MSDS, and or detailed process or operating procedures which generate the waste.

generator knowledge

Please indicate which constituents below apply. Concentrations must be entered when applicable to assist in accurate review and expedited approval of your waste profile. Please note that the total regulated metals and other constituents sections require answers.

| RCRA | REGULATED METALS | REGULATORY LEVEL (mg/l) | TCLP mg/l | TOTAL | UOM | NOT APPLICABLE | |
|-------|---------------------------|----------------------------|-------------------|------------------|-----|-------------------------------------|---------------|
| D004 | ARSENIC | 5.0 | | | | <u> </u> | |
| D005 | BARIUM | 100 0 | | | | [4] | |
| D006 | CADMIUM | 1.0 | | | | [v] | |
| D007 | CHROMIUM | 5.0 | | | | | |
| D008 | LEAD | 50 | C | | | Y | |
| D009 | MERCURY | 0.2 | | | | | • |
| D010 | SELENIUM | 10 | | | | | |
| D011 | SILVER | 5.0 | | | | · · · · · · · · [2] · · · · · · · · | |
| | VOLATILE COMPOUNDS | | | OTHER CONSTITUEN | NTS | MAX UOM | NOT |
| D018 | BENZENE | 0.5 | | | | | APPLICABLE |
| D019 | CARBON TETRACHLORIDE | 0.5 | | BROMINE | | | <u>v</u> |
| D021 | CHLOROBENZENE | 100.0 | | CHLORINE | | | |
| D022 | CHLOROFORM | 6.0 | | FLUORINE | | | V |
| D028 | 1,2-DICHLOROETHANE | 0.5 | | IODINE | | | |
| D029 | 1,1-DICHLOROETHYLENE | 0.7 | | SULFUR | | | V |
| D035 | METHYL ETHYL KETONE | 200 0 | | POTASSIUM | | | V |
| D039 | TETRACHLOROETHYLENE | 0.7 | | SODIUM | | | ~ |
| | (| 0,5 | | AMMONIA | | | Y |
| D040 | TRICHLOROETHYLENE | 0.2 | <u> </u> | CYANIDE AMENABLE | | | ¥ |
| D043 | VINYL CHLORIDE | | | CYANIDE REACTIVE | | ****************** | V |
| | SEMI-VOLATILE COMPOUN | | | CYANIDE TOTAL | | | V |
| D023 | o-CRESOL | 200 0 | | SULFIDE REACTIVE | | | |
| D024 | m-CRESOL | 200.0 | | | | | |
| D025 | p-CRESOL | 200 0 | | HOCs | | PCBs | |
| D026 | CRESOL (TOTAL) | 200.0 | | - NONE | | NONE | |
| D027 | 1,4-DICHLOROBENZENE | 7.5 | | - < 1000 PPM | | < 50 PPM | |
| D030 | 2,4-DINITROTOLUENE | 0.13 | | >= 1000 PPM | | >=50 PPM | |
| D032 | HEXACHLOROBENZENE | 0.13 | | | | IF PCBS ARE PRES | SENT, IS THE |
| D033 | HEXACHLOROBUTADIENE | 0.5 | | | | WASTE REGULATE CFR 761? | ED BY TSCA 40 |
| D034 | HEXACHLOROETHANE | 3.0 | 3.9000 | | | O K TOTA | |
| D036 | NITROBENZENE | 20 | | 1 | | l YES | ✓ NO |
| D037 | PENTACHLOROPHENOL | 100.0 | | | | | |
| D038 | PYRIDINE | 5,0 | | - | | | |
| D041 | 2,4,5-TRICHLOROPHENOL | 400.0 | | | | | |
| D042 | 2,4,6-TRICHLOROPHENOL | 2.0 | | . 8 | | | |
| | PESTICIDES AND HERBICI | DES | | | | | |
| D012 | ENDRIN | 0.02 | | | | | |
| D013 | LINDANE | 0.4 | | • | | | |
| D014 | METHOXYCHLOR | 10.0 | | • | | | |
| D015 | | 0.5 | | • | | | |
| D016 | 2.4D | 10.0 | | • | | | |
| * - * | | 1.0 | | 살 | | | |
| D017 | 2,4,5-TP (SILVEX) | 0.03 | • • • • • • • • • | - | | | |
| D020 | CHLORDANE | | | | | | |
| D031 | HEPTACHLOR (AND ITS EPOXI | UE) 0.000 | | | | | |

DOES THIS WASTE HAVE ANY UNDISCLOSED HAZARDS OR PRIOR INCIDENTS ASSOCIATED WITH IT, WHICH COULD AFFECT THE WAY IT SHOULD BE HANDLED?

✓ NO (If yes, explain) YES

CHOOSE ALL THAT APPLY

DEA REGULATED SUBSTANCES POLYMERIZABLE

EXPLOSIVE RADIOACTIVE **FUMING**

REACTIVE MATERIAL

OSHA REGULATED CARCINOGENS NONE OF THE ABOVE



Clean Harbors Profile No. CH1109336

| F. R | EGULA' | TORY | STAT | บร | |
|------|-----------|----------|------------|--|--|
| 4 | YES | | NO | USEPA HAZARDOUS W | ASTE? |
| | | | | D034 | |
| | YES | V | NO | DO ANY STATE WASTE | CODES APPLY? |
| | | | | Texas Waste Code | |
| | MEG | 1.4 | | | OVINCIAL WASTE CODES APPLY? |
| | YES | 1 | NO | DO AINT CANADIAIN PR | UVINCIAL WASTE CODES ATTETY |
| 4 | YES | | NO | IS THIS WASTE PROHIE | BITED FROM LAND DISPOSAL WITHOUT FURTHER TREATMENT PER 40 CFR PART 268? |
| | | | | LDR CATEGORY, VARIANCE INFO | This is subject to LDR. |
| | YES | 1 | NO | IS THIS A UNIVERSAL V | VASTE? |
| | YES | | NO | IS THE GENERATOR OF | F THE WASTE CLASSIFIED AS CONDITIONALLY EXEMPT SMALL QUANTITY GENERATOR (CESQG)? |
| | YES | | NO | | NG TO BE MANAGED AS A RCRA EXEMPT COMMERCIAL PRODUCT, WHICH IS FUEL (40 CFR 261.2 (C)(2)(II))? |
| | YES | V | NO | | THIS WASTE GENERATE A F006 OR F019 SLUDGE? |
| | YES | 4.5 | NO | | M SUBJECT TO THE INDRGANIC METAL BEARING WASTE PROHIBITION FOUND AT 40 CFR 2683(C)? |
| | YES | 4 | | | NTAIN VOC'S IN CONCENTRATIONS >=500 PPM? |
| | YES | 1 | NO | | STAIN GREATER THAN 20% OF ORGANIC CONSTITUENTS WITH A VAPOR PRESSURE >= .3KPA (.044 PSIA)? |
| | YES | V | NO | | NTAIN AN ORGANIC CONSTITUENT WHICH IN ITS PURE FORM HAS A VAPOR PRESSURE > 77 KPA (11.2 PSIA)? |
| | YES | V | NO | | LATED (SUPERFUND) WASTE? |
| | YES | V | | | CT TO ONE OF THE FOLLOWING NESHAP RULES? |
| | 169 | - | NO | | The state of the s |
| | umo | 1,2 | | | : NESHAP (HON) rule (subpart G) Pharmaceuticals production (subpart GGs) IZARDOUS WASTE, DOES THIS WASTE STREAM CONTAIN BENZENE? |
| | YES | | | | stream come from a facility with one of the SIC codes listed under bonzene NESHAP or is this waste regulated under the benzene |
| | | YES | | NO Does the waste NESHAP rules | because the original source of the waste is from a chemical manufacturing, coke by-product recovery, or petroleum refinery process? |
| | | YES | 6 | NO Is the generaling | g source of this waste stream a facility with Total Annual Benzene (TAB) >10 Mg/year? |
| | | Wh | at is th | e TAB quantity for your fac | dity? Megagram/year (1 Mg = 2,200 lbs) |
| | | The | bass | for this determination is. K | nowledge of the Waste Or Test Data Knowledge Testing |
| | | Des | cribe | the knowledge | |
| - | G. DOT | TDG | NFOR | MATION | |
| DO | | | | HIPPING NAME: | |
| _ | NA | 3082, | HAZ | ARDOUS WASTE, LIQ | UID, N.O.S., (PERCHLOROETHANE), 9, PG III |
| | | | | I REQUIREMENTS T FREQUENCY . ONE | TIME WEEKLY MONTHLY QUARTERLY YEARLY OTHER |
| | | 17 | | ONTAINERIZED | BULK LIQUID BULK SOLID |
| | 1-1 | CON | | RS/SHIPMENT | TON MADE |
| - | ORAGE | | | 1 | GALLONS/SHIPMENT: 0 Min -0 Max GAL. SHIPMENT UOM: TON TARD TONS/YARDS/SHIPMENT: 0 Min - 0 Max |
| ÇO | NTAINE | JBIC Y | | BOX PALLET | |
| | | OTE TA | | ₽ DRUM | |
| | | THER | ., ., | DRUM SIZE 55 | |
| _ | | | | | |
| 1. | SPECIA | | | | |
| | COMME | NISU | K KEU | 05313 | |
| | NERATO | Pie CE | PTIELC | ATION | |
| | | | | A to assess the designant of the | n suthonzed agent. I hereby certify that all information submitted in this and attached documents is correct to the best of my knowledge. I also certify that any |
| 881 | nples sub | mitted a | аге пері | resentative of the actual waste. I the discrepancy. | Clean Harbors discovers a discrepancy during the approval process, Generator grants Clean Harbors the authority to amend the profile, as Clean Harbors |
| (| m | тно | IZED 00 | SIGNATURE 1 | Michael Mushano Sr. Staff 25H Englosa 12-4-15 |
| -/ | | | | | |



WASTE MATERIAL PROFILE SHEET

Clean Harbors Profile No. CH1109341

A. GENERAL INFORMATION
GENERATOR EPA ID #/REGISTRATION # MDR000524413
MDR000548700

GENERATOR NAME: CITY Baltimore Lockheed Martin

STATE/PROVINCE MD

ZIP/POSTAL CODE

21220

ADDRESS 701-Wilson-Point Road 2323 EASTERN BLVD

>= 12.5

CUSTOMER CODE (Assigned by Clean Harbors)

ADDRESS 20251 Century Boulevard Suite 200

GENERATOR CODE (Assigned by Clean Harbors)

TE0740

LO2553

CUSTOMER NAME: CITY Germantown

Tetra Tech Inc STATE/PROVINCE

MD Z

Actual

PHONE: (610) 656-4012

ZIP/POSTAL CODE

20874

B. WASTE DESCRIPTION

> 200 (>93)

WASTE DESCRIPTION MRC Non haz soil and water

PROCESS GENERATING WASTE

IDW Waste

| PHYSICAL STATE SOLID WITHOUT FF POWDER MONOLITHIC SOLIE LIQUID WITH NO SOLID WITH NO SOLID WITH NO SOLID WIXT | olids | NUMBER OF PHASES/LAY | TOP MIDDLE BOTTOM | 0.00 0.00 0.00 | 1 - 100 (c 101 - 500 501 - 10, | (If liquid present) e.g. Water) 0 (e.g. Motor Oil) .000 (e.g. Motasses) | Brown/S |
|---|---------------------------------------|--|-------------------|---|--------------------------------------|---|---|
| % FREE LIQUID % SETTLED SOLID % TOTAL SUSPENDE SLUDGE GAS/AEROSOL | <u>25.00 - 75.00</u> 75.00 - 25.00 | ODOR NONE MILD STRONG Describe | BOILI | NG POINT °F (°C) <= 95 (<=35) 95 - 100 (35-38) 101 - 129 (38-54) >= 130 (>54) | 140- | | TOTAL ORGANIC CARBON <= 1% 1-9% >= 10% |
| FLASH POINT *F (°C) < 73 (<23) 73 - 100 (23-38) 101 -140 (38-60) 141 -200 (60-93) | pH | SPECIFIC GRAVITY < 0.8 (e.g. Gasoline) 0.8-1.0 (e.g. Ethanol) 1.0 (e.g. Water) 1.0-1.2 (e.g. Antifreeze) | ASH | < 0.1 0.1 · 1.0 | > 20 Unknown | | 00 (4.6-11.6) |

D. COMPOSITION (List the complete composition of the waste, include any inert components and/or debris. Ranges for individual components are acceptable. If a trade name is used,

> 1.2 (e.g. Methylene Chloride)

| places supply an MSDS. Pleases do not use approvisions 1 | | | | | |
|--|---|----------------|---------|----------|-----|
| CHEMICAL | MIN | | | IAX | UOM |
| IDW SOIL | 80.000 | 0000 | 95.0000 | 000 | % |
| IDW SOIL WATER | 5.0000 | 00 | 20.0000 | 000 | % |
| DOES THIS WASTE CONTAIN ANY HEAVY GAUGE METAL DEBRIS OR OTHER LARGE >12" LONG, METAL REINFORCED HOSE >12" LONG, METAL WIRE >12" LONG, METAL PIECES OF CONCRETE >3")? | OBJECTS (EX., METAL PLATE OR PIPING >1/4" THIC VALVES, PIPE FITTINGS, CONCRETE REINFORCING | K OR BAR OR | YES | V | NO |
| If yes, describe, including dimensions | | | | , | |
| DOES THIS WASTE CONTAIN ANY METALS IN POWDERED OR OTHER FINELY DIVID | ED FORM? | | YES | Y | NO |
| DOES THIS WASTE CONTAIN OR HAS IT CONTACTED ANY OF THE FOLLOWING: AN FLUIDS, MICROBIOLOGICAL WASTE, PATHOLOGICAL WASTE, HUMAN OR ANIMAL I POTENTIALLY INFECTIOUS MATERIAL? | DERIVED SEROMS OR PROTEINS OF ANY OTHER | | YES | Y | NO |
| I acknowledge that this waste material is neither infectious nor does it contain any orga- based on my knowledge of the material. Select the answer below that applies: | nism known to be a threat to human health. This certifi | ation is | | | |
| The waste was never exposed to potentially infectious material. | | | YES | | NO |
| Chemical disinfection or some other form of sterilization has been applied to the waste | | | YES | | NO |
| I ACKNOWLEDGE THAT THIS PROFILE MEETS THE CLEAN HARBORS BATTERY PAC | | | YES | | NO |
| I ACKNOWLEDGE THAT MY FRIABLE ASBESTOS WASTE IS DOUBLE BAGGED AND V | | | YES | | NO |
| SPECIFY THE SOURCE CODE ASSOCIATED WITH THE G49 WASTE | SPECIFY THE FORM CODE ASSOCIATED WITH | THE WAST | E. W301 | | |



Clean Harbors Profile No. CH1109341

E. CONSTITUENTS

Are these values based on testing or knowledge? ✓ Knowledge

If based on knowledge, please describe in detail, the rationale applied to identify and characterize the waste material. Please include reference to Material Safety Date Sheets (MSDS) when applicable. Include the chemical or trade-name represented by the MSDS, and or detailed process or operating procedures which generate the waste.

generator knowledge

Please indicate which constituents below apply. Concentrations must be entered when applicable to assist in accurate review and expedited

| RCRA | REGULATED METALS | REGULATORY LEVEL (mg/l) | TCLP mg/l | TOTAL | MOU | NOT APPLI | CABLE | |
|---------------|--|----------------------------|--------------|---|---|---------------|----------------|---|
| D004 | ARSENIC | 5.0 | | | | ~ | | |
| D005 | BARIUM | 100.0 | | | | V | | |
| D006 | CADMIUM | 1.0 | | | | · · · · · · | • • • • • • • | |
| D007 | CHROMIUM | 5.0 | | | | | | |
| D008 | LEAD | 5.0 | | ••••••••••••••••••••••••••••••••••••••• | • | 3 | ••••• | |
| D009 | MERCURY | 0.2 | | | | 7 | | |
| D010 | SELENIUM | 1.0 | | | | | | |
| D011 | SILVER | 5.0 | | | | | 125.51 | |
| D018 | VOLATILE COMPOUNDS BENZENE | 0.5 | | OTHER CONSTITUENTS | 5 | MAX | UOM | NOT APPLICABLE |
| D019 | CARBON TETRACHLORIDE | 0.5 | | BROMINE | | | | ~ |
| D021 | CHLOROBENZENE | 100.0 | •••• | CHLORINE | | | | 7 |
| D022 | CHLOROFORM | 6.0 | | FLUORINE | | | | |
| D028 | 1,2-DICHLOROETHANE | 0.5 | | IODINE | | | 10.00 - 10 - · | |
| D029 | 1,1-DICHLOROETHYLENE | 0.7 | **** | SULFUR | | | | |
| D035 | METHYL ETHYL KETONE | 200 0 | | POTASSIUM | | | | |
| D039 | TETRACHLOROETHYLENE | 0.7 | | SODIUM | | | a - 120 - 120 | |
| D040 | TRICHLOROETHYLENE | 0.5 | | AMMONIA | | a g | | |
| D043 | VINYL CHLORIDE | 0.2 | ***** | CYANIDE AMENABLE | | | ***** | |
| | | | | CYANIDE REACTIVE | | | | ····· |
| D023 | SEMI-VOLATILE COMPOUND o-CRESOL | _ | | CYANIDE TOTAL | | | | |
| D023 | m-CRESOL | 200.0 | | SULFIDE REACTIVE | **** | | | <u>-</u> |
| | | 200.0 | | SOLFIDE NEACTIVE | | | | × · · · · · · · · · · · · · · · · · · · |
| D025 | p-CRESOL | 200.0 | | HOCs | | PCBs | | |
| D026 | CRESOL (TOTAL) | 200.0 | | NONE | | V NONE | | |
| D027 | 1,4-DICHLOROBENZENE | 7.5 | | < 1000 PPM | | < 50 I | | |
| D030 | 2,4-DINITROTOLUENE | 0 13 | | >= 1000 PPM | | >=50 | PPM | |
| D032 | HEXACHLOROBENZENE | 0.13 | | | | IF PCBS AF | RE PRESEN | T. IS THE |
| D 0 33 | HEXACHLOROBUTADIENE | 0.5 | | | | WASTE RE | GULATED B | |
| D034 | HEXACHLOROETHANE | 3.0 | | | | CFR 761? | | |
| D036 | NITROBENZENE | 2.0 | | 1 | | YES | 4 | NO |
| D037 | PENTACHLOROPHENOL | 100 0 | | | | | | |
| 0038 | PYRIDINE | 5.0 | | | | | | |
| D041 | 2,4.5-TRICHLOROPHENOL | 4000 | | | | | | |
| 0042 | 2,4,6-TRICHLOROPHENOL | 2.0 | | | | | | |
| | PESTICIDES AND HERBICIDE | S | | | | | | |
| 0012 | ENDRIN | 0.02 | | | | | | |
| | LINDANE | 0.4 | | | | | | |
| 0014 | METHOXYCHLOR | 10.0 | | | | | | |
| 0015 | TOXAPHENE | 0.5 | | | | | | |
| 016 | 2,4-D | 10.0 | | | | | | |
| 0017 | 2,4,5-TP (SILVEX) | 10 | | | | | | |
| 020 | CHLORDANE | 0.03 | | | | | | |
| 031 | HEPTACHLOR (AND ITS EPOXIDE | 0.008 | | | | | | |
| ADDITIO | NAL HAZARDS WASTE HAVE ANY UNDISCLOSE | D HAZARDS OR PRIOR | INCIDENTS A | ASSOCIATED WITH IT, WHICH (| OULD AFFE | CT THE WAY IT | SHOULD BI | E HANDLED? |
| | | | | | | | | |
| YES | ✓ NO (If yes, explain) | | | | | | | |

POLYMERIZABLE

DEA REGULATED SUBSTANCES

FUMING

REACTIVE MATERIAL

EXPLOSIVE

RADIOACTIVE

OSHA REGULATED CARCINOGENS

NONE OF THE ABOVE



Clean Harbors Profile No. CH1109341

| . REGULAT | ORY | STAT | rus |
|------------------|----------|------------|--|
| YES | 4 | NO | USEPA HAZARDOUS WASTE? |
| YES | V | NO | DO ANY STATE WASTE CODES APPLY? |
| | | | Texas Waste Code |
| YES | ~ | NO | DO ANY CANADIAN PROVINCIAL WASTE CODES APPLY? |
| YES | • | NO | IS THIS WASTE PROHIBITED FROM LAND DISPOSAL WITHOUT FURTHER TREATMENT PER 40 CFR PART 2687 |
| | | | LDR CATEGORY VARIANCE INFO |
| YES | V | NO | IS THIS A UNIVERSAL WASTE? |
| YES | V | NO | IS THE GENERATOR OF THE WASTE CLASSIFIED AS CONDITIONALLY EXEMPT SMALL QUANTITY GENERATOR (CESQG)? |
| YES | | NO | IS THIS MATERIAL GOING TO BE MANAGED AS A RCRA EXEMPT COMMERCIAL PRODUCT, WHICH IS FUEL (40 CFR 261.2 (C)(2)(II))? |
| YES | V | NO | DOES TREATMENT OF THIS WASTE GENERATE A F006 OR F019 SLUDGE? |
| YES | 1 | NO | IS THIS WASTE STREAM SUBJECT TO THE INORGANIC METAL BEARING WASTE PROHIBITION FOUND AT 40 CFR 268.3(C)? |
| YES | V | NO | DOES THIS WASTE CONTAIN VOC'S IN CONCENTRATIONS >=500 PPM? |
| YES | | NO | DOES THE WASTE CONTAIN GREATER THAN 20% OF ORGANIC CONSTITUENTS WITH A VAPOR PRESSURE >= .3KPA (.044 PSIA)? |
| YES | ¥ | NO | DOES THIS WASTE CONTAIN AN ORGANIC CONSTITUENT WHICH IN ITS PURE FORM HAS A VAPOR PRESSURE > 77 KPA (11.2 PSIA)? |
| YES | V | NO | IS THIS CERCLA REGULATED (SUPERFUND) WASTE? |
| YES | 4 | NO | IS THE WASTE SUBJECT TO ONE OF THE FOLLOWING NESHAP RULES? |
| | | | Hazardous Organic NESHAP (HON) rule (subpart G) Pharmaceuticals production (subpart GGG) |
| YES | | NO | IF THIS IS A US EPA HAZARDOUS WASTE, DOES THIS WASTE STREAM CONTAIN BENZENE? |
| | YES | | NO Does the waste stream come from a facility with one of the SIC codes listed under benzene NESHAP or is this waste regulated under the benzene NESHAP rules because the original source of the waste is from a chemical manufacturing, coke by-product recovery, or petroleum refinery process |
| | YES | | NO is the generating source of this waste stream a facility with Total Annual Benzene (TAB) >10 Mg/year? |
| | Wha | t is the | e TAB quantity for your facility? Megagram/year (1 Mg = 2,200 lbs) |
| | The | basis | for this determination is. Knowledge of the Waste Or Test Data Knowledge Testing |
| | Des | cribe th | the knowledge |
| G. DOT/ | rdg II | VFOR | MATION |
| OOT/TDG P | ROPE | R SH | HIPPING NAME: |
| NON | 1 D.O | .T. R | REGULATED, (SOIL, WATER) |
| | | | I REQUIREMENTS T FREQUENCY ONE TIME WEEKLY MONTHLY QUARTERLY ▼ YEARLY OTHER Other |
| | v | CC | ONTAINERIZED BULK SOLID BULK SOLID |
| <u>1-50</u> | CONT | AINEF | RS/SHIPMENT GALLONS/SHIPMENT: 0 Min -0 Max GAL. SHIPMENT UOM: TON YARD |
| TORAGE CONTAINER | | | TONS/YARDS/SHIPMENT: 9 Min - 0 Mex |
| | | - ARD B | |
| тот | E TA | NK | □ DRUM |
| OTH | IER | | DRUM SIZE: 55 |
| . SPECIAL | REQ | UEST | |
| COMMEN | TS OR | REQUI | JESTS: |
| ENERATOR | 'S CER | TIFICA | ATION |
| amples subm | is betti | e repres | to execute this document as an authorized agent. I hereby certify that all information submitted in this and attached documents is correct to the best of my knowledge I also certify that assentative of the actual waste. If Clean Harbors discovers a discrepancy during the approval process, Generator grants Clean Harbors the authority to amend the profile, as Clean Harbors the discrepancy. |
| Mi | НОВІ | ED S | Marker Michael Musheno Sr. Stall Est Engineer 12-4-15 |

| | Waste Identifcation and C | Classification Form |
|---|---|---|
| Remediation Project Description of Waste | Middle River Complex Geotechnical Bulkh Investigation | State Generated MD |
| <u>-</u> | Debris-Decontamination Pad Plastic | Solid, Liquid, Gas Solid-Debris Additional Info. |
| Date of Waste Generation | 9/29/2015-10/9/15 | Ongoing (Y/N)? N |
| Description of Process Generating | | both onshore and offshore for geotechnical bulkhead investigation a |
| Lockheed Martin Middle River Com | , | |
| | | |
| Listed Waste ? (Y/N) | N F,K, P or U Co | odes [|
| | tion (attached supporting documentatio | |
| No sample collected, profiled as no 2015. | nhazardous based on sample analysis of se | ediment/water IDW. Drums removed from the site December 17th, |
| | | |
| Form con | Tony Apanavage Date 12/7/2015 | |

| | Waste Identifcation and Clas | ssification Form |
|--|--|---|
| Remediation Project Description of Waste | Middle River Complex Geotechnical Bulkhead Investigation | State Generated MD |
| | Sediment-Liquid/Solid Mixture | Solid, Liquid, Gas Sediment-Liquid/Solid Mixture Additional Info. |
| Date of Waste Generation | 9/29/2015-10/9/15 | Ongoing (Y/N)? N |
| Description of Process Generating | | |
| investigation at Lockheed Martin Mi | , , , , , , , , , , , , , , , , , , , | drilling from offshore boring for geotechnical bulkhead |
| | | Tana i |
| Listed Waste ? (Y/N) | N F,K, P or U Codes | [D034 |
| Justification for Waste Classifica | tion (attached supporting documentation) | |
| Waste characterization sample collesite December 17th, 2015. | ected, profiled as hazardous based on sample a | analysis and elevated PCE detection. Drum removed from the |
| | | |
| | | |
| Form con | Tony Apanavage Date 12/7/2015 | |

APPENDIX F—GEOTECHNICAL PROFILES

| | Ardaman and Assoneed Martin Co SER 194-8711 | | | | | | Lockheed Martin MRC TION Middle River, MD | URFACE DIAGE | | Fill (made grou USCS Low to H Clay USCS Low Pla Clay | High Plasticity | USCS Clayey Sand USCS Low Plasticity USCS Poorly-graded with Silt | |
|----------------|--|--|---------------|--|--|---------------|---|--------------|------------|--|-----------------|---|--------------------|
| 0 | | 200 | 400 : | 600 : | 800 : | 1,000 : | 1,200 : | 1,400 : | 1,600 : | 1, | 800 : | 2,000 : | 2,200 2,400 : : |
| 10 | | TTDHCB-9 | TTDHCB-8····· | | | | <u>:</u> | | | | <u>:</u> | | 10 |
| TTDHCB | 12:TDHCB-11 7 9 4 10 6 13 10 9 7 24 6 15 9 28 9 20 8 23 11 17 8 19 16 21 11 16 22 22 32 20 41 41 25 25 | TTDHCB-10 3 5 2 7 1 3 3 3 2 16 5 25 9 33 19 16 11 10 19 16 20 39 30 38 31 38 31 36 | . 20 | 10 14 27 19 16 13 21 24 35 37 42 | 5 8 14 11 12 12 18 22 19 | | N | | | 14 20 20 26 16 11 11 11 16 43 | 31 | 41 63/9" | TTDHCB-2TTDHCB-1 |
| -70 <u>:</u> 0 | | 200 | 400 | 600 | 800 | 1,000 Dist | 1,200 ance Along Baseline | 1,400 | 1,600 | 1,; | | 2,000 | 2,200 2,400 |

| Ardaman and Lockheed Martication Time Number 194-87 | n Corporation | | | | SUBS Lockheed Martin MRC TION Middle River, MD | URFACE DIAGI | <i> </i> /////////////////////////////////// | SCS Silty Sand SCS Clayey Sand SCS Clayey Sand | USCS Poorly-graded with Silt USCS Low Plasticity USCS Low Plasticity Clay | Clay USCS Sand | Plasti dy Silt |
|---|--------------------|--------------|-----------------------|------------|--|--------------|--|--|---|----------------|--|
| 0 | | 100 600 | 800 : | 1,000 : | 1,200 | 1,400 : | 1,600 | 1,800 : | 2,000 : | 2,200 : | 2,40 : |
|) | | | | | | | | | TTDHC-2 | | |
| 5TTDHC-7 | TTDHC-6 | | | | | | | TTDHC-3 | | TTDHC-1 | |
| 0 - 19 7 | | TTDHC-5 | TTDHC-4 | | | | | WH | WR WR 10 | WR WH | |
| 5 9 7 | 8 14 | 31 | 17 | | | | | 9. | 12 20 14 | 57 | : : : : : : : : : : |
| 9 8 | .26. | 27 34 | 23 15 34 | | | | | 15 23 19 | 12 9 | 24 | |
| 24 | 15 35 31, 30 | 47 36 | 44 : 69 | | | | | 17 23 42 | 12 | 65 41 | |
| 15 | 30 | 29 | 81/8" : 36 : 29 | | | | | 52 | 35 | 49 | |
| 18 | 34 | 56/11" 27 | 31 | | | | | 24 | 39 | -41 | |
| 37 | 22 | 17 | 32 | | | | | 37 | 31 | 35 | |
| 32 | 16 | 21 | 51/6" | | | | | 30 | 48 | 29 | |
| 38 | 32 | 21 | 39/10" | | | | | 28 | 33 | 95 | |
| 0 | | 19 | 38 | | | | | | | | |
| 5 0 | 200 4 | 100 600 | 800 | 1,000 | 1,200 | 1,400 | 1,600 | 1,800 | 2,000 | 2,200 | 2,40 |