March 31, 2023

Tyler Abbott
Director, Land and Materials Administration
Maryland Department of the Environment
1800 Washington Boulevard, Suite 645
Baltimore, MD 21230-1719

Re: Performance Management Program, Dundalk Marine Terminal, Baltimore, Maryland

Dear Mr. Abbott:

Honeywell International Inc. (Honeywell) and the Maryland Port Administration (MPA) are pleased to submit the enclosed “Performance Management Program” (PMP), as a component of the Enhanced Isolation and Containment Remedy selected by the Maryland Department of the Environment (MDE) based on the Corrective Measures Alternatives Analysis (CMAA) submitted by MPA and Honeywell pursuant to the April 5, 2006, Consent Decree among MDE, MPA, and Honeywell. This PMP is intended to monitor the performance of the corrective measures implemented at the Dundalk Marine Terminal (DMT) to ensure that chromium ore processing residue is being contained and that the implemented remedy remains protective of human health and the environment.

The PMP consists of five components: (1) a Priority Storm Drain Inspection and Maintenance Plan; (2) a Surface Cover Inspection and Maintenance Plan; (3) a Sentinel Groundwater Monitoring Plan; (4) a Site Drinking Water Plan; and (5) a Health and Safety Plan. These five plans have been modified from interim plans or newly developed to identify actions to monitor and maintain the effectiveness of the implemented corrective measures, establish reporting mechanisms to document remedy component effectiveness, and establish criteria for any additional corrective measures that may be recommended based on monitoring data.

The Sentinel Groundwater Monitoring Plan includes a proposal by MPA to include seven additional wells. The existing groundwater monitoring well network is adequate for continued monitoring of all zones. However, MPA proposes to install six new, shallow aquifer wells focused on the southern portion of the site east of Area 1501/1602 to provide more data regarding groundwater flow in the area, and one new, shallow aquifer well in the northern portion of the site to provide groundwater flow and quality data. If MDE believes these additional wells are necessary, the parties will add them to the monitoring program.

We would like to meet with MDE at your earliest convenience to discuss the PMP.

We appreciate MDE's guidance and assistance in implementing the remedy at DMT. If you have any questions or require additional information, please do not hesitate to contact us.

Sincerely,

Benny Dehghi
Vice President, Global Remediation and Redevelopment
Honeywell

Bill Richardson

Bill Richardson, Director
Office of Environment
Maryland Port Administration

Copies:
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Performance Management Program

Dundalk Marine Terminal
Baltimore, Maryland

Prepared for

Honeywell

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March 2023

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Acronyms and Abbreviations

CMAA	Corrective Measures Alternatives Analysis
COPR	chromium ore processing residue
CSM	conceptual site model
DMT	Dundalk Marine Terminal
HASP	Health and safety plan
MDE	Maryland Department of the Environment
mg/L	milligram(s) per liter
MPA	Maryland Port Administration
MS4	municipal separate storm sewer system; NPDES General Permit for Discharges from State and Federal Small Separate Storm Sewer Systems
NPDES	National Pollutant Discharge Elimination System
PMP	Performance Management Program
SCMP	Surface Cover and 14th and 15th Streets Storm Drain Inspection and Maintenance Plan
SRT	Strain relief trench
USZ	Upper Saturated Zone
WWTP	wastewater treatment plant

1. Executive Summary

This Performance Management Program (PMP) is intended to monitor the performance of the corrective measures implemented at the Dundalk Marine Terminal (DMT) to ensure that chromium ore processing residue (COPR) is being contained and that the implemented remedy remains protective of human health and the environment. The PMP is a component of the Enhanced Isolation and Containment Remedy selected by the Maryland Department of the Environment (MDE) on July 30, 2012, based on the *Corrective Measures Alternatives Analysis* (CMAA) submitted by CH2M on behalf of the Maryland Port Administration (MPA) and Honeywell International Inc. (Honeywell) in January 2011 (CH2M 2011).

The PMP builds on the remedial measures already implemented at the DMT and consists of five separate program elements:

(1) A *Priority Storm Drain Inspection and Maintenance Plan* (Appendix A) to monitor the effectiveness of and maintain the lined storm drains, manholes, inlets, and associated infrastructure.

(2) A *Surface Cover Inspection and Maintenance Plan* (Appendix B) to maintain the cover system over the COPR fill area and monitor the subsurface effects of COPR movement.

(3) A *Sentinel Groundwater Monitoring Plan* (Appendix C) to monitor groundwater quality outside of the COPR fill area, monitor groundwater elevation, and flow directions, and confirm sediment and surface water reducing conditions.

(4) A *Site Drinking Water Sampling Plan* (Appendix D).

(5) A *Master Health and Safety Plan* (Appendix E).

Collectively, these five plans identify actions to monitor and maintain the effectiveness of the implemented corrective measures, establish reporting mechanisms to document remedy component effectiveness, establish policies and procedures, and set triggers and criteria for any additional corrective measures that may be recommended based on monitoring data.

2. Background

The DMT contains about 148 acres of COPR fill under pavement (Figure 1). MPA and Honeywell have been working in partnership to investigate and address environmental conditions caused by the presence of COPR at the DMT. In accordance with the 2006 Consent Decree, MPA and Honeywell completed thorough investigations of soil, groundwater, stormwater, and COPR at the DMT, as well as sediment and water in the Patapsco River. Completed work includes the following:

- Delineation of the extent and nature of COPR present within the 148-acre fill area at DMT.
- Evaluation of the mobility, fate, and transport of hexavalent chromium in environmental media to develop measures to quantify and reduce the flux of hexavalent chromium in stormwater.
- Determination of the presence and environmental significance of COPR-related constituents in the surface water storm drain system within the COPR fill area.
- Development of an understanding of the mechanisms associated with the expansion of COPR fill which was then utilized to mitigate the detrimental effects of COPR expansion on the existing surface cover and storm drain systems.

Based on the results of those investigations and pilot studies, MPA and Honeywell developed and submitted to MDE a CMAA dated January 2011 (CH2M 2011) evaluating five remedial alternatives for the DMT. These alternatives included a containment alternative, a full excavation alternative, as required by the Consent Decree, and a “No Further Action” alternative, as required under state law. The remedial alternatives were screened against the criteria specified in the Consent Decree, including protection of human health and the environment and potential impact on port operations. After accepting public comment on the CMAA, MDE selected Alternative 3, Enhanced Isolation and Containment, as the remedy for the DMT.

This PMP is a key element for ensuring attainment and management of remedial performance objectives. MPA’s health and safety plan will continue to provide the overarching guidelines for safe implementation of the inspection and maintenance programs, including air monitoring during COPR excavations, excavation procedures and management of waste. This document presents the comprehensive framework for maintaining performance and imposes rigorous controls for long-term protection and maintenance of the COPR containment remedy. The PMP details the approach for performing priority storm drain and surface cover inspections, documenting inspection, and maintenance events, and routinely reporting information related to the containment remedy to the MDE. The PMP also includes a Sentinel Groundwater Monitoring Plan for the sampling and monitoring of groundwater quality. Lastly, a comprehensive Master Health and Safety Plan will remain in place for the protection of port users.

3. Conceptual Site Model Update

A key component of the PMP is fulfilling the requirement to update the conceptual site model (CSM) to identify changes that could potentially warrant evaluation of additional corrective measures and ensure the monitoring programs are aligned with current site conditions. The *Chromium Transport Study* (CH2M 2009b) documented the original CSM, which addressed various chromium migration pathways at the DMT. The goal of the PMP is to address the current site conditions as determined through observed changes in the CSM to date. The original CSM has remained relatively unchanged with a few exceptions, as noted below by media.

3.1 Air Transport

The 2009 CSM identified chromium transport through air as a potential incomplete pathway; however, MDE required perimeter air monitoring for hexavalent chromium (Cr(VI)) to document concentrations of Cr(VI) in airborne particulates at the DMT perimeter. In the 15 years of monitoring since, all Cr(VI) concentrations detected in the perimeter air have been significantly below the occupational exposure limits for Cr(VI) using the Occupational Safety and Health Administration Permissible Exposure Limit of 5,000 nanograms per cubic meter based on an 8-hour time-weighted average. The air monitoring program has confirmed the airborne migration of Cr(VI) from COPR is an incomplete pathway, and a request to discontinue the air monitoring program has been submitted to MDE.

3.2 Groundwater

An increase of groundwater elevations has been recorded in the COPR area from 2009 to present at locations near lined storm drains. The rise in groundwater elevation seems consistent with simulated rise conditions evaluated in the hydraulic model (CH2M 2009b) presented in the CMAA (CH2M 2011). This rise in groundwater is in response to the elimination of groundwater flux into the storm drains due to the lining program. The groundwater elevation conditions will continue to be monitored against the hydraulic model (CH2M 2009b) as part of the PMP.

The Area 1501/1602 COPR cell experienced elevated groundwater conditions before the current construction activities. In 2014, dewatering of the cell was initiated to relieve hydrostatic pressure within the confined cell by lowering the level of groundwater at the southern corner of Area 1501/1602. Additionally, a new geomembrane and asphalt cap was designed and is currently being installed to reduce recharge from surface water infiltration.

The evaluation of the site groundwater model in 2015 identified an additional water-bearing unit east of the 1501/1602 COPR cell and defined as the Upper Saturated Zone (USZ). The USZ occurs east of the 1501/1602 area where groundwater was encountered above the level of the piezometric surface in the underlying shallow aquifer. Due to the lack of lateral continuity, the zone is not considered an aquifer but acts to transmit infiltrated surface water downward to the shallow aquifer. The USZ is discussed further in the *Sentinel Groundwater Monitoring Plan* (Appendix C).

The rise in groundwater elevation has caused Cr(VI)-impacted groundwater to enter compromised sections of the subsurface utility system and transfer through electrical and communication conduits. Groundwater fluctuations, periodic dewatering operations, and surface water infiltration during rain events sometimes cause the Cr(VI)-impacted water to move into manhole vaults both inside and outside the COPR fill area. During rain events, a limited number of utility manholes experience overflow conditions. The manholes have been identified, and engineering controls are in place to prevent movement of Cr(VI)-impacted water beyond the immediate vicinity of the vaults. Remedial measures are currently being implemented to eliminate the movement of Cr(VI)-impacted water throughout the conduit system and reduce infiltration into the system. The parties will work with MDE to address these measures, which are outside the purview of the PMP.

4. PMP Elements

4.1 Program Elements

The PMP consists of five separate program elements:

(1) A *Storm Drain Inspection and Maintenance Plan* (Appendix A) to monitor the effectiveness of and maintain the lined storm drains, manholes, inlets, and associated infrastructure.

(2) A *Surface Cover Inspection and Maintenance Plan* (Appendix B) to maintain the cover system over the COPR fill area and monitor the subsurface effects of COPR movement.

(3) A *Sentinel Groundwater Monitoring Plan* (Appendix C) to monitor groundwater quality outside of the COPR fill area, monitor groundwater elevation, and flow directions, and confirm sediment and surface water reducing conditions.

(4) *Site Drinking Water Sampling Plan* (Appendix D).

(5) *Master Health and Safety Plan* (Appendix E).

Collectively, these five plans identify actions to monitor and maintain the effectiveness of the implemented corrective measures, establish reporting mechanisms to document remedy component effectiveness, and set triggers and criteria for any additional corrective measures recommended based on monitoring data. Health and safety protocols continue to be subjected to the MPA's health and safety plan.

4.2 Deliverables

PMP deliverables to the MDE are listed below. The electronic databases for surface cover and storm drain maintenance, and groundwater, sediment, and surface water sample results are updated on an ongoing basis to document remedy maintenance and monitoring activities.

PMP Requirement	Report Name	Frequency
Storm drain inspection and maintenance	*Storm Drain Inspection and Maintenance Report*	Annual
Surface cover inspection and maintenance plan	*Surface Cover Inspection Report*	Annual
Surface cover inspection and maintenance plan	*Surface Cover Repairs Summary Report*	Annual
Sentinel groundwater sampling	*Semiannual Groundwater Monitoring Report*	Semiannual
Sediment sampling	*Sediment Sampling Report*	5-year intervals
Drinking water plan	*Site Drinking Water Report*	Quarterly

5. PMP Requirements

The Enhanced Isolation and Containment Remedy requires the repair and lining of priority storm drains within the COPR fill area to address the infiltration of groundwater and eliminate the discharge of chromium-impacted water to the Patapsco River. The priority storm drains include the 12th, 12.5th, 13th, 13.5th, 14th, and 15th Streets storm drains (Figure 2). After the drains are lined, routine inspection and repairs are necessary to confirm the effectiveness of the lining. Monitoring of these storm drains is performed pursuant to the National Pollutant Discharge Elimination (NPDES) permit, State Discharge No. 10-DP-3060, and NPDES Permit No. MD0066818, which was issued by the MDE to the MPA in August 2017. The permit renewal application was submitted to MDE on September 30, 2021. The NPDES permit is provided as Appendix F.

5.1 Storm Drain Inspection and Maintenance

Once a storm drain(s) successfully meets the NPDES monitoring requirements per the above permit, it may be removed from the NPDES permit (No. MD0066818) through a major modification. The storm drain then becomes part of the MPA's NPDES General Permit for Discharges from State and Federal Small Separate Storm Sewer Systems (MS4) program. The MS4 permit, General Discharge Permit No. 13-SF-5501, General NPDES No. MDR055501, was issued to MPA on October 31, 2018. A copy of the General Discharge Permit is included as Appendix G. Inspection and maintenance of the priority storm drains will continue to be performed pursuant to the PMP requirements described herein and the MS4 permit.

The six priority storm drains were lined to isolate the drains from COPR and prevent infiltration of chromium-impacted groundwater into the priority storm drain system. Four of the priority drains (12th, 12.5th, 13th, and 13.5th Streets storm drains) were also isolated from tidal influence by the installation of tidal exclusion vaults equipped with mechanical devices such as flap gates or duckbills. The tidal exclusion vaults provide safe and reliable access for conducting storm drain inspections and maintenance. The 14th and 15th Streets storm drains have enclosed outfall structures that were used to collect chromium-impacted dry weather flows prior to rehabilitation and lining, which was conveyed to the onsite wastewater treatment plant (WWTP). The WWTP is also regulated under the NPDES permit MD0066818.

5.1.1 Storm Drain Inspection

The first element of the PMP is the establishment of the *Priority Storm Drain Inspection and Maintenance Plan* (Appendix A). This plan includes the procedures for inspection, maintenance, documentation, and reporting for the priority storm drains. The lined storm drains will be subject to Tier I or Tier II inspections, as described below. Together, the tiered programs assess the condition of the liners and host structures and will result in the development and scheduling of storm drain maintenance activities.

The Tier I inspections use an observational approach, which includes a semiannual visual inspection at the storm drain trunk line structures to observe potential groundwater intrusion sources. If dry weather flow is observed during routine DMT operations or a Tier I inspection, then a partial Tier II inspection will be performed. Maintenance and repairs of the priority storm drain will be conducted, as required, in response to those inspection observations.

Tier II inspections will be completed on a 5-year rotational basis and include detailed visual inspections and CCTV (closed circuit television) footage of approximately 5,000 linear feet of storm drain per year, with the inspections including associated inlets, manholes, and lateral piping. Tier II inspections may also include pipe diameter measurements and or laser profiling to monitor pipe deformation due to COPR movement depending on visual observations made during the CCTV inspection. The inspection frequency for complete Tier II inspections may need to be adjusted in the future, depending on liner reliability as determined from the ongoing inspections of the storm drains. The basis for performing 5,000 linear feet each year is that the extent of such inspection represents approximately one-fifth of the total priority storm drain system. At a minimum, Tier II inspections will be performed on a 5-year rotational basis but may be performed more frequently based on the findings of Tier I inspections and pipe deformation monitoring.

5.1.2 Storm Drain Maintenance

Upon discovery of a condition requiring repair to the liner system, liner repairs will be completed within 45 calendar days unless circumstances are identified that will require additional time for completion. Conditions requiring structural repair to the host pipe or inlet and manhole structures may require preparation of design drawings and specifications and may take longer than 45 days to complete. Reasonable means to expedite repairs will be made to effectively complete the repairs following the inspections.

5.2 Surface Cover Inspection and Maintenance

The development and implementation of a surface cover inspection and maintenance plan to maintain the existing pavement within the COPR fill area is the second component of the PMP. Current inspections are performed pursuant to the *Surface Cover and 14th and 15th Streets Storm Drain Inspection and Maintenance Plan* (CH2M 2007a) (SCMP), which was approved by MDE on August 28, 2007. The plan defined the methods and procedures for performing routine inspections, maintenance, and repair of surface cover materials and two of the priority storm drains affected by COPR fill at the DMT.

Inspection of the surface cover system within the COPR fill area is performed annually to identify and prioritize surface cover repairs to be performed during a calendar year. The *Surface Cover Inspection and Maintenance Plan* is provided as Appendix B and will replace the 2007 SCMP.

5.2.1 Surface Cover Inspection

The baseline surface cover inspection was conducted between March 5 and April 20, 2007. The baseline inspection included the visual inspection of existing pavements at DMT and mapping of cracks, holes, and surface manifestation of subsurface COPR expansion. The documentation of these areas using geographical information system–based maps and tables, was used to prioritize required maintenance measures. The *Surface Cover System Baseline Inspection Report* was submitted to MDE on September 12, 2007 (CH2M 2007b).

The annual surface cover system inspection reports identify specific areas for surface cover maintenance to be performed within the COPR fill area. Surface cover inspection data are mapped using a global positioning system (GPS)–enabled iPad with the ArcGIS Collector application and will be upgraded with technology advances. This electronic database will continue to be used for documenting surface cover inspections. Inspection findings and an overview of repair priorities will be documented in an annual report each calendar year.

5.2.2 Surface Cover Maintenance

Features identified for repair are located and marked in the field using a GPS-enabled iPad with the ArcGIS Collector application. A surface cover database is maintained to record inspection results and surface cover repairs. Surface cover repairs are prioritized based on the containment remedy and potential impact to port operations. Details of completed crack sealing and paving repairs (including pothole, full section mill and pave, crack area, heave, and miscellaneous repairs) are reported annually. The information in the database will be used to document completed surface cover inspection and maintenance activities, and to evaluate the condition of the existing surface cover at DMT. A summary of completed repairs and an overview of repair types will be documented in the annual report each calendar year.

5.2.3 Strain Relief Measures Monitoring

A heave investigation and minimization study was completed in 2009 to characterize the nature of manifestations of surface and subsurface heaving and expansion processes associated with the COPR fill and to identify potential means to prevent or minimize surface pavement damage. The *Heave Investigation and Minimization Study Work Plan* (CH2M 2006) defined the scope of the investigation, provided a summary of background information and findings from previous studies, specified the methods and procedures to be used to analyze and characterize COPR heave processes, and specified the data quality objectives, quality assurance, quality control and reporting requirements, as appropriate. Additionally, inclinometers, Shape Accel Arrays, and surface survey pins (pk nails) were installed to monitor COPR horizontal and vertical movement.

Subsurface strain relief trenches (SRTs) consisting of a 2- to 3-foot-wide trenches backfilled with displaceable fill have been installed to minimize surface heave in Area 1800, protect the 15th Street storm drain piping from deformation, and protect the integrity of the clay containment dike in Area 1501/1602. COPR movement data collected from inclinometers, Shape Accel Arrays, and pk nails installed adjacent to the SRTs, along with visual observations of the displaceable SRT backfill and probing of the backfill for COPR impingement will be used to determine whether and where COPR may be laterally expanding into the trench. The data will also be used to determine the rate of COPR movement and estimate the remaining life of the trench. Repairs and maintenance will be designed and implemented to refurbish portions of the trench as needed. Storm drain pipe deformation monitoring data collected as part of the Tier II storm drain inspection described in the *Priority Storm Drain Inspection and Maintenance Plan* (Appendix A) will also be used to identify portions of the SRT that are no longer protecting storm drain piping from COPR expansion, or sections of piping where new SRTs are needed.

5.3 Sentinel Groundwater and Sediment Monitoring and Sampling Plan

Semiannual groundwater sampling has been performed under the *Interim Groundwater-Sampling Plan* (CH2M 2009a). This interim sampling plan was submitted to MDE on April 20, 2009, with subsequent revisions provided to MDE in June 2009. In February 2015, due to the abandonment of seven of the originally prescribed sampling monitoring well locations, MDE approved the sampling of seven replacement wells, chosen from among the existing well network. The interim sampling program superseded the previous monitoring program and was initiated to use the monitoring well network established during the chromium transport study investigation (CH2M 2009b).

The next element of the PMP is the establishment of a groundwater monitoring network to monitor groundwater quality outside of the COPR fill area. This plan will also confirm sediment and porewater reducing conditions beneath the river. A comprehensive groundwater monitoring plan, referred to as the *Sentinel Groundwater Monitoring Plan* (Appendix C), will include components of the interim groundwater monitoring plan, as well as several new elements for assuring site containment. The approach for establishing the sentinel monitoring system was based on an evaluation of the existing network of monitoring wells installed at the site.

Existing wells were evaluated to determine which locations were suitable for continued use as part of a sentinel monitoring program. The wells deemed unsuitable or duplicative for monitoring have been or will be abandoned. The *Sentinel Groundwater Monitoring Plan*, which contains the sitewide sentinel monitoring well network, and sediment and porewater sampling, is provided as Appendix C. This plan replaces the *Groundwater Sampling and Analysis Plan* (Maryland Environmental Service 1992a), which was prepared to comply with the 1992 *Corrective Measures Implementation Program Plan* (Maryland Environmental Service 1992b) as well as the *Interim Groundwater-Sampling Plan* (CH2M 2009a).

5.4 Site Drinking Water Plan

A site drinking water monitoring plan was submitted to MDE in 2006, and a revised plan was submitted in 2013. The purpose of this plan is to ensure that chromium-contaminated materials are not adversely impacting the drinking water at the DMT. The plan contains two sections. The first section describes a sampling plan to determine existing water system baseline conditions in relation to chromium's presence or absence and establishes a routine sampling program to test for chromium in the water distribution system. The second section provides a contingency plan for operation of the water system in the event of a pipe break, which includes the return of the system to normal operation after the break has been repaired. This revised *Site Drinking Water Plan* will replace previous versions and is provided in Appendix D.

5.5 Master Health and Safety Plan

MPA’s health and safety plan (Appendix E) will continue to provide the overarching guidelines for safe implementation of the inspection and maintenance programs, inclusive of air monitoring during COPR excavations, excavation procedures and management of waste. MPA has developed the Master Health and Safety Plan (HASP) to provide both general and specific requirements regarding potential exposure to chromium and COPR at DMT. The plan outlines the responsibilities of all parties operating on this site and requires coordination of all health and safety plans to ensure compliance with state regulations and other applicable regulations. The Master HASP is intended to reduce the potential of health and safety hazards to personnel performing chromium-related or potentially chromium-related work projects at the DMT.

6. Wastewater Treatment Plant

Following completion of the 14th and 15th Streets storm drain lining and implementation of the action level monitoring in accordance with NPDES Permit Number MD0066818 (State Discharge Permit No. 10-DP-3060), the existing WWTP will no longer be needed to capture and treat dry weather flows from these priority storm drains. The WWTP may remain in service for a minimum period of 2 years, the period required to demonstrate action level monitoring requirements at the 12th,14th, and 15th Street storm drains have been met and a NPDES major permit modification has been issued. The WWTP may continue to operate beyond this time period under a revised operations plan to treat chromium-impacted water from other sources at DMT, or it may be decided that the water can be taken offsite and treated at an approved wastewater treatment disposal facility.

The other sources of chromium-impacted water being treated at the plant currently include water generated from site maintenance and construction projects and groundwater pumped from well EA-7S. Pumping of well EA-7S was initiated in 2014 as a temporary measure to lower the water level inside the COPR cell at the southern corner of Area 1501/1602. A shallow interceptor trench was installed to a maximum depth of 4 feet to collect groundwater moving along the top of the clay cap and between other gravel-like, porous layers below the original Area 1501/1602. The trench has several extraction points used for vacuum removal of any collected groundwater. Area 1501/1602 has since been capped, starting in 2021, to prevent surface water infiltration, and it is anticipated that pumping groundwater from within the COPR cell will no longer be required after the water level within the cell has stabilized. As part of the Area 1501/1602 cap work, well EW-1 (Extraction Well 1) was installed within the COPR cell as a highly conservative and precautionary measure to give Honeywell and MPA the option to control groundwater levels in the Area 1501/1602 COPR cell in the future, if needed.

7. References

CH2M. 2006. *Heave Investigation and Minimization Study Work Plan.* August.

CH2M. 2007a. *Surface Cover and 14th and 15th Street Storm Drain Inspection and Maintenance Plan.* August.

CH2M. 2007b. *Surface Cover System Baseline Inspection Report.* September.

CH2M. 2011. *Corrective Measures Alternatives Analysis, Dundalk Marine Terminal, Baltimore, Maryland*. January.

CH2M. 2009a. *Interim Groundwater-Sampling Plan, Dundalk Marine Terminal, Baltimore, Maryland*. April.

CH2M. 2009b. *Chromium Transport Study Report, Dundalk Marine Terminal, Baltimore, Maryland*. October.

Maryland Environmental Service. 1992a. *Groundwater Sampling and Analysis Plan.*

Maryland Environmental Service. 1992b. *Corrective Measures Implementation and Program Plan*.

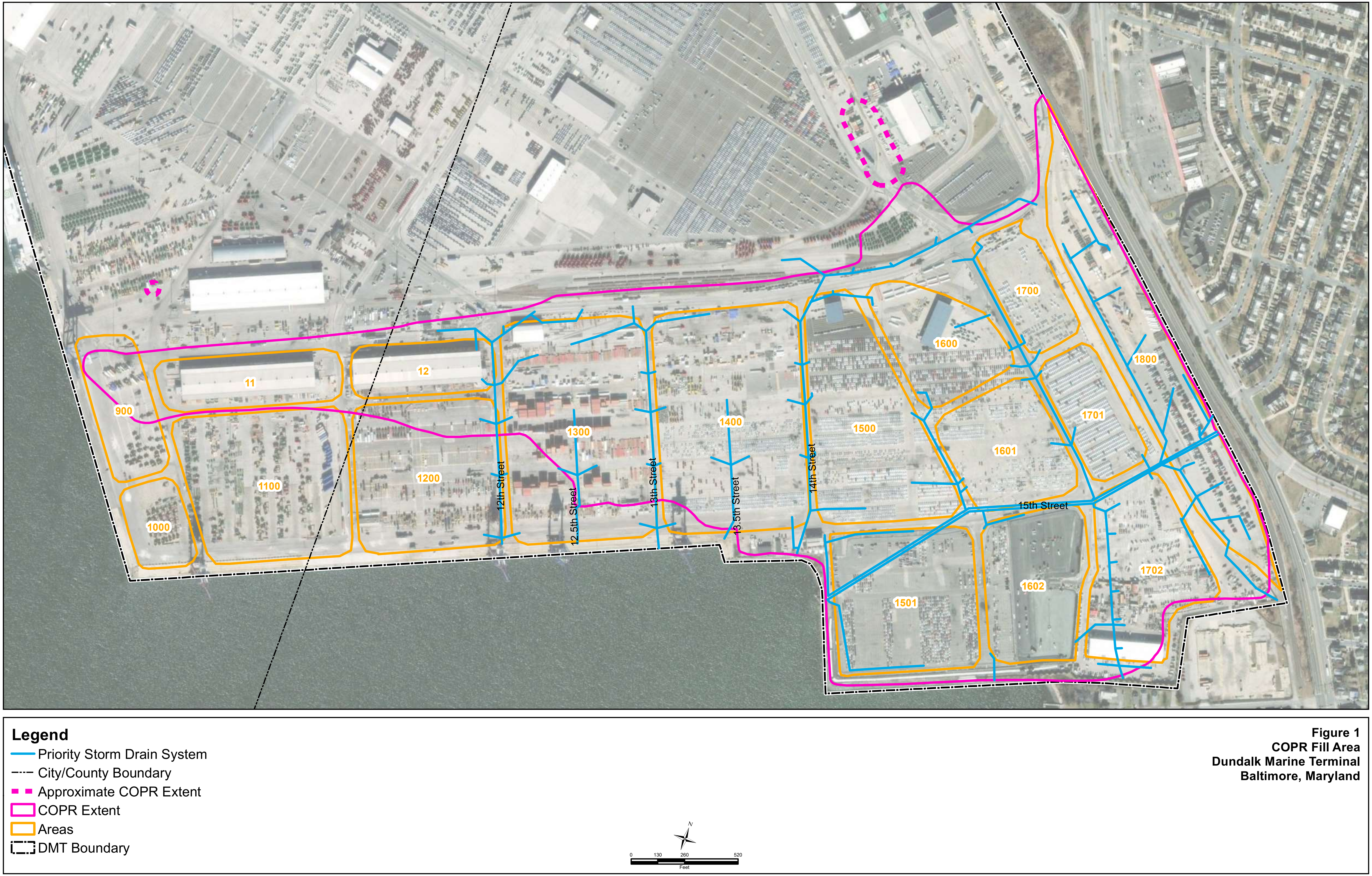
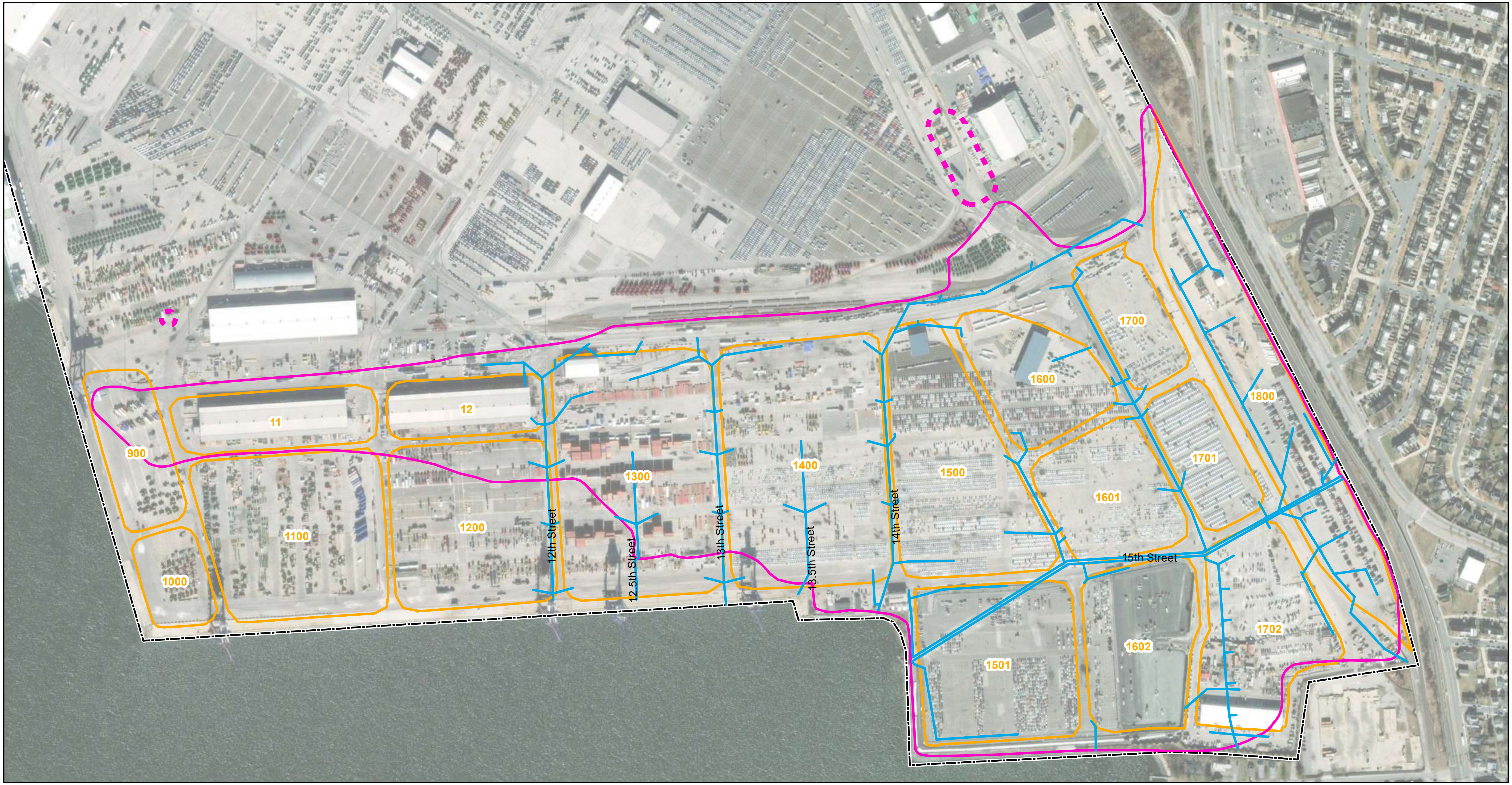


Figure 1
COPR Fill Area
Dundalk Marine Terminal
Baltimore, Maryland



Legend

- Priority Storm Drain System
- City/County Boundary
- Approximate COPR Extent
- COPR Extent
- Areas
- DMT Boundary

Figure 2
Priority Storm Drains
Dundalk Marine Terminal
Baltimore, Maryland

Appendix A

Priority Storm Drain Inspection and Maintenance Plan

Performance Management Program Priority Storm Drain Inspection and Maintenance Plan

Dundalk Marine Terminal
Baltimore, Maryland

Prepared for

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January 2023

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1. Introduction

This Priority Storm Drain Inspection and Maintenance Plan is an integrated component of the overall Performance Management Program (PMP) for the long-term monitoring and maintenance of the remedy being implemented at Dundalk Marine Terminal (DMT).

Pursuant to the Consent Decree among the Maryland Department of the Environment (MDE), the Maryland Port Administration (MPA), and Honeywell International Inc. (Honeywell), and the Corrective Measures Alternatives Analysis required by the Consent Decree, MDE has approved an Enhanced Isolation and Containment remedy for the site. The Enhanced Isolation and Containment remedy includes a requirement to repair and line priority storm drains within the chromium ore processing residue (COPR) fill area to address the infiltration of and discharge of chromium-impacted water and a PMP to confirm and monitor the effectiveness of that relining program. This Priority Storm Drain Inspection and Maintenance Plan fulfills the PMP requirements with respect to the storm drain portion of the Enhanced Isolation and Containment remedy.

The priority storm drains are the 12th, 12.5th, 13th, 13.5th, 14th, and 15th Street storm drains. Monitoring of these storm drains is performed pursuant to the National Pollutant Discharge Elimination (NPDES) permit No. MD006818, which was issued by MDE for DMT in August 2017. Once a storm drain successfully meets the NPDES monitoring requirements, it may be removed from the NPDES permit through a major modification. Any storm drains removed from the NPDES permit will continue to be covered under the MPA's Municipal Separate Storm Sewer System (MS4) permit No. MDR 055501, which governs all other storm drains at DMT. For the priority storm drains, the MS4 inspections will be performed by MPA independent of the PMP inspections performed according to this plan.

This plan comprises the following sections:

1) **Background**—summarizes general background information related to the DMT.
2) **Storm Drain Inspections**—details the Tier I and Tier II inspections procedures, dewatering and cleaning requirements required prior inspection (if necessary), and the documentation and reporting of inspection findings.
3) **Storm Drain Maintenance and Reporting**—details the maintenance schedule for storm drain repair, requirements for stormwater management, and the documentation and reporting of completed repairs.
4) **Storm Drain Deformation Monitoring**—includes assessment of collected data to determine whether lateral COPR expansion may be impacting the pipe and causing deformation of the pipe wall. The data are further evaluated to assess the condition of the pipe and the effectiveness of existing strain relief, or need for new strain relief measures.

This plan describes the procedures for inspection, maintenance, documentation, and reporting with respect to the six priority storm drains. Information obtained from this program is considered, along with information from the program elements of the PMP, to evaluate the overall effectiveness of the Enhanced Isolation and Containment remedy. These storm drain inspections, as described in Section 3, are performed as either a Tier I (visual) or a Tier II (more detailed) inspection.

2. Background

The priority storm drain systems are constructed partially or fully in the COPR fill area at the DMT, as illustrated in Figure 1. Before being lined, the priority storm drains exhibited concentrations of hexavalent chromium in dry-weather flow resulting from groundwater intrusion into sections of the storm drains. The 12th Street, 12.5th Street, 13th Street, and 13.5th Street storm drains all have outfalls located at the steel bulkhead wharf that is covered by a 60-foot marine platform. Storm drains located along 14th and 15th Streets are also priority drains, with outfall basins located along the armored shoreline embankment, and are not obstructed by a marine platform. The 15th Street drain is unique in that it accepts both dry-weather and wet-weather flow from the upgradient communities across Broening Highway.

The total length of the priority storm drains is approximately 23,400 feet. The pipe sizes for the priority drains range from 15 inches to 96 inches, with pipe shapes either round or elliptical. Generally, the catch basins farthest from the main trunk lines have the smallest pipe sizes leaving the basin. Pipe size generally increases in each basin until a main trunk line is intersected. The main trunk lines of the storm drains are accessible via manholes by personnel for visual inspection. Smaller-diameter storm drain piping less than 48 inches in diameter, particularly lateral piping and trunk line piping in the upper reaches of the storm drain, are generally inspected remotely using industry standard, robotic closed-circuit television (CCTV) equipment.

As originally designed and constructed, each priority storm drain outfall invert is located below the level of low tide of the Patapsco River. Accordingly, the priority storm drains were subject to tidal inundation that inhibited storm drain dewatering so that inspections, reliable sampling, and repairs could not be performed. As a result, tidal exclusion infrastructures (that is, vaults with backflow prevention) were installed at each of the priority drains with outfalls located beneath the marine platform to prevent or minimize tidal encroachment into the upper reaches of the drains. The 14th and 15th Street storm drains, which are not obstructed by the marine platform, have coffer-dam-type tidal exclusions, each of which is located outboard of the actual outfall location. Currently, dry-weather flow is collected in these coffer dams and pumped to a treatment plant for removal of hexavalent chromium and pH adjustment prior to discharge from Outfall 001 to the Patapsco River under the NPDES permit.

Inspection procedures for inlets, manholes, and tidal exclusion vaults, and pipe sections are described in detail in Section 3.

3. Storm Drain System Inspection Plan

3.1 Scope

Outfalls at the 12th, 12.5th, 13th, and 13.5th Street storm drains have means to exclude tidal influence using the tidal exclusion vaults. Both the 14th and 15th Street outfalls have outfall retention basins, which act as coffer dams, installed outboard of the outfall location. All tidal retention structures offer the capability of excluding the influence of the tide so that the bulk of the storm drain systems can be evacuated to prevent interference from residual rainfall or river water during inspection.

The following storm drain inspection and maintenance measures will be implemented at DMT:

- Perform Tier I inspections of each previously rehabilitated priority storm drain to determine the presence or absence of dry-weather flow at each trunk line manhole.
- Perform a Tier II inspection of each inlet, manhole, and pipe segment every 5 years to assess the condition of the liner and host structures. An anticipated Tier II inspection schedule is provided in Table 1. If groundwater intrusion is observed entering a manhole during Tier I inspections or routine site activities, a Tier II inspection will be performed on the lateral and upstream pipe sections discharging to the manhole.
- Document results of both the Tier I and Tier II inspections using digital forms that will be maintained in a geographic information system (GIS) database.
- Complete follow-up inspections to document the effectiveness of storm drain repairs.
- Monitor pipe wall deformation within the priority storm drain pipes, performed as part of the Tier II inspections.
- Prepare and submit to MDE an annual storm drain inspection and maintenance report in the first quarter of the following year.

3.2 Tiered Inspections

Tier I inspections use an observational approach that consists of performing visual inspections at the storm drain trunk line manholes to observe potential groundwater intrusion sources. Tier I inspections will initiate partial Tier II inspections to determine the source of dry-weather flow if such flow is observed during the visual inspection of a storm drain. If a partial Tier II inspection is required, it will be initiated within 14 days of the dry-weather flow observation. Maintenance and repairs will be conducted, as required, in response to inspection observations.

Tier II inspections are completed on a 5-year rotational basis and include detailed visual and CCTV inspections of on average 5,000 linear feet of storm drain system per year, including inlets, manholes, and lateral pipe sections (Table 1). A Tier II inspection may also be performed as needed if a Tier I inspection indicates a need for a more detailed inspection on a particular storm drain. The basis for performing 5,000 linear feet each year is that the extent of such inspection represents approximately one-fifth of the total priority storm drain system. The 5-year frequency for completing Tier II inspections is a minimum frequency, regardless of the observation of dry-weather flow, and considers weather, accessibility, standing water volume, and the occurrence of other independent factors. The inspection frequency for complete Tier II inspections can be increased in the future, depending on liner reliability as determined from the inspection record of the storm drains. Through the Tier I and Tier II inspections, the condition of the liners and host structures are assessed and will result in the development and scheduling of preventive maintenance activities.

Table 1. Tentative Tier II Inspection Schedule

Storm Drain	Year 1	Year 2	Year 3	Year 4	Year 5
12th St.			X		
12.5th St.		X			
13th St.	X				
13.5th St.		X			
14th St.				X	
15th St.					X

Inspection schedule to start over following year 5. Schedule is subject to Tier I findings.

3.3 Dewatering and Cleaning

Storm drains will typically be inspected in an as-found condition, without prior cleaning, so that signs of infiltration, such as calcification and staining, can be observed. Storm drain sections that contain significant amounts of debris or sediment that prohibit visual, or CCTV inspection will require cleaning prior to inspection.

Inspections will be conducted during dry weather, which is defined as a minimum period of 72 hours since the last rain event resulting in surface water entering the storm drain system. Dewatering of the storm drain will typically not be required for Tier I inspections; however, areas of the storm drain that hold standing water such as pipe sags and manhole floors will require dewatering prior to conducting Tier II inspections. Retained water will be removed from the storm drains by pumping the water downstream of the tidal exclusion vault or outfall basin for discharge to the river. As previously described, the 15th Street drain accepts flow from offsite sources; offsite flow will require diversion to the opposite twin storm drain trunk line while Tier II inspections are performed.

3.4 Inspection Procedures

3.4.1 Tier I Inspections

Tier I inspections will be performed semiannually to observe dry-weather flow from laterals and upstream trunk line piping at each trunk line manhole for the first 5 years, and then annually thereafter. Prior to an inspection, weather forecast information will be reviewed to verify that the inspection can be conducted during dry-weather conditions and that a minimum of 72 hours has passed since the last rain event. Structure covers along the storm drain trunk alignment will be removed to facilitate visual inspection. The Tier I Inspection Form provided in Appendix A will be used to document observations of flow/no-flow conditions at each trunk line manhole. If no flow is identified, the inspection will be considered complete. If chromium-impacted flow from lateral or upstream trunk line piping is observed, the upstream pipe sections, inlets, and manhole will be inspected as a Tier II inspection to locate the source of flow. Chromium-impacted dry-weather flow reported from an MS4 inspection will also prompt a partial Tier II inspection as described above. Repairs will be defined, scheduled, and implemented to restore containment. The estimated timeframe for completing repairs is discussed in Section 4.

3.4.2 Tier II Inspections

Tier II inspections comprise a visual inspection, either by CCTV or physical examination of each containment element, including lateral and trunk line piping, inlets, and manholes. Tier II inspection of the storm drains will include a physical inspection of the overall condition of each storm drain and the identification of compromised liners, structural damage, groundwater intrusion and other conditions suggesting that maintenance repair is necessary to maintain the integrity of the storm drains.

The entirety of the priority storm drain system will be inspected every 5 years. The 5-year inspections will be undertaken on a rotating basis, so that approximately one-fifth of the priority storm drain system undergoes a Tier II inspection every year. On average, approximately 5,000 linear feet of storm drain will be inspected annually. The Tier II Inspection Form provided in Appendix B will be used to document the portions of storm drains that may need corrective action so that preventive maintenance repairs can be scheduled and performed.

For Tier II inspections, planning activities will include the following:

- Secure and review the most recent inspection data (visual and CCTV) for the given drain
- Notify and coordinate with MPA operations to perform the storm drain inspections
- Reconcile the locations of inlets and manholes with the GIS storm drain map
- Assess current conditions within the pipes and arrange to dewater and clean the storm drains as needed
- Review the existing health and safety plan, including requirements for staffing, confined space entry, retrieval equipment, and air monitoring

3.4.2.1 Tier II Inlet, Manhole, and Tidal Exclusion Vault Inspection Procedures

The location of the inlets, manholes, and tidal exclusion vaults for each of the six priority storm drains are shown on Figures 2 through 7. Following are the procedures for inspection:

1) Record observations made during inspections on the Tier II Manhole/Inlet/Vault Inspection Digital Form (Appendix B). Ensure the nature of the damage and its location are described in sufficient detail and use standard nomenclature so that maintenance repairs can be developed and tracked. Take a photograph of the damage and append the photograph file in jpeg format to the corresponding digital entry.
2) With approved confined space entry procedures, enter structure, visibly inspect the surface of the high-density polyethylene liner and welds for structural damage, including holes, cracks, tears, and weld separations.
3) Inspect all surfaces of the liner and field welds for active groundwater intrusion. Provide additional description of groundwater intrusion to assist in relocating area for repair (weep, pooling water, calcification, etc.).
4) Check liner for separation from the host manhole walls.
5) Check all lined surfaces for bulges or signs of water buildup behind the liner material.
6) Inspect the transition area between the lined structure and the pipe liner for active groundwater intrusion or separation.
7) Inspect the chimney parging for cracking, spalling, and active groundwater intrusion.
8) Inspect the transition strip mechanical seal for cracking or active groundwater intrusion.
9) Inspect the tidal exclusion vault flap gate or duck bill valve for cracking and proper operation.

3.4.2.2 Tier II Lined Pipe Inspection Procedures

The manhole and catch basins are typically connected by varying sizes of bell and socket reinforced concrete pipe ranging in size from 15 inches to 96 inches in diameter. The location and label of each pipe section for each of the six priority drains are shown on Figures 2 through 7. The following procedures should be followed:

1) Record observations made during inspections on the Tier II Pipe Section Inspection Form (Appendix B). If conducting a visual inspection of the pipe section, take a photograph of the damage and append the photograph file in jpeg format to the corresponding digital entry. If the pipe section is inspected via CCTV, append a screen capture of the video in jpeg format showing the damaged area.

2) Inspect pipe sections greater than or equal to 48 inches visually unless physical access is restricted, or conditions are not conducive to safe entry. Inspect smaller piping remotely by CCTV.
3) For visual inspection, upon entry into the manhole/inlet, set the measuring wheel to 0 feet at the downstream reference manhole/inlet. When a condition is observed, record the location using the distance from the reference manhole/inlet and the radial circumferential position measured in clock positions, looking upstream. For CCTV inspections, the camera will automatically log distance from the reference manhole/inlet. For both visual and CCTV inspections, the zero-reference point is typically the point where the pipe enters the manhole/inlet. The pipe inspector will always be present with the CCTV operator during the inspection to record data on the Tier II Pipe Section Inspection Digital Form.
4) Inspect the liner for signs of structural damage, including cracking, holes, tears, delamination (for cured-in-place pipe liners only), and seam or weld separation.
5) Inspect the liner for active groundwater intrusion. Provide additional description of groundwater intrusion to assist in relocating the area for repair (weep, pooling water, calcification, etc.).
6) Check liner for separation from the host pipe.
7) Check liner for bulges or signs of water buildup behind the liner.
8) Inspect spiral pipe rehabilitation (SPR) grout injection port locations for active groundwater intrusion and separation.
9) Inspect SPR and Expanda profile butt joints for groundwater intrusion and separation.
10) Inspect the liner for signs of radial compression, exhibited by reduction in inside diameter of the pipeline.
11) Monitor deformation of the host piping by laser profiling or manually measuring sections of piping where deformation has historically been observed and new areas where radial compression was observed during the current visual and CCTV inspection.

3.5 Geographic Information System

The existing, computer-based GIS model for DMT will be used to develop base maps, figures, and other data summaries showing, as required, the locations, limits, coordinates, and other pertinent data for operating areas, roadways, structures, utilities, and other points of interest. Inspection and repair data will be added to the GIS database using relative distances from named inlet and manhole structures. The DMT GIS model will be used as the basis for illustrating and documenting storm drain system inspection and maintenance information.

3.6 Field Documentation

Electronic digital inspection forms will be completed in the field using a tablet device for upload to a storm drain inspection database. Storm drain inspection results will be reviewed for preventive maintenance repair planning and inspection report preparation. When inspecting storm drains, the procedures listed below will be followed.

1) Complete the digital inspection forms by noting the storm drain designation, identified issue, and relative location.
2) Annotate the GIS base map to show the location of each identified issue.
3) Prepare an inspection summary for each storm drain system that includes all locations requiring repair.

4. Storm Drain Maintenance

4.1 Maintenance

Upon discovery of a condition requiring repair to the liner system, liner repairs will be completed within 45 calendar days unless circumstances are identified that will require additional time for completion. Conditions requiring structural repair to the host pipe or inlet and manhole structures may require preparation of design drawings and specifications and may take longer than 45 days to complete. Reasonable means to expedite repairs will be made to effectively complete the repairs following the inspections.

Parts and materials necessary to complete typical and minor maintenance repairs, such as small cracks, transition strip separation, pinhole leaks, or other items, will be maintained onsite so that these issues can be mitigated following the inspection. More significant types of maintenance repairs, such as transition strip damage that requires replacement, will be undertaken by specialty contractors. In such instances, development of an engineering design and specifications may be necessary.

4.2 Stormwater Management During Repairs

Retained, non-impacted water will be removed as needed by pumping the water downstream of the tidal exclusion vault or outfall basin for discharge to the river. Impacted stormwater will be collected during repair activities and transported to the onsite groundwater treatment plant or to an approved disposal facility.

4.3 Field Documentation

Electronic digital work completion will be completed in the field using a tablet device for upload to a storm drain database. Storm drain repairs will be documented on the appropriate inspection form. Following repairs, a follow-up inspection shall be performed no later than 6-months after completion of the repair.

5. Storm Drain Deformation Monitoring

5.1 Purpose

At the DMT, pipe deformation (particularly springline compression) is typically the result of lateral COPR movement. Collected data typically includes measurements of horizontal and vertical diameters that can be used to determine whether COPR expansion may be impinging on the outside of the pipe and the rate of pipe compression. Historically, these data have been used to assess the condition of the pipe, length of strain relief measures and pipe protection needed, and long-term effectiveness of strain relief trench measures that have been installed. As part of the Tier II inspections, deformation monitoring via laser profiling or manual measurements will be performed on sections of piping where deformation has historically been observed and new areas where radial compression was observed during the Tier II visual or CCTV inspections. Sections of piping where deformation has historically been observed are described in Section 5.4.

5.2 Laser Profiling in Storm Drains

Laser profiling consists of scanning the inside surface of a pipe using an array of remotely operated optical and acoustical sensors to produce a three-dimensional point cloud data set. The data is processed to derive radial dimensions. Each laser profiling scan represents a “snapshot” in time. The location and rate of pipe deformation is determined by comparing repeated scans over time.

The complete data set from each scan includes spreadsheets of pipe radii, ovality, and other parameters at frequent intervals along the pipe length. The laser profiling summary reports typically include descriptions of inspection methods, photographs, and plots of horizontal diameter, vertical diameter, ovality (percent deviation of horizontal and vertical diameters from one another), and deviation from the pipe’s design diameter (sometimes termed “buildup” and “corrosion” to denote a decrease or increase, respectively from the design diameter).

To allow comparison of repeat laser profiling scans, the data provided are converted to a common reference (stationing) system based on the location of the farthest downstream structure, and scans performed on different dates are plotted on the same graph. Data are plotted in two ways: pipe dimensions and ovality with station, and deviation from the theoretical horizontal and vertical diameter with station.

The first scan performed in a length of pipe is the baseline scan for that length, performed in the first year of implementation of the storm drain inspection and maintenance plan of the PMP. To provide repeatability for subsequent scans, the following items are documented for each survey, including the baseline:

- Description of zero-reference point identifiable to 0.1 feet precision (typically, the point where the pipe enters the farthest downstream manhole/inlet)
- Frequency (spacing) of dimension measurements along the length and circumference of the pipe
- Precision of dimension measurements

5.3 Manual Measurement in Storm Drains

In pipes large enough for physical entry, manual measurements of pipe inside dimensions are performed on an as-needed basis. Crown-to-invert height is typically measured using a rigid bar of known length to penetrate bottom sediment combined with a stick ruler to the crown. A prefabricated steel “T” bar with a length equal to the pipe radius may be used to facilitate and improve repeatability of height and springline width measurements. The measuring bar also serves as a useful tool to dislodge silt cake / scale and to sound the pipe wall for delamination of the liner or concrete delamination in the underlying host pipe.

Manual measurements are typically performed at 25- to 50-foot intervals along the length of the pipe, with more frequent measurements at locations of known historic deformation or other conditions of concern. The magnitude and rate of pipe deformation is determined by comparing measurements taken over time. Consistency of location, method, and alignment (that is, plumbness of height measurements and perpendicularity of width measurements) of measurements is important to allow successive measurements to be compared.

5.4 Monitored Pipe Sections

At a minimum, the following pipe sections where deformation was observed prior to lining or rehabilitation will be monitored in conjunction with Tier II inspections.

- 12.5th Street storm drain—upstream of manhole MH-311, bumper pipe strain relief installed during rehabilitation
- 13th Street storm drain—trunkline section between tidal exclusion vault TEV-002 and manhole MH-314
- 13.5th Street storm drain—all piping upstream of tidal exclusion vault TEV-001, bumper pipe strain relief installed during rehabilitation
- 14th Street storm drain—trunkline section between manholes MH-319 and MH-320
- 15th Street storm drain—trunkline section between outfall basin EW-125 and manhole MH-339 (SRT protection installed), trunkline section between manholes MH-483 and MH-351, trunkline section between manholes MH-482 and MH-352

6. Reporting

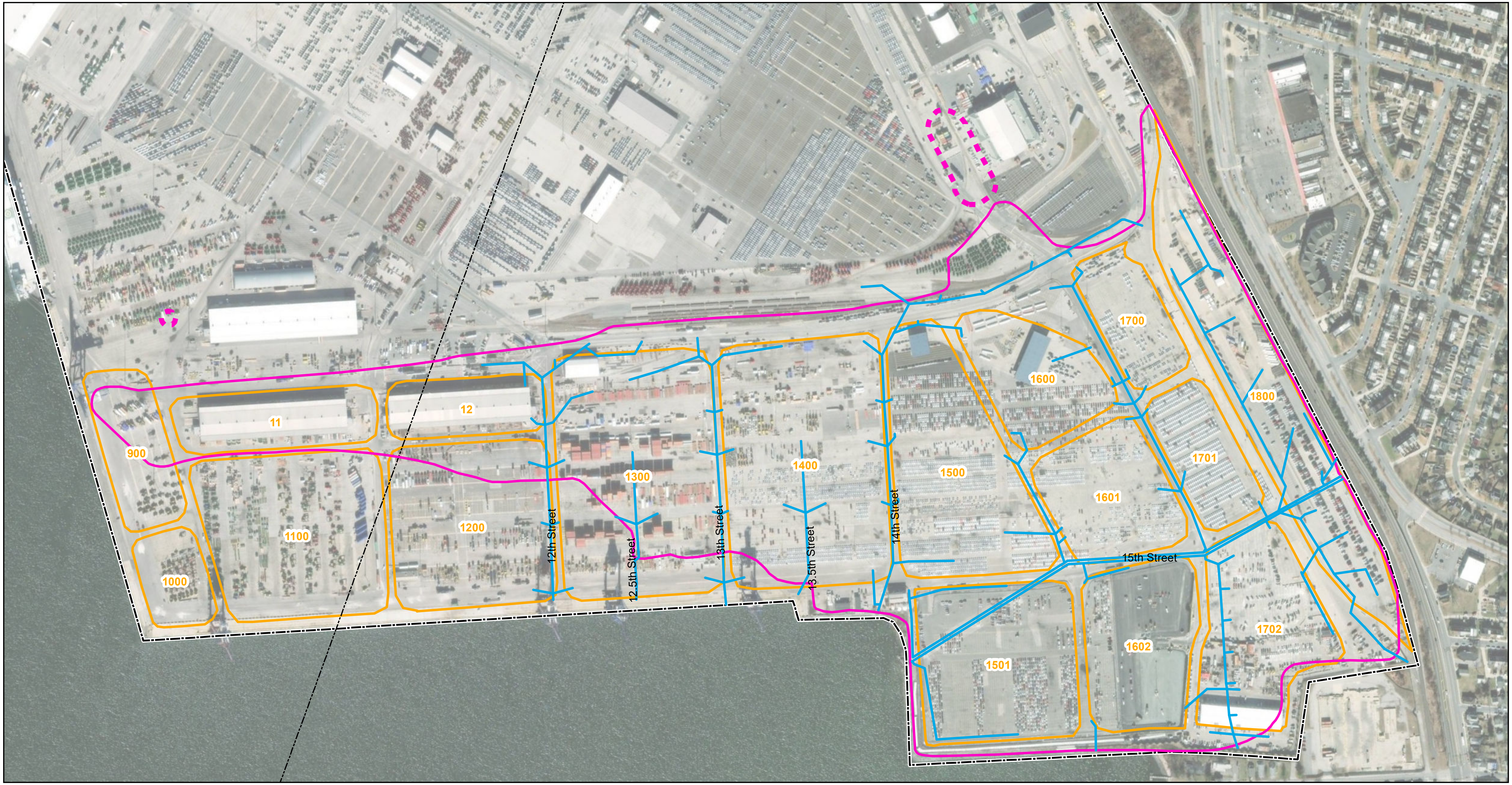
If chromium-impacted flow is observed during a PMP Tier I or Tier II inspection, MPA will be notified by Honeywell, and MPA will report the flow to the MDE under the MS4 program as applicable. If chromium-impacted dry-weather flow is observed by MPA during an MS4 inspection, Honeywell will be notified by MPA, and a partial Tier II inspection will be performed to determine and eliminate the source of the flow. Honeywell will provide notification to MPA of all planned Tier I and Tier II inspections.

An annual storm drain inspection and maintenance report documenting all storm drain inspection results, maintenance, and repairs will be prepared and submitted to MDE. This annual report will take the place of the Storm Drain Rehabilitation Schedule currently being provided to MDE on behalf of Honeywell and the MPA.

At a minimum, each annual report will include the following information:

- Dates of inspection(s) for each storm drain
- A summary of inspection procedures and results
- List of specific areas (table format) requiring maintenance or repair, including location, description, disposition status, and proposed repair method
- Completed repair location tables and figures for each storm drain including repair method used to complete the repair
- As-built drawings and specifications for more significant repairs, as appropriate
- Photos, if applicable
- Summary laser profiling reports and comparison plots, if applicable
- Appendix including the inspection data sheets

Figures



Legend

— Priority Storm Drain System

-·-·- City/County Boundary

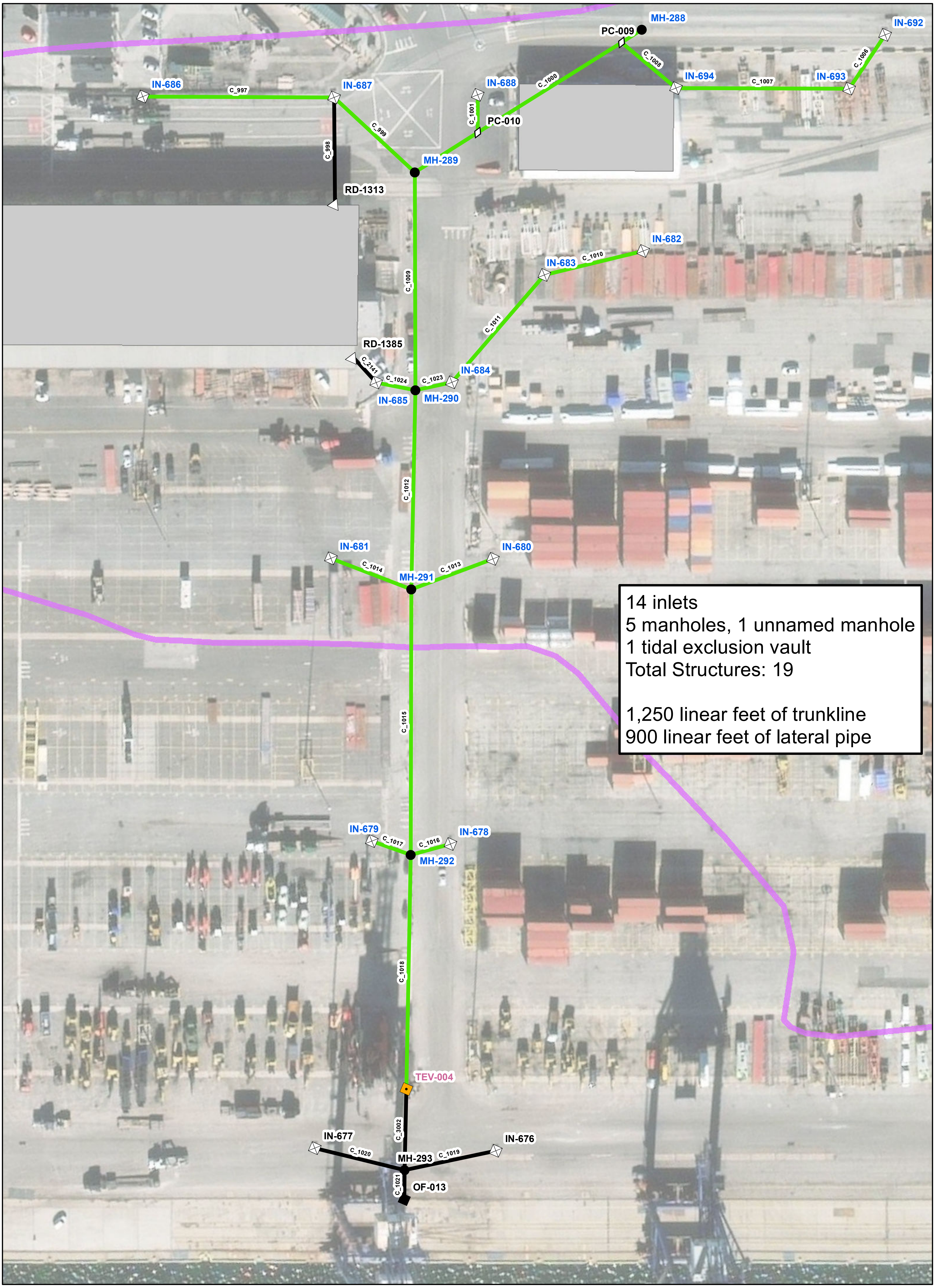
▪ ▪ Approximate COPR Extent

☐ COPR Extent

☐ Areas

☐ DMT Boundary

Figure 1
COPR Fill Area
Dundalk Marine Terminal
Baltimore, Maryland



14 inlets
5 manholes, 1 unnamed manhole
1 tidal exclusion vault
Total Structures: 19

1,250 linear feet of trunkline
900 linear feet of lateral pipe

Legend

Structure Type
- ☒ IN - Inlet
- ● MH - Manhole
- ■ OF - Outfall
- ◊ PC - Pipe Connection
- △ RD - Roof Drain Connection
- 🟧 TEV - Tidal Exclusion Vault

Pipe Section
- ━ Pipe Section
- ━ Abandoned
- ━ Rehabilitated
- ━ Rehabilitated *Movement Monitoring*

C-1009

Lining Status
- ☒ **HDPE Lined**
- 🟧 **HDPE Lined Replacment**

0 25 50 100
Feet

▨ Buildings
▭ COPR Boundary

Figure 2
12th Street Storm Drain System
Dundalk Marine Terminal
Baltimore, Maryland

Jacobs

3 inlets
1 manhole
1 tidal exclusion vault
~400 linear feet of pipe
Total Structures: 4

Legend

Structure Type

- ☒ IN - Inlet
- ● MH - Manhole
- ■ OF - Outfall
- ◊ PC - Pipe Connection
- △ RD - Roof Drain Connection
- 🟧 TEV - Tidal Exclusion Vault

Pipe Section

- Pipe Section
- Abandoned
- Rehabilitated
- Rehabilitated *Movement Monitoring* C-1009

Lining Status

- ☒ Abandoned
- ☒ HDPE Lined
- 🟧 HDPE Lined Replacment

- ▭ Buildings
- ▭ COPR Boundary

0 15 30 60
Feet

Figure 3
12.5th Street Storm Drain System
Dundalk Marine Terminal
Baltimore, Maryland

Jacobs

12 inlets
4 manholes, 1 unnamed manhole
~800 linear feet of trunkline
~900 linear feet of lateral pipe
Total Structures: 17

Legend

Structure Type
- ☒ IN - Inlet
- ● MH - Manhole
- ■ OF - Outfall
- ◊ PC - Pipe Connection
- △ RD - Roof Drain Connection
- 🟧 TEV - Tidal Exclusion Vault

Pipe Sections
- — Pipe Section
- — Abandoned
- — Rehabilitated
- — Rehabilitated *Movement Monitoring* C-1009

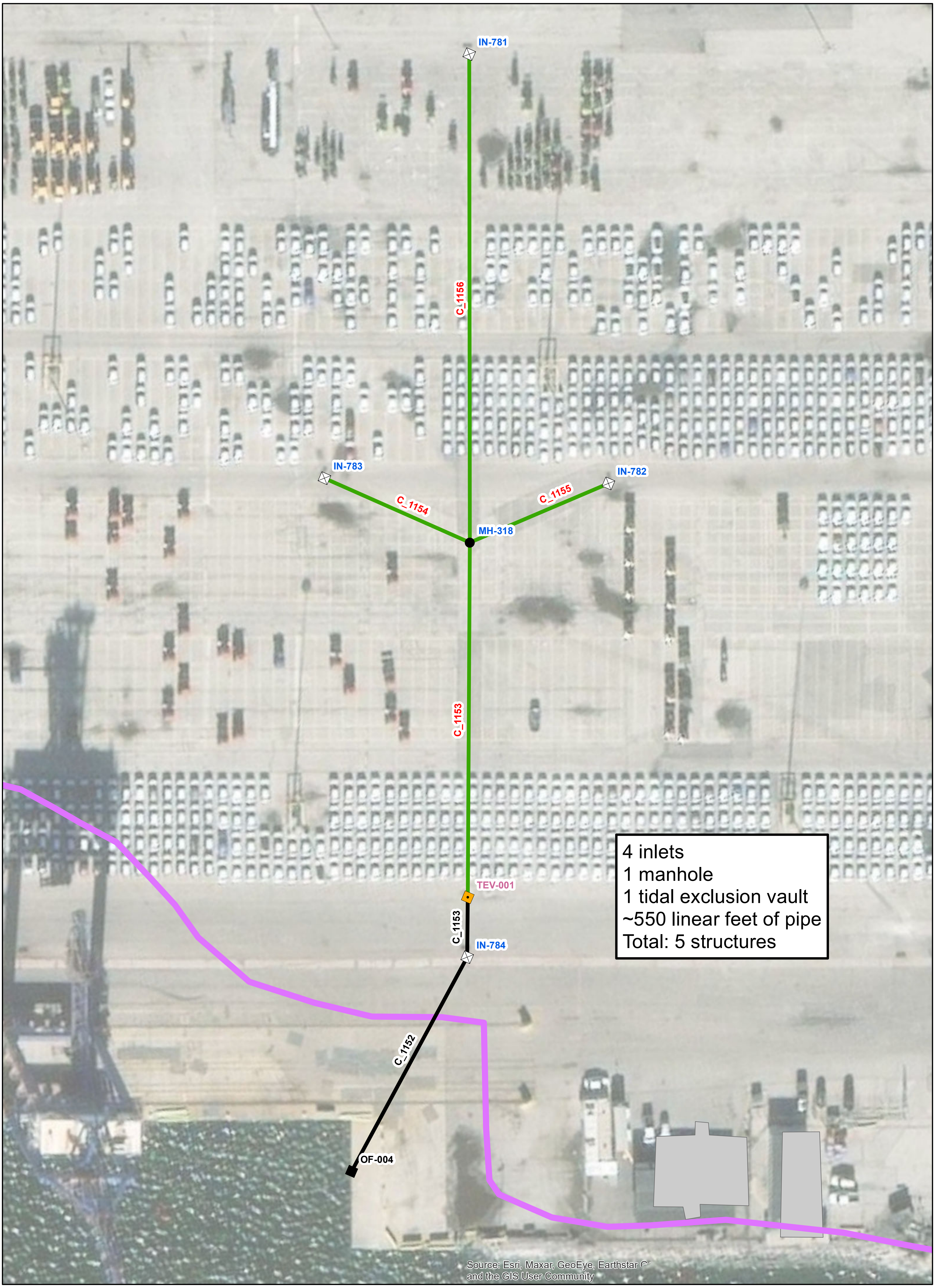
Lining Status
- ☒ Abandoned
- ☒ HDPE Lined
- 🟧 HDPE Lined Replacment

- ▨ Buildings
- ▭ COPR Boundary

0 25 50 100
Feet

Figure 4
13th Street Storm Drain System
Dundalk Marine Terminal
Baltimore, Maryland

Jacobs



4 inlets
1 manhole
1 tidal exclusion vault
~550 linear feet of pipe
Total: 5 structures

Legend

Structure Type

- ☒ IN - Inlet
- ● MH - Manhole
- ■ OF - Outfall
- ◊ PC - Pipe Connection
- △ RD - Roof Drain Connection
- 🟧 TEV - Tidal Exclusion Vault

Pipe Section

- Pipe Section
- Abandoned
- Rehabilitated
- Rehabilitated *Movement Monitoring* C-1009

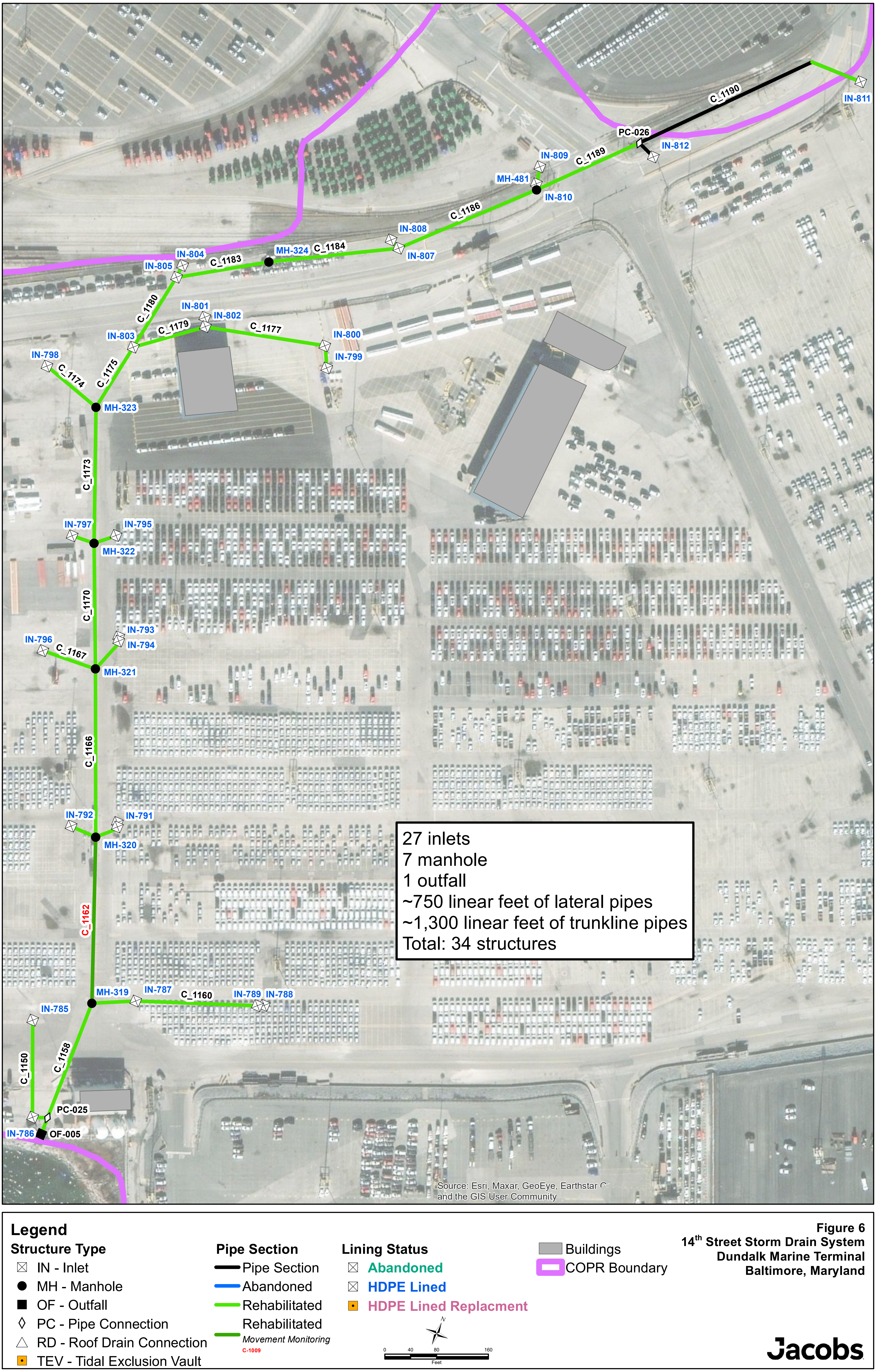
Lining Status

- ☒ **Abandoned**
- ☒ **HDPE Lined**
- 🟧 **HDPE Lined Replacment**

- ▨ Buildings
- COPR Boundary

Figure 5
13.5th Street Storm Drain System
Dundalk Marine Terminal
Baltimore, Maryland

Jacobs



27 inlets
7 manhole
1 outfall
~750 linear feet of lateral pipes
~1,300 linear feet of trunkline pipes
Total: 34 structures

Source: Esri, Maxar, GeoEye, Earthstar G
and the GIS User Community

Figure 6
14th Street Storm Drain System
Dundalk Marine Terminal
Baltimore, Maryland

Annotation	DMT_ID
A1	DMT_C_1303
A2	DMT_C_1212
A3	DMT_C_1270
A4	DMT_C_1259
A5	DMT_C_2200
B1	DMT_C_1316
B2	DMT_C_1215
B3	DMT_C_1266
B4	DMT_C_1225
B5	DMT_C_1309
C1	DMT_C_1304
C2	DMT_C_1220
C3	DMT_C_2046
C4	DMT_C_1260
C5	DMT_C_1312
D1	DMT_C_1228
D2	DMT_C_1222
D3	DMT_C_1263
D4	DMT_C_2188
D5	DMT_C_1279
E1	DMT_C_1223
E2	DMT_C_1231
E3	DMT_C_1205
E4	DMT_C_1262
E5	DMT_C_1274

Annotation	DMT_ID
F2	DMT_C_1238
F3	DMT_C_1203
F4	DMT_C_1284
F5	DMT_C_2049
G1	DMT_C_1218
G2	DMT_C_1237
G3	DMT_C_1198
G4	DMT_C_1285
G5	DMT_C_1197
H1	DMT_C_1207
H2	DMT_C_1236
H3	DMT_C_1194
H4	DMT_C_1265
H5	DMT_C_2048
I1	DMT_C_1313
I2	DMT_C_1239
I3	DMT_C_1195
I4	DMT_C_1264
I5	DMT_C_1204
J1	DMT_C_1283
J2	DMT_C_1240
J3	DMT_C_1196
J4	DMT_C_1233
J5	DMT_C_2209
K1	DMT_C_1277

Annotation	DMT_ID
K2	DMT_C_1241
K3	DMT_C_1197
K4	DMT_C_1235
K5	DMT_C_2045
L1	DMT_C_1278
L2	DMT_C_1242
L3	DMT_C_1193
L4	DMT_C_1316
L5	DMT_C_1275
M1	DMT_C_1269
M2	DMT_C_1232
M3	DMT_C_1192
M4	DMT_C_1299
M5	DMT_C_1293
N1	DMT_C_1297
N2	DMT_C_1234
N3	DMT_C_1191
N4	DMT_C_1298
N5	DMT_C_1310
O1	DMT_C_1287
O2	DMT_C_1230
O3	DMT_C_1202
O4	DMT_C_1200
O5	DMT_C_2052
P1	DMT_C_1314

Annotation	DMT_ID
P2	DMT_C_1229
P3	DMT_C_1268
P4	DMT_C_1199
P5	DMT_C_1251
Q1	DMT_C_1312
Q2	DMT_C_1281
Q3	DMT_C_1267
Q4	DMT_C_1226
R1	DMT_C_1219
R2	DMT_C_1280
R3	DMT_C_1274
R4	DMT_C_1201
S1	DMT_C_1217
S2	DMT_C_1279
S3	DMT_C_1272
S4	DMT_C_1282
T1	DMT_C_1216
T2	DMT_C_1301
T3	DMT_C_1271
T4	DMT_C_1292
U1	DMT_C_1214
U2	DMT_C_1300
U3	DMT_C_1276
U4	DMT_C_1315
V1	DMT_C_1213

Annotation	DMT_ID
V2	DMT_C_1291
V3	DMT_C_1295
W1	DMT_C_1211
W2	DMT_C_1290
W3	DMT_C_1294
W4	DMT_C_1288
X1	DMT_C_1210
X2	DMT_C_1289
X3	DMT_C_1296
X4	DMT_C_1306
Y1	DMT_C_1209
Y2	DMT_C_1286
Y3	DMT_C_1284
Y4	DMT_C_1307
Z1	DMT_C_1208
Z2	DMT_C_1273
Z3	DMT_C_1258
Z4	DMT_C_1306

A - 4 manholes
B - 4 manholes
C - 1 manhole, 1 inlet
D - 1 manhole, 5 linlets
E - 3 inlets
F - 4 manholes, 7 inlets
G - 6 manholes, 9 inlets
H - 7 manhoels, 15 inlets
J - 2 inlets
K - 1 inlet
L - 3 manholes, 14 inlets
M - 1 manhole, 13 inlets
Total: 101 Structures
3-4 miles of piping

Legend

Structure Type
- ⊡ EW - Endwall
- ☒ IN - Inlet
- ● MH - Manhole
- ■ OF - Outfall
- ◊ PC - Pipe Connection
- △ RD - Roof Drain Connection

Pipe Sections
- Pipe Section
- Abandoned
- Rehabilitated
- Rehabilitated *Movement Monitoring* C-1009

Lining Status
- ☒ **Abandoned**
- ☒ **HDPE Lined**
- ● **HDPE Lined Replacment**

- ▨ Buildings
- ▭ COPR Boundary
- 🟩 Decon Pad

Figure 7
15th Street Storm Drain System
Dundalk Marine Terminal
Baltimore, Maryland

Jacobs

Appendix A
Tier I Inspection Forms

Tier I Storm Drain Groundwater Intrusion Inspection Digital Form

Storm Drain System (circle one) **12** **12.5** **13** **13.5** **14** **15**
Date ____________________
Inspector's Initials ____________________
Date of Last Rain Event ____________________

	Left Lateral			**Right Lateral**			**Upstream Pipe**			
Component ID (Trunk Line Manholes)	Flow (Y/N) (Note 1)	Groundwater Intrusion (Notes 2,3,4)	CCTV Required (Y/N) (Note 5)	Flow (Y/N) (Note 1)	Groundwater Intrusion (Notes 2,3,4)	CCTV Required (Y/N) (Note 5)	Flow (Y/N) (Note 1)	Groundwater Intrusion (Notes 2,3,4)	CCTV Required (Y/N) (Note 5)	Comments (Note 6)

Notes -

1. Open each trunk line manhole and observe the presence or absence of dry weather flow entering the structure from the left and right laterals, and upstream piping.
2. If flow is observed, determine the upstream storm drain component (inlet, manhole, or pipe section) associated with the location of the groundwater intrusion.
3. A separate digital form will be used to further describe the groundwater intrusion including exact location, subcomponent (i.e., liner, weld, transition strip, mechanical seal), and type of damage (i.e., hole, tear, crack, separation)
4. Take a photograph or video screen capture of each groundwater intrusion location.
5. If the source of the groundwater intrusion is located in a small diameter pipe section, indicate that a CCTV inspection will be required to determine the exact location and type of damage.
6. Complete the comments column as needed.

.

Appendix B
Tier II Inspection Forms

Tier II Storm Drain Inlet, Manhole, Vault Inspection Digital Form

Storm Drain System (circle one) **12 12.5 13 13.5 14 15**

Storm Drain Component ____________________

Date ____________________

Inspector's Initials ____________________

Date of Last Rain Event ____________________

Structure Dewatered **Y N**

Structure Clean **Y N**

Item Number (Note 1)	**Location** (Notes 2,3)									**Subcomponent** (Note 2)											**GW Intrusion** (Note 2)					**Structural** (Note 2)									**Photo** (Note 4)	**Comment** (Note 5)
	US	DS	Left	Right	Floor	Wall	CE	CH	O	HS	CP	L	LW	LG	TS	TSA	TSW	MS	FG	O	GI	WP	PW	CA	O	H	CR	SP	SE	WS	BU	C	OP	O		
	US	DS	Left	Right	Floor	Wall	CE	CH	O	HS	CP	L	LW	LG	TS	TSA	TSW	MS	FG	O	GI	WP	PW	CA	O	H	CR	SP	SE	WS	BU	C	OP	O		
	US	DS	Left	Right	Floor	Wall	CE	CH	O	HS	CP	L	LW	LG	TS	TSA	TSW	MS	FG	O	GI	WP	PW	CA	O	H	CR	SP	SE	WS	BU	C	OP	O		
	US	DS	Left	Right	Floor	Wall	CE	CH	O	HS	CP	L	LW	LG	TS	TSA	TSW	MS	FG	O	GI	WP	PW	CA	O	H	CR	SP	SE	WS	BU	C	OP	O		
	US	DS	Left	Right	Floor	Wall	CE	CH	O	HS	CP	L	LW	LG	TS	TSA	TSW	MS	FG	O	GI	WP	PW	CA	O	H	CR	SP	SE	WS	BU	C	OP	O		
	US	DS	Left	Right	Floor	Wall	CE	CH	O	HS	CP	L	LW	LG	TS	TSA	TSW	MS	FG	O	GI	WP	PW	CA	O	H	CR	SP	SE	WS	BU	C	OP	O		
	US	DS	Left	Right	Floor	Wall	CE	CH	O	HS	CP	L	LW	LG	TS	TSA	TSW	MS	FG	O	GI	WP	PW	CA	O	H	CR	SP	SE	WS	BU	C	OP	O		
	US	DS	Left	Right	Floor	Wall	CE	CH	O	HS	CP	L	LW	LG	TS	TSA	TSW	MS	FG	O	GI	WP	PW	CA	O	H	CR	SP	SE	WS	BU	C	OP	O		
	US	DS	Left	Right	Floor	Wall	CE	CH	O	HS	CP	L	LW	LG	TS	TSA	TSW	MS	FG	O	GI	WP	PW	CA	O	H	CR	SP	SE	WS	BU	C	OP	O		
	US	DS	Left	Right	Floor	Wall	CE	CH	O	HS	CP	L	LW	LG	TS	TSA	TSW	MS	FG	O	GI	WP	PW	CA	O	H	CR	SP	SE	WS	BU	C	OP	O		
	US	DS	Left	Right	Floor	Wall	CE	CH	O	HS	CP	L	LW	LG	TS	TSA	TSW	MS	FG	O	GI	WP	PW	CA	O	H	CR	SP	SE	WS	BU	C	OP	O		
	US	DS	Left	Right	Floor	Wall	CE	CH	O	HS	CP	L	LW	LG	TS	TSA	TSW	MS	FG	O	GI	WP	PW	CA	O	H	CR	SP	SE	WS	BU	C	OP	O		
	US	DS	Left	Right	Floor	Wall	CE	CH	O	HS	CP	L	LW	LG	TS	TSA	TSW	MS	FG	O	GI	WP	PW	CA	O	H	CR	SP	SE	WS	BU	C	OP	O		
	US	DS	Left	Right	Floor	Wall	CE	CH	O	HS	CP	L	LW	LG	TS	TSA	TSW	MS	FG	O	GI	WP	PW	CA	O	H	CR	SP	SE	WS	BU	C	OP	O		
	US	DS	Left	Right	Floor	Wall	CE	CH	O	HS	CP	L	LW	LG	TS	TSA	TSW	MS	FG	O	GI	WP	PW	CA	O	H	CR	SP	SE	WS	BU	C	OP	O		
	US	DS	Left	Right	Floor	Wall	CE	CH	O	HS	CP	L	LW	LG	TS	TSA	TSW	MS	FG	O	GI	WP	PW	CA	O	H	CR	SP	SE	WS	BU	C	OP	O		
	US	DS	Left	Right	Floor	Wall	CE	CH	O	HS	CP	L	LW	LG	TS	TSA	TSW	MS	FG	O	GI	WP	PW	CA	O	H	CR	SP	SE	WS	BU	C	OP	O		
	US	DS	Left	Right	Floor	Wall	CE	CH	O	HS	CP	L	LW	LG	TS	TSA	TSW	MS	FG	O	GI	WP	PW	CA	O	H	CR	SP	SE	WS	BU	C	OP	O		
	US	DS	Left	Right	Floor	Wall	CE	CH	O	HS	CP	L	LW	LG	TS	TSA	TSW	MS	FG	O	GI	WP	PW	CA	O	H	CR	SP	SE	WS	BU	C	OP	O		
	US	DS	Left	Right	Floor	Wall	CE	CH	O	HS	CP	L	LW	LG	TS	TSA	TSW	MS	FG	O	GI	WP	PW	CA	O	H	CR	SP	SE	WS	BU	C	OP	O		

Notes -

1. Enter sequencial item number for each location where groundwater instrusion or structural damage is observed.
2. Describe the location, subcomponent, and observation by circling all applicable fields.
3. Left and right location descriptions are referenced looking upstream.
4. Take a photograph for each issue.
5. Complete the comments column as needed.

Key -

Location
US - Upstream
DS - Downstream
CE - Ceiling
CH - Chimney
O - Other

Subcomponent
HS - Host structure
CP - Chimney parging
L - Liner
LW - Liner weld
LG - Liner grout
TS - Transition strip
TSA - Transition strip adhesive
TSW - Transition strip weld
MS - Mechanical Seal
FG - Flap gate or duck bill valve
O - Other

GW Intrusion
GI - Active Groundwater Intrusion
WP - Weep
PW - Pooling Water
CA - Calcification
O - Other

Structural
H - Hole
CR - Crack or tear
SP - Spalling
SE - Seperation of liner
WS - Weld separation
BU - Bulge in liner
C - Compression of host structure
OP - Operation
O - Other

.

Tier II Storm Drain Pipe Section Inspection Digital Form

Storm Drain System (circle one) **12** **12.5** **13** **13.5** **14** **15**

Storm Drain Component ____________________

Date ____________________

Inspector's Initials ____________________

CCTV Contractor (if applicable) ____________________

Date of Last Rain Event ____________________

Line Dewatered **Y** **N**

Line Clean **Y** **N**

	Location																												
Item Number (Notes 1,2)	**Start Longitudinal Distance (feet)** (Note 3)	**End Longitudinal Distance (feet)** (Note 3)	**Start Radial Position (clock)** (Note 4)	**End Radial Position (clock)** (Note 4)	**Subcomponent** (Note 5)								**GW Intrusion** (Note 5)					**Structural** (Note 5)								**Photo** (Note 6)	**Springline** (Note 7)	**Crown to Invert** (Note 8)	**Comment** (Note 9)
					HP	L	J	JW	SE	GP	MS	O	GI	WP	PW	CA	O	H	CR	DL	SE	WS	BU	C	O				
					HP	L	J	JW	SE	GP	MS	O	LK	WP	PW	CA	O	H	CR	DL	SE	WS	BU	C	O				
					HP	L	J	JW	SE	GP	MS	O	LK	WP	PW	CA	O	H	CR	DL	SE	WS	BU	C	O				
					HP	L	J	JW	SE	GP	MS	O	LK	WP	PW	CA	O	H	CR	DL	SE	WS	BU	C	O				
					HP	L	J	JW	SE	GP	MS	O	LK	WP	PW	CA	O	H	CR	DL	SE	WS	BU	C	O				
					HP	L	J	JW	SE	GP	MS	O	LK	WP	PW	CA	O	H	CR	DL	SE	WS	BU	C	O				
					HP	L	J	JW	SE	GP	MS	O	LK	WP	PW	CA	O	H	CR	DL	SE	WS	BU	C	O				
					HP	L	J	JW	SE	GP	MS	O	LK	WP	PW	CA	O	H	CR	DL	SE	WS	BU	C	O				
					HP	L	J	JW	SE	GP	MS	O	LK	WP	PW	CA	O	H	CR	DL	SE	WS	BU	C	O				
					HP	L	J	JW	SE	GP	MS	O	LK	WP	PW	CA	O	H	CR	DL	SE	WS	BU	C	O				
					HP	L	J	JW	SE	GP	MS	O	LK	WP	PW	CA	O	H	CR	DL	SE	WS	BU	C	O				
					HP	L	J	JW	SE	GP	MS	O	LK	WP	PW	CA	O	H	CR	DL	SE	WS	BU	C	O				
					HP	L	J	JW	SE	GP	MS	O	LK	WP	PW	CA	O	H	CR	DL	SE	WS	BU	C	O				
					HP	L	J	JW	SE	GP	MS	O	LK	WP	PW	CA	O	H	CR	DL	SE	WS	BU	C	O				
					HP	L	J	JW	SE	GP	MS	O	LK	WP	PW	CA	O	H	CR	DL	SE	WS	BU	C	O				
					HP	L	J	JW	SE	GP	MS	O	LK	WP	PW	CA	O	H	CR	DL	SE	WS	BU	C	O				
					HP	L	J	JW	SE	GP	MS	O	LK	WP	PW	CA	O	H	CR	DL	SE	WS	BU	C	O				
					HP	L	J	JW	SE	GP	MS	O	LK	WP	PW	CA	O	H	CR	DL	SE	WS	BU	C	O				
					HP	L	J	JW	SE	GP	MS	O	LK	WP	PW	CA	O	H	CR	DL	SE	WS	BU	C	O				
					HP	L	J	JW	SE	GP	MS	O	LK	WP	PW	CA	O	H	CR	DL	SE	WS	BU	C	O				

Notes -

1. Enter sequencial item number for each location where groundwater instrusion or structural damage is observed.
2. Inspections are conducted from downstream to upstream from the reference inlet, manhole, or vault structure.
3. Longitudinal distances are measured from the downstream inlet, manhole, or vault structure.
4. Radial positions should be identified using clock positions looking upstream.
5. Describe the location, subcomponent, and observation by circling all applicable fields.
6. Take a photograph or video screen capture of each observation.
7. Measure springline distance using "T" bar as described in Section 5.1.3.
8. Measure crown to invert distance using "T" bar described in Section 5.1.3.
9. Complete the comments column as needed.

Key -

Subcomponent
HP - Host pipe
L - Liner
J - Joint
JW - Joint weld
S - Seam
GP - Grout port
MS - Mechanical Seal
O - Other

GW Intrusion
GI - Active Groundwater Intrusion
WP - Weep
PW - Pooling water
CA - Calcification
O - Other

Structural
H - Hole
CR - Crack or tear
DL - Delamination (CIPP liner only)
SE - Seperation of liner
WS - Weld or seam seperation
BU - Bulge in liner
C - Compression of host structure
O - Other

Appendix B

Surface Cover Inspection and Maintenance, and Movement Monitoring Plan

Performance Management Program
Surface Cover Inspection and Maintenance Plan

Dundalk Marine Terminal
Baltimore, Maryland

Prepared for

Honeywell

115 Tabor Road
Morris Plains, New Jersey 07950

and

Maryland Port Administration

401 East Pratt St.
Baltimore, Maryland

Prepared by

Jacobs

Jacobs Engineering
2411 Dulles Corner Park Suite #500
Herndon, VA 20171

March 2023

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1. Introduction

This Surface Cover Inspection and Maintenance Plan is an integrated component of the overall Performance Management Program (PMP) for the long-term monitoring and maintenance of the remedy being implemented at the Dundalk Marine Terminal (DMT).

Pursuant to the Consent Decree among the Maryland Department of the Environment (MDE), the Maryland Port Administration (MPA), and Honeywell International (Honeywell), and the Corrective Measures Alternatives Analysis required by the Consent Decree, MDE has approved an Enhanced Isolation and Containment remedy for the Site. The Enhanced Isolation and Containment remedy includes a requirement to maintain and repair the asphalt pavement surface cover in the chromium ore processing residue (COPR) fill area and a PMP to confirm and monitor the long-term effectiveness of the surface cover. This Surface Cover Inspection and Maintenance Plan fulfills the PMP requirements regarding the Enhanced Isolation and Containment remedy's surface cover portion.

This plan outlines the ongoing surface cover inspection and maintenance that Honeywell and MPA will undertake to maintain protection of the surface cover system. Ongoing inspection is necessary to identify damage to the surface cover and forms the basis for repairs and maintenance that must be implemented to ensure the integrity of the cap and its continued effectiveness.

The approach outlined in this plan for performing surface cover inspection and maintenance follows the plan described in the August 2007 *Surface Cover and 14th and 15th Streets Drain Inspection and Maintenance Plan* (SCMP), which was submitted to the MDE pursuant to Section III.B.4 of the Consent Decree. Following the baseline surface cover inspection documented in the September 2007 *Surface Cover System Baseline Inspection Report, Dundalk Marine Terminal*, the inspection frequency was changed from semiannual to annual based on observations that the cover system at DMT did not erode or deteriorate as quickly as soil cover systems at typical landfill sites. This plan also includes procedures for monitoring and maintaining strain relief measures that have been installed to prevent surface heave and protect the Area 1501/1602 COPR cell clay containment dike and storm drains from lateral COPR movement.

This Surface Cover Inspection and Maintenance Plan includes the following:

- Annual inspection of the surface cover system within the COPR fill area.
- Documentation of the surface cover inspections and status of recommended repairs using digital forms, maintained in a geographic information system (GIS) database.
- Performance of annual surface cover repairs and maintenance based on the inspection results and on observations of heave and maintenance priorities during MPA port operations.
- Annual monitoring and maintenance of existing strain relief measures and implementation of the repairs, as needed.
- Preparation and submittal of an annual *Surface Cover and Strain Relief Measures Inspection Report*.
- Preparation and submittal of an annual *Surface Cover and Strain Relief Measures Repairs Report*.

This plan outlines inspection and maintenance procedures and documentation and reporting requirements. This document also details the methodologies associated with monitoring strain relief measures.

2. Background

The COPR fill area consists of active operational areas, with asphalt pavement being the primary cover system over the COPR fill. A map of the COPR fill area is shown on Figure 1. Except for a portion of Area 1800 and Area 1501/1602, pavement systems consist of conventional asphalt, roller-compacted concrete asphalt, or concrete “pavers.” A 7.2-acre portion of Area 1800 was reconstructed in 2008 as a pilot area to evaluate the performance of a 4.4-acre modified conventional asphalt pavement section, a 1.8-acre low permeability asphalt (“Matcon”) pavement section, and a 1-acre articulated block cover pavement section under heavy port loading conditions.

Area 1501/1602 has approximately 7 feet of non-COPR surcharge fill and 15.5 inches of stone base and asphalt surfacing, which were placed to mitigate heave conditions. A geomembrane liner, drainage layer, and new surface cover system were installed over approximately 21 acres in 2022 to prevent surface water infiltration. A previously unpaved railroad track area north of the East Service Road is scheduled to be paved in 2023 to minimize surface water infiltration. The switch areas located within this track area will remain unpaved; however, the area will be graded to minimize surface flow to these areas.

Since 2009, the inspection process has been conducted and documented annually using inspection and documentation procedures originally detailed in in the SCMP. The inspection, maintenance, and reporting process for surface cover maintenance is summarized in this plan, which supersedes the SCMP. Inspection findings and an overview of repair priorities are documented in the *Surface Cover System Inspection Report* for each respective calendar year. Repaired issues are summarized annually in a Summary Report for Repair Cycle, Surface Cover System. Repairs are completed and documented based on methods and procedures described in Section 5.

The 2009 *Heave Investigation and Minimization Study* (HIMS) report provided a detailed explanation of COPR mineralogy, chemical expansion mechanisms, physical manifestations of subsurface COPR expansion, and heave mitigation measures. After the issuance of the HIMS report, movement monitoring continued and has been reported in a series of HIMS Supplemental Data Reports issued annually since 2013. COPR movement rates at DMT are well understood and are constant based on over 12 years of data. The final HIMS Supplemental Data Report summarizing data collected in 2022 will be submitted to the MDE in the second quarter of 2023; future lateral movement monitoring associated with the containment remedy will continue to be reported as part of the Surface Cover Inspection and Maintenance program.

Subsurface strain relief measures implemented at DMT include strain relief trenches (SRTs) and storm drain bumper pipes. Inclinometers, Shape Accel Arrays (SAAs), and surface survey pins (pk nails) were installed as part of the HIMS Work Plan (CH2M 2006). The inclinometers, SAAs, and pk nails installed adjacent to the strain relief trenches and bumper pipe sections, along with visual observations of the displaceable SRT backfill and probing of the backfill for COPR impingement, will be used to determine whether and where COPR may be laterally expanding into the trench or bumper pipes. Inspection and maintenance of the SRTs and bumper pipes will be conducted as part of this plan.

3. Surface Cover Inspection

3.1 Scope

The annual surface cover system inspection will be conducted in early spring and shall include inspection of the entire COPR area the first year, followed by inspecting one of the three zones in subsequent years thereafter, as defined in Section 3.2, within the COPR fill area based on procedures detailed in Sections 4.2 and 4.3. Due to the sensitive nature of the shoreline of Area 1501/1602, the exterior slope of Area 1501/1602 will be inspected annually. The inspection includes observing the general condition of the surface cover system and documenting identified pavement surface repair features, such as cracks, potholes, and surface heave features that could affect the integrity of the surface cover.

3.2 Inspection

The annual surface cover inspection will include sections of DMT underlain by COPR fill. The fill area was divided into three zones of near equal acreage that will be inspected at least once every three years on a rotating basis: east, west, and central. A map showing the three surface cover inspection zones is shown as Figure 2. Boundary lines between inspection zones are positioned parallel to major northbound cross streets within the COPR area. Inspections involve walking each area in parallel transects approximately 50 feet apart, observing existing surface conditions on each side of the travel path. Observed surface-damage features requiring some form of repair, such as potholes, mechanical damage, surface heave features, crack features, and drainage system damage (indicating that the cover or drainage system may be compromised or may become compromised soon) are located, photographed, and documented.

The inspection of the Area 1501/1602 shoreline may be performed through visual observation from the shoreline or by drone survey techniques. Observations of potential erosion, sloughing conditions, failure of rip rap embankment or noticeable discharge from the shoreline (sediment) will be noted. Any of these conditions would warrant further review and evaluation depending on the nature and severity.

3.2.1 Inspection Mapping and Forms

Observations are noted using a form-based GIS application developed from the blank form included as Appendix A. Field maps with real time position information are available for reference through the GIS application and include aerial imagery, boundaries of each operational area, major roads, and the COPR fill boundary. The application was developed from lessons learned during the baseline inspection and resulting repair cycle. Inspection entries are exported from the application and converted into the Excel table included as Appendix B in the annual Surface Cover Inspection Report.

3.2.2 Field Inspection and Recording Procedures

A visual walking inspection is performed to assess the general condition of the pavement surface and to identify and record the locations of features such as surface cracks, broken or spalled pavement, potholes, open or unpaved areas, heaved areas, depressed areas, damaged surface drainage structures, COPR Blooms, areas around cap penetrations such as light poles and loading docks, and other conditions indicating that the integrity or function of the cover system may be compromised or may become compromised in the future.

Locations of identified pavement damage features will be determined using a Trimble R1 global positioning system (GPS) unit with a horizontal accuracy of approximately 1 meter (3.25 feet). GPS coordinates are taken at the approximate center of the features so that they can be accurately located for future maintenance, repair, and documentation. The order of inspection during an inspection cycle is controlled by accessibility to the individual areas due to ongoing port operations. Inspection paths will be recorded using GPS logging equipment to identify areas that were not inspected because of port operation restrictions, including cargo loading, however inspections will be coordinated with port operations to minimize inaccessible areas during the current inspection and access areas that were inaccessible during the previous inspection. For newly identified features, approximate lengths and widths of cracks and approximate dimensions of potholes, areas of cracking, and other identified features are estimated or measured in the field.

Once a repair feature is identified and located, the following information is recorded:

- A point identification number (issue number), description code from Table 1, and photo of repair feature
- Coordinates identifying the approximate center of the feature, or center of irregular areas
- General type of feature (pothole, open/unpaved area, surface crack, crack area, surface heave area, inlet/manhole, unpaved gravel area) along with dimensions (width, length, height, diameter) for each location

Table 1. Standard Cover System Description Codes

Code	Description
1	3-inch mill-and-pave asphalt repair
2	Uncovered area: open or unpaved
3	Linear surface cracks or joints: between 0.25 and 1 inch wide and greater than 4 inches deep
4	Area requiring the replacement of the full 7-inch section of asphalt due to alligator or spider cracking
5	Surface heaving: areas that may affect the safe operation of port equipment (field determined)
6	Drainage inlet or manhole: damaged
7	Monitoring wellhead: damaged
8	Gravel cover areas: discoloration
9	Other (any issue not listed above that affects the barrier, safety, or integrity of the surface cover; description provided in the notes section of inspection form)

3.2.3 Geographic Information System

The existing, computer-based GIS model for DMT is used to develop base maps, figures, and other data summaries showing, as required, the locations, limits, coordinates, and other pertinent data for operating areas, roadways, structures, utilities, and other points of interest. Inspection and repair data will be added to the GIS database using coordinates, dimensions, repair type, and description recorded during the inspection. The GIS model is used as the basis for illustrating and documenting surface cover system inspections and maintenance information.

3.3 Reporting

Surface cover inspection findings and repair recommendations will be included in the annual Surface Cover and Strain Relief Measures Inspection Report prepared and submitted to MDE in the third quarter of each year. A sample of the surface cover inspection portion of the report is provided as Appendix B.

At a minimum, the report will include the following surface cover inspection information:

- A table including newly identified issues with the surface cover system and pending items from previous cycles
- A table with estimated quantities for each repair type by operational area
- A figure showing the location and repair type for each identified issue within the COPR fill area
- Repair recommendation for the current repair cycle

4. Surface Cover Maintenance

4.1 Scope

Features recommended for repair are located and marked in the field using a GPS-enabled iPad with the ArcGIS Field Maps application. Access to the areas and movement of select storage containers, equipment, or trailer chassis are coordinated with MPA port operations in preparation of repair activities.

Pavement and concrete cracks less than 1 inch wide are cleaned and sealed using a hot-rubber compound. Cracks greater than 1 inch wide, potholes, and surface-damage areas are milled to a depth of 3 inches, tack coated, and resurfaced using a hot-asphalt mix. Crack areas where the base asphalt material is not exposed are milled to a depth of 3 inches, tack coated, and resurfaced using a hot-asphalt mix. Crack areas where the base asphalt material is exposed are typically saw cut and repaired using a 6-inch milled tie-in, 4 inches of base course asphalt, and 3 inches of surface course asphalt.

Large area paving and heave repairs typically include coring to determine asphalt cover thickness and developing a milling design that: (1) minimizes exposure to the gravel base; (2) maintains the minimum surface cover profile typically consisting of 8 inches of dense graded aggregate, 4 inches of base course asphalt, and 3 inches of surface course asphalt per MPA specifications; and (3) restores surface water drainage to the nearest storm drain inlet to minimize standing water. Following the milling of the asphalt, excavation of the subgrade material to reach suitable depths to adhere each repair to the specified profile is completed, with placement of base course and surface course asphalt per the paving specifications.

Based on the surface cover inspection observations, areas that may potentially affect the port’s operational or safety requirements will be addressed on a priority basis. Other features will be prioritized based on accessibility subject to port operations and cargo loading. Identified surface cover damage not repaired during the current repair cycle will be identified for repair during future maintenance cycles.

4.2 Reporting

Completed surface cover repairs will be summarized in the annual Surface Cover and Strain Relief Measures Repair Report prepared and submitted to MDE by the first quarter of the following year. A sample of the surface cover repairs portion of the report is provided as Appendix C. The report will include the following surface cover repair information:

- A table summarizing the amount of each type of repair completed in each operational area.
- A figure illustrating the locations of completed surface cover repairs and large area paving sections.
- A photolog highlighting typical repairs capturing before and after paving or sealing.
- An appendix including a repair disposition table indicating the status of each issue identified in the inspection report as either “completed” or “pending.”

5. Strain Relief Measures Monitoring

5.1 Objectives

The primary objectives for monitoring the existing strain relief measures at DMT are to:

1) Ensure the continued protection of the Areas 1501/1602 COPR cell clay containment dike and storm drains from lateral COPR movement
2) Understand the rate and direction of surface and subsurface lateral movement adjacent to the strain relief measures
3) Evaluate the effectiveness and estimate the remaining life of SRTs and bumper pipes
4) Design and plan for maintenance repairs

5.2 Scope

Subsurface strain relief measures implemented at DMT include SRTs and storm drain bumper pipes. SRTs consisting of a 2- to 3-foot-wide trench backfilled with displaceable fill have been installed to mitigate surface heave in Areas 1501/1602, and 1800; protect the 15th Street storm drain piping from lateral deformation; and protect the clay containment dike in Area 1501/1602 from lateral deformation. Bumper pipes consisting of sacrificial, small diameter high density polyethylene pipes placed outside a corrugated metal “shell” pipe, are placed radially along the exterior of sections of storm drain piping to accommodate COPR displacement. Bumper pipes have been installed along sections of the 12.5th and 13.5th Street storm drains, and along the perimeter of the trash interceptor structure installed in Area 1800. The locations of existing SRTs and bumper pipe sections are shown in Figure 3.

Movement data collected from inclinometers, SAAs, and pk nails installed adjacent to the SRTs and bumper pipe sections, along with visual observations of the displaceable SRT backfill and probing of the backfill for COPR impingement will be used to evaluate the performance of strain relief measures and estimate their remaining service life. Maintenance repairs will be designed and implemented to refurbish portions of the SRTs, and bumper pipes as needed.

Strain relief measures monitoring will be performed annually, as listed below. Components of the monitoring consist of the following:

- Measuring inclinometers and SAAs:
  - 10 conventional cased inclinometers, COPR fill area (outside Area 1501/1602)
  - 28 SAA inclinometers in Area 1501/1602
- Survey point (pk nail) monitoring in Areas 1300, 1400, 1501/1602, 1800
- Inspecting and probing the trench backfill in Area 1501/1602 at existing access ports

The locations of all surface and subsurface movement monitoring instrumentation described above are shown in Figure 3.

5.3 Cased Inclinometers

Cased inclinometers are specialized manufactured plastic casings with internal groves at the 90-degree points, drilled and grouted into the ground. By manually reading the casings with a special probe, changes in lateral profile of the casings from time of installation can be determined.

Inclinometer data are used to establish lateral subsurface movement rate and direction, which can be used to evaluate the performance of strain relief measures. For example, inclinometers installed on the protected side of an SRT should show lower movement rates than inclinometers on the non-protected side, and lateral movement rates can be used to estimate the amount of displacement that has occurred into an SRT or bumper pipe section and hence its remaining service life.

5.3.1 Reading Cased Inclinometers

Inclinometer data are obtained by raising and lowering an inclinometer probe at specified locations, with the probe data captured by a datalogger, as described below. Inclinometer readings are currently performed using a digital inclinometer probe manufactured by Geokon.

Inclinometer casings have two sets of internal grooves oriented at right angles to one another, one set designated as the A-axis, and one set the B-axis. At DMT, the A-axis casing grooves are typically set to approximate magnetic north, and the B-axis casing grooves set to approximate the west–east direction of potential movement. Readings are taken by lowering a digital inclinometer probe in the A-axis grooves to the first (bottom most) depth reading point within the casing and raising the probe in 2-foot intervals, taking readings at each interval.

Because the inclinometer probe is equipped with a bi-axial tilt sensor, it records tilt readings in both the A-axis and B-axis directions at each interval. Each A-axis and B-axis reading point is multiple readings, which are averaged by software internal to the data logger. Upon completion of a set of readings with depth in a casing, the probe is then reversed 180 degrees and again lowered to the first (bottom) reading point, and a second set of readings is taken. The average of the two reading sets is reported as the reading for that depth. Averaging the reversed readings is intended to remove the effect of the inherent bias of the probe’s tilt sensor. As a quality control check, the magnitude and stability of the probe’s bias during each reading is set across multiple readings and is reviewed by generating “checksum plots.”

5.3.2 Cased Inclinometer Data Presentation

Inclinometer data are reduced and plotted by GTilt (or equivalent) software. The software sums changes in casing inclination between reading points (bottom to top) to obtain the lateral deflected profile. The software averages the 0- and 180-degree reading sets to remove probe bias in accordance with manufacturer recommendations. Two types of inclinometer data plots are provided: cumulative displacement profile and time rate plots. Data from both the A-axis and B-axis are provided for each plot.

Cumulative displacement (CD) plots provide a graphical depiction of the laterally deflected profile of the inclinometer casing, as deviated from the original assumed perfectly vertical line (zero movement). Time rate (TR) plots are used to track displacements at specific depths within the inclinometer casings over calendar time. The depth selected for plotting varies depending upon inclinometer location. Typically, the plotted depth is the maximum recorded lateral displacement within or slightly above the COPR layer. The slope of that plotted line represents the rate of lateral displacement for the depth point plotted. TR plots provide movement rate at the analysis depth, typically expressed as annualized rates.

In addition to the CD and TR plots, a specialized inclinometer displacement direction (DD) plot plan is prepared to show the direction of lateral subsurface movement of all monitored inclinometers.

5.4 Shape Accel Array Inclinometers

SAA inclinometers are strings of micro-electro-mechanical tilt sensors spaced at 1-foot intervals connected in an array and installed vertically below the ground surface. SAA sensor strings are either placed in smooth PVC (polyvinyl chloride) casings drilled and grouted into the ground or are directly grouted into a borehole. SAAs record lateral movement with depth without the need to lower probes. The tilt of the individual sensors is integrated to produce a profile of lateral deflection in two perpendicular axes (*x* and *y*) with depth. Surface survey points are placed at the ground surface at the SAA to measure top movement for inclinometers not embedded sufficiently deep to attain bottom fixity. Like cased inclinometers, SAA inclinometer data are used to establish lateral subsurface movement rate and direction which can be used to evaluate the performance of strain relief measures.

SAA inclinometers are read by manual computer connection. Because there is no manual reading error, SAAs are considered more accurate and have a higher resolution than cased inclinometers.

5.4.1 Reading SAA Inclinometers

SAA readings are collected by connecting a laptop computer to the SAA using the Measurand SAA Field Power Unit. A "snapshot" of deflection (tilt) of each sensor in the SAA string is recorded using Measurand SAA Recorder software and the data is imported into Microsoft Excel for analysis.

5.4.2 SAA Data Presentation

For each SAA, three plots are provided. The first is a CD plot documenting the lateral displacement profile of the SAA inclinometer in *x*- and *y*-axes from the baseline reading. Positive *x*-axis displacement indicates movement to the north, and positive *y*-axis displacement indicates movement to the west.

Because SAA inclinometers installed in the Area 1501/1602 COPR containment cell typically do not extend to a known non-moving stratum, an assumption of zero movement at the bottom of the sensor array ("bottom fixity") is not necessarily applicable. To provide an absolute point of reference, survey points are established at the top of each SAA. The CD plots are adjusted to show the top movement as surveyed. The tilt deviations of each sensor element are then summed from the top to the bottom to produce the CD profile.

The second type of data plot provided for each SAA are TR plots used to track displacements at specific depths along the SAA string over time. Two analysis depths were selected for each SAA location based on observed movement trends. Typically, an analysis depth was assigned within the fill above the top clay cap of the COPR cell, and the other analysis depth was assigned to the depth where the greatest CD was observed, usually within the COPR fill. Resultant displacement magnitude and annualized rate are computed from the *x*-axis and *y*-axis displacements at each analysis depth. Annualized rate data allow movement comparison between SAA inclinometers installed on different dates and provide a convenient means to assess changes in movement rates over time.

The third type of plot for analyzing the inclinometer SAA data is a DD plot plan. The DD plan is prepared to show the lateral displacement direction of all the SAA inclinometers at the selected analysis depths in plan view.

5.5 Surface Point Monitoring

Surface point monitoring (SPM) consists of pk nails, survey points, or scribe marks embedded in the ground surface or on structures affixed to the ground surface. pk nails are standard survey nails embedded in the ground surface. Survey points were also established at the top of each SAA inclinometer for use in computing SAA displacement.

Ground surface movement is a valid proxy for determining subsurface lateral movement where block movement is occurring. Historic movement monitoring data (Appendix 4) have indicated block movement near previously installed SRTs, bumper pipes, and the shoreline.

5.5.1 Reading SPMs

SPM coordinates and elevations are surveyed by conventional survey methods. Data recorded from each reading includes spatial northing and easting coordinates referenced to horizontal datum Maryland State Plane NAD 83/91 and elevation referenced to vertical datum NAVD88. Horizontal data (northing and easting) are measured to Second-Order, Class 1 accuracy. Vertical (elevation) data are measured to First-Order, Class 1 accuracy.

5.5.2 SPM Data Presentation

SPM survey data provided by the surveyor are reduced by calculating the rate of lateral displacement in inches per year from the change in surveyed coordinates between initial baseline readings and the most recent survey.

Scaled vectors (movement rate and direction) are plotted on plan drawings (SPM plots) to show relative displacement trends. The total (vertical) change in elevation from the baseline readings to the most recent survey at each point are also shown on the plots. Positive elevation change represents an increase in ground surface elevation (heave). Negative elevation change represents a decrease in ground surface elevation (settlement).

5.6 Strain Relief Trench Backfill Monitoring

The strain relief trenches in Area 1501/1602 were installed with observation ports consisting of manholes opening to a large diameter pipe that extends into the SRT backfill. The backfill is inspected by inserting a rod into the backfill at the left, right and center of the manhole using a drill rig to determine whether COPR has expanded into the backfill. COPR is much harder than the displaceable backfill and rejection of the rod prior to reaching the bottom of the trench is indicative of the presence of COPR. The trench backfill, which consists of a mixture of ground COPR, peat, and bentonite is also inspected for consistency to confirm that the backfill remains in a displaceable condition.

5.7 Maintenance of Instrumentation and Strain Relief Measures

5.7.1 Inclinometers and SAAs

When cased inclinometers are too crimped for use, by either the standard probe or the special short probe (designed to pass minor crimping), they are abandoned by grouting in accordance with COMAR regulations. SAA inclinometers that were fully sealed in grout at the time of installation do not require further abandonment. SAA inclinometers installed in sleeve pipes (without grout) require removal and grouting of the sleeve according to COMAR regulations. Inclinometers and SAAs will be replaced or added as needed. Replaced inclinometers and SAAs must be “re-baselined” and the absolute deflection of the new instrument is not directly comparable to the deflection of the new instrument. However, movement rate and direction computed over successive readings of the new instrument may be compared with rate and direction from the replaced instrument.

5.7.2 Surface Survey Points

Surface survey points that are disturbed or destroyed by traffic, snow removal, construction, or other activities are periodically replaced. Replaced SPM points, like inclinometers and SAAs, must be “re-baselined” and the absolute position of a new point is not directly comparable to the position of the replaced point.

5.7.3 Strain Relief Measure Maintenance

Based on movement monitoring data and observations indicating that the strain relief measure is nearing the end of life, portions of the SRTs or bumper pipe sections will be rehabilitated or replaced. This maintenance requires design and planning, and in some instances permitting prior to implementation. Design plans and specifications for the repair will be provided to MDE for review.

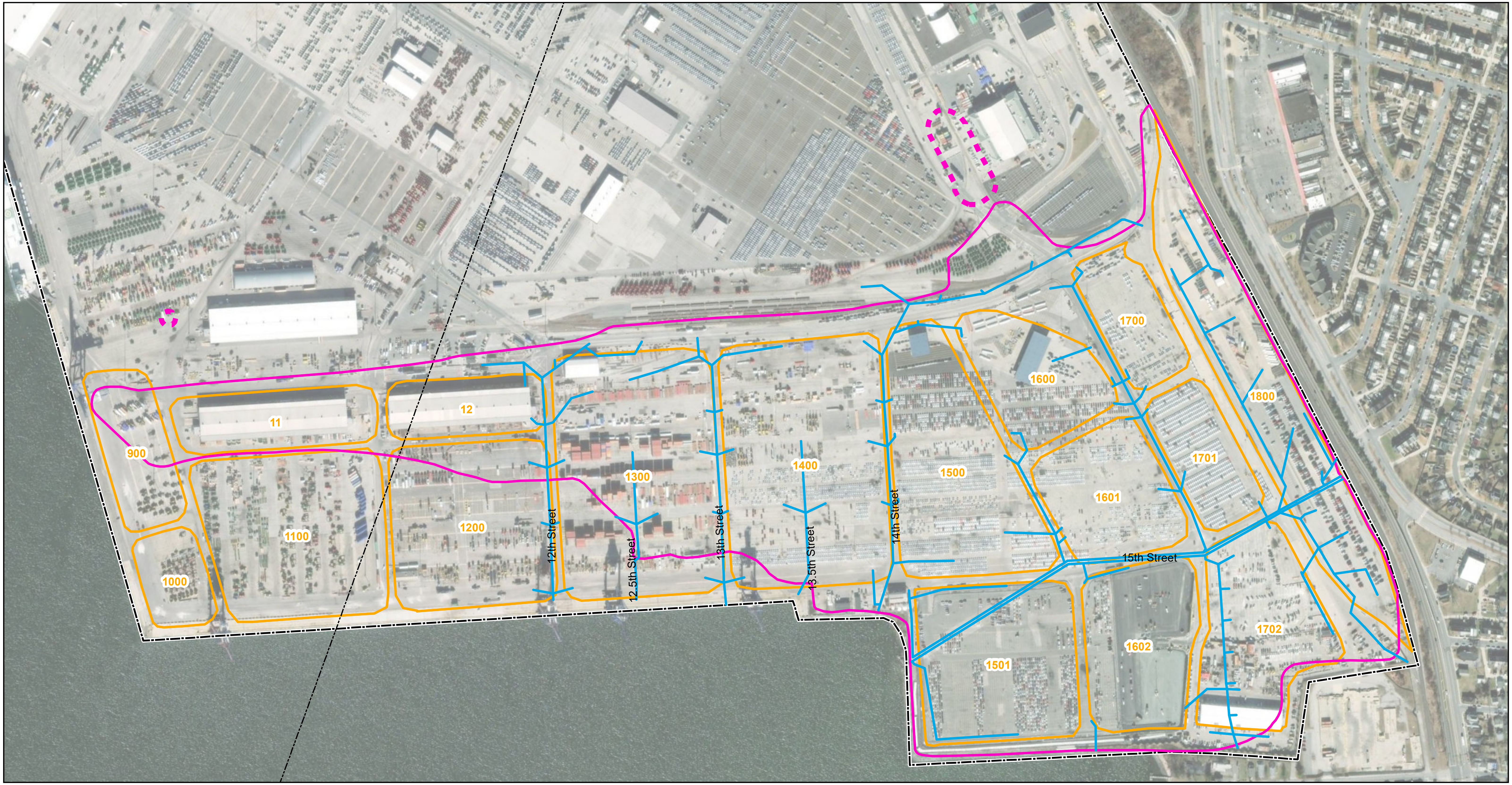
5.8 Reporting

Results of the strain relief measures monitoring will be summarized in the annual Surface Cover and Strain Relief Measures Inspection Report. Maintenance repairs will be included in the annual Surface Cover and Strain Relief Measures Repairs Report. The reports will include the following strain relief measures inspection and repair information, as applicable:

- Instrumentation description and location
- Data collection and reduction procedures
- A summary narrative and appendices containing the data for each instrument type collected during the prior year, plotted as described in the preceding sections
- Recommendations for instrumentation maintenance

- Recommendations for additional instrumentation or abandonment of existing instrumentation
- Conclusions regarding comparison of current movement rates to historical rates
- Conclusions regarding the effectiveness and remaining life of the strain relief measures
- Recommendations for strain relief measure maintenance repairs and addition of new strain relief measures as needed.

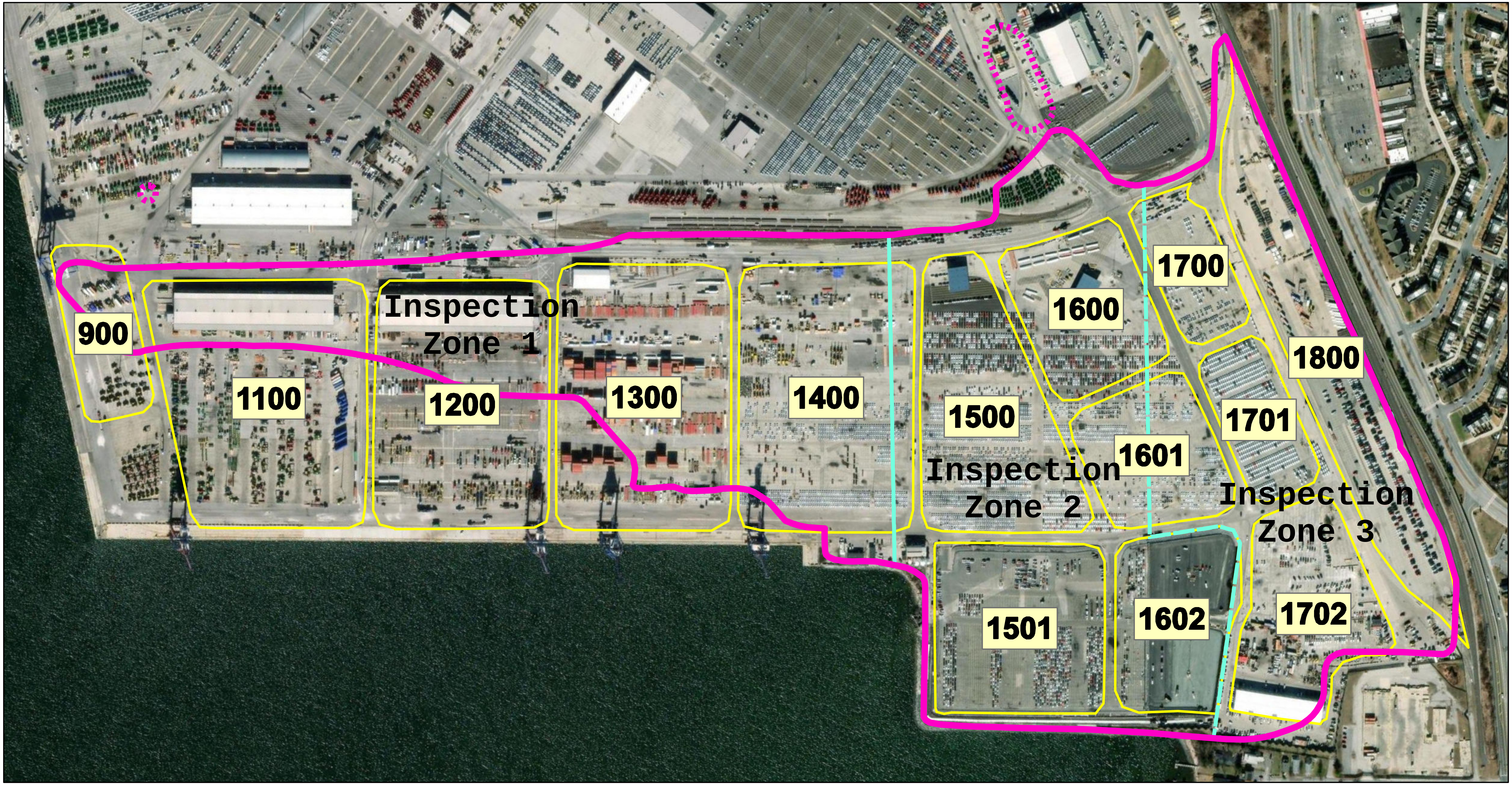
Figures



Legend

- ━ Priority Storm Drain System
- -·-·- City/County Boundary
- ▪ ▪ Approximate COPR Extent
- ▭ COPR Extent
- ▭ Areas
- ▭ DMT Boundary

Figure 1
COPR Fill Area
Dundalk Marine Terminal
Baltimore, Maryland



Legend

☐ Operational Area

━ COPR Extent

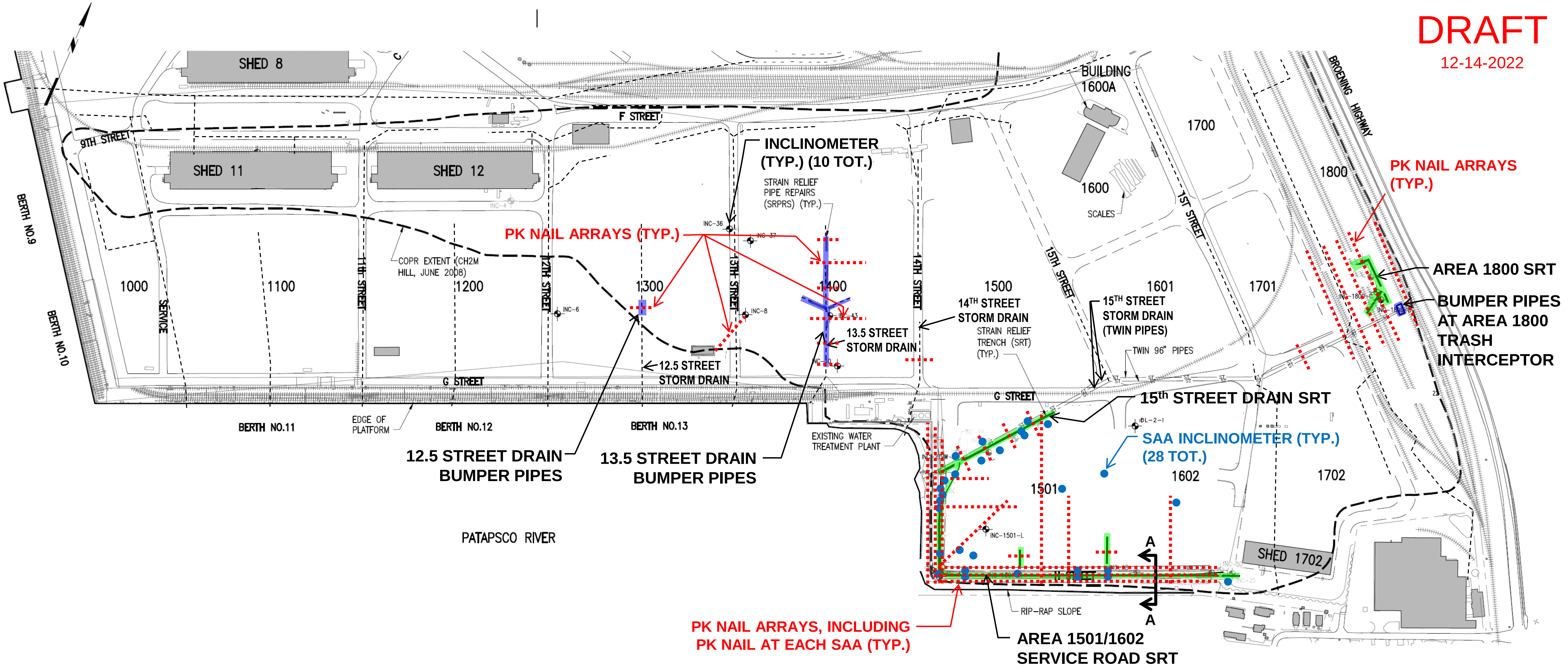
┅ Approximent COPR Extent

▭ Surface Cover Inspection Zone Boundary

FIGURE 2
2023 Surface Cover Inspections, Inspection Zones
Dundalk Marine Terminal
Baltimore, Maryland

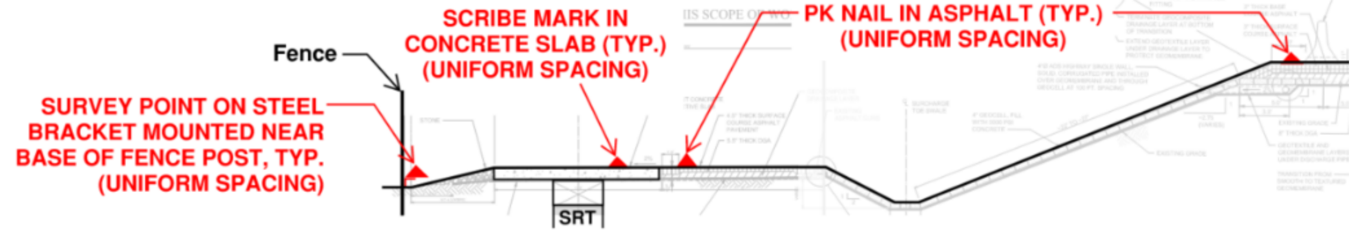
DRAFT

12-14-2022



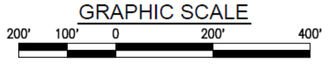
LEGEND:

- INC-1 – INCLINOMETER
- ● - SHAPEACCELARRAY (SAA) INCLINOMETER
- ▪▪▪▪ - SURFACE POINT MONITORING (SPM) PK NAIL ARRAY
- ----- - BURIED STORM DRAIN TRUNK LINE (LOCATIONS APPROX)
- 🟩 - STRAIN RELIEF TRENCH (SRT)
- ▨ - BUMPER PIPE STRAIN RELIEF



SECTION A-A

SPM TYPICAL CROSS-SECTION AT SERVICE ROAD



SITE PLAN OF GROUND SURFACE AND SUBSURFACE MOVEMENT MONITORING POINTS

FIGURE 3

G:\DWGS\105\001\1058\Instrumentation\IN-1.dwg

Appendix A

Sample Surface Cover Inspection Form

P	Pothole	LP	Light Pole	In	Inlet	O	Other
CS	Concrete Slab	GC	Gravel Cover	MH	Man Hole		
DP	Dolly Pad	MW	Monitoring Well	RR	Rail Road		

Sheet _______ of _________
Area _________________

Issue #	Category										1 - 3" M&P		2 - Open/Unpaved Area		3 - Surface Crack		4 - Full 7" Section		5 - Surface Heaving Area			6 - Inlet/ Manhole ID	7 - Monitor Wellhead ID	8 - Gravel Cover Discoloration		Vegetation	Comments
	P	CS	DP	LP	GC	MW	In	MH	RR	O	Length (feet)	Width (feet)	Length (feet)	Width (feet)	Avg. Width (inches)	Length (feet)	Length (feet)	Width (feet)	Max. Height (inches)	Length (feet)	Width (feet)			Length (feet)	Width (feet)		

Appendix B
Sample Surface Cover Inspection Report

Dundalk Marine Terminal 2021 Surface Cover Inspection Data Table

						Category										1 - 3" M&P		2 - Open/Unpaved Area		3 - Surface Crack		4 - FS Repair		5 - Surface Heaving Area			6 - Inlet/ Manhole ID	7 - Monitor Wellhead ID	8 - Gravel Cover Discoloration		Vegetation	
Area	Date	Issue Number	Location Longitude	Location Latitude	Status	P	CS	DP	LP	GC	MW	In	MH	RR	O	Length (feet)	Width (feet)	Length (feet)	Width (feet)	Avg. Width (inches)	Length (feet)	Length (feet)	Width (feet)	Max. Height (inches)	Length (feet)	Width (feet)			Length (feet)	Width (feet)		Comment
97	5/1/2019	1	-76.52380	39.24798												50	2															25 abandoned fence posts
97	5/1/2019	2	-76.52390	39.24816																0.5	220											Seam and lateral cracking
97	5/1/2019	3	-76.52380	39.24819																				6	115	8						
97	5/1/2019	4	-76.52380	39.24822																0.5	150											
97	5/1/2019	5	-76.52410	39.24850																0.5	162										x	Asphalt seam
97	5/1/2019	6	-76.52400	39.24826												13	10															Pitting asphalt
97	5/1/2019	7	-76.52410	39.24823												26	11															Pitted and cracked asphalt
97	5/1/2019	8	-76.52400	39.24807		x										60	12															Potholes in roadway
97	5/1/2019	9	-76.52370	39.24829										x				205	4													Open gravel along railroad tracks
97	5/1/2019	10	-76.52360	39.24837																0.25	115											Asphalt seam cracking
97	5/1/2019	11	-76.52380	39.24844																0.5	90											Asphalt seam
97	5/1/2019	12	-76.52350	39.24814																0.25	525											Seal asphalt seam around tracks
97	5/1/2019	13	-76.52320	39.24801																0.25	50											
97	5/1/2019	14	-76.52310	39.24792												20	15															Alligator cracking
97	5/1/2019	15	-76.52300	39.24786																0.25	95											
97	5/1/2019	16	-76.52300	39.24756		x										27	23															Potholes in roadway
97	5/1/2019	17	-76.52330	39.24758																		100	5									Asphalt cracking in roadway next to tracks
97	5/1/2019	18	-76.52340	39.24772												22	8															Asphalt cracking on road shoulder
97	5/1/2019	19	-76.52350	39.24779																0.5	225											Seal asphalt seams
97	5/1/2019	20	-76.52370	39.24788												32	12															Asphalt cracking
97	5/1/2019	21	-76.52340	39.24791										x				70	2													Open asphalt along rail
900	5/18/2019	3	-76.53450	39.24196							x																	DMT 34M				Two damaged well pads.
900	5/18/2019	7	-76.53430	39.24191																0.5	235											Various cracks.
900	5/18/2019	8	-76.53500	39.24184																0.25	140											
900	5/18/2019	9	-76.53470	39.24169												16	2															
900	5/18/2019	11	-76.53450	39.24141																0.25	250											Various cracks and conduit that runs parallel to dolly pad.
900	5/18/2019	12	-76.53420	39.24146												32	13															
900	5/18/2019	15	-76.53420	39.24150																0.25	270											
900	5/18/2019	20	-76.53350	39.24147																0.25	125											
900	5/18/2019	23	-76.53360	39.24170																0.75	38											Cracks around concrete manhole slab.
900	5/18/2019	24	-76.53350	39.24143																0.5	90											
900	5/18/2019	25	-76.53350	39.24133		x										3	7															Two potholes near dolly pad.
900	5/18/2019	26	-76.53360	39.24127				x												0.5	400											Both sides of dolly pad.
900	5/18/2019	28	-76.53390	39.24116																0.25	170											Conduit raceway. Unsealed on both sides.
900	6/12/2019	30	-76.53420	39.24289		x										25	4															
1100	6/11/2019	1	-76.53380	39.24240																				8	350	10						
1100	6/11/2019	2	-76.53370	39.24225																0.25	500											Asphalt seams
1100	6/11/2019	3	-76.53320	39.24241								x				10	5															Repair asphalt around inlet
1100	6/11/2019	4	-76.53230	39.24259																0.5	100											
1100	6/11/2019	5	-76.53330	39.24234							x																					
1100	6/11/2019	6	-76.53340	39.24209		x										5	3															
1100	6/11/2019	9	-76.53340	39.24192														120	1												x	Gap on ramp
1100	6/12/2019	12	-76.53240	39.24186		x	x									110	3															
1100	6/12/2019	13	-76.53230	39.24190		x	x									30	4															
1100	6/12/2019	14	-76.53210	39.24211														8	6												x	
1100	6/12/2019	15	-76.53200	39.24198		x	x															40	15									
1100	6/12/2019	16	-76.53190	39.24184																				6	75	15						
1100	6/12/2019	17	-76.53220	39.24204																1	200											
1100	6/12/2019	18	-76.53150	39.24223		x	x									200	3															
1100	6/12/2019	19	-76.53160	39.24198																0.5	75											
1100	6/12/2019	20	-76.53160	39.24188																				8	90	15						
1100	6/12/2019	21	-76.53110	39.24231																0.25	70											Seal conduit saw cut
1100	6/12/2019	22	-76.53060	39.24231												9	2															Four abandoned fence post
1100	6/12/2019	23	-76.53060	39.24225																				6	50	10						
1100	6/12/2019	24	-76.53110	39.24248												55	7															Cracked asphalt
1100	6/12/2019	25	-76.53100	39.24270												35	10															Cracking at bottom of ramp
1100	6/12/2019	26	-76.53120	39.24268												30	7															Cracks in asphalt
1100	6/12/2019	27	-76.53100	39.24285												40	4															
1100	6/12/2019	28	-76.53090	39.24288												8	4															
1100	6/12/2019	29	-76.53110	39.24295											x							10	10									Remove stop light foundation
1100	6/12/2019	30	-76.53120	39.24315		x										4	4															
1100	6/12/2019	31	-76.53110	39.24310		x										12	3															

Dundalk Marine Terminal 2021 Surface Cover Inspection Data Table

Area	Date	Issue Number	Location Longitude	Location Latitude	Status	Category										1 - 3" M&P		2 - Open/Unpaved Area		3 - Surface Crack		4 - FS Repair		5 - Surface Heaving Area			6 - Inlet/ Manhole ID	7 - Monitor Wellhead ID	8 - Gravel Cover Discoloration		Vegetation	Comment
						P	CS	DP	LP	GC	MW	In	MH	RR	O	Length (feet)	Width (feet)	Length (feet)	Width (feet)	Avg. Width (inches)	Length (feet)	Length (feet)	Width (feet)	Max. Height (inches)	Length (feet)	Width (feet)			Length (feet)	Width (feet)		
1200	6/13/2019	1	-76.53060	39.24277			x											50	1													Gap in concrete slab
1200	6/13/2019	2	-76.53060	39.24271												35	13															Cracking asphalt
1200	6/13/2019	6	-76.53000	39.24266		x	x															40	4									
1200	6/13/2019	7	-76.52990	39.24273			x									55	1															
1200	6/13/2019	8	-76.52980	39.24274		x	x															10	7									
1200	6/13/2019	9	-76.52960	39.24282		x	x															15	15									
1200	6/13/2019	10	-76.52950	39.24292		x	x									7	3															
1200	6/13/2019	11	-76.52930	39.24275											x																	Damaged water valve manhole
1200	6/13/2019	12	-76.52920	39.24253								x				10	5															Loose inlet frame
1200	6/13/2019	13	-76.52900	39.24314																0.75	30											
1200	6/13/2019	14	-76.52870	39.24312		x	x									30	1															
1200	6/13/2019	15	-76.52850	39.24305												10	6															
1200	6/13/2019	16	-76.52840	39.24259												20	20															Cracking asphalt
1200	6/13/2019	17	-76.52830	39.24266												35	10															
1200	6/13/2019	18	-76.52790	39.24268		x										10	5															
1200	6/13/2019	22	-76.52840	39.24322																0.5	50										x	
1200	6/13/2019	23	-76.52840	39.24333												11	15															Cracked asphalt
1200	6/13/2019	26	-76.52850	39.24362											x	22	2															11 abandoned fence posts
1200	6/13/2019	27	-76.52850	39.24357												25	20															Cracked asphalt
1200	6/13/2019	29	-76.52850	39.24380												20	15															Cracked asphalt
1200	6/13/2019	30	-76.52960	39.24349												315	53															Cracked asphalt
1200	6/13/2019	31	-76.53080	39.24304		x										364	33															
1200	6/13/2019	32	-76.53080	39.24291											x	10	2															Remove two guardrail posts
1200	6/13/2019	33	-76.53070	39.24288		x										30	30															Cracked asphalt
1200	6/13/2019	34	-76.53080	39.24305		x										30	15															Cracked asphalt
1200	6/13/2019	35	-76.53080	39.24326											x							30	10									Replace curb
1200	6/13/2019	36	-76.52970	39.24360											x							300	8									Cracked asphalt
1200	6/13/2019	37	-76.52920	39.24366							x																	DMT-30S				Damaged well pad
1200	6/14/2019	38	-76.52900	39.24385											x							227	7									Remove guardrail, replace with jersey barriers
1200	6/14/2019	39	-76.52940	39.24386																		90	45								x	Old trailer location
1200	6/14/2019	40	-76.52880	39.24399												90	45															Cracked asphalt
1200	6/14/2019	41	-76.52880	39.24389																0.5	155											
1300	5/1/2019	1	-76.52500	39.24271							x																					Damaged well pad
1300	5/1/2019	2	-76.52500	39.24267							x																					Damaged well pad
1300	5/29/2019	3	-76.52620	39.24224									x			30	15										TEV-004					Pave around vault manholes
1300	5/29/2019	4	-76.52570	39.24239																		30	15									Settlement
1300	5/29/2019	5	-76.52600	39.24232												80	4															
1300	5/29/2019	6	-76.52540	39.24245																				10	127	15						
1300	5/29/2019	7	-76.52520	39.24249																0.5	135										x	Seal crack below sidewalk
1300	5/29/2019	8	-76.52530	39.24264												60	35															Cracked asphalt
1300	5/29/2019	9	-76.52520	39.24271		x		x								12	3															
1300	5/29/2019	10	-76.52500	39.24259												2	2															
1300	5/29/2019	11	-76.52530	39.24255												25	20															
1300	5/29/2019	12	-76.52550	39.24263		x		x								8	3															
1300	5/29/2019	13	-76.52600	39.24253																0.25	35											Seal patches
1300	5/29/2019	14	-76.52620	39.24243														20	15													
1300	5/29/2019	15	-76.52640	39.24253				x								7	3															
1300	5/29/2019	16	-76.52630	39.24255												32	7															
1300	5/29/2019	17	-76.52610	39.24266												20	8															
1300	5/29/2019	18	-76.52610	39.24274												21	10															
1300	5/29/2019	19	-76.52520	39.24295									x			18	14										MH-314					
1300	5/29/2019	20	-76.52530	39.24312																				14	52	25						Heave in roadway
1300	5/29/2019	21	-76.52610	39.24283		x										35	4															
1300	5/29/2019	22	-76.52660	39.24283												32	20															
1300	5/29/2019	23	-76.52630	39.24262												20	20															
1300	5/29/2019	24	-76.52650	39.24262												35	35															
1300	5/29/2019	25	-76.52680	39.24278																												Repair DMT-37M
1300	5/29/2019	26	-76.52670	39.24289																				10	25	20						
1300	5/29/2019	27	-76.52650	39.24298							x				x													DMT-6S				
1300	5/29/2019	28	-76.52540	39.24337												125	3															
1300	5/29/2019	29	-76.52550	39.24356		x										115	3															Seam separation
1300	5/29/2019	34	-76.52550	39.24371												60	3															Separated asphalt seams
1300	5/29/2019	35	-76.52550	39.24367																0.5	65											
1300	5/30/2019	36	-76.52570	39.24386																0.5	120											Cracks at asphalt seams
1300	5/30/2019	37	-76.52620	39.24350																				6	100	15						

Dundalk Marine Terminal 2021 Surface Cover Inspection Data Table

		Issue	Location	Location	Status	Category										1 - 3" M&P		2 - Open/Unpaved Area		3 - Surface Crack		4 - FS Repair		5 - Surface Heaving Area			6 - Inlet/	7 - Monitor	8 - Gravel Cover Discoloration			
Area	Date	Number	Longitude	Latitude		P	CS	DP	LP	GC	MW	In	MH	RR	O	Length (feet)	Width (feet)	Length (feet)	Width (feet)	Avg. Width (inches)	Length (feet)	Length (feet)	Width (feet)	Max. Height (inches)	Length (feet)	Width (feet)	Manhole ID	Wellhead ID	Length (feet)	Width (feet)	Vegetation	Comment
1300	5/30/2019	38	-76.52690	39.24342												22	12															
1300	5/30/2019	39	-76.52740	39.24328		x										5	6															
1300	5/30/2019	40	-76.52760	39.24305		x										22	6															
1300	5/30/2019	41	-76.52770	39.24319		x										25	4															Seam separation
1300	5/30/2019	42	-76.52780	39.24326																0.25	35											
1300	5/30/2019	49	-76.52580	39.24404												36	3															
1300	5/30/2019	50	-76.52580	39.24409																0.5	70											Seal sawcut
1300	5/30/2019	51	-76.52580	39.24412														2	2													Hole in asphalt
1300	5/30/2019	52	-76.52680	39.24382																				8	130	15						
1300	5/30/2019	54	-76.52700	39.24375																0.5	100											
1300	5/30/2019	62	-76.52810	39.24370		x										25	3															
1300	5/30/2019	63	-76.52680	39.24416																		256	10									Damaged bollards and charging stations
1300	5/30/2019	64	-76.52650	39.24405																0.5	70											
1300	6/3/2019	65	-76.52610	39.24454																0.75	80											Seal seam
1300	6/3/2019	66	-76.52640	39.24446																0.5	100											
1300	6/3/2019	67	-76.52680	39.24448																				6	50	10						
1300	6/3/2019	68	-76.52720	39.24426												32	15															
1300	6/3/2019	69	-76.52760	39.24402		x										15	15															
1300	6/3/2019	70	-76.52780	39.24395																0.25	150											
1300	6/3/2019	71	-76.52810	39.24387												50	10															
1300	6/3/2019	72	-76.52700	39.24444										x		350	8															
1300	6/3/2019	73	-76.52670	39.24466																				6	75	10						
1300	6/3/2019	74	-76.52660	39.24465												70	7															Remove curb
1300	6/3/2019	75	-76.52650	39.24463																0.25	90											Asphalt seam around electric manhole
1300	6/3/2019	76	-76.52630	39.24475																				12	85	15						
1300	6/3/2019	77	-76.52630	39.24480												30	25															Cracking asphalt
1300	6/3/2019	78	-76.52720	39.24437		x												30	20													
1300	6/3/2019	79	-76.52760	39.24424												225	3															Seam separation
1300	6/3/2019	80	-76.52800	39.24425												85	15															Ponding water adjacent to building
1300	6/3/2019	81	-76.52840	39.24406								x				6	6															Cracked asphalt around IN-688
1300	6/3/2019	83	-76.52740	39.24450																												Cut back rebar in asphalt
1300	6/3/2019	84	-76.52620	39.24496																0.25	110											
1300	6/3/2019	85	-76.52680	39.24481																0.25	250											
1300	6/3/2019	86	-76.52730	39.24476														12	10													
1300	6/3/2019	87	-76.52780	39.24444																				6	130	8						
1300	6/3/2019	88	-76.52850	39.24420																0.25	150											Seal seams
1300	6/3/2019	89	-76.52800	39.24438																0.5	130											
1400	5/1/2019	1	-76.52380	39.24319																				8	145	20						
1400	5/1/2019	2	-76.52390	39.24313																0.5	65											
1400	5/1/2019	3	-76.52480	39.24284												41	3															Asphalt seam separating under puddle
1400	5/1/2019	4	-76.52500	39.24286		x										8	4															Two potholes
1400	5/1/2019	5	-76.52490	39.24293							x																					Damaged well pad
1400	5/1/2019	6	-76.52490	39.24298		x										6	4															Pothole at seam
1400	5/1/2019	7	-76.52430	39.24321																0.5	130											Unsealed asphalt patch and surrounding cracks
1400	5/1/2019	8	-76.52370	39.24328																0.5	170											Crack under ponding
1400	5/1/2019	9	-76.52330	39.24348																0.5	100										x	Crack along asphalt seam
1400	5/1/2019	10	-76.52300	39.24351																				10	110	15						
1400	5/1/2019	11	-76.52260	39.24364																				10	70	20						Heave in roadway
1400	5/1/2019	12	-76.52290	39.24375																0.5	100										x	
1400	5/1/2019	13	-76.52330	39.24362												20	20															Alligator cracking
1400	5/1/2019	14	-76.52390	39.24348																0.5	85											
1400	5/1/2019	15	-76.52510	39.24306								x				8	8															Damaged asphalt around inlet grate at IN-777
1400	5/1/2019	16	-76.52480	39.24264																0.5	30											
1400	5/1/2019	17	-76.52440	39.24274																0.5	300											Cracks along asphalt seams
1400	5/1/2019	19	-76.52320	39.24322																0.25	63											Unsealed asphalt patch
1400	5/1/2019	20	-76.52320	39.24320																				12	33	20						
1400	5/1/2019	21	-76.52310	39.24326																0.25	37											
1400	5/1/2019	22	-76.52280	39.24330																0.5	165											
1400	5/1/2019	24	-76.52260	39.24347																0.5	100											
1400	5/1/2019	25	-76.52260	39.24335																				12	155	10						
1400	5/1/2019	27	-76.52290	39.24345																0.5	222											Cracks along asphalt seam
1400	6/4/2019	28	-76.52610	39.24498												116	6															
1400	6/4/2019	29	-76.52580	39.24498																				6	6	6						
1400	6/4/2019	30	-76.52550	39.24515																0.25	420											Asphalt seams

Dundalk Marine Terminal 2021 Surface Cover Inspection Data Table

						Category										1 - 3" M&P		2 - Open/Unpaved Area		3 - Surface Crack		4 - FS Repair		5 - Surface Heaving Area			6 - Inlet/	7 - Monitor	8 - Gravel Cover Discoloration			
Area	Date	Issue Number	Location Longitude	Location Latitude	Status	P	CS	DP	LP	GC	MW	In	MH	RR	O	Length (feet)	Width (feet)	Length (feet)	Width (feet)	Avg. Width (inches)	Length (feet)	Length (feet)	Width (feet)	Max. Height (inches)	Length (feet)	Width (feet)	Manhole ID	Wellhead ID	Length (feet)	Width (feet)	Vegetation	Comment
1400	6/4/2019	31	-76.52530	39.24513																				12	35	12						
1400	6/4/2019	33	-76.52490	39.24529																				10	44	8						
1400	6/4/2019	34	-76.52440	39.24572														23	5													
1400	6/4/2019	36	-76.52430	39.24553																				10	32	20						
1400	6/4/2019	39	-76.52390	39.24570																0.5	135											
1400	6/4/2019	40	-76.52380	39.24566																0.5	50											
1400	6/4/2019	41	-76.52380	39.24558																0.5	90											
1400	6/4/2019	42	-76.52380	39.24547																				6	72	15						
1400	6/4/2019	43	-76.52430	39.24551											x	100	2															Remove 50 fence posts
1400	6/4/2019	44	-76.52410	39.24537																				12	133	10						
1400	6/4/2019	45	-76.52400	39.24521		x										3	3															
1400	6/4/2019	46	-76.52370	39.24531					x											0.5	72										x	
1400	6/4/2019	47	-76.52360	39.24512																0.25	115											
1400	6/4/2019	49	-76.52390	39.24509							x																	P-6				Damaged well pad
1400	6/5/2019	50	-76.52260	39.24325																0.5	100											
1400	6/5/2019	51	-76.52260	39.24322																0.5	92											Seal patch
1400	6/5/2019	52	-76.52300	39.24316					x											0.5	72										x	
1400	6/5/2019	53	-76.52280	39.24316																				12	55	10						
1400	6/5/2019	54	-76.52280	39.24309																0.5	200										x	
1400	6/5/2019	55	-76.52300	39.24307																0.25	185											Seal patches
1400	6/5/2019	59	-76.52350	39.24288												6	2															
1400	6/5/2019	60	-76.52400	39.24270																												Missing hydrant
1400	6/5/2019	61	-76.52400	39.24275					x											0.5	72										x	
1400	6/5/2019	62	-76.52420	39.24264																0.5	75											
1400	6/19/2019	64	-76.52310	39.24230														6	2													Puncture in asphalt
1400	6/19/2019	65	-76.52340	39.24239														2	2													Hole in asphalt
1400	6/19/2019	66	-76.52330	39.24246																0.75	22										x	Seal around crane stop
1400	6/19/2019	67	-76.52260	39.24258																0.5	240											Seal surface cracks around conduit
1400	6/19/2019	68	-76.52270	39.24244														24	3													
1400	6/19/2019	69	-76.52220	39.24259																0.5	240											Seal asphalt at edge of containment wall
1400	6/19/2019	70	-76.52230	39.24278														20	6													
1400	6/19/2019	71	-76.52240	39.24273														2	2													Abandoned fence posts
1400	6/19/2019	72	-76.52250	39.24298												60	3															Cracking asphalt over conduit
1400	6/19/2019	75	-76.52320	39.24275				x														21	4									Repair dolly pad seam
1400	6/19/2019	78	-76.52310	39.24288																				8	58	30						
1400	6/17/2019	80	-76.52580	39.24435		x										120	3															Repair asphalt seam
1400	6/17/2019	81	-76.52540	39.24456																0.5	200											
1400	6/17/2019	82	-76.52480	39.24459																0.25	375											
1400	6/17/2019	84	-76.52400	39.24497														17	3													
1400	6/20/2019	85	-76.52600	39.24461		x										35	4															
1400	6/20/2019	86	-76.52560	39.24454																0.5	125											
1400	6/20/2019	87	-76.52580	39.24495											x							350	12									Remove guardrail replace with jersey barrier
1400	6/21/2019	88	-76.52570	39.24406												30	3															
1400	6/21/2019	89	-76.52450	39.24452																0.5	520											Seal seams
1400	6/21/2019	90	-76.52460	39.24447																				8	50	15						
1400	6/21/2019	92	-76.52330	39.24464												35	3															
1400	6/21/2019	94	-76.52480	39.24416					x													23	15									
1400	6/21/2019	95	-76.52480	39.24401																0.25	20											Seal conduit paving
1400	6/21/2019	97	-76.52530	39.24394																				6	70	10						
1400	6/21/2019	98	-76.52550	39.24374												10	4															
1400	6/21/2019	99	-76.52470	39.24369																				10	160	20						
1400	6/21/2019	100	-76.52430	39.24378																0.25	200											
1400	6/21/2019	101	-76.52330	39.24434																				6	58	10						
1400	6/21/2019	102	-76.52310	39.24432																0.5	100											Seal seams
1400	6/21/2019	103	-76.52320	39.24411																		25	13									
1400	6/21/2019	104	-76.52330	39.24417																		18	9									
1400	6/21/2019	105	-76.52340	39.24395																				8	60	8						
1400	6/21/2019	106	-76.52320	39.24394																0.5	470										x	
1400	6/21/2019	107	-76.52390	39.24376																				12	100	25						
1400	6/21/2019	108	-76.52400	39.24373				x														36	10									Remove dolly pad
1400	6/21/2019	109	-76.52440	39.24357																0.5	300											Seal seams
1400	6/21/2019	110	-76.52490	39.24334					x															16	23	16						
1400	6/21/2019	111	-76.52450	39.24338																				10	84	15						
1400	6/21/2019	112	-76.52290	39.24391																0.5	300											
1400	6/21/2019	113	-76.52310	39.24401				x														32	128									Remove dolly pad

Dundalk Marine Terminal 2021 Surface Cover Inspection Data Table

						Category										1 - 3" M&P		2 - Open/Unpaved Area		3 - Surface Crack		4 - FS Repair		5 - Surface Heaving Area			6 - Inlet/ Manhole ID	7 - Monitor Wellhead ID	8 - Gravel Cover Discoloration		Vegetation	Comment
Area	Date	Issue Number	Location Longitude	Location Latitude	Status	P	CS	DP	LP	GC	MW	In	MH	RR	O	Length (feet)	Width (feet)	Length (feet)	Width (feet)	Avg. Width (inches)	Length (feet)	Length (feet)	Width (feet)	Max. Height (inches)	Length (feet)	Width (feet)			Length (feet)	Width (feet)		
1500	5/1/2019	1	-76.51960	39.24373												19	9															
1500	5/1/2019	2	-76.52000	39.24388																0.25	38											
1500	5/1/2019	3	-76.51990	39.24381												10	10															Concrete patch with cracking
1500	5/1/2019	4	-76.51980	39.24368		x										4	4															
1500	5/1/2019	5	-76.52030	39.24371												8	3															Puncture in asphalt
1500	5/1/2019	7	-76.52390	39.24597														8	5													Open area at edge of asphalt
1500	5/1/2019	9	-76.52360	39.24608														8	5													Open area at edge of asphalt
1500	5/1/2019	10	-76.52330	39.24623																									8	6		Discolored gravel adjacent to railroad switch
1500	5/1/2019	12	-76.52370	39.24576											x	12	2															Remove sic abandoned fence posts
1500	5/1/2019	13	-76.52330	39.24599								x				24	2															Asphalt damage around inlet grate at IN-801
1500	5/1/2019	14	-76.52330	39.24604																0.5	150											
1500	5/1/2019	16	-76.52310	39.24606											x	22	2															Remove 11 abandoned fence posts
1500	5/1/2019	17	-76.52300	39.24595												66	9															Cracked asphalt next to canopy
1500	5/1/2019	18	-76.52310	39.24592			x													0.75	360										x	Crack between concrete slab and asphalt around canopy
1500	5/1/2019	19	-76.52340	39.24582																0.25	130											Crack for conduit sawcut and adjacent crack
1500	5/1/2019	20	-76.52360	39.24574								x				28	4															Damaged asphalt around IN-803
1500	5/1/2019	21	-76.52360	39.24550												40	2															Severe cracks in roadway
1500	5/1/2019	22	-76.52350	39.24549																				10	38	20						
1500	5/1/2019	23	-76.52340	39.24542		x										37	6															
1500	5/1/2019	24	-76.52330	39.24544																				12	114	12						
1500	5/1/2019	25	-76.52310	39.24556																				12	57	10						
1500	5/1/2019	26	-76.52300	39.24562																				18	116	10						May 20, 2021 dimensions updated from 16”x82’x10’ to 18”x116’x10’
1500	5/1/2019	27	-76.52300	39.24563																				18	112	10						May 20, 2021 dimensions updated from 18”x112x10’.
1500	5/1/2019	28	-76.52280	39.24578																				8	88	25						
1500	5/1/2019	29	-76.52280	39.24575																0.5	225										x	
1500	5/1/2019	30	-76.52260	39.24576																				14	76	15						
1500	5/1/2019	31	-76.52260	39.24565																				16	164	20						5/20/2021 Dimensions updated from 14”x164’x20’ to 16”x164’x20’
1500	5/1/2019	32	-76.52280	39.24552												44	10															Cracked asphalt with ponding
1500	5/1/2019	33	-76.52290	39.24545																		24	23									Alligator cracking
1500	5/1/2019	34	-76.52310	39.24542																				6	42	10						
1500	5/1/2019	35	-76.52320	39.24534												24	24															
1500	5/1/2019	36	-76.52330	39.24529																0.5	180											Cracks along and adjacent to asphalt seams
1500	5/1/2019	37	-76.52340	39.24520																0.25	350											Seal asphalt seam
1500	5/1/2019	38	-76.52280	39.24480					x															8	16	16						Heave under light pole
1500	5/1/2019	39	-76.52280	39.24484			x													0.5	20											Seal transformer pad
1500	5/1/2019	41	-76.52170	39.24515																0.5	300											Seal asphalt seam
1500	5/1/2019	42	-76.52170	39.24514																				10	55	12						
1500	5/1/2019	43	-76.52180	39.24494																0.25	250											Reseal asphalt seam
1500	5/1/2019	44	-76.52220	39.24490																				14	40	30						
1500	5/1/2019	45	-76.52230	39.24489																0.5	220										x	Asphalt seam
1500	5/1/2019	46	-76.52220	39.24483												30	5															Pitted asphalt
1500	5/1/2019	47	-76.52240	39.24486		x										15	10															
1500	5/1/2019	48	-76.52250	39.24483												30	10															Alligator cracking
1500	5/1/2019	49	-76.52260	39.24481																				14	70	20						
1500	5/1/2019	50	-76.52260	39.24476												16	10															Alligator cracking
1500	5/1/2019	51	-76.52280	39.24465																				8	68	15						
1500	5/1/2019	52	-76.52280	39.24466																0.5	100											Asphalt seam
1500	5/1/2019	53	-76.52280	39.24460																		17	12									Alligator cracking
1500	5/1/2019	54	-76.52280	39.24459																		19	10									Alligator cracking
1500	5/1/2019	55	-76.52290	39.24457																		20	14									Alligator cracking
1500	5/1/2019	56	-76.52290	39.24455																		20	13									Alligator cracking
1500	5/2/2019	57	-76.52290	39.24435																				6	50	10						
1500	5/2/2019	58	-76.52280	39.24432												28	20															Alligator cracking
1500	5/2/2019	59	-76.52260	39.24422																				8	23	12						
1500	5/2/2019	60	-76.52260	39.24437																0.25	40											
1500	5/2/2019	61	-76.52240	39.24446																				10	113	10						
1500	5/2/2019	62	-76.52230	39.24435														2	2													Coring location
1500	5/2/2019	63	-76.52220	39.24437												58	13															Cracked asphalt along seam
1500	5/2/2019	64	-76.52220	39.24437												40	12															
1500	5/2/2019	67	-76.52200	39.24455																				10	46	10						
1500	5/2/2019	68	-76.52190	39.24453																0.25	370											Seal asphalt patches
1500	5/28/2019	69	-76.52180	39.24462												44	23															Cracking asphalt
1500	5/28/2019	70	-76.52170	39.24466												24	12															Cracking asphalt

Dundalk Marine Terminal 2021 Surface Cover Inspection Data Table

Area	Date	Issue Number	Location Longitude	Location Latitude	Status	Category										1 - 3" M&P		2 - Open/Unpaved Area		3 - Surface Crack		4 - FS Repair		5 - Surface Heaving Area			6 - Inlet/ Manhole ID	7 - Monitor Wellhead ID	8 - Gravel Cover Discoloration		Vegetation	Comment
						P	CS	DP	LP	GC	MW	In	MH	RR	O	Length (feet)	Width (feet)	Length (feet)	Width (feet)	Avg. Width (inches)	Length (feet)	Length (feet)	Width (feet)	Max. Height (inches)	Length (feet)	Width (feet)			Length (feet)	Width (feet)		
1500	5/28/2019	72	-76.52130	39.24467		x										5	5															
1500	5/28/2019	73	-76.52130	39.24469																0.5	120											Seal asphalt seams
1500	5/28/2019	74	-76.52150	39.24453																0.25	460											Seal seams for asphalt patches
1500	5/28/2019	75	-76.52150	39.24456				x												0.5	560											Seal dolly pad
1500	5/28/2019	76	-76.52270	39.24454																		45	16									
1500	5/28/2019	77	-76.52290	39.24447																		20	14									
1500	5/28/2019	78	-76.52110	39.24412																0.25	255											Seal asphalt patches
1500	5/28/2019	79	-76.52120	39.24403												155	3															Replace asphalt over conduit
1500	5/28/2019	81	-76.52180	39.24385				x												0.5	480											
1500	5/28/2019	82	-76.52180	39.24382												115	3															Replace asphalt over conduit
1500	5/28/2019	85	-76.52210	39.24368														22	2													Mill and pave along damaged seam
1500	5/28/2019	86	-76.52230	39.24355																		20	12									
1500	5/28/2019	88	-76.52150	39.24375																				6	90	5						
1500	5/28/2019	93	-76.52150	39.24356																0.5	70										x	
1500	6/17/2019	93	-76.52090	39.24449																0.5	190										x	
1501/1602	5/7/2019	1	-76.51720	39.24232																				10	36	6						Heave near wall
1501/1602	5/22/2019	2	-76.52020	39.24298					x															8	70	15						From LP 15-17
1501/1602	5/22/2019	3	-76.51970	39.24265																				12	90	35						
1501/1602	5/22/2019	4	-76.51980	39.24344																0.5	2											Crack seal around patch.
1501/1602	5/22/2019	5	-76.51960	39.24319																				10	218	30						
1501/1602	5/22/2019	6	-76.52090	39.24125											x					1	51											51 feet of crack sealing around 5 guard rail posts.
1501/1602	5/22/2019	7	-76.52090	39.24130		x										5	7															Two potholes from previous boring locations.
1501/1602	5/22/2019	8	-76.52090	39.24132																0.5	50											
1501/1602	5/22/2019	9	-76.52080	39.24130								x												8	6	6						Heave around inlet.
1501/1602	5/22/2019	10	-76.52090	39.24171																0.5	70											
1501/1602	5/22/2019	11	-76.52110	39.24198																0.5	85											
1501/1602	5/22/2019	12	-76.52110	39.24213																0.5	30											
1501/1602	5/22/2019	13	-76.52060	39.24157																0.5	90											Multiple cracks
1501/1602	5/22/2019	14	-76.52050	39.24155																0.25	60											
1501/1602	5/22/2019	15	-76.52040	39.24143																0.25	65											
1501/1602	5/22/2019	16	-76.52040	39.24142																0.5	2											Crack seal around old concrete well pad.
1501/1602	5/22/2019	17	-76.52040	39.24163																0.5	90											
1501/1602	5/22/2019	18	-76.52060	39.24180							x					4	4											Unknown				Two separate well pads. One abandoned.
1501/1602	5/22/2019	19	-76.52080	39.24211																0.5	75											
1501/1602	5/22/2019	20	-76.52050	39.24207																0.5	50											
1501/1602	5/23/2019	21	-76.52020	39.24157																				6	72	20						
1501/1602	5/23/2019	22	-76.52020	39.24165																0.5	90											
1501/1602	5/23/2019	23	-76.52050	39.24219																0.5	175											
1501/1602	5/23/2019	24	-76.52060	39.24240												51	4															
1501/1602	5/23/2019	25	-76.52060	39.24242												24	6															
1501/1602	5/23/2019	26	-76.52040	39.24218																0.5	100											Seal four asphalt seams
1501/1602	5/23/2019	27	-76.52020	39.24212																0.5	50											
1501/1602	5/23/2019	28	-76.52000	39.24162																0.5	260											Cracks in ponding area
1501/1602	5/23/2019	29	-76.51960	39.24169																0.5	125											
1501/1602	5/23/2019	30	-76.51950	39.24181																0.5	70											
1501/1602	5/23/2019	31	-76.52000	39.24211												13	4															Puncture in asphalt
1501/1602	5/23/2019	32	-76.52000	39.24213																0.5	44											
1501/1602	5/23/2019	33	-76.52010	39.24237																				8	75	20						
1501/1602	5/23/2019	34	-76.52030	39.24247		x										13	10															
1501/1602	5/23/2019	35	-76.52030	39.24249												12	10															
1501/1602	5/23/2019	36	-76.51990	39.24263		x										43	8															
1501/1602	5/23/2019	37	-76.51970	39.24220																0.75	72											Seal asphalt seam
1501/1602	5/23/2019	38	-76.51970	39.24215			x													0.25	24											Crack around electric manhole
1501/1602	5/23/2019	39	-76.51900	39.24190																				24	75	50						
1501/1602	5/23/2019	40	-76.51920	39.24225		x										2	2															
1501/1602	5/23/2019	41	-76.51950	39.24221																0.5	60											
1501/1602	5/23/2019	42	-76.51880	39.24197												22	9															
1501/1602	5/23/2019	43	-76.51870	39.24218		x										14	4															
1501/1602	5/23/2019	44	-76.51880	39.24235																				14	118	20						
1501/1602	5/23/2019	45	-76.51890	39.24250												32	3															
1501/1602	5/23/2019	46	-76.51890	39.24266																0.5	150											Seal asphalt seams
1501/1602	5/23/2019	47	-76.51910	39.24254																0.5	225											
1501/1602	5/23/2019	48	-76.51900	39.24223																1	80											
1501/1602	6/21/2019	49	-76.51740	39.24244																				16	148	20						

Dundalk Marine Terminal 2021 Surface Cover Inspection Data Table

						Category										1 - 3" M&P		2 - Open/Unpaved Area		3 - Surface Crack		4 - FS Repair		5 - Surface Heaving Area			6 - Inlet/ Manhole ID	7 - Monitor Wellhead ID	8 - Gravel Cover Discoloration		Vegetation	
Area	Date	Issue Number	Location Longitude	Location Latitude	Status	P	CS	DP	LP	GC	MW	In	MH	RR	O	Length (feet)	Width (feet)	Length (feet)	Width (feet)	Avg. Width (inches)	Length (feet)	Length (feet)	Width (feet)	Max. Height (inches)	Length (feet)	Width (feet)			Length (feet)	Width (feet)		Comment
1501/1602	6/21/2019	50	-76.51750	39.24245																0.5	190											
1501/1602	6/21/2019	51	-76.51810	39.24311												4	4															
1501/1602	6/21/2019	52	-76.51840	39.24372														8	4													Conduit open area
1501/1602	6/21/2019	53	-76.51860	39.24386																0.5	100											
1501/1602	6/21/2019	54	-76.51890	39.24314																				10	47	2						
N1600	5/1/2019	1	-76.52230	39.24752											x	8	2															4 abandoned fence posts
N1600	5/1/2019	2	-76.52220	39.24750						x				x				67	20													Railroad ballast
N1600	5/1/2019	3	-76.52230	39.24746											x					0.5	75										x	Crack at top of curb and curb gutter
N1600	5/1/2019	4	-76.52230	39.24736																		35	23									Alligator cracking
N1600	5/1/2019	5	-76.52220	39.24735																0.75	215											Long crack plus seams for traffic light signal wire
N1600	5/1/2019	6	-76.52200	39.24740												50	8															
N1600	5/1/2019	7	-76.52180	39.24739												65	4															Alligator cracking along asphalt seams
N1600	5/1/2019	8	-76.52150	39.24741						x				x				40	15													Railroad ballast at top of drainage swale
N1600	5/1/2019	9	-76.52190	39.24730												62	12															Cracking in western most north bound lane
N1600	5/1/2019	10	-76.52230	39.24766												12	3														x	Repair asphalt
N1600	5/1/2019	11	-76.52230	39.24755											x							10	5									Dig out asphalt and reset manhole ring/lid
N1600	5/1/2019	12	-76.52240	39.24757											x	36	11														x	Abandon fence posts. Damaged asphalt from curb to bottom of slope
N1600	5/1/2019	13	-76.52260	39.24764												3	2															Small hole adjacent to electric manhole
N1600	5/1/2019	14	-76.52270	39.24761																0.25	55											
N1600	5/1/2019	15	-76.52280	39.24757												22	5														x	Damaged asphalt on curb
N1600	5/1/2019	16	-76.52260	39.24760														9	4													
N1600	5/1/2019	17	-76.52280	39.24751		x										25	19															
N1600	6/11/2019	18	-76.52210	39.24673																				10	126	20						
N1600	6/11/2019	19	-76.52220	39.24668														6	2													Hole in asphalt
N1600	6/11/2019	20	-76.52250	39.24646																0.25	300											Seal seam
N1600	6/11/2019	22	-76.52290	39.24625											x																	Damaged well or valve cover
N1600	6/11/2019	23	-76.52230	39.24671																		67	15									
N1600	6/11/2019	24	-76.52220	39.24678																		25	20									
N1600	6/11/2019	25	-76.52190	39.24701																0.75	180										x	
N1600	6/11/2019	26	-76.52190	39.24692											x							8	5									Remove stop light foundation
N1600	6/11/2019	27	-76.52190	39.24716														6	2													Sign post
N1600	6/11/2019	28	-76.52200	39.24719																0.5	10										x	
N1600	6/11/2019	29	-76.52210	39.24705														10	5													
N1600	6/11/2019	30	-76.52220	39.24688														85	12													
N1600	6/11/2019	31	-76.52270	39.24668										x				10	10													Railroad switch
N1600	6/11/2019	32	-76.52280	39.24670												10	5															Puncture in asphalt
N1600	6/11/2019	33	-76.52260	39.24723												4	2															Puncture in asphalt
N1600	6/11/2019	34	-76.52310	39.24690																0.5	50											
N1600	6/11/2019	35	-76.52290	39.24723																0.5	100										x	
N1600	6/11/2019	36	-76.52270	39.24731																0.5	100										x	
N1600	6/11/2019	37	-76.52230	39.24730												20	10															Asphalt cracking
N1600	6/11/2019	38	-76.52220	39.24731												30	10															Asphalt cracking
N1600	6/11/2019	39	-76.52170	39.24716		x																50	50									
N1600	6/11/2019	40	-76.52180	39.24703																				8	30	30						
1600	5/1/2019	1	-76.52190	39.24570																0.25	60											Seal asphalt seam
1600	5/1/2019	2	-76.52180	39.24550																0.5	70											Seal asphalt seam
1600	5/10/2019	5	-76.52140	39.24576			x													1	25											Crack in concrete slab
1600	5/10/2019	6	-76.52200	39.24596																0.5	260											
1600	5/10/2019	7	-76.52160	39.24596																				16	120	20						5/20/2021; Heave extends into reinforced concrete under canopy. Dimensions updated from 10”x115’x20’ to 16”x120’x20’
1600	5/10/2019	8	-76.52160	39.24578																				14	30	15						
1600	5/10/2019	9	-76.52160	39.24611			x													0.75	560											Seal seam at concrete and asphalt joint around canopy
1600	5/10/2019	10	-76.52190	39.24618																0.25	40											
1600	5/10/2019	11	-76.52230	39.24595																0.5	165											Asphalt seam
1600	5/10/2019	12	-76.52260	39.24613																0.5	100											Asphalt seam for conduit
1600	5/10/2019	13	-76.52260	39.24627																		75	6									Repair asphalt around guardrail
1600	5/10/2019	14	-76.52270	39.24620											x	38	2															19 abandoned fence posts
1600	5/10/2019	15	-76.52240	39.24630																0.25	195											Seal asphalt seams
1600	5/10/2019	16	-76.52230	39.24615																0.25	200											
1600	5/10/2019	17	-76.52160	39.24632																				6	40	10						
1600	5/10/2019	18	-76.52200	39.24655																0.25	115											Seal asphalt seam

Dundalk Marine Terminal 2021 Surface Cover Inspection Data Table

Area	Date	Issue Number	Location Longitude	Location Latitude	Status	Category										1 - 3" M&P		2 - Open/Unpaved Area		3 - Surface Crack		4 - FS Repair		5 - Surface Heaving Area			6 - Inlet/ Manhole ID	7 - Monitor Wellhead ID	8 - Gravel Cover Discoloration		Vegetation	Comment
						P	CS	DP	LP	GC	MW	In	MH	RR	O	Length (feet)	Width (feet)	Length (feet)	Width (feet)	Avg. Width (inches)	Length (feet)	Length (feet)	Width (feet)	Max. Height (inches)	Length (feet)	Width (feet)			Length (feet)	Width (feet)		
1600	5/10/2019	19	-76.52110	39.24680																0.25	40											
1600	5/10/2019	20	-76.52070	39.24644																0.25	120											Seal conduit seam
1600	5/10/2019	21	-76.52110	39.24650						x								43	25													Open area near tower
1600	6/14/2019	22	-76.52110	39.24613																0.5	260										x	
1600	6/14/2019	23	-76.52080	39.24614																0.25	50											
1600	6/14/2019	24	-76.52050	39.24624																				14	120	15						
1600	6/14/2019	25	-76.52060	39.24636		x										8	6															
1600	6/14/2019	26	-76.52050	39.24637																				8	45	15						
1600	6/14/2019	27	-76.52060	39.24631																0.5	245											
1600	6/14/2019	28	-76.52050	39.24611			x															16	8									
1600	6/14/2019	29	-76.52050	39.24617																0.5	145											
1600	6/14/2019	30	-76.52030	39.24613																				10	140	20						Length changed from 140 feet to 86 feet on 5/20/2021. Partial heave removal during MPA paving in summer 2020
1600	6/14/2019	31	-76.52030	39.24623											x	2	2															Abandon fence post
1600	6/14/2019	32	-76.52000	39.24592																0.5	175											
1600	6/14/2019	33	-76.52030	39.24583																0.25	140											Seal parches and seam
1600	6/14/2019	34	-76.52090	39.24591																0.25	130											Seal seam
1600	6/14/2019	35	-76.52050	39.24557					x											0.5	72										x	
1600	5/20/2021	1	-76.52120	39.24634																				6	82	4						
1600	5/20/2021	2	-76.52000	39.24602																				14	128	15						
1600	5/20/2021	3	-76.52070	39.24603																0.25	55											
1600	5/20/2021	4	-76.52090	39.24570																0.5	90											
1600	5/20/2021	5	-76.52110	39.24599																0.75	47											
1600	5/20/2021	6	-76.52090	39.24506																0.25	25											Crack a newly forming heave
1600	5/20/2021	7	-76.52170	39.24616																				6	45	3						
1600	5/20/2021	8	-76.52180	39.24606																0.5	75											
1601	5/1/2019	1	-76.51830	39.24483											x	36	2															18 abandon fence posts
1601	5/1/2019	2	-76.51820	39.24479											x			6	1													6 gaps in curb
1601	5/1/2019	3	-76.51830	39.24466																0.5	125											
1601	5/1/2019	4	-76.51840	39.24465																				10	100	12						
1601	5/1/2019	5	-76.51840	39.24459		x										3	3															
1601	5/1/2019	6	-76.51830	39.24453																				10	60	20						
1601	5/1/2019	7	-76.51870	39.24442																0.5	72											
1601	5/1/2019	8	-76.51860	39.24425		x										16	7															Pothole adjacent to existing patch.
1601	5/1/2019	9	-76.51880	39.24424												17	12															Weathered asphalt.
1601	5/1/2019	10	-76.51910	39.24400												42	4															
1601	5/1/2019	11	-76.51920	39.24420																0.5	200											Lateral and seam crack.
1601	5/1/2019	12	-76.51920	39.24390												20	15															
1601	5/1/2019	13	-76.51930	39.24394												32	4															
1601	5/1/2019	14	-76.51950	39.24405																0.5	100											
1601	5/1/2019	15	-76.51950	39.24379		x										7	5															
1601	5/1/2019	16	-76.51970	39.24382												18	3															
1601	5/1/2019	17	-76.51960	39.24409																0.5	202											Lateral cracking and seams.
1601	5/1/2019	18	-76.51900	39.24444			x		x											0.5	64										x	
1601	5/1/2019	19	-76.51880	39.24457																0.5	87											
1601	5/1/2019	20	-76.51840	39.24490											x	4	2															Two abandon fence posts
1601	5/1/2019	21	-76.51870	39.24494																0.25	205											Blank increased from 147 feet to 205 on June 17, 2021
1601	5/1/2019	22	-76.51910	39.24475																0.5	188											Crack along asphalt seams. Some resealing
1601	5/1/2019	23	-76.51920	39.24468		x										2	2															
1601	5/1/2019	24	-76.51910	39.24467		x										3	3															Pothole in puddle
1601	5/1/2019	25	-76.51900	39.24445																				8	175	15						
1601	5/1/2019	26	-76.51920	39.24447			x													0.75	35											Crack resealing over asphalt covered dolly pad
1601	5/1/2019	27	-76.51960	39.24442																0.5	138											Asphalt seam and lateral cracking
1601	5/1/2019	28	-76.51960	39.24433		x										18	3															Weathered asphalt adjacent to existing patches
1601	5/1/2019	29	-76.51980	39.24400												24	4															
1601	5/1/2019	30	-76.51980	39.24447																0.25	150											Seam and lateral cracks
1601	5/1/2019	31	-76.51960	39.24470																				14	90	15						
1601	5/1/2019	32	-76.51950	39.24477																0.5	100											Seam and lateral cracks
1601	5/1/2019	33	-76.51940	39.24484																0.75	170										x	
1601	5/1/2019	34	-76.51910	39.24501																				14	93	10						
1601	6/14/2019	35	-76.52000	39.24563																0.5	120											Seal seams
1601	6/14/2019	36	-76.51980	39.24566																0.5	60											

Dundalk Marine Terminal 2021 Surface Cover Inspection Data Table

Area	Date	Issue Number	Location Longitude	Location Latitude	Status	Category										1 - 3" M&P		2 - Open/Unpaved Area		3 - Surface Crack		4 - FS Repair		5 - Surface Heaving Area			6 - Inlet/ Manhole ID	7 - Monitor Wellhead ID	8 - Gravel Cover Discoloration		Vegetation	Comment
						P	CS	DP	LP	GC	MW	In	MH	RR	O	Length (feet)	Width (feet)	Length (feet)	Width (feet)	Avg. Width (inches)	Length (feet)	Length (feet)	Width (feet)	Max. Height (inches)	Length (feet)	Width (feet)			Length (feet)	Width (feet)		
1601	6/14/2019	38	-76.51940	39.24540																				12	105	15						Heave length changed from 130 feet to 105 feet when feature inspected on June 17, 2021. A portion of the heave was removed during MPA paving of First Street in August 2020
1601	6/14/2019	39	-76.51960	39.24546																0.5	290											
1601	6/14/2019	40	-76.51960	39.24558																				10	50	15						
1601	6/14/2019	41	-76.51990	39.24518											x	34	2															Remove 17 abandoned fence posts
1601	6/14/2019	42	-76.52010	39.24533																0.5	550										x	
1601	6/14/2019	43	-76.51960	39.24538																0.5	160											
1601	6/14/2019	44	-76.51920	39.24534																				12	28	15						
1601	6/14/2019	45	-76.51960	39.24509																				16	145	15						
1601	6/14/2019	46	-76.51990	39.24490																0.5	220										x	
1601	6/14/2019	47	-76.51890	39.24523																0.5	240											
1601	6/14/2019	48	-76.52000	39.24471																0.5	275										x	
1601	6/14/2019	49	-76.52000	39.24452																				8	160	8						
1601	6/14/2019	50	-76.52030	39.24468																0.5	500										x	
1601	6/14/2019	51	-76.52040	39.24455																				12	90	10						
1601	6/14/2019	53	-76.52050	39.24449												55	25															Cracking asphalt
1601	6/14/2019	54	-76.52020	39.24424																0.5	155											
1601	6/14/2019	55	-76.52010	39.24420					x											0.25	72											
1601	6/17/2021	1	-76.51940	39.24523																				6	53	5						
1601	6/17/2021	2	-76.51850	39.24496		x										17	10															Pitting asphalt
1700/1701	5/1/2019	1	-76.51910	39.24666																0.5	200											Lateral and seam cracks
1700/1701	5/1/2019	2	-76.51920	39.24672					x						x																	Repair 14' of curb around light
1700/1701	5/1/2019	3	-76.51920	39.24660																				6	75	10						
1700/1701	5/1/2019	4	-76.51940	39.24647																0.5	250											Seal five asphalt seams
1700/1701	5/1/2019	5	-76.51970	39.24635																				8	50	10						
1700/1701	5/1/2019	6	-76.51970	39.24622																0.5	260											
1700/1701	5/1/2019	7	-76.51990	39.24619																0.5	115											Crack at asphalt seam
1700/1701	5/1/2019	8	-76.51980	39.24610																				6	65	15						Heave along roadway and shoulder. Shorten from 65 feet to 50 feet on 5/19/2021 because of paving of summer of 2020
1700/1701	5/1/2019	10	-76.51940	39.24597																				6	95	10						
1700/1701	5/1/2019	11	-76.51920	39.24626																0.5	300											
1700/1701	5/1/2019	12	-76.51880	39.24633																				8	80	15						
1700/1701	5/1/2019	13	-76.51860	39.24614																0.25	200											Cracks along seams
1700/1701	5/1/2019	14	-76.51890	39.24601																0.5	205											Crack along seam
1700/1701	5/1/2019	15	-76.51940	39.24580			x		x																							Install asphalt curb around light pole slab
1700/1701	5/1/2019	16	-76.51880	39.24566																				8	92	10						
1700/1701	5/1/2019	17	-76.51860	39.24594																				6	27	10						
1700/1701	5/1/2019	20	-76.51880	39.24541																				6	53	10						
1700/1701	5/1/2019	21	-76.51830	39.24589																0.25	150											
1700/1701	5/1/2019	22	-76.51850	39.24561																				8	60	10						
1700/1701	5/17/2019	23	-76.51970	39.24649																0.5	600											Seal seams
1700/1701	5/17/2019	24	-76.51930	39.24662																				8	90	15						
1700/1701	5/17/2019	25	-76.51930	39.24682																0.5	500											Seam and lateral cracks
1700/1701	5/17/2019	26	-76.51990	39.24646																0.5	360											Crack at asphalt seam
1700/1701	5/17/2019	27	-76.51970	39.24678																				8	165	15						
1700/1701	5/17/2019	28	-76.51960	39.24706																				6	52	5						Heave at edge of concrete slab. Length changed from 52 feet to 96 feet on 5/19/2021.
1700/1701	5/17/2019	29	-76.52000	39.24687																				6	85	10						Updated to 85 feet from 70 feet in length on 5/19/2021
1700/1701	5/17/2019	30	-76.52020	39.24678																0.5	400											
1700/1701	5/17/2019	32	-76.52020	39.24700																				8	70	50						Length changed from 70 feet to 90 feet on 5/19/2021
1700/1701	5/17/2019	33	-76.52000	39.24717																0.5	175											
1700/1701	5/17/2019	34	-76.52030	39.24728																0.5	150											
1700/1701	5/17/2019	35	-76.52050	39.24700																				6	78	10						
1700/1701	5/17/2019	36	-76.52050	39.24680																				10	65	15						Length changed from 50 to 65 feet on May 19, 2021
1700/1701	5/17/2019	37	-76.52050	39.24679																0.25	47										x	Mill a d pave along seam
1700/1701	5/17/2019	39	-76.52090	39.24693														10	10													Hydrant repair. Repair curb
1700/1701	5/17/2019	40	-76.52060	39.24703																0.5	1100											
1700/1701	5/17/2019	41	-76.52030	39.24742																0.5	500											
1700/1701	5/17/2019	42	-76.52030	39.24752												26	12															
1700/1701	6/4/2019	43	-76.51710	39.24530																0.25	180											
1700/1701	6/4/2019	44	-76.51730	39.24534																				14	235	20						

Dundalk Marine Terminal 2021 Surface Cover Inspection Data Table

						Category										1 - 3" M&P		2 - Open/Unpaved Area		3 - Surface Crack		4 - FS Repair		5 - Surface Heaving Area			6 - Inlet/ Manhole ID	7 - Monitor Wellhead ID	8 - Gravel Cover Discoloration		Vegetation	Comment
Area	Date	Issue Number	Location Longitude	Location Latitude	Status	P	CS	DP	LP	GC	MW	In	MH	RR	O	Length (feet)	Width (feet)	Length (feet)	Width (feet)	Avg. Width (inches)	Length (feet)	Length (feet)	Width (feet)	Max. Height (inches)	Length (feet)	Width (feet)			Length (feet)	Width (feet)		
1700/1701	6/4/2019	45	-76.51740	39.24524																0.25	195											Seal patches
1700/1701	6/4/2019	46	-76.51760	39.24530												33	6															
1700/1701	6/4/2019	47	-76.51760	39.24527												19	18															
1700/1701	6/4/2019	48	-76.51770	39.24523												24	13															Alligator cracking
1700/1701	6/4/2019	49	-76.51780	39.24520																				10	30	15						
1700/1701	6/4/2019	50	-76.51760	39.24505		x										20	20															
1700/1701	6/4/2019	51	-76.51800	39.24506																				8	82	10						
1700/1701	6/4/2019	53	-76.51810	39.24486																0.5	80											
1700/1701	6/4/2019	54	-76.51770	39.24557												4	2															
1700/1701	6/5/2019	55	-76.52070	39.24725																0.75	150											Seal seam
1700/1701	6/5/2019	56	-76.52070	39.24722		x										25	10															
1700/1701	6/5/2019	57	-76.52100	39.24708																0.5	185											
1700/1701	6/5/2019	58	-76.52100	39.24698		x										12	9															
1700/1701	6/5/2019	59	-76.52110	39.24708												43	3															Separated seam
1700/1701	6/5/2019	60	-76.52080	39.24742				x												0.25	90											
1700/1701	6/5/2019	61	-76.52060	39.24778																0.75	19										x	
1700/1701	6/5/2019	62	-76.52110	39.24740											x	2	2															Sign post
1700/1701	6/5/2019	63	-76.52120	39.24711																0.5	425											Seal curb
1700/1701	6/5/2019	64	-76.52120	39.24743																				10	40	15						
1700/1701	6/5/2019	65	-76.52080	39.24773																				6	42	10						
1700/1701	6/5/2019	66	-76.52090	39.24784																		310	16									
1700/1701	6/5/2019	67	-76.52140	39.24735								x				10	8															Repave around inlet IN-812
1700/1701	6/5/2019	68	-76.52160	39.24730																0.5	140											
1702	5/7/2019	1	-76.51720	39.24233																1	27											
1702	5/7/2019	2	-76.51710	39.24226														2	2												x	Holes is asphalt
1702	5/7/2019	3	-76.51710	39.24226												46	6															Wide crack
1702	5/7/2019	4	-76.51690	39.24230																0.25	120											Seal top of curb and gutter pan
1702	5/7/2019	5	-76.51670	39.24233														2	2													Hole in asphalt
1702	5/7/2019	6	-76.51640	39.24237														6	2													Hole in asphalt
1702	5/7/2019	7	-76.51600	39.24251														8	2													Four holes in asphalt
1702	5/7/2019	8	-76.51580	39.24254												6	4															Puncture in asphalt
1702	5/7/2019	9	-76.51560	39.24260												26	5															Alligator cracking
1702	5/7/2019	10	-76.51550	39.24268																0.5	100										x	
1702	5/7/2019	11	-76.51570	39.24273																				8	100	15						
1702	5/7/2019	12	-76.51570	39.24268							x																	TPZ-30B				Damaged well pad
1702	5/7/2019	13	-76.51620	39.24255																0.5	92											
1702	5/7/2019	14	-76.51630	39.24249							x																	DMT-39S				Damaged well pad
1702	5/7/2019	15	-76.51720	39.24243																0.5	40											
1702	5/7/2019	16	-76.51710	39.24244												25	5															Alligator cracking along seam
1702	5/7/2019	17	-76.51710	39.24246																0.5	100											
1702	5/7/2019	18	-76.51670	39.24262			x													0.25	45										x	
1702	5/7/2019	19	-76.51640	39.24268			x													0.5	90											
1702	5/7/2019	20	-76.51580	39.24287																0.75	86										x	Crack between asphalt and building
1702	5/7/2019	21	-76.51590	39.24298												33	4														x	Gap between building and asphalt
1702	5/7/2019	22	-76.51570	39.24303																0.5	20										x	
1702	5/7/2019	23	-76.51560	39.24307												4	2															Hole on asphalt
1702	5/7/2019	24	-76.51580	39.24310																				8	111	10						
1702	5/7/2019	25	-76.51580	39.24313												40	10															Alligator cracking
1702	5/7/2019	26	-76.51590	39.24310																				10	80	6						
1702	5/7/2019	27	-76.51610	39.24315												48	16															Alligator cracking
1702	5/7/2019	28	-76.51640	39.24306																0.5	367											Crack between asphalt and concrete slab
1702	5/15/2019	29	-76.51760	39.24488																				12	60	17						Middle of the road.
1702	5/15/2019	30	-76.51730	39.24465																1	50											
1702	5/15/2019	31	-76.51740	39.24486																0.5	55											
1702	5/15/2019	32	-76.51730	39.24490																0.5	51											
1702	5/15/2019	33	-76.51720	39.24483																0.5	33											
1702	5/15/2019	34	-76.51700	39.24469																0.5	200											
1702	5/15/2019	35	-76.51700	39.24488																0.5	75											
1702	5/15/2019	36	-76.51730	39.24512																0.5	31											
1702	5/15/2019	37	-76.51700	39.24510																				12	65	15						In between jersey barriers and roadway.
1702	5/15/2019	38	-76.51710	39.24507																				14	90	10					x	Between light pole and jersey barriers.
1702	5/15/2019	39	-76.51690	39.24503					x											0.5	65										x	LP-C
1702	5/15/2019	40	-76.51680	39.24502																0.5	60											
1702	5/15/2019	41	-76.51680	39.24510																0.5	111											In roadway.
1702	5/15/2019	42	-76.51660	39.24501												20	5															Roadway

Dundalk Marine Terminal 2021 Surface Cover Inspection Data Table

						Category										1 - 3" M&P		2 - Open/Unpaved Area		3 - Surface Crack		4 - FS Repair		5 - Surface Heaving Area			6 - Inlet/	7 - Monitor	8 - Gravel Cover Discoloration		Vegetation	
Area	Date	Issue Number	Location Longitude	Location Latitude	Status	P	CS	DP	LP	GC	MW	In	MH	RR	O	Length (feet)	Width (feet)	Length (feet)	Width (feet)	Avg. Width (inches)	Length (feet)	Length (feet)	Width (feet)	Max. Height (inches)	Length (feet)	Width (feet)	Manhole ID	Wellhead ID	Length (feet)	Width (feet)		Comment
1702	5/15/2019	43	-76.51670	39.24497			x									15	3															Spalling in concrete
1702	5/15/2019	44	-76.51680	39.24498												110	10															
1702	5/15/2019	45	-76.51670	39.24497																0.5	300											Parallel cracks in the concrete.
1702	5/15/2019	46	-76.51620	39.24485			x									50	3															In roadway. Spalling.
1702	5/15/2019	47	-76.51630	39.24473			x									15	3															Spalling just west of roadway.
1702	5/15/2019	48	-76.51620	39.24470																1	120											Asphalt patch previously sealed.
1702	5/15/2019	49	-76.51630	39.24464																				10	21	13						
1702	5/15/2019	50	-76.51630	39.24464																0.25	42											Various cracks near inlet.
1702	5/15/2019	51	-76.51640	39.24467																0.5	120										x	Dolly pad up to jersey barriers.
1702	5/15/2019	52	-76.51640	39.24464																0.5	60											Crack from dolly pad to jersey barrier.
1702	5/15/2019	53	-76.51710	39.24441												25	10															
1702	5/15/2019	54	-76.51680	39.24451																				6	130	5						
1702	5/15/2019	55	-76.51730	39.24422																				8	78	30						
1702	5/15/2019	56	-76.51770	39.24408																				10	30	15						Heave by light pole.
1702	5/15/2019	57	-76.51770	39.24415																1	100											In roadway.
1702	5/16/2019	58	-76.51770	39.24401																1	95											Various cracks in roadway.
1702	5/16/2019	59	-76.51760	39.24402																0.5	25											Cracking just east of jersey barriers by light pole 17-1
1702	5/16/2019	61	-76.51740	39.24394																1	100											
1702	5/16/2019	62	-76.51730	39.24411																				8	50	10						
1702	5/16/2019	63	-76.51670	39.24433					x											0.25	80										x	Crack around 17-4
1702	5/16/2019	64	-76.51660	39.24439																0.5	90											
1702	5/16/2019	65	-76.51600	39.24457												50	2															Damaged concrete in roadway.
1702	5/16/2019	66	-76.51600	39.24450																0.5	75											
1702	5/16/2019	67	-76.51630	39.24437																0.5	240											Various cracking east of dolly pad.
1702	5/16/2019	68	-76.51680	39.24416																0.5	45											
1702	5/16/2019	69	-76.51660	39.24424																0.5	60											
1702	5/16/2019	70	-76.51710	39.24402																0.5	150											Cracking on north side of heave.
1702	5/16/2019	72	-76.51730	39.24404																0.5	115											Cracks and asphalt patch seal missing.
1702	5/16/2019	74	-76.51740	39.24381																0.5	35											
1702	5/16/2019	75	-76.51730	39.24392												20	13															
1702	5/16/2019	78	-76.51600	39.24415																0.25	120											
1702	5/16/2019	79	-76.51600	39.24428				x												1	170											
1702	5/16/2019	80	-76.51580	39.24429																				8	50	20						
1702	5/16/2019	81	-76.51570	39.24436																0.25	70											
1702	5/16/2019	82	-76.51580	39.24427																0.5	45											
1702	5/16/2019	83	-76.51620	39.24405																0.5	160											
1702	5/16/2019	84	-76.51660	39.24389																0.5	160											
1702	5/16/2019	85	-76.51690	39.24382																0.5	60											
1702	5/16/2019	87	-76.51700	39.24379																0.5	40											
1702	5/21/2019	89	-76.51760	39.24347																0.5	80											Cracking near intersection.
1702	5/21/2019	90	-76.51680	39.24357																0.5	30											
1702	5/21/2019	91	-76.51670	39.24341																0.5	85											
1702	5/21/2019	92	-76.51670	39.24347																0.5	85										x	
1702	5/22/2019	93	-76.51670	39.24327																0.5	135											
1702	5/22/2019	94	-76.51710	39.24322																				8	25	10						
1702	5/22/2019	95	-76.51730	39.24322																				6	33	12						
1702	5/22/2019	96	-76.51720	39.24298									x							0.5	110						Electric vault					Asphalt pad around electric vault. Manhole ring is cracked and needs to be sealed.
1702	5/22/2019	97	-76.51730	39.24282												100	15															Area of road between the two patches.
1702	5/22/2019	98	-76.51720	39.24282														2	2													NW corner of Shed1702A
1702	5/22/2019	99	-76.51610	39.24314												50	15															
1702	5/22/2019	100	-76.51630	39.24326																0.25	210										x	Multiple cracks within jersey barrier area.
1702	5/22/2019	101	-76.51640	39.24346																0.5	75											Various cracks including seam between asphalt patches.
1702	5/22/2019	102	-76.51630	39.24373																0.5	220											
1702	5/22/2019	103	-76.51620	39.24342																0.5	75											
1702	5/22/2019	104	-76.51590	39.24343																				10	50	8						Heave inside of jersey barrier.
1702	5/22/2019	105	-76.51590	39.24365																0.5	280											Both joints around dolly pad.
1702	5/22/2019	106	-76.51570	39.24373																0.5	280											
1702	5/22/2019	107	-76.51540	39.24384																0.5	88											Cracks at entrance to lot.
1702	5/22/2019	108	-76.51540	39.24394					x											0.5	66											LP-A
1702	5/22/2019	109	-76.51550	39.24414			x																	10	85	15						Heave on both concrete and asphalt. Offshoot to the east at the seam of concrete and asphalt.
1702	5/22/2019	110	-76.51550	39.24413																		25	0.5									
1702	5/22/2019	111	-76.51560	39.24412								x												8	10	10						Volcano type heaves three total. Around inlet.

Dundalk Marine Terminal 2021 Surface Cover Inspection Data Table

						Category										1 - 3" M&P		2 - Open/Unpaved Area		3 - Surface Crack		4 - FS Repair		5 - Surface Heaving Area			6 - Inlet/ Manhole ID	7 - Monitor Wellhead ID	8 - Gravel Cover Discoloration		Vegetation	
Area	Date	Issue Number	Location Longitude	Location Latitude	Status	P	CS	DP	LP	GC	MW	In	MH	RR	O	Length (feet)	Width (feet)	Length (feet)	Width (feet)	Avg. Width (inches)	Length (feet)	Length (feet)	Width (feet)	Max. Height (inches)	Length (feet)	Width (feet)			Length (feet)	Width (feet)		Comment
1800	5/1/2019	1	-76.51860	39.24758																				8	80	9						
1800	5/1/2019	2	-76.51880	39.24741		x	x									15	2															Potholes at spalling concrete in slab
1800	5/1/2019	3	-76.51860	39.24763							x			x		110	9											DMT-79M				Severe cracking in asphalt between railroad tracks. Includes well
1800	5/1/2019	4	-76.51840	39.24740					x					x		23	15														x	Low point between railroad tracks with sediment and vegetation growth
1800	5/1/2019	5	-76.51860	39.24764														40	3													Wide crack under fence. Fill with asphalt and compact
1800	5/1/2019	6	-76.51830	39.24734											x									10	18	15					x	Heave around abandon hydrant
1800	5/1/2019	7	-76.51880	39.24720																0.5	19											
1800	5/1/2019	8	-76.51870	39.24732			x					x								0.5	42										x	Seal crack between inlet and concrete slabs
1800	5/1/2019	9	-76.51880	39.24715			x													0.5	400										x	Crack between concrete slab and asphalt
1800	5/1/2019	10	-76.51900	39.24702			x					x								0.5	163											Crack around inlet and between concrete slab sections
1800	5/1/2019	11	-76.51880	39.24688												4	2															Two holes through asphalt
1800	5/1/2019	12	-76.51860	39.24687																0.25	60											
1800	5/1/2019	13	-76.51850	39.24669																0.5	100											
1800	5/1/2019	14	-76.51830	39.24692			x							x										12	100	12						Heave at edge of concrete slab
1800	5/1/2019	15	-76.51870	39.24709					x							16	14														x	Replace damaged asphalt over light pole foundation
1800	5/1/2019	16	-76.51810	39.24725										x						0.5	106											Cracks between railroad tracks
1800	5/1/2019	17	-76.51820	39.24719			x																	10	65	10						Heave pushing up edge of concrete slab
1800	5/1/2019	18	-76.51800	39.24714												75	16															Cracked asphalt. Ponding water
1800	5/1/2019	19	-76.51780	39.24694			x					x												12	70	15						Heave under concrete slab extending towards inlet
1800	5/1/2019	20	-76.51810	39.24675			x																	24	115	15						Heave at edge of concrete slab
1800	5/1/2019	21	-76.51800	39.24685																0.5	28											Crack around inlet
1800	5/1/2019	22	-76.51820	39.24674																0.5	35											
1800	5/1/2019	23	-76.51830	39.24665			x													0.25	154											Crack in concrete slab and along slab edge
1800	5/1/2019	24	-76.51770	39.24685												20	14														x	Ponding area adjacent to light pole with sediment and vegetation
1800	5/1/2019	25	-76.51790	39.24649																				8	43	10						
1800	5/1/2019	26	-76.51810	39.24638								x								0.5	30											
1800	5/1/2019	27	-76.51750	39.24683																0.25	150										x	
1800	5/1/2019	28	-76.51750	39.24681														2	2													
1800	5/1/2019	29	-76.51740	39.24671																0.25	103											
1800	5/1/2019	30	-76.51760	39.24606								x								0.25	33											Seal crack around inlet
1800	5/1/2019	31	-76.51750	39.24635											x																	Monitoring point missing lid and frame
1800	5/1/2019	32	-76.51720	39.24651																0.5	50										x	
1800	5/1/2019	33	-76.51720	39.24660																0.25	162										x	Crack between jersey barrier and asphalt
1800	5/1/2019	34	-76.51720	39.24628																0.5	117											
1800	5/1/2019	35	-76.51740	39.24586																0.25	83											Seal asphalt seam crack again
1800	5/1/2019	36	-76.51710	39.24615							x																					Cracked well frame
1800	5/1/2019	37	-76.51680	39.24632														39	9													Stone cover
1800	5/1/2019	38	-76.51690	39.24579																0.5	270											Crack between toe drain and asphalt
1800	5/1/2019	39	-76.51680	39.24547																0.5	45											
1800	5/1/2019	40	-76.51610	39.24569																0.5	128											
1800	5/1/2019	41	-76.51620	39.24560																0.25	197											
1800	5/1/2019	42	-76.51640	39.24549					x											0.5	17											
1800	5/1/2019	43	-76.51640	39.24545			x													0.5	50											Crack around manhole slab
1800	5/1/2019	44	-76.51650	39.24523																0.25	125											
1800	5/1/2019	45	-76.51610	39.24534																0.5	108											
1800	5/1/2019	46	-76.51570	39.24526																0.25	88											
1800	5/1/2019	47	-76.51610	39.24493																0.5	55											
1800	5/1/2019	48	-76.51590	39.24480																				10	15	15						
1800	5/1/2019	49	-76.51550	39.24466																0.25	75											
1800	5/1/2019	50	-76.51510	39.24460																0.5	156											
1800	5/1/2019	51	-76.51490	39.24490												9	3															
1800	5/1/2019	52	-76.51590	39.24574												80	3															Cracked asphalt
1800	5/1/2019	53	-76.51620	39.24594																		10	5									Holes through asphalt
1800	5/1/2019	54	-76.51640	39.24609																		130	12									
1800	5/1/2019	55	-76.51670	39.24634										x								116	4									Separation and heaves between rails and bollards
1800	5/1/2019	56	-76.51710	39.24661																		27	4									Separating asphalt under fence
1800	5/1/2019	57	-76.51580	39.24566														414	4													
1800	5/2/2019	58	-76.51440	39.24412														7	7												x	
1800	5/2/2019	59	-76.51450	39.24406							x									0.25	10							TPZ-28			x	Two well pads
1800	5/2/2019	60	-76.51470	39.24411																0.5	100											

Dundalk Marine Terminal 2021 Surface Cover Inspection Data Table

Area	Date	Issue Number	Location Longitude	Location Latitude	Status	Category										1 - 3" M&P		2 - Open/Unpaved Area		3 - Surface Crack		4 - FS Repair		5 - Surface Heaving Area			6 - Inlet/ Manhole ID	7 - Monitor Wellhead ID	8 - Gravel Cover Discoloration		Vegetation	Comment
						P	CS	DP	LP	GC	MW	In	MH	RR	O	Length (feet)	Width (feet)	Length (feet)	Width (feet)	Avg. Width (inches)	Length (feet)	Length (feet)	Width (feet)	Max. Height (inches)	Length (feet)	Width (feet)			Length (feet)	Width (feet)		
1800	5/2/2019	61	-76.51460	39.24419																0.5	110											Seam and lateral cracking
1800	5/2/2019	62	-76.51500	39.24414																0.5	350											
1800	5/2/2019	63	-76.51490	39.24389																0.5	280											
1800	5/2/2019	64	-76.51510	39.24399												24	4															Remove six 4x4 concrete pads
1800	5/2/2019	65	-76.51460	39.24430																0.25	206											Seal around conduit cut
1800	5/2/2019	66	-76.51450	39.24439												6	2															Remove three abandoned fence posts
1800	5/2/2019	67	-76.51480	39.24438																0.5	350											Asphalt seam
1800	5/2/2019	68	-76.51490	39.24433					x											0.5	66											
1800	5/2/2019	69	-76.51510	39.24418																				6	89	12						
1800	5/2/2019	70	-76.51530	39.24411																0.5	95											Crack at asphalt seam
1800	5/2/2019	71	-76.51520	39.24448										x				24	25													Open area at railroad switch
1800	5/2/2019	72	-76.51530	39.24445																0.5	120											
1800	5/2/2019	73	-76.51530	39.24429												30	14															Cracked asphalt
1800	5/2/2019	74	-76.51540	39.24426			x															18	3									Wide crack in concrete slab. Saw cut, remove, replace
1800	5/2/2019	75	-76.51570	39.24455												78	3															
1800	5/2/2019	76	-76.51580	39.24452			x													0.5	54											
1800	5/2/2019	77	-76.51590	39.24478																				12	40	18						Heave under fence
1800	5/2/2019	78	-76.51610	39.24481																0.5	76											Asphalt seam
1800	5/2/2019	79	-76.51620	39.24492										x										8	20	10						
1800	5/2/2019	80	-76.51630	39.24498														20	5													Open at railroad switch
1800	5/2/2019	81	-76.51640	39.24508												8	2															Four abandoned fence posts
1800	5/2/2019	82	-76.51660	39.24506												28	5															
1800	5/2/2019	83	-76.51930	39.24707											x			62	2													31 holes in asphalt along yellow line between tracks
1800	5/6/2019	84	-76.52090	39.24914												43	3														x	Wide crack near fence
1800	5/6/2019	85	-76.52100	39.24932																0.25	30											Crack near fence line.
1800	5/6/2019	86	-76.52100	39.24917				x												0.5	100											Dolly pad and small crack to the inside of fence line.
1800	5/6/2019	87	-76.52080	39.24910																				8	10	10						Heave by fence.
1800	5/6/2019	88	-76.52080	39.24903														10	33													To the NW of tracks. Under poly.
1800	5/6/2019	89	-76.52070	39.24913										x				12	6													Three separate open unpaved areas near train gate.
1800	5/6/2019	90	-76.52060	39.24907																				12	35	10						Between RR and boundary fence.
1800	5/6/2019	91	-76.52080	39.24889																0.5	50											Cracks to the west of train tracks.
1800	5/6/2019	92	-76.52060	39.24892										x				6	10													Two open area where rail joints are located.
1800	5/6/2019	93	-76.52050	39.24885																0.5	110											Multiple tracks in between RR tracks.
1800	5/6/2019	94	-76.52050	39.24895										x										10	15	15						Under property fence.
1800	5/6/2019	95	-76.52060	39.24877																				10	40	3						
1800	5/6/2019	96	-76.52060	39.24884																0.5	40											
1800	5/6/2019	97	-76.52050	39.24880																0.5	150											Seam and cracks in between RR.
1800	5/6/2019	98	-76.52050	39.24862										x				15	9													Three separate unpaved areas.
1800	5/6/2019	99	-76.52040	39.24849										x				20	8													RR switch
1800	5/6/2019	100	-76.52030	39.24861																0.5	102											Recessed area in between RRs.
1800	5/6/2019	101	-76.52010	39.24865			x													0.5	120											Concrete slab for electrical utility near fence. And associated cracks.
1800	5/6/2019	102	-76.52010	39.24854			x													1	445										x	Concrete equipment pad.
1800	5/6/2019	103	-76.52000	39.24856																0.5	40											Lateral cracking between tracks.
1800	5/6/2019	104	-76.51980	39.24844					x									3	2													By light pole base.
1800	5/6/2019	105	-76.51970	39.24847																1	45											Area around bollards previously sealed.
1800	5/6/2019	106	-76.52030	39.24829			x													0.5	330											Portion north of light pole.
1800	5/6/2019	107	-76.52020	39.24838			x																	10	25	15						Partial concrete slab and asphalt by tracks.
1800	5/6/2019	108	-76.52040	39.24831										x				15	25													Six separate sections.
1800	5/6/2019	109	-76.52040	39.24813														13	6													Under poly.
1800	5/6/2019	110	-76.52050	39.24806											x					0.5	20											Curb area by guardrail.
1800	5/6/2019	111	-76.52000	39.24813			x									200	2															Large cracking in concrete by entrance of MES compound. Spalling in multiple sections.
1800	5/6/2019	112	-76.51990	39.24819			x									170	2															Concrete cracking inside MES compound.
1800	5/6/2019	113	-76.51990	39.24824			x													1	240											Concrete cracking and spalling.
1800	5/6/2019	114	-76.51990	39.24828			x									70	3															Concrete cracking and spalling.
1800	5/6/2019	115	-76.51980	39.24831			x									40	3															Chipping by MES storage sheds.
1800	5/6/2019	116	-76.51980	39.24832			x													0.5	122											Seam between asphalt and concrete by MES
1800	5/6/2019	117	-76.51950	39.24830																0.5	52										x	Cracking in between tracks.
1800	5/6/2019	118	-76.51940	39.24823																1	60											Crack along fence line. Previously sealed.
1800	5/6/2019	119	-76.51930	39.24811																1	35											Reseal.
1800	5/6/2019	120	-76.51900	39.24790																1	60										x	
1800	5/6/2019	121	-76.51870	39.24760																				6	20	8						Heave by the fence.

Dundalk Marine Terminal 2021 Surface Cover Inspection Data Table

Area	Date	Issue Number	Location Longitude	Location Latitude	Status	Category										1 - 3" M&P		2 - Open/Unpaved Area		3 - Surface Crack		4 - FS Repair		5 - Surface Heaving Area			6 - Inlet/ Manhole ID	7 - Monitor Wellhead ID	8 - Gravel Cover Discoloration		Vegetation	Comment
						P	CS	DP	LP	GC	MW	In	MH	RR	O	Length (feet)	Width (feet)	Length (feet)	Width (feet)	Avg. Width (inches)	Length (feet)	Length (feet)	Width (feet)	Max. Height (inches)	Length (feet)	Width (feet)			Length (feet)	Width (feet)		
1800	5/6/2019	122	-76.51870	39.24755			x																	10	50	15						Just inside fence of MES compound.
1800	5/6/2019	123	-76.51880	39.24754			x									20	3															
1800	5/6/2019	124	-76.51880	39.24747			x													1	55											By fence inside MES compound.
1800	5/6/2019	125	-76.51900	39.24741			x									130	1															Inside fence of MES compound. Concrete spalling.
1800	5/6/2019	126	-76.51930	39.24771			x													1	33											
1800	5/6/2019	127	-76.51940	39.24767			x													1	375										x	Seam between concrete and asphalt inside MES compound. Runs entire length of fence.
1800	5/9/2019	128	-76.52040	39.24795																				6	25	10						
1800	5/9/2019	129	-76.52020	39.24775																				8	26	20						
1800	5/9/2019	130	-76.52060	39.24778																0.5	50										x	Reseal crack
1800	5/9/2019	131	-76.52060	39.24788														2	2													Open area near guardrail post
1800	5/9/2019	132	-76.52010	39.24750																				14	78	10						
1800	5/9/2019	133	-76.52010	39.24743												55	3															Wide crack at seam with concrete slab
1800	5/9/2019	134	-76.52000	39.24768		x	x									47	2															
1800	5/9/2019	135	-76.52000	39.24778			x													0.25	52											
1800	5/9/2019	136	-76.51950	39.24764			x													0.5	26											
1800	5/9/2019	137	-76.52010	39.24812			x													0.5	430										x	
1800	5/9/2019	138	-76.51950	39.24756		x	x									10	2															
1800	5/9/2019	139	-76.51960	39.24749																0.25	30										x	Seal seam between asphalt and CS around inlet
1800	5/9/2019	140	-76.51970	39.24742										x				18	5													Open area at railroad switch
1800	5/9/2019	141	-76.51980	39.24730			x													1	18											
1800	5/9/2019	142	-76.51960	39.24739			x													0.5	105											
1800	5/9/2019	143	-76.51950	39.24747			x													0.5	80										x	
1800	5/9/2019	144	-76.51940	39.24741		x	x									15	2															
1800	5/9/2019	145	-76.51910	39.24742										x										6	59	10						
1800	5/9/2019	146	-76.51910	39.24725			x							x										14	75	13						Under fence
1800	5/9/2019	147	-76.51910	39.24742																1	75											
1800	5/9/2019	148	-76.51950	39.24718										x		88	3															Cracked asphalt
1800	5/9/2019	149	-76.51960	39.24712			x																	6	40	10						
1800	5/9/2019	150	-76.51930	39.24711										x				5	3													
1800	5/9/2019	151	-76.51910	39.24695										x				40	7													
1800	5/9/2019	152	-76.51910	39.24695										x						0.25	50											
1800	5/9/2019	153	-76.51900	39.24664			x																	14	61	18						
1800	5/9/2019	154	-76.51880	39.24674										x				6	5													
1800	5/9/2019	155	-76.51870	39.24668										x		32	3															
1800	5/9/2019	156	-76.51850	39.24658										x						0.25	50											
1800	5/9/2019	157	-76.51850	39.24653										x										6	37	7						
1800	5/9/2019	158	-76.51860	39.24647		x	x									40	2															
1800	5/9/2019	159	-76.51820	39.24634										x		33	8															Cracked asphalt
1800	5/9/2019	160	-76.51710	39.24550																0.5	145											
1800	5/9/2019	161	-76.51750	39.24559																				14	35	20						

Appendix C
Sample Surface Cover Repairs Summary Report

Summary Report for 2021 Repair Cycle, Surface Cover System

Dundalk Marine Terminal
Baltimore, Maryland

Prepared for

Honeywell

115 Tabor Road
Morris Plains, New Jersey 07950

Prepared by

Jacobs

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Herndon, VA 20171

April 2022

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Acronyms and Abbreviations

COPR	chromium ore processing residue
DMT	Dundalk Marine Terminal
ft^2	square foot
MDE	Maryland Department of the Environment
MPA	Maryland Port Administration
SCMP	*Surface Cover and 14th and 15th Streets Drain Inspection and Maintenance Plan* (CH2M HILL Engineers, Inc., 2007)

1. Introduction and Background

1.1 Introduction

This report documents surface cover repairs conducted by Jacobs Engineering Group Inc. (Jacobs), during the 2021 surface cover repair cycle within the area of Dundalk Marine Terminal (DMT) that is underlain by chromium ore processing residue (COPR) fill. These repairs were conducted in accordance with the August 2007 *Surface Cover and 14th and 15th Streets Drain Inspection and Maintenance Plan* (SCMP), which was submitted to the Maryland Department of the Environment (MDE) pursuant to Section III.B.4 of the April 5, 2006, Consent Decree entered into by MDE, the Maryland Port Administration (MPA), and Honeywell International Inc. (Honeywell).

1.2 Background

DMT is a major maritime terminal located in Baltimore, Maryland, and owned and operated by the MPA. The site covers approximately 580 acres, approximately 148 acres of which were constructed on land reclaimed from prior marshlands and the Patapsco River using fill materials composed partially of COPR. The configuration of DMT, including the delineation of current operational areas and the approximate limits of the 148-acre portion of DMT underlain by the COPR fill (e.g., COPR fill area), is illustrated in Figure 1.

The COPR fill area generally consists of active operational areas, with pavements being the primary cover system over the COPR fill. Except for a portion of Area 1800 and Areas 1501 and 1602, pavement systems generally consist of conventional asphalt, roller-compacted concrete asphalt or concrete “pavers.” A 7.2-acre portion of Area 1800 was reconstructed in 2008 as a pilot area to evaluate the performance of a 4.4-acre modified conventional asphalt pavement section, a 1.8-acre low permeability asphalt pavement section, and a 1-acre articulated block cover pavement section under heavy port loading conditions. Areas 1501 and 1602 have approximately 7 feet of non-COPR surcharge fill and 15.5 inches of stone base and asphalt surfacing, which were placed to mitigate heave conditions. A small unpaved railroad track area, approximately 0.31 acre, is located to the north of the East Service Road and operational areas. Another unpaved railroad track area, approximately 0.24 acre, is north of Area 1800. These areas are surfaced with gravel and/or railroad ballast.

For DMT to continue to operate as an active marine terminal, the existing pavement surface must remain in a functional condition, both as a structural pavement capable of supporting active port operations and as a surface cover system to minimize the potential for exposure to and release of COPR-related constituents to the environment and to reduce surface water infiltration. These functions are being maintained through a proactive cover system inspection and maintenance program detailed in the approved SCMP.

In March and April 2007, CH2M performed on behalf of MPA and Honeywell a baseline surface cover inspection pursuant to the September 2006 draft of the SCMP. This baseline surface cover inspection was documented in the September 2007 *Surface Cover System Baseline Inspection Report, Dundalk Marine Terminal* (baseline inspection report). Repairs recommended in the baseline inspection report, as well as repairs to features noted during subsequent site observations, were performed between July 2008 and May 2009. Repairs from that repair cycle were documented in the June 2009 *Summary Report for 2008 and 2009 Repairs, Surface Cover System, Dundalk Marine Terminal* (2008–2009 cover repair summary report). A change from semiannual inspection frequency originally proposed in the SCMP to annual inspections was recommended based on observations made after the baseline cover system inspection indicated that the pavements that serve as cover systems at DMT do not erode or deteriorate as quickly as soil cover systems at typical landfill sites and, therefore, require only an annual inspection frequency.

The first annual inspection under the proposed annual inspection and repair cycle was conducted in June 2009 by CH2M representatives who had been part of the baseline inspection and initial cover system repair cycle pursuant to the SCMP. The inspection, hereinafter referred to as the spring 2009 surface cover inspection, was documented in the *2009 Surface Cover System, and 14th and 15th Street Storm Drain Inspection Report, Dundalk Marine Terminal (July 2009).* This report contained recommendations for the repair of approximately 24,971 linear feet of surface cracks, 26,661 square feet (ft^2) of alligator cracking, 123,545 ft^2 of heave areas, and 8,174 ft^2 of potholes and cracks greater than 1-inch wide. Honeywell and MPA retained a paving contractor to perform the recommended repairs. Also included in the 2009 repair cycle scope of work was the repair of the Area 1501/1602 surcharge area side slope and berm, capping of light-pole areas with asphalt, abandoning fence post stubs, and replacing concrete slab sections associated with consolidation sheds 11 and 12. The 2009 surface cover repair cycle began in October and concluded in mid-December with the start of winter. Repairs from that repair cycle were documented in the report *Summary Report for Fall 2009 Repair Cycle, Surface Cover System, Dundalk Marine Terminal* (May 2010).

Since 2009, the surface cover inspection has been conducted annually. Inspection findings and an overview of repair priorities are documented in the *Surface Cover System Inspection Report* for each respective calendar year. Table 1 details completed crack sealing and paving repairs (including pothole, full-section, mill and pave, crack area, heave, and miscellaneous repairs) for all repair cycles.

The 2021 annual surface cover inspection began in May and concluded in June. Results of the inspection were detailed in the *2021 Surface Cover System and 14th and 15th Street Storm Drain Inspection Report, Dundalk Marine Terminal (October 2021).* The report identified repair features including about 51,000 linear feet of surface cracks; approximately 89,760 ft^2 of pavement mill and pave repairs; approximately 38,000 ft^2 of full depth pavement repairs; and about 11,800 ft^2 of miscellaneous surface cover repairs.

Surface cover repairs completed during the period 2005 to 2021 are summarized in Table 1.

Table 1. DMT Surface Cover Repairs, Annual Summary

Period	Paving Repair (Acres)	Crack Sealing (Linear Feet)
2005–2006	2.00	—
2007–2008	7.20	—
Fall 2008 through spring 2009	1.67	25,485
Summer and fall 2009	3.87	11,270
2010	4.43	14,105
2011	5.89	7,000
2012	2.04	7,245
2013 (through June 2014)	4.45	15,995
2014	1.43	8,665
2015	0.50	13,460
2016	2.56	17,185
2017	4.29	17,605
2018	1.41	18,250
2019	0.99	9,610
2020	1.43	0
2021	1.24	20,280
Totals	**45.40**	**186,155**

The 2021 surface cover repair cycle began in September 2021 and concluded in December 2021. The remainder of this report summarizes repairs that were made during the 2021 repair cycle.

Legend

⋯ Approximent COPR Extent

— COPR Extent

0 180 360
Feet

FIGURE 1
COPR Fill Area
Dundalk Marine Terminal
Baltimore, Maryland

2. Summary of 2021 Pavement Repairs

2.1 General

Features identified for repair are located and marked in the field using a global positioning system–enabled iPad with the ArcGIS Collector application. Access to the areas and movement of select storage containers, equipment, or trailer chassis are coordinated with port operations in preparation of repair activities.

Pavement and concrete cracks less than 1 inch wide are cleaned and sealed using a hot-rubber compound. Cracks greater than 1 inch wide, potholes, and surface-damage areas are milled to a depth of 3 inches, tack coated, and resurfaced using a hot-asphalt mix. Crack areas where the base asphalt material is not exposed are milled to a depth of 3 inches, tack coated, and resurfaced using a hot-asphalt mix. Crack areas where the base asphalt material is exposed are typically saw cut and repaired using a 6-inch milled tie-in, 4 inches of base course asphalt, and 3 inches of surface course asphalt.

Large area paving and heave repairs typically consist of coring to determine asphalt cover thickness; developing a milling design that: (1) minimizes exposure to the gravel base; (2) maintains the minimum asphalt thickness specification; and (3) restores surface water drainage to the nearest storm drain inlet to minimize standing water; milling, and installing base and surface asphalt as required.

P. Flanigan and Sons, Inc. performs the milling and paving repairs, while their lower-tiered subcontractor Teniseal Corporation conducts the crack sealing. Direction, observation and reporting of the inspections and completed work are performed by Jacobs on behalf of Honeywell and the MPA.

2.2 Project Team

The individuals and organizations with the 2020/21 surface cover repair cycle are summarized in Table 2.

Table 2. Project Team

Organization	Key Representative	Function
MPA	Bill Richardson	Owner representative and Party to Consent Decree
Honeywell	George Pfeiffer Eric Christodoulatos	Party to Consent Decree Party to Consent Decree
Jacobs	Kevin Wittmeyer Lisa Carter Bill Morris	Construction Project Manager Field Oversight Field Oversight

2.3 Summary of Completed Surface Cover Maintenance Activities

A summary of completed surface cover maintenance activities by operational area is presented in Table 3. The locations of completed repairs across the COPR fill area are illustrated in Figure 2. Detailed information for the surface cover repairs is provided in the Surface Cover Repair Disposition table (Appendix A). Heave repair areas and potholes, cracks, and crack repair areas that were included within the boundary of a large-area paving repair were given a disposition status of “completed.”

Table 3. Summary of Completed Repairs by Operational Area

Operational Area	Linear Crack Sealing (ft)	Mill and Pave, Open Area, Full-section, and Other Maintenance-type Repairs (ft^2)	Large Area Paving (ft^2)
97	0	0	0
800/900	0	0	0
1100	0	0	0
1200	0	0	0
1300	4,845	6,965	0
1400	8,580	5,545	0
1500	2,070	2,410	37,280
1501/1602	0	0	0
1600	0	0	0
1601	720	1,665	0
1700/1701	2,795	0	0
1702	0	0	0
1800	0	250	0
North of 1600	1,270	0	0
Total	20,280	16,835	37,280

Factors limiting repairs at various locations during the repair cycle included the following:

- Cargo and vehicle obstructions on or adjacent to surface cover repair features
- Requests by port operations to limit repairs in cargo loading or offloading areas

2.4 Remaining Maintenance Activities

Repairs that were not completed due to limited access or other operational causes during the 2021 repair cycle will be included in the scope of work for the 2022 cover system repair cycle, along with other repairs identified during the 2022 surface cover inspection. Repairs that were not completed during the 2021 repair cycle were given a disposition status of “pending” in the Surface Cover Repair Disposition table (Appendix A).

Legend

- ● Completed Surface Cover Feature
- ▨ Completed Large Area Repair
- ⋯ Approximent COPR Extent
- — COPR Extent

FIGURE 2
2021 Surface Cover Features
Dundalk Marine Terminal
Baltimore, Maryland

Service Layer Credits: Source: Esri, Maxar, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AeroGRID, IGN, and the GIS User Community

Appendix A

Dundalk Marine Terminal Surface Cover Repair Disposition

Dundalk Marine Terminal 2021 Surface Cover Repair Disposition

Area	Issue Number	Location Longitude	Location Latitude	Status	Category										1 - 3" M&P		2 - Open/Unpaved Area		3 - Surface Crack		4 - FS Repair		5 - Surface Heaving Area			6 - Inlet/ Manhole ID	7 - Monitor Wellhead ID	8 - Gravel Cover Discoloration		Vegetation	Comment
					P	CS	DP	LP	GC	MW	In	MH	RR	O	Length (feet)	Width (feet)	Length (feet)	Width (feet)	Avg. Width (inches)	Length (feet)	Length (feet)	Width (feet)	Max. Height (inches)	Length (feet)	Width (feet)			Length (feet)	Width (feet)		
97	2019-1	-76.523834	39.247978	Pending											50	2															25 abandoned fence posts
97	2019-2	-76.523900	39.248159	Pending															0.5	220											Seam and lateral cracking
97	2019-3	-76.523795	39.248189	Pending																			6	115	8						
97	2019-4	-76.523751	39.248222	Pending															0.5	150											
97	2019-5	-76.524058	39.248500	Pending															0.5	162										x	Asphalt seam
97	2019-6	-76.524018	39.248257	Pending											13	10															Pitting asphalt
97	2019-7	-76.524098	39.248226	Pending											26	11															Pitted and cracked asphalt
97	2019-8	-76.524041	39.248074	Pending	x										60	12															Potholes in roadway
97	2019-9	-76.523704	39.248290	Pending									x				205	4													Open gravel along railroad tracks
97	2019-10	-76.523584	39.248369	Pending															0.25	115											Asphalt seam cracking
97	2019-11	-76.523819	39.248435	Pending															0.5	90											Asphalt seam
97	2019-12	-76.523464	39.248144	Pending															0.25	525											Seal asphalt seam around tracks
97	2019-13	-76.523168	39.248014	Pending															0.25	50											
97	2019-14	-76.523053	39.247915	Pending											20	15															Alligator cracking
97	2019-15	-76.522966	39.247862	Pending															0.25	95											
97	2019-16	-76.523028	39.247559	Pending	x										27	23															Potholes in roadway
97	2019-17	-76.523259	39.247583	Pending																	100	5									Asphalt cracking in roadway next to tracks
97	2019-18	-76.523360	39.247719	Pending											22	8															Asphalt cracking on road shoulder
97	2019-19	-76.523509	39.247789	Pending															0.5	225											Seal asphalt seams
97	2019-20	-76.523685	39.247877	Pending											32	12															Asphalt cracking
97	2019-21	-76.523367	39.247914	Pending									x				70	2													Open asphalt along rail
900	2019-3	-76.534498	39.241963	Pending						x																	DMT 34M				Two damaged well pads.
900	2019-7	-76.534324	39.241907	Pending															0.5	235											Various cracks.
900	2019-8	-76.534953	39.241838	Pending															0.25	140											
900	2019-9	-76.534739	39.241693	Pending											16	2															
900	2019-11	-76.534474	39.241413	Pending															0.25	250											Various cracks and conduit that runs parallel to dolly pad.
900	2019-12	-76.534235	39.241460	Pending											32	13															
900	2019-15	-76.534184	39.241504	Pending															0.25	270											
900	2019-20	-76.533497	39.241470	Pending															0.25	125											
900	2019-23	-76.533577	39.241697	Pending															0.75	38											Cracks around concrete manhole slab.
900	2019-24	-76.533535	39.241425	Pending															0.5	90											
900	2019-25	-76.533547	39.241334	Pending	x										3	7															Two potholes near dolly pad.
900	2019-26	-76.533550	39.241272	Pending			x												0.5	400											Both sides of dolly pad.
900	2019-28	-76.533879	39.241161	Pending															0.25	170											Conduit raceway. Uneealed on both sides.
900	2019-30	-76.534248	39.242893	Pending	x										25	4															
1100	2019-1	-76.533837	39.242397	Pending																			8	350	10						
1100	2019-2	-76.533689	39.242249	Pending															0.25	500											Asphalt seams
1100	2019-3	-76.533232	39.242406	Pending							x				10	5															Repair asphalt around inlet
1100	2019-4	-76.532349	39.242588	Pending															0.5	100											
1100	2019-5	-76.533253	39.242335	Pending						x																					
1100	2019-6	-76.533406	39.242087	Pending	x										5	3															
1100	2019-9	-76.533399	39.241922	Pending													120	1												x	Gap on ramp
1100	2019-12	-76.532383	39.241861	Pending	x	x									110	3															
1100	2019-13	-76.532283	39.241904	Pending	x	x									30	4															
1100	2019-14	-76.532072	39.242108	Pending													8	6												x	
1100	2019-15	-76.532047	39.241976	Pending	x	x															40	15									
1100	2019-16	-76.531926	39.241839	Pending																			6	75	15						
1100	2019-17	-76.532160	39.242036	Pending															1	200											
1100	2019-18	-76.531541	39.242228	Pending	x	x									200	3															
1100	2019-19	-76.531572	39.241980	Pending															0.5	75											
1100	2019-20	-76.531634	39.241877	Pending																			8	90	15						
1100	2019-21	-76.531097	39.242313	Pending															0.25	70											Seal conduit saw cut
1100	2019-22	-76.530613	39.242308	Pending											9	2															Four abandoned fence post
1100	2019-23	-76.530582	39.242251	Pending																			6	50	10						
1100	2019-24	-76.531092	39.242484	Pending											55	7															Cracked asphalt
1100	2019-25	-76.530989	39.242703	Pending											35	10															Cracking at bottom of ramp
1100	2019-26	-76.531194	39.242678	Pending											30	7															Cracks in asphalt
1100	2019-27	-76.530988	39.242848	Pending											40	4															
1100	2019-28	-76.530917	39.242880	Pending											8	4															
1100	2019-29	-76.531120	39.242946	Pending										x							10	10									Remove stop light foundation
1100	2019-30	-76.531226	39.243150	Pending	x										4	4															

Dundalk Marine Terminal 2021 Surface Cover Repair Disposition

					Category										1 - 3" M&P		2 - Open/Unpaved Area		3 - Surface Crack		4 - FS Repair		5 - Surface Heaving Area			6 - Inlet/	7 - Monitor	8 - Gravel Cover Discoloration		Vegetation	Comment
Area	Issue Number	Location Longitude	Location Latitude	Status	P	CS	DP	LP	GC	MW	In	MH	RR	O	Length (feet)	Width (feet)	Length (feet)	Width (feet)	Avg. Width (inches)	Length (feet)	Length (feet)	Width (feet)	Max. Height (inches)	Length (feet)	Width (feet)	Manhole ID	Wellhead ID	Length (feet)	Width (feet)		
1100	2019-31	-76.531124	39.243096	Pending	x										12	3															
1200	2019-1	-76.530641	39.242766	Pending		x											50	1													Gap in concrete slab
1200	2019-2	-76.530648	39.242708	Pending											35	13															Cracking asphalt
1200	2019-6	-76.530006	39.242659	Pending	x	x															40	4									
1200	2019-7	-76.529911	39.242731	Pending		x									55	1															
1200	2019-8	-76.529775	39.242738	Pending	x	x															10	7									
1200	2019-9	-76.529621	39.242816	Pending	x	x															15	15									
1200	2019-10	-76.529488	39.242917	Pending	x	x									7	3															
1200	2019-11	-76.529270	39.242751	Pending										x																	Damaged water valve manhole
1200	2019-12	-76.529234	39.242530	Pending							x				10	5															Loose inlet frame
1200	2019-13	-76.528971	39.243138	Pending															0.75	30											
1200	2019-14	-76.528698	39.243120	Pending	x	x									30	1															
1200	2019-15	-76.528530	39.243047	Pending											10	6															
1200	2019-16	-76.528424	39.242587	Pending											20	20															Cracking asphalt
1200	2019-17	-76.528340	39.242658	Pending											35	10															
1200	2019-18	-76.527891	39.242675	Pending	x										10	5															
1200	2019-22	-76.528402	39.243224	Pending															0.5	50										x	
1200	2019-23	-76.528437	39.243333	Pending											11	15															Cracked asphalt
1200	2019-26	-76.528485	39.243623	Pending										x	22	2															11 abandoned fence posts
1200	2019-27	-76.528483	39.243565	Pending											25	20															Cracked asphalt
1200	2019-29	-76.528519	39.243801	Pending											20	15															Cracked asphalt
1200	2019-30	-76.529631	39.243487	Pending											315	53															Cracked asphalt
1200	2019-31	-76.530755	39.243038	Pending	x										364	33															
1200	2019-32	-76.530756	39.242905	Pending										x	10	2															Remove two guardrail posts
1200	2019-33	-76.530697	39.242876	Pending	x										30	30															Cracked asphalt
1200	2019-34	-76.530818	39.243051	Pending	x										30	15															Cracked asphalt
1200	2019-35	-76.530767	39.243263	Pending										x							30	10									Replace curb
1200	2019-36	-76.529724	39.243604	Pending										x							300	8									Cracked asphalt
1200	2019-37	-76.529210	39.243656	Pending						x																	DMT-30S				Damaged well pad
1200	2019-38	-76.528968	39.243853	Pending										x							227	7									Remove guardrail, replace with jersey barriers
1200	2019-39	-76.529421	39.243856	Pending																	90	45								x	Old trailer location
1200	2019-40	-76.528816	39.243989	Pending											90	45															Cracked asphalt
1200	2019-41	-76.528818	39.243894	Pending															0.5	155											
1300	2019-1	-76.524984	39.242710	Pending						x																					Damaded well pad
1300	2019-2	-76.525049	39.242670	Pending						x																					Damaged well pad
1300	2019-3	-76.526177	39.242239	Pending								x			30	15										TEV-004					Pave around vault manholes
1300	2019-5	-76.526014	39.242315	Complete											80	4															
1300	2019-4	-76.525722	39.242385	Pending																	30	15									Settlement
1300	2019-6	-76.525393	39.242454	Pending																			10	127	15						
1300	2019-7	-76.525171	39.242486	Pending															0.5	135										x	Seal crack below sidewalk
1300	2019-8	-76.525255	39.242640	Pending											60	35															Cracked asphalt
1300	2019-9	-76.525233	39.242714	Pending	x		x								12	3															
1300	2019-10	-76.524973	39.242594	Pending											2	2															
1300	2019-11	-76.525292	39.242550	Complete											25	20															
1300	2019-12	-76.525469	39.242627	Pending	x		x								8	3															
1300	2019-13	-76.525983	39.242526	Pending															0.25	35											Seal patches
1300	2019-14	-76.526240	39.242430	Pending													20	15													
1300	2019-15	-76.526384	39.242528	Pending			x								7	3															
1300	2019-16	-76.526303	39.242553	Pending											32	7															
1300	2019-17	-76.526098	39.242655	Complete											20	8															
1300	2019-18	-76.526136	39.242743	Complete											21	10															
1300	2019-19	-76.525169	39.242951	Pending								x			18	14										MH-314					
1300	2019-20	-76.525260	39.243120	Pending																			14	52	25						Heave in roadway
1300	2019-21	-76.526120	39.242831	Complete	x										35	4															
1300	2019-22	-76.526590	39.242829	Pending											32	20															
1300	2019-24	-76.526477	39.242624	Pending											35	35															
1300	2019-23	-76.526334	39.242618	Pending											20	20															
1300	2019-25	-76.526764	39.242776	Pending																											Repair DMT-37M
1300	2019-26	-76.526709	39.242888	Pending																			10	25	20						
1300	2019-27	-76.526520	39.242976	Pending						x				x													DMT-6S				
1300	2019-28	-76.525353	39.243367	Pending											125	3															
1300	2019-29	-76.525475	39.243556	Pending	x										115	3															Seam separation

Dundalk Marine Terminal 2021 Surface Cover Repair Disposition

															1 - 3" M&P		2 - Open/Unpaved Area		3 - Surface Crack		4 - FS Repair		5 - Surface Heaving Area			6 - Inlet/	7 - Monitor	8 - Gravel Cover Discoloration		Vegetation	
	Issue	Location	Location	Status	Category										Length	Width	Length	Width	Avg. Width	Length	Length	Width	Max. Height	Length	Width	Manhole	Wellhead	Length	Width		
Area	Number	Longitude	Latitude		P	CS	DP	LP	GC	MW	In	MH	RR	O	(feet)	(feet)	(feet)	(feet)	(inches)	(feet)	(feet)	(feet)	(inches)	(feet)	(feet)	ID	ID	(feet)	(feet)		Comment
1300	2019-33	-76.526044	39.243468	Complete											50	10															Cracking asphalt
1300	2019-34	-76.525531	39.243714	Complete											60	3															Seaparated asphalt seams
1300	2019-35	-76.525512	39.243671	Pending															0.5	65											
1300	2019-36	-76.525654	39.243862	Pending															0.5	120											Cracks at asphalt seams
1300	2019-37	-76.526237	39.243501	Pending																			6	100	15						
1300	2019-38	-76.526855	39.243419	Pending											22	12															
1300	2019-39	-76.527422	39.243275	Pending	x										5	6															
1300	2019-40	-76.527613	39.243054	Pending	x										22	6															
1300	2019-41	-76.527733	39.243190	Pending	x										25	4															Seqm separation
1300	2019-42	-76.527821	39.243263	Pending															0.25	35											
1300	2019-49	-76.525751	39.244037	Pending											36	3															
1300	2019-50	-76.525786	39.244090	Pending															0.5	70											Seal sawcut
1300	2019-51	-76.525768	39.244116	Pending													2	2													Hole in asphalt
1300	2019-52	-76.526782	39.243818	Pending																			8	130	15						
1300	2019-53	-76.526859	39.243846	Complete											20	20															
1300	2019-54	-76.527014	39.243750	Pending															0.5	100											
1300	2019-62	-76.528114	39.243702	Pending	x										25	3															
1300	2019-63	-76.526769	39.244164	Pending																	256	10									Damaged bollzrds and charging stations
1300	2019-64	-76.526466	39.244051	Pending															0.5	70											
1300	2019-65	-76.526082	39.244536	Pending															0.75	80											Seal seam
1300	2019-66	-76.526355	39.244455	Pending															0.5	100											
1300	2019-67	-76.526820	39.244478	Pending																			6	50	10						
1300	2019-68	-76.527186	39.244261	Complete											32	15															
1300	2019-69	-76.527647	39.244015	Complete	x										15	15															
1300	2019-70	-76.527816	39.243951	Pending															0.25	150											
1300	2019-71	-76.528104	39.243865	Pending											50	10															
1300	2019-72	-76.526970	39.244437	Pending									x		350	8															
1300	2019-73	-76.526675	39.244662	Pending																			6	75	10						
1300	2019-74	-76.526558	39.244654	Pending											70	7															Remove curb
1300	2019-75	-76.526492	39.244630	Pending															0.25	90											Asphalt seam around electric manhole
1300	2019-76	-76.526347	39.244747	Pending																			12	85	15						
1300	2019-77	-76.526276	39.244801	Complete											30	25															Cracking asphalt
1300	2019-78	-76.527156	39.244372	Pending	x												30	20													
1300	2019-79	-76.527584	39.244236	Complete											225	3															Seam separation
1300	2019-80	-76.528000	39.244247	Pending											85	15															Ponding water adjacent to building
1300	2019-81	-76.528413	39.244058	Pending							x				6	6															Cracked asphalt around IN-688
1300	2019-83	-76.527402	39.244503	Pending																											Cut back rebar in asphalt
1300	2019-84	-76.526224	39.244962	Complete															0.25	110											
1300	2019-85	-76.526826	39.244810	Complete															0.25	250											
1300	2019-86	-76.527309	39.244761	Pending													12	10													
1300	2019-87	-76.527844	39.244443	Pending																			6	130	8						
1300	2019-88	-76.528468	39.244200	Complete															0.25	150											Seal seams
1300	2019-89	-76.527990	39.244380	Complete															0.5	130											
1400	2019-1	-76.523778	39.243190	Pending																			8	145	20						
1400	2019-2	-76.523881	39.243133	Complete															0.5	65											
1400	2019-3	-76.524754	39.242843	Complete											41	3															Asphalt seam separating under puddle
1400	2019-4	-76.524953	39.242856	Complete	x										8	4															Two potholes
1400	2019-5	-76.524947	39.242929	Pending						x																					Damaged well pad
1400	2019-6	-76.524859	39.242984	Pending	x										6	4															Pothole at seam
1400	2019-7	-76.524265	39.243213	Complete															0.5	130											Unsealed asphalt patch and surrounding cracks
1400	2019-8	-76.523699	39.243279	Pending															0.5	170											Crack under ponding
1400	2019-9	-76.523286	39.243475	Complete															0.5	100										x	Crack along asphalt seam
1400	2019-10	-76.522979	39.243513	Pending																			10	110	15						
1400	2019-11	-76.522617	39.243637	Pending																			10	70	20						Heave in roadway
1400	2019-12	-76.522913	39.243749	Pending															0.5	100										x	
1400	2019-13	-76.523256	39.243616	Pending											20	20															Alligator cracking
1400	2019-14	-76.523861	39.243481	Pending															0.5	85											
1400	2019-15	-76.525061	39.243056	Complete							x				8	8															Damaged asphalt around inlet grate at IN-777
1400	2019-16	-76.524822	39.242636	Complete															0.5	30											
1400	2019-17	-76.524445	39.242743	Complete															0.5	300											Cracks along asphalt seams
1400	2019-19	-76.523221	39.243223	Complete															0.25	63											Unsealed asphalt patch
1400	2019-20	-76.523240	39.243199	Pending																			12	33	20						

Dundalk Marine Terminal 2021 Surface Cover Repair Disposition

					Category										1 - 3" M&P		2 - Open/Unpaved Area		3 - Surface Crack		4 - FS Repair		5 - Surface Heaving Area			6 - Inlet/	7 - Monitor	8 - Gravel Cover Discoloration		Vegetation	
Area	Issue Number	Location Longitude	Location Latitude	Status	P	CS	DP	LP	GC	MW	In	MH	RR	O	Length (feet)	Width (feet)	Length (feet)	Width (feet)	Avg. Width (inches)	Length (feet)	Length (feet)	Width (feet)	Max. Height (inches)	Length (feet)	Width (feet)	Manhole ID	Wellhead ID	Length (feet)	Width (feet)		Comment
1400	2019-21	-76.523088	39.243256	Complete															0.25	37											
1400	2019-22	-76.522827	39.243299	Complete															0.5	165											
1400	2019-24	-76.522608	39.243471	Complete															0.5	100											
1400	2019-25	-76.522564	39.243346	Pending																			12	155	10						
1400	2019-27	-76.522932	39.243451	Complete															0.5	222											Cracks along asphalt seam
1400	2019-48	-76.523914	39.245025	Complete	x										23	5															
1400	2019-28	-76.526072	39.244977	Pending											116	6															
1400	2019-29	-76.525777	39.244976	Pending																			6	6	6						
1400	2019-30	-76.525455	39.245150	Complete															0.25	420											Asphalt seams
1400	2019-31	-76.525263	39.245134	Pending																			12	35	12						
1400	2019-33	-76.524854	39.245291	Pending																			10	44	8						
1400	2019-34	-76.524429	39.245720	Pending													23	5													
1400	2019-36	-76.524286	39.245527	Pending																			10	32	20						
1400	2019-39	-76.523931	39.245704	Complete															0.5	135											
1400	2019-40	-76.523836	39.245655	Pending															0.5	50											
1400	2019-41	-76.523753	39.245581	Pending															0.5	90											
1400	2019-42	-76.523822	39.245468	Pending																			6	72	15						
1400	2019-43	-76.524272	39.245514	Pending										x	100	2															Remove 50 fence posts
1400	2019-44	-76.524077	39.245367	Pending																			12	133	10						
1400	2019-45	-76.524012	39.245214	Pending	x										3	3															
1400	2019-46	-76.523733	39.245308	Pending				x											0.5	72										x	
1400	2019-47	-76.523563	39.245121	Pending															0.25	115											
1400	2019-49	-76.523886	39.245094	Pending						x																	P-6				Damaged well pad
1400	2019-50	-76.522584	39.243245	Complete															0.5	100											
1400	2019-51	-76.522631	39.243223	Complete															0.5	92											Seal patch
1400	2019-53	-76.522814	39.243163	Pending																			12	55	10						
1400	2019-52	-76.522989	39.243155	Pending				x											0.5	72										x	
1400	2019-54	-76.522847	39.243086	Complete															0.5	200										x	
1400	2019-55	-76.522995	39.243066	Complete															0.25	185											Seal patches
1400	2019-59	-76.523512	39.242877	Pending											6	2															
1400	2019-61	-76.523998	39.242753	Pending				x											0.5	72										x	
1400	2019-60	-76.523993	39.242698	Pending																											Missing hydrant
1400	2019-62	-76.524238	39.242635	Complete															0.5	75											
1400	2019-80	-76.525801	39.244353	Complete	x										120	3															Repair asphalt seam
1400	2019-81	-76.525367	39.244561	Complete															0.5	200											
1400	2019-82	-76.524849	39.244586	Pending															0.25	375											
1400	2019-84	-76.524017	39.244972	Pending													17	3													
1400	2019-83	-76.524135	39.244995	Complete											30	12															
1400	2019-64	-76.523098	39.242299	Pending													6	2													Puncture in asphalt
1400	2019-65	-76.523356	39.242393	Pending													2	2													Hole in asphalt
1400	2019-66	-76.523278	39.242464	Pending															0.75	22										x	Seal around crane stop
1400	2019-67	-76.522601	39.242582	Pending															0.5	240											Seal surface cracks around conduit
1400	2019-68	-76.522663	39.242444	Pending													24	3													
1400	2019-69	-76.522189	39.242593	Pending															0.5	240											Seal asphalt at edge of containment wall
1400	2019-70	-76.522326	39.242776	Pending													20	6													
1400	2019-71	-76.522399	39.242731	Pending													2	2													Abandoned fence posts
1400	2019-72	-76.522542	39.242983	Pending											60	3															Cracking asphalt over conduit
1400	2019-75	-76.523221	39.242750	Pending			x														21	4									Repair dolly pad zeam
1400	2019-78	-76.523115	39.242884	Pending																			8	58	30						
1400	2019-85	-76.525988	39.244605	Complete	x										35	4															
1400	2019-86	-76.525634	39.244544	Pending															0.5	125											
1400	2019-87	-76.525823	39.244949	Pending										x							350	12									Remove guardrail replace with jersey barrier
1400	2019-88	-76.525685	39.244060	Pending											30	3															
1400	2019-89	-76.524514	39.244518	Pending															0.5	520											Seal seams
1400	2019-90	-76.524574	39.244466	Pending																			8	50	15						
1400	2019-91	-76.523791	39.244746	Complete											30	10															Asphalt cracking
1400	2019-92	-76.523258	39.244635	Complete											35	3															
1400	2019-94	-76.524757	39.244160	Pending				x													23	15									
1400	2019-95	-76.524778	39.244013	Pending															0.25	20											Seal conduit paving
1400	2019-97	-76.525294	39.243937	Pending																			6	70	10						
1400	2019-98	-76.525472	39.243735	Complete											10	4															
1400	2019-99	-76.524677	39.243690	Pending																			10	160	20						
1400	2019-100	-76.524310	39.243783	Complete															0.25	200											
1400	2019-101	-76.523319	39.244343	Pending																			6	58	10						

Dundalk Marine Terminal 2021 Surface Cover Repair Disposition

					Category										1 - 3" M&P		2 - Open/Unpaved Area		3 - Surface Crack		4 - FS Repair		5 - Surface Heaving Area			6 - Inlet/	7 - Monitor	8 - Gravel Cover Discoloration		Vegetation	
Area	Issue Number	Location Longitude	Location Latitude	Status	P	CS	DP	LP	GC	MW	In	MH	RR	O	Length (feet)	Width (feet)	Length (feet)	Width (feet)	Avg. Width (inches)	Length (feet)	Length (feet)	Width (feet)	Max. Height (inches)	Length (feet)	Width (feet)	Manhole ID	Wellhead ID	Length (feet)	Width (feet)		Comment
1400	2019-102	-76.523106	39.244317	Pending															0.5	100											Seal seams
1400	2019-103	-76.523195	39.244112	Pending																	25	13									
1400	2019-104	-76.523310	39.244168	Pending																	18	9									
1400	2019-105	-76.523419	39.243950	Pending																			8	60	8						
1400	2019-106	-76.523151	39.243939	Complete															0.5	470										x	
1400	2019-107	-76.523919	39.243763	Pending																			12	100	25						
1400	2019-108	-76.523978	39.243729	Pending			x														36	10									Remove dolly pad
1400	2019-109	-76.524406	39.243568	Complete															0.5	300											Seal seams
1400	2019-110	-76.524930	39.243342	Pending				x															16	23	16						
1400	2019-111	-76.524511	39.243378	Pending																			10	84	15						
1400	2019-112	-76.522933	39.243911	Pending															0.5	300											
1400	2019-113	-76.523115	39.244013	Pending			x														32	128									Remove dolly pad
1500	2019-1	-76.519629	39.243732	Complete											19	9															
1500	2019-2	-76.519953	39.243883	Pending															0.25	38											
1500	2019-3	-76.519908	39.243809	Complete											10	10															Concrete patch with cracking
1500	2019-4	-76.519768	39.243677	Complete	x										4	4															
1500	2019-5	-76.520326	39.243711	Complete											8	3															Puncture in asphalt
1500	2019-7	-76.523882	39.245971	Pending													8	5													Open area at edge of asphalt
1500	2019-9	-76.523629	39.246076	Pending													8	5													Open area at edge of asphalt
1500	2019-10	-76.523284	39.246231	Pending																								8	6		Discolored gravel adjacent to railroad switch
1500	2019-12	-76.523726	39.245759	Pending										x	12	2															Remove sic abandoned fence posts
1500	2019-13	-76.523279	39.245986	Pending							x				24	2															Asphalt damage around inlet grate at IN-801
1500	2019-14	-76.523250	39.246044	Complete															0.5	150											
1500	2019-16	-76.523051	39.246060	Pending										x	22	2															Remove 11 abandoned fence posts
1500	2019-17	-76.523024	39.245951	Pending											66	9															Cracked asphalt next to canopy
1500	2019-18	-76.523115	39.245920	Pending		x													0.75	360										x	Crack between concrete slab and asphalt around canopy
1500	2019-19	-76.523380	39.245816	Pending															0.25	130											Crack for conduit sawcut and adjacent crack
1500	2019-20	-76.523581	39.245740	Pending							x				28	4															Damaged asphalt around IN-803
1500	2019-21	-76.523578	39.245500	Pending											40	2															Severe cracks in roadway
1500	2019-22	-76.523452	39.245494	Complete																			10	38	20						
1500	2019-23	-76.523383	39.245416	Complete	x										37	6															
1500	2019-24	-76.523345	39.245439	Complete																			12	114	12						
1500	2019-25	-76.523117	39.245558	Complete																			12	57	10						
1500	2019-26	-76.523038	39.245622	Complete																			18	116	10						May 20, 2021 dimensions updated from 16”x82’x10’ to 18”x116’x10’
1500	2019-27	-76.522981	39.245625	Complete																			18	112	10						May 20, 2021 dimensions updated from 18”x112x10’.
1500	2019-28	-76.522776	39.245784	Complete																			8	88	25						
1500	2019-29	-76.522821	39.245746	Complete															0.5	225										x	
1500	2019-30	-76.522580	39.245755	Complete																			14	76	15						
1500	2019-31	-76.522591	39.245653	Complete																			16	164	20						5/20/2021 Dimensions updated from 14”x164’x20’ to 16”x164’x20’
1500	2019-32	-76.522831	39.245521	Complete											44	10															Cracked asphalt with ponding
1500	2019-33	-76.522910	39.245445	Complete																	24	23									Alligator cracking
1500	2019-34	-76.523089	39.245421	Complete																			6	42	10						
1500	2019-35	-76.523249	39.245339	Complete											24	24															
1500	2019-36	-76.523333	39.245293	Complete															0.5	180											Cracks along and adjacent to asphalt seams
1500	2019-37	-76.523392	39.245199	Complete															0.25	350											Seal asphalt seam
1500	2019-38	-76.522827	39.244804	Pending				x															8	16	16						Heave under light pole
1500	2019-39	-76.522788	39.244844	Pending		x													0.5	20											Seal transformer pad
1500	2019-41	-76.521651	39.245152	Pending															0.5	300											Seal asphalt seam
1500	2019-42	-76.521678	39.245137	Pending																			10	55	12						
1500	2019-43	-76.521841	39.244937	Pending															0.25	250											Reseal asphalt seam
1500	2019-44	-76.522216	39.244900	Pending																			14	40	30						
1500	2019-45	-76.522285	39.244886	Pending															0.5	220										x	Asphalt seam
1500	2019-46	-76.522177	39.244833	Pending											30	5															Pitted asphalt
1500	2019-47	-76.522429	39.244859	Pending	x										15	10															
1500	2019-48	-76.522496	39.244827	Pending											30	10															Alligator cracking
1500	2019-49	-76.522608	39.244811	Pending																			14	70	20						
1500	2019-50	-76.522565	39.244760	Pending											16	10															Alligator cracking
1500	2019-51	-76.522767	39.244654	Pending																			8	68	15						
1500	2019-52	-76.522751	39.244660	Pending															0.5	100											Asphalt seam
1500	2019-53	-76.522751	39.244604	Pending																	17	12									Alligator cracking

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	Issue	Location	Location	Status	Category										Length	Width	Length	Width	Avg. Width	Length	Length	Width	Max. Height	Length	Width	Manhole	Wellhead	Length	Width		
Area	Number	Longitude	Latitude		P	CS	DP	LP	GC	MW	In	MH	RR	O	(feet)	(feet)	(feet)	(feet)	(inches)	(feet)	(feet)	(feet)	(inches)	(feet)	(feet)	ID	ID	(feet)	(feet)		Comment
1500	2019-54	-76.522807	39.244594	Pending																	19	10									Alligator cracking
1500	2019-55	-76.522853	39.244570	Pending																	20	14									Alligator cracking
1500	2019-56	-76.522924	39.244550	Pending																	20	13									Alligator cracking
1500	2019-57	-76.522934	39.244345	Pending																			6	50	10						
1500	2019-58	-76.522765	39.244321	Pending											28	20															Alligator cracking
1500	2019-59	-76.522623	39.244221	Pending																			8	23	12						
1500	2019-60	-76.522603	39.244369	Pending															0.25	40											
1500	2019-61	-76.522380	39.244464	Pending																			10	113	10						
1500	2019-62	-76.522313	39.244349	Pending													2	2													Coring location
1500	2019-63	-76.522226	39.244366	Pending											58	13															Cracked asphalt along seam
1500	2019-64	-76.522198	39.244366	Pending											40	12															
1500	2019-67	-76.522026	39.244546	Pending																			10	46	10						
1500	2019-68	-76.521920	39.244532	Pending															0.25	370											Seal asphalt patches
1500	2019-69	-76.521792	39.244619	Pending											44	23															Cracking asphalt
1500	2019-70	-76.521710	39.244660	Pending											24	12															Cracking asphalt
1500	2019-72	-76.521267	39.244669	Pending	x										5	5															
1500	2019-73	-76.521282	39.244688	Pending															0.5	120											Seal asphalt seams
1500	2019-74	-76.521523	39.244534	Pending															0.25	460											Seal seams for asphalt patches
1500	2019-75	-76.521471	39.244559	Pending			x												0.5	560											Seal dolly pad
1500	2019-76	-76.522718	39.244535	Pending																	45	16									
1500	2019-77	-76.522858	39.244466	Pending																	20	14									
1500	2019-78	-76.521122	39.244118	Pending															0.25	255											Seal asphalt patches
1500	2019-79	-76.521177	39.244028	Complete											155	3															Replace asphalt over conduit
1500	2019-80	-76.521363	39.243995	Complete											25	12															
1500	2019-81	-76.521827	39.243853	Pending			x												0.5	480											
1500	2019-82	-76.521800	39.243820	Complete											115	3															Repace asphalt over conduit
1500	2019-85	-76.522138	39.243678	Pending													22	2													Mill and pave along damaged seam
1500	2019-86	-76.522314	39.243553	Pending																	20	12									
1500	2019-88	-76.521503	39.243753	Pending																			6	90	5						
1500	2019-93	-76.521523	39.243555	Pending															0.5	70										x	
1500	2019-93	-76.521523	39.244489	Pending															0.5	190										x	
1500	2019-101	-76.520207	39.243967	Complete											8	3															
1501/1602	2019-1	-76.517246	39.242317	Pending																			10	36	6						Heave near wall
1501/1602	2019-2	-76.520201	39.242984	Pending				x															8	70	15						From LP 15-17
1501/1602	2019-3	-76.519745	39.242654	Pending																			12	90	35						
1501/1602	2019-4	-76.519820	39.243438	Pending															0.5	2											Crack eeal around patch.
1501/1602	2019-5	-76.519564	39.243187	Pending																			10	218	30						
1501/1602	2019-6	-76.520914	39.241245	Pending										x					1	51											51 feet of crack sealing around 5 gaurd rail posts.
1501/1602	2019-7	-76.520856	39.241303	Pending	x										5	7															Two poyholes from previous boring locations.
1501/1602	2019-8	-76.520893	39.241321	Pending															0.5	50											
1501/1602	2019-9	-76.520821	39.241303	Pending							x												8	6	6						Heave around inlet.
1501/1602	2019-10	-76.520911	39.241714	Pending															0.5	70											
1501/1602	2019-11	-76.521051	39.241982	Pending															0.5	85											
1501/1602	2019-12	-76.521139	39.242130	Pending															0.5	30											
1501/1602	2019-13	-76.520613	39.241570	Pending															0.5	90											Multiple cracks
1501/1602	2019-14	-76.520493	39.241549	Pending															0.25	60											
1501/1602	2019-15	-76.520403	39.241431	Pending															0.25	65											
1501/1602	2019-16	-76.520372	39.241419	Pending															0.5	2											Crack seal around old voncrete well pad.
1501/1602	2019-17	-76.520440	39.241630	Pending															0.5	90											
1501/1602	2019-18	-76.520620	39.241804	Pending						x					4	4											Unknown				Two separate well pads. One abandoned.
1501/1602	2019-19	-76.520757	39.242109	Pending															0.5	75											
1501/1602	2019-20	-76.520541	39.242073	Pending															0.5	50											
1501/1602	2019-21	-76.520152	39.241574	Pending																			6	72	20						
1501/1602	2019-22	-76.520206	39.241645	Pending															0.5	90											
1501/1602	2019-23	-76.520541	39.242192	Pending															0.5	175											
1501/1602	2019-24	-76.520623	39.242400	Pending											51	4															
1501/1602	2019-25	-76.520608	39.242423	Pending											24	6															
1501/1602	2019-26	-76.520353	39.242180	Pending															0.5	100											Seal four asphalt seams
1501/1602	2019-27	-76.520224	39.242116	Pending															0.5	50											
1501/1602	2019-28	-76.519973	39.241619	Pending															0.5	260											Cracks in ponding area
1501/1602	2019-29	-76.519618	39.241692	Pending															0.5	125											
1501/1602	2019-30	-76.519517	39.241814	Pending															0.5	70											

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	Issue	Location	Location	Status	Category										Length	Width	Length	Width	Avg. Width	Length	Length	Width	Max. Height	Length	Width	Manhole	Wellhead	Length	Width	Vegetation	
Area	Number	Longitude	Latitude		P	CS	DP	LP	GC	MW	In	MH	RR	O	(feet)	(feet)	(feet)	(feet)	(inches)	(feet)	(feet)	(feet)	(inches)	(feet)	(feet)	ID	ID	(feet)	(feet)		Comment
1501/1602	2019-31	-76.519967	39.242109	Pending											13	4															Puncture in asphalt
1501/1602	2019-32	-76.520031	39.242127	Pending															0.5	44											
1501/1602	2019-33	-76.520096	39.242370	Pending																			8	75	20						
1501/1602	2019-34	-76.520319	39.242470	Pending	x										13	10															
1501/1602	2019-35	-76.520250	39.242491	Pending											12	10															
1501/1602	2019-36	-76.519946	39.242632	Pending	x										43	8															
1501/1602	2019-37	-76.519669	39.242199	Pending															0.75	72											Seal asphalt seam
1501/1602	2019-38	-76.519698	39.242150	Pending		x													0.25	24											Crack around electric manhole
1501/1602	2019-39	-76.518971	39.241897	Pending																			24	75	50						
1501/1602	2019-40	-76.519238	39.242245	Pending	x										2	2															
1501/1602	2019-41	-76.519466	39.242213	Pending															0.5	60											
1501/1602	2019-42	-76.518786	39.241966	Pending											22	9															
1501/1602	2019-43	-76.518653	39.242175	Pending	x										14	4															
1501/1602	2019-44	-76.518825	39.242348	Pending																			14	118	20						
1501/1602	2019-45	-76.518893	39.242502	Pending											32	3															
1501/1602	2019-46	-76.518940	39.242657	Pending															0.5	150											Seal asphalt seams
1501/1602	2019-47	-76.519113	39.242536	Pending															0.5	225											
1501/1602	2019-48	-76.518956	39.242228	Pending															1	80											
1501/1602	2019-49	-76.517400	39.242435	Pending																			16	148	20						
1501/1602	2019-50	-76.517488	39.242449	Pending															0.5	190											
1501/1602	2019-51	-76.518087	39.243113	Pending											4	4															
1501/1602	2019-52	-76.518402	39.243724	Pending													8	4													Conduit open area
1501/1602	2019-53	-76.518579	39.243864	Pending															0.5	100											
1501/1602	2019-54	-76.518928	39.243135	Pending																			10	47	2						
N1600	2019-1	-76.522291	39.247518	Pending										x	8	2															4 abandoned fence posts
N1600	2019-2	-76.522232	39.247504	Pending					x				x				67	20													Railroad ballast
N1600	2019-3	-76.522271	39.247455	Pending										x					0.5	75										x	Crack at top of curb and curb gutter
N1600	2019-4	-76.522287	39.247364	Pending																	35	23									Alligator cracking
N1600	2019-5	-76.522159	39.247347	Pending															0.75	215											Long crack plus seams for traffic light signal wire
N1600	2019-6	-76.522043	39.247400	Pending											50	8															
N1600	2019-7	-76.521845	39.247390	Pending											65	4															Aligator cracking along asphalt seams
N1600	2019-8	-76.521540	39.247414	Pending					x				x				40	15													Railroad ballast at top of drainage swale
N1600	2019-9	-76.521873	39.247296	Pending											62	12															Cracking in western most north bound lane
N1600	2019-10	-76.522268	39.247659	Pending											12	3														x	Repair asphalt
N1600	2019-11	-76.522345	39.247546	Pending										x							10	5									Dig out asphalt and reset manhole ring/lid
N1600	2019-12	-76.522355	39.247566	Pending										x	36	11														x	Abandon fence posts. Damaged asphalt from curb to bottom of slope
N1600	2019-13	-76.522567	39.247639	Pending											3	2															Small hole adjacent to electric manhole
N1600	2019-14	-76.522681	39.247609	Pending															0.25	55											
N1600	2019-15	-76.522824	39.247568	Pending											22	5														x	Damaged asphalt on curb
N1600	2019-16	-76.522584	39.247604	Pending													9	4													
N1600	2019-17	-76.522759	39.247514	Pending	x										25	19															
N1600	2019-18	-76.522135	39.246729	Pending																			10	126	20						
N1600	2019-19	-76.522234	39.246681	Pending													6	2													Hole in asphalt
N1600	2019-20	-76.522509	39.246456	Complete															0.25	300											Seal seam
N1600	2019-22	-76.522901	39.246247	Pending										x																	Damaged well or valve cover
N1600	2019-23	-76.522310	39.246714	Pending																	67	15									
N1600	2019-24	-76.522196	39.246776	Pending																	25	20									
N1600	2019-25	-76.521896	39.247013	Pending															0.75	180										x	
N1600	2019-26	-76.521923	39.246924	Pending										x							8	5									Remove stop light foundation
N1600	2019-27	-76.521886	39.247162	Pending													6	2													Sign post
N1600	2019-28	-76.522013	39.247186	Pending															0.5	10										x	
N1600	2019-29	-76.522052	39.247045	Pending													10	5													
N1600	2019-30	-76.522249	39.246876	Pending													85	12													
N1600	2019-31	-76.522685	39.246678	Pending									x				10	10													Railroad switch
N1600	2019-32	-76.522795	39.246703	Pending											10	5															Puncture in asphalt
N1600	2019-33	-76.522642	39.247228	Pending											4	2															Puncture in asphalt
N1600	2019-34	-76.523075	39.246902	Pending															0.5	50											
N1600	2019-35	-76.522882	39.247232	Pending															0.5	100										x	
N1600	2019-36	-76.522738	39.247314	Pending															0.5	100										x	
N1600	2019-37	-76.522343	39.247301	Pending											20	10															Asphalt cracking
N1600	2019-38	-76.522156	39.247309	Pending											30	10															Asphalt cracking

Dundalk Marine Terminal 2021 Surface Cover Repair Disposition

					Category										1 - 3" M&P		2 - Open/Unpaved Area		3 - Surface Crack		4 - FS Repair		5 - Surface Heaving Area			6 - Inlet/	7 - Monitor	8 - Gravel Cover Discoloration			
Area	Issue Number	Location Longitude	Location Latitude	Status	P	CS	DP	LP	GC	MW	In	MH	RR	O	Length (feet)	Width (feet)	Length (feet)	Width (feet)	Avg. Width (inches)	Length (feet)	Length (feet)	Width (feet)	Max. Height (inches)	Length (feet)	Width (feet)	Manhole ID	Wellhead ID	Length (feet)	Width (feet)	Vegetation	Comment
N1600	2019-39	-76.521688	39.247164	Pending	x																50	50									
N1600	2019-40	-76.521799	39.247034	Pending																			8	30	30						
1600	2019-1	-76.521931	39.245701	Pending															0.25	60											Seal asphalt seam
1600	2019-2	-76.521783	39.245503	Pending															0.5	70											Seal asphalt seam
1600	2019-5	-76.521428	39.245764	Pending		x													1	25											Crack in concrete slab
1600	2019-6	-76.522047	39.245958	Pending															0.5	260											
1600	2019-7	-76.521602	39.245963	Pending																			16	120	20						5/20/2021; Heave extends into reinforced concrete under canopy. Dimensions updated from 10"x115'x20' to 16"x120'x20'
1600	2019-8	-76.521600	39.245775	Pending																			14	30	15						
1600	2019-9	-76.521561	39.246114	Pending		x													0.75	560											Seal seam at concrete and asphalt joint around canopy
1600	2019-10	-76.521871	39.246175	Pending															0.25	40											
1600	2019-11	-76.522342	39.245947	Pending															0.5	165											Asphalt seam
1600	2019-12	-76.522593	39.246126	Pending															0.5	100											Asphalt seam for conduit
1600	2019-14	-76.522728	39.246203	Pending										x	38	2															19 abandoned fence posts
1600	2019-13	-76.522587	39.246272	Pending																	75	6									Repair asphalt around guardrail
1600	2019-15	-76.522394	39.246300	Pending															0.25	195											Seal asphalt seams
1600	2019-16	-76.522293	39.246147	Pending															0.25	200											
1600	2019-17	-76.521639	39.246319	Pending																			6	40	10						
1600	2019-18	-76.521977	39.246545	Pending															0.25	115											Seal asphalt seam
1600	2019-19	-76.521098	39.246804	Pending															0.25	40											
1600	2019-20	-76.520694	39.246442	Pending															0.25	120											Seal conduit seam
1600	2019-21	-76.521057	39.246500	Pending					x								43	25													Open area near toer
1600	2019-22	-76.521137	39.246131	Pending															0.5	260										x	
1600	2019-23	-76.520797	39.246138	Pending															0.25	50											
1600	2019-24	-76.520547	39.246244	Pending																			14	120	15						
1600	2019-25	-76.520602	39.246357	Pending	x										8	6															
1600	2019-26	-76.520517	39.246369	Pending																			8	45	15						
1600	2019-27	-76.520583	39.246306	Pending															0.5	245											
1600	2019-29	-76.520505	39.246174	Pending															0.5	145											
1600	2019-28	-76.520477	39.246110	Pending		x															16	8									
1600	2019-30	-76.520261	39.246129	Pending																			10	140	20						Length changed from 140 feet to 86 feet on 5/20/2021. Partial heave removal during MPA paving in summer 2020
1600	2019-31	-76.520270	39.246232	Pending										x	2	2															Abandon fence post
1600	2019-32	-76.520047	39.245915	Pending															0.5	175											
1600	2019-33	-76.520349	39.245830	Pending															0.25	140											Seal parches and seam
1600	2019-34	-76.520858	39.245910	Pending															0.25	130											Seal seam
1600	2019-35	-76.520511	39.245574	Pending				x											0.5	72										x	
1600	2021-1	-76.521190	39.246337	Pending																			6	82	4						
1600	2021-2	-76.520035	39.246019	Pending																			14	128	15						
1600	2021-3	-76.520701	39.246031	Pending															0.25	55											
1600	2021-4	-76.520850	39.245703	Pending															0.5	90											
1600	2021-5	-76.521132	39.245986	Pending															0.75	47											
1600	2021-6	-76.520858	39.245060	Pending															0.25	25											Crack a newly forming heave
1600	2021-7	-76.521690	39.246163	Pending																			6	45	3						
1600	2021-8	-76.521793	39.246057	Pending															0.5	75											
1601	2019-1	-76.518297	39.244828	Pending										x	36	2															18 abandon fence posts
1601	2019-2	-76.518237	39.244788	Pending										x			6	1													6 gaps in curb
1601	2019-3	-76.518279	39.244663	Pending															0.5	125											
1601	2019-4	-76.518392	39.244645	Pending																			10	100	12						
1601	2019-5	-76.518395	39.244590	Pending	x										3	3															
1601	2019-6	-76.518335	39.244527	Pending																			10	60	20						
1601	2019-7	-76.518689	39.244418	Pending															0.5	72											
1601	2019-8	-76.518628	39.244252	Complete	x										16	7															Pothole adjacent to existing patch.
1601	2019-9	-76.518836	39.244236	Complete											17	12															Weathered asphalt.
1601	2019-10	-76.519106	39.244001	Complete											42	4															
1601	2019-11	-76.519198	39.244196	Pending															0.5	200											Lateral and seam crack.
1601	2019-12	-76.519229	39.243904	Complete											20	15															
1601	2019-13	-76.519262	39.243943	Complete											32	4															
1601	2019-14	-76.519494	39.244046	Pending															0.5	100											
1601	2019-15	-76.519546	39.243786	Complete	x										7	5															

Dundalk Marine Terminal 2021 Surface Cover Repair Disposition

															1 - 3" M&P		2 - Open/Unpaved Area		3 - Surface Crack		4 - FS Repair		5 - Surface Heaving Area			6 - Inlet/	7 - Monitor	8 - Gravel Cover Discoloration		Vegetation	
	Issue	Location	Location	Status	Category										Length	Width	Length	Width	Avg. Width	Length	Length	Width	Max. Height	Length	Width	Manhole	Wellhead	Length	Width		
Area	Number	Longitude	Latitude		P	CS	DP	LP	GC	MW	In	MH	RR	O	(feet)	(feet)	(feet)	(feet)	(inches)	(feet)	(feet)	(feet)	(inches)	(feet)	(feet)	ID	ID	(feet)	(feet)		Comment
1601	2019-16	-76.519688	39.243816	Complete											18	3															
1601	2019-17	-76.519563	39.244087	Pending															0.5	202											Lateral cracking and seams.
1601	2019-18	-76.518969	39.244442	Pending		x		x											0.5	64										x	
1601	2019-19	-76.518776	39.244571	Pending															0.5	87											
1601	2019-20	-76.518403	39.244900	Pending										x	4	2															Two abandon fence posts
1601	2019-21	-76.518735	39.244936	Pending															0.25	205											Blank increased from 147 feet to 205 on June 17, 2021
1601	2019-22	-76.519064	39.244748	Pending															0.5	188											Crack along asphalt seams. Some resealing
1601	2019-23	-76.519186	39.244681	Pending	x										2	2															
1601	2019-24	-76.519120	39.244670	Pending	x										3	3															Pothole in puddle
1601	2019-25	-76.519036	39.244451	Pending																			8	175	15						
1601	2019-26	-76.519220	39.244473	Pending		x													0.75	35											Crack resealing over asphalt covered dolly pad
1601	2019-27	-76.519619	39.244423	Pending															0.5	138											Asphalt seam and lateral cracking
1601	2019-28	-76.519625	39.244328	Complete	x										18	3															Weathered asphalt adjacent to existing patches
1601	2019-29	-76.519794	39.243997	Complete											24	4															
1601	2019-30	-76.519760	39.244474	Pending															0.25	150											Seam and lateral cracks
1601	2019-31	-76.519595	39.244699	Pending																			14	90	15						
1601	2019-32	-76.519504	39.244767	Pending															0.5	100											Seam and lateral cracks
1601	2019-33	-76.519369	39.244837	Pending															0.75	170										x	
1601	2019-34	-76.519075	39.245005	Pending																			14	93	10						
1601	2019-35	-76.520011	39.245633	Pending															0.5	120											Seal seams
1601	2019-36	-76.519786	39.245659	Pending															0.5	60											
1601	2019-37	-76.519412	39.245650	Pending															0.5	120											Repaired by MPA during August 2020 1st St. paving
1601	2019-38	-76.519390	39.245402	Pending																			12	105	15						Heave length changed from 130 feet to 105 feet when feature inspected on June 17, 2021. A portion of the heave was removed during MPA paving of First Street in August 2020
1601	2019-39	-76.519588	39.245458	Pending															0.5	290											
1601	2019-40	-76.519624	39.245576	Pending																			10	50	15						
1601	2019-41	-76.519949	39.245178	Pending										x	34	2															Remove 17 abandoned fence posts
1601	2019-42	-76.520079	39.245332	Pending															0.5	550										x	
1601	2019-43	-76.519617	39.245375	Pending															0.5	160											
1601	2019-44	-76.519228	39.245336	Pending																			12	28	15						
1601	2019-45	-76.519555	39.245086	Pending																			16	145	15						
1601	2019-46	-76.519919	39.244899	Pending															0.5	220										x	
1601	2019-47	-76.518919	39.245226	Pending															0.5	240											
1601	2019-48	-76.519987	39.244714	Pending															0.5	275										x	
1601	2019-49	-76.520009	39.244520	Pending																			8	160	8						
1601	2019-50	-76.520340	39.244680	Pending															0.5	500										x	
1601	2019-51	-76.520403	39.244553	Pending																			12	90	10						
1601	2019-53	-76.520455	39.244485	Pending											55	25															Cracking asphalt
1601	2019-54	-76.520231	39.244241	Pending															0.5	155											
1601	2019-55	-76.520066	39.244199	Pending				x											0.25	72											
1601	2021-1	-76.519388	39.245232	Pending																			6	53	5						
1601	2021-2	-76.518534	39.244960	Pending	x										17	10															Pitting asphalt
1700/1701	2019-1	-76.519131	39.246660	Pending															0.5	200											Lateral and seam cracks
1700/1701	2019-2	-76.519225	39.246719	Pending				x						x																	Repair 14' of curb around light
1700/1701	2019-3	-76.519228	39.246604	Pending																			6	75	10						
1700/1701	2019-4	-76.519363	39.246466	Pending															0.5	250											Seal five asphalt seams
1700/1701	2019-5	-76.519689	39.246345	Pending																			8	50	10						
1700/1701	2019-6	-76.519717	39.246222	Pending															0.5	260											
1700/1701	2019-7	-76.519852	39.246192	Pending															0.5	115											Crack at asphalt seam
1700/1701	2019-8	-76.519842	39.246095	Pending																			6	65	15						Heave along roadway and shoulder. Shorten from 65 feet to 50 feet on 5/19/2021 because of paving of summer of 2020
1700/1701	2019-9	-76.519613	39.245934	Pending																	64	24									Regrade around electric and stormdrain manholes
1700/1701	2019-10	-76.519417	39.245972	Pending																			6	95	10						
1700/1701	2019-11	-76.519156	39.246260	Pending															0.5	300											
1700/1701	2019-12	-76.518810	39.246325	Pending																			8	80	15						
1700/1701	2019-13	-76.518590	39.246142	Pending															0.25	200											Cracks along seams
1700/1701	2019-14	-76.518855	39.246005	Pending															0.5	205											Crack along seam
1700/1701	2019-15	-76.519355	39.245799	Pending		x		x																							Install asphalt curb around light pole slab

Dundalk Marine Terminal 2021 Surface Cover Repair Disposition

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Area	Issue Number	Location Longitude	Location Latitude	Status	P	CS	DP	LP	GC	MW	In	MH	RR	O	Length (feet)	Width (feet)	Length (feet)	Width (feet)	Avg. Width (inches)	Length (feet)	Length (feet)	Width (feet)	Max. Height (inches)	Length (feet)	Width (feet)	Manhole ID	Wellhead ID	Length (feet)	Width (feet)	Vegetation	Comment
1700/1701	2019-16	-76.518849	39.245660	Pending																			8	92	10						
1700/1701	2019-17	-76.518568	39.245938	Pending																			6	27	10						
1700/1701	2019-18	-76.518927	39.245432	Pending															0.5	150											Seal crack around asphalt patch
1700/1701	2019-19	-76.518833	39.245352	Pending																			14	80	48						Heave in the roadway
1700/1701	2019-20	-76.518772	39.245406	Pending																			6	53	10						
1700/1701	2019-21	-76.518311	39.245887	Pending															0.25	150											
1700/1701	2019-22	-76.518499	39.245608	Pending																			8	60	10						
1700/1701	2019-23	-76.519702	39.246492	Pending															0.5	600											Seal seams
1700/1701	2019-24	-76.519326	39.246622	Pending																			8	90	15						
1700/1701	2019-25	-76.519318	39.246816	Pending															0.5	500											Seam and lateral cracks
1700/1701	2019-26	-76.519872	39.246463	Pending															0.5	360											Crack at asphalt seam
1700/1701	2019-27	-76.519683	39.246782	Pending																			8	165	15						
1700/1701	2019-28	-76.519618	39.247064	Pending																			6	52	5						Heave at edge of concrete slab. Length changed from 52 feet to 96 feet on 5/19/2021.
1700/1701	2019-29	-76.520009	39.246867	Pending																			6	85	10						Updated to 85 feet from 70 feet in length on 5/19/2021
1700/1701	2019-30	-76.520208	39.246779	Pending															0.5	400											
1700/1701	2019-31	-76.520575	39.246586	Pending															0.5	50											Marked as complete on May 19, 2021. Completed during summer 2020 paving
1700/1701	2019-32	-76.520227	39.246997	Pending																			8	70	50						Length changed from 70 feet to 90 feet on 5/19/2021
1700/1701	2019-33	-76.520028	39.247173	Pending															0.5	175											
1700/1701	2019-34	-76.520285	39.247277	Pending															0.5	150											
1700/1701	2019-35	-76.520514	39.246996	Pending																			6	78	10						
1700/1701	2019-36	-76.520547	39.246800	Pending																			10	65	15						Length changed from 50 to 65 feet on May 19, 2021
1700/1701	2019-37	-76.520513	39.246793	Pending															0.25	47										x	Mill a d pave along seam
1700/1701	2019-38	-76.520938	39.246867	Complete															0.25	100											Seal conduit seam
1700/1701	2019-39	-76.520931	39.246932	Pending													10	10													Hydrant repair. Repzir curb
1700/1701	2019-40	-76.520639	39.247026	Pending															0.5	1100											
1700/1701	2019-41	-76.520315	39.247424	Pending															0.5	500											
1700/1701	2019-42	-76.520261	39.247520	Pending											26	12															
1700/1701	2019-43	-76.517065	39.245303	Pending															0.25	180											
1700/1701	2019-44	-76.517344	39.245340	Pending																			14	235	20						
1700/1701	2019-45	-76.517432	39.245240	Pending															0.25	195											Seal patches
1700/1701	2019-46	-76.517579	39.245304	Pending											33	6															
1700/1701	2019-47	-76.517568	39.245270	Pending											19	18															
1700/1701	2019-48	-76.517693	39.245233	Pending											24	13															Alligator cracking
1700/1701	2019-49	-76.517760	39.245195	Pending																			10	30	15						
1700/1701	2019-50	-76.517570	39.245049	Pending	x										20	20															
1700/1701	2019-51	-76.517951	39.245059	Pending																			8	82	10						
1700/1701	2019-52	-76.517915	39.244732	Pending																			12	114	12						Completed during August 2020 paving by MPA
1700/1701	2019-53	-76.518110	39.244856	Pending															0.5	80											
1700/1701	2019-54	-76.517694	39.245570	Pending											4	2															
1700/1701	2019-55	-76.520702	39.247249	Pending															0.75	150											Seal seam
1700/1701	2019-56	-76.520698	39.247219	Pending	x										25	10															
1700/1701	2019-57	-76.521046	39.247080	Pending															0.5	185											
1700/1701	2019-58	-76.521014	39.246976	Pending	x										12	9															
1700/1701	2019-59	-76.521128	39.247077	Pending											43	3															Separated seam
1700/1701	2019-60	-76.520805	39.247418	Pending			x												0.25	90											
1700/1701	2019-61	-76.520634	39.247775	Pending															0.75	19										x	
1700/1701	2019-62	-76.521059	39.247398	Pending										x	2	2															Sign post
1700/1701	2019-63	-76.521178	39.247111	Pending															0.5	425											Seal curb
1700/1701	2019-64	-76.521178	39.247432	Pending																			10	40	15						
1700/1701	2019-65	-76.520824	39.247728	Pending																			6	42	10						
1700/1701	2019-66	-76.520898	39.247838	Pending																	310	16									
1700/1701	2019-67	-76.521377	39.247349	Pending							x				10	8															Repave around inlet IN-812
1700/1701	2019-68	-76.521569	39.247296	Pending															0.5	140											
1702	2019-1	-76.517164	39.242325	Pending															1	27											
1702	2019-2	-76.517073	39.242261	Pending													2	2												x	Holes is asphalt
1702	2019-3	-76.517108	39.242257	Pending											46	6															Wide crack
1702	2019-4	-76.516906	39.242300	Pending															0.25	120											Seal top of curb and gutter pan
1702	2019-5	-76.516704	39.242329	Pending													2	2													Hole in asphalt
1702	2019-6	-76.516433	39.242374	Pending													6	2													Hole in asphalt

Dundalk Marine Terminal 2021 Surface Cover Repair Disposition

															1 - 3" M&P		2 - Open/Unpaved Area		3 - Surface Crack		4 - FS Repair		5 - Surface Heaving Area			6 - Inlet/	7 - Monitor	8 - Gravel Cover Discoloration		Vegetation	
	Issue	Location	Location	Status	Category										Length	Width	Length	Width	Avg. Width	Length	Length	Width	Max. Height	Length	Width	Manhole	Wellhead	Length	Width		
Area	Number	Longitude	Latitude		P	CS	DP	LP	GC	MW	In	MH	RR	O	(feet)	(feet)	(feet)	(feet)	(inches)	(feet)	(feet)	(feet)	(inches)	(feet)	(feet)	ID	ID	(feet)	(feet)		Comment
1702	2019-7	-76.515985	39.242512	Pending													8	2													Four holes in asphalt
1702	2019-8	-76.515838	39.242542	Pending											6	4															Puncture in asphalt
1702	2019-9	-76.515577	39.242603	Pending											26	5															Alligator cracking
1702	2019-10	-76.515532	39.242681	Pending															0.5	100										x	
1702	2019-11	-76.515730	39.242729	Pending																			8	100	15						
1702	2019-12	-76.515691	39.242683	Pending						x																	TPZ-30B				Damaged well pad
1702	2019-13	-76.516235	39.242553	Pending															0.5	92											
1702	2019-14	-76.516323	39.242486	Pending						x																	DMT-39S				Damaged well pad
1702	2019-15	-76.517229	39.242426	Pending															0.5	40											
1702	2019-16	-76.517122	39.242444	Pending											25	5															Alligator cracking along seam
1702	2019-17	-76.517051	39.242458	Pending															0.5	100											
1702	2019-18	-76.516660	39.242620	Pending		x													0.25	45										x	
1702	2019-19	-76.516371	39.242683	Pending		x													0.5	90											
1702	2019-20	-76.515808	39.242865	Pending															0.75	86										x	Crack between asphalt and building
1702	2019-21	-76.515877	39.242983	Pending											33	4														x	Gap between building and asphalt
1702	2019-22	-76.515656	39.243027	Pending															0.5	20										x	
1702	2019-23	-76.515643	39.243070	Pending											4	2															Hole on asphalt
1702	2019-24	-76.515767	39.243095	Pending																			8	111	10						
1702	2019-25	-76.515822	39.243131	Pending											40	10															Alligator cracking
1702	2019-26	-76.515890	39.243098	Pending																			10	80	6						
1702	2019-27	-76.516072	39.243146	Pending											48	16															Alligator cracking
1702	2019-28	-76.516418	39.243058	Pending															0.5	367											Crack between asphalt and concrete slab
1702	2019-29	-76.517572	39.244875	Pending																			12	60	17						Middle of the road.
1702	2019-30	-76.517263	39.244650	Pending															1	50											
1702	2019-31	-76.517372	39.244860	Pending															0.5	55											
1702	2019-32	-76.517324	39.244897	Pending															0.5	51											
1702	2019-33	-76.517175	39.244828	Pending															0.5	33											
1702	2019-34	-76.516990	39.244689	Pending															0.5	200											
1702	2019-35	-76.517014	39.244883	Pending															0.5	75											
1702	2019-36	-76.517265	39.245117	Pending															0.5	31											
1702	2019-37	-76.516998	39.245096	Pending																			12	65	15						In between jersey barriers and roadway.
1702	2019-38	-76.517054	39.245065	Pending																			14	90	10					x	Between light pole and jersey barriers.
1702	2019-39	-76.516853	39.245027	Pending				x											0.5	65										x	LP-C
1702	2019-40	-76.516798	39.245021	Pending															0.5	60											
1702	2019-41	-76.516773	39.245096	Pending															0.5	111											In roadway.
1702	2019-42	-76.516640	39.245008	Pending											20	5															Roadway
1702	2019-43	-76.516673	39.244970	Pending		x									15	3															Spalling in concrete
1702	2019-44	-76.516766	39.244981	Pending											110	10															
1702	2019-45	-76.516670	39.244965	Pending															0.5	300											Parallel cracks in the concrete.
1702	2019-46	-76.516235	39.244849	Pending		x									50	3															In roadwwy. Spalling.
1702	2019-47	-76.516257	39.244731	Pending		x									15	3															Spalling just west of roadway.
1702	2019-48	-76.516239	39.244698	Pending															1	120											Asphalt patch previously sealed.
1702	2019-49	-76.516310	39.244644	Pending																			10	21	13						
1702	2019-50	-76.516272	39.244636	Pending															0.25	42											Various cracks near inlet.
1702	2019-51	-76.516427	39.244666	Pending															0.5	120										x	Dolly pad up to jersey barriers.
1702	2019-52	-76.516439	39.244642	Pending															0.5	60											Crack from dolly pad to jersey barrier.
1702	2019-53	-76.517147	39.244413	Pending											25	10															
1702	2019-54	-76.516750	39.244509	Pending																			6	130	5						
1702	2019-55	-76.517294	39.244216	Pending																			8	78	30						
1702	2019-56	-76.517651	39.244082	Pending																			10	30	15						Heave by lightpole.
1702	2019-57	-76.517694	39.244146	Pending															1	100											In roadway.
1702	2019-58	-76.517675	39.244008	Pending															1	95											Various cracks in roadway.
1702	2019-59	-76.517599	39.244018	Pending															0.5	25											Cracking just east of jersey barriers by light pole 17-1
1702	2019-61	-76.517406	39.243944	Pending															1	100											
1702	2019-62	-76.517321	39.244109	Pending																			8	50	10						
1702	2019-63	-76.516745	39.244334	Pending				x											0.25	80										x	Crack around 17-4
1702	2019-64	-76.516637	39.244387	Pending															0.5	90											
1702	2019-65	-76.515997	39.244571	Pending											50	2															Damaged concrete in roadway.
1702	2019-66	-76.515972	39.244500	Pending															0.5	75											
1702	2019-67	-76.516258	39.244366	Pending															0.5	240											Various cracking east of dolly pad.
1702	2019-69	-76.516623	39.244242	Pending															0.5	60											
1702	2019-68	-76.516780	39.244164	Pending															0.5	45											
1702	2019-70	-76.517078	39.244022	Pending															0.5	150											Cracking on north side of heave.

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															1 - 3" M&P		2 - Open/Unpaved Area		3 - Surface Crack		4 - FS Repair		5 - Surface Heaving Area			6 - Inlet/	7 - Monitor	8 - Gravel Cover Discoloration		Vegetation	
	Issue	Location	Location	Status	Category										Length	Width	Length	Width	Avg. Width	Length	Length	Width	Max. Height	Length	Width	Manhole	Wellhead	Length	Width		
Area	Number	Longitude	Latitude		P	CS	DP	LP	GC	MW	In	MH	RR	O	(feet)	(feet)	(feet)	(feet)	(inches)	(feet)	(feet)	(feet)	(inches)	(feet)	(feet)	ID	ID	(feet)	(feet)		Comment
1702	2019-72	-76.517321	39.244041	Pending															0.5	115											Cracks and asphalt patch seal missing.
1702	2019-74	-76.517403	39.243810	Pending															0.5	35											
1702	2019-75	-76.517289	39.243917	Pending											20	13															
1702	2019-78	-76.516035	39.244152	Pending															0.25	120											
1702	2019-79	-76.515985	39.244282	Pending			x												1	170											
1702	2019-80	-76.515774	39.244294	Pending																			8	50	20						
1702	2019-81	-76.515743	39.244355	Pending															0.25	70											
1702	2019-82	-76.515821	39.244269	Pending															0.5	45											
1702	2019-83	-76.516174	39.244050	Pending															0.5	160											
1702	2019-84	-76.516600	39.243891	Pending															0.5	160											
1702	2019-85	-76.516894	39.243818	Pending															0.5	60											
1702	2019-87	-76.517021	39.243790	Pending															0.5	40											
1702	2019-89	-76.517616	39.243467	Pending															0.5	80											Cracking near intersection.
1702	2019-90	-76.516816	39.243566	Pending															0.5	30											
1702	2019-91	-76.516703	39.243412	Pending															0.5	85											
1702	2019-92	-76.516703	39.243471	Pending															0.5	85										x	
1702	2019-93	-76.516655	39.243272	Pending															0.5	135											
1702	2019-94	-76.517149	39.243224	Pending																			8	25	10						
1702	2019-95	-76.517289	39.243222	Pending																			6	33	12						
1702	2019-96	-76.517246	39.242984	Pending								x							0.5	110						Electric vault					Asphalt pad around electric vault. Manhole ring is cracked and needs to be sealed.
1702	2019-97	-76.517271	39.242821	Pending											100	15															Area of road between the two patches.
1702	2019-98	-76.517157	39.242819	Pending													2	2													NW corner of Shed1702A
1702	2019-99	-76.516135	39.243139	Pending											50	15															
1702	2019-100	-76.516265	39.243264	Pending															0.25	210										x	Multiple cracks within jersey barrier area.
1702	2019-101	-76.516401	39.243464	Pending															0.5	75											Various cracks including seam between asphalt patches.
1702	2019-102	-76.516278	39.243725	Pending															0.5	220											
1702	2019-103	-76.516188	39.243418	Pending															0.5	75											
1702	2019-104	-76.515949	39.243430	Pending																			10	50	8						Heave inside of jersey barrier.
1702	2019-105	-76.515873	39.243649	Pending															0.5	280											Both joints around dolly pad.
1702	2019-106	-76.515677	39.243725	Pending															0.5	280											
1702	2019-107	-76.515396	39.243844	Pending															0.5	88											Cracks at entrance to lot.
1702	2019-108	-76.515407	39.243941	Pending				x											0.5	66											LP-A
1702	2019-109	-76.515469	39.244135	Pending		x																	10	85	15						Heave on both concrete and asphalt. Offshoot to the east at the seam of concrete and asphalt.
1702	2019-110	-76.515541	39.244134	Pending																	25	0.5									
1702	2019-111	-76.515595	39.244122	Pending							x												8	10	10						Volcano type heaves three total. Around inlet.
1800	2019-1	-76.518648	39.247584	Pending																			8	80	9						
1800	2019-2	-76.518757	39.247412	Pending	x	x									15	2															Potholes at spalling concrete in slab
1800	2019-3	-76.518591	39.247627	Pending						x			x		110	9											DMT-79M				Severe cracking in asphalt between railroad tracks. Includes well
1800	2019-4	-76.518365	39.247401	Pending				x					x		23	15														x	Low point between railroad tracks with sediment and vegitation growrh
1800	2019-5	-76.518569	39.247644	Pending													40	3													Wide crack under fence. Fill with asphalt and compact
1800	2019-6	-76.518289	39.247344	Pending										x									10	18	15					x	Heave around abandon hydrant
1800	2019-7	-76.518769	39.247200	Pending															0.5	19											
1800	2019-8	-76.518658	39.247319	Pending		x					x								0.5	42										x	Seal crack between inlet and concrete slabs
1800	2019-9	-76.518836	39.247154	Pending		x													0.5	400										x	Crack between concrete slab ans asphalt
1800	2019-10	-76.519009	39.247024	Pending		x					x								0.5	163											Crack around inlet and between concrete slab sections
1800	2019-11	-76.518795	39.246881	Pending											4	2															Two holes through asphalt
1800	2019-12	-76.518640	39.246865	Pending															0.25	60											
1800	2019-13	-76.518464	39.246687	Pending															0.5	100											
1800	2019-14	-76.518318	39.246917	Pending		x							x										12	100	12						Heave at edge of concrete slab
1800	2019-15	-76.518654	39.247091	Pending				x							16	14														x	Replsce damaged asphalt over lightpole foundation
1800	2019-16	-76.518066	39.247247	Pending									x						0.5	106											Cracks between railroad tracks
1800	2019-17	-76.518194	39.247191	Pending		x																	10	65	10						Heave pushing up edge of concrete slab
1800	2019-18	-76.518028	39.247144	Pending											75	16															Cracked asphalt. Ponding water
1800	2019-19	-76.517848	39.246938	Pending		x					x												12	70	15						Heave under concrete slab extending towards inlet
1800	2019-20	-76.518089	39.246750	Pending		x																	24	115	15						Heave at edge of concrete slab
1800	2019-21	-76.517965	39.246851	Pending															0.5	28											Crack around inlet
1800	2019-22	-76.518171	39.246737	Pending															0.5	35											

Dundalk Marine Terminal 2021 Surface Cover Repair Disposition

					Category										1 - 3" M&P		2 - Open/Unpaved Area		3 - Surface Crack		4 - FS Repair		5 - Surface Heaving Area			6 - Inlet/	7 - Monitor	8 - Gravel Cover Discoloration			
Area	Issue Number	Location Longitude	Location Latitude	Status	P	CS	DP	LP	GC	MW	In	MH	RR	O	Length (feet)	Width (feet)	Length (feet)	Width (feet)	Avg. Width (inches)	Length (feet)	Length (feet)	Width (feet)	Max. Height (inches)	Length (feet)	Width (feet)	Manhole ID	Wellhead ID	Length (feet)	Width (feet)	Vegetation	Comment
1800	2019-23	-76.518278	39.246650	Pending		x													0.25	154											Crack in concrete slab and along slab edge
1800	2019-24	-76.517660	39.246853	Pending											20	14														x	Ponding area adjacent to lightpole with sediment and vegetation
1800	2019-25	-76.517947	39.246491	Pending																			8	43	10						
1800	2019-26	-76.518103	39.246382	Pending							x								0.5	30											
1800	2019-27	-76.517489	39.246829	Pending															0.25	150										x	
1800	2019-28	-76.517452	39.246813	Pending													2	2													
1800	2019-29	-76.517416	39.246713	Pending															0.25	103											
1800	2019-30	-76.517630	39.246056	Pending							x								0.25	33											Seal crack around inlet
1800	2019-31	-76.517469	39.246346	Pending										x																	Monitoring point missing lid and frame
1800	2019-32	-76.517242	39.246513	Pending															0.5	50										x	
1800	2019-33	-76.517192	39.246604	Pending															0.25	162										x	Crack between jersey barrier and asphalt
1800	2019-34	-76.517183	39.246278	Pending															0.5	117											
1800	2019-35	-76.517361	39.245858	Pending															0.25	83											Seal asphalt seam crack again
1800	2019-36	-76.517137	39.246151	Pending						x																					Cracked well frame
1800	2019-37	-76.516786	39.246315	Pending													39	9													Stone cover
1800	2019-38	-76.516948	39.245786	Pending															0.5	270											Crack between toe drain and asphalt
1800	2019-39	-76.516836	39.245470	Pending															0.5	45											
1800	2019-40	-76.516096	39.245685	Pending															0.5	128											
1800	2019-41	-76.516246	39.245597	Pending															0.25	197											
1800	2019-42	-76.516386	39.245485	Pending				x											0.5	17											
1800	2019-43	-76.516420	39.245451	Pending		x													0.5	50											Crack around manhole slab
1800	2019-44	-76.516451	39.245232	Pending															0.25	125											
1800	2019-45	-76.516064	39.245336	Pending															0.5	108											
1800	2019-46	-76.515732	39.245260	Pending															0.25	88											
1800	2019-47	-76.516052	39.244934	Pending															0.5	55											
1800	2019-48	-76.515911	39.244797	Pending																			10	15	15						
1800	2019-49	-76.515496	39.244661	Pending															0.25	75											
1800	2019-50	-76.515081	39.244595	Pending															0.5	156											
1800	2019-51	-76.514935	39.244898	Pending											9	3															
1800	2019-52	-76.515932	39.245736	Pending											80	3															Cracked asphalt
1800	2019-53	-76.516158	39.245935	Pending																	10	5									Holes through asphalt
1800	2019-54	-76.516418	39.246088	Pending																	130	12									
1800	2019-55	-76.516729	39.246335	Pending									x								116	4									Separation and heaves between rails and bollards
1800	2019-56	-76.517110	39.246612	Pending																	27	4									Separating asphalt under fence
1800	2019-57	-76.515833	39.245656	Pending													414	4													
1800	2019-58	-76.514372	39.244120	Pending													7	7												x	
1800	2019-59	-76.514480	39.244056	Pending						x									0.25	10							TPZ-28			x	Two well pads
1800	2019-61	-76.514557	39.244190	Pending															0.5	110											Seam and lateral cracking
1800	2019-60	-76.514691	39.244109	Pending															0.5	100											
1800	2019-62	-76.514955	39.244136	Pending															0.5	350											
1800	2019-63	-76.514948	39.243892	Pending															0.5	280											
1800	2019-64	-76.515052	39.243987	Pending											24	4															Remove six 4x4 concrete pads
1800	2019-65	-76.514643	39.244297	Pending															0.25	206											Seal around conduit cut
1800	2019-66	-76.514524	39.244387	Pending											6	2															Remove three abandoned fence posts
1800	2019-67	-76.514828	39.244384	Pending															0.5	350											Asphalt seam
1800	2019-68	-76.514919	39.244331	Pending				x											0.5	66											
1800	2019-69	-76.515095	39.244177	Pending																			6	89	12						
1800	2019-70	-76.515259	39.244113	Pending															0.5	95											Crack at asphalt seam
1800	2019-71	-76.515163	39.244479	Pending									x				24	25													Open area at railroad switch
1800	2019-72	-76.515301	39.244447	Pending															0.5	120											
1800	2019-73	-76.515276	39.244289	Pending											30	14															Cracked asphalt
1800	2019-74	-76.515414	39.244262	Pending		x															18	3									Wide crack in concrete slab. Saw cut, remove, replace
1800	2019-75	-76.515656	39.244547	Pending											78	3															
1800	2019-76	-76.515769	39.244521	Pending		x													0.5	54											
1800	2019-77	-76.515927	39.244779	Pending																			12	40	18						Heave under fence
1800	2019-78	-76.516052	39.244809	Pending															0.5	76											Asphalt seam
1800	2019-79	-76.516233	39.244917	Pending									x										8	20	10						
1800	2019-80	-76.516307	39.244982	Pending													20	5													Open at railroad switch
1800	2019-81	-76.516388	39.245075	Pending											8	2															Four abandoned fence posts
1800	2019-82	-76.516556	39.245058	Pending											28	5															
1800	2019-83	-76.519261	39.247072	Pending										x			62	2													31 holes in asphalt along yellow line between tracks

Dundalk Marine Terminal 2021 Surface Cover Repair Disposition

															1 - 3" M&P		2 - Open/Unpaved Area		3 - Surface Crack		4 - FS Repair		5 - Surface Heaving Area			6 - Inlet/	7 - Monitor	8 - Gravel Cover Discoloration		Vegetation	
	Issue	Location	Location	Status	Category										Length	Width	Length	Width	Avg. Width	Length	Length	Width	Max. Height	Length	Width	Manhole	Wellhead	Length	Width		
Area	Number	Longitude	Latitude		P	CS	DP	LP	GC	MW	In	MH	RR	O	(feet)	(feet)	(feet)	(feet)	(inches)	(feet)	(feet)	(feet)	(inches)	(feet)	(feet)	ID	ID	(feet)	(feet)		Comment
1800	2019-84	-76.520894	39.249135	Pending											43	3														x	Wide crack near fence
1800	2019-85	-76.521049	39.249319	Pending															0.25	30											Crack near fence line.
1800	2019-86	-76.520980	39.249167	Pending			x												0.5	100											Dolly pad and small crack to the inside of fence line.
1800	2019-87	-76.520846	39.249103	Pending																			8	10	10						Heave by fence.
1800	2019-88	-76.520827	39.249029	Pending													10	33													To the NW of tracks. Under poly.
1800	2019-89	-76.520713	39.249133	Pending									x				12	6													Three separate open unpaved areas near train gate.
1800	2019-90	-76.520604	39.249069	Pending																			12	35	10						Between RR and boundary fence.
1800	2019-91	-76.520767	39.248885	Pending															0.5	50											Cracks to the west of train tracks.
1800	2019-92	-76.520583	39.248921	Pending									x				6	10													Two open area where rail joints are located.
1800	2019-93	-76.520467	39.248848	Pending															0.5	110											Multiple tracks in between RR tracks.
1800	2019-94	-76.520463	39.248951	Pending									x										10	15	15						Under property fence.
1800	2019-95	-76.520583	39.248774	Pending																			10	40	3						
1800	2019-96	-76.520593	39.248838	Pending															0.5	40											
1800	2019-97	-76.520492	39.248795	Pending															0.5	150											Seam and cracks in between RR.
1800	2019-98	-76.520486	39.248623	Pending									x				15	9													Three separate unpaved areas.
1800	2019-99	-76.520445	39.248488	Pending									x				20	8													RR switch
1800	2019-100	-76.520321	39.248608	Pending															0.5	102											Recessed areain between RRs.
1800	2019-101	-76.520062	39.248646	Pending		x													0.5	120											Concrete slab for electrical utility near fence. And associated cracks.
1800	2019-102	-76.520084	39.248535	Pending		x													1	445										x	Concrete equipment pad.
1800	2019-103	-76.520028	39.248557	Pending															0.5	40											Lateral cracking between tracks.
1800	2019-104	-76.519842	39.248437	Pending				x									3	2													By lightpole base.
1800	2019-105	-76.519685	39.248474	Pending															1	45											Area around bollards previously sealed.
1800	2019-106	-76.520272	39.248285	Pending		x													0.5	330											Portion north of light pole.
1800	2019-107	-76.520214	39.248378	Pending		x																	10	25	15						Partial cocrete slaband asphalt by tracks.
1800	2019-108	-76.520367	39.248309	Pending									x				15	25													Six separate sections.
1800	2019-109	-76.520432	39.248127	Pending													13	6													Under poly.
1800	2019-110	-76.520507	39.248063	Pending										x					0.5	20											Curb area by guardrail.
1800	2019-111	-76.519988	39.248128	Pending		x									200	2															Large cracking in concrete by entrance of MES compound. Spalling in multiple sections.
1800	2019-112	-76.519903	39.248193	Pending		x									170	2															Concrete cracking inside MES compound.
1800	2019-113	-76.519867	39.248244	Pending		x													1	240											Concrete cracking and spalling.
1800	2019-114	-76.519861	39.248278	Pending		x									70	3															Concrete cracking and spalling.
1800	2019-115	-76.519777	39.248310	Pending		x									40	3															Chipping by MES storage sheds.
1800	2019-116	-76.519782	39.248324	Pending		x													0.5	122											Seam between asphalt and concrete by MES
1800	2019-117	-76.519531	39.248297	Pending															0.5	52										x	Cracking in between tracks.
1800	2019-118	-76.519388	39.248233	Pending															1	60											Crack along fence line. Previously sealed.
1800	2019-119	-76.519261	39.248113	Pending															1	35											Reseal.
1800	2019-120	-76.518952	39.247897	Pending															1	60										x	
1800	2019-121	-76.518650	39.247596	Pending																			6	20	8						Heave by tbe fence.
1800	2019-122	-76.518715	39.247554	Pending		x																	10	50	15						Just inside fence of MES compound.
1800	2019-123	-76.518774	39.247535	Pending		x									20	3															
1800	2019-124	-76.518805	39.247468	Pending		x													1	55											By fence inside MES compound.
1800	2019-125	-76.518997	39.247407	Pending		x									130	1															Inside fence of MES compound. Concrete spalling.
1800	2019-126	-76.519260	39.247707	Pending		x													1	33											
1800	2019-127	-76.519370	39.247672	Pending		x													1	375										x	Seam between concrete and asphalt inside MES compound. Runs entire length of fence.
1800	2019-128	-76.520368	39.247950	Pending																			6	25	10						
1800	2019-129	-76.520220	39.247749	Pending																			8	26	20						
1800	2019-130	-76.520630	39.247778	Pending															0.5	50										x	Reseal crack
1800	2019-131	-76.520583	39.247881	Pending													2	2													Open area near guarsrail post
1800	2019-132	-76.520147	39.247503	Pending																			14	78	10						
1800	2019-133	-76.520114	39.247432	Pending											55	3															Wide crack at seam with concrete slab
1800	2019-134	-76.519979	39.247681	Pending	x	x									47	2															
1800	2019-135	-76.519954	39.247779	Pending		x													0.25	52											
1800	2019-137	-76.520125	39.248115	Pending		x													0.5	430										x	
1800	2019-136	-76.519504	39.247640	Pending		x													0.5	26											
1800	2019-138	-76.519524	39.247560	Pending	x	x									10	2															
1800	2019-139	-76.519633	39.247488	Pending															0.25	30										x	Seal seam between asphalt and CS around inlet
1800	2019-140	-76.519742	39.247423	Pending									x				18	5													Open area at railroad switch
1800	2019-141	-76.519750	39.247297	Pending		x													1	18											
1800	2019-142	-76.519623	39.247394	Pending		x													0.5	105											
1800	2019-143	-76.519527	39.247468	Pending		x													0.5	80										x	

Dundalk Marine Terminal 2021 Surface Cover Repair Disposition

															1 - 3" M&P		2 - Open/Unpaved Area		3 - Surface Crack		4 - FS Repair		5 - Surface Heaving Area			6 - Inlet/	7 - Monitor	8 - Gravel Cover Discoloration		Vegetation	
	Issue	Location	Location	Status	Category										Length	Width	Length	Width	Avg. Width	Length	Length	Width	Max. Height	Length	Width	Manhole	Wellhead	Length	Width		
Area	Number	Longitude	Latitude		P	CS	DP	LP	GC	MW	In	MH	RR	O	(feet)	(feet)	(feet)	(feet)	(inches)	(feet)	(feet)	(feet)	(inches)	(feet)	(feet)	ID	ID	(feet)	(feet)		Comment
1800	2019-144	-76.519444	39.247412	Pending	x	x									15	2															
1800	2019-145	-76.519098	39.247415	Pending									x										6	59	10						
1800	2019-146	-76.519096	39.247246	Pending		x							x										14	75	13						Under fence
1800	2019-147	-76.519095	39.247415	Pending															1	75											

Appendix C
Sentinel Groundwater Monitoring Plan

Performance Management Program Sentinel Groundwater Monitoring Plan

Dundalk Marine Terminal
Baltimore, Maryland

Prepared for

Honeywell

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April 2023

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Acronyms and Abbreviations

µg/L	microgram(s) per liter
cm/s	centimeter(s) per second
CMAA	Corrective Measures Alternatives Analysis
COPR	chromium ore processing residue
Cr (VI)	hexavalent chromium
CSM	conceptual site model
DMT	Dundalk Marine Terminal
ERA	Ecological Risk Assessment
HHRA	Human Health Risk Assessment
IGSP	Interim Groundwater Sampling Plan
MDE	Maryland Department of the Environment
mg/L	milligram(s) per liter
MPA	Maryland Port Administration
PMP	performance management program

1. Introduction

1.1 Background

This Sentinel Groundwater Monitoring Plan (Sentinel Plan) is an integrated component of the overall Performance Management Program (PMP) for the long-term monitoring and maintenance of the remedy being implemented at the Dundalk Marine Terminal (DMT).

Pursuant to the Consent Decree among the Maryland Department of the Environment (MDE), the Maryland Port Administration (MPA), and Honeywell International Inc. (Honeywell), as well as the *Corrective Measures Alternatives Analysis* (CMAA) (CH2M 2011) required by the Consent Decree, MDE selected Alternative 3, Enhanced Isolation and Containment Remedy, for the site. The Enhanced Isolation and Containment Remedy includes a requirement to establish a sentinel groundwater monitoring network inland of the shoreline perimeter to monitor groundwater flow and quality at the property boundary. The approach for establishing the sentinel monitoring system, based on an evaluation of the existing network of monitoring wells is described herein. This Sentinel Plan fulfills the PMP requirements of the Enhanced Isolation and Containment Remedy.

The Sentinel Plan will be the final groundwater monitoring plan, including components of and site understanding gained from monitoring results utilizing the *Interim Groundwater Sampling Plan* (IGSP) (CH2M 2009a). The IGSP was submitted to MDE on April 20, 2009, and revised in June 2009, and the *Conceptual Groundwater Monitoring Plan* was submitted in accordance with requirements set forth in a July 30, 2012, letter from MDE to Honeywell (MDE 2012). Honeywell and MPA have performed semiannual groundwater monitoring at the site since 2009 in accordance with the IGSP. Data from the semiannual groundwater monitoring events have been evaluated to assess changes in the groundwater flow regime and to validate the original 2009 groundwater model. The information from these events was incorporated into this Sentinel Plan, with consideration of potential changes in groundwater flow and analytical trends.

The Sentinel Plan is intended to:

- Define the objectives of the groundwater monitoring program
- Document the conceptual site model (CSM) for groundwater flow beneath DMT
- Describe how groundwater monitoring will be conducted
- Provide procedures to evaluate the data and to modify the monitoring program based on the data

1.2 Plan Objectives

The plan objectives are to collect and evaluate site-related data to confirm that the remedial components remain protective of human health and the environment. Conceptually, the data showing that this objective is being met would be collected from monitoring wells that are in water-bearing units horizontally contiguous to and downgradient of the chromium ore processing residue (COPR) fill area (**Figure 1**) or from wells that are screened below the COPR fill in the anticipated downgradient flow direction for the vertically lower aquifer unit in question.

2. Site Background

2.1 Site Geology—COPR Fill Area

The southern portion of DMT, the “COPR fill area,” was constructed on lands reclaimed from prior marshlands and the Patapsco River by placement of COPR and non-COPR fill materials. The extent of COPR at DMT is defined because of data collected from over 400 investigation locations and a review of historical documents, aerial photography, and drawings detailing the facility’s construction (CH2M 2009b) and is shown in Figure 1. There are approximately 2.5 million cubic yards of COPR located within approximately 148 acres of the COPR fill area. Vertically, COPR extends to a maximum depth of approximately 38.5 feet and ranges in thickness from 1 foot to 32 feet. The thickness of the non-COPR fill that overlies the COPR materials typically ranges between 2 and 22 feet. The southern and western edges of the DMT fill area end at a sheet pile wall with a pile-supported concrete platform, referred to as the “marine platform.” To the southeast, the DMT fill area terminates at a riprap embankment, sloping from the terminal area to the Patapsco River along Area 1501/1602, which is discussed in Section 2.2. Farther to the east, the southern boundary abuts the adjacent neighborhood of Carnegie Plat and the adjacent Former Mestek property (owned by MPA). The northern boundary aligns with a former bulkhead along East Service Road and extends farther north to Dunmar Building 97. The eastern boundary aligns with the property boundary along Broening Highway (**Figure 1**).

Relatively thick deposits of alluvial sediments underlie the DMT fill area. The alluvial sediments are composed of three distinct soil lithologies: upper silt, alluvial sand, and lower silt. The alluvial sediments are believed to represent Quaternary low-land sediments that were deposited in an estuarine environment within the Patapsco River basin. The alluvial sediments were deposited within an erosional channel that was carved into the underlying Potomac Group sediments by the ancient Patapsco River. Beneath DMT, the surface of the erosional channel corresponds to the base of the alluvial sediments. The erosional channel occurs within the western two-thirds of the fill area and was filled with fine to very fine-grained sediments (primarily silts) rich in organic materials, which indicates that these sediments are of low permeability and are highly reducing.

The Cretaceous-age Potomac Group sediments underlie the alluvial sediments. In the Baltimore City area, the Potomac Group comprises unconsolidated clay, silt, sand, and gravel beds of the Patapsco, Arundel, and Patuxent Formations (Chapelle 1985; Bennett and Meyer 1952). On a regional scale, the stratigraphic formations within the Potomac Group are distinguishable based on lithologic, fossil, and geophysical evidence, and regional data suggest that the Patapsco, Arundel, and Patuxent Formations are continuous beneath DMT (Chapelle 1985; Bennett and Meyer 1952; Hansen 1968). Investigation results from DMT suggest that the stratigraphic contacts between the formations cannot be easily distinguished based on lithologic characteristics alone (CH2M 2009b). Therefore, the soil units are referred to only as the Undifferentiated Potomac Group (Potomac Group) sediments. The aquifer within the upper portion of the Potomac Group sediments at DMT is designated the Patapsco Aquifer. Clay horizons tend to thicken below a depth interval of approximately 140 to 160 feet below grade. Permeable units encountered beneath these clay horizons are designated the Patuxent Aquifer.

A geologic cross section across the DMT site is shown as **Figure 2**. The cross section extends vertically down to the Potomac Group and shows the fill area from Broening Highway to the western bulkhead.

2.2 Site Geology—Area 1501/1602

Area 1501/1602 encompasses approximately 21 acres in the southeast corner of DMT. The western and southern boundaries of Area 1501/1602 abut the Patapsco River. Much of this area was reclaimed from the Patapsco River channel in two phases of containment cell construction, for which COPR was used as fill, that occurred from about 1974 through 1982. First, select borrow material consisting of a mixture of sand, silt, and clay was placed over the native silt and sand at the river’s edge to an elevation of about 2 feet above the mean low-water mark and then was capped with a 1- to 2-foot layer of impervious borrow material to create a clay liner. Above the clay liner, a clay containment dike was placed and graded to a 2:1 slope at the shoreline edges of Area 1501/1602, and COPR material was placed within the dike limits. Following placement in the containment cell, the COPR material was covered with a 1-foot-thick impervious layer (clay cap). The clay cap extends over the clay containment dike, hydraulically isolating the COPR material along the current shoreline.

Containment measures were included in the design and construction of the cell to mitigate stormwater infiltration and to completely contain the COPR on the southern and western banks. The northern and eastern sides of the cell were confirmed to be mostly contained with a gap between the clay liner and the clay cap on the northeast side of the cell. An asphalt cap was placed over the clay cap to minimize stormwater intrusion into the cell, thereby reducing the potential for the transport of dissolved COPR constituents. The clay liner is intact, although portions of the clay cap are absent from the top of the cell in various, isolated locations.

Additional improvements occurred across Area 1501/1602 in 1999–2002. During this final phase, the grade of Area 1501/1602 was raised by 7 feet through the placement of surcharge material; this was intended to suppress COPR heave that had previously rendered the area unusable for port cargo storage operations. The surcharge fill was then covered with a 1-foot-thick layer of graded aggregate and 3 inches of surface course asphalt. Along the sloped edge of the western and southern shorelines, gabion baskets filled with coarse stone were placed. Additionally, in 2016, riprap and jersey barriers were placed along portions of both the western and southern shorelines to reduce the potential for shoreline erosion.

3. Conceptual Site Model

3.1 Hydrogeologic Framework

The hydrogeologic regime of DMT is one characterized by a series of interbedded water-bearing units that transmit flow and confining units, or aquitards, that retard groundwater flow. These characteristics have bearing upon the design of a comprehensive long-term monitoring program. In interbedded aquifer/aquitard systems, the laws of groundwater hydraulics dictate that groundwater flow paths in the higher-permeability strata will tend to be parallel to the bedding (horizontal in flat-lying strata) and nearly vertical in the intervening aquitards. At hydraulic conductivity contrasts of 100 or greater, which are more similar to the flow regime beneath DMT, flow paths in confining units become essentially vertical and flow paths in aquifers become essentially horizontal.

A schematic representation of the conceptual hydrogeologic framework is shown on **Figure 3**. Also shown are generalized groundwater flow lines illustrating the likely patterns of groundwater flow within this interbedded aquifer/aquitard hydrogeologic regime. As depicted on **Figure 3**, flow paths in more permeable units are generally horizontal, paralleling the stratigraphy. These more permeable units include the COPR and non-COPR fill and the Upper Saturated Zone, the Shallow Fill Unit, the Upper Sand, the Patapsco Aquifer, and the Patuxent Aquifer. In contrast, flow paths in the aquitard units are nearly vertical, or perpendicular to the stratigraphy. These units include the Upper Confining Unit, the river sediments, the Lower Confining Unit, and the Arundel Clay.

Several characteristics of DMT's hydrostratigraphy strongly influence potential contaminant transport and warrant consideration for the design of groundwater monitoring systems:

- The hydrogeology underlying the site is composed of multiple layers of more permeable water-bearing zones separated by low-permeability units that limit vertical groundwater flow between the water-bearing zones. Groundwater monitoring should be focused on the higher-permeability strata, given the propensity for lateral groundwater flow to be restricted to these aquifer units. It is typically only through these higher-conductivity strata that groundwater and any groundwater-borne contaminants can migrate laterally from beneath DMT and downgradient to receptors.
- In contrast, groundwater in the low-permeability confining units migrates typically vertically downward until higher-permeability strata are encountered. Once a higher-conductivity stratum is encountered, groundwater flow and any groundwater-borne contamination are then conveyed laterally.
- The vertical flow of groundwater though the confining units depends upon the units' vertical hydraulic conductivity and head differential between the overlying and underlying water-bearing zones. Correspondingly, the mass flow rate (mass per unit of time) of any groundwater-borne contaminants through the confining units is also low. As a result, even if the vertical migration of contaminant mass through the confining unit reaches the underlying, more permeable aquifer, concentrations often decline by one or more orders of magnitude due to mixing with the considerably higher lateral groundwater flow occurring within the aquifer.
- Transport of groundwater through confining units is slow, depending upon their hydraulic conductivities and ambient vertical hydraulic gradients.
- The combined impact of groundwater's relatively higher lateral flow in the aquifer units and the typically long transport time through the confining units dictates that in most circumstances, any groundwater contamination entering an aquifer unit beneath a waste disposal site will migrate laterally rapidly enough to be detected in the downgradient groundwater monitoring system long before it can simultaneously migrate appreciably downward through the underlying confining unit toward the next aquifer in the hydrogeologic sequence.

The implications of groundwater flow and contaminant transport in layered systems lead, in turn, to the following specific conclusions for designing a long-term monitoring program for the DMT hydrogeologic regime (additional details regarding each of the water-bearing zones and aquifers to be monitored are provided in Section 4):

- Groundwater monitoring should focus on the laterally continuous upper water-bearing units in the geologic sequence adjacent to and beneath the COPR fill area, the Shallow Fill Unit. As the Upper Saturated Zone is water bearing and is stratigraphically above the COPR, this zone will only be monitored for groundwater elevation.
- The second water-bearing zone, separated from the COPR fill by the Upper Confining Unit, is the Upper Sand, which also warrants monitoring. Groundwater could flow vertically downward from the COPR deposit through the confining unit to the Upper Sand, the second water-bearing zone, and then move laterally out from beneath the site. The Upper Sand should be monitored as close as practicable to the edge of the COPR boundary.
- Each successively deeper aquifer unit (below the Shallow Fill Unit and the Upper Sand) warrants progressively less or no monitoring attention since Cr(VI) migration and detection in the monitoring network should occur in the surficial or second water-bearing zones long before contaminants could migrate through the intervening confining unit(s) to deeper aquifers. This is especially true as the hydraulic conductivity contrast between the aquifer and confining units becomes greater. While it is prudent to have some level of monitoring in the underlying Patapsco Aquifer, the likelihood of Cr(VI) reaching that aquifer through natural migration is remote.

- Given the unlikelihood of Cr(VI) ever reaching the Patapsco Aquifer and the fact that the Patapsco Aquifer is separated from the underlying Patuxent Aquifer by yet another substantial aquitard, the Arundel Clay, only limited monitoring of the Patuxent Aquifer is warranted. The three existing wells in the Patuxent Aquifer at the DMT will remain to monitor potentiometric levels in that aquifer. In addition, groundwater samples from these wells will also be collected to confirm the well integrity.

Confining units need not to be monitored as part of the long-term monitoring program since any significant lateral groundwater flow and potential Cr(VI) migration will be confined to the aquifer units. Aquitard units are also difficult to sample due to their low hydraulic conductivity and yield.

3.2 Chromium Fate and Transport

To quantify the fate and transport of chromium from the COPR fill area, Honeywell and MPA completed a Chromium Transport Study (CH2M 2009b). This study evaluated the quantities and valence states of chromium potentially being transported via storm drain flow, groundwater, air and tidal exchange with groundwater and storm drain flow in the storm drain system to the Patapsco River and Colgate Creek. Analytical results from the COPR investigation (CH2M 2009a) demonstrated that there is limited horizontal and vertical transport of Cr(VI) from the COPR fill area; specifically, that Cr(VI) concentrations in the alluvial soils immediately underlying the COPR fill are typically decreased by two to three orders of magnitude within a few feet of the COPR mass. The observed trends can be explained by the fact that the soil units and, more importantly, the groundwater underlying DMT offer a reductive environment for the reduction of Cr(VI) to Cr(III), typically $Cr(OH)_3$, which is insoluble. Further, the organic-rich sediments that underlie the COPR fill area act as a natural barrier to the migration of Cr(VI) due to their reducing environment. The following findings of this study constituted a fundamental basis for evaluating and developing remedial alternatives in the CMAA, and provided a basis for designing the sentinel groundwater monitoring program:

- Except for groundwater leakage into the storm drain system, direct groundwater transport of Cr(VI) does not constitute a significant transport pathway to the river or deeper groundwater systems
- Reductive mechanisms and physical barriers to groundwater movement limit the offsite transport of Cr(VI) through groundwater
- Impacts to groundwater have not been observed outside a horizontal distance of approximately 100 to 200 feet from the COPR limits
- Vertically, Cr(VI) impacts are not identified outside of the shallow water-bearing zones

3.3 Groundwater–Surface Water Pathway

To further evaluate and confirm the fate and transport of chromium from the COPR fill, a sediment and surface water study was conducted in the Patapsco River immediately adjacent to the site. The results of this study were presented in the *Sediment and Surface Water Study Report* (CH2M and ENVIRON, 2009). The findings of the surface water and sediment study supported the remedy selection in the CMAA and provide a basis for designing the sentinel groundwater monitoring program and porewater/surface water monitoring program, as follows:

- Cr(VI) was not detected in sediment pore water in any of the samples collected in any of the four quarterly sampling events.
- Cr(VI) was not detected in 97 percent of the surface water samples analyzed, and in those limited locations where it was detected, concentrations were well below the U.S. Environmental Protection Agency's water quality criteria.
- Measurements of geochemical parameters in pore water, surface water, and sediment demonstrate that conditions are favorable for the presence of chromium in the nontoxic trivalent chromium species (Cr(III)) rather than Cr(VI).

- Upwelling from shallow groundwater to surface water occurs primarily in the area southeast of COPR cell (1501 and 1602).
- Migration of Cr(VI) in groundwater is attenuated prior to upwelling into surface water.

Based on the results of this study and other related studies with respect to chromium geochemistry, total chromium in sediment is unlikely to oxidize to Cr(VI) in the future because the geochemical conditions necessary for this process do not naturally occur in the estuarine environment.

3.4 Potential Human and Ecological Exposures

Human health and ecological risk assessments were conducted by Honeywell and MPA to support the development of the CMAA and remedy selection. These risk assessments included the evaluation of potentially complete pathways for human and ecological exposures to COPR-related constituents of potential concern.

3.4.1 Human Health Risk Assessment (CH2M 2009c)

The shallow and deep groundwater units under the site have been investigated. Barriers (clay and organic silt units) are present that impede vertical migration of constituents of concern in the shallow groundwater unit to the deeper underlying potable groundwater unit (the Patuxent Aquifer). Therefore, the shallow groundwater unit was assessed further in the Human Health Risk Assessment (HHRA).

Site shallow groundwater is not a potable supply. In the State of Maryland, wherever the local jurisdiction provides municipal water, private potable wells cannot be installed. Potable water is supplied to DMT by the City of Baltimore, and the local regulations prohibiting the installation of private wells are reasonably expected to remain in place. Therefore, the potable water exposure pathway is considered incomplete for current and future site conditions. For the HHRA, potentially complete exposure pathways to site groundwater were assessed for incidental contact for onsite receptors (DMT workers and visitors, utility workers, and construction workers) and offsite receptors (residents near the adjacent cove, recreational users in the cove, and anglers in the Patapsco River and Colgate Creek).

The HHRA results indicated no unacceptable risks for onsite receptors (DMT workers, visitors, construction workers, and utility workers) or recreational users exposed to surface water and sediment in the cove adjacent to the site.

3.4.2 Ecological Risk Assessment (CH2M 2009d)

Areas of groundwater upwelling were identified in the near shore environment near Area 1501/1602 in the Trident probe groundwater upwelling survey; however, analytical results for groundwater samples from riverfront perimeter monitoring wells in Area 1501/1602 indicate that Cr(VI) is not detected at concentrations above the relevant surface water quality criteria. Therefore, groundwater does not appear to be a significant pathway for transport of Cr(VI) from DMT to the river.

Based on ecological survey observations within the study area (i.e., pore water, surface water, and sediment samples), the qualitative benthic study conducted in the study area, and other studies of fish, wildlife, and benthic communities conducted in the vicinity of the study area, the following specific receptors of potential concern were identified for the screening level ecological risk assessment:

- Benthic invertebrates: amphipods, polychaetes, marine clams, and mysid shrimp
- Pelagic fish: northern pipefish, white perch
- Omnivorous birds: mallard, hooded merganser
- Piscivorous birds: osprey

As COPR constituents do not biomagnify significantly within the food chain, it was determined that food chain risks did not require further evaluation, and the focus of the Ecological Risk Assessment (ERA) was on benthic and water column community exposure.

The ERA data was determined to be sufficient to establish that chromium and other COPR constituents do not pose an unacceptable risk to ecological receptors near DMT, and as such, it was concluded that no further action was required to assess the environmental impacts of COPR constituents from the site.

The results of the HHRA and ERA supported the selection of an Enhanced Isolation and Containment Remedy.

3.5 Basis for Sentinel Monitoring Program

The long-term groundwater monitoring program defined in this Sentinel Monitoring Plan is based on the current CSM for the site and details the monitoring network and the sampling, analysis, data evaluation, and reporting procedures. As detailed in this plan, the monitoring program incorporates a long-term optimization strategy to allow for annual review of the program to reaffirm that the components of the program remain current and protective. The strategy will also allow for review of the program and the defined sampling frequency to make sure that the methods for well sampling, sample analysis, data validation, data management, and reporting remain up to date. Annual reviews will also consider incorporation of relevant and applicable innovative technologies into the program as they are developed and become available for use. In addition to the extensive well network, there are new wells proposed that are detailed in Figure 4 that may be installed in the Shallow Fill to enhance the sentinel monitoring program.

4. Monitoring Well Network

4.1 Upper Saturated Zone

The Upper Saturated Zone occurs in a limited area east of the 1501/1602 area where groundwater was encountered above the level of the piezometric surface in the underlying shallow aquifer. Due to the potential lack of lateral continuity, the zone is not considered an aquifer but acts to transmit infiltrated surface water downward to the shallow aquifer The existing Upper Saturated Zone wells and piezometers will continue to be monitored for water elevations. Further assessment of the zone may be evaluated during installation of new monitoring wells targeting the Shallow Fill Unit in this area.

4.2 Shallow Fill Unit

4.2.1 COPR Fill Area

The Shallow Fill Unit, the uppermost laterally continuous hydrogeologic unit (shallow aquifer) beneath the site, is composed partly of the approximately 2.5 million cubic yards of COPR that underlie DMT. Groundwater flow in the unit is generally to the southwest, but local variations are observed where flow is affected by the heterogeneity of the fill material or by subsurface features, including storm drains, buried historic bulkhead features, and the sheet pile bulkhead that bounds the terminal to the south and west.

Excluding Area 1501/1602 (discussed below) and the immediate area between the 13.5th and 15th Streets’ outfalls, the DMT fill area is bounded by vertical sheet pile bulkheads that impede the discharge of shallow groundwater to the Patapsco River. Evidence for the impeded discharge is based on groundwater levels along the immediate inboard face of the bulkhead that are approximately 2 feet above the river level and on the lack of tidal influence observed in shallow wells close to the bulkhead. The area between the 13.5th and 15th Street outfalls consists of low permeable materials based on boring logs, groundwater elevation data, and calibrated computer modeling, which also acts to impede the flow of groundwater to the river.

The Chromium Transport Study provided evidence that the extent of Cr(VI) groundwater contamination is limited to the Shallow Fill Unit (CH2M 2009b) and that the lateral extent within the Shallow Fill Unit is limited to within about 100 to 200 feet of the COPR fill boundary. Geochemical processes that reduce Cr(VI) to Cr(III) along the groundwater flow path appear to limit the lateral migration of Cr(VI). There are also physical and geochemical barriers to the vertical migration of groundwater and the Cr(VI) groundwater contamination to deeper hydrogeologic units. The Upper Confining Layer (Figure 2) has an average permeability of 1.62×10^{-7} centimeters per second (cm/s) (CM2M 2009b) and acts as a semiconfining layer beneath the Shallow Fill Unit.

Currently, there are 88 monitoring wells and 43 temporary piezometers installed within the Upper Saturated Zone and Shallow Fill units at the site and adjacent Former Mestek property (owned by MPA) (Figure 4), not including Area 1501/1602, discussed below. The monitoring wells were installed to monitor the groundwater elevations, with 15 wells being sampled semiannually, whereas most of the temporary piezometers were installed to monitor groundwater elevations for specific investigation tasks. The groundwater monitoring network for the Shallow Fill Unit includes 59 existing monitoring wells, 14 temporary piezometers, 9 shoreline wells, and 7 new monitoring wells, as discussed below, to provide an adequate coverage of wells across the site to generate groundwater potentiometric surface. A subset of 29 monitoring well locations was selected for semiannual groundwater sampling, with wells located along the site perimeter (perimeter wells), along the upgradient area (upgradient wells), and along the downgradient edge of the COPR boundary (interior wells). With this configuration, 19 existing monitoring wells and 29 temporary piezometers will be abandoned (Figure 5 and Table 4).

4.2.2 Area 1501/1602

The characteristics of the Shallow Fill Unit near Area 1501/1602 are discussed separately because they differ slightly owing to the way this area was constructed. The land that underlies Areas 1501/1602 was reclaimed by construction of an engineered containment cell where the COPR is encapsulated within a low-permeability liner and cover (CH2M 2009b). The COPR cell was constructed above the water table, and the cell is hydraulically separated from the Shallow Fill Unit on all sides excluding the northeast side (**Appendix A**), based on the substantial difference between water levels measured inside the cell and water levels measured outside (below) the cell in the Shallow Fill Unit. Below the COPR cell the Shallow Fill Unit is composed of non-COPR fill that was used to raise the grade of the river bottom to construct the cell with the exception of the northeast portion of Area 1501/1602 where COPR is not encapsulated within the COPR cell. A new cap featuring a geomembrane cover system constructed with asphalt pavement over the full extent of the area has been implemented.

The Area 1501/1602, as part of construction of the new cap, had a separate plan developed and submitted to the MDE in March 2021 detailing an already established well network to hydraulically monitor the groundwater conditions in Area 1501/1602 (**Appendix A**). Under the plan, 68 wells will be used to monitor groundwater elevations to confirm the lateral and vertical hydraulic containment of the COPR cell. The nine shoreline wells identified for water level monitoring under the Area 1501/1602 Sentinel Plan will also be sampled as part of this Sentinel Groundwater Monitoring Plan.

4.3 Upper Sand Unit

The Upper Sand is defined as the first unit of sand encountered beneath the Upper (silt) Confining Unit, which underlies the Shallow Fill Unit. The sands screened by the Upper Sand monitoring wells are not laterally extensive or continuous; therefore, the groundwater elevations measured in them are not contoured. Though upper sand units do not promote the horizontal flow of groundwater beneath DMT due to their discontinuous nature, they do represent an important monitoring interval to assess potential vertical migration of COPR-impacted groundwater as the sands occur within a few feet below the bottom of the COPR boundary.

Currently, there are 15 monitoring wells (DMT-US series) installed within the Upper Sands at the site (**Figure 6**). The monitoring wells were installed with the screen mid-point at an elevation of about 10 feet below mean sea level and are intended to monitor the groundwater elevations at the site, with 11 wells being sampled semiannually per the IGSP. The groundwater monitoring network for the Upper Sand Unit includes the existing 15 monitoring wells to provide an adequate coverage of wells across the site to generate vertical groundwater gradients, with 11 wells selected for groundwater sampling. Of the wells selected for sampling, six are located along the perimeter, three are at interior locations, and two are upgradient. No existing Upper Sand wells are to be abandoned (**Table 2**).

4.4 Patapsco Aquifer

Regional geologic data suggest that the upper portions of the Potomac Group sediments beneath DMT are classified as the Patapsco Formation, which occurs above the Arundel Clay. Medium-depth (M-series) wells (**Figure 7**) have well screen midpoints set to an elevation of about 95 feet below grade, which is in the Patapsco Formation where the aquifer matrix is composed mainly of sand. Based on groundwater flow measurements collected from the M-series wells, the groundwater flow is consistently south-southwest with hydraulic gradients ranging up to approximately 0.002. Groundwater levels in the M-series wells are consistently lower than water elevations in the Shallow Fill Unit and Upper Sand units. The difference in water elevation is further evidence that the confining units serve as effective physical barriers to hydraulic communication between the Shallow Fill Unit, the Upper Sand, and the Patapsco Aquifer.

Soil and groundwater sample results collected from the M-series wells suggest that the Patapsco Aquifer below DMT is not impacted by chromium constituents (CH2M 2009a). The absence of chromium-related impacts in the aquifer is explained by the thickness of the overlying Upper and Lower Confining Units (upper and lower silt layers), which lie between the Shallow Fill Unit and the Patapsco Aquifer. Both silt units have low permeability, which allows them to function as confining units, and organic material that would facilitate the reduction of Cr(VI) to the relatively immobile Cr(III) species, preventing the chromium constituents from reaching the deeper hydrogeologic units. The permeability of the lower silt, which ranges up to 50 feet thick below DMT, has been determined to be 9.77×10^{-8} cm/sec (CH2M 2009b).

The aquifer outcrops directly beneath the brackish Patapsco River, and historical pumping of the aquifer caused chloride contamination within the aquifer. Use of the Patapsco Aquifer as a water resource in the vicinity of Baltimore and the Patapsco River estuary had mostly ceased by 1950 due to chloride intrusion, and at present there is no major use of the aquifer in this region (Chapelle 1985). Significant pumping of the Patapsco Aquifer does, however, occur in northern Anne Arundel County, and the nearest pumping centers are approximately 7 miles from DMT. For this reason, it is prudent to have some level of monitoring in the underlying Patapsco Aquifer, although the likelihood of a Cr(VI) ever reaching that aquifer is remote.

Currently, there are 26 monitoring wells (M-series) installed within the Patapsco Aquifer at the site. The monitoring wells are intended to monitor the groundwater elevations at the site, with nine wells being sampled semiannually. The groundwater monitoring network for the Patapsco Aquifer includes the existing 23 monitoring wells to provide an adequate coverage of wells across the site to generate groundwater potentiometric surface, with 9 wells selected for groundwater sampling (**Table 3**). Of the wells for sampling, four are along the perimeter, four are at interior locations, and one is upgradient. Three existing M-series wells are to be abandoned (**Table 4**).

4.5 Patuxent Aquifer

D-series wells are screened in what regional geologic data suggest is the Patuxent Aquifer (CH2M 2009c). Several thick sequences of clay strata exist between the M-series and D-series wells. The clay strata is considered to be the Arundel Formation, which is a regional aquitard that separates the Patapsco and Patuxent Aquifers. The function of the clay strata as an aquitard beneath the DMT is supported by the low average permeability (9.20×10^{-8} cm/sec) of the clay strata and by a substantial difference in water elevations measured in co-located D- and M-series well pairs. The Patuxent Aquifer is unaffected by conditions at the site because the Patuxent is separated from the Patapsco by the Arundel Formation; sampling of M-series wells has indicated that the overlying Patapsco Aquifer has not been impacted.

There are three D-series installed within the Patuxent Aquifer at the site and the adjacent Former Mestek facility owned by MPA (**Figure 8**). The monitoring wells are intended to monitor the groundwater elevations at the site. Although site-related contamination would not be found in this aquifer unless detections occur in the M-series wells, the D-series wells are included in the groundwater sampling plan. There are no changes to the existing Patuxent Aquifer monitoring. No existing D-series wells are to be abandoned (**Table 3**).

5. Monitoring and Assessment

Monitoring will include periodic groundwater elevation monitoring and groundwater sampling from the monitoring well network to demonstrate the containment remedy selected for the site. The groundwater monitoring approach is like the one followed under the IGSP (CH2M 2009a), with the monitoring frequency set to semiannually for the groundwater elevation monitoring and groundwater sampling. The wells to be monitored are summarized in Table 2, which includes the rationale for the well use. In addition, at 5-year intervals the sediment and porewater under the Patapsco River will be sampled to confirm reducing conditions where groundwater may upwell into the river.

As described in Section 5.2, the results of chromium sampling will be evaluated for the detection of Cr(VI) outside the COPR fill area, and if confirmed, the monitoring results will be assessed for statistically significant increasing trends. Based on these findings, increased frequency of monitoring may be implemented to further assess changes in site groundwater conditions.

5.1 Groundwater Elevation Monitoring

The groundwater elevations measured from the monitoring well network (Table 2) will be used to assess the lateral and vertical hydraulic gradients at the site, and evaluate potential changes and their possible causes. During the groundwater elevation monitoring, the integrity of the well will be evaluated and will include well depth measurements to assess redevelopment needs, a well head condition assessment to correct observed damage, and a well seal evaluation to replace well seals.

5.1.1 Upper Saturated Zone

The Upper Saturated Zone piezometers and wells will be monitored for groundwater elevations and select proposed well locations outside the COPR boundary will be sampled if a zone is present.

5.1.2 Shallow Fill—COPR Fill Area

Hydraulic monitoring in the Shallow Fill Unit will include 63 wells located both inside and outside the COPR fill limits. Within the COPR fill, the hydraulic monitoring will be used to verify that groundwater is not infiltrating the relined storm drains, to compare vertical hydraulic gradients with those of deeper units, and to establish the groundwater elevations within this area for comparison of the wells in Area 1501/1602. Hydraulic measurements outside the COPR fill would be used to confirm that the sheet pile bulkhead remains an impediment to the direct discharge of shallow groundwater to the Patapsco River.

5.1.3 Shallow Fill—Area 1501/1602

The list of 68 monitoring wells in Area 1501/1602 that will be hydraulically monitored are included in Appendix A. The groundwater elevations in the Area 1501/1602 wells will be compared to the groundwater elevations in the adjacent Shallow Fill wells and to those in the underlying and adjacent Upper Sand wells to demonstrate hydraulic containment. The groundwater elevations will also be monitored to assess the effectiveness of the overlying cap and asphalt in reducing the amount of infiltration into the COPR cell.

5.1.4 Upper Sand Unit

Groundwater elevations in the 24 Upper Sand wells will be used to assess vertical hydraulic gradients at well locations adjacent to shallower or deeper wells, and to confirm hydraulic containment in the Shallow Fill wells. As eight of the Upper Sand wells are located adjacent to the Area 1501/1602, the groundwater elevations in these wells will also assess hydraulic containment of the COPR cell.

5.1.5 Patapsco Aquifer

Hydraulic monitoring in the Patapsco Aquifer will comprise 23 wells across the site, including wells installed within the footprint of the COPR fill limits. Groundwater elevations measured from these wells will be used to confirm groundwater flow conditions in the Patapsco Aquifer, to evaluate vertical hydraulic gradients, and to potentially assess well integrity issues related to potential detections during groundwater sampling.

5.1.6 Patuxent Aquifer

Although there are three wells in the Patuxent Aquifer, the wells are included in the network for completeness. Groundwater elevations measured in these wells will be used to confirm groundwater flow conditions in the aquifer and to evaluate vertical hydraulic gradients.

5.2 Groundwater Sampling

Monitoring wells included in the semiannual groundwater sampling are identified as a subset of wells in the network (Table 3). The well network includes wells used during the IGSP as previous analytical data from these wells form a robust database for comparison of future groundwater quality. Potential changes to the well network are discussed in Section 5.4. Low-flow groundwater sampling methods will be used to purge and sample the wells, including the collection of stabilization parameters such as pH, temperature, conductivity, and turbidity, and the groundwater samples will be submitted for analysis of total and dissolved chromium by SW-846 Method 6010B and hexavalent chromium (filtered) by SW-846 Method 7199A. Quality assurance and quality control will be performed in accordance with the DMT *Quality Assurance Program Plan* (CH2M 2007). Purge water will be processed through the onsite treatment plant or at an approved disposal facility.

5.2.1 Shallow Fill and Upper Saturated Zone

Groundwater samples will be collected from the following 31 groundwater monitoring wells screened in the Shallow Fill Unit and the Upper Saturated Zone:

- DMT-01S
- DMT-12S
- DMT-14S
- DMT-17S
- DMT-27S
- DMT-28S
- DMT-31S
- DMT-32S
- DMT-39S
- DMT-41S
- DMT-42S
- DMT-47S
- DMT-56S
- EA-10S
- EA-12S
- EA-11S
- EAC-01S
- S-1
- S-2
- S-3I
- S-3D
- S-4I
- S-4D
- S-5
- S-6I[1]
- S-6D
- S-7
- DMT-90S[2]
- DMT-91S[2]
- DMT-92S[2]
- DMT-96S[2]

For distribution, wells are along the perimeter of the site, along the edge of the Area 1501/1602, outside the COPR fill limits in the site interior, below the COPR cell at Area 1501/1602, and along the eastern property boundary, considered upgradient wells. Analytical data from the perimeter wells will be used to confirm containment within the site boundary, whereas the data from the wells outside the COPR fill limits will be used to confirm the limited lateral migration potential from the COPR fill area. The well located within the COPR cell at Area 1501/1602 is screened below the clay liner and is used to assess if there is a potential for vertical migration of chromium from the COPR cell. The upgradient wells are used to assess the background groundwater quality.

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[1] Additional shallow well.

[2] Proposed well. An upper saturated zone well will be nested and sampled if the zone is present.

5.2.2 Upper Sand Unit

As the Upper Sand wells represent the first groundwater zone below the Shallow Fill Unit, these wells are critical to assess potential vertical migration of chromium from the COPR fill. There are 11 Upper Sand wells that will be sampled:

- DMT-49US
- DMT-50US
- DMT-51US
- DMT-52US
- DMT-53US
- DMT-64US
- DMT-65US
- DMT-67US
- DMT-70US
- DMT-72US
- DMT-73US

Seven of the wells are located along the site perimeter to monitor for groundwater quality if chromium has migrated vertically down to this zone and then moved laterally toward the Patapsco River. 2 Upper Sand wells are located within the footprint of the COPR limits and will be used as early warning wells if chromium has migrated vertically down below the Shallow Fill Unit. One well is set as the upgradient location to assess background conditions. One well is located outside the footprint of the COPR limits at a downgradient location to evaluate potential detections before the groundwater migrated to the perimeter.

5.2.3 Patapsco Aquifer

The Patapsco Aquifer is hydraulically separated from the Shallow Fill Unit by more than 50 feet of low-permeability material based on geological evidence. Vertical migration of chromium though this thick lower confining layer is not likely before detections of chromium is found in the Upper Sand Unit wells or in the perimeter Shallow Fill Unit wells. A total of 23 wells are screened in the Patapsco Aquifer, 9 of the 23 wells are included in the semiannual sampling program, with four perimeter locations, one upgradient location, and four locations within the footprint of the COPR fill. All remaining M-series wells (following abandonment of EA-3M, EAC-4M, and EA-5M), will be sampled during the first year of the PMP and every 5 years after to evaluate overall integrity of the well, while the nine wells footnoted will be sampled semiannually as part of this program. Groundwater samples collected from these wells will be used to evaluate potential chromium detections, and to assess potential well integrity issues related to chromium detections during groundwater sampling.

- DMT-02M
- EA-10M
- DMT-35M
- EA-08M
- DMT-80M
- EAC-02M
- EA-13M
- DMT-78M
- EA-14M
- DMT-38M
- EA-15M
- EA-02M
- DMT-79M
- EAC-03M
- DMT-77M[3]
- EA-07M[3]
- EA-11M[3]
- DMT-01M-R[3]
- DMT-34M[3]
- DMT-36M[3]
- DMT-37M[3]
- DMT-60M[3]
- EA-06M[3]

5.2.4 Patuxent Aquifer

The Patuxent Aquifer is hydraulically separated from the Patapsco Aquifer by the Arundel Clay confining unit. Vertical migration of chromium through this thick lower confining layer and then through the Arundel Clay is not likely before detections of chromium is found in the shallower units. However, the three wells screened in the Patuxent Aquifer will be sampled under this plan to continue monitoring the groundwater quality at depth:

- DMT-81D
- DMT-82D
- DMT-83D

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[3] Sampled semiannually.

5.3 Data Evaluation

Data collected during the sampling and monitoring will be evaluated to confirm containment of chromium on the site. This evaluation will include the following:

- Well integrity
- Groundwater elevations
- Chromium concentrations in groundwater
- Statistical evaluation of data to determine if statistically significant increases are identified
- Reducing conditions in the Patapsco River
- Modifications to the wells, sampling frequency, or well network

5.3.1 Well Integrity

The well integrity from the monitoring event will be summarized in a table to confirm that the groundwater information collected from the well is not affected by potential well damage or accumulation of excessive amounts of sediment at the well bottom. Well damage, including improper well seals and broken surface casings, will be corrected between monitoring events. Excessive sediment accumulation will trigger redevelopment of the well prior to the next event. Potentially damaged wells will be taken into consideration during evaluation of the groundwater elevation and sampling results as potentially impacting the data results. A downhole video camera may be used to assess well blockages or suspected breaks in the well casing.

5.3.2 Groundwater Elevations

The groundwater depths measured during the monitoring event will be converted to groundwater elevations and corrected if the well is tidally influenced (Table 1). This procedure is the same as followed for the IGSP. Groundwater elevations are used to generate contoured piezometric maps for the Shallow Fill Unit, the Patapsco Aquifer, and Patuxent Aquifer. The elevations from the Upper Saturated Zone and Upper Sand wells will be plotted as well, but not contoured based on the limited lateral extent of the water-bearing zones and the various sand lenses that occur in the Upper Sand wells between the Upper and Lower Confining Units. The Shallow Fill Unit groundwater elevations will be evaluated and compared to the Model Simulations of Storm Drain Relining Report as presented in Appendix B of the CMAA to confirm effects of relining are consistent with predictions. The contoured maps will be used to confirm groundwater flow direction and hydraulic gradient, and will be compared to previous maps to assess general patterns of groundwater elevation changes over time. Time-series graphs of groundwater elevations may be plotted if long- or short-term changes are noted. Changes in the groundwater flow pattern or impact of changes to the groundwater elevations will be evaluated to assess if modifications to the well network or sampling program are needed.

Groundwater elevations from wells within Area 1501/1602 will also be contoured to document groundwater flow and gradients within the COPR cell. These elevations will be compared to the elevations in the well points (S-series) along the shoreline and the adjacent Shallow Fill Unit wells outside Area 1501/1602 to confirm hydraulic containment of the COPR cell. The contoured maps will also be compared to previous maps to assess general patterns of groundwater elevation changes over time. Time-series graphs will be plotted to monitor the effect of the efforts to reduce infiltration into the COPR cell. Issues related to potential breach of hydraulic containment or increased infiltration will be investigated in detail to confirm data integrity and then integrity of the containment cell will be evaluated to correct the issue.

The vertical hydraulic gradients between the Upper Saturated Zone, Shallow Fill Unit, the Upper Sands, the Patapsco Aquifer, and the Patuxent Aquifer will be calculated for nearby well screened in different units. Based on the previous semiannual sampling events, the vertical gradients fluctuate with the time of year due to natural changes in recharge, but are generally within a historical range. Vertical gradients calculated outside the historical range will be reviewed to assess whether there is a potential vertical hydraulic connection. If the vertical hydraulic gradient indicates that there is a significant change, an assessment of the monitoring well integrity will be critically reviewed to make corrections. This may be necessary to prevent groundwater migration along the well casing or other integrity problems, which required monitoring well replacement.

5.3.3 Chromium Concentrations in Groundwater

Analytical results from the groundwater sampling will be validated by a third-party validator and then presented in summary tables. Level 4 validation will be completed in accordance with the Quality Assurance Project Plan (CH2M, 2007). Detections of Cr(VI) in a well will prompt a review of the field collection information and laboratory analytical process to assess whether issues related to well integrity, potential cross-contamination, or other sources of error could result in a false positive result. A Cr(VI) detection in a well that previously had no detections will prompt resampling to reduce the potential for a false positive detection. Well integrity issues, if identified, will be corrected prior to resampling. Resampled data will be used for in the evaluation process. If a Cr(VI) detection is confirmed, then the potential for a statistically significant increasing trend will be evaluated as the monitoring program continues. In addition, the confirmed Cr(VI) concentration(s) will be evaluated on the risk for potential adverse impacts to potential receptors, including Port Users, the adjacent residents, Patapsco River and the Patapsco Aquifer.

The development of this framework on evaluating chromium groundwater monitoring data is based on the objective of the sentinel groundwater monitoring program – that is, to allow sufficient time to implement contingent remedial measures, as appropriate, if Cr(VI) is detected above levels that may pose an adverse risk to human health and the environment at the site boundary. This is accomplished by establishing threshold Action Levels that would be an indicator of a potential adverse impact on surface water or groundwater outside of COPR fill areas. The general evaluation process of the analytical data will be based on the well location and groundwater-bearing zone where the well is screened, as follows:

1. Detection of Cr(VI) in wells not previously detecting Cr(VI) will trigger further assessment, e.g.:
    a. Confirmation of detection
    b. Assessment of temporal trends (i.e., are concentrations increasing)
    c. Comparison with the risk-based Action Level protective of reasonably anticipated potential receptors
2. Action Levels are developed based on reasonably anticipated potential receptors:
    a. Lateral flow to adjacent Patapsco River
    b. Vertical migration to Patapsco Aquifer
3. For groundwater-bearing units that flow laterally towards the Patapsco River and/or offsite, detection of Cr(VI) concentrations above the Action Level may warrant increased monitoring frequency, sampling of surface water in the vicinity of well(s) with concentrations exceeding the Action Level, and/or consideration of modifications and/or additions to existing corrective measures.
4. For groundwater units that have a downward gradient toward the Patapsco Aquifer, detection of total chromium and/or Cr(VI) above Action Levels for protection of Patapsco Aquifer may warrant increased monitoring frequency, and/or consideration of modifications and/or additions to existing corrective measures.

Shallow Fill Unit

For evaluating groundwater monitoring data for lateral migration within the Shallow Fill Unit, the site was divided into two zones.

- Zone 1 wells are outside the footprint of the COPR fill limit in the portion of DMT that is contained within the perimeter bulkhead, which reduces the potential for groundwater discharges to the river. If Cr(VI) detections are confirmed in a Zone 1 well, the data from the well and in downgradient wells (if available) will be assessed for a statistically increasing concentration trends for evidence of Cr(VI) migration from the COPR fill area. If the well has confirmed Cr(VI) detections and an increasing trend is noted based on subsequent sampling events, the groundwater conditions at the site will be reviewed for changes that may have affected the stability of the groundwater system, including an assessment of upgradient conditions. A change in the well network will be evaluated to use an existing downgradient monitoring well or to drill a new downgradient monitoring well as a replacement monitoring location. Any new well installed will need to be assessed for tidal influence to generate an appropriate correction to the groundwater elevation. If there is no suitable downgradient location (i.e., perimeter monitoring well location), then evaluations will be conducted to confirm hydraulic containment or additional remedial actions considered to protect human health and the environment.
- Zone 2 wells are in areas where lateral groundwater flow may discharge to the river. Zone 2 is defined as the discharge area (1) between the site bulkhead and the COPR cell, (2) the western and southern sides of the COPR cell, and (3) the area south of the COPR cell (i.e., under the adjacent Mestek Property and Carnegie Plat neighborhood). For Zone 2, an Action Level was developed based on protection of ecological receptors in the Patapsco River where groundwater upwelling from this lateral groundwater flow may occur. The chronic saline surface water quality standard for Cr(VI) of 0.05 milligram per liter (mg/L) was selected as the basis for this Action Level. The Action Level calculated for the groundwater monitoring program is intentionally conservative. For example, it is assumed that all groundwater discharging from Zone 2 contains Cr(VI), mixing in surface water only occurs within first few inches of the water depth, and no exchange of surface water occurs over a 24-hour period (i.e., tidal exchange is ignored). This Action Level thus provide a conservative threshold to trigger an investigation of potential changes in groundwater conditions and potential impacts to the Patapsco River. Based on the surface water quality standard as the target concentration, and estimation of groundwater discharge using the three-dimensional flow model developed for the site (CH2M 2009b), and the area of groundwater upwelling identified in the 2008 study (CH2M and ENVIRON 2009), an Action Level calculated for these areas of the site where groundwater discharges into the Patapsco River and divided by a safety factor of 2 for an Action Level of 25 mg/L Cr(VI). Supporting information for the computation of the Action Level is provided in Appendix C.

For these zones, any Cr(VI) detection will be confirmed, and if confirmed, a statistical evaluation of concentration trends will be conducted as additional data are collected. If a statistically significant increasing trend is identified, the groundwater conditions at the site will be reviewed for changes that may have affected the stability of the groundwater system, including an assessment of upgradient conditions. If appropriate, a change in the well network will be evaluated, specifically to consider incorporating an existing downgradient monitoring well or installing a new downgradient (offsite) monitoring well to assess lateral migration. If a new well is installed, it will be assessed for tidal influence to evaluate an appropriate correction to the groundwater elevation. Hydraulic containment will be confirmed, or additional remedial actions will be considered to protect human health and the environment. If concentration(s) exceed the Action Level for this lateral migration pathway, sampling frequency may be increased to support a more expedient trend evaluation. In addition, surface water sampling may be conducted to confirm that groundwater migration is not adversely impacting surface water quality in groundwater upwelling.

Upper Sand Unit

As detailed in Appendix C, groundwater Action Levels were developed for the Upper Sand Unit based on protection of the Patapsco Aquifer associated with a vertical migration pathway. These Action Levels are based on meeting the drinking water standard (i.e., federal and Maryland maximum contaminant level [MCL]) of 0.1 mg/L (100 micrograms per liter [µg/L]) for total chromium and the Maryland groundwater cleanup standard of 0.000035 mg/L (0.035 µg/L) for Cr(VI) (MDE 2018). The Action Levels calculated for the groundwater monitoring program are intentionally conservative and provide a threshold to trigger an investigation of potential changes in groundwater conditions or impacts to the Patapsco Aquifer rather than an indication of actual impacts.

Based on the drinking water and groundwater cleanup standards and the groundwater model developed for the site (CH2M 2009), Action Levels for vertical migration of 25.7 mg/L total chromium and 0.009 mg/L Cr(VI) were calculated for the Upper Sand Unit monitoring program. The details of this calculation are provided in Appendix C.

Detections of total chromium and Cr(VI) will be confirmed through resampling, as discussed above. If a statistically significant increasing trend for total chromium and Cr(VI) is identified as additional data are collected, the groundwater conditions at the site will be reviewed for changes that may have affected the stability of the groundwater system, including an assessment of upgradient conditions. If appropriate, a change in the well network will be evaluated, specifically to consider incorporating an existing downgradient monitoring well or installing a new downgradient (offsite) monitoring well to track lateral migration. If a new well is installed, it will be assessed for tidal influence to evaluate an appropriate correction to the groundwater elevation. Hydraulic containment will be confirmed, or additional remedial actions will be considered to protect human health and the environment.

If the average total chromium or Cr(VI) concentrations in the Upper Sand Unit wells for each monitoring event are above the respective Action Levels for vertical migration of 25.7 mg/L or 0.009 mg/L, respectively, the monitoring frequency may be increased to support the evaluation of concentration trends. In addition, monitoring of the Patapsco Aquifer wells will be increased to assess potential impacts to groundwater quality in this lower aquifer.

Patapsco and Patuxent Aquifers

Confirmed total chromium or Cr(VI) concentrations in the Patapsco and Patuxent Aquifer wells will be compared to the drinking water standard and groundwater cleanup level of 0.1 mg/L and 0.000035 mg/L, respectively. If an increasing trend is noted or if the concentrations are above the standard for total chromium or Cr(VI) during the past four sampling events, the groundwater conditions at the site will be reviewed for changes that may have affected the stability of the groundwater system, including an assessment of upgradient conditions. If appropriate, a change in the well network will be evaluated, specifically to consider incorporating an existing downgradient monitoring well or installing a new downgradient (offsite) monitoring well to track lateral migration. If a new well is installed, it will be assessed for tidal influence to evaluate an appropriate correction to the groundwater elevation. If there is no suitable downgradient location (i.e., perimeter monitoring well location), hydraulic containment will be confirmed through additional monitoring, or additional remedial actions will be considered to protect the receptors of this groundwater resource.

5.3.4 Monitoring Plan Modifications

This monitoring plan will be evaluated annually to make adjustments to specific wells, to the monitoring well network, and to the sampling frequency. Well integrity evaluations may require repairs to the well heads and redevelopment actions to remove accumulated sediment at the well bottom. If damaged beyond repair, a well may need to be replaced. Based on assessment of the groundwater sample analytical results, replacement wells or supplemental wells may be added to the well network. The well network may require adjustments if changing groundwater conditions are noted to the site due to changing site conditions. The monitoring frequency may be adjusted based on site conditions. The sediment and porewater sampling frequency may be increased if changing geochemical conditions that necessitate additional evaluation are noted. Modifications to this Sentinel Plan will be documented in the monitoring reports and will be implemented based on MDE approval.

5.4 Sediment and Porewater Sampling

As part of the *Corrective Measures Alternative Analysis* (CH2M 2011), the hydraulic containment system monitoring has a component to confirm chemically reducing conditions in the Patapsco River adjacent to DMT. Based on previous work completed at the site in 2007 and 2008, the reducing conditions will be assessed with the collection of sediment and porewater samples beneath the Patapsco River adjacent to the site, consistent with these prior studies. A detailed work plan for the sediment and porewater sampling is included in Appendix B. As specified in the CMAA (CH2M 2011), the monitoring of sediment and porewater will occur at 5-year intervals commencing with approval of this plan.

Analytical results from the sediment and porewater will be assessed to confirm reducing conditions beneath the Patapsco River. Maps detailing the sampling locations and graphs of the data compared to previous information will be used to evaluate any potential changes in the sediment and/or the porewater geochemical conditions. Areas where reducing conditions may not be occurring will be highlighted and discussed regarding implications to the selected containment remedy for the DMT site. The discussion will include potential reasons that the geochemistry has changed.

6. Reporting

Reports of the monitoring events will be completed at the conclusion of each sampling event after receipt of validated analytical results. These reports will summarize the data in tables and figures, and will provide a detailed evaluation of the data as described in Section 5.3. Proposed well repair, well redevelopment, well replacement, adjustments to the well network, and actions considered based on the data evaluation will be documented in the semiannual report.

7. References

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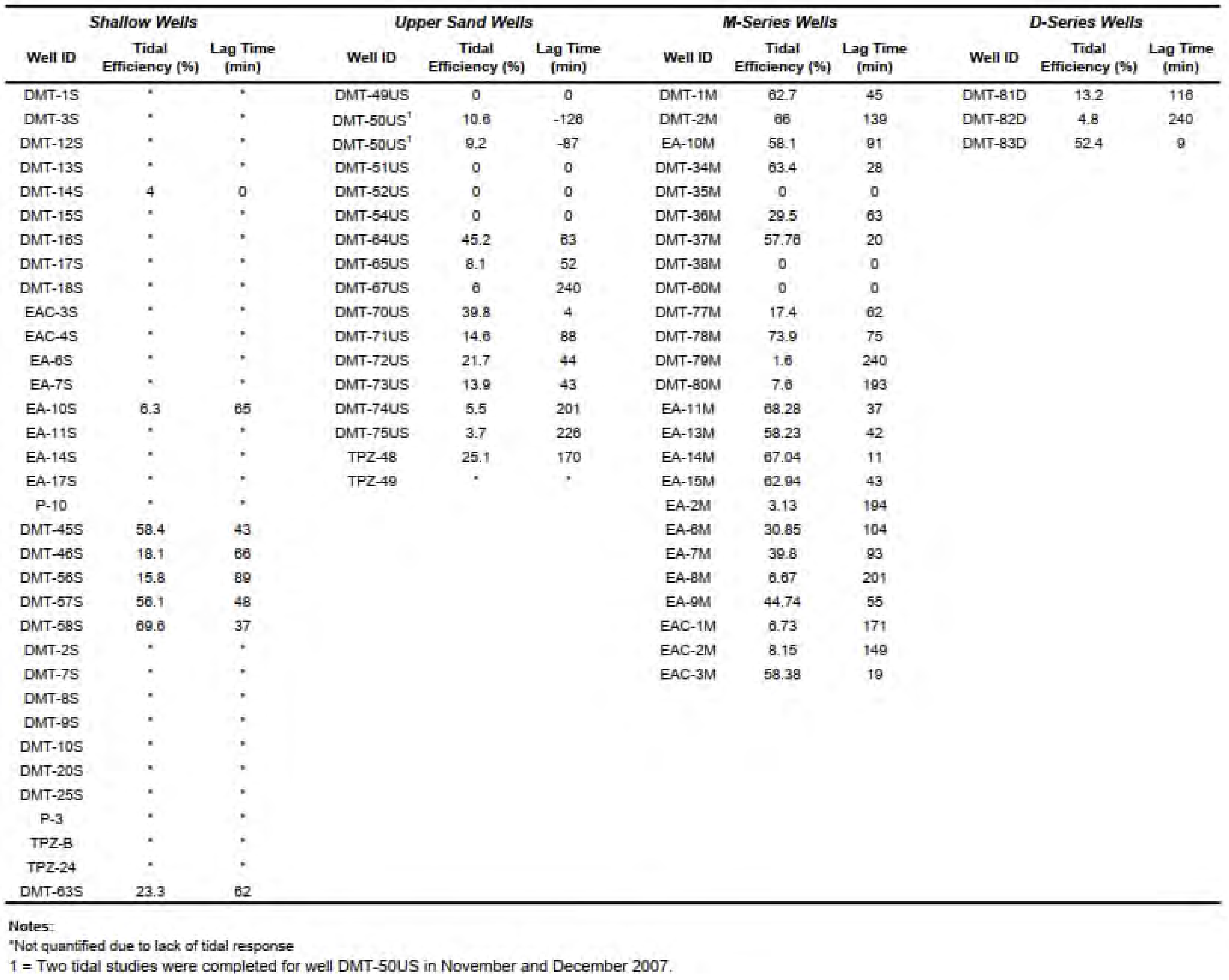
Tables

Table 1. Chromium Transport Study, Tidal Study Results



Shallow Wells			Upper Sand Wells			M-Series Wells			D-Series Wells		
Well ID	Tidal Efficiency (%)	Lag Time (min)	Well ID	Tidal Efficiency (%)	Lag Time (min)	Well ID	Tidal Efficiency (%)	Lag Time (min)	Well ID	Tidal Efficiency (%)	Lag Time (min)
DMT-1S	*	*	DMT-49US	0	0	DMT-1M	62.7	45	DMT-81D	13.2	116
DMT-3S	*	*	DMT-50US^1	10.6	-126	DMT-2M	66	139	DMT-82D	4.8	240
DMT-12S	*	*	DMT-50US^1	9.2	-87	EA-10M	58.1	91	DMT-83D	52.4	9
DMT-13S	*	*	DMT-51US	0	0	DMT-34M	63.4	28			
DMT-14S	4	0	DMT-52US	0	0	DMT-35M	0	0			
DMT-15S	*	*	DMT-54US	0	0	DMT-36M	29.5	63			
DMT-16S	*	*	DMT-64US	45.2	63	DMT-37M	57.76	20			
DMT-17S	*	*	DMT-65US	8.1	52	DMT-38M	0	0			
DMT-18S	*	*	DMT-67US	6	240	DMT-60M	0	0			
EAC-3S	*	*	DMT-70US	39.8	4	DMT-77M	17.4	62			
EAC-4S	*	*	DMT-71US	14.6	88	DMT-78M	73.9	75			
EA-6S	*	*	DMT-72US	21.7	44	DMT-79M	1.6	240			
EA-7S	*	*	DMT-73US	13.9	43	DMT-80M	7.6	193			
EA-10S	6.3	65	DMT-74US	5.5	201	EA-11M	68.28	37			
EA-11S	*	*	DMT-75US	3.7	226	EA-13M	58.23	42			
EA-14S	*	*	TPZ-48	25.1	170	EA-14M	67.04	11			
EA-17S	*	*	TPZ-49	*	*	EA-15M	62.94	43			
P-10	*	*				EA-2M	3.13	194			
DMT-45S	58.4	43				EA-6M	30.85	104			
DMT-46S	18.1	66				EA-7M	39.8	93			
DMT-56S	15.8	89				EA-8M	6.67	201			
DMT-57S	56.1	48				EA-9M	44.74	55			
DMT-58S	69.6	37				EAC-1M	6.73	171			
DMT-2S	*	*				EAC-2M	8.15	149			
DMT-7S	*	*				EAC-3M	58.38	19			
DMT-8S	*	*									
DMT-9S	*	*									
DMT-10S	*	*									
DMT-20S	*	*									
DMT-25S	*	*									
P-3	*	*									
TPZ-B	*	*									
TPZ-24	*	*									
DMT-63S	23.3	62									

Notes:

*Not quantified due to lack of tidal response

1 = Two tidal studies were completed for well DMT-50US in November and December 2007.

Note: Not all wells listed are still in use.

Table 2. Sentinel Well Network/Well Gauging

Qty	Well Name	Screened Unit	Sampled (Y/N)	Location	Rationale
1	DMT-01S	Shallow Fill	Y	Interior, Outside COPR	Assess potential lateral chromium migration
2	DMT-02S	Shallow Fill	N	Interior, Outside COPR	Assess lateral groundwater movement
3	DMT-03S	Shallow Fill	N	Interior, Outside COPR	Assess lateral groundwater movement
4	DMT-04S	Shallow Fill	N	Interior, Outside COPR	Assess lateral groundwater movement
5	DMT-05S	Shallow Fill	N	Interior, Outside COPR	Assess lateral groundwater movement
6	DMT-06S	Shallow Fill	N	Interior, Inside COPR	Assess lateral groundwater movement
7	DMT-07S	Shallow Fill	N	Interior, Inside COPR	Assess lateral groundwater movement
8	DMT-08S	Shallow Fill	N	Interior, Inside COPR	Assess lateral groundwater movement
9	DMT-09S	Shallow Fill	N	Interior, Inside COPR	Assess lateral groundwater movement
10	DMT-10S	Shallow Fill	N	Interior, Inside COPR	Assess lateral groundwater movement
11	DMT-11S	Shallow Fill	N	Interior, Inside COPR	Assess lateral groundwater movement
12	DMT-12S	Shallow Fill	Y	Perimeter, South	Assess potential lateral chromium migration
13	DMT-13S	Shallow Fill	N	Interior, Inside COPR	Assess lateral groundwater movement
14	DMT-14S	Shallow Fill	Y	Perimeter, South	Assess potential lateral chromium migration
15	DMT-15S	Shallow Fill	N	Perimeter, South	Assess lateral groundwater movement
16	DMT-17S	Shallow Fill	Y	Perimeter, West	Assess potential lateral chromium migration
17	DMT-18S	Shallow Fill	N	Perimeter, West	Assess lateral groundwater movement
18	DMT-19S	Shallow Fill	N	Interior, Outside COPR	Assess lateral groundwater movement
19	DMT-20S	Shallow Fill	N	Interior, Outside COPR	Assess lateral groundwater movement
20	DMT-22S	Shallow Fill	N	Interior, Inside COPR	Assess lateral groundwater movement
21	DMT-26S	Shallow Fill	N	Interior, Outside COPR	Assess lateral groundwater movement
22	DMT-27S	Shallow Fill	Y	Interior, Outside COPR	Assess potential lateral chromium migration
23	DMT-28S	Shallow Fill	Y	Interior, Outside COPR	Assess potential lateral chromium migration
24	DMT-29S	Shallow Fill	N	Interior, Inside COPR	Assess lateral groundwater movement
25	DMT-30S	Shallow Fill	N	Interior, Inside COPR	Assess lateral groundwater movement
26	DMT-31S	Shallow Fill	Y	Perimeter, South	Assess potential lateral chromium migration
27	DMT-32S	Shallow Fill	Y	Perimeter, South	Assess potential lateral chromium migration
28	DMT-33S	Shallow Fill	N	Interior, Inside COPR	Assess lateral groundwater movement
29	DMT-39S	Shallow Fill	Y	Perimeter, Outside COPR	Assess potential lateral chromium migration
30	DMT-40S	Shallow Fill	N	Perimeter, West	Assess lateral groundwater movement
31	DMT-41S	Shallow Fill	Y	Interior, Outside COPR	Assess potential lateral chromium migration
32	DMT-42S	Shallow Fill	Y	Perimeter, West	Assess potential lateral chromium migration
33	DMT-43S	Shallow Fill	N	Interior, Inside COPR	Assess lateral groundwater movement
34	DMT-47S	Shallow Fill	Y	Upgradient, East	Assess background groundwater quality
35	DMT-56S	Shallow Fill	Y	1501/1602 Below Liner	Assess potential vertical chromium migration
36	DMT-59S	Upper Saturated Zone	N	Upgradient, East	Assess vertical groundwater movement
37	DMT-61S	Shallow Fill	N	Upgradient, East	Assess upgradient groundwater movement
38	DMT-62S	Shallow Fill	N	Perimeter, Outside COPR	Assess lateral groundwater movement
39	DMT-90S	Shallow Fill	Y	Perimeter, South	Assess potential lateral chromium migration
40	DMT-91S	Shallow Fill	Y	Perimeter, South	Assess potential lateral chromium migration
41	DMT-92S	Shallow Fill	Y	Interior, Outside COPR	Assess potential lateral chromium migration
42	DMT-93S	Shallow Fill	N	Interior, Inside COPR	Assess lateral groundwater movement
43	DMT-94S	Shallow Fill	N	Interior, Inside COPR	Assess lateral groundwater movement
44	DMT-95S	Shallow Fill	N	Interior, Inside COPR	Assess lateral groundwater movement
45	DMT-96S	Shallow Fill	N	Interior, Inside COPR	Assess lateral groundwater movement
46	TPZ-27A	Shallow Fill	N	Upgradient, East	Assess lateral groundwater movement
47	TPZ-27B	Upper Saturated Zone	N	Upgradient, East	Assess vertical groundwater movement
48	TPZ-28	Upper Saturated Zone	N	Interior, East	Assess vertical groundwater movement
49	TPZ-29	Upper Saturated Zone	N	Interior, East	Assess vertical groundwater movement
50	TPZ-30A	Shallow Fill	N	Interior, East	Assess lateral groundwater movement
51	TPZ-30B	Upper Saturated Zone	N	Interior, East	Assess vertical groundwater movement
52	TPZ-33	Shallow Fill	N	Interior, Outside COPR	Assess lateral groundwater movement
53	TPZ-35	Shallow Fill	N	Interior, Inside COPR	Assess lateral groundwater movement
54	TPZ-36	Shallow Fill	N	Interior, Inside COPR	Assess lateral groundwater movement
55	TPZ-37	Shallow Fill	N	Interior, Inside COPR	Assess lateral groundwater movement
56	TPZ-45	Shallow Fill	N	Upgradient, East	Assess upgradient groundwater movement
57	TPZ-58	Shallow Fill	N	Interior, Inside COPR	Assess lateral groundwater movement
58	TPZ-59	Shallow Fill	N	Interior, Inside COPR	Assess lateral groundwater movement
59	TPZ-61	Shallow Fill	N	Interior, Inside COPR	Assess lateral groundwater movement
60	EA-02S	Shallow Fill	N	Interior, East	Assess lateral groundwater movement
61	EA-03S	Shallow Fill	N	Interior, East	Assess lateral groundwater movement
62	EA-06S	Shallow Fill	N	Interior, Inside COPR	Assess lateral groundwater movement
63	EA-07S	Shallow Fill	N	Inside 1501/1602 Cell	Assess lateral groundwater movement
64	EA-08S	Shallow Fill	N	Interior, Inside COPR	Assess lateral groundwater movement
65	EA-10S	Shallow Fill	Y	Interior, Outside COPR	Assess lateral groundwater movement
66	EA-11S	Shallow Fill	Y	Perimeter, South	Assess potential lateral chromium migration
67	EA-12S	Shallow Fill	Y	Interior, Outside COPR	Assess lateral groundwater movement
68	EA-15S	Shallow Fill	N	Interior, Inside COPR	Assess lateral groundwater movement
69	EA-16S	Shallow Fill	N	Interior, Outside COPR	Assess lateral groundwater movement
70	EA-17S	Shallow Fill	N	Perimeter, South	Assess lateral groundwater movement
71	EA-21S	Shallow Fill	N	Interior, Outside COPR	Assess lateral groundwater movement
72	EAC-01S	Shallow Fill	Y	Upgradient, East	Assess background groundwater quality
73	EAC-02S	Shallow Fill	N	Interior, Outside COPR	Assess lateral groundwater movement
74	EAC-03S	Shallow Fill	N	Perimeter, South	Assess lateral groundwater movement
75	P-03	Shallow Fill	N	Interior, Inside COPR	Assess lateral groundwater movement
76	P-06	Shallow Fill	N	Interior, Inside COPR	Assess lateral groundwater movement
77	P-07	Shallow Fill	N	Interior, Inside COPR	Assess lateral groundwater movement
78	P-09	Shallow Fill	N	Interior, Inside COPR	Assess lateral groundwater movement
79	P-10	Shallow Fill	N	Interior, Inside COPR	Assess lateral groundwater movement
80	P-11	Shallow Fill	N	Interior, Inside COPR	Assess lateral groundwater movement
81	S-1	Shallow Fill	Y	Perimeter, 1501/1602	Assess potential lateral chromium migration
82	S-2	Shallow Fill	Y	Perimeter, 1501/1602	Assess potential lateral chromium migration
83	S-3I	Shallow Fill	Y	Perimeter, 1501/1602	Assess potential lateral chromium migration
84	S-3D	Shallow Fill	Y	Perimeter, 1501/1602	Assess potential lateral chromium migration
85	S-4I	Shallow Fill	Y	Perimeter, 1501/1602	Assess potential lateral chromium migration
86	S-4D	Shallow Fill	Y	Perimeter, 1501/1602	Assess potential lateral chromium migration
87	S-5	Shallow Fill	Y	Perimeter, 1501/1602	Assess potential lateral chromium migration
88	S-6	Shallow Fill	Y	Perimeter, 1501/1602	Assess potential lateral chromium migration
89	S-7	Shallow Fill	Y	Perimeter, 1501/1602	Assess potential lateral chromium migration
90	DMT-49US	Upper Sand	Y	Interior, West	Assess potential vertical chromium migration
91	DMT-50US	Upper Sand	Y	Perimeter, West	Assess potential vertical and lateral chromium migration
92	DMT-51US	Upper Sand	Y	Interior, Inside COPR	Assess potential vertical chromium migration
93	DMT-52US	Upper Sand	Y	Interior, Inside COPR	Assess potential vertical chromium migration
94	DMT-53US	Upper Sand	N	Interior, Inside COPR	Assess vertical and lateral groundwater movement
95	DMT-54US	Upper Sand	Y	Upgradient, East	Assess background groundwater quality

Table 2. Sentinel Well Network/Well Gauging

Qty	Well Name	Screened Unit	Sampled (Y/N)	Location	Rationale
96	DMT-64US	Upper Sand	Y	Perimeter, West	Assess potential vertical and lateral chromium migration
97	DMT-65US	Upper Sand	Y	Perimeter, West	Assess potential vertical and lateral chromium migration
98	DMT-67US	Upper Sand	Y	Perimeter, South	Assess potential vertical and lateral chromium migration
99	DMT-70US	Upper Sand	Y	Perimeter, South	Assess potential vertical and lateral chromium migration
100	DMT-71US	Upper Sand	N	Interior, Outside COPR	Assess vertical and lateral groundwater movement
101	DMT-72US	Upper Sand	Y	Perimeter, South	Assess potential vertical and lateral chromium migration
102	DMT-73US	Upper Sand	Y	Perimeter, South	Assess potential vertical and lateral chromium migration
103	DMT-74US	Upper Sand	N	Upgradient, East	Assess upgradient groundwater movement
104	DMT-75US	Upper Sand	N	Upgradient, East	Assess upgradient groundwater movement
105	DMT-01M	Medium-Depth	Y	Interior, Inside COPR	Assess potential vertical chromium migration
106	DMT-02M	Medium-Depth	N	Interior, Outside COPR	Assess vertical and lateral groundwater movement
107	DMT-34M	Medium-Depth	Y	Perimeter	Assess potential lateral and vertical chromium migration
108	DMT-35M	Medium-Depth	N	Interior, Inside COPR	Assess vertical and lateral groundwater movement
109	DMT-36M	Medium-Depth	Y	Interior, Inside COPR	Assess potential vertical chromium migration
110	DMT-37M	Medium-Depth	Y	Interior, Inside COPR	Assess potential vertical chromium migration
111	DMT-38M	Medium-Depth	N	Upgradient, East	Assess upgradient groundwater movement
112	DMT-60M	Medium-Depth	Y	Upgradient, East	Assess background groundwater quality
113	DMT-77M	Medium-Depth	Y	Perimeter, South	Assess potential lateral and vertical chromium migration
114	DMT-78M	Medium-Depth	N	Interior, Outside COPR	Assess vertical and lateral groundwater movement
115	DMT-79M	Medium-Depth	N	Upgradient, East	Assess upgradient groundwater movement
116	DMT-80M	Medium-Depth	N	Upgradient, East	Assess upgradient groundwater movement
117	EA-02M	Medium-Depth	N	Interior, Inside COPR	Assess vertical and lateral groundwater movement
118	EA-06M	Medium-Depth	Y	Interior, Inside COPR	Assess potential vertical chromium migration
119	EA-07M	Medium-Depth	Y	Perimeter, 1501/1602	Assess potential lateral and vertical chromium migration
120	EA-08M	Medium-Depth	N	Interior, Inside COPR	Assess vertical and lateral groundwater movement
121	EA-10M	Medium-Depth	N	Interior, Outside COPR	Assess vertical and lateral groundwater movement
122	EA-11M	Medium-Depth	Y	Perimeter, West South	Assess potential lateral and vertical chromium migration
123	EA-13M	Medium-Depth	N	Interior, Inside COPR	Assess vertical and lateral groundwater movement
124	EA-14M	Medium-Depth	N	Perimeter, South	Assess vertical and lateral groundwater movement
125	EA-15M	Medium-Depth	N	Interior, Inside COPR	Assess vertical and lateral groundwater movement
126	EAC-02M	Medium-Depth	N	Interior, Outside COPR	Assess vertical and lateral groundwater movement
127	EAC-03M	Medium-Depth	N	Interior, Inside COPR	Assess vertical and lateral groundwater movement
128	DMT-81D	Deep Well	Y	Perimeter, South	Assess potential lateral and vertical chromium migration
129	DMT-82D	Deep Well	Y	Upgradient, East	Assess background groundwater quality
130	DMT-83D	Deep Well	Y	Perimeter, West	Assess potential lateral and vertical chromium migration

Table 3. Sentinel Well Network/Well Sampling

Qty	Well Name	Screened Unit	Sampled (Y/N)	Location
1	DMT-01S	Shallow Fill	Y	Interior, Outside COPR
2	DMT-12S	Shallow Fill	Y	Perimeter, South
3	DMT-14S	Shallow Fill	Y	Perimeter, South
4	DMT-17S	Shallow Fill	Y	Perimeter, West
5	DMT-27S	Shallow Fill	Y	Interior, Outside COPR
6	DMT-28S	Shallow Fill	Y	Interior, Outside COPR
7	DMT-31S	Shallow Fill	Y	Perimeter, South
8	DMT-32S	Shallow Fill	Y	Perimeter, South
9	DMT-39S	Shallow Fill	Y	Perimeter, Outside COPR
10	DMT-41S	Shallow Fill	Y	Interior, Outside COPR
11	DMT-42S	Shallow Fill	Y	Perimeter, West
12	DMT-47S	Shallow Fill	Y	Upgradient, East
13	DMT-56S	Shallow Fill	Y	1501/1602 Below Liner
14	DMT-90S	Shallow Fill	Y	Perimeter, South
15	DMT-91S	Shallow Fill	Y	Perimeter, South
16	DMT-92S	Shallow Fill	Y	Interior, Outside COPR
17	EA-10S	Shallow Fill	Y	Interior, Outside COPR
18	EA-11S	Shallow Fill	Y	Perimeter, South
19	EA-12S	Shallow Fill	Y	Interior, Outside COPR
20	EAC-01S	Shallow Fill	Y	Upgradient, East
21	S-1	Shallow Fill	Y	Perimeter, 1501/1602
22	S-2	Shallow Fill	Y	Perimeter, 1501/1602
23	S-3I	Shallow Fill	Y	Perimeter, 1501/1602
24	S-3D	Shallow Fill	Y	Perimeter, 1501/1602
25	S-4I	Shallow Fill	Y	Perimeter, 1501/1602
26	S-4D	Shallow Fill	Y	Perimeter, 1501/1602
27	S-5	Shallow Fill	Y	Perimeter, 1501/1602
28	S-6	Shallow Fill	Y	Perimeter, 1501/1602
29	S-7	Shallow Fill	Y	Perimeter, 1501/1602
30	DMT-49US	Upper Sand	Y	Interior, West
31	DMT-50US	Upper Sand	Y	Perimeter, West
32	DMT-51US	Upper Sand	Y	Interior, Inside COPR
33	DMT-52US	Upper Sand	Y	Interior, Inside COPR
34	DMT-53US	Upper Sand	Y	Upgradient, East
35	DMT-64US	Upper Sand	Y	Perimeter, West
36	DMT-65US	Upper Sand	Y	Perimeter, West
37	DMT-67US	Upper Sand	Y	Perimeter, South
38	DMT-70US	Upper Sand	Y	Perimeter, South
39	DMT-72US	Upper Sand	Y	Perimeter, South
40	DMT-73US	Upper Sand	Y	Perimeter, South
41	DMT-01M	Medium-Depth	Y	Interior, Inside COPR
42	DMT-34M	Medium-Depth	Y	Perimeter
43	DMT-36M	Medium-Depth	Y	Interior, Inside COPR
44	DMT-37M	Medium-Depth	Y	Interior, Inside COPR
45	DMT-60M	Medium-Depth	Y	Upgradient, East
46	DMT-77M	Medium-Depth	Y	Perimeter, South
47	EA-06M	Medium-Depth	Y	Interior, Inside COPR
48	EA-07M	Medium-Depth	Y	Perimeter, 1501/1602
49	EA-11M	Medium-Depth	Y	Perimeter, West South
50	DMT-81D	Deep Well	Y	Perimeter, South
51	DMT-82D	Deep Well	Y	Upgradient, East
52	DMT-83D	Deep Well	Y	Perimeter, West

Rationale
Assess potential lateral chromium migration
Assess potential lateral chromium migration
Assess potential lateral chromium migration
Assess potential lateral chromium migration
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Assess potential lateral chromium migration
Assess potential lateral chromium migration
Assess potential lateral chromium migration
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Assess background groundwater quality
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Assess potential lateral and vertical chromium migration
Assess potential vertical chromium migration
Assess potential vertical chromium migration
Assess background groundwater quality
Assess potential lateral and vertical chromium migration
Assess potential vertical chromium migration
Assess potential lateral and vertical chromium migration
Assess potential lateral and vertical chromium migration
Assess potential lateral and vertical chromium migration
Assess background groundwater quality
Assess potential lateral and vertical chromium migration

Table 4. Sentinel Well Network/Well Abandonment

Qty	Well Name	Screened Unit	Location	Rationale
1	DMT-21S	Shallow Fill	Adjacent to DMT-20S	Duplicative
2	DMT-23S	Shallow Fill	Adjacent to DMT-2S	Duplicative
3	DMT-24S	Shallow Fill	Adjacent to DMT-8S	Duplicative
4	DMT-25S	Shallow Fill	Adjacent to DMT-10S	Duplicative
5	DMT-59S	Shallow Fill	Adjacent to DMT-47S	Duplicative
6	TPZ-A	Shallow Fill	Adjacent to EA-9S	Duplicative
7	TPZ-B	Shallow Fill	Between DMT-8S and EA-3S	Duplicative
8	TPZ-01	Shallow Fill	Near DMT-9S	Duplicative
9	TPZ-02	Shallow Fill	Near DMT-9S	Duplicative
10	TPZ-03	Shallow Fill	Near DMT-9S	Duplicative
11	TPZ-04	Shallow Fill	Near DMT-13S	Duplicative
12	TPZ-05	Shallow Fill	Near DMT-13S	Duplicative
13	TPZ-06	Shallow Fill	Near DMT-13S	Duplicative
14	TPZ-07	Shallow Fill	Near DMT-13S	Duplicative
15	TPZ-08	Shallow Fill	Between DMT-8S and EA-3S	Duplicative
16	TPZ-09	Shallow Fill	Between DMT-8S and EA-3S	Duplicative
17	TPZ-10	Shallow Fill	Between DMT-8S and EA-3S	Duplicative
18	TPZ-11	Shallow Fill	Between DMT-8S and EA-3S	Duplicative
19	TPZ-14	Shallow Fill	Near DMT-14S	Duplicative
20	TPZ-15	Shallow Fill	Near DMT-14S	Duplicative
21	TPZ-16	Shallow Fill	Between DMT-14S and DMT-15S	Duplicative
22	TPZ-17	Shallow Fill	Between DMT-14S and DMT-15S	Duplicative
23	TPZ-18	Shallow Fill	Between DMT-14S and DMT-15S	Duplicative
24	TPZ-19	Shallow Fill	Between DMT-14S and DMT-15S	Duplicative
25	TPZ-20	Shallow Fill	Adjacent to EA-10S	Duplicative
26	TPZ-21	Shallow Fill	Adjacent to EA-10S	Duplicative
27	TPZ-22	Shallow Fill	Adjacent to EA-10S	Duplicative
28	TPZ-23	Shallow Fill	Adjacent to EA-10S	Duplicative
29	TPZ-24	Shallow Fill	Adjacent to DMT-20S	Duplicative
30	TPZ-34	Shallow Fill	Adjacent to DMT-30S	Duplicative
31	TPZ-38	Shallow Fill	Between EAC-2S and P-06	Duplicative
32	TPZ-46	Shallow Fill	Near DMT-36M	Duplicative
33	TPZ-47	Shallow Fill	Between DMT-30S and DMT-4S	Duplicative
34	TPZ-60	Upper Saturated Zone	Near P-12	Duplicative with new wells
35	EA-09S	Shallow Fill	Near P-3	Interior, Inside COPR
36	EA-13S	Shallow Fill	Near DMT-43S	Duplicative
37	EA-23S	Shallow Fill	Near DMT-19S	Duplicative
38	EAS-01A	Shallow Fill	Near former EW	Used for Aquifer Test
39	EAS-01B	Shallow Fill	Near former EW	Used for Aquifer Test
40	EAS-02A	Shallow Fill	Near former EW	Used for Aquifer Test
41	EAS-02B	Shallow Fill	Near former EW	Used for Aquifer Test
42	EAC-04S	Shallow Fill	Adjacent to DMT-18S	Duplicative
43	MW-23	Shallow Fill	Far North Well	Distant Well
44	P-01	Shallow Fill	Near EA-2S	Duplicative
45	P-04	Shallow Fill	Near DMT-43S	Duplicative
46	P-05	Shallow Fill	Near P-6	Duplicative
47	P-08	Shallow Fill	Near P-7	Duplicative
48	P-12	Upper Saturated Zone		Duplicative with new wells
49	EA-03M	Medium-Depth	Interior, Inside COPR	Duplicative
50	EA-05M	Medium-Depth	Interior, Inside COPR	Duplicative
51	EAC-04M	Medium-Depth	Perimeter, West	Duplicative

Figures

Legend

■	Shallow Well	┼	Railroad Centerline
▣	D-Series Well	▭	Areas
▣	Upper Sand Well	▭	Buildings
⊠	M-Series Well	▭	COPR Extent (CH2M Hill, 2012)
●	S-Series Well	▭	DMT Boundary
⊗	Piezometer		

Notes:

1. Refer to Appendix A for Area 1501/1602 Network.

Figure 1

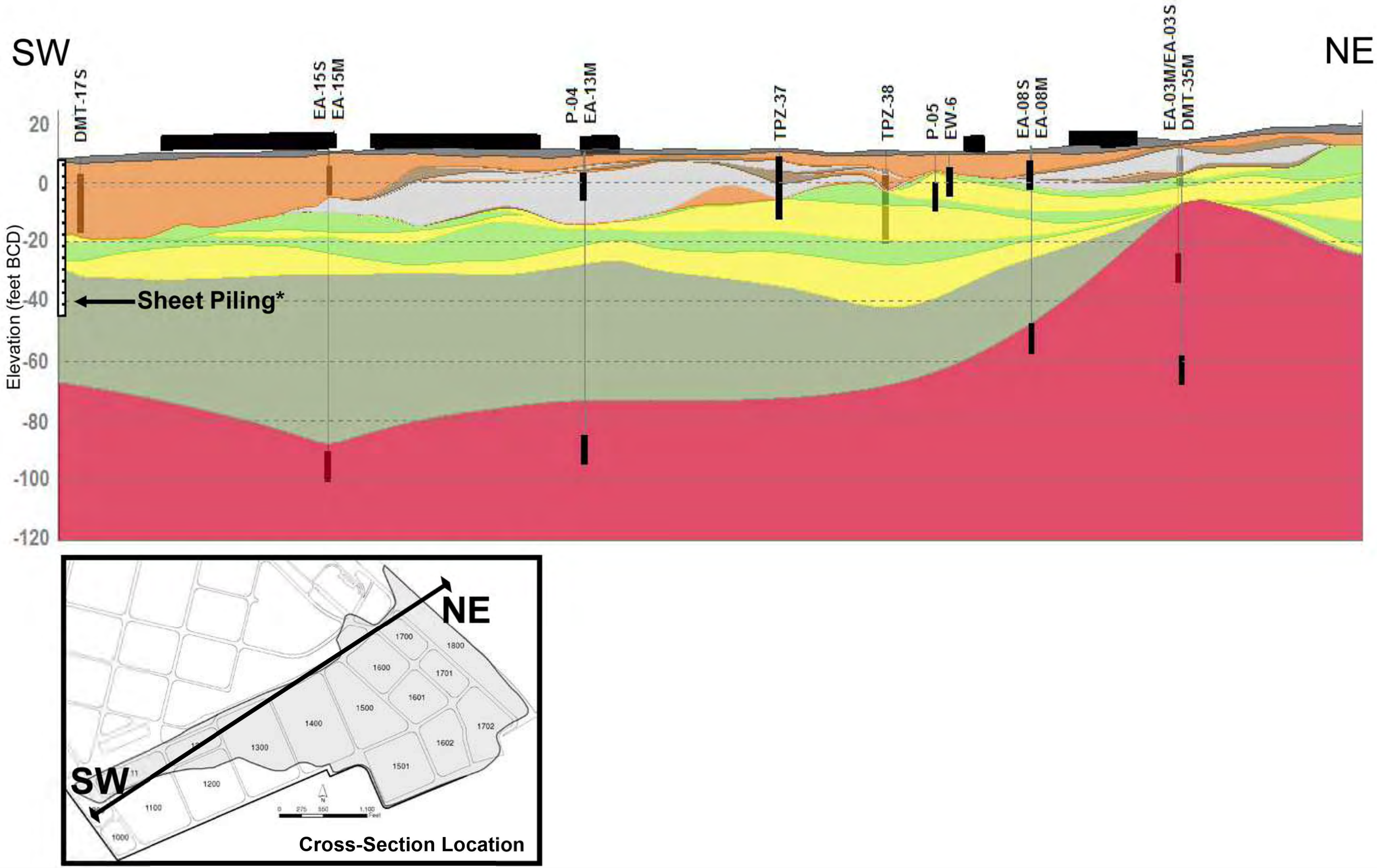
Monitoring Well Location Map (Current)

Performance Management Plan

Sentinel Groundwater Monitoring Plan

Dundalk Marine Terminal, Baltimore, Maryland

Jacobs



Legend

⬛ Surface Cover and Type I Fill
🟧 Type II Fill
🟫 HB COPR
⬜ GB COPR
🟨 Alluvial Sand
🟩 Upper Silt
🟩 Lower Silt
🟥 Potomac Group

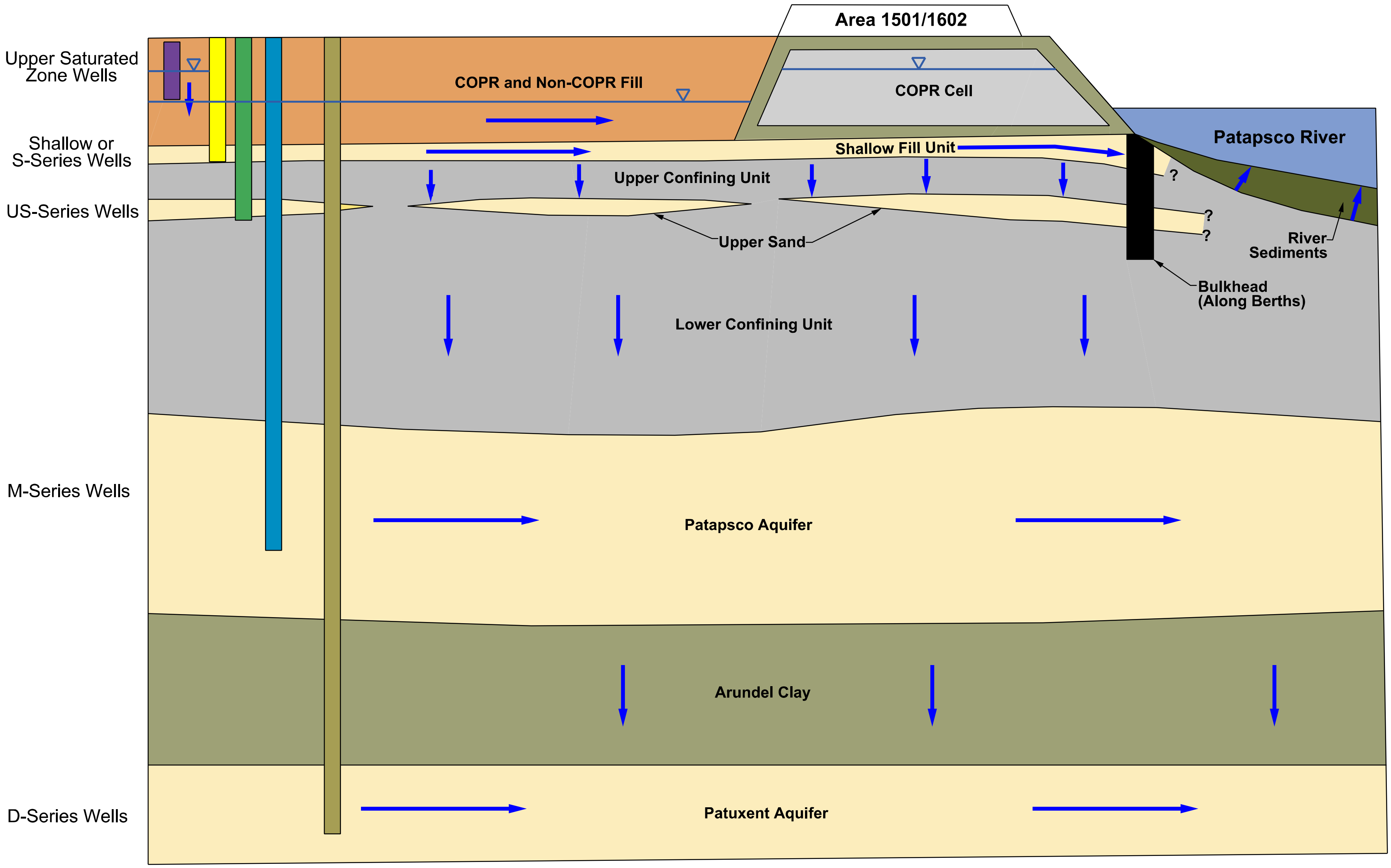
DMT-33S ←ID
←Riser
←Screen
Monitoring Well

500 Feet
Vertical Exaggeration = 10X

*Depth of sheet piling is represented as a minimum depth as recorded on construction drawings.

Figure 2
Geologic Cross-Section
Performance Management Plan
Sentinel Groundwater Monitoring Plan
Dundalk Marine Terminal, Baltimore, Maryland

Jacobs



Legend

→ Groundwater Flow

▽ Groundwater Table

Figure 3
Typical Well Configurations
Performance Management Plan
Sentinel Groundwater Monitoring Plan
Dundalk Marine Terminal, Baltimore, Maryland

Legend

■ Shallow Well
● S-Series Well
⌖ Piezometer
■ Upper Saturated Zone

Railroad Centerline
Areas
Buildings
COPR Extent (CH2M Hill, 2012)
DMT Boundary
○ Wells for Groundwater Sampling

Notes:

1. Seven wells are included as new wells (DMT-90S, DMT-91S, DMT-92S, DMT-93S, DMT-94S, DMT-95S, and DMT-96S).

N
W E
S

0 200 400 600 800
Feet

Figure 4
Shallow Fill Monitoring Wells in Network
Performance Management Plan
Sentinel Groundwater Monitoring Plan
Dundalk Marine Terminal, Baltimore, Maryland

Jacobs

Legend

■ Shallow Well
■ M-Series Well
✦ Piezometer
○ Proposed Wells for Abandonment

Railroad Centerline
▭ Areas
▭ Buildings
▭ COPR Extent (CH2M Hill, 2012)
▭ DMT Boundary

N
W E
S

0 200 400 600 800
Feet

Figure 5
Proposed Wells for Abandonment
Performance Management Plan
Sentinel Groundwater Monitoring Plan
Dundalk Marine Terminal, Baltimore, Maryland

Jacobs

Legend

- ▣ Upper Sand Well
- ○ Wells for Groundwater Sampling
- Railroad Centerline
- ▭ Areas
- ▭ Buildings
- ▭ COPR Extent (CH2M Hill, 2012)
- ▭ DMT Boundary

Figure 6
Upper Sand Monitoring Wells in Network

Performance Management Plan

Sentinel Groundwater Monitoring Plan

Dundalk Marine Terminal, Baltimore, Maryland

Jacobs

Legend

■ M-Series Well	Railroad Centerline
○ Wells for Groundwater Sampling	Areas
	Buildings
	COPR Extent (CH2M Hill, 2012)
	DMT Boundary

N
W E
S

0 200 400 600 800
Feet

Figure 7
Patapsco Aquifer Monitoring Wells in Network
Performance Management Plan
Sentinel Groundwater Monitoring Plan
Dundalk Marine Terminal, Baltimore, Maryland

Jacobs

Figure 8
Patuxent Aquifer Monitoring Wells in Network
Performance Management Plan
Sentinel Groundwater Monitoring Plan
Dundalk Marine Terminal, Baltimore, Maryland

Notes:

1. Refer to Appendix A for Area 1501/1602 Network.

Figure 9
Groundwater Migration Pathways
Performance Management Plan
Sentinel Groundwater Monitoring Plan
Dundalk Marine Terminal, Baltimore, Maryland

Jacobs

Appendix A

Sentinel Well Location Plan for Area 1501/1602

Honeywell

HEALTH, SAFETY, ENVIRONMENTAL, PRODUCT STEWARDSHIP AND SUSTAINABILITY
115 Tabor Road, 4-D4
Morris Plains, New Jersey 07950
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March 5, 2021

Ms. Irena Rybak
Administrator, Land Restoration Program
Maryland Department of the Environment
1800 Washington Boulevard, Suite 645
Baltimore, MD 21230-1719

Re: Sentinel Well Monitoring Plan for Area 1501/1602, Dundalk Marine Terminal, Baltimore, Maryland

Dear Ms. Rybak:

Honeywell International Inc. (Honeywell) and the Maryland Port Administration (MPA) are submitting the enclosed Sentinel Well Monitoring Plan for Area 1501/1602 for the Dundalk Marine Terminal, in Baltimore, Maryland.

This report documents the approach for establishing the sentinel monitoring system, based on an evaluation of the existing network of monitoring wells located within Area 1501/1602.

If you have any questions or require additional information, please contact me at 973-216-7501.

Very truly yours,

Maria Kaouris
Remediation Manager

Enclosures

cc: Mr. Matthew Zimmerman /MDE
Mr. Bill Richardson/MPA
Mr. Robert Munroe/MPA
Mr. Michael Daneker/Arnold & Porter

Sentinel Monitoring Plan
Area 1501/1602

Dundalk Marine Terminal
Baltimore, Maryland

Prepared for

Honeywell

115 Tabor Road
Morris Plains, New Jersey 07950

Prepared by

Jacobs

Jacobs Engineering
2411 Dulles Corner Park Suite #500
Herndon, VA 20171

March 2021

Contents

Appendixes

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1. Introduction

Honeywell International Inc. and the Maryland Port Administration are submitting this Sentinel Monitoring Plan for Area 1501/1602 at the Dundalk Marine Terminal (DMT), located in Baltimore, Maryland. The sentinel monitoring program is a requirement of the Corrective Measures Alternatives Analysis report (CH2M, 2011), which was approved by the Maryland Department of Environment (MDE) on July 30, 2012, as part of the requirements of the Consent Decree dated April 5, 2006.

Under Alternative 3, Enhanced Isolation and Containment, the selected remedial alternative, the chromium ore processing residue (COPR) containment system at DMT is to be maintained and the surface cover improved over the long term while contaminated groundwater is prevented from infiltrating into the priority storm drains within the COPR fill area. This alternative also requires the preparation of a Program Management Plan (PMP) at the completion of remedy implementation to provide a comprehensive framework for maintaining remedy performance and remedy protection in the future. The PMP is an observational-based process that represents a formalized and comprehensive approach for identifying, evaluating, and implementing contingent corrective measures. The PMP is intended to link monitoring and maintenance programs so that if a trigger is activated, an evaluation of additional corrective measures or enhancement of existing measures is initiated and implemented.

One of the elements of the PMP is the establishment of a sentinel groundwater monitoring network inland of the shoreline perimeter to measure groundwater flow and quality at the property boundary. The approach for establishing the sentinel monitoring system, based on an evaluation of the existing network of monitoring wells installed in Area 1501/1602, is described herein. Additionally, inclinometers and SAAs are in-place for monitoring COPR horizontal and vertical movement. These structures were also evaluated to ensure that adequate movement monitoring data will be collected for ongoing surface cover evaluation and maintenance efforts. The draft Area 1501 1602 Sentinel Monitoring Plan was submitted to MDE on September 11, 2020. This plan incorporates MDE review comments.

Only the sentinel and movement monitoring network for Area 1501/1602 is presented herein prior to implementing the containment remedy for Area 1501/1602, including the installation of the Service Road Strain Relief Trench (SRT) and the placement of an enhanced containment cap over the 21-acre Site, which will be performed during 2021 and 2022. The sentinel well network for the remainder of the COPR fill area inland from Area 1501/1602 will be developed once the containment cap has been installed.

1.1 Site Background

Area 1501/1602 encompasses approximately 21 acres in the southeast corner of DMT. The western and southern boundaries of Area 1501/1602 abut the Patapsco River. Much of this area was reclaimed from the Patapsco River channel in two phases of containment cell construction, for which COPR was used as fill, which occurred from about 1974 through 1982. Select borrow material consisting of a mixture of sand, silt, and clay was placed over the native silt and sand at the river’s edge to an elevation of about 2 feet above the mean low-water mark and then was capped with a 1- to 2-foot layer of impervious borrow to create a clay liner. Above the clay liner, a clay containment dike was placed and graded to a 2:1 slope at the shoreline edges of Area 1501/1602, and COPR material was placed within the dike limits. Following placement in the containment cell, the COPR material was covered with a 1-foot-thick impervious layer (clay cap).

Containment measures were included in the design and construction of the cell to mitigate stormwater infiltration and to contain the COPR. An asphalt cap was placed over the clay liner and cap referenced above to minimize stormwater intrusion into the cells, thereby reducing the potential for transport of dissolved COPR constituents. A third, final phase of construction occurred across Area 1501/1602 in 1999–2002. During this final phase, the grade of Area 1501/1602 was raised by 7 feet through the placement of surcharge material intended to suppress COPR heave that had previously rendered the area unusable for port cargo storage operations. The surcharge fill was then covered with a 1-foot-thick layer of graded aggregate and 3 inches of surface course asphalt.

Along the sloped edge of the western and southern shorelines, gabion baskets filled with coarse stone were placed. More recently, additional riprap and jersey barriers were placed along portions of both the western and southern shorelines to reduce the potential for shoreline erosion.

SRTs were installed as two separate locations within Area 1501/1602 to address COPR lateral movement. One SRT was placed adjacent to the 15th Street drain located at the northern portion of Area 1501/1602. This SRT was installed in two sections: the first 200 feet in 2002, and the second, 380-foot section, in 2011. The second SRT was placed near the sound wall, which is approximately 80 feet in length, was installed in 2008 at southeast portion of Area 1501/1602. Additionally, a third SRT will be installed along the service road on the western and southern sides Area 1501/1602 as part of the capping of Area 1501/1602.

1.2 2017 Supplemental Site Investigation

A Supplemental Site Investigation (SSI) was performed in 2017 (CH2M, 2017) as a focused subsurface investigation of Area 1501/1602. This investigation supplemented previous investigations conducted at the Site—including the COPR Investigation, conducted between October 2006 and December 2008 (CH2M, 2009), and the *Heave Investigation and Minimization Study* (CH2M and Geosyntec, 2009), as updated through surface and subsurface displacement data from MRCE (2013–2020)—and is intended to characterize the subsurface conditions of this former COPR fill area.

Specifically, the purpose of this additional phase of investigation was to further evaluate the hydrogeology and geotechnical characteristics of the COPR cell by obtaining stratigraphic, hydrogeologic, and lateral subsurface and surface movement data to supplement the prior investigations conducted at the Site and to expand the heave monitoring and survey network. The findings from the SSI and data obtained from the installed instrumentation were used to update the site conceptual model (CSM) and further assess the effectiveness of the isolation and containment of the COPR fill. Additionally, data from the SSI were used to determine the need for any additional investigations for maintenance of the containment dike, cover system, stormwater management features, or other components of the Area 1501/1602 COPR containment cell, as further discussed in Section 1.3.

Field activities included drilling 101 soil borings and installing a network of subsurface instrumentation including vibrating wire piezometers, thermistors, Shape Accel Arrays (SAAs), and inclinometers in some of the borings. No borings drilled within the COPR cell penetrated the underlying basal clay liner. Initial findings of the investigation indicated the need for continued collection and analysis of data from the instruments installed in the SSI over a period of one or more years to enable further conclusions to be drawn regarding the COPR containment cell properties and behaviors. The results were also used to develop a CSM, which is a PMP post-closure care requirement.

1.3 2018 Predesign Investigation

In 2018, a geotechnical and groundwater Predesign Investigation was performed within Area 1501/1602 which included an uplands geotechnical investigation to evaluate the existing conditions and stability of the containment cell and a groundwater investigation along both the western and southern shorelines, which abut the Patapsco River, to evaluate the containment effectiveness of the existing clay containment dike. The *Predesign Geotechnical and Groundwater Investigation Work Plan* (Jacobs, 2018) was submitted to the MDE in June 2018.

The groundwater investigation consisted of installing well points at seven locations along the Area 1501/1602 western and southern shorelines to collect groundwater samples to assess whether the existing perimeter dike is providing adequate groundwater containment. The well points were installed outboard of the COPR containment cell to an elevation that is below the clay liner within the COPR cell. The seven well point locations (S-1 to S-7) along the shoreline were selected based on accessibility and coverage of the shoreline (Figure 1). The geotechnical investigation consisted of installing shallow and deep borings in the upland portions of Area 1501/1602, to evaluate the stability of the Area 1501/1602 containment cell in support of the development of a final containment remedy (i.e., enhanced containment cap). The locations of the geotechnical borings (SL-1 to SL-10) are illustrated in Figure 1.

The installation and sampling of well points along the southern and western shorelines was successful in evaluating the effectiveness of the existing containment dike. Groundwater elevation differences between the well points along the shoreline and the wells within the containment cell confirm the competency of the clay liner and clay dike in restricting groundwater flow beyond the limits of the containment cell. The wells installed along the western and southern shoreline will be used as part of the sentinel groundwater monitoring program.

The geotechnical investigation evaluated existing stability conditions for the containment cell and the stability of the remedy condition involving the addition of 2 feet of fill. Global stability analyses determined that placement of an addition of 2 feet of fill over the existing “surcharge” area of 1501/1602 will not adversely affect global stability. Additionally, the installation of a shoreline SRT along the existing service road will not reduce shoreline stability, provided the SRT alignment is sufficiently set back from the shoreline slope at a minimum of 14 feet inland from the crest of the shoreline slope.

1.4 Existing Monitoring Wells

As described on the previous sections, numerous investigations have been performed within the Area 1501/1602 boundaries since 1986, resulting in the existing 123 subsurface monitoring installations, including 105 groundwater monitoring wells and 18 geotechnical inclinometers, as illustrated on Figure 1. This network of existing wells and inclinometers were evaluated for inclusion in the sentinel monitoring program.

The monitoring wells were completed with either a vibrating wire piezometer grouted into the well bore or a section of well screen and casing. Typical configurations of the wells are shown on an idealized block diagram in Figure 2, which shows the vertical positioning of the wells. As such, there are wells that monitor the groundwater elevation above the COPR cell clay cap, within the COPR cell, and below the clay liner. The lateral locations of the wells extend from the center of the COPR cell to locations adjacent to the edges of the cell boundary, and beyond the cell boundary toward the Patapsco River. A table presenting the construction details for all the existing wells is provided as Table 1.

2. Sentinel Monitoring Program

An effective sentinel monitoring program would include wells above the clay cap, wells within the COPR cell, and below the clay liner to monitor groundwater levels, and inclinometers and SAAs to monitor subsurface ground movement. As such the following components of a monitoring program:

- Hydraulic assessment monitoring
- Sentinel groundwater monitoring
- COPR Movement monitoring

Existing wells and geotechnical locations were evaluated to determine which locations are suitable for continued use as part of a sentinel monitoring program. The wells and geotechnical locations deemed unsuitable or duplicative for monitoring were identified for abandonment. Table 1 provides a summary of the wells, the vertical location where the well monitors (i.e., above the clay cap, within the COPR cell, and below the clay liner), and a proposed use for the well, including abandonment.

As noted in Table 1, several wells provide data for multiple intervals and may also have a SAA installed. When considering wells to include, preference was given to these wells as they would provide additional data at one location. No new wells were considered necessary, as the existing wells at the Site are more than adequate to develop an effective monitoring program.

2.1 Hydraulic Assessment Monitoring

Hydraulic assessment monitoring focuses on monitoring water levels above the clay cap and in wells located adjacent to the 15th Street drain. A total of 21 monitoring wells were selected for the hydraulic assessment, as detailed in Table 2. Five wells that are either screened above the clay cap or screened below the clay cap adjacent to the 15th Street drain were identified as duplicative or unnecessary for the monitoring network. These wells will be abandoned prior to installation of the Service Road SRT and enhanced containment cap over the next 2 years.

The water levels screened above the clay cap will evaluate the potential for surface water infiltration through the enhanced containment cap to be installed across Area 1501/1602 during 2021 and 2022. Water levels in wells adjacent to the 15th Street drain will be used to assess the potential presence of water within the COPR cell that could be from water exfiltration from the 15th Street storm drain.

Thirteen wells that monitor water levels above the clay cap were selected for hydraulic assessment monitoring (Table 2), as illustrated on Figure 3. These wells are located preferentially near the southwestern portion of the Site where the clay cap naturally slopes toward the shoreline.

Eight wells screened within the COPR cell and located adjacent to the 15th Street drain were selected as sentinel wells (Table 2) and shown on Figure 3. These wells are approximately equidistant along either side of the 15th Street storm drain. Groundwater elevation data from these wells would be used to prepare groundwater contour maps and periodic time-series graphs to assess the potential for surface water infiltration and to evaluate the integrity of the COPR cell adjacent to the 15th Street drain.

2.2 Sentinel Groundwater Monitoring

The sentinel groundwater monitoring network include wells screened within the COPR cell, along the perimeter of the cell, interior of the cell, and wells below the clay liner. Twenty-eight wells were selected (Table 3) along the perimeter of the COPR cell, as illustrated on Figure 4. These well locations represent an approximate equal spatial distribution throughout the COPR cell.

For monitoring the interior of the COPR cell, 10 wells were selected based on an even distribution of wells across the area (Table 4) as shown on Figure 5. Groundwater elevation data from these observation wells will be used in conjunction with the perimeter monitoring wells to generate a groundwater flow maps to confirm the hydraulic containment of the COPR cell and to assess the potential for groundwater flow within the cell.

Eighteen wells screened below the clay liner that monitor groundwater were selected to provide verification of vertical hydraulic containment of the COPR cell (Table 5). The location of these wells is shown on Figure 6. No existing wells that monitor water level below the clay liner were considered duplicative, and as such none are targeted for abandonment.

A total of 56 monitoring wells were selected to represent an effective sentinel groundwater monitoring network to assess the lateral and vertical hydraulic containment of the COPR cell. A total of 32 wells screened within the COPR cell were identified as duplicative or unnecessary for the monitoring network and these wells are targeted for abandonment.

Geologic cross-sections were constructed to illustrate the vertical positioning of the monitored zones for selected wells. The six cross-section locations are shown on Figure 7 and the sections A-A’, B-B’, C-C’, D-D’, E-E’, F-F’, and G-G’ are included as Figures 8 through 12. Cross-section A-A’ shows the details for the screened interval relative to the subsurface geologic materials. From this figure, the position of wells that monitor water levels above the clay cap, within the COPR cell, and below the clay liner are illustrated. Cross-section B-B’ was included to show the position of the deepest well (EA-7M) relative to most of the wells. On this cross-section, there is a shallow sand unit that is monitored by the S-series wells (represented by S-2), and a thick sequence of low-permeability clayey silt separates this shallow sand from the deeper Patapsco sand that is monitored by the EA-7M well. The distribution of geologic materials indicates that the shallower sand would be the primary flow path to respond were the COPR cell integrity compromised. The remaining cross-sections illustrate the geologic conditions across the 1501/1602 Area in various orientations.

2.3 COPR Movement Monitoring

Monitoring of the surface and subsurface lateral displacement of COPR within the 148-acre fill area is performed under the 2006 DMT Consent Order. The movement monitoring results were reported to MDE in the *Heave Investigation and Minimization Study* (HIMS) (CH2M and Geosyntec, 2009), which has been updated since 2013 in a series of supplemental data reports. The 2009 HIMS report provided a detailed explanation of COPR mineralogy, chemical expansion mechanisms, physical manifestations of subsurface COPR expansion, and heave mitigation measures. The first update to this report was issued in 2013 as *Heave Investigation and Minimization Study Supplemental Data Report #1* (MRCE, 2013), and was followed by updates in 2014, 2015, 2016, 2017, 2018, and 2020 (MRCE, 2014–2018, 2020). This movement monitoring and reporting will continue, as an element of the PMP, after the completion of the containment remedy.

Lateral subsurface movement within and below the COPR cell are monitored using inclinometers and SAAs (Table 6). Thirteen existing inclinometers have reached the end of their usefulness based on deformation and will be abandoned. However, the remaining five inclinometers and 22 SAA locations are situated at locations shown on Figure 13 and depths suitable for continued subsurface monitoring. It is noted that five locations (DL-1-SAA, BRP-6, BRP-12, GP-7A, and GP-7C) are used solely for their SAA information. In addition, the existing Sound Wall and 15th Street Drain SRTs have numerous ports to assess the potential lateral COPR expansion and will remain in service.

3. Sentinel Program Summary

The evaluation of the network of existing groundwater wells has identified 68 well locations and five inclinometers are suitable to establish an effective sentinel monitoring program that would include hydraulic assessment and perimeter monitoring to confirm the lateral and vertical hydraulic containment of the COPR cell and to monitor lateral movement. Additionally, 37 well locations and 13 inclinometers are either duplicative or have reached the end of their usefulness and are selected for abandonment (Table 7). These locations are illustrated on Figure 14. The soil boring logs for wells that are planned for abandonment are presented in Appendix A, and those for wells to be retained are in Appendix B.

The abandonment of wells will be coordinated with the planned installation of the Service Road SRT during 2021 and construction of the enhanced containment cap in a phased approach during 2021 and 2022. There are 15 well locations that were closed in November 2020 along the western and southern service road in preparation of installing the SRT in 2021.

4. References

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Tables

Table 1. List of Wells and Geotechnical Points
Sentinel Monitoring Plan, Area 1501/1602, Dundalk Marine Terminal

					VWP Elevation		Well Screen Elevation							
Well ID	**Year Installed**	**Well Type**	**Northing**	**Easting**	**VWP1**	**VWP2**	**Top**	**Bottom**	**Single or Multiple Purpose Well**	**Monitoring Interval(s)**	**Other Use(s)**	**Proposed Status**	**Well Location**	**Program**
BRP-01	2015	Grouted	574544.6035	1448037.46	2.768	NA	NA	NA	Single	Below Cap	None	Plan to keep within monitoring well network to evaluate water level within cell.	Cell Edge	Sentinel
BRP-02	2015	Grouted	574435.23	1447902.46	2.018	NA	NA	NA	Single	Below Cap	None	Plan to keep within monitoring well network to evaluate water level within cell.	Cell Edge	Sentinel
BRP-03	2015	Grouted	574340.497	1447832.373	4.713	NA	NA	NA	Single	Below Cap	None	Plan to abandon		
BRP-06	2015	Grouted	574481.6574	1448092.779	NA	NA	NA	NA	Single	NA	SAA	Plan to keep within monitoring well network to evaluate movement monitoring (SAA)	15th St Drain, SAA	Performance, Movement
BRP-06A	2018	Grouted	574485.1813	1448090.039	4	NA	NA	NA	Single	Below Cap	None	Plan to keep within monitoring well network to evaluate water level within cell.		
BRP-07	2015	Grouted	574325.94	1447953.66	4.189	NA	NA	NA	Multiple	Below Cap	SAA	Plan to keep within monitoring well network to evaluate water level within cell. Also SAA	15th St Drain, SAA	Performance, Movement
BRP-08	2015	Grouted	574229.1737	1447873.886	1.399	NA	NA	NA	Multiple	Below Cap	SAA	Plan to keep within monitoring well network to evaluate water level within cell. Also SAA	15th St Drain, SAA	Performance, Movement
BRP-09	2015	Grouted	574507.62	1448174.09	2.582	NA	NA	NA	Multiple	Below Cap	SAA	Plan to keep within monitoring well network to evaluate water level within cell. Also SAA.	15th St Drain, SAA	Performance, Movement
BRP-10	2015	Grouted	574422.2626	1448106.419	1.499	NA	NA	NA	Multiple	Below Cap	SAA	Plan to abandon		
BRP-11	2015	Grouted	574434.0191	1448095.932	1.263	NA	NA	NA	Multiple	Below Cap	SAA	Plan to keep within monitoring well network to evaluate water level within cell. Also SAA		
BRP-12	2015	Grouted	574325.2623	1448040.438	NA	NA	NA	NA	Multiple	NA	SAA	Plan to keep within monitoring well network to evaluate movement monitoring (SAA)	SAA	Movement
BRP-12A	2018	Grouted	574337.8253	1448098.932	3.16	NA	NA	NA	Single	Below Cap	None	Plan to keep within monitoring well network to evaluate water level within cell.		
BRP-13	2015	Grouted	574254.0645	1447980.313	2.225	NA	NA	NA	Single	Below Cap	None	Plan to keep	15th St Drain	Performance
BRP-14	2015	Grouted	574157.6013	1447904.385	0.743	NA	NA	NA	Multiple	Below Cap	SAA	Plan to keep within monitoring well network to evaluate water level within cell. Also SAA.	15th St Drain, SAA	Performance, Movement
BRP-16	2015	Grouted	573742.781	1448000.799	0.962	9.962	NA	NA	Multiple	Below Cap, Above Cap	SAA	Plan to keep within monitoring well network to evaluate water level within cell and above cap. Also SAA.	Cell Edge, Above Cap, SAA	Performance, Sentinel, Movement
BRP-17	2015	Grouted	573877.4188	1448309.165	2.534	11.534	NA	NA	Multiple	Below Cap, Above Cap	SAA	Plan to keep within monitoring well network to evaluate water level within cell and above cap. Also SAA.	Cell Edge, Above Cap, SAA	Performance, Sentinel, Movement
BRP-18	2015	Grouted	574199.8173	1449073.588	-15.207	3.793	NA	NA	Multiple	Below Cap, Below Liner	SAA	Plan to keep within monitoring well network to evaluate water level within cell and below liner. Also SAA.	Cell Edge, Below Liner, SAA	Sentinel, Movement
BRP-20	2015	Grouted	574313.38	1449004.61	4.43	-17.57	NA	NA	Multiple	Below Cap, Below Liner	None	Plan to keep within monitoring well network to evaluate water level within cell and below liner.	Cell Edge, Below Liner	Sentinel
BRP-21	2015	Grouted	574420.78	1448804.7	10.585	NA	NA	NA	Multiple	Below Cap	SAA	Plan to keep within monitoring well network to evaluate water level within cell. Also SAA.	Cell Edge, SAA	Sentinel, Movement
BRP-23	2015	Grouted	574439.55	1448860.2	-17.308	1.692	NA	NA	Multiple	Below Cap, Below Liner	None	Plan to keep within monitoring well network to evaluate water level within cell and below liner.	Cell Edge, Below Liner	Sentinel
BRP-25	2015	Grouted	574589	1448832.17	-16.964	6.036	NA	NA	Multiple	Below Cap, Below Liner	None	Plan to keep within monitoring well network to evaluate water level within cell and below liner.	Cell Edge, Below Liner	Sentinel
BRP-26	2015	Grouted	574550.98	1448634.28	0.268	NA	NA	NA	Single	Below Cap	None	Plan to abandon		
BRP-28	2015	Grouted	574611.92	1448617.02	-16.397	5.603	NA	NA	Multiple	Below Cap, Below Liner	None	Plan to keep within monitoring well network to evaluate water level within cell and below liner.	Cell Edge, Below Liner	Sentinel
BRP-29	2015	Grouted	574533.55	1448298.73	6.667	NA	NA	NA	Multiple	Below Cap	SAA	Plan to keep within monitoring well network to evaluate water level within cell. Also SAA.	Cell Interior, SAA	Sentinel, Movement
BRP-31	2015	Grouted	574621.01	1448314.67	-25.715	-0.715	NA	NA	Multiple	Below Cap, Below Liner	None	Plan to keep within monitoring well network to evaluate water level within cell and below liner.	Cell Edge, Below Liner	Sentinel
BRP-32	2015	Grouted	574343.1531	1448154.146	3.726	NA	NA	NA	Single	Below Cap	None	Plan to keep within monitoring well network to evaluate water level within cell.	Cell Interior	Sentinel
BRP-33	2015	Grouted	574408.3	1448471.91	3.375	NA	NA	NA	Multiple	Below Cap	SAA	Plan to keep within monitoring well network to evaluate water level within cell. Also SAA	Cell Interior, SAA	Sentinel, Movement
BRP-34	2015	Grouted	574420.58	1448671.6	5.888	NA	NA	NA	Single	Below Cap	None	Plan to abandon		
BRP-35	2015	Grouted	574175.44	1448085.77	3.1	NA	NA	NA	Single	Below Cap	None	Plan to abandon		
BRP-36	2015	Grouted	574279.04	1448338.51	5.415	NA	NA	NA	Single	Below Cap	None	Plan to keep within monitoring well network to evaluate water level within cell.	Cell Interior	Sentinel
BRP-37	2015	Grouted	574249.01	1448530.46	4.425	NA	NA	NA	Single	Below Cap	None	Plan to abandon		
BRP-38	2015	Grouted	574020.12	1447997.62	13.385	NA	NA	NA	Single	Above Cap	None	Plan to abandon		
BRP-39	2015	Grouted	574108.72	1448209.89	4.306	NA	NA	NA	Single	Below Cap	None	Plan to keep within monitoring well network to evaluate water level within cell.	Cell Interior	Sentinel
BRP-40	2015	Grouted	573875.2925	1448048.302	2.828	NA	NA	NA	Multiple	Below Cap	SAA	Plan to abandon		
BRP-41	2015	Grouted	573936.27	1448265.23	4.023	NA	NA	NA	Single	Below Cap	None	Plan to abandon		
BRP-42	2015	Grouted	574046.7712	1448408.714	4.204	NA	NA	NA	Single	Below Cap	None	Plan to keep within monitoring well network to evaluate water level within cell.	Cell Interior	Sentinel
BRP-43	2015	Grouted	574095.59	1448636.37	3.474	NA	NA	NA	Single	Below Cap	None	Plan to abandon		
BRP-44	2015	Grouted	574231.5264	1448710.326	3.388	NA	NA	NA	Single	Below Cap	None	Plan to keep within monitoring well network to evaluate water level within cell.	Cell Interior	Sentinel
BRP-45	2015	Grouted	574254.42	1448871.8	3.64	NA	NA	NA	Single	Below Cap	None	Plan to keep within monitoring well network to evaluate water level within cell.	Cell Edge	Sentinel
BRP-46	2015	Grouted	573963.68	1448080.89	13.426	NA	NA	NA	Single	Above Cap	None	Plan to keep within monitoring well network to evaluate water level above cell.	Above Cap	Performance
BRP-47	2015	Grouted	573954.58	1448046.8	1.46	NA	NA	NA	Single	Below Cap	None	Plan to abandon		
BRP-48	2015	Grouted	573922.4924	1448024.626	13.087	NA	NA	NA	Single	Above Cap	None	Plan to abandon		
DL-1-SAA	2018	Grouted	573853.6651	1448061.169	NA	NA	NA	NA	Single	Below Liner	SAA	Plan to keep for ground movement	SAA	Movement
DL-2-I	2018	Open	574621.31	1448479.55	NA	NA	NA	NA	Single	Below Liner	Inclinometer	Plan to keep for ground movement	INC	Movement
DMT-11S	2006	Open	574430.8821	1448175.936	NA	NA	-2.9	-22.9	Single	Below Liner	None	Plan to keep within monitoring well network to evaluate water level below cell.	Below Liner	Sentinel
DMT-56S	2007	Open	574170.1164	1447839.516	NA	NA	-6.9	-16.9	Single	Below Liner	None	Plan to keep to monitor deep	Below Liner	Sentinel
DMT-TW1	2011	Open	573898.9498	1448111.774	NA	NA	7	2	Single	Below Cap	None	Plan to abandon		
DMT-TW2	2011	Open	574014.6	1448454.992	NA	NA	6.5	1.5	Single	Below Cap	None	Plan to abandon		
EA-7M	1987	Open	573744.5189	1448006.41	NA	NA	-86.37	-97.37	Single	Below Liner	None	Plan to keep to monitor deep	Below Liner	Sentinel
EA-7S	1987	Open	573747.4446	1447986.576	NA	NA	6.54	2.54	Single	Below Cap	None	Plan to keep	Cell Edge	Sentinel
EW-1	2018	Open	573909.296	1448080.586	NA	NA	8	1	Single	Below Cap	None	Plan to keep for potential extraction	Cell Interior	Sentinel
EW-2	2018	Open	574278.0496	1448275.921	NA	NA	10.47	0.47	Single	Below Cap	None	Plan to abandon		
GP-10A	2015	Grouted	574163.65	1448933.12	2.766	NA	NA	NA	Single	Below Cap	None	Plan to keep within monitoring well network to evaluate water level within cell. Inside SRT.	Cell Edge	Sentinel
GP-10C	2015	Grouted	574144.61	1448941.16	4.281	NA	NA	NA	Single	Below Cap	None	Plan to keep within monitoring well network to evaluate water level within cell. Outside SRT.	Cell Edge	Sentinel
GP-1A	2015	Grouted	574071.4694	1447875.695	0.327	NA	NA	NA	Multiple	Below Cap	SAA	Plan to keep within monitoring well network to evaluate water level within cell. Also SAA.	Cell Edge, SAA	Sentinel, Movement
GP-1C	2015	Grouted	574066.1674	1447863.402	2.375	NA	NA	NA	Single	Below Cap	None	Plan to abandon		
GP-2A	2015	Grouted	574006.5727	1447898.498	1.472	10.472	NA	NA	Multiple	Below Cap, Above Cap	SAA	Plan to keep within monitoring well network to evaluate water level within cell and above cap. Also SAA.	Cell Edge, Above Cap, SAA	Performance, Sentinel, Movement
GP-2C	2015	Grouted	574001.5837	1447886.472	1.541	10.341	NA	NA	Multiple	Below Cap, Above Cap	SAA	Plan to keep within monitoring well network to evaluate water level within cell and above cap. Also SAA.	Cell Edge, Above Cap, SAA	Performance, Sentinel, Movement
GP-3A	2015	Grouted	573824.7818	1447975.856	2.538	11.038	NA	NA	Multiple	Below Cap, Above Cap	SAA	Plan to keep within monitoring well network to evaluate water level within cell and above cap. Also SAA.	Cell Edge, Above Cap, SAA	Performance, Sentinel, Movement
GP-3C	2015	Grouted	573817.0101	1447958.517	4.525	9.025	NA	NA	Multiple	Below Cap, Above Cap	None	Plan to keep within monitoring well network to evaluate water level within cell and above cap.	Cell Edge, Above Cap	Performance, Sentinel
GP-4A	2015	Grouted	573801.7689	1448106.456	0.965	11.965	NA	NA	Multiple	Below Cap, Above Cap	None	Plan to keep within monitoring well network to evaluate water level within cell and above cap.	Cell Edge, Above Cap	Performance, Sentinel
GP-4C	2015	Grouted	573785.8188	1448114.622	2.305	11.605	NA	NA	Multiple	Below Cap, Above Cap	None	Plan to keep within monitoring well network to evaluate water level within cell and above cap. Also SAA.	Cell Edge, Above Cap	Performance, Sentinel
GP-5A	2015	Grouted	573872.9513	1448269.223	3.517	NA	NA	NA	Single	Below Cap	None	Plan to abandon		
GP-5C	2015	Grouted	573856.9	1448275.27	3.011	NA	NA	NA	Single	Below Cap	None	Plan to abandon		
GP-6A	2015	Grouted	573930	1448399.49	2.817	NA	NA	NA	Single	Below Cap	None	Plan to keep within monitoring well network to evaluate water level within cell.	Cell Edge	Sentinel
GP-6C	2015	Grouted	573911.6541	1448406.701	3.251	NA	NA	NA	Single	Below Cap	None	Plan to keep within monitoring well network to evaluate water level within cell.	Cell Edge	Sentinel
GP-7A	2015	Grouted	573987.823	1448535.718	3.234	NA	NA	NA	Multiple	Below Cap	SAA	Plan to keep for movement monitoring	SAA	Movement
GP-7C	2015	Grouted	573970.2839	1448542.649	4.39	NA	NA	NA	Multiple	Below Cap	SAA	Plan to keep for movement monitoring	SAA	Movement
GP-8A	2015	Grouted	574040.24	1448652.08	3.019	NA	NA	NA	Multiple	Below Cap	SAA	Plan to keep within monitoring well network to evaluate water level within cell. Also SAA	Cell Edge, SAA	Sentinel, Movement
GP-8C	2015	Grouted	574022.8362	1448659.885	2.197	NA	NA	NA	Multiple	Below Cap	SAA	Plan to keep within monitoring well network to evaluate water level within cell. Also SAA.	Cell Edge, SAA	Sentinel, Movement
GP-9A	2015	Grouted	574119.82	1448833.55	3.64	NA	NA	NA	Single	Below Cap	None	Plan to abandon		

Table 1. List of Wells and Geotechnical Points

Sentinel Monitoring Plan, Area 1501/1602, Dundalk Marine Terminal

Well ID	Year Installed	Well Type	Northing	Easting	VWP Elevation		Well Screen Elevation		Single or Multiple Purpose Well	Monitoring Interval(s)	Other Use(s)	Proposed Status	Well Location	Program
					VWP1	VWP2	Top	Bottom						
GP-9C	2015	Grouted	574100.48	1448841.45	3.062	NA	NA	NA	Single	Below Cap	None	Plan to abandon		
INC-1501-C	2007	Open	574233.5827	1448047.946	NA	NA	NA	NA	Single	NA	Inclinometer	Plan to abandon		
INC-1501-D	2007	Open	574248.5841	1448084.991	NA	NA	NA	NA	Single	NA	Inclinometer	Plan to abandon		
INC-1501-I	2007	Open	574029.5994	1447950.663	NA	NA	NA	NA	Single	NA	Inclinometer	Plan to abandon		
INC-1501-J	2007	Open	573973.2842	1448062.592	NA	NA	NA	NA	Single	NA	Inclinometer	Plan to keep	INC	Movement
INC-1501-K	2007	Open	573867.9787	1448175.161	NA	NA	NA	NA	Single	NA	Inclinometer	Plan to abandon		
INC-1501-L	2007	Open	574006.084	1448106.892	NA	NA	NA	NA	Single	NA	Inclinometer	Plan to keep	INC	Movement
INC-1501-M	2007	Open	573912.8722	1448225.496	NA	NA	NA	NA	Single	NA	Inclinometer	Plan to abandon		
INC-19	2010	Open	574783.8839	1448806.892	NA	NA	NA	NA	Single	NA	Inclinometer	Abandoned due to damage		
INC-27VW	2010	Open	574191.7453	1447929.722	NA	NA	NA	NA	Single	NA	Inclinometer	Plan to abandon		
INC-30VW	2010	Open	574481.9366	1448147.388	NA	NA	NA	NA	Single	NA	Inclinometer	Plan to abandon		
INC-44	2011	Open	573761.0283	1447983.085	NA	NA	NA	NA	Single	NA	Inclinometer	Plan to abandon		
INC-45	2011	Open	573748.1489	1448018.268	NA	NA	NA	NA	Single	NA	Inclinometer	Plan to abandon		
INC-46	2011	Open	574063.4867	1448749.781	NA	NA	NA	NA	Single	NA	Inclinometer	Plan to abandon		
INC-47	2011	Open	574139.2603	1448946.768	NA	NA	NA	NA	Single	NA	Inclinometer	Plan to abandon		
INC-48	2012	Open	574242.6299	1447890.886	NA	NA	NA	NA	Single	NA	Inclinometer	Plan to keep	INC	Movement
INC-49	2012	Open	574190.4459	1447941.951	NA	NA	NA	NA	Single	NA	Inclinometer	Plan to abandon		
INC-50	2012	Open	574219.0965	1449049.583	NA	NA	NA	NA	Single	NA	Inclinometer	Plan to keep if debris is succesfully removed	INC	Movement
P-12	2001	Open	574658.8505	1448959.292	NA	NA	10.15	14.15	Single	Outside Cell	None	Plan to keep	Cell Edge	Sentinel
S-1	2018	Open	574023.0589	1447845.934	NA	NA	-9.3	-19.3	Single	Below Liner	None	Plan to keep	Below Liner	Sentinel
S-2	2018	Open	573826.9567	1447926.658	NA	NA	-15.9	-16.9	Single	Below Liner	None	Plan to keep	Below Liner	Sentinel
S-3D	2018	Open	573751.8893	1448119.703	NA	NA	-16.3	-17.3	Single	Below Liner	None	Plan to keep	Below Liner	Sentinel
S-3I	2018	Open	573752.2308	1448118.595	NA	NA	-11.5	-12.5	Single	Below Liner	None	Plan to keep	Below Liner	Sentinel
S-4D	2018	Open	573890.5621	1448451.287	NA	NA	-10.4	-15.4	Single	Below Liner	None	Plan to keep	Below Liner	Sentinel
S-4I	2018	Open	573890.9754	1448449.512	NA	NA	-8.5	-9.5	Single	Below Liner	None	Plan to keep	Below Liner	Sentinel
S-5	2018	Open	573986.0278	1448681.98	NA	NA	-8.9	-18.9	Single	Below Liner	None	Plan to keep	Below Liner	Sentinel
S-6	2019	Open	574116.0768	1449016.034	NA	NA	-16.5	-18.5	Single	Below Liner	None	Plan to keep	Below Liner	Sentinel
S-7	2018	Open	574264.9151	1447701.367	NA	NA	-0.2	-5.2	Single	Below Liner	None	Plan to keep	Below Liner	Sentinel
SL-1	2018	Grouted	574503.15	1448435.69	6.5	NA	NA	NA	Single	Below Cap	None	Plan to abandon		
SL-10	2018	Grouted	574504.95	1448732.86	3.6	NA	NA	NA	Single	Below Cap	None	Plan to abandon		
SL-2	2018	Grouted	574462.45	1448580.66	6.5	NA	NA	NA	Single	Below Cap	None	Plan to abandon		
SL-4	2018	Grouted	574353.04	1448868.59	4	NA	NA	NA	Single	Below Cap	None	Plan to abandon		
SL-5	2018	Grouted	574187.58	1448898.99	3.3	NA	NA	NA	Single	Below Cap	None	Plan to abandon		
SL-6	2018	Grouted	574067.05	1448755.23	4.3	NA	NA	NA	Single	Below Cap	None	Plan to abandon		
SL-7	2018	Grouted	573941.7478	1448467.447	3.4	NA	NA	NA	Single	Below Cap	None	Plan to abandon		
SL-8	2018	Grouted	573766.505	1448037.06	1	NA	NA	NA	Single	Below Cap	None	Plan to abandon		
SL-9	2018	Grouted	573935.6584	1447923.214	1.4	NA	NA	NA	Single	Below Cap	None	Plan to abandon		
TPZ-50	2010	Open	574113.0214	1447972.64	NA	NA	4.4	-0.6	Single	Below Cap	None	Plan to keep within monitoring well network to evaluate water level within cell.	Cell Interior	Sentinel
TPZ-51	2010	Open	574326.4581	1448066.911	NA	NA	6.5	1.5	Single	Below Cap	None	Plan to abandon		
TPZ-52	2010	Open	574556.13	1448335.451	NA	NA	7.7	1.7	Single	Below Cap	None	Plan to abandon		
TPZ-53	2010	Open	574491.2841	1448832.092	NA	NA	10	5	Single	Below Cap	None	Plan to abandon		
TPZ-54	2010	Open	574195.684	1448910.892	NA	NA	8.2	2.2	Single	Below Cap	None	Plan to abandon		
TPZ-55	2010	Open	573992.3871	1448462.813	NA	NA	7.4	2.4	Single	Below Cap	None	Plan to abandon		
TPZ-56	2010	Open	573867.9842	1448087.692	NA	NA	4	-1	Single	Below Cap	None	Plan to keep within monitoring well network to evaluate water level within cell.	Cell Interior	Sentinel
TPZ-57	2010	Open	574235.9923	1448335.979	NA	NA	8.1	3.1	Single	Below Cap	None	Plan to abandon		
TPZ-61	2010	Open	574396.3552	1449066.676	NA	NA	2.6	-7.4	Single	Below Cap	None	Plan to keep within monitoring well network to evaluate water level within cell.	Cell Edge	Sentinel
TPZ-63	2010	Open	573885.0931	1448089.063	NA	NA	13.1	8.1	Single	Above Cap	None	Plan to keep within monitoring well network to evaluate water level above cell.	Above Cap	Performance
TPZ-64	2011	Open	574028.7279	1448100.301	NA	NA	15.7	10.7	Single	Above Cap	None	Plan to abandon		
TPZ-65	2011	Open	574223.8211	1448330.143	NA	NA	18.7	13.7	Single	Above Cap	None	Plan to keep within monitoring well network to evaluate water level above cell.	Above Cap	Performance
TPZ-66	2011	Open	573995.5765	1448450.064	NA	NA	16.6	11.6	Single	Above Cap	None	Plan to keep within monitoring well network to evaluate water level above cell.	Above Cap	Performance
TPZ-67	2011	Open	573888.6052	1447944.483	NA	NA	15	10	Single	Above Cap	None	Plan to abandon		
TPZ-68	2011	Open	573943.3741	1448293.719	NA	NA	15.9	10.9	Single	Above Cap	None	Plan to keep within monitoring well network to evaluate water level above cell.	Above Cap	Performance

Notes:
VWP = Vibrating Wire Piezometer
Elevations in ft (NAVD88)

Table 2. Wells for Hydraulic Assessment Monitoring

Sentinel Monitoring Plan, Area 1501/1602, Dundalk Marine Terminal

Well ID	Well Type	Northing	Easting	VWP Elevation		Well Screen Elevation		Single or Multiple Purpose Well	Monitoring Interval(s)
				VWP1	VWP2	Top	Bottom		
Wells Adjacent to 15th Street Drain									
BRP-06A	Grouted	574485.18	1448090.04	4	NA	NA	NA	Single	Below Cap
BRP-07	Grouted	574325.94	1447953.66	4.189	NA	NA	NA	Multiple	Below Cap
BRP-08	Grouted	574229.17	1447873.89	1.399	NA	NA	NA	Multiple	Below Cap
BRP-09	Grouted	574507.62	1448174.09	2.582	NA	NA	NA	Multiple	Below Cap
BRP-11	Grouted	574434.02	1448095.93	1.263	NA	NA	NA	Multiple	Below Cap
BRP-12A	Grouted	574337.83	1448098.93	3.16	NA	NA	NA	Single	Below Cap
BRP-13	Grouted	574254.06	1447980.31	2.225	NA	NA	NA	Single	Below Cap
BRP-14	Grouted	574157.6	1447904.39	0.743	NA	NA	NA	Multiple	Below Cap
Wells Above Clay Cap									
BRP-16	Grouted	573742.78	1448000.8	0.962	9.962	NA	NA	Multiple	Below Cap, Above Cap
BRP-17	Grouted	573877.42	1448309.17	2.534	11.534	NA	NA	Multiple	Below Cap, Above Cap
BRP-46	Grouted	573963.68	1448080.89	13.426	NA	NA	NA	Single	Above Cap
GP-2A	Grouted	574006.57	1447898.5	1.472	10.472	NA	NA	Multiple	Below Cap, Above Cap
GP-2C	Grouted	574001.58	1447886.47	1.541	10.341	NA	NA	Multiple	Below Cap, Above Cap
GP-3A	Grouted	573824.78	1447975.86	2.538	11.038	NA	NA	Multiple	Below Cap, Above Cap
GP-3C	Grouted	573817.01	1447958.52	4.525	9.025	NA	NA	Multiple	Below Cap, Above Cap
GP-4A	Grouted	573801.77	1448106.46	0.965	11.965	NA	NA	Multiple	Below Cap, Above Cap
GP-4C	Grouted	573785.82	1448114.62	2.305	11.605	NA	NA	Multiple	Below Cap, Above Cap
TPZ-63	Open	573885.09	1448089.06	NA	NA	13.1	8.1	Single	Above Cap
TPZ-65	Open	574223.82	1448330.14	NA	NA	18.7	13.7	Single	Above Cap
TPZ-66	Open	573995.58	1448450.06	NA	NA	16.6	11.6	Single	Above Cap
TPZ-68	Open	573943.37	1448293.72	NA	NA	15.9	10.9	Single	Above Cap
Wells for Abandonment									
BRP-10	Grouted	574422.26	1448106.42	1.499	NA	NA	NA	Multiple	Below Cap
BRP-38	Grouted	574020.12	1447997.62	13.385	NA	NA	NA	Single	Above Cap
BRP-48	Grouted	573922.49	1448024.63	13.087	NA	NA	NA	Single	Above Cap
TPZ-64	Open	574028.73	1448100.3	NA	NA	15.7	10.7	Single	Above Cap
TPZ-67	Open	573888.61	1447944.48	NA	NA	15	10	Single	Above Cap

Table 3. Perimeter Sentinel Wells

Sentinel Monitoring Plan, Area 1501/1602, Dundalk Marine Terminal

Well ID	Well Type	Northing	Easting	VWP Elevation		Well Screen		Single or Multiple Purpose Well	Monitoring Interval(s)
				VWP1	VWP2	Top	Bottom		
Perimeter Wells for Sentinel Monitoring									
BRP-01	Grouted	574544.6	1448037.46	2.768	NA	NA	NA	Single	Below Cap
BRP-02	Grouted	574435.23	1447902.46	2.018	NA	NA	NA	Single	Below Cap
BRP-16	Grouted	573742.78	1448000.8	0.962	9.962	NA	NA	Multiple	Below Cap, Above Cap
BRP-17	Grouted	573877.42	1448309.17	2.534	11.534	NA	NA	Multiple	Below Cap, Above Cap
BRP-18	Grouted	574199.82	1449073.59	-15.207	3.793	NA	NA	Multiple	Below Cap, Below Liner
BRP-20	Grouted	574313.38	1449004.61	4.43	-17.57	NA	NA	Multiple	Below Cap, Below Liner
BRP-21	Grouted	574420.78	1448804.7	10.585	NA	NA	NA	Multiple	Below Cap
BRP-23	Grouted	574439.55	1448860.2	-17.308	1.692	NA	NA	Multiple	Below Cap, Below Liner
BRP-25	Grouted	574589	1448832.17	-16.964	6.036	NA	NA	Multiple	Below Cap, Below Liner
BRP-28	Grouted	574611.92	1448617.02	-16.397	5.603	NA	NA	Multiple	Below Cap, Below Liner
BRP-31	Grouted	574621.01	1448314.67	-25.715	-0.715	NA	NA	Multiple	Below Cap, Below Liner
BRP-45	Grouted	574254.42	1448871.8	3.64	NA	NA	NA	Single	Below Cap
EA-7S	Open	573747.44	1447986.58	NA	NA	6.54	2.54	Single	Below Cap
GP-10A	Grouted	574163.65	1448933.12	2.766	NA	NA	NA	Single	Below Cap
GP-10C	Grouted	574144.61	1448941.16	4.281	NA	NA	NA	Single	Below Cap
GP-1A	Grouted	574071.47	1447875.7	0.327	NA	NA	NA	Multiple	Below Cap
GP-2A	Grouted	574006.57	1447898.5	1.472	10.472	NA	NA	Multiple	Below Cap, Above Cap
GP-2C	Grouted	574001.58	1447886.47	1.541	10.341	NA	NA	Multiple	Below Cap, Above Cap
GP-3A	Grouted	573824.78	1447975.86	2.538	11.038	NA	NA	Multiple	Below Cap, Above Cap
GP-3C	Grouted	573817.01	1447958.52	4.525	9.025	NA	NA	Multiple	Below Cap, Above Cap
GP-4A	Grouted	573801.77	1448106.46	0.965	11.965	NA	NA	Multiple	Below Cap, Above Cap
GP-4C	Grouted	573785.82	1448114.62	2.305	11.605	NA	NA	Multiple	Below Cap, Above Cap
GP-6A	Grouted	573930	1448399.49	2.817	NA	NA	NA	Single	Below Cap
GP-6C	Grouted	573911.65	1448406.7	3.251	NA	NA	NA	Single	Below Cap
GP-8A	Grouted	574040.24	1448652.08	3.019	NA	NA	NA	Multiple	Below Cap
GP-8C	Grouted	574022.84	1448659.89	2.197	NA	NA	NA	Multiple	Below Cap
P-12	Open	574658.85	1448959.29	NA	NA	10.15	14.15	Single	Outside Cell
TPZ-61	Open	574396.36	1449066.68	NA	NA	2.6	-7.4	Single	Below Cap
Perimeter Wells for Abandonment									
BRP-03	Grouted	574340.5	1447832.37	4.713	NA	NA	NA	Single	Below Cap
BRP-26	Grouted	574550.98	1448634.28	0.268	NA	NA	NA	Single	Below Cap
BRP-34	Grouted	574420.58	1448671.6	5.888	NA	NA	NA	Single	Below Cap
GP-1C	Grouted	574066.17	1447863.4	2.375	NA	NA	NA	Single	Below Cap
GP-5A	Grouted	573872.95	1448269.22	3.517	NA	NA	NA	Single	Below Cap
GP-5C	Grouted	573856.9	1448275.27	3.011	NA	NA	NA	Single	Below Cap
GP-9A	Grouted	574119.82	1448833.55	3.64	NA	NA	NA	Single	Below Cap
GP-9C	Grouted	574100.48	1448841.45	3.062	NA	NA	NA	Single	Below Cap

Table 3. Perimeter Sentinel Wells

Sentinel Monitoring Plan, Area 1501/1602, Dundalk Marine Terminal

				VWP Elevation		Well Screen		Single or Multiple	
Well ID	Well Type	Northing	Easting	VWP1	VWP2	Top	Bottom	Purpose Well	Monitoring Interval(s)
SL-1	Grouted	574503.15	1448435.69	6.5		NA	NA	Single	Below Cap
SL-10	Grouted	574504.95	1448732.86	3.6		NA	NA	Single	Below Cap
SL-2	Grouted	574462.45	1448580.66	6.5		NA	NA	Single	Below Cap
SL-4	Grouted	574353.04	1448868.59	4		NA	NA	Single	Below Cap
SL-5	Grouted	574187.58	1448898.99	3.3		NA	NA	Single	Below Cap
SL-6	Grouted	574067.05	1448755.23	4.3		NA	NA	Single	Below Cap
SL-7	Grouted	573941.75	1448467.45	3.4		NA	NA	Single	Below Cap
SL-8	Grouted	573766.51	1448037.06	1		NA	NA	Single	Below Cap
SL-9	Grouted	573935.66	1447923.21	1.4		NA	NA	Single	Below Cap
TPZ-52	Open	574556.13	1448335.45	NA	NA	7.7	1.7	Single	Below Cap
TPZ-53	Open	574491.28	1448832.09	NA	NA	10	5	Single	Below Cap
TPZ-54	Open	574195.68	1448910.89	NA	NA	8.2	2.2	Single	Below Cap

Table 4. Interior Monitoring Wells

Sentinel Monitoring Plan, Area 1501/1602, Dundalk Marine Terminal

Well ID	Well Type	Northing	Easting	Elevation		Well Screen Elevation		Single or Multiple Purpose Well	Monitoring Interval(s)
				VWP1	VWP2	Top	Bottom		
Interior Wells for Monitoring									
BRP-29	Grouted	574533.55	1448298.73	6.667	NA	NA	NA	Multiple	Below Cap
BRP-32	Grouted	574343.15	1448154.15	3.726	NA	NA	NA	Single	Below Cap
BRP-33	Grouted	574408.3	1448471.91	3.375	NA	NA	NA	Multiple	Below Cap
BRP-36	Grouted	574279.04	1448338.51	5.415	NA	NA	NA	Single	Below Cap
BRP-39	Grouted	574108.72	1448209.89	4.306	NA	NA	NA	Single	Below Cap
BRP-42	Grouted	574046.77	1448408.71	4.204	NA	NA	NA	Single	Below Cap
BRP-44	Grouted	574231.53	1448710.33	3.388	NA	NA	NA	Single	Below Cap
EW-1	Open	573909.3	1448080.59	NA	NA	8	1	Single	Below Cap
TPZ-50	Open	574113.02	1447972.64	NA	NA	4.4	-0.6	Single	Below Cap
TPZ-56	Open	573867.98	1448087.69	NA	NA	4	-1	Single	Below Cap
Interior Wells for Abandonment									
BRP-35	Grouted	574175.44	1448085.77	3.1	NA	NA	NA	Single	Below Cap
BRP-37	Grouted	574249.01	1448530.46	4.425	NA	NA	NA	Single	Below Cap
BRP-40	Grouted	573875.29	1448048.3	2.828	NA	NA	NA	Multiple	Below Cap
BRP-41	Grouted	573936.27	1448265.23	4.023	NA	NA	NA	Single	Below Cap
BRP-43	Grouted	574095.59	1448636.37	3.474	NA	NA	NA	Single	Below Cap
BRP-47	Grouted	573954.58	1448046.8	1.46	NA	NA	NA	Single	Below Cap
DMT-TW1	Open	573898.95	1448111.77	NA	NA	7	2	Single	Below Cap
DMT-TW2	Open	574014.6	1448454.99	NA	NA	6.5	1.5	Single	Below Cap
EW-2	Open	574278.05	1448275.92	NA	NA	10.47	0.47	Single	Below Cap
TPZ-51	Open	574326.46	1448066.91	NA	NA	6.5	1.5	Single	Below Cap
TPZ-55	Open	573992.39	1448462.81	NA	NA	7.4	2.4	Single	Below Cap
TPZ-57	Open	574235.99	1448335.98	NA	NA	8.1	3.1	Single	Below Cap

Table 5. Vertical Sentinel Wells

Sentinel Monitoring Plan, Area 1501/1602, Dundalk Marine Terminal

				Elevation		Well Screen Elevation		Single or Multiple	
Well ID	Well Type	Northing	Easting	VWP1	VWP2	Top	Bottom	Purpose Well	Monitoring Interval(s)
BRP-18	Grouted	574199.82	1449073.6	-15.207	3.793	NA	NA	Multiple	Below Cap, Below Liner
BRP-20	Grouted	574313.38	1449004.6	4.43	-17.57	NA	NA	Multiple	Below Cap, Below Liner
BRP-23	Grouted	574439.55	1448860.2	-17.308	1.692	NA	NA	Multiple	Below Cap, Below Liner
BRP-25	Grouted	574589	1448832.2	-16.964	6.036	NA	NA	Multiple	Below Cap, Below Liner
BRP-28	Grouted	574611.92	1448617	-16.397	5.603	NA	NA	Multiple	Below Cap, Below Liner
BRP-31	Grouted	574621.01	1448314.7	-25.715	-0.715	NA	NA	Multiple	Below Cap, Below Liner
DMT-11S	Open	574430.88	1448175.9	NA	NA	-2.9	-22.9	Single	Below Liner
DMT-56S	Open	574170.12	1447839.5	NA	NA	-6.9	-16.9	Single	Below Liner
EA-7M	Open	573744.52	1448006.4	NA	NA	-86.37	-97.37	Single	Below Liner
S-1	Open	574023.06	1447845.9	NA	NA	-9.3	-19.3	Single	Below Liner
S-2	Open	573826.96	1447926.7	NA	NA	-15.9	-16.9	Single	Below Liner
S-3D	Open	573751.89	1448119.7	NA	NA	-16.3	-17.3	Single	Below Liner
S-3I	Open	573752.23	1448118.6	NA	NA	-11.5	-12.5	Single	Below Liner
S-4D	Open	573890.56	1448451.3	NA	NA	-10.4	-15.4	Single	Below Liner
S-4I	Open	573890.98	1448449.5	NA	NA	-8.5	-9.5	Single	Below Liner
S-5	Open	573986.03	1448682	NA	NA	-8.9	-18.9	Single	Below Liner
S-6	Open	574116.08	1449016	NA	NA	-16.5	-18.5	Single	Below Liner
S-7	Open	574264.92	1447701.4	NA	NA	-0.2	-5.2	Single	Below Liner

Table 6. Movement Monitoring Wells

Sentinel Monitoring Plan, Area 1501/1602, Dundalk Marine Terminal

Well ID	Well Type	Northing	Easting	Movement Monitoring Type
Wells for Movement Monitoring				
DL-1-SAA	Grouted	573853.6651	1448061.169	Shape Accel Array
DL-2-I	Open	574621.31	1448479.55	Inclinometer
INC-1501-J	Open	573973.2842	1448062.592	Inclinometer
INC-1501-L	Open	574006.084	1448106.892	Inclinometer
INC-48	Open	574242.6299	1447890.886	Inclinometer
INC-50	Open	574219.0965	1449049.583	Inclinometer
BRP-06	Grouted	574481.6574	1448092.779	Shape Accel Array
BRP-07	Grouted	574325.94	1447953.66	Shape Accel Array
BRP-08	Grouted	574229.1737	1447873.886	Shape Accel Array
BRP-09	Grouted	574507.62	1448174.09	Shape Accel Array
BRP-11	Grouted	574434.0191	1448095.932	Shape Accel Array
BRP-12	Grouted	574325.2623	1448040.438	Shape Accel Array
BRP-14	Grouted	574157.6013	1447904.385	Shape Accel Array
BRP-16	Grouted	573742.781	1448000.799	Shape Accel Array
BRP-17	Grouted	573877.4188	1448309.165	Shape Accel Array
BRP-18	Grouted	574199.8173	1449073.588	Shape Accel Array
BRP-21	Grouted	574420.78	1448804.7	Shape Accel Array
BRP-29	Grouted	574533.55	1448298.73	Shape Accel Array
BRP-33	Grouted	574408.3	1448471.91	Shape Accel Array
GP-1A	Grouted	574071.4694	1447875.695	Shape Accel Array
GP-2A	Grouted	574006.5727	1447898.498	Shape Accel Array
GP-2C	Grouted	574001.5837	1447886.472	Shape Accel Array
GP-3A	Grouted	573824.7818	1447975.856	Shape Accel Array
GP-7A	Grouted	573987.823	1448535.718	Shape Accel Array
GP-7C	Grouted	573970.2839	1448542.649	Shape Accel Array
GP-8A	Grouted	574040.24	1448652.08	Shape Accel Array
GP-8C	Grouted	574022.8362	1448659.885	Shape Accel Array
Movement Wells for Abandonment				
INC-1501-C	Open	574233.5827	1448047.946	Inclinometer
INC-1501-D	Open	574248.5841	1448084.991	Inclinometer
INC-1501-I	Open	574029.5994	1447950.663	Inclinometer
INC-1501-K	Open	573867.9787	1448175.161	Inclinometer
INC-1501-M	Open	573912.8722	1448225.496	Inclinometer
INC-19	Open	574783.8839	1448806.892	Inclinometer
INC-27VW	Open	574191.7453	1447929.722	Inclinometer
INC-30VW	Open	574481.9366	1448147.388	Inclinometer
INC-44	Open	573761.0283	1447983.085	Inclinometer
INC-45	Open	573748.1489	1448018.268	Inclinometer
INC-46	Open	574063.4867	1448749.781	Inclinometer
INC-47	Open	574139.2603	1448946.768	Inclinometer
INC-49	Open	574190.4459	1447941.951	Inclinometer

Table 7. Wells and Inclinometers for Abandonment

Sentinel Monitoring Plan, Area 1501/1602, Dundalk Marine Terminal

Well ID	Date Installed	Date Abandoned	Well Type	Northing	Easting	VWP Elevation		Well Screen Elevation		Single or Multiple Purpose Well	Monitoring Interval(s)	Rationale	Report Document and Latest Information
						VWP1	VWP2	Top	Bottom				
BRP-03	2015	2020	Grouted	574340.5	1447832.4	4.713	NA	NA	NA	Single	Below Cap	Duplicative. Using BRP-02, BRP-07, and BRP-08	SSI (Jan 2018). Last groundwater elevation measured Dec 2019 at 7.88 ft
BRP-10	2015		Grouted	574422.26	1448106.4	1.499	NA	NA	NA	Multiple	Below Cap	Duplicative. Using BRP-09, BRP-11, and BRP12A	SSI (Jan 2018). Last groundwater elevation measured May 2019 at 7.67 ft
BRP-26 *	2015		Grouted	574550.98	1448634.3	0.268	NA	NA	NA	Single	Below Cap	Duplicative. Using BRP-28	SSI (Jan 2018). Mechanical failure with no data collected.
BRP-34 *	2015		Grouted	574420.58	1448671.6	5.888	NA	NA	NA	Single	Below Cap	Duplicative. Using BRP-21	SSI (Jan 2018). Last groundwater elevation measured May 2019 at 9.23 ft
BRP-35 *	2015		Grouted	574175.44	1448085.8	3.1	NA	NA	NA	Single	Below Cap	Duplicative. Using BRP-32, BRP-39, and TPZ-50	SSI (Jan 2018). Last groundwater elevation measured Jan 2018 at 6.59 ft
BRP-37	2015		Grouted	574249.01	1448530.5	4.425	NA	NA	NA	Single	Below Cap	Duplicative. Using BRP-33, BRP-36, BRP-42, and BRP-44	SSI (Jan 2018). Last groundwater elevation measured Jan 2019 at 9.04 ft
BRP-38	2015		Grouted	574020.12	1447997.6	13.385	NA	NA	NA	Single	Above Cap	Duplicative. Using GP-2A and BRP-46	SSI (Jan 2018). Last groundwater elevation measured Jan 2019 at 12.86 ft
BRP-40	2015		Grouted	573875.29	1448048.3	2.828	NA	NA	NA	Multiple	Below Cap	Duplicative. Using TPZ-56 and TPZ-63	SSI (Jan 2018). Last groundwater elevation measured Apr 2019 at 8.37 ft
BRP-41	2015		Grouted	573936.27	1448265.2	4.023	NA	NA	NA	Single	Below Cap	Duplicative. Using BRP-17 and BRP-39	SSI (Jan 2018). Last groundwater elevation measured Jan 2018 at 8.88 ft
BRP-43	2015		Grouted	574095.59	1448636.4	3.474	NA	NA	NA	Single	Below Cap	Duplicative. Using andGP-8C and BRP-44	SSI (Jan 2018). Last groundwater elevation measured May 2019 at 9.24 ft
BRP-47	2015		Grouted	573954.58	1448046.8	1.46	NA	NA	NA	Single	Below Cap	Duplicative. Using TPZ-56 and TPZ-63	SSI (Jan 2018). Last groundwater elevation measured Jan 2020 at 9.54 ft
BRP-48	2015		Grouted	573922.49	1448024.6	13.087	NA	NA	NA	Single	Above Cap	Duplicative. Using TPZ-56 and TPZ-63	SSI (Jan 2018). Last groundwater elevation measured Dec 2020 at 12.89 ft
DMT-TW1	2011		Open	573898.95	1448111.8	NA	NA	7	2	Single	Below Cap	Duplicative. Using TPZ-56 and TPZ-63	Internal use only. Last groundwater elevation measured Jun 2020 at 10.21 ft
DMT-TW2	2011		Open	574014.6	1448455	NA	NA	6.5	1.5	Single	Below Cap	Duplicative. Using BRP-42, GP-6C and GP-8C	Internal use only. Last groundwater elevation measured Jan 2018 at 8.92 ft
EW-2	2018		Open	574278.05	1448275.9	NA	NA	10.47	0.47	Single	Below Cap	Duplicative. Using BRP-36	GGIR (Aug 2019). Last groundwater elevation measured Jun 2020 at 8.75 ft
GP-1C	2015	2020	Grouted	574066.17	1447863.4	2.375	NA	NA	NA	Single	Below Cap	Duplicative. Using GP-2C	SSI (Jan 2018). Last groundwater elevation measured Mar 2019 at 10.07 ft
GP-5A *	2015	2020	Grouted	573872.95	1448269.2	3.517	NA	NA	NA	Single	Below Cap	Duplicative. Using BRP-17, GP-4A, and GP-6A	SSI (Jan 2018). Last groundwater elevation measured Mar 2019 at 9.79 ft
GP-5C	2015	2020	Grouted	573856.9	1448275.3	3.011	NA	NA	NA	Single	Below Cap	Duplicative. Using BRP-17, GP-4C, and GP-6C	SSI (Jan 2018). Last groundwater elevation measured Mar 2019 at 8.75 ft
GP-9A *	2015	2020	Grouted	574119.82	1448833.6	3.64	NA	NA	NA	Single	Below Cap	Duplicative. Using GP-8A and GP-10A	SSI (Jan 2018). Last groundwater elevation measured Mar 2019 at 10.65 ft
GP-9C *	2015	2020	Grouted	574100.48	1448841.5	3.062	NA	NA	NA	Single	Below Cap	Duplicative. Using GP-8C and GP-10C	SSI (Jan 2018). Last groundwater elevation measured Mar 2019 at 7.77 ft
SL-1	2018		Grouted	574503.15	1448435.7	6.5	NA	NA	NA	Single	Below Cap	Duplicative. Using BRP-28, BRP-31, and BRP-33	GGIR (Aug 2019). Last groundwater elevation measured Mar 2019 at 10.17 ft
SL-10	2018		Grouted	574504.95	1448732.9	3.6	NA	NA	NA	Single	Below Cap	Duplicative. Using BRP-21, BRP-25, and BRP-28	GGIR (Aug 2019). Last groundwater elevation measured Apr 2019 at 8.13 ft
SL-2	2018		Grouted	574462.45	1448580.7	6.5	NA	NA	NA	Single	Below Cap	Duplicative. Using BRP-21 and BRP-28	GGIR (Aug 2019). Last groundwater elevation measured Mar 2019 at 10.13 ft
SL-4	2018		Grouted	574353.04	1448868.6	4	NA	NA	NA	Single	Below Cap	Duplicative. Using BRP-20, BRP-23, and BRP-45	GGIR (Aug 2019). Last groundwater elevation measured Jan 2018 at 4.36 ft
SL-5	2018		Grouted	574187.58	1448899	3.3	NA	NA	NA	Single	Below Cap	Duplicative. Using GP-10C	GGIR (Aug 2019). Last groundwater elevation measured Mar 2019 at 10.50 ft
SL-6	2018	2020	Grouted	574067.05	1448755.2	4.3	NA	NA	NA	Single	Below Cap	Duplicative. Using GP-8C and GP-10C	GGIR (Aug 2019). Last groundwater elevation measured Mar 2019 at 12.40 ft
SL-7	2018	2020	Grouted	573941.75	1448467.4	3.4	NA	NA	NA	Single	Below Cap	Duplicative. Using GP-6C	GGIR (Aug 2019). Last groundwater elevation measured Mar 2019 at 12.18 ft
SL-8	2018	2020	Grouted	573766.51	1448037.1	1	NA	NA	NA	Single	Below Cap	Duplicative. Using BRP-16 and GP-4C	GGIR (Aug 2019). Last groundwater elevation measured Mar 2019 at 10.25 ft
SL-9	2018	2020	Grouted	573935.66	1447923.2	1.4	NA	NA	NA	Single	Below Cap	Duplicative. Using GP-2C and GP-3C	GGIR (Aug 2019). Last groundwater elevation measured Mar 2019 at 11.59 ft
TPZ-51	2010		Open	574326.46	1448066.9	NA	NA	6.5	1.5	Single	Below Cap	Duplicative. Using BRP-12A	GWMR (Oct 2020). Last groundwater elevation measured June 2020 at 13.12 ft
TPZ-52	2010		Open	574556.13	1448335.5	NA	NA	7.7	1.7	Single	Below Cap	Duplicative. Using BRP-29 and BRP-31	GWMR (Oct 2020). Last groundwater elevation measured June 2020 at 15.44 ft
TPZ-53	2010		Open	574491.28	1448832.1	NA	NA	10	5	Single	Below Cap	Duplicative. Using BRP-21, BRP-23, and BRP-25	GWMR (Oct 2020). Last groundwater elevation measured June 2020 at 18.67 ft
TPZ-54	2010		Open	574195.68	1448910.9	NA	NA	8.2	2.2	Single	Below Cap	Duplicative. Using GP-10C and BRP-45	GWMR (Oct 2020). Last groundwater elevation measured June 2020 at 16.00 ft
TPZ-55	2010		Open	573992.39	1448462.8	NA	NA	7.4	2.4	Single	Below Cap	Duplicative. Using GP-6C and BRP-42	GWMR (Oct 2020). Last groundwater elevation measured June 2020 at 11.54 ft
TPZ-57	2010		Open	574235.99	1448336	NA	NA	8.1	3.1	Single	Below Cap	Duplicative. Using BRP-36	GWMR (Oct 2020). Last groundwater elevation measured June 2020 at 14.09 ft
TPZ-64	2011		Open	574028.73	1448100.3	NA	NA	15.7	10.7	Single	Above Cap	Duplicative. Using BRP-46	Internal use only. Last groundwater elevation measured Dec 2019 at 13.48 ft
TPZ-67	2011	2020	Open	573888.61	1447944.5	NA	NA	15	10	Single	Above Cap	Duplicative. Using GP-2A and GP-3A	Internal use only. Last groundwater elevation measured Aug 2018 at 5.03 ft
INC-1501-C	2007		Inclinometer	574233.58	1448047.9	NA	NA	NA	NA	Single	Below Cap	No longer usable. Using BRP-12	HIMS. Last used Mar 2011
INC-1501-D	2007		Inclinometer	574248.58	1448085	NA	NA	NA	NA	Single	Below Cap	No longer usable. Using BRP-12	HIMS. Last used Sep 2012
INC-1501-I	2007		Inclinometer	574029.6	1447950.7	NA	NA	NA	NA	Single	Below Cap	No longer usable. Using GP-2A and GP-2C	HIMS. Last used Jun 2013
INC-1501-K	2007		Inclinometer	573867.98	1448175.2	NA	NA	NA	NA	Single	Below Cap	No longer usable. Using BRP-17	HIMS. Last used Mar 2011
INC-1501-M	2007		Inclinometer	573912.87	1448225.5	NA	NA	NA	NA	Single	Below Cap	No longer usable. Using BRP-17	HIMS. Last used Jun 2013
INC-19	2007	2020	Inclinometer	574783.88	1448806.9	NA	NA	NA	NA	Single	Below Cap	Abandoned due to damage	HIMS. Last used Nov 2014
INC-27VW	2010		Inclinometer	574191.75	1447929.7	NA	NA	NA	NA	Single	Below Cap	No longer usable. Using BRP-08, BRP-14, and INC-48	HIMS. Last used Mar 2012
INC-30VW	2010		Inclinometer	574481.94	1448147.4	NA	NA	NA	NA	Single	Below Cap	No longer usable. Using BRP-06 and BRP-09	HIMS. Last used Jun 2013
INC-44	2011	2020	Inclinometer	573761.03	1447983.1	NA	NA	NA	NA	Single	Below Cap	Abandoned due to construction. Using BRP-16	HIMS. Last used Dec 2015

Table 7. Wells and Inclinometers for Abandonment

Sentinel Monitoring Plan, Area 1501/1602, Dundalk Marine Terminal

Well ID	Date Installed	Date Abandoned	Well Type	Northing	Easting	VWP Elevation		Well Screen Elevation		Single or Multiple Purpose Well	Monitoring Interval(s)	Rationale	Report Document and Latest Information
						VWP1	VWP2	Top	Bottom				
INC-45	2011	2020	Inclinometer	573748.15	1448018.3	NA	NA	NA	NA	Single	Below Cap	Abandoned due to construction. Using BRP-16	HIMS. Last used Jun 2013
INC-46	2011	2020	Inclinometer	574063.49	1448749.8	NA	NA	NA	NA	Single	Below Cap	Abandoned due to construction. Using GP-8A and GP-8C	HIMS. Last used Jun 2013
INC-47	2011	2020	Inclinometer	574139.26	1448946.8	NA	NA	NA	NA	Single	Below Cap	Abandoned due to construction. Using INC-50	HIMS. Last used Jun 2013
INC-49	2012		Inclinometer	574190.45	1447942	NA	NA	NA	NA	Single	Below Cap	No longer usable. Using BRP-08, BRP-14, and INC-48	HIMS. Last used Aug 2014

Notes:
Below cap is in COPR.
* - Non-functional VWP
GGIR - Geotechnical and Groundwater Investigation Report (August 2019)
GWMR - Semiannual Groundwater Monitoring Report (October 2020)
HIMS - Heavy Investigation and Minimization Study, Supplemental Data Report #7 (February 2020)
SSI - Area 1501/1602 Baseline Supplemental Site Investigation Report (January 2018)

Figures

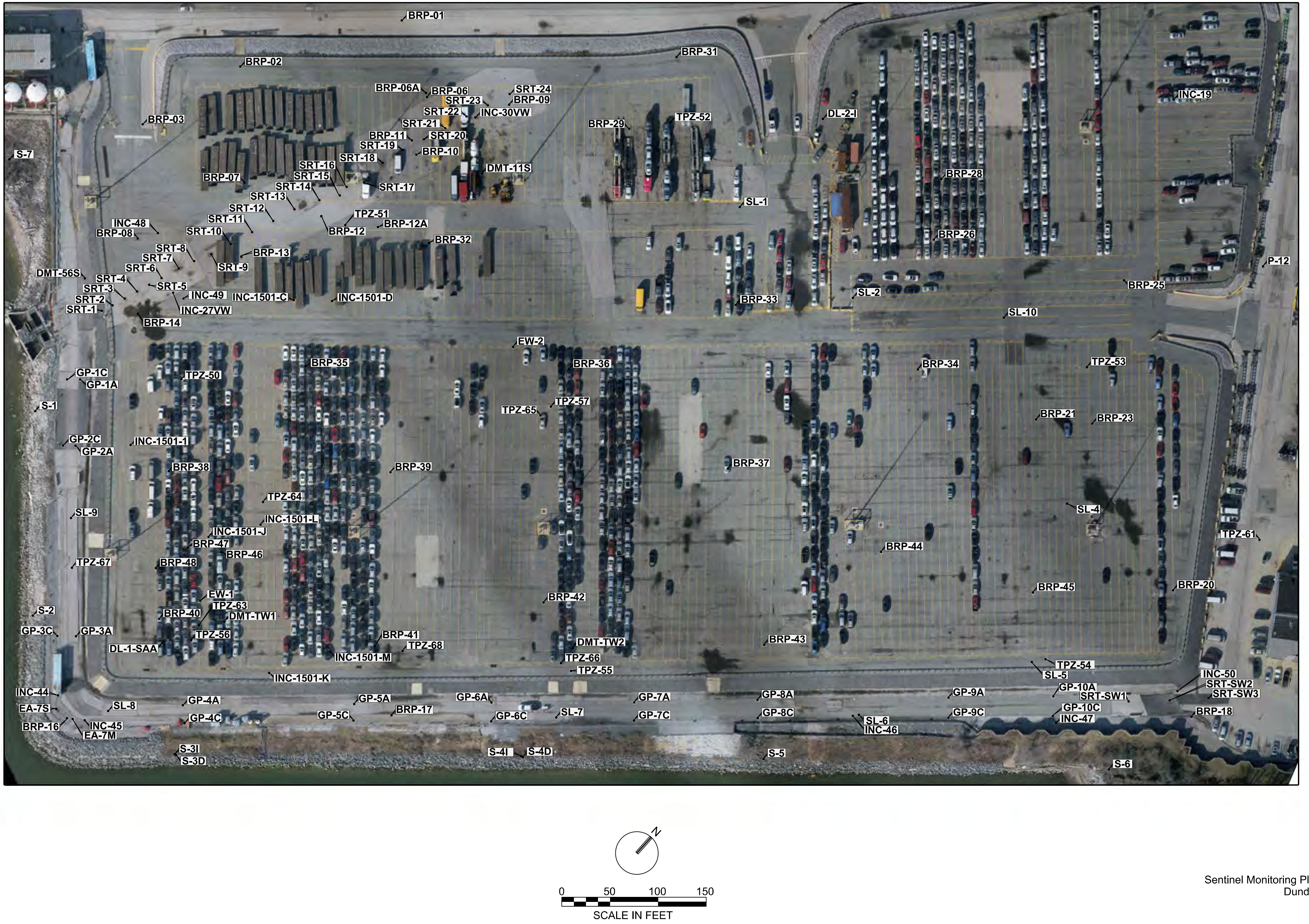


Figure 1
Site Map

Sentinel Monitoring Plan, Area 1501/1602
Dundalk Marine Terminal
Baltimore, Maryland

DEN001 | DOCUMENTS | 000181 - DEN1 WBG IMPERIAL SF | DESIGNS - SMALL PROJECTS | HWDMT109 - HONEYWELL | DLV | F01_HWDMT109.dgn

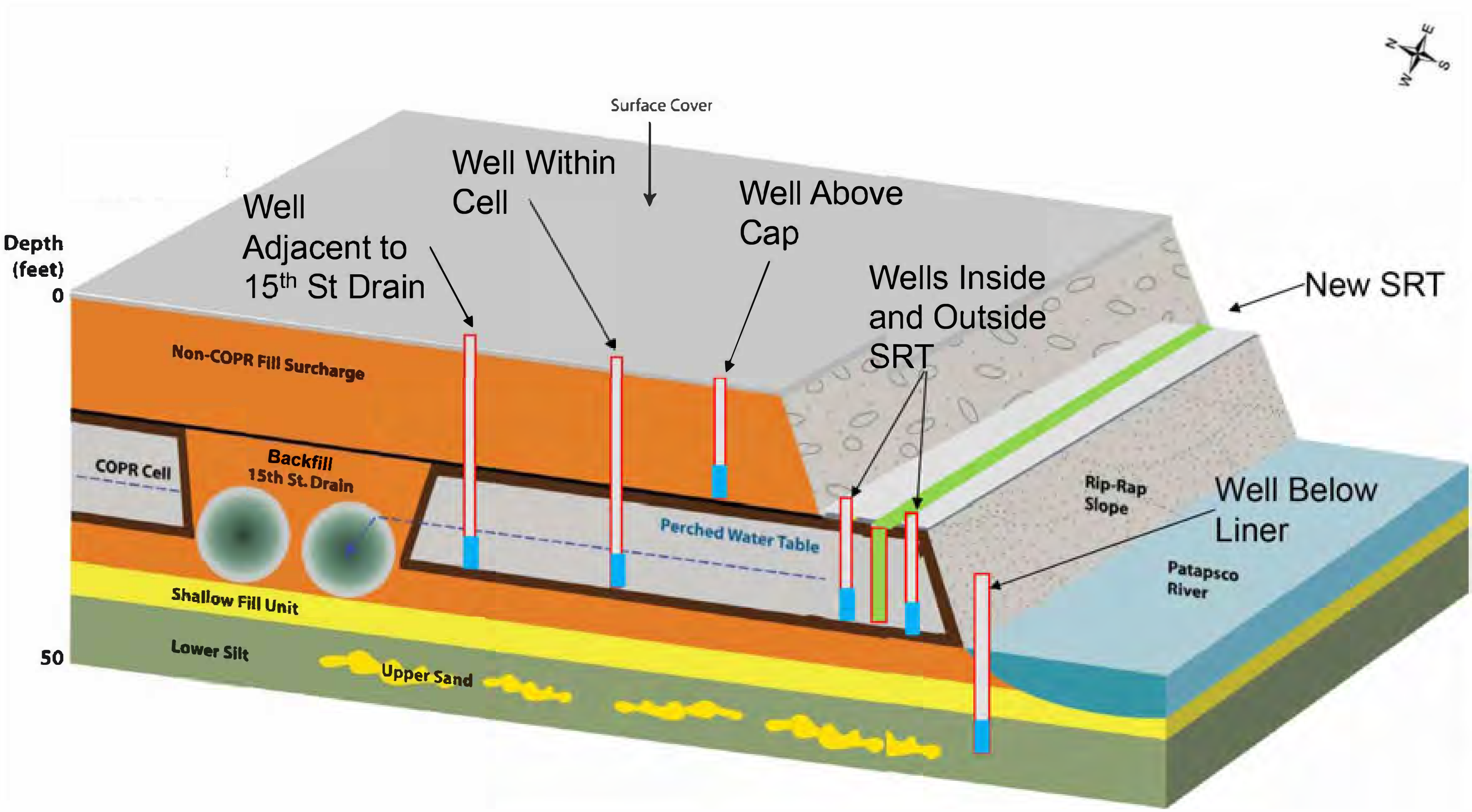
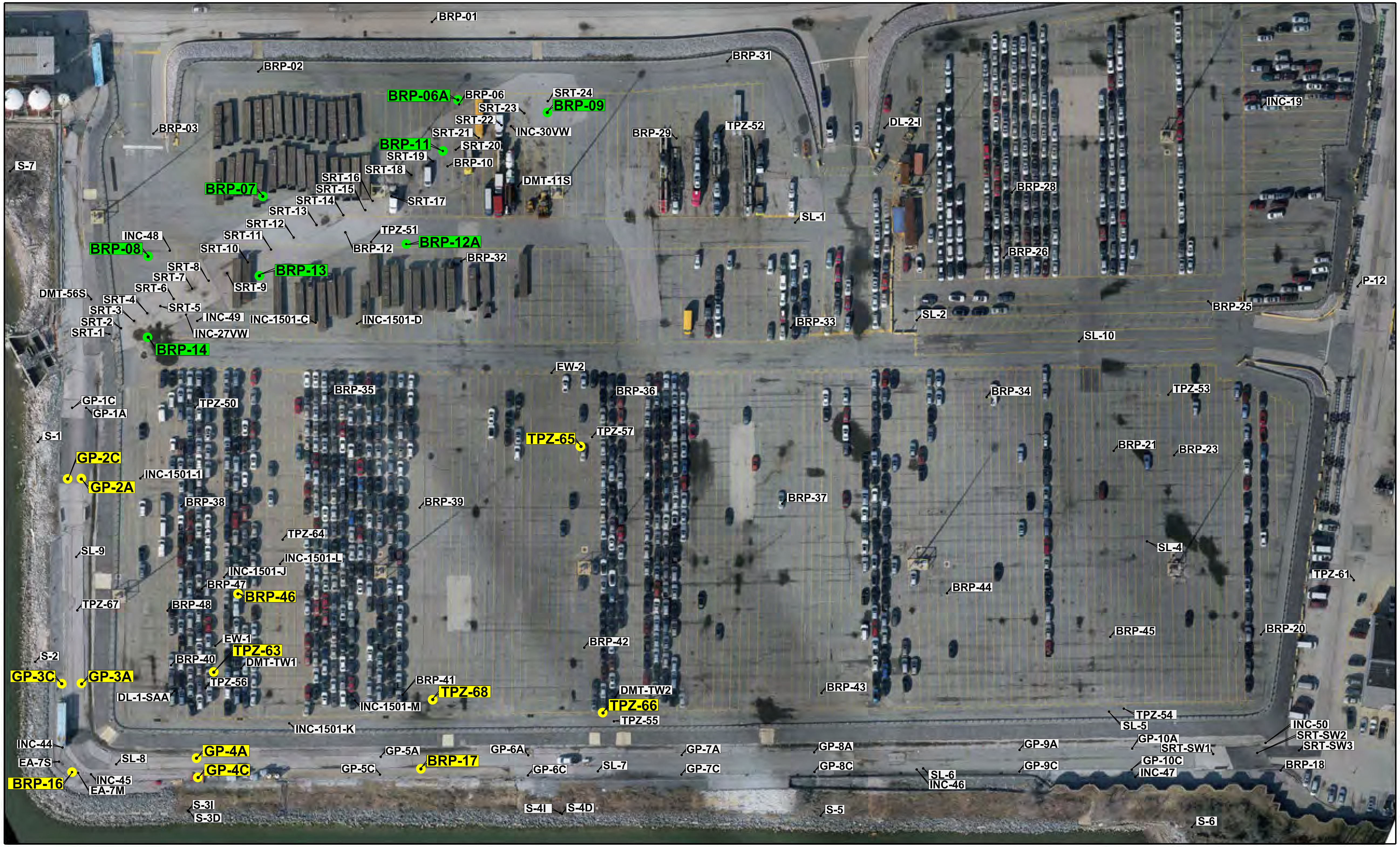


Figure 2

Typical Well Configurations

Sentinel Monitoring Plan -Area 1501/1602
Dundalk Marine Terminal
Baltimore, Maryland



N

0 50 100 150

SCALE IN FEET

Legend

🟡 Wells Above Clay Cap

🟢 Wells Adjacent to 15th St. Drain

Figure 3
Hydraulic Assessment Wells
Sentinel Monitoring Plan, Area 1501/1602
Dundalk Marine Terminal
Baltimore, Maryland

Legend

● Sentinel Perimeter Wells

Figure 4
Sentinel Perimeter Wells

Sentinel Monitoring Plan, Area 1501/1602
Dundalk Marine Terminal
Baltimore, Maryland

Jacobs

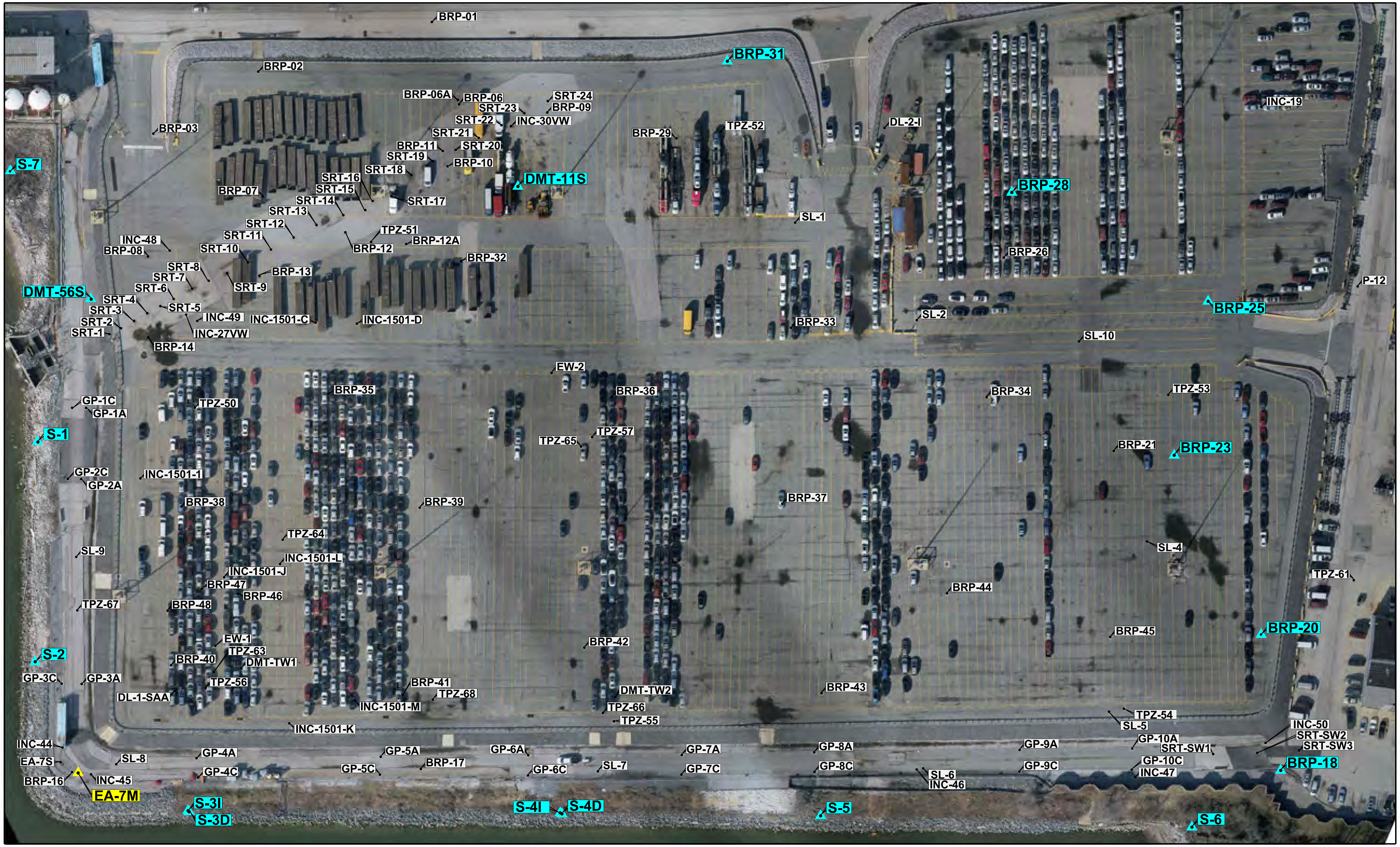
N

0 50 100 150
SCALE IN FEET

Legend
● Interior Observation Wells

Figure 5
Interior Observation Wells
Sentinel Monitoring Plan, Area 1501/1602
Dundalk Marine Terminal
Baltimore, Maryland

Jacobs



Legend

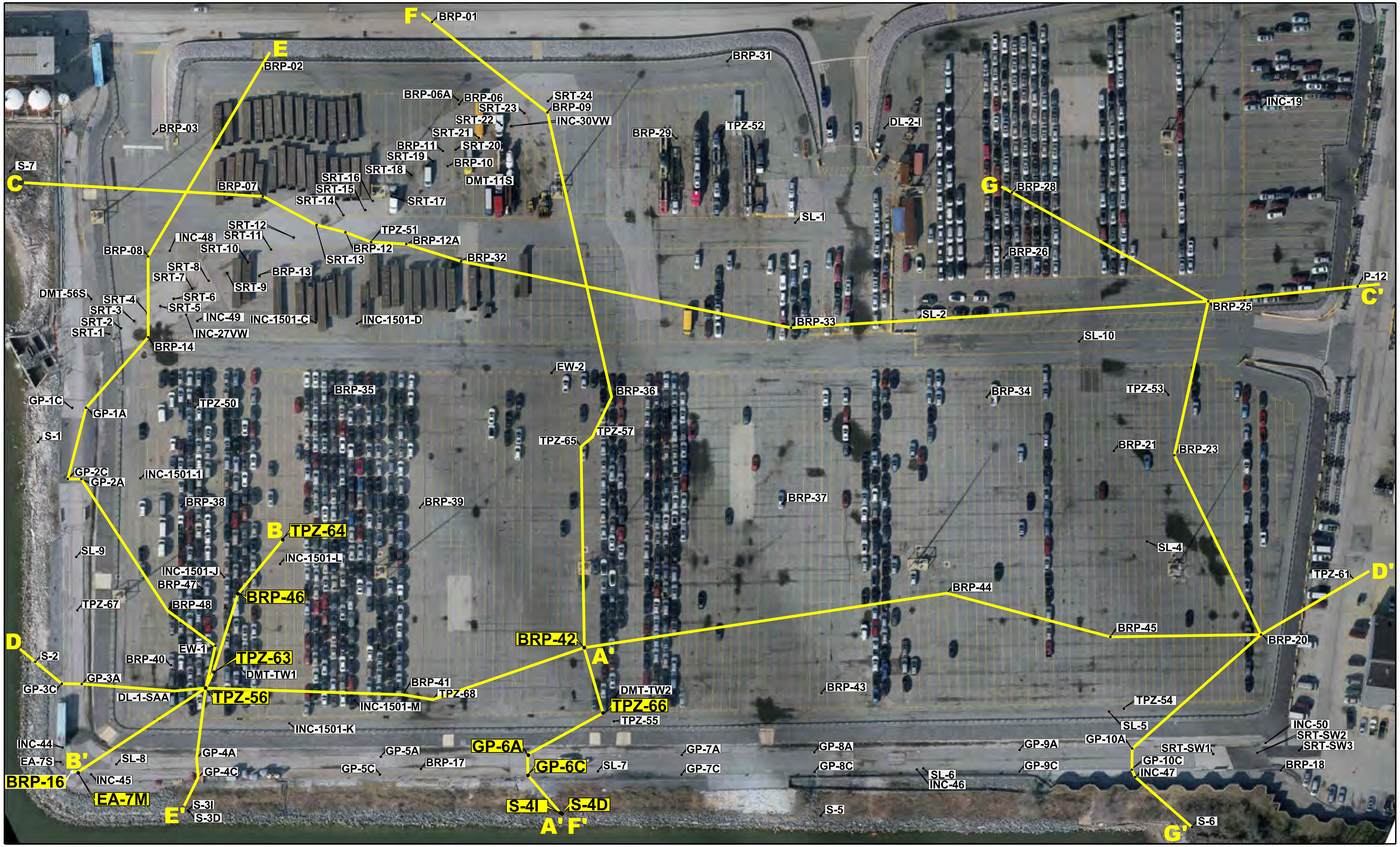
Vertical Sentinel Wells

▲ (~ -25 Ft. Elevation)

△ (~ -90 Ft. Elevation)

Figure 6
Vertical Sentinel Wells

Sentinel Monitoring Plan, Area 1501/1602
Dundalk Marine Terminal
Baltimore, Maryland



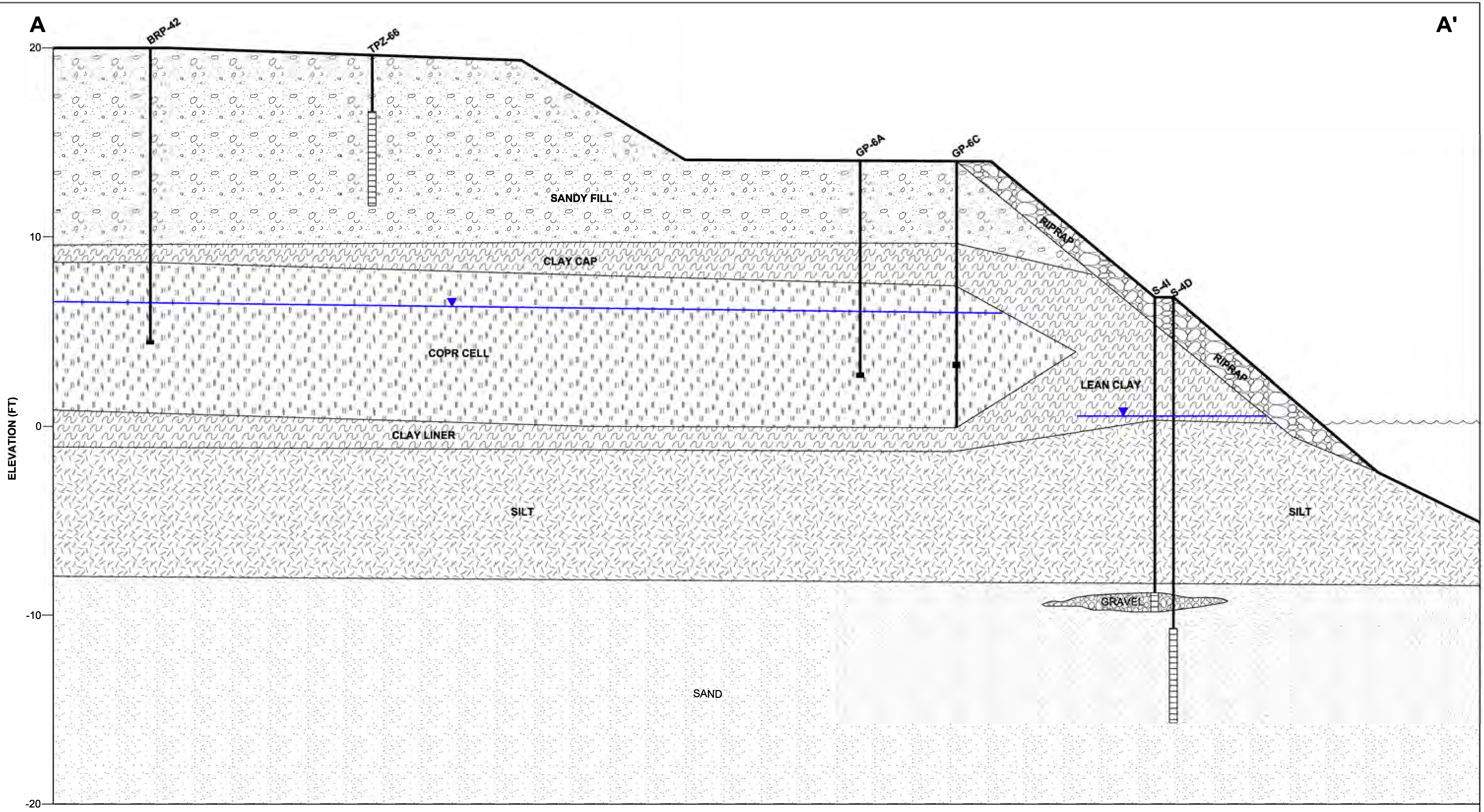
N

0 50 100 150

SCALE IN FEET

Figure 7
Cross Section Line
A - A', B - B', C - C', D - D', E - E', F - F' and G - G'

Sentinel Monitoring Plan, Area 1501/1602
Dundalk Marine Terminal
Baltimore, Maryland



Legend

WELL WITH VMP

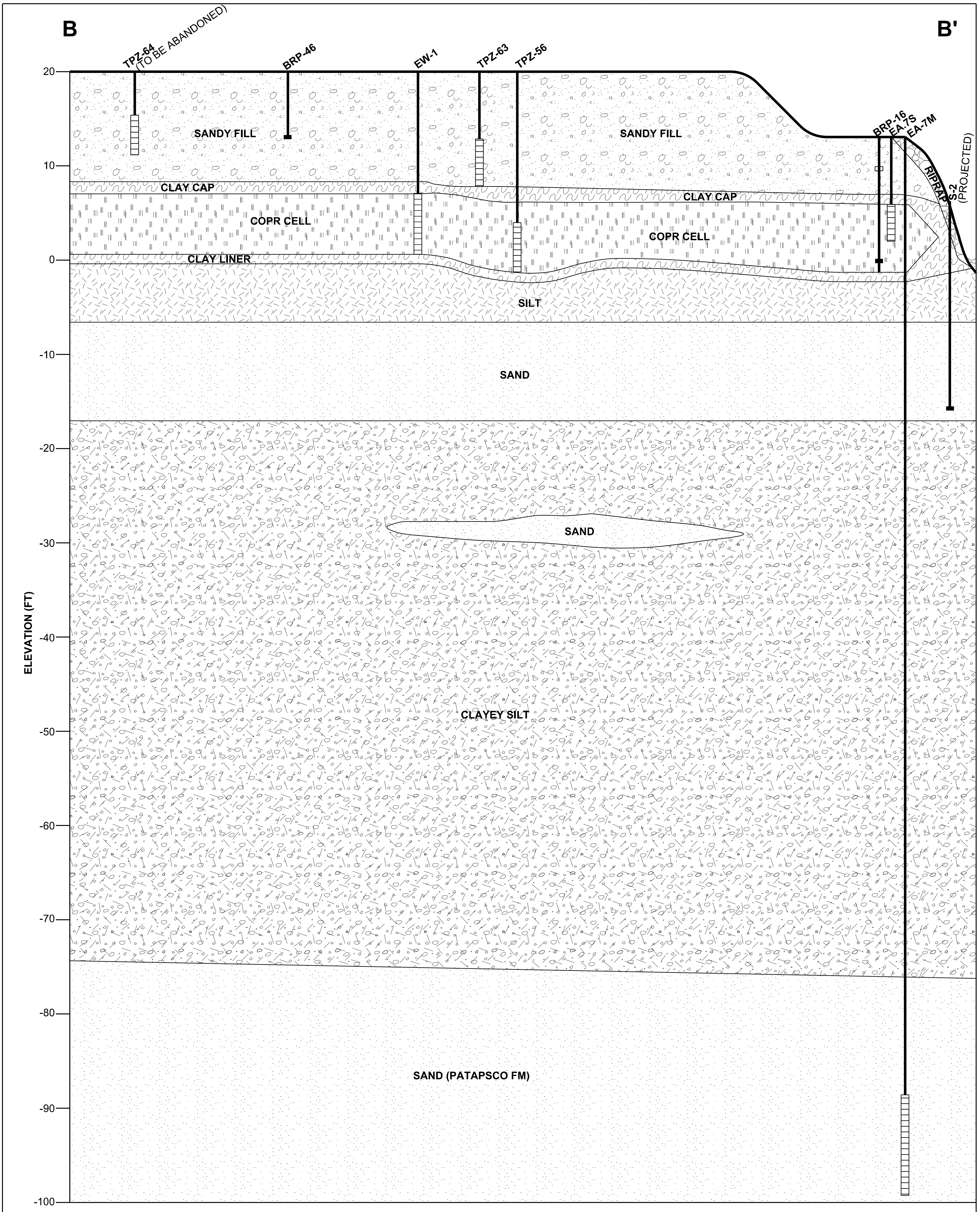
WELL WITH WELL SCREEN

VMP VIBRATING WIRE PIEZOMETER

GROUNDWATER ELEVATION (APPROX.)

0 20
SCALE (FEET)
VERTICAL EXAGGERATION = 4X

Figure 8
Cross Section A - A'
Sentinel Monitoring Plan Area 1501/1602
Dundalk Marine Terminal
Baltimore, Maryland



Legend

WELL WITH VMP

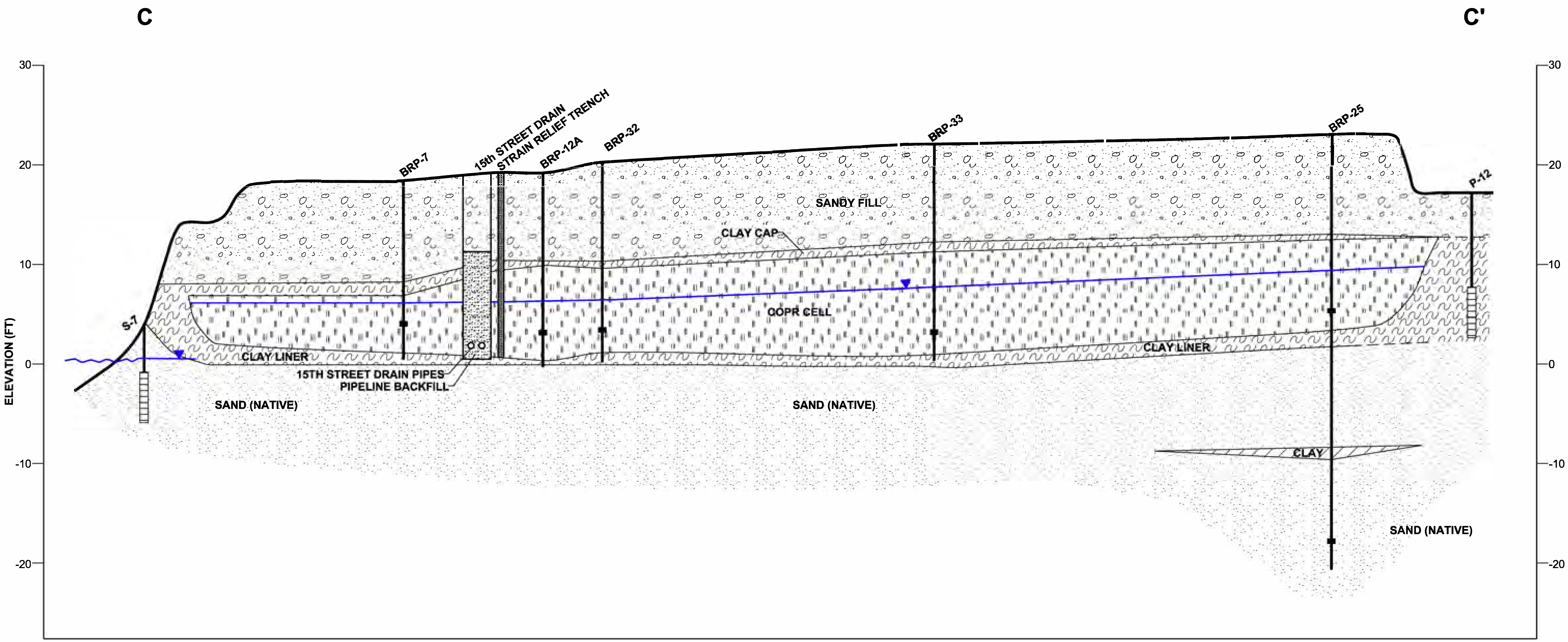
WELL WITH WELL SCREEN

VMP VIBRATING WIRE PIEZOMETER

0 40
SCALE (FEET)
VERTICAL EXAGGERATION = 4X

Figure 9
Cross Section B - B'
Area 1501/1602
Dundalk Marine Terminal
Baltimore, Maryland

Jacobs



Legend

WELL WITH VMP

WELL WITH WELL SCREEN

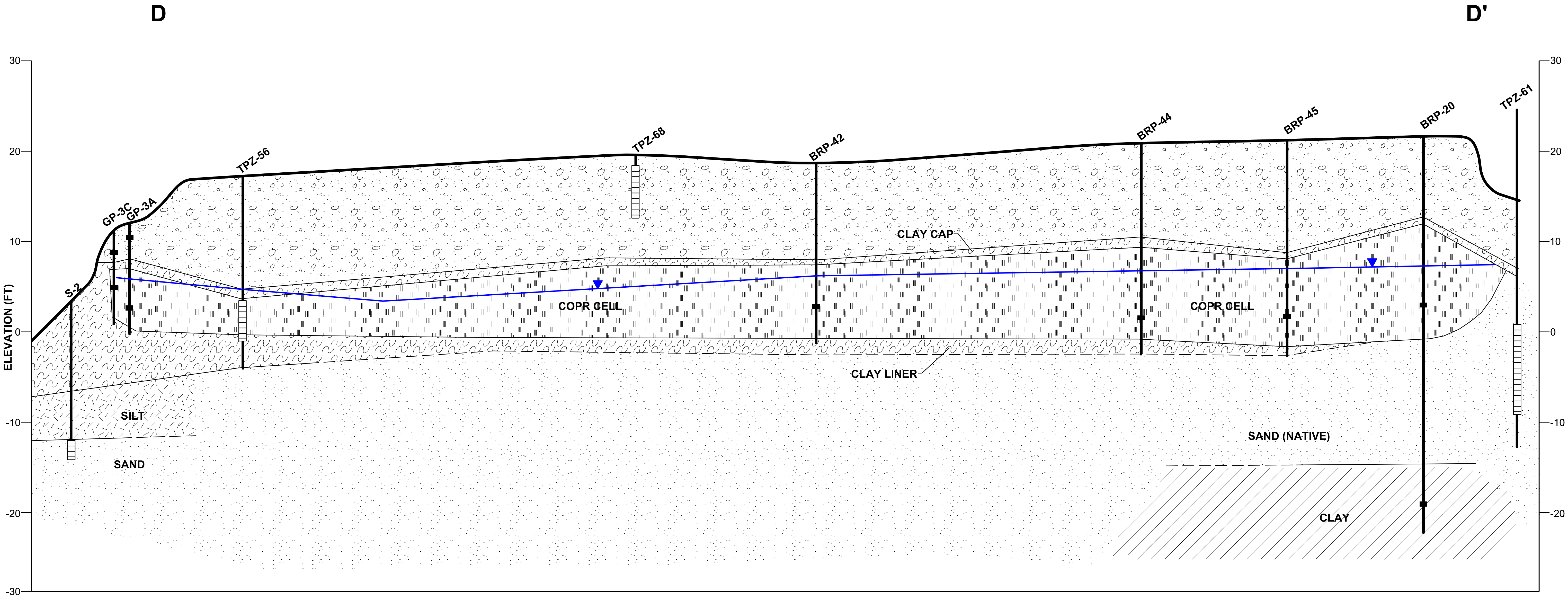
VMP VIBRATING WIRE PIEZOMETER

GROUNDWATER ELEVATION (APPROX.)

0 100
SCALE (FEET)
VERTICAL EXAGGERATION = 10X

Figure 10
Cross Section C - C'
Sentinel Monitoring Plan Area 1501/1602
Dundalk Marine Terminal
Baltimore, Maryland

Jacobs



Legend

⊥	WELL WITH VMP
▯	WELL WITH WELL SCREEN
VMP	VIBRATING WIRE PIEZOMETER
▼	GROUNDWATER ELEVATION (APPROX.)

0 100
SCALE (FEET)
VERTICAL EXAGGERATION = 10X

Figure 11
Cross Section D - D'
Sentinel Monitoring Plan, Area 1501/1602
Dundalk Marine Terminal
Baltimore, Maryland

Jacobs

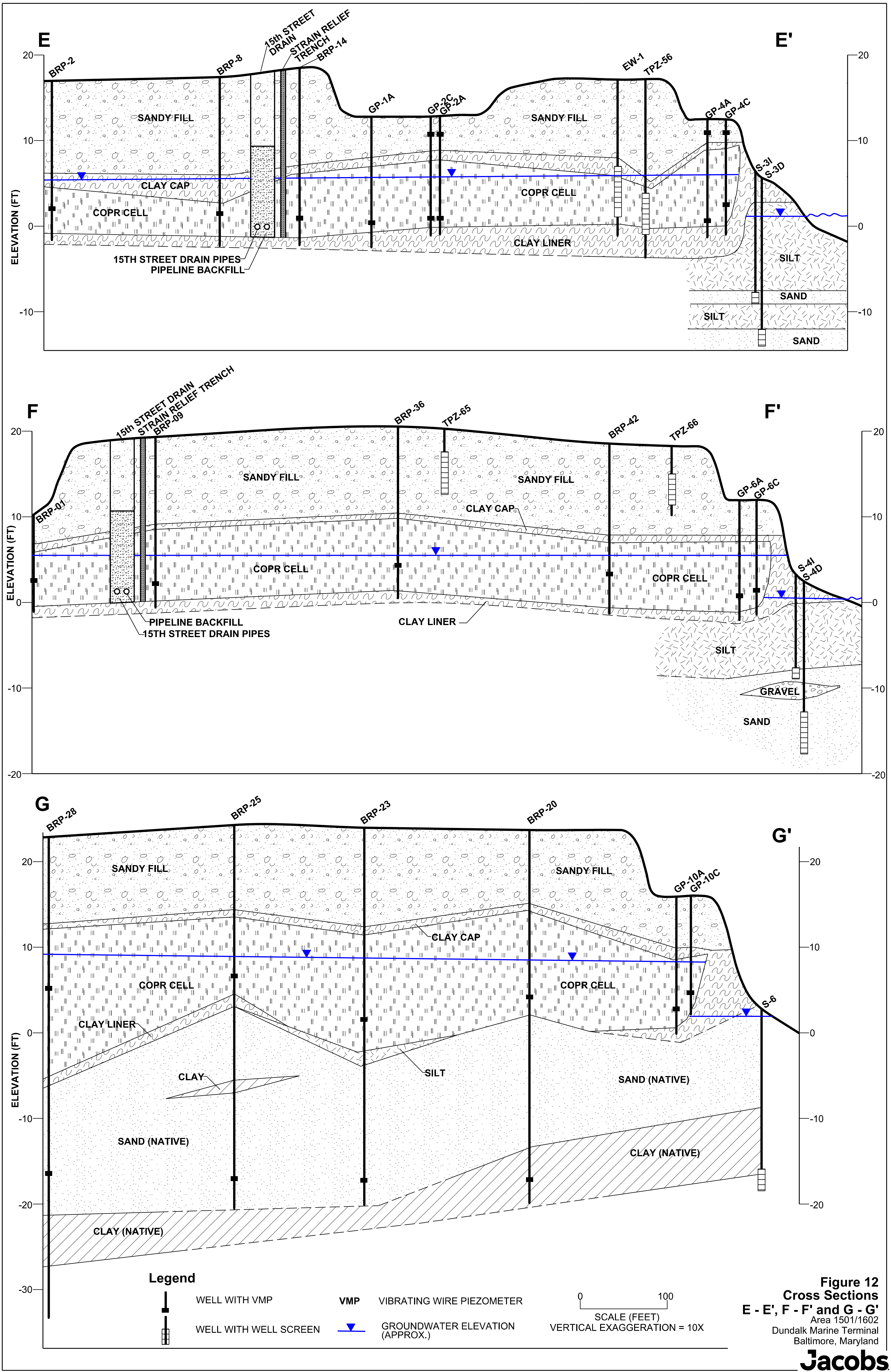
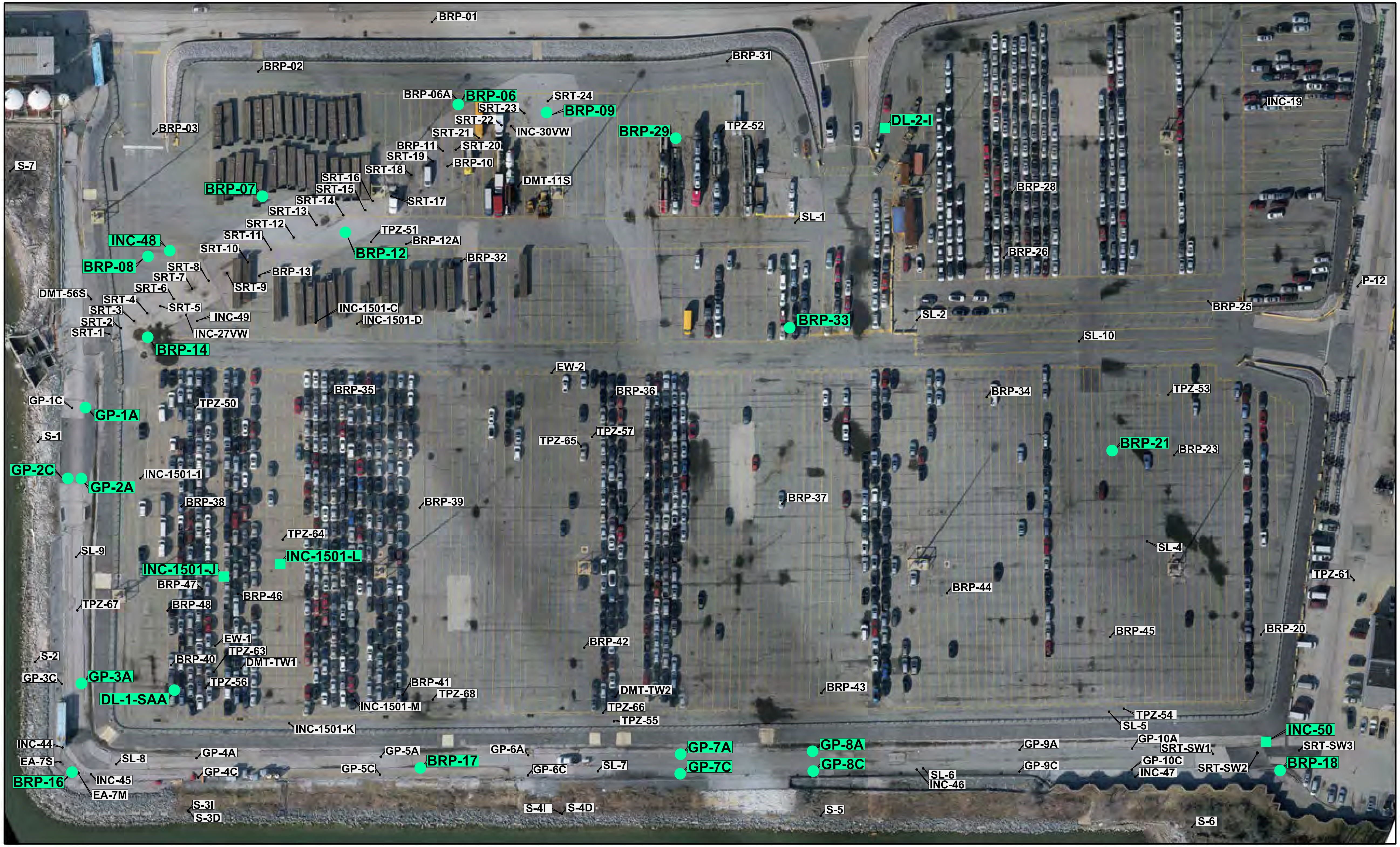


Figure 12
Cross Sections
E - E', F - F' and G - G'
Area 1501/1602
Dundalk Marine Terminal
Baltimore, Maryland



N

0 50 100 150

SCALE IN FEET

Legend

🟩 Inclinometer

● Shape Accel Array Wells

Figure 13
Inclinometer and Shape Accel Array Wells

Sentinel Monitoring Plan, Area 1501/1602
Dundalk Marine Terminal
Baltimore, Maryland

Jacobs

N

0 50 100 150

SCALE IN FEET

Legend

● Inclinometers and Monitoring Wells to be Abandoned

Figure 14
Inclinometers and Monitoring Wells for Abandonment

Sentinel Monitoring Plan, Area 1501/1602
Dundalk Marine Terminal
Baltimore, Maryland

Jacobs

Appendix A

Soil Boring Logs for Wells To Be Abandoned

ch2m:

PROJECT NUMBER:

BORING NUMBER: BRP-3

Sheet: 1

SOIL BORING LOG

PROJECT: Honeywell DMT SSI

LOCATION:

ELEVATION:

DRILLING CONTRACTOR: Aquifer Drilling and testing, Inc.

DRILLING METHOD AND EQUIPMENT: Sonic SAMP DRILL Mmo 170; SPT Sampling

WATER LEVELS:

START: 12/7/15 11:00

FINISH: 12/7/15 12:30.

LOGGER: K. Chaturvedula

DEPTH BELOW (ft)	SAMPLE			STANDARD PENETRATION TEST RESULTS	SOIL DESCRIPTION	COMMENTS
	NUMBER	TYPE	RECOVERY (ft)	6" - 6" - 6" (N)	SOIL NAME, USCS GROUP SYMBOL, COLOR, MOISTURE CONTENT, RELATIVE DENSITY OR CONSISTENCY, SOIL STRUCTURE, MINERALOGY	DEPTH OF CASING, DRILLING RATE, DRILLING FLUID LOSS, TESTS AND INTRUMENTATION
0 1 2	S-1	SONIC MACRO CORE	24"	–	3" Asphalt 0.25' - well graded gravel with sand and silt (GW-GM), dark brown (7.5YR 4/2), dry, coarse grained sand.	0'-3' - Advanced the sonic Macrocore, 3" ID - Hard drilling conditions. DPC -
3	SS-2	SS	12"	8 8	3.0' - Silty SAND with gravel (SM), brown (7.5YR 4/3), dry, fine to medium grained sand 3.5' - 0.25" thick rubber membrane 3.5' - Same as above, clay seams	3.0' - Switched to splitspoon sampling: 140-lb hammer; 3" dia sampler. DPC - DPC -
4	SS-3	SS	12"	14 11	4.1' - Polyethylene membrane Same as above	DPC –
5 6	SS-4	SS	8"	5 8	Same as above	DPC –

ch2m.

PROJECT NUMBER:

BORING NUMBER: BRP-3
Sheet: 2

SOIL BORING LOG

PROJECT:
LOCATION:
ELEVATION:
DRILLING CONTRACTOR:
DRILLING METHOD AND EQUIPMENT:
WATER LEVELS:
START:
FINISH:
LOGGER:

DEPTH BELOW (ft)	SAMPLE			STANDARD PENETRATION TEST RESULTS	SOIL DESCRIPTION	COMMENTS
	NUMBER	TYPE	RECOVERY (ft)	6" - 6" - 6" (N)	SOIL NAME, USCS GROUP SYMBOL, COLOR, MOISTURE CONTENT, RELATIVE DENSITY OR CONSISTENCY, SOIL STRUCTURE, MINERALOGY	DEPTH OF CASING, DRILLING RATE, DRILLING FLUID LOSS, TESTS AND INTRUMENTATION
6	SS-5	SS	9"	6 100/3"	6.0' - same as above, trace clay 6.5' - 3" thick Asphalt	
6.75'	S-6	SONIC MACRO CORE	15"	-	6.75' - 2" thick Asphalt 7.0' - Poorly graded gravel with sand (GP), gray (7.5YR 7/1), dry, coarse grained sand -, Road based aggregate 7.9' - Silty SAND (SM), Red-Brown (7.5YR 7/6), dry, fine to medium grained sand	Advanced 3" OD sonic macro core to 8' bgs. DPC - DPC -
8	SS-7	SS	12"	16 19	8.0' - Poorly graded SAND with gravel (SP), brown - gray (7.5YR 4/2), moist medium to coarse grained sand	DPC -
9	SS-8	SS	12"	11 12	9.0' - same as above 9.5' - Silty SAND (SM), Red-Brown (7.5YR 5/8), moist, fine to medium grained sand, trace gravel and wooden pieces.	DPC -
10	SS-9	SS	12"	13 10	10.0' - Same as above 10.3' - sandy lean CLAY (CL), tan (GLEY1 7/5GY) dry, Low plasticity, stiff, trace gravel	DPC -
11	SS-10	SS	12"	19 33	11.0' - Lean CLAY (CL), Red (10YR4/4), dry, Low plasticity, very stiff. 11.75' - Silty SAND (SM), Brown-greenish gray (7.5YR 4/3), dry, particulate (COPR)	DPC - DPC +
12						

ch2m:

PROJECT NUMBER:

BORING NUMBER: BRP-3
Sheet: 3

SOIL BORING LOG

PROJECT:
ELEVATION:
DRILLING METHOD AND EQUIPMENT:
WATER LEVELS:

LOCATION:
DRILLING CONTRACTOR:

START:
FINISH:
LOGGER:

DEPTH BELOW (ft)	SAMPLE			STANDARD PENETRATION TEST RESULTS	SOIL DESCRIPTION	COMMENTS
	NUMBER	TYPE	RECOVERY (ft)	6" - 6" - 6" (N)	SOIL NAME, USCS GROUP SYMBOL, COLOR, MOISTURE CONTENT, RELATIVE DENSITY OR CONSISTENCY, SOIL STRUCTURE, MINERALOGY	DEPTH OF CASING, DRILLING RATE, DRILLING FLUID LOSS, TESTS AND INTRUMENTATION
12	SS-11	SS	12"	48 53	12.0' - same as above 12.8' - lean clay (CL), Red (10YR4/4), moist, Low plasticity,	DPC + 12.5' - 6" OD outer casing installed to 13' bgs DPC -
13					Bottom of boring @ 13.0' bgs.	

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BORING NO. BRP-3
SHEET 4 **OF** 5
FILE NO. 10587
SURFACE ELEV.
DATUM

PROJECT DUNDALK MARINE TERMINAL
LOCATION BALTIMORE, MARYLAND
BORING LOCATION

TEST/INSPECTION EQUIPMENT SONIC SAMP DRILL MAX 170: SPT Sampling
REFERENCE CODES/STANDARDS

BORING EQUIPMENT AND METHODS OF STABILIZING BOREHOLE

TYPE OF BORING RIG		TYPE OF FEED DURING CORING		CASING USED	☑ YES ☐ NO		
TRUCK		MECHANICAL		DIA., IN. 6"	DEPTH, FT. FROM	0	TO 13'
SKID		HYDRAULIC		DIA., IN.	DEPTH, FT. FROM		TO
BARGE		OTHER		DIA., IN.	DEPTH, FT. FROM		TO
OTHER	TRACK						

TYPE AND SIZE OF:
D-SAMPLER
U-SAMPLER
S-SAMPLER SS sampling - 3" ID sample
CORE BARREL
CORE BIT
DRILL RODS
SONIC MACRO CORE - 3" ID

DRILLING MUD USED ☐ YES ☑ NO
DIAMETER OF ROTARY BIT, IN.
TYPE OF DRILLING MUD
AUGER USED ☐ YES ☑ NO
TYPE AND DIAMETER, IN.
CASING HAMMER, LBS. AVERAGE FALL, IN.
SAMPLER HAMMER, LBS. 140 AVERAGE FALL, IN. 30
TYPE OF HAMMER Automatic

WATER LEVEL OBSERVATIONS IN BOREHOLE

DATE	TIME	DEPTH OF HOLE	DEPTH OF CASING	DEPTH TO WATER	CONDITIONS OF OBSERVATION

PIEZOMETER INSTALLED ☑ YES ☐ NO **SKETCH SHOWN ON** See piezometer log

STANDPIPE:	TYPE	Standpipe	ID, IN.	2"	LENGTH, FT.	13'	TOP ELEV.	
INTAKE ELEMENT:	TYPE		OD, IN.		LENGTH, FT.		TIP ELEV.	
FILTER:	MATERIAL		OD, IN.		LENGTH, FT.		BOT. ELEV.	

PAY QUANTITIES

3.5" DIA. DRY SAMPLE BORING	LIN. FT.		NO. OF 3" SHELBY TUBE SAMPLES	
3.5" DIA. U-SAMPLE BORING	LIN. FT.		NO. OF 3" UNDISTURBED SAMPLES	
CORE DRILLING IN ROCK	LIN. FT.		OTHER:	

BORING CONTRACTOR Aquifer Drilling and Testing, Inc.
DRILLER Brian Karshick **HELPERS** Chris Thelen
REMARKS 2" PVC well installed with 5 feet screen
RESIDENT ENGINEER K. Chaturvedula **DATE** 12/7/15

BORING NO. BRP-3

ch2m.

PROJECT NUMBER:

BORING NUMBER: BRP-10

Sheet: 1

SOIL BORING LOG

PROJECT: Honeywell DMT SSI

ELEVATION:

LOCATION:

DRILLING CONTRACTOR: Aquifer Drilling and testing, Inc.

DRILLING METHOD AND EQUIPMENT: Sonic Samp Drill xLMay 170; SPT sampling

WATER LEVELS:

START: 12/10/15 13:30 **FINISH:** 12/10/15 **LOGGER:** K. Chaturvedula

DEPTH BELOW (ft)	SAMPLE			STANDARD PENETRATION TEST RESULTS	SOIL DESCRIPTION	COMMENTS
	NUMBER	TYPE	RECOVERY (ft)	6" - 6" - 6" (N)	SOIL NAME, USCS GROUP SYMBOL, COLOR, MOISTURE CONTENT, RELATIVE DENSITY OR CONSISTENCY, SOIL STRUCTURE, MINERALOGY	DEPTH OF CASING, DRILLING RATE, DRILLING FLUID LOSS, TESTS AND INTRUMENTATION
0					3" Asphalt Poorly graded Sand with gravel (SP), gray-black (5N), dry, coarse grained Sand, Road based aggregate	Advanced the 3" ID Sonic macro core to 10' bgs. DPC -
1	S-1	Sonic Macro Core	36"		1.0' - Silty SAND (SM) with gravel, gray-brown (7.5YR 4/2), moist, fine to medium grained Sand	
2					2.0' - woven geotextile 2.0' - same as above	DPC.
3						DPC.
4					4.0' - same as above	DPC -
5	S-2	Sonic Macro Core	36"		5.0' - Mixed with layers of Asphalt	DPC -
6						

ch2m.

PROJECT NUMBER:

BORING NUMBER: BRP-10

Sheet: 2

SOIL BORING LOG

PROJECT:

ELEVATION:

LOCATION:

DRILLING CONTRACTOR:

DRILLING METHOD AND EQUIPMENT:

WATER LEVELS:

START:

FINISH:

LOGGER:

DEPTH BELOW (ft)	SAMPLE			STANDARD PENETRATION TEST RESULTS	SOIL DESCRIPTION	COMMENTS
	NUMBER	TYPE	RECOVERY (ft)	6" - 6" - 6" (N)	SOIL NAME, USCS GROUP SYMBOL, COLOR, MOISTURE CONTENT, RELATIVE DENSITY OR CONSISTENCY, SOIL STRUCTURE, MINERALOGY	DEPTH OF CASING, DRILLING RATE, DRILLING FLUID LOSS, TESTS AND INTRUMENTATION
6	S-2	Sonic Macro core	1			
					6.5' - 3" thick Asphalt	
7					6.7' - Poorly graded GRAVEL with sand (GP), gray (5N), dry, coarse grained sand, Road based aggregate	DPC -
					7.0' - 7.5' - same as above	
					7.5' - Clayey SAND (SC), Red (10YR4/4), moist, fine to medium grained sand	DPC -
8	S-3	SONIC MACRO CORE	36"		8.0' - 8.5' - Fat CLAY (CH), Red (10YR4/4), moist, ~~ka~~ stiff, highly plastic	DPC -
					8.5' - Silty SAND (SM), Red-Brown greenish (7.5YR 4/4), dry, fine grained sand, particulate to highly indurated (CH3 COPR)	
9						DPCf
10				18	810.0' - same as above, particulate to slightly indurated	DPC+ 10.0' - 6" OD outer casing installed to 10.0' bgs.
				55		
11	SS-4	SS	19"	34		10.5' - switched to SS sampling; 140-lb hammer; 30-in. drop; 3" ~~to~~ sampler
				14		
12						

PROJECT NUMBER:

BORING NUMBER: BRP-10

Sheet: 3

SOIL BORING LOG

PROJECT:

LOCATION:

ELEVATION:

DRILLING CONTRACTOR:

DRILLING METHOD AND EQUIPMENT:

WATER LEVELS:

START:

FINISH:

LOGGER:

DEPTH BELOW (ft)	SAMPLE			STANDARD PENETRATION TEST RESULTS	SOIL DESCRIPTION	COMMENTS
	NUMBER	TYPE	RECOVERY (ft)	6" - 6" - 6" (N)	SOIL NAME, USCS GROUP SYMBOL, COLOR, MOISTURE CONTENT, RELATIVE DENSITY OR CONSISTENCY, SOIL STRUCTURE, MINERALOGY	DEPTH OF CASING, DRILLING RATE, DRILLING FLUID LOSS, TESTS AND INTRUMENTATION
12	SS-5	SS	18"	7 39 30	12.0' - 13.5' - same as above.	
13				15	13.5' - 13.6' - Brick and pieces of glass 13.6' - Poorly graded sand with silt (SP-SM), gray-black (N2), moist, coarse grained sand, particulate (GB COPR)	DPC+
14	SS-6	SS	18"	17 16	Same as above, wet, bright green particles	14.0' - groundwater encountered during drilling
15				20 15		
16	SS-7	SS	10"	2 50/4"	16.0' - Same as above, wet. 16.21' - Silty SAND (SM), Red-Brown - (7.5 YR 4/3), moist, fine to medium grained sand (HB COPR)	DPC+ SS refusal encountered; Advanced the hole to 18.0' bgs, using 3" OD sonic macro core
17	S-8	sonic macro core	12"	–	Same as above, green-yellow particles	DPC+
18						

ch2m

PROJECT NUMBER: 10587 **BORING NUMBER:** BRP-10
Sheet: 4

SOIL BORING LOG

PROJECT:
LOCATION:
ELEVATION:
DRILLING CONTRACTOR:
DRILLING METHOD AND EQUIPMENT:
WATER LEVELS:
START:
FINISH: 4:15
LOGGER:

DEPTH BELOW (ft)	SAMPLE			STANDARD PENETRATION TEST RESULTS	SOIL DESCRIPTION	COMMENTS
	NUMBER	TYPE	RECOVERY (ft)	6" - 6" - 6" (N)	SOIL NAME, USCS GROUP SYMBOL, COLOR, MOISTURE CONTENT, RELATIVE DENSITY OR CONSISTENCY, SOIL STRUCTURE, MINERALOGY	DEPTH OF CASING, DRILLING RATE, DRILLING FLUID LOSS, TESTS AND INTRUMENTATION
18	SS-9	SS	12"	20 27	18.0'- Poorly graded sand with silt (SP-SM), gray-black (N2), wet, medium to coarse grained sand, particulate. (GB COPR), green and gray seams.	DPC+
19	ss-10	SS	6"	12	19.0'- Silty sand (SM), Red-Brown (10YR 4/6), wet, fine to medium grained sand, particulate (COPR and non-COPR)	DPC +/-
	SS-11	SS	6"	17	same as above	DPC +/_
20	SS-12	3" Sampler	4"	7	20.0-20.5' loose gray black to brown M-C sand GB COPR	20.0'- 6" OD Outer casing installed to 20.0' bgs DPC+/-
	SS-13	3" Sampler	6"	4	20.5-21' loose wet Red mottled with white medium plasticity Fat clay (CH)	DPC – none
21					1" PVC installed to 21 depth	Bore hole terminated @ 21'
					1 Vwp installed at 20 1518424	Vwp Air T_0 16.1 P_0 9734 Dgtn T_1 17 P_1 9500 Slurry T_2 20.2 P_2 8432
					1 thermistor installed at 16', interface of HB & GB COPR	
					Thermometer Air temp = 16.2	
					thermistor Air Dgtn Slurry 17.9	

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BORING NO. BRP-10
SHEET 6 OF 6
FILE NO. 10587
SURFACE ELEV.
DATUM

PROJECT DUNDALK MARINE TERMINAL
LOCATION BALTIMORE, MARYLAND
BORING LOCATION See location Plan

TEST/INSPECTION EQUIPMENT Sonic Samp Drill Max 170; SPT Sampling
REFERENCE CODES/STANDARDS

BORING EQUIPMENT AND METHODS OF STABILIZING BOREHOLE

TYPE OF BORING RIG
TRUCK
SKID
BARGE
OTHER Truck

TYPE OF FEED DURING CORING
MECHANICAL
HYDRAULIC
OTHER

CASING USED ☑ YES ☐ NO
DIA., IN. 6" DEPTH, FT. FROM 0 TO 21
DIA., IN. DEPTH, FT. FROM TO
DIA., IN. DEPTH, FT. FROM TO

TYPE AND SIZE OF:
D-SAMPLER
U-SAMPLER
S-SAMPLER SS-Sampler ; 3" Diam Sampler
CORE BARREL
CORE BIT
DRILL RODS 3" ID Sonic Macrocore

DRILLING MUD USED ☐ YES ☑ NO
DIAMETER OF ROTARY BIT, IN.
TYPE OF DRILLING MUD

AUGER USED ☐ YES ☑ NO
TYPE AND DIAMETER, IN.

CASING HAMMER, LBS. AVERAGE FALL, IN.
SAMPLER HAMMER, LBS. 140 AVERAGE FALL, IN. 30
TYPE OF HAMMER Automatic

WATER LEVEL OBSERVATIONS IN BOREHOLE

DATE	TIME	DEPTH OF HOLE	DEPTH OF CASING	DEPTH TO WATER	CONDITIONS OF OBSERVATION

PIEZOMETER INSTALLED ☑ YES ☐ NO SKETCH SHOWN ON Pg 5/6

STANDPIPE: TYPE ID, IN. LENGTH, FT. TOP ELEV.
INTAKE ELEMENT: TYPE OD, IN. LENGTH, FT. TIP ELEV.
FILTER MATERIAL OD, IN. LENGTH, FT. BOT. ELEV.

PAY QUANTITIES

3.5" DIA. DRY SAMPLE BORING LIN. FT.
3.5" DIA. U-SAMPLE BORING LIN. FT.
CORE DRILLING IN ROCK LIN. FT.
NO. OF 3" SHELBY TUBE SAMPLES
NO. OF 3" UNDISTURBED SAMPLES
OTHER:

BORING CONTRACTOR Aquifer Drilling and Testing
DRILLER Tony Palomeque HELPERS Joseph Arroyo
REMARKS 1vwp & 1 thermistor installed
RESIDENT ENGINEER Mark Chaney DATE 12-10-15

BORING NO. BRP-10

ch2m:

PROJECT NUMBER: BORING NUMBER: BRP-26
Sheet: 1

SOIL BORING LOG

PROJECT: Honeywell DHT SSI
LOCATION:
ELEVATION:
DRILLING CONTRACTOR: Aquifer drilling and testing Inc.
DRILLING METHOD AND EQUIPMENT: Sonic Samp Drill max 170; SPT Sampling
WATER LEVELS:
START: 11/14/15 14:00
FINISH: 11/15/15 08:00
LOGGER: K. Chaturvedula

DEPTH BELOW (ft)	SAMPLE			STANDARD PENETRATION TEST RESULTS	SOIL DESCRIPTION	COMMENTS
	NUMBER	TYPE	RECOVERY (ft)	6" - 6" - 6" (N)	SOIL NAME, USCS GROUP SYMBOL, COLOR, MOISTURE CONTENT, RELATIVE DENSITY OR CONSISTENCY, SOIL STRUCTURE, MINERALOGY	DEPTH OF CASING, DRILLING RATE, DRILLING FLUID LOSS, TESTS AND INTRUMENTATION
0					3-4" Asphalt Poorly graded SAND with gravel (GP) gray (GLEY 1 4/10Y), dry, pieces of Asphalt. Road based aggregate?	Advanced the hole from 0'-10' using 2"OD sonic macro core DPc -
1	S-1	SONIC MACRO CORE	36"			DPc-
2						
3					3.0' - woven geotextile 3.0'-4.0' - silty SAND with gravel (SM), dark brown-gray (2.5Y 5/4), moist fine to medium grained sand	DPr -
4					4.0'-6.0' - Same as above	
5	S2	SONIC MACRO CORE	36"			
6					6.0' - Polyethylene liner	

ch2m

PROJECT NUMBER:

BORING NUMBER: BRP-26
Sheet: 2

SOIL BORING LOG

PROJECT:
LOCATION:
ELEVATION:
DRILLING CONTRACTOR:
DRILLING METHOD AND EQUIPMENT:
WATER LEVELS:
START:
FINISH:
LOGGER:

DEPTH BELOW (ft)	SAMPLE NUMBER	SAMPLE TYPE	SAMPLE RECOVERY (ft)	STANDARD PENETRATION TEST RESULTS 6" - 6" - 6" (N)	SOIL DESCRIPTION: SOIL NAME, USCS GROUP SYMBOL, COLOR, MOISTURE CONTENT, RELATIVE DENSITY OR CONSISTENCY, SOIL STRUCTURE, MINERALOGY	COMMENTS: DEPTH OF CASING, DRILLING RATE, DRILLING FLUID LOSS, TESTS AND INTRUMENTATION
6	S-2			–	6.0' - Poorly graded SAND (SP) mixed with crushed asphalt, dark gray-black (N2), dry	DPC -
7					7.0' 9.75' - same as above.	DPC -
8	S-3	SONIC MACRO CORE	36"			
9					9.0' - decrease in Asphalt content	DPC -
					9.75' - Fat CLAY (CH), Red (10R 4/4), moist, highly plastic, very stiff	DPC - 10.0'. 6" OD outer casing installed to a depth of 10 bgs
10				9	10.0' - Poorly graded SAND with gravel (SP), dark gray black (N7), dry, Road based aggregate	10.5' - Below 10' switched to SS sampling; 140-lb hammer; 30-in. drop; 3" dia sampler. DPC -
	SS-4	SS	24"	8		
11				14	11.0' - Clayey SAND (SC), Red-white (10Y 4/4), moist, fine to medium grained sand	DPC -
				25		
12						

ch2m

PROJECT NUMBER:

BORING NUMBER: BRP-26

Sheet: 3

SOIL BORING LOG

PROJECT:

LOCATION:

ELEVATION:

DRILLING CONTRACTOR:

DRILLING METHOD AND EQUIPMENT:

WATER LEVELS:

START:

FINISH:

LOGGER:

DEPTH BELOW (ft)	SAMPLE			STANDARD PENETRATION TEST RESULTS	SOIL DESCRIPTION	COMMENTS
	NUMBER	TYPE	RECOVERY (ft)	6" - 6" - 6" (N)	SOIL NAME, USCS GROUP SYMBOL, COLOR, MOISTURE CONTENT, RELATIVE DENSITY OR CONSISTENCY, SOIL STRUCTURE, MINERALOGY	DEPTH OF CASING, DRILLING RATE, DRILLING FLUID LOSS, TESTS AND INTRUMENTATION
12	SS-5	SS	9"	16 50/3"	Silty SAND (SM), greenish-brown (7.5Y 4/3), dry, particulate (COPR)	DPC + 12.75' - spoon bouncing Advanced to 14.0' bgs with 3" ID sonic macro core
13	S-6	Sonic macro core	15"	-	~~GRA~~ same as above, Reddish-Brown and green (7.5Y 5/4), particulate to moderately indurated, laminated (HB COPR)	DPC +
14	SS-7	SS/ sonic macro core	NR / 12"	50/1"	Same as above	14.0' - spoon bouncing Advanced to 15.0' bgs with 3" ID sonic macro core.
15	SS-8	SS/ sonic macro core	NR/ 24"	50/3"	15.0' - 16.5' - Same as above	15.0' - spoon bouncing Advanced to 17.0' bgs with sonic macro core
16					16.5' - Poorly graded SAND with silt (SP-SM), dark gray-black (N2), moist, medium grained sand, particulate (GB COPR)	DPC +
17	SS-9	SS	NR	12	No Recovery	
	SS-10	SS	4"	36	17.5' - silty SAND (SM), brown-green (7.5YR 4/3), dry, particulate (COPR)	DPC +
18						

ch2m.

PROJECT NUMBER:

BORING NUMBER: BRP-26
Sheet: 4

SOIL BORING LOG

PROJECT:
LOCATION:
ELEVATION:
DRILLING CONTRACTOR:
DRILLING METHOD AND EQUIPMENT:
WATER LEVELS:
START:
FINISH:
LOGGER:

DEPTH BELOW (ft)	SAMPLE			STANDARD PENETRATION TEST RESULTS	SOIL DESCRIPTION	COMMENTS
	NUMBER	TYPE	RECOVERY (ft)	6" - 6" - 6" (N)	SOIL NAME, USCS GROUP SYMBOL, COLOR, MOISTURE CONTENT, RELATIVE DENSITY OR CONSISTENCY, SOIL STRUCTURE, MINERALOGY	DEPTH OF CASING, DRILLING RATE, DRILLING FLUID LOSS, TESTS AND INTRUMENTATION
18	SS-11	SS	1"	21	Same as above	
	SS-12	SS	4"	19	Poorly graded SAND with silt (SP-SM), dark gray-green (2.5Y4/3), wet, particulate (GB COPE)	DPC +
19	SS-13	SS	6"	13	Same as above, wet	
	SS-14	SS	4"	11	Same as above, wet	20.0' - water encountered during drilling.
20	SS-15	SS	4"	9	Same as above	
	SS-16	SS	6"	9	Same as above	
21	SS-17	SS	6"	10	Same as above	DPC +
	SS-18	SS	6"	25	Same as above	DPC +
22	SS-19	SS	6"	9	Same as above	22.1' - 6" OD outer casing advanced to 20.0' bgs
	SS-20	SS	6"	11	Same as above	DPC +
23	SS-21	SS	6"	15	Same as above, ~~with~~ contains gravel	DPC +
	SS-22	SS	6"	33	Same as above, contains gravel	DPC +

ch2m:

PROJECT NUMBER:

BORING NUMBER: BRP-26
Sheet: 5

SOIL BORING LOG

PROJECT:
LOCATION:
ELEVATION:
DRILLING CONTRACTOR:
DRILLING METHOD AND EQUIPMENT:
WATER LEVELS:
START:
FINISH:
LOGGER:

DEPTH BELOW (ft)	SAMPLE			STANDARD PENETRATION TEST RESULTS	SOIL DESCRIPTION	COMMENTS
	NUMBER	TYPE	RECOVERY (ft)	6" - 6" - 6" (N)	SOIL NAME, USCS GROUP SYMBOL, COLOR, MOISTURE CONTENT, RELATIVE DENSITY OR CONSISTENCY, SOIL STRUCTURE, MINERALOGY	DEPTH OF CASING, DRILLING RATE, DRILLING FLUID LOSS, TESTS AND INTRUMENTATION
24	SS-23	SS	6"	27	Same as above;	DPC + - 17:30 11/14/15 - stopped work. Resumed drilling on 11/17/15
	SS-24	SS	6"	33	Poorly graded sand with gravel (GP), brown-gray (5YR 4/3), wet, medium to coarse grained sand,	DPC -
25	SS-25	SS	6"	14	same as above	25.5' Advanced the 6" OD outer casing to a depth of 25' bgs.
					Bottom of boring at 25.5' bgs	
26						

ch2m

PROJECT NUMBER: 10587 BORING NUMBER: BRP-34
Sheet: 1/7

SOIL BORING LOG

PROJECT: Dundalk Marine Terminal
LOCATION: Baltimore, Maryland
ELEVATION: ~+25
DRILLING CONTRACTOR: ADT
DRILLING METHOD AND EQUIPMENT: Fraste Multi' Drill Max 170; Sonic Sampling
WATER LEVELS:
START: 0745
FINISH:
LOGGER: Mark Chancy

DEPTH BELOW (ft)	SAMPLE			STANDARD PENETRATION TEST RESULTS	SOIL DESCRIPTION	COMMENTS
	NUMBER	TYPE	RECOVERY (ft)	6" - 6" - 6" (N)	SOIL NAME, USCS GROUP SYMBOL, COLOR, MOISTURE CONTENT, RELATIVE DENSITY OR CONSISTENCY, SOIL STRUCTURE, MINERALOGY	DEPTH OF CASING, DRILLING RATE, DRILLING FLUID LOSS, TESTS AND INTRUMENTATION
0	S-1	3" Sonic	2.5'	NA	Road base/Asphalt	15 mins stand by time needed to test 1 VWP DPC – none
1						
2						
					2.5'-4.0' Dry Red brown f-C silty sand trace gravel (SM)	DPC – none
3						
4	S-2	3" Sonic	4'		4-6.0 Dry Red brown with orange particles f-M silty sand trace gravel, trace clay (SM-CL)	DPC – none
5						
6						

ch2m

PROJECT NUMBER: 10587 BORING NUMBER: BRP-34
Sheet: 2/7

SOIL BORING LOG

PROJECT: Dundalk Marine Terminal LOCATION: Baltimore, Maryland
ELEVATION: ~+25 DRILLING CONTRACTOR: ADT
DRILLING METHOD AND EQUIPMENT: Fraste Multi' Drill Max 170; Sonic Sampling
WATER LEVELS: START: FINISH: LOGGER: Mark Chancy

DEPTH BELOW (ft)	SAMPLE			STANDARD PENETRATION TEST RESULTS	SOIL DESCRIPTION	COMMENTS
	NUMBER	TYPE	RECOVERY (ft)	6" - 6" - 6" (N)	SOIL NAME, USCS GROUP SYMBOL, COLOR, MOISTURE CONTENT, RELATIVE DENSITY OR CONSISTENCY, SOIL STRUCTURE, MINERALOGY	DEPTH OF CASING, DRILLING RATE, DRILLING FLUID LOSS, TESTS AND INTRUMENTATION
6	S-2	3" Sonic	4'	NA	6.0-7.0 Road base/Asphalt	geo membrane @ 6.' DPC - none
7	S-3				7.0-8.0 Dry brown f-m silty sand trace gravel (SM)	DPC-none
8					8.0-8.5 Road base/asphalt	DPC - none
					8.5-9.5 Brown f-c sand trace gravel, silt (SM)	DPC-none
9					9.5-10 Dry red mottled with white Fat clay (CH)	DPC - none PP = 2.75
10	SS-1	2" OD Sampler	1'3"	5 - 12 100/4	10'-11' Dry mottled with white Fat clay (CH) (Hard)	DPC - none PP = 3.75
11					11-11'4" Dry very dense red brown highly indurated f-m silty sand, trace grave (SM)	DPC + strong refusal @11'4" advanced with sonic to 12'
	S-4	3" Sonic	2'	NA	11'4"-12' Dry very dense red brown highly indurated f-M silty sand trace grave (SM)(HB)	DPC + Strong
12						

ch2m:

PROJECT NUMBER: 10587 BORING NUMBER: BRP-34
Sheet: 3/7

SOIL BORING LOG

PROJECT: Dundalk Marine Terminal LOCATION: Baltimore, Maryland
ELEVATION: ~+25 DRILLING CONTRACTOR: ADT
DRILLING METHOD AND EQUIPMENT: Fraste Multi Drill Max 170; Sonic Sampling
WATER LEVELS: START: FINISH: LOGGER: Mark Chancy

DEPTH BELOW (ft)	SAMPLE			STANDARD PENETRATION TEST RESULTS	SOIL DESCRIPTION	COMMENTS
	NUMBER	TYPE	RECOVERY (ft)	6" - 6" - 6" (N)	SOIL NAME, USCS GROUP SYMBOL, COLOR, MOISTURE CONTENT, RELATIVE DENSITY OR CONSISTENCY, SOIL STRUCTURE, MINERALOGY	DEPTH OF CASING, DRILLING RATE, DRILLING FLUID LOSS, TESTS AND INTRUMENTATION
12	SS-2	2" OD sampler	0	100/5	12'	No sample in spoon
	S-5	3" Sonic	1'	NA	12'5"-13' Same as S-4 (HB)	DPC++ very strong
13	SS-3	2" OD sampler	8"	100/3"	13'-13'3" Dry Very dense red f-m silty sand (SM)(HB) with orange+black particles Highly indurated	DPC++ very strong refusal at 13'3" advanced w/sonic to 14
	S-6	3" sonic	1'	NA	13'3"-14 Same as S-5 (HB)	DPC+ strong
14	SS-4	2" OD sampler	8"	100/4"	14'-14'4" Same as SS-3 (HB)	DPC+ Strong refusal @ 14'4" advanced to 15 w/sonic
	S-7	3" sonic	1'	NA	14'4"-15' Dry red to grayish black f-m silty sand trace gravel (HB) and (GB) intermingled	DPC++
15	SS-5	3" OD sampler	1"	100/1"	15.0' - Silty SAND (SM), Red-Brown (7.5YR 4/3), dry, slightly to moderately indurated, (HB CORE)	DPC+ (SS refusal: Advanced the hole to 16' bgs using 3" ID Sonic macro core.
	S-8	3" Sonic	12"	NA	Same as above	
16	SS-6	2" OD Sampler	1"	50/3"	Same as above, 1'	16.0' - SS refusal; Advanced the hole to 17' bgs using 3" ID sonic macro core
	S-9	3" sonic	2"	NA	Same as above	
17	SS-7	2" OD Sampler	5"	50/5"	17.0' - Poorly graded SAND with silt (SP-SM), dark gray-black (N2), wet, particulate, coarse grained sand, (GB CORE)	17.0' - SS refusal; Advanced the hole to 18' bgs using 3" ID sonic macro core
	S-10	3" sonic	8"	NA	Same as above	17.0' - groundwater encountered during drilling. DPC+
18						

ch2m.

PROJECT NUMBER: 10587 **BORING NUMBER:** BRP-34
Sheet: 4/7

SOIL BORING LOG

PROJECT: Dundalk Marine Terminal **LOCATION:** Baltimore, Maryland
ELEVATION: ~ +25 **DRILLING CONTRACTOR:** ADT
DRILLING METHOD AND EQUIPMENT: Fraste Multi Drill Max 170; Sonic Sampling
WATER LEVELS: **START:** **FINISH:** 12:30 **LOGGER:** Mark Chancy

DEPTH BELOW (ft)	SAMPLE			STANDARD PENETRATION TEST RESULTS	SOIL DESCRIPTION	COMMENTS
	NUMBER	TYPE	RECOVERY (ft)	6" - 6" - 6" (N)	SOIL NAME, USCS GROUP SYMBOL, COLOR, MOISTURE CONTENT, RELATIVE DENSITY OR CONSISTENCY, SOIL STRUCTURE, MINERALOGY	DEPTH OF CASING, DRILLING RATE, DRILLING FLUID LOSS, TESTS AND INTRUMENTATION
18	SS-8	2" OD sample	6"	47	18.0'- Silty SAND (SM), Red-Brown-gray (7.5YR 4/3), moist, fine to medium grained sand, particulate (COPR)	DPC +
	SS-9	2" OD sample	6"	24	Same as above	DPC+
19	SS-10	2" OD sample	3"	50/3"	Same as above	19.0' -SS refusal; Advanced 3" OD Sonic macro core to 20.0' bgs.
	S-11	3" Sonic	2'	NA	19.5'-20' Red brown f-m silty sand, moderately indurated (HB)(SM)	DPC + Strong
20	SS-11	2" OD Sampler	3"	50/3"	20'-20'3" Wet very dense red brown moderately indurated f-M silty sand, (SM) (HB)	DPC + strong refusal @ 20'3" advanced w/sonic to 21'
	S-12	3" Sonic	1'	NA	20'3"-21' Dry red brown moderately indurated f-M silty sand, trace gravel (SM) (HB)	DPC + strong
21	SS-12	2" OD Sampler	10"	22	21'-21'6" Moist very stiff Red mottled with white Fat clay CH	DPC 6" OD casing to 21' PP= 4.5 tsf 2" standpipe installed Two thermistors installed
22					Thermanoter air temp 13.5°	T_2 @ 14 $\frac{1}{3}$ through COPR
				T_2	Thermistor Air temp 14.6° 2) Slurry temp 22.7	T_1 @ 17' interface of GB & HB
23						
				T_1	Thermistor 14.0° 2) 19.1	
24						

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BORING NO. BRP-34
SHEET 7 **OF** 7
FILE NO. 10587
SURFACE ELEV. ~+25
DATUM

PROJECT Dundalk Marine Terminal
LOCATION Baltimore, Maryland
BORING LOCATION See location Plan

TEST/INSPECTION EQUIPMENT Sonic Samp Drill Max 170; SPT Sampling
REFERENCE CODES/STANDARDS

BORING EQUIPMENT AND METHODS OF STABILIZING BOREHOLE

TYPE OF BORING RIG
TRUCK
SKID
BARGE
OTHER Track

TYPE OF FEED DURING CORING
MECHANICAL
HYDRAULIC
OTHER

CASING USED ☑ YES ☐ NO
DIA., IN. 6" DEPTH, FT. FROM 0 TO 21'
DIA., IN. DEPTH, FT. FROM TO
DIA., IN. DEPTH, FT. FROM TO

TYPE AND SIZE OF:
D-SAMPLER
U-SAMPLER
S-SAMPLER SS-Sampler: 2" Dia Sampler
CORE BARREL
CORE BIT
DRILL RODS
3" ID Sonic Macrocore

DRILLING MUD USED ☐ YES ☑ NO
DIAMETER OF ROTARY BIT, IN.
TYPE OF DRILLING MUD

AUGER USED ☐ YES ☑ NO
TYPE AND DIAMETER, IN.

CASING HAMMER, LBS. AVERAGE FALL, IN.
SAMPLER HAMMER, LBS. 140 AVERAGE FALL, IN. 30
TYPE OF HAMMER Automatic

WATER LEVEL OBSERVATIONS IN BOREHOLE

DATE	TIME	DEPTH OF HOLE	DEPTH OF CASING	DEPTH TO WATER	CONDITIONS OF OBSERVATION

PIEZOMETER INSTALLED ☐ YES ☐ NO SKETCH SHOWN ON

STANDPIPE: TYPE ID, IN. LENGTH, FT. TOP ELEV.
INTAKE ELEMENT: TYPE OD, IN. LENGTH, FT. TIP ELEV.
FILTER: MATERIAL OD, IN. LENGTH, FT. BOT. ELEV.

PAY QUANTITIES

3.5" DIA. DRY SAMPLE BORING LIN. FT.
3.5" DIA. U-SAMPLE BORING LIN. FT.
CORE DRILLING IN ROCK LIN. FT.
NO. OF 3" SHELBY TUBE SAMPLES
NO. OF 3" UNDISTURBED SAMPLES
OTHER:

BORING CONTRACTOR Aquifer Drilling and Testing
DRILLER Tony Palomeque HELPERS Joseph Arroyo
REMARKS 2 thermistors installed
RESIDENT ENGINEER Mark Cheng DATE 12-9-15

BORING NO. BRP-34

ch2m

PROJECT NUMBER:

BORING NUMBER: BRP-35

Sheet: 1

SOIL BORING LOG

PROJECT: Honeywell DMT SSI

LOCATION:

ELEVATION:

DRILLING CONTRACTOR: Aquifer Drilling and testing, Inc.

DRILLING METHOD AND EQUIPMENT: SONIC SAMP DRILL MAK 170; SPT sampling

WATER LEVELS:

START: 11/13/15 8:45

FINISH: 11/13/15 11:50

LOGGER: K.Chaturvedula

DEPTH BELOW (ft)	SAMPLE			STANDARD PENETRATION TEST RESULTS	SOIL DESCRIPTION	COMMENTS
	NUMBER	TYPE	RECOVERY (ft)	6" - 6" - 6" (N)	SOIL NAME, USCS GROUP SYMBOL, COLOR, MOISTURE CONTENT, RELATIVE DENSITY OR CONSISTENCY, SOIL STRUCTURE, MINERALOGY	DEPTH OF CASING, DRILLING RATE, DRILLING FLUID LOSS, TESTS AND INTRUMENTATION
0					3" Asphalt 0.25'-1.5'- Poorly graded sand (SP), light gray (GLEY 1 7/10Y), dry, alternating layers of Asphalt and sand	Advanced from 0'-10' with 3" ID sonic macro core DPC -
1	S-1	Sonic MACRO CORE	48"	-	1.5'-4.0'- Silty SAND with gravel (SM), gray-Brown (2.5Y 5/4), moist, fine to medium grained sand	DPC -
2						DPC -
3						3.0'- ground water observed on the outside of the macro core
4					4.0'-5.0'- Same as above	DPC -
5	S-2	SONIC MACRO CORE	36"		5.0'- Polyethylene layer encountered 5.0'-6.0'- Poorly graded sand with gravel (SP), Red-white (2.5YR 6/6), moist, medium grained sand	DPC-
6						

ch2m:

PROJECT NUMBER:

BORING NUMBER: BRP-35

Sheet: 2

SOIL BORING LOG

PROJECT:

LOCATION:

ELEVATION:

DRILLING CONTRACTOR:

DRILLING METHOD AND EQUIPMENT:

WATER LEVELS:

START:

FINISH:

LOGGER:

DEPTH BELOW (ft)	SAMPLE			STANDARD PENETRATION TEST RESULTS	SOIL DESCRIPTION	COMMENTS
	NUMBER	TYPE	RECOVERY (ft)	6" - 6" - 6" (N)	SOIL NAME, USCS GROUP SYMBOL, COLOR, MOISTURE CONTENT, RELATIVE DENSITY OR CONSISTENCY, SOIL STRUCTURE, MINERALOGY	DEPTH OF CASING, DRILLING RATE, DRILLING FLUID LOSS, TESTS AND INTRUMENTATION
6					6.0'-7.0'- Alternating layers of Asphalt and Poorly graded sand with gravel (SP), gray (GLEY 1, 7/10Y), dry	DPC-
	S-2	〃				
7					7.0'-9.6' - Silty SAND with gravel (SM), gray-brown (2.5Y 5/4), wet, fine to medium grained sand	DPC-
8	S-3	SONIC MACRO CORE	36"			
9						
					9.6'-10.0' lean CLAY (CL), Red (10Y 4/4), moist, medium plasticity	DPC—
10						10.0' - Switched to SS sampling below 10'; 140-lb hammer; 30-in drop; 3" dia. sampler. Installed the 6" OD outer casing to a depth of 10' bgs DPC+
	SS-4	SS	18"	5 15 100 50/6"	10.0' - Silty SAND (SM), Red-Brown (7.5YR 5/6), dry, slightly indurated, (HB COPR)	
11						
12						Advanced the hole to 13' bgs with 3" ID Sonic macro core

ch2m:

PROJECT NUMBER:

BORING NUMBER: BRP-35
Sheet: 3

SOIL BORING LOG

PROJECT:
ELEVATION:
DRILLING METHOD AND EQUIPMENT:
WATER LEVELS:
LOCATION:
DRILLING CONTRACTOR:
START:
FINISH:
LOGGER:

DEPTH BELOW (ft)	SAMPLE			STANDARD PENETRATION TEST RESULTS	SOIL DESCRIPTION	COMMENTS
	NUMBER	TYPE	RECOVERY (ft)	6" - 6" - 6" (N)	SOIL NAME, USCS GROUP SYMBOL, COLOR, MOISTURE CONTENT, RELATIVE DENSITY OR CONSISTENCY, SOIL STRUCTURE, MINERALOGY	DEPTH OF CASING, DRILLING RATE, DRILLING FLUID LOSS, TESTS AND INTRUMENTATION
12	S-5	Sonic Macro Core	24"	-	same as above, dry, particulate	DPC +
13						
14					14.0 - 14.5' - same as above	
	SS-6	SS	24"	25 34 30 78	14.5' - 15.5' - Poorly graded SAND with silt (SP-SM), dark gray-black (N2), wet, particulate, bright green particles (GB COPR)	DPC +2
15					15.5' - Silty SAND (SM), Red-Brown greenish (7.5YR 5/6), moist, particulate to slightly indurated, laminated (HB COPR)	DPC +
16	SS-7	SS	2"	50/2"	same as above, wet	16.1' - Advanced the 6" OD outer casing to 15' bgs - Advanced the hole to 17' bgs with 3" ID sonic macro core
17	SS-8	SS	6"	35	same as above, wet	
	SS-9	SS	2"	12	same as above, wet	
18						

ch2m:

PROJECT NUMBER:

BORING NUMBER: BRP-35
Sheet: 4

SOIL BORING LOG

PROJECT:
LOCATION:
ELEVATION:
DRILLING CONTRACTOR:
DRILLING METHOD AND EQUIPMENT:
WATER LEVELS:
START:
FINISH:
LOGGER:

DEPTH BELOW (ft)	SAMPLE			STANDARD PENETRATION TEST RESULTS	SOIL DESCRIPTION	COMMENTS
	NUMBER	TYPE	RECOVERY (ft)	6" - 6" - 6" (N)	SOIL NAME, USCS GROUP SYMBOL, COLOR, MOISTURE CONTENT, RELATIVE DENSITY OR CONSISTENCY, SOIL STRUCTURE, MINERALOGY	DEPTH OF CASING, DRILLING RATE, DRILLING FLUID LOSS, TESTS AND INTRUMENTATION
18	SS-10	SS	6"	71	Same as above, greenish particles	DPC ++
	SS-11	SS	6"	42	15.5' - Poorly graded sand with silt (SP-SM), dark gray-black (N2), wet, particulate (AB CORE)	DPC ++
19	SS-12	SS	3"	62/3"	Same as above	DPC +
	S-13	sonic macro core	6"	-	Same as above	Advanced the 3" OD sonic macro core to 20.0' bgs.
20					19.9' - Fat clay (CH), Red (10Y 4/4), wet, highly plastic	DPC -
					Bottom of boring @ 20.0' bgs.	6" OD outer casing advanced to 20.0' bgs
21						
22						
23						
24						

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BORING NO. BRP-35
SHEET 5 OF
FILE NO. 10587
SURFACE ELEV.
DATUM

PROJECT DUNDALK MARINE TERMINAL
LOCATION BALTIMORE, MARYLAND
BORING LOCATION

TEST/INSPECTION EQUIPMENT Sonic Samp Drill Max 170; SPT sampling
REFERENCE CODES/STANDARDS

BORING EQUIPMENT AND METHODS OF STABILIZING BOREHOLE

TYPE OF BORING RIG
TRUCK
SKID
BARGE
OTHER Track

TYPE OF FEED DURING CORING
MECHANICAL
HYDRAULIC
OTHER

CASING USED ☑ YES ☐ NO
DIA., IN. 6" OD DEPTH, FT. FROM 0 TO 20
DIA., IN. DEPTH, FT. FROM TO
DIA., IN. DEPTH, FT. FROM TO

TYPE AND SIZE OF:
D-SAMPLER
U-SAMPLER
S-SAMPLER SS Sampling - 3" dia.
CORE BARREL
CORE BIT
DRILL RODS
3" ID Sonic Macro Core

DRILLING MUD USED ☐ YES ☑ NO
DIAMETER OF ROTARY BIT, IN.
TYPE OF DRILLING MUD

AUGER USED ☐ YES ☑ NO
TYPE AND DIAMETER, IN.

CASING HAMMER, LBS. AVERAGE FALL, IN.
SAMPLER HAMMER, LBS. 140 AVERAGE FALL, IN. 30
TYPE OF HAMMER Automatic

WATER LEVEL OBSERVATIONS IN BOREHOLE

DATE	TIME	DEPTH OF HOLE	DEPTH OF CASING	DEPTH TO WATER	CONDITIONS OF OBSERVATION

PIEZOMETER INSTALLED ☑ YES ☐ NO SKETCH SHOWN ON See Standpipe log

STANDPIPE: TYPE ID, IN. LENGTH, FT. TOP ELEV.
INTAKE ELEMENT: TYPE OD, IN. LENGTH, FT. TIP ELEV.
FILTER: MATERIAL OD, IN. LENGTH, FT. BOT. ELEV.

PAY QUANTITIES
3.5" DIA. DRY SAMPLE BORING LIN. FT.
3.5" DIA. U-SAMPLE BORING LIN. FT.
CORE DRILLING IN ROCK LIN. FT.
NO. OF 3" SHELBY TUBE SAMPLES
NO. OF 3" UNDISTURBED SAMPLES
OTHER:

BORING CONTRACTOR Aquifer Drilling and Testing, Inc.
DRILLER Brian Karshick HELPERS Chris Phelan
REMARKS
RESIDENT ENGINEER K. Chaturvedula DATE 11/13/15

BOR-4_JAN2013

BORING NO. BRP-35

CH2MHILL

PROJECT NUMBER	BORING NUMBER	SHEET	OF
10587	BRP 37	1	7

SOIL BORING LOG

12-2-15

PROJECT Dundalk Marine Terminal LOCATION Baltimore, Maryland

ELEVATION ~23 DRILLING CONTRACTOR ADT

DRILLING METHOD AND EQUIPMENT Sonic Samp Drill MAX 170, SPT sampling

WATER LEVELS START 220 FINISH LOGGER M Chancy

DEPTH BELOW SURFACE (FT)	SAMPLE INTERVAL	SAMPLE NUMBER AND TYPE	SAMPLE RECOVERY (FT)	STANDARD PENETRATION TEST RESULTS 6"-6"-6" (N)	SOIL DESCRIPTION SOIL NAME, USCS GROUP SYMBOL, COLOR, MOISTURE CONTENT, RELATIVE DENSITY OR CONSISTENCY, SOIL STRUCTURE, MINERALOGY	COMMENTS DEPTH OF CASING, DRILLING RATE, DRILLING FLUID LOSS, TESTS AND INSTRUMENTATION
0	S-1	3" sonic			Asphalt/Road base	Sample under pressure
1			NA			
2				NA		
3						
4					4'-4'8" f-m Red brown siltysand, trace gravel, clay	
	S2	3" Sonic	3'	NA	4'8"-5'3" Black gravel asphalt/Road base	Geomembrane
5						
					5'3	
6						

(8.30)

REV 12/01 FORM D1586

PROJECT NUMBER: 10587 **BORING NUMBER:** BRP37
Sheet: 2/7

SOIL BORING LOG

PROJECT: Dundalk Marine Terminal LOCATION: Baltimore, MD
ELEVATION: ~+23 DRILLING CONTRACTOR: ADT
DRILLING METHOD AND EQUIPMENT: Sonic Samp Drill Max 170; SPT sampling
WATER LEVELS: START: FINISH: LOGGER: Mark Chancy

DEPTH BELOW (ft)	SAMPLE			STANDARD PENETRATION TEST RESULTS	SOIL DESCRIPTION	COMMENTS
	NUMBER	TYPE	RECOVERY (ft)	6" - 6" - 6" (N)	SOIL NAME, USCS GROUP SYMBOL, COLOR, MOISTURE CONTENT, RELATIVE DENSITY OR CONSISTENCY, SOIL STRUCTURE, MINERALOGY	DEPTH OF CASING, DRILLING RATE, DRILLING FLUID LOSS, TESTS AND INTRUMENTATION
6	S-2	3" Sonic	3'		Asphalt road base	S-2 photo not taken
7	S-3	3" Sonic			7-7'8" light brown f-M silty sand, trace gravel	DPC –
					7'8"-8'4" Black wel graded gravel f-c sand asphalt	
8						~~S-3 photo not taken~~
					8'4"-9'6" Red brown silty f-c sand with green & orange seams some gravel	
9					9'6"-10' Brown f-M sand trace gravel, clay	Geosynthetic Membrane @ 10'
10	SS-1	3" OD SS	20"	12-15 34 2/1.6	8" Top 12" Mod-highly indurated grayish white fine to medium sand, Some gravel	DPC –
					Bott 12 ~~clay~~ Red Clay mottled with green Orange particles Liner	DPC –
11						
12	S-4		2'		11'8"-13 Red brown f-M sand with gravel (HB)	Sonic from 11'8"–13' DPC +

ch2m

PROJECT NUMBER: 10587 **BORING NUMBER:** BRP 37
Sheet: 3/7

SOIL BORING LOG

PROJECT: Dundalk Marine Terminal **LOCATION:** Baltimore, MD
ELEVATION: ~+23 **DRILLING CONTRACTOR:** ADT
DRILLING METHOD AND EQUIPMENT: Sonic Samp Drill max 170; SPT sampling
WATER LEVELS: **START:** **FINISH:** **LOGGER:** Mark Chanoy

DEPTH BELOW (ft)	SAMPLE			STANDARD PENETRATION TEST RESULTS	SOIL DESCRIPTION	COMMENTS
	NUMBER	TYPE	RECOVERY (ft)	6" - 6" - 6" (N)	SOIL NAME, USCS GROUP SYMBOL, COLOR, MOISTURE CONTENT, RELATIVE DENSITY OR CONSISTENCY, SOIL STRUCTURE, MINERALOGY	DEPTH OF CASING, DRILLING RATE, DRILLING FLUID LOSS, TESTS AND INTRUMENTATION
12	S4	3" sonic	2'	NA	11'8"-13' Red brown f-M sand with gravel (HB)	DPC+
13	SS-2	3" OD	NO rec	4"/50	No photo	refusal advanced with sonic from 13-14'
	S-5	3" Sonic	1'	NA	13-14' Red f-M sand, trace gravel (HB)	DPC++
14	SS-3	3" OD	21	9-24 43-13	top 10 Red brown Mod to highly indurated f-M silty sand trace gravel (HB) bott 14" Red brown indurated with green + orange speckles f-M silty sand trace gravel (HB)	Top 10" DPC++ Bott 14" DPC+
15					Red brown mod indurated with green + orange particles, trace gravel HB	
16	SS-4	3" OD	10 ~~8~~"	45 4/100	16'-16'10" Highly indurated ~~gre~~ black with 16-16'10" green particles f-M silty sand trace gravel (GB)	DPC+ split spoon ~~sonic~~ from 17'-18'
17	SS-5	3" OD	8"	67 2/100	Highly 17'-17'8" indurated Red brown with orange ~~speckles~~ orange particles HB M-C Sand trace gravel (HB)	DPC+
18	S-6	3" sonic	17"		17'8"-18' Red brown C-f sand trace gravel (HB) trace clay	sonic from 17'8"-18' DPC+

ch2m:

PROJECT NUMBER: 10587 BORING NUMBER: BRP37
Sheet: 4/7

SOIL BORING LOG

PROJECT: Dundalk Marine Terminal LOCATION: Baltimore, MD
ELEVATION: ~+23 DRILLING CONTRACTOR: ADT
DRILLING METHOD AND EQUIPMENT: Sonic Samp Drill Max 170, SPT sampling
WATER LEVELS: START: FINISH: LOGGER: Mark Chaney

DEPTH BELOW (ft)	SAMPLE			STANDARD PENETRATION TEST RESULTS	SOIL DESCRIPTION	COMMENTS
	NUMBER	TYPE	RECOVERY (ft)	6" - 6" - 6" (N)	SOIL NAME, USCS GROUP SYMBOL, COLOR, MOISTURE CONTENT, RELATIVE DENSITY OR CONSISTENCY, SOIL STRUCTURE, MINERALOGY.	DEPTH OF CASING, DRILLING RATE, DRILLING FLUID LOSS, TESTS AND INTRUMENTATION
18					~~Dark Brown~~ Dark Brown same as above	DPC+
	S-17	3" Sonic	1'	NA	Red brown C-M sand with grean particles some gravel (HB)	DPC+
19	~~SS~~-6	3" OD	NO REC	4"/50		refusal @ 19'4" 19.0 advanced with sonic to 20'
	S-18	3" sonic	1.5'	NA	Top 6" Red brown (HB) clayey fm sand trace gravel Bott 1' Red brown f-M sand with gravel (HB)	DPC+ DPC+
20	SS-7	3" OD SS	4"	4/100	Highly indurated Red brown f-C sand some gravel HB	DPC+
	S-9	3" sonic	12"	NA	Red brown f-M sand some gravel HB	advance with sonic to 21 DPC+ Installed 12-3-15 Thermometer 7.9°
21	SS-8	3" OD SS	3"	7	21-21'3" Red Fat Clay Liner	Thermistor T' @ 17' 8.4° Air 19.4 Slurry
22						Thermistor T² @ 14.5' 7.2 Air 19.1 Slurry
23						
24						

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BORING NO. BRP-37
SHEET 7 **OF** 7
FILE NO. 10587
SURFACE ELEV. ~+23
DATUM

PROJECT Dundalk Marine Terminal
LOCATION Baltimore, Maryland
BORING LOCATION See location Plan

TEST/INSPECTION EQUIPMENT Sonic Samp Drill Max 170; SPT sampling
REFERENCE CODES/STANDARDS

BORING EQUIPMENT AND METHODS OF STABILIZING BOREHOLE

TYPE OF BORING RIG
TRUCK
SKID
BARGE
OTHER Track

TYPE OF FEED DURING CORING
MECHANICAL
HYDRAULIC
OTHER

CASING USED ☑ YES ☐ NO
DIA., IN. DEPTH, FT. FROM TO
DIA., IN. DEPTH, FT. FROM TO
DIA., IN. DEPTH, FT. FROM TO

TYPE AND SIZE OF:
D-SAMPLER
U-SAMPLER
S-SAMPLER SS-Sampler; 3" Diam sampler
CORE BARREL
CORE BIT
DRILL RODS 3" ID Sonic Macrocore

DRILLING MUD USED ☐ YES ☑ NO
DIAMETER OF ROTARY BIT, IN.
TYPE OF DRILLING MUD

AUGER USED ☐ YES ☑ NO
TYPE AND DIAMETER, IN.

CASING HAMMER, LBS. AVERAGE FALL, IN.
SAMPLER HAMMER, LBS. 140 AVERAGE FALL, IN. 30
TYPE OF HAMMER Automatic

WATER LEVEL OBSERVATIONS IN BOREHOLE

DATE	TIME	DEPTH OF HOLE	DEPTH OF CASING	DEPTH TO WATER	CONDITIONS OF OBSERVATION

PIEZOMETER INSTALLED ☐ YES ☐ NO SKETCH SHOWN ON

STANDPIPE: TYPE ID, IN. LENGTH, FT. TOP ELEV.
INTAKE ELEMENT: TYPE OD, IN. LENGTH, FT. TIP ELEV.
FILTER: MATERIAL OD, IN. LENGTH, FT. BOT. ELEV.

PAY QUANTITIES

3.5" DIA. DRY SAMPLE BORING LIN. FT.
3.5" DIA. U-SAMPLE BORING LIN. FT.
CORE DRILLING IN ROCK LIN. FT.
NO. OF 3" SHELBY TUBE SAMPLES
NO. OF 3" UNDISTURBED SAMPLES
OTHER:

BORING CONTRACTOR Aquifer Drilling and Testing
DRILLER Brian Karshick HELPERS Chris Phelan
REMARKS 2 thermistors installed
RESIDENT ENGINEER Mark Chancy DATE 12-2-15

BORING NO. BRP-37

ch2m:

PROJECT NUMBER: BORING NUMBER: BRP-38
Sheet: 1

SOIL BORING LOG

PROJECT: HONEYWELL DMT ISI
LOCATION:
ELEVATION:
DRILLING CONTRACTOR: AQUIFER DRILLING AND TESTING, INC
DRILLING METHOD AND EQUIPMENT: SONICSAMP DRILL MAX 170; SPT SAMPLING
WATER LEVELS:
START: 11/19/15 07:45
FINISH: 11/19/15 08:30
LOGGER: K. Chaturvedula

DEPTH BELOW (ft)	SAMPLE			STANDARD PENETRATION TEST RESULTS	SOIL DESCRIPTION	COMMENTS
	NUMBER	TYPE	RECOVERY (ft)	6" - 6" - 6" (N)	SOIL NAME, USCS GROUP SYMBOL, COLOR, MOISTURE CONTENT, RELATIVE DENSITY OR CONSISTENCY, SOIL STRUCTURE, MINERALOGY	DEPTH OF CASING, DRILLING RATE, DRILLING FLUID LOSS, TESTS AND INTRUMENTATION
0					3" Asphalt 0.25' - 1.0'. Poorly graded GRAVEL with sand (GP), dry, gray (GLEY1 5/10Y), dry, mixed with crushed Pieces of Asphalt	Advanced the hole from 0'-8' using 3" ID sonic macro core DPC -
1	S-1	SONIC ~~[illegible]~~ MACRO CORE	36"	-	1.0' - Silty SAND with gravel (SM), Red-Brown (10YR 4/6), moist, fine to medium grained Sand	DPC -
2					2.0' - Geotextile	DPC -
3					3.0'-5.0' - Same as abow	DPC -
4	S-2	SONIC MACRO CORE	36"	-		
5					5.0' - Clayey SAND with gravel (SC), Brown-gray (10YR 4/4), moist, fine to medium grained Sand	DPI -
6						

ch2m

PROJECT NUMBER:

BORING NUMBER: BRP-38
Sheet: 2

SOIL BORING LOG

PROJECT:
LOCATION:
ELEVATION:
DRILLING CONTRACTOR:
DRILLING METHOD AND EQUIPMENT:
WATER LEVELS:
START:
FINISH:
LOGGER:

DEPTH BELOW (ft)	SAMPLE			STANDARD PENETRATION TEST RESULTS	SOIL DESCRIPTION	COMMENTS
	NUMBER	TYPE	RECOVERY (ft)	6" - 6" - 6" (N)	SOIL NAME, USCS GROUP SYMBOL, COLOR, MOISTURE CONTENT, RELATIVE DENSITY OR CONSISTENCY, SOIL STRUCTURE, MINERALOGY	DEPTH OF CASING, DRILLING RATE, DRILLING FLUID LOSS, TESTS AND INTRUMENTATION
8	S-3	SONIC MACRO CORE	24"	—	6.0'- 7-5' - same as above.	DPC-
7					7-5'- Asphalt, multiple layers 2" thick, crushed [illegible] pieces.	7-0'- 6" OD outer casing installed to a depth of 8' bgs.
8					Bottom of Boring @ 8-0' bgs.	

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BORING NO. BRP-38
SHEET 1 OF 1
FILE NO. 10587
SURFACE ELEV.
DATUM

PROJECT DUNDALK MARINE TERMINAL
LOCATION BALTIMORE, MARYLAND
BORING LOCATION

TEST/INSPECTION EQUIPMENT SONIC CAMP DRILL MAX 170
REFERENCE CODES/STANDARDS

BORING EQUIPMENT AND METHODS OF STABILIZING BOREHOLE

TYPE OF BORING RIG		TYPE OF FEED DURING CORING		CASING USED	☑ YES	☐ NO	
TRUCK		MECHANICAL		DIA., IN. 6" O.D	DEPTH, FT. FROM	0	TO 8
SKID		HYDRAULIC		DIA., IN.	DEPTH, FT. FROM		TO
BARGE		OTHER		DIA., IN.	DEPTH, FT. FROM		TO
OTHER	TRACK						

TYPE AND SIZE OF:
D-SAMPLER
U-SAMPLER
S-SAMPLER SONIC MACRO CORE 3" ID
CORE BARREL
CORE BIT
DRILL RODS

DRILLING MUD USED ☐ YES ☑ NO
DIAMETER OF ROTARY BIT, IN.
TYPE OF DRILLING MUD

AUGER USED ☐ YES ☑ NO
TYPE AND DIAMETER, IN.

CASING HAMMER, LBS. AVERAGE FALL, IN.
SAMPLER HAMMER, LBS. 140 AVERAGE FALL, IN. 30
TYPE OF HAMMER Automatic

WATER LEVEL OBSERVATIONS IN BOREHOLE

DATE	TIME	DEPTH OF HOLE	DEPTH OF CASING	DEPTH TO WATER	CONDITIONS OF OBSERVATION
11/19/15	08-45	8.0'	8.0'	NE	CLOUDY ; DRIZZLE

PIEZOMETER INSTALLED ☑ YES ☐ NO SKETCH SHOWN ON PIEZOMETER RECORD

STANDPIPE:	TYPE	PVC	ID, IN.	2	LENGTH, FT.	5	TOP ELEV.	
INTAKE ELEMENT:	TYPE		OD, IN.		LENGTH, FT.		TIP ELEV.	
FILTER:	MATERIAL		OD, IN.		LENGTH, FT.		BOT. ELEV.	

PAY QUANTITIES

3.5" DIA. DRY SAMPLE BORING	LIN. FT.		NO. OF 3" SHELBY TUBE SAMPLES	
3.5" DIA. U-SAMPLE BORING	LIN. FT.		NO. OF 3" UNDISTURBED SAMPLES	
CORE DRILLING IN ROCK	LIN. FT.		OTHER:	

BORING CONTRACTOR AQUIFER DRILLING AND TESTING, INC
DRILLER BRIAN KARSHICK HELPERS CHRIS PHELEN
REMARKS
RESIDENT ENGINEER K. Chaturvedula DATE 11/19/15

BORING NO. BRP-38

PROJECT NUMBER: 10587 **BORING NUMBER:** BRP-40
Sheet: 1/5

SOIL BORING LOG

PROJECT: DUNDALK MARINE TERMINAL **LOCATION:** BALTIMORE
ELEVATION: ~ +19 **DRILLING CONTRACTOR:** ADT
DRILLING METHOD AND EQUIPMENT: FRASTE MULTIDRILL XL MAX 170
WATER LEVELS: **START:** 1400 11/30/15 **FINISH:** **LOGGER:** M. CHAMONI / L. LINCOLN

DEPTH BELOW (ft)	SAMPLE			STANDARD PENETRATION TEST RESULTS	SOIL DESCRIPTION	COMMENTS
	NUMBER	TYPE	RECOVERY (ft)	6" - 6" - 6" (N)	SOIL NAME, USCS GROUP SYMBOL, COLOR, MOISTURE CONTENT, RELATIVE DENSITY OR CONSISTENCY, SOIL STRUCTURE, MINERALOGY	DEPTH OF CASING, DRILLING RATE, DRILLING FLUID LOSS, TESTS AND INTRUMENTATION
0					ASPHALT / ROAD BASE	
1	S-1	3" SPN	3' 8"	N/A	BRN. C-M SAND, SM GVL, TR. CLAY	DPC-
2						
3						
4					4-5.5 DARK BRN C-M SAND, SM GVL, CLAY	
5	S-2		3'	N/A	5.5-6 DK BRN CLAY	
6						GEOMEMBRANE @ 6.0'

ch2m:

PROJECT NUMBER: 10587 BORING NUMBER: BRP-40
Sheet: 2/5

SOIL BORING LOG

PROJECT: DMT
LOCATION: BALTIMORE, MD
ELEVATION: ~ + 19
DRILLING CONTRACTOR: ADT
DRILLING METHOD AND EQUIPMENT:
WATER LEVELS:
START: 1400 11/30
FINISH: 1600 11/30
LOGGER: L. LINCOLN / M. CHANCY

DEPTH BELOW (ft)	SAMPLE			STANDARD PENETRATION TEST RESULTS	SOIL DESCRIPTION	COMMENTS
	NUMBER	TYPE	RECOVERY (ft)	6" - 6" - 6" (N)	SOIL NAME, USCS GROUP SYMBOL, COLOR, MOISTURE CONTENT, RELATIVE DENSITY OR CONSISTENCY, SOIL STRUCTURE, MINERALOGY	DEPTH OF CASING, DRILLING RATE, DRILLING FLUID LOSS, TESTS AND INTRUMENTATION
6	S-2 CONT		3'	N/A	6- RED-BRN M-C SAND, SM GVL	
7		3" SONIC			7 - 8 DK BRN CLAY	
8	S-3		2'6"	N/A	8- GRY, GRY-GREEN C-M SAND, SM GVL (ROAD BASE	WOVEN FABRIC @ 9.25'
9					9.5 - 10 RED CLY, SM GVL	
10				8	TOP 12" DK GRY, BRN CLAYEY C-M SAND, SM GVL	DPC-
11	SS-4			7 50/5"	BOT 7" RED CLAY MOTT. YELLOW, WHITE	
					1" RED-BRN HIGHLY INDURATED F-M SAND (HB)	DPC+
12	S-5				RED-BRN SILTY F-M SAND, SM GVL	

ch2m:

PROJECT NUMBER: 10587 **BORING NUMBER:** BRP-40
Sheet: 3/5

SOIL BORING LOG

PROJECT: DMT **LOCATION:** BALTIMORE, MD
ELEVATION: ~+19 **DRILLING CONTRACTOR:** ADT
DRILLING METHOD AND EQUIPMENT: FRASTE MULTIDRILL XL MAX 170
WATER LEVELS: **START:** 1400 11/30/15 **FINISH:** 1600 11/30/15 **LOGGER:** L. LINCOLN / M. CHANCY

DEPTH BELOW (ft)	SAMPLE			STANDARD PENETRATION TEST RESULTS	SOIL DESCRIPTION	COMMENTS
	NUMBER	TYPE	RECOVERY (ft)	6" - 6" - 6" (N)	SOIL NAME, USCS GROUP SYMBOL, COLOR, MOISTURE CONTENT, RELATIVE DENSITY OR CONSISTENCY, SOIL STRUCTURE, MINERALOGY	DEPTH OF CASING, DRILLING RATE, DRILLING FLUID LOSS, TESTS AND INTRUMENTATION
12	SS-6	3" S.S.	6"	50	12-12.5 HIGHLY INDURATED RED-BRN, BRN, GRY SILTY M-F SAND, TR GVL, GREEN PARTICLES	DPC+?
13	S-7	3" SONIC		N/A	12.5-13.2 DO SS-6 (HB) 13.2-13.7 BLK M-F SAND, TR. GREEN PARTICLES (GB) 13.7-14 DO SS-6 (HB)	
14	SS-8	3" O.D. S.S.	3"	50	14-14.5 DK GRY M-F SAND, SM GREEN PARTICLES (GB)	WATER IN DPC+ SAMPLE 14-14.5
15	S-9	3" SONIC	18"	N/A	14.5-16 MOD-HIGHLY INDURATED RED-BRN C-F SAND, SM GVL, TR. GREEN PARTICLES (HB)	DPC+
16	SS-10	3" O.D. SS.	12"	3 13	16-16.75 BRN, RED BRN GVLY C-M SAND 16.75-17 RED CLAY MOTT WHITE	DPC+
17						EOB @17.0'
18						

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BORING NO. BRP-40
SHEET 5 OF 5
PROJECT Dundalk Marine Terminal
FILE NO. 10587
LOCATION Baltimore, Maryland
SURFACE ELEV. ~ +19
BORING LOCATION see boring location plan
DATUM

TEST/INSPECTION EQUIPMENT Sonic samp Drill max 170; SPT sampling
REFERENCE CODES/STANDARDS

BORING EQUIPMENT AND METHODS OF STABILIZING BOREHOLE

TYPE OF BORING RIG
TRUCK
SKID
BARGE
OTHER Track

TYPE OF FEED DURING CORING
MECHANICAL
HYDRAULIC
OTHER

CASING USED ☑ YES ☐ NO
DIA., IN. 6" DEPTH, FT. FROM 0 TO
DIA., IN. DEPTH, FT. FROM TO
DIA., IN. DEPTH, FT. FROM TO

TYPE AND SIZE OF:
D-SAMPLER
U-SAMPLER
S-SAMPLER SS-Sampler; 3" dia sampler
CORE BARREL
CORE BIT
DRILL RODS
3" ID Sonic Macrocore

DRILLING MUD USED ☐ YES ☑ NO
DIAMETER OF ROTARY BIT, IN.
TYPE OF DRILLING MUD

AUGER USED ☐ YES ☑ NO
TYPE AND DIAMETER, IN.

CASING HAMMER, LBS. AVERAGE FALL, IN.
SAMPLER HAMMER, LBS. 140 AVERAGE FALL, IN. 30
TYPE OF HAMMER Automatic

WATER LEVEL OBSERVATIONS IN BOREHOLE

DATE	TIME	DEPTH OF HOLE	DEPTH OF CASING	DEPTH TO WATER	CONDITIONS OF OBSERVATION

PIEZOMETER INSTALLED ☑ YES ☐ NO SKETCH SHOWN ON VW Piezometer Installation Record pg 4/5

STANDPIPE: TYPE ID, IN. LENGTH, FT. TOP ELEV.
INTAKE ELEMENT: TYPE OD, IN. LENGTH, FT. TIP ELEV.
FILTER: MATERIAL OD, IN. LENGTH, FT. BOT. ELEV.

PAY QUANTITIES

3.5" DIA. DRY SAMPLE BORING LIN. FT.
3.5" DIA. U-SAMPLE BORING LIN. FT.
CORE DRILLING IN ROCK LIN. FT.
NO. OF 3" SHELBY TUBE SAMPLES
NO. OF 3" UNDISTURBED SAMPLES
OTHER:

BORING CONTRACTOR Aquifer Drilling and testing, Inc
DRILLER Brian Karshick HELPERS Chris Phelan
REMARKS 1 vw piezometer and 2 thermistors installed
RESIDENT ENGINEER M. Chaney/L Lincoln DATE 11-30-15

BORING NO. BRP-40

ch2m.

PROJECT NUMBER: 10587 **BORING NUMBER:** BRP-41
Sheet: 1/7

SOIL BORING LOG

PROJECT: Dundalk Marine Terminal **LOCATION:** Baltimore, Maryland
ELEVATION: ~14 **DRILLING CONTRACTOR:** ADT
DRILLING METHOD AND EQUIPMENT: Sonic Samp Drill max 170; SPT sampling
WATER LEVELS: **START:** 09:45 12-4-15 **FINISH:** **LOGGER:** M. Chaney

DEPTH BELOW (ft)	SAMPLE			STANDARD PENETRATION TEST RESULTS	SOIL DESCRIPTION	COMMENTS
	NUMBER	TYPE	RECOVERY (ft)	6" - 6" - 6" (N)	SOIL NAME, USCS GROUP SYMBOL, COLOR, MOISTURE CONTENT, RELATIVE DENSITY OR CONSISTENCY, SOIL STRUCTURE, MINERALOGY	DEPTH OF CASING, DRILLING RATE, DRILLING FLUID LOSS, TESTS AND INTRUMENTATION
0	S-1	3" Sonic	1.5'	NA	Road base/asphalt, Well graded gravel	DPC- none 6"OD casing to 5'
1						
2						
3						
					3.5-4.0 Dry Red brown silty f-M sand trace gravel (SM)	DPC- none
4	S-2	3" Sonic	3'	NA	4.0-6.0' Dry Red brown with orange particles Silty f-M sand trace gravel (SM)	DPC- none
5						
6						Geo membrane @ 6.00

ch2m.

PROJECT NUMBER: 10587 **BORING NUMBER:** BRP-41
Sheet: 2/7

SOIL BORING LOG

PROJECT: Dundalk Marine Terminal **LOCATION:** Baltimore, Maryland
ELEVATION: ~+14 **DRILLING CONTRACTOR:** ADT
DRILLING METHOD AND EQUIPMENT: Sonic Samp Drill Max; SPT sampler
WATER LEVELS: **START:** **FINISH:** **LOGGER:** Mark Chang

DEPTH BELOW (ft)	SAMPLE			STANDARD PENETRATION TEST RESULTS	SOIL DESCRIPTION	COMMENTS
	NUMBER	TYPE	RECOVERY (ft)	6" - 6" - 6" (N)	SOIL NAME, USCS GROUP SYMBOL, COLOR, MOISTURE CONTENT, RELATIVE DENSITY OR CONSISTENCY, SOIL STRUCTURE, MINERALOGY	DEPTH OF CASING, DRILLING RATE, DRILLING FLUID LOSS, TESTS AND INTRUMENTATION
6	S-2	3" Sonic	3'	NA	6.0-7.0 Dry red brown with orange Particles Silty f-M sand, trace gravel (SM)	DPC- none 6" OD casing to 10'
7	S-3	3" Sonic	2.5'	NA	7-9.0 Damp Dark brown with orange Particles f-M silty sand (SM)	DPC - none
8						
9					9.0-9.5 Dry whitish concrete with gravel, f-M sand (S)	DPC - none
					9.5-10.0 Dry Red Fat Clay (CH) (top Clay liner)	DPC - none
10	SS-1	2" OD SS		45-100/2"	10-10.5 Dry Red brown Highly indurated Medium to Course sand, trace gravel (S) HB	Refusal @ 10.5' Advance w/sonic to 12' DPC+ strong
	S-4	3" OD sonic	2.5'	NA	10.5-12 Dry red brown M-C sand with gravel (S) (HB)	DPC+ strong
11						
12						

ch2m

PROJECT NUMBER: 10587 **BORING NUMBER:** BRP41
Sheet: 3/7

SOIL BORING LOG

PROJECT: Dundalk Marine Terminal **LOCATION:** Baltimore, Maryland
ELEVATION: ~+14 **DRILLING CONTRACTOR:** ADT
DRILLING METHOD AND EQUIPMENT: Sonic Samp Drill Max 170; SPT sampler
WATER LEVELS:
START: **FINISH:** 01:15 **LOGGER:** Mark Chaney

DEPTH BELOW (ft)	SAMPLE NUMBER	SAMPLE TYPE	SAMPLE RECOVERY (ft)	STANDARD PENETRATION TEST RESULTS 6" - 6" - 6" (N)	SOIL DESCRIPTION: SOIL NAME, USCS GROUP SYMBOL, COLOR, MOISTURE CONTENT, RELATIVE DENSITY OR CONSISTENCY, SOIL STRUCTURE, MINERALOGY	COMMENTS: DEPTH OF CASING, DRILLING RATE, DRILLING FLUID LOSS, TESTS AND INTRUMENTATION
12	SS-2	2"OD SS	1.5'	41-22 3-11	12.0-14 Dry red brown moderately indurated f-C sand, trace gravel (S) (HB)	DPC+ strong 6'OD cased to 15'
13					13.0-14.0 Dry red brown with green particles f-M sand (S) (GB)	DPC+ strong
14	SS-3	2"OD SS	5"	100/5"	14-14'5" Dense moist Brown f-M sand, trace silt (SM) (GB	refusal @ 14'5" DPC+ strong advanced w/ sonic to 15'
	S-5	3" sonic	1.5'	NA	14'5"-15.0 Moist Red Brown with orange silty f-M sand trace gravel, trace clay (SM-CL)	DPC+ Strong
15	SS-4	2" OD	3"	100/3"	15-15'3" wet very dense brown silty f-m sand (SM) (GB)	DPC+ strong
	S-6	3" sonic		NA	15'3"-16.0 Moist Red brown silty sand with gravel (SM) (HB)	Sonic sample saturated DPC+ strong
16	SS-5	2"OD SS	1'4"	100/2"	16-16'2" Moist Highly indurated red brown silty sand (SM) (HB)	DPC+ strong refusal @ 16'2" rod just bouncing
	S-7	3" Sonic	1'	NA	16'2"-17 wet red brown f-C silty sand trace gravel (SM) (HB)	advance with sonic to 17' Sonic sample saturated DPC+
17	SS-6	2" OD	None	100/0	17'-17'5" moist red brown f-C silty sand trace gravel (SM) (GB)	rod bounces 100/0" DPC+ advanced with sonic to 18'
	S-8	3" Sonic	1'	NA	17'5"-18.0" red orange silty f-C sand with gravel (SM) HB	DPC+ Strong DPC+ Strong
18						

ch2m:

PROJECT NUMBER: 10587 **BORING NUMBER:** BRP 41
Sheet: 4/7

SOIL BORING LOG

PROJECT: Dundalk Marine Terminal **LOCATION:** Baltimore, Maryland
ELEVATION: ~+14 **DRILLING CONTRACTOR:** AOT
DRILLING METHOD AND EQUIPMENT: Sonic Samp Drill Max 170; SPT Sampler
WATER LEVELS: **START:** **FINISH:** **LOGGER:** Mark Chang

DEPTH BELOW (ft)	SAMPLE			STANDARD PENETRATION TEST RESULTS	SOIL DESCRIPTION	COMMENTS
	NUMBER	TYPE	RECOVERY (ft)	6" - 6" - 6" (N)	SOIL NAME, USCS GROUP SYMBOL, COLOR, MOISTURE CONTENT, RELATIVE DENSITY OR CONSISTENCY, SOIL STRUCTURE, MINERALOGY	DEPTH OF CASING, DRILLING RATE, DRILLING FLUID LOSS, TESTS AND INTRUMENTATION
18'	SS7	2" GD	3"	8/6"	18'-18'3" Dry loose Red mottled with white streaks (CH)	OPC+ Boring terminated @ 18'6" Thermistors installed @ 13' 15.5'

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BORING NO. BRP-41
SHEET 7 **OF** 7
FILE NO. 10587
SURFACE ELEV.
DATUM

PROJECT Dundalk Marine Terminal
LOCATION Baltimore, Maryland
BORING LOCATION See location plan

TEST/INSPECTION EQUIPMENT Sonic Samp Drill max 170; SPT sampler
REFERENCE CODES/STANDARDS

BORING EQUIPMENT AND METHODS OF STABILIZING BOREHOLE

TYPE OF BORING RIG		TYPE OF FEED DURING CORING		CASING USED	☑ YES	☐ NO	
TRUCK		MECHANICAL		DIA., IN.	6"	DEPTH, FT. FROM 0	TO 15'
SKID		HYDRAULIC		DIA., IN.		DEPTH, FT. FROM	TO
BARGE		OTHER		DIA., IN.		DEPTH, FT. FROM	TO
OTHER	Track						

TYPE AND SIZE OF:
D-SAMPLER
U-SAMPLER
S-SAMPLER SS-Sampler; 2" diam Sampler
CORE BARREL
CORE BIT
DRILL RODS
3" ID Sonic Macrocore

DRILLING MUD USED ☐ YES ☑ NO
DIAMETER OF ROTARY BIT, IN.
TYPE OF DRILLING MUD

AUGER USED ☐ YES ☑ NO
TYPE AND DIAMETER, IN.

CASING HAMMER, LBS. AVERAGE FALL, IN.
SAMPLER HAMMER, LBS. 140 AVERAGE FALL, IN. 30
TYPE OF HAMMER Automatic

WATER LEVEL OBSERVATIONS IN BOREHOLE

DATE	TIME	DEPTH OF HOLE	DEPTH OF CASING	DEPTH TO WATER	CONDITIONS OF OBSERVATION

PIEZOMETER INSTALLED ☐ YES ☐ NO SKETCH SHOWN ON

STANDPIPE:	TYPE	ID, IN.		LENGTH, FT.		TOP ELEV.	
INTAKE ELEMENT:	TYPE	OD, IN.		LENGTH, FT.		TIP ELEV.	
FILTER:	MATERIAL	OD, IN.		LENGTH, FT.		BOT. ELEV.	

PAY QUANTITIES

3.5" DIA. DRY SAMPLE BORING	LIN. FT.		NO. OF 3" SHELBY TUBE SAMPLES	
3.5" DIA. U-SAMPLE BORING	LIN. FT.		NO. OF 3" UNDISTURBED SAMPLES	
CORE DRILLING IN ROCK	LIN. FT.		OTHER:	

BORING CONTRACTOR Aquifer Drilling and Testing
DRILLER Tony HELPERS Joseph
REMARKS 12 thermistors installed
RESIDENT ENGINEER Mark Chaney DATE 12-4-15

BORING NO. BRP-41

ch2m:

PROJECT NUMBER:	BORING NUMBER: BRP-43 Sheet: 1

SOIL BORING LOG

PROJECT: Honeywell DMT SSI
LOCATION:
ELEVATION:
DRILLING CONTRACTOR: Aquifer drilling and testing, Inc.
DRILLING METHOD AND EQUIPMENT: Sonic SARAP DRILL Max 170; SPT sampling
WATER LEVELS:
START: 11/11/15 9:40
FINISH:
LOGGER: K. Chaturvedula

DEPTH BELOW (ft)	SAMPLE			STANDARD PENETRATION TEST RESULTS	SOIL DESCRIPTION	COMMENTS
	NUMBER	TYPE	RECOVERY (ft)	6" - 6" - 6" (N)	SOIL NAME, USCS GROUP SYMBOL, COLOR, MOISTURE CONTENT, RELATIVE DENSITY OR CONSISTENCY, SOIL STRUCTURE, MINERALOGY	DEPTH OF CASING, DRILLING RATE, DRILLING FLUID LOSS, TESTS AND INTRUMENTATION
0					5" Asphalt Poorly graded SANDS with silt and gravel (SP-SM), gray-brown (GLEY 4/10Y) dry, fine to medium grained sand	Advanced from 0'-10' with sonic macro core 3" ID DPC –
1	S-1	SONIC MACRO CORE	17"			
2						
3						
4					4.0' - same as above, moist 4.75' - geotextile fabric encountered 4.75' - 6.5' - Silty sand (SM), with trace gravel, dark brown-gray (10YR 3/2) moist, fine grained sand	
5	S-2	SONIC MACRO CORE	36"		6.5' - ~~base~~ Polyethylene liner encountered 6.5' - 6.6' ~ 2" Asphalt 6.6' - Silty sand (SM) with gravel, Red-Brown (2.5YR 5/6), dry, fine grained sand	DPC =
6						

ch2m:

PROJECT NUMBER:

BORING NUMBER: BRP-43
Sheet: 2

SOIL BORING LOG

PROJECT:
LOCATION:
ELEVATION:
DRILLING CONTRACTOR:
DRILLING METHOD AND EQUIPMENT:
WATER LEVELS:
START:
FINISH:
LOGGER:

DEPTH BELOW (ft)	SAMPLE			STANDARD PENETRATION TEST RESULTS	SOIL DESCRIPTION	COMMENTS
	NUMBER	TYPE	RECOVERY (ft)	6" - 6" - 6" (N)	SOIL NAME, USCS GROUP SYMBOL, COLOR, MOISTURE CONTENT, RELATIVE DENSITY OR CONSISTENCY, SOIL STRUCTURE, MINERALOGY	DEPTH OF CASING, DRILLING RATE, DRILLING FLUID LOSS, TESTS AND INTRUMENTATION
6						
7					7.0' - 8.5' - Poorly graded GRAVEL with Sand (GP), gray-white (GLEY1 dry, Road based aggregate 8/10Y)	DPC -
8						
	S-3	SONIC MACROCORE	36"		8.5' - 9.9' - Poorly graded SAND (SP), light Red-white (5YR 6/6), dry, medium to coarse grained sand	DPC +
9					9.9' - Silty SAND (SM), Red-white (5YR 6/6) dry, fine grained sand	DPC +
10					10' - 11' - well graded GRAVEL with sand and silt (GP-GM), dark gray, (2.5YR 4/1) moist non-COPR fill	DPC - 10.0' - Below 10' switched to SS sampling; 140-lb hammer; 30-in drop ; 3" dia. Sampler
	SS-4	SS	24"	17 19		
11				16	11' - 11.75' - Poorly graded GRAVEL with sand (GP), tan-green (GLEY1 8/5GY) dry, Particulate (COPR)	DPC +
				26	11.75' - Silty SAND (SM), Red-Yellow (5YR 5/6) dry, bright green particles, particulate to slightly indurated (COPR)	
12						

ch2m:

PROJECT NUMBER:

BORING NUMBER: BRP-43

Sheet: 3

SOIL BORING LOG

PROJECT:

LOCATION:

ELEVATION:

DRILLING CONTRACTOR:

DRILLING METHOD AND EQUIPMENT:

WATER LEVELS:

START:

FINISH:

LOGGER:

DEPTH BELOW (ft)	SAMPLE			STANDARD PENETRATION TEST RESULTS	SOIL DESCRIPTION	COMMENTS
	NUMBER	TYPE	RECOVERY (ft)	6" - 6" - 6" (N)	SOIL NAME, USCS GROUP SYMBOL, COLOR, MOISTURE CONTENT, RELATIVE DENSITY OR CONSISTENCY, SOIL STRUCTURE, MINERALOGY	DEPTH OF CASING, DRILLING RATE, DRILLING FLUID LOSS, TESTS AND INTRUMENTATION
12 13	SS-5	SS	NR	100/5"	~~No Recovery~~ ~~split spoon~~ Silty SAND (SM), Red-Brown (7.5YR 4/6) dry, fine to medium grained sand, Particulate to slightly indurated (HB CORE)	- Advanced the sonic macrocore to 14' bgs - No Recovery in split spoon
14 15	SS-6	SS	17"	8 6 14 22	14.0' - Poorly graded SAND with silt (SP-SM), dark gray-black (N2), moist, Particulate, bright green particles (GR CORE)	- encountered groundwater at 15' bgs during drilling
16	SS-7	SS	4"	100/4"	16.0' - silty SAND (SM), dark brown-Red([illegible]) dry, particulate to slightly indurated, laminated (HB CORE)	- Advanced the 3" to sonic macro core to 17' bgs
17	SS-8	SS	NR	10	No recovery	
18	SS-9	SS	5"	100/5"	17.5' - Poorly graded SAND with silt (SP-SM) dark gray-black (N2), wet, particulate bright green particles (GR CORE) 17.9' - Silty SAND (SM), dark brown-red, moist, particulate (HB CORE)	

PROJECT NUMBER:

BORING NUMBER: BRR-63

Sheet: 4

SOIL BORING LOG

PROJECT:

LOCATION:

ELEVATION:

DRILLING CONTRACTOR:

DRILLING METHOD AND EQUIPMENT:

WATER LEVELS:

START:

FINISH:

LOGGER:

DEPTH BELOW (ft)	SAMPLE			STANDARD PENETRATION TEST RESULTS	SOIL DESCRIPTION	COMMENTS
	NUMBER	TYPE	RECOVERY (ft)	6" - 6" - 6" (N)	SOIL NAME, USCS GROUP SYMBOL, COLOR, MOISTURE CONTENT, RELATIVE DENSITY OR CONSISTENCY, SOIL STRUCTURE, MINERALOGY	DEPTH OF CASING, DRILLING RATE, DRILLING FLUID LOSS, TESTS AND INTRUMENTATION
18	SS-9	SS	NR	50/6"	Same as above, dry, particulate	Advanced the sonic macro core to 18.5' bgs
	SS-10	SS	6"	56	Same as above, particulate to slightly indurated, laminated	
19	SS-11	SS	3"	100/3"	Same as above, particulate, wet, bright green and yellow particles	Advanced the sonic macro core to 20' bgs
	S-12	S	6"	-	Same as above, particulate to moderately indurated, laminated	
20	SS-13	SS	6"	11	Same as above, particulate to slightly indurated	20.0 - Installed the 6" OD outer casing to a depth of 20' bgs
	SS-14	SS	6"	8	20.5' - Sandy lean clay (CL), Red (10R 4/4) dry, fine grained sand	DPC -
21					Bottom of boring @ 21.0' bgs	
22						

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BORING NO. BRP-43
SHEET 5 OF
FILE NO. 10587
SURFACE ELEV.
DATUM

PROJECT DUNDALK MARINE TERMINAL
LOCATION BALTIMORE, MARYLAND
BORING LOCATION

TEST/INSPECTION EQUIPMENT Sonic Samp Drill Map 170'; SPT-Sampling
REFERENCE CODES/STANDARDS

BORING EQUIPMENT AND METHODS OF STABILIZING BOREHOLE

TYPE OF BORING RIG
TRUCK
SKID
BARGE
OTHER Track

TYPE OF FEED DURING CORING
MECHANICAL
HYDRAULIC
OTHER

CASING USED ☑ YES ☐ NO
DIA., IN. 6" OD DEPTH, FT. FROM 0 TO 21
DIA., IN. DEPTH, FT. FROM TO
DIA., IN. DEPTH, FT. FROM TO

TYPE AND SIZE OF:
D-SAMPLER
U-SAMPLER
S-SAMPLER SS Sampling; 3" dia.
CORE BARREL
CORE BIT
DRILL RODS
3'RD Sonic Macro Core

DRILLING MUD USED ☐ YES ☑ NO
DIAMETER OF ROTARY BIT, IN.
TYPE OF DRILLING MUD

AUGER USED ☐ YES ☑ NO
TYPE AND DIAMETER, IN.

CASING HAMMER, LBS. AVERAGE FALL, IN.
SAMPLER HAMMER, LBS. AVERAGE FALL, IN.
TYPE OF HAMMER

WATER LEVEL OBSERVATIONS IN BOREHOLE

DATE	TIME	DEPTH OF HOLE	DEPTH OF CASING	DEPTH TO WATER	CONDITIONS OF OBSERVATION
11/11/15	12:15	16	10	15	During Drilling

PIEZOMETER INSTALLED ☑ YES ☐ NO SKETCH SHOWN ON See Standpipe Installation log

STANDPIPE: TYPE ID, IN. LENGTH, FT. TOP ELEV.
INTAKE ELEMENT: TYPE OD, IN. LENGTH, FT. TIP ELEV.
FILTER: MATERIAL OD, IN. LENGTH, FT. BOT. ELEV.

PAY QUANTITIES

3.5" DIA. DRY SAMPLE BORING LIN. FT.
3.5" DIA. U-SAMPLE BORING LIN. FT.
CORE DRILLING IN ROCK LIN. FT.
NO. OF 3" SHELBY TUBE SAMPLES
NO. OF 3" UNDISTURBED SAMPLES
OTHER:

BORING CONTRACTOR Aquifer Drilling and Testing, Inc.
DRILLER Brian Karshick HELPERS Chris Phelan
REMARKS
RESIDENT ENGINEER K. Chaturvedula DATE 11/11/15

BORING NO. BRP-43

ch2m.℠

PROJECT NUMBER:

BORING NUMBER: BRP-47

Sheet: 1

SOIL BORING LOG

PROJECT: DUNDALK MARINE TERMINAL **LOCATION:** SEE PLAN

ELEVATION: **DRILLING CONTRACTOR:**

DRILLING METHOD AND EQUIPMENT: FRASTE MULTIDRILL XL MAX 170

WATER LEVELS: **START:** 0950 11/11/15 **FINISH:** 1300 **LOGGER:** L. LINCOLN

DEPTH BELOW (ft)	SAMPLE			STANDARD PENETRATION TEST RESULTS	SOIL DESCRIPTION	COMMENTS
	NUMBER	TYPE	RECOVERY (ft)	6" - 6" - 6" (N)	SOIL NAME, USCS GROUP SYMBOL, COLOR, MOISTURE CONTENT, RELATIVE DENSITY OR CONSISTENCY, SOIL STRUCTURE, MINERALOGY	DEPTH OF CASING, DRILLING RATE, DRILLING FLUID LOSS, TESTS AND INTRUMENTATION
0					4" ASPHALT BRN, DK GRY SILTY F.C SAND, SM GVL (FILL)	DPC -
1						
2	S-1	3" O.D. SONIC CORE	24"	N/A	GRY F C SAND, SM GVL, TR. SILT (ROAD BASE AGGREGATE)	DPC -
3						
4					4-7.0 DK BRN, RED, DK GRY F.C SAND, SM GVL, CLAY (FILL)	DPC -
5	S-2			N/A		
6						

ch2m

PROJECT NUMBER:
BORING NUMBER: BRP-47
Sheet: 2

SOIL BORING LOG

PROJECT: DUNDALK MARINE TERMINAL LOCATION: SEE PLAN
ELEVATION:
DRILLING CONTRACTOR: ADT
DRILLING METHOD AND EQUIPMENT: FRASTE MULTIDRILL XL MAX 170
WATER LEVELS:
START: 0950 FINISH: 1300 LOGGER: L. LINCOLN

DEPTH BELOW (ft)	SAMPLE			STANDARD PENETRATION TEST RESULTS	SOIL DESCRIPTION	COMMENTS
	NUMBER	TYPE	RECOVERY (ft)	6" - 6" - 6" (N)	SOIL NAME, USCS GROUP SYMBOL, COLOR, MOISTURE CONTENT, RELATIVE DENSITY OR CONSISTENCY, SOIL STRUCTURE, MINERALOGY	DEPTH OF CASING, DRILLING RATE, DRILLING FLUID LOSS, TESTS AND INTRUMENTATION
4	S-2 cont.		3'	N/A	BRN, RED, DK GRY F-C SAND, SM GVL, CLAY (FILL)	DPC-
7	S-3	3" SONIC CORE	3'	N/A	7-8 DO S-2	
8					8-8.5 ASPHALT	
					8.5-9 GRY C-F SAND, SM GVL (ROADBASE)	DPC-
9					9-10 DK GRY, GRAY-BLUE F-C SAND, SM SILT, GVL (ROAD BASE)	DPC- DROVE CASING TO 10'
10	SS-4	2" SP. SPOON		8	10-11 DK BRN SILTY F-M SAND, TR GVL	DPC-
				18		
11				23	11-11.2 GRY F-M SAND	
					11.2-11.5 DK BRN, RED SILTY F-M SAND, SM GVL, WOOD FRAG.	DPC-
				9	11.5-12 GRY, GREEN, BRN C-F SAND, SM GVL, TR SILT	DPC- FABRIC GEOTEXTILE @ 11.8'
12						

ch2m

PROJECT NUMBER: **BORING NUMBER:** BRP-47
Sheet: 3

SOIL BORING LOG

PROJECT: DUNDALK MARINE TERMINAL **LOCATION:** SEE PLAN
ELEVATION: **DRILLING CONTRACTOR:** ADT
DRILLING METHOD AND EQUIPMENT:
WATER LEVELS: **START:** 0950 **FINISH:** 1300 **LOGGER:** L. LINCOLN

DEPTH BELOW (ft)	SAMPLE			STANDARD PENETRATION TEST RESULTS	SOIL DESCRIPTION	COMMENTS
	NUMBER	TYPE	RECOVERY (ft)	6" - 6" - 6" (N)	SOIL NAME, USCS GROUP SYMBOL, COLOR, MOISTURE CONTENT, RELATIVE DENSITY OR CONSISTENCY, SOIL STRUCTURE, MINERALOGY	DEPTH OF CASING, DRILLING RATE, DRILLING FLUID LOSS, TESTS AND INTRUMENTATION
12	SS-5	2" O.D. SPOON	19"	16 39	12-12.5 BRN, DK GRY C-F SAND, SM GVL (FILL)	DPC-
					12.5-12.8 RED CLAY MOTT. WHITE	PP = 1.6
13					12.8-14 GREEN, BRN, GRY F-M SAND, TR. SILT, WEAKLY INDURATED (COPR)	DPC+
14	SS-6		7"	45 50/1"	14-14.6 BLK, GREEN M-F SAND, TR. YELLOW PARTICLES (GB)	DPC+ BROKEN WOOD FRAGMENTS @14.6'
15	S-7	3" SONIC CORE	17"	N/A	14.6-15.5 BRN F-C SAND, TR GVL, SILT, MOD INDURATED (HB COPR)	DPC++
					15.5-16' RED-BRN, DK GRY SILTY F-M SAND, SM GVL, TR. YELLOW PARTICLES, MOD. INDURATED (HB COPR)	DPC+
16	SS-8	2" O.D. SPOON		36 66 56 18	16-16.4 DK BRN SILTY M-F SAND (HB COPR)	
					16.4-16.7 BLK, GREEN M-F SAND TR. YELLOW PARTICLES (GB)	DPC+
17					16.7-17 RED-BRN, DK GRY SILTY F-M SAND, MOD LITH. (HB)	DPC+
					17.0-17.3 RED-BRN CLAYEY F-M SAND, TR. GVL	
					17.3-18 GRY, GREEN, RED-BRN SILTY F-M SAND, TR. GVL, YELLOW PARTICLES, MOD. INDURATED (HB)	DPC+
18						

ch2m

PROJECT NUMBER: **BORING NUMBER:** BRP-47
Sheet: 4

SOIL BORING LOG

PROJECT: DUNDALK MARINE TERMINAL **LOCATION:** SEE PLAN
ELEVATION: ~ +20 **DRILLING CONTRACTOR:** ADT
DRILLING METHOD AND EQUIPMENT:
WATER LEVELS: **START:** 0950 **FINISH:** 1300 **LOGGER:** L. LINCOLN

DEPTH BELOW (ft)	SAMPLE			STANDARD PENETRATION TEST RESULTS	SOIL DESCRIPTION	COMMENTS
	NUMBER	TYPE	RECOVERY (ft)	6" - 6" - 6" (N)	SOIL NAME, USCS GROUP SYMBOL, COLOR, MOISTURE CONTENT, RELATIVE DENSITY OR CONSISTENCY, SOIL STRUCTURE, MINERALOGY	DEPTH OF CASING, DRILLING RATE, DRILLING FLUID LOSS, TESTS AND INTRUMENTATION
18	SS-9	2" O.D. SPOON	6"	24	18-18.5 DK BRN M-F SAND, TR SILT (HB) MOIST	DPC+
	SS-10		6"	32	18.5-19 RED-BRN, BRN, DK GRY SILTY M-F SAND, SM GVL, TR. RED CLAY (HB) MOIST, WEAKLY INDURATED	DPC+
19	SS-11		6"	17	DK BRN, RED-BRN C-F SAND, SM SILT, TR GVL, RED CLAY (HB) MOIST, WEAKLY INDURATED	DPC+
	SS-12		3"	50/3"	BRN SANDY GVL, TR SILT	DPC+
20	S-13	3" SONIC	6"	N/A	RED-BRN, BRN, DK GRY SILTY F-M SAND, TR GVL, MOD. INDURATED	WOOD FIBERS (?) DPC+
	SS-14	2" O.D. SPOON		7	RED CLAY MOTT. YELLOW, WHITE TR. F-M SAND SEAMS	EOB @ 21.0'
21						
22						
23						
24						

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BORING NO. BRP-47
SHEET 5 **OF** 6
PROJECT DUNDALK MARINE TERMINAL
FILE NO. 10587
LOCATION BALTIMORE, MARYLAND
SURFACE ELEV. ~ +20
BORING LOCATION SEE PLAN
DATUM

TEST/INSPECTION EQUIPMENT
REFERENCE CODES/STANDARDS

BORING EQUIPMENT AND METHODS OF STABILIZING BOREHOLE

TYPE OF BORING RIG
TRUCK
SKID ✓
BARGE
OTHER

TYPE OF FEED DURING CORING
MECHANICAL
HYDRAULIC
OTHER

CASING USED ☑ YES ☐ NO
DIA., IN. 4" **DEPTH, FT. FROM** 0 **TO** 15
DIA., IN. **DEPTH, FT. FROM** **TO**
DIA., IN. **DEPTH, FT. FROM** **TO**

TYPE AND SIZE OF:
D-SAMPLER 2" O.D. SPLIT SPOON
U-SAMPLER
S-SAMPLER
CORE BARREL 3" SONIC
CORE BIT
DRILL RODS

DRILLING MUD USED ☐ YES ☑ NO
DIAMETER OF ROTARY BIT, IN.
TYPE OF DRILLING MUD

AUGER USED ☐ YES ☑ NO
TYPE AND DIAMETER, IN.

CASING HAMMER, LBS. **AVERAGE FALL, IN.**
SAMPLER HAMMER, LBS. 140 **AVERAGE FALL, IN.** 30
TYPE OF HAMMER

WATER LEVEL OBSERVATIONS IN BOREHOLE

DATE	TIME	DEPTH OF HOLE	DEPTH OF CASING	DEPTH TO WATER	CONDITIONS OF OBSERVATION

PIEZOMETER INSTALLED ☑ YES ☐ NO **SKETCH SHOWN ON** P. 6

STANDPIPE: TYPE PVC ID, IN. 2 LENGTH, FT. 20 TOP ELEV. ~ +19.6
INTAKE ELEMENT: TYPE PVC OD, IN. 2 LENGTH, FT. 5 TIP ELEV. ~ 0.0
FILTER: MATERIAL OD, IN. LENGTH, FT. BOT. ELEV.

PAY QUANTITIES
3.5" DIA. DRY SAMPLE BORING LIN. FT.
3.5" DIA. U-SAMPLE BORING LIN. FT.
CORE DRILLING IN ROCK LIN. FT.
NO. OF 3" SHELBY TUBE SAMPLES
NO. OF 3" UNDISTURBED SAMPLES
OTHER:

BORING CONTRACTOR AQUIFER DRILLING AND TESTING
DRILLER TONY PALOMEQUE **HELPERS** DYLAN JEWELL
REMARKS
RESIDENT ENGINEER LYSANDRA LINCOLN **DATE** 11/11/15

BORING NO. BRP-47

BOR-4_JAN2013

ch2m.

PROJECT NUMBER:

BORING NUMBER: BRP-48
Sheet: 1

SOIL BORING LOG

PROJECT: DUNDALK MARINE TERMINAL LOCATION: SEE PLAN
ELEVATION: ~ +20 DRILLING CONTRACTOR: ADT
DRILLING METHOD AND EQUIPMENT: FRASTE MULTIDRILL XL MAX 170
WATER LEVELS: START: 0850 11/11/15 FINISH: 0905 LOGGER: L. LINCOLN

DEPTH BELOW (ft)	SAMPLE			STANDARD PENETRATION TEST RESULTS	SOIL DESCRIPTION	COMMENTS
	NUMBER	TYPE	RECOVERY (ft)	6" - 6" - 6" (N)	SOIL NAME, USCS GROUP SYMBOL, COLOR, MOISTURE CONTENT, RELATIVE DENSITY OR CONSISTENCY, SOIL STRUCTURE, MINERALOGY	DEPTH OF CASING, DRILLING RATE, DRILLING FLUID LOSS, TESTS AND INTRUMENTATION
0					3" ASPHALT GRY C-F SAND, SM GVL (ROAD BASE AGGREGATE)	DPC-
1						
	S-1		3'	N/A		
2						
3						
					BRN SILTY F M SAND, SM GVL	DPC-
	S-2		3'	N/A		

PROJECT NUMBER:

BORING NUMBER: BRP-48
Sheet: 2

SOIL BORING LOG

PROJECT: DUNDALK MARINE TERMINAL **LOCATION:** SEE PLAN
ELEVATION: **DRILLING CONTRACTOR:**
DRILLING METHOD AND EQUIPMENT:
WATER LEVELS: **START:** **FINISH:** 0905 **LOGGER:**

DEPTH BELOW (ft)	SAMPLE			STANDARD PENETRATION TEST RESULTS	SOIL DESCRIPTION	COMMENTS
	NUMBER	TYPE	RECOVERY (ft)	6" - 6" - 6" (N)	SOIL NAME, USCS GROUP SYMBOL, COLOR, MOISTURE CONTENT, RELATIVE DENSITY OR CONSISTENCY, SOIL STRUCTURE, MINERALOGY	DEPTH OF CASING, DRILLING RATE, DRILLING FLUID LOSS, TESTS AND INTRUMENTATION
6					6-7.5 BRN C-F SAND, SM GVL, SILT (SURCHARGE FILL)	DPC.
7	S-3		24"	N/A		
					7.5-8.0 BRN CLAYEY F-M SAND, SM GVL (FILL)	DPC.
8						EOB @ 8.0'

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BORING NO. BRP-48
SHEET 3 OF 4
FILE NO. 10587
SURFACE ELEV. ~ +20
DATUM

PROJECT DUNDALK MARINE TERMINAL
LOCATION BALTIMORE, MARYLAND
BORING LOCATION SEE PLAN

TEST/INSPECTION EQUIPMENT
REFERENCE CODES/STANDARDS

BORING EQUIPMENT AND METHODS OF STABILIZING BOREHOLE

TYPE OF BORING RIG
TRUCK
SKID ✓
BARGE
OTHER

TYPE OF FEED DURING CORING
MECHANICAL
HYDRAULIC
OTHER

CASING USED ☐ YES ☑ NO
DIA., IN. DEPTH, FT. FROM TO
DIA., IN. DEPTH, FT. FROM TO
DIA., IN. DEPTH, FT. FROM TO

TYPE AND SIZE OF:
D-SAMPLER
U-SAMPLER
S-SAMPLER
CORE BARREL 3" SONIC
CORE BIT
DRILL RODS

DRILLING MUD USED ☐ YES ☑ NO
DIAMETER OF ROTARY BIT, IN.
TYPE OF DRILLING MUD

AUGER USED ☐ YES ☑ NO
TYPE AND DIAMETER, IN.

CASING HAMMER, LBS. AVERAGE FALL, IN.
SAMPLER HAMMER, LBS. 140 AVERAGE FALL, IN. 30
TYPE OF HAMMER

WATER LEVEL OBSERVATIONS IN BOREHOLE

DATE	TIME	DEPTH OF HOLE	DEPTH OF CASING	DEPTH TO WATER	CONDITIONS OF OBSERVATION
11/11/15	1300	8	0	6.7'	

PIEZOMETER INSTALLED ☑ YES ☐ NO SKETCH SHOWN ON P. 4

STANDPIPE: TYPE 2 ID, IN. LENGTH, FT. TOP ELEV.
INTAKE ELEMENT: TYPE OD, IN. LENGTH, FT. TIP ELEV.
FILTER MATERIAL OD, IN. LENGTH, FT. BOT. ELEV.

PAY QUANTITIES
3.5" DIA. DRY SAMPLE BORING LIN. FT.
3.5" DIA. U-SAMPLE BORING LIN. FT.
CORE DRILLING IN ROCK LIN. FT.
NO. OF 3" SHELBY TUBE SAMPLES
NO. OF 3" UNDISTURBED SAMPLES
OTHER:

BORING CONTRACTOR AQUIFER DRILLING AND TESTING
DRILLER TONY PALOMEQUE HELPERS DYLLON JEWELL
REMARKS
RESIDENT ENGINEER LYSANDRA LINCOLN DATE 11/11/15

BORING NO. BRP-48

ch2m:

PROJECT NUMBER:

BORING NUMBER: GP-1C

Sheet: 1

SOIL BORING LOG

PROJECT: Honeywell DMT SSI

LOCATION:

ELEVATION:

DRILLING CONTRACTOR: AQUIFER DRILLING AND TESTING, INC.

DRILLING METHOD AND EQUIPMENT: SONIC SAMP DRILL MAX 170 ; SPT sampling

WATER LEVELS:

START: 12/12/15 10:45

FINISH: 12/18/15

LOGGER: K. Chaturvedula

DEPTH BELOW (ft)	SAMPLE			STANDARD PENETRATION TEST RESULTS	SOIL DESCRIPTION	COMMENTS
	NUMBER	TYPE	RECOVERY (ft)	6" - 6" - 6" (N)	SOIL NAME, USCS GROUP SYMBOL, COLOR, MOISTURE CONTENT, RELATIVE DENSITY OR CONSISTENCY, SOIL STRUCTURE, MINERALOGY	DEPTH OF CASING, DRILLING RATE, DRILLING FLUID LOSS, TESTS AND INTRUMENTATION
0					4" asphalt 0.3' - crushed concrete, chunks 2-5" dia of concrete.	Advanced the borehole from 0-8' using 3" OD sonic macro core. -Hard drilling; concrete powder flying from the macro core as the sample is collected
1	S-1	SONIC MACRO CORE	34"	—		DPC -
2						
3					3.0' - silty sand (SM), dark brown (7.5YR 3/3), moist, fine to medium sand	DPC -
4					4.0' - same as above, with gravel	DPC -
5	S-2	SONIC MACRO CORE	48"	—		
					5.5' - same as above. Reddish Brown (7.5YR 4/6), with gravel	DPC -
6						

ch2m:

PROJECT NUMBER:

BORING NUMBER: GP-1C
Sheet: 2

SOIL BORING LOG

PROJECT:
LOCATION:
ELEVATION:
DRILLING CONTRACTOR:
DRILLING METHOD AND EQUIPMENT:
WATER LEVELS:
START:
FINISH:
LOGGER:

DEPTH BELOW (ft)	SAMPLE			STANDARD PENETRATION TEST RESULTS	SOIL DESCRIPTION	COMMENTS
	NUMBER	TYPE	RECOVERY (ft)	6" - 6" - 6" (N)	SOIL NAME, USCS GROUP SYMBOL, COLOR, MOISTURE CONTENT, RELATIVE DENSITY OR CONSISTENCY, SOIL STRUCTURE, MINERALOGY	DEPTH OF CASING, DRILLING RATE, DRILLING FLUID LOSS, TESTS AND INTRUMENTATION
6					6.0'- Same as above, with gravel	DPC=
	S-2	SONIC MACRO CORE	18"	–		
7						
					7.8'- Clayey SAND (SC), Red-Yellow (10YR 4/7), moist, fine to medium sand, trace gravel	SPT-
8				4	8.0'-8.2'- Fat CLAY (CH), Red-white (10YR 4/6), dry, very stiff	DPC=
				28	8.2'- Silty SAND with gravel (SM), Gray-brown-red, moist, fine to medium grained sand, greenish particles (COPR and non-COPR)	DPC +/-
9	SS-3	SS	20"	23		
				25		
10				41	10.0'- Poorly graded sand with clay and gravel (SP-SC), Red-Brown-gray, wet, medium to coarse grained sand (COPR and non-COPR)	10.0'- 6" OD outer casing installed to 10' bgs. 10.0'- groundwater encountered during drilling DPC+/-
	SS-4	SS	6"	8		
11				7		
				4		
12						

ch2m.

PROJECT NUMBER:

BORING NUMBER: GP-1C
Sheet: 3

SOIL BORING LOG

PROJECT:
LOCATION:
ELEVATION:
DRILLING CONTRACTOR:
DRILLING METHOD AND EQUIPMENT:
WATER LEVELS:
START:
FINISH:
LOGGER:

DEPTH BELOW (ft)	SAMPLE			STANDARD PENETRATION TEST RESULTS	SOIL DESCRIPTION	COMMENTS
	NUMBER	TYPE	RECOVERY (ft)	6" - 6" - 6" (N)	SOIL NAME, USCS GROUP SYMBOL, COLOR, MOISTURE CONTENT, RELATIVE DENSITY OR CONSISTENCY, SOIL STRUCTURE, MINERALOGY	DEPTH OF CASING, DRILLING RATE, DRILLING FLUID LOSS, TESTS AND INTRUMENTATION
12	SS-5	SS	8"	10 6	12.0' - Poorly graded sand (SP) dark gray (GLEY 1 4/10Y), wet medium grained sand	DPC -
13	SS-6	SS	12"	21 8	13.0' - Clayey sand with gravel (SC), Red-Brown (7.5YR 4/6), wet, fine to medium grained sand	DPC -
14	SS-7	SS	4"	7 18	14.0' - same as above.	DPC -
15					Bottom of boring @ 15.0' bgs	

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BORING NO. GP-1C
SHEET 4 OF
FILE NO. 10587
SURFACE ELEV.
DATUM

PROJECT DUNDALK MARINE TERMINAL
LOCATION BALTIMORE, MARYLAND
BORING LOCATION

TEST/INSPECTION EQUIPMENT Sonic Samp Drill Max XL 170, SPT Sampling
REFERENCE CODES/STANDARDS

BORING EQUIPMENT AND METHODS OF STABILIZING BOREHOLE

TYPE OF BORING RIG
TRUCK
SKID
BARGE
OTHER Truck

TYPE OF FEED DURING CORING
MECHANICAL
HYDRAULIC
OTHER

CASING USED ☑ YES ☐ NO
DIA., IN 6" DEPTH, FT. FROM 0 TO 15'
DIA., IN DEPTH, FT. FROM TO
DIA., IN DEPTH, FT. FROM TO

TYPE AND SIZE OF:
D-SAMPLER
U-SAMPLER
S-SAMPLER SS Sampler - 3" dia. OD.
CORE BARREL
CORE BIT
DRILL RODS
Sonic macro core : 8" OD

DRILLING MUD USED ☐ YES ☑ NO
DIAMETER OF ROTARY BIT, IN.
TYPE OF DRILLING MUD

AUGER USED ☐ YES ☑ NO
TYPE AND DIAMETER, IN.

CASING HAMMER, LBS. AVERAGE FALL, IN.
SAMPLER HAMMER, LBS. 140 AVERAGE FALL, IN. 30
TYPE OF HAMMER Automatic

WATER LEVEL OBSERVATIONS IN BOREHOLE

DATE	TIME	DEPTH OF HOLE	DEPTH OF CASING	DEPTH TO WATER	CONDITIONS OF OBSERVATION
12/8/15	11:23	12.0'	10.0	10.0	encountered during drilling

PIEZOMETER INSTALLED ☑ YES ☐ NO SKETCH SHOWN ON VWP Installation log

STANDPIPE: TYPE ID, IN. LENGTH, FT. TOP ELEV.
INTAKE ELEMENT: TYPE OD, IN. LENGTH, FT. TIP ELEV.
FILTER MATERIAL OD, IN. LENGTH, FT. BOT. ELEV

PAY QUANTITIES
3.5" DIA. DRY SAMPLE BORING LIN. FT.
3.5" DIA. U-SAMPLE BORING LIN. FT.
CORE DRILLING IN ROCK LIN. FT.
NO. OF 3" SHELBY TUBE SAMPLES
NO. OF 3" UNDISTURBED SAMPLES
OTHER:

BORING CONTRACTOR Aquifer Drilling and Testing, Inc.
DRILLER Brian Karshick HELPERS Chris Phelen
REMARKS Instrumentation Installed by MRCE
RESIDENT ENGINEER K. Chaturvedula DATE 12/18/15

BORING NO. GP-1C

BOR-4_JAN2013

ch2m

PROJECT NUMBER:

BORING NUMBER: GP-5A

Sheet: 1

SOIL BORING LOG

PROJECT: Honeywell DMT SSI

LOCATION:

ELEVATION:

DRILLING CONTRACTOR: Aquifer drilling and testing Inc.

DRILLING METHOD AND EQUIPMENT: SONIC SAMP DRILL MAX 170; SM Sampling

WATER LEVELS:

START: 11/2/15 14:00

FINISH: 11/2/15 15:15

LOGGER: K. Chaturvedula

DEPTH BELOW (ft)	SAMPLE			STANDARD PENETRATION TEST RESULTS	SOIL DESCRIPTION	COMMENTS
	NUMBER	TYPE	RECOVERY (ft)	6" - 6" - 6" (N)	SOIL NAME, USCS GROUP SYMBOL, COLOR, MOISTURE CONTENT, RELATIVE DENSITY OR CONSISTENCY, SOIL STRUCTURE, MINERALOGY	DEPTH OF CASING, DRILLING RATE, DRILLING FLUID LOSS, TESTS AND INTRUMENTATION
0					2" Asphalt	Advanced to 3'bgs with 3"ID sonic macro core
	S-1	SONIC MACRO CORE	26"		0.2'-1.2' - Poorly graded gravel with SAND (GP), gray-black (10YR 4/2) dry, road based aggregate	
1					1.2'-1.5' - Fat CLAY (CH), Red (10Y 4/4), moist, highly plastic.	
					1.5'-3.6' - Silty SAND (SM), Brown Reddish-green (10YR 4/3), dry, fine to medium grained sand, particulate to slightly indurated (COPR)	sample tested with diphenyl carbazide for the presence of COPR
2						
3					Same as above, higher fines content	Advanced the 3" ID sonic macro core from @ 3'-6'
4	S-2	SONIC MACRO CORE	24"			
5						
6						

ch2m

PROJECT NUMBER:
BORING NUMBER: GP-5A
Sheet: 2

SOIL BORING LOG

PROJECT:
LOCATION:
ELEVATION:
DRILLING CONTRACTOR:
DRILLING METHOD AND EQUIPMENT:
WATER LEVELS:
START:
FINISH:
LOGGER:

DEPTH BELOW (ft)	SAMPLE			STANDARD PENETRATION TEST RESULTS	SOIL DESCRIPTION	COMMENTS
	NUMBER	TYPE	RECOVERY (ft)	6" - 6" - 6" (N)	SOIL NAME, USCS GROUP SYMBOL, COLOR, MOISTURE CONTENT, RELATIVE DENSITY OR CONSISTENCY, SOIL STRUCTURE, MINERALOGY	DEPTH OF CASING, DRILLING RATE, DRILLING FLUID LOSS, TESTS AND INTRUMENTATION
6	S-3	SONIC MACRO CORE	32"		Same as above, wet	groundwater observed at 6.0' bgs during drilling Advanced the 3" sonic macro core from 6-9'
7					7.75'-8' - silty SAND (SM), dark gray and black (N2), wet, medium grained sand, particulate (GB COPR)	
8					8.0'-9.0' - Silty SAND (SM), Red-Brown and green (10YR 4/3), moist, particulate to slightly indurated. (HB COPR)	
9	SS-4	SS	9"	21 30	9.0' - Silty SAND (SM), Black and Red-Brown (10YR 4/3), wet, intermixed layers of GB and HB COPR, ~~white translucent~~ part	9.0' - White translucent particles observed in the sample. 10.0' - 6' OD casing installed to a depth of 10' bgs. 11.0. Below 9' switched to SS sampling, 140-lb hammer, 30 in. drop; 3" dia. sampler.
10	SS-5	SS	12"	15 48	10.0'-10.75' - Silty SAND (SM), dark gray ~~and~~ (10YR 3/2) and bright green (5Y 6/6), wet, medium grained sand, Particulate to slightly indurated (GB COPR) 10.75' - Silty SAND (SM), Red-Brown (10YR 5/6), wet, medium grained sand	
11	SS-6	SS	12"	67 93	11.0'-11.75' - Same as above 11.75'-12.0' - Silty SAND (SM), dark gray (10YR 3/1) and bright green (5Y 6/6), wet, medium grained sand, slightly indurated (GB COPR)	
12						

ch2m.

PROJECT NUMBER:

BORING NUMBER: GP-5A

Sheet: 3

SOIL BORING LOG

PROJECT:

LOCATION:

ELEVATION:

DRILLING CONTRACTOR:

DRILLING METHOD AND EQUIPMENT:

WATER LEVELS:

START:

FINISH:

LOGGER:

DEPTH BELOW (ft)	SAMPLE			STANDARD PENETRATION TEST RESULTS	SOIL DESCRIPTION	COMMENTS
	NUMBER	TYPE	RECOVERY (ft)	6" - 6" - 6" (N)	SOIL NAME, USCS GROUP SYMBOL, COLOR, MOISTURE CONTENT, RELATIVE DENSITY OR CONSISTENCY, SOIL STRUCTURE, MINERALOGY	DEPTH OF CASING, DRILLING RATE, DRILLING FLUID LOSS, TESTS AND INTRUMENTATION
12	SS-7	SS	6"	81	Silty SAND (SM), Brown-gray and greenish (2.5Y 5/4), wet, fine to medium grained sand, slightly indurated (HB COPR)	~~[illegible]~~ Advanced the 6' OD Outer casing to 13.0' bgs
	SS-8	SS	4"	25	~~Red~~ Fat CLAY (CH), Red (10YR 4/4) wet, highly plastic	
13					Bottom of the boring at 13 feet bgs	
14						

ch2m:

PROJECT NUMBER:

BORING NUMBER: GP-5C
Sheet: 1

SOIL BORING LOG

PROJECT: Honeywell DMT SSI
LOCATION:
ELEVATION:
DRILLING CONTRACTOR: Aquifer drilling and testing, Inc.
DRILLING METHOD AND EQUIPMENT: SONIC SAMP DRILLMAX 170; SPT sampling
WATER LEVELS:
START: 11/2/15 10:55
FINISH: 11/2/15 12:22
LOGGER: K. Chaturvedula

DEPTH BELOW (ft)	SAMPLE			STANDARD PENETRATION TEST RESULTS	SOIL DESCRIPTION	COMMENTS
	NUMBER	TYPE	RECOVERY (ft)	6" - 6" - 6" (N)	SOIL NAME, USCS GROUP SYMBOL, COLOR, MOISTURE CONTENT, RELATIVE DENSITY OR CONSISTENCY, SOIL STRUCTURE, MINERALOGY	DEPTH OF CASING, DRILLING RATE, DRILLING FLUID LOSS, TESTS AND INTRUMENTATION
0 1 2	SONIC MACRO CORE	S-1	17"		2" Asphalt Poorly graded GRAVEL with sand (GP), gray and black (10YR 4/1), dry Alternating layers of Asphalt and gravel ~~found on the spoon~~	Advanced the sonic macro core 3" ID to 3' bgs
3 4 5 6	S-2	[illegible] SONIC MACRO CORE	19"		3.0'-3.25' Fat CLAY (CH), Red (10YR 4/4), moist, highly plastic. 3.25'- Silty SAND with gravel (SM), Reddish-Brown and green (10YR 4/4) dry, fine to medium grained sand (COPR)	3' - Advanced the sonic macro core 3" ID from 3'-6'. sample tested with diphenyl carbazide to determine the presence of COPR

ch2m

PROJECT NUMBER:

BORING NUMBER: GP-5C
Sheet: 2

SOIL BORING LOG

PROJECT:
LOCATION:
ELEVATION:
DRILLING CONTRACTOR:
DRILLING METHOD AND EQUIPMENT:
WATER LEVELS:
START:
FINISH:
LOGGER:

DEPTH BELOW (ft)	SAMPLE			STANDARD PENETRATION TEST RESULTS	SOIL DESCRIPTION	COMMENTS
	NUMBER	TYPE	RECOVERY (ft)	6" - 6" - 6" (N)	SOIL NAME, USCS GROUP SYMBOL, COLOR, MOISTURE CONTENT, RELATIVE DENSITY OR CONSISTENCY, SOIL STRUCTURE, MINERALOGY	DEPTH OF CASING, DRILLING RATE, DRILLING FLUID LOSS, TESTS AND INTRUMENTATION
6 7 8	S-3	SONIC MACRO CORE	24"		6.0'-6.2' - same as above 6.2'-7.0' - Silty SAND (SM), dark gray (10YR 4/2), wet, medium grained sand, Particulate (GB COPR) 7.0' - silty SAND with gravel (SM) Reddish-Brown and greenish (10YR 4/4), dry, fine to medium grained sand, particulate (HB COPR)	6.0' - Advanced 3" ID sonic macro core from 6'-9'. - Water encountered at approximately 6.2' bgs during drilling
9	SS-4	SS	12"	20 31	9.0' - Poorly graded SAND with silt (SP-SM), wet, dark gray and black (N2), medium grained sand, particulate, (GB COPR)	10.0' - 6" OD outer casing installed to a depth of 10' bgs
10	SS-5	SS	12"	28 83	same as above, slightly to moderately indurated	
11	SS-6	SS	5"	100/5"	same as above	Advanced to 12' using 3" ID sonic macrocore
12						

ch2m:

PROJECT NUMBER:

BORING NUMBER: GP-5C

Sheet: 2

SOIL BORING LOG

PROJECT:

LOCATION:

ELEVATION:

DRILLING CONTRACTOR:

DRILLING METHOD AND EQUIPMENT:

WATER LEVELS:

START:

FINISH:

LOGGER:

DEPTH BELOW (ft)	SAMPLE			STANDARD PENETRATION TEST RESULTS	SOIL DESCRIPTION	COMMENTS
	NUMBER	TYPE	RECOVERY (ft)	6" - 6" - 6" (N)	SOIL NAME, USCS GROUP SYMBOL, COLOR, MOISTURE CONTENT, RELATIVE DENSITY OR CONSISTENCY, SOIL STRUCTURE, MINERALOGY	DEPTH OF CASING, DRILLING RATE, DRILLING FLUID LOSS, TESTS AND INTRUMENTATION
12	SS-7	SS	6"	30	same as above, pockets of gray Sand clay.	
	SS-8	SS	6"	30	same as above, moderately to highly indurated	
13					13.0'- same as above	
	SS-9	SS	4"	13	13.4'- Fat CLAY (CH), Red (10Y4/4), highly plastic.	
					Bottom of boring at 13.5' bgs	
14						

ch2m:

PROJECT NUMBER:
BORING NUMBER: GP-9A
Sheet: 1

SOIL BORING LOG

PROJECT: Honeywell DMT SSI
LOCATION:
ELEVATION:
DRILLING CONTRACTOR: Aquifer drilling and testing Inc.
DRILLING METHOD AND EQUIPMENT: SONIC SAMP DRILL MAX 170; SPT sampling
WATER LEVELS:
START: 11/3/15 16:15
FINISH: 11/3/15 17:40
LOGGER: K. Chaturvedula

DEPTH BELOW (ft)	SAMPLE			STANDARD PENETRATION TEST RESULTS	SOIL DESCRIPTION	COMMENTS
	NUMBER	TYPE	RECOVERY (ft)	6" - 6" - 6" (N)	SOIL NAME, USCS GROUP SYMBOL, COLOR, MOISTURE CONTENT, RELATIVE DENSITY OR CONSISTENCY, SOIL STRUCTURE, MINERALOGY	DEPTH OF CASING, DRILLING RATE, DRILLING FLUID LOSS, TESTS AND INTRUMENTATION
0	S-1	SONIC MACRO CORE	32"		3" Asphalt 0.25'-2.0' - Poorly graded GRAVEL with sand and silt (GP-GM), gray (10YR 6/2), moist. Road based aggregate	Advanced the hole using 3" ID sonic macro core
1						2.0' - Polyethylene membrane encountered in the spoon
2					2.0' - Poorly graded SAND with silt and gravel (SP-SM), gray-brown (10YR 4/3), moist, medium to coarse grained sand	
3	S-2	SONIC MACRO CORE	29"		3.0'-4.0' - Same as above.	
4					4.0'-4.5' - Clayey SAND (SC), Red-white (10Y 4/4), dry, fine to medium grained sand. 4.5'-5.5' - Poorly graded GRAVEL with sand (GP), Black (N2), dry, Road based aggregate	
5					5.5'-6.0' - same as above, tan-white (10YR 8/2), moist, coarse grained sand	
6						

ch2m

PROJECT NUMBER:

BORING NUMBER: GP-9A
Sheet: 2

SOIL BORING LOG

PROJECT:
LOCATION:
ELEVATION:
DRILLING CONTRACTOR:
DRILLING METHOD AND EQUIPMENT:
WATER LEVELS:
START:
FINISH:
LOGGER:

DEPTH BELOW (ft)	SAMPLE			STANDARD PENETRATION TEST RESULTS	SOIL DESCRIPTION	COMMENTS
	NUMBER	TYPE	RECOVERY (ft)	6" - 6" - 6" (N)	SOIL NAME, USCS GROUP SYMBOL, COLOR, MOISTURE CONTENT, RELATIVE DENSITY OR CONSISTENCY, SOIL STRUCTURE, MINERALOGY	DEPTH OF CASING, DRILLING RATE, DRILLING FLUID LOSS, TESTS AND INTRUMENTATION
6					Silty sand (SM), dark gray and brown (10YR 4/4), dry, fine to medium grained sand, particulate (HB COPR)	Sample tested with diphenyl carbazide for the presence of COPR
7	S-3	SONIC MACRO CORE	36"		7.0' - Same as above, Red-Brown and greenish. (10YR 4/6)	
8						
9	S-4	SONIC MACRO CORE	12"		Same as above slightly to moderately indurated.	installed the 6" OD outer casing down to 10' bgs
10	SS-5	SS	10"	12 23	Same as above	10' - switched to SS sampling, 140-lb hammer, 30in drop, 3" dia sampler
11	SS-6	SS	5"	50/5"	11.0' - Poorly graded SAND with Silt (SP-SM), gray-black (N2) and greenish, wet, Particulate (GB COPR)	
12						

ch2m

PROJECT NUMBER:

BORING NUMBER: GR 9A

Sheet: 3

SOIL BORING LOG

PROJECT:

LOCATION:

ELEVATION:

DRILLING CONTRACTOR:

DRILLING METHOD AND EQUIPMENT:

WATER LEVELS:

START:

FINISH:

LOGGER:

DEPTH BELOW (ft)	SAMPLE			STANDARD PENETRATION TEST RESULTS	SOIL DESCRIPTION	COMMENTS
	NUMBER	TYPE	RECOVERY (ft)	6" - 6" - 6" (N)	SOIL NAME, USCS GROUP SYMBOL, COLOR, MOISTURE CONTENT, RELATIVE DENSITY OR CONSISTENCY, SOIL STRUCTURE, MINERALOGY	DEPTH OF CASING, DRILLING RATE, DRILLING FLUID LOSS, TESTS AND INTRUMENTATION
12	SS-7	SS	6"	28 32	Silty Sand (SM), Brown-gray and greenish (10YR 4/3), dry, Particulate to slightly indurated (HB COPR)	
13	SS-8	SS	NR	28	No Recovery	
	SS-9	SS	6"	75	Poorly graded sand with silt (SP-SM), dark gray and black (N3), wet, medium grained sand, Particulate (GB COPR)	13.5' - Groundwater encountered during drilling at 13.5' bgs
14	SS-10	SS	NR	50/1"	No Recovery	Advanced to 14.5' bgs using 3" ID sonic macro core
	SS-11	SS	6"	22	Same as above	
15	SS-12	SS	6"	9$	Sandy lean CLAY (CL), Red (10Y 4/6) moist, fine grained sand	
					Bottom of boring @ 15.5' bgs.	
16						

PROJECT NUMBER:	BORING NUMBER: GP-9C Sheet: 1

SOIL BORING LOG

PROJECT: DUNDALK MARINE TERMINAL LOCATION: SEE PLAN
ELEVATION: ~ +17 DRILLING CONTRACTOR:
DRILLING METHOD AND EQUIPMENT: FRASTE MULTIDRILL XL MAX 170
WATER LEVELS: ~ + [illegible] START: 0830 FINISH: 1130 LOGGER: L. LINCOLN

DEPTH BELOW (ft)	SAMPLE			STANDARD PENETRATION TEST RESULTS	SOIL DESCRIPTION	COMMENTS
	NUMBER	TYPE	RECOVERY (ft)	6" - 6" - 6" (N)	SOIL NAME, USCS GROUP SYMBOL, COLOR, MOISTURE CONTENT, RELATIVE DENSITY OR CONSISTENCY, SOIL STRUCTURE, MINERALOGY	DEPTH OF CASING, DRILLING RATE, DRILLING FLUID LOSS, TESTS AND INTRUMENTATION
0					4" ASPHALT 6" TAN C-M SAND, TR GVL, SILT (FILL) 2" ASPHALT	
1		SONIC			BRN C-F SAND, SM GVL, TR SILT (FILL)	
	S-1		27"	N/A		
2						
3					3-3.2 BRN C-F SAND, SM GVL, SILT, TR PLANT FIBERS 3.2-3.4 BLK ASPHALT 3.4-3.8 WHITE C-M SAND, SM GVL, 3.8-4.2 BRN, BLK C-F SAND, GVL	NO DPC
4					4.2-4.7 RED CLAY MOTT WHITE, YELLOW, SM C-F SAND, GVL	
	S-2	SONIC				
5					4.7-6 MOD. LITH BRN, GRY, YELLOW SILTY F-C SAND, SM GVL (HB)	DPC+
6						

ch2m

PROJECT NUMBER:

BORING NUMBER: GP-9C
Sheet: 2

SOIL BORING LOG

PROJECT: DUNDALK MARINE TERMINAL **LOCATION:** SEE PLAN
ELEVATION: ~ +17 **DRILLING CONTRACTOR:** SDS
DRILLING METHOD AND EQUIPMENT: FRASTE MULTIDRILL XL MAX 170
WATER LEVELS: ~ +6 **START:** 0830 **FINISH:** 1130 **LOGGER:** L. LINCOLN

DEPTH BELOW (ft)	SAMPLE			STANDARD PENETRATION TEST RESULTS	SOIL DESCRIPTION	COMMENTS
	NUMBER	TYPE	RECOVERY (ft)	6" - 6" - 6" (N)	SOIL NAME, USCS GROUP SYMBOL, COLOR, MOISTURE CONTENT, RELATIVE DENSITY OR CONSISTENCY, SOIL STRUCTURE, MINERALOGY	DEPTH OF CASING, DRILLING RATE, DRILLING FLUID LOSS, TESTS AND INTRUMENTATION
6					6-9' GRY, YELLOW, RED-BRN MOD-HIGHLY LITHIFIED SILTY F-C SAND, SM GVL (HB)	
7	S-3	SONIC	27'	N/A		
8						
9	S-4	SONIC	8"	N/A	9-10 RED-BRN, GRY, YELLOW CLAYEY F-C SAND, TR. GVL (HB)	DPCT
10	SS-5	3" O.D. SS	12"	20 87	10-11 RED-BRN, GRY, BLK, YELLOW MOD-HIGHLY LITH. SILTY F-M SAND, TR. GVL (HB)	
11	SS-6		12"	42 29	11-12 DO SS-5 (HB)	
12						

ch2m

PROJECT NUMBER: **BORING NUMBER:** GP-9C
Sheet: 3

SOIL BORING LOG

PROJECT: DUNDALK MARINE TERMINAL **LOCATION:** SEE PLAN
ELEVATION: ~ +17 **DRILLING CONTRACTOR:** SDS
DRILLING METHOD AND EQUIPMENT: FRASTE MULTIDRILL XL MAX 170
WATER LEVELS: **START:** 0830 **FINISH:** **LOGGER:** L. LINCOLN

DEPTH BELOW (ft)	SAMPLE			STANDARD PENETRATION TEST RESULTS	SOIL DESCRIPTION	COMMENTS
	NUMBER	TYPE	RECOVERY (ft)	6" - 6" - 6" (N)	SOIL NAME, USCS GROUP SYMBOL, COLOR, MOISTURE CONTENT, RELATIVE DENSITY OR CONSISTENCY, SOIL STRUCTURE, MINERALOGY	DEPTH OF CASING, DRILLING RATE, DRILLING FLUID LOSS, TESTS AND INTRUMENTATION
12	SS-7	3" O.D. SS	0"	9 15	12-13' NO RECOVERY	
13	SS-8		12"	21 53	13-13.7 DK GRY, GREEN F-M SAND, TR. SILT (GB) 13.7-14 BRN, GRY, YELLOW SILTY F-M SAND, TR. GVL (HB)	13' - WATER IN SPOON
14	SS-9		2"	9	14-14.4 BRN, GRY, GVLY SAND, SM SILT 14.4-14.5 RED BRN, GRY SANDY CLAY	DPC +
	SS-10		6"	7	14.5-15.0 RED CLAY MOTT. WHITE, YELLOW SM TAN M-F SAND	
15						EOB @ 15.0'
16						
17						
18						

Mueser Rutledge Consulting Engineers
14 Penn Plaza - 225 West 34th Street
New York, NY 10122
T: 917 339-9300 F: 917 339-9400
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BORING NO. GP- 9C
SHEET OF
PROJECT DUNDALK MARINE TERMINAL
FILE NO. 10587
LOCATION BALTIMORE, MARYLAND
SURFACE ELEV. ~+17
BORING LOCATION SEE PLAN
DATUM

TEST/INSPECTION EQUIPMENT
REFERENCE CODES/STANDARDS

BORING EQUIPMENT AND METHODS OF STABILIZING BOREHOLE

TYPE OF BORING RIG
TRUCK
SKID ✓
BARGE
OTHER

TYPE OF FEED DURING CORING
MECHANICAL
HYDRAULIC
OTHER

CASING USED ☐ YES ☐ NO
DIA., IN. DEPTH, FT. FROM TO
DIA., IN. DEPTH, FT. FROM TO
DIA., IN. DEPTH, FT. FROM TO

TYPE AND SIZE OF:
D-SAMPLER
U-SAMPLER
S-SAMPLER
CORE BARREL 3" SONIC
CORE BIT
DRILL RODS

DRILLING MUD USED ☐ YES ☑ NO
DIAMETER OF ROTARY BIT, IN.
TYPE OF DRILLING MUD

AUGER USED ☐ YES ☑ NO
TYPE AND DIAMETER, IN.

CASING HAMMER, LBS. AVERAGE FALL, IN.
SAMPLER HAMMER, LBS. 140 AVERAGE FALL, IN. 30
TYPE OF HAMMER

WATER LEVEL OBSERVATIONS IN BOREHOLE

DATE	TIME	DEPTH OF HOLE	DEPTH OF CASING	DEPTH TO WATER	CONDITIONS OF OBSERVATION

PIEZOMETER INSTALLED ☑ YES VWP ☐ NO **SKETCH SHOWN ON**

STANDPIPE: TYPE ID, IN. LENGTH, FT. TOP ELEV.
INTAKE ELEMENT: TYPE OD, IN. LENGTH, FT. TIP ELEV.
FILTER: MATERIAL OD, IN. LENGTH, FT. BOT. ELEV.

PAY QUANTITIES
3.5" DIA. DRY SAMPLE BORING LIN. FT.
3.5" DIA. U-SAMPLE BORING LIN. FT.
CORE DRILLING IN ROCK LIN. FT.
NO. OF 3" SHELBY TUBE SAMPLES
NO. OF 3" UNDISTURBED SAMPLES
OTHER:

BORING CONTRACTOR SONIC DRILLING SERVICES
DRILLER BRIAN KARSHICK **HELPERS** WARREN JAMES
REMARKS
RESIDENT ENGINEER LYSANDRA LINCOLN **DATE** 11/4/15

BORING NO. GP- 9C

BORING LOG Page 1 of 2

CH2MHILL

Site: Dundalk Marine Terminal
Boring No: DMT-TW1

Northing: 573899.856
Easting: 1448112.085
Elevation: 17.673

Driller: Parratt Wolff, Inc.
Method: Hollow Stem Auger
Consultant: CH2M Hill
Geologist: C. Reed

Total Depth: 18.0 Ft
Start Date: 07/21/2011

Depth Ft	Rec	DPC	PID	USCS	Soil Code	Stratum Description
0		-				Asphalt/subbase.
		-		SP-SC		POORLY GRADED SAND with CLAY and GRAVEL (SP-SC), dark yellow brown (10YR 3/4), dry to moist, fine to coarse sand with little angular gravel, (firm).
5		-		SP-SC		POORLY GRADED SAND with CLAY and GRAVEL (SP-SC), dark yellow brown (10YR 3/4), dry to moist, fine to coarse sand with little angular gravel and black geotextile fabric at 0.5' of this interval, (firm).
		-		ML		SILT with SAND (ML), dark gray (10YR 4/1), dry, with fine sand, (loose).
		-		SP-SC		POORLY GRADED SAND with CLAY and GRAVEL (SP-SC), dark yellow brown (10YR 3/4), dry to moist, fine to coarse sand with little angular gravel, (firm).
		+		MH		GRAVELLY ELASTIC SILT with SAND (MH), very dark gray (10YR 3/1), dry, with fine to medium subangular gravel and little fine to medium sand, (loose).
10						

BORING LOG

Page 2 of 2

CH2MHILL

Site: Dundalk Marine Terminal
Boring No: DMT-TW1

Northing: 573899.856
Easting: 1448112.085
Elevation: 17.673

Driller: Parratt Wolff, Inc.
Method: Hollow Stem Auger
Consultant: CH2M Hill
Geologist: C. Reed

Total Depth: 18.0 Ft
Start Date: 07/21/2011

Depth Ft	Rec	DPC	PID	USCS	Soil Code	Stratum Description
10		-		CL		LEAN CLAY (CL), red (2.5YR 4/8), dry to moist, with trace fine sand, (stiff).
		++		SP	HB	POORLY GRADED SAND (SP), strong brown (7.5YR 4/8), wet, fine to medium sand with trace silt, strongly indurated, (medium dense).
15		++		SP	HB	POORLY GRADED SAND (SP), strong brown (7.5YR 4/8), wet, fine to medium sand with trace silt, weakly indurated, (medium dense).
		++				
18.0		-		CL		LEAN CLAY with SAND (CL), red (2.5YR 4/8), moist, with fine sand, (stiff).

BORING LOG

Page 1 of 2

CH2MHILL

Site: Dundalk Marine Terminal
Boring No: DMT-TW2

Northing: 574014.616
Easting: 1448455.513
Elevation: 19.776

Driller: Parratt Wolff, Inc.
Method: Hollow Stem Auger
Consultant: CH2M Hill
Geologist: C. Reed

Total Depth: 19.0 Ft
Start Date: 07/22/2011

Depth Ft	Rec	DPC	PID	USCS	Soil Code	Stratum Description
0		-				Asphalt/subbase.
		-		SP-SC		POORLY GRADED SAND with CLAY and GRAVEL (SP-SC), dark brown (10YR 3/3), dry to moist, fine to medium sand with little fine to medium subangular gravel, (firm).
5		-				
		-				
		-		MH		GRAVELLY ELASTIC SILT with SAND (MH), dark gray (10YR 4/1), dry, fine to medium sand with little fine to medium angular gravel, (loose).
		-		CL		LEAN CLAY (CL), red (2.5YR 4/8), dry to moist, with trace fine sand and fibrous geotextile fabric, (stiff).
10						

BORING LOG Page 2 of 2

CH2MHILL

Site: Dundalk Marine Terminal
Boring No: DMT-TW2

Northing: 574014.616
Easting: 1448455.513
Elevation: 19.776

Driller: Parratt Wolff, Inc.
Method: Hollow Stem Auger
Consultant: CH2M Hill
Geologist: C. Reed

Total Depth: 19.0 Ft
Start Date: 07/22/2011

Depth Ft	Rec	DPC	PID	USCS	Soil Code	Stratum Description
10		-		CL		LEAN CLAY (CL), red (2.5YR 4/6), dry to moist, with trace fine sand and fibrous geotextile fabric, (stiff).
		++		SP	GB	POORLY GRADED SAND (SP), strong brown (7.5YR 4/6), moist to dry, fine to medium sand with trace silt, moderately indurated, (medium dense).
		++		SP	HB	POORLY GRADED SAND (SP), strong brown (7.5YR 4/6), wet, fine to medium sand with trace silt, moderately indurated, (medium dense).
15		++		SP	HB	POORLY GRADED SAND (SP), strong brown (7.5YR 4/6), moist to dry, fine to medium sand with trace silt, weakly indurated, (medium dense).
		+				
		+		SP-SM	GB	POORLY GRADED SAND with SILT (SP-SM), very dark gray (10YR 3/1), wet, fine to medium sand with trace subangular gravel, particulate, (loose).
		+		SP	HB	POORLY GRADED SAND (SP), very dark brown (10YR 2/2), wet, fine to medium sand with little fine angular gravel, wealy indurated, (dense).
		+		SP-SM	GB	POORLY GRADED SAND with SILT (SP-SM), very dark gray brown (10YR 3/2), wet, fine to medium grained sand with trace angular gravel, particulate, (medium dense).
		+		CL		LEAN CLAY with SAND (CL), red (2.5YR 4/6), moist, with fine sand, (stiff).
19.0						

JACOBS

PROJECT NUMBER: 704692
BORING NUMBER: SL-1
Page 1 of 2

SOIL BORING LOG

PROJECT : Honeywell DMT
LOCATION : Baltimore, MD
ELEVATION : ±23.5
DRILLING CONTRACTOI Parratt Wolff
DRILLING METHOD AND EQUIPMENT USED : CME 55 HSA
ATD WATER LEVEL :
START : 1410 7/25/18 END : 1045 7/26/18
LOGGER : [illegible]

DEPTH BELOW SURFACE (FT)	INTERVAL (FT)	RECOVERY (IN)	SAMPLE #TYPE	DPC (COPR)	COPR Strata	SOIL DESCRIPTION: SOIL NAME, USCS GROUP SYMBOL, COLOR, MOISTURE CONTENT, RELATIVE DENSITY, OR CONSISTENCY, SOIL STRUCTURE, MINERALOGY.	USCS	BLOW COUNTS	COMMENTS: DEPTH OF CASING, DRILLING RATE, DRILLING FLUID LOSS, TESTS, AND STRUMENTATION DRILLING ACTIONS/DRILLER COMMENTS
	0 to 1					ASPHALT ROAD BASE			3.25" SS HSA used Sampled with [illegible] rig
	1 to 2	9	SS1	– –		12-15" - [illegible] 15-24" F to C Sand & Gravel, trace silt, 2.5 Y 3/2 (very dark grayish brown) moist, medium, well graded	SW-SM	16 11	Mesh encountered at 2' bgs
	2 to 4	20	SS2	– – – –		24-28" - No Recovery 28-32" - SOD 32-48" - Clayey F Sand, some gravel, 5 YR 3/2 (dark reddish brown) moist, medium, well graded	SP-SM	1 3 6 11	Advanced HSA from 2 to 4
	4 to 6	13	SS3	– – – –		48-59" - No Recovery 59-72" - SOD	SP-SM	5 5 6 10	
	6 to 8	13	SS4	– – – –		72-78" - No Recovery 78-85" - SOD 85-86" - White Cobble 86-96" - Asphalt road base	SP-SM	9 31 24 25	Advanced HSA from 6 to 8.
	8 to 10	19	SS5	– – – –		96-101" - No Recovery 101-102" - White Cobble 102-111" - F. to M. Sand, trace gravel, gley 1 4 5G/1 (greenish gray) dry, medium, well graded 111-112" - F. to M. Sand, trace silt, 5 YR 4/6 (yellowish red) dry, medium, poorly graded 112-120" - F to C Sand, trace silt & gravel 7.5 YR 7/3 (dark brown) dry, loose, well graded		29 28 15 8	

JACOBS

PROJECT NUMBER: 706612
BORING NUMBER: SL-1
Page 2 of 2

SOIL BORING LOG

PROJECT : Honeywell DMT
LOCATION : Baltimore, MD
ELEVATION : +23.5
DRILLING CONTRACTOf Parratt Wolff
DRILLING METHOD AND EQUIPMENT USED : CME 55, HSA
ATD WATER LEVEL :
START : 1410 7/11/18
END : 1645 7/21/18
LOGGER : T. Crandall / Jacobs N. Hopkins / Parratt

DEPTH BELOW SURFACE (FT)	INTERVAL (FT)	RECOVERY (IN)	SAMPLE #/TYPE	DPC (COPR)	COPR Strata	SOIL DESCRIPTION SOIL NAME, USCS GROUP SYMBOL, COLOR, MOISTURE CONTENT, RELATIVE DENSITY, OR CONSISTENCY, SOIL STRUCTURE, MINERALOGY.	USCS	BLOW COUNTS	COMMENTS DEPTH OF CASING, DRILLING RATE, DRILLING FLUID LOSS, TESTS, AND STRUMENTATION. DRILLING ACTIONS/DRILLER COMMENTS
	10 to ~~12"~~ 11'3"	14"	SS6	- - +	HB	120 - 124" - No Recovery 124 - 125" - SDD 125 - 134" - Clay, 2.5 YR 5/6 (Red) F. Sandy Clay, Moist, Stiff, Poorly Graded, Mottles with White 134 - 135" - F. to M. Sand with Silt, 5YR 4/6 (Yellowish Red) Dry, Very Dense, Poorly Graded, Weakly Indurated	CL SM	5 10 75/3	Pocket Pen: >4 tsf Advance HSA from 8 to 12
	12 to 13'6"	18"	SS7	++	HB	144 - 162" - SDA	SM	22 17 100/6	
	14 to 16	24"	SS8	++ ++	HB GB	168 - 185" - SDD 185 - 192" - F. to M. Silty Sand, trace gravel, 5Y 4/1 (Dark Gray), Moist, Very Dense, Poorly Graded COPR Nodules	SM SM	64 35 18 68	Advanced HSA from 12 to 16
	16 to 17'6"	18"	SS9	++ ++ ++	HB GB	192 - 207" - F. to M. Sand, 5YR 4/6 (Yellowish Red) Dry, Dense, Poorly Graded, Weakly Indurated 207 - 210" - F. to M. Silty Sand, trace Gravel, 5Y 7/1 (Dark Gray) Dry, Medium, Poorly Graded	SM SM	30 34 13	
	17'6" to 18'	5"	SS10	++ ++	GB	210" - 211" : No recovery 211" - 216" : SAA (207" - 210") WET	SM	20	Begin 6" sample intervals with 3" spoon
	18' to 18'6"	6"	SS11	++ -	HB	216 - 218" - SDA (192 - 207") 218 - 222" - Silty Clay, some F. Sand, 5Y 4/1 (Dark Gray), Moist, Stiff, Poorly Graded	SM CL	9	PP = 2.5 tsf
	18'6" to 18'9"		SS12	-		222 - 225" - ~~SAA (216~~ Sd Clay, trace F. Sand, 5Y 4/1 (Dark Gray) Wet, Soft, Poorly Graded, Mottled with 2.5 YR 5/6 (Red) Clay		3	PP: 0.75 tsf

B.O.B. @ 18' 9" bgs

JACOBS

PROJECT NUMBER: 706612
BORING NUMBER: SL-2
Page 1 of 3

SOIL BORING LOG

PROJECT : Honeywell DMT
LOCATION : Baltimore, MD
ELEVATION : +24.5
DRILLING CONTRACTOF Parratt Wolff
DRILLING METHOD AND EQUIPMENT USED : CME 55; HSA
ATD WATER LEVEL :
START : 1800 7/23/18
END : 1100 7/28/18
LOGGER : E. Zhuchnic / Jacobs
M. [illegible] / MACE

DEPTH BELOW SURFACE (FT) INTERVAL (FT)	RECOVERY (IN)	SAMPLE #/TYPE	SAMPLE DPC (COPR)	COPR Strata	SOIL DESCRIPTION: SOIL NAME, USCS GROUP SYMBOL, COLOR, MOISTURE CONTENT, RELATIVE DENSITY, OR CONSISTENCY, SOIL STRUCTURE, MINERALOGY.	USCS	BLOW COUNTS	COMMENTS: DEPTH OF CASING, DRILLING RATE, DRILLING FLUID LOSS, TESTS, AND STRUMENTATION. DRILLING ACTIONS/DRILLER COMMENTS
0 - 0.5	\	\	\	\	ASPHALT			3¼" ID HSA Sample w/ LAW rods
0.5 to 2	12	SS1	– –		0-12" : No recovery 12-24" : Gravelly F-C SA, TR SI (SP-SM) 5Y 5/2 (OLIVE GRAY) Dry, Dense, Well Graded	SP-SM	19 34 22	
2 to 4	18	SS2	– – –		24"-30" : No recovery 30-40" : SILTY F SAND (SM) 10YR 4/3 (Brown) Dry, Med. Dense, Poorly Grad. 40-48" : F SANDY CLAY (SC) 10YR 4/3 (BROWN) Moist, Stiff	SM SC	2 6 6 7	Advance HSA 0'-4'.
4 to 6	20	SS3	– – –		48"-52" : No recovery 52-67" : SAA (40"-48") (SC) 67"-72" : weathered Asphalt Road Base Black F-C SA, some SILT (SM) Dry, very Dense	SC SM	4 4 19 20	PP > 4 tsf
6' to 8'	20	SS4	– – –		72"-76" : No recovery 76"-96" : SAA (67"-72") (SM) Weathered Asphalt, tar-like consistency	SM	16 29 32 54	Advance HSA 4'-8'.
8' to 10'	20	SS5	– – –		96-100" : No recovery 100-109" : F-C SA, SM GVL, TR SI (SP-SM) GLEY 2 5/1 (Bluish Gry) Dry, Well Graded, Med. Dense 109-115" : F-M SA, TR GVL, SI (SP-SM) 7.5 YR 7/4 (Pink) Dry, Poorly Graded, Medium Dense	SP-SM CL	21 10 6 4	PP = 2.5 tsf ~~Advance HSA 4'-8'.~~

115"-120" : SILTY CLAY, TR F SA (CL)
2.5 YR 4/6 (RED)
Poorly Graded, Moist

Scanned by CamScanner

JACOBS

PROJECT NUMBER	BORING NUMBER	
706612	SL-2	Page 2 of 3

SOIL BORING LOG

PROJECT : Honeywell DMT
LOCATION : Baltimore, MD
ELEVATION : +24.5
DRILLING CONTRACTOI Parratt Wolff
DRILLING METHOD AND EQUIPMENT USED : CME 55 HSA
ATD WATER LEVEL :
START : 0800 7/28/18
END : 1100 7/28/18
LOGGER : I. ZAMDZIN (JACOBS) M. HAMILTON (MPCC)

DEPTH BELOW SURFACE (FT)	INTERVAL (FT)	RECOVERY (IN)	SAMPLE #/TYPE	DPC (COPR)	COPR Strata	SOIL DESCRIPTION SOIL NAME, USCS GROUP SYMBOL, COLOR, MOISTURE CONTENT, RELATIVE DENSITY, OR CONSISTENCY, SOIL STRUCTURE, MINERALOGY.	USCS	BLOW COUNTS	COMMENTS DEPTH OF CASING, DRILLING RATE, DRILLING FLUID LOSS, TESTS, AND STRUMENTATION. DRILLING ACTIONS/DRILLER COMMENTS
	10' to 10.9'	10	SS6	— ++	HB	120"-178" : SAA (115"-120") (CL) 128"-130" : F-M SILTY SAND (SM) 10YR 5/6 (Yellowish Brn) Dry, Poorly Graded, V. Dense Moderately Indurated	CL SM	3 100/4"	PP = 8.5 tsf Drill ahead to 12'.
	12 to 12.3	4	SS7	++	HB	144"-148" : SAA (128"-130") 7.5 YR 4/6 (Strong Brn)	SM	100/4"	Advance HSA 8'-12'. Drill ahead to 14'.
	14 to 15.9'	23	SS8	++ ++ ++ ++	HB GB HB	168"-182" : F SILTY SAND, TR GVL (SM) 7.5 YR 4/6 (Strong Brn) Dry, Very Dense 182"-188" : F-M SILTY SAND (SM) 2.5 Y 2.5/1 (BLACK) Moist, Poorly Graded COPR (Yellow) Nodules 188"-191" : SAA (168"-182")	SM	71 32 25 100/5"	Advance HSA 12'-16'.
	16' to 18'	16	SS9	++ ++ ++ ++	HB GB	192"-199" : No recovery 197"-206" : SAA (168"-182") 206"-211" : SAA (182"-188")	SM	20 16 24 70/3"	
	18 to 18.5	2 (CM Shoe)	SS 10	++ ++	GB	216"-218" : F-M SILTY SAND (SM) Yellow COPR nodules Strongly Indurated Dry, V. Dense, Poorly Graded	SM	50/2"	
	18.5 to 19	6	SS 11	++ ++	GB HB	222"-225" : F-M SILTY SAND (SM) GLEY 1 3/N (V. Dark Gry) Moist, Poorly Graded Weakly Indurated	SM	46	

225"-228" : SAA (168"-182")
Weakly Indurated

JACOBS

PROJECT NUMBER

BORING NUMBER SL-2

Page 3 of 3

SOIL BORING LOG

PROJECT : Honeywell DMT
LOCATION : Baltimore, MD
ELEVATION : +24.5
DRILLING CONTRACTOR Parratt Wolff
DRILLING METHOD AND EQUIPMENT USED :
ATD WATER LEVEL :
START : 0800 1/28/18
END : 1100 7/28/18
LOGGER : I. ZMUDZIN (JACOBS) M. HAMILTON (ARCE)

DEPTH BELOW SURFACE (FT)	INTERVAL (FT)	RECOVERY (IN)	SAMPLE #/TYPE	SAMPLE DPC (COPR)	COPR Strata	SOIL DESCRIPTION: SOIL NAME, USCS GROUP SYMBOL, COLOR, MOISTURE CONTENT, RELATIVE DENSITY, OR CONSISTENCY, SOIL STRUCTURE, MINERALOGY.	USCS	BLOW COUNTS	COMMENTS: DEPTH OF CASING, DRILLING RATE, DRILLING FLUID LOSS, TESTS, AND STRUMENTATION. DRILLING ACTIONS/DRILLER COMMENTS
	19 to 19.5	6	SS 12	++ —		228"-230": SAA (225"-228") 230"-234": F-M SANDY CLAY, TR GVL (SC) 2.5YR 4/8 (RED) MOIST, POORLY GRADED	SM SC	15	
						End of boring at 19.5'.			

JACOBS

PROJECT NUMBER: 706612

BORING NUMBER: SL-4

Page 1 of 3

SOIL BORING LOG

PROJECT: Honeywell DMT

ELEVATION: +25

LOCATION: Baltimore, MD

DRILLING METHOD AND EQUIPMENT USED: CME 55, HSA

DRILLING CONTRACTOI Parratt Wolff

ATD WATER LEVEL:

START: 1605 7/25/18 END: 1035 7/26/18

LOGGER: J. ZAMORIN/M. HAMILTON

DEPTH BELOW SURFACE (FT)	INTERVAL (FT)	RECOVERY (IN)	SAMPLE #/TYPE	DPC (COPR)	COPR Strata	SOIL DESCRIPTION: SOIL NAME, USCS GROUP SYMBOL, COLOR, MOISTURE CONTENT, RELATIVE DENSITY, OR CONSISTENCY, SOIL STRUCTURE, MINERALOGY.	USCS	BLOW COUNTS	COMMENTS: DEPTH OF CASING, DRILLING RATE, DRILLING FLUID LOSS, TESTS, AND STRUMENTATION. DRILLING ACTIONS/DRILLER COMMENTS
	0 - ~~0.5~~ 0.1ft	\	\	N/A	N/A	ASPHALT ROAD BASE (0-0.1')	\	\	
1	~~0.5~~ to 2'	12	SS1	— —		12-24" - F. to C. Sand, trace silt, trace gravel, 10YR 3/4 (DARK YELLOWISH BROWN) DRY, MEDIUM, WELL GRADED, MESH AT 2' bgs	SW-SM	25 16	
	2 to 4	18	SS2	— — — —		24-30" - NO RECOVERY 30-35" - SILTY SAND, 10YR 3/2 (VERY DARK GRAYISH BROWN) DRY, LOOSE, POORLY GRADED 35-48" - SANDY CLAY, 2.5YR 4/6 (RED) MOIST, MEDIUM, POORLY GRADED	SM-SM CL	3 7 7 11	POCKET PEN.: 3.5tsf ADVANCED HSA fm 0 to 4
	4 to 6	20	SS3	— — — —		48-52" - NO RECOVERY 52-72" - CLAYEY F. to M. Sand, trace gravel, 10YR 3/2 (VERY DARK GRAYISH BROWN) ~~DRY~~ MOIST, LOOSE, POORLY GRADED	SC	3 7 5 4	
	6 to 8	24	SS4	— — — —		72-79" - SOD 79-88" - ASPHALT (BLACK) 88-96" - F. to C. Sand, trace silt, trace gravel, GLEY 2 4/1 (DARK BLUISH GRAY) Dry, MEDIUM ~~[illegible]~~, WELL GRADED	SP-SM	65 33 29 13	ADVANCED HSA from 4 to 8
	8 to 10	23	SS5	— — — —		96-97" - NO RECOVERY 97-101" - F. to M. ~~SAND~~ SILTY SAND, TRACE GRAVEL, 5YR 7/3 (PINK) MOIST, LOOSE, WELL GRADED 101-110" - SILTY SAND, SOME GRAVEL, 5YR 4/3 (REDDISH BROWN) MOIST LOOSE, WELL GRADED 110-120" - CLAYEY F. SAND, TRACE SILT, 5YR 5/6 (YELLOWISH-RED) MOIST, LOOSE, POORLY GRADED	SW-SM SM	6 13 10 12	

JACOBS

PROJECT NUMBER: 706612
BORING NUMBER: SL-4
Page 2 of 3

SOIL BORING LOG

PROJECT : Honeywell DMT
ELEVATION : +25
LOCATION : Baltimore, MD
DRILLING METHOD AND EQUIPMENT USED : CME 55 HSA
DRILLING CONTRACTOI Parratt Wolff
ATD WATER LEVEL :
START : 1605 7/25/18 END : 1055 7/26/18
LOGGER : I. Zm[illegible] Brooks / M. H[illegible] / MRS

DEPTH BELOW SURFACE (FT)				COPR Strata	SOIL DESCRIPTION	USCS	BLOW COUNTS	COMMENTS
INTERVAL (FT)	RECOVERY (IN)	SAMPLE #/TYPE	DPC (COPR)		SOIL NAME, USCS GROUP SYMBOL, COLOR, MOISTURE CONTENT, RELATIVE DENSITY, OR CONSISTENCY, SOIL STRUCTURE, MINERALOGY.			DEPTH OF CASING, DRILLING RATE, DRILLING FLUID LOSS, TESTS, AND STRUMENTATION. DRILLING ACTIONS/DRILLER COMMENTS
10 to 12	12	SS6	– – – +		120-132" - No Recovery 132-136" - SAA 136-143" - F. Sand, Clay, Trace Gravel, 2.5 YR 5/8 (Red), moist, stiff, poorly graded 143-144" - COPR, F. to M. Sand & Gravel, Trace Silt, 5Y 5/1 ([illegible]) Dry, Loose, Well Graded	CL SP-SM	6 10 11 7	Pocket pen: 1.75 tsf Advanced HSA from 8 to 12
12 to 14	9	SS7	– +		144-154" - No Recovery 155-164" - Clay, 2.5 YR 5/8 (Red) moist, very stiff, poorly graded 164-168" - F. to C. Sand & Gravel, 10YR 5/6 (Yellowish Brown) moist, Loose, poorly graded	CL SP-SM	20 70/2"	Pocket pen: 1.5 tsf
14 to 15	9	SS8	+ +	HB	168-177" - F. to M. Silty Sand, 5YR 4/6 (yellowish red) COPR, moist, medium, poorly graded, weakly indurated	SP-SM	21 25	
15 to 15'6"	6	SS9	++	HB GB	180-181" - SAA 181-186" - F. to M. Sand, Some Silt (GB) 5Y 4/2 (olive gray) moist, medium, poorly graded, COPR nodules	SM	15	
15'6" to 16'0"	6	SS10	++	HB	187-193" - F. to M. Silty Sand, 5YR 4/6 (Yellowish Brown) COPR, moist, medium, poorly graded, weakly indurated	SP-SM	82	Advanced HSA from 12 to 16
16'1" to 16'8"	6	SS11	++	HB	194-200" - SAA	SP-SM	66	Sampled with 3" spoon
16'5" to 17'3"	6	SS12	++		201-202" - SAA 202-207" - F. to M. Sand, Some Silt (GB) 5Y 4/2 (Olive Gray) moist, Dense, Poorly Graded, COPR Nodules	SM	37	Sampled with 3" spoon

JACOBS

PROJECT NUMBER 766612

BORING NUMBER SL-4

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SOIL BORING LOG

PROJECT : Honeywell DMT
LOCATION : Baltimore, MD
ELEVATION :
DRILLING CONTRACTOI Parratt Wolff
DRILLING METHOD AND EQUIPMENT USED : CME 55 HSA
ATD WATER LEVEL :
START : 1605 7/25/18 END : 1035 7/26/18
LOGGER : I. Zmudin / JACOBS
M. Hamilton / MRCE

DEPTH BELOW SURFACE (FT)	INTERVAL (FT)	RECOVERY (IN)	SAMPLE #/TYPE	DPC (COPR)	COPR Strata	SOIL DESCRIPTION: SOIL NAME, USCS GROUP SYMBOL, COLOR, MOISTURE CONTENT, RELATIVE DENSITY, OR CONSISTENCY, SOIL STRUCTURE, MINERALOGY	USCS	BLOW COUNTS	COMMENTS: DEPTH OF CASING, DRILLING RATE, DRILLING FLUID LOSS, TESTS, AND STRUMENTATION DRILLING ACTIONS/DRILLER COMMENTS
	17'3" to 17'10"	6	SS13	++ ++	HB GB	208-211" - F. to M. Silty Sand, 5YR 4/6 (Yellowish Brown) COPR, moist, dense, poorly graded 211-214" - F. to M. Sand, Some Silt, 5Y 4/2 (Olive Gray) moist, dense, poorly graded, COPR nodules	SP-SM SM	32	Sampled with 3" spoon
	17'10" to 18'5"	6	SS14	++ ++	GB/HB	213"-221" - F to M. Silty Sand, 5YR 4/6 (Yellowish Brown) intermixed with 5Y 4/2 (Olive Gray) moist, very dense, poorly graded, COPR nodules in GB	SP-SM	55	Sampled with 3" spoon
	18'5" to 19'	6	SS15	++	GB	222-228" - F. to M. Silty Sand, 5Y 4/2 (Olive Gray) intermixed with some 2.5YR 5/8 (Red) moist, very dense, poorly graded, COPR nodules, moderately indurated	SP-SM	95	Sampled with 3" spoon
	19' to 19'7"	6	SS16	++	HB	229-235" - F. to M. Silty Sand, 5YR 4/6 (Yellowish Brown) moist, dense, poorly graded, likely indurated, 2.5YR 5/8 (Red) COPR at bottom of shoe	SP-SM	30	Sampled with 3" spoon
	19'7" to 20'2"	4	SS17	++	HB	~~235-239"~~ 236-240" - F. to M. Silty Sand, 7.5YR 5/6 (Strong Brown) moist, V. dense, poorly graded, moderately indurated 240-242 - N/R	SP-SM	100/4	Sampled with 3" spoon
	20'2" to 20'9"	3	SS18	++	HB	243-246" - SAA 246-249" - N/R	SP-SM	70/3	Sampled with 3" spoon Spoon bouncing
	20'9" to 21'4"	6	SS19	++	HB	250-256" - SAA, COPR nodules present	SP-SM	38	Sampled with 3" spoon
	21'4" to 21'11"	6	SS20	++ ++	HB GB	257-260" - SAA 260-263" - F. to M. Silty Sand, 5Y 4/2 (Olive Gray) dry, medium, poorly graded, weakly indurated	SP-SM	19	Sampled with 3" spoon
	21'11" to 22'6"	6	SS21	++	HB	264-270" - F. to M. Silty Sand, 7.5YR 5/6 (Strong Brown) wet, very loose, poorly graded	SP-SM	3	Sampled with 3" spoon
	22'6" to 23'	6	SS22	+ –	HB	270-273" - SAA 273-276" - M. to C. Sand, 5YR 2.5/1 (Black) wet, loose, poorly graded	SM	17	Installed to 21' bgs

B.O.B. @ 23' bgs

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JACOBS

PROJECT NUMBER 706612
BORING NUMBER SL-5
Page 1 of 3

SOIL BORING LOG

PROJECT : Honeywell DMT
LOCATION : Baltimore, MD
ELEVATION : 124.1
DRILLING CONTRACTOI Parratt Wolff
DRILLING METHOD AND EQUIPMENT USED : CME 55 w/ 4.25" HSA
ATD WATER LEVEL :
START : 0930 7/24/18 END : 1300 7/24/18
LOGGER [illegible]

DEPTH BELOW SURFACE (FT)	INTERVAL (FT)	RECOVERY (IN)	SAMPLE #/TYPE	DPC (COPR)	COPR Strata	SOIL DESCRIPTION SOIL NAME, USCS GROUP SYMBOL, COLOR, MOISTURE CONTENT, RELATIVE DENSITY, OR CONSISTENCY, SOIL STRUCTURE, MINERALOGY.	USCS	BLOW COUNTS	COMMENTS DEPTH OF CASING, DRILLING RATE, DRILLING FLUID LOSS, TESTS, AND STRUMENTATION DRILLING ACTIONS/DRILLER COMMENTS
0	0' to 0.5'					Asphalt Road Base			3/4" ID HSA used AW rods used to sample
1	0.5 to 2'	15	SS1	– – – –		6-9": No recovery 9"-21": F-C SA, SM GVL, TR SI (SP-SM) 10YR 4/4 (Dark Yellow Brown) Dry, Poorly Graded Black mesh encountered @22".	SP-SM	16 22 6	
2	2' to 4'	14	SS2	– – – –		24"-34": No recovery ~~24-30~~": SAA 34"-36": ~~36~~: clay, sm si, sm f-c sa, tr gvl (CL) 36"-48' 2.5YR 4/4 (Brown) Moist, Poorly Graded	SP-SM CL	2 2 2 2	
3									Advance auger 0-4' bgs.
4	4' to 6'	21	SS3	– – – –		48-51": No recovery ~~48~~ 51"-72": SAA (Cly)(2.5YR 4/4)	CL	2 6 6 4	PP = 2.25 tsf
5									

JACOBS

PROJECT NUMBER 706612

BORING NUMBER SL-5

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SOIL BORING LOG

PROJECT : Honeywell DMT

LOCATION : Baltimore, MD

ELEVATION : +24.1

DRILLING CONTRACTOR Parratt Wolff

DRILLING METHOD AND EQUIPMENT USED : CME SS w/ 4.25" HSA

ATD WATER LEVEL :

START : 0930 7/24/18

END : 1500 7/24/18

LOGGER J Zmuda / Jacobs, M [illegible]/WRB

DEPTH BELOW SURFACE (FT)	INTERVAL (FT)	RECOVERY (IN)	SAMPLE #/TYPE	DPC (COPR)	COPR Strata	SOIL DESCRIPTION SOIL NAME, USCS GROUP SYMBOL, COLOR, MOISTURE CONTENT, RELATIVE DENSITY, OR CONSISTENCY, SOIL STRUCTURE, MINERALOGY.	USCS	BLOW COUNTS	COMMENTS DEPTH OF CASING, DRILLING RATE, DRILLING FLUID LOSS, TESTS, AND STRUMENTATION. DRILLING ACTIONS/DRILLER COMMENTS
	6 to 8'	15	SS4	– – – –		72-80" - Sand (Clay)(Brown) 80-87" - F. Sand & Silt, Some Clay (2.5YR 4/4)(Brown) Moist, Medium, Poorly Graded	CL SP-SM	1 2 6 13	Advance auger 4'-8' bgs.
	8 to 10'	21	SS5	– – – –		96-108" - Asphalt 108-117" - M. & C. Sand, Some Gravel, Trace Silt (2.5Y 5/1 Gray) Dry, Loose, Well Graded	SW-SM	64 42 24 16	
	10 to 12	17	SS6	– – – –		120-126" - Clay, Some F. Sand (2.5YR 4/4)(Brown) Dry, Soft, Poorly Graded 126-137" - M. & C. Sand, Some Asphalt Moist, Loose, Poorly Graded	CL SM	8 13 15 18	Advance auger 8'-12'.
	12 to 14	17	SS7	– – + +	HB	144-154" - Silty Clay (5YR 5/6 Yellowish Red) Moist, Medium, Poorly Graded 154-159" - COPR ([illegible]) V.F. & M. Sand, Some Silt, 5YR 5/4 (Reddish Brown) Moist, Dense, Poorly Graded	CL SP-SM	3 8 37 75/3"	pp = 3.5 tsf
	14 to 16	3	SS8	+	HB	SAA	SM	100/3"	pp = pocket penetrometer

JACOBS

PROJECT NUMBER: 706612
BORING NUMBER: SL-5
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SOIL BORING LOG

PROJECT: Honeywell DMT
LOCATION: Baltimore, MD
ELEVATION: 124.1
DRILLING CONTRACTOR: Parratt Wolff
DRILLING METHOD AND EQUIPMENT USED: CME 55 w/ 4.25" HSA
ATD WATER LEVEL:
START: 0830 7/21/18
END: 1500 7/21/18
LOGGER: [illegible]

DEPTH BELOW SURFACE (FT) INTERVAL (FT)	RECOVERY (IN)	SAMPLE #/TYPE	DPC (COPR)	COPR Strata	SOIL DESCRIPTION: SOIL NAME, USCS GROUP SYMBOL, COLOR, MOISTURE CONTENT, RELATIVE DENSITY, OR CONSISTENCY, SOIL STRUCTURE, MINERALOGY.	USCS	BLOW COUNTS	COMMENTS: DEPTH OF CASING, DRILLING RATE, DRILLING FLUID LOSS, TESTS, AND STRUMENTATION, DRILLING ACTIONS/DRILLER COMMENTS
16 to 18	20	SS9	+ + ++ ++	HB GB	192-202 - SPD (HB) 202-212 - COPR (GB) V.F. & F. SAND (5Y4/1 - DARK GRAY) MOIST, MEDIUM, POORLY GRADED, CRYSTALLIZED COPR NODULES.	SP-SM	21 14 17 15	Slower advancement w/ HSA beginning at approx. 14' bgs.
18 to 20	12	SS 10	++ ++ ++ ++	GB	216-235 SPD (GB) 235-238 COPR (HB) V.F. & M. SAND, 5YR5/4 (REDDISH BROWN) MOIST, DENSE, POORLY GRADED.	SP-SM	8 14 12 39	
20 to 20.5	6	SS 11	++	GB	~~SPD~~ 240-246 - COPR (GB) V.F. & F. SAND (5Y 4/1 - DARK GRAY) ~~MOIST~~ WET, MEDIUM, POORLY GRADED	SP-SM	23	Begin 6" Split Spoon increments.
20.5 to 21	6	SS 12		GB	SPD	SP-SM	17	
21 to 21.5	6	SS 13	++ ++	GB HB	252-255 - SPD (GB) 255-258 - COPR (HB) V.F. & M. SAND (5YR 5/4 - REDDISH BRN) MOIST, DENSE, POORLY GRADED	SP-SM	43	
21.5 to 22	~~6~~ 3	SS 14		~~HB~~	~~268-272 - SPD (HB)~~ ~~268-274 - Clay~~ 258-261 - NO RECOVERY 261-264 - CLAY (2.5YR 4/8 - RED) MOIST, FIRM, POORLY GRADED	CL	7	PP>3.5 tsf

B.O.B. @ 22 ft bgs.

JACOBS

PROJECT NUMBER

BORING NUMBER SL-6

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SOIL BORING LOG

PROJECT : Honeywell DMT

LOCATION : Baltimore, MD

ELEVATION : 417.3

DRILLING CONTRACTOR: Parratt Wolff

DRILLING METHOD AND EQUIPMENT USED : CME 55 HSA

ATD WATER LEVEL :

START : 0745 7/18/18

END : 1020 7/18/18

LOGGER : E. COSTAS/M. HAMILTON

DEPTH BELOW SURFACE (FT)	INTERVAL (FT)	RECOVERY (IN)	SAMPLE #/TYPE	DPC (COPR)	COPR Strata	SOIL DESCRIPTION SOIL NAME, USCS GROUP SYMBOL, COLOR, MOISTURE CONTENT, RELATIVE DENSITY, OR CONSISTENCY, SOIL STRUCTURE, MINERALOGY.	USCS	BLOW COUNTS	COMMENTS DEPTH OF CASING, DRILLING RATE, DRILLING FLUID LOSS, TESTS, AND STRUMENTATION DRILLING ACTIONS/DRILLER COMMENTS
	0' to 0'6"					Asphalt road base			Drilled w/ 3¼" ID Auger (7" OD) (Hollow STEM)
1	0'6" to 2'	13	SS-1	– – –		0-11" : No recovery 11"-24" : F-M sand, trace fine gravel, tr silt (SP-SM) (Fill) 10YR 4/4 (Dark Yellowish Brn) Subangular gravel, low spheri Medium Dense Moist	SP-SM	4 7 5	Sample w/ AW rods Advance auger 0.5-2 ft.
2 3	2' to 4'	11	SS-2	– – – – –		24"-37" : No recovery 37"-39" : Clayey silt (ML) 2.5YR 4/8 (RED) AND M SA w/ SOME CLAY 10YR 7/4 (very Pale Brown) Moist to wet Well Graded 39"-48" : F-M SAND, some F-M Gravel, tr silt (SP-SM) (Fill) 10YR 9.5/2 (Pale Orange Yellow) subangular gravel, med. sphericity well Graded	ML SP-SM	5 3 5 6	
4 5	4' to 6'	24	SS-3	– –		48"-56" : Clayey M-C Sand w/ trace fine gravel (SC) 10YR 4/3 (Brown) wet, well Graded Medium Dense	SC	2 8 16 27	

JACOBS

PROJECT NUMBER	BORING NUMBER	
	SL-6	Page 2 of 3

SOIL BORING LOG

PROJECT : Honeywell DMT
LOCATION : Baltimore, MD
ELEVATION : 117.3
DRILLING CONTRACTOR : Parratt Wolff
DRILLING METHOD AND EQUIPMENT USED : CME 55 HSA
ATD WATER LEVEL :
START : 0745 7/18/18
END : 1030 7/18/18
LOGGER : F. CEJAS/M. HAMILTON

DEPTH BELOW SURFACE (FT)	INTERVAL (FT)	RECOVERY (IN)	SAMPLE #/TYPE	DPC (COPR)	COPR Strata	SOIL DESCRIPTION SOIL NAME, USCS GROUP SYMBOL, COLOR, MOISTURE CONTENT, RELATIVE DENSITY, OR CONSISTENCY, SOIL STRUCTURE, MINERALOGY.	USCS	BLOW COUNTS	COMMENTS DEPTH OF CASING, DRILLING RATE, DRILLING FLUID LOSS, TESTS, AND STRUMENTATION DRILLING ACTIONS/DRILLER COMMENTS
5			SS3	++ ++		56"-72" . F SANDY SILT, MOTTLED (ML) 2.5 YR 3/6 (DARK RED) Trace white crystalline COPR Medium Dense Dry	TOP CC CAP ML		Advance auger 2' to 6'.
6	6' to 8'	18	SS4	++ ++	HB	72"-78" : No recovery 78"-87" : F sandy silt, tr f gravel (ML) 2.5YR 4/3 (Reddish Brown) Gravel Sub-Angular, low sphericity Moist	ML	26 60 98 50/1"	
7				++ ++	GB	87"-96": sandy silt, tr f gravel Subrounded, high sphericity GLEY 1 5/10Y (Greenish Gray) and variegated brown Dry, Very Dense weakly Indurated	ML		
8	8' to 10'	19	SS5	++ ++	HB	96"-101": No recovery 101"-114": F-C silty sand, trace gravel (SM) 2.5 YR 4/3 (Reddish Brown) Dry, Dense, well Graded	SM	96 38 9 26	
9				++ ++	GB	114"-120" : F-M silty sand, tr gravel (SM) GLEY 1 3/N (very Dark Gray) Wet, yellow COPR crystalline modules Dense, well Graded	SM		water return observed at surface when auger advanced through 9 ft. Advance auger 6'-10'.
10									

JACOBS

PROJECT NUMBER	BORING NUMBER	
	SC-16	Page 3 of 3

SOIL BORING LOG

PROJECT : Honeywell DMT
LOCATION : Baltimore, MD
ELEVATION : 117.3
DRILLING CONTRACTOf Parratt Wolff
DRILLING METHOD AND EQUIPMENT USED : CME 55 HSA
ATD WATER LEVEL :
START : 0745 7/18/18
END : 1030 7/18/18
LOGGER : E. COSTAS/M. HAMILTON

DEPTH BELOW SURFACE (FT)	INTERVAL (FT)	RECOVERY (IN)	SAMPLE #/TYPE	DPC (COPR)	COPR Strata	SOIL DESCRIPTION SOIL NAME, USCS GROUP SYMBOL, COLOR, MOISTURE CONTENT, RELATIVE DENSITY, OR CONSISTENCY, SOIL STRUCTURE, MINERALOGY.	USCS	BLOW COUNTS	COMMENTS DEPTH OF CASING, DRILLING RATE, DRILLING FLUID LOSS, TESTS, AND STRUMENTATION DRILLING ACTIONS/DRILLER COMMENTS
10 11	10' to 12'	22	SS6	++ ++ ++ ++	HB GB HB	120"-122": No recovery 122"-133": SAA (101"-114") (SM) 133"-138": SAA (114"-120") Moist (SM) 138"-144": SAA (78"-87") (ML) Dry	SM ML	35 39 33 96	
12 13	12' to 14'	11	SS7	++ ++ ++ ++	HB GB	144"-157": No recovery 157"-165": F-M SILTY SAND, SOME F-M GVL (SM) 7.5 YR 5/4 (BROWN) Mod. indurated Dry, Dense 165-168": F-M SAND, SOME SILT, tr gravel (SM) GLEY 1 3/N (very dark Greenish Gray) Moist to wet	SM	30 29 17 14	Advance auger 10'-14'. Rig chatter at 10'.
14	14' to 14'6"	9	SS8	++ —		168"-174": Silty Sand grading to Silty Clay (SM/ML-CL) 10R 5/6 (RED) Dry	SM/ML-CL	19	Quicker advancement at 11'. Hole taped at 14.5 ft after SS-8 PP = 3.0
15	14'6" to 15'	6	SS9	—		174"-180": Silty Clay (ML) 10 R 5/6 (RED) MOIST	ML	12	PP = 0.5 tsf Hole taped at 15.0 ft

End of boring at 15' bgs.

JACOBS

[redacted]

PROJECT NUMBER: 706612

BORING NUMBER: SL-7

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SOIL BORING LOG

PROJECT : Honeywell DMT

ELEVATION : +15.9

LOCATION : Baltimore, MD

DRILLING CONTRACTOR: Parratt Wolff

DRILLING METHOD AND EQUIPMENT USED : CME 55 MUD ROTARY

ATD WATER LEVEL :

START : 0830 7/13/18 END : 0900 7/13/18

LOGGER : I. ZMUDZIN/M. HAMILTON

DEPTH BELOW SURFACE (FT)	INTERVAL (FT)	RECOVERY (IN)	SAMPLE #/TYPE	DPC (COPR)	COPR Strata	SOIL DESCRIPTION: SOIL NAME, USCS GROUP SYMBOL, COLOR, MOISTURE CONTENT, RELATIVE DENSITY, OR CONSISTENCY, SOIL STRUCTURE, MINERALOGY.	USCS	BLOW COUNTS	COMMENTS: DEPTH OF CASING, DRILLING RATE, DRILLING FLUID LOSS, TESTS, AND STRUMENTATION. DRILLING ACTIONS/DRILLER COMMENTS
	0 to 0'6"					Asphalt road base			7" ϕ ID Auger used to open hole
1	0'6" to 2'	14	SS1	– – +		0-10": No recovery 10"-21": F-M SAND, some clay (SW-SC) 2.5Y 4/3 (OLIVE BROWN) Moist, loose, Poorly Graded 21"-24": F-C sand and gravel, some silt GLEY1 5/1 (greenish gray) Dry, loose, well Graded COPR impacted Fill (GW-GM)	SW-SC GW-GM	5 18 17	
2 3	2' to 4'	12	SS2	– – – –		24"-36": No recovery 36"-47": F-C SAND AND GVL (GW-GM) 5Y 5/1 (GRAY) Dry, loose, well Graded 47"-48": F-C sand, some gvl, trace silt 5Y 2.5Y/1 (BLACK) Dry, loose, Well Graded	GW-GM GW-GM	7 6 3 3	
4 5	4' to 6'	18	SS3	– –		48"-54": No recovery 54"-63": CLAY (CL) 2.5YR 5/6 (RED) moist, high plasticity	CL	WH 8 37 49	Set 4" casing to 3 ft bgs. Introduced mud at 4 ft (using 3 7/8" PDC bit) PP = 0.25-1.0 tsf

JACOBS

PROJECT NUMBER	BORING NUMBER	
706612	SL-7	Page 2 of 3

SOIL BORING LOG

PROJECT : Honeywell DMT LOCATION : Baltimore, MD
ELEVATION : +15.9 DRILLING CONTRACTOR: Parratt Wolff
DRILLING METHOD AND EQUIPMENT USED : CME 55 MUD ROTARY
ATD WATER LEVEL : START : 0830 7/13/18 END : 0900 7/17/18 LOGGER : I. ZMUDZIN/M. HAMILTON

DEPTH BELOW SURFACE (FT)	INTERVAL (FT)	RECOVERY (IN)	SAMPLE #/TYPE	DPC (COPR)	COPR Strata	SOIL DESCRIPTION SOIL NAME, USCS GROUP SYMBOL, COLOR, MOISTURE CONTENT, RELATIVE DENSITY, OR CONSISTENCY, SOIL STRUCTURE, MINERALOGY.	USCS	BLOW COUNTS	COMMENTS DEPTH OF CASING, DRILLING RATE, DRILLING FLUID LOSS, TESTS, AND STRUMENTATION. DRILLING ACTIONS/DRILLER COMMENTS
5				++ ++	HB	63"-72": F-M sand with silt (SM) 10 YR 4/6 (Dark Yellowish Brown) Very dense, well Graded [illegible]	CL SM		
6 7	6' to 8'	12	SS4	++ ++ ++ ++	HB	72"-84" : Slough 84"-95" : F-M SAND W/ SILT (SM) 2.5YR 4/8 (RED) Very dense, well graded 95"-96" : Gray cobble	SM CBL	24 38 100/5"	Drilled ahead from 7'5" to 8'
8 9 10	8' to 10'	20	SS5	++ ++ ++ ++	HB GB	96"-100": No recovery 100"-[illegible] 119" : F-M sand w/silt (SM) 10 YR 4/6 (Dark Yellowish Brown) weakly indurated very dense, Poorly Graded 119"-120" : [illegible]": F-M SAND, WITH SILT (SM) 5Y 2.5Y/1 (BLACK) weakly indurated, Poorly Graded	SM SM	68 58 22 33	

JACOBS

PROJECT NUMBER 706612

BORING NUMBER SL-7

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SOIL BORING LOG

PROJECT : Honeywell DMT

ELEVATION : +15.9 (BCD)

LOCATION : Baltimore, MD

DRILLING CONTRACTOI Parratt Wolff

DRILLING METHOD AND EQUIPMENT USED : CME 55 MUD ROTARY

ATD WATER LEVEL :

START : 0830 7/13/18

END : 0900 7/17/18

LOGGER : I. ZMUDZIN/M. HAMILTON

DEPTH BELOW SURFACE (FT)	INTERVAL (FT)	RECOVERY (IN)	SAMPLE #/TYPE	DPC (COPR)	COPR Strata	SOIL DESCRIPTION SOIL NAME, USCS GROUP SYMBOL, COLOR, MOISTURE CONTENT, RELATIVE DENSITY, OR CONSISTENCY, SOIL STRUCTURE, MINERALOGY.	USCS	BLOW COUNTS	COMMENTS DEPTH OF CASING, DRILLING RATE, DRILLING FLUID LOSS, TESTS, AND STRUMENTATION, DRILLING ACTIONS/DRILLER COMMENTS
10	10' to 12'	18	SS6	++ ++ ++ ++	GB GB GB HB GB	120"-126": No recovery 126"-129": F SAND w/ TRACE SILT GLEY 1 10Y 3/1 (very Dark Greenish Gray) MOIST (SP-SM), Dense 129"-132": F SAND, SOME SILT, TRACE F GRAVEL (SM) 10Y 5/4 (LIGHT OLIVE) Moist 132"-136": SAA 126"-129" 136"-139": F-M SAND, SM GVL (SM) 10YR 4/6 (Dark Yellowish Brown) Mod. Indurated 139"-144": SAA (126"-129") Moist	SP-SM SM	12 22 15 12	
11									
12	12' to 13'	9	SS7	++ ++		144"-156": Slough		3 3	switched to 3" OD split spoon and drove from 12-13.5' to obtain better visual classification Blow counts = 10-27-25. 3-3 were original blows recorded with 2" split spoon.
13	13' to 13'6"	6	SS8	++ ++	GB GB	156"-162": F SAND AND SILT (SM) GLEY 1 10Y 3/1 (very Dark Greenish Gray) trace white crystalline material, Moist, Poorly Graded, Med Dense to V. Dense	SM	25	
	13'6" to 14'	6 (in shoe)	SS9	–		162"-163": CLAY (CL) 2.5YR 4/6 (RED) MIXED w/ GB COPR 163"-168" CLAY (CL) 2.5YR 4/6 (RED) Stiff to V. Stiff, Moist	CL	6	PP=0.5 tsf
14						End of boring at 14.0' bgs.			PP = pocket penetrometer
15									

JACOBS

PROJECT NUMBER: 706612

BORING NUMBER: SL-8

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SOIL BORING LOG

PROJECT: Honeywell DMT

ELEVATION: +13

LOCATION: Baltimore, MD

DRILLING CONTRACTOR: Parratt Wolff

DRILLING METHOD AND EQUIPMENT USED: CME 55 MUD ROTARY

ATD WATER LEVEL:

START: 1605 7/11/18

END: 1156 7/12/18

LOGGER: I. ZMUDZIN/M. HAMILTON

DEPTH BELOW SURFACE (FT)	INTERVAL (FT)	RECOVERY (IN)	SAMPLE #/TYPE	DPC (COPR)	COPR Strata	SOIL DESCRIPTION SOIL NAME, USCS GROUP SYMBOL, COLOR, MOISTURE CONTENT, RELATIVE DENSITY, OR CONSISTENCY, SOIL STRUCTURE, MINERALOGY.	USCS	BLOW COUNTS	COMMENTS DEPTH OF CASING, DRILLING RATE, DRILLING FLUID LOSS, TESTS, AND STRUMENTATION. DRILLING ACTIONS/DRILLER COMMENTS
	0' 0'6"					Asphalt road base		~~2~~	7" ∅ ID AUGER used to open hole
1	0'6" to 2'	14	SS1		+ + +	6" to 24": clayey sand (SC) 10YR 7/3 (Very Pale Brown) Moist, Loose, Poorly Graded, Slight Plasticity COPR-impacted Fill	SC	2 4 7	
2 3	2' to 4'	10"	SS2		+ + + +	24"-30": slough 30"-48": F-M silty sand (SM) 7.5YR 5/6 (Strong Brown) Dry, Very dense, Poorly Graded COPR-impacted Fill	SM	11 6 17 100/4"	
4 5	4' to 6'	22"	SS3		++ +	48"-72": SAA (SM) 7.5YR 5/6 (Strong Brown) COPR-impacted Fill	SM	24 34 55 81	Set 4" casing to 3ft bgs. Introduce mud at 4 ft bgs.

JACOBS

PROJECT NUMBER	BORING NUMBER	
706612	SL-8	Page 2 of 3

SOIL BORING LOG

PROJECT : Honeywell DMT

LOCATION : Baltimore, MD

ELEVATION : +13

DRILLING CONTRACTOR Parratt Wolff

DRILLING METHOD AND EQUIPMENT USED : CME 55 MUD ROTARY

ATD WATER LEVEL :

START : 1605 7/11/18

END : 1150 7/12/18

LOGGER : I. ZMUDZIN/M.HAMILTON

DEPTH BELOW SURFACE (FT)	INTERVAL (FT)	RECOVERY (IN)	SAMPLE #/TYPE	DPC (COPR)	COPR Strata	SOIL DESCRIPTION SOIL NAME, USCS GROUP SYMBOL, COLOR, MOISTURE CONTENT, RELATIVE DENSITY, OR CONSISTENCY, SOIL STRUCTURE, MINERALOGY.	USCS	BLOW COUNTS	COMMENTS DEPTH OF CASING, DRILLING RATE, DRILLING FLUID LOSS, TESTS, AND STRUMENTATION. DRILLING ACTIONS/DRILLER COMMENTS
5				+ ++					
6 7	6' to 8'	15	SS4	++ ++ –		72"-81" : slough 81"-94" : SAA (SM) 7.5 YR 5/6 (strong Brown) COPR-impacted fill crystallized COPR nodule 94"-96" : clay (CL) 2.5 YR 5/6 (RED) Mottled with white clay wet, soft, high plasticity Poorly graded	CL	39 70 20 15	PP = pocket penetrometer PP=0.25 tsf
8	8' to 9'	4 (in shoe)	SS5	– –		96"-105" : slough 105"-109" : SAA (CL) 2.5 YR 5/6 (RED)	CL	WH WH	PP=1.5-1.75 tsf
9 10	9' to 11'	9	SS6	– –		109"-123" : slough 123"-132" : SAA (CL) 2.5 YR 5/6 (RED)	CL	WH WH 2 4	PP=0.25 tsf

JACOBS

PROJECT NUMBER 706612

BORING NUMBER SL-8

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SOIL BORING LOG

PROJECT : Honeywell DMT

ELEVATION : +13

LOCATION : Baltimore, MD

DRILLING CONTRACTOR Parratt Wolff

DRILLING METHOD AND EQUIPMENT USED : CME 55 MUD ROTARY

ATD WATER LEVEL :

START : 1605 7/11/18 END : 1150 7/12/18

LOGGER : I. ZMUDZIN / M. HAMILTON

DEPTH BELOW SURFACE (FT)	INTERVAL (FT)	RECOVERY (IN)	SAMPLE #/TYPE	DPC (COPR)	COPR Strata	SOIL DESCRIPTION SOIL NAME, USCS GROUP SYMBOL, COLOR, MOISTURE CONTENT, RELATIVE DENSITY, OR CONSISTENCY, SOIL STRUCTURE, MINERALOGY.	USCS	BLOW COUNTS	COMMENTS DEPTH OF CASING, DRILLING RATE, DRILLING FLUID LOSS, TESTS, AND STRUMENTATION. DRILLING ACTIONS/DRILLER COMMENTS
10				— —		see page 2	CL		
11	11' to 11'6"	6	SS7	— ++ ++	GB	132"-136" : SAA (CL) 2.5 YR 5/6 (RED) 136"-137" : F-M SAND WITH SILT (SM) 2.5 Y 4/1 (DARK GRAY) weakly Indurated 137"-138" : F-C SAND, trace gravel (SM) 5Y 4/2 (OLIVE GRAY) MOIST, LOOSE,	CL SM	29	→ Well Graded COPR, impacted
	11'6" to 12'	6	SS8	+ + + +		138"-144" : SAA (SM) 5Y 4/2 (OLIVE GRAY) COPR IMPACTED FILL	SM	22	
12	12' to 12'6"	4 (on shoe)	SS9	++ ++	GB	144"-150" : F-M SAND W/ SILT (SM) 2.5 Y 4/1 (DARK GRAY) WEAKLY INDURATED	SM	9	
	12'6" to 13'	4	SS10	++ ++	GB	150"-152" : SLOUGH 152"-155" ; F-M SAND WITH SILT (SM) 2.5 Y 4/1 (DARK GRAY) DENSE, weakly Indurated 155"-156" : F-M SAND W/ SILT, SOME CLAY (SM)	SM	14	→ 2.5 YR 5/6 (RED)
13	13' to 13'6"	4	SS11	+		156"-158" : NO RECOVERY 158"-162" : SANDY CLAY (SC) MOD. PLASTICITY 2.5 YR 5/6 (RED)	SC	9	PP = 1.75 tsf
	13'6" to 14'	6	SS12	+		162"-167" : SAA (SC) SOFT, 2.5 YR 5/6 (RED) 167"-168" : F-M SAND W/ SILT (SM) 5Y 4/2 (OLIVE GRAY)	SC	9	PP=0.5 tsf
14						B.O.B @ 14 ft bgs			PP = pocket Penetrometer
15									

JACOBS

PROJECT NUMBER	BORING NUMBER	
706612	SL-9	Page 1 of 3

SOIL BORING LOG

PROJECT : Honeywell DMT LOCATION : Baltimore, MD

ELEVATION : DRILLING CONTRACTOR : Parratt Wolff

DRILLING METHOD AND EQUIPMENT USED : CME 55 - MUD ROTARY

ATD WATER LEVEL : START : 1335 7/10/18 END : 1100 7/11/18 LOGGER : I. Zmudzin/AK

DEPTH BELOW SURFACE (FT)	INTERVAL (FT)	RECOVERY (IN)	SAMPLE #/TYPE	DPC (COPR)	COPR Strata	SOIL DESCRIPTION SOIL NAME, USCS GROUP SYMBOL, COLOR, MOISTURE CONTENT, RELATIVE DENSITY, OR CONSISTENCY, SOIL STRUCTURE, MINERALOGY.	USCS	BLOW COUNTS	COMMENTS DEPTH OF CASING, DRILLING RATE, DRILLING FLUID LOSS, TESTS, AND STRUMENTATION. DRILLING ACTIONS/DRILLER COMMENTS
0						0-6" - NO RECOVERY (ASPHALT BASE)			
2	6" to 2' 6"	13"	SS-1	— — — —		6-11" - NO RECOVERY 11-24" - GRAVELLY SAND (SW) 10 YR 5/3 (BROWN) moist, medium, well graded, F. to C. Sand, Some M. to C. Gravel, angular to subangular, trace silt, Cobble at 2 ft bgs		6 5 10 24	
4	2' 6" to 4' 6"	21"	SS-2	+ + + ++		30-33" - NO RECOVERY 33-43" - SAA (SW) 43-46" - F. to M. Sand (SP) 5 YR 6/6 (REDDISH YELLOW) MOIST, MEDIUM DENSE, POORLY GRADED 46-50" - FILL MATERIAL (FILL) GLEY 2 5/1 (GREENISH GRAY), DRY, MEDIUM DENSE, WELL GRADED, CRYSTALIZED YELLOW COPR NODULES AT 50" BGS 50-52" - F. to M. SAND (SP) 5YR 6/6 (REDDISH YELLOW) MOIST, MEDIUM DENSE, POORLY GRADED 52-54" - GRAVEL (GW) 5Y 6/3 (PALE OLIVE) DRY, MEDIUM DENSE, WELL GRADED	SP FILL SP GW	22 27 14 20	
6	4' to 6'	24"	SS-3	\\ + ++ ++ +	HB	48-54" - SLOUGH 54-60" - COPR IMPACTED FILL, 5 YR 6/6 (REDDISH YELLOW) F. & C. SILT, Sand, and Gravel, moist, Loose, well GRADED 60-62" - CRYSTALIZED COPR (5 YR 6/3) (PALE OLIVE) HARD, LITHIFIED, STRONGLY INDURATED 62-68" - F. to M. SILT, SAND, and GRAVEL, (FILL) MOIST, LOOSE, WELL GRADED, 5YR 6/6 (REDDISH YELLOW) 68-70" - HARD BROWN COPR, WEAKLY INDURATED, V.F. & F. SAND WITH SILT, DRY, MEDIUM DENSITY, POORLY GRADED 70-72" - SAA (FILL)		3 8 8 7	

JACOBS

PROJECT NUMBER 706612

BORING NUMBER SL-9

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SOIL BORING LOG

PROJECT : Honeywell DMT
LOCATION : Baltimore, MD
ELEVATION : +14.4
DRILLING CONTRACTOR: Parratt Wolff
DRILLING METHOD AND EQUIPMENT USED : Cme 55 / Mud Rotary
ATD WATER LEVEL :
START : 1335 7/12/18
END : 1100 7/11/18
LOGGER : EZmuki/EK, Dr. [illegible] / MRG

DEPTH BELOW SURFACE (FT)	INTERVAL (FT)	RECOVERY (IN)	SAMPLE #/TYPE	OPC (COPR)	COPR Strata	SOIL DESCRIPTION SOIL NAME, USCS GROUP SYMBOL, COLOR, MOISTURE CONTENT, RELATIVE DENSITY, OR CONSISTENCY, SOIL STRUCTURE, MINERALOGY.	USCS	BLOW COUNTS	COMMENTS DEPTH OF CASING, DRILLING RATE, DRILLING FLUID LOSS, TESTS, AND STRUMENTATION. DRILLING ACTIONS/DRILLER COMMENTS
6	6-8	16	SS4	++ ++ ++	HB	72-76" clay (CL) 5YR 4/6 (Yellowish Red) Moist, soft, Mod. plastic, some M-C gravel 76"-88" F to M sand with silt (SW-SM) Moist, Very dense, Well graded, Weakly Indurated 10YR 4/6 (Dark Yellowish Brown)	CL SW-SM	14 45 100/4"	8" CASING @ 5ft Introduced mud PP=1.0 tsf
7									
13				++					
8	8 to 10	14	SS5	+- ++	HB GB	96"-106": slough 106"-118": SAA (SW-SM) 118"-120" F to M sand with silt (SP-SM) Moist, 2.5Y 4/1 (Dark Gray) Dense, weakly Indurated	SW-SM SP-SM	67 79 44 38	
9				++ ++					
10	10		SS6	++ ++ ++ ++	GB	120-132" SAA (SP-SM) 2.5Y 4/1 (Dark Gray)	SP-SM	12 42	
11									

JACOBS

PROJECT NUMBER: 706612

BORING NUMBER: SL-9

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SOIL BORING LOG

PROJECT: Honeywell DMT

LOCATION: Baltimore, MD

ELEVATION: +14.4

DRILLING CONTRACTOR: Parratt Wolff

DRILLING METHOD AND EQUIPMENT USED: CME 55 MUD ROTARY

ATD WATER LEVEL:

START: 1335 7/10/18

END: 1100 7/11/18

LOGGER: I. ZMUDZIN/M. HAMILTON

DEPTH BELOW SURFACE (FT)	INTERVAL (FT)	RECOVERY (IN)	SAMPLE #/TYPE	DPC (COPR)	COPR Strata	SOIL DESCRIPTION SOIL NAME, USCS GROUP SYMBOL, COLOR, MOISTURE CONTENT, RELATIVE DENSITY, OR CONSISTENCY, SOIL STRUCTURE, MINERALOGY.	USCS	BLOW COUNTS	COMMENTS DEPTH OF CASING, DRILLING RATE, DRILLING FLUID LOSS, TESTS, AND STRUMENTATION. DRILLING ACTIONS/DRILLER COMMENTS
11	11' to 11'6"	6" (IN SHOE)	SS7	++ ++	GB	132"-138": SAA (SP-SM) 2.5Y 4/1 (Dark Gray)	SP-SM	21	Start 6" sampling at 11 ft bgs.
	11'6" to 12'	6" (IN SHOE)	SS8	++ ++	GB	138"-144": SAA (SP-SM) 2.5Y 4/1 (Dark Gray)	SP-SM	45	
12	12' to 12'6"	6" (IN SHOE)	SS9	++ +	GB	144"-150": SAA (SP-SM) 2.5Y 4/1 (Dark Gray) lense of 5YR 4/6 (Yellow Red) (SP-SM)	SP-SM	50/	
	12'6" to 13'	6" (IN SHOE)	SS10	++ ++	GB	150"-156": SAA (SP-SM) 2.5Y 4/1 (Dark Gray) Crystalized COPR Nodules	SP-SM	25	
13	13' to 13'6"	6" (IN SHOE)	SS11	++ ++	GB	156"-172": SAA (SP-SM) 2.5Y 4/1 (Dark Gray) intermixed with 5YR 4/6 (Yellow Red)	SP-SM	35	
	13'6" to 14'	6" (IN SHOE)	SS12	+		CLAY (CL) 2.5YR 4/6 (RED) intermixed with GB moist, ~~[illegible]~~ medium, poorly graded, high plasticity	CL	7	PP=1.5 tsf
						End of boring at 14 ft.			

JACOBS

PROJECT NUMBER 706612
BORING NUMBER SL-10
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SOIL BORING LOG

PROJECT : Honeywell DMT
LOCATION : Baltimore, MD
ELEVATION : +25.6
DRILLING CONTRACTOI Parratt Wolff
DRILLING METHOD AND EQUIPMENT USED : CME 55 HSA
ATD WATER LEVEL :
START : 1415 7/28/18
END : 1715 7/28/18
LOGGER : S. Zander/Speck M. [illegible]/MRCE

DEPTH BELOW SURFACE (FT)	INTERVAL (FT)	RECOVERY (IN)	SAMPLE #/TYPE	DPC (COPR)	COPR Strata	SOIL DESCRIPTION SOIL NAME, USCS GROUP SYMBOL, COLOR, MOISTURE CONTENT, RELATIVE DENSITY, OR CONSISTENCY, SOIL STRUCTURE, MINERALOGY.	USCS	BLOW COUNTS	COMMENTS DEPTH OF CASING, DRILLING RATE, DRILLING FLUID LOSS, TESTS, AND STRUMENTATION. DRILLING ACTIONS/DRILLER COMMENTS
						Asphalt road base			3¼" ID HSA used sampled w/ AW rods
	0.5 to 2'	12	SS1	— —		6"-12" : No recovery 12"-24" : Gravelly F-C sand, trace silt (SP-SM) 7.5 YR 4/2 (Brown) Dry, well Graded, V. Dense	SP-SM	30 31 5	
	2' to 4'	18	SS2	— — —		24"-30" : No recovery 30"-33" : SAA (12"-24") Black mesh encountered at 33". (woven) 33"-43" : Silty clay, tr f sa (CL) 5YR 4/3 (Reddish Brown) Moist, Poorly Graded 43"-48" : weathered asphalt Black silty F-C SA (SM)	SP-SM CL SM	5 7 18 17	pp >4 tsf Advance HSA 0'-4'
	4' to 6'	13	SS3	— — —		48"-59" : No recovery 59"-70" : F SANDY SILT (ML) 7.5 YR 3/2 (Dark Brown) Moist, Poorly Graded Medium 70"-72" : weathered asphalt Black non-woven liner encountered at 70".	ML SM	4 8 3 14	
	6' to 8'	16	SS4	— — —		72"-80" : No recovery 80"-96" : weathered asphalt silty F-M sa and gvl Black and gray well graded, Dry very dense	SM	15 16 23 19	Advance HSA 4'-8'
	8' to 10'	16	SS5	— — —		96"-102" : No recovery 102"-108" : SAA (80"-96") 108"-~~[illegible]~~ 112" : F-C SAND, TR SILT (SP-SM) 7.5 YR 7/3 (PINK) DRY, POORLY GRADED 112"-113" ~~113"-120"~~ : CLAY (CL) 7.5 YR 8/1 (WHITE) Moist, poorly Graded, SdA	SM SP-SM CL	12 6 3 8	112" : PP = 0.25 TSF 113" : PP = 2.25 tsf

113"-120" : F SANDY CLAY (CL)
2.5 YR 4/6 (RED)
Poorly Graded, moist

JACOBS	**PROJECT NUMBER** 7066612	**BORING NUMBER** SL-10	Page 2 of 3

SOIL BORING LOG

PROJECT : Honeywell DMT
LOCATION : Baltimore, MD
ELEVATION : +25.6
DRILLING CONTRACTOR Parratt Wolff
DRILLING METHOD AND EQUIPMENT USED : CME 55, HSA
ATD WATER LEVEL :
START : 1415 7/28/18
END : 1715 7/28/18
LOGGER : J. ZIMUDZI (JACOBS) M. HAMILTON (MRCE)

DEPTH BELOW SURFACE (FT)	INTERVAL (FT)	RECOVERY (IN)	SAMPLE #/TYPE	DPC (COPR)	COPR Strata	SOIL DESCRIPTION SOIL NAME, USCS GROUP SYMBOL, COLOR, MOISTURE CONTENT, RELATIVE DENSITY, OR CONSISTENCY, SOIL STRUCTURE, MINERALOGY.	USCS	BLOW COUNTS	COMMENTS DEPTH OF CASING, DRILLING RATE, DRILLING FLUID LOSS, TESTS, AND STRUMENTATION. DRILLING ACTIONS/DRILLER COMMENTS
	10' to 12'	23	SS6	++ ++ ++ — ++	HB → HB	120"-121" : No recovery 121"-122" : SAA (113"-120") 122"-124" : weathered asphalt 124"-127" : F-C SA, SM SILT (SM) 10YR 5/6 (Yellowish Brn) 127"-137" : SAA (113"-120") 137"-144" : SAA (124"-127")	SM CL SM	10 8 52 59	Advance HSA 8'-12'.
	12' to 14'	18	SS7	++ ++ ++	HB	144-150" : No recovery 150"-168" : F-C SA, SM GVL, SI (SM) 10YR 5/6 (yellowish Brn) Dry, Dense Well Graded	SM	27 21 17 15	
	14' to 16'	19	SS8	++ + ++	HB ? GB	168"-173" : No recovery 173"-177" : F-M SAND, TR SILT (SP-SM) 7.5YR 5/6 (Strong Brn) Dry, Poorly Graded, Loose 177"-183" : F SAND, SOME SILT (SM) 10YR 5/6 (Yellowish Brn) AND 10YR 2/2 (DK. Brn) 183"-192" : F-M SILTY SAND (SM) 5Y 2.5/1 (BLK) w/ COPR NODULES	SP-SM SM SM	5 6 7 14	Advance HSA 12'-16'.
	16' to 18'	22	SS9	++ ++ ++	GB	192"-194" : No recovery 194"-216" : F-M SILTY SAND (SM) 5Y 2.5/1 (BLACK) MOIST, POORLY GRADED Medium Dense Yellow COPR nodules	SM	6 8 11 10	
	18' to 20'	20	SS10			216"-220" : No recovery 220"-240" : SAA (194"-216")	SM	7 16 15 15	Advance HSA 16'-20'.

JACOBS

PROJECT NUMBER: 706612
BORING NUMBER: SI-10
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SOIL BORING LOG

PROJECT : Honeywell DMT
LOCATION : Baltimore, MD
ELEVATION : +25.6
DRILLING CONTRACTOR: Parratt Wolff
DRILLING METHOD AND EQUIPMENT USED : CME 55 HSA
ATD WATER LEVEL :
START : 1415 7/28/18
END : 1715 7/28/18
LOGGER : I. ZMUDZIN (JACOBS)
M. HAMILTON (JACOBS)

DEPTH BELOW SURFACE (FT)	INTERVAL (FT)	RECOVERY (IN)	SAMPLE #/TYPE	SAMPLE DPC (COPR)	COPR Strata	SOIL DESCRIPTION: SOIL NAME, USCS GROUP SYMBOL, COLOR, MOISTURE CONTENT, RELATIVE DENSITY, OR CONSISTENCY, SOIL STRUCTURE, MINERALOGY.	USCS	BLOW COUNTS	COMMENTS: DEPTH OF CASING, DRILLING RATE, DRILLING FLUID LOSS, TESTS, AND STRUMENTATION. DRILLING ACTIONS/DRILLER COMMENTS
	20' to 20.5	6	SS 11	++	GB	240"-246": SAA (194"-216") Yellow COPR nodule wet	SM	8	
	20.5 to 21'	6	SS 12	++	GB	246"-252" : SAA (194"-216") intermixed with 5Y 6/4 (Pale olive) wet	SM	14	
	21' to 21.5	6	SS 13	++	GB	252"-258": SAA (194"-216") Yellow nodule Wet, Poorly Graded	SM	9	
	21.5 to 22	6	SS 14	++	GB	258"-264" : SAA (194"-216") Wet, Poorly Graded weakly Indurated	SM	10	Advance HSA 20'-22'.
	22' to 22.5'	6	SS15	++	GB	264"-270" : SAA (194"-216") wet, Poorly Graded weakly Indurated	SM	6	
	22.5 to 23	6	SS 16	++	GB	270"-276": SAA (194"-216") weakly Indurated wet, Poorly Graded	SM	9	
	23 to 23.5'	6	SS 17	++ +	GB	276"-~~282~~ 279" : SAA (194"-216") 279"-282" = Brown wood	SM	8	
	23.5 to 24'	6	SS 18	–		282"-288": SILTY F-M SA, TR GRAVEL (SM) 10YR 4/4 (Dk Yell. Brn) wet, Poorly Graded	SM	15	
						End of boring at 24.0'.			

JACOBS

PROJECT NUMBER	BORING NUMBER
706612	EW-2 Page 1 of 3

SOIL BORING LOG

PROJECT : Honeywell DMT LOCATION : Baltimore, MD
ELEVATION :
DRILLING CONTRACTOI Parratt Wolff
DRILLING METHOD AND EQUIPMENT USED : CME 55 HSA
ATD WATER LEVEL :
START : 9/5/18 0815 END : 9/5/18
LOGGER : L. Raterink

DEPTH BELOW SURFACE (FT)	INTERVAL (FT)	RECOVERY (IN)	SAMPLE #/TYPE	DPC (COPR)	COPR Strata	SOIL DESCRIPTION: SOIL NAME, USCS GROUP SYMBOL, COLOR, MOISTURE CONTENT, RELATIVE DENSITY, OR CONSISTENCY, SOIL STRUCTURE, MINERALOGY.	USCS	BLOW COUNTS	COMMENTS: DEPTH OF CASING, DRILLING RATE, DRILLING FLUID LOSS, TESTS, AND STRUMENTATION. DRILLING ACTIONS/DRILLER COMMENTS
	0-1					no sample			
1 2	1-3	12	SS1	- - -		1.0-1.8 no recovery 1.8-2.0 silt, dry, loose little sand, dark gray 2.0-2.3 gravel, loose, gray 2.3-3.0 sand, dry, medium 10YR3/1		1 6 4 7	
3 4	3-5	1.4	SS-2	- - -		3.0-3.6 no recovery 3.6-4.5 fine to med sand, some silt, dry 10YR2/1 4.5-5.0 same as 2.0-2.3		11 8 6 6	
5 6	5-7	16	SS 3	- - - -		5.0-5.4 no recovery 5.4-5.9 sand, little gravel loose, dry 5.9-6.3 silty sand, red, dry, little clay 6.3-6.6 silty clay, red, dry 6.6-7.0 SA 5.9-6.3		6 12 36 50/4	
7 8	7-9	15	SS 4	- - -		7.0-7.5 no recovery 7.5-7.7 SAA 7.7-8.2 sand, little gravel loose dry, 10YR3/3 8.2-9.0 clayey silt, Med-firm dry		38 24 13 5	
9	9-11	1.0	SS 5	-		9.0-9.4 no recovery 9.4-9.8 silty sand, Med, dry		4 7	

JACOBS

PROJECT NUMBER	BORING NUMBER
	EW-2 Page 2 of 3

SOIL BORING LOG

PROJECT : Honeywell DMT LOCATION : Baltimore, MD
ELEVATION :
DRILLING CONTRACTOR Parratt Wolff
DRILLING METHOD AND EQUIPMENT USED : CME 55 HSA
ATD WATER LEVEL :
START : 9/5/18 0815 END : 9/5/18 LOGGER : L. Rakrick

DEPTH BELOW SURFACE (FT)	INTERVAL (FT)	RECOVERY (IN)	SAMPLE #/TYPE	DPC (COPR)	COPR Strata	SOIL DESCRIPTION SOIL NAME, USCS GROUP SYMBOL, COLOR, MOISTURE CONTENT, RELATIVE DENSITY, OR CONSISTENCY, SOIL STRUCTURE, MINERALOGY	USCS	BLOW COUNTS	COMMENTS DEPTH OF CASING, DRILLING RATE, DRILLING FLUID LOSS, TESTS, AND STRUMENTATION DRILLING ACTIONS/DRILLER COMMENTS
10			SS 6			9.8-10.4 clay, red 2.5YR4/6 dry firm 10.4-11 no recovery		50/4	
11 12	11- 13	1.0	SS 7	++ ++	HB GB	11-11.2 no recovery 11.2-11.7 Silt, dry, firm moderately indurated 7.5 YR 4/6 11.7-12.2 clayey silt, dry particulate		22 21 50/2	
13 14	13 15	0.4	SS 8	++	HB	13.0-13.4 silt, dry, little sand weakly indurated 7.5 YR 4/6 13.4-15.0 no recovery		50/4	
15	15- 16	0.6	SS 9	++	HB	15.0-15.6 SAA except moist		77 50/1	
16	16- 16.5	0.5	SS 10	++ ++	GB HB	16.0-16.2 clayey silt, moist 2.5YR4/3 (olive brown), 16.2-16.5 silty w little sand, moist 2.5YR4/6, weakly indurated		32	
16.5	16.5 17	0.2	SS 11	++	GB	16.5-16.7 SA 16.0-16.2		50/2	
17	17- 17.5	0.5	SS 12	++ ++	GB HB	17.0-17.2 SAA 17.2-17.5 silt, moist, 2.5YR4/6 weakly-med indurated		79	
17.5 18	17.5- 18	0.5	SS 13	++	GB	17.5-18.0 SA 16.0-16.2		27	

JACOBS

PROJECT NUMBER

BORING NUMBER EW-2 Page 3 of 3

SOIL BORING LOG

PROJECT : Honeywell DMT LOCATION : Baltimore, MD
ELEVATION :
DRILLING CONTRACTOR Parratt Wolff
DRILLING METHOD AND EQUIPMENT USED : CME 55 HSA
ATD WATER LEVEL : START : 9/5/18 0813 END : 9/5/18 LOGGER : L.Ratenick

DEPTH BELOW SURFACE (FT)	INTERVAL (FT)	RECOVERY (IN)	SAMPLE #/TYPE	DPC (COPR)	COPR Strata	SOIL DESCRIPTION SOIL NAME, USCS GROUP SYMBOL, COLOR, MOISTURE CONTENT, RELATIVE DENSITY, OR CONSISTENCY, SOIL STRUCTURE, MINERALOGY	USCS	BLOW COUNTS	COMMENTS DEPTH OF CASING, DRILLING RATE, DRILLING FLUID LOSS, TESTS, AND STRUMENTATION DRILLING ACTIONS/DRILLER COMMENTS
18	18 18.5	0.5	SS 14	++ ++	GB HB	18.0-18.2 SAA 18.2-18.5 silt, moist, Little sand		32	
18.5	18.5 - 19	0.5	SS 15	++	HB	18.5-19.0 SAA		77	
19	19 - 19.5	0.5	SS 16	++	HB	19.0 19.2 SAA		27	
19.5	19.5 - 20	0	SS 17			no recovery			
20	20 - 20.5	0.5	SS 18	+		20.0-20.5 sand w/gravel, moist, med		6	
20.5	20.5 - 21	0.5	SS 18			20.5-21.0 SAA		4	
21	21 - 21.5	0.5	SS 19			21.0-21.5 SAA		10	
21.5	21.5 - 22	0.5	SS 20			21.5-22.0 gravel, moist some sand			
22	22- 22.5	0.5	SS 21			22.0-22.5 silty sand, some gravel, moist		8	
22.5	22.5 - 23	0.5	SS 22			22.5-23.0 SAA		6	
23									

BORING LOG

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Honeywell

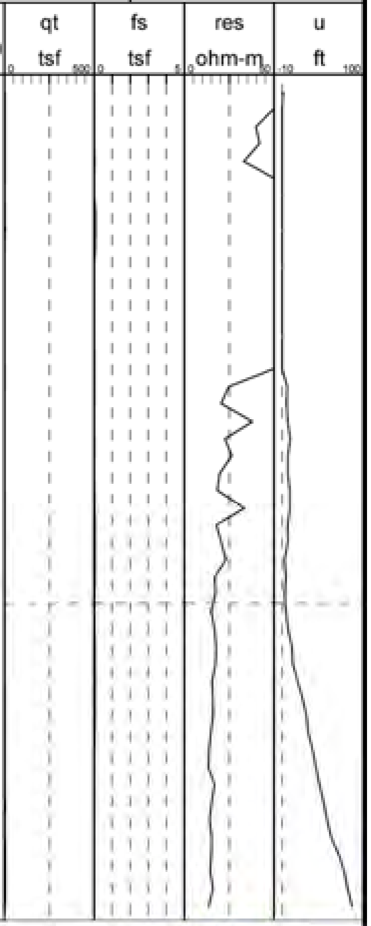
Site: Dundalk Marine Terminal
Boring No: INC-19
CPT No: CPT-148A

Northing: 574783.9
Easting: 1448806.9
Elevation: 25.19

Driller: A. Chapel (Parratt Wolff, Inc.)
Method: Hollow Stem Auger
Consultant: J. Rodgers (CH2M Hill, Inc.)

Total Depth: 30.0 Ft
GW Depth: 0.0 Ft
Date: 10/24/2006

Depth Ft	Recov	Sample ID	DPC	Soil Code	Soil Description	USCS	Comments	W	Gs	PL	LL	P200
0					Asphalt and gravel fill							
			-					12				
					POORLY-GRADED SAND with GRAVEL (SP) - gray (10 YR 4/1) mottled with black (10 YR 2.5/1), red (2.5 YR 4/8) and white (10 YR 8/1), dry to moist, medium to coarse sand.	SP						
5												
			-									
8												



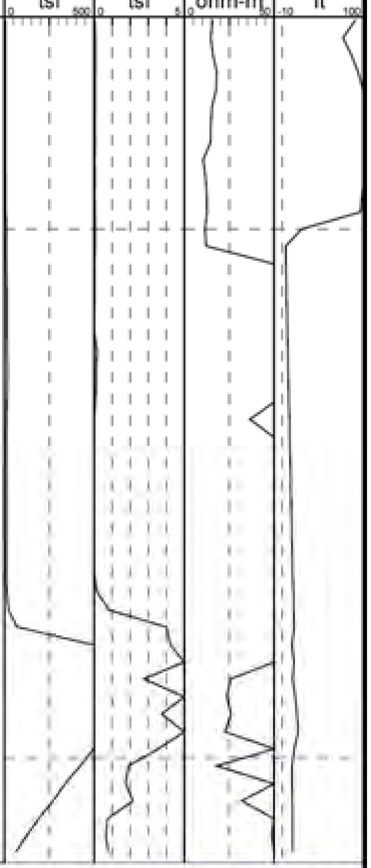
Locus

BORING LOG Page 2 of 4

Honeywell

Site: Dundalk Marine Terminal	Northing: 574783.9	Driller: A. Chapel (Parratt Wolff, Inc.)	Total Depth: 30.0 Ft
Boring No: INC-19	Easting: 1448806.9	Method: Hollow Stem Auger	GW Depth: 0.0 Ft
CPT No: CPT-148A	Elevation: 25.19	Consultant: J. Rodgers (CH2M Hill, Inc.)	Date: 10/24/2006

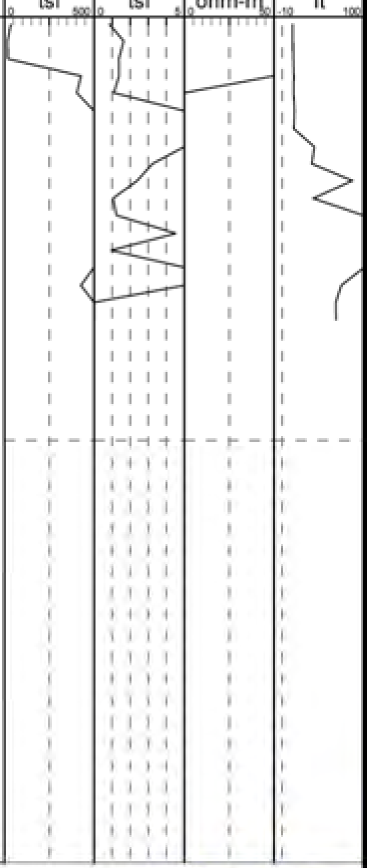
Depth Ft	Recov	Sample ID	DPC	Soil Code	Soil Description	USCS	Comments	W	Gs	PL	LL	P200	qt tsf	fs tsf	res ohm-m	u ft
8			–		POORLY-GRADED SAND with GRAVEL (SP) - gray (10 YR 4/1) mottled with black (10 YR 2.5/1), red (2.5 YR 4/8) and white (10 YR 8/1), dry to moist medium to coarse sand.	SP										
10			+		SILTY CLAY (CL) -strong brown (2.5 YR 5/8), dry, hard, low plasticity.	CL	Increased DPT hammer intensity. Driller states material is like concrete.	15								
					No Recovery		Refusal at 11 feet. Used auger and rock core to open hole.									
15 16			++	HB	Minimal recovery. Recovered sample was coarse sand, strong brown (10 YR 4/8), dry.		Material extremely difficult to penetrate with DPT. Sampler bent when retrieved from hole. CPT refusal at 12.9 feet									



Locus

BORING LOG Page 3 of 4 Honeywell	Site: Dundalk Marine Terminal Boring No: INC-19 CPT No: CPT-148A	Northing: 574783.9 Easting: 1448806.9 Elevation: 25.19	Driller: A. Chapel (Parratt Wolff, Inc.) Method: Hollow Stem Auger Consultant: J. Rodgers (CH2M Hill, Inc.)	Total Depth: 30.0 Ft GW Depth: 0.0 Ft Date: 10/24/2006

Depth Ft	Recov	Sample ID	DPC	Soil Code	Soil Description	USCS	Comments	W	Gs	PL	LL	P200	qt tsf	fs tsf	res ohm-m	u ft
16		INC-19-SOI-1518	++	HB	POORLY-GRADED SAND with GRAVEL (SP) -strong brown (7.5 YR 5/8), dry, medium to coarse sand.	SP	CPT refusal at 18.9 feet.									
20		INC-19-SOI-1921		GB	POORLY-GRADED SAND (SP) -bluish black (GLEY 2 2.5/1 10B), becomes strong brown (7.5 YR 5/8) at 22-23 feet, moist, fine to medium sand.	SP			3.20							
		~~[illegible]~~						~~27~~	~~3.01~~							
		INC-19-SOI-2223	++					50	2.92							
24																



Locus

BORING LOG Page 4 of 4

Honeywell

Site: Dundalk Marine Terminal
Boring No: INC-19
CPT No: CPT-148A

Northing: 574783.9
Easting: 1448806.9
Elevation: 25.19

Driller: A. Chapel (Parratt Wolff, Inc.)
Method: Hollow Stem Auger
Consultant: J. Rodgers (CH2M Hill, Inc.)

Total Depth: 30.0 Ft
GW Depth: 0.0 Ft
Date: 10/24/2006

Depth Ft	Recov	Sample ID	DPC	Soil Code	Soil Description	USCS	Comments	W	Gs	PL	LL	P200	qt tsf	fs tsf	res ohm-m	u ft
24			++	GB	POORLY-GRADED SAND (SP) -bluish black (GLEY 2 2.5/1 10B), becomes strong brown (7.5 YR 5/6) at 22-23 feet, moist, fine to medium sand.	SP										
25			-		LEAN CLAY (CL) -gray (10 YR 5/1) and yellowish brown (10 YR 5/8), dry, hard, low plasticity, trace organics.	CL	DPT push difficult and slow.	75								
			-		SILTY SAND (SM) -moist, low plasticity, sand lens at 27.6-27.8 feet.	SM										
					Collect shelby tube sample.											
30.0																

Borehole completed as an inclinometer location.

Locus

BORING LOG

Page 1 of 4

Honeywell

Site: Dundalk Marine Terminal
Boring No: INC-44

Northing: NA
Easting: NA
Elevation: NA

Driller: Parratt Wolff, Inc.
Method: Direct Push
Consultant:
Geologist: C. Reed / A. Louder

Total Depth: 36.0 Ft
GW Depth: 0.0 Ft
Date: 12/13/2011

Depth Ft	Rec	PID	DPC	Blow Count	USCS	Soil Code	Stratum Description	Sample Comments
0							Asphalt.	
							Subbase.	
			-		GW-GM		WELL GRADED GRAVEL WITH SILT AND SAND (GW-GM), dark brown (7.5YR 3/4), dry to moist, fine to medium subrounded gravel with some fine to coarse sand and silt, (loose).	
					CL		LEAN CLAY (CL), red (2.5YR 4/8), moist, with trace fine sand, (firm)	
							No recovery within known COPR cell. Refusal/no return beyond 4' bgs, advance augurs to 14' and continue DPT.	
5								
10								

BORING LOG

Page 2 of 4

Site: Dundalk Marine Terminal
Boring No: INC-44

Northing: NA
Easting: NA
Elevation: NA

Driller: Parratt Wolff, Inc.
Method: Direct Push
Consultant:
Geologist: C. Reed / A. Louder

Total Depth: 36.0 Ft
GW Depth: 0.0 Ft
Date: 12/13/2011

Depth Ft	Rec	PID	DPC	Blow Count	USCS	Soil Code	Stratum Description	Sample Comments
10							No recovery within known COPR cell. Refusal/no return beyond 4' bgs, advance augurs to 14' and continue DPT.	
							LEAN CLAY (CL), RED (2.5YR 4/8), dry to moist, with trace fine to coarse sand and fine subangular gravel, (stiff).	
15								
			-					
					CL			
			-					
20								

BORING LOG

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Honeywell

Site: Dundalk Marine Terminal
Boring No: INC-44

Northing: NA
Easting: NA
Elevation: NA

Driller: Parratt Wolff, Inc.
Method: Direct Push
Consultant:
Geologist: C. Reed / A. Louder

Total Depth: 36.0 Ft
GW Depth: 0.0 Ft
Date: 12/13/2011

Depth Ft	Rec	PID	DPC	Blow Count	USCS	Soil Code	Stratum Description	Sample Comments
20					CL		LEAN CLAY (CL), RED (2.5YR 4/8), dry to moist, with trace fine to coarse sand and fine subangular gravel, (stiff).	
			-		ML		GRAVELLY SILT WITH SAND (ML), brown (7.5YR 4/4), moist, with some fine to coarse rounded gravel and little fine to coarse sand, (firm).	
					MH		ELASTIC SILT (MH), very dark gray (7.5YR 3/1), moist, with trace fine sand, (firm).	
			-		SW-SM		WELL GRADED SAND WITH SILT AND GRAVEL (SW-SM), gray (7.5YR 5/1), wet, fine to coarse sand with little silt and trace fine subangular gravel, (medium firm).	
25					CL		SANDY LEAN CLAY (CL), olive (5Y 5/3), moist to wet, with fine to coarse sand, (soft).	
			-		CL		SANDY LEAN CLAY (CL), light gray (7.5YR 7/1), moist to wet, with fine to coarse sand, (soft).	
30								

BORING LOG

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Honeywell

Site: Dundalk Marine Terminal
Boring No: INC-44

Northing: NA
Easting: NA
Elevation: NA

Driller: Parratt Wolff, Inc.
Method: Direct Push
Consultant:
Geologist: C. Reed / A. Louder

Total Depth: 36.0 Ft
GW Depth: 0.0 Ft
Date: 12/13/2011

Depth Ft	Rec	PID	DPC	Blow Count	USCS	Soil Code	Stratum Description	Sample Comments
30			-		CL		SANDY LEAN CLAY (CL), light gray (7.5YR 7/1), moist to wet, with fine to coarse sand, (soft).	
					CL		SANDY LEAN CLAY (CL), brown (2.5YR 5/4), moist to wet, with fine to coarse sand, (soft).	
							No recovery.	
35								
36.0								

BORING LOG

Honeywell

Site: Dundalk Marine Terminal
Boring No: INC-45

Northing: NA Easting: NA Elevation: NA	Driller: Parratt Wolff, Inc. Method: Direct Push Consultant: Geologist: C. Reed / A. Louder	Total Depth: 36.0 Ft GW Depth: 0.0 Ft Date: 12/12/2011 - 12/13/2

Depth Ft	Rec	PID	DPC	Blow Count	USCS	Soil Code	Stratum Description	Sample Comments
0			-				Asphalt.	
							Subbase gravel.	
					GW-GM		WELL GRADED GRAVEL WITH SILT AND SAND (GW-GM), dark brown (7.5YR 3/4), dry to moist, fine to medium subrounded gravel with some fine to coarse sand and silt, (loose).	
5			+		CL		SANDY LEAN CLAY (CL), yellow red (5YR 4/6), dry to moist, fine to coarse sand with little silt and subrounded gravel, (soft).	
					SP		POORLY GRADED SAND (SP), brown (7.5YR 5/4), moist, fine to medium sand with trace silt, weakly indurated.	
10			++		CL		SANDY LEAN CLAY (CL), red (2.5YR 5/8), wet, fine to coarse sand with little subangular gravel and trace silt, (soft).	
					SP	HB	POORLY GRADED SAND (SP), dark red brown (2.5YR 3/4), moist, fine to medium sand with trace silt, weakly indurated.	
12					SP-SM	GB	POORLY GRADED SAND WITH SILT (SP-SM), brown (7.5YR 5/2), moist, with trace fine subrounded gravel, particulate.	

BORING LOG

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Honeywell

Site: Dundalk Marine Terminal
Boring No: INC-45

Northing: NA
Easting: NA
Elevation: NA

Driller: Parratt Wolff, Inc.
Method: Direct Push
Consultant:
Geologist: C. Reed / A. Louder

Total Depth: 36.0 Ft
GW Depth: 0.0 Ft
Date: 12/12/2011 - 12/13/2

Depth Ft	Rec	PID	DPC	Blow Count	USCS	Soil Code	Stratum Description	Sample Comments
12							No recovery	
15			-		CL		LEAN CLAY (CL), red (2.5YR 4/8), moist, with trace fine sand, (firm).	
20			-		ML		GRAVELLY SILT WITH SAND (ML), brown (7.5YR 4/4), moist, with some fine to coarse subrounded gravel and little fine to coarse sand, (firm).	
			-		MH		ELASTIC SILT WITH SAND (MH), very dark gray (7.5YR 3/1), moist to wet, with little fine to medium sand, (soft).	
24								

BORING LOG

Honeywell

Site: Dundalk Marine Terminal
Boring No: INC-45

Northing: NA
Easting: NA
Elevation: NA

Driller: Parratt Wolff, Inc.
Method: Direct Push
Consultant:
Geologist: C. Reed / A. Louder

Total Depth: 36.0 Ft
GW Depth: 0.0 Ft
Date: 12/12/2011 - 12/13/2

Depth Ft	Rec	PID	DPC	Blow Count	USCS	Soil Code	Stratum Description	Sample Comments
24							ELASTIC SILT WITH SAND (MH), very dark gray (7.5YR 3/1), moist to wet, with little fine to medium sand, (soft).	
25			-					
			-		MH			
					SP-SM		POORLY GRADED SAND WITH SILT (SP-SM), very dark gray (7.5YR 3/1), wet, fine sand with some silt, (very soft).	
30			-		SM		SILTY SAND (SM), gray (7.5YR 5/1), wet, fine to medium sand, (very soft).	
							No recovery. Too soft.	
35								
36.0								

BORING LOG

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Honeywell

Site: Dundalk Marine Terminal
Boring No: INC-46

Northing: NA Easting: NA Elevation: NA	Driller: Parratt Wolff, Inc. Method: Direct Push Consultant: Geologist: C. Reed / A. Louder	Total Depth: 38.0 Ft GW Depth: 0.0 Ft Date: 12/14/2011 - 12/15/2

Depth Ft	Rec	PID	DPC	Blow Count	USCS	Soil Code	Stratum Description	Sample Comments
0							HSA without characterization to 12' due to known material. Begin DPT at 12' to define bottom clay depth.	
5			-					
10								
	■		++		SP-SM	GB	POORLY GRADED SAND WITH SILT AND GRAVEL (SP-SM), dark gray (5Y 4/1), moist to wet, fine to medium sand with some silt and fine to coarse subrounded gravel, yellow particulate present.	
	■		+		SP-SM	HB	POORLY GRADED SAND WITH SILT (SP-SM), strong brown (7.5YR 4/6), moist, fine to medium sand with little subangular gravel, weakly indurated.	
14								

BORING LOG

Honeywell

Site: Dundalk Marine Terminal
Boring No: INC-46

Northing: NA
Easting: NA
Elevation: NA

Driller: Parratt Wolff, Inc.
Method: Direct Push
Consultant:
Geologist: C. Reed / A. Louder

Total Depth: 38.0 Ft
GW Depth: 0.0 Ft
Date: 12/14/2011 - 12/15/2

Depth Ft	Rec	PID	DPC	Blow Count	USCS	Soil Code	Stratum Description	Sample Comments
14			+		SP-SM	HB	POORLY GRADED SAND WITH SILT (SP-SM), strong brown (7.5YR 4/6), moist, fine to medium sand with little subangular gravel, weakly indurated.	
15					CL		SANDY LEAN CLAY (CL), red (2.5YR 4/5), dry to moist, with some fine to medium sand, (very stiff).	
			-					
20			-		ML		GRAVELLY SILT WITH SAND (ML), brown (7.5YR 4/2), moist to wet, with some fine to coarse sand and fine to medium subangular gravel (stiff).	
					MH		ELASTIC SILT (MH), dark gray (7.5YR 4/1), wet, with trace fine sand and petroleum odor, (very soft).	
					SM		SILTY SAND (SM), gray (7.5YR 6/1), wet, medium sand with some silt, (loose).	
							No recovery.	
25								
28								

BORING LOG

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Honeywell

Site: Dundalk Marine Terminal
Boring No: INC-46

Northing: NA
Easting: NA
Elevation: NA

Driller: Parratt Wolff, Inc.
Method: Direct Push
Consultant:
Geologist: C. Reed / A. Louder

Total Depth: 38.0 Ft
GW Depth: 0.0 Ft
Date: 12/14/2011 - 12/15/2

Depth Ft	Rec	PID	DPC	Blow Count	USCS	Soil Code	Stratum Description	Sample Comments
28	■				SM		SILTY SAND (SM), reddish yellow (7.5YR 6/6), wet, medium sand with some silt, (loose).	
30	■		-		MH		ELASTIC SILT WITH SAND (MH), very dark gray (YR 3/1), wet, with some fine to medium sand, (very soft).	
35							No recovery	
38.0	■		-		MH		ELASTIC SILT WITH SAND (MH), very dark gray (YR 3/1), wet, with some fine to medium sand, (very soft).	

BORING LOG

Site: Dundalk Marine Terminal
Boring No: INC-47

Northing: NA
Easting: NA
Elevation: NA

Driller: Parratt Wolff, Inc.
Method: Direct Push
Consultant:
Geologist: C. Reed / A. Louder

Total Depth: 38.0 Ft
GW Depth: 0.0 Ft
Date: 12/15/2011 - 12/16/2

Depth Ft	Rec	PID	DPC	Blow Count	USCS	Soil Code	Stratum Description	Sample Comments
0							Not sampled. Drillers used HSA to 12' bgs -not sampled since interval material already know. DPT at 12'.	
5								
10								
			++		SP-SM		POORLY GRADED SAND WITH SILT AND GRAVEL (SP-SM), dark gray (5YR 4/1), wet, fine to medium sand with some silt and fine to medium subangular gravel, particulate.	
			-		CL		SANDY LEAN CLAY (CL), red (2.5YR 4/6), dry to moist, with some fine to medium sand and trace fine subangular gravel, (very stiff).	
15								

BORING LOG

Honeywell

Site: Dundalk Marine Terminal
Boring No: INC-47

Northing: NA
Easting: NA
Elevation: NA

Driller: Parratt Wolff, Inc.
Method: Direct Push
Consultant:
Geologist: C. Reed / A. Louder

Total Depth: 38.0 Ft
GW Depth: 0.0 Ft
Date: 12/15/2011 - 12/16/2

Depth Ft	Rec	PID	DPC	Blow Count	USCS	Soil Code	Stratum Description	Sample Comments
15			-		CL		SANDY LEAN CLAY (CL), red (2.5YR 4/6), dry to moist, with some fine to medium sand and trace fine subangular gravel, (very stiff).	
			-		CL		SANDY LEAN CLAY (CL), red (2.5YR 4/6), dry to moist, with some fine to medium sand and little fine to medium subround gravel, (stiff).	
					ML		GRAVELLY SILT WITH SAND (ML), brown (7.5YR 4/2), moist to wet, with some fine to coarse sand and fine to medium subangular gravel, (stiff).	
20			-				No recovery. Poorly graded sand in top of macrocore sampler.	
			-		SM		SILTY SAND (SM), pale olive (5Y 6/3), wet, fine to medium sand with some silt, (loose).	
25					SM		SILTY SAND (SM), reddish yellow (7.5YR 6/6), wet, fine to medium sand with some silt, (loose).	
			-		MH		ELASTIC SILT (MH), very dark gray (7.5YR 4/1), wet, with trace fine sand, (soft).	
30								

BORING LOG

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Honeywell

Site: Dundalk Marine Terminal
Boring No: INC-47

Northing: NA
Easting: NA
Elevation: NA

Driller: Parratt Wolff, Inc.
Method: Direct Push
Consultant:
Geologist: C. Reed / A. Louder

Total Depth: 38.0 Ft
GW Depth: 0.0 Ft
Date: 12/15/2011 - 12/16/2

Depth Ft	Rec	PID	DPC	Blow Count	USCS	Soil Code	Stratum Description	Sample Comments
30							ELASTIC SILT (MH), very dark gray (7.5YR 4/1), wet, with trace fine sand, (soft).	
	■		-					
	□							
	■		-		MH			
35								
	□							
	■		-					
	□							
38.0								

BORING LOG

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Site: Dundalk Marine Terminal
Boring No: INC-27VW

Northing: 574193.2
Easting: 1447924.8
Elevation: 20.4

Driller: Parratt Wolff, Inc.
Method: Hollow Stem Auger
Consultant: CH2M Hill, Inc.
Geologist: Mary Velasquez

Total Depth: 36.0 Ft
GW Depth: 12.0 Ft
Date: 01/24/2010

Depth Ft	Rec	DPC	Blow Count	USCS	Soil Code	Stratum Description	Sample Comments
0		-	5-13-9			Asphalt	
				SC		Clayey Sand and Gravel (SC) -large gravel fragments (fill)	geotextile fabric liner encountered
		-	8-8-12-15	SM		Silty Sand (SM) -dark brown (10 YR 3/3), medium dense, dry, fine sand, trace subangular fine gravel, (fill material)	
5		-	2-4-4-5	SM		Silty Sand (SM) -dark brown (10 YR 3/3), loose, few coarse angular gravel, dry	geotextile fabric liner encountered
		-	9-7-12-50/5	GM		Silty Gravel (GM) -dark grayish brown (10 YR 3/2), coarse gravel, damp, medium dense	
				SM		Silty Sand (SM) -brown (10 YR 3/3), medium dense, few coarse angular gravel, dry	refusal at 7.9' with split spoons, auger to 9.0'
		-	6-10-5-6	SM		Silty Sand (SM) -olive gray (5 Y 4/2), road base, concrete, moist, medium dense	
9							

BORING LOG

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Honeywell

Site: Dundalk Marine Terminal
Boring No: INC-27VW

Northing: 574193.2
Easting: 1447924.8
Elevation: 20.4

Driller: Parratt Wolff, Inc.
Method: Hollow Stem Auger
Consultant: CH2M Hill, Inc.
Geologist: Mary Velasquez

Total Depth: 36.0 Ft
GW Depth: 12.0 Ft
Date: 01/24/2010

Depth Ft	Rec	DPC	Blow Count	USCS	Soil Code	Stratum Description	Sample Comments
9		-	6-10-5-6	SM		Silty Sand (SM) -olive gray (5 Y 4/2), road base, concrete, moist, medium dense	
				SM		Silty Sand (SM) -brown (7.5 YR 5/4), trace fine to coarse angular gravel	
				SM		Silty Sand (SM) -brown (10 YR 3/3), medium dense, few coarse angular gravel, dry	
10		-	4-8-50/3			Fill material (concrete, asphalt)	
		++	4-8-50/3	SM	HB	Silty Sand (SM) -dark yellowish brown (10 YR 3/6), moist, dry in last 0.2', fine to medium sand, very fine angular gravel, very dense, strongly indurated	refusal at 11.2' with split spoons, auger to 12.0'
		++	28-29	SM	GB	Silty Sand (SM) -black (10 YR 2/1), trace yellow nodules, wet, fine sand, particulate	
				SM	HB	Silty Sand (SM) -dark yellowish brown (10 YR 3/6), highly indurated, moist	
				SM	GB	Silty Sand (SM) -black (10 YR 2/1), trace gravel, trace yellow nodules, moist, slightly indurated	
				SM	HB	Silty Sand (SM) -dark yellowish brown (10 YR 3/6), trace yellow nodules, fine sand, slightly indurated, strongly indurated at 14.6', very dense	refusal at 13.0' with split spoons, auger to 14.0'
		++	23-50/4				refusal at 14.6' with split spoons, auger to 15.0'
15		++	50/3				refusal at 15.3' with split spoons, auger to 16.0'
		++	50/4				refusal at 16.3' with split spoons, auger to 17.0'
		++	50/5	SM	GB	Silty Sand (SM) -black (10 YR 2/1), lightly indurated, trace yellow nodules, moist	refusal at 17.4' with split spoons, auger to 18.0'
				SM	HB	Silty Sand (SM) -dark yellowish brown (10 YR 3/6), trace yellow nodules, fine sand, highly indurated, very dense	
18							

Locus

BORING LOG

Honeywell

Site: Dundalk Marine Terminal
Boring No: INC-27VW

Northing: 574193.2
Easting: 1447924.8
Elevation: 20.4

Driller: Parratt Wolff, Inc.
Method: Hollow Stem Auger
Consultant: CH2M Hill, Inc.
Geologist: Mary Velasquez

Total Depth: 36.0 Ft
GW Depth: 12.0 Ft
Date: 01/24/2010

Depth Ft	Rec	DPC	Blow Count	USCS	Soil Code	Stratum Description	Sample Comments
18		++	18-62-23-7	SM	HB	Silty Sand (SM) -dark yellowish brown (10 YR 3/6), trace yellow nodules, fine sand, highly indurated, very dense	
				SM	GB	Silty Sand (SM) -black (10 YR 2/1), yellow nodules, green nodules, moist, particulate	driller notes strata change
20		+	3-5-13-17	CL		Lean Clay (CL) -mottled with red (2.5 YR 4/8), yellowish red (5YR 5/8) and light brownish gray (10 YR 6/2), silty clay with fine sand, slightly moist, very stiff	
		+	6-4-7-6				
				CL		Lean Clay (CL) -yellowish red (5 YR 5/8), high plasticity, stiff	
25		-	WOR	CL		Lean Clay (CL) -yellowish red (5 YR 5/8), mottled with red (2.5 YR 4/8) and light brownish gray (10 YR 6/2), silty clay with fine sand, moist, very soft	
		-	2-3-4-5	SP		Poorly Graded Sand (SP) -dark olive brown (2.5 Y 3/3), fine to medium sand, moist, loose	
27							

Locus

BORING LOG Page 4 of 4

Honeywell

Site: Dundalk Marine Terminal	Northing: 574193.2	Driller: Parratt Wolff, Inc.	Total Depth: 36.0 Ft
Boring No: INC-27VW	Easting: 1447924.8	Method: Hollow Stem Auger	GW Depth: 12.0 Ft
	Elevation: 20.4	Consultant: CH2M Hill, Inc.	Date: 01/24/2010
		Geologist: Mary Velasquez	

Depth Ft	Rec	DPC	Blow Count	USCS	Soil Code	Stratum Description	Sample Comments
27		-	2-3-4-5	SP		Poorly Graded Sand (SP) -dark olive brown (2.5 Y 3/3), fine to medium sand, moist, loose	
		-	1-2-2-3	SP		Poorly Graded Sand (SP) -gray (2.5 Y 5/1), very fine to fine sand, wet, loose	
30		-	1-2-2-4	SP		Poorly Graded Sand (SP) -layered black (2.5 Y 2/1) and gray (2.5 Y 5/1), fine sand, loose, wet	
		-	5-3-3-2	ML		Clayey Silt (ML) -gray (2.5 Y 5/1), medium stiff, wet, low plasticity	
				SC		Clayey Silt (SC) -gray (2.5 Y 5/1), wet, sand clay mixture, fine sand	
35		-	4-2-11	SM		Silty Sand (SM) -dark gray (2.5 Y 4/1), medium sand, trace shell fragments, wet, medium dense	Vibrating wire piezometer installed at 7', 19.5' and 34' bgs. Inclinometer installed at 35' bgs
36.0				SM		Silty Sand (SM) -gray (2.5 Y 4/1), fine sand, medium dense	

Locus

BORING LOG

Honeywell

Site: Dundalk Marine Terminal
Boring No: INC-30VW

Northing: 574482.2
Easting: 1448146.9
Elevation: 21.562

Driller: Parratt Wolff, Inc.
Method: Hollow Stem Auger
Consultant: CH2M Hill, Inc.
Geologist: Mary Velasquez

Total Depth: 36.0 Ft
GW Depth: 33.0 Ft
Date: 01/25/2010

Depth Ft	Rec	DPC	Blow Count	USCS	Soil Code	Stratum Description	Sample Comments
0						Asphalt and road base	
		-	15-9-8	SC		Clayey Sand with Gravel (SC) -large subangular gravel fragments, (fill)	
							geotextile fabric liner encountered
		-	5-6-18-14	SM		Silty Sand (SM) -dark brown (10 YR 3/3), medium dense, dry, 1.6-2' fine sand, trace fine subangular gravel, (fill)	
5		-	2-2-3-4				geotextile fabric liner encountered
				ML		Clayey Silt (ML) -brown (10 YR 4/3), medium stiff, damp, slight plasticity, some fine sand	
				SM		Silty Sand (SM) -dark brown (10 YR 3/3), damp, few coarse angular gravel	
		-	10-10-50/5			Road base with gravel, coarse sand, asphalt	
						No Recovery	refusal at 7.5' with split spoons, auger to 8.0'
8							

Locus

BORING LOG

Site: Dundalk Marine Terminal
Boring No: INC-30VW

Northing: 574482.2
Easting: 1448146.9
Elevation: 21.562

Driller: Parratt Wolff, Inc.
Method: Hollow Stem Auger
Consultant: CH2M Hill, Inc.
Geologist: Mary Velasquez

Total Depth: 36.0 Ft
GW Depth: 33.0 Ft
Date: 01/25/2010

Depth Ft	Rec	DPC	Blow Count	USCS	Soil Code	Stratum Description	Sample Comments
8		-	10-17-14-14			Road base, sand-gravel-silt mix, with coarse subangular gravel, asphalt	
10		+		SM	HB	Silty Sand (SM) -dark yellowish brown (10 YR 3/6), highly indurated, dry, medium dense	
		-	8-11-6-5	SW		Well Graded Sand (SW) -olive yellow (2.5 Y 6/6), moist, fine to medium sand, coarse subrounded gravel, medium dense	
		-	4-11-25-23	CL		Lean Clay (CL) -yellowish red (5 YR 5/8), mottled with red (2.5 YR 4/8), fine sand, moist, hard, silty clay 12-13.2'	
		++		SM	HB	Silty Sand (SM) -dark yellowish brown (10 YR 3/6), highly indurated, dry, yellow nodules, (dense)	
		++	27-34-50/5	SM	HB/GB	Silty Sand (SM) -black (10 YR 2/1), dry, loose, particulate, fine to medium sand	
15				SM	HB	Silty Sand (SM) -dark yellowish brown (10 YR 5/6), yellow nodules, dry, very dense	
				SM		Silty Sand (SM) -dark brown (10 YR 3/3) mottled with gray (10 YR 5/3) and brownish yellow (10 YR 6/6), moist, trace small angular gravel	refusal at 15.4' with split spoons; auger to 16.0'
16							

BORING LOG Page 3 of 5

Honeywell

Site: Dundalk Marine Terminal
Boring No: INC-30VW

Northing: 574482.2
Easting: 1448146.9
Elevation: 21.562

Driller: Parratt Wolff, Inc.
Method: Hollow Stem Auger
Consultant: CH2M Hill, Inc.
Geologist: Mary Velasquez

Total Depth: 36.0 Ft
GW Depth: 33.0 Ft
Date: 01/25/2010

Depth Ft	Rec	DPC	Blow Count	USCS	Soil Code	Stratum Description	Sample Comments
16			32-50/3	SM		Silty Sand (SM) -dark brown (10 YR 3/3) mottled with gray (10 YR 5/3) and brownish yellow (10 YR 6/6), moist, trace small angular gravel	
						No Recovery	refusal at 16.8' with split spoons, auger to 18.0'
		++	WOR-4-10-17	SM	HB/GB	Silty Sand (SM) -black (10 YR 2/1), moist, slightly indurated, medium dense, fine to medium sand	
20		++	5-4-7-13	SM	HB/GB	Silty Sand (SM) -dark yellowish brown (10 YR 3/3), lightly indurated, trace hard brown with yellow nodules	
		-		CL		Lean Clay (CL) -red (2.5 YR 4/8), moist, fine sand, (very stiff)	
				CL		Lean Clay (CL) -red (2.5 YR 4/8), moist, (very stiff)	
		-	5-6-5-7	SC		Clayey Sand (SC) -red (2.5 YR 4/8), moist, medium dense, fine to medium sand	
				CL		Lean Clay (CL) -red (2.5 YR 4/8), moist, medium plasticity, stiff	
24				SC		Clayey Sand (SC) -dark brown (10 YR 3/3), moist, loose, fine sand	

Locus

BORING LOG

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Honeywell

Site: Dundalk Marine Terminal Boring No: INC-30VW	Northing: 574482.2 Easting: 1448146.9 Elevation: 21.562	Driller: Parratt Wolff, Inc. Method: Hollow Stem Auger Consultant: CH2M Hill, Inc. Geologist: Mary Velasquez	Total Depth: 36.0 Ft GW Depth: 33.0 Ft Date: 01/25/2010

Depth Ft	Rec	DPC	Blow Count	USCS	Soil Code	Stratum Description	Sample Comments
24		+		SC		Clayey Sand (SC) -dark brown (10 YR 3/3), moist, loose, fine sand	
25		-	3-3-5-5				
				SP		Poorly Graded Sand (SP) -dark grayish brown (2.5 Y 3/2) with trace black (2.5 Y 2.5/1), moist, loose, coarse subrounded gravel, fine to medium sand	
		-	4-4-5-5				
				ML		Sandy Silt (ML) -very dark grayish brown (2.5 Y 3/2), fine sand, moist, soft, medium stiff, layers of sandy silt and clayey silt	
				ML		Silt (ML) -very dark grayish brown (2.5 Y 3/2), clayey silt, slight plasticity, moist, stiff	
		-	7-11-4-6				
				SW		Well Graded Sand with Gravel (SW) -dark grayish brown (2.5 Y 3/2), shell fragments, fine to medium subrounded gravel, medium dense, moist	
				CL		Silty Clay (CL) -dark greenish gray mottled with bluish black (GLEY 2 4/1 and 2.5/1), moist, medium to high plasticity, stiff	
30		-	2-3-5-12				
				SP		Poorly Graded Sand with Gravel (SP) -dark greenish gray (GLEY 2 4/1), 32.5-34' greenish gray (GLEY 1 5/1), moist, dense, fine to medium sand, trace well rounded fine gravel	
32							

Locus

BORING LOG

Honeywell

Site: Dundalk Marine Terminal
Boring No: INC-30VW

Northing: 574482.2
Easting: 1448146.9
Elevation: 21.562

Driller: Parratt Wolff, Inc.
Method: Hollow Stem Auger
Consultant: CH2M Hill, Inc.
Geologist: Mary Velasquez

Total Depth: 36.0 Ft
GW Depth: 33.0 Ft
Date: 01/25/2010

Depth Ft	Rec	DPC	Blow Count	USCS	Soil Code	Stratum Description	Sample Comments
32		-	6-14-20-15	SP		Poorly Graded Sand with Gravel (SP) -dark greenish gray (GLEY 2 4/1), 32.5-34' greenish gray (GLEY 1 5/1), moist, dense, fine to medium sand, trace well rounded fine gravel	
35			8-12-15-24	SP		Poorly Graded Sand (SP) -greenish gray (GLEY 1 5/1), fine to medium sand, wet, medium dense, trace fine rounded gravel	Vibrating wires installed at 7', 18' and 28' bgs. Inclinometer installed to 35'.
36.0							

Locus

BORING LOG

Site: Dundalk Marine Terminal
Boring No: INC-49

Driller: Boart Longyear
Method: Rotosonic

Consultant: CH2M Hill
Geologist: E. Curbo

Total Depth: 40.0 Ft
Start Date: 07/13/2012
End Date: 07/13/2012

Depth Ft	Rec	DPC	Stratum	USCS Code	Stratum Description
0					Asphalt.
				GW-GM	WELL GRADED GRAVEL with SILT and SAND (GW-GM), brown (10YR 4/3), moist, subrounded gravel with medium to fine grained sand, loose.
				CL	GRAVELLY LEAN CLAY (CL), dark grayish brown (10YR 4/2), moist, with subangular gravel, low plasticity, stiff.
5		-		CL	LEAN CLAY with GRAVEL (CL), dark grayish brown (10YR 4/2), moist, with subrounded gravel, low plasticity, stiff.
				CL	LEAN CLAY with GRAVEL (CL), dark grayish brown (10YR 4/2), dry, with subrounded gravel, low plasticity, stiff.
				GW-GM	WELL GRADED GRAVEL with SILT and SAND (GW-GM), light grey (10YR 7/1), dry, subangular gravel with fine sand, very loose.
10					

BORING LOG

Site: Dundalk Marine Terminal
Boring No: INC-49

Driller: Boart Longyear
Method: Rotosonic

Consultant: CH2M Hill
Geologist: E. Curbo

Total Depth: 40.0 Ft
Start Date: 07/13/2012
End Date: 07/13/2012

Depth Ft	Rec	DPC	Stratum	USCS Code	Stratum Description
10	■			CH	FAT CLAY with GRAVEL (CH), reddish brown (2.5YR 4/4), dry, with subangular gravel, stiff.
			HB	SP	POORLY GRADED SAND with GRAVEL (SP), very dark brown (10YR 2/2), dry, fine to coarse grained sand with subangular gravel and trace silt, weakly indurated, loose.
			GB	SP	POORLY GRADED SAND (SP), very dark gray (10YR 3/1), fine to medium grained sand with trace rounded gravel, loose.
			HB	SP	POORLY GRADED SAND with GRAVEL (SP), very dark brown (10YR 2/2), dry, fine to coarse grained sand with subangular gravel and trace silt, weakly indurated, loose.
15		++		CH	FAT CLAY with GRAVEL (CH), reddish brown (2.5YR 4/4), dry, with some subrounded gravel, stiff.
			GB	SP	POORLY GRADED SAND (SP), very dark gray (10YR 3/1), moist, fine to medium grained sand with trace rounded gravel, weakly indurated, medium dense.
			HB	SP	POORLY GRADED SAND (SP), brown (7.5Y 4/4), moist to dry, fine to medium grained sand with trace silt, strongly indurated, medium dense.
			GB	SP	POORLY GRADED SAND (SP), very dark gray (10YR 3/1), moist, fine to medium grained sand with trace rounded gravel, weakly indurated, medium dense.
20					

BORING LOG

Site: Dundalk Marine Terminal
Boring No: INC-49

Driller: Boart Longyear
Method: Rotosonic

Consultant: CH2M Hill
Geologist: E. Curbo

Total Depth: 40.0 Ft
Start Date: 07/13/2012
End Date: 07/13/2012

Depth Ft	Rec	DPC	Stratum	USCS Code	Stratum Description
20				CH	FAT CLAY with SAND (CH), reddish brown (2.5YR 4/4), moist, with medium to fine grained sand, low plasticity, firm.
				CH	SANDY LEAN CLAY (CL), reddish brown (2.5YR 4/4), moist, with fine to medium grained sand, low plasticity, very soft.
				CH	FAT CLAY (CH), red (2.5YR 4/6), moist, high plasticity, firm.
				SP	POORLY GRADED SAND (SP), light brownish gray (10YR 6/2), wet, medium to coarse grained sand, loose.
25		-		SP	POORLY GRADED SAND (SP), reddish brown (2.5YR 4/4), wet, medium to coarse grained sand with trace clay, very soft, very loose.
				SP	POORLY GRADED SAND (SP), brown (7.5YR 4/4), wet, medium to coarse grained sand with trace clay, very soft, very loose.
				SP	POORLY GRADED SAND (SP), grayish brown (10YR 5/2), wet, medium to coarse grained sand with trace clay, very soft, very loose.
30					

BORING LOG

Site: Dundalk Marine Terminal
Boring No: INC-49

Driller: Boart Longyear
Method: Rotosonic

Consultant: CH2M Hill
Geologist: E. Curbo

Total Depth: 40.0 Ft
Start Date: 07/13/2012
End Date: 07/13/2012

Depth Ft	Rec	DPC	Stratum	USCS Code	Stratum Description
30	■			SP	POORLY GRADED SAND with GRAVEL (SP), very dark gray (10YR 3/1), wet, medium to coarse sand with subrounded gravel, very loose.
				SW-SC	WELL GRADED SAND with CLAY and GRAVEL (SW-SC), gray (10YR 5/1), wet, medium to coarse sand with subangular gravel and low plasticity clay, loose.
35		-		SP	POORLY GRADED SAND (SP), gray (10YR 5/1), wet, medium to coarse sand, very loose.
				SP	POORLY GRADED SAND (SP), light brownish gray (10YR 6/2), wet, medium to coarse sand, very loose.
				SP	POORLY GRADED SAND (SP), reddish brown (2.5YR 4/4), wet, medium to coarse sand, very loose.
				CL	SANDY LEAN CLAY (CL), yellowish brown (10YR 5/4), moist, with medium to fine grained sand, dense.
				CH	FAT CLAY (CH), dark grayish brown (10YR 4/2), moist, high plasticity, firm. EOB at 40'.
40.0					

BORING LOG

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Honeywell

Site: Dundalk Marine Terminal	Northing: 574233.5	Driller: Parratt Wolff, Inc.	Total Depth: 27.0 Ft
Boring No: INC-1501-C	Easting: 1448048.8	Method: NA	GW Depth: 0.0 Ft
CPT No:	Elevation: 21.53	Consultant: Mira Abdelaziz (CH2M Hill, Inc.)	Date: 01/26/2007

Depth Ft	Recov	Sample ID	DPC	Soil Code	Soil Description	USCS	Comments	W	Gs	PL	LL	P200
0					Asphalt and gravel subbase							
			-		SILTY SAND (SM) -brown (7.5 YR 4/3), some clay and gravel, damp, stiff, silty clay.	SM						
5			-									
			-		SAND (SP) -with concrete, some gravel, dry, dense sand.	SP						
9												

Locus

BORING LOG

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Honeywell

Site: Dundalk Marine Terminal
Boring No: INC-1501-C
CPT No:

Northing: 574233.5
Easting: 1448048.8
Elevation: 21.53

Driller: Parratt Wolff, Inc.
Method: NA
Consultant: Mira Abdelaziz (CH2M Hill, Inc.)

Total Depth: 27.0 Ft
GW Depth: 0.0 Ft
Date: 01/26/2007

Depth Ft	Recov	Sample ID	DPC	Soil Code	Soil Description	USCS	Comments	W	Gs	PL	LL	P200
9					SAND (SP) -with concrete, some gravel, dry, dense sand	SP						
10			-		SILTY CLAY (CL) -red (2.5 YR 5/6), trace fine sand, stiff, moist silty clay.	CL						
					refusal -no recovery.							
			++	HB	SILTY SAND (SM) -reddish brown (5 YR 4/4), weakly indurated, some to little gravel, moist, medium stiff to stiff, silty sand.	SM						
				GB	SILTY SAND (SM) -black (GLEY 1 2.5), green particles, yellow particles, moist to wet, medium stiff to stiff, silty sand.	SM						
15			++	HB	SILTY SAND (SM) -reddish brown (5 YR 4/4), weakly indurated, some to little gravel, moist, medium stiff to stiff, silty sand.	SM						
				GB	SILTY SAND (SM) -black (GLEY 1 2.5), green particles, yellow particles, moist to wet, medium stiff to stiff, silty sand.	SM						
					refusal -no recovery.							
18												

Locus

BORING LOG

Honeywell

Site: Dundalk Marine Terminal
Boring No: INC-1501-C
CPT No:

Northing: 574233.5
Easting: 1448048.8
Elevation: 21.53

Driller: Parratt Wolff, Inc.
Method: NA
Consultant: Mira Abdelaziz (CH2M Hill, Inc.)

Total Depth: 27.0 Ft
GW Depth: 0.0 Ft
Date: 01/26/2007

Depth Ft	Recov	Sample ID	DPC	Soil Code	Soil Description	USCS	Comments	W	Gs	PL	LL	P200
18			++		refusal -no recovery							
			-		SILTY SAND (SM) -yellowish brown (10 YR 5/4), some gravel, wet, medium stiffness, silty sand.	SM						
20					SILTY SAND (SM) -red (2.5 YR 4/6), little clay, trace gravel, medium stiff to stiff, wet to moist, silty sand.	SM						
25 27.0			-		CLAYEY SILT (ML) -reddish brown (2.5 YR 4/4), some fine sand, trace gravel, wet, soft, clayey silt.	ML						

Locus

BORING LOG

Honeywell

Site: Dundalk Marine Terminal
Boring No: INC-1501-D
CPT No:

Northing: 574248.6
Easting: 1448085.7
Elevation: 21.77

Driller: Parratt Wolff, Inc.
Method: NA
Consultant: Mira Abdelaziz (CH2M Hill, Inc.)

Total Depth: 28.0 Ft
GW Depth: 0.0 Ft
Date: 01/23/2007

Depth Ft	Recov	Sample ID	Blow Count	DPC	Soil Code	Soil Description	USCS	Comments	W	Gs	PL	LL	P200
0						Asphalt, gravel subbase							
			3-20-9	-		SAND (SP) -dark yellowish brown (10 YR 4/4), medium grained, some gravel, trace silt, damp, medium density, sand	SP						
			10-7-11-14	-		SILTY SAND (SM) -dark yellowish brown (10 YR 4/4), some gravel, damp, medium dense, trace clay, silty sand	SM						
5			4-6-13-13	-									
			12-12-37-50/3	-		GRAVEL AND SAND (SW) -medium grained, dry, hard, with concrete gravel and sand very dense.	SW						
			35-25-17-20	++		SAND (SP) -bluish gray (GLEY 2 5/1), medium grained, damp, dense sand.	SP						
					GB	SILTY SAND (SM) -red (10 YR 4/6), little gravel and clay, very dense, silty sand.	SM						
10													

Locus

BORING LOG Page 2 of 3

Honeywell

Site: Dundalk Marine Terminal	Northing: 574248.6	Driller: Parratt Wolff, Inc.	Total Depth: 28.0 Ft
Boring No: INC-1501-D	Easting: 1448085.7	Method: NA	GW Depth: 0.0 Ft
CPT No:	Elevation: 21.77	Consultant: Mira Abdelaziz (CH2M Hill, Inc.)	Date: 01/23/2007

Depth Ft	Recov	Sample ID	Blow Count	DPC	Soil Code	Soil Description	USCS	Comments	W	Gs	PL	LL	P200
10			4-50/4	-	GB	SILTY SAND (SM) -red (10 YR 4/6), little gravel and clay, very dense, silty sand.	SM						
					HB	SILTY SAND (SM) -dark reddish brown (5 YR 3/2), indurated: trace gravel, very dense, silty sand.	SM	Classified as HB based on descriptions and high blow counts through intervals 12-14 and 14-16.					
			50/2	-		no recovery							
15			50/4	++	HB	SILTY SAND (SM) -dark reddish brown (5 YR 3/2), indurated, trace gravel, very dense silty sand.	SM						
			28-50/5	++		SILTY SAND (SM) -black (GLEY 2.5/1), little gravel, green particulates, damp, very dense, silty sand.	SM						
			50/4	++		SAND (SP) -red (20 YR 5/3), some clay, trace gravel, wet to moist, very dense, silty sand.	SP						
20													

Locus

BORING LOG

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Honeywell

Site: Dundalk Marine Terminal	Northing: 574248.6	Driller: Parratt Wolff, Inc.	Total Depth: 28.0 Ft
Boring No: INC-1501-D	Easting: 1448085.7	Method: NA	GW Depth: 0.0 Ft
CPT No:	Elevation: 21.77	Consultant: Mira Abdelaziz (CH2M Hill, Inc.)	Date: 01/23/2007

Depth Ft	Recov	Sample ID	Blow Count	DPC	Soil Code	Soil Description	USCS	Comments	W	Gs	PL	LL	P200
20			33-60-47-12	-		SILTY SAND (SM) -red (20 R 4/6), some clays, trace gravel, wet to moise, very dense, silty sand.	SM						
			9-9-10-16			no recovery							
25			3-4-6-7			SILTY SAND (SM) -red (20 R 4/6), some clay, trace gravel, wet to moist, loose, silty sand.	SM						
			3-4-6-9										
						SAND (SP) -black (GLEY 2.5/1), medium grained, trace silt, wet, loose, sand.	SP						
28.0													

Locus

BORING LOG Page 1 of 3

Honeywell

Site: Dundalk Marine Terminal	Northing: 574030.1	Driller: Parratt Wolff, Inc.	Total Depth: 27.0 Ft
Boring No: INC-1501-I	Easting: 1447951.8	Method: NA	GW Depth: 0.0 Ft
CPT No:	Elevation: 19.71	Consultant: Mira Abdelaziz (CH2M Hill, Inc.)	Date: 01/24/2007

Depth Ft	Recov	Sample ID	DPC	Soil Code	Soil Description	USCS	Comments	W	Gs	PL	LL	P200
0					Asphalt / gravel subbase							
			-		SILTY SAND (SM) -dark grayish brown (10 YR 4/2), some gravel and clay, moist, silty sand	SM						
5			-									
					SAND (SP) -ligh gray (10 YR 7/1), medium grained, concrete, some gravel, dry, sand	SP						
			-		SILTY SAND (SM) -dark grayish brown (10 YR 4/2), some gravel and clay, moist, silty sand.	SM						
10												

Locus

BORING LOG Page 2 of 3

Honeywell

Site: Dundalk Marine Terminal	Northing: 574030.1	Driller: Parratt Wolff, Inc.	Total Depth: 27.0 Ft
Boring No: INC-1501-I	Easting: 1447951.8	Method: NA	GW Depth: 0.0 Ft
CPT No:	Elevation: 19.71	Consultant: Mira Abdelaziz (CH2M Hill, Inc.)	Date: 01/24/2007

Depth Ft	Recov	Sample ID	DPC	Soil Code	Soil Description	USCS	Comments	W	Gs	PL	LL	P200
10			-		SILTY SAND (SM) -dark grayish brown (10 YR 4/2), some gravel and clay, moist, silty sand	SM						
					SILTY CLAY (CL) -red (10 YR 5/6), moist, cohesive, stiff, silty clay.	CL						
			-		no recovery							
15			++	HB	SILTY SAND (SM) -yellowish red (5 YR 4/6), very hard, dry, some gravel, silty sand.	SM						
				GB	SILTY SAND (SM) -black (GLEY 1 2.5/-), green particulates, moist to dry, some gravel, silty sand.	SM						
					SILTY CLAY (CL) -red (10 YR 5/6), moist, stiff, silty clay.	CL						
			++		SILTY SAND (SM) -red (10 YR 5/6), molted with yellow and white, some clay and gravel, silt pockets, wet to moist, stiff, silty clay.	SM						
20												

Locus

BORING LOG Page 3 of 3

Honeywell

Site: Dundalk Marine Terminal Boring No: INC-1501-I CPT No:	Northing: 574030.1 Easting: 1447951.8 Elevation: 19.71	Driller: Parratt Wolff, Inc. Method: NA Consultant: Mira Abdelaziz (CH2M Hill, Inc.)	Total Depth: 27.0 Ft GW Depth: 0.0 Ft Date: 01/24/2007

Depth Ft	Recov	Sample ID	DPC	Soil Code	Soil Description	USCS	Comments	W	Gs	PL	LL	P200
20			++		SILTY SAND (SM) -red (10 YR 5/6), molted with yellow and white, some clay and gravel, silt pockets, wet to moist, stiff, silty clay.	SM						
25			-		CLAYEY SILT (CL) -black (5 YR 2.5/1), trace medium to fine sand, soft, clayey silt.	ML						
27.0					SAND (SP) -black (5 YR 2.5/1), wet, loose, medium sand.	SP						

Locus

BORING LOG

Page 1 of 5

Honeywell

Site: Dundalk Marine Terminal	Northing: 573868.8	Driller: A. Chapel (Parratt Wolff, Inc.)	Total Depth: 24.0 Ft
Boring No: INC-1501-K	Easting: 1448175.1	Method: Hollow Stem Auger	GW Depth: 0.0 Ft
CPT No:	Elevation: 19.8	Consultant: J. Rogers (CH2M Hill, Inc.)	Date: 06/15/2007

Depth Ft	Recov	Sample ID	DPC	Soil Code	Soil Description	USCS	Comments	W	Gs	PL	LL	P200
0					Precut asphalt and gravel pack		Location is ~ 8' from a storm drain					
			-		GRAVELLY SAND (SW) -gray (7.5YR 5/1), brown (7.5YR 4/3), moist, (loose), coarse sand with some medium sand, fine gravel	SW						
			-		SANDY SILT (ML) -dark brown (7.5YR 3/3), brown (7.5YR 4/3), medium stiff, moist, silt, fine to medium sand with some gravel, trace organics, trace debris (brick)	ML						
5												

Locus

BORING LOG

Page 2 of 5

Site: Dundalk Marine Terminal
Boring No: INC-1501-K
CPT No:

Northing: 573868.8
Easting: 1448175.1
Elevation: 19.8

Driller: A. Chapel (Parratt Wolff, Inc.)
Method: Hollow Stem Auger
Consultant: J. Rogers (CH2M Hill, Inc.)

Total Depth: 24.0 Ft
GW Depth: 0.0 Ft
Date: 06/15/2007

Depth Ft	Recov	Sample ID	DPC	Soil Code	Soil Description	USCS	Comments	W	Gs	PL	LL	P200
5					SANDY SILT (ML) -dark brown (7.5YR 3/3), brown (7.5YR 4/3), medium stiff, moist, silt, fine to medium sand with some gravel, trace organics, trace debris (brick)	ML						
					SANDY SILT (ML) -dark brown (7.5YR 3/3), brown (7.5YR 4/3), soft, moist, silt, fine to medium sand with some gravel, trace organics, trace debris (brick), low plasticity	ML						
					SANDY SILT (ML) -dark brown (7.5YR 3/3), brown (7.5YR 4/3), medium stiff, moist, silt, fine to medium sand with some gravel, trace organics, trace debris (brick)	ML	Increased hammering at ~7.0'					
					POORLY-GRADED GRAVEL (GP) -light gray (7.5YR 7/1), damp, hard, gravel, coarse sand	GP						
		INC-1501-K-SD-[illegible]			WELL-GRADED SAND (SW) -gray (7.5YR 6/1), moist, (loose), coarse sand, medium sand, some fine gravel	SW	Appears to be old concrete mixed with asphalt black (7.5YR 2.5/1)	13				
					FAT CLAY (CH) -red (2.5YR 5/8), moist, medium stiff to soft, high plasticity	CH						
10												

BORING LOG Page 3 of 5

Honeywell

Site: Dundalk Marine Terminal
Boring No: INC-1501-K
CPT No:

Northing: 573868.8
Easting: 1448175.1
Elevation: 19.8

Driller: A. Chapel (Parratt Wolff, Inc.)
Method: Hollow Stem Auger
Consultant: J. Rogers (CH2M Hill, Inc.)

Total Depth: 24.0 Ft
GW Depth: 0.0 Ft
Date: 06/15/2007

Depth Ft	Recov	Sample ID	DPC	Soil Code	Soil Description	USCS	Comments	W	Gs	PL	LL	P200
10			--		FAT CLAY (CH) -red (2.5YR 5/8), moist, medium stiff to soft, high plasticity	CH						
		INC-1501-K-SOIL-105115	++	HB	WELL-GRADED SAND with GRAVEL (SW) -strong brown (7.5YR 5/8), damp, (dense), lightly to moderately indurated, coarse sand, fine gravel, trace yellow nodules, GB COPR present from 10.5 -10.8 feet	SW	10.5 -10.8 HB/GB mix GB very dark gray (7.5YR 3/1), fine sand, lightly indurated	13				
					No Recovery		Refusal at 11.5', very hard					
15												

Locus

BORING LOG

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Honeywell

Site: Dundalk Marine Terminal
Boring No: INC-1501-K
CPT No:

Northing: 573868.8
Easting: 1448175.1
Elevation: 19.8

Driller: A. Chapel (Parratt Wolff, Inc.)
Method: Hollow Stem Auger
Consultant: J. Rogers (CH2M Hill, Inc.)

Total Depth: 24.0 Ft
GW Depth: 0.0 Ft
Date: 06/15/2007

Depth Ft	Recov	Sample ID	DPC	Soil Code	Soil Description	USCS	Comments	W	Gs	PL	LL	P200
15	■	INC-1501-K-SOI-15016	++	HB	WELL-GRADED SAND with GRAVEL (SW) -strong brown (7.5YR 5/8), damp, (dense), lightly to moderately indurated, coarse sand, fine gravel, trace yellow nodules	SW	High intensity and downward pressure on hammer	19	2.86			
	☐				No Recovery							
	■	INC-1501-K-SOI-17018	++	GB	SILTY SAND (SM) -very dark gray (7.5YR 3/1), wet, (loose), particulate, fine sand, some yellow sand	SM		24	3.05			
	■	INC-1501-K-SOI-18019	-		FAT CLAY (CH) -red (2.5YR 5/8), reddish yellow (5YR 6/8), moist, medium stiff to soft, high plasticity	CH		18				
	■				SILTY CLAY (CL) -red (2.5YR 5/8), reddish yellow (5YR 6/8), moist, soft, medium plasticity, trace sand	CL						
20												

Locus

BORING LOG

Honeywell

Site: Dundalk Marine Terminal
Boring No: INC-1501-K
CPT No:

Northing: 573868.8
Easting: 1448175.1
Elevation: 19.8

Driller: A. Chapel (Parratt Wolff, Inc.)
Method: Hollow Stem Auger
Consultant: J. Rogers (CH2M Hill, Inc.)

Total Depth: 24.0 Ft
GW Depth: 0.0 Ft
Date: 06/15/2007

Depth Ft	Recov	Sample ID	DPC	Soil Code	Soil Description	USCS	Comments	W	Gs	PL	LL	P200
20 24.0	■		-		SILTY CLAY (CL) -red (2.5YR 5/8), reddish yellow (5YR 6/8), moist, soft, medium plasticity, trace sand	CL						

inclinometer installed at this location

Locus

BORING LOG Page 1 of 6

Honeywell

Site: Dundalk Marine Terminal	Northing: 573913.5	Driller: A. Chapel (Parratt Wolff, Inc.)	Total Depth: 22.0 Ft
Boring No: INC-1501-M	Easting: 1448225.7	Method: Hollow Stem Auger	GW Depth: 6.0 Ft
CPT No:	Elevation: 20.2	Consultant: J. Rogers (CH2M Hill, Inc.)	Date: 06/29/2007

Depth Ft	Recov	Sample ID	DPC	Soil Code	Soil Description	USCS	Comments	W	Gs	PL	LL	P200
0					Asphalt, concrete, gravel pack removed by Parratt Wolff							
	■	INC-1501-M-SOI-020030	-		SANDY SILT (ML) -dark grayish brown (10YR 4/2), gray (10YR 5/1), trace red (2.5YR 5/8), damp to moist, hard, silt, fine sand, medium sand, trace gravel, trace debris (brick)	ML	perched water was encountered at 5' bgs	11				
4												

BORING LOG
Page 2 of 6

Honeywell

Site: Dundalk Marine Terminal
Boring No: INC-1501-M
CPT No:

Northing: 573913.5
Easting: 1448225.7
Elevation: 20.2

Driller: A. Chapel (Parratt Wolff, Inc.)
Method: Hollow Stem Auger
Consultant: J. Rogers (CH2M Hill, Inc.)

Total Depth: 22.0 Ft
GW Depth: 6.0 Ft
Date: 06/29/2007

Depth Ft	Recov	Sample ID	DPC	Soil Code	Soil Description	USCS	Comments	W	Gs	PL	LL	P200
4 5			-		SANDY SILT (ML) -dark grayish brown (10YR 4/2), gray (10YR 5/1), trace red (2.5YR 5/8), damp to moist, hard, silt, fine sand, medium sand, trace gravel, trace debris (brick)	ML	perched water was encountered at 6' bgs					
			-		SANDY SILT (ML) -dark grayish brown (10YR 4/2), gray (10YR 5/1), trace red (2.5YR 5/8), wet to saturated, hard, silt, fine sand, medium sand, trace gravel, trace debris (brick)	ML						
					WELL-GRADED SAND with GRAVEL (SW) -black (10YR 2/1), light gray (10YR 7/1), damp, (very dense), coarse sand, fine gravel, coarse gravel, medium sand	SW	increased hammer intensity at 7.0', sample looks like asphalt and concrete					
8												

Locus

BORING LOG Page 3 of 6 **Honeywell**	Site: Dundalk Marine Terminal Boring No: INC-1501-M CPT No:	Northing: 573913.5 Easting: 1448225.7 Elevation: 20.2	Driller: A. Chapel (Parratt Wolff, Inc.) Method: Hollow Stem Auger Consultant: J. Rogers (CH2M Hill, Inc.)	Total Depth: 22.0 Ft GW Depth: 6.0 Ft Date: 06/29/2007

Depth Ft	Recov	Sample ID	DPC	Soil Code	Soil Description	USCS	Comments	W	Gs	PL	LL	P200
8		INC-1501-M-S09-080090			POORLY-GRADED SAND (SP) -gray (10YR 5/1), damp, (dense), medium sand, coarse sand	SP		8.5				
			-		POORLY-GRADED SAND (SP) -very pale brown (10YR 7/4), pale brown (10YR 6/3), damp, (dense), fine sand, medium sand	SP						
10		INC-1501-M-S09-100105			FAT CLAY (CH) -reddish yellow (5YR 6/6), yellowish red (5YR 5/8), damp, stiff, medium plasticity	CH		26				
			-		No Recovery		hammer intensity near maximum pressure, very slow downward movement, refusal ~12.0' bgs					
12												

Locus

BORING LOG

Page 4 of 6

Honeywell

Site: Dundalk Marine Terminal
Boring No: INC-1501-M
CPT No:

Northing: 573913.5
Easting: 1448225.7
Elevation: 20.2

Driller: A. Chapel (Parratt Wolff, Inc.)
Method: Hollow Stem Auger
Consultant: J. Rogers (CH2M Hill, Inc.)

Total Depth: 22.0 Ft
GW Depth: 6.0 Ft
Date: 06/29/2007

Depth Ft	Recov	Sample ID	DPC	Soil Code	Soil Description	USCS	Comments	W	Gs	PL	LL	P200
12			-		No Recovery		COPR in soil cuttings when auger is advanced to 14', appears to be HB					
		[illegible]		GB	SILTY SAND (SM) -very dark gray (7.5YR 3/1), black (2.5YR 2.5/1), strong brown (7.5YR 5/8), wet, (very dense), lightly indurated to particulate, fine sand, medium sand, silt, trace fine gravel, trace bright yellow nodules, mixed with strong brown (7.5YR 5/8) HB COPR	SM	hammer intensity high, weight of rig applied, could only advance approximately 1' until refusal near 15.0'	26				
15			++		No Recovery							
16												

Locus

BORING LOG

Honeywell

Site: Dundalk Marine Terminal
Boring No: INC-1501-M
CPT No:

Northing: 573913.5
Easting: 1448225.7
Elevation: 20.2

Driller: A. Chapel (Parratt Wolff, Inc.)
Method: Hollow Stem Auger
Consultant: J. Rogers (CH2M Hill, Inc.)

Total Depth: 22.0 Ft
GW Depth: 6.0 Ft
Date: 06/29/2007

Depth Ft	Recov	Sample ID	DPC	Soil Code	Soil Description	USCS	Comments	W	Gs	PL	LL	P200
16												
			**		No Recovery							
		[illegible]	+	GB	WELL-GRADED SAND with GRAVEL (SW) -very dark gray (7 5YR 3/1), trace yellowish red (5YR 5/8), trace gray (10YR 5/1), wet, (very dense), moderately indurated to particulate (some pieces of gravel strongly indurated), coarse sand, coarse gravel, medium sand, fine gravel, trace bright yellow	SW	during retrieval of sampler threads sheared off top of sampler. sampler stuck in hole, sampler retrieved by overdrilling	19				
			-		SILTY CLAY (CL) -reddish yellow (5YR 5/8), yellowish red (5YR 6/8), moist to damp, hard to medium stiff, clay, silt, trace sand, medium plasticity	CL						
20												

Locus

BORING LOG

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Honeywell

Site: Dundalk Marine Terminal
Boring No: INC-1501-M
CPT No:

Northing: 573913.5
Easting: 1448225.7
Elevation: 20.2

Driller: A. Chapel (Parratt Wolff, Inc.)
Method: Hollow Stem Auger
Consultant: J. Rogers (CH2M Hill, Inc.)

Total Depth: 22.0 Ft
GW Depth: 6.0 Ft
Date: 06/29/2007

Depth Ft	Recov	Sample ID	DPC	Soil Code	Soil Description	USCS	Comments	W	Gs	PL	LL	P200
20		[illegible]						21				
			-		SILTY CLAY (CL) -reddish yellow (5YR 5/8), yellowish red (5YR 6/8), moist to damp, hard to medium stiff, clay, silt, trace sand, medium plasticity	CL						
22.0												

Locus

BORING LOG

Page 1 of 2

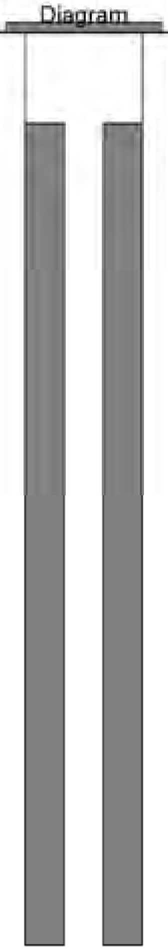
Honeywell

Site: Dundalk Marine Terminal
Boring No: TPZ-51

Northing: 574326.7
Easting: 1448068.5
Elevation: 21.514

Driller: Parratt Wolff, Inc.
Method: Hollow Stem Auger
Consultant: CH2M Hill, Inc.
Geologist: Mary Velasquez

Total Depth: 20.0 Ft
GW Depth: 14.2 Ft
Date: 02/16/2010



Depth Ft	Rec	DPC	Blow Count	USCS	Soil Code	Stratum Description	Sample Comments
0						Asphalt and road base	
		-		SC		Clayey Sand (SC) -dark brown (10 YR 3/3), dry, fine to medium sand, trace fine gravel, (dense), (fill)	
5		-					
		-					refusal at 7.5' with split spoons, augered to 9'
						Asphalt	refusal at 9' with split spoons, augered to 11', driller notes softer material
						No Recovery	
10							

Locus

BORING LOG

Page 2 of 2

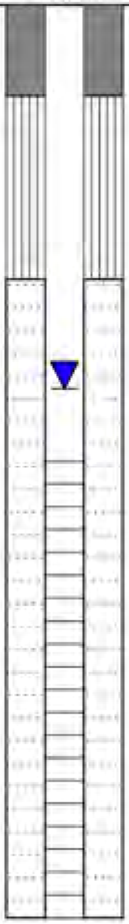
Honeywell

Site: Dundalk Marine Terminal
Boring No: TPZ-51

Northing: 574326.7
Easting: 1448068.5
Elevation: 21.514

Driller: Parratt Wolff, Inc.
Method: Hollow Stem Auger
Consultant: CH2M Hill, Inc.
Geologist: Mary Velasquez

Total Depth: 20.0 Ft
GW Depth: 14.2 Ft
Date: 02/16/2010



Depth Ft	Rec	DPC	Blow Count	USCS	Soil Code	Stratum Description	Sample Comments
10		-				No Recovery	refusal at 9' with split spoons, augered to 11', driller notes softer material
		++		SM	HB	Silty Sand (SM) -dark brown (7.5 YR 4/4), dry, (medium dense), lightly to strongly indurated, fine to medium sand, fine angular gravel	
		+		SC		Clayey Sand (SC) -dark grayish brown (2.5 Y 4/2), dry, fine to medium sand, (very dense), (fill)	
▼ 15		++		SM	HB	Silty Sand (SM) -strong brown (7.5 YR 5/6), dry, (medium dense), indurated, fine to medium sand, fine angular gravel	DPT refusal at 14' synoptic water levels collected 3-11-10
				SC		Clayey Sand (SC) -dark yellowish brown (10 YR 4/3), dry, fine to medium sand, (very dense), trace fine gravel	
				SM	HB	Silty Sand (SM) -dark yellowish brown (10 YR 6/3), dry, particulate to slightly indurated, (fill)	
		++		SM	GB	Silty Sand (SM) -black (10 YR 2/1), green nodules, fine to medium sand, lightly indurated, dry, (medium dense)	
				SM	HB	Silty Sand (SM) -dark yellowish brown (10 YR 4/3), yellow nodules, slightly indurated, dry, fine to medium sand	driller notes softer material
				SM	GB	Silty Sand (SM) -dark gray (7.5 YR 3/1), fine to medium sand, particulate, (medium dense), trace green nodules	
20.0				CL		Lean Clay (CL) -red (2.5 YR 4/6), damp, hard, medium plasticity, trace fine sand	

▼ Boring GW Depth

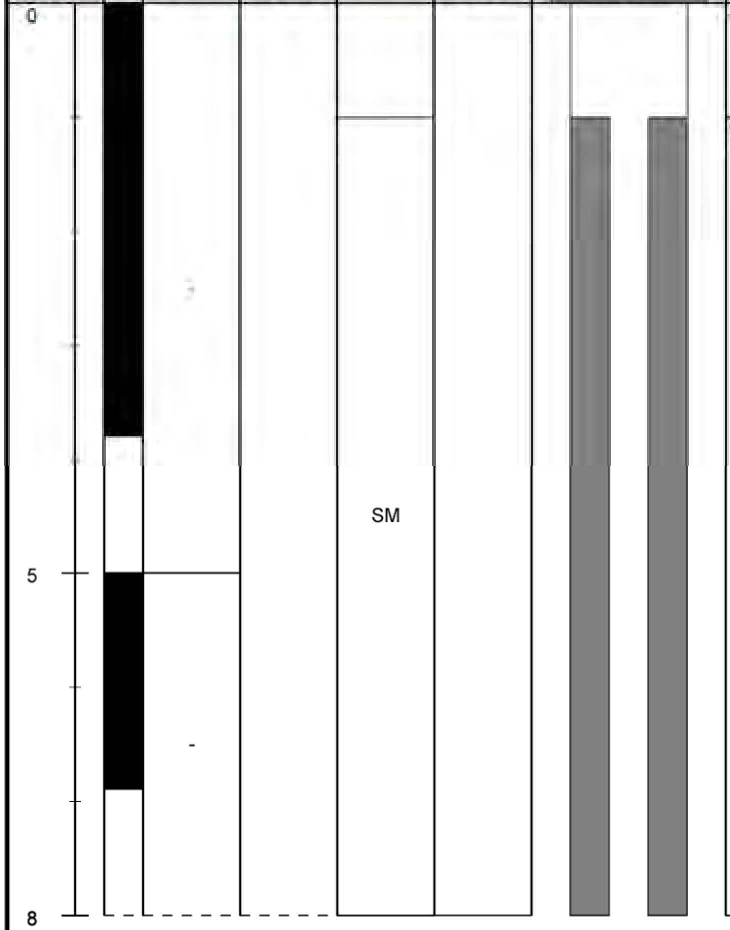
Locus

BORING LOG

Page 1 of 3

Honeywell

Site: Dundalk Marine Terminal	Northing: 574557.9	Driller: Parratt Wolff, Inc.	Total Depth: 24.0 Ft
Boring No: TPZ-52	Easting: 1448335.1	Method: Hollow Stem Auger	GW Depth: 16.36 Ft
	Elevation: 22.742	Consultant: CH2M Hill, Inc.	Date: 02/01/2010
		Geologist: Mary Velasquez	



Depth Ft	Rec	DPC	Blow Count	USCS	Soil Code	Well Construction Diagram	Stratum Description	Sample Comments
0							Asphalt and road base	
				SM			Clayey Sand (SM) -dark brown (7.5 YR 3/3), moist, subrounded to rounded, fine to coarse gravel, fine to medium sand	
5		-						
8								

BORING LOG

Page 2 of 3

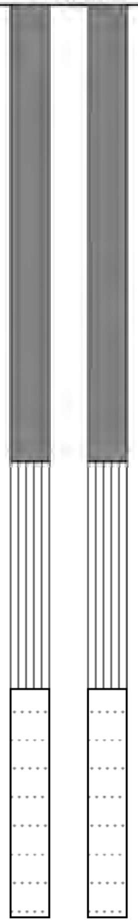
Honeywell

Site: Dundalk Marine Terminal
Boring No: TPZ-52

Northing: 574557.9
Easting: 1448335.1
Elevation: 22.742

Driller: Parratt Wolff, Inc.
Method: Hollow Stem Auger
Consultant: CH2M Hill, Inc.
Geologist: Mary Velasquez

Total Depth: 24.0 Ft
GW Depth: 16.36 Ft
Date: 02/01/2010

Depth Ft	Rec	DPC	Blow Count	USCS	Soil Code	Well Construction Diagram	Stratum Description	Sample Comments
8		–		SM			Silty Sand (SM) -black (10 YR 2/1) and very dark grayish brown (10 YR 3/2), moist, coarse sand, trace mica, trace subangular gravel	
		–						
10		++		CL			Lean Clay (CL) -yellowish red (5 YR 4/6), moist, medium to no plasticity, (very stiff)	
				SM	HB		Silty Sand (SM) -yellowish red (5 YR 5/8), fine to medium sand, moist, slightly indurated, trace light green nodules, (medium dense)	driller notes DPT refusal at 11', auger to 15.6', attemp DPT at 15.6'
15		++						driller notes difficult drilling at 15' using 15 tons down pressure, synoptic water levels collected 3-11-10
16								

Locus

BORING LOG

Page 3 of 3

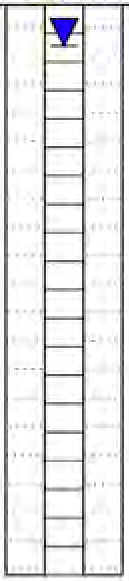
Honeywell

Site: Dundalk Marine Terminal
Boring No: TPZ-52

Northing: 574557.9
Easting: 1448335.1
Elevation: 22.742

Driller: Parratt Wolff, Inc.
Method: Hollow Stem Auger
Consultant: CH2M Hill, Inc.
Geologist: Mary Velasquez

Total Depth: 24.0 Ft
GW Depth: 16.36 Ft
Date: 02/01/2010



Depth Ft	Rec	DPC	Blow Count	USCS	Soil Code	Stratum Description	Sample Comments
16 ▼	■	++		SM	HB	Silty Sand (SM) -yellowish red (5 YR 5/8), fine to medium sand, moist, slightly indurated, trace light green nodules. (medium dense)	driller notes difficult drilling at 15' using 15 tons down pressure, synoptic water levels collected 3-11-10
	☐					No Recovery	driller notes out of HB at approximately 17.3', refusa at 17.0' with DPT, augered to 20.0', drill to 18' and DPT to 20'
	■	+		SM		Silty Sand (SM) -yellowish brown (10 YR 5/6), moist, (medium dense), trace fine subangular gravel, fine to medium sand, (fill)	
20	☐			SC		Clayey Sand (SC) -black (10 YR 2/1), moist, fine to medium sand, trace fine rounded gravel, trace shell fragments	encountered lightly indurated gray black nodule approximately 3 cm at 21.6'
	■			CL		Lean Clay (CL) -yellowish red (5 YR 5/8), moist, medium to no plasticity, very stiff	
	■			ML		Clayey Silt (ML) -dark grayish brown (2.5 Y 4/2), damp, fine sand, soft	
	■			SW		Well Graded Sand with Gravel (SW) -olive brown (2.5 Y 4/4), damp, (loose), medium to coarse sand	
24.0							

▼ Boring GW Depth

Locus

BORING LOG

Honeywell

Site: Dundalk Marine Terminal
Boring No: TPZ-53

Northing: 574491.3
Easting: 1448832.1
Elevation: 25.955

Driller: Parratt Wolff, Inc.
Method: Hollow Stem Auger
Consultant: CH2M Hill, Inc.
Geologist: Lisa Carter

Total Depth: 28.0 Ft
GW Depth: 18.08 Ft
Date: 02/04/2010 - 02/05/201

Depth Ft	Rec	DPC	Blow Count	USCS	Soil Code	Well Construction Diagram	Stratum Description	Sample Comments
0							Asphalt and road base	
		-		SC			Clayey Sand (SC) -dark brown (10 YR 3/3), moist, (dense), fine to coarse sand, little fine to coarse angular limestone gravel, very gravelly section from 2.7-3', (fill)	
5		-						
				SM			Silty Sand with Gravel (SM) -black (10 YR 2/1) -dry, (medium dense), medium to coarse sand, some fine to coarse angular gravel	
7								

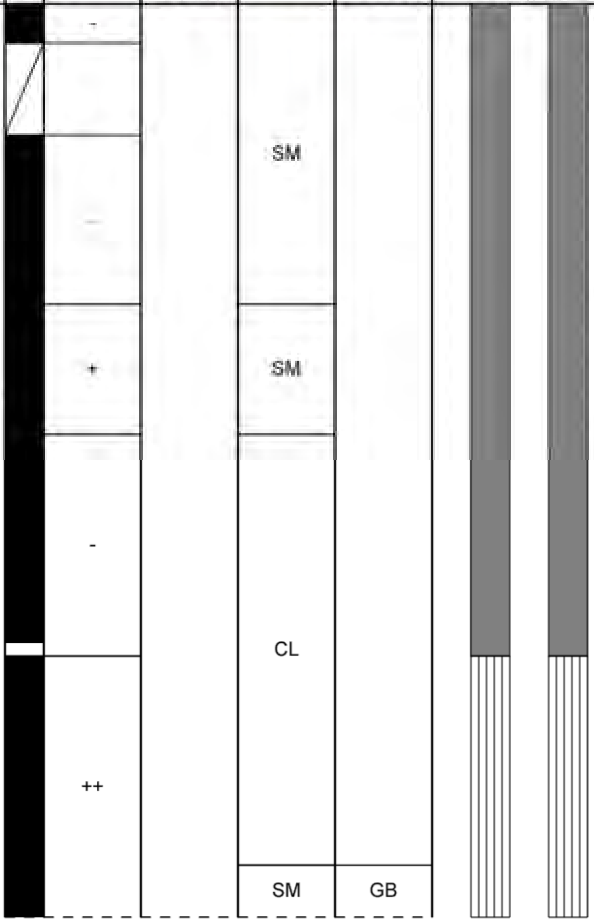
Locus

BORING LOG

Page 2 of 4

Honeywell

Site: Dundalk Marine Terminal **Boring No: TPZ-53**	**Northing: 574491.3** **Easting: 1448832.1** **Elevation: 25.955**	**Driller: Parratt Wolff, Inc.** **Method: Hollow Stem Auger** **Consultant: CH2M Hill, Inc.** **Geologist: Lisa Carter**	**Total Depth: 28.0 Ft** **GW Depth: 18.08 Ft** **Date: 02/04/2010 - 02/05/201**



Depth Ft	DPC	Blow Count	USCS	Soil Code	Stratum Description	Sample Comments
7	-		SM		Silty Sand with Gravel (SM) -black (10 YR 2/1) -dry, (medium dense), medium to coarse sand, some fine to coarse angular gravel	
						offset ~10' from original location (east) due to concrete pad encountered while drilling to 7.3', auger to 8' and collect DPT sample
	-					
	+		SM		Silty Sand (SM) -pale brown (10 YR 6/3) and dark gray (2.5 Y 4/1), slightly moist, (dense), fine to coarse angular gravel, coarse sand	
10						
	-		CL		Lean Clay (CL) -yellowish red (5 YR 5/6), mosit, medium plasticity, (stiff to very stiff), fine sand below 11.3'	
	++					
			SM	GB	Silty Sand (SM) -black (10 YR 2/1), wet, (medium dense), particulate, little green nodules, medium sand	
14						

Locus

BORING LOG

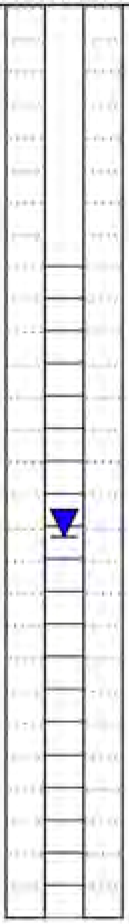
Honeywell

Site: Dundalk Marine Terminal
Boring No: TPZ-53

Northing: 574491.3
Easting: 1448832.1
Elevation: 25.955

Driller: Parratt Wolff, Inc.
Method: Hollow Stem Auger
Consultant: CH2M Hill, Inc.
Geologist: Lisa Carter

Total Depth: 28.0 Ft
GW Depth: 18.08 Ft
Date: 02/04/2010 - 02/05/201



Depth Ft	Rec	DPC	Blow Count	USCS	Soil Code	Well Construction Diagram	Stratum Description	Sample Comments
14		++		SM	GB		Silty Sand (SM) -black (10 YR 2/1), wet, (medium dense), particulate, little green nodules, medium sand	
15				SM	HB		Silty Sand (SM) -brownish yellow (10 YR 6/1), very moist, lighly indurated, (medium dense), pockets of clay	
		++		SM	GB		Silty Sand (SM) -black (10 YR 2/1), intermittant layers of concentrated green nodules at 15.6', 17.1-17.2', 20.8-20.9', thin layer of HB at 17.9-18', wet, (medium dense), particulate, medium sand	synoptic water levels collected 3-11-10
20		++						
21								

▼ Boring GW Depth

Locus

BORING LOG Page 4 of 4

Honeywell

Site: Dundalk Marine Terminal	Northing: 574491.3	Driller: Parratt Wolff, Inc.	Total Depth: 28.0 Ft
Boring No: TPZ-53	Easting: 1448832.1	Method: Hollow Stem Auger	GW Depth: 18.08 Ft
	Elevation: 25.955	Consultant: CH2M Hill, Inc.	Date: 02/04/2010 - 02/05/201
		Geologist: Lisa Carter	

Depth Ft	Rec	DPC	Blow Count	USCS	Soil Code	Well Construction Diagram	Stratum Description	Sample Comments
21		++		SM	GB		Silty Sand (SM) -black (10 YR 2/1), intermittant layers of concentrated green nodules at 15.6', 17.1-17.2', 20.8-20.9', thin layer of HB at 17.9-18', wet, (medium dense), particulate, medium sand	
		++		SP			Poorly Graded Sand (SP) -dark olive brown (2.5 Y 3/3) and olive brown, medium to coarse sand, wet, (loose)	
							Poorly Graded Sand (SP) -light olive brown (2.5 Y 5/6), wet, (loose), coarse sand, fine to coarse angular gravel	
25				SP				
		++						
28.0								

Locus

BORING LOG

Page 1 of 3

Honeywell

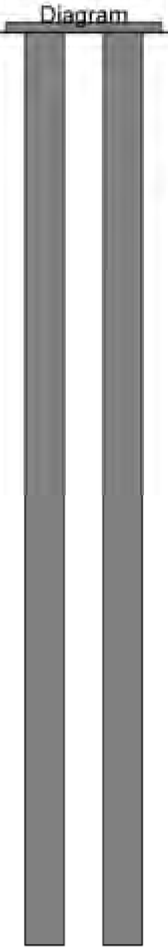
Site: Dundalk Marine Terminal
Boring No: TPZ-54

Northing: 574195.7
Easting: 1448910.9
Elevation: 24.228

Driller: Parratt Wolff, Inc.
Method: Hollow Stem Auger
Consultant: CH2M Hill, Inc.
Geologist: Mary Velasquez

Total Depth: 23.0 Ft
GW Depth: 15.97 Ft
Date: 01/20/2010

Depth Ft	Rec	DPC	Blow Count	USCS	Soil Code	Well Construction Diagram	Stratum Description	Sample Comments
0							Asphalt, road base (gravel fill)	
				SC			Clayey Sand with Gravel (SC) -olive brown (2.5 Y 4/4) and dark olive brown (2.5 Y 4/3), moist, medium sand, cinders and asphalt present at 3.7'	
5		-						
8								



Locus

BORING LOG

Page 2 of 3

Honeywell

Site: Dundalk Marine Terminal

Boring No: TPZ-54

Northing: 574195.7

Easting: 1448910.9

Elevation: 24.228

Driller: Parratt Wolff, Inc.

Method: Hollow Stem Auger

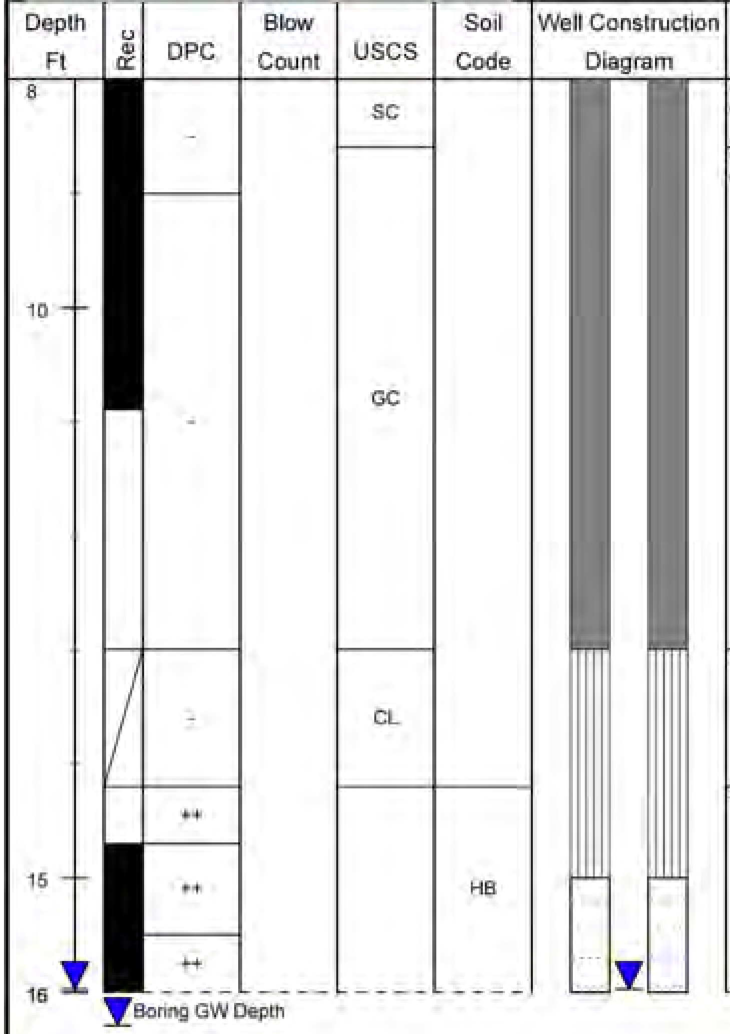
Consultant: CH2M Hill, Inc.

Geologist: Mary Velasquez

Total Depth: 23.0 Ft

GW Depth: 15.97 Ft

Date: 01/20/2010



Stratum Description	Sample Comments
Clayey Sand with Gravel (SC) -olive brown (2.5 Y 4/4) and dark olive brown (2.5 Y 4/3), moist, medium sand, cinders and asphalt present at 3.7'	
Clayey Gravel with Sand (SC) -dark olive brown (2.5 Y 4/3), sand/clay/silt mixture, well graded angular gravel (2cm and 3-5cm gravel)	driller notes DPT refusal at 8.6'
Lean Clay (CL)-yellowish red (5 YR 5/6), slightly moist, medium to no plasticity, trace angular gravel (1-2cm)	
Silty Sand (SM) -dark yellowish brown (10 YR 4/6), bright yellow nodules; dry, lightly indurated, (very dense)	driller notes DPT refusal at 14.7' synoptic water levels collected 3-11-10

Locus

BORING LOG

Page 3 of 3

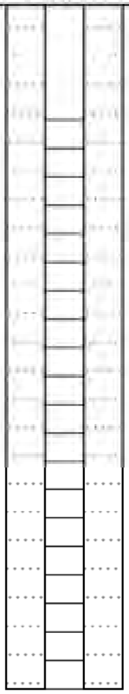
Honeywell

Site: Dundalk Marine Terminal
Boring No: TPZ-54

Northing: 574195.7
Easting: 1448910.9
Elevation: 24.228

Driller: Parratt Wolff, Inc.
Method: Hollow Stem Auger
Consultant: CH2M Hill, Inc.
Geologist: Mary Velasquez

Total Depth: 23.0 Ft
GW Depth: 15.97 Ft
Date: 01/20/2010

Depth Ft	Rec	DPC	Blow Count	USCS	Soil Code	Well Construction Diagram	Stratum Description	Sample Comments
16		++			HB		Silty Sand (SM) -dark yellowish brown (10 YR 4/6), bright yellow nodules, dry, lightly indurated, (very dense)	driller notes DPT refusal at 16.5'
20		++ ++		SM	GB		Silty Sand (SM) -gray black/greenish black (GLEY 1 2.5/1) very moist, fine sand, bright yellow nodules, particulate (medium dense)	attempted sample at 19.5' to 21' but hit DPT refusal at 20.5'
23.0				CL			Lean Clay (CL) -yellowish red (5 YR 5/6), moist, medium to low plasticity, trace very fine angular gravel (1-2cm)	

Locus

BORING LOG

Page 1 of 2

Honeywell

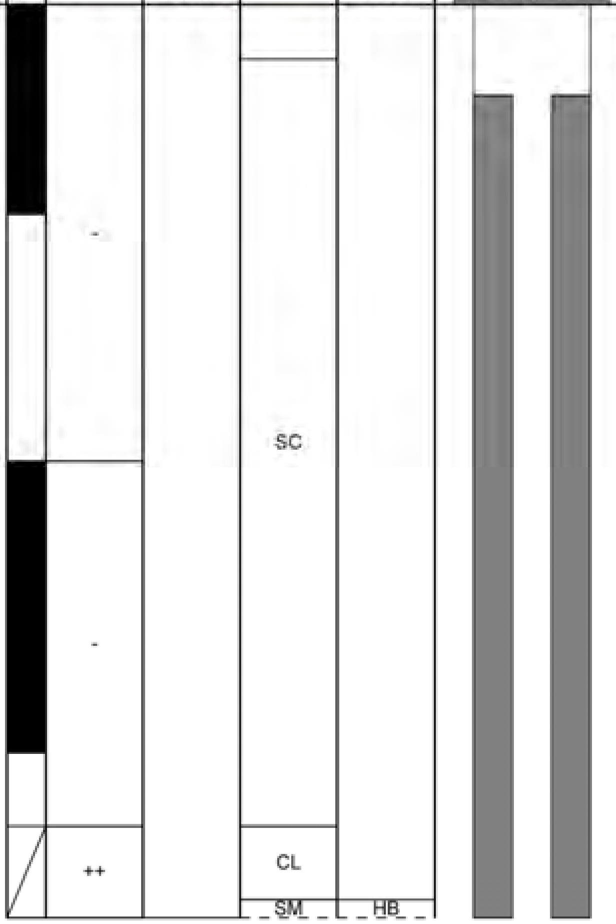
Site: Dundalk Marine Terminal
Boring No: TPZ-55

Northing: 573990.9
Easting: 1448462.8
Elevation: 21.434

Driller: Parratt Wolff, Inc.
Method: Hollow Stem Auger
Consultant: CH2M Hill, Inc.
Geologist: Lisa Carter

Total Depth: 19.5 Ft
GW Depth: 10.86 Ft
Date: 01/19/2010

Depth Ft	Rec	DPC	Blow Count	USCS	Soil Code	Well Construction Diagram	Stratum Description	Sample Comments
0							Asphalt, road base (gravel fill)	
		-		SC			Clayey Sand with Gravel (SC) -brown (10 YR 4/3), moist, (very stiff), fine to coarse gravel fragments, slag fill 7.5-8.0'	
5		-						driller notes material becomes dense
		++		CL			Lean Clay (CL) -yellowish red (5 YR 5/6), mottled with yellow (10 YR 7/8), dry, (very stiff), medium plasticity	
10				SM	HB		Silty Sand (SM) -dark yellowish brown (10 YR 4/6), dry, (very dense), lightly indurated, 14-15' traces of bright yellow nodules	



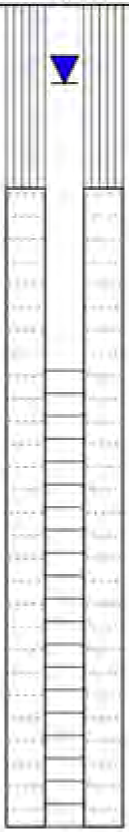
Locus

BORING LOG

Page 2 of 2

Honeywell

Site: Dundalk Marine Terminal **Boring No: TPZ-55**	**Northing: 573990.9** **Easting: 1448462.8** **Elevation: 21.434**	**Driller: Parratt Wolff, Inc.** **Method: Hollow Stem Auger** **Consultant: CH2M Hill, Inc.** **Geologist: Lisa Carter**	**Total Depth: 19.5 Ft** **GW Depth: 10.86 Ft** **Date: 01/19/2010**



Depth Ft	Rec	DPC	Blow Count	USCS	Soil Code	Stratum Description	Sample Comments
10				SM	HB	Silty Sand (SM) -dark yellowish brown (10 YR 4/6), dry, (very dense), lightly indurated, 14-15' traces of bright yellow nodules	driller notes DPT refusal at 10'
▼							synoptic water levels collected 3-11-10
		++					attempted sample at 14' but hit DPT refusal at 15'
15		++					
		++		SM	GB	Silty Sand (SM) -very dark gray (GLEY 1 3/1), moist, moderately particulate to indurated, some bright yellow nodules, hard brown fragments	water observed above clay layer
				CL		Lean Clay (CL) -yellowish red (5 YR 5/6), moist, medium plasticity, (stiff), trace fine sand	
19.5							

▼ Boring GW Depth

Locus

BORING LOG

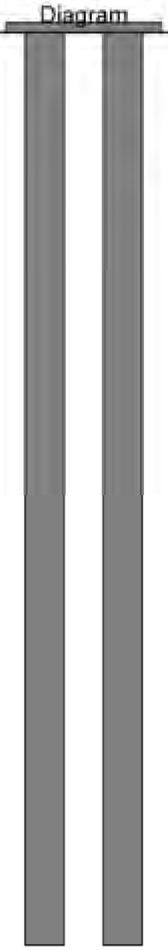
Page 1 of 4

Site: Dundalk Marine Terminal
Boring No: TPZ-57

Northing: 574235.4
Easting: 1448334.6
Elevation: 23.136

Driller: Parratt Wolff, Inc.
Method: Hollow Stem Auger
Consultant: CH2M Hill, Inc.
Geologist: Mary Velasquez

Total Depth: 22.0 Ft
GW Depth: 14.91 Ft
Date: 02/03/2010

Depth Ft	Rec	DPC	Blow Count	USCS	Soil Code	Well Construction Diagram	Stratum Description	Sample Comments
0							Asphalt and road base	
		-		SC			Clayey Sand (SC) -dark brown (10 YR 3/3), sand/clay mixture, fine to medium sand, damp, trace medium round gravel. (dense), (fill)	
								geotextile fabric liner encountered
5								
		-					No Recovery	refusal at 6' with DPT, advanced to 8.0'; geotextile liner encountered
7								

BORING LOG

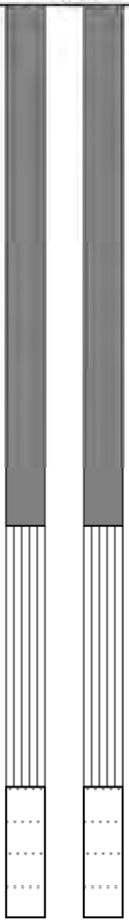
Honeywell

Site: Dundalk Marine Terminal
Boring No: TPZ-57

Northing: 574235.4
Easting: 1448334.6
Elevation: 23.136

Driller: Parratt Wolff, Inc.
Method: Hollow Stem Auger
Consultant: CH2M Hill, Inc.
Geologist: Mary Velasquez

Total Depth: 22.0 Ft
GW Depth: 14.91 Ft
Date: 02/03/2010

Depth Ft	Rec	DPC	Blow Count	USCS	Soil Code	Well Construction Diagram	Stratum Description	Sample Comments
7		–					No Recovery	refusal at 6' with DPT, advanced to 8.0'; geotextile liner encountered
		–					Asphalt	
				CL			Lean Clay (CL) -yellowish red (5 YR 5/6), medium to low plasticity, dry, (very stiff)	driller notes soft material
10		++ ++		SM	HB		Silty Sand (SM) -dark yellowish brown (10 YR 4/6), bright yellow nodules, dry, indurated, (medium dense), fine to medium sand	
14								refusal at 13' with DPT, advanced to 15.0', synoptic water levels collected 3-11-10

Locus

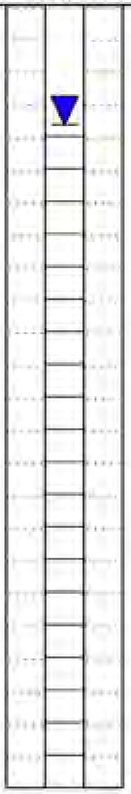
BORING LOG

Site: Dundalk Marine Terminal
Boring No: TPZ-57

Northing: 574235.4
Easting: 1448334.6
Elevation: 23.136

Driller: Parratt Wolff, Inc.
Method: Hollow Stem Auger
Consultant: CH2M Hill, Inc.
Geologist: Mary Velasquez

Total Depth: 22.0 Ft
GW Depth: 14.91 Ft
Date: 02/03/2010



Depth Ft	Rec	DPC	Blow Count	USCS	Soil Code	Well Construction Diagram	Stratum Description	Sample Comments
14 15				SM	HB		Silty Sand (SM) -dark yellowish brown (10 YR 4/6), bright yellow nodules, dry, indurated, (medium dense), fine to medium sand	refusal at 13' with DPT, advanced to 15.0', synoptic water levels collected 3-11-10
		++		SM	HB		Silty Sand (SM) -yellowish brown (5 YR 5/8), bright yellow nodules, dry, moderately indurated, fine to medium sand, (medium dense)	HB and GB alternate at 3-6" intervals
				SM	HB/GB		Silty Sand (SM) -black (10 YR 2/1), light green and yellow nodules, dry to damp, particulate, (loose), fine to medium sand	
		++		SM	GB		Silty Sand (SM) -black (10 YR 2/1), light green nodules, damp, particulate, (loose), fine to medium sand	DPT refusal at 18.5'
20		-		CL			Lean Clay (CL) -yellowish red (5 YR 5/6), medium to low plasticity, hard, dry	
21				SM			Silty Sand (SM) -black (10 YR 2/1), slightly moist, (dense), fine to medium sand, little angular fine gravel	

▼ Boring GW Depth

BORING LOG

Page 4 of 4

Honeywell

Site: Dundalk Marine Terminal
Boring No: TPZ-57

Northing: 574235.4
Easting: 1448334.6
Elevation: 23.136

Driller: Parratt Wolff, Inc.
Method: Hollow Stem Auger
Consultant: CH2M Hill, Inc.
Geologist: Mary Velasquez

Total Depth: 22.0 Ft
GW Depth: 14.91 Ft
Date: 02/03/2010

Depth Ft	Rec	DPC	Blow Count	USCS	Soil Code	Well Construction Diagram	Stratum Description	Sample Comments
21	█	-		SM			Silty Sand (SM) -black (10 YR 2/1), slightly moist, (dense), fine to medium sand, little angular fine gravel	
22.0	█			ML			Clayey Silt (ML) -dark gray (2.5 Y 4/2), (stiff), some angular fine gravel, damp, trace fine sand	

Locus

BORING LOG Page 1 of 1

CH2MHILL

Site: Dundalk Marine Terminal
Boring No: TPZ-64

Northing: 574028.744
Easting: 1448100.31
Elevation: 18.68

Driller: Parratt Wolff, Inc.
Method: Direct Push
Consultant: CH2M Hill
Geologist: J. Myers

Total Depth: 8.0 Ft
Start Date: 07/13/2011

Depth Ft	Rec	DPC	PID	USCS	Soil Code	Stratum Description
0	■	-	0			Asphalt and road base (sand and gravel).
	■			SC		CLAYEY SAND with GRAVEL (SC), very dark grayish brown (10YR 3/2), moist, with coarse gravel, (very dense).
5		-	0	SC		CLAYEY SAND with GRAVEL (SC), very dark grayish brown (10YR 3/2), wet, with coarse gravel, (very dense).
				SC		CLAYEY SAND with GRAVEL (SC), very dark grayish brown (10YR 3/2), moist, with coarse gravel, (very dense).
						Asphalt.
8.0						

BORING LOG	Page 1 of 2	Site: Dundalk Marine Terminal Boring No: TPZ-67
CH2MHILL		

Northing: 573889.398 Easting: 1447945.441 Elevation: 12	Driller: Parratt Wolff, Inc. Method: Direct Push Consultant: CH2M Hill Geologist: J. Myers	Total Depth: 12.0 Ft Start Date: 07/14/2011

Depth Ft	Rec	DPC	PID	USCS	Soil Code	Stratum Description
0		-	0			Asphalt and road base.
				SC		CLAYEY SAND with GRAVEL (SC), brown (10YR 4/3), moist, with fine to medium sand and some gravel, (dense), fill.
		-	0	CL		CLAY (CL), reddish brown (2.5YR), moist, (stiff), medium plasticity.
5		+	0	SM	HB	SILTY SAND (SM), yellowish red (5YR 4/4), dry, friable, nonplastic.
				CL		CLAY (CL), reddish brown (2.5YR), moist, (stiff), medium plasticity.
		-	0			
		-	0			
				GW-SM		WELL GRADED GRAVEL with SAND and SILT (GW-SM), dark yellowish brown (10YR 3/4), wet, angular granitic gravel, (medium dense).
		+	0			
						Silt grout, gray, wet.
				GW-SM		WELL GRADED GRAVEL with SAND and SILT (GW-SM), dark yellowish brown (10YR 3/4), wet, with angular granitic gravel, (medium dense).
10						

BORING LOG

CH2MHILL

Site: Dundalk Marine Terminal
Boring No: TPZ-67

Northing: 573889.398
Easting: 1447945.441
Elevation: 12

Driller: Parratt Wolff, Inc.
Method: Direct Push
Consultant: CH2M Hill
Geologist: J. Myers

Total Depth: 12.0 Ft
Start Date: 07/14/2011

Depth Ft	Rec	DPC	PID	USCS	Soil Code	Stratum Description
10		+	0	GW-SM		WELL GRADED GRAVEL with SAND and SILT (GW-SM), dark yellowish brown (10YR 3/4), wet, with angular granitic gravel, (medium dense).
12.0		++	0	SW	GB	WELL GRADED SAND (SW), dark yellowish brown (10YR 3/4), wet, fine to coarse sand with little fine gravel, (very dense).

Appendix B

Soil Boring Logs for Wells To Be Retained

ch2m

PROJECT NUMBER:

BORING NUMBER: BRP-1

Sheet: 1

SOIL BORING LOG

PROJECT: DUNDALK MARINE TERMINAL **LOCATION:** SEE PLAN

ELEVATION: ~ +14 **DRILLING CONTRACTOR:** ADT

DRILLING METHOD AND EQUIPMENT: FRASTE MULTIDRILL XL MAX 170

WATER LEVELS: **START:** **FINISH:** **LOGGER:** L. LINCOLN

DEPTH BELOW (ft)	SAMPLE			STANDARD PENETRATION TEST RESULTS	SOIL DESCRIPTION	COMMENTS
	NUMBER	TYPE	RECOVERY (ft)	6" - 6" - 6" (N)	SOIL NAME, USCS GROUP SYMBOL, COLOR, MOISTURE CONTENT, RELATIVE DENSITY OR CONSISTENCY, SOIL STRUCTURE, MINERALOGY	DEPTH OF CASING, DRILLING RATE, DRILLING FLUID LOSS, TESTS AND INTRUMENTATION
0					0-0.4 ASPHALT 0.4-1.5 GRY, BLK SILTY F-C SAND, SM GVL (FILL)	NO RXN
1						
	S-1	3" SONIC CORE	3'	N/A	1.5-2.0 GRY C-M SAND, SM GVL (ROAD BASE AGGREGATE)	NO RXN
2					2.0-2.3 GRY-GREEN C-F SAND, SM GVL (ROAD BASE) 2.3-3.0 RED BRN, BRN SILTY F-C SAND, SM GVL (FILL)	↓
3					3-4.3 SOFT RED CLAY, TR GVL	NO RXN
4						
	S-2		3'	N/A	4.3-6.0 BRN, RED BRN C-F SAND, SM SILT, YELLOW FLAKES/PARTICLES, TR. GVL (COPR)	DPC+
5						
6						

ch2m

PROJECT NUMBER: **BORING NUMBER:** BRP-1
Sheet: 2

SOIL BORING LOG

PROJECT: DUNDALK MARINE TERMINAL **LOCATION:** SEE PLAN
ELEVATION: ~ +14 **DRILLING CONTRACTOR:** ADT
DRILLING METHOD AND EQUIPMENT: FRASTE MULTIDRILL XL MAX 170
WATER LEVELS: **START:** 1450 **FINISH:** **LOGGER:** L. LINCOLN

DEPTH BELOW (ft)	SAMPLE NUMBER	SAMPLE TYPE	SAMPLE RECOVERY (ft)	STANDARD PENETRATION TEST RESULTS 6" - 6" - 6" (N)	SOIL DESCRIPTION SOIL NAME, USCS GROUP SYMBOL, COLOR, MOISTURE CONTENT, RELATIVE DENSITY OR CONSISTENCY, SOIL STRUCTURE, MINERALOGY	COMMENTS DEPTH OF CASING, DRILLING RATE, DRILLING FLUID LOSS, TESTS AND INTRUMENTATION
6					6-7.3 RED CLAY, SM DK GRY F-M SAND, TR GVL (WET)	DPC+
7	S-3	SONIC CORE	3'	N/A	7.3-9.0 RED-BRN, DK GRY, BRN SILTY F-C SAND, SM GVL, MOD LITHIFIED	DPC+
8						
9	SS-4	2" O.D. S.S.	12"	6	9-9.6 DK GRY SILTY F-M SAND, WET	DPC+
				7	9.6-10 RED-BRN, BRN CLAYEY F-M SAND, TR. GVL	DPC+
10	SS-5			19	10-11 DK BRN MOD-HIGHLY LITHIFIED SILTY F-M SAND, SM GVL (NON-COPR FILL)	NO DPC RXN
				11		
11						EOB @ 11.0'

Mueser Rutledge Consulting Engineers
14 Penn Plaza - 225 West 34th Street
New York, NY 10122
T: 917 339-9300 F: 917 339-9400
www.mrce.com

BORING NO. BRP-1
SHEET 3 **OF** 5
FILE NO. 10587
SURFACE ELEV. ~ +14
DATUM

PROJECT DUNDALK MARINE TERMINAL
LOCATION BALTIMORE, MARYLAND
BORING LOCATION SEE PLAN

TEST/INSPECTION EQUIPMENT
REFERENCE CODES/STANDARDS

BORING EQUIPMENT AND METHODS OF STABILIZING BOREHOLE

TYPE OF BORING RIG
TRUCK
SKID ✓
BARGE
OTHER

TYPE OF FEED DURING CORING
MECHANICAL
HYDRAULIC
OTHER

CASING USED ☐ YES ☑ NO
DIA., IN. DEPTH, FT. FROM TO
DIA., IN. DEPTH, FT. FROM TO
DIA., IN. DEPTH, FT. FROM TO

TYPE AND SIZE OF:
D-SAMPLER 2" O.D. SPLIT SPOON
U-SAMPLER
S-SAMPLER
CORE BARREL 3" SONIC
CORE BIT
DRILL RODS

DRILLING MUD USED ☐ YES ☑ NO
DIAMETER OF ROTARY BIT, IN.
TYPE OF DRILLING MUD

AUGER USED ☐ YES ☑ NO
TYPE AND DIAMETER, IN.

CASING HAMMER, LBS. AVERAGE FALL, IN.
SAMPLER HAMMER, LBS. 140 AVERAGE FALL, IN. 30
TYPE OF HAMMER

WATER LEVEL OBSERVATIONS IN BOREHOLE

DATE	TIME	DEPTH OF HOLE	DEPTH OF CASING	DEPTH TO WATER	CONDITIONS OF OBSERVATION

PIEZOMETER INSTALLED ☑ YES ☐ NO **SKETCH SHOWN ON** P. 4

STANDPIPE: TYPE 2 ID, IN. LENGTH, FT. TOP ELEV.
INTAKE ELEMENT: TYPE OD, IN. LENGTH, FT. TIP ELEV.
FILTER MATERIAL OD, IN. LENGTH, FT. BOT. ELEV.

PAY QUANTITIES
3.5" DIA. DRY SAMPLE BORING LIN. FT.
3.5" DIA. U-SAMPLE BORING LIN. FT.
CORE DRILLING IN ROCK LIN. FT.
NO. OF 3" SHELBY TUBE SAMPLES
NO. OF 3" UNDISTURBED SAMPLES
OTHER:

BORING CONTRACTOR AQUIFER DRILLING AND TESTING
DRILLER TONY PALOMEQUE **HELPERS**
REMARKS
RESIDENT ENGINEER LYSANDRA LINCOLN **DATE** 11/9/15

BORING NO. BRP-1

ch2m:

PROJECT NUMBER:

BORING NUMBER: BRP-2
Sheet: 1

SOIL BORING LOG

PROJECT: Honeywell DMT SSZ

LOCATION:

DRILLING CONTRACTOR: Aquifer Drilling and Testing, Inc.

ELEVATION:

DRILLING METHOD AND EQUIPMENT: Sonic Samp Drill mar 170'; SPT sampling

START: 12/7/15 14:20

FINISH: 12/7/15 15:45

LOGGER: K. Chaturvedula

WATER LEVELS:

DEPTH BELOW (ft)	SAMPLE			STANDARD PENETRATION TEST RESULTS	SOIL DESCRIPTION	COMMENTS
	NUMBER	TYPE	RECOVERY (ft)	6" - 6" - 6" (N)	SOIL NAME, USCS GROUP SYMBOL, COLOR, MOISTURE CONTENT, RELATIVE DENSITY OR CONSISTENCY, SOIL STRUCTURE, MINERALOGY	DEPTH OF CASING, DRILLING RATE, DRILLING FLUID LOSS, TESTS AND INTRUMENTATION
0	S-1	SONIC MACRO CORE	48"	-	3" Asphalt 0.25-1.0' - Poorly graded GRAVEL with sand (GP), gray-brown (7.5YR 5/2), dry mixed with crushed Asphalt	Advanced the 3" ID Sonic Macro core from 0'-10' bgs DPC –
1					1.0' - Poorly graded Sand with gravel Red-Brown (7.5YR 4/4), dry, medium to coarse grained sand,	(SP), DPC –
2						
3					3.0' - woven geotextile Silty SAND with gravel (SM), Brown-Red gray (7.5YR 4/2), moist, fine to medium grained sand	DPC –
4		SONIC MACRO CORE	36"	/	4.0' - same as above, wet	DPC –
5					5.0' - Polyethylene liner 5.0' - same as above, moist	DPC –
6						

ch2m

PROJECT NUMBER:

BORING NUMBER: BRP-2

Sheet: 2

SOIL BORING LOG

PROJECT:
LOCATION:
ELEVATION:
DRILLING CONTRACTOR:
DRILLING METHOD AND EQUIPMENT:
WATER LEVELS:
START:
FINISH:
LOGGER:

DEPTH BELOW (ft)	SAMPLE			STANDARD PENETRATION TEST RESULTS	SOIL DESCRIPTION	COMMENTS
	NUMBER	TYPE	RECOVERY (ft)	6" - 6" - 6" (N)	SOIL NAME, USCS GROUP SYMBOL, COLOR, MOISTURE CONTENT, RELATIVE DENSITY OR CONSISTENCY, SOIL STRUCTURE, MINERALOGY	DEPTH OF CASING, DRILLING RATE, DRILLING FLUID LOSS, TESTS AND INTRUMENTATION
6	S-2	SONIC MACRO CORE	-	–	6.8'- Piece of crushed asphalt	DPC-
7	S-3	SONIC MACRO CORE			7.0'- same as above, higher fines content, wet	DPC-
8			36"		8.0'-8.5'- Poorly graded sand with silt and gravel (SP-SM), Red-Brown (7.5YR 4/4), moist, medium to coarse graind sand. 8.5'- Crushed concrete	DPC- DPC -
9				–		
10	SS-4	SS	24"	8 7	10.0'- Poorly graded sand with gravel (SP), gray (7.5YR 5/1), wet, coarse grained sand	10.0'- 6" OD outer casing installed to a depth of 10.0' bgs. 10.0'- switched to SS sampling; 140-lb hammer; 30-in. drop; 3" dia. sampler.
11				13 10	11.0'- Lean CLAY (CL), tan (7.5YR 7/1), dry, Low plasticity, very stiff	DPC-
12						

ch2m.

PROJECT NUMBER: BORING NUMBER: BRP-2
Sheet: 3

SOIL BORING LOG

PROJECT:
LOCATION:
ELEVATION:
DRILLING CONTRACTOR:
DRILLING METHOD AND EQUIPMENT:
WATER LEVELS:
START:
FINISH:
LOGGER:

DEPTH BELOW (ft)	SAMPLE			STANDARD PENETRATION TEST RESULTS	SOIL DESCRIPTION	COMMENTS
	NUMBER	TYPE	RECOVERY (ft)	6" - 6" - 6" (N)	SOIL NAME, USCS GROUP SYMBOL, COLOR, MOISTURE CONTENT, RELATIVE DENSITY OR CONSISTENCY, SOIL STRUCTURE, MINERALOGY	DEPTH OF CASING, DRILLING RATE, DRILLING FLUID LOSS, TESTS AND INTRUMENTATION
12	SS-5	SS	13"	6 98 50/1"	12.0'-12.5'- Fat CLAY (CH), Red (10Y 4/4), wet, highly plastic, very stiff. 12.5'- silty SAND (SM), Red-Brown (7.5YR 4/4). moist, fine to medium grained sand. particulate (HB COPR)	12.0'-groundwater encountered during drilling DPC +
13	S-6	SONIC MACRO CORE	23"	-	Same as above, bright green Particles, slightly indurated.	DPC +
14						
15	SS-7	SS	20"	8 25 19 14	Same as above	DPC +
16						
17	SS-8	SS	12"	10 16	Same as above, wet 17.7'- same as above, greenish brown (7.5YR 4/3), trace gravel	DPC + DPC +
18						

ch2m

PROJECT NUMBER:

BORING NUMBER: BRP-2

Sheet: 4

SOIL BORING LOG

PROJECT:

LOCATION:

ELEVATION:

DRILLING CONTRACTOR:

DRILLING METHOD AND EQUIPMENT:

WATER LEVELS:

START:

FINISH:

LOGGER:

DEPTH BELOW (ft)	SAMPLE			STANDARD PENETRATION TEST RESULTS	SOIL DESCRIPTION	COMMENTS
	NUMBER	TYPE	RECOVERY (ft)	6" - 6" - 6" (N)	SOIL NAME, USCS GROUP SYMBOL, COLOR, MOISTURE CONTENT, RELATIVE DENSITY OR CONSISTENCY, SOIL STRUCTURE, MINERALOGY	DEPTH OF CASING, DRILLING RATE, DRILLING FLUID LOSS, TESTS AND INTRUMENTATION
18	SS-9	SS	6"	5	18.0' - Fat CLAY (CH), Red (10YR 4/4), wet, very stiff, highly plastic	DPC- 18.0' - 6" OD outer casing installed to 18.0' bgs
					Bottom of boring @ 18.5' bgs	
19						

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BORING NO. BRP-2
SHEET 5 OF 6
FILE NO. 10587
SURFACE ELEV.
DATUM

PROJECT DUNDALK MARINE TERMINAL
LOCATION BALTIMORE, MARYLAND
BORING LOCATION

TEST/INSPECTION EQUIPMENT Sonic Samp Drill Maxi 170'; SPT Sampling.
REFERENCE CODES/STANDARDS

BORING EQUIPMENT AND METHODS OF STABILIZING BOREHOLE

TYPE OF BORING RIG
TRUCK
SKID
BARGE
OTHER Track

TYPE OF FEED DURING CORING
MECHANICAL
HYDRAULIC
OTHER

CASING USED ☑ YES ☐ NO
DIA., IN. 6" DEPTH, FT. FROM 0 TO 18'
DIA., IN. DEPTH, FT. FROM TO
DIA., IN. DEPTH, FT. FROM TO

TYPE AND SIZE OF:
D-SAMPLER
U-SAMPLER
S-SAMPLER SS Sampling - 3" dia sampler
CORE BARREL
CORE BIT
DRILL RODS
Sonic Macro Core - 3" ID

DRILLING MUD USED ☐ YES ☑ NO
DIAMETER OF ROTARY BIT, IN.
TYPE OF DRILLING MUD

AUGER USED ☐ YES ☑ NO
TYPE AND DIAMETER, IN.

CASING HAMMER, LBS. AVERAGE FALL, IN.
SAMPLER HAMMER, LBS. 140 AVERAGE FALL, IN. 30
TYPE OF HAMMER Automatic

WATER LEVEL OBSERVATIONS IN BOREHOLE

DATE	TIME	DEPTH OF HOLE	DEPTH OF CASING	DEPTH TO WATER	CONDITIONS OF OBSERVATION
12/7/15	15:15	14.0'	10.0'	12.0'	During drilling

PIEZOMETER INSTALLED ☑ YES ☐ NO SKETCH SHOWN ON Well Installation log

STANDPIPE: TYPE PVC ID, IN. 2" LENGTH, FT. 18' TOP ELEV.
INTAKE ELEMENT: TYPE OD, IN. LENGTH, FT. TIP ELEV.
FILTER: MATERIAL OD, IN. LENGTH, FT. BOT. ELEV.

PAY QUANTITIES
3.5" DIA. DRY SAMPLE BORING LIN. FT.
3.5" DIA. U-SAMPLE BORING LIN. FT.
CORE DRILLING IN ROCK LIN. FT.
NO. OF 3" SHELBY TUBE SAMPLES
NO. OF 3" UNDISTURBED SAMPLES
OTHER:

BORING CONTRACTOR Aquifer Drilling and testing, Inc.
DRILLER Brian Karshick HELPERS Chris Phelen
REMARKS Standpipe piezometer installed
RESIDENT ENGINEER K-Chaturvedula DATE 12/7/15

BORING NO. BRP-2

ch2m

PROJECT NUMBER: 10587 **BORING NUMBER:** BRP-6
Sheet: 1/6

SOIL BORING LOG

PROJECT: Dundalk Marine Terminal **LOCATION:** Baltimore, Maryland
ELEVATION: ~+20 **DRILLING CONTRACTOR:** ADT
DRILLING METHOD AND EQUIPMENT: Sonic Samp Drill Max 170; SPT Sampling
WATER LEVELS: **START:** 08:45 **FINISH:** **LOGGER:** Mark Chaney

DEPTH BELOW (ft)	SAMPLE			STANDARD PENETRATION TEST RESULTS	SOIL DESCRIPTION	COMMENTS
	NUMBER	TYPE	RECOVERY (ft)	6" - 6" - 6" (N)	SOIL NAME, USCS GROUP SYMBOL, COLOR, MOISTURE CONTENT, RELATIVE DENSITY OR CONSISTENCY, SOIL STRUCTURE, MINERALOGY	DEPTH OF CASING, DRILLING RATE, DRILLING FLUID LOSS, TESTS AND INTRUMENTATION
0	S1	3" Sonic	3'	NA	Roadbase / Asphalt Brown to black	DPC - none
1						
2						
3					3.0-4.0 Dry red brown f-C silty sand, trace gravel (SM)	geomembrane @ 3.0 DPC - none
4	S-2	3" Sonic	3'	NA	4.0-5.5 Damp red brown f-m silty sand, trace gravel, trace clay (SM)	DPC -
5						
					5.5-6.0 Dry red brown with white and green particles f-m silty sand, trace gravel (SM)	geomembrane @ 5.5' DPC -
6						

PROJECT NUMBER: 10587 **BORING NUMBER:** BRP-6
Sheet: 2/6

SOIL BORING LOG

PROJECT: Dundalk Marine Terminal **LOCATION:** Baltimore, Maryland
ELEVATION: ~ +20 **DRILLING CONTRACTOR:** ADT
DRILLING METHOD AND EQUIPMENT: Fraste MultiDrill Max 170; Sonic Sampling
WATER LEVELS: **START:** **FINISH:** **LOGGER:** Mark Chaney

DEPTH BELOW (ft)	SAMPLE			STANDARD PENETRATION TEST RESULTS	SOIL DESCRIPTION	COMMENTS
	NUMBER	TYPE	RECOVERY (ft)	6" - 6" - 6" (N)	SOIL NAME, USCS GROUP SYMBOL, COLOR, MOISTURE CONTENT, RELATIVE DENSITY OR CONSISTENCY, SOIL STRUCTURE, MINERALOGY	DEPTH OF CASING, DRILLING RATE, DRILLING FLUID LOSS, TESTS AND INTRUMENTATION
6	S-2	3" Sonic	3'	NA	6.0-7.0 Dry red brown with white and green particles f-M silty sand, trace gravel (SM)	DPC - none
7	S-3				7.0'-8'9" Damp Red brown with white and orange particles f-M silty sand, trace gravel, trace clay (SM-CL)	DPC - none
8					8'9"-9.0' Road base/asphalt	
9					9.0-10.0 Dry white f-M sand, concrete	DPC - none
10	SS-1	2" OD sampler		19 - 15 22 - 26	10'-11'3" Dry red brown with white particles f-m silty sand, trace gravel (SM) medium dense	DPC - none
11					11'3"-11'6" Damp red brown f-m silty sand (SM) with quartz	DPC - none
					11'6"-12' Damp red brown f-M silty sand (SM)	DPC - none
12						

ch2m

PROJECT NUMBER: 10587 **BORING NUMBER:** BRP-6
Sheet: 3/6

SOIL BORING LOG

PROJECT: Dundalk Marine Terminal **LOCATION:** Baltimore, Maryland
ELEVATION: ~+20 **DRILLING CONTRACTOR:** ADT
DRILLING METHOD AND EQUIPMENT: Fraste Multi Drill Max 170; Sonic Sampling
WATER LEVELS: **START:** **FINISH:** **LOGGER:** Mark Chaney

DEPTH BELOW (ft)	SAMPLE			STANDARD PENETRATION TEST RESULTS	SOIL DESCRIPTION	COMMENTS
	NUMBER	TYPE	RECOVERY (ft)	6" - 6" - 6" (N)	SOIL NAME, USCS GROUP SYMBOL, COLOR, MOISTURE CONTENT, RELATIVE DENSITY OR CONSISTENCY, SOIL STRUCTURE, MINERALOGY	DEPTH OF CASING, DRILLING RATE, DRILLING FLUID LOSS, TESTS AND INTRUMENTATION
12	SS-2	2" OD sampler	1'	36-41 45-28	12-13'8" Brown moist f-m silty sand with green particls (SM) Medium to medium dense	DPC- none
13						
					13'8"-14' Moist red brown f-M silty sand (SM)	DPC - none
14	SS-3	2" OD sampler	1.5'	34-32 32-34	14-15 moist dense red brown to black f-m silty sand, trace gravel, trace quartz, trace clay (SM-CL)	DPC — none
15					15'-16' Dry Dense red f-M silty sand, trace clay (SM-CL)	DPC - none
16	SS4	2" OD Sampler	1	48-39	16.0-17.0 Dry Dense Red brown f-M silty sand trace gravel, quartz (SM)	DPC - none
17	SS-5	2" OD Sampler	1.5'	49-52	17.0-18.0 Dry dense red brown f-M silty sand trace gravel trace clay (SM-CL)	DPC -
18						

ch2m

PROJECT NUMBER: 10587 **BORING NUMBER:** BRP-6
Sheet: 4/6

SOIL BORING LOG

PROJECT:
LOCATION:
ELEVATION:
DRILLING CONTRACTOR:
DRILLING METHOD AND EQUIPMENT:
WATER LEVELS:
START:
FINISH: 12:35
LOGGER:

DEPTH BELOW (ft)	SAMPLE			STANDARD PENETRATION TEST RESULTS	SOIL DESCRIPTION	COMMENTS
	NUMBER	TYPE	RECOVERY (ft)	6" - 6" - 6" (N)	SOIL NAME, USCS GROUP SYMBOL, COLOR, MOISTURE CONTENT, RELATIVE DENSITY OR CONSISTENCY, SOIL STRUCTURE, MINERALOGY	DEPTH OF CASING, DRILLING RATE, DRILLING FLUID LOSS, TESTS AND INTRUMENTATION
18	SS-6	2" OD sampler	6"	64	18.0-18'6" Moist Dense red brown f-M sandy clay trace gravel, silt (CL-SM)	DPC + faint
	SS-7	2"	3"	67	18'6"-19' moist dense red clay liner	DPC - none
19					Boring terminated @ 19' per K Chaturvedula	6" OD casing to 19'
						Thermometer Air temp 9.0 thermistor Air temp 7.0
20					1 vwp installed @ 18' 1518415	Vwp Air temp 14.3 P_o 9629
21					1 thermistor installed @ 9.5'	Vwp depth T_1 14.4 P_1 9632
22						Vwp Slurry T_2 P_2
23						Thermistor slurry temp
24						

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BORING NO. BRP-6
SHEET 5 **OF** 6
FILE NO. 10567
SURFACE ELEV. ~ +20
DATUM

PROJECT Dundalk Marine Terminal
LOCATION Baltimore, Maryland
BORING LOCATION See location plan

TEST/INSPECTION EQUIPMENT Sonic Samp Drill max 170; Sonic Sampling
REFERENCE CODES/STANDARDS

BORING EQUIPMENT AND METHODS OF STABILIZING BOREHOLE

TYPE OF BORING RIG
TRUCK
SKID
BARGE
OTHER Track

TYPE OF FEED DURING CORING
MECHANICAL
HYDRAULIC
OTHER

CASING USED ☑ YES ☐ NO
DIA., IN. 6" DEPTH, FT. FROM 0 TO 19
DIA., IN. DEPTH, FT. FROM TO
DIA., IN. DEPTH, FT. FROM TO

TYPE AND SIZE OF:
D-SAMPLER
U-SAMPLER
S-SAMPLER SS-Sampler; 2" Diam Sampler
CORE BARREL
CORE BIT
DRILL RODS
3" ID Sonic Macrocore

DRILLING MUD USED ☐ YES ☑ NO
DIAMETER OF ROTARY BIT, IN.
TYPE OF DRILLING MUD

AUGER USED ☐ YES ☑ NO
TYPE AND DIAMETER, IN.

CASING HAMMER, LBS. AVERAGE FALL, IN.
SAMPLER HAMMER, LBS. 140 AVERAGE FALL, IN. 30
TYPE OF HAMMER Automatic

WATER LEVEL OBSERVATIONS IN BOREHOLE

DATE	TIME	DEPTH OF HOLE	DEPTH OF CASING	DEPTH TO WATER	CONDITIONS OF OBSERVATION

PIEZOMETER INSTALLED ☑ YES ☐ NO SKETCH SHOWN ON See VWP installation record

STANDPIPE: TYPE ID, IN. LENGTH, FT. TOP ELEV.
INTAKE ELEMENT: TYPE OD, IN. LENGTH, FT. TIP ELEV.
FILTER: MATERIAL OD, IN. LENGTH, FT. BOT. ELEV.

PAY QUANTITIES
3.5" DIA. DRY SAMPLE BORING LIN. FT.
3.5" DIA. U-SAMPLE BORING LIN. FT.
CORE DRILLING IN ROCK LIN. FT.
NO. OF 3" SHELBY TUBE SAMPLES
NO. OF 3" UNDISTURBED SAMPLES
OTHER:

BORING CONTRACTOR Aquifer Drilling and Testing
DRILLER Tony HELPERS
REMARKS 1 VWP & 1 thermistor installed
RESIDENT ENGINEER Mark Cheney DATE 12-8-15

BORING NO. BRP-6

BORING LOG

Page 1 of 2

Honeywell

Site: Dundalk Marine Terminal
Boring No: BRP-6A

Northing: 574484.781
Easting: 1448090.619
Elevation: NA

Driller: Parratt Wolff, Inc.
Method:
Consultant: JACOBS
Geologist: Jacobs

Total Depth: 18.5 feet
GW Depth:
Date: 07/18/2018 - 07/19/201

Depth feet	Rec	DPC	Blow Count	USCS	Soil Code	Stratum Description	Sample Comments
0				Asphalt		Asphalt	
	■	+					
	■	+	27-34-14	SP-SM		Coarse SAND (SP-SM); medium to very coarse sand, some gravel, trace silt, 10 YR 4/3 (brown), dry, well-graded, dense, possible COPR impacted fill	
	■	+					
	■	+					
	■	+					
		-	11-12-14-15				
		-		SP-SM CL		Coarse SAND (SP-SM); medium to very coarse sand, some gravel, trace silt, 10 YR 4/3 (brown), dry, well-graded, dense, possible COPR impacted fill, contains 3 of red brick fill Silty CLAY (CL); 10 YR 4/2 (dark grayish brown), dry	
	■	-					
	■	-					
5	■	-	2-3-4-6	ML		Clayey SILT (ML); trace f-m gravel, 10 YR 4/2 (dark grayish brown), gravel subangular, dry, loose	
		-					
	■	-				Sandy SILT (ML); trace fine to medium gravel, trace clay, 10 YR 4/2 (dark grayish brown), dry, med dense	
	■	-					
	■	-	8-10-11-11	ML			
	■	-					
	■	-		ML Asphalt		Sandy SILT (ML); trace fine to medium gravel, trace clay, 10 YR 4/2 (dark grayish brown), dry, med dense Weathered Asphalt; GLEY 1 2.5/N (black), f-m sand, trace fine gravel, dry, dense	
		-					
		-	13-100/4				
10		-					

BORING LOG

Page 2 of 2

Site: Dundalk Marine Terminal
Boring No: BRP-6A

Northing: 574484.781
Easting: 1448090.619
Elevation: NA

Driller: Parratt Wolff, Inc.
Method:
Consultant: JACOBS
Geologist: Jacobs

Total Depth: 18.5 feet
GW Depth:
Date: 07/18/2018 - 07/19/201

Depth feet	Rec	DPC	Blow Count	USCS	Soil Code	Stratum Description	Sample Comments
10	■	-	10-11-7-11				
	■	-		SP-SM		SAND (SP-SM); f-m sand, trace silt, trace f-m gravel, 10 YR 5/6 (yellowish brown), moist, med dense, mixed with GLEY 1 2.5/N	
	□	-					
	□	-		SP-SM		SAND (SP-SM); f-m sand, trace silt, GLEY 1 2.5/N (black) moist, med dense, well graded	
	■ □	-	3-6-8-7				
	□	-					
	□	-					
	□	-		CL		Silty CLAY (CL); trace fine silt, 7.5 YR 9.5/1 (white) mixed with 10 YR 4/3 (brown), moist, stiff	
	■	-	3-5-7-24	SP-SM		SAND (SP-SM); f-m sand, trace silt, clay	
	■	-		ML		Clayey SILT (ML); trace fine sand, GLEY 1 4/N (dark gray) and 2.5 YR 5/8 (red), dry, trace rounded gravel	
15	■	-		SM	GB	SAND and Silt (SM); f-c sand, GLEY 1 2.5 3/N (black), dry, med dense	
	■ □	++					
	■	++	8-3-27-50/3				
	■	++		SM	GB	Silty SAND (SM); trace fine gravel, 10 YR 3/2 (very dark grayish brown), dry, dense	
	■	++					
	□	++		SM	GB	Silty SAND (SM); Gley 1 10/3 Y (very dark greenish gray), dry, dense	
	■	++	11	SM	GB	Silty SAND (SM); Gley 1 10/3 Y (very dark greenish gray), dry, dense, Gley 1 3/N (very dark gray), trace yellow COPR modules	
				CL	GB	Silty CLAY (CL); 2.5 YR 4/6 (red), dry	
18.5							

ch2m.

PROJECT NUMBER:

BORING NUMBER: BRP-7
Sheet: 1

SOIL BORING LOG

PROJECT: Honeywell DMTSSI
ELEVATION:
LOCATION:
DRILLING CONTRACTOR: Aquifer Drilling and testing, Inc.
DRILLING METHOD AND EQUIPMENT: Sonic Samp Drill 12 Max 170; SPT Sampling
WATER LEVELS:
START: 12/9/15 13:50 **FINISH:** 12/9/15 15:00 **LOGGER:** K.chaturvedula

DEPTH BELOW (ft)	SAMPLE			STANDARD PENETRATION TEST RESULTS	SOIL DESCRIPTION	COMMENTS
	NUMBER	TYPE	RECOVERY (ft)	6" - 6" - 6" (N)	SOIL NAME, USCS GROUP SYMBOL, COLOR, MOISTURE CONTENT, RELATIVE DENSITY OR CONSISTENCY, SOIL STRUCTURE, MINERALOGY	DEPTH OF CASING, DRILLING RATE, DRILLING FLUID LOSS, TESTS AND INTRUMENTATION
0					4" Asphalt 0.33' - Poorly graded gravel with Sand (GP), Gray-black (N2), dry, Road based aggregate	Advanced the borehole using 3" ID sonic macro core from 0'-10' DPC-
1	S-1	SONIC MACRO CORE	36"	—	1.0' - Silty SAND with gravel (SM), Brown-gray (7.5YR 4/2), dry, medium to coarse grained sand	DPC-
2						
3						DPC-
4					4.0' - Same as above, wet	
5	S-2	SONIC MACRO CORE		—	5.0' - woven geotextile 5.0' - Same as above	DPC-
6					6.0' - Polyethylene liner	DPC-

ch2m.

PROJECT NUMBER:

BORING NUMBER: BRP-7
Sheet: 2

SOIL BORING LOG

PROJECT:
LOCATION:
ELEVATION:
DRILLING CONTRACTOR:
DRILLING METHOD AND EQUIPMENT:
WATER LEVELS:
START:
FINISH:
LOGGER:

DEPTH BELOW (ft)	SAMPLE			STANDARD PENETRATION TEST RESULTS	SOIL DESCRIPTION	COMMENTS
	NUMBER	TYPE	RECOVERY (ft)	6" - 6" - 6" (N)	SOIL NAME, USCS GROUP SYMBOL, COLOR, MOISTURE CONTENT, RELATIVE DENSITY OR CONSISTENCY, SOIL STRUCTURE, MINERALOGY	DEPTH OF CASING, DRILLING RATE, DRILLING FLUID LOSS, TESTS AND INTRUMENTATION
6	S-2	SONIC MACRO CORE		-	6.0' - Same as above, moist	DPC -
7 8 9	S-3	SONIC MACRO CORE	36"	-	7.0' - 8.5' - Same as above 8.5' - 3" thick Asphalt 8.5' - 10' - Poorly graded gravel with sand (GP), gray (7.5YR 5/1), dry, coarse grained sand, Road based aggregate, mixed with concrete	DPC -
10 11 12	SS-4	SS	21"	1 8 11 10	10.0' - 11.25' - Fat CLAY (CH), Red (10Y 4/4), moist, very stiff to hard, medium plasticity. 11.25' - Silty SAND (SM), Brown-Yellow (7.5YR 6/4), dry, medium to coarse grained sand, particulate (COPR and non-COPR)	10.0' - 6" OD outer casing advanced to 10' bgs. 10.5' - Below 10' switched to SS sampling; 140-lb hammer; 30-in. drop; 3" dia. sampler DPC +

ch2m.

PROJECT NUMBER:

BORING NUMBER: BRP-7

Sheet: 3

SOIL BORING LOG

PROJECT:

LOCATION:

ELEVATION:

DRILLING CONTRACTOR:

DRILLING METHOD AND EQUIPMENT:

WATER LEVELS:

START:

FINISH:

LOGGER:

DEPTH BELOW (ft)	SAMPLE			STANDARD PENETRATION TEST RESULTS	SOIL DESCRIPTION	COMMENTS
	NUMBER	TYPE	RECOVERY (ft)	6" - 6" - 6" (N)	SOIL NAME, USCS GROUP SYMBOL, COLOR, MOISTURE CONTENT, RELATIVE DENSITY OR CONSISTENCY, SOIL STRUCTURE, MINERALOGY	DEPTH OF CASING, DRILLING RATE, DRILLING FLUID LOSS, TESTS AND INTRUMENTATION
12				21	12.0'-12.5'- same as above.	
	SS-5	SS	21"	23	12.5'- same as above, HB COPR, Slightly to moderately indurated	DPC+
				30		
13				50/3"		
13.5'						13.5'- SS refusal; sonic macrocore advanced to 15.0' bgs DPC+
					13.8'- same as above.	
14	S-6	sonic macro core	15"	-		
15				50/2"	15.0'-16.3'- same as above	15.0'- 6" OD outer casing installed to 15.0' bgs. 15.0'- SS refusal; sonic macro core advanced to 17.0' bgs
	S-7	sonic macro core	24"			
16						
					16.3'- Poorly graded SAND with silt (SP-SM), gray-black (N2), wet, particulate, (GBCOPR)	DPC+
					16.8'- Fat CLAY (CH), Red (10Y4/4), moist, very stiff, highly plastic	
17	SS-8	SS	5"	4	same as above	DPC-
					Bottom of the boring @ 17.5' bgs.	
18						

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BORING NO. BRP-7
SHEET 54 OF
FILE NO. 10587
SURFACE ELEV.
DATUM

PROJECT DUNDALK MARINE TERMINAL
LOCATION BALTIMORE, MARYLAND
BORING LOCATION

TEST/INSPECTION EQUIPMENT Sonic Samp DrillxL Max 170; SPT sampling
REFERENCE CODES/STANDARDS

BORING EQUIPMENT AND METHODS OF STABILIZING BOREHOLE

TYPE OF BORING RIG		TYPE OF FEED DURING CORING							
				CASING USED		☑ YES	☐ NO		
TRUCK		MECHANICAL		DIA., IN.	6"	DEPTH, FT. FROM	0'	TO	17'
SKID		HYDRAULIC		DIA., IN.		DEPTH, FT. FROM		TO	
BARGE		OTHER		DIA., IN.		DEPTH, FT. FROM		TO	
OTHER	track								

TYPE AND SIZE OF:
D-SAMPLER
U-SAMPLER
S-SAMPLER SS sampler - 3" dia.
CORE BARREL
CORE BIT
DRILL RODS
Sonic Macro Core - 3" ID

DRILLING MUD USED ☐ YES ☑ NO
DIAMETER OF ROTARY BIT, IN.
TYPE OF DRILLING MUD

AUGER USED ☐ YES ☑ NO
TYPE AND DIAMETER, IN.

CASING HAMMER, LBS. AVERAGE FALL, IN.
SAMPLER HAMMER, LBS. 140 AVERAGE FALL, IN. 30
TYPE OF HAMMER Automatic

WATER LEVEL OBSERVATIONS IN BOREHOLE

DATE	TIME	DEPTH OF HOLE	DEPTH OF CASING	DEPTH TO WATER	CONDITIONS OF OBSERVATION

PIEZOMETER INSTALLED ☑ YES ☐ NO SKETCH SHOWN ON VWP installation log

STANDPIPE:	TYPE		ID, IN.		LENGTH, FT.		TOP ELEV.
INTAKE ELEMENT:	TYPE		OD, IN.		LENGTH, FT.		TIP ELEV.
FILTER:	MATERIAL		OD, IN.		LENGTH, FT.		BOT. ELEV.

PAY QUANTITIES

3.5" DIA. DRY SAMPLE BORING	LIN. FT.		NO. OF 3" SHELBY TUBE SAMPLES	
3.5" DIA. U-SAMPLE BORING	LIN. FT.		NO. OF 3" UNDISTURBED SAMPLES	
CORE DRILLING IN ROCK	LIN. FT.		OTHER:	

BORING CONTRACTOR Aquifer Drilling and testing, Inc
DRILLER Brian Karshick HELPERS Chris Phelan
REMARKS VWP, thermistor installed; 1" PVC installed.
RESIDENT ENGINEER K. Chaturvedula DATE 12/9/15

BOR-4_JAN2013

BORING NO. BRP-7

ch2m

PROJECT NUMBER: **BORING NUMBER:** BPP-8
Sheet: 1

SOIL BORING LOG

PROJECT: Honeywell DM7 SSB
LOCATION:
ELEVATION:
DRILLING CONTRACTOR: Aquifer Drilling and testing, Inc.
DRILLING METHOD AND EQUIPMENT: Sonic Samp Drill Max 170', SPT sampling
WATER LEVELS:
START: 12/9/15 07:40 **FINISH:** 12/9/15 09:30 **LOGGER:** K. Chaturvedula

DEPTH BELOW (ft)	SAMPLE			STANDARD PENETRATION TEST RESULTS	SOIL DESCRIPTION	COMMENTS
	NUMBER	TYPE	RECOVERY (ft)	6" - 6" - 6" (N)	SOIL NAME, USCS GROUP SYMBOL, COLOR, MOISTURE CONTENT, RELATIVE DENSITY OR CONSISTENCY, SOIL STRUCTURE, MINERALOGY	DEPTH OF CASING, DRILLING RATE, DRILLING FLUID LOSS, TESTS AND INTRUMENTATION
0					3" Asphalt 0.25' - Silty SAND with gravel (SM), gray-Brown (7.5YR 4/2), dry, medium to coarse grained sand	Advanced the borehole from 0'-10' using 3" ID sonic macro core DPC -
1						
	S-1					
2		Sonic Macro Core	36"	-		DPC -
3						
4					4.0' - Same as above.	PPC -
5	S-2	Sonic Macro Core	36"	-	5.0' - Clayey Sand (SC), gray-brown (7.5YR 4/2), wet, fine to medium grained sand	PPC -
6					6.0' - Polyethylene liner	

ch2m

PROJECT NUMBER: **BORING NUMBER:** BRP-8
Sheet: 2

SOIL BORING LOG

PROJECT: **LOCATION:**
ELEVATION: **DRILLING CONTRACTOR:**
DRILLING METHOD AND EQUIPMENT:
WATER LEVELS: **START:** **FINISH:** **LOGGER:**

DEPTH BELOW (ft)	SAMPLE			STANDARD PENETRATION TEST RESULTS	SOIL DESCRIPTION	COMMENTS
	NUMBER	TYPE	RECOVERY (ft)	6" - 6" - 6" (N)	SOIL NAME, USCS GROUP SYMBOL, COLOR, MOISTURE CONTENT, RELATIVE DENSITY OR CONSISTENCY, SOIL STRUCTURE, MINERALOGY	DEPTH OF CASING, DRILLING RATE, DRILLING FLUID LOSS, TESTS AND INTRUMENTATION
6	S-2	SONIC MACRO CORE		-	6.0'- Silty SAND with gravel (SM), gray-Brown (7.5YR 4/2), dry, medium to coarse grained sand	DPC -
7					7.0'-8.0'- same as above	DPC-
8	S-3	SONIC MACRO CORE	36"	-	8.0'- 3" thick Asphalt 8.25'- crushed concrete	
9					8.75'- Silty sand (SM), Red Brown (7.5YR 4/6), dry, fine to medium grained sand, trace gravel	DPC -
					9.4'- Poorly graded sand with gravel (SP), Red-white (7.5YR 7/4), dry, coarse grained sand	DPC -
10				21	10.0'- Silty SAND with gravel (SM), gray-Brown (7.5YR 4/2), dry, medium to coarse grained sand	10.0'- 6" OD outer casing installed to 10' bgs. 10.5'- Below 10' switched to SS sampling; 140-lb hammer 30-in drop; 3" dia. sampler
				26		
11	SS-4	SS	22"	18	11.0'- Piece of wood, decomposed organics 11.2'- Fat CLAY (CH), Red (10Y4/4), dry, very stiff, medium plasticity	DPC -
				22		
12						

ch2m

PROJECT NUMBER:

BORING NUMBER: BRP-8

Sheet: 3

SOIL BORING LOG

PROJECT:

LOCATION:

ELEVATION:

DRILLING CONTRACTOR:

DRILLING METHOD AND EQUIPMENT:

WATER LEVELS:

START:

FINISH:

LOGGER:

DEPTH BELOW (ft)	SAMPLE			STANDARD PENETRATION TEST RESULTS	SOIL DESCRIPTION	COMMENTS
	NUMBER	TYPE	RECOVERY (ft)	6" - 6" - 6" (N)	SOIL NAME, USCS GROUP SYMBOL, COLOR, MOISTURE CONTENT, RELATIVE DENSITY OR CONSISTENCY, SOIL STRUCTURE, MINERALOGY	DEPTH OF CASING, DRILLING RATE, DRILLING FLUID LOSS, TESTS AND INTRUMENTATION
12				25	12.0' - Poorly graded sand (SP), greenish-Brown (10YR 4/3), dry, fine grained sand, trace gravel	DPC-
				24		
	SS-5	SONIC MACRO CORE	24"	21		
13					13.0' - Fat [illegible] (CH), Red-white (10YR 6/4), moist, very stiff, high plasticity	DPC-
				100		
					13.6' - Silty SAND (SM), Red-Brown-green (7.5YR 4/4), dry, fine to medium grained sand, particulate (HB COPR)	DPC-+.
14	SS-6	SS	NR	50/1"		14.0' - SS refusal, 3" OD sonic macro core advanced to 15' bgs.
	S-7	sonic macro core	12"		same as above	
15				24	15.0' - same as above, wet	15.0' - 6" OD sonic macro core advanced to 15' bgs.
				44	15.5' - Same as above, dry.	15.0' - ground water encountered during drilling
16	SS-8	SS	24"	17		
				13	16.7' - Poorly graded SAND with Silt (SP-SM), dark-gray black (N2), wet, medium to coarse grained sand, particulate (GB COPR): bright green-yellow particles.	DPC+-
17				20		
	SS-9	SS	6"		Same as above	
				15		
18						

ch2m.

PROJECT NUMBER:

BORING NUMBER: BRP-8
Sheet: 4

SOIL BORING LOG

PROJECT:
LOCATION:
ELEVATION:
DRILLING CONTRACTOR:
DRILLING METHOD AND EQUIPMENT:
WATER LEVELS:
START:
FINISH:
LOGGER:

DEPTH BELOW (ft)	SAMPLE			STANDARD PENETRATION TEST RESULTS	SOIL DESCRIPTION	COMMENTS
	NUMBER	TYPE	RECOVERY (ft)	6" - 6" - 6" (N)	SOIL NAME, USCS GROUP SYMBOL, COLOR, MOISTURE CONTENT, RELATIVE DENSITY OR CONSISTENCY, SOIL STRUCTURE, MINERALOGY	DEPTH OF CASING, DRILLING RATE, DRILLING FLUID LOSS, TESTS AND INTRUMENTATION
18	SS-10	SS	6"	10	18.0'. Same as above, bright green and yellow particles	
	SS-11	SS	6"	19	18.5'-18.8'. Same as above 18.8'. Silty SAND (SM), Red-Brown (7.5YR 4/6), dry, fine to medium grained sand, slightly to moderately indurated (HB (OPE)	DPC +
19	S-12	SS	4"	4	Fat CLAY (CH), Red-white (10Y 4/4), moist, very stiff, highly plastic	DPC-
					Bottom of boring @ 19.5' bgs.	
20						1" PVC installed @ 19'
					Thermometer Air temp = 10.0	Vwp installed @ 18' 1518427 thermistor installed at 16.5' interface of HB & OB copr
					Thermistor Air Temp 9.3	Air Vwp T_0 12.7 P_0 9736
					Thermistor Slurry Temp 10.3	depth T_1 13.7 P_1 9710
						Slurry T_2 13.3 P_2 8336

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BORING NO. BRP-8
SHEET 5 **OF**
FILE NO. 10587
SURFACE ELEV.
DATUM

PROJECT DUNDALK MARINE TERMINAL
LOCATION BALTIMORE, MARYLAND
BORING LOCATION

TEST/INSPECTION EQUIPMENT Sonic SAMP DRILL MAX 170; SPT Sampling
REFERENCE CODES/STANDARDS

BORING EQUIPMENT AND METHODS OF STABILIZING BOREHOLE

TYPE OF BORING RIG
TRUCK
SKID
BARGE
OTHER Track

TYPE OF FEED DURING CORING
MECHANICAL
HYDRAULIC
OTHER

CASING USED ☑ YES ☐ NO
DIA., IN. 6" **DEPTH, FT. FROM** 0 **TO** 19'
DIA., IN. **DEPTH, FT. FROM** **TO**
DIA., IN. **DEPTH, FT. FROM** **TO**

TYPE AND SIZE OF:
D-SAMPLER
U-SAMPLER
S-SAMPLER SS Sampler : 3" dia. Sampler
CORE BARREL
CORE BIT
DRILL RODS
SONIC MACRO CORE . 3" I.D.

DRILLING MUD USED ☐ YES ☑ NO
DIAMETER OF ROTARY BIT, IN.
TYPE OF DRILLING MUD

AUGER USED ☐ YES ☑ NO
TYPE AND DIAMETER, IN.

CASING HAMMER, LBS. **AVERAGE FALL, IN.**
SAMPLER HAMMER, LBS. 140 **AVERAGE FALL, IN.** 30
TYPE OF HAMMER Automatic

WATER LEVEL OBSERVATIONS IN BOREHOLE

DATE	TIME	DEPTH OF HOLE	DEPTH OF CASING	DEPTH TO WATER	CONDITIONS OF OBSERVATION
12/9/15	08:40	17.0'	15.0'	15.0'	encountered during drilling

PIEZOMETER INSTALLED ☑ YES ☐ NO **SKETCH SHOWN ON** VWP

STANOPIPE: **TYPE** **ID, IN.** **LENGTH, FT.** **TOP ELEV.**
INTAKE ELEMENT: **TYPE** **OD, IN.** **LENGTH, FT.** **TIP ELEV.**
FILTER: **MATERIAL** **OD, IN.** **LENGTH, FT.** **BOT. ELEV.**

PAY QUANTITIES
3.5" DIA. DRY SAMPLE BORING **LIN. FT.**
3.5" DIA. U-SAMPLE BORING **LIN. FT.**
CORE DRILLING IN ROCK **LIN. FT.**
NO. OF 3" SHELBY TUBE SAMPLES
NO. OF 3" UNDISTURBED SAMPLES
OTHER:

BORING CONTRACTOR Aquifer Drilling and testing, Inc.
DRILLER Brian Karchick **HELPERS** Chris Phelen
REMARKS VWP, thermistor and 1" PVC installed
RESIDENT ENGINEER K. Chaturvedula **DATE** 12/9/15

BORING NO. BRP-8

ch2m

PROJECT NUMBER:

BORING NUMBER: BPP-9

Sheet: 1

SOIL BORING LOG

PROJECT: Honeywell DMT SSI

LOCATION:

ELEVATION:

DRILLING CONTRACTOR: Aquifer Drilling and Testing, Inc.

DRILLING METHOD AND EQUIPMENT: SONIC SAMP DRILL XL MAX 170; SPT Sampling

WATER LEVELS:

START: 12/10/15 15:00

FINISH: 12/10/15 16:30

LOGGER: K. chaturvedula

DEPTH BELOW (ft)	SAMPLE NUMBER	SAMPLE TYPE	SAMPLE RECOVERY (ft)	STANDARD PENETRATION TEST RESULTS 6" - 6" - 6" (N)	SOIL DESCRIPTION: SOIL NAME, USCS GROUP SYMBOL, COLOR, MOISTURE CONTENT, RELATIVE DENSITY OR CONSISTENCY, SOIL STRUCTURE, MINERALOGY	COMMENTS: DEPTH OF CASING, DRILLING RATE, DRILLING FLUID LOSS, TESTS AND INTRUMENTATION
0					2" Asphalt 0-1'- Poorly graded sand with GRAVEL (SP), gray-brown (7.5 YR 4/1), moist, coarse grained sand	Advanced the Borehole to 10' bgs using 3" ID sonic macro core DPC-
1						
2	S-1	SONIC MACRO CORE	48"	-	2.0'- Silty SAND with gravel (SM), Dark Red-Brown (7.5YR 4/2), moist,	DPC-
3					3.5'- same as above, higher fines content	DPC-
4					4.0'- same as above, higher fines content	
5	S-2	SONIC MACRO CORE			5.0'- same as above	
6					6.0'- two layers of geotextile	

ch2m

PROJECT NUMBER:

BORING NUMBER: BRP-9
Sheet: 2

SOIL BORING LOG

PROJECT:
LOCATION:
ELEVATION:
DRILLING CONTRACTOR:
DRILLING METHOD AND EQUIPMENT:
WATER LEVELS:
START:
FINISH:
LOGGER:

DEPTH BELOW (ft)	SAMPLE			STANDARD PENETRATION TEST RESULTS	SOIL DESCRIPTION	COMMENTS
	NUMBER	TYPE	RECOVERY (ft)	6" - 6" - 6" (N)	SOIL NAME, USCS GROUP SYMBOL, COLOR, MOISTURE CONTENT, RELATIVE DENSITY OR CONSISTENCY, SOIL STRUCTURE, MINERALOGY	DEPTH OF CASING, DRILLING RATE, DRILLING FLUID LOSS, TESTS AND INTRUMENTATION
6	S-2	sonic macro core		-	6.0' same as above.	
7	S-3	SONIC MACRO CORE	36"	-	7.0'. Clayey SAND (SC) with gravel, gray-brown (7.5YR 4/2), wet, fine grained sand	DPC -
8					8.5' - Crushed concrete and Asphalt	DPC -
9					9.5' - Poorly graded SAND with gravel (SP), gray (5N), moist, coarse grained sand, Road based aggregate.	DPC -
10	SS-4	SS	5"	31 50/1"	10.0' - Clayey SAND (SC), Red (10Y4/4), dry, fine to medium grained sand, very dense, (COPR and non-COPR) 10.4' - Silty SAND (SM), Red-Brown-greenish (7.5YR 4/3), dry, fine to medium grained sand, Particulate (HBCOPR)	10.0' - 6" OD outer casing installed to 10' bgs 10.5' - Below 10' switched to SS sampling, 140-lb hammer 30-in drop; 1 3/4" ID Sampler DPC +/-
11	S-5	sonic macro core	18"		11.1' - same as above	SS refusal: Advanced the 3" ID Sonic macrocore to 12.0' bgs
12						

ch2m:

PROJECT NUMBER:
BORING NUMBER: BRP-9
Sheet: 3

SOIL BORING LOG

PROJECT:
LOCATION:
ELEVATION:
DRILLING CONTRACTOR:
DRILLING METHOD AND EQUIPMENT:
WATER LEVELS:
START:
FINISH:
LOGGER:

DEPTH BELOW (ft)	SAMPLE			STANDARD PENETRATION TEST RESULTS	SOIL DESCRIPTION	COMMENTS
	NUMBER	TYPE	RECOVERY (ft)	6" - 6" - 6" (N)	SOIL NAME, USCS GROUP SYMBOL, COLOR, MOISTURE CONTENT, RELATIVE DENSITY OR CONSISTENCY, SOIL STRUCTURE, MINERALOGY	DEPTH OF CASING, DRILLING RATE, DRILLING FLUID LOSS, TESTS AND INTRUMENTATION
12	SS-6	SS	4"	29	12.0' - Same as above, (COPR and non-COPR)	DPC +/-
				51/1"		12.5' - SS refusal; sonic macro core advanced to 14.0' bgs
12.5		SONIC MACRO CORE			12.5' - Same as above, HB COPR	
13	S-7				13.0' - Same as above, greenish	
					13.2' - same as above, greenish	DPC +
				—		
					13.9' - Poorly graded SAND with silt (SP-SM), gray-black (N2), moist, coarse grained sand, particulate (GB COPR)	DPC +
14	SS-8	SS		35	14.0'-14.2' - same as above	14.0' - groundwater encountered during drilling DPC +
			12"	30	14.2'-14.5'. Silty SAND with gravel (SM), gray-brown (7.5YR 4/2), moist, fine to medium grained sand. (COPR and non-COPR)	DPC +/-
				50/5"	14.5'-15.5'. Silty SAND (SM), gray-Brown (7.5YR 4/2), moist, fine to medium grained sand (COPR)	
15						
15.5						DPC +
					15.5'-16.0' - COPR and non-COPR fill	SS-refusal; Sonic macro core advanced to 17.0' bgs.
16	S-9	SONIC MACRO CORE	18"	—	16.0' - Silty SAND (SM). Red-Brown-greenish (7.5YR 4/3), moist, fine to medium grained sand. particulate (HBCOPR), trace gravel	DPC+
17	SS-10	SS	12"	10	17.0' - Same as above, gray-brown (7.5YR 4/2), wet. (COPR and non-COPR)	DPC +/-
				13		
18						

ch2m:

PROJECT NUMBER:

BORING NUMBER: BRP-9

Sheet: 4

SOIL BORING LOG

PROJECT:

LOCATION:

ELEVATION:

DRILLING CONTRACTOR:

DRILLING METHOD AND EQUIPMENT:

WATER LEVELS:

START:

FINISH:

LOGGER:

DEPTH BELOW (ft)	SAMPLE			STANDARD PENETRATION TEST RESULTS	SOIL DESCRIPTION	COMMENTS
	NUMBER	TYPE	RECOVERY (ft)	6" - 6" - 6" (N)	SOIL NAME, USCS GROUP SYMBOL, COLOR, MOISTURE CONTENT, RELATIVE DENSITY OR CONSISTENCY, SOIL STRUCTURE, MINERALOGY	DEPTH OF CASING, DRILLING RATE, DRILLING FLUID LOSS, TESTS AND INTRUMENTATION
18	SS-11	SS	9"	9 14	18.0' - Same as above	DPC +/-
19	SS-12	SS	4"	9	19.0' - same as above	DPC -
	SS-13	SS	6"	18	Fat CLAY (CH), Red (10R4/4), wet, very stiff, highly plastic	DPC -
20					Bottom of boring @ 20.0' bgs	20.0' - 6" OD outer casing installed to a depth of 20.0' bgs
					1 vwp 1517448 installed @ 19'	
21						Vwp Air T_0 10.9 P_0 9769
					1 thermistor installed @ 13.5' depth	Depth T_1 12.1 P_1 9466
					thermometer air temp: 7.2°	Slurry T_2 19.9 P_2 8542
					Thermistor Air Temp 7.8	
					Thermistor Slurry Temp 13.2	

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BORING NO. BRP-9
SHEET 5 OF
FILE NO. 10587
SURFACE ELEV.
DATUM

PROJECT DUNDALK MARINE TERMINAL
LOCATION BALTIMORE, MARYLAND
BORING LOCATION

TEST/INSPECTION EQUIPMENT
REFERENCE CODES/STANDARDS

BORING EQUIPMENT AND METHODS OF STABILIZING BOREHOLE

TYPE OF BORING RIG
TRUCK
SKID
BARGE
OTHER track

TYPE OF FEED DURING CORING
MECHANICAL
HYDRAULIC
OTHER

CASING USED ☑ YES ☐ NO
DIA., IN. 6" DEPTH, FT. FROM 0 TO 20'
DIA., IN. DEPTH, FT. FROM TO
DIA., IN. DEPTH, FT. FROM TO

TYPE AND SIZE OF:
D-SAMPLER
U-SAMPLER
S-SAMPLER SS Sampler - 3/8" dia.
CORE BARREL
CORE BIT
DRILL RODS
SONIC MACRO CORE : 3" ID

DRILLING MUD USED ☐ YES ☑ NO
DIAMETER OF ROTARY BIT, IN.
TYPE OF DRILLING MUD

AUGER USED ☐ YES ☑ NO
TYPE AND DIAMETER, IN.

CASING HAMMER, LBS. AVERAGE FALL, IN.
SAMPLER HAMMER, LBS. 140 AVERAGE FALL, IN. 30
TYPE OF HAMMER Automatic

WATER LEVEL OBSERVATIONS IN BOREHOLE

DATE	TIME	DEPTH OF HOLE	DEPTH OF CASING	DEPTH TO WATER	CONDITIONS OF OBSERVATION

PIEZOMETER INSTALLED ☑ YES ☐ NO SKETCH SHOWN ON VWP Installation log

STANDPIPE: TYPE ID, IN. LENGTH, FT. TOP ELEV.
INTAKE ELEMENT: TYPE OD, IN. LENGTH, FT. TIP ELEV.
FILTER MATERIAL OD, IN. LENGTH, FT. BOT. ELEV

PAY QUANTITIES

3.5" DIA. DRY SAMPLE BORING LIN. FT.
3.5" DIA. U-SAMPLE BORING LIN. FT.
CORE DRILLING IN ROCK LIN. FT.
NO. OF 3" SHELBY TUBE SAMPLES
NO. OF 3" UNDISTURBED SAMPLES
OTHER:

BORING CONTRACTOR Aquifer Drilling and teching, Inc.
DRILLER Tony HELPERS Joseph
REMARKS
RESIDENT ENGINEER K-Chaturvedula DATE 12/10/15

BOR-4_JAN2013 BORING NO. BRP-9

ch2m.

PROJECT NUMBER:

BORING NUMBER: BRP-11
Sheet: 1

SOIL BORING LOG

PROJECT: Honeywell DMT SST
LOCATION:
ELEVATION:
DRILLING CONTRACTOR: Aquifer Drilling and testing, Inc.
DRILLING METHOD AND EQUIPMENT: Sonic Samp XL Drill Max 170', SPT sampling
WATER LEVELS:
START: 12/10/15 08:20
FINISH: 12/10/15 11:40
LOGGER: K Chaturvedula

DEPTH BELOW (ft)	SAMPLE			STANDARD PENETRATION TEST RESULTS	SOIL DESCRIPTION	COMMENTS
	NUMBER	TYPE	RECOVERY (ft)	6" - 6" - 6" (N)	SOIL NAME, USCS GROUP SYMBOL, COLOR, MOISTURE CONTENT, RELATIVE DENSITY OR CONSISTENCY, SOIL STRUCTURE, MINERALOGY	DEPTH OF CASING, DRILLING RATE, DRILLING FLUID LOSS, TESTS AND INTRUMENTATION
0					3" asphalt 0.25'-1.0'- Poorly graded gravel with sand (GP), gray-black (N2), dry, road based aggregate	Advanced the borehole between 0'-10' bgs with 3" ID sonic macrocore
1	S-1	SONIC MACRO CORE	36"	-	1.0'- Silty sand with gravel (SM), Red-Brown (7.5YR 4/6), moist, fine to medium grained sand	DPC -
2					2.0'- Woven geotextile 2.0'- Same as above	
3						DPC -
4	S-2	SONIC MACRO CORE	36"	-	4.0'- Same as above	- Hard drilling
5					5.0'-6.0'- Reinforced concrete	
6						

ch2m

PROJECT NUMBER: **BORING NUMBER:** BRP-11
Sheet: 2

SOIL BORING LOG

PROJECT: **LOCATION:**
ELEVATION: **DRILLING CONTRACTOR:**
DRILLING METHOD AND EQUIPMENT:
WATER LEVELS: **START:** **FINISH:** **LOGGER:**

DEPTH BELOW (ft)	SAMPLE			STANDARD PENETRATION TEST RESULTS	SOIL DESCRIPTION	COMMENTS
	NUMBER	TYPE	RECOVERY (ft)	6" - 6" - 6" (N)	SOIL NAME, USCS GROUP SYMBOL, COLOR, MOISTURE CONTENT, RELATIVE DENSITY OR CONSISTENCY, SOIL STRUCTURE, MINERALOGY	DEPTH OF CASING, DRILLING RATE, DRILLING FLUID LOSS, TESTS AND INTRUMENTATION
6	S-2	Sonic Macro Core		–	6.0' - Silty SAND with gravel (SM), Brown (7.5YR 5/6), moist, fine to medium grained sand.	DPC - mps = 0.5"
7	S-3	SONIC MACRO CORE	36"	–	7.0'-8.0' - Poorly graded sand with gravel (SP), gray (5N), moist, coarse grained sand. Road based aggregate	DPC-
8					8.0'-8.5' - Clayey sand (SC) with gravel, Red-Brown (7.5YR 4/3), wet, fine to medium grained sand 8.5'-9.0' - 6" thick layer of Asphalt	DPC -
9					9.0' - Crushed concrete	10.0' - 6" OD outer casing installed to a depth of 10.0' bgs.
10	SS-4	SS	22"	11 12 23 22	10.0' - Poorly graded sand with gravel (SP), gray-brown (7.5YR 4/2), moist, medium to coarse grained sand.	10.5' - below 10' switched to SS sampling; 140-lb hammer 30-in. drop; 3" dia. sampler
11					11.3'-11.5' - Bentonite mix 11.5' - Same as above 11.9' - Piece of concrete encountered	DPC -
12						

ch2m.

PROJECT NUMBER:

BORING NUMBER: BRP-11

Sheet: 3

SOIL BORING LOG

PROJECT:

LOCATION:

ELEVATION:

DRILLING CONTRACTOR:

DRILLING METHOD AND EQUIPMENT:

WATER LEVELS:

START:

FINISH:

LOGGER:

DEPTH BELOW (ft)	SAMPLE			STANDARD PENETRATION TEST RESULTS	SOIL DESCRIPTION	COMMENTS
	NUMBER	TYPE	RECOVERY (ft)	6" - 6" - 6" (N)	SOIL NAME, USCS GROUP SYMBOL, COLOR, MOISTURE CONTENT, RELATIVE DENSITY OR CONSISTENCY, SOIL STRUCTURE, MINERALOGY	DEPTH OF CASING, DRILLING RATE, DRILLING FLUID LOSS, TESTS AND INTRUMENTATION
12	SS-5	SS	24"	23 24	12.0'-13.0' - Same as above, Red-White (7.5YR 7/4), moist, coarse grained sand	DPC -
13				19 13	13.0' - Sandy CLAY (SC); Red (10Y4/4), moist, Low plasticity, stiff, trace gravel	DPC -
14	SS-6	SS	24"	19 17	14.0' - Fat CLAY (CH), Red (10Y 4/4), 'dry', Low plasticity, very stiff, trace gravel	DPC -
15				23 26		
16	SS-7	SS	12"	3 7	16.0' - Same as above - wet 17.0' 16.5' 16.5' - Same as above, traces of COPC	16.0' - 6" OD outer casing installed to a depth of 15' bgs DPC +1 -
17	SS-8	SS	6"	10	17.0' - Clayey SAND (SC), Red-Yellow (7.5YR 5/6), moist, fine to medium grained sand	DPC -
	SS-9	SS	NR	8	No recovery	
18						

ch2m:

PROJECT NUMBER:

BORING NUMBER: BRP-11
Sheet: 4

SOIL BORING LOG

PROJECT:
ELEVATION:
DRILLING METHOD AND EQUIPMENT:
WATER LEVELS:
LOCATION:
DRILLING CONTRACTOR:
START:
FINISH:
LOGGER:

DEPTH BELOW (ft)	SAMPLE			STANDARD PENETRATION TEST RESULTS	SOIL DESCRIPTION	COMMENTS
	NUMBER	TYPE	RECOVERY (ft)	6" - 6" - 6" (N)	SOIL NAME, USCS GROUP SYMBOL, COLOR, MOISTURE CONTENT, RELATIVE DENSITY OR CONSISTENCY, SOIL STRUCTURE, MINERALOGY	DEPTH OF CASING, DRILLING RATE, DRILLING FLUID LOSS, TESTS AND INTRUMENTATION
18	SS-10	SS	6"	10	18.0' - Fat clay (CH), Red (10Y 4/4), moist, stiff, medium plasticity.	DPC-
	SS-11	SS	6"	17	18.5' - same as above	
19	SS-12	SS	6"	17	Poorly graded sand with silt (SP-SM) gray-brown (7.5YR 4/3), moist, fine to medium grained sand, Particulate (GB COPE)	COPR encountered at the bottom of the spoon. DPC+
	SS-13	SS	6"	17	Same as above	DPC+
20	SS-14	SS	5"	3	Fat CLAY (CH), Red (10YR4/4), moist, stiff, medium plasticity, traces of COPR material (COPR and non-COPR)	20.0'-6" OD outer casing installed to 20.0' bgs. DPC +/-
	SS-15	SS	NR	5	No Recovery	
21	SS-16	SS	6"	3	Fat CLAY (CH), Red (10Y4/4), moist, stiff, high plasticity.	DPC-
					Bottom of boring @ 21.5' bgs.	Air Vwp T_0 20.3 P_0 9619
				20'	1" PVC installed to 21' depth	Depth T_1 20.4 P_1 9608
					Vwp installed @ 20 depth Thermometer Air reading = 13.2 thermistor installed @ 16.5 depth	Slurry T_2 17.5 P_2 8184
					Thermistor Air 13.4	
					Thermistor slurry	

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BORING NO. BRP-11
SHEET 5 OF 5
FILE NO. 10587
SURFACE ELEV.
DATUM

PROJECT DUNDALK MARINE TERMINAL
LOCATION BALTIMORE, MARYLAND
BORING LOCATION

TEST/INSPECTION EQUIPMENT
REFERENCE CODES/STANDARDS Sonic samp Drill XL Max 170; SPT sampling

BORING EQUIPMENT AND METHODS OF STABILIZING BOREHOLE

TYPE OF BORING RIG
TRUCK
SKID
BARGE
OTHER Track

TYPE OF FEED DURING CORING
MECHANICAL
HYDRAULIC
OTHER

CASING USED ☑ YES ☐ NO
DIA., IN. 6" DEPTH, FT. FROM 0 TO 21'
DIA., IN. DEPTH, FT. FROM TO
DIA., IN. DEPTH, FT. FROM TO

TYPE AND SIZE OF:
D-SAMPLER
U-SAMPLER
S-SAMPLER SS Sampler - 3" dia.
CORE BARREL
CORE BIT
DRILL RODS
Sonic macro core: 3" ID

DRILLING MUD USED ☐ YES ☑ NO
DIAMETER OF ROTARY BIT, IN.
TYPE OF DRILLING MUD

AUGER USED ☐ YES ☑ NO
TYPE AND DIAMETER, IN.

CASING HAMMER, LBS. AVERAGE FALL, IN.
SAMPLER HAMMER, LBS. 140 AVERAGE FALL, IN. 30
TYPE OF HAMMER Automatic

WATER LEVEL OBSERVATIONS IN BOREHOLE

DATE	TIME	DEPTH OF HOLE	DEPTH OF CASING	DEPTH TO WATER	CONDITIONS OF OBSERVATION

PIEZOMETER INSTALLED ☑ YES ☐ NO SKETCH SHOWN ON VWP Installation log

STANDPIPE: TYPE ID, IN. LENGTH, FT. TOP ELEV.
INTAKE ELEMENT: TYPE OD, IN. LENGTH, FT. TIP ELEV.
FILTER MATERIAL OD, IN. LENGTH, FT. BOT. ELEV

PAY QUANTITIES

3.5" DIA. DRY SAMPLE BORING LIN. FT.
3.5" DIA. U-SAMPLE BORING LIN. FT.
CORE DRILLING IN ROCK LIN. FT.
NO. OF 3" SHELBY TUBE SAMPLES
NO. OF 3" UNDISTURBED SAMPLES
OTHER:

BORING CONTRACTOR Aquifer Drilling and testing.
DRILLER Brian Korshick HELPERS Chris Phelen 09:30
REMARKS encountered concrete-Reinforced-at 5-6' - called Ramz' and discussed. Okay to proceed
RESIDENT ENGINEER K. Chaturvedula DATE 12/10/15

BORING NO. BRP-11

PROJECT NUMBER: 10587 **BORING NUMBER:** BRP-12
Sheet: 1/6

SOIL BORING LOG

PROJECT: Dundalk Marine Terminal
LOCATION: Baltimore, Maryland
ELEVATION: ~+20
DRILLING CONTRACTOR: ADT
DRILLING METHOD AND EQUIPMENT: Frask Multi Drill XL Max 170: Sonic Sampler
WATER LEVELS:
START: 2:20 **FINISH:** **LOGGER:** Mark chancy

DEPTH BELOW (ft)	SAMPLE			STANDARD PENETRATION TEST RESULTS	SOIL DESCRIPTION	COMMENTS
	NUMBER	TYPE	RECOVERY (ft)	6" - 6" - 6" (N)	SOIL NAME, USCS GROUP SYMBOL, COLOR, MOISTURE CONTENT, RELATIVE DENSITY OR CONSISTENCY, SOIL STRUCTURE, MINERALOGY	DEPTH OF CASING, DRILLING RATE, DRILLING FLUID LOSS, TESTS AND INTRUMENTATION
0	S1	3" sonic	3'		Asphalt/Roadbase	
1						
2						
3					3.0-4.0 Dark Dry Red brown f-M silty sand, trace gravel (SM)	DPC - none
4	S-2	3" sonic			4.0-7.0 Damp Red brown f-M silty sand trace gravel SM	DPC - none
5						
6						geomembrane @ 6'

ch2m

PROJECT NUMBER: 10587 **BORING NUMBER:** BRP-12
Sheet: 2/6

SOIL BORING LOG

PROJECT: Dundalk Marine Terminal **LOCATION:** Baltimore, Maryland
ELEVATION: ~+20 **DRILLING CONTRACTOR:** ADT
DRILLING METHOD AND EQUIPMENT: Fraste Multi Drill Max 170, Sonic Sampler
WATER LEVELS: **START:** **FINISH:** **LOGGER:** Mark Chaney

DEPTH BELOW (ft)	SAMPLE			STANDARD PENETRATION TEST RESULTS	SOIL DESCRIPTION	COMMENTS
	NUMBER	TYPE	RECOVERY (ft)	6" - 6" - 6" (N)	SOIL NAME, USCS GROUP SYMBOL, COLOR, MOISTURE CONTENT, RELATIVE DENSITY OR CONSISTENCY, SOIL STRUCTURE, MINERALOGY	DEPTH OF CASING, DRILLING RATE, DRILLING FLUID LOSS, TESTS AND INTRUMENTATION
6	S-2	3" Sonic	3'	NA	6.0-7.0 Damp red brown f-M silty sand trace gravel SM	DPC - none geomembrane @ 6.0
7	S-3	3" Sonic	3'	NA	7.0-7.5 damp red brown f-M silty sand trace gravel, trace clay (SMCL)	
					7.5-9.0 Asphalt/road base concrete gray to white to black gravelly f-C sand (S)	
8						
9					9.0-10.0 Damp Red Fat clay	DPC - none pocket pen 3.75 4.0 4.25 3 readings taken @ mid point of Fat clay layer
10	SS-1			35-61/3"	Dry Dense to very dense Red brown f-M silty sand moderately indurated (SM)(HB)	DPC ++ very strong
11	S-4				10'9"-12' Dry Red brown f-M moderately indurated silty sand, some gravel (SM) (HB)	DPC+ strong
12						

ch2m

PROJECT NUMBER: 10587 **BORING NUMBER:** BRP-12
Sheet: 3/6

SOIL BORING LOG

PROJECT: Dundalk Marine Terminal **LOCATION:** Baltimore, Maryland
ELEVATION: ~+20 **DRILLING CONTRACTOR:** ADT
DRILLING METHOD AND EQUIPMENT: Fraste Multi Drill Max 170: Sonic sampling
WATER LEVELS: **START:** **FINISH:** **LOGGER:** Mark Chancy

DEPTH BELOW (ft)	SAMPLE			STANDARD PENETRATION TEST RESULTS	SOIL DESCRIPTION	COMMENTS
	NUMBER	TYPE	RECOVERY (ft)	6" - 6" - 6" (N)	SOIL NAME, USCS GROUP SYMBOL, COLOR, MOISTURE CONTENT, RELATIVE DENSITY OR CONSISTENCY, SOIL STRUCTURE, MINERALOGY	DEPTH OF CASING, DRILLING RATE, DRILLING FLUID LOSS, TESTS AND INTRUMENTATION
12	SS-2	2" OD sampler	20"	28-31 21-31	12'-14' Dry medium dense, moderately indurated f-m silty sand (SM) (HB)	DPC+ strong
13						
14	SS-3	2" OD sampler	7"	32 100/3	14-14'9" wet dense to very dense highly indurated f-M silty sand (SM) (HB)	refusal @ 14'9" DPC+ strong advanced with sonic to 16'
	S-5	3" sonic	4'	NA	14'9"-15' Moist brown with purple particles f-M silty sand (SM) (GB)	DPC+ strong Sonic sample saturated
15					15.0-16.0 Dry red brown f-m silty sand some gravel (SM) (HB)	DPC+ strong
16	SS-4	2" OD sampler	2'	71-64	16.0-17 Dry very dense Red brown f-M silty sand some gravel (SM) (HB)	DPC++ very strong
17	SS-5			33-28	17.0-18 wet med dense - dense red brown f-M silty sand trace gravel (GB) (SM)	DPC+ strong
18						

ch2m

PROJECT NUMBER: 10587 **BORING NUMBER:** BRP-12
Sheet: 4/6

SOIL BORING LOG

PROJECT: DundalkMarineTerminal **LOCATION:** Baltimore, Maryland
ELEVATION: ~+20 **DRILLING CONTRACTOR:** ADT
DRILLING METHOD AND EQUIPMENT: Fraste Multi Drill Max 170; Sonic Sampler
WATER LEVELS: **START:** - **FINISH:** 6:00pm **LOGGER:** Mark Cherry

DEPTH BELOW (ft)	SAMPLE			STANDARD PENETRATION TEST RESULTS	SOIL DESCRIPTION	COMMENTS
	NUMBER	TYPE	RECOVERY (ft)	6" - 6" - 6" (N)	SOIL NAME, USCS GROUP SYMBOL, COLOR, MOISTURE CONTENT, RELATIVE DENSITY OR CONSISTENCY, SOIL STRUCTURE, MINERALOGY	DEPTH OF CASING, DRILLING RATE, DRILLING FLUID LOSS, TESTS AND INTRUMENTATION
18	SS-6	2" OD sampler	4"	100/5	18'-18'4" wet very dense grayish brown with green particles silty sand (SM) (GB)	refusal @ 18'5" DPC ++ very strong advanced with sonic to 19'
	S-6	3" sonic	4'	NA	18'4"-19' moist Red brown with green particles f-M silty sand (GB)(SM)	DPC + strong
19	SS-7	2" OD sampler	1'	13	19.0-19.6" moist Red mottled with white Fat clay (CH)	DPC — none
					Borehole terminated @ 19.5'	pocket pen 1.75 1.25 1.50
20						6" OD casing to 19'
						Air Vwp T_0 15.9 P_0 9668
21					Thermometer Air temp = 12.2 thermistor air reading 12.8	depth
22						T_1 24.4 P_1 9172
					Vwp 1517441 Installed @ 18.0'	Slurry T_2 29.9
23					thermistor installed @ 15'	P_2 8348.
					Thermistor slurry 24.7	
24						

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BORING NO. BLP-12
SHEET 6 **OF** 6
FILE NO. 10587
SURFACE ELEV. ~+20
DATUM

PROJECT Dundalk Marine Terminal
LOCATION Baltimore, Maryland
BORING LOCATION See location Plan

TEST/INSPECTION EQUIPMENT Sonic Samp Drill Max 170; SPT sampling
REFERENCE CODES/STANDARDS

BORING EQUIPMENT AND METHODS OF STABILIZING BOREHOLE

TYPE OF BORING RIG
TRUCK
SKID
BARGE
OTHER Track

TYPE OF FEED DURING CORING
MECHANICAL
HYDRAULIC
OTHER

CASING USED ☑ YES ☐ NO
DIA., IN. DEPTH, FT. FROM TO
DIA., IN. DEPTH, FT. FROM TO
DIA., IN. DEPTH, FT. FROM TO

TYPE AND SIZE OF:
D-SAMPLER
U-SAMPLER
S-SAMPLER SS-Sampler; 2" Dia Sampler
CORE BARREL
CORE BIT
DRILL RODS
3" ID Sonic Macrocore

DRILLING MUD USED ☐ YES ☑ NO
DIAMETER OF ROTARY BIT, IN.
TYPE OF DRILLING MUD

AUGER USED ☐ YES ☑ NO
TYPE AND DIAMETER, IN.

CASING HAMMER, LBS. AVERAGE FALL, IN.
SAMPLER HAMMER, LBS. 140 AVERAGE FALL, IN. 30
TYPE OF HAMMER Automatic

WATER LEVEL OBSERVATIONS IN BOREHOLE

DATE	TIME	DEPTH OF HOLE	DEPTH OF CASING	DEPTH TO WATER	CONDITIONS OF OBSERVATION

PIEZOMETER INSTALLED ☑ YES ☐ NO **SKETCH SHOWN ON**

STANDPIPE: TYPE ID, IN. LENGTH, FT. TOP ELEV.
INTAKE ELEMENT: TYPE OD, IN. LENGTH, FT. TIP ELEV.
FILTER: MATERIAL OD, IN. LENGTH, FT. BOT. ELEV.

PAY QUANTITIES
3.5" DIA. DRY SAMPLE BORING LIN. FT.
3.5" DIA. U-SAMPLE BORING LIN. FT.
CORE DRILLING IN ROCK LIN. FT.
NO. OF 3" SHELBY TUBE SAMPLES
NO. OF 3" UNDISTURBED SAMPLES
OTHER:

BORING CONTRACTOR Aquifer Drilling and Testing
DRILLER Tony HELPERS Joseph
REMARKS 1 VWP and 1 thermistor installed
RESIDENT ENGINEER Mark Chancy DATE 12-7-15

BORING NO. BLP-12

BOR-4_JAN2013

BORING LOG

Page 1 of 2

Honeywell

Site: Dundalk Marine Terminal Boring No: BRP-12A	Northing: 574337.694 Easting: 1448099.493 Elevation: NA	Driller: Parratt Wolff, Inc. Method: Consultant: JACOBS Geologist: Jacobs	Total Depth: 20.0 feet GW Depth: Date: 07/19/2018 - 07/20/201

Depth feet	Rec	DPC	Blow Count	USCS	Soil Code	Stratum Description	Sample Comments
0	□					Asphalt	
	■	-	12-13-6				
	■	-		SP-SM		SAND (SP-SM); f-m sand, trace silt, gravel, 10 YR 3/2 (very dark grayish brown), increasing gravel content with depth, angular to subangular, dry, well graded, medium dense	
	□	-					
	■	-	2-1-3-4	ML		Clayey SILT (ML); trace fine sand, trace medium gravel, 10 YR 3/2 (very dark grayish brown), mottled with GLEY 1 2.5/N (black), moist	
	■	-					
	■	-					
	□	-					
	■	-	2-4-6-11	ML		Clayey SILT (ML); trace fine sand, trace medium gravel, 10 YR 3/2 (very dark grayish brown), mottled with GLEY 1 2.5/N (black), moist	
	■	-					
5	■	-		SP-SM		SAND (SP-SM); f-m sand, trace silt, 10 YR 4/3 (brown), dry, loose, poorly graded	
	□	-					
	■	-	28-18-50-65	SP-SM SW		SAND (SP-SM); f-m sand, trace silt, 10 YR 4/3 (brown), dry, loose, poorly graded SAND (SW); f-m sand, trace silt, gravel, weathered asphalt, GLEY 1 2.5/N (black), dry, very dense, well-graded	
	■	-					
	■	-					
	■	-					
	■	-	14-7-31-10/6				
	■	-		SW SM		SAND (SW); f-m sand, trace silt, gravel, weathered asphalt, GLEY 1 2.5/N (black), dry, very dense, well-graded Silty SAND (SM); 2.5 YR 5/8 (red), grading to silty clay	
	■	++		SP-SM		SAND (SP-SM); f-m sand, trace silt, 7.5 YR 6/8 (reddish yellow), poorly graded, dry, med. Dense	
	□	++					
10							

BORING LOG

Page 2 of 2

Honeywell

Site: Dundalk Marine Terminal Boring No: BRP-12A	Northing: 574337.694 Easting: 1448099.493 Elevation: NA	Driller: Parratt Wolff, Inc. Method: Consultant: JACOBS Geologist: Jacobs	Total Depth: 20.0 feet GW Depth: Date: 07/19/2018 - 07/20/201

Depth feet	Rec	DPC	Blow Count	USCS	Soil Code	Stratum Description	Sample Comments
10		++ ++ ++ ++	34-39-52-41	SP-SM	HB	SAND (SP-SM); f-m sand, trace silt, 10 YR 6/4 (yellowish brown) and 5 YR 4/6 (yellowish red), dry, very dense, weakly indurated	
		++ ++ ++	13-7-8-13	SP-SM	HB	SAND (SP-SM); f-m sand, trace fine gravel, silt, 2.5 Y 6/2 to 6/4, dry to moist	
		++		SP-SM	HB	SAND (SP-SM); f-m sand, trace fine gravel, silt, 5 YR 4/6 (yellowish red)	
15		++ ++	24-66-50/1	SP-SM	GB	SAND (SP-SM); f-m sand, trace silt, GLEY 1 2.5/N (black), wet, poorly graded, very dense	
		++ ++		SP-SM	HB	SAND (SP-SM); f-m sand, trace silt, 7.5 YR 6/8 (yellowish brown), weakly to strongly indurated, poorly graded, dry, dense	
		++ ++	27-26-49-39	SP-SM	HB	SAND (SP-SM); f-m sand, trace silt, trace gravel, grading to silty f-m sand, 7.5 YR 5/4 (brown), moist, well-graded, very dense	
		++ ++		SP-SM	GB	SAND (SP-SM); f-m sand, trace gravel and silt, GLEY 1 3/N (very dark gray) intermixed with 2.5 Y 5/3 (olive brown), dry, very dense, poorly graded, weakly indurated	
		++	14-16-13-5	SM	GB	SAND with silt (SM); f-c sand, trace gravel, GLEY 1 3/N (very dark gray), moist, poorly graded, weakly indurated	
		++		SM	GB	SAND with silt (SM); f-c sand, trace gravel, GLEY 1 3/N (very dark gray), moist, poorly graded, weakly indurated	
		++		SM	GB	SAND with silt (SM); f-c sand, trace gravel, GLEY 1 3/N (very dark gray), moist, poorly graded, weakly indurated	
		++		SM	GB	SAND with silt (SM); f-c sand, trace gravel, GLEY 1 3/N (very dark gray), moist, poorly graded, weakly indurated	
20.0				CL		CLAY (CL); trace f-m sand, 2.5 YR 4/6 (red)	

ch2m.

PROJECT NUMBER: 10587 **BORING NUMBER:** BRP-13
Sheet: 1/5

SOIL BORING LOG

PROJECT: Dundalk Marine Terminal **LOCATION:** Baltimore, Maryland
ELEVATION: ~20 **DRILLING CONTRACTOR:** ADT
DRILLING METHOD AND EQUIPMENT: Fraste Multi Drill Max 170; Sonic Sampler
WATER LEVELS: **START:** 10:45 **FINISH:** **LOGGER:** Mark Chaney

DEPTH BELOW (ft)	SAMPLE			STANDARD PENETRATION TEST RESULTS	SOIL DESCRIPTION	COMMENTS
	NUMBER	TYPE	RECOVERY (ft)	6" - 6" - 6" (N)	SOIL NAME, USCS GROUP SYMBOL, COLOR, MOISTURE CONTENT, RELATIVE DENSITY OR CONSISTENCY, SOIL STRUCTURE, MINERALOGY	DEPTH OF CASING, DRILLING RATE, DRILLING FLUID LOSS, TESTS AND INTRUMENTATION
0	S-1	3" Sonic	1.5'	NA	Asphalt/Road base	
1						
2						
3						
					Bot 6" Dry red brown silty f-M sand trace gravel SM.	PPL –
4	S-2	3" Sonic			4.0-6.0 Dry red brown silty f-M sand trace gravel SM	PPL –
5						geo membrane @ 5'
6						

ch2m:

PROJECT NUMBER: 10587 **BORING NUMBER:** BRP-13
Sheet: 2/5

SOIL BORING LOG

PROJECT: Dundalk Marine Terminal **LOCATION:** Baltimore, Maryland
ELEVATION: ~20 **DRILLING CONTRACTOR:** ADT
DRILLING METHOD AND EQUIPMENT: Fraste MultiDrill Max 170: Sonic Sampler
WATER LEVELS: **START:** **FINISH:** **LOGGER:** Mark Chaney

DEPTH BELOW (ft)	SAMPLE			STANDARD PENETRATION TEST RESULTS	SOIL DESCRIPTION	COMMENTS
	NUMBER	TYPE	RECOVERY (ft)	6" - 6" - 6" (N)	SOIL NAME, USCS GROUP SYMBOL, COLOR, MOISTURE CONTENT, RELATIVE DENSITY OR CONSISTENCY, SOIL STRUCTURE, MINERALOGY	DEPTH OF CASING, DRILLING RATE, DRILLING FLUID LOSS, TESTS AND INTRUMENTATION
6				NA	6.0-7.0 Road base/Asphalt with red brown f-M silty sand trace gravel (SM)	DPC - none
7	S-3	3" Sonic	3'	NA	7.0-8.0 Dry Red mottled with white Fat clay (CH)	DPC - none
8					8.0-9.0 Dry Red brown f-M silty sand trace gravel with concrete (SM)	DPC - none
9					9.0-10.0 Dry l brown f-C silty sand with white particles (SM)	DPC - none
10	SS-1	2" OD	1'	20-10 71-100/3	Dry red with orange particles mod-highly indurated f-M silty sand trace gravel (SM) (HB) Medium dense to very dense	DPC + Strong refusal at 11'3" Advanced with sonic to 13'
11						
12	S-4	3" Sonic		NA	Dry red with orange particles f-M silty Sand with gravel (SM) (HB)	DPC + Strong

ch2m:

PROJECT NUMBER: 10587 **BORING NUMBER:** BPP-13
Sheet: 3/5

SOIL BORING LOG

PROJECT: Dundalk Marine Terminal **LOCATION:** Baltimore, Maryland
ELEVATION: ~20 **DRILLING CONTRACTOR:** ADT
DRILLING METHOD AND EQUIPMENT: Fraste Multi drill max 170; Sonic Sampler
WATER LEVELS: **START:** **FINISH:** **LOGGER:** Mark Chavez

DEPTH BELOW (ft)	SAMPLE			STANDARD PENETRATION TEST RESULTS	SOIL DESCRIPTION	COMMENTS
	NUMBER	TYPE	RECOVERY (ft)	6" - 6" - 6" (N)	SOIL NAME, USCS GROUP SYMBOL, COLOR, MOISTURE CONTENT, RELATIVE DENSITY OR CONSISTENCY, SOIL STRUCTURE, MINERALOGY	DEPTH OF CASING, DRILLING RATE, DRILLING FLUID LOSS, TESTS AND INTRUMENTATION
12	S4	3" Sonic	2.5'	NA	Dry red brown f-M silty sand with gravel (SM) (HB)	sonic from 11'3"-13' DPC ++ very strong
13	SS-2	2" OD sampler	1.5'	10-6 7-35	Top 4" Dry red brown f-M silty sand with gravel (SM)(HB)	DPC + strong
14					bott 14" Moist dark brown with purple and green f-M silty sand (GB) (SM)	DPC ++ very strong
15	SS-3	2" OD sampler	3"	36-100/3	Moist red brown f-M silty sand Moderate to highly indurated (SM)(HB)	DPC + strong refusal @ 15'9"
	S-5	3" Sonic	3'	NA	15'9"-17.0' Dry red brown f-C silty sand with gravel (SM) (HB)	advanced DPC ++ very strong
16						
17	SS-4	2" OD Sampler	2'	44-44	17.0-18.0 Moist Medium dense moderately indurated f-M silty sand, trace gravel	DPC ++ very strong
18						

ch2m.

PROJECT NUMBER: 10587 **BORING NUMBER:** BRP-13

Sheet: 4/6

SOIL BORING LOG

PROJECT: Dundalk Marine Terminal **LOCATION:** Baltimore, Maryland
ELEVATION: ~+20 **DRILLING CONTRACTOR:** ADT
DRILLING METHOD AND EQUIPMENT: Frast Multidrill max 170 ; Sonic Sampler
WATER LEVELS: **START:** **FINISH:** 2:10pm **LOGGER:** Mark Chancy

DEPTH BELOW (ft)	SAMPLE			STANDARD PENETRATION TEST RESULTS	SOIL DESCRIPTION	COMMENTS
	NUMBER	TYPE	RECOVERY (ft)	6" - 6" - 6" (N)	SOIL NAME, USCS GROUP SYMBOL, COLOR, MOISTURE CONTENT, RELATIVE DENSITY OR CONSISTENCY, SOIL STRUCTURE, MINERALOGY	DEPTH OF CASING, DRILLING RATE, DRILLING FLUID LOSS, TESTS AND INTRUMENTATION
18	SS-5	2" OD Sampler	2'	22-11	18.0-19.0 Moist red brown Med dense f-M silty sand; trace clay SM (GB)	DPC + strong
19	SS-6	2" OD Sampler	2'	27	19'-19.5' Moist red brown Med dense f-M silty Sand trace clay (SM) (GB)	Sampled from 19-19.5' DPC + strong
	SS-7	2" OD Sampler		100/3"	19.5'-19.75' Dry Very dense red mottled with white Fat clay (CH)	DPC - none
20						pocket pen reading of 2.25 tsf 2 readings of 2.25
21						Boring terminated @ 19.75' 1" PVC sleeve installed @ 19.5'
22						Vwp installed @ 18.5' thermistor installed @ 15'
23						6" OD casing to 19.5'
24						

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BORING NO. BRP-13
SHEET 6 **OF** 6
FILE NO. 10587
SURFACE ELEV. ~+20
DATUM

PROJECT Dundalk Marine Terminal
LOCATION Baltimore, Maryland
BORING LOCATION See location Plan

TEST/INSPECTION EQUIPMENT Frost Multi drill max 170; Sonic sampler
REFERENCE CODES/STANDARDS

BORING EQUIPMENT AND METHODS OF STABILIZING BOREHOLE

TYPE OF BORING RIG
TRUCK
SKID
BARGE
OTHER Track

TYPE OF FEED DURING CORING
MECHANICAL
HYDRAULIC
OTHER

CASING USED ☑ YES ☐ NO
DIA., IN. 6" OD DEPTH, FT. FROM 0 TO 19.5'
DIA., IN. DEPTH, FT. FROM TO
DIA., IN. DEPTH, FT. FROM TO

TYPE AND SIZE OF:
D-SAMPLER
U-SAMPLER
S-SAMPLER SS-Sampler; 2" Dia Sampler
CORE BARREL
CORE BIT
DRILL RODS
3" ID Sonic Macrocore

DRILLING MUD USED ☐ YES ☑ NO
DIAMETER OF ROTARY BIT, IN.
TYPE OF DRILLING MUD

AUGER USED ☐ YES ☑ NO
TYPE AND DIAMETER, IN.

CASING HAMMER, LBS. AVERAGE FALL, IN.
SAMPLER HAMMER, LBS. 140 AVERAGE FALL, IN. 30
TYPE OF HAMMER Automatic

WATER LEVEL OBSERVATIONS IN BOREHOLE

DATE	TIME	DEPTH OF HOLE	DEPTH OF CASING	DEPTH TO WATER	CONDITIONS OF OBSERVATION

PIEZOMETER INSTALLED ☑ YES ☐ NO SKETCH SHOWN ON Pg 5/6

STANDPIPE: TYPE ID, IN. LENGTH, FT. TOP ELEV.
INTAKE ELEMENT: TYPE OD, IN. LENGTH, FT. TIP ELEV.
FILTER: MATERIAL OD, IN. LENGTH, FT. BOT. ELEV.

PAY QUANTITIES
3.5" DIA. DRY SAMPLE BORING LIN. FT.
3.5" DIA. U-SAMPLE BORING LIN. FT.
CORE DRILLING IN ROCK LIN. FT.
NO. OF 3" SHELBY TUBE SAMPLES
NO. OF 3" UNDISTURBED SAMPLES
OTHER:

BORING CONTRACTOR Aquifer Drilling & Testing
DRILLER Tony HELPERS Joseph
REMARKS 1 vwp & 1 thermistor installed, grouted in place
RESIDENT ENGINEER Mark Chaney DATE 12-7-15

BORING NO. BRP-13

BOR-4_JAN2013

ch2m

PROJECT NUMBER:
BORING NUMBER: BRP-14
Sheet: 1

SOIL BORING LOG

PROJECT: Honeywell DMT SSD
LOCATION:
ELEVATION:
DRILLING CONTRACTOR: Aquifer drilling and testing, Inc.
DRILLING METHOD AND EQUIPMENT: Sonic Samp Drill Max 170; SPT sampling
WATER LEVELS:
START: 12/9/15
FINISH:
LOGGER: K.Chaturvedula

DEPTH BELOW (ft)	SAMPLE			STANDARD PENETRATION TEST RESULTS	SOIL DESCRIPTION	COMMENTS
	NUMBER	TYPE	RECOVERY (ft)	6" - 6" - 6" (N)	SOIL NAME, USCS GROUP SYMBOL, COLOR, MOISTURE CONTENT, RELATIVE DENSITY OR CONSISTENCY, SOIL STRUCTURE, MINERALOGY	DEPTH OF CASING, DRILLING RATE, DRILLING FLUID LOSS, TESTS AND INTRUMENTATION
0					3" Asphalt 0.25' - Silty SAND with gravel (SM), gray-brown (7.5YR 4/2), dry, medium to Coarse grained Sand	Advanced the hole from 0'-10' using 3" ID Sonic macro core. DPC –
1						
	S-1	SONIC MACRO CORE	40"	—		
2						
3						DPC -
4					4.0'-5.0' - same as above	DPC -
5	S-2	SONIC MACRO CORE	36"	—	5.3' - clayey SAND (SC) with gravel, gray-brown (7.5YR 4/2), wet, fine to medium grained sand.	DPC -
6					6.0' - Polyethylene liner	

ch2m.

PROJECT NUMBER: **BORING NUMBER:** BRP-14
Sheet: 2

SOIL BORING LOG

PROJECT: **LOCATION:**
ELEVATION: **DRILLING CONTRACTOR:**
DRILLING METHOD AND EQUIPMENT:
WATER LEVELS: **START:** **FINISH:** **LOGGER:**

DEPTH BELOW (ft)	SAMPLE			STANDARD PENETRATION TEST RESULTS	SOIL DESCRIPTION	COMMENTS
	NUMBER	TYPE	RECOVERY (ft)	6" - 6" - 6" (N)	SOIL NAME, USCS GROUP SYMBOL, COLOR, MOISTURE CONTENT, RELATIVE DENSITY OR CONSISTENCY, SOIL STRUCTURE, MINERALOGY	DEPTH OF CASING, DRILLING RATE, DRILLING FLUID LOSS, TESTS AND INTRUMENTATION
6	S-2	Sonic Macro core		–	6.0' – Silty SAND with gravel (SM), Red-Brown (7.5YR 4/4), dry, fine to medium grained sand	DPC –
7	S-3	SONIC MACRO CORE	28"	–	7.0' – clayey SAND (SC), gray-brown (7.5YR 4/2), wet, fine to medium grained sand, trace gravel 7.8' – 2" Asphalt 8.0' – Poorly graded GRAVEL with Sand (GP), dry, coarse grained sand mixed with layer of crushed asphalt.	DPC – DPC –
8						
9						
10	SS-4	SS	21"	4 9 14 50/4"	10.0' – Poorly graded SAND (SP) with gravel, gray (7.5YR 5/1), dry, medium grained sand 10.75' - 11.2' – Silty SAND (SM), Red (10Y4/4), moist, fine to medium grained sand 11.2' - 11.9' – Fat CLAY (CH), Red (10Y4/4), very stiff, medium plasticity, moist	10.0' - 6" OD outercasing installed to 10' bgs. 10.5' - below 10' switched to SS sampling 140-lb hammer; 30-in. drop; 3" dia sampler. DPC – DPC –
11						
12						HB COPR encountered at the bottom of the spoon

ch2m

PROJECT NUMBER:

BORING NUMBER: BRP-14

Sheet: 3

SOIL BORING LOG

PROJECT:
LOCATION:
ELEVATION:
DRILLING CONTRACTOR:
DRILLING METHOD AND EQUIPMENT:
WATER LEVELS:
START:
FINISH:
LOGGER:

DEPTH BELOW (ft)	SAMPLE			STANDARD PENETRATION TEST RESULTS	SOIL DESCRIPTION	COMMENTS
	NUMBER	TYPE	RECOVERY (ft)	6" - 6" - 6" (N)	SOIL NAME, USCS GROUP SYMBOL, COLOR, MOISTURE CONTENT, RELATIVE DENSITY OR CONSISTENCY, SOIL STRUCTURE, MINERALOGY	DEPTH OF CASING, DRILLING RATE, DRILLING FLUID LOSS, TESTS AND INTRUMENTATION
12	S-5	SONIC MACRO CORE	12"	-	12.0'- Silty SAND (SM), Red-Brown-greenish (7.5YR 4/3), dry, fine to medium grained sand, Particulate to moderately indurated, bright green particles (HB COPR)	12.0'- SS refusal; Advanced the Borehole to 13' bgs using 3" ID Sonic macro core. DPC +
13	SS-6	SS	NR	50/4"	NO Recovery	13.0'- SS refusal; Advanced the borehole to 15' bgs using 3" ID Sonic macro core.
14	S-7	SONIC MACRO CORE	24"	—	Same as above	
15	SS8	SS	2"	50/2"	Same as above, wet	15.0'- 6" OD outer casing installed to 15' bgs.
16	S-9	Sonic macro core	23"	-	15.8'-16.0'- Poorly graded SAND with silt (SP-SM), wet, medium to coarse grained Sand, particulate, bright green particles (GB COPR) 16.0'- Silty SAND (SM), Red-Brown-greenish (7.5YR 4/3), dry, fine to medium grained sand, particulate to moderately indurated (HB COPR)	15.0'- SS refusal; Advanced the borehole to 17' bgs using 3" ID sonic macro core. -15.0'- groundwater encountered at 15.0' bgs during drilling. DPC +
17	SS-10	SS	6"	22 50/2"	17.0'- GB COPR layer; wet 17.3'- HB COPR, moderately to highly indurated, dry	DPC +
17.6' 18	S-11	Sonic macro core			Same as above	SS refusal; Advanced the borehole to 19' bgs using 3" ID sonic macro core.

ch2m:

PROJECT NUMBER:

BORING NUMBER: BRP-14

Sheet: 4

SOIL BORING LOG

PROJECT:

LOCATION:

ELEVATION:

DRILLING CONTRACTOR:

DRILLING METHOD AND EQUIPMENT:

WATER LEVELS:

START:

FINISH:

LOGGER:

DEPTH BELOW (ft)	SAMPLE			STANDARD PENETRATION TEST RESULTS	SOIL DESCRIPTION	COMMENTS
	NUMBER	TYPE	RECOVERY (ft)	6" - 6" - 6" (N)	SOIL NAME, USCS GROUP SYMBOL, COLOR, MOISTURE CONTENT, RELATIVE DENSITY OR CONSISTENCY, SOIL STRUCTURE, MINERALOGY	DEPTH OF CASING, DRILLING RATE, DRILLING FLUID LOSS, TESTS AND INTRUMENTATION
18	S-11	sonic macro core	18"	–		DPC+
19	SS-12	SS	4"	50/4"	19.0'- Same as above, highly indurated	19.0'- SS refusal; sonic sample to 20' bgs.
	S-13	sonic macro core	6"	–	19.5'- Same as above.	DPC+
20	SS-14	SS	6"	14	20.0'- Lean CLAY (CL), Red-White (10Y4/1), dry, very stiff, low plasticity	20.0'- 6" OD outer casing installed to 20' bgs
21.5'					Bottom of boring @ 20.5' bgs	
						1" PVC installed to 20. '
					Thermometer Air temp = 12.6°	Vwp installed at 19.5'
					Thermistor Air temp = 17.9	Thermistor installed at 17" Interface of HB/GB Copr
					Thermistor Slurry temp	~~Air~~ Vwp Air T_0 17.6 P_0 9773
						depth T_1 20.5 P_1 9672
						Slurry T_2 P_2

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BORING NO. BRP-14
SHEET 65 **OF**
PROJECT DUNDALK MARINE TERMINAL
FILE NO. 10587
LOCATION BALTIMORE, MARYLAND
SURFACE ELEV.
BORING LOCATION
DATUM

TEST/INSPECTION EQUIPMENT SONIC SAMP DRILL MAY 170; SPT sampling
REFERENCE CODES/STANDARDS

BORING EQUIPMENT AND METHODS OF STABILIZING BOREHOLE

TYPE OF BORING RIG
TRUCK
SKID
BARGE
OTHER tracks

TYPE OF FEED DURING CORING
MECHANICAL
HYDRAULIC
OTHER

CASING USED ☑ YES ☐ NO
DIA., IN. 6" DEPTH, FT. FROM 0 TO 20'
DIA., IN. DEPTH, FT. FROM TO
DIA., IN. DEPTH, FT. FROM TO

TYPE AND SIZE OF:
D-SAMPLER
U-SAMPLER
S-SAMPLER SS sampler - 3" dia. sampler
CORE BARREL
CORE BIT
DRILL RODS

SONIC MACRO CORE - 3" RD

DRILLING MUD USED ☐ YES ☑ NO
DIAMETER OF ROTARY BIT, IN.
TYPE OF DRILLING MUD

AUGER USED ☐ YES ☑ NO
TYPE AND DIAMETER, IN.

CASING HAMMER, LBS. AVERAGE FALL, IN.
SAMPLER HAMMER, LBS. 140 AVERAGE FALL, IN. 30
TYPE OF HAMMER Automatic

WATER LEVEL OBSERVATIONS IN BOREHOLE

DATE	TIME	DEPTH OF HOLE	DEPTH OF CASING	DEPTH TO WATER	CONDITIONS OF OBSERVATION
12/9/15	11:40	15.2'	15.0	15.0'	encountered during drilling.

PIEZOMETER INSTALLED ☑ YES ☐ NO **SKETCH SHOWN ON** VWP installation log

STANDPIPE: TYPE ID, IN. LENGTH, FT. TOP ELEV.
INTAKE ELEMENT: TYPE OD, IN. LENGTH, FT. TIP ELEV.
FILTER: MATERIAL OD, IN. LENGTH, FT. BOT. ELEV.

PAY QUANTITIES
3.5" DIA. DRY SAMPLE BORING LIN. FT.
3.5" DIA. U-SAMPLE BORING LIN. FT.
CORE DRILLING IN ROCK LIN. FT.
NO. OF 3" SHELBY TUBE SAMPLES
NO. OF 3" UNDISTURBED SAMPLES
OTHER:

BORING CONTRACTOR Aquifer Drilling and testing, Inc.
DRILLER Brian Karshick **HELPERS** Chris Phelan
REMARKS Instrumentation Installed
RESIDENT ENGINEER K. Chaturvedula **DATE** 12/9/15

BORING NO. BRP-14

ch2m

PROJECT NUMBER: [redacted]

BORING NUMBER: BRP-16

Sheet: 1

SOIL BORING LOG

PROJECT: DUNDALK MARINE TERMINAL **LOCATION:** SEE PLAN

ELEVATION: ~ +13 **DRILLING CONTRACTOR:** SDS

DRILLING METHOD AND EQUIPMENT: FRASTE MULTIDRILL XL MAX 170

WATER LEVELS: **START:** 11/3/15 1040 **FINISH:** 11/3/15 12:05 **LOGGER:** L. LINCOLN/ K. Chaturvedula

DEPTH BELOW (ft)	SAMPLE			STANDARD PENETRATION TEST RESULTS	SOIL DESCRIPTION	COMMENTS
	NUMBER	TYPE	RECOVERY (ft)	6" - 6" - 6" (N)	SOIL NAME, USCS GROUP SYMBOL, COLOR, MOISTURE CONTENT, RELATIVE DENSITY OR CONSISTENCY, SOIL STRUCTURE, MINERALOGY	DEPTH OF CASING, DRILLING RATE, DRILLING FLUID LOSS, TESTS AND INTRUMENTATION
0	S-1	SONIC MACRO CORE	14"		4" ASPHALT 4" CONCRETE BRN, DK GRY F-M SAND, SM SILT, GVL (FILL)	NO DPC
1	[illegible]			[illegible] [illegible]		
2	SS-2	SS	5"	7 4	2-3' RED-BRN, DK GRY C-F SAND, SM GVL, TR SILT, PLANT FIBERS (FILL)	
3	SS-3	SS		10 10	3-3.2 GRY C SAND (FILL) 3.2-3.7 RED CLY, MOTT WHITE 3.7-4.0 BRN, DK GRY, MOD. LITHIFIED SILTY F-C SAND, TR GVL (HB)	DPC+
4	SS-4	SS	NR	4 5	No Recovery	
5	SS-5	SS	12"	13 18	5.0'-6.0' Fat CLAY (CH), Red (10Y 7/4), highly plastic, soft to stiff.	NO DPC
6						

ch2m

PROJECT NUMBER:

BORING NUMBER: BRP-16

Sheet: 2

SOIL BORING LOG

PROJECT:

LOCATION:

ELEVATION:

DRILLING CONTRACTOR:

DRILLING METHOD AND EQUIPMENT:

WATER LEVELS:

START:

FINISH:

LOGGER:

DEPTH BELOW (ft)	SAMPLE			STANDARD PENETRATION TEST RESULTS	SOIL DESCRIPTION	COMMENTS
	NUMBER	TYPE	RECOVERY (ft)	6" - 6" - 6" (N)	SOIL NAME, USCS GROUP SYMBOL, COLOR, MOISTURE CONTENT, RELATIVE DENSITY OR CONSISTENCY, SOIL STRUCTURE, MINERALOGY	DEPTH OF CASING, DRILLING RATE, DRILLING FLUID LOSS, TESTS AND INTRUMENTATION
6	SS-6	SS	12"	42 31	Silty SAND (SM), Reddish-Brown and green (10YR 4/4), moist, Particulate ~~do~~ to slightly Indurated (HB COPR)	DPC-1
7	SS-7	SS	7"	17 21	Same as above	
8	SS-8	SS	12"	20 18	same as above 8.8' - silty sand (SM), dark gray - black (N2), wet, Particulate (GB COPR)	8.0': water encountered during drilling at 8.0' bgs
9	SS-9	SS	6"	31	9.6' - silty SAND (SM), brown-greenish gray (10YR 4/3), wet, Particulate (COPR)	
	SS-10	SS	6"	35	same as above 9.9' - Poorly graded SAND with silt (SP-SM) dark gray - black (N2), wet, Particulate (GB COPR)	
10	SS-11	SS	6"	61	Same as Above	
	SS-12	SS	6"	33	same as above	
11	SS-13	SS	6"	28	silty SAND (SM), brown-greenish gray (10YR 4/3), wet, Particulate (COPR)	
	SS-14	SS	6"	17	Same as above	
12						

ch2m

PROJECT NUMBER:

BORING NUMBER: BRP-16
Sheet: 3

SOIL BORING LOG

PROJECT:
LOCATION:
ELEVATION:
DRILLING CONTRACTOR:
DRILLING METHOD AND EQUIPMENT:
WATER LEVELS:
START:
FINISH:
LOGGER:

DEPTH BELOW (ft)	SAMPLE			STANDARD PENETRATION TEST RESULTS	SOIL DESCRIPTION	COMMENTS
	NUMBER	TYPE	RECOVERY (ft)	6" - 6" - 6" (N)	SOIL NAME, USCS GROUP SYMBOL, COLOR, MOISTURE CONTENT, RELATIVE DENSITY OR CONSISTENCY, SOIL STRUCTURE, MINERALOGY	DEPTH OF CASING, DRILLING RATE, DRILLING FLUID LOSS, TESTS AND INTRUMENTATION
12	SS-15	SS	4"	11	Poorly graded SAND with silt (SP-SM), dark gray and black (N2), wet, Particulate (GB COPR)	
	SS-16	SS	NR	13	No Recovery	
13	SS-17	SS	6"	18	13.0'-13.3' - Same as SS-15 13.3'-13.5' - Sandy CLAY (CL), Red (10R 4/4), wet,	
					Bottom of boring at 13.5 bgs.	
14						

ch2m

PROJECT NUMBER:

BORING NUMBER: BRP-17

Sheet: 1

SOIL BORING LOG

PROJECT: Honeywell DNT SSI

LOCATION:

ELEVATION:

DRILLING CONTRACTOR: Aquifer drilling and testing Inc.

DRILLING METHOD AND EQUIPMENT: SONIC SAMP DRILL MAX 170, SPT SAMPLING

WATER LEVELS:

START: 11/3/15 08:40

FINISH: 11/3/15 10:43

LOGGER: K.Chaturvedula

DEPTH BELOW (ft)	SAMPLE			STANDARD PENETRATION TEST RESULTS	SOIL DESCRIPTION	COMMENTS
	NUMBER	TYPE	RECOVERY (ft)	6" - 6" - 6" (N)	SOIL NAME, USCS GROUP SYMBOL, COLOR, MOISTURE CONTENT, RELATIVE DENSITY OR CONSISTENCY, SOIL STRUCTURE, MINERALOGY	DEPTH OF CASING, DRILLING RATE, DRILLING FLUID LOSS, TESTS AND INTRUMENTATION
0 1 2	S-1	SONIC MACRO CORE	12"	-	4" Asphalt 0.3'-1.0'- Concrete 1.0'-3.0'- Alternating layers of Silty SAND (SM), gray-black (10YR 4/3) dry and Asphalt -	Advanced the top 3' with the 3" ID Sonic macro core 3.0'- Below 3' switched to SS sampling; 140-lb hammer, 30-in drop; 2" dia. sample
3	SS-2	SS	7"	27 21	3.0'-3.4'- Poorly graded SAND (SP) tan-gray (10YR 7/2), moist, Medium to coarse grained Sand 3.4'- Well graded GRAVEL with Sand and Clay (GP). Red and Black, moist, fine to medium grained sand	3.4'- Piece of woven geotextile encountered in the spoon. -5
4	SS-3	SS	12"	17 11	4.0'- Poorly graded SAND with gravel (SP), dark Black (10YR 2/1), dry, medium to coarse grained sand. 4.3'- Fat CLAY (CH), Red (10Y 4/6), moist, highly plastic	
5 6	SS-4	SS	7"	24 21	5.6'- ~~[illegible]~~ Silty SAND (SM), Brown, Reddish-green (10YR 4/4), dry, fine to medium grained sand, Particulate to slightly indurated (COPR)	Tested the sample with diphenyl carbazide Installed the 6" OD outer casing to depth of 5' bgs

ch2m

PROJECT NUMBER:

BORING NUMBER: BRP-17

Sheet: 2

SOIL BORING LOG

PROJECT:

LOCATION:

ELEVATION:

DRILLING CONTRACTOR:

DRILLING METHOD AND EQUIPMENT:

WATER LEVELS:

START:

FINISH:

LOGGER:

DEPTH BELOW (ft)	SAMPLE			STANDARD PENETRATION TEST RESULTS	SOIL DESCRIPTION	COMMENTS
	NUMBER	TYPE	RECOVERY (ft)	6" - 6" - 6" (N)	SOIL NAME, USCS GROUP SYMBOL, COLOR, MOISTURE CONTENT, RELATIVE DENSITY OR CONSISTENCY, SOIL STRUCTURE, MINERALOGY	DEPTH OF CASING, DRILLING RATE, DRILLING FLUID LOSS, TESTS AND INTRUMENTATION
6	SS-5	SS	12"	11 24	Poorly graded SAND with Silt (SP-SM), dark gray and black (N2), wet, particulate (GB COPR)	
7	SS-6	SS	2"	50/2"	7.0' - silty SAND (SM), Red-Brown and greenish (10YR 4/4), dry, fine to medium sand, Particulate (UG COPR)	
8	SS-7	SS	12"	50 100	Same as above, wet, slightly to moderately indurated	8.0' - ground water encountered at 8.0' bgs during drilling
9	SS-8	SS	NR	100/4"	~~Same as above~~ NO Recovery	- Advanced the sonic macro core 3" ID to 10.0' bgs - Also advanced the 6" OD outer casing down to 10' bgs
	S9	S	6"	-	Same as above, dry (SS-7)	
10	SS-10	SS	6"	87	Same as above	
	SS-11	SS	NR	50/2"	No Recovery	Advanced sonic macro core to 11.0' bgs
11	SS-12	SS	6"	53	Same as above (SS-10)	-
	SS-13	SS	6"	41	Same as above	
12						

ch2m

PROJECT NUMBER:

BORING NUMBER: BRR-17
Sheet: 3

SOIL BORING LOG

PROJECT:
LOCATION:
ELEVATION:
DRILLING CONTRACTOR:
DRILLING METHOD AND EQUIPMENT:
WATER LEVELS:
START:
FINISH:
LOGGER:

DEPTH BELOW (ft)	SAMPLE			STANDARD PENETRATION TEST RESULTS	SOIL DESCRIPTION	COMMENTS
	NUMBER	TYPE	RECOVERY (ft)	6" - 6" - 6" (N)	SOIL NAME, USCS GROUP SYMBOL, COLOR, MOISTURE CONTENT, RELATIVE DENSITY OR CONSISTENCY, SOIL STRUCTURE, MINERALOGY	DEPTH OF CASING, DRILLING RATE, DRILLING FLUID LOSS, TESTS AND INTRUMENTATION
12	SS-14	SS	4"	18	Same as above, wet	
	SS-15	SS	NR	10	No Recovery	sample bag added
13	SS-16	SS	6"	9	Poorly graded SAND with silt (SP-SM), dark gray - black (N2), wet, medium grained sand, Particulate. (GB COPR)	
	SS-17	SS	6"	4	13.5'-13.7' same as above 13.7'-14.0' - Fat CLAY (CH), Red (10YR 4/4) wet, highly plastic	
14					Bottom of Boring at 14.0' bgs	
15						
16						

ch2m.

PROJECT NUMBER: BORING NUMBER: BRP-18
Sheet: 1

SOIL BORING LOG

PROJECT: Honeywell DMT SSI
LOCATION:
ELEVATION:
DRILLING CONTRACTOR: Aquifer Drilling and Testing, Inc.
DRILLING METHOD AND EQUIPMENT: Sonic SAMP DRILL MAX 170, SPT-Sampling
WATER LEVELS:
START: 11/16/15 07:23
FINISH: 11/17/15 10:15
LOGGER: K. Chaturvedula

DEPTH BELOW (ft)	SAMPLE			STANDARD PENETRATION TEST RESULTS	SOIL DESCRIPTION	COMMENTS
	NUMBER	TYPE	RECOVERY (ft)	6" - 6" - 6" (N)	SOIL NAME, USCS GROUP SYMBOL, COLOR, MOISTURE CONTENT, RELATIVE DENSITY OR CONSISTENCY, SOIL STRUCTURE, MINERALOGY	DEPTH OF CASING, DRILLING RATE, DRILLING FLUID LOSS, TESTS AND INTRUMENTATION
0					5" Asphalt	Advanced the between 0'-10' using Sonic macro core 3" ID
					Silty SAND with gravel (SM), gray-brown (7.5YR 4/4), moist, fine to medium grained sand.	DPC –
1	S-1	SONIC MACRO CORE	36"	–		
2					2.0' - increase in gravel content	DPC –
3						
4					4.0' - 5.0' - Same as above, dry	DPC –
	S-2	SONIC MACRO CORE	36"	–		
5					5.0' - Silty SAND (SM), Red (10Y 4/6), moist, fine grained sand.	DPC –
					5.75' - Sandy CLAY (CL), dark gray-brown (7.5YR 3/2), moist, stiff	
6						

ch2m

PROJECT NUMBER:

BORING NUMBER: BRP-18
Sheet: 2

SOIL BORING LOG

PROJECT:
LOCATION:
ELEVATION:
DRILLING CONTRACTOR:
DRILLING METHOD AND EQUIPMENT:
WATER LEVELS:
START:
FINISH:
LOGGER:

DEPTH BELOW (ft)	SAMPLE			STANDARD PENETRATION TEST RESULTS	SOIL DESCRIPTION	COMMENTS
	NUMBER	TYPE	RECOVERY (ft)	6" - 6" - 6" (N)	SOIL NAME, USCS GROUP SYMBOL, COLOR, MOISTURE CONTENT, RELATIVE DENSITY OR CONSISTENCY, SOIL STRUCTURE, MINERALOGY	DEPTH OF CASING, DRILLING RATE, DRILLING FLUID LOSS, TESTS AND INTRUMENTATION
6						
	S-2			-	6.5' - same as above, wet, with gravel	DPC -
7					7.0' - 7.75' - same as above, pockets of COPR material	DPC +/-
					7.75' - Poorly graded SAND with Silt (SP-SM), dark gray - black (N2), moist bright green particles. (GB COPR) particulate	DPC +
8	S-3	SONIC MACRO CORE	36"	-		
9						
						10.0' 6" OD outer casing advanced to 10' bgs
10				11	10.0' - same as above, wet	DPC +
				18		
	SS4	SS	24"			
11				26	11.0' - 11.5' - Same as above, bright green and dark gray	DPC +
				26	11.5' - Poorly graded sand with gravel (SP), tan - Brown (10YR 6/4), moist, medium grained sand	DPC +
12						

ch2m

PROJECT NUMBER:

BORING NUMBER: BRP-18

Sheet: 3

SOIL BORING LOG

PROJECT:

LOCATION:

ELEVATION:

DRILLING CONTRACTOR:

DRILLING METHOD AND EQUIPMENT:

WATER LEVELS:

START:

FINISH:

LOGGER:

DEPTH BELOW (ft)	SAMPLE			STANDARD PENETRATION TEST RESULTS	SOIL DESCRIPTION	COMMENTS
	NUMBER	TYPE	RECOVERY (ft)	6" - 6" - 6" (N)	SOIL NAME, USCS GROUP SYMBOL, COLOR, MOISTURE CONTENT, RELATIVE DENSITY OR CONSISTENCY, SOIL STRUCTURE, MINERALOGY	DEPTH OF CASING, DRILLING RATE, DRILLING FLUID LOSS, TESTS AND INTRUMENTATION
12	SS-5	SS	12"	6 7	12.0' - Same as above, trace gravel 12.5' - Poorly graded sand with clay (SP-SC), gray-Brown (10YR 6/4), moist, medium to coarse grained sand	DPC -
13	SS-6	SS	6"	9	same as above, wet	DPC -
	SS-7	SS	6"	11	13.5' - Poorly graded SAND (SP), gray Brown (10YR 6/4), moist, medium to coarse grained sand, trace clay	DPC -
14	SS-8	SS	6"	7	Same as above, increase in fines content	DPC -
	SS-9	SS	6"	15	Same as above	DPC -
15	SS-10	SS	12"	WOH 5	Poorly graded SAND with silt (SP-SM), dark gray-black (N2), wet, Pockets of soft clay (GB COPR) 15.75' - Fat CLAY (CH), gray (GLEY1 6/10Y), wet, highly plastic, mixed with GB COPR	15.0' - Advanced the 6" OD outer casing to 15' bgs. DPC + DPC +
16	SS-11	SS	6"	8	Poorly graded sand ~~case~~ (SP), dark gray (10YR 4/1), wet, Pockets of soft clay	DPC —
	SS-12	SS	6"	8	Same as above	DPC -
17	SS-13	SS	6"	10	Same as above, contains roots	17.0' - encountered water at 17.0' during drilling.
	SS-14	SS	6"	10	Same as above, contains roots, trace clay	
18						

ch2m

PROJECT NUMBER:

BORING NUMBER: BRP-18

Sheet: 4

SOIL BORING LOG

PROJECT:

LOCATION:

ELEVATION:

DRILLING CONTRACTOR:

DRILLING METHOD AND EQUIPMENT:

WATER LEVELS:

START:

FINISH:

LOGGER:

DEPTH BELOW (ft)	SAMPLE			STANDARD PENETRATION TEST RESULTS	SOIL DESCRIPTION	COMMENTS
	NUMBER	TYPE	RECOVERY (ft)	6" - 6" - 6" (N)	SOIL NAME, USCS GROUP SYMBOL, COLOR, MOISTURE CONTENT, RELATIVE DENSITY OR CONSISTENCY, SOIL STRUCTURE, MINERALOGY	DEPTH OF CASING, DRILLING RATE, DRILLING FLUID LOSS, TESTS AND INTRUMENTATION
18	SS-15	SS	24"	5 12 9 18	18.0'. Same as above, trace gravel, wet	
19					19.5'-20.0' - Fat CLAY (CH), gray (GLEY1 5/10Y), wet, highly plastic, soft, seam of Red-Brown, clayey sand. (<1" thick)	PP ≑ 1.5-2.5 tsf
20	S-16	SONIC MACRO CORE	24"		20.0' Poorly graded SAND with gravel (SP), gray (GLEY1 5/10Y), wet, medium grained sand.	20.0'- Advanced the 6" OD Outer casing to 20.0' bgs. 20'-22' collected an undisturbed Piston sample - NO Recovery in the sampler - Pressure increased to ~350 psi the sample extended but no recovery. - A sonic macro core sample collected between 20'-22' bgs
21				-		
22	SS-17	SS	24"	1 6 10 14	22.0' - Poorly graded SAND (SP), gray (GLEY 5/10Y), wet, medium grained sand	
23					23.0' - Same as above, Red-brown-Yellow (7.5YR 6/8)	
24						

ch2m:

PROJECT NUMBER:

BORING NUMBER: BRP-18

Sheet: 5

SOIL BORING LOG

PROJECT:

LOCATION:

ELEVATION:

DRILLING CONTRACTOR:

DRILLING METHOD AND EQUIPMENT:

WATER LEVELS:

START:

FINISH:

LOGGER:

DEPTH BELOW (ft)	SAMPLE			STANDARD PENETRATION TEST RESULTS	SOIL DESCRIPTION	COMMENTS
	NUMBER	TYPE	RECOVERY (ft)	6" - 6" - 6" (N)	SOIL NAME, USCS GROUP SYMBOL, COLOR, MOISTURE CONTENT, RELATIVE DENSITY OR CONSISTENCY, SOIL STRUCTURE, MINERALOGY	DEPTH OF CASING, DRILLING RATE, DRILLING FLUID LOSS, TESTS AND INTRUMENTATION
24				10	same as above	
	SS-18	SS	24"	8		
				7		
25				5	25.5' - seam of clay, Brown-Red	
					25.75' - same as above, tan-gray	
26				WOH	26.0' - Same as above, Reddish Brown-Yellow.	
	SS-19	SS	24"	WOH		
27				1	27.0' - Fat CLAY with Sand (CH), gray (GLEY2 5/10Y), wet, medium plasticity	
				1		
28				1	Same as above	
	SS-20	SS	24"	3		
29				3	29.25' - same as above, trace Sand	
				4		advanced the 6" OD outer casing to 30' bgs.
30						

ch2m:

PROJECT NUMBER:

BORING NUMBER: BRP-18

Sheet: 6

SOIL BORING LOG

PROJECT:

LOCATION:

ELEVATION:

DRILLING CONTRACTOR:

DRILLING METHOD AND EQUIPMENT:

WATER LEVELS:

START:

FINISH:

LOGGER:

DEPTH BELOW (ft)	SAMPLE			STANDARD PENETRATION TEST RESULTS	SOIL DESCRIPTION	COMMENTS
	NUMBER	TYPE	RECOVERY (ft)	6" - 6" - 6" (N)	SOIL NAME, USCS GROUP SYMBOL, COLOR, MOISTURE CONTENT, RELATIVE DENSITY OR CONSISTENCY, SOIL STRUCTURE, MINERALOGY	DEPTH OF CASING, DRILLING RATE, DRILLING FLUID LOSS, TESTS AND INTRUMENTATION
30 31	PT-21	PISTON TUBE	24"	–	Top - Fat CLAY (CH), gray (GLEY 5/10Y), wet, highly plastic, Bottom - same as above	PP: 0.9 tsf Piston tube sample collected between 30'-32'.
32 33	SS-22	SS	24"	WOH WOH 2 1	32.0'-32.5' - Sandy CLAY (CL), gray (GLEY1 5/10Y), wet, soft 32.5' - Fat CLAY (CH), gray (GLEY1 5/10Y), wet, highly plastic, soft	PP: 0.5-0.6 tsf
34 35 36	SS-23	SS	24"	2 3 4 4	34.0'-35.5' - Sandy CLAY (CL), gray (GLEY1 5/10Y), wet, soft. 35.5' - Fat CLAY (CH), gray (GLEY1 5/10Y), wet, firm, highly plastic.	

PROJECT NUMBER:

BORING NUMBER: BRP-18

Sheet: 7

SOIL BORING LOG

PROJECT:

LOCATION:

ELEVATION:

DRILLING CONTRACTOR:

DRILLING METHOD AND EQUIPMENT:

WATER LEVELS:

START:

FINISH:

LOGGER:

DEPTH BELOW (ft)	SAMPLE			STANDARD PENETRATION TEST RESULTS	SOIL DESCRIPTION	COMMENTS
	NUMBER	TYPE	RECOVERY (ft)	6" - 6" - 6" (N)	SOIL NAME, USCS GROUP SYMBOL, COLOR, MOISTURE CONTENT, RELATIVE DENSITY OR CONSISTENCY, SOIL STRUCTURE, MINERALOGY	DEPTH OF CASING, DRILLING RATE, DRILLING FLUID LOSS, TESTS AND INTRUMENTATION
36	PT-24	PISTON TUBE	NR		No Recovery	the sampler could not be retrieved from the hole.
37						
38					Bottom of boring @ 38 0' bgs.	
39						
40						
41						
42						

ch2m.

PROJECT NUMBER:

BORING NUMBER: BRP-20
Sheet: 1

SOIL BORING LOG

PROJECT: DUNDALK MARINE TERMINAL **LOCATION:** SEE PLAN
ELEVATION: ~ +126 **DRILLING CONTRACTOR:** ADT
DRILLING METHOD AND EQUIPMENT: FRASTE MULTIDRILL XL MAX 170
WATER LEVELS: ~ +6 **START:** 1645 11/12/15 **FINISH:** 1030 11/14/15 **LOGGER:** L. LINCOLN

DEPTH BELOW (ft)	SAMPLE			STANDARD PENETRATION TEST RESULTS	SOIL DESCRIPTION	COMMENTS
	NUMBER	TYPE	RECOVERY (ft)	6" - 6" - 6" (N)	SOIL NAME, USCS GROUP SYMBOL, COLOR, MOISTURE CONTENT, RELATIVE DENSITY OR CONSISTENCY, SOIL STRUCTURE, MINERALOGY	DEPTH OF CASING, DRILLING RATE, DRILLING FLUID LOSS, TESTS AND INTRUMENTATION
0					4" ASPHALT CONCRETE GRY-BRN GVLY C-M SAND (ROADBASE	DPC-
1	S-1	3" SONIC CORE	3'	N/A		
2					2.5-4.0 BRN, DK GRY SILTY F-M SAND, SM GVL (FILL)	FABRIC GEOTEXTILE ~2.5' DPC-
3						
4					4-7 BRN, RED-BRN, DK GRY CLAYEY F-M SAND, SM GVL	
5	S-2		3'	N/A		
6						

ch2m

PROJECT NUMBER:

BORING NUMBER: BRP-20
Sheet: 2

SOIL BORING LOG

PROJECT: DUNDALK MARINE TERMINAL **LOCATION:** SEE PLAN
ELEVATION: ~ +26 **DRILLING CONTRACTOR:** ADT
DRILLING METHOD AND EQUIPMENT: FRASTE MULTIDRILL XL MAX 170
WATER LEVELS: ~ +6 **START:** 1645 11/12/15 **FINISH:** 1030 11/14/15 **LOGGER:** L. LINCOLN

DEPTH BELOW (ft)	SAMPLE NUMBER	SAMPLE TYPE	SAMPLE RECOVERY (ft)	STANDARD PENETRATION TEST RESULTS 6" - 6" - 6" (N)	SOIL DESCRIPTION SOIL NAME, USCS GROUP SYMBOL, COLOR, MOISTURE CONTENT, RELATIVE DENSITY OR CONSISTENCY, SOIL STRUCTURE, MINERALOGY	COMMENTS DEPTH OF CASING, DRILLING RATE, DRILLING FLUID LOSS, TESTS AND INTRUMENTATION
6	S-2 cont	CORE		N/A		
7		3" SONIC			7-7.4 DO S-2	
					7.4-9 GRY, BLUE-GRY C-F SAND, SM GVL (ROAD BASE AGGREGATE)	DPC-
8	S-3		3'	N/A		
9					9-9.5 RED SILTY F SAND	DPC-
					9.5-10 TAN, DK GRY SILTY F-M SAND, SM GVL (COPR)	DPC+ 4" CASING TO 10'
100 1/12/15 715 11/13/15 10		2" O.D. S.S.		11	10-11.5 STRONGLY INDURATED BRN, DK GRY, TAN SILTY F-M SAND, SM GVL (HB)	DPC+
				28		
11	SS-4		24"	52		
1				31	11.5-12 BLK, GREEN M-F SAND, WEAKLY-MOD. INDURATED (GB)	DPC+
12						

ch2m:

PROJECT NUMBER:

BORING NUMBER: BRP-20

Sheet: 3

SOIL BORING LOG

PROJECT: DUNDALK MARINE TERMINAL **LOCATION:** SEE PLAN

ELEVATION: ~+26 **DRILLING CONTRACTOR:** ADT

DRILLING METHOD AND EQUIPMENT: FRASTE MULTIDRILL XL MAX 170

WATER LEVELS: ~+6 **START:** 1645 11/12/15 **FINISH:** 1030 11/14/15 **LOGGER:** L. LINCOLN

DEPTH BELOW (ft)	SAMPLE			STANDARD PENETRATION TEST RESULTS	SOIL DESCRIPTION	COMMENTS
	NUMBER	TYPE	RECOVERY (ft)	6" - 6" - 6" (N)	SOIL NAME, USCS GROUP SYMBOL, COLOR, MOISTURE CONTENT, RELATIVE DENSITY OR CONSISTENCY, SOIL STRUCTURE, MINERALOGY	DEPTH OF CASING, DRILLING RATE, DRILLING FLUID LOSS, TESTS AND INTRUMENTATION
12		2" O.D. S.S.		36	12-14' BLK, GREEN M-F SAND, WEAKLY-MOD. INDURATED (GB)	DPC+
13	SS-5		21"	47 51 42		
14	SS-6		6"	67 50/2"	14-14.3 DO SS 5 (GB) 14.3-14.6 DK BRN, RED, DK GRY SILTY F-M SAND, TR. GVL, STRONGLY INDURATED (HB)	DPC+
		3" SONIC			14.6-15 DO SS-6 (HB)	DPC+
15	S-7		22"	N/A	15-15.6 BRN, TAN, YELLOW SILTY F-M SAND, SM GVL (HB)	DPC+
					15.6-16.0 MOD. INDURATED BLK SILTY F-M SAND (GB)	DPC+
16		2" O.D. S.S.		9	16-18 RED-BRN, BRN, BLK, GREEN, TAN F-M SAND, SM SILT, GVL, MOD-INDURATED (HB/GB MIX)	
17	SS-8		17"	15 12	17.4' RUBBER GEOSYNTHETIC	
18				14		

ch2m.

PROJECT NUMBER:

BORING NUMBER: BRP-20
Sheet: 4

SOIL BORING LOG

PROJECT: DUNDALK MARINE TERMINAL
LOCATION: SEE PLAN
ELEVATION: ~ +26
DRILLING CONTRACTOR: ADT
DRILLING METHOD AND EQUIPMENT: FRASTE MULTIDRILL XL MAX 170
WATER LEVELS: ~ + 6
START: 1645 11/12/15
FINISH: 1030 11/13/15
LOGGER: L. LINCOLN

DEPTH BELOW (ft)	SAMPLE			STANDARD PENETRATION TEST RESULTS	SOIL DESCRIPTION	COMMENTS	
	NUMBER	TYPE	RECOVERY (ft)	6" - 6" - 6" (N)	SOIL NAME, USCS GROUP SYMBOL, COLOR, MOISTURE CONTENT, RELATIVE DENSITY OR CONSISTENCY, SOIL STRUCTURE, MINERALOGY	DEPTH OF CASING, DRILLING RATE, DRILLING FLUID LOSS, TESTS AND INTRUMENTATION	
18	SS-9	2" O.D. S.S	3"		18-18.5 DO SS-9 (HB/GB)		4" CASING TO 15'
	SS-10		6"		18.5-19.0 MOD INDURATED BRN, TAN, DK GRY SILTY F M SAND, (HB) TR. GVL	DPC↑	
19	SS-11		6"	27	19-19.5 MOD INDURATED RED-BRN, DK GRY, GREEN SILTY F M SAND, TR GVL (HB)		
	SS-12		6"	35	19.5-19.9 DO SS-11 (HB)	DPC+	
20	SS-13		6"	35	19.9-20 BLK M-F SAND, TR YELLOW PARTICLES (GB) 20-20.2 DK BRN, DK GRY SILTY F-M SAND, TR GVL (HB) 20.2-20.5 BLK, GREEN M-F SAND, MOD. INDURATED (GB)	DPC↑	
	SS-14		6"	25	20.5-21 DK BRN, DK GRY, RED-BRN SILTY F-M SAND, TR GVL, YELLOW/GREEN PARTICLES (HB)	DPC↑	WATER IN SAMPLE @ 21'
21	SS-15		6"	22	21-21.5 BLK, GREEN M-F SAND, WEAKLY INDURATED, MOIST (GB) 21.5-21.7 DO SS 15 (GB)	DPC+	4" CASING TO 20'
	SS-16		6"	36	21.7-22 BRN C-M SAND, SATURATED	DPC↑ → UNCLEAR WHETHER DUE TO CONTAMINATION IN GW	
22	SS-17		12"	22 26	22-23 DO SS-16	"	
23	SS-18			51 72	23-24 TAN, BRN C-M SAND, SATURATED	"	
24							

ch2m:

PROJECT NUMBER:

BORING NUMBER: BRP-20
Sheet: 5

SOIL BORING LOG

PROJECT: DUNDALK MARINE TERMINAL
LOCATION: SEE PLAN
ELEVATION: ~+26
DRILLING CONTRACTOR: ADT
DRILLING METHOD AND EQUIPMENT: FRASTE MULTIDRILL XL MAX 170
WATER LEVELS: ~+6
START: 1645 11/12/15
FINISH: 1030 11/14/15
LOGGER: L. LINCOLN

DEPTH BELOW (ft)	SAMPLE			STANDARD PENETRATION TEST RESULTS	SOIL DESCRIPTION	COMMENTS
	NUMBER	TYPE	RECOVERY (ft)	6" - 6" - 6" (N)	SOIL NAME, USCS GROUP SYMBOL, COLOR, MOISTURE CONTENT, RELATIVE DENSITY OR CONSISTENCY, SOIL STRUCTURE, MINERALOGY	DEPTH OF CASING, DRILLING RATE, DRILLING FLUID LOSS, TESTS AND INTRUMENTATION
24	SS-19	2" O.D. S.S.	9"	77 50/3"	24-24.8 BRN C-M SAND, SATURATED	DPC+ → UNCLEAR IF REACTING TO CONTAMINATED WATER • 4" CASING TO 25'
25	S-20	3" SONIC	15"	N/A	24.8-26 BRN, TAN C-M SAND, TR. GVL, SATURATED	"
26	SS-21	2" O.D. S.S		19 21 16	26-27.5 BRN, TAN C-F SAND, TR. GVL, SATURATED	DPC+ → UNCLEAR IF REACTING TO CONTAMINATED WATER
27				17	27.5-28 TAN, GRY M-F SAND, SM SILT, TR. GVL	DPC-
28				36	28-28.7 BRN C-M SAND, SATURATED	DPC+
29	SS-22			51 71 70	28.7-30 TAN, GRY, YELLOW SILTY F-M SAND, SAT.	DPC- 4" CASING TO 30'
30						

ch2m.

PROJECT NUMBER:

BORING NUMBER: BRP 20
Sheet: 6

SOIL BORING LOG

PROJECT: DUNDALK MARINE TERMINAL
LOCATION: SEE PLAN
ELEVATION: ~ +26
DRILLING CONTRACTOR: ADT
DRILLING METHOD AND EQUIPMENT: FRASTE MULTIDRILL XL MAX 170
WATER LEVELS: ~ +6
START: 1645 11/12/15
FINISH: 1030 11/14/15
LOGGER: L. LINCOLN

DEPTH BELOW (ft)	SAMPLE			STANDARD PENETRATION TEST RESULTS	SOIL DESCRIPTION	COMMENTS
	NUMBER	TYPE	RECOVERY (ft)	6" - 6" - 6" (N)	SOIL NAME, USCS GROUP SYMBOL, COLOR, MOISTURE CONTENT, RELATIVE DENSITY OR CONSISTENCY, SOIL STRUCTURE, MINERALOGY	DEPTH OF CASING, DRILLING RATE, DRILLING FLUID LOSS, TESTS AND INTRUMENTATION
30		2" O.D. S.S.		16	30-30.5 BRN GVLY M-F SAND, MOIST	DPC-
				13	30.5-31.5 LT. BRN, BRN M-F SAND, MOIST	DPC-
31	SS 23		24"	12		
				23	31.5-32 TAN M-F SAND, SATURATED	DPC-
32				25	32-33.7 TAN, GRY, LT BRN M-C SAND, SATURATED	
				26		
33	SS 24		24'	42		
				51	33.7-40 BRN M-F SAND, SM SILT, MOIST	DPC-
34				19	34-35.7 TAN, LT. BRN, BRN M-F SAND, TR. GVL, MOIST	
				16		
35	SS 25			16		
				18	35.7-36 DK GRY CLAYEY F-M SAND	
36						

ch2m:

PROJECT NUMBER:

BORING NUMBER: BRP-20
Sheet: 7

SOIL BORING LOG

PROJECT: DUNDALK MARINE TERMINAL **LOCATION:** SEE PLAN
ELEVATION: ~ +26 **DRILLING CONTRACTOR:** ADT
DRILLING METHOD AND EQUIPMENT: FRASTE MULTIDRILL XL MAX 170
WATER LEVELS: ~ +6 **START:** 1645 11/12/15 **FINISH:** 1030 11/14/15 **LOGGER:** L. LINCOLN

DEPTH BELOW (ft)	SAMPLE			STANDARD PENETRATION TEST RESULTS	SOIL DESCRIPTION	COMMENTS
	NUMBER	TYPE	RECOVERY (ft)	6" - 6" - 6" (N)	SOIL NAME, USCS GROUP SYMBOL, COLOR, MOISTURE CONTENT, RELATIVE DENSITY OR CONSISTENCY, SOIL STRUCTURE, MINERALOGY	DEPTH OF CASING, DRILLING RATE, DRILLING FLUID LOSS, TESTS AND INTRUMENTATION
36		2" O.D. S.S.		WH	36-37.5 DO BOT SS-25	
37	SS 24		24"	1		
				3		
				4	37.5-38 DK GRY CLAY, MOTTL RED, TR SILT	PP = 1.0
38					NO RECOVERY IN TUBE, SONIC TO 40' - DK GRY CLAY, TR SILT, V. SOFT	CASING TO 38' PISTON SAMPLER 38-40' PP <1.0
39	U-27	UNDISTURBED PISTON	0"	P=24" R=0"		
700 /13/15 40					DO SS-26 BOT	
41	U-28		13.5"	P:24" R:13.5"		
42						

ch2m.

PROJECT NUMBER:

BORING NUMBER: BRP-20

Sheet: 8

SOIL BORING LOG

PROJECT: DUNDALK MARINE TERMINAL

LOCATION: SEE PLAN

ELEVATION: ~+26

DRILLING CONTRACTOR: ADT

DRILLING METHOD AND EQUIPMENT: FRASTE MULTIDRILL XL MAX 170

WATER LEVELS: ~+16

START: 1645 11/12/15

FINISH: 1030 11/14/15

LOGGER: L. LINCOLN

DEPTH BELOW (ft)	SAMPLE			STANDARD PENETRATION TEST RESULTS	SOIL DESCRIPTION	COMMENTS
	NUMBER	TYPE	RECOVERY (ft)	6" - 6" - 6" (N)	SOIL NAME, USCS GROUP SYMBOL, COLOR, MOISTURE CONTENT, RELATIVE DENSITY OR CONSISTENCY, SOIL STRUCTURE, MINERALOGY	DEPTH OF CASING, DRILLING RATE, DRILLING FLUID LOSS, TESTS AND INTRUMENTATION
42		UNDISTURBED PISTON SAMPLER	7.5"	P=24" R=7.5"	DO SS-26 BOT V. SOFT DK GRY CLAY	
43						
44						EOB @ 44'

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BORING NO. BRP-20
SHEET 9 OF 11
FILE NO. 10587
SURFACE ELEV. ~+26
DATUM

PROJECT DUNDALK MARINE TERMINAL
LOCATION BALTIMORE, MARYLAND
BORING LOCATION SEE PLAN

TEST/INSPECTION EQUIPMENT
REFERENCE CODES/STANDARDS

BORING EQUIPMENT AND METHODS OF STABILIZING BOREHOLE

TYPE OF BORING RIG
TRUCK
SKID ✓
BARGE
OTHER

TYPE OF FEED DURING CORING
MECHANICAL
HYDRAULIC
OTHER

CASING USED ☑ YES ☐ NO
DIA., IN. 4 DEPTH, FT. FROM 0 TO 40
DIA., IN. DEPTH, FT. FROM TO
DIA., IN. DEPTH, FT. FROM TO

TYPE AND SIZE OF:
D-SAMPLER 2" O.D. SPLIT SPOON
U-SAMPLER PISTON
S-SAMPLER
CORE BARREL 3" SONIC
CORE BIT
DRILL RODS

DRILLING MUD USED ☐ YES ☑ NO
DIAMETER OF ROTARY BIT, IN.
TYPE OF DRILLING MUD

AUGER USED ☐ YES ☑ NO
TYPE AND DIAMETER, IN.

CASING HAMMER, LBS. AVERAGE FALL, IN.
SAMPLER HAMMER, LBS. 140 AVERAGE FALL, IN. 30
TYPE OF HAMMER AUTOMATIC

WATER LEVEL OBSERVATIONS IN BOREHOLE

DATE	TIME	DEPTH OF HOLE	DEPTH OF CASING	DEPTH TO WATER	CONDITIONS OF OBSERVATION

PIEZOMETER INSTALLED ☑ YES ☐ NO SKETCH SHOWN ON
2 VWPs

STANDPIPE: TYPE ID, IN. LENGTH, FT. TOP ELEV.
INTAKE ELEMENT: TYPE OD, IN. LENGTH, FT. TIP ELEV.
FILTER: MATERIAL OD, IN. LENGTH, FT. BOT. ELEV.

PAY QUANTITIES
3.5" DIA. DRY SAMPLE BORING LIN. FT.
3.5" DIA. U-SAMPLE BORING LIN. FT.
CORE DRILLING IN ROCK LIN. FT.
NO. OF 3" SHELBY TUBE SAMPLES
NO. OF 3" UNDISTURBED SAMPLES
OTHER:

BORING CONTRACTOR AQUIFER DRILLING AND TESTING
DRILLER TONY PALOMEQUE HELPERS DYLAN JEWELL
REMARKS
RESIDENT ENGINEER LYSANDRA LINCOLN DATE 11/14/15

BORING NO. BRP-20

ch2m

PROJECT NUMBER:

BORING NUMBER: BRP-21
Sheet: 1

SOIL BORING LOG

PROJECT: Honeywell DMT SSI
LOCATION:
ELEVATION:
DRILLING CONTRACTOR: Aquifer Drilling and testing, Inc.
DRILLING METHOD AND EQUIPMENT: Sonic Samp drill max 170; SPT Sampling
WATER LEVELS:
START: 11/14/15 07:45
FINISH: 11/14/15 09:00
LOGGER: Kchaturvedula

DEPTH BELOW (ft)	SAMPLE			STANDARD PENETRATION TEST RESULTS	SOIL DESCRIPTION	COMMENTS
	NUMBER	TYPE	RECOVERY (ft)	6" - 6" - 6" (N)	SOIL NAME, USCS GROUP SYMBOL, COLOR, MOISTURE CONTENT, RELATIVE DENSITY OR CONSISTENCY, SOIL STRUCTURE, MINERALOGY	DEPTH OF CASING, DRILLING RATE, DRILLING FLUID LOSS, TESTS AND INTRUMENTATION
0					4" Asphalt Poorly graded SAND with gravel (SP), gray (GLEY2 7/10Y), dry, fine to medium grained sand, layers of Asphalt	Advanced the hole from 0'-10' with sonic macro core 3" ID DPC -
1					1.5' - silty SAND with gravel (SM) dark brown-gray (2.5Y 5/4), dry, fine to medium grained sand.	DPC -
2	S-1	Sonic Macro Core	30"	–		
3						
4					4.0'-6.0' - Same as above, moist	DPC -
					5.0'-5.5' - lower fines content	DPC -
5	S2	Sonic Macro Core	36"			
6					6.0' - Polyethylene layer	DPC -

PROJECT NUMBER:

BORING NUMBER: BR R 21

Sheet: 2

SOIL BORING LOG

PROJECT:
LOCATION:
ELEVATION:
DRILLING CONTRACTOR:
DRILLING METHOD AND EQUIPMENT:
WATER LEVELS:
START:
FINISH:
LOGGER:

DEPTH BELOW (ft)	SAMPLE			STANDARD PENETRATION TEST RESULTS	SOIL DESCRIPTION	COMMENTS
	NUMBER	TYPE	RECOVERY (ft)	6" - 6" - 6" (N)	SOIL NAME, USCS GROUP SYMBOL, COLOR, MOISTURE CONTENT, RELATIVE DENSITY OR CONSISTENCY, SOIL STRUCTURE, MINERALOGY	DEPTH OF CASING, DRILLING RATE, DRILLING FLUID LOSS, TESTS AND INTRUMENTATION
6	S-2				6.0' - Poorly graded sand with gravel (SP), dark gray-black (N2), dry, medium to coarse grained sand, Road based aggregate	DPC -
7					7.0' - 9.5' - Same as above	DPC -
8	S-3	SONIC MACRO CORE	36"			
9					9.5' - Silty SAND (SM), light red-yellow (2.5YR 6/8), moist, medium grained sand	DPC - DPI -
10	SS-4	CS	24"	17 21 12	10.0' - 10.75' - same as above, gray-light red, higher fines content 10.75' - 11.5' - same as above, light red-yellow (2.5YR 6/8)	10.0' - Advanced 6" OD outer casing to 10' bgs. 10.5 - Below 10' switched to SS sampling; 140-lb hammer; 30-in. drop; 2" dia. sampler DPC -
11				19	11.5' Fat CLAY (CH), Red-white (10Y 4/6), moist, very stiff, highly plastic	DPC -
12						

ch2m

PROJECT NUMBER:

BORING NUMBER: BRP-21
Sheet: 3

SOIL BORING LOG

PROJECT:
LOCATION:
ELEVATION:
DRILLING CONTRACTOR:
DRILLING METHOD AND EQUIPMENT:
WATER LEVELS:
START:
FINISH:
LOGGER:

DEPTH BELOW (ft)	SAMPLE			STANDARD PENETRATION TEST RESULTS	SOIL DESCRIPTION	COMMENTS
	NUMBER	TYPE	RECOVERY (ft)	6" - 6" - 6" (N)	SOIL NAME, USCS GROUP SYMBOL, COLOR, MOISTURE CONTENT, RELATIVE DENSITY OR CONSISTENCY, SOIL STRUCTURE, MINERALOGY	DEPTH OF CASING, DRILLING RATE, DRILLING FLUID LOSS, TESTS AND INTRUMENTATION
12	SS-5	SS	20"	12 14 28 50/3"	12.0'-13.0' Same as above	DPC -
13					13.0' - Silty sand (SM) - Reddish Brown-greenish (7.5YR 4/3), dry, particulate to slightly indurated (HB core)	DPC +
13.75 14	S-6	SONIC MACRO CORE	15"	-	Same as above	Advanced to 15' bgs using 3" ID Sonic macrocore DPC +
15	SS-7	SS	12'	12 11	15.0'-15.75' - Same as above	15.0' - Advanced the 6" OD outercasing to 15' bgs DPC +
					15.75'-16.0' - Fat clay (CH), Red (10YR4/6), moist, highly plastic	DPC -
16					Bottom of boring @ 16.0' bgs	
17						
18'						

ch2m.

PROJECT NUMBER: 10587 **BORING NUMBER:** BRP 23
Sheet: 1/11

SOIL BORING LOG

PROJECT: Dundalk Marine Terminal **LOCATION:** Baltimore, Maryland
ELEVATION: ~ +26 **DRILLING CONTRACTOR:**
DRILLING METHOD AND EQUIPMENT: Fraste Sonic samp Drill Max 170; SPT sampling
WATER LEVELS: **START:** 12-14-15 2:40 **FINISH:** **LOGGER:** Mark Chaney

DEPTH BELOW (ft)	SAMPLE			STANDARD PENETRATION TEST RESULTS	SOIL DESCRIPTION	COMMENTS
	NUMBER	TYPE	RECOVERY (ft)	6" - 6" - 6" (N)	SOIL NAME, USCS GROUP SYMBOL, COLOR, MOISTURE CONTENT, RELATIVE DENSITY OR CONSISTENCY, SOIL STRUCTURE, MINERALOGY	DEPTH OF CASING, DRILLING RATE, DRILLING FLUID LOSS, TESTS AND INTRUMENTATION
0	S-1	3" sonic	3'	NA	Asphalt/Road base Well graded gravel	Estimated depth: 44' DPC – none
1						
2						
3						
					3'9"-4.0 Dry red brown f-m silty sand trace gravel (SM)	DPC +
4	S-2	3" Sonic	3'	NA	4.0-6.5 Dry brown with white, red and orange particles f-m silty sand trace gravel (SM)	geomembrane @4'6"
5						
6						

ch2m

PROJECT NUMBER: 10587 **BORING NUMBER:** BRP-23
Sheet: 2/11

SOIL BORING LOG

PROJECT: Dundalk Marine Terminal **LOCATION:** Baltimore, Maryland
ELEVATION: ~+26 **DRILLING CONTRACTOR:** ADT
DRILLING METHOD AND EQUIPMENT: Frost Sonic Sampling Drill Max 170; SPT sampling
WATER LEVELS: **START:** **FINISH:** **LOGGER:** Mark Chouey

DEPTH BELOW (ft)	SAMPLE			STANDARD PENETRATION TEST RESULTS	SOIL DESCRIPTION	COMMENTS
	NUMBER	TYPE	RECOVERY (ft)	6" - 6" - 6" (N)	SOIL NAME, USCS GROUP SYMBOL, COLOR, MOISTURE CONTENT, RELATIVE DENSITY OR CONSISTENCY, SOIL STRUCTURE, MINERALOGY	DEPTH OF CASING, DRILLING RATE, DRILLING FLUID LOSS, TESTS AND INTRUMENTATION
6	S-2	3" Sonic	3'	NA		
					6.5-7.0 Dry grayish blue poorly graded gravel with f-C sand	geomembrane @ 6.5' DPC - none
7	S-3	3" Sonic	3'	NA	7.0-7.5 same as above	DPC - none
					7.5-10 Dry Brown with blue f-M sand with bits of concrete	DPC - none
8						
9						
10	SS-1	3" OD Sampler		16-17 25-12	10-10.5 Same as above	DPC - none
					10'5"-10'10" Dry medium brown f-C sand trace gravel	DPC - none
11					10'0"-11'6" Dry medium Red f-M silty sand	DPC - none
					11'6"-11'9" Dry Black f-C sand with gravel	
					11'9"-12' Dry medium red Clay (CL)	PPC - none PP 1.25
12						

ch2m

PROJECT NUMBER: 10587
BORING NUMBER: BRP-23
Sheet: 3/11

SOIL BORING LOG

PROJECT: Dundalk Marine Terminal
LOCATION: Baltimore, Maryland
ELEVATION: ~+26
DRILLING CONTRACTOR: ADT
DRILLING METHOD AND EQUIPMENT: Fraste Multi Drill Max 170; Sonic Sampling
WATER LEVELS:
START:
FINISH:
LOGGER: Mark Cheney

DEPTH BELOW (ft)	SAMPLE			STANDARD PENETRATION TEST RESULTS	SOIL DESCRIPTION	COMMENTS
	NUMBER	TYPE	RECOVERY (ft)	6" - 6" - 6" (N)	SOIL NAME, USCS GROUP SYMBOL, COLOR, MOISTURE CONTENT, RELATIVE DENSITY OR CONSISTENCY, SOIL STRUCTURE, MINERALOGY	DEPTH OF CASING, DRILLING RATE, DRILLING FLUID LOSS, TESTS AND INTRUMENTATION
12	SS-2	3" Drive sampler	9"	42-50/1	12-12'7" Red mottled with white Hard clay (CH)	DPC - none refusal @ 12'7"
13	S-4	3" Sonic	2'	NA	12'7"-13' Dry red brown f-M silty sand (SM) (HB)	advanced with sonic to 14' DPC + strong
					13-14 Black f-C sand with gravel trace silt	DPC + strong
14	SS3	3" OD sampler	22"	16-18 17-17	14-15 Dry red brown moderately indurated f-M silty sand trace gravel (SM) (HB)	DPC + strong
15					15-16 Dry medium Red brown with black and green particles f-M silty sand (SM) (GB)	DPC + strong
16	SS-4	3" OD sampler	1'	1-6	16-17 Dry loose Red mottled with white clay (CL)	PP 1.25 DPC - none
17	SS-5	3" OD sample	15"	7-37	17-18 Dry loose to dense Red brown w/orange f-M Sandy clay, trace silt (CL)	DPC - none
18						PP - 2.25

ch2m.

PROJECT NUMBER: 10587 **BORING NUMBER:** BRP-23
Sheet: 4/11

SOIL BORING LOG

PROJECT: Dundalk Marine Terminal
LOCATION: Baltimore, Maryland
ELEVATION: ~+26
DRILLING CONTRACTOR: ADT
DRILLING METHOD AND EQUIPMENT: Frost MultiDrill Max 170, Sonic Sampling
WATER LEVELS:
START:
FINISH:
LOGGER: Mark Chaney

DEPTH BELOW (ft)	SAMPLE			STANDARD PENETRATION TEST RESULTS	SOIL DESCRIPTION	COMMENTS
	NUMBER	TYPE	RECOVERY (ft)	6" - 6" - 6" (N)	SOIL NAME, USCS GROUP SYMBOL, COLOR, MOISTURE CONTENT, RELATIVE DENSITY OR CONSISTENCY, SOIL STRUCTURE, MINERALOGY	DEPTH OF CASING, DRILLING RATE, DRILLING FLUID LOSS, TESTS AND INTRUMENTATION
18	SS-6	3" OD sample	1'	25-27	16.0-18'2" Dry medium red brown f-m Sandy Clay (CL)	DPC - none
					18'2"-19' Dry medium Black with orange and green particles f-M siltysand (SM)(GB)	DPC + Strong
19	SS-7	3" OD sample	1'	21-19	19.0-20.0 Dry medium Black with orange and green particles f-M silty sand (SM) GB)	DPC + strong
20	SS-8	3" OD sample	NO Rec	2-6 5-10		
21						
22	SS-9	3" OD sample	2'	23-50	22-22.7" moist medium black W/green particles f-M silty sand (SM) (GB)	DPC + Strong encountered water
					22'7"-23' Moist very dense f-M sand / trace silt	DPC +/-
23	SS-10	3" OD sample	2'	20-25	23.-24'1" moist medium black w/ green particles f-m silty sand (SM) (GB)	DPC +/-
24						

ch2m

PROJECT NUMBER:

BORING NUMBER: BRP-23

Sheet: 5/11

SOIL BORING LOG

PROJECT: Dundalk Marine Terminal
LOCATION: Baltimore, Maryland
ELEVATION: ~+26
DRILLING CONTRACTOR: ADT
DRILLING METHOD AND EQUIPMENT: Fraste Multi Drill Max 170, Sonic Sampling
WATER LEVELS:
START: 12-14-15
FINISH: 5:00pm
LOGGER: Mark Chaney

DEPTH BELOW (ft)	SAMPLE			STANDARD PENETRATION TEST RESULTS	SOIL DESCRIPTION	COMMENTS
	NUMBER	TYPE	RECOVERY (ft)	6" - 6" - 6" (N)	SOIL NAME, USCS GROUP SYMBOL, COLOR, MOISTURE CONTENT, RELATIVE DENSITY OR CONSISTENCY, SOIL STRUCTURE, MINERALOGY	DEPTH OF CASING, DRILLING RATE, DRILLING FLUID LOSS, TESTS AND INTRUMENTATION
24	SS10	3" OD sample	21	75-50/2"	24-24'1" moist med black w/green particles f-m silty sand (SM) (GB) 24'1"-24'8" moist very dense brown f-C sand trace silt	DPC+ DPC-none refusal @ 24'8" advanced with sonic to 26' Stopped work at 5pm 12-14-15
25	SS-11	3" OD sample	20"	46-63 50/3"	25.0-26'3" wet dense to very dense light brown f-C sand trace gravel DPC + strong	Started S-5 at 8:20 am 12-15-15 Cleaned out hole from 24'8"-25 smooth gravel
	S-5	3" sonic	4'	NA	26'3"-27 moist light brown f-C sand trace smooth gravel transitioning to f-C sandy gray silt	refusal at 26'3" advanced with sonic to 28' DPC - none
27					27-28 moist gray clayey silt (ML)	DPC - none
28	U-1					bottom of casing @ 25' Shelby tube sample from 28'-30' 24" penetration, 30" tube 27" recovery Top 3" Bott
29						
30						

ch2m.

PROJECT NUMBER: 10587 BORING NUMBER: BRP-23

Sheet: 6/11

SOIL BORING LOG

PROJECT: Dundalk Marine Terminal
LOCATION: Baltimore, Maryland
ELEVATION: ~+26
DRILLING CONTRACTOR: ADT
DRILLING METHOD AND EQUIPMENT: Fraste Multidrill Max 170; Sonic Sampling
WATER LEVELS:
START:
FINISH:
LOGGER: Mark Chaney

DEPTH BELOW (ft)	SAMPLE			STANDARD PENETRATION TEST RESULTS	SOIL DESCRIPTION	COMMENTS
	NUMBER	TYPE	RECOVERY (ft)	6" - 6" - 6" (N)	SOIL NAME, USCS GROUP SYMBOL, COLOR, MOISTURE CONTENT, RELATIVE DENSITY OR CONSISTENCY, SOIL STRUCTURE, MINERALOGY	DEPTH OF CASING, DRILLING RATE, DRILLING FLUID LOSS, TESTS AND INTRUMENTATION
30	SS-12	3" OD sample	1'	12-18	30-31 wet medium light brown f-C sand (S)	Sample saturated DPC- none
31	SS-13	3" OD sample	2'	26-28 32-29	31-33 wet medium light brown f-C sand (S)	DPC- none
32						
33	SS-14	3" OD sample	1.5'	33-34 45-31	33-35 wet Dense light brown f-C sand (S)	2' recovered in spoon top 6" wash DPC-none
34						
35	SS-15	3" OD sample	2'	24-19	35-36 Same as SS-14	DPC- none
36						

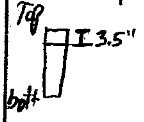
ch2m.

PROJECT NUMBER: 10587 BORING NUMBER: BRP-23
Sheet: 7/11

SOIL BORING LOG

PROJECT: Dundalk Marine Terminal
LOCATION: Baltimore, Maryland
ELEVATION: ~+26
DRILLING CONTRACTOR: ADT
DRILLING METHOD AND EQUIPMENT: Fraste Multidrill Max 170; Sonic Sampling
WATER LEVELS:
START:
FINISH:
LOGGER: Mark Chaney

DEPTH BELOW (ft)	SAMPLE			STANDARD PENETRATION TEST RESULTS	SOIL DESCRIPTION	COMMENTS
	NUMBER	TYPE	RECOVERY (ft)	6" - 6" - 6" (N)	SOIL NAME, USCS GROUP SYMBOL, COLOR, MOISTURE CONTENT, RELATIVE DENSITY OR CONSISTENCY, SOIL STRUCTURE, MINERALOGY	DEPTH OF CASING, DRILLING RATE, DRILLING FLUID LOSS, TESTS AND INTRUMENTATION
36	SS-15	3" OD Sample	2'	21-24	36-37 moist medium light brown f-c sand (S)	DPC-none
37	SS-16	3" OD Sample	2'	1-1 8-11	37-38.5 moist very loose to loose brown f-m sand (S)	DPC-none
38						
					38.5-39 moist loose red brown f-m sand trace silt (SM)	DPC-none
39	U-2					advanced casing to 39' before advancing shelby tube from 39'-41' Penetration = 24" recovery = 27" PP= 0.75' 30" shelby
40						
41	U-3					
42						PP= 0.25



ch2m.

PROJECT NUMBER: 10587
BORING NUMBER: BCP-23
Sheet: 8/11

SOIL BORING LOG

PROJECT: Dundalk Marine Terminal
LOCATION: Baltimore, Maryland
ELEVATION: ~+26
DRILLING CONTRACTOR: ADT
DRILLING METHOD AND EQUIPMENT: Frost MultiDrill max 170, Sonic Sampling
WATER LEVELS:
START: 12-15-15
FINISH: 1:30
LOGGER: Mark Chaney

DEPTH BELOW (ft)	SAMPLE			STANDARD PENETRATION TEST RESULTS	SOIL DESCRIPTION	COMMENTS
	NUMBER	TYPE	RECOVERY (ft)	6" - 6" - 6" (N)	SOIL NAME, USCS GROUP SYMBOL, COLOR, MOISTURE CONTENT, RELATIVE DENSITY OR CONSISTENCY, SOIL STRUCTURE, MINERALOGY	DEPTH OF CASING, DRILLING RATE, DRILLING FLUID LOSS, TESTS AND INTRUMENTATION
42	U-3					 pp: 0.25 tsf Penetration = 2' recovery = 24" Shelby tube
43						Borehole terminated @ 43'

VWP

Depth

P-1 → 1) 1534629 - 50' Air T0 19.6 P0 8923 T1 18.7 P1 8687 Slurry T2 19.1 P2 8061
installed at 43' depth

P-2 → 2) 1517395 - 30' Air T0 19.7 P0 9519 T1 19.0 P1 9522 Slurry T2 19.7 P2 8480
installed at 24' depth

thermistor

1) 50' installed at 15' depth Air 18.4 Slurry 19.4

Thermometer Air temp = 15.6

Mueser Rutledge Consulting Engineers
14 Penn Plaza - 225 West 34th Street
New York, NY 10122
T: 917 339-9300 F: 917 339-9400
www.mrce.com

BORING NO. BRP-23
SHEET 11 **OF** 11
PROJECT Dundalk Marine Terminal
FILE NO. 12587
LOCATION Baltimore, Maryland
SURFACE ELEV. ~+26
BORING LOCATION See location Plan
DATUM

TEST/INSPECTION EQUIPMENT Sonic Samp Drill Max 170; SPT Sampling
REFERENCE CODES/STANDARDS

BORING EQUIPMENT AND METHODS OF STABILIZING BOREHOLE

TYPE OF BORING RIG		TYPE OF FEED DURING CORING		CASING USED		☑ YES		☐ NO	
TRUCK		MECHANICAL		DIA., IN.	6"	DEPTH, FT. FROM	0	TO	41
SKID		HYDRAULIC		DIA., IN.		DEPTH, FT. FROM		TO	
BARGE		OTHER		DIA., IN.		DEPTH, FT. FROM		TO	
OTHER	Track								

TYPE AND SIZE OF:
D-SAMPLER
U-SAMPLER
S-SAMPLER SS-Sampler; 3" dia Sampler
CORE BARREL
CORE BIT
DRILL RODS
3" ID Sonic Macrocore

DRILLING MUD USED ☐ YES ☑ NO
DIAMETER OF ROTARY BIT, IN.
TYPE OF DRILLING MUD
AUGER USED ☐ YES ☑ NO
TYPE AND DIAMETER, IN.

CASING HAMMER, LBS. AVERAGE FALL, IN.
SAMPLER HAMMER, LBS. 140 AVERAGE FALL, IN. 30
TYPE OF HAMMER Automatic

WATER LEVEL OBSERVATIONS IN BOREHOLE

DATE	TIME	DEPTH OF HOLE	DEPTH OF CASING	DEPTH TO WATER	CONDITIONS OF OBSERVATION

PIEZOMETER INSTALLED ☐ YES ☐ NO **SKETCH SHOWN ON**

STANDPIPE: TYPE ID, IN. LENGTH, FT. TOP ELEV.
INTAKE ELEMENT: TYPE OD, IN. LENGTH, FT. TIP ELEV.
FILTER: MATERIAL OD, IN. LENGTH, FT. BOT. ELEV.

PAY QUANTITIES
3.5" DIA. DRY SAMPLE BORING LIN. FT.
3.5" DIA. U-SAMPLE BORING LIN. FT.
CORE DRILLING IN ROCK LIN. FT.
NO. OF 3" SHELBY TUBE SAMPLES
NO. OF 3" UNDISTURBED SAMPLES
OTHER:

BORING CONTRACTOR Aquifer Drilling and Testing
DRILLER Brian Karshick **HELPERS** Chris Phelan
REMARKS 2 Vwps 50', 30' 1 thermistor 50'
RESIDENT ENGINEER Mark Chaney **DATE** 12-14-15

BORING NO. BRP-23

ch2m

PROJECT NUMBER:

BORING NUMBER: BRP-25
Sheet: 1

SOIL BORING LOG

PROJECT: DUNDALK MARINE TERMINAL **LOCATION:** SEE PLAN
ELEVATION: ~ +26 **DRILLING CONTRACTOR:** ADT
DRILLING METHOD AND EQUIPMENT: FRASTE MULTIDRILL XL MAX 170
WATER LEVELS: **START:** 1230 11/14/15 **FINISH:** 0930 11/15/15 **LOGGER:** L. LINCOLN

DEPTH BELOW (ft)	SAMPLE			STANDARD PENETRATION TEST RESULTS	SOIL DESCRIPTION	COMMENTS
	NUMBER	TYPE	RECOVERY (ft)	6" - 6" - 6" (N)	SOIL NAME, USCS GROUP SYMBOL, COLOR, MOISTURE CONTENT, RELATIVE DENSITY OR CONSISTENCY, SOIL STRUCTURE, MINERALOGY	DEPTH OF CASING, DRILLING RATE, DRILLING FLUID LOSS, TESTS AND INTRUMENTATION
0					4" ASPHALT	
					GRY, BRN GVLY C F SAND (FILL)	DPC-
1						
2	S-1		4'	N/A	2-3.7 DK BRN SILTY F-M SAND, SM GVL (FILL)	DPC-
3		SONIC			3.7-4 LT BRN M-C SAND, TR GVL (FILL)	
4		3"			4-5.7 BRN, GRY SILTY F M SAND, SM GVL (FILL)	DPC-
5	S-2		3'	N/A		
					5.7-6 LT BRN, TAN M-C SAND, SM GVL (FILL)	DPC-
6						

ch2m

PROJECT NUMBER:

BORING NUMBER: BRP-25
Sheet: 2

SOIL BORING LOG

PROJECT: DUNDALK MARINE TERMINAL **LOCATION:** SEE PLAN
ELEVATION: ~ +26 **DRILLING CONTRACTOR:** ADT
DRILLING METHOD AND EQUIPMENT: FRASTE MULTIDRILL XL MAX 170
WATER LEVELS: **START:** 1230 11/14/15 **FINISH:** 0930 11/15/15 **LOGGER:** L LINCOLN

DEPTH BELOW (ft)	SAMPLE			STANDARD PENETRATION TEST RESULTS	SOIL DESCRIPTION	COMMENTS
	NUMBER	TYPE	RECOVERY (ft)	6" - 6" - 6" (N)	SOIL NAME, USCS GROUP SYMBOL, COLOR, MOISTURE CONTENT, RELATIVE DENSITY OR CONSISTENCY, SOIL STRUCTURE, MINERALOGY	DEPTH OF CASING, DRILLING RATE, DRILLING FLUID LOSS, TESTS AND INTRUMENTATION
6	S-2 CONT	3" SONIC	3'	N/A	6-7 BLK, GRY GVLY C-F SAND (FILL)	DPC-
7					7-7.5 GRY C F SAND, SM GVL (FILL)	DPC-
					7.5-9.0 GRY GREEN C F SAND, SM GVL (FILL)	
8	S-3		2.5'	N/A		
9					9-10 RED-BRN, BRN, GRY SILTY F-M SAND, SM GVL (FILL	DPC-
10		2" O.D. S.S		24	10-10.5 GRY SILTY F-M SAND, TR GVL (FILL)	GEOTEXTILE @ 10.0' DPC-
				105	10.5-11 DK BRN, GRY GVLY C-F SAND, TR. SILT (COPR)	DPC+
11	SS-4		24"	34	11-12 RED-BRN, GRY, GREEN SILTY F-M SAND, TR. GVL MOD. INDURATED (HB)	DPC+
				50		
12						

ch2m

PROJECT NUMBER:

BORING NUMBER: BRP-25
Sheet: 3

SOIL BORING LOG

PROJECT: DUNDALK MARINE TERMINAL **LOCATION:** SEE PLAN
ELEVATION: ~+26 **DRILLING CONTRACTOR:** ADT
DRILLING METHOD AND EQUIPMENT: FRASTE MULTIDRILL XL MAX 170
WATER LEVELS: **START:** 1230 11/14/15 **FINISH:** 0930 11/15/15 **LOGGER:** L. LINCOLN

DEPTH BELOW (ft)	SAMPLE			STANDARD PENETRATION TEST RESULTS	SOIL DESCRIPTION	COMMENTS
	NUMBER	TYPE	RECOVERY (ft)	6" - 6" - 6" (N)	SOIL NAME, USCS GROUP SYMBOL, COLOR, MOISTURE CONTENT, RELATIVE DENSITY OR CONSISTENCY, SOIL STRUCTURE, MINERALOGY	DEPTH OF CASING, DRILLING RATE, DRILLING FLUID LOSS, TESTS AND INTRUMENTATION
12	SS5	2" O.D. S.S.	4"	50/4"	12-12.2 RED BRN, DK GRY SILTY F-M SAND, TR GVL (HB)	DPC+
					12.2-12.3 TAN M-F SAND (FILL)	DPC-
	S6	SONIC 3"	12"	N/A	12.3-14 BRN, DK GRY F-C SAND, SM SILT, GVL STRONGLY INDURATED	DPC+
13						
14	SS7	2" O.D. S.S.	20"	13	14-14.8 TAN, YELLOW, BRN SILTY F-M SAND, TR GVL	DPC+
				9		
15				9	14.8-15.5 YELLOW LT. BRN M SAND	DPC-
					15.5-15.8 GRY, GREEN, BRN SILTY F-M SAND, TR GVL	DPC-
				13	15.8-16 YELLOW-LT. BRN M. SAND	
16	SS8		24"	17	16-16.3 BRN, GRY, TAN SILTY F-M SAND	DPC-
					16.3-16.8 YELLOW-LT BRN M SAND	DPC-
				23	16.8-17.3 BLK, GREEN M-F SAND (GB) WEAKLY INDURATED	DPC+
17				30	17.3-17.5 RED-BRN, PINK GRY F-C SAND, SM SILT, MOD. INDURATED	DPC+
				40	17.5-18 BLK, GREEN M-F SAND, WEAKLY INDURATED (GB)	DPC+
18						

ch2m.

PROJECT NUMBER:

BORING NUMBER: BRP-25
Sheet: 4

SOIL BORING LOG

PROJECT: DUNDALK MARINE TERMINAL **LOCATION:** SEE PLAN
ELEVATION: ~+26 **DRILLING CONTRACTOR:** ADT
DRILLING METHOD AND EQUIPMENT: FRASTE MULTIDRILL XL MAX 170
WATER LEVELS: **START:** 1230 11/14/15 **FINISH:** 0930 11/15/15 **LOGGER:** L. LINCOLN

DEPTH BELOW (ft)	SAMPLE			STANDARD PENETRATION TEST RESULTS	SOIL DESCRIPTION	COMMENTS
	NUMBER	TYPE	RECOVERY (ft)	6" - 6" - 6" (N)	SOIL NAME, USCS GROUP SYMBOL, COLOR, MOISTURE CONTENT, RELATIVE DENSITY OR CONSISTENCY, SOIL STRUCTURE, MINERALOGY	DEPTH OF CASING, DRILLING RATE, DRILLING FLUID LOSS, TESTS AND INTRUMENTATION
18		2" O.D. S.S.		51	18-19.3 BLK, GREEN M-F SAND (GB)	DPC+
			24"	69		
19	SS-9			74		
					19.3-20 LT BRN SILT, SM F SAND, TR WOOD FIBERS	DPC-
				78		
20				52	20-21.4 DK GRY, BRN CLAY	
			24"	72		
21	SS10			81		
					21.4-22 TAN, LT BRN, GRY SILT, TR. F SAND	
				84		
22				15	22 22.8 DK BRN, GRY SILTY F M SAND, MOD. INDURATED (HB)	DPC+ WATER APPROX. 22" bgs
				23		
23			24'	15	22.8-24 TAN, GRY M SAND, TR. SILT	DPC-
				24		
24						

ch2m.

PROJECT NUMBER:

BORING NUMBER: BRP-25
Sheet: 5

SOIL BORING LOG

PROJECT: DUNDALK MARINE TERMINAL **LOCATION:** SEE PLAN
ELEVATION: ~ +26 **DRILLING CONTRACTOR:** ADT
DRILLING METHOD AND EQUIPMENT: FRASTE MULTIDRILL XL MAX 170
WATER LEVELS: **START:** 1230 11/14/15 **FINISH:** 0930 11/15/15 **LOGGER:** L. LINCOLN

DEPTH BELOW (ft)	SAMPLE			STANDARD PENETRATION TEST RESULTS	SOIL DESCRIPTION	COMMENTS
	NUMBER	TYPE	RECOVERY (ft)	6" - 6" - 6" (N)	SOIL NAME, USCS GROUP SYMBOL, COLOR, MOISTURE CONTENT, RELATIVE DENSITY OR CONSISTENCY, SOIL STRUCTURE, MINERALOGY	DEPTH OF CASING, DRILLING RATE, DRILLING FLUID LOSS, TESTS AND INTRUMENTATION
24		2" O.D. S.S.		17	24-26 TAN, ORANGE CLAYEY M-F SAND	DPC-
25	SS-12		24"	17 25 22		
26					NR	DRILLED THROUGH WHEN ADVANCED CASING
27						
28		2" O.D. S.S		27	28-28.8 DK BRN, GRY, YELLOW SILTY F-M SAND (HB)	DPC+
29	SS-13		24"	27 23 24	28.8-30 DO SS-12	DPC-
30						

ch2m:

PROJECT NUMBER:

BORING NUMBER: BRP-25
Sheet: 6

SOIL BORING LOG

PROJECT: DUNDALK MARINE TERMINAL LOCATION: SEE PLAN
ELEVATION: ~ +26 DRILLING CONTRACTOR: ADT
DRILLING METHOD AND EQUIPMENT: FRASTE MULTIDRILL XL MAX 170
WATER LEVELS:
START: 1230 11/14/15 FINISH: 0930 11/15/15 LOGGER: L. LINCOLN

DEPTH BELOW (ft)	SAMPLE			STANDARD PENETRATION TEST RESULTS	SOIL DESCRIPTION	COMMENTS
	NUMBER	TYPE	RECOVERY (ft)	6" - 6" - 6" (N)	SOIL NAME, USCS GROUP SYMBOL, COLOR, MOISTURE CONTENT, RELATIVE DENSITY OR CONSISTENCY, SOIL STRUCTURE, MINERALOGY	DEPTH OF CASING, DRILLING RATE, DRILLING FLUID LOSS, TESTS AND INTRUMENTATION
30		2" O.D. S.S.		30	30-31.7 TAN, GRY, ORANGE CLAY, SM F-M SAND	DPC
				28		
31	SS 14		24"	44		
				57	31.7-32 ORANGE M SAND	
32				14	32-33.5 DO SS 14 BOT.	
				15		
33	SS 15			20		
				33	33.5-34 TAN M SAND, MOIST	
34				30	34-35.5 ORANGE M SAND, MOIST	
				38		
35	SS 16			21		
				29	35.5-36 TAN M SAND, MOIST	
36						

1715
1/14/15
0700
1/15/15

ch2m:

PROJECT NUMBER:

BORING NUMBER: BRP-25
Sheet: 7

SOIL BORING LOG

PROJECT: DUNDALK MARINE TERMINAL **LOCATION:** SEE PLAN
ELEVATION: ~ +26 **DRILLING CONTRACTOR:** ADT
DRILLING METHOD AND EQUIPMENT: FRASTE MULTIDRILL XL MAX 170
WATER LEVELS: **START:** 1230 11/14/15 **FINISH:** 11/15/15 0930 **LOGGER:** L LINCOLN

DEPTH BELOW (ft)	SAMPLE NUMBER	SAMPLE TYPE	SAMPLE RECOVERY (ft)	STANDARD PENETRATION TEST RESULTS 6" - 6" - 6" (N)	SOIL DESCRIPTION: SOIL NAME, USCS GROUP SYMBOL, COLOR, MOISTURE CONTENT, RELATIVE DENSITY OR CONSISTENCY, SOIL STRUCTURE, MINERALOGY	COMMENTS: DEPTH OF CASING, DRILLING RATE, DRILLING FLUID LOSS, TESTS AND INTRUMENTATION
36		2" O.D. 5.5		2	36-36.5 ORANGE M SAND, MOIST	
				6	36.5-38 TAN M SAND, MOIST	
37	SS17		24"	5		
				8		
38				6	38-39.5 ORANGE, LT. BRN M SAND, MOIST	
				12		
39	SS-18		24"	14		
				17	39.5-40 DK GRY SANDY CLAY	4" CASING TO 40'
40				8	40-42 LT BRN M SAND	
41	SS-19			6		
				7		
				8		
42						

ch2m

PROJECT NUMBER:

BORING NUMBER: BRP-25
Sheet: 8

SOIL BORING LOG

PROJECT: DUNDALK MARINE TERMINAL
LOCATION: SEE PLAN
ELEVATION: ~ +26
DRILLING CONTRACTOR: ADT
DRILLING METHOD AND EQUIPMENT: FRASTE MULTIDRILL XL MAY 170
WATER LEVELS:
START: 1230 11/14/15
FINISH: 0930 11/15/15
LOGGER: L LINCOLN

DEPTH BELOW (ft)	SAMPLE			STANDARD PENETRATION TEST RESULTS	SOIL DESCRIPTION	COMMENTS
	NUMBER	TYPE	RECOVERY (ft)	6" - 6" - 6" (N)	SOIL NAME, USCS GROUP SYMBOL, COLOR, MOISTURE CONTENT, RELATIVE DENSITY OR CONSISTENCY, SOIL STRUCTURE, MINERALOGY	DEPTH OF CASING, DRILLING RATE, DRILLING FLUID LOSS, TESTS AND INTRUMENTATION
42	SS-20	2" O.D. S.S.	24"	9 12 11 15	42-44 LT BRN M-F SAND	
43						
44						EOB @44'
45						
46						
47						
48						

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New York, NY 10122
T: 917 339-9300 F: 917 339-9400
www.mrce.com

BORING NO. BRP-25
SHEET 9 **OF** 11
FILE NO. 10587
SURFACE ELEV. ~+26
DATUM

PROJECT DUNDALK MARINE TERMINAL
LOCATION BALTIMORE, MARYLAND
BORING LOCATION SEE PLAN

TEST/INSPECTION EQUIPMENT
REFERENCE CODES/STANDARDS

BORING EQUIPMENT AND METHODS OF STABILIZING BOREHOLE

TYPE OF BORING RIG
TRUCK
SKID ✓
BARGE
OTHER

TYPE OF FEED DURING CORING
MECHANICAL
HYDRAULIC
OTHER

CASING USED ☐ YES ☐ NO
DIA., IN. DEPTH, FT. FROM TO
DIA., IN. DEPTH, FT. FROM TO
DIA., IN. DEPTH, FT. FROM TO

TYPE AND SIZE OF:
D-SAMPLER 2" O.D. SPLIT SPOON
U-SAMPLER
S-SAMPLER
CORE BARREL
CORE BIT
DRILL RODS

DRILLING MUD USED ☐ YES ☑ NO
DIAMETER OF ROTARY BIT, IN.
TYPE OF DRILLING MUD

AUGER USED ☐ YES ☑ NO
TYPE AND DIAMETER, IN.

CASING HAMMER, LBS. AVERAGE FALL, IN.
SAMPLER HAMMER, LBS. 140 AVERAGE FALL, IN. 30
TYPE OF HAMMER AUTOMATIC

WATER LEVEL OBSERVATIONS IN BOREHOLE

DATE	TIME	DEPTH OF HOLE	DEPTH OF CASING	DEPTH TO WATER	CONDITIONS OF OBSERVATION

PIEZOMETER INSTALLED ☐ YES ☐ NO **SKETCH SHOWN ON**

STANDPIPE: TYPE ID, IN. LENGTH, FT. TOP ELEV.
INTAKE ELEMENT: TYPE OD, IN. LENGTH, FT. TIP ELEV.
FILTER: MATERIAL OD, IN. LENGTH, FT. BOT. ELEV.

PAY QUANTITIES
3.5" DIA. DRY SAMPLE BORING LIN. FT.
3.5" DIA. U-SAMPLE BORING LIN. FT.
CORE DRILLING IN ROCK LIN. FT.
NO. OF 3" SHELBY TUBE SAMPLES
NO. OF 3" UNDISTURBED SAMPLES
OTHER:

BORING CONTRACTOR AQUIFER DRILLING AND TESTING
DRILLER TONY PALOMEQUE **HELPERS** DYLAN JEWELL
REMARKS
RESIDENT ENGINEER LYSANDRA LINCOLN **DATE**

BORING NO. BRP-25

ch2m.

PROJECT NUMBER: **BORING NUMBER:** BRP-28
Sheet: 1

SOIL BORING LOG

PROJECT: HONEYWELL DRA SSI
LOCATION:
ELEVATION:
DRILLING CONTRACTOR: AQUIFER DRILLING AND TESTING, INC.
DRILLING METHOD AND EQUIPMENT: SONIC SAMP DRILL MAX [illegible] ; SPT SAMPLING
WATER LEVELS:
START: 12/16/15 07:40
FINISH: 12/16/15
LOGGER: K. Chaturvedula

DEPTH BELOW (ft)	SAMPLE			STANDARD PENETRATION TEST RESULTS	SOIL DESCRIPTION	COMMENTS
	NUMBER	TYPE	RECOVERY (ft)	6" - 6" - 6" (N)	SOIL NAME, USCS GROUP SYMBOL, COLOR, MOISTURE CONTENT, RELATIVE DENSITY OR CONSISTENCY, SOIL STRUCTURE, MINERALOGY	DEPTH OF CASING, DRILLING RATE, DRILLING FLUID LOSS, TESTS AND INTRUMENTATION
0					4" Asphalt	Advanced the borehole from 0'-10' using 3" ID sonic macro core.
					0.3-0.75' - Poorly graded gravel with sand (GP), gray (GLEY1 6/10Y), dry, road based aggregate.	DPC - 1 MPS = 0.5"
					0.75' - Poorly graded sand with silt and gravel (SP-SM), Red-Brown (7.5YR 4/6), moist, coarse grained sand	DPC -
1	[illegible]	SONIC MACRO CORE	24"	—		
2						DPC -
3						
4					4.0' - Silty sand with gravel (SM), brown (5Y 5/2), wet, fine to medium grained sand	DPC -
	[illegible]	SONIC MACRO CORE		—	4.25' - Woven geotextile liner 4.25' - same as above, wet	
5						
6					6.0' - Polyethylene liner	DPC -

ch2m

PROJECT NUMBER:

BORING NUMBER: BRR-78
Sheet: 2

SOIL BORING LOG

PROJECT:
LOCATION:
ELEVATION:
DRILLING CONTRACTOR:
DRILLING METHOD AND EQUIPMENT:
WATER LEVELS:
START:
FINISH:
LOGGER:

DEPTH BELOW (ft)	SAMPLE			STANDARD PENETRATION TEST RESULTS	SOIL DESCRIPTION	COMMENTS
	NUMBER	TYPE	RECOVERY (ft)	6" - 6" - 6" (N)	SOIL NAME, USCS GROUP SYMBOL, COLOR, MOISTURE CONTENT, RELATIVE DENSITY OR CONSISTENCY, SOIL STRUCTURE, MINERALOGY	DEPTH OF CASING, DRILLING RATE, DRILLING FLUID LOSS, TESTS AND INTRUMENTATION
6	S-2	[illegible] core		-	6.0'-6.9'. Same as above, moist, Red-brown [illegible]	DPC-
					6.9'. Poorly graded gravel with sand (GP), Gray black [illegible] dry, road based aggregate.	DPC-', mps= 0.75"
7					7.0'-7.25'. same as above	DPC-
					7.25'-7.75'- Crushed Concrete	Mps: 2.5"
8	S-3	[illegible] core	30"	-	7.75'- Poorly graded sand with gravel (SP), Gray (GLEY1 5/N), moist, coarse grained sand, Road based aggregate.	
					8.2'- same as above, light red (7.5YR 7/6)	DPC.
9						
10	SS-4	SS	24"	3 18 44 44	10.0'-10.75'- Sandy Clay (SC), Red-Yellow (2.5YR 5/6), dry, very Stiff, Low plasticity.	10.0'- 6" OD outer casing installed to a depth of 10' bgs. 10.5'- Below 10' switched to SS Sampling; 140-lb hammer; 30-in drop; 3" dia sampler - DPC-
					10.75'- Silty SAND (SM), Red-Brown-greenish (7.5YR 4/4), dry, fine to medium grained Sand, Particulate to Moderately indurated (HB CORE)	DPC+
12						

ch2m:

PROJECT NUMBER:

BORING NUMBER: BRP-28
Sheet: 3

SOIL BORING LOG

PROJECT:
LOCATION:
ELEVATION:
DRILLING CONTRACTOR:
DRILLING METHOD AND EQUIPMENT:
WATER LEVELS:
START:
FINISH:
LOGGER:

DEPTH BELOW (ft)	SAMPLE			STANDARD PENETRATION TEST RESULTS	SOIL DESCRIPTION	COMMENTS
	NUMBER	TYPE	RECOVERY (ft)	6" - 6" - 6" (N)	SOIL NAME, USCS GROUP SYMBOL, COLOR, MOISTURE CONTENT, RELATIVE DENSITY OR CONSISTENCY, SOIL STRUCTURE, MINERALOGY	DEPTH OF CASING, DRILLING RATE, DRILLING FLUID LOSS, TESTS AND INTRUMENTATION
12	SS-5	SS	10"	36 50/4"	12.0' - Same as above	DPC+
12.8'					12.8' - Same as above	SS Refusal; Sonic macro core advanced to 14.0' bgs.
13	S-6	Sonic macro core	18"	—		
14	S-7	Sonic macro core	24"	50/3"	14.0' - Same as above	14.0' - SS refusal; Sonic macro core advanced to 16' bgs. SS sample - No recovery DPC+
15						15.0' - 6" OD Outer casing installed to a depth of 15' bgs.
16	SS-8 S-8	Sonic macro core	12"	50/1"	Same as above	16.0' - SS refusal; Sonic macrocore advanced to 17' bgs.
17	SS-9	SS	6"	35 50/1"	17.0' - Same as above	SS refusal; Sonic to 19' bgs.
17.5'	S-10				17.5' - Same as above	
18						

ch2m

PROJECT NUMBER: 10587 BORING NUMBER: BRP-28
Sheet: 4

SOIL BORING LOG

PROJECT: Dundalk Marine Terminal LOCATION: Baltimore, Maryland
ELEVATION: DRILLING CONTRACTOR: ADT
DRILLING METHOD AND EQUIPMENT: Fraste Multi Drill Max 170; Sonic Sampling
WATER LEVELS: START: FINISH: LOGGER: [redacted]

DEPTH BELOW (ft)	SAMPLE			STANDARD PENETRATION TEST RESULTS	SOIL DESCRIPTION	COMMENTS
	NUMBER	TYPE	RECOVERY (ft)	6" - 6" - 6" (N)	SOIL NAME, USCS GROUP SYMBOL, COLOR, MOISTURE CONTENT, RELATIVE DENSITY OR CONSISTENCY, SOIL STRUCTURE, MINERALOGY	DEPTH OF CASING, DRILLING RATE, DRILLING FLUID LOSS, TESTS AND INTRUMENTATION
18	S-10	SONIC MACRO CORE	18"	–	18.2' - same as above, moist, contains gravel	DPC+
19	SS-11	SS	NR	50/5"	NO Recovery	SS refusal; sonic to 21'bgs
20	S-12	SONIC MACRO CORE	18"	–	19.5' - silty sand with gravel (SM), Red-Brown (7.5YR 4/3) moist, fine to medium grained sand, green and white particles (COPR and non-COPR)	DPC+ ; mps = [illegible]
21 22	SS-13	SS	24"	6 13 15 12	21.0' - same as above, bright green particles	21.0' - 6" OD outer casing installed to a depth of 20.0' bgs DPC+/- ; mps = 1.0"
23 24	SS-14	SS	24"	11 17 11	23.0'-23.5' - same as above 23.5'-24.0' - Poorly graded sand with gravel (SP), gray (GLEY 1 6/10Y), wet, coarse grained sand	DPC+/- DPC-

ch2m

PROJECT NUMBER: 10587 **BORING NUMBER:** BRP-28
Sheet: 5

SOIL BORING LOG

PROJECT: Dundalk Marine Terminal **LOCATION:** Baltimore, Maryland
ELEVATION: **DRILLING CONTRACTOR:** ADT
DRILLING METHOD AND EQUIPMENT: Fraste Multi Drill Max 170; Sonic Sampling
WATER LEVELS: **START:** **FINISH:** **LOGGER:** [redacted]

DEPTH BELOW (ft)	SAMPLE			STANDARD PENETRATION TEST RESULTS	SOIL DESCRIPTION	COMMENTS
	NUMBER	TYPE	RECOVERY (ft)	6" - 6" - 6" (N)	SOIL NAME, USCS GROUP SYMBOL, COLOR, MOISTURE CONTENT, RELATIVE DENSITY OR CONSISTENCY, SOIL STRUCTURE, MINERALOGY	DEPTH OF CASING, DRILLING RATE, DRILLING FLUID LOSS, TESTS AND INTRUMENTATION
24	S-14	SS	24"	2	24.0' - Poorly graded sand with silt and gravel (SP-SM), greenish-gray, wet coarse grained sand. (COPR and non-COPR)	DPC +/- ; mps 21.5"
25	SS-15	SS	24"	8 9 12 25	25.0' - same as above, wet (COPR and non-COPR)	25.0' - 6" OD outer casing installed to 25.0' bgs. 25.0' - groundwater at 25' bgs encountered during drilling DPC +/-
26						
27	SS-16	SS	24"	17 16 17 24	27.0' - 27.8' - Poorly graded sand (SP), gray-brown (7.5YR 4/1), wet, coarse grained sand 27.8' - Fat CLAY (CH), gray (GLEY1 6/10Y), wet, stiff to very stiff, medium to high plasticity	DPC - DPC -
28						
29	SS-17	SS	12"	15 24	29.0' - 29.75' - Poorly graded sand (SP), gray-brown (7.5YR 4/1), wet, coarse grained sand 29.75' - Silty SAND (SM), gray brown-yellow (2.5Y 6/3), wet, fine grained sand	DPC- DPC-
30						

PROJECT NUMBER:

BORING NUMBER: BRP-28
Sheet: 6

SOIL BORING LOG

PROJECT:
LOCATION:
ELEVATION:
DRILLING CONTRACTOR:
DRILLING METHOD AND EQUIPMENT:
WATER LEVELS:
START:
FINISH:
LOGGER:

DEPTH BELOW (ft)	SAMPLE			STANDARD PENETRATION TEST RESULTS	SOIL DESCRIPTION	COMMENTS
	NUMBER	TYPE	RECOVERY (ft)	6" - 6" - 6" (N)	SOIL NAME, USCS GROUP SYMBOL, COLOR, MOISTURE CONTENT, RELATIVE DENSITY OR CONSISTENCY, SOIL STRUCTURE, MINERALOGY	DEPTH OF CASING, DRILLING RATE, DRILLING FLUID LOSS, TESTS AND INTRUMENTATION
30	SS-18	SS	20"	3 8	30.0'-31.0' - same as above.	30.0' - 6" OD outer casing installed to 30' bgs.
31				10 13	31.0' - Fat CLAY (CH), gray (GLEY1 6/10Y), wet. stiff to very stiff, high plasticity	DPC -
32	ST-19	Shelby tube	24"	-	TOP - Poorly graded sand, dark gray-black	32.0' - Shelby tube pushed to 33.25' - resistance penetrating further. - Full recovery may be because of the tube pushing through wash.
33					Bottom - Fat CLAY and Silty sand	
33.25'						
34				1 4	34.0' - Poorly graded sand with silt (SP-SM), gray (GLEY1, 6/10Y), wet, coarse grained sand	34.0' - Cleaned the hole to 34' bgs and SS sample was collected from 34-36' bgs.
35	SS-20	SS	22"	9 15		
36						36.0' - 6" OD outer casing advanced to 35' bgs

ch2m

PROJECT NUMBER:

BORING NUMBER: BRP-28

Sheet: 7

SOIL BORING LOG

PROJECT:

LOCATION:

ELEVATION:

DRILLING CONTRACTOR:

DRILLING METHOD AND EQUIPMENT:

WATER LEVELS:

START:

FINISH:

LOGGER:

DEPTH BELOW (ft)	SAMPLE			STANDARD PENETRATION TEST RESULTS	SOIL DESCRIPTION	COMMENTS
	NUMBER	TYPE	RECOVERY (ft)	6" - 6" - 6" (N)	SOIL NAME, USCS GROUP SYMBOL, COLOR, MOISTURE CONTENT, RELATIVE DENSITY OR CONSISTENCY, SOIL STRUCTURE, MINERALOGY	DEPTH OF CASING, DRILLING RATE, DRILLING FLUID LOSS, TESTS AND INTRUMENTATION
36	SS-21	SS	10"	39 50/4"	36.0' - same as above	36'. Sample full with wash.
37						
38	S22	SONIC MACRO CORE	24"	–	38.0' - same as above.	38.0'. Before taking the sample from 38'-40', the bottom of the hole was measured to be 36'. To minize the heaving of the sand into the borehole, the outer casing was installed 40' bgs and a sonic sample was obtained from 38'-40'.
39						
40	SS-23	SS	16"	1 2 6 7	40.0' - same as above 41.5' - Silty SAND (SM), Gray (GLEY 1 6/10Y), wet, fine to medium grained sand	40.0' - Cleaned the hole prior to taking new sample
41						
42						

ch2m:

PROJECT NUMBER:

BORING NUMBER: BRP-28
Sheet: 8

SOIL BORING LOG

PROJECT:
LOCATION:
ELEVATION:
DRILLING CONTRACTOR:
DRILLING METHOD AND EQUIPMENT:
WATER LEVELS:
START:
FINISH:
LOGGER:

DEPTH BELOW (ft)	SAMPLE			STANDARD PENETRATION TEST RESULTS	SOIL DESCRIPTION	COMMENTS
	NUMBER	TYPE	RECOVERY (ft)	6" - 6" - 6" (N)	SOIL NAME, USCS GROUP SYMBOL, COLOR, MOISTURE CONTENT, RELATIVE DENSITY OR CONSISTENCY, SOIL STRUCTURE, MINERALOGY	DEPTH OF CASING, DRILLING RATE, DRILLING FLUID LOSS, TESTS AND INTRUMENTATION
42	SS-24	SS	12"	10 11	same as above.	
43	SS-25	SS	12"	9 7	same as above, higher fines content	
44	SS-26	SS	12"	12 11	44-44'4" Same as above 44'4"-45' moist stiff fat clay trace f-m sand	PP=1.25 tsf measured the Bottom of the hole - 45' bgs
45	ST-27	Shelby tube	NR	–	45.0'- Poorly graded sand with silt (SP-SM), gray, wet, coarse grained sand 45.5' - Fat CLAY (CH), gray (GLEY 1 6/10Y), wet, medium stiff, highly plastic	No Recovery in the Shelby tube. Sonic macro core advanced to 47' and Sonic sample collected. -Description based on Sonic sample. PP- 0.5 to 1.5 tsf
46						
47	SS-28	SS	12"	3 9	47.0'- Same as above	PP = 2.0 tsf
48						

ch2m.

PROJECT NUMBER:
BORING NUMBER: BPP-28
Sheet: 9

SOIL BORING LOG

PROJECT:
LOCATION:
ELEVATION:
DRILLING CONTRACTOR:
DRILLING METHOD AND EQUIPMENT:
WATER LEVELS:
START:
FINISH:
LOGGER:

DEPTH BELOW (ft)	SAMPLE			STANDARD PENETRATION TEST RESULTS	SOIL DESCRIPTION	COMMENTS
	NUMBER	TYPE	RECOVERY (ft)	6" - 6" - 6" (N)	SOIL NAME, USCS GROUP SYMBOL, COLOR, MOISTURE CONTENT, RELATIVE DENSITY OR CONSISTENCY, SOIL STRUCTURE, MINERALOGY	DEPTH OF CASING, DRILLING RATE, DRILLING FLUID LOSS, TESTS AND INTRUMENTATION
48					Top - Fat CLAY	
49	ST-29	Shelby tube	24"			
					Bottom - Silty SAND	Cleaned the hole and measured the bottom of hole - 50' bgs before SS sampling
50				1	50.0' - Silty Sand (SM), gray, wet, loose, fine grained sand	50' - 6" OD outer casing installed to 50' bgs
				4		
51	SS-30	SS	18"	7		
				6	51.8' - Fat clay (CH), gray, wet, stiff, highly plastic	
52					TOP - Silty Sand	52-54' Full recovery
53	ST-31	Shelby tube	24"			PP: 2.5 - 1.5 tsf
					Bottom - Fat clay	
54						

ch2m

PROJECT NUMBER:

BORING NUMBER: BRP-28

Sheet: 10

SOIL BORING LOG

PROJECT:

LOCATION:

ELEVATION:

DRILLING CONTRACTOR:

DRILLING METHOD AND EQUIPMENT:

WATER LEVELS:

START:

FINISH:

LOGGER:

DEPTH BELOW (ft)	SAMPLE			STANDARD PENETRATION TEST RESULTS	SOIL DESCRIPTION	COMMENTS
	NUMBER	TYPE	RECOVERY (ft)	6" - 6" - 6" (N)	SOIL NAME, USCS GROUP SYMBOL, COLOR, MOISTURE CONTENT, RELATIVE DENSITY OR CONSISTENCY, SOIL STRUCTURE, MINERALOGY	DEPTH OF CASING, DRILLING RATE, DRILLING FLUID LOSS, TESTS AND INTRUMENTATION
54	SS-32	SS	2.0'	WOH WOH 9 16	54.0'-55.0': Poorly graded sand with clay (SP-SC) gray, wet, medium grained sand	
55					55.0'-56.0' Fat CLAY (CH), gray, wet, stiff to very stiff, highly plastic	PP = 1.5-2.0 tsf
56					Bottom of boring @ 56.0' bgs.	
57						
58						
59						
60						

CH2MHILL

PROJECT NUMBER 10587

BORING NUMBER BRP 29 SHEET 1 OF 6

12-2-15 **SOIL BORING LOG**

PROJECT Dundalk Marine Terminal LOCATION Baltimore

ELEVATION ~21 DRILLING CONTRACTOR [redacted]

DRILLING METHOD AND EQUIPMENT Fraste Multi Drill XL Max 170

WATER LEVELS ~~12-2-15~~ START 08:05 FINISH 12:15 LOGGER M Chaney

DEPTH BELOW SURFACE (FT)	SAMPLE			STANDARD PENETRATION TEST RESULTS	SOIL DESCRIPTION	COMMENTS
	INTERVAL	NUMBER AND TYPE	RECOVERY (FT)	6"-6"-6" (N)	SOIL NAME, USCS GROUP SYMBOL, COLOR, MOISTURE CONTENT, RELATIVE DENSITY OR CONSISTENCY, SOIL STRUCTURE, MINERALOGY	DEPTH OF CASING, DRILLING RATE, DRILLING FLUID LOSS, TESTS AND INSTRUMENTATION
0	S-1	3" Sonic	3'		Top 2' road base asphalt	DPC — None
1						
2						geotextile membrane @ 2.5'
3					3.0 - 4.0 Red Mottled clayey f-M sand some gravel	
4					Red Mottled with grayish brown clayey f-m sand, trace gravel	DPC — None
5	S-2	3" Sonic	3'			
6						geo membrane @ 6.00

(8.30)

REV 12/01 FORM D1586

CH2MHILL

PROJECT NUMBER 10587
BORING NUMBER BRP29 SHEET 2 OF 6

SOIL BORING LOG

PROJECT Dundalk Marine Terminal LOCATION Baltimore
ELEVATION ~21 DRILLING CONTRACTOR ADT
DRILLING METHOD AND EQUIPMENT Fraste M[redacted]
WATER LEVELS START FINISH LOGGER M. Chancy

DEPTH BELOW SURFACE (FT)	SAMPLE INTERVAL	SAMPLE NUMBER AND TYPE	SAMPLE RECOVERY (FT)	STANDARD PENETRATION TEST RESULTS 6"-6"-6" (N)	SOIL DESCRIPTION SOIL NAME, USCS GROUP SYMBOL, COLOR, MOISTURE CONTENT, RELATIVE DENSITY OR CONSISTENCY, SOIL STRUCTURE, MINERALOGY	COMMENTS DEPTH OF CASING, DRILLING RATE, DRILLING FLUID LOSS, TESTS AND INSTRUMENTATION
6	S-2	3" Sonic			Red mottled with brown & white ~~Sa~~ f-M sandy clay, trace gravel	geo membrane @ 6.00 DPC — None
7					7.0-8.5' Red ~~mottled~~ Brown f-M sandy clay 8.5-9.25 Road base/asphalt	DPC — None
8	S-3				9.25-9.5 White to grey gravel 9.5-10 red clay hardened almost rock like	
9						
10	SS-1	3" OD SS	0 None	4"/50	SS from 10-10.4" No recovery 10-11.5 Red brown f-M sand some gravel (HB) DPC +	Advance with sonic from 10.4"-12'
11	S4	3" Sonic			11.5-12 Red-Brown ~~SA~~ Sand, ~~trace~~ some gravel trace clay DPC -	
12						

CH2MHILL

PROJECT NUMBER 10587

BORING NUMBER BRP29 SHEET 3 OF 6

SOIL BORING LOG

12-2-15

PROJECT Dundalk Marine Terminal LOCATION Baltimore

ELEVATION ~21 DRILLING CONTRACTOR ADT

DRILLING METHOD AND EQUIPMENT Fraste Multi Drill XL Max 170

WATER LEVELS START FINISH LOGGER MChaney

DEPTH BELOW SURFACE (FT)	SAMPLE			STANDARD PENETRATION TEST RESULTS	SOIL DESCRIPTION	COMMENTS
	INTERVAL	NUMBER AND TYPE	RECOVERY (FT)	6"-6"-6" (N)	SOIL NAME, USCS GROUP SYMBOL, COLOR, MOISTURE CONTENT, RELATIVE DENSITY OR CONSISTENCY, SOIL STRUCTURE, MINERALOGY	DEPTH OF CASING, DRILLING RATE, DRILLING FLUID LOSS, TESTS AND INSTRUMENTATION
12	SS-2	3" OD SS	14"	18-30 2/50	Mod indurated Red Clay dry mottled with green particles 12'- ~~12~~ 12.5 ~~f-M Red f-C sand trace particles~~	DPC + strong
					12.5'-13'2" Red brown f-M sand trace gravel	
13						Sonic from 13.0-14
	S-5	3" sonic	~~10~~ 2'		Top 12" Brown with green specks f-M sand trace gravel ~~HB~~ (GB)	DPC + strong
					Bottom 12 Red brown M-C sand, some gravel, trace clay (HB)	DPC + strong
14	SS-3	3" OD SS	16"	20-44 86-1/50	Top 12 Dry Red brown mottled clay M-h indurated with orange and green particles f-C sand & trace gravel (HB)	DPC + strong
					Bott 4 red f-C sand, trace gravel (HB)	DPC + strong
15						
	S-6	3" sonic	2'		Dry Top 12" Brown with white & green specks f-M sand trace gravel (GB)	DPC + strong Sonic from 15-16.0
					Bott 12 Red f-C sand with gravel (HB)	DPC + strong
16	SS-4	3" SS	2'	10-11 13-12	Top 12" Red brown lightly indurated M-C sand some gravel	
					~~Bot~~ 17-17.5 Mottled f-M sandy clay trace gravel	DPC — none
17						
					17.5-18' Red mottled Fat Clay Possible clay liner	DPC → none
18						

(8.30)

REV 12/01 FORM D1586

CH2MHILL

PROJECT NUMBER	BORING NUMBER
10587	BRP29 SHEET 4 OF 6

SOIL BORING LOG

PROJECT Dundalk Marine Terminal LOCATION Baltimore
ELEVATION ~21 DRILLING CONTRACTOR ADT
DRILLING METHOD AND EQUIPMENT Fraste Multi Drill XL Max 170
WATER LEVELS START FINISH LOGGER M. Cheney

DEPTH BELOW SURFACE (FT)	SAMPLE			STANDARD PENETRATION TEST RESULTS	SOIL DESCRIPTION	COMMENTS
	INTERVAL	NUMBER AND TYPE	RECOVERY (FT)	6"-6"-6" (N)	SOIL NAME, USCS GROUP SYMBOL, COLOR, MOISTURE CONTENT, RELATIVE DENSITY OR CONSISTENCY, SOIL STRUCTURE, MINERALOGY	DEPTH OF CASING, DRILLING RATE, DRILLING FLUID LOSS, TESTS AND INSTRUMENTATION
18	555	3" OD	0.5'	11/6"	18-18.5 Red Clay mottled with white & Brown particles f-m Sand, trace gravel not as plastic as Fat clay Clayiy Sand	DPC — Boring terminated @ 18.5'
19						Thermistor installed @ 13' VWP installed @ 16' Thermometer 11.6° Therm T° = 11.7 Slurry 14.3 VWP T_0 13.8° P_0 9713.5 P at depth 9719.2 T 14.3 P_{slurry} 85~~[illegible]~~55 T 19.9 VWP ~~[illegible]~~ 1518429

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BORING NO. BRP-29
SHEET 6 **OF** 6
FILE NO. 10587
SURFACE ELEV. ~21
DATUM

PROJECT Dundalk Marine Terminal
LOCATION Baltimore, Maryland
BORING LOCATION See boring location Plan

TEST/INSPECTION EQUIPMENT Sonic Samp Drill Max 170; SPT Sampling
REFERENCE CODES/STANDARDS

BORING EQUIPMENT AND METHODS OF STABILIZING BOREHOLE

TYPE OF BORING RIG
TRUCK
SKID
BARGE
OTHER Track

TYPE OF FEED DURING CORING
MECHANICAL
HYDRAULIC
OTHER

CASING USED ☑ YES ☐ NO
DIA., IN. 6" DEPTH, FT. FROM TO
DIA., IN. DEPTH, FT. FROM TO
DIA., IN. DEPTH, FT. FROM TO

TYPE AND SIZE OF:
D-SAMPLER
U-SAMPLER
S-SAMPLER SS-sampler; 3" Diam sampler
CORE BARREL
CORE BIT
DRILL RODS

DRILLING MUD USED ☐ YES ☑ NO
DIAMETER OF ROTARY BIT, IN.
TYPE OF DRILLING MUD

AUGER USED ☐ YES ☑ NO
TYPE AND DIAMETER, IN.

CASING HAMMER, LBS. AVERAGE FALL, IN.
SAMPLER HAMMER, LBS. 140 AVERAGE FALL, IN. 30
TYPE OF HAMMER Automatic

WATER LEVEL OBSERVATIONS IN BOREHOLE

DATE	TIME	DEPTH OF HOLE	DEPTH OF CASING	DEPTH TO WATER	CONDITIONS OF OBSERVATION

PIEZOMETER INSTALLED ☑ YES ☐ NO SKETCH SHOWN ON See VW Piezometer Installation Record

STANDPIPE: TYPE ID, IN. LENGTH, FT. TOP ELEV.
INTAKE ELEMENT: TYPE OD, IN. LENGTH, FT. TIP ELEV.
FILTER: MATERIAL Sand OD, IN. LENGTH, FT. BOT. ELEV.

PAY QUANTITIES

3.5" DIA. DRY SAMPLE BORING LIN. FT.
3.5" DIA. U-SAMPLE BORING LIN. FT.
CORE DRILLING IN ROCK LIN. FT.
NO. OF 3" SHELBY TUBE SAMPLES
NO. OF 3" UNDISTURBED SAMPLES
OTHER:

BORING CONTRACTOR Aquifer Drilling and Testing
DRILLER Brian Karshick HELPERS Chris Phelan
REMARKS 1 VWP & 2 thermistors installed
RESIDENT ENGINEER Mark Chancy DATE 12-2-15

BORING NO. BRP-29

ch2m:

PROJECT NUMBER:

BORING NUMBER: BRP-31
Sheet: 1

SOIL BORING LOG

PROJECT: Honeywell DMT SPT
LOCATION: Moved approx. 23' from the staked location towards the guard rail
ELEVATION:
DRILLING CONTRACTOR: AQUIFER DRILLING AND TESTING, Inc.
DRILLING METHOD AND EQUIPMENT: SONIC SAMP DRILL MAX XL170; SPT sampling
WATER LEVELS:
START: 12/21/15 9:20
FINISH:
LOGGER: K. Chaturvedula

DEPTH BELOW (ft)	SAMPLE			STANDARD PENETRATION TEST RESULTS	SOIL DESCRIPTION	COMMENTS
	NUMBER	TYPE	RECOVERY (ft)	6" - 6" - 6" (N)	SOIL NAME, USCS GROUP SYMBOL, COLOR, MOISTURE CONTENT, RELATIVE DENSITY OR CONSISTENCY, SOIL STRUCTURE, MINERALOGY	DEPTH OF CASING, DRILLING RATE, DRILLING FLUID LOSS, TESTS AND INTRUMENTATION
0					3" Asphalt 0.25' - Poorly graded GRAVEL with sand (GP), gray-Brown (7.5YR 4/2), dry, medium to coarse grained sand, Road based aggregate.	Advanced the borehole from 0'-16' using 3" ID Sonic macro core. DPC- ; mps = 0.25"
1						
2	S-1	SONIC MACRO CORE	60"	—	2.0' _ woven geotextile. 2.0' - Silty sand with gravel (SM), Red-Brown and gray (7.5YR 4/6), moist. fine to medium grained sand	DPC-
3						
4					4.0'-6.0' - same as above, wet	mps = 1.0" DPC-
5	S-2	SONIC MACRO CORE	42"	—		
6					6.0' - Polyethylene liner	

ch2m:

PROJECT NUMBER:

BORING NUMBER: BRP-31
Sheet: 2

SOIL BORING LOG

PROJECT:
LOCATION:
ELEVATION:
DRILLING CONTRACTOR:
DRILLING METHOD AND EQUIPMENT:
WATER LEVELS:
START:
FINISH:
LOGGER:

DEPTH BELOW (ft)	SAMPLE			STANDARD PENETRATION TEST RESULTS	SOIL DESCRIPTION	COMMENTS
	NUMBER	TYPE	RECOVERY (ft)	6" - 6" - 6" (N)	SOIL NAME, USCS GROUP SYMBOL, COLOR, MOISTURE CONTENT, RELATIVE DENSITY OR CONSISTENCY, SOIL STRUCTURE, MINERALOGY	DEPTH OF CASING, DRILLING RATE, DRILLING FLUID LOSS, TESTS AND INTRUMENTATION
6					6.0'– same as above, moist	DPT—
7	S-2	SONIC MACRO CORE		—		
8					8.0'– 6" thick Asphalt, separated into 4 layers. 8.5'– Poorly graded sand with gravel (SP), gray (GLEY1 6/10Y), wet, Road based aggregate.	8.0'– Relatively difficult drilling conditions. – Difficulty in extracting the sonic macro core – Low recovery; part of the sample lost due to the pressure release in the sonic macrocore.
9						
	S-3		14"	—		
10		SONIC MACRO CORE				
11						
12						

PROJECT NUMBER:

BORING NUMBER: BRP-31
Sheet: 3

SOIL BORING LOG

PROJECT:
LOCATION:
ELEVATION:
DRILLING CONTRACTOR:
DRILLING METHOD AND EQUIPMENT:
WATER LEVELS:
START:
FINISH:
LOGGER:

DEPTH BELOW (ft)	SAMPLE			STANDARD PENETRATION TEST RESULTS	SOIL DESCRIPTION	COMMENTS
	NUMBER	TYPE	RECOVERY (ft)	6" - 6" - 6" (N)	SOIL NAME, USCS GROUP SYMBOL, COLOR, MOISTURE CONTENT, RELATIVE DENSITY OR CONSISTENCY, SOIL STRUCTURE, MINERALOGY	DEPTH OF CASING, DRILLING RATE, DRILLING FLUID LOSS, TESTS AND INTRUMENTATION
12					12.0'- 13.5' – Poorly graded sand with gravel (SP), light brown (10YR 5/3), dry, fine to medium grained sand, road based fill	12.0'– hard drilling conditions DPC-
13					13.5'. well graded gravel with sand (GW), brown (10YR 5/3), dry, mixed with pieces of asphalt	DPC- ;mps=0.5"
14	S-4	SONIC MACRO CORE	48"	-		
15						15.5'- At 16.0' pieces of wood encountered in the macro core while cleaning the hole. 16.0'. 6" OD outer casing installed to a depth of 15.0' bgs.
16	SS-5	SS	16"	1 11 6 4	16.0' – Silty SAND (SM), gray-brown (7.5YR 4/2), moist, trace gravel trace COPR – Yellow particles (COPR and non-COPR) contains roots / organic fibers.	16.5'– Below 16.0' switched to SS sampling; 140-lb hammer; 30 in. drop; 3" dia. sampler DPC+/–
17					17.0'. Clayey-sand (SC), gray (GLEY1 4/10Y), moist, fine grained sand. contains roots	DPC –
18						

ch2m:

PROJECT NUMBER:

BORING NUMBER: BRP-31
Sheet: 4

SOIL BORING LOG

PROJECT:
LOCATION:
ELEVATION:
DRILLING CONTRACTOR:
DRILLING METHOD AND EQUIPMENT:
WATER LEVELS:
START:
FINISH:
LOGGER:

DEPTH BELOW (ft)	SAMPLE			STANDARD PENETRATION TEST RESULTS	SOIL DESCRIPTION	COMMENTS
	NUMBER	TYPE	RECOVERY (ft)	6" - 6" - 6" (N)	SOIL NAME, USCS GROUP SYMBOL, COLOR, MOISTURE CONTENT, RELATIVE DENSITY OR CONSISTENCY, SOIL STRUCTURE, MINERALOGY	DEPTH OF CASING, DRILLING RATE, DRILLING FLUID LOSS, TESTS AND INTRUMENTATION
18	SS-6	SS	12"	8 5	Same as above, wet, contains roots.	18.0'-groundwater encountered during drilling. DPC-
19	SS-7	SS	12"	12 34	19.0'-Same as above, contains pieces of wood, wet 19.7'-Poorly graded sand with silt (SP-S) dark gray (N2), wet, coarse grained sand, contains pieces od	DPC- 19.5'-Pieces of metal mesh encountered while cleaning the hole.
20	SS-8	SS	5"	50/5"	20.0'-Same as above Red-Brown (7.5YR 4/4) 20.5'-Silty SAND (SM), Red-Brown (7.5YR 5/6), dry, fine to medium grained sand, slightly to moderately indurated. (HB COPR)	20.0'-6" OD outer casing installed to 20.0' bgs. 20.5'-SS refusal; Macro core advanced to 22' bgs. DPC+ DPC+
21						
22	SS-9	SS	8"	1 8	22.0'-Poorly graded sand with silt (SP-SN), dark gray black N2) wet, medium to coarse grained sand, Particulate to highly indurated (GB COPR)	DPC+
23	SS-10	SS	5"	6 10	23.0'-Well graded sand w/ gravel (SW), gray (4/10Y), wet, fine to coarse grained sand	DPC+/- ; mps = 0.75" - water in the spoon
24						

PROJECT NUMBER:

BORING NUMBER: BRP-31
Sheet: 5

SOIL BORING LOG

PROJECT:
ELEVATION:
DRILLING METHOD AND EQUIPMENT:
WATER LEVELS:

LOCATION:
DRILLING CONTRACTOR:

START: **FINISH:** **LOGGER:**

DEPTH BELOW (ft)	SAMPLE			STANDARD PENETRATION TEST RESULTS	SOIL DESCRIPTION	COMMENTS
	NUMBER	TYPE	RECOVERY (ft)	6" - 6" - 6" (N)	SOIL NAME, USCS GROUP SYMBOL, COLOR, MOISTURE CONTENT, RELATIVE DENSITY OR CONSISTENCY, SOIL STRUCTURE, MINERALOGY	DEPTH OF CASING, DRILLING RATE, DRILLING FLUID LOSS, TESTS AND INTRUMENTATION
24	SS-11	SS	12"	11 13	24.0' - Same as above, higher gravel content	DPC - - water in the spoon
25 26	SS-12	SS	24"	24 24 24 30	25.0' - well graded gravel with sand (GW), gray (4/10Y), wet, coarse grained sand	DPC - ; mps = 0.5"
27 28	SS-13	SS	21"	5 5 12 14	27.0' - elastic silt (MH), gray (GLEY 1 6/10Y), wet, very stiff	
29 30	SS-14	SS	16"	9 15	29.0' - same as above, higher Sand Content	

ch2m:

PROJECT NUMBER:

BORING NUMBER: BRP-31
Sheet: 6

SOIL BORING LOG

PROJECT:
LOCATION:
ELEVATION:
DRILLING CONTRACTOR:
DRILLING METHOD AND EQUIPMENT:
WATER LEVELS:
START:
FINISH:
LOGGER:

DEPTH BELOW (ft)	SAMPLE			STANDARD PENETRATION TEST RESULTS	SOIL DESCRIPTION	COMMENTS
	NUMBER	TYPE	RECOVERY (ft)	6" - 6" - 6" (N)	SOIL NAME, USCS GROUP SYMBOL, COLOR, MOISTURE CONTENT, RELATIVE DENSITY OR CONSISTENCY, SOIL STRUCTURE, MINERALOGY	DEPTH OF CASING, DRILLING RATE, DRILLING FLUID LOSS, TESTS AND INTRUMENTATION
30				26 40	30.0' – Poorly graded sand with silt (SP-SM), gray (6/10Y), wet, medium grained sand	30.0' - 6" OD outer casing installed to 30.0' bgs.
31				3 5	31.0' same as above	
32	SS-15	SS	24"	10 17		
33				11 15	33.0' - Same as above	
34	SS-16	SS	24"	23 33		
35	SS-17	SS	18"	5 11	35.0' - Poorly graded sand (SP), gray (GLEY1 6/10Y), wet, coarse grained sand, trace silt	35.0'. 6" OD outer casing installed to 35.0' bgs
36						

ch2m

PROJECT NUMBER:

BORING NUMBER: BRP-31

Sheet: 7

SOIL BORING LOG

PROJECT:

LOCATION:

ELEVATION:

DRILLING CONTRACTOR:

DRILLING METHOD AND EQUIPMENT:

WATER LEVELS:

START:

FINISH:

LOGGER:

DEPTH BELOW (ft)	SAMPLE			STANDARD PENETRATION TEST RESULTS	SOIL DESCRIPTION	COMMENTS
	NUMBER	TYPE	RECOVERY (ft)	6" - 6" - 6" (N)	SOIL NAME, USCS GROUP SYMBOL, COLOR, MOISTURE CONTENT, RELATIVE DENSITY OR CONSISTENCY, SOIL STRUCTURE, MINERALOGY	DEPTH OF CASING, DRILLING RATE, DRILLING FLUID LOSS, TESTS AND INTRUMENTATION
36		SS		25 36		
37	SS-18	SS	24"	20 48 60 50	37.0' – same as above	
38						
39						
40	S-19	SONIC MACRO CORE	24"	–	40.0' – same as above	40.0' - 6" OD outer casing advanced to 40' bgs - Bottom of casing at 42.0' bgs - outer casing sinking down the hole
41						
42						

ch2m.

PROJECT NUMBER:

BORING NUMBER: BRP-31
Sheet: 8

SOIL BORING LOG

PROJECT:
LOCATION:
ELEVATION:
DRILLING CONTRACTOR:
DRILLING METHOD AND EQUIPMENT:
WATER LEVELS:
START:
FINISH:
LOGGER:

DEPTH BELOW (ft)	SAMPLE			STANDARD PENETRATION TEST RESULTS	SOIL DESCRIPTION	COMMENTS
	NUMBER	TYPE	RECOVERY (ft)	6" - 6" - 6" (N)	SOIL NAME, USCS GROUP SYMBOL, COLOR, MOISTURE CONTENT, RELATIVE DENSITY OR CONSISTENCY, SOIL STRUCTURE, MINERALOGY	DEPTH OF CASING, DRILLING RATE, DRILLING FLUID LOSS, TESTS AND INTRUMENTATION
42					42.0'- 43.0'- same as above.	-6" OD outer casing Sinking down the hole about 2' bgs. Hence, 5' outer casing section added and hole advanced to 45' bgs.
43	S-2	SONIC MACRO CORE	36"	—	43.0'- Fat CLAY (CH), gray. (GLEY1 6/10Y), wet, soft to stiff, highly plastic	PP - 0.25 - 0.5 tsf
44						
45					TOP - Fat CLAY	PP = 0.25-0.5 tsf
46	ST-21	shelby tube	24"	—		
47					Bottom - Fat CLAY TOP - Fat CLAY	PP = 0.5-0.75 tsf - 47.0'- cleaned the hole and confirmed the depth of the hole to be 47' bgs before collecting the Shelby from 47'-49'
48	ST-22	shelby tube	20"			

ch2m:

PROJECT NUMBER:

BORING NUMBER: BRP-31

Sheet: 9

SOIL BORING LOG

PROJECT:

LOCATION:

ELEVATION:

DRILLING CONTRACTOR:

DRILLING METHOD AND EQUIPMENT:

WATER LEVELS:

START:

FINISH:

LOGGER:

DEPTH BELOW (ft)	SAMPLE			STANDARD PENETRATION TEST RESULTS	SOIL DESCRIPTION	COMMENTS
	NUMBER	TYPE	RECOVERY (ft)	6" - 6" - 6" (N)	SOIL NAME, USCS GROUP SYMBOL, COLOR, MOISTURE CONTENT, RELATIVE DENSITY OR CONSISTENCY, SOIL STRUCTURE, MINERALOGY	DEPTH OF CASING, DRILLING RATE, DRILLING FLUID LOSS, TESTS AND INTRUMENTATION
48						
49					Bottom- Poorly graded sand with Clay	
	SS-22	SS	22"	WOH 1 4 4	Poorly graded sand with clay (SP-SC) dark gray (GLEY 4/10Y), wet, coarse grained sand,	
50					50.3' - Fat CLAY (CH), dark gray (GLEY 1 4/10Y), wet, very stiff, highly plastic.	PP = 1.5-1.75 tsf
51	ST-24	Shelby tube	16"	–	TOP - Poorly graded sand with clay	Shelby discarded –
52						
53					Bottom - Poorly graded sand with Clay.	53.0' -
	S-25	Sonic main core	24"	/	53.0' - Poorly graded sand with clay, gray (GLEY 4/10Y), wet, coarse grained sand.	6" OD outer casing installed to 45.0' bgs.
54						

ch2m:

PROJECT NUMBER:

BORING NUMBER: BRP-31
Sheet: 10

SOIL BORING LOG

PROJECT:
LOCATION:
ELEVATION:
DRILLING CONTRACTOR:
DRILLING METHOD AND EQUIPMENT:
WATER LEVELS:
START:
FINISH:
LOGGER: K Chaturvedula/M.Chaney

DEPTH BELOW (ft)	SAMPLE			STANDARD PENETRATION TEST RESULTS	SOIL DESCRIPTION	COMMENTS
	NUMBER	TYPE	RECOVERY (ft)	6" - 6" - 6" (N)	SOIL NAME, USCS GROUP SYMBOL, COLOR, MOISTURE CONTENT, RELATIVE DENSITY OR CONSISTENCY, SOIL STRUCTURE, MINERALOGY	DEPTH OF CASING, DRILLING RATE, DRILLING FLUID LOSS, TESTS AND INTRUMENTATION
54				–	Fat CLAY (CH), gray (GLEY1 4/10Y) wet, Stiff, highly plastic.	
55					TOP - Fat clay (CH)	55.0' 6" OD outer casing installed to 55.0' bgs PP. = 0.25-0.5 tsf.
56	ST-26	Shelby tube.	22"	–		
					Bottom - Fat Clay	PP = 0.5-0.75 tsf
57	SS-27	3" OD Sampler	24"	Wolt 1 3 4	57-59 Wet Soft gray Clay, (CH)	57'-stopped at 17:00 on 12/21/15 57' Started at 6:32 12-22-15 will sample from 57-59 with (3") split-spoon PP: 0.5 tsf
58						
59	ST-28	Shelby Tube	24"	–	59-61 Top - Fat Clay (CH).	Shelby tube from 59-61 PP= 0.5
60						

ch2m:

PROJECT NUMBER:

BORING NUMBER: BRP-31

Sheet: 11

SOIL BORING LOG

PROJECT:

LOCATION:

ELEVATION:

DRILLING CONTRACTOR:

DRILLING METHOD AND EQUIPMENT:

WATER LEVELS:

START:

FINISH: 08:45

LOGGER: Mark Chaney

DEPTH BELOW (ft)	SAMPLE			STANDARD PENETRATION TEST RESULTS	SOIL DESCRIPTION	COMMENTS
	NUMBER	TYPE	RECOVERY (ft)	6" - 6" - 6" (N)	SOIL NAME, USCS GROUP SYMBOL, COLOR, MOISTURE CONTENT, RELATIVE DENSITY OR CONSISTENCY, SOIL STRUCTURE, MINERALOGY	DEPTH OF CASING, DRILLING RATE, DRILLING FLUID LOSS, TESTS AND INTRUMENTATION
60	ST-28	Shelby Tube	24"	—		PP: 0.5 24" penetration Full recovery
61					Bott Fat Clay (CH) Borehole terminated @ 61' Per Ramzi Khuri (CH2MHill)	2 vwp's & 1 thermistor installed and grouted in place
62						P-1 depth: 48'
63						P-2 depth: 23' Thermistor depth: 22'
64						
65						
66						

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BORING NO. BRP-31
SHEET 14 OF 14
FILE NO. 10587
SURFACE ELEV.
DATUM

PROJECT Dundalk Marine Terminal
LOCATION Baltimore Maryland
BORING LOCATION

TEST/INSPECTION EQUIPMENT Sonic Samp Drill max 170; SPT Sampling
REFERENCE CODES/STANDARDS

BORING EQUIPMENT AND METHODS OF STABILIZING BOREHOLE

TYPE OF BORING RIG
TRUCK
SKID
BARGE
OTHER Truck

TYPE OF FEED DURING CORING
MECHANICAL
HYDRAULIC
OTHER

CASING USED ☑ YES ☐ NO
DIA., IN. 6" DEPTH, FT. FROM 0 TO 60
DIA., IN. DEPTH, FT. FROM TO
DIA., IN. DEPTH, FT. FROM TO

TYPE AND SIZE OF:
D-SAMPLER
U-SAMPLER
S-SAMPLER SS-Sampler; 3" dia Sampler
CORE BARREL
CORE BIT
DRILL RODS
3" ID Sonic Macrocore

DRILLING MUD USED ☐ YES ☑ NO
DIAMETER OF ROTARY BIT, IN.
TYPE OF DRILLING MUD

AUGER USED ☐ YES ☑ NO
TYPE AND DIAMETER, IN.

CASING HAMMER, LBS. AVERAGE FALL, IN.
SAMPLER HAMMER, LBS. 140 AVERAGE FALL, IN. 30
TYPE OF HAMMER Automatic

WATER LEVEL OBSERVATIONS IN BOREHOLE

DATE	TIME	DEPTH OF HOLE	DEPTH OF CASING	DEPTH TO WATER	CONDITIONS OF OBSERVATION

PIEZOMETER INSTALLED ☐ YES ☐ NO SKETCH SHOWN ON

STANDPIPE: TYPE ID, IN. LENGTH, FT. TOP ELEV.
INTAKE ELEMENT: TYPE OD, IN. LENGTH, FT. TIP ELEV.
FILTER: MATERIAL OD, IN. LENGTH, FT. BOT. ELEV.

PAY QUANTITIES

3.5" DIA. DRY SAMPLE BORING LIN. FT.
3.5" DIA. U-SAMPLE BORING LIN. FT.
CORE DRILLING IN ROCK LIN. FT.
NO. OF 3" SHELBY TUBE SAMPLES
NO. OF 3" UNDISTURBED SAMPLES
OTHER:

BORING CONTRACTOR Aquifer Drilling and testing
DRILLER Brian Karshick HELPERS Chris Phelan
REMARKS 2 Vwp's and 1 thermistor installed
RESIDENT ENGINEER K. Chaturvedula (CH2MHill) / Mark Chancy DATE (12-21)-(12-22-15)

BORING NO. BRP-31

ch2m:

PROJECT NUMBER: 10587 **BORING NUMBER:** BRP-32
Sheet: 1/6

SOIL BORING LOG

PROJECT: Honeywell DMT ISR
ELEVATION: ~+23
LOCATION: Baltimore, Maryland
DRILLING CONTRACTOR: Aquifer Drilling and Testing, Inc.
DRILLING METHOD AND EQUIPMENT: SONIC SAMP DRILL MAP 170; SPT Sampling
WATER LEVELS:
START: 12/9/15 13:20 **FINISH:** 12/9/15 15:40 **LOGGER:** K. Chaturvedula

DEPTH BELOW (ft)	SAMPLE NUMBER	SAMPLE TYPE	SAMPLE RECOVERY (ft)	STANDARD PENETRATION TEST RESULTS 6" - 6" - 6" (N)	SOIL DESCRIPTION SOIL NAME, USCS GROUP SYMBOL, COLOR, MOISTURE CONTENT, RELATIVE DENSITY OR CONSISTENCY, SOIL STRUCTURE, MINERALOGY	COMMENTS DEPTH OF CASING, DRILLING RATE, DRILLING FLUID LOSS, TESTS AND INTRUMENTATION
0					4" - Asphalt 0.25' - Poorly graded GRAVEL with sand (GP), gray-black-white (N2), dry, coarse grained sand, Road based aggregate	Advanced the 3"DD sonic macro core from 0'-10' DPC -
1					1.0' - Silty SAND with Gravel (SM), gray-brown (7.5YR 4/2), dry, medium to coarse grained sand	
2	S-1	SONIC MACRO CORE	36"	–		
3					3.0' - woven geotextile 3.0' - Same as above, Red-Brown (7.5YR 4/4), moist	DPC-
4					4.0'-4.5' - same as above	
5	S-2	SONIC MACRO CORE		/	4.5'-5.5' - clayey SAND with gravel (SC), gray-brown (7.5YR 4/2), wet, fine to medium grained sand. 5.5' - Polyethylene liner 5.5' - silty SAND with gravel (SM), gray-brown-Reddish (7.5YR 4/3), moist, fine to medium grained sand	DPC- DPC-
6						

ch2m.

PROJECT NUMBER: 10587
BORING NUMBER: BRP-32
Sheet: 2/6

SOIL BORING LOG

PROJECT: Dundalk Marine Terminal
LOCATION: Baltimore, Maryland
ELEVATION: ~+23
DRILLING CONTRACTOR: ADT
DRILLING METHOD AND EQUIPMENT: Fraste MultiDrill Max 170; Sonic Sampling
WATER LEVELS:
START:
FINISH:
LOGGER: M. Chang/K. Chaturvedula

DEPTH BELOW (ft)	SAMPLE			STANDARD PENETRATION TEST RESULTS	SOIL DESCRIPTION	COMMENTS
	NUMBER	TYPE	RECOVERY (ft)	6" - 6" - 6" (N)	SOIL NAME, USCS GROUP SYMBOL, COLOR, MOISTURE CONTENT, RELATIVE DENSITY OR CONSISTENCY, SOIL STRUCTURE, MINERALOGY	DEPTH OF CASING, DRILLING RATE, DRILLING FLUID LOSS, TESTS AND INTRUMENTATION
6	S-2	sonic macro core		–		DPC –
7					7.0' - 3" thick Asphalt 7.25' - 8.25' - Poorly graded SAND with gravel (SP), dry, gray (7.5YR 5/1), Coarse grained sand	DPC –
8	S-3	SONIC MACRO CORE	28"	–	8.25' - 9.0' - Silty SAND with gravel (SM), Red-Brown (7.5YR 4/4), dry, fine to medium grained sand	DPC –
9					9.0' - Silty SAND (SM), Red-Brown - greenish (7.5YR 4/3), dry, fine to medium grained sand. Particulate to moderately indurated (HBCOPR)	DPC +
10	SS-1	2" OD sampler	6"	50/3	10.0-10'3 Dry very dense f-m silty sand moderately indurated (SM) HB	10 0' - 6" OD outercasing installed to 10 0' bgs
	S-4	3" sonic	3'	NA	10'3-11 Dry red brown f-m silty sand moderately indurated (SM) (HB) trace gravel DPC + strong	10.5' - Below 10' switched to SS Sampling; 140-lb hammer, 30 in. drop; 1 3/4" dia sampler
11	SS-2	2" OD sampler	3"	50/3	11'-11'3" Same as SS-1	DPC + strong
	S-5	3" Sonic		NA	11'3"-12' Sam as S-4	DPC + strong
12						

ch2m

PROJECT NUMBER: 10587 BORING NUMBER: BRP-32
Sheet: 3/6

SOIL BORING LOG

PROJECT: Dundalk Marine Terminal LOCATION: Baltimore, Maryland
ELEVATION: ~ +23 DRILLING CONTRACTOR: ADT
DRILLING METHOD AND EQUIPMENT: Fraste Multi Drill Max 170; Sonic Sampling
WATER LEVELS: START: FINISH: LOGGER: Mark Chaney

DEPTH BELOW (ft)	SAMPLE NUMBER	SAMPLE TYPE	SAMPLE RECOVERY (ft)	STANDARD PENETRATION TEST RESULTS 6" - 6" - 6" (N)	SOIL DESCRIPTION: SOIL NAME, USCS GROUP SYMBOL, COLOR, MOISTURE CONTENT, RELATIVE DENSITY OR CONSISTENCY, SOIL STRUCTURE, MINERALOGY	COMMENTS: DEPTH OF CASING, DRILLING RATE, DRILLING FLUID LOSS, TESTS AND INTRUMENTATION
12	SS-3	3" OD sample	14'	22-47 50/3"	12.0-12'6" Same as SS-2	DPC+ strong
					12'6"-13' Dry Hard Red clay with f-m sand, trace gravel	DPC+ faint
13					13-13'2" Dry very dense f-m silty sand	DPC+ strong
	S-6	3" Sonic	1.5'	NA	13'2"-14 Same as S-5	DPC+ strong
14	SS-4	2" OD sample	6"	50/3"	14'-14'3" same as SS-3	DPC+ strong
	S-7	3" Sonic	1.5'	NA	14'3"-15' Dry red brown f-m silty sand, moderately indurated (SM) (HB) trace white particles trace gravel	DPC+ strong
15	SS-5	2" OD sample	1'	4-9 11-12	[illegible]	[illegible] faint
					[illegible]	[illegible]
16					16-16'6" Dry red brown f-m silty sand Moderately indurated (SM) (HB)	DPC+ faint
					16'6"-17' Dry medium dense brown to black f-m silty sand with quartz (SM)(HB)	DPC+ strong
17	SS-6	2" OD sample	12"	17-50	17-0'- Same as above	DPC+
					17-3'- Poorly graded SAND with silt (SP-SM), gray-black (N2), coarse grained sand, particulate (GB CORE)	DPC+
18						

ch2m:

PROJECT NUMBER: 10587 **BORING NUMBER:** BRP-32
Sheet: 4/6

SOIL BORING LOG

PROJECT: Dundalk Marine Terminal **LOCATION:** Baltimore, Maryland
ELEVATION: ~+23 **DRILLING CONTRACTOR:** ADT
DRILLING METHOD AND EQUIPMENT: Fraste Multi Drill Max 170; Sonic Sampling
WATER LEVELS: **START:** 12/9/15 13:20 **FINISH:** 15:40 **LOGGER:** Mark Chancy

DEPTH BELOW (ft)	SAMPLE			STANDARD PENETRATION TEST RESULTS	SOIL DESCRIPTION	COMMENTS
	NUMBER	TYPE	RECOVERY (ft)	6" - 6" - 6" (N)	SOIL NAME, USCS GROUP SYMBOL, COLOR, MOISTURE CONTENT, RELATIVE DENSITY OR CONSISTENCY, SOIL STRUCTURE, MINERALOGY	DEPTH OF CASING, DRILLING RATE, DRILLING FLUID LOSS, TESTS AND INTRUMENTATION
18	SS-7	SS	6"	22	18.0' - same as above	DPC+ 18.0' - Groundwater encountered during drilling
	SS-8	SS	6"	47	18.5' - same as above, dry	DPC+
19	SS-9	SS	6"	35	19.0' - same as above, wet 19.3' - lean CLAY (CL), Red (10Y4/4), dry, very stiff, Low plasticity	DPC -
	SS-10	SS	4"	33	19.5' - Fat CLAY (CH), Red (10Y4/4), moist, very, stiff, high plasticity	DPC - PP-3.0tsf
20					Bottom of boring @ 20.0' bgs	20.0' - 6" OD outer casing installed to 20.0' bgs.
21					thermometer air reading 11.6	2 thermistors installed Air depth T2 12' 11.7 21.7 T1 17.5' 11.8 38.6 Drillers damaged both thermistors while dropping stand pipe into borehole I had to replace a 15 & 25' thermistor

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BORING NO. BRP-32
SHEET 5 **OF** 6
PROJECT DUNDALK MARINE TERMINAL
FILE NO. 10587
LOCATION BALTIMORE, MARYLAND
SURFACE ELEV. ~+23
BORING LOCATION See location plan
DATUM

TEST/INSPECTION EQUIPMENT Sonic Samp Drill Maxi XL 170; SPT sampling
REFERENCE CODES/STANDARDS

BORING EQUIPMENT AND METHODS OF STABILIZING BOREHOLE

TYPE OF BORING RIG
TRUCK
SKID
BARGE
OTHER track

TYPE OF FEED DURING CORING
MECHANICAL
HYDRAULIC
OTHER

CASING USED ☑ YES ☐ NO
DIA., IN. 6" DEPTH, FT. FROM 0 TO 20'
DIA., IN. DEPTH, FT. FROM TO
DIA., IN. DEPTH, FT. FROM TO

TYPE AND SIZE OF:
D-SAMPLER
U-SAMPLER
S-SAMPLER SS sampling - 3" dia.
CORE BARREL
CORE BIT
DRILL RODS
Sonic Macro core - 3" ID

DRILLING MUD USED ☐ YES ☑ NO
DIAMETER OF ROTARY BIT, IN.
TYPE OF DRILLING MUD

AUGER USED ☐ YES ☑ NO
TYPE AND DIAMETER, IN.

CASING HAMMER, LBS. AVERAGE FALL, IN.
SAMPLER HAMMER, LBS. 140 AVERAGE FALL, IN. 30
TYPE OF HAMMER Automatic

WATER LEVEL OBSERVATIONS IN BOREHOLE

DATE	TIME	DEPTH OF HOLE	DEPTH OF CASING	DEPTH TO WATER	CONDITIONS OF OBSERVATION
12/9/15	15:10	18.5'	10.0	18.0'	encountered during drilling

PIEZOMETER INSTALLED ☑ YES ☐ NO **SKETCH SHOWN ON** Stand pipe installation log

STANDPIPE: TYPE ID, IN. LENGTH, FT. TOP ELEV.
INTAKE ELEMENT: TYPE OD, IN. LENGTH, FT. TIP ELEV.
FILTER: MATERIAL OD, IN. LENGTH, FT. BOT. ELEV.

PAY QUANTITIES
3.5" DIA. DRY SAMPLE BORING LIN. FT.
3.5" DIA. U-SAMPLE BORING LIN. FT.
CORE DRILLING IN ROCK LIN. FT.
NO. OF 3" SHELBY TUBE SAMPLES
NO. OF 3" UNDISTURBED SAMPLES
OTHER:

BORING CONTRACTOR Aquifer Drilling and testing, Inc
DRILLER Tony **HELPERS** Joseph
REMARKS Stand pipe piezometer with thermistor installed
RESIDENT ENGINEER K. Chaturvedula / M. Chancey **DATE**

BORING NO. BRP-32

BOR-4_JAN2013

Only 1 thermistor installed

ch2m.

PROJECT NUMBER: 10587 **BORING NUMBER:** BAP-33
Sheet: 1/6

SOIL BORING LOG

PROJECT: Dundalk Marine Terminal **LOCATION:** Baltimore, Maryland
ELEVATION: ~ +24 **DRILLING CONTRACTOR:** ADT
DRILLING METHOD AND EQUIPMENT: Fraste Multi' Drill Max 170; Sonic Sampling
WATER LEVELS: **START:** 09:00 12/10/15 08:50 **FINISH:** 12/10/15 12:30 **LOGGER:** Mark Chancy

DEPTH BELOW (ft)	SAMPLE			STANDARD PENETRATION TEST RESULTS	SOIL DESCRIPTION	COMMENTS
	NUMBER	TYPE	RECOVERY (ft)	6" - 6" - 6" (N)	SOIL NAME, USCS GROUP SYMBOL, COLOR, MOISTURE CONTENT, RELATIVE DENSITY OR CONSISTENCY, SOIL STRUCTURE, MINERALOGY	DEPTH OF CASING, DRILLING RATE, DRILLING FLUID LOSS, TESTS AND INTRUMENTATION
0	S-1	3" sonic		NA	Roadbase/Asphalt	DPC - none
1			4'			
2						
					2.5-4.0 Dry red brown f-m silty sand trace gravel (SM)	geomembrane @ 2.5' DPC - none
3						
4	S-2	3" sonic	4'	NA	4.0-5.5 Dry red brown f-m silty sand trace gravel, (SM)	DPC-
5						
					5.5-6.0 Road base/asphalt	geomembrane @ 5.5'
6						

ch2m:

PROJECT NUMBER: 10587 **BORING NUMBER:** BRP-33

Sheet: 2/6

SOIL BORING LOG

PROJECT: Dundalk Marine Terminal **LOCATION:** Baltimore, Maryland

ELEVATION: ~ +24 **DRILLING CONTRACTOR:** ADT

DRILLING METHOD AND EQUIPMENT: Fraste Multi' Drill Max 170; Sonic Sampling

WATER LEVELS: **START:** **FINISH:** **LOGGER:** Mark Chaney

DEPTH BELOW (ft)	SAMPLE NUMBER	SAMPLE TYPE	SAMPLE RECOVERY (ft)	STANDARD PENETRATION TEST RESULTS 6" - 6" - 6" (N)	SOIL DESCRIPTION SOIL NAME, USCS GROUP SYMBOL, COLOR, MOISTURE CONTENT, RELATIVE DENSITY OR CONSISTENCY, SOIL STRUCTURE, MINERALOGY	COMMENTS DEPTH OF CASING, DRILLING RATE, DRILLING FLUID LOSS, TESTS AND INTRUMENTATION
6	S-2	3" Sonic	4'	NA	6.0 - 6.5 Dry grayish green f-m sand with gravel, trace silt (S)	DPC - none
					6.5-7.0 Dry brown f-C sand with gravel trace silt (S)	DPC - none
7	S-3	3" Sonic	3'	NA	7-8.0 Concrete with f-m sand, trace silt (S)	DPC - none
8					8.0-9.0 Dry grayish white f-m sand with gravel (S)	DPC - none
9					9.0-10.0 Dry light brown f-M sand with white and red particles, trace gravel, trace silt (SM)	DPC - none
10	SS-1	2" OD sample	1.5'	22-50/4"	10.0'-10'3" Dry medium dense red brown f-M silty Sand trace gravel (SM) DPC-none	refusal @ 10'10" advanced w/sonic to 12'
					10'3"-10'6" Dry medium to very dense f-C sand with quartz	DPC-none
					10'6"-10'10" Dry red brown very dense f-M silty sand (SM)	DPC-none
11	S-4	3" Sonic	2'	NA	10'10"- 11'3" Dry white f-C sand with concrete	DPC - none
					11'3-12' Dry reddish brown f-M silty sand with gravel moderately indurated (SM) HB	DPC+ strong
12						

ch2m:

PROJECT NUMBER: 10587 **BORING NUMBER:** BLP-33
Sheet: 3/6

SOIL BORING LOG

PROJECT: Dundalk Marine Terminal **LOCATION:** Baltimore, Maryland
ELEVATION: ~+24 **DRILLING CONTRACTOR:** ADT
DRILLING METHOD AND EQUIPMENT: Fraste Multi' Drill Max 170; Sonic Sampling
WATER LEVELS: **START:** **FINISH:** **LOGGER:** Mark Chancy

DEPTH BELOW (ft)	SAMPLE			STANDARD PENETRATION TEST RESULTS	SOIL DESCRIPTION	COMMENTS
	NUMBER	TYPE	RECOVERY (ft)	6" - 6" - 6" (N)	SOIL NAME, USCS GROUP SYMBOL, COLOR, MOISTURE CONTENT, RELATIVE DENSITY OR CONSISTENCY, SOIL STRUCTURE, MINERALOGY	DEPTH OF CASING, DRILLING RATE, DRILLING FLUID LOSS, TESTS AND INTRUMENTATION
12	SS-2	2" OD sample	8"	22-50/5"	12-12'11" Dry medium to very dense Reddish/ f-M silty sand trace gravel moderately indurated (SM) HB	DPC + strong
13	S-5	3" Sonic	2'	NA	12'11"-13' Dry red brown f-m silty sand moderately indurated trace gravel (SM) (HB)	refusal @ 12'11" advanced w/sonic to 14' DPC + strong
14	SS-3	2" OD sample	1'3"	15-16 52/3"	14-15'3" Damp Medium dense to very dense red brown - black f-M silty sand (SM)(GB) trace green particles	DPC + strong
15	S-6	3" sonic	2'	NA	15'3"-16.0' Damp red brown to black with green particles f-m silty sand (SM) (GB)	refusal @ 15'3" advanced with sonic, to 17
16					16.0-17.0 Same as S-5	DPC + strong
17	SS-4	2" OD	4"	50/2"	17.0-17'2" wet very dense red brown	advanced 6" OD casing to 17' wet sample
	S-7		2'	NA	17'2"-18' Same as S-5	DPC + Strong
18						

ch2m

PROJECT NUMBER: 10587 **BORING NUMBER:** BRP-33
Sheet: 4/6

SOIL BORING LOG

PROJECT: Dundalk Marine Terminal **LOCATION:** Baltimore, Maryland
ELEVATION: ~+24 **DRILLING CONTRACTOR:** ADT
DRILLING METHOD AND EQUIPMENT: Fraste Multi' Drill Max 170; Sonic Sampling
WATER LEVELS: **START:** **FINISH:** **LOGGER:** Mark Chaney

DEPTH BELOW (ft)	SAMPLE			STANDARD PENETRATION TEST RESULTS	SOIL DESCRIPTION	COMMENTS
	NUMBER	TYPE	RECOVERY (ft)	6" - 6" - 6" (N)	SOIL NAME, USCS GROUP SYMBOL, COLOR, MOISTURE CONTENT, RELATIVE DENSITY OR CONSISTENCY, SOIL STRUCTURE, MINERALOGY	DEPTH OF CASING, DRILLING RATE, DRILLING FLUID LOSS, TESTS AND INTRUMENTATION
18	SS-5	2" OD sample	1'	21	18-18'3" Same as SS-2 (SM)(HB)	DPC + Strong
					18'3"-18'6" Same as SS-3 (SM)(GB)	DPC+ strong
	SS-6	2" OD sample	8"	54	18'6"-19' Moist very dense black with green & brown particles f-m silty sand (SM)(GB)	DPC + strong
19	SS-7	2" OD sample	6"	65	19-19'6" Very dense damp red brown with orange particles f-m silty sand (SM)(HB)	DPC + strong
	SS-8	2" OD sample	4"	62	19'6"-20' damp very dense red brown with orange and white particles f-M silty sand, trace clay (SM-CL) HB	DPC + strong
20	SS-9	2" OD sample	10'	67	20'-20.5' Same as SS-8	DPC+strong
	SS-10	2" OD sample	1"	50/1"	NO Recovery	DPC+
21	S-8	Sonic	12"	—	Same as above	Advanced the borehole to 21.5' using sonic macrocore DPC+
	SS-11	2" OD sample	3"	9	Fat CLAY (CH), Red - Gray (10Y 4/4), wet, stiff, highly plastic,	DPC -
22					Bottom of boring @ 22-0' bgs. Vwp # 1517443 1" PVC installed to 22 Vwp installed @ 21 Thermistor installed @ 14' Thermistor Air: 24.3 Thermistor depth: 23.6 Thermometer Air Temp = 17.3	Vwp Air T₀ 9815 P₀ 22.6 Depth T₁ 9812 P₁ 22.6 Slurry T₂ 9346 P₂ 25.7
23						
24						

thermistor slurry = 21.1

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BORING NO. BRP-3
SHEET 6 OF 6
FILE NO. 10587
SURFACE ELEV. ~+24
DATUM

PROJECT Dundalk Marine Terminal
LOCATION Baltimore, Maryland
BORING LOCATION

TEST/INSPECTION EQUIPMENT Sonic samp Drill Max 170; SPT Sampling
REFERENCE CODES/STANDARDS

BORING EQUIPMENT AND METHODS OF STABILIZING BOREHOLE

TYPE OF BORING RIG
TRUCK
SKID
BARGE
OTHER Track

TYPE OF FEED DURING CORING
MECHANICAL
HYDRAULIC
OTHER

CASING USED ☑ YES ☐ NO
DIA., IN. 6" DEPTH, FT. FROM 0 TO 22
DIA., IN. DEPTH, FT. FROM TO
DIA., IN. DEPTH, FT. FROM TO

TYPE AND SIZE OF:
D-SAMPLER
U-SAMPLER
S-SAMPLER SS-Sampler: 2" Dia Sampler
CORE BARREL
CORE BIT
DRILL RODS

3" ID Sonic Macrocore

DRILLING MUD USED ☐ YES ☑ NO
DIAMETER OF ROTARY BIT, IN.
TYPE OF DRILLING MUD

AUGER USED ☐ YES ☑ NO
TYPE AND DIAMETER, IN.

CASING HAMMER, LBS. AVERAGE FALL, IN.
SAMPLER HAMMER, LBS. 140 AVERAGE FALL, IN. 30
TYPE OF HAMMER Automatic

WATER LEVEL OBSERVATIONS IN BOREHOLE

DATE	TIME	DEPTH OF HOLE	DEPTH OF CASING	DEPTH TO WATER	CONDITIONS OF OBSERVATION

PIEZOMETER INSTALLED ☑ YES ☐ NO SKETCH SHOWN ON pg 5/6

STANDPIPE: TYPE ID, IN. LENGTH, FT. TOP ELEV.
INTAKE ELEMENT: TYPE OD, IN. LENGTH, FT. TIP ELEV.
FILTER: MATERIAL OD, IN. LENGTH, FT. BOT. ELEV.

PAY QUANTITIES

3.5" DIA. DRY SAMPLE BORING LIN. FT.
3.5" DIA. U-SAMPLE BORING LIN. FT.
CORE DRILLING IN ROCK LIN. FT.

NO. OF 3" SHELBY TUBE SAMPLES
NO. OF 3" UNDISTURBED SAMPLES
OTHER:

BORING CONTRACTOR Aquifer Drilling and Testing
DRILLER Tony Palomeque HELPERS Joseph Arroyo
REMARKS 1 vwp and 1 thermistor installed
RESIDENT ENGINEER Mark Cheney DATE 12-10-15

BOR-4_JAN2013

BORING NO. BRP-33

ch2m:

PROJECT NUMBER: 10587 BORING NUMBER: BRP-36
Sheet: 1/6

SOIL BORING LOG

PROJECT: Dundalk Marine Terminal LOCATION: Baltimore, Maryland
ELEVATION: ~+23 DRILLING CONTRACTOR: ADT
DRILLING METHOD AND EQUIPMENT: Fraste Multi Drill Max 170; Sonic Sampling
WATER LEVELS: START: 0800 FINISH: LOGGER: Mark Chancy

DEPTH BELOW (ft)	SAMPLE			STANDARD PENETRATION TEST RESULTS	SOIL DESCRIPTION	COMMENTS
	NUMBER	TYPE	RECOVERY (ft)	6" - 6" - 6" (N)	SOIL NAME, USCS GROUP SYMBOL, COLOR, MOISTURE CONTENT, RELATIVE DENSITY OR CONSISTENCY, SOIL STRUCTURE, MINERALOGY	DEPTH OF CASING, DRILLING RATE, DRILLING FLUID LOSS, TESTS AND INTRUMENTATION
0	S-1	3" sonic	2'	NA	Road base asphalt	
1						
2						
3						
4	S-2	3" Sonic	3'	NA	4.0-5.0 Damp red brown f-m silty sand trace gravel, trace clay (SM-CL)	DRC -
5					5.0-6.0 concrete with gravel	
6						

ch2m

PROJECT NUMBER: 10587 **BORING NUMBER:** BRP-36
Sheet: 2/6

SOIL BORING LOG

PROJECT: Dundalk Marine Terminal **LOCATION:** Baltimore, Maryland
ELEVATION: ~ +23 **DRILLING CONTRACTOR:** ADT
DRILLING METHOD AND EQUIPMENT: Fraste Multi' Drill Max 170; Sonic Sampling
WATER LEVELS: **START:** **FINISH:** **LOGGER:** Mark Chancy

DEPTH BELOW (ft)	SAMPLE			STANDARD PENETRATION TEST RESULTS	SOIL DESCRIPTION	COMMENTS
	NUMBER	TYPE	RECOVERY (ft)	6" - 6" - 6" (N)	SOIL NAME, USCS GROUP SYMBOL, COLOR, MOISTURE CONTENT, RELATIVE DENSITY OR CONSISTENCY, SOIL STRUCTURE, MINERALOGY	DEPTH OF CASING, DRILLING RATE, DRILLING FLUID LOSS, TESTS AND INTRUMENTATION
6	S-2	3" Sonic	3'	NA	6.0-7.0 Asphalt with concrete	DPC - none
7	S-3	3" Sonic	3'	NA	7.0 - 8.0 Damp Red brown f-m silty sand trace clay trace gravel (SM-CL)	DPC - none
8					8.0-9'8" Dry gray to light brown f-c sand with gravel, trace silt, trace concrete chips (SM)	DPC - none
9						
					9'8"-10' Dry Red clay with white streaks (CL)	DPC — none
10	SS-1	2" OD Split	2'	41- 44 50/3"	10'-11.0 Dry red brown silty f-m sand (SM)	DPC + strong advanced 6" OD casing to 10' DPC + strong
11					11-11'3" Dry light brown to green f-m sand trace gravel	DPC +/- refusal at 11'3" advanced w/sonic to 12'
	S-4	3" sonic	1.5'	NA	11'3"-12' Dry green to black gravelly f-M sand, trace silt (GB)	DPC + strong
12						

ch2m.

PROJECT NUMBER: 10587 **BORING NUMBER:** BRP-36
Sheet: 3/6

SOIL BORING LOG

PROJECT: Dundalk Marine Terminal **LOCATION:** Baltimore, Maryland
ELEVATION: ~+23 **DRILLING CONTRACTOR:** ADT
DRILLING METHOD AND EQUIPMENT: Fraste Multi' Drill Max 170; Sonic Sampling
WATER LEVELS: **START:** **FINISH:** **LOGGER:** Mark Chancy

DEPTH BELOW (ft)	SAMPLE			STANDARD PENETRATION TEST RESULTS	SOIL DESCRIPTION	COMMENTS
	NUMBER	TYPE	RECOVERY (ft)	6" - 6" - 6" (N)	SOIL NAME, USCS GROUP SYMBOL, COLOR, MOISTURE CONTENT, RELATIVE DENSITY OR CONSISTENCY, SOIL STRUCTURE, MINERALOGY	DEPTH OF CASING, DRILLING RATE, DRILLING FLUID LOSS, TESTS AND INTRUMENTATION
12	SS-2	2" OD sampler	9"	10-50/3"	12-12'9" Dry loose to very dense red brown moderately indurated f-m silty sand (SM) (HB) trace green particles	DPC + strong refusal at 12'9"
13	S-5	3" Sonic	10"	NA	12-9"-14' Dry damp red brown f-m silty sand, trace gravel, trace black (GB (COPR) trace clay Mostly (HB)	DPC + strong
14	SS-3	2" OD Sampler	1'3"	45-50/5"	14'-7" Dry dense to very dense red brown f-m silty sand trace gravel (SM) (HB)	DPC + strong
					14'7"-14'11" Damp very dense red to black f-m silty sand (SM) GB	DPC + strong
15	S-6	3" Sonic	2'	NA	14'11'-16' Damp red brown to black f-m silty sand (HB) COPR mixed together, trace clay SM	DPC + strong
16	SS-4	2" OD Sampler	1'	50/4"	16'-16'4" Dry very dense red brown with green and white particles f-m silty sand (SM) (HB) trace gravel	DPC + strong refusal at 16'4" sonic to 18'
17	S-7	3" Sonic	1'	NA	16'4-18 Dry red brown highly indurated f-M silty sand, trace gravel (SM) HB	Driller says the sonic needs to advance and loses a foot very hard drilling rig chatter Sample under pressure, lost sample in air
18						

ch2m:

PROJECT NUMBER: 10587 **BORING NUMBER:** BRP 35
Sheet: 4/6

SOIL BORING LOG

PROJECT: Dundalk Marine Terminal **LOCATION:** Baltimore, Maryland
ELEVATION: ~+23 **DRILLING CONTRACTOR:** ADT
DRILLING METHOD AND EQUIPMENT: Fraste Multi Drill Max 170; Sonic Sampling
WATER LEVELS: **START:** **FINISH:** 12:45 **LOGGER:** Mark Chaney

DEPTH BELOW (ft)	SAMPLE			STANDARD PENETRATION TEST RESULTS	SOIL DESCRIPTION	COMMENTS
	NUMBER	TYPE	RECOVERY (ft)	6" - 6" - 6" (N)	SOIL NAME, USCS GROUP SYMBOL, COLOR, MOISTURE CONTENT, RELATIVE DENSITY OR CONSISTENCY, SOIL STRUCTURE, MINERALOGY	DEPTH OF CASING, DRILLING RATE, DRILLING FLUID LOSS, TESTS AND INTRUMENTATION
18	SS5	2" OD sample	1'	50/4"	18-18'2" Dry very dense red brown f-M silty sand (SM)(HB) 18'2"-18'4" Dry very dense black f-m silty sand (SM) (GB)	DPC ++ Very strong DPC ++ Very strong
	S-8	3" Sonic	2'	NA	18'4' Dry Black moderately indurated cementitious material almost asphalt like with white streaks and trace clay, trace f-M silty sand (Material bagged for testing)	Refusal at 18'4" Drill says cannot advance with sonic to 19' no sample will be obtained, advanced with sonic to 20'
19						
20					Thermometer air temp 15.5° 1 vwp installed at 18' 1518414 2 thermistors Air Slurry T_1 14.5' 17.6 24.2 T_2 12' 17.2 20.0 Vwp Air T_0 19.7 P_0 9817 Depth. T_1 19.8 P_1 9823 Slurry T_2 30.4 P_2 8836	as driller was attempting to sample from 20'-20'6" the rod and spoon dropped 3.5' under self weight. when drillers removed rods with spoon a " piece of bottom clay liner was in the catch of the spoon Drillers did not drill to 23.5' depth. drillers drilled to 20' and under self weight the rod sank to 23.5' into clay liner I sounded borehole and confirmed the depth as 23'. (Clay bagged for testing)
21						
22						
23					Borehole terminated @ 23' after speaking with K. Chaturvedula	
24						

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BORING NO. BRP-36
SHEET 6 **OF** 6
FILE NO. 10587
SURFACE ELEV. ~+23
DATUM

PROJECT Dundalk Marine Terminal
LOCATION Baltimore, Maryland
BORING LOCATION See location Plan

TEST/INSPECTION EQUIPMENT Sonic Samp Drill Max 170; SPT Sampling
REFERENCE CODES/STANDARDS

BORING EQUIPMENT AND METHODS OF STABILIZING BOREHOLE

TYPE OF BORING RIG		TYPE OF FEED DURING CORING							
				CASING USED	☑ YES	☐ NO			
TRUCK		MECHANICAL		DIA., IN.	6"	DEPTH, FT. FROM	0	TO	
SKID		HYDRAULIC		DIA., IN.		DEPTH, FT. FROM		TO	
BARGE		OTHER		DIA., IN.		DEPTH, FT. FROM		TO	
OTHER	Track								

TYPE AND SIZE OF:
D-SAMPLER
U-SAMPLER
S-SAMPLER SS-Sampler: 2" Dia Sampler
CORE BARREL
CORE BIT
DRILL RODS
3" ID Sonic Macrocore

DRILLING MUD USED ☐ YES ☑ NO
DIAMETER OF ROTARY BIT, IN.
TYPE OF DRILLING MUD
AUGER USED ☐ YES ☑ NO
TYPE AND DIAMETER, IN.
CASING HAMMER, LBS. AVERAGE FALL, IN.
SAMPLER HAMMER, LBS. 140 AVERAGE FALL, IN. 30
TYPE OF HAMMER Automatic

WATER LEVEL OBSERVATIONS IN BOREHOLE

DATE	TIME	DEPTH OF HOLE	DEPTH OF CASING	DEPTH TO WATER	CONDITIONS OF OBSERVATION

PIEZOMETER INSTALLED ☑ YES ☐ NO SKETCH SHOWN ON pg 5/6

STANDPIPE:	TYPE		ID, IN.		LENGTH, FT.		TOP ELEV.	
INTAKE ELEMENT:	TYPE		OD, IN.		LENGTH, FT.		TIP ELEV.	
FILTER:	MATERIAL		OD, IN.		LENGTH, FT.		BOT. ELEV.	

PAY QUANTITIES

3.5" DIA. DRY SAMPLE BORING	LIN. FT.		NO. OF 3" SHELBY TUBE SAMPLES	
3.5" DIA. U-SAMPLE BORING	LIN. FT.		NO. OF 3" UNDISTURBED SAMPLES	
CORE DRILLING IN ROCK	LIN. FT.		OTHER:	

BORING CONTRACTOR Aquifer Drilling and Testing
DRILLER Tony Palomeque HELPERS Joseph Arroyo
REMARKS 1 vwp and 1 thermistor installed
RESIDENT ENGINEER Mark Cheney DATE 12-9-15

BORING NO.

BOR-4_JAN2013

ch2m:

PROJECT NUMBER: 10587 **BORING NUMBER:** BRP 39
Sheet: 1/7

SOIL BORING LOG

PROJECT: Dundalk Marine Terminal **LOCATION:** Baltimore, MD
ELEVATION: ~21 **DRILLING CONTRACTOR:** ADT
DRILLING METHOD AND EQUIPMENT: Fraste Multidrill XL Max 170
WATER LEVELS: **START:** 12-1-15 08:20 **FINISH:** 12-1-15 11:45 **LOGGER:** M. Chaney

DEPTH BELOW (ft)	SAMPLE			STANDARD PENETRATION TEST RESULTS	SOIL DESCRIPTION	COMMENTS
	NUMBER	TYPE	RECOVERY (ft)	6" - 6" - 6" (N)	SOIL NAME, USCS GROUP SYMBOL, COLOR, MOISTURE CONTENT, RELATIVE DENSITY OR CONSISTENCY, SOIL STRUCTURE, MINERALOGY	DEPTH OF CASING, DRILLING RATE, DRILLING FLUID LOSS, TESTS AND INTRUMENTATION
0					Asphalt / Road Base	6" OD casing installed to 5'
	S-1	3" sonic		NA		
1			3'			DPC – none
2						
3					3-4 Red brown C-M silty sand, some gravel, trace clay (SM)	
4					Brown M-C Sand, some gravel trace clay (S)	DPC – none
5	S-2	3" Sonic	3'	NA		
6						

ch2m:

PROJECT NUMBER: 10587
BORING NUMBER: BRP39
Sheet: 2/7

SOIL BORING LOG

PROJECT: Dundalk Marine Terminal
LOCATION: Baltimore, MD
ELEVATION: ~21
DRILLING CONTRACTOR: ADT
DRILLING METHOD AND EQUIPMENT: Fraste Multi Drill XL Max 170
WATER LEVELS:
START: 12-1-15 08:20
FINISH: 12-1-15 11:45
LOGGER: M. Chaney

	SAMPLE			STANDARD PENETRATION TEST RESULTS	SOIL DESCRIPTION	COMMENTS
DEPTH BELOW (ft)	NUMBER	TYPE	RECOVERY (ft)	6" - 6" - 6" (N)	SOIL NAME, USCS GROUP SYMBOL, COLOR, MOISTURE CONTENT, RELATIVE DENSITY OR CONSISTENCY, SOIL STRUCTURE, MINERALOGY	DEPTH OF CASING, DRILLING RATE, DRILLING FLUID LOSS, TESTS AND INTRUMENTATION
6	S2	3" Sonic	3'	NA	6.5'-7.0' Road base asphalt	DPC – none Membrane @ 6.0'
7					Top 17" Red brown M-C sand trace clay (S)	
8	S3	3" Sonic	2'	NA		DPC – none
9					9'5"-10' light brown to white gravelly m-c sand (S)	
10	SS1	3" SS	2'	6-82-50-15	Top 6 Red brown silty f-M sand some gravel (HB) (SM) Mod-highly indurated	6" OD casing installed to 10' DPC + strong
11					Bott 18 Red brown highly indurated f-M silty sand, some gravel (HB) (SM)	
12						

ch2m:

PROJECT NUMBER: 10587 **BORING NUMBER:** BLP 39
Sheet: 3/7

SOIL BORING LOG

PROJECT: Dundalk Marine Terminal **LOCATION:** Baltimore, MD
ELEVATION: ~21 **DRILLING CONTRACTOR:** ADT
DRILLING METHOD AND EQUIPMENT: Fraste Multi Drill XL Max 170
WATER LEVELS: **START:** 12-1-15 08:20 **FINISH:** 12-1-15 11:45 **LOGGER:** M Chaney

DEPTH BELOW (ft)	SAMPLE			STANDARD PENETRATION TEST RESULTS	SOIL DESCRIPTION	COMMENTS
	NUMBER	TYPE	RECOVERY (ft)	6" - 6" - 6" (N)	SOIL NAME, USCS GROUP SYMBOL, COLOR, MOISTURE CONTENT, RELATIVE DENSITY OR CONSISTENCY, SOIL STRUCTURE, MINERALOGY	DEPTH OF CASING, DRILLING RATE, DRILLING FLUID LOSS, TESTS AND INTRUMENTATION
12 13	SS-2	3" SS	2'	27-34 45-56	Top 18" Red silty sand f-M sand (Highly indurated) some gravel trace white specks trace clay (HB) (SM) Bott 6" Red brown Highly indurated with grayish brown specks M-C silty sand trace gravel (HB)(SM)	DPC+ strong
14 15	SS-3	3" SS	20	28-26 26-44	Red brown Mod indurated M-C sand some gravel (HB)	DPC+ strong 6" OD casing installed to 15'
16	SS-4	3" SS	8"	45-2/100	16'-16'8" Red brown Highly indurated M-C sand some gravel trace clay HB	
17 18	S4	3" sonic	1'4"	NA	16'8"-18' advanced with sonic Red brown M-C sand, gravel HB	Picture not taken

ch2m:

PROJECT NUMBER: 10587 **BORING NUMBER:** BLP 39
Sheet: 4/7

SOIL BORING LOG

PROJECT: Dundalk Marine Terminal **LOCATION:** Baltimore, MD
ELEVATION: ~21 **DRILLING CONTRACTOR:** ADT
DRILLING METHOD AND EQUIPMENT: Fraste Multidrill XL Max 170
WATER LEVELS: **START:** 12-1-15 08:20 **FINISH:** 12-1-15 11:45 **LOGGER:** M. Chaney

DEPTH BELOW (ft)	SAMPLE			STANDARD PENETRATION TEST RESULTS	SOIL DESCRIPTION	COMMENTS
	NUMBER	TYPE	RECOVERY (ft)	6" - 6" - 6" (N)	SOIL NAME, USCS GROUP SYMBOL, COLOR, MOISTURE CONTENT, RELATIVE DENSITY OR CONSISTENCY, SOIL STRUCTURE, MINERALOGY	DEPTH OF CASING, DRILLING RATE, DRILLING FLUID LOSS, TESTS AND INTRUMENTATION
18	SS5		12	97-58	Red brown very dense Highly Indurated M-C Sand, some gravel	DPC + Strong
19	SS-6	3" SS	6"		19.0 - 19.25 Mod indurated Redbrown M-C Sand, trace clay	DPC + strong
					19.25'-19.5' Bottled clay liner	Boring terminated @ 19.5' 2 thermistors installed @ 13.5' - T_2 16.5' - T_1 Thermometer = 12.0° dec Celcius Air reading T_1 11.7° T_2 11.2° reading @ installation depth T_1 16.5° T_2 13.5'

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BORING NO. BRP-39
SHEET 7 OF 7
FILE NO. 10587
SURFACE ELEV. ~21
DATUM

PROJECT Dundalk Marine Terminal
LOCATION Baltimore, Maryland
BORING LOCATION See boring location Plan

TEST/INSPECTION EQUIPMENT Sonic Samp Drill Max 170; SPT Sampling
REFERENCE CODES/STANDARDS

BORING EQUIPMENT AND METHODS OF STABILIZING BOREHOLE

TYPE OF BORING RIG
TRUCK
SKID
BARGE
OTHER Track

TYPE OF FEED DURING CORING
MECHANICAL
HYDRAULIC
OTHER

CASING USED ☑ YES ☐ NO
DIA., IN. 6" DEPTH, FT. FROM 0 TO 15
DIA., IN. DEPTH, FT. FROM TO
DIA., IN. DEPTH, FT. FROM TO

TYPE AND SIZE OF:
D-SAMPLER
U-SAMPLER
S-SAMPLER SS-Sampler; 3" Dia. Sampler
CORE BARREL
CORE BIT
DRILL RODS

DRILLING MUD USED ☐ YES ☑ NO
DIAMETER OF ROTARY BIT, IN.
TYPE OF DRILLING MUD

AUGER USED ☐ YES ☑ NO
TYPE AND DIAMETER, IN.

CASING HAMMER, LBS. AVERAGE FALL, IN.
SAMPLER HAMMER, LBS. 140 AVERAGE FALL, IN. 30
TYPE OF HAMMER Automatic

WATER LEVEL OBSERVATIONS IN BOREHOLE

DATE	TIME	DEPTH OF HOLE	DEPTH OF CASING	DEPTH TO WATER	CONDITIONS OF OBSERVATION

PIEZOMETER INSTALLED ☐ YES ☐ NO SKETCH SHOWN ON

STANDPIPE: TYPE ID, IN. LENGTH, FT. TOP ELEV.
INTAKE ELEMENT: TYPE OD, IN. LENGTH, FT. TIP ELEV.
FILTER: MATERIAL OD, IN. LENGTH, FT. BOT. ELEV.

PAY QUANTITIES
3.5" DIA. DRY SAMPLE BORING LIN. FT.
3.5" DIA. U-SAMPLE BORING LIN. FT.
CORE DRILLING IN ROCK LIN. FT.
NO. OF 3" SHELBY TUBE SAMPLES
NO. OF 3" UNDISTURBED SAMPLES
OTHER:

BORING CONTRACTOR Aquifer Drilling and testing, Inc
DRILLER Brian Karshick HELPERS Chris Phelan
REMARKS 2 thermistors installed
RESIDENT ENGINEER M. Chaney DATE 12-1-15

BORING NO. BRP-39

ch2m.

PROJECT NUMBER:

BORING NUMBER: BPP-42

Sheet: 1

SOIL BORING LOG

PROJECT: Honeywell DMT IST

LOCATION: Moved 10 feet to the South of Staked loc

ELEVATION:

DRILLING CONTRACTOR:

DRILLING METHOD AND EQUIPMENT: SONIC SAMP DRILL MAX 170; SPT sampling

WATER LEVELS:

START: 11/12/15 11:33

FINISH: 11/12/15 14:30

LOGGER: K. Chaturvedula

DEPTH BELOW (ft)	SAMPLE			STANDARD PENETRATION TEST RESULTS	SOIL DESCRIPTION	COMMENTS
	NUMBER	TYPE	RECOVERY (ft)	6" - 6" - 6" (N)	SOIL NAME, USCS GROUP SYMBOL, COLOR, MOISTURE CONTENT, RELATIVE DENSITY OR CONSISTENCY, SOIL STRUCTURE, MINERALOGY	DEPTH OF CASING, DRILLING RATE, DRILLING FLUID LOSS, TESTS AND INTRUMENTATION
0					6" Asphalt 0.75'-2.0' Poorly graded gravel with Sand (GP), Gray-white (7.5YR 5/1), dry, Road based aggregate	Advanced the hole from 0' to 10' bgs using 3" ID Sonic micro core DPC -
1	S-1	SONIC BORING MACRO CORE	36"	–		DPC -
2					2.0' - woven geotextile 2.0' - Silty SAND with gravel (SM), dark red-Brown (10YR 3/2), dry, fine to medium grained sand	DPC-
3						
4					4.0' - same as above, wet	DPC -
5	S-2	SONIC MACRO CORE			5.0' - Polyethylene liner encountered 5.0'-6.0' - Same as above, wet	DPC -
6						

ch2m

PROJECT NUMBER:

BORING NUMBER: BRP-42
Sheet: 2

SOIL BORING LOG

PROJECT:
ELEVATION:
DRILLING METHOD AND EQUIPMENT:
WATER LEVELS:
LOCATION:
DRILLING CONTRACTOR:
START:
FINISH:
LOGGER:

DEPTH BELOW (ft)	SAMPLE			STANDARD PENETRATION TEST RESULTS	SOIL DESCRIPTION	COMMENTS
	NUMBER	TYPE	RECOVERY (ft)	6" - 6" - 6" (N)	SOIL NAME, USCS GROUP SYMBOL, COLOR, MOISTURE CONTENT, RELATIVE DENSITY OR CONSISTENCY, SOIL STRUCTURE, MINERALOGY	DEPTH OF CASING, DRILLING RATE, DRILLING FLUID LOSS, TESTS AND INTRUMENTATION
6	S-2				6.0' - Poorly graded GRAVEL with sand (GP), gray-white (7.5Y 8/1), dry, road based aggregate.	DPC -
					6.8' - 3" of Asphalt	
7					7.0' - 7.75' - Silty SAND with gravel (SM), dark red-brown (10YR 3/4), moist fine to medium grained sand	DPC -
8	S-3	SONIC MACRO CORE	36"		7.75' - 8.0' - Poorly graded GRAVEL with sand (GP), gray-white (7.5Y 8/1), dry, road based aggregate, medium to coarse grained sand	DPC -
9					9.0' - Poorly graded SAND with silt and gravel (SP-SM), light red-white (7.5YR 8/6), moist, medium to coarse grained sand	DPC -
					9.9' - woven geotextile	
10	SS-4	SS		4 6 79 100/2"	10' - 10.5' - Same as above, dark gray (7.5YR 4/1), moist	10.0' - Below 10' switched to SS sampling; 140 lb hammer; 30 in drop; 3" dia. sampler -
					10.5' - 11.0' - Fat CLAY (CH), Red (10Y 4/6), moist, ~~too~~ medium plasticity	DPC -
11					11.0' - Silty SAND (SM), Reddish Brown (7.5YR 4/3), dry, partially to slightly indurated. (Inferred LHS core)	11.0' - Advanced to 15' using sonic macro core - DPC + 11.5' - 6" sonic outer casing installed to 10.0' bgs.
(10'-12') 12						

ch2m:

PROJECT NUMBER:

BORING NUMBER: BRP-42
Sheet: 3

SOIL BORING LOG

PROJECT:
LOCATION:
ELEVATION:
DRILLING CONTRACTOR:
DRILLING METHOD AND EQUIPMENT:
WATER LEVELS:
START:
FINISH:
LOGGER:

DEPTH BELOW (ft)	SAMPLE			STANDARD PENETRATION TEST RESULTS	SOIL DESCRIPTION	COMMENTS
	NUMBER	TYPE	RECOVERY (ft)	6" - 6" - 6" (N)	SOIL NAME, USCS GROUP SYMBOL, COLOR, MOISTURE CONTENT, RELATIVE DENSITY OR CONSISTENCY, SOIL STRUCTURE, MINERALOGY	DEPTH OF CASING, DRILLING RATE, DRILLING FLUID LOSS, TESTS AND INTRUMENTATION
12	SS-5	Sonic macro core	12"		same as above,	DPC +
13	SS-6	SS	24"	5 12 17 34	13.0'-14.5' - Poorly graded sand with silt (SP-SM), dark gray-black (N2), wet, bright green particles, particulate (GB COPR)	13.0' - Groundwater encountered during drilling at 13.0 bgs DPC ++
14					14.5' - Silty sand (SM), Red-Brown (7.5YR 4/4), moist, particulate to slightly indurated (HB COPR)	DPC +
15	SS-7	SS	2"	100/3"	same as above.	Advanced the sonic macro core to 17' bgs using SPTs.
16					16.5' - GB COPR layer, wet	DPC ++
17	SS-8	SS	4"	19	17.0' - same as above (GB COPR) Bright green particles, wet	Alternating layers of GB and HB COPR
18	SS-9	SS	6"	65	17.5' - HB COPR layer, Yellow particles, slightly indurated, dry	

ch2m:

PROJECT NUMBER:

BORING NUMBER: BKP-42

Sheet: 4

SOIL BORING LOG

PROJECT:

LOCATION:

ELEVATION:

DRILLING CONTRACTOR:

DRILLING METHOD AND EQUIPMENT:

WATER LEVELS:

START:

FINISH:

LOGGER:

DEPTH BELOW (ft)	SAMPLE			STANDARD PENETRATION TEST RESULTS	SOIL DESCRIPTION	COMMENTS
	NUMBER	TYPE	RECOVERY (ft)	6" - 6" - 6" (N)	SOIL NAME, USCS GROUP SYMBOL, COLOR, MOISTURE CONTENT, RELATIVE DENSITY OR CONSISTENCY, SOIL STRUCTURE, MINERALOGY	DEPTH OF CASING, DRILLING RATE, DRILLING FLUID LOSS, TESTS AND INTRUMENTATION
18	SS-10	SS	3"	100/3"	same as above, particulate, dry	18.8' - 6" OD outer casing advanced to 15' bgs.
	S-11	Sonic 3" core	2"	-	same as above, dry	Advanced the hole to 19' bgs using ~~[illegible]~~ 3" ID sonic macro core
19	SS-12	SS	6"	10	19.0' - Sand lean clay (CL), Red-White (10Y W/1), moist, Low plasticity	DPT -
					Boring terminated at 19.5' bgs	
20						
21						
22						
23						

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BORING NO. BRP-42
SHEET 5 OF
FILE NO. 10587
SURFACE ELEV.
DATUM

PROJECT DUNDALK MARINE TERMINAL
LOCATION BALTIMORE, MARYLAND
BORING LOCATION

TEST/INSPECTION EQUIPMENT Sonic Samp Drill May 170 ; SPT Sampling
REFERENCE CODES/STANDARDS

BORING EQUIPMENT AND METHODS OF STABILIZING BOREHOLE

TYPE OF BORING RIG
TRUCK
SKID
BARGE
OTHER Track

TYPE OF FEED DURING CORING
MECHANICAL
HYDRAULIC
OTHER

CASING USED ☑ YES ☐ NO
DIA., IN. 6" OD DEPTH, FT. FROM 0 TO 19.5'
DIA., IN. DEPTH, FT. FROM TO
DIA., IN. DEPTH, FT. FROM TO

TYPE AND SIZE OF:
D-SAMPLER
U-SAMPLER
S-SAMPLER SS Sampling 3" dia.
CORE BARREL
CORE BIT
DRILL RODS
3" ID Sonic MacroCore

DRILLING MUD USED ☐ YES ☑ NO
DIAMETER OF ROTARY BIT, IN.
TYPE OF DRILLING MUD

AUGER USED ☐ YES ☑ NO
TYPE AND DIAMETER, IN.

CASING HAMMER, LBS. AVERAGE FALL, IN.
SAMPLER HAMMER, LBS. 140 AVERAGE FALL, IN. 30
TYPE OF HAMMER Automatic

WATER LEVEL OBSERVATIONS IN BOREHOLE

DATE	TIME	DEPTH OF HOLE	DEPTH OF CASING	DEPTH TO WATER	CONDITIONS OF OBSERVATION
11/12/15	13:00	13.0'	10.0'	13.0'	During Drilling

PIEZOMETER INSTALLED ☑ YES ☐ NO SKETCH SHOWN ON See Standpipe Installation log

STANDPIPE: TYPE ID, IN. LENGTH, FT. TOP ELEV.
INTAKE ELEMENT: TYPE OD, IN. LENGTH, FT. TIP ELEV.
FILTER: MATERIAL OD, IN. LENGTH, FT. BOT. ELEV.

PAY QUANTITIES
3.5" DIA. DRY SAMPLE BORING LIN. FT.
3.5" DIA. U-SAMPLE BORING LIN. FT.
CORE DRILLING IN ROCK LIN. FT.
NO. OF 3" SHELBY TUBE SAMPLES
NO. OF 3" UNDISTURBED SAMPLES
OTHER:

BORING CONTRACTOR Aquifer Drilling and Testing, Inc.
DRILLER Brian Karshick HELPERS Chris Phelen
REMARKS
RESIDENT ENGINEER K. Chaturvedula DATE 11/12/15

BORING NO. BRP-42

BOR-4_JAN2013

ch2m

PROJECT NUMBER:

BORING NUMBER: BRP-U4
Sheet: 1

SOIL BORING LOG

PROJECT: Honeywell DMT 55
ELEVATION:
LOCATION:
DRILLING CONTRACTOR: AQUIFER DRILLING AND TESTING, INC.
DRILLING METHOD AND EQUIPMENT: SONIC SAND DRILL MODEL 170; SPT Sampling
WATER LEVELS:
START: 12/15/15 14:30
FINISH: 12/15/15 16:40
LOGGER: R-Chaturvedula

DEPTH BELOW (ft)	SAMPLE			STANDARD PENETRATION TEST RESULTS	SOIL DESCRIPTION	COMMENTS
	NUMBER	TYPE	RECOVERY (ft)	6" - 6" - 6" (N)	SOIL NAME, USCS GROUP SYMBOL, COLOR, MOISTURE CONTENT, RELATIVE DENSITY OR CONSISTENCY, SOIL STRUCTURE, MINERALOGY	DEPTH OF CASING, DRILLING RATE, DRILLING FLUID LOSS, TESTS AND INTRUMENTATION
0					3" Asphalt 0.25'- Poorly graded gravel with sand (GP), gray-brown (7.5YR 4/1), dry, mixed with crushed pieces of asphalt	Advanced the borehole from 0'-16' using 5" ID sonic macro core - DPC-
1						
	S-1	SONIC MACRO CORE	43"	–		
2						
					2.8'- Silty SAND with gravel (SM), Brown (7.5YR 4/2), dry, fine to medium sand	DPC-
3						
					3.8'- Decomposed pieces of wood	
4					4.0'- Clayey SAND (SC), gray-Brown (7.5YR 4/1), wet, fine to medium grained sand.	DPC-
	S-2	SONIC MACRO CORE				
5			36"	–		
					5.5'- Polyethylene liner. 5.5'- Silty SAND with gravel (SM) Brown-Red (7.5YR 4/4), dry, fine to medium grained sand!	DPC-
6						

ch2m.

PROJECT NUMBER:

BORING NUMBER: BPP-44
Sheet: 2

SOIL BORING LOG

PROJECT:
LOCATION:
ELEVATION:
DRILLING CONTRACTOR:
DRILLING METHOD AND EQUIPMENT:
WATER LEVELS:
START:
FINISH:
LOGGER:

DEPTH BELOW (ft)	SAMPLE			STANDARD PENETRATION TEST RESULTS	SOIL DESCRIPTION	COMMENTS
	NUMBER	TYPE	RECOVERY (ft)	6" - 6" - 6" (N)	SOIL NAME, USCS GROUP SYMBOL, COLOR, MOISTURE CONTENT, RELATIVE DENSITY OR CONSISTENCY, SOIL STRUCTURE, MINERALOGY	DEPTH OF CASING, DRILLING RATE, DRILLING FLUID LOSS, TESTS AND INTRUMENTATION
6	S-2	SONIC MACRO CORE		–	6.8' - 2" thick Asphalt and Crushed Asphalt pieces	DPP -
7					7.0' - Poorly graded sand with gravel (CP), gray (7.5 YR 7/1), dry, coarse grained sand, Roadbased aggregate	DPC - sup = 1.5"
8	S-3	SONIC MACRO CORE	30"	–	8.3' - silty SAND with gravel (SM), Red Brown (7.5 YR 4/6), moist, fine to medium grained sand, pockets of clay	DPC -
9						
10		SS	9"	3	10.0' - Fat CLAY (CH) Red (10R 4/4), moist, stiff, highly plastic, pockets of sand	10.0' - 6" OD outer casing installed to 10' bgs. 10.5 - below 10' switched to SS sampling; 140-lb hammer; 30in drop, 3" dia Sampler
(10.25')	SS-4			10.5' 50/5'	10.5' - 11.0' - Silty SAND (SM), gray-greenish; dry, fine to medium grained sand, bright green particles (COPR)	DPC+
11	S-5	sonic macro core	15"	–	11.2' - Same as above, Reddish-Brown (7.5YR 4/4), slighty to moderately indurated (HB COPR)	
12						

ch2m:

PROJECT NUMBER:

BORING NUMBER: BRP-44
Sheet: 3

SOIL BORING LOG

PROJECT:
LOCATION:
ELEVATION:
DRILLING CONTRACTOR:
DRILLING METHOD AND EQUIPMENT:
WATER LEVELS:
START:
FINISH:
LOGGER:

DEPTH BELOW (ft)	SAMPLE			STANDARD PENETRATION TEST RESULTS	SOIL DESCRIPTION	COMMENTS
	NUMBER	TYPE	RECOVERY (ft)	6" - 6" - 6" (N)	SOIL NAME, USCS GROUP SYMBOL, COLOR, MOISTURE CONTENT, RELATIVE DENSITY OR CONSISTENCY, SOIL STRUCTURE, MINERALOGY	DEPTH OF CASING, DRILLING RATE, DRILLING FLUID LOSS, TESTS AND INTRUMENTATION
12	S-6	SS	15"	15 18 13 26	Poorly graded sand with silt (SP-SM), dark gray - black (N1), moist, medium to coarse grained sand, particulate, bright green particles (GB COPR)	DPC-T
13						
14	S-7	Sonic macro core	18"	50/2"	14.0' - Silty Sand (SM), Reddish brown (7.5 YR 4/6), dry, fine to medium grained sand, bright green particles, particulate to slightly indurated (HB COPR)	14.0' - SS refusal; Advanced the 3" ID sonic macro core to 16' bgs - No recovery in the SS sample DPC-T
15						16.0' - 6" OD outer casing installed to 15.0' bgs
16	S-8	sonic macro core	12"	50/2"	16.0' - Same as above	16.0' - SS refusal; Advanced the 3" ID sonic macro core to 17' bgs; No recovery in the SS sampler
17	S-9	sonic macro core	18"	50/3"	17.0' - Same as above, particulate to moderately indurated	17.0' - SS refusal; macro core advanced to 18.5' bgs
18						

ch2m

PROJECT NUMBER:

BORING NUMBER: BPR-44
Sheet: 4

SOIL BORING LOG

PROJECT:
LOCATION:
ELEVATION:
DRILLING CONTRACTOR:
DRILLING METHOD AND EQUIPMENT:
WATER LEVELS:
START:
FINISH:
LOGGER:

DEPTH BELOW (ft)	SAMPLE			STANDARD PENETRATION TEST RESULTS	SOIL DESCRIPTION	COMMENTS
	NUMBER	TYPE	RECOVERY (ft)	6" - 6" - 6" (N)	SOIL NAME, USCS GROUP SYMBOL, COLOR, MOISTURE CONTENT, RELATIVE DENSITY OR CONSISTENCY, SOIL STRUCTURE, MINERALOGY	DEPTH OF CASING, DRILLING RATE, DRILLING FLUID LOSS, TESTS AND INTRUMENTATION
18	S-9			–	18.1' Poorly graded sand with silt (SP-SM), gray-greenish, moist, coarse grained sand particulate (GB COPR)	DPC-F
	SS-10	SS	1"	34	Same as above	
19	SS-11	SS	2"	50/2"	same as above, wet	19.0' groundwater encountered during drilling SS-refusal; sonic macro core advanced to 20.0' bgs.
	S-12	sonic macro core	10"	–	same as above, wet, dark gray and greenish particles	DPC-F
20	SS-13	SS	3"	24	20.0'- same as above. 20.2'- Silty sand (SM), Reddish Brown (7.5YR 4/4), moist, fine to medium grained sand, green particles (HB COPR)	20.0'- 6" OD outer casing installed to 20.0' bgs.
20.25'	SS-14	SS	3"	50/3"	20.25'- same as above	DPC-F Sonic macro core advanced to 21.5' bgs
21	S-15	sonic macro core	9"	–	21.0'- GB COPR layer, wet	
	SS-16	SS	5"	10	21.5'- Sandy clay (CL), Red-Yellow (10YR 4/4), moist, mixed with Fat clay seams	DPC-
22					Bottom of boring @ 22.0' bgs. 50', Air, Slurry T1 @ 18' 13.2 15' T2 @ 13' 12.9 6' sand 1.5' bentonite	Thermometer air temp: 13 22' 2" Standpipe installed

ch2m:

PROJECT NUMBER:

BORING NUMBER: BRP-45

Sheet: 1

SOIL BORING LOG

PROJECT: Honeywell DMT SSI

LOCATION: Moved 10' South from the staked location

ELEVATION:

DRILLING CONTRACTOR: Aquifer drilling and testing, Inc.

DRILLING METHOD AND EQUIPMENT: SONIC TAMP DRILL MAP 170 ; 5ft sampling

WATER LEVELS:

START: 11/11/15 15:00

FINISH: 11/12/15 9:45

LOGGER: K Chaturvedula

DEPTH BELOW (ft)	SAMPLE			STANDARD PENETRATION TEST RESULTS	SOIL DESCRIPTION	COMMENTS
	NUMBER	TYPE	RECOVERY (ft)	6" - 6" - 6" (N)	SOIL NAME, USCS GROUP SYMBOL, COLOR, MOISTURE CONTENT, RELATIVE DENSITY OR CONSISTENCY, SOIL STRUCTURE, MINERALOGY	DEPTH OF CASING, DRILLING RATE, DRILLING FLUID LOSS, TESTS AND INTRUMENTATION
0	S-1	SONIC 8 MACRO CORE			4" Asphalt 0.25'-2.0' - Poorly graded GRAVEL with Sand (GP). Gray (7.5YR 5/1), dry. Road based aggregate 2.0' - woven geotextile encountered 2.0' - silty SAND (SM) with gravel, dark brown-gray (10YR 3/2), dry, fine to medium grained sand	Advanced the hole from 0' to 10' bgs using 8" I.D sonic macro core DPC – DPC –
1			36"	–		
2						
3						
4		SONIC MACRO CORE	36"		4.0'-6.5' - Sandy lean CLAY (CL), dark gray (10YR 4/1), wet, soft	DPC –
5	S-2				5.0' - Pieces of wood	
6						

ch2m.

PROJECT NUMBER: **BORING NUMBER:** BRP-45
Sheet: 2

SOIL BORING LOG

PROJECT:
LOCATION:
ELEVATION:
DRILLING CONTRACTOR:
DRILLING METHOD AND EQUIPMENT:
WATER LEVELS:
START:
FINISH:
LOGGER:

DEPTH BELOW (ft)	SAMPLE			STANDARD PENETRATION TEST RESULTS	SOIL DESCRIPTION	COMMENTS
	NUMBER	TYPE	RECOVERY (ft)	6" - 6" - 6" (N)	SOIL NAME, USCS GROUP SYMBOL, COLOR, MOISTURE CONTENT, RELATIVE DENSITY OR CONSISTENCY, SOIL STRUCTURE, MINERALOGY	DEPTH OF CASING, DRILLING RATE, DRILLING FLUID LOSS, TESTS AND INTRUMENTATION
6	S-2	SONIC MACRO CORE			6.5' - encountered Polyethylene liner 6.5'-7.0' - Poorly graded SAND (SP), Black, Asphalt odor, moist	DPC –
7					7.0'-7.75' - Sandy CLAY (CL), dark gray (10YR 4/1), wet, soft	DPC –
8	S-3	SONIC MACRO CORE	36"		7.75'-9.0' - Poorly graded SAND (SP), gray-tan (10YR 7/1), dry, road base fill, pieces of crushed asphalt	DPC –
9					9.0' - Silty SAND (SM), Red-Brown (7.5YR 5/6), dry, Particulate to slightly indurated, laminated (HS core)	DPC –
10				2	10.0'-10.75' - same as above	DPC –
				13		10.5' - 6" OD outer casing advanced to 10.0' bgs.
11	SS-4	SS	24"	12	10.75'-11.5' - Poorly graded gravel with sand (GP), tan-white, moist, medium grained sand	DPC – 11.0' - Below 10' switched to SS sampling; 140-lb hammer, 30 in drop, 3" Dia Sampler
				22	11.5' - same as above, dark gray (10YR 4/1)	
12						

ch2m

PROJECT NUMBER:

BORING NUMBER: BRP-45

Sheet: 3

SOIL BORING LOG

PROJECT:

LOCATION:

ELEVATION:

DRILLING CONTRACTOR:

DRILLING METHOD AND EQUIPMENT:

WATER LEVELS:

START:

FINISH:

LOGGER:

DEPTH BELOW (ft)	SAMPLE			STANDARD PENETRATION TEST RESULTS	SOIL DESCRIPTION	COMMENTS
	NUMBER	TYPE	RECOVERY (ft)	6" - 6" - 6" (N)	SOIL NAME, USCS GROUP SYMBOL, COLOR, MOISTURE CONTENT, RELATIVE DENSITY OR CONSISTENCY, SOIL STRUCTURE, MINERALOGY	DEPTH OF CASING, DRILLING RATE, DRILLING FLUID LOSS, TESTS AND INTRUMENTATION
12 13	SS-5	SS	20"	12 18 10 14	12'-12.5' - Fat CLAY (CH), Red (10YR 4/4) moist, stiff, highly plastic 12.5' - 13.5' - Silty SAND (SM), Red-yellow (10YR 7/6), moist, 13.6' 13.5' - Fat CLAY (CH), Red (10YR 4/4) moist, stiff, highly Plastic	DPC - DPC - DPC -
14 15	SS-6	SS	7"	46 50/1"	14.0' - Silty SAND (SM), Red-Brown (7.5YR 5/6), dry, slightly to Moderately indurated, laminated (HB COPR) 14.5' - same as above. greenish-Brown	14.0'- Advanced to 16.0' bgs using 3" ID sonic macro core. DPC - 15.0'. Advanced the 6" OD outer casing to 15' bgs.
16	SS-7	SS	NR	50/3"	16.0' - Same as above. Red-Brown (7.5YR 5/6) dry, Particulate to moderately indurated	16.0' - No recovery in the split spoon sample. Advanced the hole using 3" ID sonic macro core to a depth of 17.0' bgs
17	SS-8	SS	2"	9	same as above, bright yellow particles	
18	SS-9	SS	3"	100/4"	17.5' - Poorly graded SAND with silt (SP-SM), dark gray-black (N2), wet Particulate, bright green particles (GB COPR)	17.5' - Groundwater encountered at 17.5' bgs during drilling

ch2m

PROJECT NUMBER:

BORING NUMBER: BRP-45

Sheet: 4

SOIL BORING LOG

PROJECT:

LOCATION:

ELEVATION:

DRILLING CONTRACTOR:

DRILLING METHOD AND EQUIPMENT:

WATER LEVELS:

START:

FINISH:

LOGGER:

DEPTH BELOW (ft)	SAMPLE			STANDARD PENETRATION TEST RESULTS	SOIL DESCRIPTION	COMMENTS
	NUMBER	TYPE	RECOVERY (ft)	6" - 6" - 6" (N)	SOIL NAME, USCS GROUP SYMBOL, COLOR, MOISTURE CONTENT, RELATIVE DENSITY OR CONSISTENCY, SOIL STRUCTURE, MINERALOGY	DEPTH OF CASING, DRILLING RATE, DRILLING FLUID LOSS, TESTS AND INTRUMENTATION
18	S-10	Sonic macro core	6"	-	Silty SAND (SM), Red-Brown (7.5YR 5/6) dry, particulate to moderately indurated, laminated. (HB COPR)	Advanced the sonic macro core to 18.5' bgs
	S-11	Sonic macro core	6"	50/0"	same as above, bright green and Yellow particles	Advanced the sonic macro to 19.0' bgs.
19	SS-12	SS	3"	100/3"	Poorly graded SAND with silt (SP-SM), dark gray - black (N2), wet, green particles (GB COPR)	
	S-13	Sonic macro core	6"	-	HB COPR, particulate, dry	Advanced to 20' bgs using Sonic macro core
20	SS-14	SS	2"	60	Same as above	
	SS-15	SS	1"	50/1"	same as above, ~~[illegible]~~ gray	Advanced the sonic macro Core to 21' bgs
21	SS-16	SS	4"	66	Same as above, wet	
	SS-17	SS	5"	54	same as abow, wet	
22	SS-18	SS	5"	12	22.0' - same as above	
					22.4' - fat CLAY, Red (10YR 4/4), wet, highly plastic	
					Bottom of boring at 22.5' bgs	

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BORING NO. BRP-45
SHEET 5 OF
FILE NO. 10587
SURFACE ELEV.
DATUM

PROJECT DUNDALK MARINE TERMINAL
LOCATION BALTIMORE, MARYLAND
BORING LOCATION

TEST/INSPECTION EQUIPMENT
REFERENCE CODES/STANDARDS Sonic Samp Drill Max 170; SPT sampling

BORING EQUIPMENT AND METHODS OF STABILIZING BOREHOLE

TYPE OF BORING RIG		TYPE OF FEED DURING CORING		CASING USED	☑ YES ☐ NO
TRUCK		MECHANICAL		DIA., IN. 6" OD	DEPTH, FT. FROM 0 TO 22.5'
SKID		HYDRAULIC		DIA., IN.	DEPTH, FT. FROM TO
BARGE		OTHER		DIA., IN.	DEPTH, FT. FROM TO
OTHER	Track				

TYPE AND SIZE OF:
D-SAMPLER
U-SAMPLER
S-SAMPLER SS Sampling - 3" dia.
CORE BARREL
CORE BIT
DRILL RODS
3" ID Sonic Macro core

DRILLING MUD USED ☐ YES ☑ NO
DIAMETER OF ROTARY BIT, IN.
TYPE OF DRILLING MUD

AUGER USED ☐ YES ☑ NO
TYPE AND DIAMETER, IN.

CASING HAMMER, LBS. AVERAGE FALL, IN.
SAMPLER HAMMER, LBS. 140 AVERAGE FALL, IN. 30
TYPE OF HAMMER Automatic

WATER LEVEL OBSERVATIONS IN BOREHOLE

DATE	TIME	DEPTH OF HOLE	DEPTH OF CASING	DEPTH TO WATER	CONDITIONS OF OBSERVATION
11/12/15	08:00	17.5	15	17.5	

PIEZOMETER INSTALLED ☑ YES ☐ NO SKETCH SHOWN ON Standpipe Installation log

STANDPIPE: TYPE ID, IN. LENGTH, FT. TOP ELEV.
INTAKE ELEMENT: TYPE OD, IN. LENGTH, FT. TIP ELEV.
FILTER: MATERIAL OD, IN. LENGTH, FT. BOT. ELEV.

PAY QUANTITIES

3.5" DIA. DRY SAMPLE BORING LIN. FT.
3.5" DIA. U-SAMPLE BORING LIN. FT.
CORE DRILLING IN ROCK LIN. FT.
NO. OF 3" SHELBY TUBE SAMPLES
NO. OF 3" UNDISTURBED SAMPLES
OTHER:

BORING CONTRACTOR Aquifer Drilling and testing, Inc.
DRILLER Brian Karchick HELPERS Chris Phelan
REMARKS
RESIDENT ENGINEER K. Chaturvedula DATE 11/12/15

BORING NO. BRP-45

ch2m:

PROJECT NUMBER:

BORING NUMBER: BRY-46

Sheet: 1

SOIL BORING LOG

PROJECT: Honeywell DMT SSD

LOCATION:

ELEVATION:

DRILLING CONTRACTOR: Aquifer drilling and testing, Inc.

DRILLING METHOD AND EQUIPMENT: Sonic Sampling [illegible]; SPT sampling

WATER LEVELS:

START: 11/12/15 16:00

FINISH: 11/12/15 16:45

LOGGER: K. Chaturvedula

DEPTH BELOW (ft)	SAMPLE			STANDARD PENETRATION TEST RESULTS	SOIL DESCRIPTION	COMMENTS
	NUMBER	TYPE	RECOVERY (ft)	6" - 6" - 6" (N)	SOIL NAME, USCS GROUP SYMBOL, COLOR, MOISTURE CONTENT, RELATIVE DENSITY OR CONSISTENCY, SOIL STRUCTURE, MINERALOGY	DEPTH OF CASING, DRILLING RATE, DRILLING FLUID LOSS, TESTS AND INTRUMENTATION
0	S-1	Sonic Macro Core	30"		3" Asphalt 0.25'-1.25' - Poorly graded gravel with sand and silt (GP-GM), dark gray (GLEY1 5/N) Road based aggregate, dry	Advanced the boring from 5-8' using a 3' [illegible] Macro core DPC -
1					1.25'-1.75' - Silty SAND (SM), Brown-gray (5YR 3/2), moist	DPC -
2					1.75' - Poorly graded gravel with Sand and silt (GP-GM), gray (GLEY1 5/N) wet, Road based aggregate	DPC -
3	S-2	Sonic Macro Core	30"		3.0'-4.0' - Silty GRAVEL with Sand (GM) Brown-white (5YR 5/3), wet,	DPC -
4					4.0' - Silty SAND (SM), gray-brown (5YR 3/1), wet, fine to medium grained Sand	DPC -
5						
6						

ch2m

PROJECT NUMBER:

BORING NUMBER: BRP-46

Sheet: 2

SOIL BORING LOG

PROJECT:
LOCATION:
ELEVATION:
DRILLING CONTRACTOR:
DRILLING METHOD AND EQUIPMENT:
WATER LEVELS:
START:
FINISH:
LOGGER:

DEPTH BELOW (ft)	SAMPLE			STANDARD PENETRATION TEST RESULTS	SOIL DESCRIPTION	COMMENTS
	NUMBER	TYPE	RECOVERY (ft)	6" - 6" - 6" (N)	SOIL NAME, USCS GROUP SYMBOL, COLOR, MOISTURE CONTENT, RELATIVE DENSITY OR CONSISTENCY, SOIL STRUCTURE, MINERALOGY	DEPTH OF CASING, DRILLING RATE, DRILLING FLUID LOSS, TESTS AND INTRUMENTATION
6	S-3	SONIC NAKED CORE	2.4'		6.0' - 7.0' - Same as above, wet	PID -
7					7.0' - 7.25' - Asphalt 7.25' - 8.0' - Poorly graded sand (SP), Gray (GLEY1 5/N), dry, Recrushed aggregate.	PID - 7.5' - Installed the 6" [illegible] casing to a depth of 8' bgs
8					Bottom of boring @ 8.0' bgs.	

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BORING NO. BRP-46
SHEET 3 **OF** 4
FILE NO. 10587
SURFACE ELEV.
DATUM

PROJECT DUNDALK MARINE TERMINAL
LOCATION BALTIMORE, MARYLAND
BORING LOCATION

TEST/INSPECTION EQUIPMENT Sonic Samp Drill Max 170; SPT Sampling
REFERENCE CODES/STANDARDS

BORING EQUIPMENT AND METHODS OF STABILIZING BOREHOLE

TYPE OF BORING RIG
TRUCK
SKID
BARGE
OTHER Track

TYPE OF FEED DURING CORING
MECHANICAL
HYDRAULIC
OTHER

CASING USED ☑ YES ☐ NO
DIA., IN. 6" OD DEPTH, FT. FROM 0 TO 8
DIA., IN. DEPTH, FT. FROM TO
DIA., IN. DEPTH, FT. FROM TO

TYPE AND SIZE OF:
D-SAMPLER
U-SAMPLER
S-SAMPLER 8 -
CORE BARREL
CORE BIT
DRILL RODS
3" RD Sonic Macro core

DRILLING MUD USED ☐ YES ☑ NO
DIAMETER OF ROTARY BIT, IN.
TYPE OF DRILLING MUD

AUGER USED ☐ YES ☑ NO
TYPE AND DIAMETER, IN.

CASING HAMMER, LBS. AVERAGE FALL, IN.
SAMPLER HAMMER, LBS. - AVERAGE FALL, IN. -
TYPE OF HAMMER

WATER LEVEL OBSERVATIONS IN BOREHOLE

DATE	TIME	DEPTH OF HOLE	DEPTH OF CASING	DEPTH TO WATER	CONDITIONS OF OBSERVATION

PIEZOMETER INSTALLED ☑ YES ☐ NO **SKETCH SHOWN ON** See Standpipe Installation log

STANDPIPE: TYPE ID, IN. LENGTH, FT. TOP ELEV.
INTAKE ELEMENT: TYPE OD, IN. LENGTH, FT. TIP ELEV.
FILTER: MATERIAL OD, IN. LENGTH, FT. BOT. ELEV.

PAY QUANTITIES
3.5" DIA. DRY SAMPLE BORING LIN. FT.
3.5" DIA. U-SAMPLE BORING LIN. FT.
CORE DRILLING IN ROCK LIN. FT.
NO. OF 3" SHELBY TUBE SAMPLES
NO. OF 3" UNDISTURBED SAMPLES
OTHER:

BORING CONTRACTOR Aquifer Drilling and testing, Inc.
DRILLER Brian Karchick **HELPERS** Chris Phelan
REMARKS
RESIDENT ENGINEER K. Chaturvedula **DATE** 11/12/15

BOR-4_JAN2013

BORING NO. BRP-46

ch2m

PROJECT NUMBER:

BORING NUMBER: GP-1A

Sheet: 1

SOIL BORING LOG

PROJECT: Honeywell DMT SSI
ELEVATION:
LOCATION:
DRILLING CONTRACTOR: AQUIFER DRILLING AND TESTING, INC.
DRILLING METHOD AND EQUIPMENT: Sonic Sonic Drill 12 Max 120; SPT sampling.
WATER LEVELS:
START: 12/18/15 08:10
FINISH: 12/18/15 10:30
LOGGER: K. Chaturvedula

DEPTH BELOW (ft)	SAMPLE			STANDARD PENETRATION TEST RESULTS	SOIL DESCRIPTION	COMMENTS
	NUMBER	TYPE	RECOVERY (ft)	6" - 6" - 6" (N)	SOIL NAME, USCS GROUP SYMBOL, COLOR, MOISTURE CONTENT, RELATIVE DENSITY OR CONSISTENCY, SOIL STRUCTURE, MINERALOGY	DEPTH OF CASING, DRILLING RATE, DRILLING FLUID LOSS, TESTS AND INTRUMENTATION
0					4" Asphalt 0.3' - Poorly graded gravel with sand (GP) gray (GLEY 1 6/10Y) dry, Road based aggregate. 0.75' - Polyethylene liner	Advanced the borehole from 0-8' using Sonic macro core DPC - ; mps = 0.25" Low recovery
1	S-1	SONIC MACRO CORE	30"			
2					2.0' - Poorly graded sand with gravel (SP), dark gray (GLEY 1 4/10Y) moist, road based aggregate	DPC -
3					2.5' - Silty sand with gravel (SM), Red-Brown (7.5YR 4/4), moist, fine to medium grained sand	DPC - ; mps = 0.75"
4					4.0' - Same as above, dark brown-gray black (7.5YR 3/3), moist, fine to medium grained sand, Pieces of wood	DPC -
5	S-2	SONIC MACRO CORE	42"			
6					6.0' - Same as above, contains rocks	DPC -

ch2m

PROJECT NUMBER:

BORING NUMBER: GP-1A
Sheet: 2

SOIL BORING LOG

PROJECT:
ELEVATION:
LOCATION:
DRILLING CONTRACTOR:
DRILLING METHOD AND EQUIPMENT:
WATER LEVELS:
START:
FINISH:
LOGGER:

DEPTH BELOW (ft)	SAMPLE			STANDARD PENETRATION TEST RESULTS	SOIL DESCRIPTION	COMMENTS
	NUMBER	TYPE	RECOVERY (ft)	6" - 6" - 6" (N)	SOIL NAME, USCS GROUP SYMBOL, COLOR, MOISTURE CONTENT, RELATIVE DENSITY OR CONSISTENCY, SOIL STRUCTURE, MINERALOGY	DEPTH OF CASING, DRILLING RATE, DRILLING FLUID LOSS, TESTS AND INTRUMENTATION
6					Same as above	DPC-
7	S-2	SONIC MACROCORE	42"			Below 8' switched to SS sampling: 140-lb hammer, 30 in drop; 3" dia. sampler.
8				50/3"	8.0'- crushed concrete. 8.2'- Silty sand with gravel (SM), gray-black (N2), dry, fine grained sand, pieces of wire mesh	8.0'- SS spoon refusal; Advanced sonic macro core to 10' bgs.
9	S3	CS/SONIC MACRO CORE	24"		9.2'- Poorly graded GRAVEL and sand (GP), Red-Brown (7.5YR 4/6), moist.	MPS = 1.25", DPC-
10				10	10.0'- Silty SAND (SM) with gravel, Brown (7.5YR 4/6), moist, fine to medium grained sand, intermixed with layers of gravel (road base)	10.0'- 6" OD outer casing installed to 10.0' bgs DPC-
11	SS-4	SS	24"	22 21 14	11.2'- same as above. Red-Brown (7.5YR 5/6)	DPC-
12						

ch2m.

PROJECT NUMBER:

BORING NUMBER: GP-1A
Sheet: 3

SOIL BORING LOG

PROJECT:
ELEVATION:
LOCATION:
DRILLING CONTRACTOR:
DRILLING METHOD AND EQUIPMENT:
WATER LEVELS:
START:
FINISH:
LOGGER:

DEPTH BELOW (ft)	SAMPLE			STANDARD PENETRATION TEST RESULTS	SOIL DESCRIPTION	COMMENTS
	NUMBER	TYPE	RECOVERY (ft)	6" - 6" - 6" (N)	SOIL NAME, USCS GROUP SYMBOL, COLOR, MOISTURE CONTENT, RELATIVE DENSITY OR CONSISTENCY, SOIL STRUCTURE, MINERALOGY	DEPTH OF CASING, DRILLING RATE, DRILLING FLUID LOSS, TESTS AND INTRUMENTATION
12.0	SS-5	SS	6"	9	12.0' - Same as above.	DPC -
13.0	SS-6	SS	3"	16	Same as above, trace COPR	DPC +/-
	SS-7	SS	2"	7	Same as above, Piece of gravel	Mps 21-25" DPC -
14.0	SS-8	SS	4"	9	13.5' - Sandy CLAY (CL), Red-Yellowish Brown (7.5YR 5/8), moist, Soft	DPC -
	SS-9	SS	6"	8	Same as above	DPC -
15.0	SS-10	SS	6"	6	Same as above	DPC -
					Bottom of boring @ 15.0' bgs.	15.0' - 6" OD outer casing installed to 15' bgs.

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BORING NO. GP-1A
SHEET 4 OF
FILE NO. 10587
SURFACE ELEV.
DATUM

PROJECT DUNDALK MARINE TERMINAL
LOCATION BALTIMORE, MARYLAND
BORING LOCATION

TEST/INSPECTION EQUIPMENT Sonic Samp Drill XL Max 170; SPT Sampling
REFERENCE CODES/STANDARDS

BORING EQUIPMENT AND METHODS OF STABILIZING BOREHOLE

TYPE OF BORING RIG
TRUCK
SKID
BARGE
OTHER Track

TYPE OF FEED DURING CORING
MECHANICAL
HYDRAULIC
OTHER

CASING USED ☑ YES ☐ NO
DIA., IN 6" DEPTH, FT. FROM 0 TO 15
DIA., IN DEPTH, FT. FROM TO
DIA., IN DEPTH, FT. FROM TO

TYPE AND SIZE OF:
D-SAMPLER
U-SAMPLER
S-SAMPLER SS Sampler - 3" dia.
CORE BARREL
CORE BIT
DRILL RODS
Sonic Macro Core - 3" ID

DRILLING MUD USED ☐ YES ☑ NO
DIAMETER OF ROTARY BIT, IN.
TYPE OF DRILLING MUD

AUGER USED ☐ YES ☑ NO
TYPE AND DIAMETER, IN.

CASING HAMMER, LBS. AVERAGE FALL, IN.
SAMPLER HAMMER, LBS. 140 AVERAGE FALL, IN. 30
TYPE OF HAMMER Automatic

WATER LEVEL OBSERVATIONS IN BOREHOLE

DATE	TIME	DEPTH OF HOLE	DEPTH OF CASING	DEPTH TO WATER	CONDITIONS OF OBSERVATION
					NE

PIEZOMETER INSTALLED ☑ YES ☐ NO SKETCH SHOWN ON VWP Installation log.

STANDPIPE: TYPE ID, IN LENGTH, FT. TOP ELEV.
INTAKE ELEMENT: TYPE OD, IN. LENGTH, FT. TIP ELEV.
FILTER MATERIAL OD, IN. LENGTH, FT. BOT. ELEV

PAY QUANTITIES
3.5" DIA. DRY SAMPLE BORING LIN. FT.
3.5" DIA. U-SAMPLE BORING LIN. FT.
CORE DRILLING IN ROCK LIN. FT.
NO. OF 3" SHELBY TUBE SAMPLES
NO. OF 3" UNDISTURBED SAMPLES
OTHER:

BORING CONTRACTOR Aquifer Drilling and testing, Inc.
DRILLER Brian Karchick HELPERS Chris Phelan
REMARKS Instrumentation installed
RESIDENT ENGINEER K. Chaturvedula DATE 12/18/15

ch2m.

PROJECT NUMBER:

BORING NUMBER: GP-2A

Sheet: 1

SOIL BORING LOG

PROJECT: Honeywell DMTSSI

LOCATION:

ELEVATION:

DRILLING CONTRACTOR: AQUIFER DRILLING AND TESTING, Rn

DRILLING METHOD AND EQUIPMENT: SONIC SAMP DRILL XL MAX 170.

WATER LEVELS:

START: 12/17/15 08:00

FINISH:

LOGGER: Kchaturvedula

DEPTH BELOW (ft)	SAMPLE			STANDARD PENETRATION TEST RESULTS	SOIL DESCRIPTION	COMMENTS
	NUMBER	TYPE	RECOVERY (ft)	6" - 6" - 6" (N)	SOIL NAME, USCS GROUP SYMBOL, COLOR, MOISTURE CONTENT, RELATIVE DENSITY OR CONSISTENCY, SOIL STRUCTURE, MINERALOGY	DEPTH OF CASING, DRILLING RATE, DRILLING FLUID LOSS, TESTS AND INTRUMENTATION
0	S-1	SONIC MACRO CORE	44	—	4" Asphalt	Advanced the borehole from 0-8' using 3"ED sonic macro core. DPC -
					0.3'- Poorly graded sand with gravel (SP), gray-brown, (GLEY1 G/10v), dry Road based aggregate	
1					0.8'- Silty SAND with gravel (SM), Red-Brown, moist, medium to Coarse grained sand	
2					2.0'-2.3'- same as above, dark gray-black	
					2.3'-2.8'- same as above, gray, Road based aggregate	
3					2.8'- Silty SAND (SM), Red-Brown (7.5YR 4/6), moist, fine to medium grained sand (COPR and non-COPR mix)	DPC+1_
4		SONIC MACRO CORE	48"	—	4.0'-4.3'- Clayey SAND with gravel (SC), Red-Brown (7.5YR 4/6), moist, fine to medium grained sand	DPC -
5					4.3'-5.8'- Fat CLAY (CH), Red (10YR 4/4), moist, stiff to very stiff, highly plastic.	
6					5.8'- Silty SAND (SM), Reddish Brown-greenish (7.5YR 4/4),	

PROJECT NUMBER:

BORING NUMBER: GP-2A

Sheet: 2

SOIL BORING LOG

PROJECT:

LOCATION:

ELEVATION:

DRILLING CONTRACTOR:

DRILLING METHOD AND EQUIPMENT:

WATER LEVELS:

START:

FINISH:

LOGGER:

DEPTH BELOW (ft)	SAMPLE			STANDARD PENETRATION TEST RESULTS	SOIL DESCRIPTION	COMMENTS
	NUMBER	TYPE	RECOVERY (ft)	6" - 6" - 6" (N)	SOIL NAME, USGS GROUP SYMBOL, COLOR, MOISTURE CONTENT, RELATIVE DENSITY OR CONSISTENCY, SOIL STRUCTURE, MINERALOGY	DEPTH OF CASING, DRILLING RATE, DRILLING FLUID LOSS, TESTS AND INTRUMENTATION
6					moist, fine to medium grained sand, particulate to moderately indurated (HB COPR)	DPC+
7	S-2	SONIC MACROCORE	48"	-	6.8'- same as above, dry, slightly to moderately indurated	DPC +
8	SS-3	SS	NR	50/4"	No Recovery 8.3'- same as above (HB COPR)	8.0'-switched to SS sampling below 8.0'; 140-lb hammer; 30-in drop 3-inch sampler. SS-refusal at 8.25' bgs Advanced the hole to 10' bgs using sonic macro core. - No recovery in the SS sampler.
8.3'						
9	S-4	sonic macro core	18"			
10	SS-5	SS	11	27 84	10.0'-10.5'- same as above, moderately indurated 10.5'- same as above, greenish-brown, gray	Bedding pattern observed in the spoon 11.0'- 6" OD outer casing installed to a depth of 10.0' bgs.
11	SS-6	SS	12"	32 34	11.0'- same as above, greenish-brown-gray, bright green particles (COPR)	DPC+
12						

ch2m:

PROJECT NUMBER:

BORING NUMBER: GP-7A
Sheet: 3

SOIL BORING LOG

PROJECT:
LOCATION:
ELEVATION:
DRILLING CONTRACTOR:
DRILLING METHOD AND EQUIPMENT:
WATER LEVELS:
START:
FINISH:
LOGGER:

DEPTH BELOW (ft)	SAMPLE			STANDARD PENETRATION TEST RESULTS	SOIL DESCRIPTION	COMMENTS
	NUMBER	TYPE	RECOVERY (ft)	6" - 6" - 6" (N)	SOIL NAME, USCS GROUP SYMBOL, COLOR, MOISTURE CONTENT, RELATIVE DENSITY OR CONSISTENCY, SOIL STRUCTURE, MINERALOGY	DEPTH OF CASING, DRILLING RATE, DRILLING FLUID LOSS, TESTS AND INSTRUMENTATION
12	SS-6	SS	6"	25	Same as above. GB (OPR)	DPC+
	SS-7	SS	4"	11	12.5' - same as above	DPC+
13	SS-8	SS	NR	7	No Recovery	
	SS-9	SS	3"	3	Fat CLAY (CH), Red (10Y 4/4), wet Soft to medium stiff, highly plastic.	DPC-
14					Bottom of Boring @ 14.0' bgs	

CH2M:

PROJECT NUMBER:

BORING NUMBER: GP-2C
Sheet: 1

SOIL BORING LOG

PROJECT:
ELEVATION: **LOCATION:**
DRILLING METHOD AND EQUIPMENT: **DRILLING CONTRACTOR:**
WATER LEVELS:
START: 12/17/15 12:00 **FINISH:** 12/17/15 **LOGGER:** K. Chaturvedula

DEPTH BELOW (ft)	SAMPLE			STANDARD PENETRATION TEST RESULTS	SOIL DESCRIPTION	COMMENTS
	NUMBER	TYPE	RECOVERY (ft)	6" - 6" - 6" (N)	SOIL NAME, USCS GROUP SYMBOL, COLOR, MOISTURE CONTENT, RELATIVE DENSITY OR CONSISTENCY, SOIL STRUCTURE, MINERALOGY	DEPTH OF CASING, DRILLING RATE, DRILLING FLUID LOSS, TESTS AND INTRUMENTATION
0					4" Asphalt	Advanced the borehole from 0'-8' bgs using 3" ID Sonic macro core - No recovery in the first Sonic spoon - Hard drilling conditions - Concrete dust emitted when the drillers opened the Sonic macro core and lost the sample down the hole.
1	S-1	Sonic macro core	NR	—		
2						
3						
4	S-2	Sonic macro core	40'	— —	4.0'. 5.5' - silty sand with gravel (SM), dark brown - red (7.5YR4/6), moist, fine to medium grained sand. (COPR and non-COPR)	DPC +1 mpc = 1.0"
5						
6					5.5' - silty sand (SM). red-brown	

PROJECT NUMBER:

BORING NUMBER: GP-2C

Sheet: 2

SOIL BORING LOG

PROJECT:

LOCATION:

ELEVATION:

DRILLING CONTRACTOR:

DRILLING METHOD AND EQUIPMENT:

WATER LEVELS:

START:

FINISH:

LOGGER:

DEPTH BELOW (ft)	SAMPLE			STANDARD PENETRATION TEST RESULTS	SOIL DESCRIPTION	COMMENTS
	NUMBER	TYPE	RECOVERY (ft)	6" - 6" - 6" (N)	SOIL NAME, USCS GROUP SYMBOL, COLOR, MOISTURE CONTENT, RELATIVE DENSITY OR CONSISTENCY, SOIL STRUCTURE, MINERALOGY	DEPTH OF CASING, DRILLING RATE, DRILLING FLUID LOSS, TESTS AND INTRUMENTATION
6	S-2	Sonic macro core			(7.5 YR 4/6), dry, fine to medium grained sand, particulate to slightly indurated (HB COPR)	DPC+
7						7.5' - Below 8' switched to SS sampling; 140-lb hammer 30-in drop; 3" dia sampler.
8	SS-3	SS	18"	12 9 21	8.0' same as above, greenish gray, ~~color~~ wet (COPR)	DPC+ Bedding structure observed in the spoon
9				29	9.0' - bright yellow and green particles.	DPC+
10	SS-4	SS	10"	22 50/4"	10.0' - clayey sand (SC), ~~with~~ Red-white (10Y4/4), dry, fine to medium sand, trace gravel (COPR and non-COPR) 10.6' - ~~to~~ Silty SAND (SM), greenish gray, moist, fine to medium sand, particulate (COPR)	10.0' - 6" OD outer casing installed to 10' bgs. DPC+/- 10.8' - SS refusal; sonic macro core advanced to 12' bgs; DPC+
11	S-5	Sonic macro core	12"	—	11.0' same as above, moderately to highly indurated.	bedding of different layers of COPR observed greenish gray,
12						

ch2m

PROJECT NUMBER:

BORING NUMBER: GP-2C
Sheet: 3

SOIL BORING LOG

PROJECT:
LOCATION:
ELEVATION:
DRILLING CONTRACTOR:
DRILLING METHOD AND EQUIPMENT:
WATER LEVELS:
START:
FINISH:
LOGGER:

DEPTH BELOW (ft)	SAMPLE			STANDARD PENETRATION TEST RESULTS	SOIL DESCRIPTION	COMMENTS
	NUMBER	TYPE	RECOVERY (ft)	6" - 6" - 6" (N)	SOIL NAME, USCS GROUP SYMBOL, COLOR, MOISTURE CONTENT, RELATIVE DENSITY OR CONSISTENCY, SOIL STRUCTURE, MINERALOGY	DEPTH OF CASING, DRILLING RATE, DRILLING FLUID LOSS, TESTS AND INTRUMENTATION
						12.0' - groundwater encountered during drilling
12	SS-6	SS	6"	13	12.0. Poorly graded sand with silt (SP-SM), gray-black-greenish, wet. Particulate to slightly indurated (GB COPR)	DPC+
	SS-7	SS	6"	16	same as above	DPC+
13	SS-8	SS	2"	10	13.0'. Sand Clay (CL), Red (10Y 4/4), ~~fine~~ moist, fine to medium grained sand	DPC +/-
	SS-10	SS	4"	6	13.5'- Fat CLAY (CH), Red (10Y 4/4), wet, stiff, highly plastic	DPC -
14					Bottom of boring at 14.0' bgs.	
					Diaphram @ 4' Bott COPR 12.5 thermistor @ 8	SAA 92889 Installed at 13' depth

ch2m

PROJECT NUMBER:

BORING NUMBER: GP-3A
Sheet: 1

SOIL BORING LOG

PROJECT:
LOCATION:
ELEVATION: ~ +13
DRILLING CONTRACTOR:
DRILLING METHOD AND EQUIPMENT:
WATER LEVELS: ~ +9.2
START: 0745
FINISH:
LOGGER: L. LINCOLN

DEPTH BELOW (ft)	SAMPLE			STANDARD PENETRATION TEST RESULTS	SOIL DESCRIPTION	COMMENTS
	NUMBER	TYPE	RECOVERY (ft)	6" - 6" - 6" (N)	SOIL NAME, USCS GROUP SYMBOL, COLOR, MOISTURE CONTENT, RELATIVE DENSITY OR CONSISTENCY, SOIL STRUCTURE, MINERALOGY	DEPTH OF CASING, DRILLING RATE, DRILLING FLUID LOSS, TESTS AND INTRUMENTATION
0					0-0.4 ASPHALT 2" CONCRETE BRN, GRY SILTY C-F SAND, SM GVL (FILL)	
1	S-1	SONIC	20"	N/A		NO DPC RXN
2						
3					3-3.9 RED CLAY, MOTT. WHITE, TR GVL	
4	S-2			N/A	3.9-6.0 BRN, GRY, GREEN MOD. LITHIFIED SILTY F-C SAND, SM GVL (HB)	DPC+
5						
6						

ch2m

PROJECT NUMBER:

BORING NUMBER: GP-3A
Sheet: 2

SOIL BORING LOG

PROJECT: DUNDALK MARINE TERMINAL **LOCATION:** SEE PLAN
ELEVATION: ~ + 13 **DRILLING CONTRACTOR:** SDS
DRILLING METHOD AND EQUIPMENT:
WATER LEVELS: 3.8' bgs ~ + 9.2 **START:** 0745 **FINISH:** 0900 **LOGGER:** L. LINCOLN

DEPTH BELOW (ft)	SAMPLE			STANDARD PENETRATION TEST RESULTS	SOIL DESCRIPTION	COMMENTS
	NUMBER	TYPE	RECOVERY (ft)	6" - 6" - 6" (N)	SOIL NAME, USCS GROUP SYMBOL, COLOR, MOISTURE CONTENT, RELATIVE DENSITY OR CONSISTENCY, SOIL STRUCTURE, MINERALOGY	DEPTH OF CASING, DRILLING RATE, DRILLING FLUID LOSS, TESTS AND INTRUMENTATION
4	S-3	SONIC	12"		TOP 3" RED BRN GRY MOD LITH SILTY SAND, SM GVL, PLANT FIBERS (HB) BOT 9" TAN, BRN, GRY, GREEN SILTY F-C SAND, SM GVL (HB)	
7	SS-4	2" O.D. SPOON	9"	12 6	TOP 3" DO S-3 BOT (HB) BOT 6" RED-BRN, BLK, GRY, GREEN SILTY F-M SAND, TR GVL, RED CLAY (HB)	
8	SS-5		11"	5 6	TOP 2" DO BOT SS-4 (HB) BOT 9" BLK, DK GRY, GREEN F-M SAND, SM SILT, WET (GB)	
9	SS-6		5"	7	9-9.5 DO SS-5 BOT. (GB)	
	SS-7		6"	6	9.5-10 DO SS-5 BOT. (GB)	
10	SS-8		6"	33	10-10.1 DO SS-5 BOT. (GB) 10.1-10.5 RED-BRN, GRY, YELLOW SILTY F-M SAND, TR GVL (HB)	
	SS-9		6"	29	10.5-10.8 BLK F-M SAND, SM SILT (GB) 10.8-11.0 RED-BRN, GRY SILTY F-M SAND, TR GVL (HB)	
11	SS-10		6"	13	11-11.5 DO SS-9 (HB)	
12	SS-11			3	11.5-12.0 RED CLAY MOTT. WHITE	EOB @ 12.0'

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BORING NO. GP-3A
SHEET 3 OF
FILE NO. 10587
SURFACE ELEV. ~+13
DATUM

PROJECT DUNDALK MARINE TERMINAL
LOCATION BALTIMORE, MARYLAND
BORING LOCATION SEE PLAN

TEST/INSPECTION EQUIPMENT
REFERENCE CODES/STANDARDS

BORING EQUIPMENT AND METHODS OF STABILIZING BOREHOLE

TYPE OF BORING RIG
TRUCK
SKID ✓
BARGE
OTHER

TYPE OF FEED DURING CORING
MECHANICAL
HYDRAULIC
OTHER

CASING USED ☐ YES ☑ NO
DIA., IN. DEPTH, FT. FROM TO
DIA., IN. DEPTH, FT. FROM TO
DIA., IN. DEPTH, FT. FROM TO

TYPE AND SIZE OF:
D-SAMPLER 2" O.D. SPLIT SPOON
U-SAMPLER
S-SAMPLER
CORE BARREL
CORE BIT
DRILL RODS

DRILLING MUD USED ☐ YES ☑ NO
DIAMETER OF ROTARY BIT, IN.
TYPE OF DRILLING MUD

AUGER USED ☐ YES ☑ NO
TYPE AND DIAMETER, IN.

CASING HAMMER, LBS. AVERAGE FALL, IN.
SAMPLER HAMMER, LBS. 140 AVERAGE FALL, IN. 30
TYPE OF HAMMER

WATER LEVEL OBSERVATIONS IN BOREHOLE

DATE	TIME	DEPTH OF HOLE	DEPTH OF CASING	DEPTH TO WATER	CONDITIONS OF OBSERVATION
11/3/15	0900	12	0	3.8	

PIEZOMETER INSTALLED ☑ YES ☐ NO SKETCH SHOWN ON

STANDPIPE: TYPE ID, IN. LENGTH, FT. TOP ELEV.
INTAKE ELEMENT: TYPE OD, IN. LENGTH, FT. TIP ELEV.
FILTER: MATERIAL OD, IN. LENGTH, FT. BOT. ELEV.

PAY QUANTITIES
3.5" DIA. DRY SAMPLE BORING LIN. FT.
3.5" DIA. U-SAMPLE BORING LIN. FT.
CORE DRILLING IN ROCK LIN. FT.
NO. OF 3" SHELBY TUBE SAMPLES
NO. OF 3" UNDISTURBED SAMPLES
OTHER:

BORING CONTRACTOR SONIC DRILLING SERVICES
DRILLER TONY HELPERS WARREN
REMARKS
RESIDENT ENGINEER LYSANDRA LINCOLN DATE 11/3/15

BORING NO. GP-3A

ch2m:

PROJECT NUMBER:

BORING NUMBER: GP-3C

Sheet: 1

SOIL BORING LOG

PROJECT: Honeywell DM7 SSI

LOCATION:

ELEVATION:

DRILLING CONTRACTOR: Aquifer drilling and testing Inc.

DRILLING METHOD AND EQUIPMENT: Sonic SAMP DRILLMAX 1704 SPT sampling

WATER LEVELS:

START: 11/2/15 15:15

FINISH: 11/2/15 15:50

LOGGER: K. Chaturvedula

DEPTH BELOW (ft)	SAMPLE			STANDARD PENETRATION TEST RESULTS	SOIL DESCRIPTION	COMMENTS
	NUMBER	TYPE	RECOVERY (ft)	6" - 6" - 6" (N)	SOIL NAME, USCS GROUP SYMBOL, COLOR, MOISTURE CONTENT, RELATIVE DENSITY OR CONSISTENCY, SOIL STRUCTURE, MINERALOGY	DEPTH OF CASING, DRILLING RATE, DRILLING FLUID LOSS, TESTS AND INTRUMENTATION
0					2" Asphalt	Advanced 0-3' using 3" ID sonic macro core
					0.2'-1.2' - Poorly graded GRAVEL with sand (GP), black and gray (10 YR 4/1), dry, coarse grained sand, road based aggregate	
1	S-1	SONIC MACRO CORE	2"		1.2'-2.0' - Poorly graded SAND (SP) moist, tan-white, medium grained sand, trace gravel	
					2.0'-3.0' - silty SAND with gravel (SM) Red-gray (10YR 7/4), moist, fine to medium grained sand.	
2						
3					3.0'- silty SAND with gravel (SM), dark gray (N2), dry, medium to coarse sand.	Advanced from 3'-6' using sonic macro core 3" ID
					3.5'-4.0' - Fat CLAY (CH), Red (10Y 4/4), moist, highly Plastic.	
4	S-2	SONIC MACRO CORE	17"		4.0'- silty sand (SM), Red-Brown and greenish (10Y 4/4), dry, fine to medium sand. Particulate (HB COPR)	diphenyl carbazide used to test the presence of COPR in the sample.
5						
6						

ch2m:

PROJECT NUMBER:

BORING NUMBER: GP-3C
Sheet: 2

SOIL BORING LOG

PROJECT:
LOCATION:
ELEVATION:
DRILLING CONTRACTOR:
DRILLING METHOD AND EQUIPMENT:
WATER LEVELS:
START:
FINISH:
LOGGER:

DEPTH BELOW (ft)	SAMPLE			STANDARD PENETRATION TEST RESULTS	SOIL DESCRIPTION	COMMENTS
	NUMBER	TYPE	RECOVERY (ft)	6" - 6" - 6" (N)	SOIL NAME, USCS GROUP SYMBOL, COLOR, MOISTURE CONTENT, RELATIVE DENSITY OR CONSISTENCY, SOIL STRUCTURE, MINERALOGY	DEPTH OF CASING, DRILLING RATE, DRILLING FLUID LOSS, TESTS AND INTRUMENTATION
6	S-3	SONIC MACRO CORE	12"		Silty SAND (SM), Red-Brown and greenish (10YR 4/4), dry, fine grained sand, particulate (HB COPR)	Advanced from 6'-7' using 3" OD sonic macro core
7	SS-4	SS	12"	12 11	7.0'-7.3' - Same as above 7.3'-7.6' - Sandy lean clay (CL) Red-white (10Y 4/4), moist. 7.6'-8.0' - Silty SAND (SM), Brown and gray (10YR 4/3), greenish particles, moist, fine grained sand, particulate (HB COPR)	7.0' - ground water encountered at 7.0' bgs during drilling Below 7.0' switched to SS sampling; 140-lb hammer; 30-in drop; 1 3/4" dia. sampler
8	SS-5	SS	9"	8 9	8.0' - Poorly graded SAND with silt (SP-SM), dark gray and black (N2), wet, particulate (ABCOPR)	
9	SS-6	SS	3"	8	Same as above	Installed the 6" OD
	SS-7	SS	3"	6	9.5' - Fat CLAY (CH), Red (10Y 4/6), wet, highly plastic	outer casing to 10' bgs
10					Bottom of Boring @ 10' bgs	

ch2m.

PROJECT NUMBER:

BORING NUMBER: GP-4A

Sheet: 1

SOIL BORING LOG

PROJECT: Honeywell DMT SSI

LOCATION:

ELEVATION:

DRILLING CONTRACTOR: Aquifer Drilling and testing Inc.

DRILLING METHOD AND EQUIPMENT:

WATER LEVELS:

START: 11/4/15 07:40

FINISH: 11/4/15 10:04

LOGGER: K. Chaturvedula

DEPTH BELOW (ft)	SAMPLE			STANDARD PENETRATION TEST RESULTS	SOIL DESCRIPTION	COMMENTS
	NUMBER	TYPE	RECOVERY (ft)	6" - 6" - 6" (N)	SOIL NAME, USCS GROUP SYMBOL, COLOR, MOISTURE CONTENT, RELATIVE DENSITY OR CONSISTENCY, SOIL STRUCTURE, MINERALOGY	DEPTH OF CASING, DRILLING RATE, DRILLING FLUID LOSS, TESTS AND INTRUMENTATION
0					2" Asphalt 0.2' - 1.0' _ Poorly graded GRAVEL with sand (GP), darkgray (10YR 3/1) dry, coarse grained sand, road based aggregate.	Advanced the sonic macro Core 3" ID to a depth of 10' bgs.
1	S-1	SONIC MACRO CORE	24"		1.0'- 2.9' - Poorly graded SAND with clay and gravel (SP-SC), tan-white (10YR 8/1), moist, medium to coarse grained sand	
2					2.5'- 3.0' - sandy lean CLAY (CL), Red-white (10Y 4/4), dry.	
3					Silty SAND (SM), Red-Brown (10YR5/4) dry, fine to coarse grained sand, Particulate. (HB COPR)	-Portion of the sample lost while pulling up the sonic macro core. - Diphenyl Carbazide used to test the presence of COPR
4	S-2	SONIC MACRO CORE	5"			
5						
6						

ch2m

PROJECT NUMBER:

BORING NUMBER: GP-4A

Sheet: 2

SOIL BORING LOG

PROJECT:

LOCATION:

ELEVATION:

DRILLING CONTRACTOR:

DRILLING METHOD AND EQUIPMENT:

WATER LEVELS:

START:

FINISH:

LOGGER:

DEPTH BELOW (ft)	SAMPLE			STANDARD PENETRATION TEST RESULTS	SOIL DESCRIPTION	COMMENTS
	NUMBER	TYPE	RECOVERY (ft)	6" - 6" - 6" (N)	SOIL NAME, USCS GROUP SYMBOL, COLOR, MOISTURE CONTENT, RELATIVE DENSITY OR CONSISTENCY, SOIL STRUCTURE, MINERALOGY	DEPTH OF CASING, DRILLING RATE, DRILLING FLUID LOSS, TESTS AND INTRUMENTATION
6					Same as above, slightly to moderately indurated	
7	S-3	SONIC MACRO CORE	26"			
8						
9	S-4	SONIC MACRO CORE	12"		Same as above, Particulate to slightly indurated	
10	SS-5	SS	12"	62 41	same as above, wet	-Below 10' switched to SS sampling; 140-lb hammer, 30-in. drop, 1¾" dia. sampler -Installed the 6"OD outer casing to 10' bgs. -water encountered during drilling at 10' bgs.
11	SS-6	SS	9"	19 19	Poorly graded SAND with silt (SM), dark-gray and black (N2), wet, Particulate (GB COPR)	
12						

ch2m

PROJECT NUMBER:

BORING NUMBER: GP-4A

Sheet: 3

SOIL BORING LOG

PROJECT:

LOCATION:

ELEVATION:

DRILLING CONTRACTOR:

DRILLING METHOD AND EQUIPMENT:

WATER LEVELS:

START:

FINISH:

LOGGER:

DEPTH BELOW (ft)	SAMPLE			STANDARD PENETRATION TEST RESULTS	SOIL DESCRIPTION	COMMENTS
	NUMBER	TYPE	RECOVERY (ft)	6" - 6" - 6" (N)	SOIL NAME, USCS GROUP SYMBOL, COLOR, MOISTURE CONTENT, RELATIVE DENSITY OR CONSISTENCY, SOIL STRUCTURE, MINERALOGY	DEPTH OF CASING, DRILLING RATE, DRILLING FLUID LOSS, TESTS AND INTRUMENTATION
12	SS-7	SS	12"	35 34	Silty SAND with gravel (SM), Brown and gray (7.5YR 4/3), moist, moderately to highly indurated (HB COPR)	
13	SS-8	SS	1"	50/24	Clayey SAND (SC), dark gray-black (N2), wet, fine grained sand, particulate (GB COPR)	
	SS-9	SS	6'	6	13.5' - same as above 13.9' - 14.0' - Fat clay (CH) mixed with GB COPR, wet	
14					Bottom of boring @ 14.0' bgs	
15						

ch2m

PROJECT NUMBER:

BORING NUMBER: GP-4C
Sheet: 1 OF 7

SOIL BORING LOG

PROJECT: DUNDALK MARINE TERMINAL **LOCATION:** SEE PLAN
ELEVATION: ~ +14 **DRILLING CONTRACTOR:** ADT
DRILLING METHOD AND EQUIPMENT: FRASTE MULTIDRILL XL MAX 170
WATER LEVELS: ~ +5 **START:** 1015 **FINISH:** 1120 **LOGGER:** L. LINCOLN

DEPTH BELOW (ft)	SAMPLE			STANDARD PENETRATION TEST RESULTS	SOIL DESCRIPTION	COMMENTS
	NUMBER	TYPE	RECOVERY (ft)	6" - 6" - 6" (N)	SOIL NAME, USCS GROUP SYMBOL, COLOR, MOISTURE CONTENT, RELATIVE DENSITY OR CONSISTENCY, SOIL STRUCTURE, MINERALOGY	DEPTH OF CASING, DRILLING RATE, DRILLING FLUID LOSS, TESTS AND INTRUMENTATION
0					4" ASPHALT CONCRETE, GRY-BRN C AGGREGATE	NO DPC RXN
1	S-1	SONIC CORE	24"	N/A		
2					2-2.7 BRN, TAN GVLY C-F SAND, SM SILT (FILL)	NO DPC RXN
					2.7-3.0 RED CLAY MOTT WHITE, SM GVL	FABRIC GEOTEXTILE @2.7'
3					3-3.5 TAN, GRY SILTY F-M SAND, SM GVL (FILL)	NO DPC RXN
					3.5-5.0 RED-BRN, GRY SANDY CLAY, TR. GVL, YELLOW PARTICLES	DPC+
4	S-2		26"	N/A		
5					5.0-6.0 RED-BRN, DK GRY, WHITE V. STIFF CLAY, SM F-M SAND, TR. GVL, YELLOW STREAKS	DPC+
6						

ch2m

PROJECT NUMBER:

BORING NUMBER: GP-4C

Sheet: 2 of 7

SOIL BORING LOG

PROJECT: DUNDALK MARINE TERMINAL
LOCATION: SEE PLAN
ELEVATION: ~ +14
DRILLING CONTRACTOR: ADT
DRILLING METHOD AND EQUIPMENT: FRASTE MULTIDRILL XL MAX 170
WATER LEVELS: ~ +5
START: 1015
FINISH: 1120
LOGGER: L. LINCOLN

DEPTH BELOW (ft)	SAMPLE			STANDARD PENETRATION TEST RESULTS	SOIL DESCRIPTION	COMMENTS
	NUMBER	TYPE	RECOVERY (ft)	6" - 6" - 6" (N)	SOIL NAME, USCS GROUP SYMBOL, COLOR, MOISTURE CONTENT, RELATIVE DENSITY OR CONSISTENCY, SOIL STRUCTURE, MINERALOGY	DEPTH OF CASING, DRILLING RATE, DRILLING FLUID LOSS, TESTS AND INTRUMENTATION
6					6-6.8 BRN, LT. GRY CLAYEY F-M SAND, TR GVL MOD. LITHIFIED	DPC+
7					6.8-7.0 GREEN, GRY, BRN F-M SAND, SM SILT, GVL WEAKLY LITH	DPC+
	S-3		3'	N/A	7.0-8.5 RED-BRN, DK GRY SILTY F-M SAND, SM GVL, YELLOW STREAKS, MOD. LITHIFIED (HB)	DPC+
8		SONIC CORE				
					8.5-9 BLK, YELLOW, GREEN F-M SAND, SOME SILT (MOD LITHIFIED) (GB COPR)	DPC+
9	S-4		12"	N/A	9-10 RED-BRN SILTY F-C SAND, SM GVL, TR. GREEN PARTICLES, WEAKLY-MOD. LITH., MOIST (HB)	DPC+ WATER IN SAMPLE S-4
10	SS-5	2" O.D. S.S.			NO RECOVERY	SPOON PUSHED TO 12', SAMPLE SS-5 12'2" TO 13'2"
11	↓				11-12 BRN, DK GRY, YELLOW-ORANGE SILTY F-C SAND, TR. GVL (HB) MOD-HIGHLY LITHIFIED, MOST	
12						

ch2m

PROJECT NUMBER:

BORING NUMBER: GP-4C
Sheet: 3 OF 7

SOIL BORING LOG

PROJECT: DUNDALK MARINE TERMINAL **LOCATION:** SEE PLAN
ELEVATION: ~ +14 **DRILLING CONTRACTOR:** ADT
DRILLING METHOD AND EQUIPMENT: FRASTE MULTIDRILL XL MAX 170
WATER LEVELS: ~ +5 **START:** 1015 **FINISH:** 1120 **LOGGER:** L. LINCOLN

DEPTH BELOW (ft)	SAMPLE			STANDARD PENETRATION TEST RESULTS	SOIL DESCRIPTION	COMMENTS
	NUMBER	TYPE	RECOVERY (ft)	6" - 6" - 6" (N)	SOIL NAME, USCS GROUP SYMBOL, COLOR, MOISTURE CONTENT, RELATIVE DENSITY OR CONSISTENCY, SOIL STRUCTURE, MINERALOGY	DEPTH OF CASING, DRILLING RATE, DRILLING FLUID LOSS, TESTS AND INTRUMENTATION
12	SS-5	2" O.D. SS	12"	19	12 - 12.7 DK GRY, GREEN F-M SAND, TR SILT, MOIST (GB)	
				16	12.7-13.0 RED CLAY MOTT WHITE	
13					13-13.1 RED CLAY MIXED W/ DK GRY GVLY SAND, SM SILT	EOB @ 13.1'
14						
15						
16						
17						
18						

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BORING NO. GP-4C
SHEET 4 **OF** 7
FILE NO. 10587
SURFACE ELEV. ~ +14
DATUM

PROJECT DUNDALK MARINE TERMINAL
LOCATION BALTIMORE, MARYLAND
BORING LOCATION SEE PLAN

TEST/INSPECTION EQUIPMENT
REFERENCE CODES/STANDARDS

BORING EQUIPMENT AND METHODS OF STABILIZING BOREHOLE

TYPE OF BORING RIG
TRUCK
SKID ✓
BARGE
OTHER

TYPE OF FEED DURING CORING
MECHANICAL
HYDRAULIC
OTHER

CASING USED ☐ YES ☑ NO
DIA., IN. DEPTH, FT. FROM TO
DIA., IN. DEPTH, FT. FROM TO
DIA., IN. DEPTH, FT. FROM TO

TYPE AND SIZE OF:
D-SAMPLER 2" O.D. SPLIT SPOON
U-SAMPLER
S-SAMPLER
CORE BARREL SONIC (3")
CORE BIT
DRILL RODS

DRILLING MUD USED ☐ YES ☑ NO
DIAMETER OF ROTARY BIT, IN.
TYPE OF DRILLING MUD

AUGER USED ☐ YES ☑ NO
TYPE AND DIAMETER, IN.

CASING HAMMER, LBS. AVERAGE FALL, IN.
SAMPLER HAMMER, LBS. 140 AVERAGE FALL, IN. 30
TYPE OF HAMMER

WATER LEVEL OBSERVATIONS IN BOREHOLE

DATE	TIME	DEPTH OF HOLE	DEPTH OF CASING	DEPTH TO WATER	CONDITIONS OF OBSERVATION
11/9/15	1200	13.0	13.0	9.0	BEFORE INSTRUMENTATION INSTALL

PIEZOMETER INSTALLED ☑ YES ☐ NO **SKETCH SHOWN ON** PG. 5

2 VWPS

STANDPIPE: TYPE ID, IN. LENGTH, FT. TOP ELEV.
INTAKE ELEMENT: TYPE OD, IN. LENGTH, FT. TIP ELEV.
FILTER: MATERIAL OD, IN. LENGTH, FT. BOT. ELEV.

PAY QUANTITIES

3.5" DIA. DRY SAMPLE BORING LIN. FT.
3.5" DIA. U-SAMPLE BORING LIN. FT.
CORE DRILLING IN ROCK LIN. FT.
NO. OF 3" SHELBY TUBE SAMPLES
NO. OF 3" UNDISTURBED SAMPLES
OTHER:

BORING CONTRACTOR AQUIFER DRILLING AND TESTING
DRILLER TONY PALOMEQUE **HELPERS** –
REMARKS
RESIDENT ENGINEER LYSANDRA LINCOLN **DATE** 11/9/15

BORING NO. GP-4C

BOR-4_JAN2013

ch2m

PROJECT NUMBER:

BORING NUMBER: SP-6A
Sheet: 1

SOIL BORING LOG

PROJECT: Honeywell DMT SSI
LOCATION:
ELEVATION:
DRILLING CONTRACTOR: Aquifer drilling and testing, Inc.
DRILLING METHOD AND EQUIPMENT: SONIC SAMP DRILL XL MAX 170, SPT Sampling
WATER LEVELS:
START: 11/1/15 13:50
FINISH: 11/1/15 15:30
LOGGER: K. Chaturvedula

DEPTH BELOW (ft)	SAMPLE			STANDARD PENETRATION TEST RESULTS	SOIL DESCRIPTION	COMMENTS
	NUMBER	TYPE	RECOVERY (ft)	6" - 6" - 6" (N)	SOIL NAME, USCS GROUP SYMBOL, COLOR, MOISTURE CONTENT, RELATIVE DENSITY OR CONSISTENCY, SOIL STRUCTURE, MINERALOGY	DEPTH OF CASING, DRILLING RATE, DRILLING FLUID LOSS, TESTS AND INTRUMENTATION
0	S-1	SONIC MACRO CORE	24"	–	3" - Asphalt 0.25' - 3' Poorly graded SAND with gravel (SP), gray-brown (2.5Y 4/3), moist, medium grained sand.	Advanced the top 3' with 3" ID Sonic Macro core
1						
2						
3	S-2	SONIC MACRO CORE	30"	–	3' - 3.25' _ same as above 3.25' - 3.8' - Poorly graded GRAVEL with sand (GP), tan-white (7.5YR 8/1), moist, coarse grained sand 3.8' - 4.3' - Fat CLAY (CH), Red (10Y 4/4) moist, highly plastic. 4.3' - Silty SAND (SM) Red-Brown (7.5YR 5/6), dry, trace gravel, particulate (COPR)	3.0' - 6.0'. Advanced using 3" ID sonic macro core diphenyl carbazide used to test the presence of COPR in the sample.
4						
5						
6						

ch2m

PROJECT NUMBER:
BORING NUMBER: GP-6A
Sheet: 2

SOIL BORING LOG

PROJECT:
LOCATION:
ELEVATION:
DRILLING CONTRACTOR:
DRILLING METHOD AND EQUIPMENT:
WATER LEVELS:
START:
FINISH:
LOGGER:

DEPTH BELOW (ft)	SAMPLE			STANDARD PENETRATION TEST RESULTS	SOIL DESCRIPTION	COMMENTS
	NUMBER	TYPE	RECOVERY (ft)	6" - 6" - 6" (N)	SOIL NAME, USCS GROUP SYMBOL, COLOR, MOISTURE CONTENT, RELATIVE DENSITY OR CONSISTENCY, SOIL STRUCTURE, MINERALOGY	DEPTH OF CASING, DRILLING RATE, DRILLING FLUID LOSS, TESTS AND INTRUMENTATION
6	S-3	SONIC MACRO CORE	33"		6.0' - 6.75' Poorly graded GRAVEL with sand (GP) gray-brown (7.5YR 5/3), wet (COPR) 6.75' - Poorly graded SAND with gravel (SP) Red-Brown (7.5YR 5/6), dry (HB COPR)	[illegible]
7						
8						
9	SS-4	SS	12"	46 50	9.0' - Silty SAND with gravel (SM), (7.5YR 4/3) Red-Brown and greenish, dry, slightly to moderately indurated. (HB COPR)	9.0' - Below 9.0' switched to SS sampling; 140-lb hammer; 30-in. drop; 3" Sampler 6" OD Casing installed to a depth of 10' bgs
10	S-5	SS	12"	18 37	Same as above	
11	SS-6	SS		46 30	11.0'-11.5' same as above 11.5' - 12.0' - Silty SAND (SM), dark gray-black (N2), moist, fine to medium grained sand. Particulate (GB COPR)	
12						

ch2m

PROJECT NUMBER:

BORING NUMBER: GP-6A

Sheet: 3

SOIL BORING LOG

PROJECT:

LOCATION:

ELEVATION:

DRILLING CONTRACTOR:

DRILLING METHOD AND EQUIPMENT:

WATER LEVELS:

START:

FINISH:

LOGGER:

DEPTH BELOW (ft)	SAMPLE			STANDARD PENETRATION TEST RESULTS	SOIL DESCRIPTION	COMMENTS
	NUMBER	TYPE	RECOVERY (ft)	6" - 6" - 6" (N)	SOIL NAME, USCS GROUP SYMBOL, COLOR, MOISTURE CONTENT, RELATIVE DENSITY OR CONSISTENCY, SOIL STRUCTURE, MINERALOGY	DEPTH OF CASING, DRILLING RATE, DRILLING FLUID LOSS, TESTS AND INTRUMENTATION
12	SS-7	SS	6"	40	Same as above, moist	~~[illegible]~~ 12.0' Water encountered during drilling
	SS-8	SS	6"	38	Same as above, wet, greenish brown (7.5YR 4/3), slightly indurated.	
13	SS-9	SS	5"	21	Same as above, wet	
	SS-10	SS	6"	8	13.6' – Fat CLAY (CH), Red (10R 4/6), highly plastic	
14					Boring terminated at a depth of 14.0' bgs	

ch2m

PROJECT NUMBER:

BORING NUMBER: GP-6C
Sheet: 1

SOIL BORING LOG

PROJECT: DUNDALK MARINE TERMINAL LOCATION: SEE PLAN
ELEVATION: ~ +16 DRILLING CONTRACTOR: SDS
DRILLING METHOD AND EQUIPMENT: FRASTE MULTIDRILL XL MAX 170
WATER LEVELS: ~ +5.3 START: 1100 FINISH: LOGGER: L. LINCOLN

DEPTH BELOW (ft)	SAMPLE			STANDARD PENETRATION TEST RESULTS	SOIL DESCRIPTION	COMMENTS
	NUMBER	TYPE	RECOVERY (ft)	6" - 6" - 6" (N)	SOIL NAME, USCS GROUP SYMBOL, COLOR, MOISTURE CONTENT, RELATIVE DENSITY OR CONSISTENCY, SOIL STRUCTURE, MINERALOGY	DEPTH OF CASING, DRILLING RATE, DRILLING FLUID LOSS, TESTS AND INTRUMENTATION
0					0.0-0.2 ASPHALT 0.2-1.3' BRN SILTY F-C SAND SM GVL	4" DIAM. CASING 0-10'
1	S-1	3" SONIC CORE	2'6"	N/A	1.3-3' GRY, BRN C-F SAND, SM SILT, GVL (FILL)	
2						
3					3.0-4.0 GRY SILTY F-M SAND, TR GVL (FILL	
4	S-2		3'	N/A	4-5.5 RED CLAY MOTTLED YELLOW, WHITE, TR F-M SAND SEAMS	PP = 2.6
5					5.5-6' BRN GVLY C-F SAND, SM SILT (HB)	DPC+
6						

ch2m.

PROJECT NUMBER:

BORING NUMBER: GP-6C

Sheet: 2

SOIL BORING LOG

PROJECT: DUNDALK MARINE TERMINAL **LOCATION:** SEE PLAN

ELEVATION: ~ +16 **DRILLING CONTRACTOR:** SDS

DRILLING METHOD AND EQUIPMENT: FRASTE MULTIDRILL XL MAX 170

WATER LEVELS: ~ +5.3 **START:** 1100 **FINISH:** 1230 **LOGGER:** L. LINCOLN

DEPTH BELOW (ft)	SAMPLE			STANDARD PENETRATION TEST RESULTS	SOIL DESCRIPTION	COMMENTS
	NUMBER	TYPE	RECOVERY (ft)	6" - 6" - 6" (N)	SOIL NAME, USCS GROUP SYMBOL, COLOR, MOISTURE CONTENT, RELATIVE DENSITY OR CONSISTENCY, SOIL STRUCTURE, MINERALOGY	DEPTH OF CASING, DRILLING RATE, DRILLING FLUID LOSS, TESTS AND INTRUMENTATION
4					6.0-6.5' RED CLAY MOTT YELLOW, WHITE, SM C-F SAND	NO RXN
					6.5-8.5 WEAKLY LITHIFIED BRN, GRY SANDY GVL, SM SILT, GREEN PARTICLES (HB COPR)	DPC+
7	S-3	SONIC	3'	N/A		
8						
					8.5-9.0 MOD. LITH. RED BRN SILTY F-C SAND, SM GVL, GREEN PARTICLES (HB)	DPC+
9	SS-4	3" DIA. SS	12"	6	9-9.7 BRN, GRY, TAN SILTY F-M SAND, TR. GVL (HB)	DPC+
				30	9.7-10 BLK, F-C SAND, SM GVL, TR. SILT, MIXED W/ RED CLAY (GB)	DPC++ 4" CASING TO 10'
10	SS-5		12"	15	10-10.3 - BRN, GRY SILTY F-M SAND, TR GVL. (HB)	
				12	10.3-11' MOD LITH. DK GRY, GREEN F-M SAND, SM SILT, TR GVL (GB)	
11	SS-6			9	11-11.4 DO SS-5 BOT (GB)	DPC+
12				24	11.4-12 MOD. LITH. RED BRN GRY, GREEN F-C SAND, SM GVL, SILT (HB)	DPC+

ch2m

PROJECT NUMBER:

BORING NUMBER: GP-6C
Sheet: 3

SOIL BORING LOG

PROJECT: DUNDALK MARINE TERMINAL **LOCATION:** SEE PLAN
ELEVATION: ~ +16 **DRILLING CONTRACTOR:** SDS
DRILLING METHOD AND EQUIPMENT: FRASTE MULTIDRILL XL MAX 170
WATER LEVELS: 10.7' bgs ~+5.3 **START:** 1100 **FINISH:** 1230 **LOGGER:** L. LINCOLN

DEPTH BELOW (ft)	SAMPLE			STANDARD PENETRATION TEST RESULTS	SOIL DESCRIPTION	COMMENTS
	NUMBER	TYPE	RECOVERY (ft)	6" - 6" - 6" (N)	SOIL NAME, USCS GROUP SYMBOL, COLOR, MOISTURE CONTENT, RELATIVE DENSITY OR CONSISTENCY, SOIL STRUCTURE, MINERALOGY	DEPTH OF CASING, DRILLING RATE, DRILLING FLUID LOSS, TESTS AND INTRUMENTATION
12	SS-7	3" DIA SS	1"		MOIST WEAKLY LITH. BRN, GRY F-C SAND, SM SILT, TR. GVL, RED CLAY (HB)	
	SS-8		4"	4	MOIST MOD LITH. DK. GRY, GREEN SILTY F-M SAND (GB)	
13					13-13.2 DO SS-8	
	SS-9		6"	2	13.2-13.5 RED CLAY, SM GVL, F-M SAND SEAMS	NO DPC RXN
14						EOB @ 13.5'
15						
16						
17						
18						

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BORING NO. GP-6C
SHEET 4 OF 5
FILE NO. 10587
SURFACE ELEV. ~ +16
DATUM

PROJECT DUNDALK MARINE TERMINAL
LOCATION BALTIMORE, MARYLAND
BORING LOCATION SEE PLAN

TEST/INSPECTION EQUIPMENT
REFERENCE CODES/STANDARDS

BORING EQUIPMENT AND METHODS OF STABILIZING BOREHOLE

TYPE OF BORING RIG
TRUCK
SKID ✓
BARGE
OTHER

TYPE OF FEED DURING CORING
MECHANICAL
HYDRAULIC
OTHER

CASING USED ☑ YES ☐ NO
DIA., IN. 4" DEPTH, FT. FROM 0 TO 10
DIA., IN. DEPTH, FT. FROM TO
DIA., IN. DEPTH, FT. FROM TO

TYPE AND SIZE OF:
D-SAMPLER
U-SAMPLER
S-SAMPLER
CORE BARREL
CORE BIT
DRILL RODS

DRILLING MUD USED ☐ YES ☐ NO
DIAMETER OF ROTARY BIT, IN.
TYPE OF DRILLING MUD

AUGER USED ☐ YES ☐ NO
TYPE AND DIAMETER, IN.

CASING HAMMER, LBS. AVERAGE FALL, IN.
SAMPLER HAMMER, LBS. 140 AVERAGE FALL, IN. 30
TYPE OF HAMMER

WATER LEVEL OBSERVATIONS IN BOREHOLE

DATE	TIME	DEPTH OF HOLE	DEPTH OF CASING	DEPTH TO WATER	CONDITIONS OF OBSERVATION
11/1/15	1215	13.5	10	10.7	AFTER BORING COMPLETION,
					BEFORE INSTRUMENTATION
					INSTALLATION

PIEZOMETER INSTALLED ☑ YES ☐ NO SKETCH SHOWN ON

STANDPIPE: TYPE ID, IN. LENGTH, FT. TOP ELEV.
INTAKE ELEMENT: TYPE OD, IN. LENGTH, FT. TIP ELEV.
FILTER: MATERIAL OD, IN. LENGTH, FT. BOT. ELEV.

PAY QUANTITIES

3.5" DIA. DRY SAMPLE BORING LIN. FT.
3.5" DIA. U-SAMPLE BORING LIN. FT.
CORE DRILLING IN ROCK LIN. FT.
NO. OF 3" SHELBY TUBE SAMPLES
NO. OF 3" UNDISTURBED SAMPLES
OTHER:

BORING CONTRACTOR SONIC DRILLING SERVICES
DRILLER BRIAN KARSHICK HELPERS CHRIS PHELAN
REMARKS
RESIDENT ENGINEER LYSANDRA LINCOLN DATE 11/1/15

BORING NO. GP-6C

CH2MHILL

PROJECT NUMBER

BORING NUMBER GP-7A SHEET 1 OF

SOIL BORING LOG

PROJECT Honeywell DMT SST LOCATION

ELEVATION DRILLING CONTRACTOR Aquifer Drilling & testing, Inc.

DRILLING METHOD AND EQUIPMENT Sonic SampDrill XL Max 170; 4-in OD drill;

WATER LEVELS START 10/29/15 9:30 FINISH 10/29/15 14:30 LOGGER K. Chaturvedula

DEPTH BELOW SURFACE (FT)	SAMPLE			STANDARD PENETRATION TEST RESULTS	SOIL DESCRIPTION	COMMENTS
	INTERVAL	NUMBER AND TYPE	RECOVERY (FT)	6"-6"-6" (N)	SOIL NAME, USCS GROUP SYMBOL, COLOR, MOISTURE CONTENT, RELATIVE DENSITY OR CONSISTENCY, SOIL STRUCTURE, MINERALOGY	DEPTH OF CASING, DRILLING RATE, DRILLING FLUID LOSS, TESTS AND INSTRUMENTATION
1 2	0 2	Sonic core S-1	8"		4" Asphalt 0-4'-2' Road based aggregate and Concrete/cement treated aggregate	~~Cored through the first 2'~~ Advanced the sonic core through the first 2'.
3	2 3	SS-2	12"	35 29	Poorly graded GRAVEL (GP) tan-gray (GLEY 2 7/10B), dense, dry, road based aggregate	Below 2 feet, switched to 1' split spoon sampling; $1\frac{3}{4}$" sampler; 140-lb hammer 30" drop
4	3 4	SS-3	6"	13 9	3.0'-3.5' - Same as above 3.5' - Well graded SAND with silt (SW-SM), gray (GLEY1 7/10Y), moist,	
5	4 5	SS-4	7"	6 31	~~Sand with clay and gravel~~ Clayey SAND with gravel (SC) gray (GLEY1 4/10Y), wet	
6	5 6	SS-5	10"	51 50/1"	5.0'-5.2' - Same as above 5.2'-5.45' - Fat clay (CH) Red (10R 4/6), highly plastic 5.45' - Silty SAND (SM) with gravel - gray-brown (7.5YR 4/2), dry - medium grained Sand. (GB COPR)	Advanced the sonic core the remaining 5" to a depth of 6' bgs

CH2MHILL

PROJECT NUMBER

BORING NUMBER GP-7A SHEET 2 OF

SOIL BORING LOG

PROJECT ______ LOCATION ______

ELEVATION ______ DRILLING CONTRACTOR ______

DRILLING METHOD AND EQUIPMENT ______

WATER LEVELS ______ START ______ FINISH ______ LOGGER ______

DEPTH BELOW SURFACE (FT)	SAMPLE			STANDARD PENETRATION TEST RESULTS	SOIL DESCRIPTION	COMMENTS
	INTERVAL	NUMBER AND TYPE	RECOVERY (FT)	6"-6"-6" (N)	SOIL NAME, USCS GROUP SYMBOL, COLOR, MOISTURE CONTENT, RELATIVE DENSITY OR CONSISTENCY, SOIL STRUCTURE, MINERALOGY	DEPTH OF CASING, DRILLING RATE, DRILLING FLUID LOSS, TESTS AND INSTRUMENTATION
6	6				6'-6.4' - same as above	
		SS-6		31 62	6.4'-6.9' - Silty SAND (SM) gray black (N2), moist, fine to medium grained sand (GB COPR)	Alternating layers of GB and HB COPR tested the soil samples for Presence of COPR with dyp diphenyl Carbazide
7	7 7				6.9'-7.0' - Silty SAND with gravel (SM), greenish Brown (2.5Y 4/4) medium grained sand (HB COPR)	
		SS-7	5"	71/5"	7.0'-7.3' - same as above, increase in gravel content 7.3'-[illegible] - silty SAND (SM) gray black (N2), ~~b~~ moist, fine to medium grained sand (GB COPR)	Advanced the remaining 7" using the sonic core, to a depth of 8 ft bgs
8	8 8				~~8.0'-8.1'~~	
		SS-8	2"	50/2"	8.0'- silty SAND (SM) with gravel, greenish brown (2.5Y 4/4), ~~[illegible]~~ dry, medium grained sand (HB COPR)	Sonic core advanced to 9.0' bgs and sample collected in bag ~~for~~. wash observed in the recovered sample
9	9 9					
		SS-9	4"	50/4"	Same as above	~~to minimize the wash ou~~ 6'00 10.0'-Outer casing advanced to a depth of 10 feet bgs
10	10					
		SS-10	5"	50/5"	Same as above	
11	11 11					
		SS-11		14 16	silty SAND (SM) gray-black (N2), medium grained sand, moist (GB COPR)	
12	12					

CH2MHILL

PROJECT NUMBER	BORING NUMBER GP-7A	SHEET 3	OF

SOIL BORING LOG

PROJECT ______ LOCATION ______

ELEVATION ______ DRILLING CONTRACTOR ______

DRILLING METHOD AND EQUIPMENT ______

WATER LEVELS ______ START ______ FINISH ______ LOGGER ______

DEPTH BELOW SURFACE (FT)	SAMPLE			STANDARD PENETRATION TEST RESULTS	SOIL DESCRIPTION	COMMENTS
	INTERVAL	NUMBER AND TYPE	RECOVERY (FT)	6"-6"-6" (N)	SOIL NAME, USCS GROUP SYMBOL, COLOR, MOISTURE CONTENT, RELATIVE DENSITY OR CONSISTENCY, SOIL STRUCTURE, MINERALOGY.	DEPTH OF CASING, DRILLING RATE, DRILLING FLUID LOSS, TESTS AND INSTRUMENTATION
12	12	SS-12	12"	17 38	Same as above, greenish (2.5Y 4/3)	
13	13	SS-13		17 31	same as above	
					13.8' - Fat CLAY (CH) Red (10R 4/6), highly plastic.	
14	14				Boring terminated at 14.0 ft bgs	
15						
16						

ch2m

PROJECT NUMBER:

BORING NUMBER: GP-7C

Sheet: 1

SOIL BORING LOG

PROJECT: Honeywell DMT SSI

LOCATION:

ELEVATION:

DRILLING CONTRACTOR: Aquifer drilling and testing, Inc.

DRILLING METHOD AND EQUIPMENT: SONIC SAMP DRILL-XL MAX 170; SPT Sampling

WATER LEVELS:

START: 10/30/15 12:30

FINISH: 10/30/15 14:17

LOGGER: K. Chaturvedula

DEPTH BELOW (ft)	SAMPLE NUMBER	SAMPLE TYPE	SAMPLE RECOVERY (ft)	STANDARD PENETRATION TEST RESULTS 6" - 6" - 6" (N)	SOIL DESCRIPTION: SOIL NAME, USCS GROUP SYMBOL, COLOR, MOISTURE CONTENT, RELATIVE DENSITY OR CONSISTENCY, SOIL STRUCTURE, MINERALOGY	COMMENTS: DEPTH OF CASING, DRILLING RATE, DRILLING FLUID LOSS, TESTS AND INTRUMENTATION
0	S-1 (0'-3')	SONIC MACRO CORE	16"		2.5" Asphalt 0.25'-3.0' concrete/cement treated aggregate	Advanced the top 3' with the 3" OD Sonic Macro Core 2"-2.5" concrete ~~pieces~~ Pieces observed in the macro core
1						
2						
3	S-2 (3'-6')	SONIC MACRO CORE	25"		3.0'-3.4' Poorly graded SAND with gravel (SP) gray-white ( ), moist, medium grained sand	Advanced from 3'-6' with the 3" OD Sonic Macro Core
					3.4'-3.9' Fat clay (CH) Red (10R 4/6), highly plastic, moist	
4					3.9'-5.0' Silty sand with gravel (SM), ~~Bd~~ Red-Brown (7.5YR 4/4), moist,	
5					5.0'-6.0' Well graded SAND with silt and gravel (SW-SM), dry, fine to coarse grained sand, slightly to moderately indurated (HB COPR)	Macro core sample tested with diphenyl carbazide for presence of COPR
6						

ch2m.

PROJECT NUMBER:

BORING NUMBER: GP-7C

Sheet: 2

SOIL BORING LOG

PROJECT:

ELEVATION:

LOCATION:

DRILLING CONTRACTOR:

DRILLING METHOD AND EQUIPMENT:

WATER LEVELS:

START:

FINISH:

LOGGER:

DEPTH BELOW (ft)	SAMPLE			STANDARD PENETRATION TEST RESULTS	SOIL DESCRIPTION	COMMENTS
	NUMBER	TYPE	RECOVERY (ft)	6" - 6" - 6" (N)	SOIL NAME, USCS GROUP SYMBOL, COLOR, MOISTURE CONTENT, RELATIVE DENSITY OR CONSISTENCY, SOIL STRUCTURE, MINERALOGY	DEPTH OF CASING, DRILLING RATE, DRILLING FLUID LOSS, TESTS AND INTRUMENTATION
6					same as above, dark gray Particulate	Advanced from 6'-9' with the 3" OD sonic macro core.
7	S-3 6'-9'	SONIC MACRO CORE	19"			
8					8.0' – Clayey SAND with gravel (SC) Red-white (10R 4/6), dry, fine to medium grained sand, (COPR and non-COPR fill)	9.0' - Switched to 1-foot split spoon sampling. 140-lb hammer; 1 3/8" ID sampler, 30-in. drop
9	SS-4	SS	12"	14 20	9.0' - silty SAND (SM) dark gray and black (N2), wet, fine to medium grained, particulate (GB COPR)	Water encountered at 9.0' bgs during drilling
10	SS-5	SS	12"	9 18	silty SAND with gravel (SM) gray-greenish (5Y 4/4), dry fine to medium grained sand, slightly to moderately indurated (COPR)	10.0' - 6" OD outer casing advanced to a depth of 10' bgs
11	SS-6	SS	12"	13 49	silty SAND (SM), dark gray and black (N2), moist, slightly indurated (GB COPR)	
12						

ch2m

PROJECT NUMBER:

BORING NUMBER: GP-7C
Sheet: 3

SOIL BORING LOG

PROJECT:
ELEVATION:
LOCATION:
DRILLING CONTRACTOR:
DRILLING METHOD AND EQUIPMENT:
WATER LEVELS:
START:
FINISH:
LOGGER:

DEPTH BELOW (ft)	SAMPLE			STANDARD PENETRATION TEST RESULTS	SOIL DESCRIPTION	COMMENTS
	NUMBER	TYPE	RECOVERY (ft)	6" - 6" - 6" (N)	SOIL NAME, USCS GROUP SYMBOL, COLOR, MOISTURE CONTENT, RELATIVE DENSITY OR CONSISTENCY, SOIL STRUCTURE, MINERALOGY	DEPTH OF CASING, DRILLING RATE, DRILLING FLUID LOSS, TESTS AND INTRUMENTATION
12	SS-7	SS	6"	22	same as above, bright green particles	Switched to 6 in. Split spoon sample
	SS-8	SS	4"	32	12.5' - Fat CLAY (CH) Red (10R 4/6), highly plastic	
13					Boring terminated at a depth of 13.0' bgs	
14						
15						
16						
17						
18						

ch2m.

PROJECT NUMBER:

BORING NUMBER: GP-8A
Sheet: 1 OF 6

SOIL BORING LOG

PROJECT: DUNDALK MARINE TERMINAL **LOCATION:** SEE LOCATION PLAN
ELEVATION: ~ +17 **DRILLING CONTRACTOR:** SDS
DRILLING METHOD AND EQUIPMENT: SONIC MULTIDRILL XL MAX 170
WATER LEVELS: ~ +8.5 **START:** 0800 **FINISH:** 1200 **LOGGER:** L. LINCOLN

DEPTH BELOW (ft)	SAMPLE			STANDARD PENETRATION TEST RESULTS	SOIL DESCRIPTION	COMMENTS
	NUMBER	TYPE	RECOVERY (ft)	6" - 6" - 6" (N)	SOIL NAME, USCS GROUP SYMBOL, COLOR, MOISTURE CONTENT, RELATIVE DENSITY OR CONSISTENCY, SOIL STRUCTURE, MINERALOGY	DEPTH OF CASING, DRILLING RATE, DRILLING FLUID LOSS, TESTS AND INTRUMENTATION
0					0-0.5': BLK ASPHALT	
					0.5-2.5': LT GRY CEMENTED F-M SAND (ROAD BASE)	
1						
	S-1		3'	N/A		
2						
		ROTOSONIC CORE			2.5-3.0': BRN C-F SAND, SM SILT (FILL)	
3					3.0-4.25': GRY CLAY, SM F-M SAND, SILT, TR GVL	
4						
					4.25-5.0': RED BRN, BLK SILTY F-C SAND, SM GVL, HB	DCP +
	S-2		3'	N/A		
5					5.0-5.75': WHITE, GREEN CEMENTED C-M SAND, SM GVL	DCP ++
					5.75-6': RED BRN MOD CEMENTED C-F SAND, SM GVL, GREEN PARTICLES (HB COPR)	DCP ++
6						

ch2m

PROJECT NUMBER:

BORING NUMBER: GP-8A
Sheet: 2 OF 6

SOIL BORING LOG

PROJECT: DUNDALK MARINE TERMINAL **LOCATION:** SEE LOCATION PLAN
ELEVATION: ~ +17 **DRILLING CONTRACTOR:** SDS
DRILLING METHOD AND EQUIPMENT: SONIC MULTIDRILL XL MAY 170
WATER LEVELS: ~ +8.5 **START:** 0800 **FINISH:** 1200 **LOGGER:** L. LINCOLN

DEPTH BELOW (ft)	SAMPLE			STANDARD PENETRATION TEST RESULTS	SOIL DESCRIPTION	COMMENTS
	NUMBER	TYPE	RECOVERY (ft)	6" - 6" - 6" (N)	SOIL NAME, USCS GROUP SYMBOL, COLOR, MOISTURE CONTENT, RELATIVE DENSITY OR CONSISTENCY, SOIL STRUCTURE, MINERALOGY	DEPTH OF CASING, DRILLING RATE, DRILLING FLUID LOSS, TESTS AND INTRUMENTATION
6					6-7' GRY, RED BRN SANDY SILT, SM GVL	DCP +
7	S-3	ROTOSONIC	3'	N/A	7-7.6' MOD HIGHLY LITHIFIED GB COPR - BLK, GREEN SILTY SAND, SM GVL	DCP ++
8					7.6-9' RED BRN HIGHLY LITHIFIED HB COPR - SILTY C-F SAND, SM GVL, GREEN PARTICLES	DCP ++
9	SS-4	3" DIA. SS.	12"	2 55	9-9.5 HARD BLK GREEN M-F SAND, TR SILT MOD LITHIFIED GB COPR 9.5-10.0 RED BRN GRY, GREEN M-F SAND, TR. SILT, GVL, HIGHLY LITHIFIED HB	
10	SS-5		12"	5 43	10-11 SOFT WET SILTY F-M SAND, TR CLAY, GREEN PARTICLES - HB COPR	DCP +
11	SS-6			25 69	11-11.7 BRN, GRY HIGHLY LITHIFIED, MOIST F-M SAND, SM SILT, GREEN PARTICLES (HB COPR) 11.7-11.9 BLK, GREEN HIGHLY LITHIFIED M.F SAND (GB COPR) 11.9-12 BRN, GRY HIGHLY LITHIFIED F-M SAND, SM SILT, GREEN PARTICLES (HB COPR)	
12						

ch2m

PROJECT NUMBER:

BORING NUMBER: GP-8A
Sheet: 3 OF 6

SOIL BORING LOG

PROJECT: DUNDALK MARINE TERMINAL **LOCATION:** SEE LOCATION PLAN
ELEVATION: ~ +17 **DRILLING CONTRACTOR:** SDS
DRILLING METHOD AND EQUIPMENT: SONIC MULTIDRILL XL MAX 170
WATER LEVELS: ~ +8.5 **START:** 0800 **FINISH:** 1200 **LOGGER:** L. LINCOLN

DEPTH BELOW (ft)	SAMPLE			STANDARD PENETRATION TEST RESULTS	SOIL DESCRIPTION	COMMENTS
	NUMBER	TYPE	RECOVERY (ft)	6" - 6" - 6" (N)	SOIL NAME, USCS GROUP SYMBOL, COLOR, MOISTURE CONTENT, RELATIVE DENSITY OR CONSISTENCY, SOIL STRUCTURE, MINERALOGY	DEPTH OF CASING, DRILLING RATE, DRILLING FLUID LOSS, TESTS AND INTRUMENTATION
12				26	12-13': BRN, GRY, YELLOW HIGHLY LITHIFIED F-M SAND, TR SILT, GVL (HB COPR)	
	SS-7	3" DIA. SS	12"	64		
13				21	13-13.6: MOIST MOD. LITHIFIED BRN, GRY, GREEN M-F SAND SM SILT (HB COPR)	
	SS-8		12"	24	13.6-14: MOIST MOD LITHIFIED DK GRY, BLK, GREEN F-M SAND, TR. SILT (GB COPR)	
14	SS-9		2"	16	14-14.5: MOIST MOD LITHIFIED RED BRN, GRY, F M SAND, SM SILT, YELLOW PARTICLES (HB COPR)	
	SS-10		6"	11	14.5-14.8: WET DK GRY, BRN M-F SAND, TR SILT, GREEN PARTICLES (GB) 14.8-15 RED CLAY, MOTT. YELLOW	
15						EOB @ 15.0' DRILLER PUSHED 5" CASING TO 15', CLEANED OUT HOLE WITH SONIC CORE BEFORE INSTALLING INSTRUMENTATION
16						
17						
18						

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BORING NO. GP-8A
SHEET 4 **OF** 6
PROJECT DUNDALK MARINE TERMINAL
FILE NO. 10587
LOCATION BALTIMORE, MARYLAND
SURFACE ELEV. ~+17
BORING LOCATION SEE LOCATION PLAN
DATUM

TEST/INSPECTION EQUIPMENT SONIC MULTIDRILL XL MAX 170
REFERENCE CODES/STANDARDS

BORING EQUIPMENT AND METHODS OF STABILIZING BOREHOLE

TYPE OF BORING RIG		TYPE OF FEED DURING CORING		CASING USED	☑ YES	☐ NO		
TRUCK		MECHANICAL		DIA., IN.	5"	DEPTH, FT. FROM	0	TO 10
SKID	✓	HYDRAULIC		DIA., IN.		DEPTH, FT. FROM		TO
BARGE		OTHER		DIA., IN.		DEPTH, FT. FROM		TO
OTHER								

TYPE AND SIZE OF:
D-SAMPLER 3" O.D. SPLIT SPOON
U-SAMPLER
S-SAMPLER
CORE BARREL 3" DIA. ROTOSONIC
CORE BIT
DRILL RODS

DRILLING MUD USED ☐ YES ☑ NO
DIAMETER OF ROTARY BIT, IN.
TYPE OF DRILLING MUD
AUGER USED ☐ YES ☑ NO
TYPE AND DIAMETER, IN.
CASING HAMMER, LBS. 140 AVERAGE FALL, IN. 30
SAMPLER HAMMER, LBS. AVERAGE FALL, IN.
TYPE OF HAMMER

WATER LEVEL OBSERVATIONS IN BOREHOLE

DATE	TIME	DEPTH OF HOLE	DEPTH OF CASING	DEPTH TO WATER	CONDITIONS OF OBSERVATION
10/29	1200	15.0	15.0	7.5	HEAVY RAIN PREVIOUS NIGHT

PIEZOMETER INSTALLED ☑ YES ☐ NO **SKETCH SHOWN ON** PG. 5

STANDPIPE:	TYPE	ID, IN.		LENGTH, FT.		TOP ELEV.	
INTAKE ELEMENT:	TYPE	OD, IN.		LENGTH, FT.		TIP ELEV.	
FILTER:	MATERIAL	OD, IN.		LENGTH, FT.		BOT. ELEV.	

PAY QUANTITIES
3.5" DIA. DRY SAMPLE BORING LIN. FT.
3.5" DIA. U-SAMPLE BORING LIN. FT.
CORE DRILLING IN ROCK LIN. FT.
NO. OF 3" SHELBY TUBE SAMPLES
NO. OF 3" UNDISTURBED SAMPLES
OTHER:

BORING CONTRACTOR SONIC DRILLING SERVICES
DRILLER BRIAN KARSHAK **HELPERS** CHRIS PHELAN
REMARKS
RESIDENT ENGINEER LYSANDRA LINCOLN **DATE** 10/29/15

BORING NO. GP-8A

BOR-4_JAN2013

ch2m

PROJECT NUMBER:
BORING NUMBER: GP-8C
Sheet: 1

SOIL BORING LOG

PROJECT: DUNDALK MARINE TERMINAL
LOCATION: SEE PLAN
ELEVATION: ~ +17
DRILLING CONTRACTOR: SDS
DRILLING METHOD AND EQUIPMENT: FRASTE MULTIDRILL XL MAX 170
WATER LEVELS: ~ + 8
START: 0830
FINISH: 1200
LOGGER: L. LINCOLN

DEPTH BELOW (ft)	SAMPLE			STANDARD PENETRATION TEST RESULTS	SOIL DESCRIPTION	COMMENTS
	NUMBER	TYPE	RECOVERY (ft)	6" - 6" - 6" (N)	SOIL NAME, USCS GROUP SYMBOL, COLOR, MOISTURE CONTENT, RELATIVE DENSITY OR CONSISTENCY, SOIL STRUCTURE, MINERALOGY	DEPTH OF CASING, DRILLING RATE, DRILLING FLUID LOSS, TESTS AND INTRUMENTATION
0					0-0.3 BLK ASPHALT CONCRETE	5" DIA. CASING DRIVEN TO 10' ↓
1	S-1	ROTOSONIC	12"	N/A		
2						
3					3-5' CONCRETE	
4						
5	S-2		2'3"	N/A	5-5.5' BRN SANDY GVL	
					5.5-6.0' MOD LITHIFIED BRN, BLK, GRY SILTY C-F SAND, TR. GVL	DPC+
6						

ch2m

PROJECT NUMBER:

BORING NUMBER: GP-8C
Sheet: 2

SOIL BORING LOG

PROJECT: DUNDALK MARINE TERMINAL
LOCATION: SEE PLAN
ELEVATION: ~ +17
DRILLING CONTRACTOR: SDS
DRILLING METHOD AND EQUIPMENT: SONIC MULTIDRILL XL MAX 170
WATER LEVELS: ~ +8
START: 0830
FINISH: 1200
LOGGER: L. LINCOLN

DEPTH BELOW (ft)	SAMPLE			STANDARD PENETRATION TEST RESULTS	SOIL DESCRIPTION	COMMENTS	
	NUMBER	TYPE	RECOVERY (ft)	6" - 6" - 6" (N)	SOIL NAME, USCS GROUP SYMBOL, COLOR, MOISTURE CONTENT, RELATIVE DENSITY OR CONSISTENCY, SOIL STRUCTURE, MINERALOGY	DEPTH OF CASING, DRILLING RATE, DRILLING FLUID LOSS, TESTS AND INTRUMENTATION	
6	S-3	ROTOSONIC	3'	N/A	6-6.5 RED-BRN CLAYEY F-M SAND, TR. GVL (HB)	DPC+	
7					6.5 - 8.7 WEAKLY LITHIFIED RED-BRN F-C SAND, SM GVL, SILT (HB)	DPC+	
8					8.7-9.0 HIGHLY LITHIFIED RED-BRN, GRY, GREEN SILTY F-M SAND (HB)	DPC+	
9	SS-4	3" SS	12"	4 4	9-9.5 MOIST SOFT BRN-DK GRY SILTY F-M SAND (HB)	DPC+	5" CASING DRIVEN TO 10'
					9.5 - 9.75 CONCRETE		
					9.75-10 MOIST MOD LITHIFIED BRN, GRY SILTY F-M SAND TR GVL (HB)	DPC+	
10	SS-5		12"	3 5	10-10.5 MOD LITHIFIED DK GRY, YELLOW M-F SAND, SM SILT (GB)		
					10.5-11 MOIST SOFT CLAY M-F SAND (GB)	DPC+	
11	SS-6			3 82	11-12 MOIST MOD LITHIFIED RED BRN, GRY, GREEN SILTY F-M SAND (HB)		
12							

ch2m

PROJECT NUMBER:

BORING NUMBER: GP-8C
Sheet: 3

SOIL BORING LOG

PROJECT: DUNDALK MARINE TERMINAL **LOCATION:** SEE PLAN
ELEVATION: ~ +17 **DRILLING CONTRACTOR:** SDS
DRILLING METHOD AND EQUIPMENT: SONIC MULTIDRILL XL MAX 170
WATER LEVELS: ~ +8 **START:** 0830 **FINISH:** 1200 **LOGGER:** L. LINCOLN

DEPTH BELOW (ft)	SAMPLE			STANDARD PENETRATION TEST RESULTS	SOIL DESCRIPTION	COMMENTS
	NUMBER	TYPE	RECOVERY (ft)	6" - 6" - 6" (N)	SOIL NAME, USCS GROUP SYMBOL, COLOR, MOISTURE CONTENT, RELATIVE DENSITY OR CONSISTENCY, SOIL STRUCTURE, MINERALOGY	DEPTH OF CASING, DRILLING RATE, DRILLING FLUID LOSS, TESTS AND INTRUMENTATION
12	SS-7 SS/7	3" DIA. SS	4"	100/4"	HIGHLY LITHIFIED RED·BRN, GRY, GREEN M·F SAND, SM SILT, TR. GVL (HB)	
	S-8	SONIC	8"	N/A	DO SS-7	
13	SS-9	3" DIA. SS	12"	31 41	DO SS-7	
14	SS-10		6"	30	DO SS-7	
	SS-11		6"	17	HIGHLY LITHIFIED RED·BRN CLAYEY F·M SAND, TR GVL (HB)	LOW DPC RXN SAMPLE SS-11 MAY BE MIXED W/ RED CLAY LINER
15	SS-12		4"	9	DO SS-11	
	SS-13		3"	7	V. SOFT RED CLAY	EOB @ 16.0'
16						
17						
18						

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BORING NO. GP-8C
SHEET 4 OF 6
FILE NO. 10587
SURFACE ELEV. ~ +17
DATUM

PROJECT DUNDALK MARINE TERMINAL
LOCATION BALTIMORE, MARYLAND
BORING LOCATION SEE PLAN

TEST/INSPECTION EQUIPMENT
REFERENCE CODES/STANDARDS

BORING EQUIPMENT AND METHODS OF STABILIZING BOREHOLE

TYPE OF BORING RIG
TRUCK
SKID ✓
BARGE
OTHER

TYPE OF FEED DURING CORING
MECHANICAL
HYDRAULIC
OTHER

CASING USED ☑ YES ☐ NO
DIA., IN. 5" DEPTH, FT. FROM 0 TO 10
DIA., IN. 4" DEPTH, FT. FROM TO
DIA., IN. DEPTH, FT. FROM TO

TYPE AND SIZE OF:
D-SAMPLER 3" O.D SPLIT SPOON
U-SAMPLER
S-SAMPLER
CORE BARREL
CORE BIT
DRILL RODS

DRILLING MUD USED ☐ YES ☑ NO
DIAMETER OF ROTARY BIT, IN.
TYPE OF DRILLING MUD

AUGER USED ☐ YES ☑ NO
TYPE AND DIAMETER, IN.

CASING HAMMER, LBS. AVERAGE FALL, IN.
SAMPLER HAMMER, LBS. 140 AVERAGE FALL, IN. 30
TYPE OF HAMMER

WATER LEVEL OBSERVATIONS IN BOREHOLE

DATE	TIME	DEPTH OF HOLE	DEPTH OF CASING	DEPTH TO WATER	CONDITIONS OF OBSERVATION
10/30	1130	16	10	9	WATER LEVEL PRE-INSTRUMENTATION INSTALLATION

PIEZOMETER INSTALLED ☑ YES ☐ NO SKETCH SHOWN ON PG. 5

STANDPIPE: TYPE ID, IN. LENGTH, FT. TOP ELEV.
INTAKE ELEMENT: TYPE OD, IN. LENGTH, FT. TIP ELEV.
FILTER: MATERIAL OD, IN. LENGTH, FT. BOT. ELEV.

PAY QUANTITIES

3.5" DIA. DRY SAMPLE BORING LIN. FT.
3.5" DIA. U-SAMPLE BORING LIN. FT.
CORE DRILLING IN ROCK LIN. FT.
NO. OF 3" SHELBY TUBE SAMPLES
NO. OF 3" UNDISTURBED SAMPLES
OTHER:

BORING CONTRACTOR SONIC DRILLING SERVICES
DRILLER BRIAN KARSTICK HELPERS CHRIS PHELAN
REMARKS
RESIDENT ENGINEER LYSANDRA LINCOLN DATE 10/30/15

BORING NO. GP-8C

ch2m:

PROJECT NUMBER:

BORING NUMBER: GP-10A

Sheet: 1

SOIL BORING LOG

PROJECT: Honeywell DMT SSI

LOCATION:

ELEVATION:

DRILLING CONTRACTOR: Aquifer Drilling and testing Inc.

DRILLING METHOD AND EQUIPMENT: Sonic samp Drill max 170; SPT sampling

WATER LEVELS:

START: 11/9/15 13:52

FINISH: 11/9/15 15:30

LOGGER: K. Chaturvedula

DEPTH BELOW (ft)	SAMPLE			STANDARD PENETRATION TEST RESULTS	SOIL DESCRIPTION	COMMENTS
	NUMBER	TYPE	RECOVERY (ft)	6" - 6" - 6" (N)	SOIL NAME, USCS GROUP SYMBOL, COLOR, MOISTURE CONTENT, RELATIVE DENSITY OR CONSISTENCY, SOIL STRUCTURE, MINERALOGY	DEPTH OF CASING, DRILLING RATE, DRILLING FLUID LOSS, TESTS AND INTRUMENTATION
0					3" Asphalt. Silty SAND with gravel (SM), gray, light brown, (7.5YR 5/4), moist, fine to medium grained sand	Advanced to 10.0' bgs Using Rotosonic macro core 2" ID 0'-3'- Sample tested with PID = -ve.
1	S1	SONIC MACRO CORE	36"			
2						2.0'- Polyethylene Clay liner encountered.
3					3.0'- same as above, wet.	
4					4.0'- Poorly graded sand with clay and gravel (SP-SC), Red-Yellow, Brown (7.5YR 4/6), dry, medium grained sand	
	S-2	SONIC MACRO CORE	20"		5.0'- Same as above, gray (10YR 4/2)	
5						
6						

ch2m:

PROJECT NUMBER:
BORING NUMBER: GP-10A
Sheet: 2

SOIL BORING LOG

PROJECT:
ELEVATION:
DRILLING METHOD AND EQUIPMENT:
WATER LEVELS:
LOCATION:
DRILLING CONTRACTOR:
START:
FINISH:
LOGGER:

DEPTH BELOW (ft)	SAMPLE			STANDARD PENETRATION TEST RESULTS	SOIL DESCRIPTION	COMMENTS
	NUMBER	TYPE	RECOVERY (ft)	6" - 6" - 6" (N)	SOIL NAME, USCS GROUP SYMBOL, COLOR, MOISTURE CONTENT, RELATIVE DENSITY OR CONSISTENCY, SOIL STRUCTURE, MINERALOGY	DEPTH OF CASING, DRILLING RATE, DRILLING FLUID LOSS, TESTS AND INTRUMENTATION
6					6.0'-7.5' - ~~Red~~ Fat CLAY (CH), Red (10Y4/6), moist, highly plastic.	
7	S-3	SONIC MACRO CORE	36"		7.5'-8.75' - Silty SAND (SM), Brown, Red-green (7.5YR 4/3), dry, Particulate. (HB COPE)	BPC test : [illegible]
8					8.75' - Poorly graded SAND with silt (SP-SM), ~~dark~~ gray (7.5YR 5/2), moist, particulate (GB COPE)	
9	S-4	SONIC MACRO CORE	12"		Silty SAND (SM), Reddish-Brown (7.5YR 5/6), dry, Particulate to moderately indurated, Laminated (HB COPE)	
10	SS-5	SS	12"	13 30	10.0'-10.25' - Same as above, moist, dark brown, gray-Black (7.5YR 4/2), moderately ~~[illegible]~~ indurated 10.25'-10.9' - Same as above, Reddish-Brown (7.5YR 5/6), dry 10.9'-11.0' - Poorly graded SAND with silt (SP-SM), dark gray - Black (N3), bright green particles, moist, Particulate (GB COPE)	10.0' - Installed the 6" OD outer casing to a depth of 10.0' bgs. -10.5 - Switched to SS sampling below 10', 140-lb hammer, 30 in drop, 3" dia sampler.
11	SS-6	SS		35 18	11.0'-11.2' - Same as above 11.2'-11.8' - Silty SAND (SM), Reddish-Brown (7.5YR 5/6), dry, moderately ~~in~~ to highly indurated (HB COPE) 11.8'-12.0' - ~~Robbly~~ (GB COPE), dark green (5Y 4/4), moist	11.0' - Alternating layers of GB and HB COPE
12						

PROJECT NUMBER:

BORING NUMBER: GP-10A

Sheet: 3

SOIL BORING LOG

PROJECT:

LOCATION:

ELEVATION:

DRILLING CONTRACTOR:

DRILLING METHOD AND EQUIPMENT:

WATER LEVELS:

START:

FINISH:

LOGGER:

DEPTH BELOW (ft)	SAMPLE			STANDARD PENETRATION TEST RESULTS	SOIL DESCRIPTION	COMMENTS
	NUMBER	TYPE	RECOVERY (ft)	6" - 6" - 6" (N)	SOIL NAME, USCS GROUP SYMBOL, COLOR, MOISTURE CONTENT, RELATIVE DENSITY OR CONSISTENCY, SOIL STRUCTURE, MINERALOGY	DEPTH OF CASING, DRILLING RATE, DRILLING FLUID LOSS, TESTS AND INTRUMENTATION
12	SS-7	SS	12"	49 92	Poorly graded SAND with Silt (SP-SM), dark green (5Y 4/4), wet, Particulate (GB COPR) 12.5'-12.7'- Same as above, Red-Brown (7.5YR 5/6)	12.0'- Groundwater encountered at 12.0' bgs during drilling
13	SS-8	SS	6"	96	13.0'. Silty SAND (SM), Brownish Red (7.5YR 5/6), moist, moderately indurated, laminated Bright Yellow particles (HB COPR)	
	SS-9	SS	6"	46	Same as above, moist	
14	SS-10	SS	5"	41	Same as above, wet, ~~Red~~ Red clay lumps	
	SS-11	SS	4"	28	Poorly graded SAND with Silt (SP-SM), gray and dark green (2.5Y 4/3), moist, Particulate (GB COPR), Bright green Particles	
15	SS-12	SS	4"	10	Same as above, wet	15.0'- Installing the 6" OD outer casing down to 16' bgs.
	SS-13	SS	6"	7	15.5'-16.0'- Fat CLAY (CH), Red (10YR 4/4), wet, highly plastic	
16					Bottom of boring at 16.0' bgs	

ch2m.

PROJECT NUMBER:

BORING NUMBER: GP-16C
Sheet: 1

SOIL BORING LOG

PROJECT: Honeywell DMT SSI
ELEVATION:
DRILLING METHOD AND EQUIPMENT: Sonic Samp Drill Max 170; SPT sampling
WATER LEVELS:
LOCATION:
DRILLING CONTRACTOR: Aquifer drilling and testing Inc
START: 11/10/15 7:45
FINISH: 11/10/15 9:20
LOGGER: K. Chaturvedula

DEPTH BELOW (ft)	SAMPLE NUMBER	SAMPLE TYPE	SAMPLE RECOVERY (ft)	STANDARD PENETRATION TEST RESULTS 6" - 6" - 6" (N)	SOIL DESCRIPTION: SOIL NAME, USCS GROUP SYMBOL, COLOR, MOISTURE CONTENT, RELATIVE DENSITY OR CONSISTENCY, SOIL STRUCTURE, MINERALOGY	COMMENTS: DEPTH OF CASING, DRILLING RATE, DRILLING FLUID LOSS, TESTS AND INTRUMENTATION
0					3" Asphalt Silty SAND with gravel (SM), gray light brown (2.5YR 5/3), moist, fine to medium grained sand	From 0'-10' Advanced the hole using sonic macro core 3" ID DPC –
1	S-1	SONIC MACRO CORE	18"	–		DPC –
2						
3					3.0' - Same as above	DPC –
					3.5' - Poorly graded SAND with clay and gravel (SP-SC), Reddish Brown (2.5YR 4/6), dry, fine grained sand	
4	S-2	SONIC MACRO CORE	20"	–		DPC –
5					5.0' - Same as above, gray (10YR 4/2)	DPC –
6						

ch2m:

PROJECT NUMBER:

BORING NUMBER: GP-10C
Sheet: 2

SOIL BORING LOG

PROJECT:
ELEVATION:
LOCATION:
DRILLING CONTRACTOR:
DRILLING METHOD AND EQUIPMENT:
WATER LEVELS:
START:
FINISH:
LOGGER:

DEPTH BELOW (ft)	SAMPLE			STANDARD PENETRATION TEST RESULTS	SOIL DESCRIPTION	COMMENTS
	NUMBER	TYPE	RECOVERY (ft)	6" - 6" - 6" (N)	SOIL NAME, USCS GROUP SYMBOL, COLOR, MOISTURE CONTENT, RELATIVE DENSITY OR CONSISTENCY, SOIL STRUCTURE, MINERALOGY	DEPTH OF CASING, DRILLING RATE, DRILLING FLUID LOSS, TESTS AND INTRUMENTATION
6					6.0'-7.0' - Fat CLAY (CH), Red (10Y 4/6) moist, highly plastic	
7	S3	SONIC MACROCORE	36"	–	7.0' - Silty SAND (SM), Red-Brown (7.5YR 5/6) dry, fine grained sand, particulate to slightly indurated (HB COPR)	DPC +
8						
9	S-4	SONIC MACRO CORE	12"	–	9.0' - Silty SAND (SM), light gray (10YR 4/2) wet, bright yellow particles, particulate to slightly indurated (GB COPR)	DPC +
10	SS-5	SS	12"	27 35	10.0' - Silty SAND with gravel (SM), Red-Brown (7.5YR 5/6), dry, bright green particles, moderately to highly indurated, laminated (HB COPR) 10.5' - increase in gravel content, white quartz-like gravel	10.0' Installed the 6" OD outer casing to a depth of 10' bgs. 10.5' - Below 10' switched to SS sampling, 140-lb hammer; 30 in drop, 2" dia sampler.
11	SS-6	SS	12"	60 62	11.0' - Poorly graded sand with silt (SP-SM), dark gray-black (N2), wet, bright green particles, particulate 11.6' - Silty SAND (SM), Brown-green dry, moderately indurated, laminated	11.0' - Alternating layers of GB and HB COPR
12						

ch2m

PROJECT NUMBER:

BORING NUMBER: GP-10C
Sheet: 3

SOIL BORING LOG

PROJECT:
LOCATION:
ELEVATION:
DRILLING CONTRACTOR:
DRILLING METHOD AND EQUIPMENT:
WATER LEVELS:
START:
FINISH:
LOGGER:

DEPTH BELOW (ft)	SAMPLE			STANDARD PENETRATION TEST RESULTS	SOIL DESCRIPTION	COMMENTS
	NUMBER	TYPE	RECOVERY (ft)	6" - 6" - 6" (N)	SOIL NAME, USCS GROUP SYMBOL, COLOR, MOISTURE CONTENT, RELATIVE DENSITY OR CONSISTENCY, SOIL STRUCTURE, MINERALOGY	DEPTH OF CASING, DRILLING RATE, DRILLING FLUID LOSS, TESTS AND INTRUMENTATION
12				34	Same as above, wet	12.8' - groundwater encountered at 12.8' bgs during drilling
	SS-7	SS	12"	58		
13			2"		same as above, wet	
	SS-8	SS		9		
	SS-9	SS	4"	11	Sandy lean CLAY (CL), Red-white (10YR 6/4) dry, low plasticity	
14					Bottom of boring at 14.0' bgs.	13.8' - outer casing installed to a depth of 14.0' bgs.
15						
16						

BORING LOG

Page 1 of 7

Honeywell

Site: Dundalk Marine Terminal
Boring No: DMT-11S
Diameter: 8 in
Date: 01/06/2006

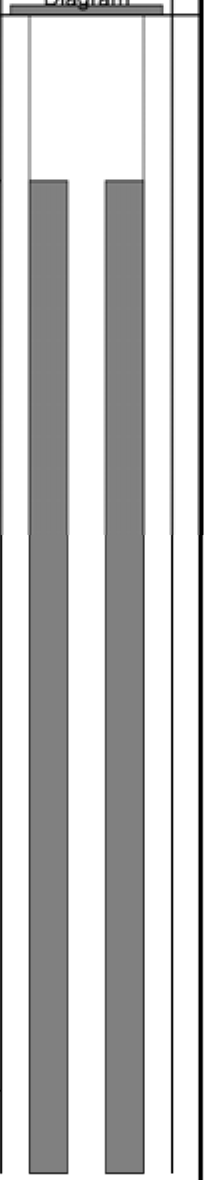
Northing: 574430.5
Easting: 1448175.9
Elevation: 22.10
Datum: Baltimore City

Driller: A. Chapel (Parratt Wolff, Inc.)
Method: Hollow Stem Auger
Consultant: L. Hunt (CH2M Hill, Inc.)
Project No: 327494
Field Book No:

Total Depth: 48.0 Ft
GW Depth: 24.0 Ft

Depth Ft	Recov	Soil Code	Pattern	Soil Description
0		Asphalt		Asphalt
		CL		SANDY CLAY (CL): moist, dark reddish brown, stiff, trace gravel and silt, trace organics, homogeneous, fill
5				
		GP		GRAVEL (GP): moist to dry, white and black, dense, poorly graded gravel, trace silt and sand, fill
7				

DMT-11S Diagram



BORING LOG

Honeywell

Site: Dundalk Marine Terminal
Boring No: DMT-11S
Diameter: 8 in
Date: 01/06/2006

Northing: 574430.5
Easting: 1448175.9
Elevation: 22.10
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Driller: A. Chapel (Parratt Wolff, Inc.)
Method: Hollow Stem Auger
Consultant: L. Hunt (CH2M Hill, Inc.)
Project No: 327494 **Field Book No:**

Total Depth: 48.0 Ft
GW Depth: 24.0 Ft

Depth Ft	Recov	Soil Code	Pattern	Soil Description	DMT-11S Diagram
7		GP		GRAVEL (GP); moist to dry, white and black, dense, poorly graded gravel, trace silt and sand, fill.	
		SP		SAND (SP), moist, light tan, dense, fine to coarse grained quartz sand, trace silt, homogeneous, fill.	
		CL		SILTY CLAY (CL); moist, red brown, very stiff, trace gravel, sand and organics, homogeneous, trace sand pockets, fill.	
10		GP		SANDY GRAVEL (GP); moist, gray, dense, homogeneous, fill.	
		SP		SAND (SP), moist, red brown, dense, fine to coarse grained quartz sand, trace silt, well compacted, COPR.	
		SP		SAND (SP), moist, brown, mottled green and black, fine to coarse grained quartz sand, trace gravel, silt, and clay, well compacted, lensed, gravel lense at 12.5', COPR.	
		ML		CLAYEY SILT (ML), moist, gray brown, very stiff, trace gravel, homogeneous, fill.	
14					

BORING LOG Page 3 of 7

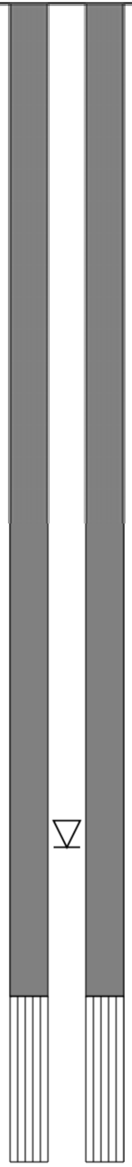
Honeywell

Site: Dundalk Marine Terminal
Boring No: DMT-11S
Diameter: 8 in
Date: 01/06/2006

Northing: 574430.5
Easting: 1448175.9
Elevation: 22.10
Datum: Baltimore City

Driller: A. Chapel (Parratt Wolff, Inc.)
Method: Hollow Stem Auger
Consultant: L. Hunt (CH2M Hill, Inc.)
Project No: 327494 Field Book No:

Total Depth: 48.0 Ft
GW Depth: 24.0 Ft

Depth Ft	Recov	Soil Code	Pattern	Soil Description	DMT-11S Diagram
14		CL		CLAY (CL), moist, gray, red and white, dense, fine to coarse grained quartz sand, trace silt, interbedded, fill.	
15		SP		SAND (SP), moist, gray, brown, light brown, black and green, dense, fine to coarse grained quartz sand, trace gravel, concrete and silt, well compacted, COPR and fill intermixed.	
				No recovery from 17' to 20'	
20		SC		CLAYEY SAND (SC), moist, red brown and dark gray, mottled white, stiff, trace gravel and silt, fine to coarse grained quartz sand lenses, fill, confining COPR above from material below.	
21					

BORING LOG Page 4 of 7

Honeywell

Site: Dundalk Marine Terminal
Boring No: DMT-11S
Diameter: 8 in
Date: 01/06/2006

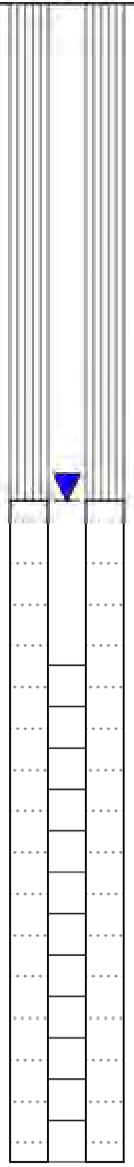
Northing: 574430.5
Easting: 1448175.9
Elevation: 22.10
Datum: Baltimore City

Driller: A. Chapel (Parratt Wolff, Inc.)
Method: Hollow Stem Auger
Consultant: L. Hunt (CH2M Hill, Inc.)
Project No: 327494 Field Book No:

Total Depth: 48.0 Ft
GW Depth: 24.0 Ft

Depth Ft	Recov	Soil Code	Pattern	Soil Description
21		SC		CLAYEY SAND (SC); moist, red brown and dark gray, mottled white, stiff, trace gravel and silt fine to coarse grained quartz sand lenses, fill, confining COPR above from material below.
		SP		SAND (SP); wet, gray, loose, fine to coarse grained quartz sand, little gravel, homogeneous, native materials.
25				
28				

DMT-11S Diagram



BORING LOG

Page 5 of 7

Honeywell

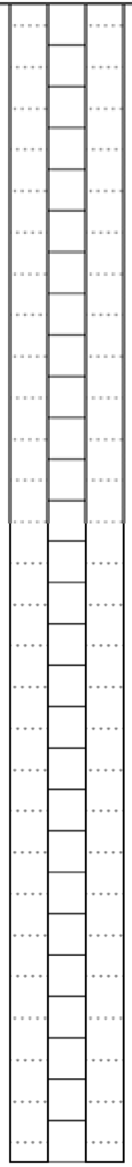
Site: Dundalk Marine Terminal
Boring No: DMT-11S
Diameter: 8 in
Date: 01/06/2006

Northing: 574430.5
Easting: 1448175.9
Elevation: 22.10
Datum: Baltimore City

Driller: A. Chapel (Parratt Wolff, Inc.)
Method: Hollow Stem Auger
Consultant: L. Hunt (CH2M Hill, Inc.)
Project No: 327494
Field Book No:

Total Depth: 48.0 Ft
GW Depth: 24.0 Ft

Depth Ft	Recov	Soil Code	Pattern	Soil Description	DMT-11S Diagram
28		CL		CLAY (CL); moist, light gray, mottled light brown (FeO2), stiff to very stiff, some silt, trace organics, homogeneous, native materials.	
30					
		SM		SILTY SAND (SM); wet, brown, loose, fine to coarse grained quartz sand, homogeneous.	
35					



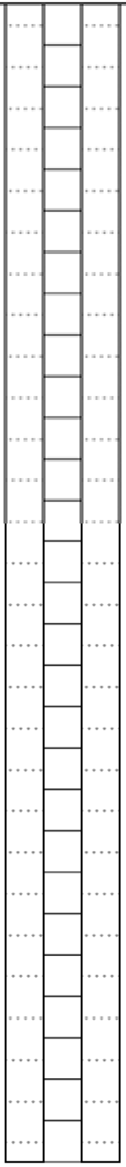
BORING LOG

Site: Dundalk Marine Terminal
Boring No: DMT-11S
Diameter: 8 in
Date: 01/06/2006

Northing: 574430.5
Easting: 1448175.9
Elevation: 22.10
Datum: Baltimore City

Driller: A. Chapel (Parratt Wolff, Inc.)
Method: Hollow Stem Auger
Consultant: L. Hunt (CH2M Hill, Inc.)
Project No: 327494 **Field Book No:**

Total Depth: 48.0 Ft
GW Depth: 24.0 Ft

Depth Ft	Recov	Soil Code	Pattern	Soil Description	DMT-11S Diagram
35		SM		SILTY SAND (SM), wet, brown, loose, fine to coarse grained quartz sand, homogeneous.	
		SP		SAND (SP), wet, light gray, loose, fine to coarse grained quartz sand, trace silt and organics, homogeneous, native materials.	
40					
42					

BORING LOG Page 7 of 7

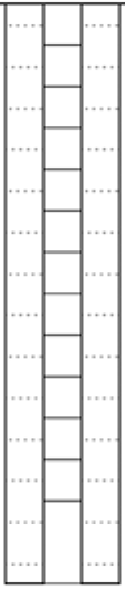
Honeywell

Site: Dundalk Marine Terminal
Boring No: DMT-11S
Diameter: 8 in
Date: 01/06/2006

Northing: 574430.5
Easting: 1448175.9
Elevation: 22.10
Datum: Baltimore City

Driller: A. Chapel (Parratt Wolff, Inc.)
Method: Hollow Stem Auger
Consultant: L. Hunt (CH2M Hill, Inc.)
Project No: 327494 **Field Book No:**

Total Depth: 48.0 Ft
GW Depth: 24.0 Ft

Depth Ft	Recov	Soil Code	Pattern	Soil Description	DMT-11S Diagram
42		SP		SAND (SP); wet, light gray, loose, fine to coarse grained quartz sand, trace silt and organics, homogeneous, native materials.	
		SC		CLAYEY SAND (SC); wet, gray, medium dense, homogeneous, grades to finer sand and silt at bottom, native materials.	
		CL		SILTY CLAY (CL); moist, gray, stiff, trace micas, organics, and sand, homogeneous, native materials.	
45					
48.0					

Twenty-five feet of augers were lost in first attempt at sampling and well installation. The augers were lost in the process of installing the well, so another borehole was drilled nearby and the well was installed here.

BORING LOG

Page 1 of 2

Honeywell

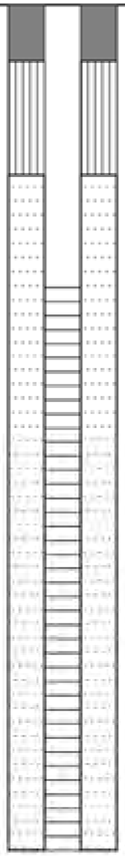
Site: Dundalk Marine Terminal	**Northing: 574170.4**	**Driller: A. Chapel (Parratt Wolff, Inc.)**	**Total Depth: 29.0 Ft**
Boring No: DMT-56S	**Easting: 1447839.8**	**Method: Hollow Stem Auger**	**GW Depth: 0.0 Ft**
CPT No:	**Elevation: 13.1**	**Consultant: J. Rogers (CH2M Hill, Inc.)**	**Date: 09/04/2007**

Depth Ft	Recov	Sample ID	DPC	Soil Code	Soil Description	USCS	Comments	Well Diagram	W	Gs	PL	LL	P200
0													
5			-		Borehole advanced to 10 feet prior to collecting samples								
10		DMT-56US-SO-110120	-		SANDY SILT (ML) -yellowish red (5 YR 5/8) with trace gray (10 YR 6/1), moist to wet, fine sand, trace coarse sand, some gravel, medium stiff)	ML			15				
			-										
15													

Locus

BORING LOG Page 2 of 2 Honeywell	Site: Dundalk Marine Terminal Boring No: DMT-56S CPT No:	Northing: 574170.4 Easting: 1447839.8 Elevation: 13.1	Driller: A. Chapel (Parratt Wolff, Inc.) Method: Hollow Stem Auger Consultant: J. Rogers (CH2M Hill, Inc.)	Total Depth: 29.0 Ft GW Depth: 0.0 Ft Date: 09/04/2007

Depth Ft	Recov	Sample ID	DPC	Soil Code	Soil Description	USCS	Comments	Well Diagram	W	Gs	PL	LL	P200
15	■		-		SANDY SILT (ML) -yellowish red (5 YR 5/8) with trace gray (10 YR 5/1), moist to wet, fine sand, trace coarse sand, some gravel, medium stiff)	ML							
	■	DMT-56US-SO-170175			SILTY CLAY (CL) -dark gray (10 YR 4/1), moist, trace very fine sand, soft, medium plasticity	CL			30				
20	■		- -		POORLY-GRADED SAND (SP) -black (10 YR 2/1) and pale brown (10 YR 6/3) grading to pale brown (10 YR 6/3) and very pale brown (10 YR 7/3) at 18 feet; saturated, fine to medium sand, (dense)	SP							
			-		No recovery								
25	■	DMT-56US-SO-250260			POORLY-GRADED SAND (SP) -pale brown (10 YR 6/3), very pale brown (10 YR 7/3) and dark gray (10 YR 4/1), saturated, fine to medium sand, (dense)	SP	Poor recovery due to runny, saturated sands		29				
			-		No recovery								
30.0													



Lithology described from DPT borehole. Well installed with hollow-stem auger

Locus

EA ENGINEERING, SCIENCE, AND TECHNOLOGY

LOG OF SOIL BORING

15 LOVETON CIRCLE SPARKS, MARYLAND 21152 TELE: 301-771-4950

BORING NO. EA 7M

Coordinates:

Surface Elevation: 11.76

Casing Above Surface:

Reference Elevation:

Reference Description:

Location: Dundalk Marine Terminal

Job No. DMT61A

Client: Maryland Port Administration

Drilling Method: Mobile B-61 Drill Rig, 11"O.D., 6"I.D. Hollow Stem Augers

Sampling Method: Split Spoon 2"O.D., 24" long driven w/ 140 lb. Hammer dropping 30"

Start Date: 02-17-87

Completion Date: 02-20-87

SAMP TYPE	IN DRVN	IN RCVD	SAMP NO.	SAMP DPTH	BLOWS/6"	Cr FILL	DEPTH FEET	GRAPH LOG	SURFACE CONDITIONS Flat asphalt road surface
									SOIL DESCRIPTION
							0		Asphalt to 10"
								GP	Green gravel, wet, coarse to 3 ft.
SS	24	24	1	4.5	3-3-3-6				Bright orange red clay, dry to moist, slightly sticky, medium stiff plastic
SS	24	24	2	6.5	3-9-9-6		5	CL	Bright orange red clay, dry to moist, slightly sticky, medium stiff plastic Water in augers at 6.5 ft.
SS	24	14	3	8.5	6-4-8-12			SP	Dark gray green silty sand, moist, fine grained, medium dense, w/ yellow to yellow green tailings fill and odor
SS	24	13	4	10.0	4-5-6-11		10		Bright orange red clay, dry to moist, slightly sticky, medium stiff, plastic w/ some tailings fill 10.8-11.0 ft.
SS	24	22			3-2-5-6			CL	Bright orange red clay, dry to moist, slightly sticky, medium stiff, plastic
SS	24	14	5	14.0	3-7-7-7				Bright orange red clay, dry to moist, slightly sticky, medium stiff, plastic w/ some tailings 14.7-15.0 ft.
							15		
									TD soil sampling 13:30 hrs at 15.0 ft. Shallow well completion; hole backfilled to 9 ft. w/ bentonite pellets, Morie no. 2 sand foot to 8.7 ft. Install 4"I.D. sched 40 PVC no. 10 slot screen 9.0-6.0 ft. Place morie no. 2 sand pack 9.0-5.5 ft. Place bentonite pellet seal from 5.5 ft. to 10 in. Manhole installation to follow
							20		

SAMPLER TYPE

SS-DRIVEN SPLIT SPOON

SH-PRESSED SHELBY TUBE

OST-OSTERBURG PISTON SAMPLER

DEN-DENISON CORE BARREL SAMPLER

SPT-STANDARD PENETRATION TEST (ASTM D 1586-84)

GROUND-WATER DEPTH BELOW GRADE

AT COMPLETION FT.

AFTER HRS. FT.

AFTER 24 HRS. FT.

LOG OF SOIL BORING

15 LOVETON CIRCLE SPARKS, MARYLAND 21152 TELE: 301-771-4950

BORING NO. EA 7M

Coordinates:

Location: Dundalk Marine Terminal
Job No. DMT61A
Client: Maryland Port Administration
Drilling Method: Mobile B-80 Drill Rig, 7"O.D.roller bit mud rotary method
Sampling Method: Split Spoon 2"O.D., 18" long driven w/ 140 lb. Hammer dropping 30"

Surface Elevation: 11.76
Casing Above Surface:
Reference Elevation:
Reference Description:

Start Date: 02-17-87

Completion Date: 02-20-87

SAMP TYPE	IN DRVN	IN RCVD	SAMP NO.	SAMP DPTH	BLOWS/6"	Cr FILL	DEPTH FEET	GRAPH LOG	SURFACE CONDITIONS Flat asphalt road surface
									SOIL DESCRIPTION
SPT	18	0			2-2-3		20	GM	Varicolored red clay, green silt and clay, organic mud, with fine to medium subrounded gravel and sand, wood debris
SPT	18	6	6	25.0	2-3-3		25		Various fill material, clay, sand, gravel, mud and wood debris
SPT	18	14	7	31.0	2-3-4		30	SM	Light gray streaked brown sand, wet, very fine to fine grained, with some silt, loose
									Gradational contact
SPT	18	12	8	35.0	1-2-2		35	CL/ML	Medium gray streaked green silt w/ some clay, wet, some fine sand, soft, low to moderate plasticity
								ML	Dark green silt, fine sand, micaceous composition
							40		

SAMPLER TYPE
SS-DRIVEN SPLIT SPOON
SH-PRESSED SHELBY TUBE
OST-OSTERBURG PISTON SAMPLER
DEN-DENISON CORE BARREL SAMPLER
SPT-STANDARD PENETRATION TEST (ASTM D 1586-84)

GROUND-WATER DEPTH BELOW GRADE
AT COMPLETION FT.
AFTER HRS. FT.
AFTER 24 HRS. FT.

LOG OF SOIL BORING

15 LOVETON CIRCLE SPARKS, MARYLAND 21152 TELE: 301-771-4950

BORING NO. EA 7M

Coordinates:

Surface Elevation: 11.76

Casing Above Surface:

Reference Elevation:

Reference Description:

Location: Dundalk Marine Terminal

Job No. DMT61A

Client: Maryland Port Administration

Drilling Method: Mobile B-80 Drill Rig, 7"O.D.roller bit mud rotary method

Sampling Method: Split Spoon 2"O.D., 18" long driven w/ 140 lb. Hammer dropping 30"

Start Date: 02-17-87

Completion Date: 02-20-87

SAMP TYPE	IN DRVN	IN RCVD	SAMP NO.	SAMP DPTH	BLOWS/6"	Cr FILL	DEPTH FEET	GRAPH LOG	SURFACE CONDITIONS Flat asphalt road surface
									SOIL DESCRIPTION
							40		
SPT	18	15	9	41.0	4-5-7			ML	Dark green silt w/ little very fine sand, moist, stiff, micaceous, non-plastic
									Grading to medium stiff, increasing fines content
							45		
SPT	18	18	10	46.0	2-2-4				Dark green silt w/ little fine sand and trace clay, medium stiff, low plasticity
SH	24	24	ST 1	48.0				ML/CL	Collect Shelby Tube sample from 48.0-50.0 ft. Dark green silt w. some clay and very fine sand, very moist, slightly micaceous, low plasticity, medium stiff
							50		
							55		
SPT	18	18	11	56.0	1-2-2				Dark green silt w/ little clay, moist
							60		

SAMPLER TYPE
SS-DRIVEN SPLIT SPOON
SH-PRESSED SHELBY TUBE
OST-OSTERBURG PISTON SAMPLER
DEN-DENISON CORE BARREL SAMPLER
SPT-STANDARD PENETRATION TEST (ASTM D 1586-84)

GROUND-WATER DEPTH BELOW GRADE
AT COMPLETION FT.
AFTER HRS. FT.
AFTER 24 HRS. FT.

LOG OF SOIL BORING

15 LOVETON CIRCLE SPARKS, MARYLAND 21152 TELE: 301-771-4950

BORING NO. EA 7M

Coordinates:

Surface Elevation: 11.76
Casing Above Surface:
Reference Elevation:
Reference Description:

Location: Dundalk Marine Terminal
Job No. DMT61A
Client: Maryland Port Administration
Drilling Method: Mobile B-80 Drill Rig, 7"O.D.roller bit mud rotary method
Sampling Method: Split Spoon 2"O.D., 18" long driven w/ 140 lb. Hammer dropping 30"

Start Date: 02-17-87 Completion Date: 02-20-87

SAMP TYPE	IN DRVN	IN RCVD	SAMP NO.	SAMP DPTH	BLOWS/6"	Cr FILL	DEPTH FEET	GRAPH LOG	SURFACE CONDITIONS Flat asphalt road surface SOIL DESCRIPTION
							60		
SPT	18	15	12	61.0	2-3-3			ML	Dark green silt w/ little clay and very fine sand, moist, medium stiff, low plasticity
							65		
									Drilling smoothly
SPT	18	16	13	71.0	2-2-3		70		Dark green silt w/ trace of clay
							75		Drilling smoothly
							80		

SAMPLER TYPE
SS-DRIVEN SPLIT SPOON
SH-PRESSED SHELBY TUBE
OST-OSTERBURG PISTON SAMPLER
DEN-DENISON CORE BARREL SAMPLER
SPT-STANDARD PENETRATION TEST (ASTM D 1586-84)

GROUND-WATER DEPTH BELOW GRADE
AT COMPLETION FT.
AFTER HRS. FT.
AFTER 24 HRS. FT.

LOG OF SOIL BORING

15 LOVETON CIRCLE SPARKS, MARYLAND 21152 TELE: 301-771-4950

BORING NO. EA 7M
Coordinates:

Surface Elevation: 11.76
Casing Above Surface:
Reference Elevation:
Reference Description:

Start Date: 02-17-87
Completion Date: 02-20-87

Location: Dundalk Marine Terminal
Job No. DMT61A
Client: Maryland Port Administration
Drilling Method: Mobile B-80 Drill Rig, 7"O.D.roller bit mud rotary method
Sampling Method: Split Spoon 2"O.D., 18" long driven w/ 140 lb. Hammer dropping 30"

SAMP TYPE	IN DRVN	IN RCVD	SAMP NO.	SAMP DPTH	BLOWS/6"	Cr FILL	DEPTH FEET	GRAPH LOG	SURFACE CONDITIONS Flat asphalt road surface SOIL DESCRIPTION
							80		
SPT	18	18	14	81.0	2-4-5			ML/CL	Dark green silt w/little clay and very fine sand, moist micaceous, low to medium plasticity
SPT	18	12	15	85.5	4-4-7		85		Dark green silt, micaceous
									Penetration difficult past 80.5 ft., but no fluid loss
SS	12	8	16	90.5	35-48		90	SP/SM	Medium gray sand, wet, fine to medium grained w/ trace to a little amount silt, subangular to subrounded grains, very dense predominantly quartzose composition
									Grading to more silt content
SPT	18	12	17	95.5	17-21-24		95	SM	Medium gray sand, wet, fine grained w/ some silt micaceous, dense
								SP/SM	Less silt content past 95.5-98.5 ft.
SPT	18	13	18	99.9	14-15-17				
							100		

SAMPLER TYPE
SS-DRIVEN SPLIT SPOON
SH-PRESSED SHELBY TUBE
OST-OSTERBURG PISTON SAMPLER
DEN-DENISON CORE BARREL SAMPLER
SPT-STANDARD PENETRATION TEST (ASTM D 1586-84)

GROUND-WATER DEPTH BELOW GRADE
AT COMPLETION FT.
AFTER HRS. FT.
AFTER 24 HRS. FT.

LOG OF SOIL BORING

15 LOVETON CIRCLE SPARKS, MARYLAND 21152 TELE: 301-771-4950

BORING NO. EA 7M

Coordinates:

Surface Elevation: 11.76

Casing Above Surface:

Reference Elevation:

Reference Description:

Start Date: 02-17-87

Completion Date: 02-20-87

Location: Dundalk Marine Terminal

Job No. DMT61A

Client: Maryland Port Administration

Drilling Method: Mobile B-80 Drill Rig, 7"O.D.roller bit mud rotary method

Sampling Method: Split Spoon 2"O.D., 18" long driven w/ 140 lb. Hammer dropping 30"

SAMP TYPE	IN DRVN	IN RCVD	SAMP NO.	SAMP DPTH	BLOWS/6"	Cr FILL	DEPTH FEET	GRAPH LOG	SURFACE CONDITIONS Flat asphalt road surface SOIL DESCRIPTION
							100	SP/SM	Some fluid loss noted past 100 ft.
SPT	12	0			8-44		105	SP/GP	Varicolored to tan gravel and coarse sand, poorly sorted/well graded trace silt content
									Penetration difficult past 107 ft. Lost large amount of fluid past 108 ft.
SPT	9	6	19	110	38-50/3		110		
									TD soil sampling 15:00 hrs. at 111 ft.
							115		
							120		

SAMPLER TYPE
SS-DRIVEN SPLIT SPOON
SH-PRESSED SHELBY TUBE
OST-OSTERBURG PISTON SAMPLER
DEN-DENISON CORE BARREL SAMPLER
SPT-STANDARD PENETRATION TEST (ASTM D 1586-84)

GROUND-WATER DEPTH BELOW GRADE
AT COMPLETION FT.
AFTER HRS. FT.
AFTER 24 HRS. FT.

PROJECT NUMBER
706612.DM.03.30.36.ES

BORING NUMBER
S-1

SHEET 2 OF 2

SOIL BORING LOG

PROJECT : Geotech and GW Invest Area 1501/1602
ELEVATION : TBD
LOCATION : DMT, Baltimore, MD
DRILLING CONTRACTOR : Haynes and Associates
DRILLING METHOD AND EQUIPMENT USED : 7822DT Geoprobe rig w/ 3 1/4 ID HSA / Split spoon
WATER LEVELS : NM
START : 1-18-19 0845
END : 1-18-19 1110
LOGGER : Lisa Conte

DEPTH BELOW SURFACE (FT)	INTERVAL (FT)	RECOVERY (IN)	#/TYPE	STANDARD PENETRATION TEST RESULTS 6"-6"-6"-6" (N)	CORE DESCRIPTION SOIL NAME, USCS GROUP SYMBOL, COLOR, MOISTURE CONTENT, RELATIVE DENSITY, OR CONSISTENCY, SOIL STRUCTURE, MINERALOGY.	COMMENTS DEPTH OF CASING, DRILLING RATE, DRILLING FLUID LOSS, TESTS, AND INSTRUMENTATION.
0 1	0'-2'		SS-1	7-11-12-14 (23) Previous attempt on 1-3-19		Note = Sediment starts 8'2 below top of rip rap. All depths are below sediment level in feet. DPC
2 3	2'-4	0.6' / 2.0'	SS-2	4-5-6-4 (11)	2'-2.6' Sandy Silt (ML), dark yellowish brown 10YR 4/4, wet, stiff, No plasticity, fine to med grained sand, trace subrounded gravel ≈ 1"	
4 5	4-6'	1.3' / 2.0'	SS-3	2-3-3-4 (6)	4'-5.3' Poorly Graded Sand (SP), very dark grayish brown 10YR 3/2, wet, loose, medium grained sand, trace silt, trace well rounded gravel 0.2 inches, at 4.7' bgs	
6 7	6'-8'	2.0' / 2.0'	SS-4	1-2-2-4 (4)	6'-8' Same as above. clay lense at 7.3' and 7.6'	
8 9 10	8'-10'	2.0' / 2.0'	SS-5	2-2-2-3 (4)	8'-10' Same as above - all SP	

PROJECT NUMBER	BORING NUMBER	
706612.DM.03.30.36.ES	S-1	SHEET 1 OF 2

SOIL BORING LOG

PROJECT : Geotech and GW Invest Area 1501/1602 LOCATION : DMT, Baltimore, MD
ELEVATION : TBD DRILLING CONTRACTOR : Haynes and Associates
DRILLING METHOD AND EQUIPMENT USED : 7822DT Geoprobe HSA 3 1/4" ID w/split spoon
WATER LEVELS : NM START : 1-18-19 0845 END : 1-18-19 1110 LOGGER : Lisa Carter

DEPTH BELOW SURFACE (FT)	INTERVAL (FT)	RECOVERY (IN)	#/TYPE	STANDARD PENETRATION TEST RESULTS 6"-6"-6"-6" (N)	CORE DESCRIPTION SOIL NAME, USCS GROUP SYMBOL, COLOR, MOISTURE CONTENT, RELATIVE DENSITY, OR CONSISTENCY, SOIL STRUCTURE, MINERALOGY.	COMMENTS DEPTH OF CASING, DRILLING RATE, DRILLING FLUID LOSS, TESTS, AND INSTRUMENTATION.
10 11	10'-12'	1.5' / 2.0'	SS-6	5-13-14-16 (27)	10'-11.5' Poorly Graded Sand (SP) very dark grayish brown 10YR 3/2, wet, medium dense, medium grained sand, trace silt.	DPC
12 13	12'-14'	1.3' / 2.0'	SS-7	13-15-18-19 (33)	12'-12.6' Poor Graded Sand (SP), Brown 10YR 4/3, dense, wet, medium grained sand, trace silt 12.6'-12.8' Poorly Graded Gravel w/ Sand (GP), dark brown 10YR 3/3, wet, dense, fine rounded gravel. 12.8'-13.3' Poorly Graded Sand (SP), brown 5/3 10YR, wet, dense, fine to medium grained sand, little silt	
14 15	14'-16'	0.5' / 2.0'	SS-8	4-7-12-15 (19)	14'-14.6' Poorly Graded Sand (SP), yellowish brown 10YR 5/6, wet, medium dense, fine grained sand, trace silt	
16 17	16'-18'	0.3' / 2.0'	SS-9	4-8-9-11 (17)	16'-16.3' Same as above	
18 19 20	18'-20'	2.0 / 2.0'	SS-10	WOH-2-2-12 (4)	18'-20' Fat Clay (CH), very dark gray 10YR 3/2 w/ black mottling to 18.9'. From 18.9'-20' dark grayish brown 10YR 4/2, moist soft to medium consistency, high plasticity.	Set 1" well 10' screen to 18' bgs

End boring at 20' below sediment

JACOBS	**PROJECT NUMBER** 706612	**BORING NUMBER** S-2 Page 1 of 2
	SOIL BORING LOG	

PROJECT : Honeywell DMT LOCATION : Baltimore, MD

ELEVATION : DRILLING CONTRACTOI Parratt Wolff

DRILLING METHOD AND EQUIPMENT USED : tripod cathead hammer

ATD WATER LEVEL : START : 8/21/18 1020 END : LOGGER : L. Raterine

DEPTH BELOW SURFACE (FT)	INTERVAL (FT)	RECOVERY (IN)	SAMPLE #/TYPE	DPC (COPR)	COPR Strata	SOIL DESCRIPTION SOIL NAME, USCS GROUP SYMBOL, COLOR, MOISTURE CONTENT, RELATIVE DENSITY, OR CONSISTENCY, SOIL STRUCTURE, MINERALOGY.	USCS	BLOW COUNTS	COMMENTS DEPTH OF CASING, DRILLING RATE, DRILLING FLUID LOSS, TESTS, AND STRUMENTATION. DRILLING ACTIONS/DRILLER COMMENTS
1 2 3	0-4	0.4		-	-	0-3.6 No recovery 3.6-4.0 Clay (CL) 2.5YR 7/8 moderate orange Moist, M-F, trace sand at 4.0 ft	CL		
4 5 6 7	4-8	1.5		- -		4-6.5 No recovery 6.5-6.8 Clay (CL) 2.5YR 7/8 moist, firm 6.8-7.6: Clay (CL) 2.5YR 7/8 moist, M-F, trace sand 7.6-8.0 Clay (CL) 2.5YR 7/8 moist, S-M	CL		
8 9 10						8-11.6 No recovery 11.6-12.0 Clay (CL) 2.5Y/R 7/8 moist M-F			

JACOBS

PROJECT NUMBER 706612

BORING NUMBER S-2

Page 2 of 2

SOIL BORING LOG

PROJECT : Honeywell DMT
LOCATION : Baltimore, MD
ELEVATION :
DRILLING CONTRACTOI Parratt Wolff
DRILLING METHOD AND EQUIPMENT USED : tripod
ATD WATER LEVEL :
START : 8/21/18 1020
END :
LOGGER : L Ratcnik

DEPTH BELOW SURFACE (FT)	INTERVAL (FT)	RECOVERY (IN)	SAMPLE #/TYPE	DPC (COPR)	COPR Strata	SOIL DESCRIPTION SOIL NAME, USCS GROUP SYMBOL, COLOR, MOISTURE CONTENT, RELATIVE DENSITY, OR CONSISTENCY, SOIL STRUCTURE, MINERALOGY.	USCS	BLOW COUNTS	COMMENTS DEPTH OF CASING, DRILLING RATE, DRILLING FLUID LOSS, TESTS, AND STRUMENTATION. DRILLING ACTIONS/DRILLER COMMENTS
11				—			CL		
12						12-15.5 No recovery 15.5-16 Silty clay 2.5YR 7/8 wet, Soft to Medium. little Med sand			
13	12- 16	05							
14									
15				—					
16									
17									
18									
19									
20									

JACOBS

PROJECT NUMBER 706612

BORING NUMBER S-2 (offset) Page 1 of 2

SOIL BORING LOG

PROJECT : Honeywell DMT

LOCATION : Baltimore, MD

ELEVATION :

DRILLING CONTRACTOr Parratt Wolff

DRILLING METHOD AND EQUIPMENT USED : tripod

ATD WATER LEVEL :

START : 8/23/18 830

END : 8/23/18 1630

LOGGER : L. Rateriuk

DEPTH BELOW SURFACE (FT)	INTERVAL (FT)	RECOVERY (IN)	SAMPLE #/TYPE	DPC (COPR)	COPR Strata	SOIL DESCRIPTION SOIL NAME, USCS GROUP SYMBOL, COLOR, MOISTURE CONTENT, RELATIVE DENSITY, OR CONSISTENCY, SOIL STRUCTURE, MINERALOGY.	USCS	BLOW COUNTS	COMMENTS DEPTH OF CASING, DRILLING RATE, DRILLING FLUID LOSS, TESTS, AND STRUMENTATION, DRILLING ACTIONS/DRILLER COMMENTS
1 2	0-2	0.9	SS-1	—		0-1.1 No recovery 1.1-1.6 clay (CL) S-M, moist 2.5 YR 7/8 1.6-2.0 Silty clay M-F Moist 10YR 7/8			
3 4	2-4	0.5	SS-2	—		2.0-3.5 No recovery 3.5-4.0 SAA			
5 6	4-6	1.0	SS-3	—		4.0-5.0 No recovery 5.0-6.0 SAA			
7 8	6-8	1.3	SS-4	—		6.0-6.7 No recovery 6.7-7.7 SAA 7.7-8.0 silty clay (CL) little sand, moist, (transition zone)			
9 10	8-10	1.5	SS-5	—		8.0-8.5 No recovery 8.5-9.3 silty clay (CL) moist, S-M 9.3-9.6 SAA, wet, v. soft 9.6-10.0 silty clay, M-F dry - Moist			

JACOBS	PROJECT NUMBER 706612	BORING NUMBER S-2 (offset)	Page 2 of 2

SOIL BORING LOG

PROJECT : Honeywell DMT
LOCATION : Baltimore, MD
ELEVATION :
DRILLING CONTRACTOR: Parratt Wolff
DRILLING METHOD AND EQUIPMENT USED : tripod
ATD WATER LEVEL :
START : 8/23/18 0830
END : 8/23/18 1630
LOGGER : L.Raterink

DEPTH BELOW SURFACE (FT)	INTERVAL (FT)	RECOVERY (IN)	SAMPLE #/TYPE	DPC (COPR)	COPR Strata	SOIL DESCRIPTION SOIL NAME, USCS GROUP SYMBOL, COLOR, MOISTURE CONTENT, RELATIVE DENSITY, OR CONSISTENCY, SOIL STRUCTURE, MINERALOGY.	USCS	BLOW COUNTS	COMMENTS DEPTH OF CASING, DRILLING RATE, DRILLING FLUID LOSS, TESTS, AND STRUMENTATION. DRILLING ACTIONS/DRILLER COMMENTS
11	10-12	1.8	SS-6	— —		10.0-10.2 No recovery 10.2-10.8 Silty Clay, M-F 25YR7/8, moist 10.8-11.3 clayey silt, soft moist ~~to~~ 2.5YR 7/8 11.3-11.8 clayey silt, soft, moist 2.5YR7/8 w/ 5YR5/6 11.8-12.0 clayey silt M-F Moist			
12 13	12-14	1.3	SS-7	— —		12.0-12.7 No recovery 12.7-13.3 same as 11.3-11.8 13.3-14.0 clayey silt, moist Medium, little fine sand 25YR 7/8 w/5YR 5/6			
14 15	14-16	0.5	SS-8	— —		14-15.5 No recovery 15.5-16.0 SAA			
16 17	16-18	1.4	SS-9	— —		16.0-16.6 No recovery 16.6-16.8 Med Sand, wet, trace gravel, loose/Med 10YR 2/2 16.8-17.5 Med Sand, wet, loose/Med, poorly graded 10YR6/2 17.5-18.0 fine to Med Sand wet, poorly graded			
18 19 20	18-20	0.9	SS-10	— —		18-19.1 No recovery 19.1-19.3 SAA 19.3-20.0 Same as 16.8-17.5			

EOB @ 20 ft

JACOBS

PROJECT NUMBER 706612

BORING NUMBER S-3

Page 1 of 2

SOIL BORING LOG

PROJECT : Honeywell DMT

LOCATION : Baltimore, MD

ELEVATION :

DRILLING CONTRACTOR: Parratt Wolff

DRILLING METHOD AND EQUIPMENT USED : tripod

ATD WATER LEVEL :

START 8/24/18 1450

END : 8/24/18 1715

LOGGER : L Raterink

DEPTH BELOW SURFACE (FT)	INTERVAL (FT)	RECOVERY (IN)	SAMPLE #/TYPE	DPC (COPR)	COPR Strata	SOIL DESCRIPTION SOIL NAME, USCS GROUP SYMBOL, COLOR, MOISTURE CONTENT, RELATIVE DENSITY, OR CONSISTENCY, SOIL STRUCTURE, MINERALOGY.	USCS	BLOW COUNTS	COMMENTS DEPTH OF CASING, DRILLING RATE, DRILLING FLUID LOSS, TESTS, AND STRUMENTATION. DRILLING ACTIONS/DRILLER COMMENTS
1 2 3	0-4	1.9	MC-1	– – – –	– – – –	0-2.1 No recovery 2.1-3.2 Clay (CL) - 2.5 YR 7/8 moderate orange S-M, moist, med plasticity 3.2-3.4 sandy gravel, moist med loose, well graded- 3.4-4.0 clayey silt, moist few f-M sand			
4 5 6 7	4-8	2.5	MC-2	– – – –	– 64 + – – –	4.0-5.5 no recovery 5.5-6.3 SAA 6.3-6.5 sandy gravel, wet well graded 6.5-6.7 clayey silt, moist 2.5 YR 7/8, firm 6.7-7.6 clayey silt, moist little sand, 5YR 5/6 medium 7.6-8.0 Same as 6.5-6.7			
8 9 10	8-10	2.1	MC-3	– –		8-9.9 No recovery 9.9-10.2 Same as 6.7-7.6 10.2-10.5 silty clay, firm moist, 10YR 9/6			

JACOBS

PROJECT NUMBER 706612

BORING NUMBER S-3

Page 2 of 2

SOIL BORING LOG

PROJECT : Honeywell DMT

LOCATION : Baltimore, MD

ELEVATION :

DRILLING CONTRACTOR: Parratt Wolff

DRILLING METHOD AND EQUIPMENT USED : tripod

ATD WATER LEVEL :

START 8/24/18 1450

END : 8/24/18 1715

LOGGER : L. Raterink

DEPTH BELOW SURFACE (FT)	INTERVAL (FT)	RECOVERY (IN)	SAMPLE #/TYPE	DPC (COPR)	COPR Strata	SOIL DESCRIPTION: SOIL NAME, USCS GROUP SYMBOL, COLOR, MOISTURE CONTENT, RELATIVE DENSITY, OR CONSISTENCY, SOIL STRUCTURE, MINERALOGY.	USCS	BLOW COUNTS	COMMENTS: DEPTH OF CASING, DRILLING RATE, DRILLING FLUID LOSS, TESTS, AND STRUMENTATION, DRILLING ACTIONS/DRILLER COMMENTS
11				– – –	– – –	10.5-10.8 Same as 9.9-10.2 10.8-12.0 clayey silt 2.5YR 7/8, moist few v fine sand			
12 13 14 15	12-16	3.7	MC-4	– – – – – –	– – – – – –	12.0-12.3 no recovery 12.3-12.6 SAA 12.6-12.8 sandy gravel little silty clay, wet 10YR 3/2 12.8-13.9 clayey silt moist, soft 13.9-14.6 silty clay, moist v. soft 10YR 3/2 14.6-15.2 medium sand, wet loose to medium, few silt 10YR 3/2 15.2-16 clayey silt, moist firm 10YR 3/2			
16 17 18 19 20	16-20	3.8	MC-5	– – – – –	– – – – –	16-16.2 no recovery 16.2-17.3 SAA 17.3-18.5 clayey silt, M-F, moist, 10YR 7/2 18.5-19.5 fine sand, few silt, moist to wet, 10YR 7/2 19.5-20 f-M sand, wet, 10YR 7/2			

EOB @ 20 ft

JACOBS

PROJECT NUMBER: 706612

BORING NUMBER: S-4

Page 1 of 2

SOIL BORING LOG

PROJECT : Honeywell DMT

LOCATION : Baltimore, MD

ELEVATION :

DRILLING CONTRACTOR: Parratt Wolff

DRILLING METHOD AND EQUIPMENT USED : tripod

ATD WATER LEVEL :

START 8/25/18 1520

END : 8/25/18

LOGGER : C. Ratenik

DEPTH BELOW SURFACE (FT)	INTERVAL (FT)	RECOVERY (IN)	SAMPLE #/TYPE	DPC (COPR)	COPR Strata	SOIL DESCRIPTION SOIL NAME, USCS GROUP SYMBOL, COLOR, MOISTURE CONTENT, RELATIVE DENSITY, OR CONSISTENCY, SOIL STRUCTURE, MINERALOGY	USCS	BLOW COUNTS	COMMENTS DEPTH OF CASING, DRILLING RATE, DRILLING FLUID LOSS, TESTS, AND STRUMENTATION, DRILLING ACTIONS/DRILLER COMMENTS
1 2 3	0-4	1.5	MC-1	— — — —		0-2.5 no recovery 2.5-3.0 Silty clay red, v soft, moist trace gravel 3.0-3.6 silty clay red moist Firm 3.6-4.0 Clayey silt moist, red & brown little sand (fine)			10YR7/6
4 5 6 7	4-8	25	MC-2	— — — — —		4-5.5 no recovery 5.5-5.9 clayey silt 10YR7/6, moist, Firm little fine sand 5.9 8.0 clayey silt (CL) moist, M-F 25YR5/10			
8 9 10	8-12	26	MC-3			8-9.4 no recovery 9.4-10.1 SAA 10.1-10.6 Clayey silt Firm 25YR5/10 10.6-11 SA 9.4-10.1 11-11.2 SA 10.1-10.6			

JACOBS

PROJECT NUMBER	BORING NUMBER	
706612	S-4	Page 2 of 2

SOIL BORING LOG

PROJECT : Honeywell DMT
LOCATION : Baltimore, MD
ELEVATION :
DRILLING CONTRACTOI Parratt Wolff
DRILLING METHOD AND EQUIPMENT USED : tripod
ATD WATER LEVEL :
START : 8/25/18
END : 8/25/18
LOGGER : L. Ratenik

DEPTH BELOW SURFACE (FT)	INTERVAL (FT)	RECOVERY (IN)	SAMPLE #/TYPE	DPC (COPR)	COPR Strata	SOIL DESCRIPTION SOIL NAME, USCS GROUP SYMBOL, COLOR, MOISTURE CONTENT, RELATIVE DENSITY, OR CONSISTENCY, SOIL STRUCTURE, MINERALOGY.	USCS	BLOW COUNTS	COMMENTS DEPTH OF CASING, DRILLING RATE, DRILLING FLUID LOSS, TESTS, AND STRUMENTATION. DRILLING ACTIONS/DRILLER COMMENTS
11						11.2-11.6 fine-med sand dark gray, wet, med 11.6-11.8 sandy gravel wet med, gray 11.8-12 sand (med), wet med, brown			10YR 3/2 10YR 5/4 10YR 5/6
12 13 14 15	12-16		MC-4			12-14.8 SAA 14.8-16 med sand moist to wet; med loose 10YR 9/4 15.8-16 SAA, 10YR 6/2			
16 17 18 19 20	16-20	2.5	MC-5			16-17.5 no recovery 17.5-20 SAA			Screens 11-12 15-20

JACOBS

PROJECT NUMBER	BORING NUMBER	
	S-5	Page 1 of 2

SOIL BORING LOG

PROJECT : Honeywell DMT
LOCATION : : Baltimore, MD
ELEVATION :
DRILLING CONTRACTOR Parratt Wolff
DRILLING METHOD AND EQUIPMENT USED : tripod
ATD WATER LEVEL :
START : 8/27/18
END : 8/27/18
LOGGER : L. Ratenik

DEPTH BELOW SURFACE (FT)	INTERVAL (FT)	RECOVERY (IN)	SAMPLE #/TYPE	DPC (COPR)	COPR Strata	SOIL DESCRIPTION SOIL NAME, USCS GROUP SYMBOL, COLOR, MOISTURE CONTENT, RELATIVE DENSITY, OR CONSISTENCY, SOIL STRUCTURE, MINERALOGY.	USCS	BLOW COUNTS	COMMENTS DEPTH OF CASING, DRILLING RATE, DRILLING FLUID LOSS, TESTS, AND STRUMENTATION DRILLING ACTIONS/DRILLER COMMENTS
1 2 3	0-4	27	MC 1	— — — —		0-1.3 no recovery 1.3-2.0 clayey silt med, red moist 2.0-2.6 silty clay M-F, red moist 2.6-3.3 SA 1.3-2.0 3.3-3.4 silty clay firm, moist, pink 3.4-4.0 SA 1.3-2.0			
4 5 6 7		1.1				4-6.9 no recovery 6.9-7.1 SA 3.3-3.4 7.1-8.0 SA 1.3-2.0			
8 9		34				8-8.6 No recovery 8.6-8.8 clayey silt red, soft 8.8-8.9 Angular gravel Fill material wet, pooling water			

JACOBS

PROJECT NUMBER 706612

BORING NUMBER S-5

Page 2 of 2

SOIL BORING LOG

PROJECT : Honeywell DMT

LOCATION : Baltimore, MD

ELEVATION :

DRILLING CONTRACTOf Parratt Wolff

DRILLING METHOD AND EQUIPMENT USED : tripod

ATD WATER LEVEL :

START : 8/27/18

END : 8/27/18

LOGGER : L.Reyenik

DEPTH BELOW SURFACE (FT)	INTERVAL (FT)	RECOVERY (IN)	SAMPLE #/TYPE	DPC (COPR)	COPR Strata	SOIL DESCRIPTION SOIL NAME, USCS GROUP SYMBOL, COLOR, MOISTURE CONTENT, RELATIVE DENSITY, OR CONSISTENCY, SOIL STRUCTURE, MINERALOGY.	USCS	BLOW COUNTS	COMMENTS DEPTH OF CASING, DRILLING RATE, DRILLING FLUID LOSS, TESTS, AND STRUMENTATION DRILLING ACTIONS/DRILLER COMMENTS
11						8.9-9.1ft med sand, wet little gravel, med 9.1-10.8 F-M sand moist-wet med loose 15.8-11.7 SAA w/ mixing 7.5YR8/16			10YR 5/12 10YR3/2 2.5YR 8/16
12						11.7-12 SA 9.1-10.8 except 7.5YR 8/16			10YR 9/8
13	12-16	3.8	ML-4			12-12.2 no recovery 12.2-16 med sand, ~~to~~ moist to wet, medium dense			
14									
1									
15									
16						16-20 SAA			
17	16-20	4.0	ML-5						
18									
19									
20									

JACOBS

PROJECT NUMBER	BORING NUMBER
	S-6 Pg 1 of 2

SOIL BORING LOG

PROJECT : Honeywell DMT LOCATION : Baltimore, MD

ELEVATION : TBD DRILLING CONTRACTOR : ~~Parratt Wolff~~ Mike Hynes - driller Hynes and Associates Drilling

DRILLING METHOD AND EQUIPMENT USED : HSA/Split Spoon - mobile Drill 45 3 1/4 augers

ATD WATER LEVEL : TBD START : 12-3-18 1020 END : 12-3-18 1210 LOGGER : Lisa Carter

DEPTH BELOW SURFACE (FT)	INTERVAL (FT)	RECOVERY (FT)	SAMPLE #TYPE	SAMPLE DPC (COPR)	COPR Strata	SOIL DESCRIPTION: SOIL NAME, USCS GROUP SYMBOL, COLOR, MOISTURE CONTENT, RELATIVE DENSITY OR CONSISTENCY, SOIL STRUCTURE, MINERALOGY.	USCS	BLOW COUNTS	COMMENTS: DEPTH OF CASING, DRILLING RATE, DRILLING FLUID LOSS, TESTS, AND INSTRUMENTATION. DRILLING ACTIONS/DRILLER COMMENTS. DRILLING ACTIONS/DRILLER COMMENTS
0 1	0-2	0.5' 2'	SS-1	— —		0'-0.2' Debris / Trash 0.2'-0.5' Poorly Graded Sand (SP), wet, ~~dense~~ ~~medium~~ very loose, medium grained Sand. Strong brown 7.5YR 4/6, trace silt,	SP	1-1-2-2 (3)	Blow counts 1-1-2-2
2 3	2-4	1.2' 2.0	SS-2	— +		2'-3.1' Same as above - medium dense Positive DPC Dye at 2.7' bgs minor reaction. wood fragments at 3.1' bgs 3.1'-3.2' - limestone gravel	SP	6-8 9-10 (17)	6-8-9-10
4 5	4-6	1.3' ~~2.0~~ 1.3' refusal	SS-3	— — —		4'-5.3' Well Graded gravel with Sand (GW) wet, very dense, yellowish brown 10YR 5/4, fine to coarse gravel, angular to subrounded, medium to coarse grained Sand.	GW	8-21 50/3	
6 7	6-8	0.8' 2.0'	SS-4	— —		6'-6.8' Poorly Graded Sand (SP), wet, ~~dark~~ medium dense, dark yellowish brown 10YR 3/6, medium grained Sand, some silt, trace rounded fine gravel	SP	6-8 6-6 (14)	
8 9 10	8-10	1.1 ~~2.0~~, 1.1 refusal	SS-5			8'-9.1' Silty Sand (SM), wet, loose to very dense. yellowish brown 10YR 5/6, fine to medium grained sand, slightly cohesive Angular gravel fragment at 9.1' bgs	SM	2-3 50/5	

JACOBS

PROJECT NUMBER:

BORING NUMBER: S-6

Pg 2 of 3

SOIL BORING LOG

PROJECT : Honeywell DMT
LOCATION : Baltimore, MD
ELEVATION : TBD
DRILLING CONTRACTOR : ~~Parratt Wolff~~ Hines and Associated Drilling
DRILLING METHOD AND EQUIPMENT USED : HSA / Split Spoon - mobile Drill 4" 3/4" Augers
ATD WATER LEVEL : TBD
START : 12-3-18 1020
END : 12-3-18
LOGGER : Luc Cute

DEPTH BELOW SURFACE (FT)	INTERVAL (FT)	RECOVERY (FT)	SAMPLE #TYPE	DPC (COPR)	COPR Strata	SOIL DESCRIPTION SOIL NAME, USCS GROUP SYMBOL, COLOR, MOISTURE CONTENT, RELATIVE DENSITY OR CONSISTENCY, SOIL STRUCTURE, MINERALOGY.	USCS	BLOW COUNTS	COMMENTS DEPTH OF CASING, DRILLING RATE, DRILLING FLUID LOSS, TESTS, AND INSTRUMENTATION. DRILLING ACTIONS/DRILLER COMMENTS. DRILLING ACTIONS/DRILLER COMMENTS
10						10'-11.2' Same as above, loose.	SM		
11	10'-12'	1.8' / 2.0'	SS-6			11.2'-11.8' Fat Clay (CH) wet, stiff, very dark grayish brown 3/2 2.5Y, high plasticity	CH	10-5-4-5 (9)	
12						12'-13' Same as above Soft to medium consistency			
13	12'-14'	1.2' / 2.0'	SS-7					1-2-3-3 (5)	
14						14'-15.2 Same as previous			
15	14'-16'	1.2' / 2.0	SS-8					2-3-2-3 (5)	
16						16'-18' Same as previous			
17	16'-18'	2.0' / 2.0	SS-9					2-2-3-1 (5)	
18						18'-19' Same as previous			
19	18'-20'	1.2' / 2.0'	SS-10			19'-19.2' Clayey Sand (SC), wet, loose, dark grayish brown 2.5Y 3/2. fine to medium grained SC sand, cohesive.	SC	2-3-6-6 (9)	
20									

Pg 3 of 3

JACOBS

PROJECT NUMBER	BORING NUMBER
	S-6

SOIL BORING LOG

PROJECT : Honeywell DMT LOCATION : Baltimore, MD

ELEVATION : TBD DRILLING CONTRACTOR : ~~Parratt-Wolff~~ Hawnes & Associates

DRILLING METHOD AND EQUIPMENT USED : HSA / split spoon . mobile Drill 45 3¼" ID auger

ATD WATER LEVEL : TBD START : 12-3-18 1020 END : 12-3-18 1210 LOGGER : Lisa Carter

DEPTH BELOW SURFACE (FT)	INTERVAL (FT)	RECOVERY (FT)	SAMPLE #TYPE	DPC (COPR)	COPR Strata	SOIL DESCRIPTION SOIL NAME, USCS GROUP SYMBOL, COLOR, MOISTURE CONTENT, RELATIVE DENSITY OR CONSISTENCY, SOIL STRUCTURE, MINERALOGY.	USCS	BLOW COUNTS	COMMENTS DEPTH OF CASING, DRILLING RATE, DRILLING FLUID LOSS, TESTS, AND INSTRUMENTATION. DRILLING ACTIONS/DRILLER COMMENTS. DRILLING ACTIONS/DRILLER COMMENTS
20 21	20'-22'	1.2'/2.0'	ss-11	— — — —		20'-20.8' Poorly Graded Sand (SP), wet, loose, very dark grayish brown 2.5Y 3/2, medium grained Sand, trace rounded fine gravel 20.8'-21.2' Fat Clay (CH) very dark grayish brown 2.5YR 3/2, wet, medium, high plasticity	SP CH	1-3-5-5 (8)	Set well from 19'-21' target Sand interval
22 23	22'-24'	2.0'/2.0'	SS-12	— — — — — —		22'-24' Fat clay same as above		3-3-4-4 (7)	
24 25	24'-26'	2.0'/2.0'	SS-13	— — — — —		24'-26' Same as above		2-3-3-4 (6)	
26						End boring at 26' bgs			

JACOBS

PROJECT NUMBER

BORING NUMBER 57

Page 1 of 2

SOIL BORING LOG

PROJECT : Honeywell DMT
ELEVATION :
LOCATION : Baltimore, MD
DRILLING CONTRACTOI Parratt Wolff
DRILLING METHOD AND EQUIPMENT USED : Tripod/Cathead → Macro Core
ATD WATER LEVEL :
START : 9/6/18
END :
LOGGER : Costas

DEPTH BELOW SURFACE (FT)	INTERVAL (FT)	RECOVERY (IN)	SAMPLE #/TYPE	DPC (COPR)	COPR Strata	SOIL DESCRIPTION SOIL NAME, USCS GROUP SYMBOL, COLOR, MOISTURE CONTENT, RELATIVE DENSITY, OR CONSISTENCY, SOIL STRUCTURE, MINERALOGY.	USCS	BLOW COUNTS	COMMENTS DEPTH OF CASING, DRILLING RATE, DRILLING FLUID LOSS, TESTS, AND STRUMENTATION. DRILLING ACTIONS/DRILLER COMMENTS
						SILTY SAND and GRAVEL		60	
1						variegated browns → 10 YR 6/2, 10 YR 4/2, 10 YR 2/2 10 YR 6/6		150	
	0-4	28"	MC-1	–			SP/SM	85	
2						gravel- qtz ~~well~~ rounded, spher. dry-moist, med to dense		35	
				–				35	
3								12	
				–				14	
4								15	
	4-5.5	16"	MC-2	–		SAA 8" dry	SP/SM	>50	
5								35	
				–		8" N1 (black) med-cs SAND wet	SP	>100/5	bouncing/refusal
6								15	- redrill/hammered past refusal
	5.5-8	22"	MC-3	–		13" SAA - N1 black med-cs SAND trace f-med gravel, trace silt	SP/SM	14	
7				–				9	
				–		-shard of plastic 9" N1 (black) stained wood/petrol odor		9	
8								14	wood in shoe
				–		5YR 2/1 Brownish black		150	
9	8-10	12"	MC-4			med-CS SAND, trace gravel + silt, wet, very dens		46	
				–				150	
10								15/2"	refusal

JACOBS

PROJECT NUMBER: 706612

BORING NUMBER: DL-1-SAA

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SOIL BORING LOG

PROJECT : Honeywell DMT

LOCATION : Baltimore, MD

ELEVATION :

DRILLING CONTRACTOR: Parratt Wolff

DRILLING METHOD AND EQUIPMENT USED : CME 55 [illegible] Rotary

ATD WATER LEVEL :

START : 1030 9/20/18 END : 1400 9/19/18

LOGGER : T. [illegible]/Jacobs

DEPTH BELOW SURFACE (FT) INTERVAL (FT)	RECOVERY (IN)	SAMPLE #/TYPE	DPC (COPR)	COPR Strata	SOIL DESCRIPTION: SOIL NAME, USCS GROUP SYMBOL, COLOR, MOISTURE CONTENT, RELATIVE DENSITY, OR CONSISTENCY, SOIL STRUCTURE, MINERALOGY.	USCS	BLOW COUNTS	COMMENTS: DEPTH OF CASING, DRILLING RATE, DRILLING FLUID LOSS, TESTS, AND STRUMENTATION. DRILLING ACTIONS/DRILLER COMMENTS
0 to 0.5	\	\	\	\	Asphalt Surface	\	\	\
0.5 to 2	9	SS1	— — —		6-15" - No Recovery 15-18" - Asphalt (Gravel) 18-24" - F.+C. Sandy ~~[illegible]~~/Some Clay, 10YR 5/8 (Yellowish Brown) Wet, Loose, Well graded	GW-GC	19 9 4	6 5/8" ID HSA used - sample w/ AW rods
2 to 4	12	SS2	— — — —		24-36" - No Recovery 36-42" - Asphalt 42-46" - Sandy Silt, 10YR 3/2 (V. Dark Grayish Brown) Dry, Loose, Poorly Graded 46-48" - F. Sand, 10YR 3/4 (Yellowish Brown) Moist, Loose, V. Poorly Graded	ML SP	5 3 6 4	Advancing HSA 0'-4'
4 to 6	18	SS3	— — — —		48-54" - No Recovery 54-56" - Slough (asphalt) 56-68" - ~~Sand~~ Silty Clay, Some Gravel, 10YR 3/2 (V. Dark Grayish Brown) Moist, Stiff, Poorly Graded 68-72" - Sandy Silt, 10YR 3/2 (V. Dark Grayish Brown) Dry, Loose, Poorly Graded	CL ML	2 2 2 6	Layer ([illegible]/[illegible]) Encountered at 68" bgs
6 to 8	10	SS4	— — —		72-74" Slough 74-75" - Concrete 75-82" - Asphalt and Base 96-100 - No Recovery		4 73 50/1	Advance HSA 4'-8'. Slower advancement at 7'.
8 to 10	20	SS5	— — — —	~~100~~ 105 105-105 105-110 110-120	~~96-101~~" - Slough ~~101-105~~" - F. to C. Sand, Some Gravel, GLEY 1 4/N (Dark Gray) Wet, Loose, Well Graded ~~10[illegible]-1[illegible]~~" - Silty Clay, 10YR 3/2 (V. Dark Grayish Brown) Moist, Soft, Poorly Graded ~~1[illegible]-1[illegible]~~" - Clay, 2.5YR 4/6 (Red) Dry, Medium, Poorly Graded	SW-SC CL	5 6 5 5	PP: 2 tsf

JACOBS

PROJECT NUMBER 706612

BORING NUMBER DL-1-SAN

Page 2 of 8

SOIL BORING LOG

PROJECT : Honeywell DMT

LOCATION : Baltimore, MD

ELEVATION :

DRILLING CONTRACTOI Parratt Wolff

DRILLING METHOD AND EQUIPMENT USED : CME SS, HSA & MUD Rotary

ATD WATER LEVEL :

START : 1030 7/30/18 END : 1400 9/19/18

LOGGER : I. Zmudzin / Jacobs

DEPTH BELOW SURFACE (FT) INTERVAL (FT)	RECOVERY (IN)	SAMPLE #/TYPE	DPC (COPR)	COPR Strata	SOIL DESCRIPTION: SOIL NAME, USCS GROUP SYMBOL, COLOR, MOISTURE CONTENT, RELATIVE DENSITY, OR CONSISTENCY, SOIL STRUCTURE, MINERALOGY.	USCS	BLOW COUNTS	COMMENTS: DEPTH OF CASING, DRILLING RATE, DRILLING FLUID LOSS, TESTS, AND STRUMENTATION. DRILLING ACTIONS/DRILLER COMMENTS
10 to 12	18	SS6	— ++ — ++	HC GB	120-126" - no recovery 126-137" - Smp HB COPR from 133-135" 137-140" - SILT (HB COPR), 7.5 YR 4/6 (Strong Brown) Dry, Stiff, Poorly Graded, Minimally Weathered 140-144" - Clayey SILT, 2.5Y 4/3 (Olive Brown) Moist, Very Stiff, Poorly Graded, Wet in Shoe.	ML	5 4 14 27	PP = 1.5 tsf Advance HSA 8'-12'
12 to 14	18	SS7	++ ++ ++	HB GB HB	144-147" - No Recovery 147-153" - SILT (HB COPR) Smp (137-140) 153-157" - Smp (140-144)(GB) 157-162" - Smp (147-153")(HB)	ML	9 42 53 60/3	
14 to 16	10	SS8	+ +	HB HB	168-175" - Slough 175-178" - Smp (HB) Calcitized COPR Nodules 178-192" - N/R	ML	1 100/5	Advance HSA 14'-16'
16 to 16.5	6	SS9	++ ++	HB GB	192-196" - Smp (HB) 196-198" - Smp (153-157)(GB) F. Sand, some silt, 2.5Y 4/3 (Olive Brown) Moist, Loose, Poorly Graded	SM	6	
16.5 to 17	3	SS10	+	GB	198-201" - No Recovery 201-204" - Smp (GB) with Clay (2.5 YR 4/6) Red at tip of shoe	SM	1	
17 to 17'3"	3	SS11	+	GB	204-207" - Clayey F. Sand, Some gravel, 2.5 YR 4/3 (Olive Brown) Moist, Loose, Well Graded, Weakly Indurated	SM	3/3	
17'3" to 17'6"	3	SS12	—		207-210" - CLAY, 2.5 YR 4/6 (Red) Moist, Soft, Poorly Graded.		1	P.P. = 0.75 tsf

JACOBS	PROJECT NUMBER 706612	BORING NUMBER DL-1-SPP	Page 3 of 8

SOIL BORING LOG

PROJECT : Honeywell DMT
LOCATION : Baltimore, MD
ELEVATION :
DRILLING CONTRACTOI Parratt Wolff
DRILLING METHOD AND EQUIPMENT USED : CME 55 HSA & mud rotary
ATD WATER LEVEL :
START : 1030 7/30/18
END : 1400 9/19/18
LOGGER : S. Zmudzin | Jacobs

DEPTH BELOW SURFACE (FT)					COPR Strata	SOIL DESCRIPTION	USCS	BLOW COUNTS	COMMENTS
	INTERVAL (FT)	RECOVERY (IN)	SAMPLE #/TYPE	DPC (COPR)		SOIL NAME, USCS GROUP SYMBOL, COLOR, MOISTURE CONTENT, RELATIVE DENSITY, OR CONSISTENCY, SOIL STRUCTURE, MINERALOGY.			DEPTH OF CASING, DRILLING RATE, DRILLING FLUID LOSS, TESTS, AND STRUMENTATION. DRILLING ACTIONS/DRILLER COMMENTS
	17.5 to 18	12"	X3 S1	—		Shelby tube: 6" - ~~Clay~~ CLAY, trace F. Sand, 2.5YR 4/6 (Red) wet,	CL	Pushed 6" Recovery 6"	P.P = 0.75 tsf Isolation casing to be set to 18' bgs
	18.5' TO 20.5'	7"	SS13	—		0-7" SAME AS ABOVE	CL	6 7 5 4	PP = 0.5 TSF
	23' TO 25'	6"	SS14	—		0-6" SANDY LEAN CLAY, LITTLE F-M SAND, MOIST, FIRM 2.5 YR 5/8 RED	CL	6 3 3 2	PP = 0.5 TSF

JACOBS

PROJECT NUMBER	BORING NUMBER	
706612	DL-1-SAA	Page 4 of 8

SOIL BORING LOG

PROJECT : Honeywell DMT

LOCATION : Baltimore, MD

ELEVATION :

DRILLING CONTRACTOI Parratt Wolff

DRILLING METHOD AND EQUIPMENT USED : CME 55 HSA / MUD ROTARY

ATD WATER LEVEL :

START : 1030 7/30/18 END : 1400 9/19/18

LOGGER : C. REED / JACOBS

DEPTH BELOW SURFACE (FT)	INTERVAL (FT)	RECOVERY (IN)	SAMPLE #/TYPE	DPC (COPR)	COPR Strata	SOIL DESCRIPTION: SOIL NAME, USCS GROUP SYMBOL, COLOR, MOISTURE CONTENT, RELATIVE DENSITY, OR CONSISTENCY, SOIL STRUCTURE, MINERALOGY.	USCS	BLOW COUNTS	COMMENTS: DEPTH OF CASING, DRILLING RATE, DRILLING FLUID LOSS, TESTS, AND STRUMENTATION. DRILLING ACTIONS/DRILLER COMMENTS
	28' TO 30'	9"	SS15	–		0-9" PG SAND (F-M), TRACE SILT, WET, LOOSE, 2.5YR 5/1 RED-GRAY (AND COARSE RND. GRAVEL)	SP-SM	6 12 12 13	
	33' TO 35'	9"	SS16	–		0-9" SAME AS ABOVE, EXCEPT NO GRAVEL	SP-SM	5 5 7 6	
	38' TO 40'	24"	SS17	–		0-24" CLAYEY SILT, SOME CLAY, MOIST, V. SOFT, 5YR 4/1 DK GRAY	MH	WOH/ 18"-2'	PP = 0.25 TSF

JACOBS

PROJECT NUMBER 706612

BORING NUMBER DL-1 - SAA

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SOIL BORING LOG

PROJECT : Honeywell DMT

LOCATION : Baltimore, MD

ELEVATION :

DRILLING CONTRACTOF Parratt Wolff

DRILLING METHOD AND EQUIPMENT USED : CME 55 HSA / MUD ROTARY

START : 1030 7/30/18 END : 1400 9/19/18

LOGGER : C. REED / JACOBS

ATD WATER LEVEL :

DEPTH BELOW SURFACE (FT)	INTERVAL (FT)	RECOVERY (IN)	SAMPLE #/TYPE	DPC (COPR)	COPR Strata	SOIL DESCRIPTION SOIL NAME, USCS GROUP SYMBOL, COLOR, MOISTURE CONTENT, RELATIVE DENSITY, OR CONSISTENCY, SOIL STRUCTURE, MINERALOGY.	USCS	BLOW COUNTS	COMMENTS DEPTH OF CASING, DRILLING RATE, DRILLING FLUID LOSS, TESTS, AND STRUMENTATION. DRILLING ACTIONS/DRILLER COMMENTS
	43' TO 45'	21"	SS18	—		0-21" SAME AS ABOVE	MH	WOR WOH 2 4	PP = 0.25 TSF
	48' TO 50'	3"	S2	N/A		0-3" PG SAND (F-M), WET, V. LOOSE, 5YR 5/1 GRAY — COLLECT SHELBY TUBE	SM		SHELBY TUBE DAMAGED DURING REMOVAL — ONLY 3" RECOVERY
	53' TO 55'	24"	SS19	—		0-24" CLAYEY SILT, SOME CLAY MOIST, V. SOFT, 5YR 4/1 DK. GRAY (TRACE SHELLS)	MH	WOH/12" 2 2	PP = 0.5 TSF

JACOBS

PROJECT NUMBER	BORING NUMBER	
706612	DL-1-SAA	Page 6 of 8

SOIL BORING LOG

PROJECT : Honeywell DMT
LOCATION : Baltimore, MD
ELEVATION :
DRILLING CONTRACTOR: Parratt Wolff
DRILLING METHOD AND EQUIPMENT USED : CME 55 HSA / MUD ROTARY
ATD WATER LEVEL :
START : 1030 7/30/18 END : 1400 9/17/18
LOGGER : C. REED / JACOBS

DEPTH BELOW SURFACE (FT)	INTERVAL (FT)	RECOVERY (IN)	SAMPLE #/TYPE	DPC (COPR)	COPR Strata	SOIL DESCRIPTION SOIL NAME, USCS GROUP SYMBOL, COLOR, MOISTURE CONTENT, RELATIVE DENSITY, OR CONSISTENCY, SOIL STRUCTURE, MINERALOGY.	USCS	BLOW COUNTS	COMMENTS DEPTH OF CASING, DRILLING RATE, DRILLING FLUID LOSS, TESTS, AND STRUMENTATION. DRILLING ACTIONS/DRILLER COMMENTS
	58' TO 60'	24"	S3	N/A		0-24" CLAYEY SILT, SOME CLAY/SHELLS MOIST, V SOFT, 5YR 4/1 DK GRAY — COLLECT SHELBY TUBE	MH		PP = 0.75 TSF TV = 0.25 TSF
									VANE-SHEAR 61.7'-62'
	63' TO 65'	24"	SS20	—		0-24" SAME AS ABOVE, TRACE SHELLS, ORGANIC ODOR	MH	WOH/12" 2 2	PP = 0.5 TSF
	68' TO 70'	24"	S4	N/A		0-24" SAME AS ABOVE - COLLECT SHELBY TUBE	MH		PP = 0.5 TSF TV = 0.4 TSF

VANE-SHEAR TEST 71.7'-72'

JACOBS

PROJECT NUMBER 706612
BORING NUMBER DL-1-SAA
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SOIL BORING LOG

PROJECT : Honeywell DMT
ELEVATION :
LOCATION : Baltimore, MD
DRILLING CONTRACTOR: Parratt Wolff
DRILLING METHOD AND EQUIPMENT USED : CME 55 HSA / MUD ROTARY
ATD WATER LEVEL :
START : 1030 7/30/18 END : 1400 9/19/18
LOGGER : C. REED / JACOBS

DEPTH BELOW SURFACE (FT) INTERVAL (FT)	RECOVERY (IN)	SAMPLE #/TYPE	DPC (COPR)	COPR Strata	SOIL DESCRIPTION SOIL NAME, USCS GROUP SYMBOL, COLOR, MOISTURE CONTENT, RELATIVE DENSITY, OR CONSISTENCY, SOIL STRUCTURE, MINERALOGY.	USCS	BLOW COUNTS	COMMENTS DEPTH OF CASING, DRILLING RATE, DRILLING FLUID LOSS, TESTS, AND STRUMENTATION. DRILLING ACTIONS/DRILLER COMMENTS
73' TO 75'	24"	SS21	-		0-24" SAME AS ABOVE, TRACE ORGANIC MATTER	MH	WOR WOH WOH 3	PP = 0.25 TSF
78' TO 80'	24"	SS22	-		0-24" SAME AS ABOVE	MH	WOR WOH WOH 1	PP = 0.5 TSF
83' TO 85'	24"	SS	NA		0-24" SAME AS ABOVE - COLLECT SHELBY TUBE	MH		PP = 1.0 TSF TV = 0.35 TSF

VANE-SHEAR TEST
86.7' - 87'

JACOBS

PROJECT NUMBER 706612

BORING NUMBER DL-1-SAA

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SOIL BORING LOG

PROJECT : Honeywell DMT
LOCATION : Baltimore, MD
ELEVATION :
DRILLING CONTRACTOR : Parratt Wolff
DRILLING METHOD AND EQUIPMENT USED : CME 55 HSA / MUD ROTARY
ATD WATER LEVEL :
START : 1030 7/30/18
END : 1400 9/19/18
LOGGER : C. REED / JACOBS

DEPTH BELOW SURFACE (FT)	INTERVAL (FT)	RECOVERY (FT)	SAMPLE #TYPE	DPC (COPR)	COPR Strata	SOIL DESCRIPTION SOIL NAME, USCS GROUP SYMBOL, COLOR, MOISTURE CONTENT, RELATIVE DENSITY OR CONSISTENCY, SOIL STRUCTURE, MINERALOGY.	USCS	BLOW COUNTS	COMMENTS DEPTH OF CASING, DRILLING RATE, DRILLING FLUID LOSS, TESTS, AND INSTRUMENTATION. DRILLING ACTIONS/DRILLER COMMENTS. DRILLING ACTIONS/DRILLER COMMENTS
	88' TO 90'	24"	SS23	–		0-24" SAME AS ABOVE	MH	WOR/12" WOH 5	PP = 0.75 TSF
	93' TO 95'	22"	SS24	–		0-10" SAME AS ABOVE, EXCEPT TRACE F. SAND	MH	WOR 29	PP = 0.5 TSF
				–		10"-22" PG SAND (F-M), TRACE SILT, MOIST TO WET, DENSE, 5YR 6/2 PINKISH-GRAY	SP-SM	41 27	PATAPSCO SAND
									CONTINUE STEEL CASING ADVANCEMENT TO 103' BGS, THEN OPEN-HOLE DRILLING TO 107' BGS TO ALLOW FOR SSA INSTALLATION

Δ END OF BORING @ 107' BGS

JACOBS

PROJECT NUMBER	BORING NUMBER	
706612	DL-2-I	Page 1 of 7

SOIL BORING LOG

PROJECT : Honeywell DMT
LOCATION : Baltimore, MD
ELEVATION : +22.7
DRILLING CONTRACTOR Parratt Wolff
DRILLING METHOD AND EQUIPMENT USED : CME 55 HSA & Mud Rotary
ATD WATER LEVEL :
START : 0945 7/31/18
END : 1030 8/10/18
LOGGER : [illegible]

DEPTH BELOW SURFACE (FT)	INTERVAL (FT)	RECOVERY (IN)	SAMPLE #/TYPE	DPC (COPR)	COPR Strata	SOIL DESCRIPTION: SOIL NAME, USCS GROUP SYMBOL, COLOR, MOISTURE CONTENT, RELATIVE DENSITY, OR CONSISTENCY, SOIL STRUCTURE, MINERALOGY.	USCS	BLOW COUNTS	COMMENTS: DEPTH OF CASING, DRILLING RATE, DRILLING FLUID LOSS, TESTS, AND STRUMENTATION. DRILLING ACTIONS/DRILLER COMMENTS
	0 to 0.5	\	\	\	\	0-6" - Asphalt	\	\	\
	0.5' to 2'	15	SS1	— —		6"-9": No recovery 9-12": Asphalt road base 12"-24": F-M SILTY SAND, SM GVL (SM) 10YR 4/2 (Dark Grayish Brn) DRY, well Graded Medium Dense	SM	21 17 10	6 5/8" ID HSA used Sample w/ AW rods Black woven mesh encountered at 22".
	2' to 4'	22	SS2	— —		24"-26": No recovery 26"-48": SAA (12"-24") Some clay/moist content present from 38"-42".	SM	3 2 5 5	Advance HSA 0'-4'.
	4' to 6'	14	SS3	— —		48"-58": No recovery 58"-70": SAA (12"-24") (SM) Dry, Well Graded 70"-72": F-C GRAVELLY SA, TR SILT (SP-SM) 10YR 4/6 (Dk. Yell. Brn) DRY, LOOSE Well Graded	SM SP-SM	2 4 6 9	
	6' to 8'	10	SS4	— —		72"-86": No recovery 86"-96": F-M Sandy Silt (ML) 10YR 4/6 (DK. Yellowish Brn) Moist, V. loose Poorly Graded	ML	WH/12" 3 6	Advance HSA 4'-8'.
	8' to 10'	9	SS5	— —		96"-99": F-M sandy silt, trace clay (ML) 10YR 4/6 (Dk. Yell. Brn) Moist, very Dense 99"-103": ~~Asphalt~~ weathered asphalt V. Dense 103"-120": N/A	ML	12 50/1"	Slight auger chatter at 8'.

JACOBS

PROJECT NUMBER 706612 | **BORING NUMBER** SDL-2-I | Page 2 of 7

SOIL BORING LOG

PROJECT : Honeywell DMT LOCATION : Baltimore, MD
ELEVATION : 422.7 DRILLING CONTRACTOI Parratt Wolff
DRILLING METHOD AND EQUIPMENT USED : CME 55 HSA
ATD WATER LEVEL : START : 0945 7/31/18 END : LOGGER : I. ZAWOZIN (JACOBS)

DEPTH BELOW SURFACE (FT)				COPR Strata	SOIL DESCRIPTION	USCS	BLOW COUNTS	COMMENTS
INTERVAL (FT)	RECOVERY (IN)	SAMPLE #/TYPE	DPC (COPR)		SOIL NAME, USCS GROUP SYMBOL, COLOR, MOISTURE CONTENT, RELATIVE DENSITY, OR CONSISTENCY, SOIL STRUCTURE, MINERALOGY.			DEPTH OF CASING, DRILLING RATE, DRILLING FLUID LOSS, TESTS, AND STRUMENTATION. DRILLING ACTIONS/DRILLER COMMENTS
10' to 12'	18	SS6	– – –		120"- 126": No recovery 126"-129": SAA (99"-103") 129"-138": F-C SAND AND GVL, TR SI (SP-SM) 10YR 4/3 (BRN) w/ 2.5 YR 5/6 (RED), Moist, Loose, Well Graded 138"-144": Silty F-M Sand, trc (SM 2.5 YR 5/6 (RED) Dry, Poorly Graded	SP-SM SM	9 9 9 18	Advance HSA 8'-10'.
12' to 14'	22	SS7	– – –		144"-146": No recovery 146"-168": SILTY F-M SAND (SM) 2.5 YR 5/6 (RED) Dry, Poorly Graded Medium Dense	SM	5 9 13 19	
14' to 16'	16	SS8	+ – –		168"-176": No recovery 176"-181": SAA (146"-168") 181"-185": Weathered Asphalt 185"-192": F-M sand, some silt (SM) 5YR 2.5/2 (Dk. reddish brn) Dry, Poorly Graded	SM	1 18 26 22	Woven fabric encountered at 176".
16' to 17'	12	SS9	+ +	HB GB	192"-194" ~~[illegible]~~ ~~[illegible]~~": SAA (185"-192") ~~[illegible]~~": F-M SILTY SAND (SM) 194"-~~204~~ 199" 10YR 5/4 (yellowish Brn) Dry, Poorly Graded ~~211"-216"~~ 199-204": F-M SAND, TR SILT (SP-SM) 5Y 4/1 (Dark Gray) Moist, Poorly Graded Weakly Indurated	SM SP-SM	29 45	
17 to 17.5	6	SS 10	++	HB	~~210"-222"~~ 204-210": SAA (206"-211")	SM	22	
17.5' to 18'	6	SS 11	+	HB	~~222"-228"~~ 210"-216": F-[illegible] silty sand (SM) 5YR 3/4 (Dk. Reddish Brn) Wet, Poorly Graded	SM	27	

JACOBS

PROJECT NUMBER 7066012 **BORING NUMBER** DL-2-I Page 3 of 7

SOIL BORING LOG

PROJECT : Honeywell DMT LOCATION : Baltimore, MD

ELEVATION : 122.7 DRILLING CONTRACTOR Parratt Wolff

DRILLING METHOD AND EQUIPMENT USED :

ATD WATER LEVEL : START : 0945 7/31/18 END : LOGGER : I. ZNUDZIN (JACOBS)

DEPTH BELOW SURFACE (FT)	INTERVAL (FT)	RECOVERY (IN)	SAMPLE #/TYPE	DPC (COPR)	COPR Strata	SOIL DESCRIPTION SOIL NAME, USCS GROUP SYMBOL, COLOR, MOISTURE CONTENT, RELATIVE DENSITY, OR CONSISTENCY, SOIL STRUCTURE, MINERALOGY.	USCS	BLOW COUNTS	COMMENTS DEPTH OF CASING, DRILLING RATE, DRILLING FLUID LOSS, TESTS, AND STRUMENTATION. DRILLING ACTIONS/DRILLER COMMENTS
	18' to 19.0'	9	SS 12	++		216" - 219": No recovery 219" - 228": SAA (210"-216")	SP-SM	4 8	
	19' to 20'	12	SS 13	++ ++ —	GB	228 - 232" : SAA (210"-216") 232"-234" : F-M SAND, SM SILT (SM) 5Y 4/1 (DK. Gray) wet 234"-240" : WOOD	SM	9 8	232"-234": MIXED w/ 2.5Y 7/6 (yellow)
	20' to 20.5'	6	SS 14	+		240"-246" : WOOD wet		8	
	20.5' to 21'	6	SS 15	—		246"-248" : SAA (Wood) 248"-252" : F-M SAND, TR SILT (SP-SM) 10YR 3/2 (V. DK Grayish Brn) wet, Poorly Graded	SP-SM	36	Set 5" ISOLATION CASING TO 21' BGS
23	23-25	16	SS 16	—		10YR 6/2 (Pale yellowish brown) f-cs SAND, tr silt, tr f-med gravel (SP/SM low) - gravel qtz, well rounded, Spherical, moist, med dense, well graded	SP-SM	14 16 11 9	276" - 300" Significant Mud loss ~75-100 gal
25									

JACOBS

PROJECT NUMBER: 706612

BORING NUMBER: DL-2-I

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SOIL BORING LOG

PROJECT : Honeywell DMT
LOCATION : Baltimore, MD
ELEVATION :
DRILLING CONTRACTOR: Parratt Wolff
DRILLING METHOD AND EQUIPMENT USED :
ATD WATER LEVEL :
START :
END :
LOGGER.: E. Costas

DEPTH BELOW SURFACE (FT)	INTERVAL (FT)	RECOVERY (IN)	SAMPLE #/TYPE	DPC (COPR)	COPR Strata	SOIL DESCRIPTION: SOIL NAME, USCS GROUP SYMBOL, COLOR, MOISTURE CONTENT, RELATIVE DENSITY, OR CONSISTENCY, SOIL STRUCTURE, MINERALOGY.	USCS	BLOW COUNTS	COMMENTS: DEPTH OF CASING, DRILLING RATE, DRILLING FLUID LOSS, TESTS, AND STRUMENTATION. DRILLING ACTIONS/DRILLER COMMENTS
28	28-30	20"	SS 17	—		N6 (med light gray), mottled w/ 5 YR 5/6 (light brown) SILT, tr. fi sand, moist, stiff 336"-360"	ML	3 4 6 9	PP 1.75 Upper Silt?
30									
33	33-35	21"	SS 18	—		396"-420" SAA N5-N6 (med gray to med light gray) - brown ~~to~~ trace f. sand moist, Stiff	ML	3 4 5 5	PP 1.0 trace clay in shoe Upper Silt?
35									
38	38-40	24	SS19	—		2" 456-458" 5 Y 6/1 (light olive gray) f-c S SAND, wet, v. loose 22" N5 w/ tr N4 (med gray), ~~Clay, SILT~~ Silty CLAY tr. fine sand, moist, firm 458-480" micaceous	SP CH	Wt hammer/1' 5 6	PP 0.5-1.0 Lower Silt?
40									

JACOBS

PROJECT NUMBER

BORING NUMBER DL-2-I

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SOIL BORING LOG

PROJECT : Honeywell DMT

LOCATION : Baltimore, MD

ELEVATION :

DRILLING CONTRACTOR : Parratt Wolff

DRILLING METHOD AND EQUIPMENT USED :

ATD WATER LEVEL :

START :

END :

LOGGER : Costa

DEPTH BELOW SURFACE (FT)	INTERVAL (FT)	RECOVERY (IN)	SAMPLE #/TYPE	SAMPLE DPC (COPR)	COPR Strata	SOIL DESCRIPTION SOIL NAME, USCS GROUP SYMBOL, COLOR, MOISTURE CONTENT, RELATIVE DENSITY, OR CONSISTENCY, SOIL STRUCTURE, MINERALOGY.	USCS	BLOW COUNTS	COMMENTS DEPTH OF CASING, DRILLING RATE, DRILLING FLUID LOSS, TESTS, AND STRUMENTATION, DRILLING ACTIONS/DRILLER COMMENTS
43	43-45	21"	SS 20	–		519"-526" 7" 5Y 6/1 (light olive grey) ~~silty~~ SAND, (f-med sand), tr. silt wet, very loose 14" SAA (38-43') ~~[illegible]~~ er 5Y 6/1 SILTY CLAY 526-540"	SM CH	1 1 2 4	PP .5-.75
45									
48	48-50	22"	SS 21	–		13" SAA silty CLAY 578-591" moist, stiff (by hand + PP) 591-600" 9" N3 (dark gray) ~~silty~~ SAND, (f-med) tr. silt moist, med dens	CH SM	1 4 13 17	PP 1.25
50	50-52	16"	SS 22	–		608-624": SAA, moist to wet	SM	1 6 7 7	
52									
53	53-55	24"	Shelby 1	–		24" recovery of Shelby tube 5Y 6/1 silty CLAY at bottom of tube => 55 ft	CH		PP @ bot 1.5-1.75

55

Vane Shear 55-57'

JACOBS

PROJECT NUMBER

BORING NUMBER DL-2-J

Page 6 of 7

SOIL BORING LOG

PROJECT : Honeywell DMT
LOCATION : Baltimore, MD
ELEVATION :
DRILLING CONTRACTOR: Parratt Wolff
DRILLING METHOD AND EQUIPMENT USED :
ATD WATER LEVEL :
START :
END :
LOGGER : Costas

DEPTH BELOW SURFACE (FT)	INTERVAL (FT)	RECOVERY (IN)	SAMPLE #/TYPE	DPC (COPR)	COPR Strata	SOIL DESCRIPTION: SOIL NAME, USCS GROUP SYMBOL, COLOR, MOISTURE CONTENT, RELATIVE DENSITY, OR CONSISTENCY, SOIL STRUCTURE, MINERALOGY.	USCS	BLOW COUNTS	COMMENTS: DEPTH OF CASING, DRILLING RATE, DRILLING FLUID LOSS, TESTS, AND STRUMENTATION. DRILLING ACTIONS/DRILLER COMMENTS
58	58-60	24"	Shelby 2	–		N3/N4 CLAY @ 60' - bottom of tube, tr shells ~~640"–130"~~ ER	CH		PP 1.5
60									
63									
64	63-65	24"	SS 23	–		756"-780" N5 silty CLAY, micaceous, moist, soft to firm	CH	WOH WOH 1 5	PP .5-.75
65									
71	71-73	24"	Shelby 3	–		SAA - notably stiffer →@ 73'	CH		PP 1.25-1.5
73									

JACOBS

PROJECT NUMBER	BORING NUMBER	
706612	DL-2-I	Page 7 of 7

SOIL BORING LOG

PROJECT : Honeywell DMT LOCATION : Baltimore, MD

ELEVATION : DRILLING CONTRACTOR Parratt Wolff

DRILLING METHOD AND EQUIPMENT USED :

ATD WATER LEVEL : START : END : 8/10/16 LOGGER : Costas

DEPTH BELOW SURFACE (FT)	INTERVAL (FT)	RECOVERY (IN)	SAMPLE #/TYPE	DPC (COPR)	COPR Strata	SOIL DESCRIPTION SOIL NAME, USCS GROUP SYMBOL, COLOR, MOISTURE CONTENT, RELATIVE DENSITY, OR CONSISTENCY, SOIL STRUCTURE, MINERALOGY.	USCS	BLOW COUNTS	COMMENTS DEPTH OF CASING, DRILLING RATE, DRILLING FLUID LOSS, TESTS, AND STRUMENTATION. DRILLING ACTIONS/DRILLER COMMENTS
78	78-80	24"	SS 24	–		SAA - silty CLAY	OH	WOH WOH 6 6	PP .75 - 1
80									
83	83-85	24"	Shelby 4	–		SAA - from 85' - bot of shelby	OH		PP 1 - 1.5
85									
88	88-90	17"	SS 25	–		10 YR 8/2 (Pale yellowish brown) f-med SAND, tr silt, moist, ~~well graded~~ poorly graded, very dense	SP	23 41 39 48	Patapsco Sand
90									EOB

JACOBS

PROJECT NUMBER

BORING NUMBER EW-1

Page 1 of 1

SOIL BORING LOG

PROJECT: Honeywell DMT
LOCATION: Baltimore, MD
ELEVATION:
DRILLING CONTRACTOR: Parratt Wolff
DRILLING METHOD AND EQUIPMENT USED: CME55 HSA
ATD WATER LEVEL:
START: 9/4/18
END: 9/4/18
LOGGER: L Rakerink

DEPTH BELOW SURFACE (FT)	INTERVAL (FT)	RECOVERY (IN)	SAMPLE #/TYPE	OPC (COPR)	COPR Strata	SOIL DESCRIPTION SOIL NAME, USCS GROUP SYMBOL, COLOR, MOISTURE CONTENT, RELATIVE DENSITY, OR CONSISTENCY, SOIL STRUCTURE, MINERALOGY	USCS	BLOW COUNTS	COMMENTS DEPTH OF CASING, DRILLING RATE, DRILLING FLUID LOSS, TESTS, AND STRUMENTATION DRILLING ACTIONS/DRILLER COMMENTS
0						See boring log DL-1-SAA for 0-15.5 ft bgs			
15									
15.5				++	HB	15.5-15.9 silty sand F-M weakly to moderately indurated		4	
16	15.5 - 17.5	12	SS 1	++	GB	15.9-16.2 silty sand, F-M little clay, particulate		6	
16.5				++	HB	16.2-16.4 SA 15.5-15.9			
				++	GB	16.4-16.7 GB transitioning to HB, particulate		44	
17						16.7-17.5 no recovery		50/4	
17.5				++	HB	17.5-17.7 SA 16.2-16.4		11	
18	17.5 - 19	10	SS 2	—		17.7-18.5 Clay, 2.5YR 4/6 (red) moist, soft, liner clay			
				—		18.5-19.0 no recovery		12	
18.5								8	
19						EOB @ 19 ft bgs			Set screen [illegible]-18

BORING LOG

Site: Dundalk Marine Terminal
Boring No: INC-48

Driller: Boart Longyear
Method: Rotosonic

Consultant: CH2M Hill
Geologist: E. Curbo

Total Depth: 40.0 Ft
Start Date: 07/16/2012
End Date: 07/16/2012

Depth Ft	Rec	DPC	Stratum	USCS Code	Stratum Description
0					Asphalt.
				GW-GM	WELL GRADED GRAVEL with SILT and SAND (GW-GM), brown (10YR 4/3), dry, subrounded gravel with medium to fine grained sand, loose.
				CL	GRAVELLY LEAN CLAY (CL), dark grayish brown (10YR 4/2), dry, with subangular gravel, stiff.
				GW-GM	WELL GRADED GRAVEL with SILT and SAND (GW-GM), light gray (10YR 7/1), dry, subrounded gravel, loose.
5		-		CL	LEAN CLAY with GRAVEL (CL), dark grayish brown (10YR 4/2), dry, with subangular gravel, low plasticity, stiff.
				GW-GM	WELL GRADED GRAVEL with SILT and SAND (GW-GM), brown (10YR 4/3), dry, subangular gravel with medium to fine grained sand and trace clay, very loose.
				GW-GM	WELL GRADED GRAVEL with SILT and SAND (GW-GM), light gray (10YR 7/1), dry, subrounded gravel with fine to medium grained sand and trace clay, very loose.
10					

BORING LOG

Site: Dundalk Marine Terminal
Boring No: INC-48

Driller: Boart Longyear
Method: Rotosonic

Consultant: CH2M Hill
Geologist: E. Curbo

Total Depth: 40.0 Ft
Start Date: 07/16/2012
End Date: 07/16/2012

Depth Ft	Rec	DPC	Stratum	USCS Code	Stratum Description
10		-		CH	FAT CLAY with GRAVEL (CH), reddish brown (2.5YR 4/4), with subangular gravel, low plasticity, stiff.
				GW-GM	WELL GRADED GRAVEL with SILT and SAND (GW-GM), brown (10YR 4/3), dry, subangular gravel with medium to fine grained sand, very loose.
				CH	FAT CLAY with GRAVEL (CH), reddish brown (2.5YR 4/4), with subangular gravel, low plasticity, stiff.
		++	HB	SP	POORLY GRADED SAND with GRAVEL (SP), red (2.5YR 4/6), dry, fine to medium grained sand with subrounded gravel and trace silt, weakly indurated.
15			HB	SP	POORLY GRADED SAND with GRAVEL (SP), very dark brown (10YR 2/2), dry, fine to medium grained sand with subrounded gravel, trace silt, and yellow particulate, strongly indurated, very loose.
			GB	SP	POORLY GRADED SAND (SP), very dark gray (10YR 3/1), dry, fine to medium grained sand with trace rounded gravel, very loose.
			HB	SP	POORLY GRADED SAND with GRAVEL (SP), very dark brown (10YR 2/2), dry, fine to medium grained sand with subrounded gravel, trace silt, and yellow particulate, strongly indurated, very loose.
		-	GB	SP	POORLY GRADED SAND (SP), very dark gray (10YR 3/1), moist, fine to medium grained sand with trace rounded gravel, very loose.
			HB	SP	POORLY GRADED SAND with GRAVEL (SP), very dark brown (10YR 2/2), dry, fine to medium grained sand with subrounded gravel, trace silt, and yellow particulate, strongly indurated, very loose.
20					

BORING LOG

Site: Dundalk Marine Terminal
Boring No: INC-48

Driller: Boart Longyear
Method: Rotosonic

Consultant: CH2M Hill
Geologist: E. Curbo

Total Depth: 40.0 Ft
Start Date: 07/16/2012
End Date: 07/16/2012

Depth Ft	Rec	DPC	Stratum	USCS Code	Stratum Description
20				CH	FAT CLAY with SAND (CH), reddish brown (2.5YR 4/4), moist, with medium to fine sand and trace silt, low plasticity, medium firm.
				SP-SC	POORLY GRADED SAND with CLAY (SP-SC), reddish brown (2.5YR 4/4), moist, medium to fine sand, loose.
				SP-SC	POORLY GRADED SAND with CLAY (SP-SC), yellowing brown (10YR 5/6), moist, medium to fine sand, loose.
				CH	FAT CLAY with SAND (CH), red (2.5YR 4/6), moist, with medium to coarse sand, medium plasticity, dense.
25		-		GW-GM	WELL GRADED GRAVEL with CLAY and SAND (GW-GC), grayish brown (10YR 5/2), wet, subrounded gravel with medium to coarse grained sand and medium plasticity clay.
30					

BORING LOG

Page 4 of 4

Site: Dundalk Marine Terminal

Boring No: INC-48

Driller: Boart Longyear

Method: Rotosonic

Consultant: CH2M Hill

Geologist: E. Curbo

Total Depth: 40.0 Ft

Start Date: 07/16/2012

End Date: 07/16/2012

Depth Ft	Rec	DPC	Stratum	USCS Code	Stratum Description
30	■			SW-SM	WELL GRADED SAND with SILT and GRAVEL (SW-SM), very dark grayish brown (10YR 3/2), wet, fine to medium grained sand with subgrounded gravel, very loose.
35	■	-			
	■			CH	FAT CLAY with SAND (CH), dark grayish brown (10YR 4/2), moist, with fine grained sand, high plasticity, stiff to firm. EOB at 40'.
40.0					

BORING LOG

Page 1 of 12

Site: Dundalk Marine Terminal
Boring No: INC-50

Driller: Boart Longyear
Method: Rotosonic

Consultant: CH2M Hill
Geologist: E. Curbo

Total Depth: 35.0 Ft
Start Date: 07/16/2012
End Date: 07/16/2012

Depth Ft	Rec	DPC	Stratum	USCS Code	Stratum Description
0					Asphalt.
				GW-GM	WELL GRADED GRAVEL with SILT and SAND (GW-GM), brown (10YR 4/3), dry, subrounded gravel with medium to fine grained sand, loose.
		-		GW-GM	WELL GRADED GRAVEL with SILT and SAND (GW-GM), light gray (10YR 7/1), dry, subrounded gravel with medium to fine grained sand, loose.
				GW-GM	WELL GRADED GRAVEL with SILT and SAND (GW-GM), reddish brown (2.5YR 4/4), dry, subrounded gravel with medium to fine grained sand, loose.
3					

BORING LOG

Site: Dundalk Marine Terminal
Boring No: INC-50

Driller: Boart Longyear Method: Rotosonic	Consultant: CH2M Hill Geologist: E. Curbo	Total Depth: 35.0 Ft Start Date: 07/16/2012 End Date: 07/16/2012

Depth Ft	Rec	DPC	Stratum	USCS Code	Stratum Description
3		-		SP-SM	POORLY GRADED SAND with CLAY (SP-SC), very dark brown (10YR 2/2), moist, medium to fine grained sand with low plasticity clay, very loose.
5				SP-SM	POORLY GRADED SAND with SILT (SP-SM), black (10YR 2/1), moist, medium to fine sand with trace gravel, very loose.
6					

BORING LOG

CH2MHILL

Site: Dundalk Marine Terminal
Boring No: INC-50

Driller: Boart Longyear
Method: Rotosonic

Consultant: CH2M Hill
Geologist: E. Curbo

Total Depth: 35.0 Ft
Start Date: 07/16/2012
End Date: 07/16/2012

Depth Ft	Rec	DPC	Stratum	USCS Code	Stratum Description
6				SP-SM	POORLY GRADED SAND with SILT (SP-SM), yellow (10YR 7/6), moist, medium to fine sand with trace gravel, very loose.
		-		SP-SM	POORLY GRADED SAND with SILT (SP-SM), black (10YR 2/1), moist, medium to fine sand with trace gravel, very loose.
9					

BORING LOG

Site: Dundalk Marine Terminal
Boring No: INC-50

Driller: Boart Longyear
Method: Rotosonic

Consultant: CH2M Hill
Geologist: E. Curbo

Total Depth: 35.0 Ft
Start Date: 07/16/2012
End Date: 07/16/2012

Depth Ft	Rec	DPC	Stratum	USCS Code	Stratum Description
9		-		CH	FAT CLAY with SAND (CH), brown (10YR 4/3), moist, with fine to medium grained sand, medium plasticity, firm.
10		++	HB	SP	POORLY GRADED SAND with GRAVEL (SP), very dark brown (10YR 2/2), dry, fine to coarse sand with gravel and trace silt, weakly indurated, very loose.
			GB	SP	POORLY GRADED SAND with GRAVEL (SP), black (10YR 2/1), moist, fine to medium grained sand with subangular gravel and trace yellow particulate, loose.
			HB	SP	POORLY GRADED SAND with GRAVEL (SP), very dark brown (10YR 2/2), dry, fine to coarse sand with gravel, some clay, and trace silt, weakly indurated, very loose.
12					

BORING LOG

CH2MHILL

Site: Dundalk Marine Terminal
Boring No: INC-50

Driller: Boart Longyear
Method: Rotosonic

Consultant: CH2M Hill
Geologist: E. Curbo

Total Depth: 35.0 Ft
Start Date: 07/16/2012
End Date: 07/16/2012

Depth Ft	Rec	DPC	Stratum	USCS Code	Stratum Description
12		++	HB	SP	POORLY GRADED SAND with GRAVEL (SP), very dark brown (10YR 2/2), dry, fine to coarse sand with gravel, some clay, and trace silt, weakly indurated, very loose.
				CH	FAT CLAY with SAND (CH), brown (10YR 4/3), moist, with fine to medium grained sand, medium plasticity, firm.
15					

BORING LOG

Site: Dundalk Marine Terminal
Boring No: INC-50

Driller: Boart Longyear
Method: Rotosonic

Consultant: CH2M Hill
Geologist: E. Curbo

Total Depth: 35.0 Ft
Start Date: 07/16/2012
End Date: 07/16/2012

Depth Ft	Rec	DPC	Stratum	USCS Code	Stratum Description
15		-		SP-SM	POORLY GRADED SAND with GRAVEL and SILT (SP-SM), brown (10YR 4/3), wet, medium to coarse grained sand with rounded gravel, very loose.
18					

BORING LOG

Site: Dundalk Marine Terminal
Boring No: INC-50

Driller: Boart Longyear
Method: Rotosonic

Consultant: CH2M Hill
Geologist: E. Curbo

Total Depth: 35.0 Ft
Start Date: 07/16/2012
End Date: 07/16/2012

Depth Ft	Rec	DPC	Stratum	USCS Code	Stratum Description
18		-		SP-SM	POORLY GRADED SAND with GRAVEL and SILT (SP-SM), brown (10YR 4/3), wet, medium to coarse grained sand with rounded gravel, very loose.
20				SW-SM	WELL GRADED SAND with GRAVEL (SW-SM), brown (10YR 4/3), moist, coarse sand with rounded gravel, very loose.
21					

BORING LOG

Site: Dundalk Marine Terminal
Boring No: INC-50

Driller: Boart Longyear
Method: Rotosonic

Consultant: CH2M Hill
Geologist: E. Curbo

Total Depth: 35.0 Ft
Start Date: 07/16/2012
End Date: 07/16/2012

Depth Ft	Rec	DPC	Stratum	USCS Code	Stratum Description
21		-		SP-SM	POORLY GRADED SAND with SILT (SP-SM), strong brown (7.5YR 5/8), wet, medium to fine sand, very loose.
24					

BORING LOG

Site: Dundalk Marine Terminal
Boring No: INC-50

Driller: Boart Longyear
Method: Rotosonic

Consultant: CH2M Hill
Geologist: E. Curbo

Total Depth: 35.0 Ft
Start Date: 07/16/2012
End Date: 07/16/2012

Depth Ft	Rec	DPC	Stratum	USCS Code	Stratum Description
24				SP-SM	POORLY GRADED SAND with SILT (SP-SM), strong brown (7.5YR 5/8), wet, medium to fine sand, very loose.
				SP-SC	POORLY GRADED SAND with CLAY (SP-SC), dark gray (7.5YR 4/1), wet, with fine grained sand, low to medium plasticity, very soft.
25		-		CH	FAT CLAY with SAND (CH), very dark gray (10YR 3/1), moist, with fine to medium grained sand, medium plasticity, soft. EOB at 35'.
27					

BORING LOG

Site: Dundalk Marine Terminal
Boring No: INC-50

Driller: Boart Longyear
Method: Rotosonic

Consultant: CH2M Hill
Geologist: E. Curbo

Total Depth: 35.0 Ft
Start Date: 07/16/2012
End Date: 07/16/2012

Depth Ft	Rec	DPC	Stratum	USCS Code	Stratum Description
27		-		CH	FAT CLAY with SAND (CH), very dark gray (10YR 3/1), moist, with fine to medium grained sand, medium plasticity, soft. EOB at 35'.
30					

BORING LOG

CH2MHILL

Site: Dundalk Marine Terminal
Boring No: INC-50

Driller: Boart Longyear
Method: Rotosonic

Consultant: CH2M Hill
Geologist: E. Curbo

Total Depth: 35.0 Ft
Start Date: 07/16/2012
End Date: 07/16/2012

Depth Ft	Rec	DPC	Stratum	USCS Code	Stratum Description
30		-		CH	FAT CLAY with SAND (CH), very dark gray (10YR 3/1), moist, with fine to medium grained sand, medium plasticity, soft. EOB at 35'.
33					

BORING LOG

Page 12 of 12

Site: Dundalk Marine Terminal
Boring No: INC-50

Driller: Boart Longyear
Method: Rotosonic

Consultant: CH2M Hill
Geologist: E. Curbo

Total Depth: 35.0 Ft
Start Date: 07/16/2012
End Date: 07/16/2012

Depth Ft	Rec	DPC	Stratum	USCS Code	Stratum Description
33	█	-		CH	FAT CLAY with SAND (CH), very dark gray (10YR 3/1), moist, with fine to medium grained sand, medium plasticity, soft. EOB at 35'.
35.0					

BORING LOG

Page 1 of 6

Honeywell

Site: Dundalk Marine Terminal
Boring No: INC-1501-J
CPT No:

Northing: 573973.3
Easting: 1448062.6
Elevation: 19.9

Driller: A. Chapel (Parratt Wolff, Inc.)
Method: Hollow Stem Auger
Consultant: J. Rogers (CH2M Hill, Inc.)

Total Depth: 27.0 Ft
GW Depth: 0.0 Ft
Date: 06/14/2007

Depth Ft	Recov	Sample ID	DPC	Soil Code	Soil Description	USCS	Comments	W	Gs	PL	LL	P200
0					Precut Asphalt and Concrete							
			-		WELL-GRADED SAND (SW) with GRAVEL -brown (10YR 4/3) and dark gray (10YR 4/1), damp, (loose), coarse sand, some medium sand, trace organics	SW						
					SANDY SILT (ML) -trace gravel, strong brown (7.5YR 5/6), brown (7.5YR 5/2), some red (2.5YR 4/8), damp, medium stiff to hard, debris, fragments (brick), trace organics (wood pieces)	ML						
					POORLY-GRADED SAND (SP) -light brown	SP						
			-		SANDY SILT with GRAVEL (ML) -strong brown (7.5YR 5/6), brown (7.5YR 5/2), some red (2.5YR 4/8), damp, medium stiff to hard, debris, fragments (brick), trace gravel, trace organics (wood pieces)	ML						
5												

Locus

BORING LOG

Honeywell

Site: Dundalk Marine Terminal
Boring No: INC-1501-J
CPT No:

Northing: 573973.3
Easting: 1448062.6
Elevation: 19.9

Driller: A. Chapel (Parratt Wolff, Inc.)
Method: Hollow Stem Auger
Consultant: J. Rogers (CH2M Hill, Inc.)

Total Depth: 27.0 Ft
GW Depth: 0.0 Ft
Date: 06/14/2007

Depth Ft	Recov	Sample ID	DPC	Soil Code	Soil Description	USCS	Comments	W	Gs	PL	LL	P200
5			-		SANDY SILT with GRAVEL (ML) -strong brown (7.5YR 5/6), brown (7.5YR 5/2), some red (2.5YR 4/8), damp, medium stiff to hard, debris, fragments (brick), trace gravel, trace organics (wood pieces)	ML						
			-		POORLY-GRADED SAND with GRAVEL (SP) -gray (10YR 5/1 and 10YR 6/1), damp, (loose), coarse sand, medium sand, some fine to coarse gravel	SP						
					POORLY-GRADED SAND (SP) -light yellowish brown (10YR 6/4) and gray (10YR 6/1), moist, (loose), medium sand	SP						
10												

Locus

BORING LOG Page 3 of 6

Honeywell

Site: Dundalk Marine Terminal
Boring No: INC-1501-J
CPT No:

Northing: 573973.3
Easting: 1448062.6
Elevation: 19.9

Driller: A. Chapel (Parratt Wolff, Inc.)
Method: Hollow Stem Auger
Consultant: J. Rogers (CH2M Hill, Inc.)

Total Depth: 27.0 Ft
GW Depth: 0.0 Ft
Date: 06/14/2007

Depth Ft	Recov	Sample ID	DPC	Soil Code	Soil Description	USCS	Comments	W	Gs	PL	LL	P200
10			-		POORLY-GRADED SAND (SP) -light yellowish brown (10YR 6/4) and gray (10YR 6/1), moist, (loose), medium sand	SP						
					SANDY SILT with GRAVEL (ML) -some gravel, strong brown (7.5YR 5/6), brown (7.5YR 5/2), some red (2.5YR 4/8), damp, medium stiff to hard, debris, fragments (brick), trace organics (wood pieces)	ML						
		[illegible]			WELL-GRADED SAND (SW) -gray (10YR 6/1), olive yellow (2.5YR 6/6), damp, (loose), coarse sand, medium sand, trace fine gravel	SW		9.9				
			-		SILTY CLAY (CL) -red (2.5YR 5/8), medium stiff, damp, medium plasticity	CL	refusal at 12.3' bgs, material hard, difficult to push hammer					
			++	HB	WELL-GRADED SAND with GRAVEL (SW), strong brown (7.5YR 5/8), yellowish red (5YR 5/8), dry, (very dense), moderately to strongly indurated, coarse sand, fine gravel, trace bright yellow nodules	SW						
					No Recovery							
			++	HB	WELL-GRADED SAND with GRAVEL (SW) -strong brown (7.5YR 5/8), yellowish red (5YR 5/8), dry, (very dense), moderately to strongly indurated, coarse sand, fine gravel, trace bright yellow nodules (in shoe), minimal recovery	SW	little recovery, bent macro tube, small portion returned					
					No Recovery							
15												

Locus

BORING LOG Page 4 of 6

Honeywell

Site: Dundalk Marine Terminal
Boring No: INC-1501-J
CPT No:

Northing: 573973.3
Easting: 1448062.6
Elevation: 19.9

Driller: A. Chapel (Parratt Wolff, Inc.)
Method: Hollow Stem Auger
Consultant: J. Rogers (CH2M Hill, Inc.)

Total Depth: 27.0 Ft
GW Depth: 0.0 Ft
Date: 06/14/2007

Depth Ft	Recov	Sample ID	DPC	Soil Code	Soil Description	USCS	Comments	W	Gs	PL	LL	P200
15		INC-1501-J-SOI-150170	++	HB	SILTY SAND (SM) -strong brown (7.5YR 5/8), damp to moist, moderately indurated, coarse sand, some gravel, bright yellow nodules	SM	difficulty retrieving macro samplers	15	2.78			26
		INC-1501-J-SOI-170175		GB	POORLY-GRADED SAND (SP) -very dark gray (7.5YR 3/1), moist, lightly indurated to particulate, fine sand, trace yellow nodules	SP		21	3.10			
				HB	WELL-GRADED SAND with GRAVEL (SW) -contains strong brown (7.5YR 5/8) and very dark gray (7.5YR 3/1) GB COPR, moist, moderately to lightly indurated, medium sand, some coarse sand, some fine sand, trace gravel, some yellow nodules	SW						
			-		FAT CLAY (CH) -red (7.5YR 5/8), damp, hard, medium plasticity	CH						
			-		No Recovery							
20												

Locus

BORING LOG Page 5 of 6 **Honeywell**	Site: Dundalk Marine Terminal Boring No: INC-1501-J CPT No:	Northing: 573973.3 Easting: 1448062.6 Elevation: 19.9	Driller: A. Chapel (Parratt Wolff, Inc.) Method: Hollow Stem Auger Consultant: J. Rogers (CH2M Hill, Inc.)	Total Depth: 27.0 Ft GW Depth: 0.0 Ft Date: 06/14/2007

Depth Ft	Recov	Sample ID	DPC	Soil Code	Soil Description	USCS	Comments	W	Gs	PL	LL	P200
20												
		INC-1501-J-SO-200210			SILTY SAND (SM) -gray (7.5YR 5/1), damp, (loose), medium sand, some find sand, some silt, very low plasticity	SM		11				
			-		POORLY-GRADED GRAVEL (GP) -light gray (7.5YR 7/1), dry, hard, (concrete)	GP						
			-		FAT CLAY (CH) -yellowish red (5YR 5/8), red (2.5YR 5/6), white (2.5YR 8/1), damp, medium stiff, medium to high plasticity, trace organics	CH						
25												

Locus

BORING LOG

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Honeywell

Site: Dundalk Marine Terminal
Boring No: INC-1501-J
CPT No:

Northing: 573973.3
Easting: 1448062.6
Elevation: 19.9

Driller: A. Chapel (Parratt Wolff, Inc.)
Method: Hollow Stem Auger
Consultant: J. Rogers (CH2M Hill, Inc.)

Total Depth: 27.0 Ft
GW Depth: 0.0 Ft
Date: 06/14/2007

Depth Ft	Recov	Sample ID	DPC	Soil Code	Soil Description	USCS	Comments	W	Gs	PL	LL	P200
25					FAT CLAY (CH) -yellowish red (5YR 5/8), red (2.5YR 5/6), white (2.5YR 8/1), damp; medium stiff: medium to high plasticity, trace organics	CH						
27.0					SILTY CLAY (CL) -red (2.5YR 5/6), yellowish red (5YR 5/8), moist, very soft, medium plasticity, trace organics	CL						

Inclinometer installed at this location

Locus

BORING LOG Page 1 of 3

Honeywell

Site: Dundalk Marine Terminal	Northing: 574006.1	Driller: A. Chapel (Parratt Wolff, Inc.)	Total Depth: 24.0 Ft
Boring No: INC-1501-L	Easting: 1448106.9	Method: Hollow Stem Auger	GW Depth: 0.0 Ft
CPT No:	Elevation: 20.3	Consultant: J. Rogers (CH2M Hill, Inc.)	Date: 06/29/2007

Depth Ft	Recov	Sample ID	Blow Count	DPC	Soil Code	Soil Description	USCS	Comments	W	Gs	PL	LL	P200
0						Precut asphalt, gravel pack							
		INC-1501-L-SOI-010020	5-6-6-8	-		WELL-GRADED SAND (SW) -very dark gray (10YR 3/1), dark brown (10YR 3/3), gray (10YR 5/1), moist, medium dense, coarse sand, medium sand, fine gravel, debris throughout (brick)	SW		12				
			5-9-10-11	-		SILTY SAND (SM) -grayish brown (10YR 4/2), dark gray (10YR 4/1), damp, medium dense, very stiff, fine sand, silt, coarse sand, fine gravel	SM						
						No Recovery							
5		INC-1501-L-SOI-040050	4-5-6-6	-		SILTY SAND (SM) -grayish brown (10YR 4/2), dark gray (10YR 4/1), damp, medium dense, very stiff, fine sand, silt, coarse sand, fine gravel	SM		11				
						No Recovery							
			8-11-50/2	-		SILTY SAND (SM) -grayish brown (10YR 4/2), dark gray (10YR 4/1), damp, very dense, very stiff, fine sand, silt, coarse sand, fine gravel, asphalt and concrete in shoe	SM	asphalt and concrete in shoe of spoon					
						No Recovery							
8													

Locus

BORING LOG

Honeywell

Site: Dundalk Marine Terminal
Boring No: INC-1501-L
CPT No:

Northing: 574006.1
Easting: 1448106.9
Elevation: 20.3

Driller: A. Chapel (Parratt Wolff, Inc.)
Method: Hollow Stem Auger
Consultant: J. Rogers (CH2M Hill, Inc.)

Total Depth: 24.0 Ft
GW Depth: 0.0 Ft
Date: 06/29/2007

Depth Ft	Recov	Sample ID	Blow Count	DPC	Soil Code	Soil Description	USCS	Comments	W	Gs	PL	LL	P200
8			25-27/16-17			No Recovery							
10		INC-1501-L-SOI-100110	38-21/15-11	-		WELL-GRADED SAND (SW) -gray (10YR 5/1), damp, dense, medium sand, coarse sand, fine gravel, fine sand	SW		7.3				
						No Recovery							
			50/.2	+	HB	WELL-GRADED SAND (SW) -gray (10YR 5/1), dark yellowish brown 510YR 4/6), lightly indurated, damp, very dense, medium sand, coarse sand, fine gravel, fine sand, mixed with HB COPR	SW						
						No Recovery							
		INC-1501-L-SOI-140150	6-19-50/.2	++	HB	WELL-GRADED SAND (SW) -strong brown (7.5YR 5/6), damp, very dense, particulate coarse sand, medium sand, fine gravel	SW		19	2.68			
15						No Recovery							
16													

Locus

BORING LOG Page 3 of 3 **Honeywell**	Site: Dundalk Marine Terminal Boring No: INC-1501-L CPT No:	Northing: 574006.1 Easting: 1448106.9 Elevation: 20.3	Driller: A. Chapel (Parratt Wolff, Inc.) Method: Hollow Stem Auger Consultant: J. Rogers (CH2M Hill, Inc.)	Total Depth: 24.0 Ft GW Depth: 0.0 Ft Date: 06/29/2007

Depth Ft	Recov	Sample ID	Blow Count	DPC	Soil Code	Soil Description	USCS	Comments	W	Gs	PL	LL	P200
16			50/.2			No Recovery		no penetration, material very hard					
			49-13-9-11	++	HB	WELL-GRADED SAND (SW) -strong brown (7.5YR 5/8), damp, medium dense, particulate, coarse sand, medium sand, fine gravel	SW						
		INC-1501-L-SO-180190			HB	WELL-GRADED SAND (SW) -strong brown (7.5YR 5/8), damp, very dense, particulate, coarse sand, medium sand, fine gravel, mixed with very dark gray (7.5YR 3/1) GB COPR	SW		16				
20				-		SILTY CLAY (CL) -yellowish red (5YR 5/8), reddish yellow (5YR 6/8), damp, very stiff, clay, silt, trace fine sand, low plasticity, DPC reading at approximately 19' +, DPC reading at approximately 19.5' -	CL						
24.0		INC-1501-L-SO-230240							17				

Locus

BORING LOG

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Honeywell

Site: Dundalk Marine Terminal
Boring No: TPZ-50

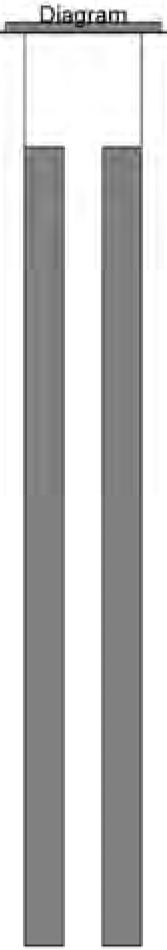
Northing: 574113.3
Easting: 1447974.2
Elevation: 20.381

Driller: Parratt Wolff, Inc.
Method: Hollow Stem Auger
Consultant: CH2M Hill, Inc.
Geologist: Lisa Carter

Total Depth: 22.0 Ft
GW Depth: 12.21 Ft
Date: 02/04/2010

Depth Ft	Rec	DPC	Blow Count	USCS	Soil Code	Stratum Description	Sample Comments
0	■	-				Aphalt and road base	
				SC		Clayey Sand (SC) -dark brown (10 YR 3/3), moist, (medium dense), fine to medium sand, trace fine gravel, (fill)	
5	■	-					
						Asphalt and road base	driller notes refusal
				CL		Lean Clay (CL) -red (2.5 YR 4/6), slightly moist, (very stiff), medium plasticity, trace fine gravel	at 7' move location 10' to the east and start sampling at 5'
				SC		Clayey Sand (SC) -dark yellowish brown (10 YR 4/4), dry (medium dense), fine to medium sand	
						Asphalt and road base	
8							

Well Construction Diagram



BORING LOG

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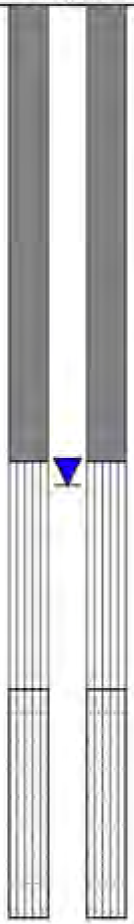
Honeywell

Site: Dundalk Marine Terminal
Boring No: TPZ-50

Northing: 574113.3
Easting: 1447974.2
Elevation: 20.381

Driller: Parratt Wolff, Inc.
Method: Hollow Stem Auger
Consultant: CH2M Hill, Inc.
Geologist: Lisa Carter

Total Depth: 22.0 Ft
GW Depth: 12.21 Ft
Date: 02/04/2010

Depth Ft	Rec	DPC	Blow Count	USCS	Soil Code	Well Construction Diagram	Stratum Description	Sample Comments
8		-					Asphalt and road base	
		-		SC			Clayey Sand with Gravel (SC) -dark yellowish brown (10 YR 4/4), dry, (medium dense), fine to medium sand, some fine angular gravel, (fill)	
10				CL			Lean Clay (CL) -red (2.5 YR 4/6), slightly moist, (very stiff), medium plasticity, little fine sand	
		++		SM	HB		Silty Sand (SM) -reddish yellow (5 YR 6/6), dry, lightly indurated	augered through HB to 15'
▼								synoptic water levels collected 3-11-10
15		++						
16								

▼ Boring GW Depth

Locus

BORING LOG

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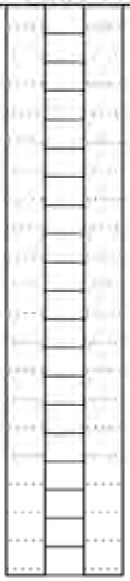
Honeywell

Site: Dundalk Marine Terminal
Boring No: TPZ-50

Northing: 574113.3
Easting: 1447974.2
Elevation: 20.381

Driller: Parratt Wolff, Inc.
Method: Hollow Stem Auger
Consultant: CH2M Hill, Inc.
Geologist: Lisa Carter

Total Depth: 22.0 Ft
GW Depth: 12.21 Ft
Date: 02/04/2010

Depth Ft	Rec	DPC	Blow Count	USCS	Soil Code	Well Construction Diagram	Stratum Description	Sample Comments
16				SM	HB		Silty Sand (SM) -reddish yellow (5 YR 6/6), dry, lightly indurated	
		++		SM	GB		Silty Sand (SM) -black (10 YR 2/1), wet, lightly indurated, medium sand, some yellow nodules	
				SM	HB		Silty Sand (SM) -reddish yellow (5 YR 6/6), dry, lightly indurated	
20		++		SM	GB		Silty Sand (SM) -black (10 YR 2/1), wet, (dense), medium sand with some silt and clay, trace yellow nodules, (fill)	
22.0		+		CL			Lean Clay (CL) -red (2.5 YR 4/6), moist, (stiff), medium plasticity, some fine sand	

Locus

BORING LOG Page 1 of 3

Honeywell

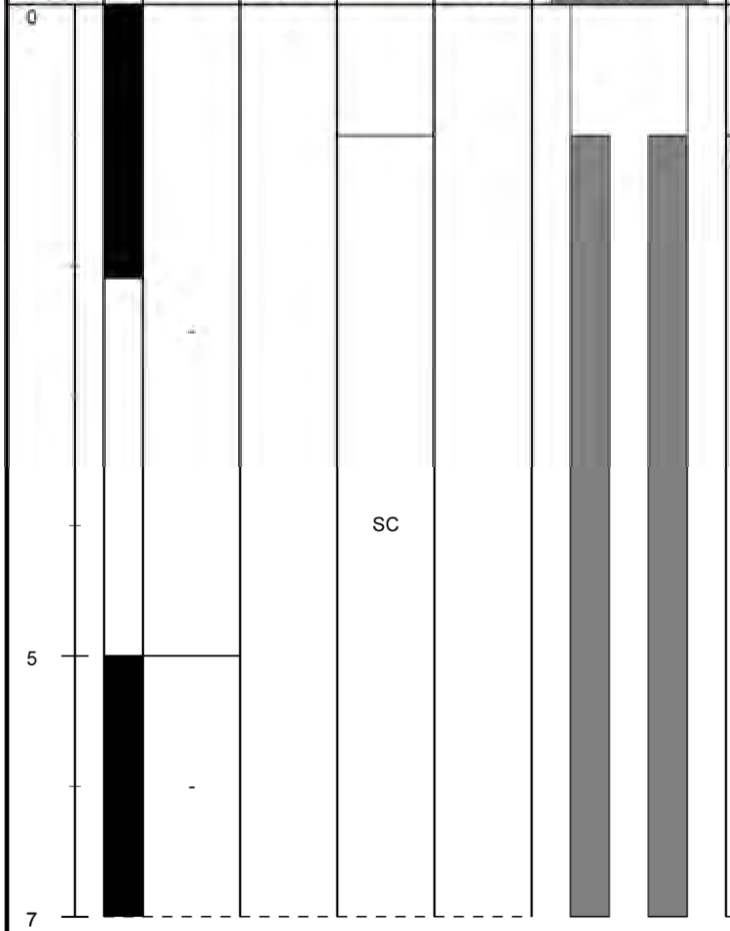
Site: Dundalk Marine Terminal
Boring No: TPZ-56

Northing: 573868.0
Easting: 1448087.7
Elevation: 19.023

Driller: Parratt Wolff, Inc.
Method: Hollow Stem Auger
Consultant: CH2M Hill, Inc.
Geologist: Mary Velasquez

Total Depth: 21.0 Ft
GW Depth: 9.73 Ft
Date: 02/05/2010

Depth Ft	Rec	DPC	Blow Count	USCS	Soil Code	Well Construction Diagram	Stratum Description	Sample Comments



Asphalt and road base

Clayey Sand (SC) -dark brown (10 YR 3/3), moist, fine to coarse angular gravel, (dense), fine to medium sand

Locus

BORING LOG

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Honeywell

Site: Dundalk Marine Terminal
Boring No: TPZ-56

Northing: 573868.0
Easting: 1448087.7
Elevation: 19.023

Driller: Parratt Wolff, Inc.
Method: Hollow Stem Auger
Consultant: CH2M Hill, Inc.
Geologist: Mary Velasquez

Total Depth: 21.0 Ft
GW Depth: 9.73 Ft
Date: 02/05/2010

Depth Ft	Rec	DPC	Blow Count	USCS	Soil Code	Well Construction Diagram	Stratum Description	Sample Comments
7		-		SC			Clayey Sand (SC) -dark brown (10 YR 3/3), moist, fine to coarse angular gravel, (dense), fine to medium sand	
							Aschalt and road base	
10		++		GW-GM		▼	Well Graded Gravel with Silt (GW-GM) -dark brown (10 YR 3/3), (loose), wet, coarse angular gravel >5cm	synoptic water levels collected 3-11-10 DPT refusal at 11.0'
							No Recovery	
		++		SM	HB		Silty Sand (SM) -dark yellowish brown (10 YR 4/6), very moist, yellow nodules, moderately indurated, fine to medium sand	
				CL			Lean Clay (CL) -yellowish red (5 YR 4/6), moist, medium to low plasticity, (very soft)	
14				SM	HB		Silty Sand (SM) -dark yellowish brown (10 YR 4/6), very moist, yellow nodules, moderately indurated, fine to medium sand	refusal at 13.5' with DPT, advanced to 15.0'

▼ Boring GW Depth

Locus

BORING LOG
Page 3 of 3

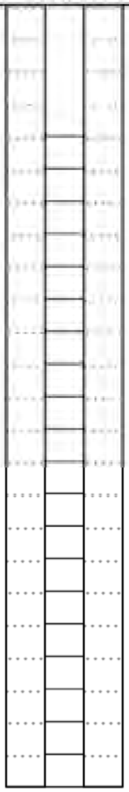
Honeywell

Site: Dundalk Marine Terminal
Boring No: TPZ-56

Northing: 573868.0
Easting: 1448087.7
Elevation: 19.023

Driller: Parratt Wolff, Inc.
Method: Hollow Stem Auger
Consultant: CH2M Hill, Inc.
Geologist: Mary Velasquez

Total Depth: 21.0 Ft
GW Depth: 9.73 Ft
Date: 02/05/2010

Depth Ft	Rec	DPC	Blow Count	USCS	Soil Code	Well Construction Diagram	Stratum Description	Sample Comments
14				SM	HB		Silty Sand (SM) -dark yellowish brown (10 YR 4/6), very moist, yellow nodules, moderately indurated, fine to medium sand	
15		++						refusal at 15.6' with DPT, advanced to 18.0'
				CL			Lean Clay (CL) -dark reddish brown (5 YR 5/2), moist, (stiff), some fine sand, trace fine angular gravel low plasticity	
20				CL			Lean Clay (CL) -mottled strong brown (7.5 YR 5/6) and red (7.5 YR 4/6), moist, medium to low plasticity, (very stiff to hard)	
21.0								

Locus

BORING LOG

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Honeywell

Site: Dundalk Marine Terminal
Boring No: TPZ-61

Northing: 574396.7
Easting: 1449068.1
Elevation: 18.614

Driller: Parratt Wolff, Inc.
Method: Hollow Stem Auger
Consultant: CH2M Hill, Inc.
Geologist: Mary Velasquez

Total Depth: 27.0 Ft
GW Depth: 14.36 Ft
Date: 02/07/2010 - 02/08/201

Depth Ft	Rec	DPC	Blow Count	USCS	Soil Code	Well Construction Diagram	Stratum Description	Sample Comments
0							Asphalt and road base	
				SM			Silty Sand (SM) -yellowish brown (10 YR 5/6) and dark grayish brown (10 YR 4/3), medium to coarse sand, subangular gravel, dry, (dense), slag material at bottom, (fill)	
		+					Clayey Silt with Sand (ML) -mottled yellowish brown (2.5 Y 6/3) and olive yellow (2.5 Y 6/6), no plasticity, dry, some fine sand, (stiff)	
5		++ ++		SM	GB		Silty Sand (SM) -black (2.5 YR 2/1), fine sand, dry, (dense), yellow nodules, particulate	
		-		ML			Clayey Silt (ML) -mottled light yellowish brown (2.5 Y 6/3) and olive yellow (2.5 Y 6/6), (very stiff) no plasticity, fine sand	
				CH			Fat Clay (CH) -light olive brown (2.5 Y 5/4), very moist, high plasticity, trace fine sand, (soft)	
				SM			Silty Sand (SM) -olive brown (2.5 Y 4/5), very moist, fine to medium sand, micaceous, (dense)	
				ML			Clayey Silt (ML) -mottled light yellowish brown (2.5 Y 6/3) and olive yellow (2.5 Y 6/6), (very stiff) moist, fine sand	
9								

Locus

BORING LOG

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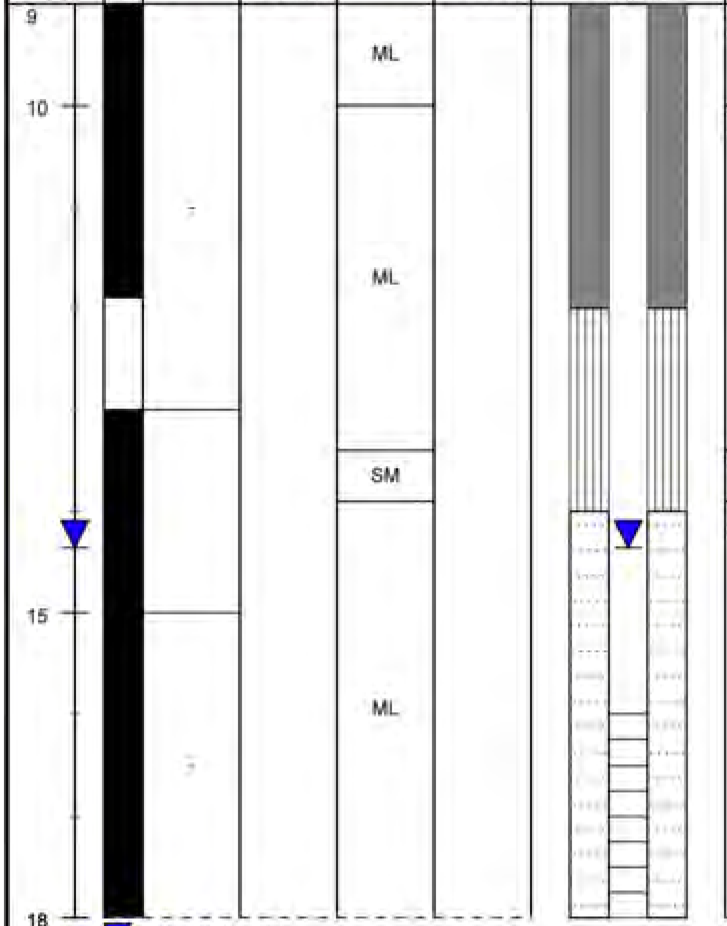
Honeywell

Site: Dundalk Marine Terminal
Boring No: TPZ-61

Northing: 574396.7
Easting: 1449068.1
Elevation: 18.614

Driller: Parratt Wolff, Inc.
Method: Hollow Stem Auger
Consultant: CH2M Hill, Inc.
Geologist: Mary Velasquez

Total Depth: 27.0 Ft
GW Depth: 14.36 Ft
Date: 02/07/2010 - 02/08/201



Depth Ft	Rec	DPC	Blow Count	USCS	Soil Code	Well Construction Diagram	Stratum Description	Sample Comments
9				ML			Clayey Silt (ML) -mottled light yellowish brown (2.5 Y 6/3) and olive yellow (2.5 Y 6/6), (very stiff), moist, fine sand	
10				ML			Sandy Silt (ML) -greenish gray, moist, very fine sand, (soft), micaceous, color changes to light brownish gray (2.5 Y 5/2) at 11.5'	
				SM			Silty Sand (SM) -light yellowish brown (2.5 Y 6/3), wet, medium to coarse sand, (medium dense)	
15				ML			Clayey Silt (ML) -light yellowish brown (2.5 Y 6/3), mottled with strong brown (7.5 YR 5/8), (stiff), medium plasticity	synoptic water levels collected 3-11-10
18								

▼ Boring GW Depth

Locus

BORING LOG

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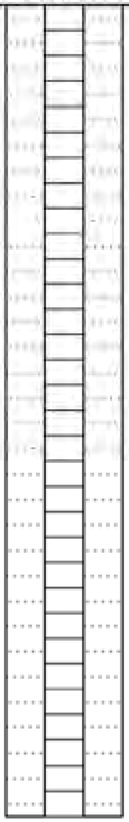
Honeywell

Site: Dundalk Marine Terminal
Boring No: TPZ-61

Northing: 574396.7
Easting: 1449068.1
Elevation: 18.614

Driller: Parratt Wolff, Inc.
Method: Hollow Stem Auger
Consultant: CH2M Hill, Inc.
Geologist: Mary Velasquez

Total Depth: 27.0 Ft
GW Depth: 14.36 Ft
Date: 02/07/2010 - 02/08/201

Depth Ft	Rec	DPC	Blow Count	USCS	Soil Code	Well Construction Diagram	Stratum Description	Sample Comments
18		-		ML			Clayey Silt (ML) -light yellowish brown (2.5 Y 6/3), mottled with strong brown (7.5 YR 5/8), (stiff), medium plasticity	
20		-		SP			Poorly Graded Sand (SP) -brownish yellow (10 YR 6/6), wet, (loose), fine to medium sand	wet at 19.5'
25				SC			Clayey Sand (SC) -light yellowish brown (10 YR 6/4) and gray (10 YR 6/1), fine sand	
27.0				ML			Clayey Silt (ML) -dark gray (2.5 Y 4/1), very moist, (soft), very fine sand	

Locus

BORING LOG

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CH2MHILL

Site: Dundalk Marine Terminal
Boring No: TPZ-63

Northing: 573885.724
Easting: 1448089.232
Elevation: 17.56

Driller: Parratt Wolff, Inc.
Method: Direct Push
Consultant: CH2M Hill
Geologist: J. Myers

Total Depth: 9.95 Ft
Start Date: 07/13/2011

Depth Ft	Rec	DPC	PID	USCS	Soil Code	Stratum Description
0						Asphalt and road base.
		-	0			CLAYEY SAND with GRAVEL (SC), brown (10YR 4/3), moist, with fine to coarse gravel, (very dense), fill.
				SC		
5		-	0			
						Asphalt and slag.
						Sand road base.
				CL		CLAY (CL), red (2.5YR 4/8), moist, with little medium to fine sand, (very stiff).
9.5						

BORING LOG

Page 1 of 1

CH2MHILL

Site: Dundalk Marine Terminal
Boring No: TPZ-65

Northing: 574223.837
Easting: 1448330.152
Elevation: 21.221

Driller: Parratt Wolff, Inc.
Method: Direct Push
Consultant: CH2M Hill
Geologist: J. Myers

Total Depth: 7.5 Ft
Start Date: 07/13/2011

Depth Ft	Rec	DPC	PID	USCS	Soil Code	Stratum Description
0		-	0			Asphalt and gravel road base.
				SC		CLAYEY SAND with GRAVEL (SC), dark grayish brown (10YR 4/2), moist, with some coarse gravel, (dense), fill.
5		-	0			
				SC		CLAYEY SAND with GRAVEL (SC), dark grayish brown (10YR 4/2), wet, with some coarse gravel, (dense), fill.
7.5						Asphalt

BORING LOG

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CH2MHILL

Site: Dundalk Marine Terminal
Boring No: TPZ-66

Northing: 573996.017
Easting: 1448449.78
Elevation: 19.644

Driller: Parratt Wolff, Inc.
Method: Direct Push
Consultant: CH2M Hill
Geologist: J. Myers

Total Depth: 8.0 Ft
Start Date: 07/12/2011

Depth Ft	Rec	DPC	PID	USCS	Soil Code	Stratum Description
0						Asphalt.
						Gravel road base.
		-	0	SC		CLAYEY SAND and GRAVEL (SC), brown (10YR 4/3), moist, with brick fragments, (dense), fill.
5		-	0			
						Gravel and asphalt.
8.0						Slag fill.

BORING LOG Page 1 of 1 CH2MHILL	Site: Dundalk Marine Terminal Boring No: TPZ-68

Northing: 573943.39 Easting: 1448293.727 Elevation: 18.863	Driller: Parratt Wolff, Inc. Method: Hollow Stem Auger Consultant: CH2M Hill Geologist: C. Reed / C. Houck	Total Depth: 8.0 Ft Start Date: 07/22/2011

Depth Ft	Rec	DPC	PID	USCS	Soil Code	Stratum Description
0						Not logged.
5	■	- -		SP-SC		POORLY GRADED SAND with CLAY and GRAVEL (SP-SC), dark yellow brown (10YR 3/4), dry, fine to medium sand with little angular fine gravel, (dense).
8.0				CL		LEAN CLAY (CL), red (2.5YR 4/8), dry to moist, trace fine sand, (stiff).

Appendix B

Sediment and Pore Water Monitoring Work Plan

Dundalk Marine Terminal, Baltimore, Maryland

Sediment and Pore Water Monitoring Work Plan

September 2022

Honeywell
Maryland Port Administration

Prepared by

Jacobs
Ramboll

Contents

Tables

Figures

Acronyms and Abbreviations

AVS	acid volatile sulfides
COC	chain of custody
Cr(III)	trivalent chromium
Cr(VI)	hexavalent chromium
DMT	Dundalk Marine Terminal
DO	dissolved oxygen
DOC	dissolved organic content
Eh	reduction-oxidation potential
EqP	Equilibrium partitioning
ESB	equilibrium partitioning sediment benchmark
Fe(II)	Ferrous iron
GPS	global positioning system
MDE	Maryland Department of the Environment
MS/MSD	matrix spike/matrix spike duplicate
ORP	oxidation-reduction potential
QA/QC	Quality assurance/quality control
QAPP	quality assurance project plan
TOC	organic content
USEPA	U.S. Environmental Protection Agency

1. Monitoring of Sediment Reducing Conditions

1.1 Introduction

The objective of the monitoring described in this section is to "*confirm sediment reducing conditions*" in the Patapsco River adjacent to DMT, in accordance with the components of CMAA Alternative 3 (CH2M Hill 2011). The scope and methods for this monitoring program are based on the results of work completed at DMT in 2007 and 2008 (CH2M Hill and ENVIRON 2007abc; 2008ab, 2009). The confirmation of reducing conditions will be determined based on the assessment of sediment and sediment pore water geochemical conditions in areas previously identified groundwater upwelling areas adjacent to the DMT site. As specified in the CMAA, this monitoring will be conducted at 5-year intervals following MDE approval of this plan.

Confirmation of reducing sediment conditions at DMT in areas where groundwater upwelling is known to occur will indicate that chromium is present as Cr(III) because Cr(VI) cannot persist in reducing conditions. In addition, confirmation of reducing conditions will indicate that if Cr(VI) migration toward the river does occur, the Cr(VI) would be reduced to Cr(III) within the sediment column prior to discharge to the river, ensuring that the reduction of Cr(VI) reduction to Cr(III) does not occur in the river. Confirmation of sediment reducing conditions will be based on the geochemical parameters described in this section.

The reminder of this section provides the following:

- Section 1.2 identifies sampling locations and proposed sampling season based on previous geochemical results for DMT.
- Section 1.3 provides an overview of the geochemical parameters that will be monitored for DMT.
- Section 1.4 summarizes the sediment/pore water sample collection approaches, sample nomenclature, quality assurance/quality controls, and laboratory handling procedures.
- Section 1.5 provides the data evaluation approach.

1.2 Sample Locations and Proposed Winter Sampling Season

Twenty-four sediment and twenty-four pore water sample locations will be sampled for the CMAA monitoring to confirm reducing conditions in sediment, as indicated on Figure 1-1, Figure 1-2, and Table 1-1. These sample locations are a subset of those previously sampled (CH2M Hill and ENVIRON, 2007a; 2009).

Figure 1-1. Proposed Sediment and Pore Water Locations

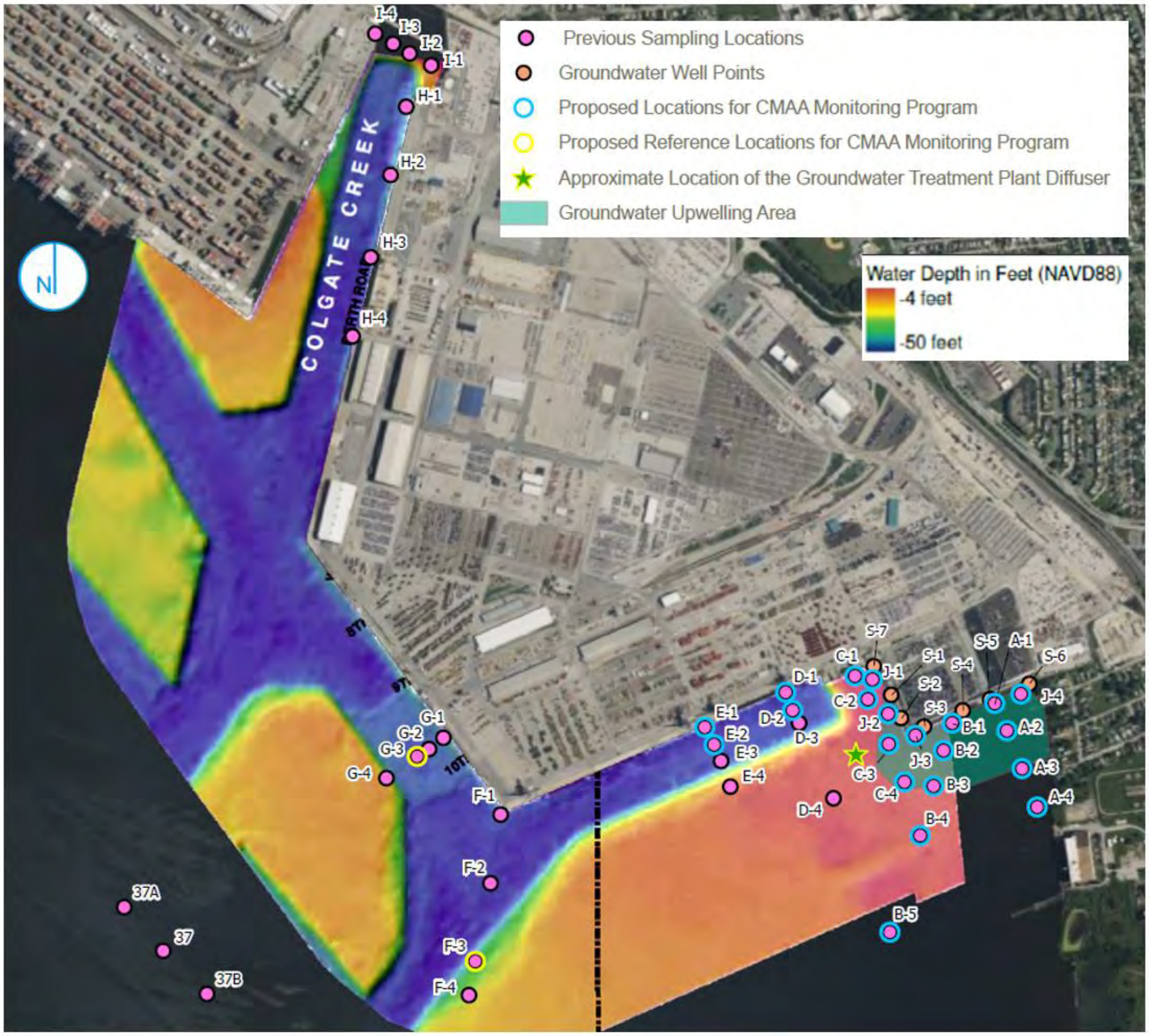
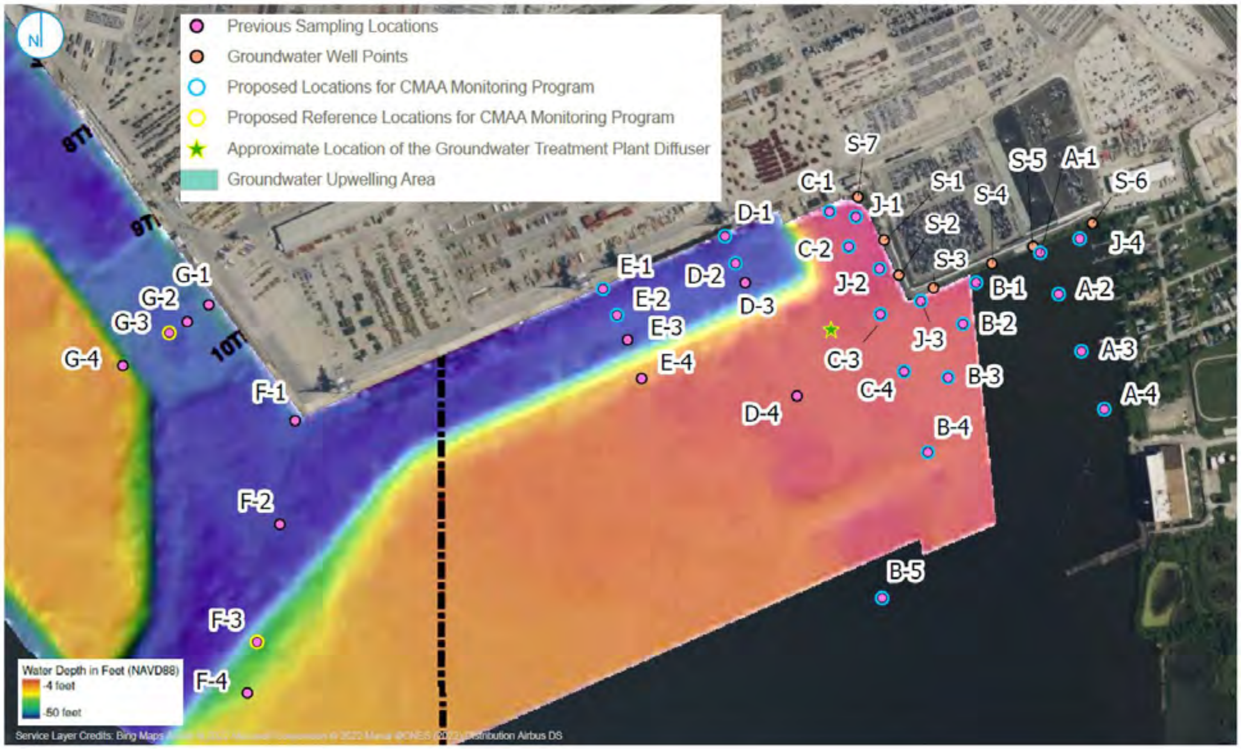


Figure 1-2. Zoom View of Proposed Sediment and Pore Water Locations



Service Layer Credits: Bing Maps [illegible] © 2022 Maxar ©CNES (2022) Distribution Airbus DS

Table 1-1. Total Number of Proposed Sample Location by Transect

Transect	Surface Sediment	Pore Water
Within or Adjacent to Groundwater Upwelling		
A	4	4
B	4	4
C	4	4
J	4	4
Adjacent to the Bulkhead		
D	2	2
E	2	2
References Samples		
F	1	1
G	1	1
Total	24	24

The sample locations focus on sampling locations within and adjacent to the groundwater upwelling area and adjacent to the bulkhead, as follows:

- Transects A, B, C, and J are clustered near the southeast end of DMT within and adjacent to the area where prior investigations identified groundwater upwelling and in the area of the 14th and 15th

Street outfalls.. Four locations will be sampled on each transect. Note that the groundwater treatment plant discharge via submerged diffuser T is adjacent to Transect C, location C-3 (Figure 1-2).

- Transects D and E are adjacent to the bulkhead, placed at smaller stormwater outfalls. The two locations closet to the terminal will be sampled.
- Transects F and G will serve as reference area conditions for geochemical parameters. The previous sampling results showed low chromium concentrations and there are no outfalls in the vicinity of these transects. In addition, the results from Transects F and G were similar to the geochemical parameter results from the previous reference areas 37A, 37B, and 37C from the deeper river channel (illustrated on Figure 1-1). This sampling will include reference location information to provide insight into the reducing conditions that would be expected to occur in areas unimpacted by groundwater upwelling to aid in the interpretation of results within areas of potential groundwater upwelling.

The CMAA monitoring of geochemical parameters will be conducted in winter timeframe because the previous investigation of sediment and pore water demonstrated that winter conditions tend to be less favorable for geochemical conditions compared to warmer seasons (CH2M Hill and ENVIRON, 2009).

1.3 Geochemical Parameters and Analytical Methods

The geochemical parameters that will be monitored and the rationale for monitoring these parameters are listed in Table 1-2 and are consistent with the previous study of sediment conditions at DMT (CH2M Hill and ENVIRON, 2009). The basis of these parameters is discussed further in the data evaluation approach, Section 1.5.

Table 1-2. Geochemical Parameters to be Measured and Analytical Methods

Parameter	Surface Sediment	Pore Water
Acid volatilized sulfides (AVS)	EPA Method 821-R-91-100	NA
Total Sulfides	Prep: EPA 9030B (acid soluble fraction only); Analyses: EPA 9034	NA
Ferrous iron (Fe(II))	Prep: Extraction 1 g:100 mL with pH 2 (HCl) DI water—5 minutes—lab to take initial and final pH; Analyses: Standard Method 3500-D	Analyses: Standard Method SM-3500-D
Total organic carbon (TOC)	Prep and analyses: EPA 9060M	NA
DOC	NA	Prep and analyses: EPA 9060A
Dissolved oxygen (DO)	NA	Laboratory confirmation or field monitoring, as appropriate (a)
Oxidation-reduction potential (ORP)	Field monitoring	Laboratory confirmation or field monitoring, as appropriate (a)
Eh/pH, salinity	Field monitoring	Field monitoring
pH	Field monitoring	Field monitoring

Table 1-2. Geochemical Parameters to be Measured and Analytical Methods

Parameter	Surface Sediment	Pore Water
Salinity		Field monitoring
Hardness	NA	SM 2340-C

NA: Not applicable

(a) field monitoring only if pore water is collected by direct push sampling instead of centrifugation

1.4 Sampling Procedures

This section provides the procedures for assigning sample collection (sediment and sediment pore water), sample nomenclature, quality assurance/quality control (QA/QC), and laboratory handling.

1.4.1 Sample Collection and Shipping Procedures

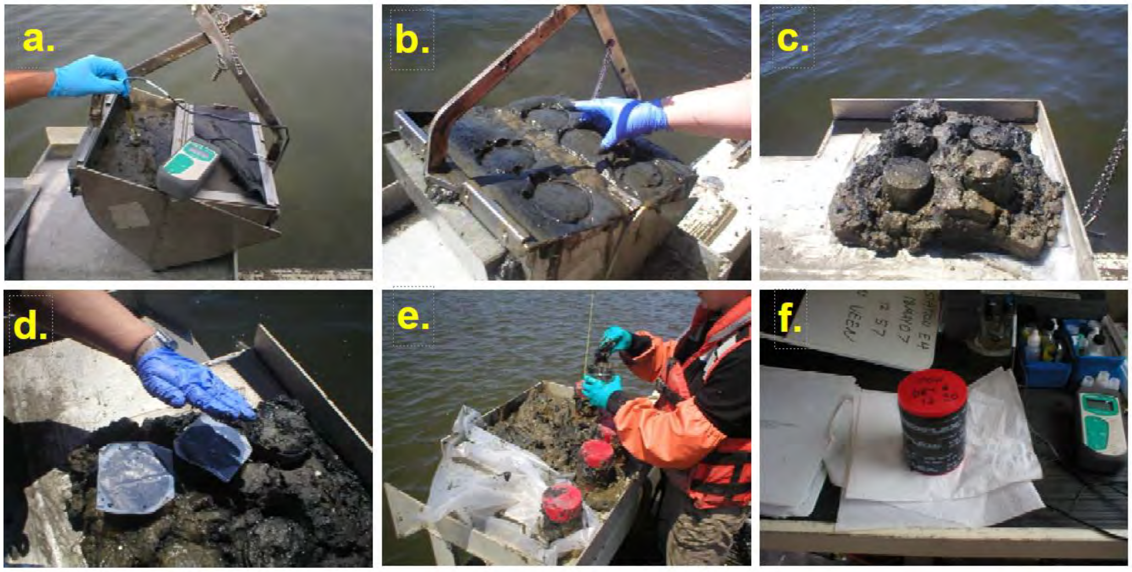
All samples will be shipped to a designated laboratory for analysis. Sample shipment shall be controlled by sample chain of custody (COC) forms. Each transect will be surveyed using global positioning system (GPS) and target coordinates established from past sampling efforts at DMT.

1.4.2 Surface Sediment Samples

Sample Collection Method

The surface sediment interval that will be sampled is the upper 6 inches of the sediment column at each location. A sampling vessel will be used to collect surface sediment samples. Surficial sediment samples will be collected from a grab sampler or box core concurrently with pore water sampling, as illustrated in Figure 1-3.

Figure 1-3. Sediment Collection Methods



Sediment sampling collection, as illustrated in Figure 1-3:

a) A sediment box core or grab sample will be collected by field staff wearing clean nitrile gloves by lowering the collection unit into the sediment on one or more occasions to get intact samples.

  - Date, time, and weather conditions will be recorded by the sampling crew in the field book.

  - The choice of box core or grab sampler will be based on the most efficient method available for collecting an intact sample based on conditions observed at the time of sampling.

  - A sediment box corer or grab sampler is a sediment sampling device that is lowered vertically to the seabed. Weights will be used to force the stainless steel sampling device (box or grab sampler) into the sediment. The core sample size is controlled by the speed at which the corer is lowered into the substrate. Firmer substrates require a higher speed to obtain a complete sample.

  - Once the core box or grab sampler has penetrated and is filled with sediment, the sample is secured by a spade that cuts across the sediment (box core) or the closure of the sediment grab sampler to secure the sample.

  - The box spade (or grab sampler closure flap) prevents sample loss during retrieval and limits disturbance of the sediments collected.

  - Sediments will be placed on a wash down table.

  - Field measurements of reduction oxidation potential (Eh), pH, and oxidation-reduction potential (ORP) will be performed on each box core or grab sample using field sampling equipment such as an Oakton Acorn pH/mV/ORP meters; one with a double juncture pH probe, and the other with an ORP platinum band electrode for Eh readings.

b) Pre-cut and decontaminated Lexan tubes will be pushed into the sample by the field team.

  - Samples will not be homogenized to maintain the natural geochemical conditions to the extent possible.

  - This method will be used to collect samples for bulk sediment analyses and for pore water analyses.

c) Sediment and tubes will be carefully deposited on the boat wash down table, with the Lexan tubes in place for the remainder of handling.

  - Water within the box core/grab sampler will be collected using turkey baster and will be added back to the sample to eliminate head space, as needed.

d) Each end of each tube will be covered with a Teflon sheet to minimize sediment contact with air in the head space within the sample container.

  - Sediment/water from the turkey baster collected from the sediment sample will be added to the Lexan tubes to top off the sediment in any tube to limit headspace.

e) Each end of each tube will be capped after the Teflon sheet is in place.

f) Each tube will be cleaned, labeled (if not pre-labeled), and sealed with tape for shipment to the laboratory.

  - Sealing of the tubes will be done using duct tape or other similar tape that will prevent leakage of water out of the sediment and prevent air intrusion into the samples (i.e., to maintain the geochemical conditions).

  - The top of each tube will be identified, and samples will be maintained in an upright position for all handling and shipping activities.

  - Sufficient sediment volume will be collected for both sediment (approximately 16 ounces of sediment for bulk sediment analyses) and approximately 3 liters of sediment for sediment pore water samples (pore water handling is discussed further in Section 1.4.3). Prior to sampling, the laboratory will be consulted to confirm sample volume preferred by the laboratory for centrifugation.

  - Collected samples will be processed and shipped to offsite laboratories. When transported to shore for processing, they will be kept vertical to prevent mixing the unconsolidated surficial sediments.

  - All sediment tubes will be transferred to pre-cleaned plastic bags and transported on ice to the laboratory using a COC protocol.

The following equipment or equivalent will also be used for collecting sediment samples:

- Field book/sampling log/ GPS Unit
- Polycarbonate (Lexan®) tubes and caps
- Pipe wrap, Teflon tape, and duct tape
- Box corer or grab sampler
- Ziploc bags and Indelible markers
- Nitrile or latex gloves
- Cooler, ice, tape, COC forms and shipping labels
- Plastic spoons and scoops (if needed to ensure no headspace in Lexan tube liners)
- Turkey baster (to add water from sediment sample to eliminate headspace in Lexan tub liners)

1.4.3 Pore Water Collection

At least 3.0 L of sample volume of sediment will be collected at each station using polycarbonate (Lexan®) tubes as sample containers, as was described in Section 1.4.2 for surface sediment. Pore water will be extracted from sediment at the analytical laboratory using a centrifugation approach, which was used in the 2007/2008 sampling program and by MDE in the collection of pore water as part of the Water Quality Analyses of Chromium in the Inner Harbor/Northwest Branch and Bear Creek (MDE, 2004).

Efforts will be made to collect pore water samples using the box core or grab sampling approach. However, during past sampling at DMT, some of the locations in Transects A, B, C, and J were sandy and obtaining sufficient pore water volume using the box or grab core approach was challenging. Therefore, if sediments drain rapidly and it is suspected that sufficient pore water volume cannot be obtained using the box or grab sampling approach, pore water sample will be collected using a direct push method from a depth of approximately 0.6 inches to 1 foot below sediment surface using a probe flange to avoid the collection of surface water instead of sediment pore water. If a direct push probe is used, the following collection techniques will be considered:

- Pore water collected by direct push probe will be collected within an anaerobic handling bag to ensure maintenance of the geochemical conditions.
  - Clean samples containers from the laboratory will be filled and sealed within an anaerobic bag.

  - Prior to sealing samples, field measurements of Eh, pH, and in pore water sample will be measured using field sampling equipment such as an Oakton Acorn pH/mV/ORP meters; one with a double juncture pH probe, and the other with an ORP platinum band electrode for Eh readings. This will be also done within the anaerobic handling bag.
  - Once the containers are sealed, they will be removed from the bag and final labels will be added and samples will be secured for shipment to the laboratory under COC protocols similar to those used for bulk sediment samples identified for centrifugation.
  - Sample collection technique (i.e., direct push probe) will be recorded in the field notes and in the sample nomenclature. Sample containers/volumes will be those identified for each analysis and preservation as indicated in Table 1-3.

Table 1-3. Pore Water Containers/Volumes for Direct Push Samples (If Any)

Method	Containers / Volumes
Fe(II): Standard Method SM-3500-D	0.5 Liter Glass
DOC: EPA 9060A and Hardness: SM20-2340-C	1 Liter Glass

1.4.4 Sample Nomenclature

A systematic nomenclature will be used to identify samples collected during the sampling program. Samples will be identified and labeled with a code identifying media, sample station number, and sample depth, in the following order: medium type, station, sample type, and sample depth.

- Medium will be represented by a two-letter code:
  - BS—bulk sediment
  - PW—pore water
- Station locations will be identified with a two-number code following medium type. Stations will run sequentially, beginning with 01 (e.g., BS-01).
- Pore water samples will be further differentiated by a sample type code after the location code:
- PW-xx-CEN—pore water collected from sediment via centrifuge
- PW-xx-DP—pore water collected with direct push probe, such as a Trident probe
- Sample depth will be identified with a four-number code indicating depth in feet, with all sediment samples labeled as 0005 reflecting the surface sediment interval (i.e., 0.0 to 0.5 feet below sediment surface).

1.4.5 Quality Assurance and Quality Control

The quality assurance/quality control samples will be collected in accordance with the DMT Quality Assurance Project Plan (QAPP). Specifically:

- All non-dedicated sampling equipment will be decontaminated before and between uses, as described in the QAPP.
- Dedicated sampling equipment designed for a single use and delivered from the supplier pre-cleaned, will not be decontaminated in the field before use.

- Sample duplicates will be collected at a frequency of 10% and matrix spike/matrix spike duplicates will be collected at a frequency of 20%.
- Samples will be validated in accordance with the QAPP.

1.4.6 Laboratory Handling

Sediment Handling for Sediment Analyses

The purpose of this sampling is to confirm sediment reducing conditions. Therefore, the handling of sediments in the laboratory must also maintain geochemical conditions to the extent possible. For sediment handling, arrangements will be made with the laboratory in advance to ensure that geochemical conditions are maintained to the extent possible, such as:

- The top of each tube will be identified, and samples will be maintained in an upright position for all handling and shipping to the laboratory.
- The COC(s) will indicate that samples are to be maintained in upright position in the laboratory and that sediments are to be extracted from the top of the container for obtaining samples for sediment analyses.
- The laboratory will be requested to obtain sediment aliquots planned for sediment analyses via handling of tubes in anaerobic conditions until immediately before preparation/analyses.

Sediment Handling for Pore Water Centrifugation and Pore Water Analyses

Pore water will be collected by sediment centrifugation unless collected by direct push, as discussed above. Sediment handling for pore water analysis will be arranged with the laboratory, such as:

- Sediment will be transferred from the Lexan tubes to centrifugation containers in anaerobic handling conditions (bag or box, as available from the laboratory).
- Pore water will be extracted from the sample containers using a centrifuge operated at a maximum of 10,000 g for up to 30 minutes.
- Pore water will be extracted from the centrifugation tubes for analysis under anaerobic conditions and will be maintained in containers with no head space until immediately before preparation/analyses.
- Eh, pH, and ORP in each pore water sample will be measured using equipment such as an Oakton Acorn pH/mV/ORP meters or other similar equipment used by the analytical laboratory.
- Samples will not be filtered prior to analysis.

1.5 Data Evaluation Approach

The geochemical parameters, the rationale for each parameter, and the evaluation criteria are identified in Table 1-4. These parameters and evaluation criteria are consistent with regulatory guidance and scientific literature, cited by MDE in the Water Quality Analysis of Chromium in Northwest Branch and Bear Creek Portions of the Patapsco River (2013). MDE stated:

> “Chromium present within the aquatic environment (water column or sediment) exists in two oxidation states, trivalent (Cr(III)) or hexavalent (Cr(VI)). The distinction between these two oxidation states is significant due to the toxicity associated with each species; Cr(III) is relatively non-toxic at levels typically found within the environment and Cr(VI) is highly toxic. Reduction/oxidation (Redox) conditions within the water column or sediment govern the speciation of chromium. Within Northwest Branch and Bear Creek, low levels of dissolved oxygen (DO) in the water column and elevated levels of biologically oxygen demanding (BOD) substances, produce anoxic conditions within the sediment supporting a

> reducing environment. Reductants present within the sediment (total organic carbon (TOC), acid volatile sulfides (AVS), and divalent iron (Fe (II))) facilitate the conversion of Cr(VI) to Cr(III). Cr(III) exhibits low solubility and will undergo reactions to form stable oxides/hydroxides resulting in partitioning from pore water to sediment. As Cr(III) is not present in the pore water at elevated levels under these conditions, it is no longer bioavailable to sediment dwelling organisms through the mechanisms of respiration and dermal absorption. Therefore, chromium remains bound in the sediment in its trivalent state and has no toxicological impact on benthic life."

Consideration of geochemical parameters is consistent with USEPA's efforts related to understanding chromium in aquatic environments are summarized in the 2005 Equilibrium Partitioning (EqP) Guidance for Metals Mixtures, Appendix D Chromium (USEPA, 2005; Berry et al., 2002, Boothman et al., 2000;). The sediment and pore water sampling design presented herein is consistent with the USEPA EqP approach. USEPA states that geochemical processes govern the reduction of Cr(VI) to Cr(III) in aquatic environments, and geochemical processes are critical to the attenuation of chromium in sediments, including AVS, ferrous iron, and organic carbon.

Scientific literature support the use of geochemical parameters as well. Specifically, studies show that Cr(III) is relatively insoluble at environmentally relevant pH, due to the formation of insoluble hydroxide and oxide compounds by strong complexation with sediment minerals and organic ligands (Sass and Rai, 1987; Fendorf and Zasoski, 1992; James, 2002). Studies also show that anaerobic sediments with sulfides, ferrous iron, and organic matter facilitate rapid reduction of Cr(VI) to Cr(III) (Hansel et al., 2003; James, 2002).

The evaluation approach identified in Table 1-4 is considered appropriate for the confirmation of reducing conditions in sediment. Past conditions at DMT have confirmed the presence of reducing conditions in sediment and sediment pore water (CH2M Hill and ENVIRON, 2009).

Table 1-4. Approach To Evaluate Sediment Reducing Conditions from Measured Geochemical Parameters

Physical Parameter	Rationale for Monitoring	Evaluation Criteria
AVS and sulfide	AVS and sulfide will be measured in sediment because thse conditions demonstrate reducing conditions (USEPA, 2005; MDE, 2013; DiToro et al. 2005; Berry et al. 2002; Boothman et al. 2000).	The presence of AVS or presence of sulfide will confirm reducing conditions.
Fe(II)	Fe(II) will be measured in sediment and pore water. Under reducing conditions iron is present in the form of Fe(II); under oxidizing conditions Fe(III) will dominate (USEPA, 2005; MDE, 2013; DiToro et al. 2005).	Presence of Fe(II) will confirm reducing conditions.
DO	DO will be measured in pore water. Reducing conditions are indicated by anaerobic sediments (i.e., in the absence of DO). DO varies with temperature and season (Stanin, 2005; Eary and Rai, 1987; USGS, 2018).	DO less than 3 mg/L will reflect reducing conditions because sampling is planned during winter conditions.
ORP	ORP is a direct measure of oxidation reduction potential. Redox zones of sediments can fall into three classes: the aerobic (oxygen reduction), the suboxic (nitrate and iron reduction), and the anoxic (sulfate reduction and methanogenesis) (Zhang et al., 2014; Di Toro et al., 2005).	Aerobic conditions: ORP>1 Reducing conditions: ORP<1

Table 1-4. Approach To Evaluate Sediment Reducing Conditions from Measured Geochemical Parameters

Physical Parameter	Rationale for Monitoring	Evaluation Criteria
Eh, pH, hardness, and salinity	Eh/pH, and salinity provide insight about the water quality relative to groundwater conditions and reference area conditions.	These parameters will be used in conjunction with other parameters to evaluate water quality compared to reference locations.
TOC and DOC	TOC and DOC will be measured in sediment and pore water, respectively. Organic ligands can also serve as reducing agents, although the reduction kinetics are slower than for AVS or Fe(II) (USEPA, 2005; Eisler, 1986).	Detected TOC and DOC will be used in addition to AVS, Sulfide, and Fe(II) to indicate reducing conditions.

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Appendix C
Groundwater Action Levels

Technical Appendix C
PERFORMANCE MANAGEMENT PROGRAM SENTINEL GROUNDWATER MONITORING PLAN

DUNDALK MARINE TERMINAL
BALTIMORE, MARYLAND

Prepared for

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March 2023

Joint Defense Privileged

Contents

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Acronyms and Abbreviations

Cr (VI)	hexavalent chromium; the more toxic form of chromium
COPR	chromium ore processing residue
DF	dilution factor
DMT	Dundalk Marine Terminal
gpm	gallons per minute
MCL	maximum contaminant level
MDE	Maryland Department of the Environment
mg/L	milligrams per liter
PSU	practical salinity units
SWQS	surface water quality standard
ug/L	micrograms/liter
USEPA	United States Environmental Protection Agency

1. Introduction

As part of the Sentinel Groundwater Monitoring Plan for the Dundalk Marine Terminal (DMT) site (**Figure 1**), risk-based action levels have been developed for assessing the potential significance of measured chromium concentrations in groundwater. As the sentinel monitoring plan defines initial threshold conditions for follow-up assessment (e.g., initiating an assessment when hexavalent chromium is initially detected in a well where it has not been previously or recently detected), the action levels developed in this technical appendix are intended to provide an early warning of off-site migration beyond the property boundaries, potentially significant surface water impacts in the Patapsco River or vertical migration of groundwater impacted by chromium from the shallow fill hydrogeologic unit to the Patapsco Aquifer. This appendix describes the methods used to calculate the groundwater action levels and how the action levels will be applied to the evaluation of groundwater data collected as part of the sentinel monitoring program. The action levels are intentionally conservative and provide a threshold to trigger an investigation of potential impacts beyond the boundaries of the property, to the Patapsco River or Patapsco Aquifer rather than an indication of actual impacts.

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Figure 1. Dundalk Marine Terminal Site

2. Background

Shallow groundwater in some portions of the DMT site contains chromium as a result of the use of chromium ore processing residue (COPR) as fill material, both by itself and mixed with other fill materials. The approximate boundary of COPR-containing materials is shown on **Figure 1**. As stated in the Semiannual Groundwater Monitoring Report (Jacobs, 2021), the chromium impacts are limited to the COPR and Non-COPR Fill and Shallow Fill unit and the Upper Saturated Zone (collectively referred to as the “Upper Water Bearing Unit”, or “UWB Unit”), which is hydraulically connected to the Patapsco River and is underlain by the Upper Confining unit. Below the Upper Confining unit is the Upper Sand unit, the Lower Confining unit, and then the Patapsco Aquifer (**Figure 2**). Monitoring wells in the UWB Unit will be used to monitor for lateral migration, and monitoring wells in the Upper Sand unit will be used to monitored for vertical migration of chromium.

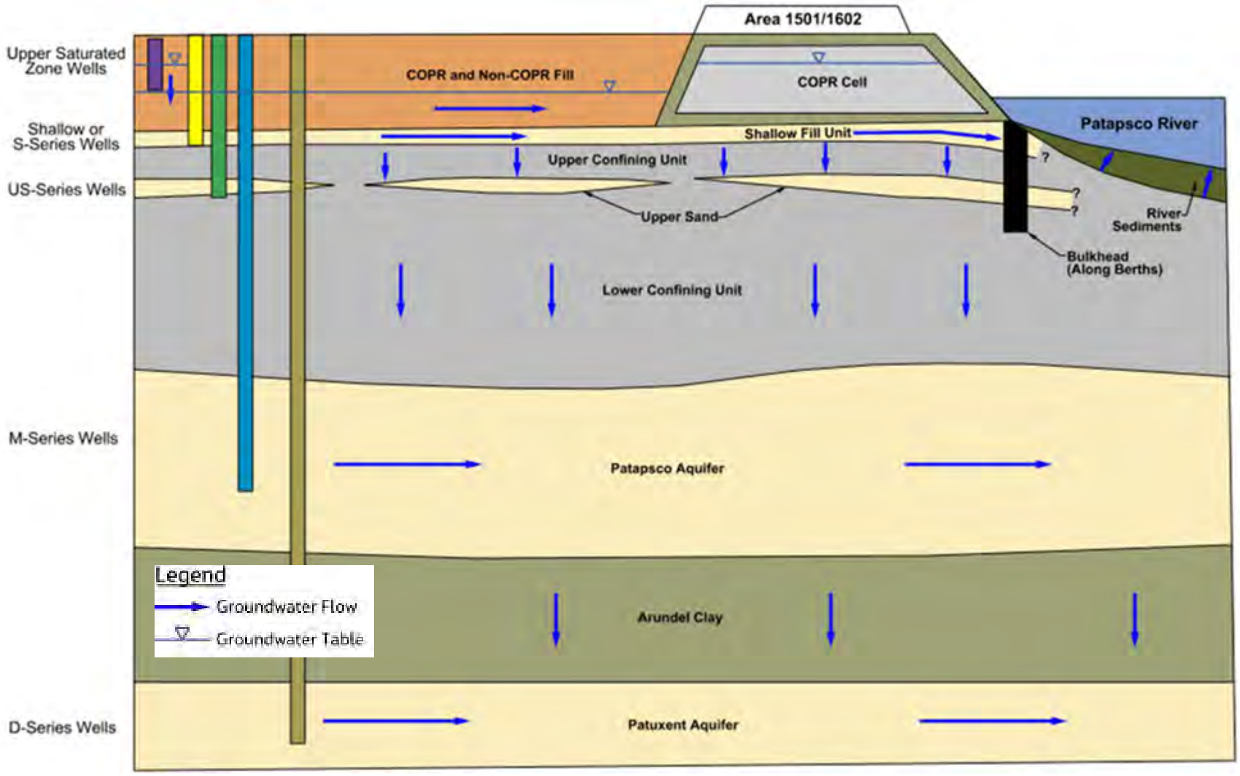

Figure 2. Geology of the DMT Site

For evaluating groundwater monitoring data for lateral migration within the UWB Unit, the site was divided into two zones, as shown by arrows in **Figure 3**. Zone 1 wells are outside the footprint of the COPR fill limit within the portion of DMT that is contained within the perimeter bulkhead, which reduces the potential for groundwater discharges to the river. Zone 2 wells are in areas where groundwater may discharge to the Patapsco River from the Site. Zone 2 is defined as the discharge area between the site bulkhead and the COPR Cell, under the COPR cell, and around the southeast side of the COPR Cell (between COPR Cell at Area 1501/1602 and Broening Highway).

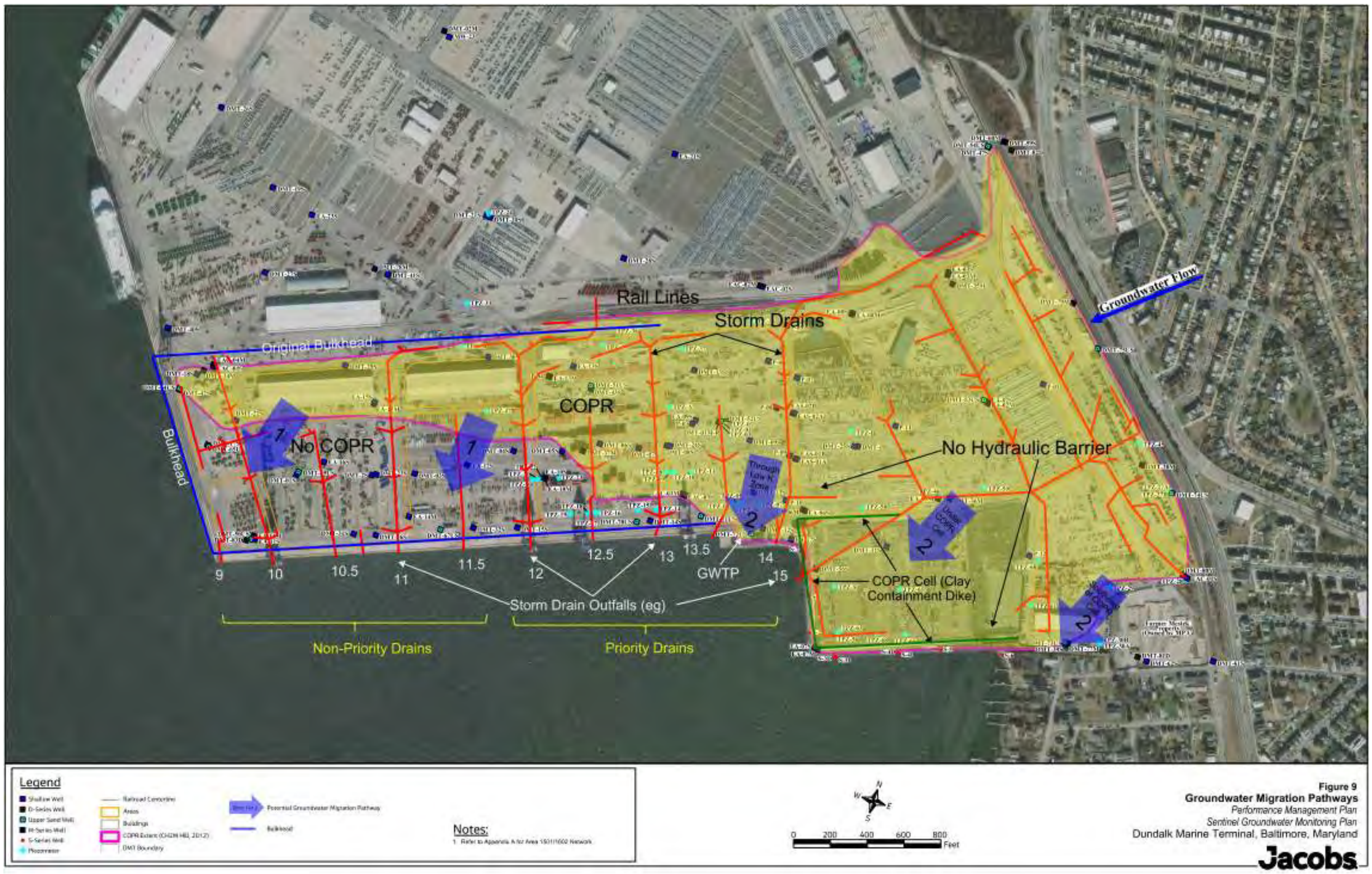

Figure 3. Groundwater Zones

The potential for significant vertical migration of chromium mass from the UWB Unit to the Patapsco Aquifer is to be evaluated based on a site-wide assessment of chromium concentrations using data from wells screened in the Upper Sand Unit.

3. Lateral Migration

3.1 Zone 1

Because the groundwater in Zone 1 is isolated from the Patapsco River by the perimeter bulkhead, the groundwater will be monitored for a statistically significant increasing trend in chromium concentration rather than compared to a concentration-based action level.

For a sentinel monitoring well outside the COPR Fill area in which hexavalent chromium is detected during future monitoring, the data from that well will be evaluated for evidence of a statistically significant increasing trend that would indicate migration of hexavalent chromium in groundwater from the COPR Fill. To assess the temporal trend in a well, a nonparametric Mann-Kendall trend test using all data collected from the impacted well will be conducted. The Mann-Kendall test will be performed as a one-tailed test, where statistically significant increasing concentrations of Cr (VI) are identified at a significance level of 5%. For the testing, non-detect results will be calculated using the sample quantitation limit as the concentration. When collected, field duplicate sample results will be averaged with the results of their respective parent samples. If a well is re-sampled as part of an event, the latter of the results will be used in the test.

3.2 Zone 2

For Zone 2, an action level has been developed based on protection of ecological receptors in the Patapsco River where UWB Unit groundwater upwelling may occur. Salinity measurements in the Patapsco River are generally between 5 and 15 practical salinity units (PSU), indicating an estuarine to saline environment. Therefore, to assess the potential significance of exposure to Cr (VI) by ecological receptors, the surface water quality standard (SWQS) for protection of ecological receptors in saltwater is more appropriate than that for freshwater. The chronic SWQS is conservative because Cr (VI) does not bioaccumulate. The chronic saline SWQS for Cr (VI) of 0.05 mg/L is therefore the basis for computing the groundwater action level for lateral migration in Zone 2.

As groundwater flows from the Site and discharges to surface water, chromium is subject to dilution and attenuation prior to and concurrent with mixing with the nearshore surface water column. The site-related chromium surface water concentrations that may result from shallow groundwater discharge near the shoreline are conservatively estimated considering the following processes:

- Groundwater is assumed to discharge to the surface water from the UWB Unit and potentially from the Upper Sand Units.
- Groundwater flux is calculated using the three-dimensional groundwater flow model developed for the site. The model accounts for variability in hydraulic conductivities across the site in each hydrogeologic layer, including the riverbed material. The model was updated to include recent (2020) groundwater elevation monitoring and to simulate the lining of the 12th through 15th Street storm drains. Groundwater outflow estimates for the UWB Unit are shown on Table 1. The flow is shown in multiple segments but is considered together for the calculation of the action level.
- Groundwater is assumed to discharge into the nearshore area of the Patapsco River (see Figure 4) in Zone 2 as determined during prior investigation of sediment / porewater (CH2M Hill and ENVIRON 2009).
- The groundwater discharge rate is assumed to be constant, with no exchange of surface water occurring outside of the mixing zone, including via tidal mixing.
- The estimated average water depth during low tide is 6 feet (see Figure 5). The groundwater is assumed to mix only with the bottom 6 inches of the surface water column.
- No attenuation of Cr (VI) to Cr (III) is assumed to occur.

Table 1: Modeled Groundwater Outflows

Outflow Segment	**Outflow (ft^3/day)**
Between bulkhead and COPR Cell	190.8
West side of COPR Cell	140.3
South side of COPR Cell	187
South of COPR Cell	95.4
Total groundwater discharge	613.5 ft^3/day

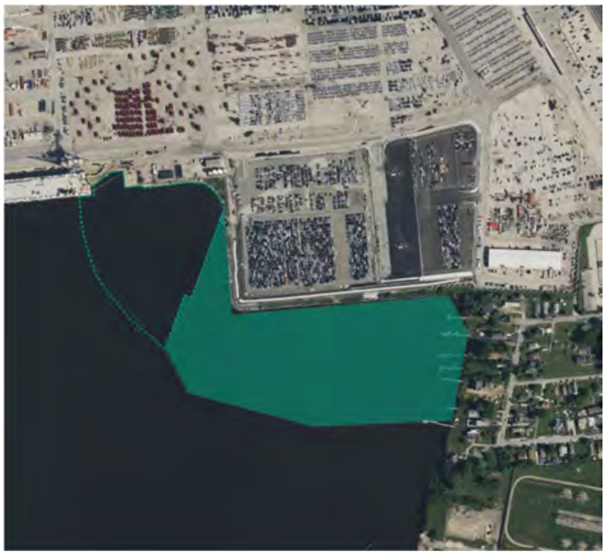

Figure 4. Groundwater Upwelling Area

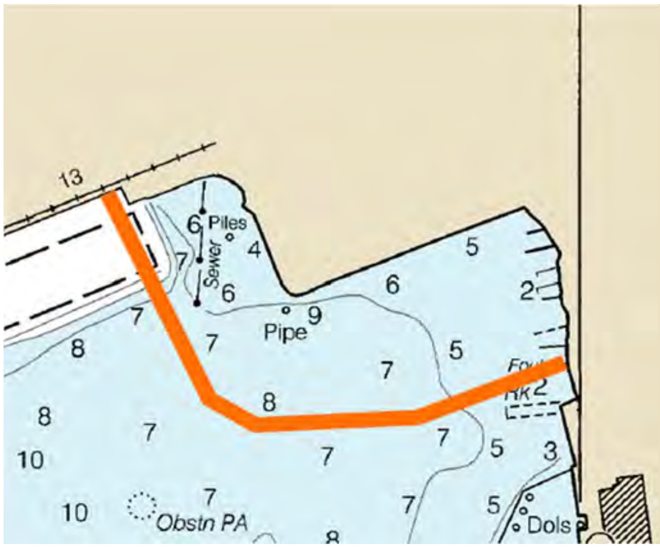

Figure 5. Low Tide Water Depths

The total mixing zone area is estimated at 1.2 million ft^2. Assuming an initial mixing layer of 6 inches (0.5 ft), the surface water mixing volume is 602,574 ft^3.

Considering the groundwater discharge and surface water mixing volume over a 24-hour period, the estimated mixing of groundwater discharging into surface water (DF = Surface Water Volume/Groundwater Discharge Volume) is approximately 982. This calculated discharge factor is used in combination with the SWQS (0.05 mg/L) to calculate the action level for lateral migration of chromium in groundwater, as follows:

$$Groundwater\ Action\ Level = SWQS\ \times\ DF$$

This results in a Cr (VI) action level of 49 mg/L for Zone 2. With an additional factor of safety of 2, the action level is 24.5 mg/L.

4. Vertical Migration

A mixing model based on the groundwater flow model developed for the Site is used to calculate the vertical migration action level that is protective of the Patapsco Aquifer. The action level is based on meeting the federal and Maryland maximum contaminant level (MCL) for total chromium of 0.1 mg/L, or 100 ug/L and the Maryland groundwater cleanup standard for Cr (VI) of 0.000035 mg/L, or 0.035 ug/L (Maryland Department of the Environment 2018) in the Patapsco Aquifer. The groundwater action level for the Upper Sand Unit is computed based on these target concentrations and a dilution factor (DF) that accounts for the vertical groundwater flux relative to the horizontal groundwater flux through the Patapsco Aquifer beneath the Site, as follows:

$$Groundwater\ Action\ Level = Target\ Concentration\ \times\ DF$$

The DF for vertical migration is conservatively estimated without considering attenuation by assuming that groundwater moving vertically from the Upper Sand Unit to the Patapsco Aquifer mixes uniformly with groundwater flowing through the Patapsco Aquifer. The vertical rate for groundwater flow through the Lower Confining unit into the Patapsco Aquifer was estimated by the groundwater model (CH2M Hill, 2015) to be 0.6 gallons per minute (gpm). The estimated lateral flow in the Patapsco Aquifer from the upgradient boundary onto the site is estimated to be 154 gpm. The DF computed based on these flow rates is:

$$DF = \frac{\text{Horizonal Flow (154 gpm)}}{\text{Vertical Flow (0.6 gpm)}} \approx 257$$

With this DF, the action levels are calculated as:

$$Total\ Cr\ Groundwater\ Action\ Level = 0.1\ \frac{mg}{L} \times\ 257 =\ 25.7\ \frac{mg}{L}$$

and

$$Cr(VI)\ Groundwater\ Action\ Level = 0.000035\frac{mg}{L} \times\ 257 =\ 0.009\frac{mg}{L}$$

Because the DF is calculated assuming uniform vertical migration with mixing across the entire Site, the groundwater action level is not intended to be compared to the concentration of total chromium or Cr (VI) measured in a single groundwater sample. Rather, it is intended to be compared to the average concentration across the Site. To account for varied spacing of wells included in the groundwater monitoring program (Figure **3**), a spatially weighted average concentration will be computed for total chromium and Cr (VI) from Upper Sand Unit wells. This is accomplished by dividing the site into Thiessen polygons, with each polygon associated with the wells that will be sampled (Figure 6). To properly account for the differences in the size of each polygon, the concentration for each well will be weighted by the ratio of the polygon's area to the total Site area. Because most of the Upper Sand Unit wells are not known to be impacted by chromium, samples in which chromium are not detected should be assumed to have a concentration of 0 mg/L.

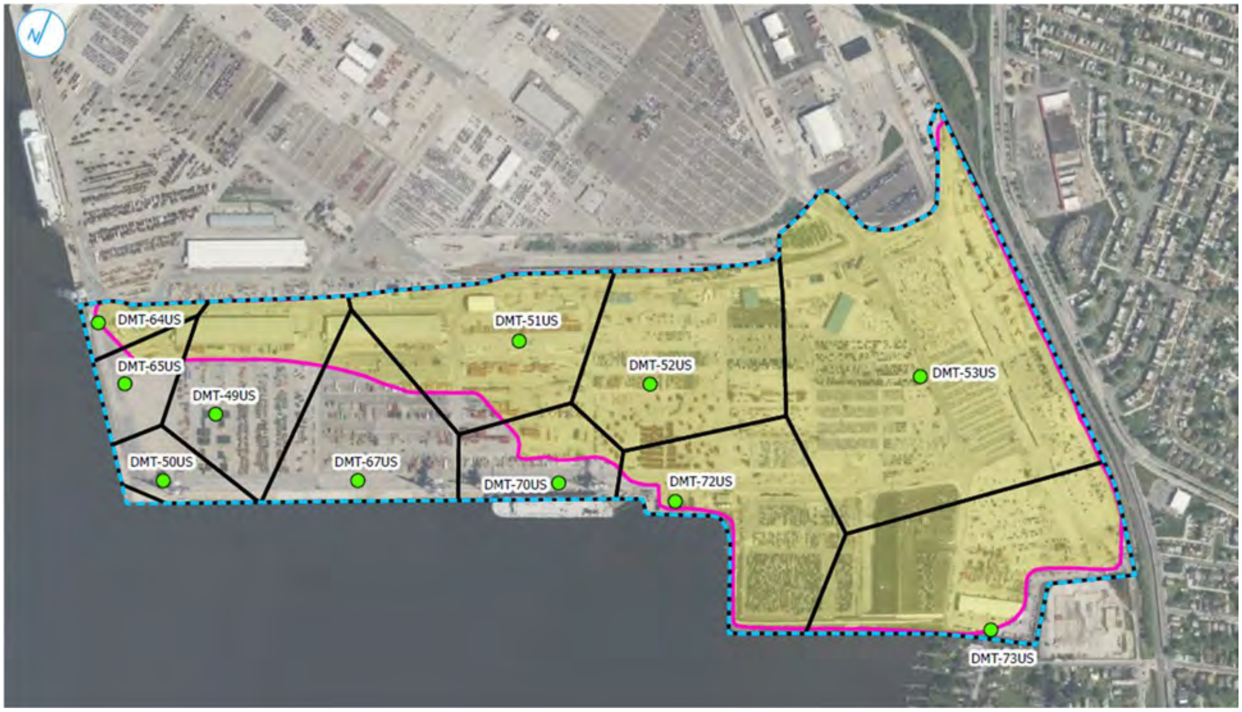

Figure 6. Upper Sand Unit Monitoring Wells

5. References

CH2M Hill and ENVIRON. 2009. Sediment and Surface Water Study Report, Dundalk Marine Terminal, Baltimore, Maryland. May.

CH2M Hill, 2015. Appendix B, Groundwater Flow Model Development.

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Appendix D
Site Drinking Water Plan

Site Drinking Water Plan, Dundalk Marine Terminal, Baltimore, Maryland

Prepared for

Honeywell International Inc.

Maryland Port Administration

Updated February 2023

Updated by:
Maryland Environmental Service
259 Najoles Road
Millersville, MD 21108

Contents

Acronyms and Abbreviations

COPR	chromium ore processing residue
DMT	Dundalk Marine Terminal
EPA	U.S. Environmental Protection Agency
gpm	gallons per minute
GWTP	groundwater treatment plant
MCL	maximum contaminant level
MDE	Maryland Department of the Environment
MES	Maryland Environmental Service
MPA	Maryland Port Administration
POC	point of contact
POV	personally operated vehicle

SECTION 1

Background

This Site Drinking Water Plan is an integrated component of the overall Performance Management Program (PMP) for the long-term monitoring and maintenance of the chromium remedy being implemented at the Dundalk Marine Terminal (DMT).

Pursuant to the Consent Decree among the Maryland Department of the Environment (MDE), the Maryland Port Administration (MPA), and Honeywell International, Inc. (Honeywell), and the Corrective Measures Alternatives Analysis required by the Consent Decree, MDE has selected an Enhanced Isolation and Containment remedy for the Site. This Site Drinking Water Monitoring Plan fulfills the PMP requirements with respect to the potable water and outlines the approach for monitoring the water distribution system to verify that chromium is not present in the drinking water supply at the Dundalk Marine Terminal (DMT). This plan supersedes the initial Site Drinking Water Monitoring Plan that was established in response to Section III.B.9.c of the April 2006 Consent Decree entered into by the MDE, MPA, and Honeywell. To date, routine monitoring confirms that the water distribution system remains free of chromium concentrations which exceed the U.S. Environmental Protection Agency (EPA) regulated maximum contaminant level (MCL) of 0.1 mg/L.

The DMT is a port facility, owned and operated by the MPA, located along the southeast edge of the City of Baltimore, Maryland, and Baltimore County, and is bounded by Broening Highway, the Patapsco River, and Colgate Creek. As the operator of DMT, the MPA is responsible for inspection, maintenance, and monitoring of the potable water system at the DMT. Potable water is defined as water that meets the standards for drinking purposes and meets the quality standards prescribed by the EPA's National Primary Drinking Water Regulations, published in 40 CFR Part 141. The groundwater at or near the DMT is not used for potable water at the site. The potable water at the site is supplied by the City of Baltimore municipal water supply. The potable water system at DMT contains approximately 16 miles of pipe ranging in size from 4 to 16 inches in diameter. Portions of the water system pass through areas of the site where chromium ore processing residue (COPR) was historically used as fill material (Figure 1). The water is supplied to the DMT system by the City of Baltimore at two connection points: one located at the Personally Operated Vehicle (POV) Gate on North Service Road at Broening Highway and the second located off Broening Highway near Lot 99 (Figure 1). Both connections are 16-inch-diameter water mains. The POV Gate connection is a Baltimore City-owned and maintained double-check valve, and the Lot 99 (Broening Highway) connection is fitted with a backflow prevention device that is inspected and maintained by MPA. Both connections are designed to prevent the backflow of water from the DMT water conveyance system into the Baltimore City water supply system.

Building 1702 (Figure 2) is supplied via a single 6-inch line that connects to a 12-inch Baltimore City main on Maryland Avenue, to the south. Building 1702 has no connection to the main distribution system at DMT. The configuration of the system and its connections to the Baltimore City Water System are shown in Figure 1.

The remainder of this plan consists of two sections. The first section describes the sampling approach that was used to determine baseline conditions of the water distribution system in relation to the presence or absence of chromium. This section also confirms the routine sampling program currently in place to test for chromium in the water distribution system. The second section provides a contingency plan for operating the water system in the event of a pipe break, including measures to flush and resample the system after breaks have been repaired so that the system can be returned to service.

SECTION 2

Water Quality Monitoring

2.1 Baseline Monitoring

The purpose of the baseline monitoring of the DMT water distribution system was to quantify baseline conditions for comparison to future routine monitoring events.

To monitor the water distribution system for chromium, initial baseline monitoring was conducted for the system in 2007 (CH2M HILL, 2007d) to determine the presence or absence of chromium. The baseline monitoring determined if total chromium was present in the system above the EPA-regulated MCL of 0.1 mg/L or if there was detection of hexavalent chromium that needed to be addressed prior to performing ongoing routine monitoring. Baseline monitoring indicated absence of chromium in the water distribution system.

The initial 2007 baseline sampling of potable water was conducted in existing buildings, and as new buildings were added to the site, this sampling plan was updated to include additional baseline water sampling at those locations (CH2M HILL, 2011 and CH2M HILL, 2013). Table 1 lists the current sampling locations, including existing buildings at the DMT with water service, the two main water supply points, and the water sampling location descriptions for each. Since 2007, Building 201A, Building 1600, and MPA Engineering Trailers have been demolished or removed from site, and water service has been disconnected from Shed 4. Table 1 includes those updates and is reviewed and updated annually in coordination with MPA Maintenance to remove or add sample locations.

2.2 Routine Monitoring

The purpose of routine monitoring is to confirm that the DMT water system remains free of chromium above the MCL and to verify that public health is being protected. This routine sampling will provide assurance that the system continues to meet EPA drinking water regulations and is suitable for potable use.

The water is supplied to the system by the City of Baltimore at two connection points, one located at the POV Gate on North Service Road at Broening Highway and the second located off Broening Highway near Lot 99 (Figure 1). Upon MPA request, Baltimore City will perform routine maintenance inspection of the POV Gate double-check valve connection, which is property of Baltimore City. Routine monitoring of the backflow prevention devices on the DMT site, including at the Lot 99 (Broening Highway) connection, are the responsibility of MPA Maintenance. The backflow devices onsite are monitored annually to ensure they are compliant with all applicable federal, state, and local drinking water codes.

The routine water sampling is conducted quarterly from a rotating selection of the buildings with water service. This sampling plan provides regular monitoring for presence of chromium in the water and a schedule that ensures the annual collection and analysis of water samples at each building at DMT with water service. Table 1 is a comprehensive list of all the current sampling locations. Table 2 provides a list of the sample points for routine monitoring and the sample schedule for appropriate spatial variation within each quarterly sampling event. This includes the DMT buildings with water service and the two main water supply points. The water supply points will be sampled every quarter to verify the quality of water being supplied to the site. Figure 2 shows current sampling locations.

The samples will be collected and analyzed in accordance with the procedures discussed in Sections 2.2.1 and 2.2.2. All sample results must be submitted to MDE using normal reporting procedures within 30 days of receiving the results.

2.2.1 Sampling Plan

The following process will be used in the collection of a water sample at each of the locations described above and listed in Table 1:

1. Identify the described sample point
2. Complete appropriate sample label
3. Put on nitrile or latex gloves
4. Turn on faucet and take water temperature reading
5. Allow water to flow for a minimum of 5 minutes and until the water temperature drops below the initial temperature reading
6. For total chromium, collect the samples in plastic 250-mL, HNO_3-preserved bottle ware provided by the analytical laboratory. For hexavalent chromium, collect the samples in 250-mL non-preserved plastic bottle ware provided by the analytical laboratory.
7. Store sample in cooler with ice to reduce temperature to 2°C
8. Complete chain-of-custody log and request analysis for total chromium in compliance with EPA analytical method requirements (EPA Method 200.7 or 200.8 and hexavalent chromium by EPA Method 7199); both analyses should have a detection limit of <0.01 mg/L at a minimum.

2.2.2 Sample Analysis

Analysis of collected samples will be conducted at an EPA-certified laboratory for hexavalent chromium by Method 7199 and total chromium by Method 200.7 or 200.8. The analysis for hexavalent chromium is time critical, with samples having a maximum holding time of 24 hours. In addition, the laboratory will be instructed and required to notify MPA and/or its designee, Maryland Environmental Service (MES) immediately upon determining and confirming that a drinking water sample has a total chromium detection over the MCL or a hexavalent chromium detection over the reporting limit. For this Plan, “immediately” means the same day when determined during standard business hours, or next day if the determination is made after normal business hours.

All sample results will be submitted to MDE within 30 days of receiving the results from the laboratory. In the event that an exceedance of the MCL for total chromium or a detection of hexavalent chromium over the reporting limit is identified in any sample, MPA will notify MDE immediately upon receipt of notification from the laboratory. The sample results will also be on file at the MPA Office of Environmental Quality.

2.2.3 Response Plan

The EPA regulates chromium in drinking water having a MCL for total chromium of 0.1 mg/L. If any of the routine samples show a level higher than this MCL, the mitigation actions provided in Section 2.2.6 will be taken to reduce the total chromium concentrations below the MCL. Additionally, if any concentration of hexavalent chromium is detected in water samples, the same mitigation actions will be performed.

If the MCL for total chromium is amended, the text in the plan will be revised within 30 days of enactment of the new standard.

2.2.4 User Notification

In the event of detectable chromium concentrations above actionable limits, DMT personnel will be advised to not use the water system for potable water uses until further notified. This will be conducted by notifying a point of contact (POC) for the buildings by a tenant advisory issued by MPA Operations. Signs will be posted at the buildings that the water supply is temporarily to be for only non-potable uses.

Building 1702 is not connected to the main distribution system at DMT, and therefore the use of potable water at this building will continue to be allowed, unless the detection is specific to this building. Conversely, if chromium is detected at Building 1702 only, it will not trigger the notification of tenants in other portions of the terminal, who are not affected.

2.2.5 Alternate Water Supply

An alternate supply of potable water service shall be made available to all users affected by the temporary loss of municipal potable water service due to chromium detection.

2.2.6 Mitigation

In conjunction with notifying users, the following actions will be taken to verify the sample result.

- The affected building's system will be flushed using all service points for a period of 15 minutes, and a confirmatory sample will be collected. The samples will be collected and analyzed in accordance with the procedures discussed in Sections 2.2.1 and 2.2.2.
- The affected building's system will then be flushed for an additional 15 minutes, and a second confirmatory sample will be collected. The samples will be collected and analyzed in accordance with the procedures discussed in Sections 2.2.1 and 2.2.2.
- Both samples will be submitted for rush laboratory analysis to confirm the sample result.
- If the analytical results of the confirmation samples do not exceed the MCL for total chromium or result in a detection of hexavalent chromium, the building location will be put back into service.
- If the analytical result of either confirmation sample again shows an exceedance of the MCL for total chromium or a detection of hexavalent chromium, the following procedure will be followed to remove the contaminated water from the potable water conveyance system. (A standard operating procedure for opening hydrants and purging the system is included as Appendix A.)
    - Utilize the three nearby hydrant(s) or adjacent water pits for primary flushing of the system.
    - Open the three hydrants identified for flushing (or water pits nearest them). Collect a water sample for laboratory analysis from each hydrant or water pit and test for hexavalent chromium. Initial screening for hexavalent chromium can be conducted at the onsite DMT Groundwater Treatment Plant (GWTP).
    - If the sample has a hexavalent chromium concentration less than 1,100 ppb (the Ambient Water Quality Criteria for saltwater acute exposure limit), discharge all flushing water to river in accordance with MDE General Permit Number 17HT9473, avoiding the use of the 14th and 15th Street storm drains.
    - If the hexavalent chromium concentration is greater than 1,100 ppb, a plan for discharge of the flush water will be developed so that it can be discharged to the 14th and/or 15th Street storm drains and treated at the onsite GWTP in accordance with MES's 2007 "Interim Operations Plan." As stipulated in the "Interim Operations Plan," the water will be managed as a wet-weather event, and the first flush will be captured for treatment and the remaining flow will be discharged to the river. If the GWTP is not operational, alternate temporary water storage and treatment/disposal, if required, will be coordinated with MPA Office of Environmental Quality.
    - Any discharge that may affect the operational capacity of the GWTP will be coordinated with the personnel managing the GWTP.
    - Identify the nearest appropriate storm drain that will receive the water from the flushing hydrants or water pits. Check that flushing of the hydrant or water pits will not cause localized flooding due to blockage of stormwater inlets.
    - Set up a system for dechlorination of flushed water, such as a diffuser or inlet blankets with dechlorination tablets.

- Notify the buildings with auxiliary fire pumps (Sheds 4, 6, 400 and 500) that flushing activities will be taking place which could cause low-pressure alarms associated with the pumps to trip.
- Flow the designated hydrants for approximately 6 hours at a minimum combined flow rate of 1,000 gallons per minute (gpm). If water pits are used, flow the pits for approximately 12 hours at a minimum flow rate of 500 gpm. Conduct the flushing activity in accordance with MDE General Permit Number 17HT9473 and added special conditions.
- Collect a water sample at each sample location provided in Table 1 using the procedures described in the sampling plan. Rush analysis will be requested so potable service can be restored as quickly as possible.
- If any sample taken at a sample location listed in Table 1 is determined to have total chromium concentrations higher than 0.1 mg/L or hexavalent chromium is detected, flush the identified hydrant(s) for approximately 6 hours or the water pits for approximately 12 hours and resample. Continue sampling and flushing at 6- or 12-hour intervals until the chromium concentration drops below the MCL of 0.1 mg/L and hexavalent chromium is not detected.

2.2.7 Return to Normal Operation

After all sampling has demonstrated full mitigation of chromium contamination in the water system, the system will be returned to service. The POC of each building on the terminal will be notified by a tenant advisory issued by MPA Operations. The signs stating the water supply is temporarily to be for only non-potable uses will be removed from the buildings.

TABLE 1 - DMT BUILDINGS WITH WATER SERVICE (38 BUILDINGS, LOT 90, AND LOT 99)

Building ID	Sample Location Description
90A	Kitchen in lunchroom
91A	Lavatory at maintenance bay
91B	Lavatory at maintenance bay
91C	Lavatory at maintenance bay
94A	Exterior spigot
George’s Café	Lavatory at entrance
95B	Lavatory
96E	Kitchen
97C	Lavatory at entrance
97D	Lavatory at entrance
100A	Lavatory
100B	Lavatory
201D	Lavatory
201D-2	Lavatory
201B	Utility sink at north end of building
Ceres Office Trailer	Kitchen Sink
Ceres Lavatory	Lavatory
301A	Lavatory at maintenance bay
301B	Kitchen in lunchroom
401A	Lavatory in office area
401B	Lavatory
401C	Kitchen sink
403A	Break room sink

Building ID	Sample Location Description
500 Office Trailer	Lavatory
502A	Lavatory
502B-1	Trailer 1 bathroom
502B-2	Trailer 2 bathroom
503A	Lavatory
MAT	Lavatory at entrance
Shed 6	Lavatory at south end of building
Shed 8	Lavatory at west end of building
Shed 11	Lavatory at west end of building
Shed 12	Lavatory at west end of building
1200	Lavatory at south end of building
1300	Lavatory at south end of building
MES Trailer	Kitchen sink
MES GWTP Trailer	Lavatory
1702	Lavatory at maintenance bay
Lot 90 (west of POV gate)	Hydrant (NE corner of Lot 90)
Lot 99	Backflow prevention/meter pit

Table 2 - DMT Quarterly Sample Locations

QUARTER 1 Building ID	QUARTER 2 Building ID	QUARTER 3 Building ID	QUARTER 4 Building ID
Shed 8	Shed 6	Shed 12	94A
91B	Shed 11	90A	95B
96E	91A	97D	401B
97C	100B	201B	1702
George’s Café	201D	301A	502B-2
100A	401A	401C	1200
201D-2	500 Office Trailer	502B-1	1300
301B	502A	Ceres Lavatory	Ceres Office
403A	MES GWTP Trailer	MAT	MES Trailer
503A		91C	
Lot 90	Lot 90	Lot 90	Lot 90
Lot 99	Lot 99	Lot 99	Lot 99

SECTION 3

Pipe Break Contingency Plan

The following plan has been developed to outline the measures to be taken in the event of a pipe break in the COPR fill area (Figure 1) or a pipe break in the non-COPR area where testing indicates potential chromium presence. If a pipe break occurs in the non-COPR area and testing indicates the absence of chromium, the following planned actions are not necessary, and the routine pipe break repair approach will be utilized. The plan details actions to isolate the break and return the system to normal operation.

3.1 Pipe Break Detection

A pipe break can be detected by a number of methods. The most important element of break detection is to identify it quickly and isolate it to reduce potential impacts from vacuum conditions in the pipe or damage to nearby property. The most common methods of break detection at the port are observing above-ground water pooling or a leak or stream of water from an opening in the ground surface along pipe alignments. These or other recommended methods of detection will be achieved through maintenance personnel or any personnel working at the DMT who may notice evidence of a pipe break and contact the DMT MPA Maintenance Department.

Once a pipe break is identified, MPA will determine its location relative to the defined COPR area. If the break is in a non-COPR fill area, the water from the leak and the excavation around the pipe break will be visually inspected for the presence of chromium by MPA Maintenance. If visual observations indicate presence of chromium, samples of the system water and groundwater will be collected and screened for total chromium and hexavalent chromium at the GWTP. If required, a duplicate sample will be sent to an EPA-certified laboratory for confirmation, with requested rush analysis. If (1) there is hexavalent chromium present or (2) the total chromium concentration in either the system water or the groundwater sample exceeds the MCL for drinking water Sections 3.2 through 3.7 of this plan must be implemented. The health and safety measures outlined in MPA’s “Site Specific Health and Safety Plan for Utility Repair (Water Main Break)” and the “Standard Operating Procedure for Surface Cover Penetration” may be required. Otherwise, the response to the break can proceed as normal without following the requirements set forth in this plan for pipe break repair in the COPR area.

If the break occurs within the COPR fill area, precautions must be taken as presented in Sections 3.2 through 3.7. The health and safety measures outlined in MPA’s “Site Specific Health and Safety Plan for Utility Repair (Water Main Break)” and the “Standard Operating Procedure for Surface Cover Penetration” will be followed. This plan does not replace those measures but simply provides additional clarification and actions that once completed will restore the potable water system.

3.2 Pipe Break Isolation

After a pipe break is identified, the section of broken water main that is leaking will be isolated by closing the two nearest valves. MPA Maintenance Department will maintain a plot plan of all valve locations to assist in the isolation effort.

3.3 User Notification

Simultaneously with isolation of the pipe break, potential users in the affected buildings will be immediately notified not to use the water system until further notification. A POC for every building with affected water service will be notified. The water supply to affected portions of the port will lose all of the water supply during the period that repairs and water testing are performed.

3.4 Alternate Water Supply

During the period of break isolation, repair, and return to service, an alternate supply of potable water service will be provided to the affected buildings.

3.5 Mitigation

Pipe break repair activities will begin in conjunction with users being notified. Pipe break repair activities will be conducted in a manner to limit the disturbance of COPR material and exposure of new and existing pipes to COPR material. All pipe repairs will be performed in accordance with the health and safety measures outlined in MPA's "Site Specific Health and Safety Plan for Utility Repair (Water Main Break)" and the "Standard Operating Procedure for Surface Cover Penetration." Once the section of broken pipe is repaired, the following process will be implemented in coordination with MPA DMT Maintenance:

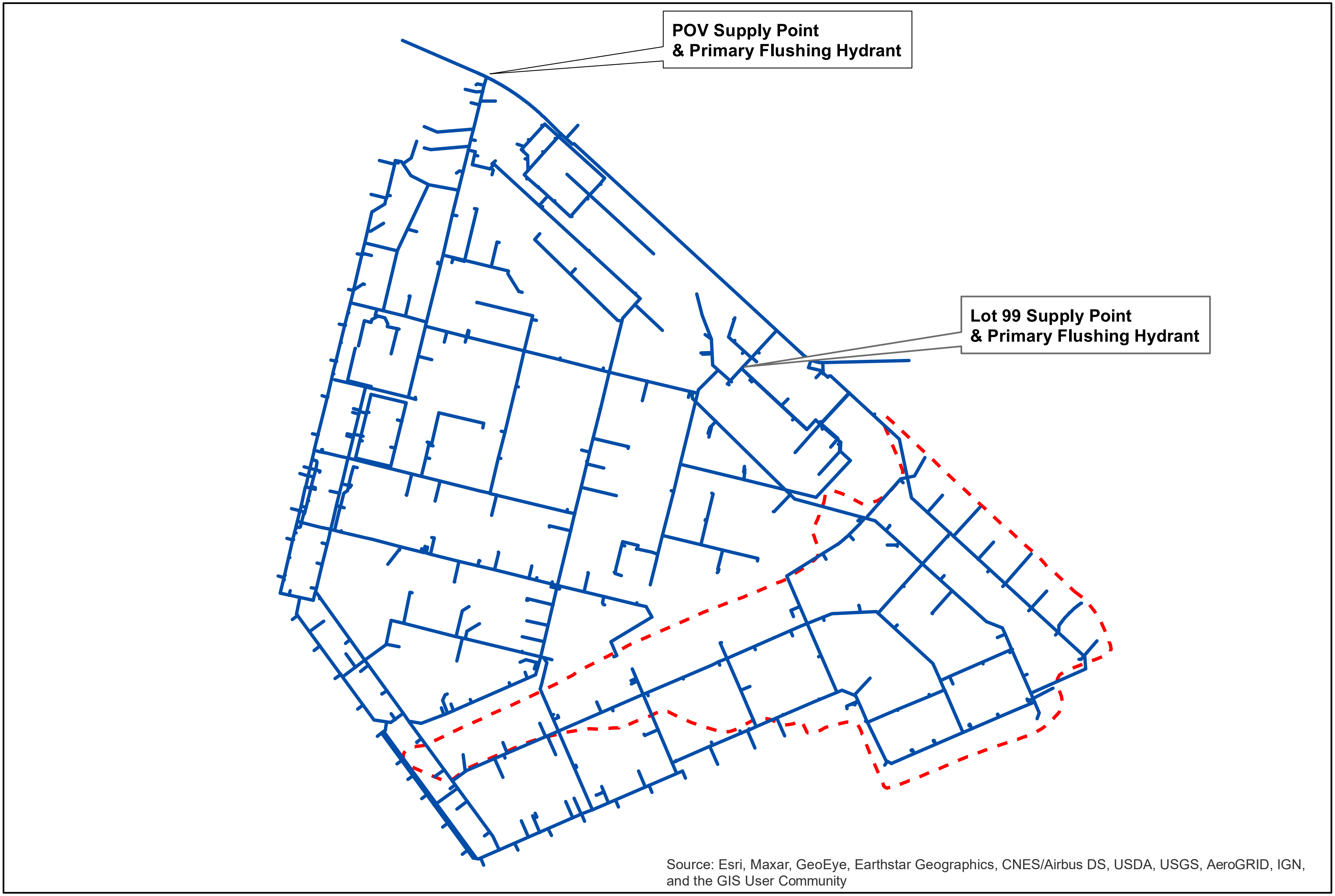
- Identify a hydrant within the isolated section of pipe that can be used for flushing the repaired pipe.
- If the originally isolated section of pipe does not include a hydrant, additional valves will be closed in order to access a hydrant within the isolated portion of DMT.
- Open the hydrant to be used for flushing using the standard operating procedure included as Appendix A. Then open only one of the closed valves to pressurize the pipe, limiting the flow of water during flushing activities in one direction and restricting potentially contaminated water from moving to another portion of the pipe network. Run water until clear for 5 minutes using a sediment filter bag.
- Samples will be collected and screened for total chromium and hexavalent chromium at the GWTP, and a duplicate sample will be sent to an EPA-certified laboratory for confirmation with rush analysis. If the hexavalent concentration is greater than 1,100 ppb, the plan for discharging the flushing water requires temporary collection of the water in an appropriate collection and storage container. The flushing water will be transported for treatment to the GWTP after coordinating with the personnel managing the GWTP. If the GWTP is not operational, alternate temporary water storage and treatment/disposal, if required, will be coordinated with MPA Office of Environmental Quality.
- Identify the nearest appropriate storm drain that will receive the water from the identified flushing hydrant. Check that flushing of the hydrant will not cause localized flooding related to blockage of stormwater inlets.
- Set up a system for dechlorinating flushed water, such as a diffuser or inlet blankets with dechlorination tablets.
- Flow the hydrant until the system is free of air and sediment.
- Repeat flushing procedure for all of the closed valves needed for the repair. This ensures all lines are flushed and flow is maintained in only one direction, towards the isolated hydrant.

3.6 Sampling and Response

Once the water line break has been repaired and the new section of pipe has been adequately flushed, confirmation sampling will be conducted at the affected building(s) and submitted for laboratory analysis and screened at the GWTP in coordination with MPA Office of Environmental Quality.

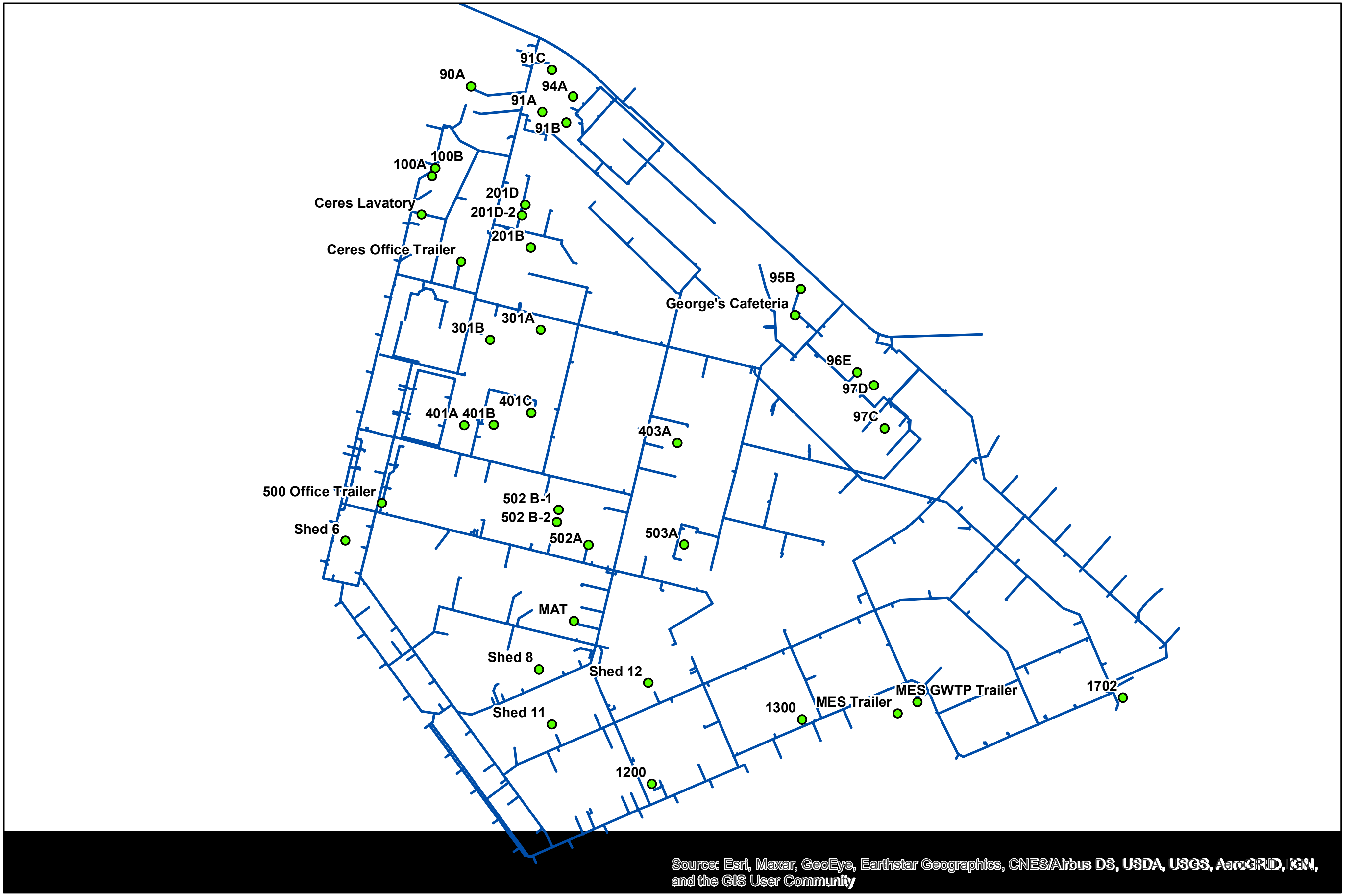
3.7 Return to Normal Operation

After all confirmation sampling has demonstrated full mitigation of chromium contamination in the water system, the system can be returned to service. MPA will notify the POC of each affected building that the water system has been returned to service.



Source: Esri, Maxar, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AeroGRID, IGN, and the GIS User Community

Figure 1 - Water System Configuration
Dundalk Marine Terminal
Baltimore, Maryland



Source: Esri, Maxar, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AeroGRID, IGN, and the GIS User Community

Figure 2 - Water System Sampling Locations
Dundalk Marine Terminal
Baltimore, Maryland

Appendix A
Standard Operating Procedure

Standard Operating Procedure for Opening and Closing Hydrants during System Flushing

The operation of water distribution system hydrants may be necessary for flushing purposes as defined in the Site Drinking Water Plan. Under the specified conditions that require flushing activities, it is important that proper hydrant operating procedures be used to prevent the formation of hydraulic transients in the pipe network. These powerful hydraulic transients can cause pipe leaks and breaks. The following procedure should be followed to operate hydrants in a manner to prevent the formation of hydraulic transients.

1. Ensure that all the pertinent steps outlined in the Site Drinking Water Plan have been taken. These include but are not limited to following all MDE regulations and providing appropriate control of discharge water from the hydrant to prevent flooding.
2. After removal of the hydrant cap on the chosen nozzle to be used for flushing, the hydrant wrench should be secured tightly to the operating nut.
3. The hydrant should be opened slowly. Specifically, the hydrant nut should be turned at an even rate, not exceeding more than five revolutions per minute until the hydrant is fully opened or has reached the minimum required flow rate defined in the Site Drinking Water Plan.
4. After the flushing activity required in the Site Drinking Water Plan is achieved, the hydrants should be closed slowly. Specifically, the hydrant nut should be turned at an even rate, not exceeding more than five revolutions per minute until the hydrant is fully closed. After the hydrant is closed, the hydrant cap should be replaced on the hydrant nozzle.

Appendix E
Maryland Port Administration
Health and Safety Plan

MARYLAND PORT ADMINISTRATION
MASTER HEALTH AND SAFETY PROGRAM
FOR CHROMIUM-RELATED WORK PROJECTS

At:

Dundalk Marine Terminal
Maryland Port Administration

December 2022

KCI Technologies, Inc

KCI Job #0107160224 GE-3

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Abbreviations

CM	Construction Management
COPR	Chromium Ore Processing Residue
Cr (III)	Trivalent Chromium
Cr (VI)	Hexavalent Chromium
DMT	Dundalk Marine Terminal
EPA	United States Environmental Protection Agency
HASP	Health and Safety Plan
HAZMAT	Hazardous Materials
HAZWOPER	OSHA Standard for Hazardous Waste Operations and Emergency Response
MDE	Maryland Department of the Environment
MDTA	Maryland Transportation Authority
MES	Maryland Environmental Service
MOSH	Maryland Occupational Safety and Health Administration
MPA	Maryland Port Administration
NEG	Non-Exposure Group
OSHA	US Occupational Safety and Health Administration
PC	Primary Contractors, Tenants
PEG	Possible Exposure Group
PEL	Permissible Exposure Level
PPE	Personal Protective Equipment
SC	Secondary Contractors, Subcontractors, Consultants
SSHASP	Site-Specific Health and Safety Plan

1.0 Background

1.1 Purpose

The purpose of this Maryland Port Administration (MPA) Master Health & Safety Plan (HASP) is to develop health and safety procedures and processes to address all chromium-related or potentially chromium-related work projects at the Dundalk Marine Terminal (DMT) pursuant to Section 9(d) of the DMT Consent Order dated April 4, 2006 (the "Consent Decree") entered into by the Maryland Department of the Environment (MDE), MPA, and Honeywell International, Inc (Honeywell).

MPA has developed the Master HASP to provide both general and specific requirements regarding potential exposure to chromium and chromium ore processing residue (COPR) at DMT. This program must be followed by all personnel performing chromium-related or potentially chromium-related work projects at DMT. This plan outlines the responsibilities of all parties operating on this site and requires coordination of all health and safety plans to ensure compliance with Maryland Occupational Safety and Health (MOSH) regulations and other applicable regulations. The Master HASP is intended to reduce the potential of health and safety hazards to personnel performing chromium-related or potentially chromium-related work projects at DMT.

It is a general requirement at DMT that all contractors, subcontractors, and tenants performing chromium-related work at the site exercise reasonable care to ensure that their employees, representatives, and visitors are following appropriate health and safety procedures. Each contractor, subcontractor, and tenant working at the DMT is responsible for the health and safety of its employees and authorized visitors. Each contractor, subcontractor, and tenant is also responsible for complying with the procedures in this document and for developing appropriate Site-Specific Health and Safety Plans (SSHASP) covering the activities on its site.

This Master HASP, including the minimum requirements for SSHASPs in Appendix A of this document, solely address hazards relating to COPR. Contractors, tenants, and the MPA are responsible for developing their own health and safety programs to address other hazards present or suspected in their workplaces. The MPA, depending on contractual agreement, may require a copy of contractors’ and tenants’ HASPs for review and acceptance by the MPA.

1.2 Site Description

The DMT, located at 2700 Broening Highway, is an active marine terminal consisting of approximately 600 acres split by the Baltimore City/Baltimore County boundary. The site perimeter of DMT consists of the Patapsco River, Colgate Creek, and Broening Highway. The DMT is an active marine terminal with a wide variety of operations and activities. The majority of DMT is covered by asphalt or other similar materials that act as a physical barrier covering the subsurface soil, which may consist of COPR or potentially COPR-contaminated soil.

The “COPR-fill area” refers to approximately 148 acres where COPR is known to have been used as fill on the DMT and is located beneath an asphalt cap or other similar barrier. The boundaries of the COPR-fill area are identified in Figure 1. COPR was also used as fill in some areas outside of the known COPR-fill area, and soil outside of the COPR-fill area may have been contaminated by groundwater from the COPR-fill area.

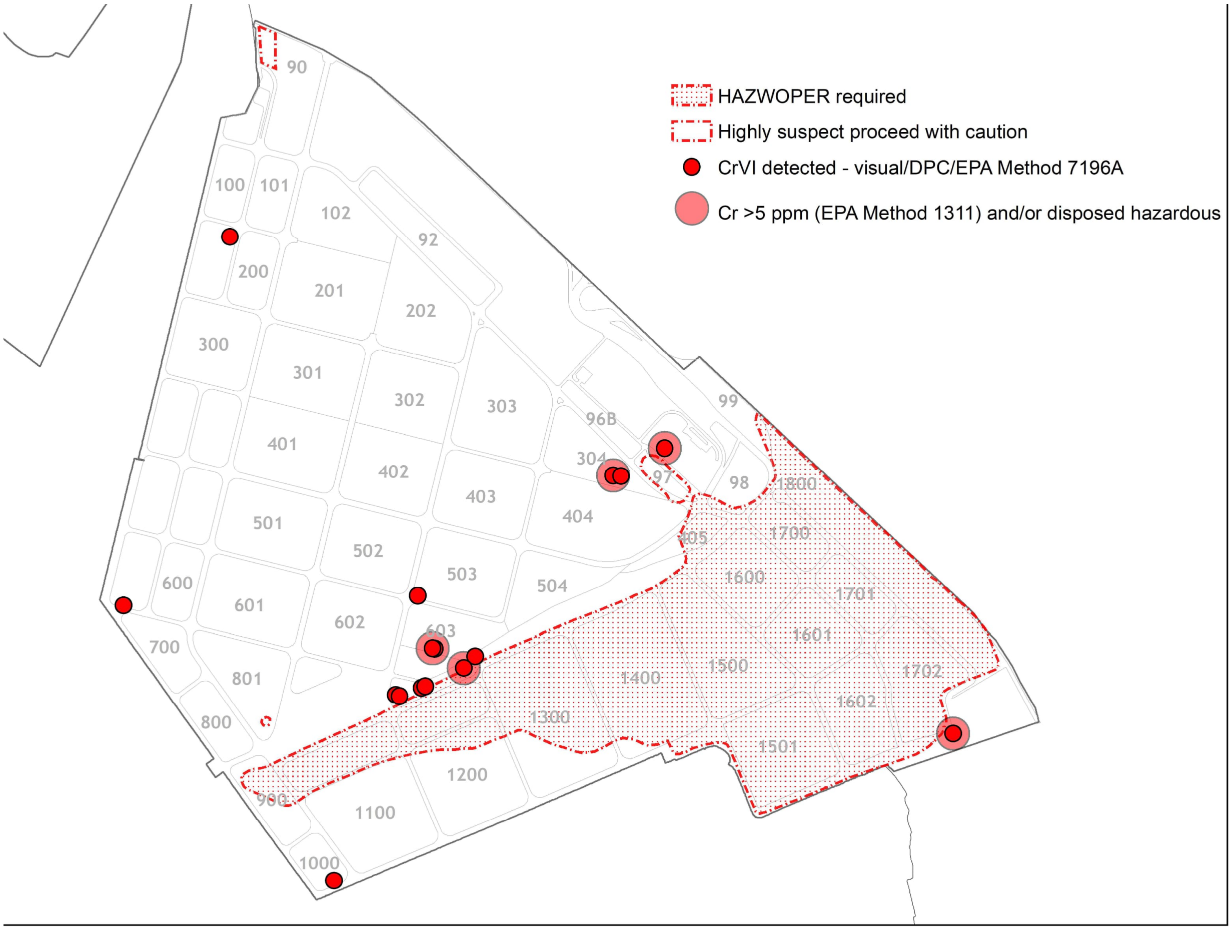


Figure 1: Boundary of the COPR-fill area, as defined in April 2022 and areas outside of COPR area where CrVI has been identified or suspected.

1.3 Consent Decree Requirements and Tasks

The Consent Decree is designed to protect the public health and the environment by providing a final remedy for addressing, treating, controlling, preventing, or mitigating the presence and/or releases or threatened releases of chromium at or from the DMT. Generally, the Consent Decree is a continuation of corrective measures taken pursuant to a 1992 administrative consent order between MPA and MDE. Under the 1992 administrative consent order, MPA undertook a variety of remedial measures, including, but not limited to: (i) the preparation of a Corrective Measures Implementation Project Plan; (ii) construction of outfall structures to serve as backflow preventers; (iii) rehabilitation of the storm water pipes; (iv) monitoring of groundwater and surface water flow; (v) a new plan for management of chromium contaminated soils excavated; and (vi) design and construction of extraction wells and a wastewater treatment plant to treat contaminated groundwater and dry weather flow in the storm drains. Under the updated Consent Decree, MPA and Honeywell will update and continue corrective measures commenced under the 1992 administrative consent order; perform certain interim corrective measures and studies; complete a Corrective Measures Alternatives Analysis to evaluate all permanent and/or long-term remedial alternatives; and implement all permanent or long-term corrective measures chosen by MDE within 17 years.

As part of the Consent Decree, MPA and Honeywell are required to develop and implement a master health and safety plan that addresses all chromium-related work projects at the site. This Master HASP and its attachments are designed to meet this requirement.

1.4 Definition of Chromium-Related Work Projects

Chromium-Related Work Projects – For the purposes of this HASP, chromium-related work projects shall include any work to be performed in the COPR-fill area at DMT that involves, or is reasonably likely to involve, contact with known or potential COPR or chromium-contaminated soil and water. This covers all sub-surface activities in the COPR-fill area. Additionally, work performed in electrical or communication manholes or vaults on the terminal is categorized as chromium-related due to the presence of chromium-contaminated groundwater.

Potentially Chromium-Related Work Projects – Any sub-surface work performed outside the boundaries of the COPR-fill area at DMT will be considered potentially chromium-related, and all contractors, subcontractors, and tenants must be aware of the potential for encountering COPR or chromium-contaminated soil or water and may request screening, sampling or other analytical methods as set forth in this Master HASP.

Non-Chromium-Related Work Projects – Work activities that are determined by screening, sampling, observations, planning, or historical data to have no reasonable probability of contacting chromium-contaminated soil or water will not be considered a chromium-related work project or activity.

1.5 Health & Safety Roles and Responsibilities

At the DMT, there may be multiple chromium-related projects running simultaneously and involving various companies and organizations. MPA personnel, contractors, subcontractors, and consultants routinely conduct maintenance, construction, and remedial activities, which may involve contact with chromium-contaminated materials. Each individual company and organization is responsible for its own health & safety program and procedures and, ultimately, the performance of its employees and subcontractors. There is a need, however, to establish a health & safety management system that ensures that each program meets minimum requirements, is coordinated to work with other health & safety programs, and is technically correct, reasonable, and effective.

The health & safety organization at DMT consists of five major groups:

- MPA Management Team (MPA Team)
- Primary Contractors or Tenants (PC)
- Secondary Contractors, Subcontractors and Consultants (SCs)
- MPA Employees who perform maintenance work in COPR areas
- Visitors

Responsibilities of each group will be defined in sections 1.5.1 – 1.5.5.

1.5.1 MPA Management Team (MPA Team)

The MPA management team (MPA Team) is the group that has project management oversight for all health and safety related matters and the Master HASP. The MPA Team consists of six groups:

- MPA Engineering
- MPA Construction Management (CM)
- MPA Safety and Risk Management Department
- MPA Office of Environmental Quality
- MPA DMT Security
- MPA-approved consultant support, including Maryland Environmental Service (MES)

The overall role of the MPA Team is to ensure that procedures are in place and being implemented to:

- Protect workers, the public, and the environment from possible chromium-related contamination associated with activities being conducted on site.
- Provide security for the DMT.
- Establish health and safety management systems to maintain regulatory compliance, worker safety, and environmental protection.

<u>MPA Engineering</u> - MPA Engineering has overall project authority for MPA construction projects. MPA Engineering has the following health and safety responsibilities:

- Developing clear project specifications identifying work;
- Designating health and safety responsibilities (e.g., PCs and SCs for each project and/or project phase);
- Providing direction in disputes that involve health and safety issues;
- Communicating and meeting regularly with the MPA Team regarding health and safety issues;
- Serving as the liaison with public officials as required.

<u>MPA Construction Management (CM)</u> – CM's primary job function is to provide direction and construction oversight of site activities to determine compliance with the project work plan and other project performance expectations. Specific health and safety responsibilities may include:

- Becoming knowledgeable of the health and safety requirements, procedures, organization and responsibilities of the project and the companies/organizations involved;
- Receiving and maintaining health and safety documentation which includes: health and safety plans, personnel training, job and medical qualification documents, incident reports, and other health and safety documentation as appropriate;
- Obtaining and distributing SSHASP and other related health and safety documentation to appropriate persons;
- Documenting daily health and safety oversight activities and providing feedback to appropriate parties;
- Terminating work for violation or discrepancy with agreed-to health and safety work plans;
- Communicating and meeting regularly with the MPA Team regarding health and safety issues.

<u>MPA Safety and Risk Management Department/MPA Office of Environmental Quality</u> - Safety has responsibility for health and safety and emergency response for the MPA. Specific health and safety responsibilities related to the Master HASP include:

- Reviewing and accepting or rejecting all chromium-related contractor health and safety plans, including the SSHASP, and providing comments to appropriate persons; major changes must also be reviewed by the MPA Safety Department;
- Providing health and safety advice or consultation on projects or work activities where MPA Team is taking the role of the PC or MPA employees are performing the work;
- Providing health and safety oversight, in conjunction with CM, of contractor health and safety program implementation;
- Conducting Health Hazard Evaluations and oversight as necessary;
- Determining health and safety actions as required;
- Leading Incident Investigations, as needed;
- Providing health and safety technical resources and support as needed;
- Communicating and meeting regularly with the MPA Team regarding health and safety issues;
- Conducting sampling for chromium in soil and water;
- Serving as the liaison with public officials when directed by MPA Engineering.

MPA DMT Security – DMT Security consists of the Maryland Transportation Authority (MDTA) Police, a law enforcement agency, and the MPA Security Department and its subcontractor, a guard force. DMT Security health and safety responsibilities include:

- Managing the overall DMT security program;
- Managing the site emergency response program; all emergencies must be coordinated through the MDTA Police Dispatch (410.537.7911).

MPA-approved Health and Safety Support (MES) – MES is an MPA PC at DMT that provides a variety of site environmental and maintenance services as directed by MPA. For the majority of work onsite, MES must meet the health and safety responsibilities of the PC as detailed in Section 1.5.2. MES also provides a technical support role as directed by the MPA. This support role includes:

- Assisting with sampling for chromium in soil and water;
- Coordinating with sub-contractors for hazardous waste handling.

1.5.2 Primary Contractor (PC)

MPA Engineering will formally designate a PC for each project or project phase prior to the onset of field project activities. The PC is responsible for coordinating overall project site health and safety activities within its area of control, so that all groups associated with the project can successfully integrate their SSHASP. The PC's SSHASP must address all the construction type hazards that may apply to the project task, as well as the potential hazards associated with possible chromium contamination. The SSHASP of SCs must be integrated with the plans and procedures of the PC, when necessary. No project activity may begin until the PC's SSHASP, including integration of the SC's SSHASP, has been reviewed and accepted by the MPA. The PC's SSHASP must meet the requirements of the MOSH/OSHA Hazardous Waste Standard (29 CFR 1910.120 (b)) and other applicable MOSH/OSHA, United States Environmental Protection Agency (EPA), and MDE standards and regulations, as well as this Master HASP. As part of this plan, the PC must ensure that the plans and procedures of all other designated SCs are coordinated and integrated.

1.5.3 Secondary Contractors (SC)

Secondary Contractors (SC) are designated for a specific project or a specific phase of a chromium-related project. The SC can consist of one or more or the following: engineering and environmental consultants, construction contractors or subcontractors, transportation contractors and/or other support organizations for a designated project.

1.5.4 MPA Employees Who Perform Work in COPR Area

MPA maintenance employees are required to perform utility repairs and other sub-surface work at the DMT in accordance with a SSHASP that meets the minimum requirements set forth in this Master HASP.

1.5.5 Visitors

Any personnel onsite who may be involved with chromium-related projects and are not part of the MPA Team, PC, or SC is considered a Visitor as part of this health and safety procedure. Visitors may not enter exclusion zones or hazardous areas. Anybody who is required to enter an exclusion zone must be classified as an SC and must meet the training and other requirements of an SC under this Master HASP. All visitors must meet the requirements set by MPA Security.

Visitors fall into one of two categories:

- Escorted Visitors – This category includes people that come to DMT and are authorized to be onsite at a potentially chromium-related project for a specific limited purpose. They must always have an escort and are limited to site areas and operations that are classified as non-hazardous.
- Restricted Visitors – This category includes people that come to DMT and are authorized to be at a chromium-related project site for a specific purpose that may require visiting for an extended period of time. They do not always need an escort if they are limited to site areas and operations that are classified as non-hazardous.

1.6 Applicable Health and Safety Regulations and Criteria

- Chapter 01 Hazardous Waste Management System: General Authority: Environment Article, Title 7, Subtitle 2, Annotated Code of Maryland
- Maryland Occupational Safety and Health (MOSH) – Occupational Health and Safety Administration (OSHA), Title 29
- 29 CFR 1926 Construction (including but not limited to)
    - Subpart D, Section 65, Hazardous Waste Operations and Emergency Response
    - Subpart Z, Section 1126, Occupational Exposure to Chromium (VI)
- 29 CFR 1910 General Industry (including but not limited to)
    - Subpart H, Section 120, Hazardous Waste Operations and Emergency Response
    - Subpart Z, Section 1026, Occupational Exposure to Chromium (VI)
- 40 CFR 260-282 Hazardous Waste Management

2.0 General Hazard Assessment

Chromium compounds are present in COPR, which is located primarily in areas of DMT shown on the MPA COPR-fill area site map (Figure 1). Chromium compounds may also be present in groundwater or in soil that has come into contact with chromium-contaminated groundwater. Potential exposure to chromium is possible when the areas containing COPR or chromium-contaminated soil or water are disturbed during construction activities. To minimize the potential for exposure, engineering controls and work practices have been put into place.

The COPR contains both trivalent (Cr (III)) and hexavalent chromium (Cr (VI)). The primary chemical of concern is Cr (VI) since the OSHA permissible exposure limit (PEL) for Cr (VI) is 5 micrograms/cubic meter of air (µg/m^3). This is 100 times lower than the PEL for Cr (III), which is 500 µg/m^3. Methods implemented to minimize exposure to Cr (VI) are focused on controlling exposure to COPR dust and will provide appropriate protection for exposure to Cr (III) as well as Cr (VI).

2.1 Health Effects of Cr (VI)

The primary means of exposure to Cr (VI) are inhalation, ingestion, and skin contact with Cr (VI)-containing dust. Cr (VI) may be inhaled when dust containing Cr (VI) is present in the air. Particles of Cr (VI)-containing dust may contaminate hands, clothing, hair, food, and beverages. MOSH/OSHA has established a PEL for Cr (VI) of 5 µg/m^3 (8-hour, time-weighted average) with an action level (AL) of 2.5 µg/m^3. The MPA Master HASP and SSHASPs are designed to keep worker exposure well below the recognized OSHA PEL for Cr (VI) and to prevent accidental ingestion or adverse dermal effects.

OSHA considers the primary health effects from workplace overexposure to Cr (VI) as lung cancer, nasal irritation, nasal tissue ulcerations, nasal septum perforations, asthma, eye irritation, and damage to the skin. The information that OSHA used to define these health effects and establish the PEL was based on occupational health studies from many different industries including chromium ore mining and processing; chromium compound manufacturing and application (including pigments and paints); stainless steel production and welding; and chromic acid manufacturing and use. No operations handling COPR were included in the OSHA investigation. The type of and mechanism for exposure to Cr (VI) through COPR may be different from those studied by OSHA. Below is a summary of the health effects from overexposure to Cr (VI).

The scientific literature documents that at very high exposure concentrations, Cr (VI) may increase the risk of developing lung cancer. It is not anticipated that Cr (VI) exposures at DMT will be at these high concentrations or at *overexposure* concentrations exceeding those considered acceptable by MOSH.

Occupational overexposure to Cr (VI) can lead to nasal tissue ulcerations and nasal septum perforations through direct "hand to nose" contact in addition to inhalation of Cr (VI), which can contaminate the nasal passages. The nasal septum separates the nostrils and is composed of a thin strip of cartilage. The nostril tissue consists of an overlying mucous membrane known as the mucosa. The initial lesion after Cr (VI) exposure is characterized by localized inflammation or a reddening of the affected mucosa, which can later lead to atrophy. This may progress to an ulceration of the mucosa layer upon continued overexposure. If exposure is discontinued, the ulcer progression will stop, and a scar may form. If the tissue damage is sufficiently severe, it can result in a perforation of the nasal septum, sometimes referred to as a chrome hole. Individuals with nasal perforations may experience a range of signs and symptoms, such as a whistling sound, bleeding, nasal discharge, and infection. Some individuals may experience no noticeable effects.

Cr (VI) is considered an airway sensitizer. Airway sensitizers cause asthma through an immune response. The sensitizing agent initially causes production of specific antibodies that attach to cells in the airways. Subsequent exposure to the sensitizing agent, such as Cr (VI), can trigger an immune-mediated narrowing of the airways and onset of bronchial inflammation. Not all workers overexposed become sensitized to Cr (VI), and the asthma only occurs in sensitized individuals.

OSHA has stated that it is not clear what occupational exposure levels of Cr (VI) compounds lead to airway sensitization or the development of occupational asthma. Occupational asthma is considered "a disease characterized by variable airflow limitation and/or airway hyper-responsiveness due to causes and conditions attributable to a particular occupational environment and not to stimuli encountered outside the workplace." Asthma is a serious illness that can damage the lungs and in some cases be life threatening. The common symptoms associated with asthma include heavy coughing while exercising or when resting after exercising, shortness of breath, wheezing sound, and tightness of chest.

Occupational overexposure to Cr (VI) is a well-established cause of adverse health effects of the skin. Direct dermal contact with Cr (VI) is the most relevant factor in the development of dermatitis and ulcers. The mildest skin reactions consist of erythema (redness), edema (swelling), papules (raised spots), vesicles (liquid spots), and scaling. Cr (VI) compounds can also have a corrosive, necrotizing effect (i.e., causing cell death) on living tissue, forming ulcers, or "chrome holes".

Chrome ulcers generally occur on areas of the body exposed to Cr (VI), chiefly on the hands and forearms. The lesions are initially painless and are often ignored until the surface ulcerates with a crust, which, if removed, leaves a crater two to five millimeters in diameter with a thickened, hardened border. The ulcers can penetrate deeply into tissue and become painful. Chrome ulcers may penetrate joints and cartilage. The lesions usually heal in several weeks if exposure to Cr (VI) ceases, leaving a scar. If exposure continues, chrome ulcers may persist for months. Some individuals may develop an allergic sensitization to Cr (VI). In sensitized workers, contact with even small amounts may cause a serious skin rash.

2.2 Exposure Assessment of Cr (VI) at DMT

In compliance with the MOSH/OSHA Cr (VI) Standard, a combination of historical and current exposure monitoring data has been used to define the potential for exposure for all workers on the DMT site. Between 2007 and 2009, 843 air samples were collected and analyzed for Cr (VI) and total dust. The results, methodologies, and discussions are included in "Assessment of Potential Human Exposure to Hexavalent Chromium at Dundalk Marine Terminal," dated August 7, 2009, which is available from the MPA Safety Department. Since 2009, an additional 543 samples have been collected and analyzed for Cr (VI).

Based on the results of this study and confirmed by subsequent air samples, it has been determined that individuals working at sub-surface sites in the COPR-fill area are at risk for some exposure to Cr (VI). Most, if not all, of these individuals are expected to be exposed at concentrations below the OSHA PEL. All other individuals working at the DMT, including contractors, tenants, MPA employees, and visitors are expected to have very low to no exposure to Cr (VI).

2.2.1 Exposure Classifications

All individuals who may work or visit DMT will be categorized into one of two exposure categories:

Possible Exposure Group (PEG) - Any individual who is working specifically at a site in the COPR-fill area (Figure 1) where the asphalt cap has been penetrated will be included in the PEG. Additionally, any individual working at DMT outside of the COPR-fill area where the asphalt cap has been penetrated will be included in the PEG if, in the opinion of the PC or MPA Safety Department, there is reason to believe that soil or groundwater may be contaminated with Cr (VI). When deciding whether workers at a site outside of the COPR-fill area should be classified as PEG, the PC or MPA Safety Department will use historical data, results of soil testing or field screening, proximity to the COPR-fill area, and/or the visual appearance of the soil.

Non-Exposure Group (NEG) - All individuals whose work at DMT does not involve direct contact with chromium-contaminated soil or water are considered to have an extremely low probability of exposure to Cr (VI).

2.2.2 Mechanism to Determine Exposure Group Classification

The PC is responsible for the classification of workers and others on its work site. The workers will be categorized as described in Section 2.2. 1. A strategy for defining these exposure groups may be found in *A Strategy for Assessing and Managing Occupational Exposures*, 4th edition (AIHA, 2015).

3.0 Health and Safety Requirements for Each Cr (VI) Exposure Group

Possible Exposure Group (PEG) - This group must meet specific requirements for personal protective equipment (PPE) (Section 6.1), training (Section 7.0), medical surveillance (Section 8.0) and decontamination to mitigate possible exposure to Cr (VI).

Non-Exposure Group (NEG) - The requirements for this group are limited to site orientation and exclusion from hazardous areas.

4.0 Procedures for Identifying Chromium-Related Work Projects

All work at DMT can be divided into three classifications:

Chromium-related work - All sub-surface work performed within the delineated COPR-fill area is considered *chromium-related work*. Additionally, sub-surface work conducted at any site where soil has been found to contain greater than 50 mg/kg Cr (VI) will be considered *chromium-related work*, regardless of the site location. This 50 mg/kg threshold is based on sampling data analyzed in “Analysis of Solid Data for COPR Monitoring Sites”, dated December 9, 2008, available from MPA Safety Department. This threshold may be updated as additional data is made available. General requirements for *chromium-related work* can be found in Sections 5 – 10 and Appendix A of this Master HASP.

Potentially chromium-related work - Since COPR may have been used as fill in various locations outside of the delineated COPR-fill area, and because soil outside of the COPR-fill area may have been impacted by chromium-contaminated groundwater, the MPA has taken the position that all sub-surface work outside of the COPR-fill area will be considered *potentially chromium-related work*. Requirements for *potentially chromium-related work* can be found in Appendix B of this Master HASP.

Non-chromium-related work - Work that takes place above the asphalt cap and that is not likely to involve direct contact with chromium-contaminated soil or ground water is considered *non-chromium-related work.*

Methods for soil testing and classifying excavation sites as *chromium-related* or *potentially chromium-related* may be found in Attachments B and C of this Master HASP.

5.0 Air Monitoring Requirements for Chromium-Related Work

MPA requires all contractors and subcontractors to perform air monitoring for all chromium-related work for which exposures have not been previously characterized. The contractors' and subcontractors' proposed air-monitoring program must be submitted to MPA for approval prior to initiating work activities. Except for tasks for which previous monitoring has adequately characterized exposures, air monitoring must be performed to determine the zone delineation within the project work area and to ensure that employees are not exposed above the OSHA PEL to Cr (VI).

For sites where exposures have not been adequately characterized, air samples for Cr (VI) will be collected at the perimeter of the exclusion zone and from the breathing zones of employees working within the exclusion zone. In addition, real-time total particulate measurements will be monitored at the exclusion-zone perimeter downwind of the work area.

5.1 Personal Monitoring

Personal air sampling will be conducted to comply with exposure assessment requirements set forth in 29 CFR 1910.120 and 29 CFR 1910.1026. The results of this monitoring will be compared to the OSHA AL and PEL for Cr (VI) (2.5 $\mu g/m^3$ and 5 $\mu g/m^3$, respectively). Personal air sampling will be conducted in a manner sufficient to characterize employee's exposures for all tasks within a project.

5.2 Perimeter Monitoring

Perimeter monitoring will consist of real-time total dust monitoring along with sampling for Cr (VI) at the perimeter of the exclusion zone. The need for perimeter monitoring during tasks for which exposures have been adequately characterized will be determined by the Manager, Safety and Risk Management.

Real-time total dust monitoring will be conducted at the perimeter of the exclusion zone, downwind of the work area, during all work that takes place inside of the exclusion zone. The real time measurements of total dust will be compared against the MPA site specific total dust AL of 1.0 mg/m^3. This AL is a concentration of total dust below which it is considered unlikely that the PEL for Cr (VI) would be exceeded. When this AL is exceeded, additional dust suppression controls must be implemented. If additional suppression is not effective, the work must be stopped.

The AL has been calculated using the 95th percentile concentration of Cr (VI) in airborne dust at sites where the asphalt cap has been penetrated. The supporting documentation for this AL, "Re-Evaluation of Maryland Port Administration's Action Level of 1.0 mg/m^3 for Total Dust", dated March 31, 2009, is available from MPA Safety and Risk Management.

Air samples will be collected at the perimeter to assess the effectiveness of the AL and to ensure that people working outside of the exclusion zone are not exposed to Cr (VI) above the OSHA AL of 2.5 $\mu g/m^3$.

5.3 Method of Sampling and Analysis

Air samples will be collected and analyzed using OSHA Method ID-215 and NIOSH Method 0500. An air sample will be collected using a pre-weighed, 37-mm diameter polyvinyl chloride (PVC) filter (5µm pore size) contained in a polystyrene cassette. A calibrated sampling pump is used to draw a representative air sample from the breathing zone of an individual through the cassette and collect particulate on the filter. A post-sampling weight is determined for the filter, providing a measure of total particulate. The amount of

Cr (VI) is determined using ion chromatograph with UV–visible detection. The sample analyses will be conducted by a laboratory accredited for these methodologies by the American Industrial Hygiene Association.

5.4 Performance-Oriented Exposure Determination

Requirements for air sampling may be met using any combination of air monitoring data, historical monitoring data or objective data sufficient to accurately characterize employees' exposure to Cr (VI). Any historical data must be from a sufficiently similar work site to ensure that the data are applicable. Because exposure is likely to vary greatly depending on the type of work performed, the concentration of Cr (VI) in soil, shift duration, the equipment and work practices used, care must taken to ensure that any historical exposure data adequately represent conditions likely to be present at the current site. Additional monitoring will be required if work practices or site conditions change.

5.5 Recordkeeping

Information documented during personal sampling will include:

- Pre-sampling flow rate
- Post-sampling flow rate
- Field observations
- Calculations and chain of custody forms
- Analytical results
- Work activities being performed
- Location of the sample relative to the location of intrusive activity
- Wind and other relevant weather conditions

6.0 Personal Protective Equipment (PPE) and Respiratory Protection

6.1 PPE

Employees in the PEG must, at a minimum, use the following PPE when working within the exclusion zone:

<u>Modified Level C</u>

- Disposable protective coveralls – when working with liquids, use impervious coveralls
- Half-face or full-face negative pressure respirator
- Inner and outer gloves
- Eye protection
- Rubber boots, when working with liquids

All PPE must meet or exceed the following standards:

Eye and Face:	29 CFR 1910.133	29 CFR 1926.102	ANSI Z87.1-1989
Respiratory:	29 CFR 1910.134	29 CFR 1926.103	ANSI Z88.1-1992

Head:	29 CFR 1910.135	29 CFR 1926.100	ANSI Z89.1-2003
Foot:	29 CFR 1910.136	29 CFR 1926.96	ANSI Z41.1-1991

ANSI = American National Standards Institute

6.2 Respiratory Protection

With the exception of tasks for which exposures have been adequately assessed in accordance with Section 5.4 and found to be below the PEL, workers in the PEG must be supplied with respiratory protection as part of a written Respiratory Protection Program that complies with the OSHA respiratory protection standard (29 CFR 1910.134). Only approved respiratory protective equipment that has been properly selected for the project will be used. Employees will be instructed on the selection and proper fit, maintenance procedures of equipment, and warning signs of respirator failure. The use of all respiratory protective equipment will conform to the manufacturer's operating instructions and training provided to the employee. In all environments where it has been determined that respiratory protection is necessary, additional ambient air monitoring may be warranted. All personnel on-site must be properly fit-tested for each type of respiratory protection they will use.

All individuals required to use respiratory protection must successfully pass a medical evaluation and receive written approval from the physician or licensed health care provider. The written approvals for all site personnel must be maintained by the PC.

Respirators will not be worn when conditions exist which prevent a good face to face piece seal. These conditions include, but are not limited to, the growth of a beard or sideburns, a skull cap which projects under the face piece, or the use of regular corrective glasses because the temple bards prohibit a proper seal. Also, the absence of one or both dentures can seriously affect the fit of any respiratory protection.

All respirators must be cleaned and disinfected at a frequency necessary to ensure that the proper protection is provided to the wearer. Respirators used by more than one worker must be cleaned and disinfected after each use. All respiratory protection must be stored in a convenient, clean, and sanitary location and according to specific manufacturer recommendations. Special attention must be paid to protecting respiratory protection from dusty conditions, temperature extremes, and potential contamination during storage.

All respiratory protection equipment used on a routine basis will be inspected prior to use. Worn or deteriorated parts must be immediately replaced or the respirator must be tagged with a “Do Not Use” sign and taken out of service. The inspection procedure for each type of equipment will follow the manufacturer’s recommended procedure.

7.0 Health & Safety Training Requirements

MPA requires that all employees in the PEG must receive a minimum of 40-hour training as detailed in the OSHA HAZWOPER standard (29 CFR 1910.120). Additionally, the PC is responsible for providing a site-specific initial training to all employees, visitors, and sub-contractors prior to allowing onto the work site. This training will include description of the potential hazards at the site and controls in place to protect individuals on the site. Additional training may be required depending on the work performed and potential hazards. Additional training may include confined space entry and lockout/tagout procedures. The PC will provide, in writing, to the MPA the names of the employees trained, the training date, training certifications, and the specific training. Copies of certifications or training records may be requested by the MPA.

In addition to health and safety training, all employees who handle hazardous waste must receive Resource Conservation and Recovery Act (RCRA) training, in accordance with 40 CFR 214.16 and 215.16. Additionally, all employees who sign hazardous waste manifests, or who label hazardous waste for transportation must receive Department of Transportation (DOT) training in accordance with 49 CFR 172.702.

8.0 Medical Surveillance Requirements

Medical surveillance must be made available to workers in the following categories:

HAZWOPER Medical Surveillance Requirements as indicated for General Industry in 29CFR1910.120 and Construction in 29CFR1926.65:

- Workers who are or may be exposed to hazardous substances or health hazards at or above the established permissible exposure limit, above the published exposure levels for these substances, without regard to the use of respirators, for 30 days or more a year;
- Workers who are injured, become ill or develop signs or symptoms due to possible overexposure involving hazardous substances or health hazards from an emergency response or hazardous waste operation; or
- Members of HAZMAT teams.

Hexavalent Chromium Standard Medical Surveillance Requirements as indicated for General Industry in 29CFR 1910.1026 and Construction in 29CFR 1926.1126:

- Workers with the potential for exposure to Cr (VI) above the action level for 30 days or more per year;
- Workers who experience signs or symptoms of the adverse health effects associated with Cr (VI) exposure; or
- Workers who are exposed to Cr (VI) in an emergency.

Respiratory Protection Standard Medical Evaluation Requirements as indicated for General Industry and Construction in 29CFR 1910.134:

- Workers that are required to wear a respirator (prior to being fit tested or using the respirator in the workplace)

Employers will make available the appropriate medical examination as required by the OSHA. All consultations or examinations will be performed by or under the supervision of a physician or licensed health care provider. Employers will establish and maintain an accurate record for each employee who was either offered or provided with medical surveillance. These records are considered to be medical records and the employer will maintain them and make them available in accordance with OSHA Access to Medical Records Standard, 29 CFR 1910.1020.

The PC will provide, in writing, the names of the employees required to participate in any of the above medical evaluation programs and certify that the employees named are physically qualified to work in the chromium-contaminated areas and wear respirators.

9.0 Decontamination and Personal Hygiene

SSHASPs for chromium-related projects must include a description of procedures and equipment that will be used to decontaminate personnel and equipment. At a minimum, this description will include who is responsible for establishing and overseeing decontamination equipment and procedures and methods for containing water used during decontamination.

PCs must provide potable water and hand washing facilities at chromium-related project sites. PCs must establish personal hygiene procedures in their SSHASPs, requiring employees to eat, smoke, drink, or chew tobacco or gum only in designated areas and only after washing their face and hands.

10.0 Emergency Response Procedures

All field personnel working in the DMT will receive health and safety training prior to the initiation of any site activities. On a day-to-day basis, individual personnel should be constantly alert for indicators of potentially hazardous situations and for signs and symptoms in themselves and others that warn of hazardous conditions and exposures.

Rapid recognition of dangerous situations can avert an emergency. Before daily work assignments, regular toolbox safety meetings should be held. Discussion should include:

- Tasks to be performed, Health and Safety Hazard Analysis;
- Time constraints (e.g. rest breaks, respirator cartridge changes);
- Hazards that may be encountered, including their effects, how to recognize symptoms or monitor them, concentration limits or other danger signals;
- Wearing, use and fitting requirements of site PPE;
- Emergency procedures, points of contact, muster points;
- Potential residential exposure issues;
- Weather conditions; and
- Recent incidents, near misses and at-risk behaviors.

An Emergency Contingency Plan must be developed to address any potential emergencies that may occur while working at the DMT. A contingency plan is a written document, established before work on the site begins, outlining policies and procedures for responding to, handling, and reporting emergencies. Potential emergencies include:

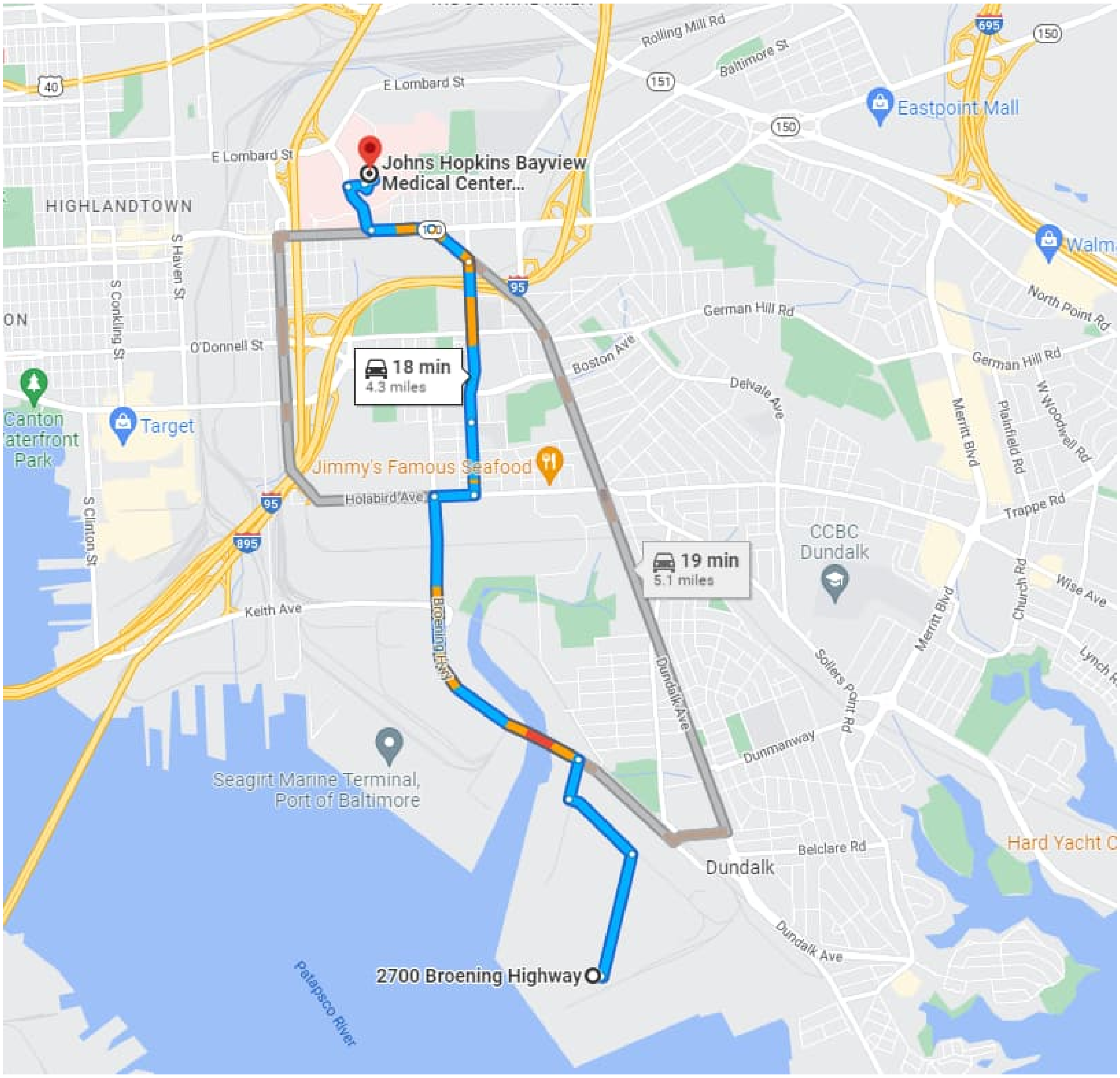
- Medical emergency
- Chemical exposure
- Structural failure
- Hazardous materials release
- Fire or explosion
- Severe weather

- Civil disturbance

When an emergency occurs, decisive action is required. Delays of minutes can increase life-threatening situations. A response needs to be immediate and accurate. Emergency situations can be characterized as a fire, explosion, serious weather conditions, a hazardous environmental release, or accident or injury to personnel. The MPA has emergency procedures that apply to DMT. These procedures will be reviewed and made available to PC prior to starting work. The PC must develop an emergency contingency plan for its work site; the PC's contingency plan should incorporate the MPA's plans.

In the event of emergency, all communications must be routed through the MDTA police at (410) 537 7911. If 911 is called during an emergency, the caller must notify the MDTA police.

In the event of a medical emergency, the nearest Emergency Room (ER) is at the Johns Hopkins Bayview Medical Center located at 4940 Eastern Ave, Baltimore, MD 21224. Below is a map with turn-by-turn directions to the ER:



- Turn left onto Broening Hwy 1.4 mi
- Turn right onto Holabird Ave 0.2 mi
- Turn left onto Charlotte Ave 0.3 mi
- Continue onto Gusryan St 0.6 mi
- Turn left onto Dundalk Ave 0.2 mi
- Use any lane to turn slightly left onto Eastern Ave 0.2 mi
- Turn right onto Bayview Blvd 0.2 mi
- Continue on Hopkins Bayview Cir to your destination (0.2 mi)
- Turn right onto Hopkins Bayview Cir 0.1 mi
- Turn right: Destination will be on the right

10.1 Evacuation Procedures

PC shall develop an Evacuation Plan that provides an orderly and safe means to evacuate persons working or visiting its worksite. An evacuation may result from a weather event, a HAZMAT incident, a fire, an act of terrorism, or other emergencies. The PC is responsible for determining muster points for its personnel. A copy of the plan should be included in the PC's SSHASP.

The plan must include plans for marine terminal evacuation as well. The current MPA Marine Terminal Evacuation Plan is available from Safety and Risk Management.

Appendix F

DMT NPDES Permit

Maryland
Department of
the Environment

Larry Hogan
Governor

Boyd Rutherford
Lieutenant Governor

Ben Grumbles
Secretary

AUG 2 4 2017

CERTIFIED MAIL

Bill Richardson, Environmental
Maryland Port Administration
2700 Broening Highway
Baltimore, MD 21224

Re: State Discharge Permit No. 10DP3060, NPDES Permit MD0066818

Dear Mr. Richardson,

Enclosed is the issued discharge permit referenced above with the effective date indicated on the cover page. The permittee is responsible for complying with all permit conditions. You are therefore advised to read the permit carefully and become thoroughly familiar with the requirements.

The U.S. Environmental Protection Agency (EPA) recently promulgated a final rule to modernize Clean Water Act reporting for municipalities, industries, and other facilities by converting to an electronic data reporting system (see 40 CFR 127.16). Under the final rule, any Discharge Monitoring Reports (DMRs) to be submitted on or after **December 21, 2016** must be electronically reported to the Department.

Thus Maryland Department of the Environment now requires use of NetDMR for filing your required NPDES DMRs. NetDMR is a freely available Web based tool that allows NPDES permittees to electronically sign and submit their DMRs to EPA via a secure internet connection. NetDMR is designed to improve data quality, reduce reporting liabilities, save paper, and provide cost savings. It allows participants to discontinue mailing in hard copy forms under 40 CFR 122.41 and 403.12. For more information go to the EPA website (www.epa.gov/netdmr) or call the MDE Water Management Administration, Compliance Program, at 410-537-3520 and ask to speak to a NetDMR coordinator.

As indicated in Condition II.A.2 of your permit, before you can submit official DMRs using NetDMR you must attend a training Webinar and successfully set-up and submit test monitoring results electronically. If you do not attend the required training in a timely manner, you will be at risk of violating the new U.S. EPA NPDES electronic reporting rule.

Enclosed is also a copy of the Federal Register, Part 136 - "Guidelines Establishing Test Procedures for Analysis of Pollutants". Unless otherwise specified, these guidelines are to be used for the analyses required by this permit. The most current version of 40 C.F.R. Part 136 can be found online at

EPA's website (www.epa.gov/epahome/cfr40.htm). Finally you'll find enclosed a brochure for NetDMRs.

Please direct all future correspondence regarding permit compliance to the following address:

Attention: Discharge Monitoring Reports
Water and Science Administration – Compliance Program
Maryland Department of the Environment
1800 Washington Boulevard, Suite 425
Baltimore, Maryland 21230-1708

If you have any other questions, please do not hesitate to call Paul Hlavinka, Industrial and General Permits Division, at 410-537-3323.

Sincerely,

Virginia F Kearney/ fn

D. Lee Currey, Director
Water and Science Administration

LB:aw

Enclosures (3)

Cc: William Lee (delivered electronically)
WSA-Compliance, Central Division Chief

Maryland
Department of
the Environment

Larry Hogan
Governor

Boyd Rutherford
Lieutenant Governor

Ben Grumbles
Secretary

STATE DISCHARGE PERMIT NUMBER	10-DP-3060	NPDES PERMIT NUMBER	MD0066818
EFFECTIVE DATE	October 1, 2017	EXPIRATION DATE	September 30, 2022
MODIFICATION DATE:	N/A	REAPPLICATION DATE	September 30, 2021

Pursuant to the provisions of Title 9 of the Environment Article, Annotated Code of Maryland, and regulations promulgated thereunder, and the provisions of the Clean Water Act, 33 U.S.C. § 1251 et seq. and implementing regulations 40 CFR Parts 122, 123, 124, and 125, the Department of the Environment, hereinafter referred to as the "Department," hereby authorizes

Maryland Port Administration
401 E. Pratt Street, Suite 1653
Baltimore, Maryland 21202

TO DISCHARGE FROM

a municipal separate storm sewer system (MS4) containing infiltrated groundwater and a wastewater treatment system at a terminal and cargo handling facility

LOCATED AT

2700 Broening Highway, Baltimore, Maryland

VIA OUTFALLS

001, 002, 004, 005, 006, and 013 as identified and described herein

TO

Patapsco River which is protected for (Use II) water contact recreation, fishing, aquatic life, wildlife in accordance with the following special and general conditions and map(s) made a part hereof.

1800 Washington Boulevard | Baltimore, MD 21230 | 1-800-633-6101 | 410-537-3000 | TTY Users 1-800-735-2258
www.mde.maryland.gov

I. SPECIAL CONDITIONS

A.1. EFFLUENT LIMITATIONS AND MONITORING REQUIREMENTS

During the effective period of this permit, the permittee is authorized to discharge treated effluent, including but not limited to dry weather flows from the Outfall 005 and Outfall 006 storm drain systems, via the wastewater treatment system to Outfall 001 (Maryland Coordinates 1446.82E and 574.45N).

As specified below, such discharge shall be limited and monitored by the permittee at the sampling port in the onsite treatment plant.

PARAMETER	QUANTITY OR LOADING			QUALITY OR CONCENTRATION				FREQUENCY OF ANALYSIS	SAMPLE TYPE	NOTES
	MONTHLY AVERAGE	DAILY MAXIMUM	UNITS	MIN	MONTHLY AVERAGE	DAILY MAXIMUM	UNITS			
Flow	Report	Report	MGD					1/Week	Measured	
Total Suspended Solids					26	52	mg/l	1/Month	24-hour Composite	
Oil and Grease						15	mg/l	1/Month	Grab	
Total Chromium					1.71	2.77	mg/l	1/Week	24-hour Composite	(1)
Hexavalent Chromium					0.05	0.10	mg/l	1/Week	24-hour Composite	(1)
Total Nickel					Report		mg/l	1/Month	24-hour Composite	(1)
Dissolved Nickel					Report		mg/l	1/Month	24-hour Composite	(1)
Total Copper					Report		mg/l	1/Month	24-hour Composite	(1)
Dissolved Copper					Report		mg/l	1/Month	24-hour Composite	(1)
Hardness					Report		mg/l	1/Month	Grab	(1)
Total Cyanide					Report		mg/l	1/Month	24-hour Composite	
Available Cyanide					0.049	0.049	mg/l	1/Month	24-hour Composite	(2), (3), (4)
pH				6.0		9.0		1/Day	Grab	

There shall be no discharge of floating solids or persistent foam in other than trace amounts. Persistent foam is foam that does not dissipate within one half-hour of point of discharge.

(1) Results for hardness to be taken the same time as the metals.

(2) The permittee shall report the result from a combination of individual grab samples representative of a 24-hour period consistent with the EPA test methodology and holding times. Cyanide shall be measured as available cyanide (or alternatively cyanide amenable to chlorination) using EPA Method OIA-

I. SPECIAL CONDITIONS

A.1. EFFLUENT LIMITATIONS AND MONITORING REQUIREMENTS – Continued from previous page

1677. The minimum level (ML) for cyanide is 2.0 µg/l. Analytical results for cyanide below the minimum level shall be reported as zero. Other NPDES approved test methods may be used if minimum levels/quantitation levels at or below the applicable permit limit can be demonstrated.

(3) Limitation becomes effective 3 years after the effective date of this permit. See Special Condition O. Monitoring without limits is required until that time.

(4) Limits are based on discharge through the existing outfall and diffuser. Any discharge event that bypasses the diffuser must meet a limit of 0.001 mg/l.

1. During the effective period of this permit, the permittee must select, design, install, and implement control measures (including best management practices) to minimize pollutant discharges of infiltrated contaminated ground water from the following MS4 stormdrains: Outfall 002 (12.5 Street Storm Drain), Outfall 004 (13.5 Street Storm Drain), Outfall 005 (14 Street Storm Drain), Outfall 006 (15 Street Storm Drain), and Outfall 013 (12 Street Storm Drain). The permittee must minimize exposure of stormwater to infiltrated contaminated groundwater by using available engineering practices as control measures (such as lining of the storm drains, capping the area, etc.).

2. The Dundalk Corrective Measures Alternatives Analysis (CMAA) resulted in an approved approach to reline storm drains leading to Outfalls 002, 004, 005, 006 and 013. The permittee shall submit to the Department (WSA) on a quarterly basis the current "Storm Drain Rehabilitation Schedule" (see Definition B.23) via NetDMR.

3. If the selected control measures are not achieving the intended effect of minimizing pollutant discharges as indicated by action level results required below, the permittee must modify these control measures per the corrective action requirements in Special Condition Q.

4. Beginning on the dates specified in paragraph A.2.5 below, such discharges shall be monitored by the permittee as specified below at the monitoring points established for the outfall pipes to the Patapsco River or, if inaccessible due to tidal influence, at the nearest manhole or tidal exclusion vault upstream of any tidal influence.

PARAMETER	ACTION LEVEL	UNITS	FREQUENCY OF ANALYSIS	SAMPLE	NOTES
Flow	Report	MGD	1/Month	Estimated	
Total Chromium (Wet Weather)	Report	mg/l	1/Month	Composite	(1) (2) (3)
Hexavalent Chromium (Wet Weather)	0.55	mg/l	1/Month	Composite	(1) (2) (3) (4)
Total Chromium (Dry Weather)	Report	mg/l	1/Month	Composite	(1) (4)
Hexavalent Chromium (Dry	0.55	mg/l	1/Month	Composite	(1) (3) (4)

(1) Sampling and reporting requirements apply to discharges from at least one *wet weather* event and one *dry weather* event (refer to Special Condition U) per sampling period for all outfalls except Outfalls 005 and 006. For Outfalls 005 and 006, only *wet weather* monitoring applies, since all *dry weather* flows must be pumped via the wastewater treatment system to Outfall 001 (Special Condition A.1), until such time that the treatment plant is closed and Outfall 001 is removed from the permit after a major permit modification. Sampling results from *dry weather* events shall be reported with the designation "-D" after the Outfall number, such as "Outfall 002-D", and results of *wet weather* events shall be reported with the designation "-W" after the outfall number, such as "Outfall 002-W". If a *dry weather* event or a *wet weather* event discharge does not occur during the reporting period, the permittee shall report "No Discharge" for the applicable parameter(s).

(2) Beginning on the effective date of the permit, the permittee shall monitor the discharges from Outfalls 005, 006, and 013 at a frequency of twice per year until the effective date of the Action Levels in paragraph A.2.5.

(3) See "Action Level Implementation Requirements" in Special Condition P. When an action level is exceeded see "Corrective Actions and Deadlines in Special Condition Q."

(4) Monthly monitoring of an outfall may be reduced to quarterly monitoring after 4 consecutive months of sampling in which all samples have concentrations of Hexavalent Chromium at or below the Action Level, by notifying the Department (WSA). However, if a quarterly sample exceeds the Action Level, monthly monitoring will again be required for a minimum of another 4 months.

5. Action Level monitoring shall begin no later than the following dates:

OUTFALL NUMBER	MONITORING START DATE
Outfall 002 (12.5 Street Storm Drain)	Permit effective date
Outfall 004 (13.5 Street Storm Drain)	Permit effective date
Outfall 013 (12 Street Storm Drain)	November 1, 2019
Outfall 005 (14 Street Storm Drain)	November 1, 2022
Outfall 006 (15 Street Storm Drain)	November 1, 2022

SPECIAL CONDITIONS

B. DEFINITIONS

1. “Action Level”: This permit establishes pollutant action level concentrations applicable to discharges from this facility. The action level concentrations are not effluent limitations; and an action level exceedance therefore, is not a permit violation. Action level monitoring data is primarily for the permittee’s use to determine the overall effectiveness of control measures, and to indicate when additional corrective actions may be necessary.

2. "Bypass" means the intentional diversion of wastes from any portion of a treatment facility.

3. “Clean Water Act: means the Federal Water Pollution Control Act, as amended, 33 U.S.C. Section 1251 et seq.

4. “CFR” means the Code of Federal Regulations.

5. "Composite sample" means a combination of individual samples obtained at least at hourly intervals over a time period. Either the volume of each individual sample is proportional to discharge flow rates or the sampling interval (for constant volume samples) is proportional to the flow rates over the time period used to produce the composite.

6. “Corrective Measures Alternatives Analysis” (or “CMAA”): The CMAA is a document that was produced under the supervision of the Department (LMA) to investigate, analyze, and address environmental conditions related to chromium at the Port of Baltimore’s Dundalk Marine Terminal (DMT).

7. "Daily determination of concentration" means one analysis performed on any given sample representing flow during a calendar day, with one number in mg/l or other appropriate units as an outcome.

8. The "daily maximum" effluent concentration means the highest reading of any daily determination of concentration.

9. "Department (LMA)" means, for the purposes of this permit, the Land Management Administration of the Maryland Department of the Environment.

10. "Department (WSA)" means, for the purposes of this permit, the Water and Science Administration of the Maryland Department of the Environment.

11. “Draft Construction Completion Report”: This report is produced to document the completion of relining of an outfall. This report is presented to the Department (LMA) upon successful completion of the relining and verification that completion of the required contractor work has been accepted by the Maryland Port Administration.

12. “Dry weather” means the sample was taken from flow that results in discharge from an outfall that begins when there is no longer any precipitation runoff flowing into the facility’s storm drains. It ends with any precipitation event that produces runoff.

13. “Final Completeness Report”: Upon completion of all relining projects to address Outfall 002-006 and Outfall 013, this report will document the final completeness to the Department (LMA) of the relining work.

14. "Grab sample" means an individual sample collected over a period of time not exceeding 15 minutes. Grab samples collected for pH and total residual chlorine shall be analyzed within 15 minutes of time of sample collection.

15. “Infeasible” means not technologically possible or not economically practicable and achievable in light of best industry practices.

16. "Measured" flow means any method of liquid volume measurement the accuracy of which has been previously demonstrated in engineering practice, or for which a relationship to absolute volume has been obtained.

17. “Minimize” means reduce and/or eliminate to the extent achievable using control measures (including best management practices) that are technologically available and economically practicable and achievable in light of best industry practice.

18. The "minimum" value means the lowest value measured during a 24-hour period.

19. The "monthly, quarterly, semi-annual, or annual average" effluent concentration means the value calculated by computing the arithmetic mean of all the daily determinations of concentration made during any calendar-month, 3-month, 6-month, or 12-month period respectively.

20. Municipal Separate Storm Sewer System (MS4) – a conveyance or system of conveyances (including roads with drainage systems, municipal streets, catch basins, curbs, gutters, ditches, man-made channels, or storm drains):
    a) Owned or operated by a State, city, town, borough, county, parish, district, association, or other public body (created by or pursuant to State law) having jurisdiction over disposal of sewage, industrial wastes, stormwater, or other wastes, including special districts under State law such as a sewer district, flood control district or drainage district, or similar entity, or an Indian tribe or an authorized Indian tribal organization, or a designated and approved management agency under section 208 of the CWA that discharges to waters of the United States;
    b) Designed or used for collecting or conveying stormwater;
    c) Which is not a combined sewer; and
    d) Which is not part of a Publicly Owned Treatment Works (POTW) as defined at 40 CFR 122.2. See 40 CFR 122.26(b)(4) and (b)(7).

21. "NetDMR" means a nationally-available electronic reporting tool, initially designed by states and later adapted for national use by EPA, which can be used by NPDES-regulated facilities to submit discharge monitoring reports (DMRs) electronically to EPA through a secure Internet application over the National Environmental Information Exchange Network (NEIEN). EPA can then share this information with authorized states, tribes, and territories.

22. "Oil and Grease" refers to the use of and results yielded from EPA Method 1664 or any EPA approved revisions of this analytical test method approved for use with Clean Water Act monitoring programs.

23. "Stormdrain Inspection and Maintenance Plan": This term refers to a plan the Maryland Port Administration will implement to address both inspection and maintenance of the completed relining projects.

24. "Storm Drain Rehabilitation Schedule": This term refers to the schedule for the relining project, which includes Draft Construction Completion Report(s), and Final Completeness Report milestones, and is the primary tool used to communicate to the Department (LMA) the status of the relining control measures.

25. "Uncontaminated ground water infiltration" means water below the land surface in the zone of saturation which has been impacted by activities associated with disposal of Chrome Ore Processing Residue (COPR) material and infiltrates into the MS4 system, discharges only as the result of wet weather events, and results in discharge levels below the action level defined in this permit.

26. "Upset" means the exceptional incident in which there is unintentional and temporary noncompliance with technology-based permit effluent limitations because of factors beyond the reasonable control of the permittee. An upset does not include noncompliance to the extent caused by operational error, improperly designed treatment facilities, inadequate treatment facilities, lack of preventive maintenance, or careless or improper operation.

27. "Wet weather" means the period during which precipitation or melting snow causes visible runoff from the facility that results in discharge from an outfall.

C. TOXIC POLLUTANT REPORTING

The permittee shall notify the Department (WSA) as soon as it is known or suspected that any toxic pollutants at Outfall 001 which are not specifically limited by this permit have been discharged at levels specified in 40 CFR Part 122.42(a).

D. REMOVED SUBSTANCES

1. Within 30 days after notification by the Department (WSA), the permittee shall provide information on the disposal of any removed substances, as defined by General Condition B.7, including the following information:

    a. A suitable map showing all areas used for disposal of removed substances.

    b. The physical, chemical, and biological characteristics, as appropriate; quantities of any removed substances; and the method of disposal.

    c. If disposal is handled by persons other than the permittee, identification of the contractor or subcontractor, their mailing address, and the information specified in a and b above.

2. The Department's notification may also require the permittee to provide the above information prior to the use of new or additional disposal areas, contractors, or subcontractors.

E. ANALYTICAL LABORATORY

Within 30 days after the effective date of this permit, the permittee shall submit to the Department (WSA) the name and address of the analytical laboratory (including the permittee's own laboratory) which is used to perform the monitoring required by this permit.

If the laboratory changes during the effective period of this permit, the permittee shall notify the Department (WSA) of the new laboratory within 30 days after the change.

F. WASTEWATER OPERATOR CERTIFICATION

As of the effective date of this permit, the permittee's facility shall be operated by an industrial wastewater operator duly certified by the Maryland Board of Waterworks and Waste Systems Operators. Certification shall be for operation of a Class 6 industrial wastewater works, unless the Board determines that a different classification is appropriate. At no time during the effective period of this permit shall the treatment facilities be operated for more than two months without a certified operator.

G. FLOW MONITORING

In lieu of providing measured flow (defined in the Special Conditions Definitions section) at Outfalls 001, 002, 004, 005, 006 and 013, the permittee may estimate flows and submit the following information at the time of submission of the initial discharge monitoring report and/or upon any change in the methodology:

1. a description of the methodology used to estimate flow at each outfall where flow measurement equipment is not present;

2. documentation appropriate to the methodology utilized which provides information necessary to support the validity of the reported flow estimate. If actual measurements or observations are made, a description of typical sampling times, locations, and persons performing the measurements/observations should also be provided.

3. a description of the factors (e.g., batch discharges, intermittent operation, etc.) which cause flow at the outfall to fluctuate significantly from the estimate provided.

H. FLOW BASIS FOR ANNUAL DISCHARGE PERMIT FEE – [Reserved]

I. REAPPLICATION FOR A PERMIT

The Department (WSA) is implementing a schedule for issuance of discharge permits grouped by geographical areas (watersheds). To implement the watershed-based schedule, the Department (WSA) may revoke and reissue this permit concurrently with other permits in the watershed.

Unless the Department (WSA) grants permission for a later date, the permittee shall submit a renewal application by no later than 12 months prior to the expiration date on the first page of this permit, or notify the Department (WSA) of the intent to cease discharging by the expiration date.

In the event that a timely and sufficient reapplication has been submitted and the Department (WSA) is unable, through no fault of the permittee, to issue a new permit before the expiration date of this permit, the terms and conditions of this permit are automatically continued and remain fully effective and enforceable.

J. PERMIT REOPENER FOR TOTAL MAXIMUM DAILY LOAD (TMDL) AT OUTFALL 001

This permit may be reopened as a major modification to implement any applicable requirements associated with a Total Maximum Daily Load (TMDL) issued or approved for this watershed Baltimore Harbor , 02.13.09.03, including but not limited to: Total Chromium and Hexavalent chromium.

The terms and conditions of this permit are in conformance with the Chesapeake Bay Total Maximum Daily Load (TMDL) for Sediments, Nitrogen and Phosphorus, approved December 29, 2010.

At this time, the permit limits total suspended solids, but does not introduce limits for total nitrogen and total phosphorus. Such limitations are to prevent water quality degradation of the receiving waters and ultimately the Chesapeake Bay. This determination has been based on facility operations and/or discharge characteristics.

To ensure the Chesapeake Bay and its tributaries are protected from discharges of sediments, nitrogen and phosphorus, this permit may be reopened as a major modification to implement any applicable requirements associated with the Chesapeake Bay TMDL. The permittee may become subject to a Department-issued General Permit regarding the discharge of such pollutants.

K. BIOMONITORING PROGRAM – [Reserved]

L. TOXICITY REDUCTION EVALUATION AT OUTFALL 001

The permittee shall conduct a Toxicity Reduction Evaluation (TRE) when a review of toxicity test data by the Department (WSA) indicates unacceptable acute or chronic effluent toxicity. A TRE is an investigation conducted to identify the causative agents of effluent toxicity, isolate the source(s), determine the effectiveness of control options, implement the necessary control measures and then confirm the reduction in toxicity.

1. Within 90 days following notification by the Department (WSA) that a TRE is required, the permittee shall submit a plan of study and schedule for conducting a TRE. The permittee shall conduct the TRE study consistent with the submitted plan and schedule.

2. This plan should follow the framework presented in Generalized Methods for Conducting Industrial Toxicity Reduction Evaluations (EPA/600/2-88/070).

3. Beginning 60 days following the date of the Department's (WSA) acceptance of the TRE study plan and every 60 days thereafter, the permittee shall submit progress reports including all relevant test data to the Department (WSA). This shall continue until completion of the toxicity reduction confirmation.

4. Within 60 days following completion of the toxicity identification, or the source identification phase of the TRE, the permittee shall submit to the Department (WSA) a plan and schedule for implementing those measures necessary to eliminate acute toxicity and/or reduce chronic toxicity to acceptable levels. The implementation of these measures shall begin immediately upon submission of this plan.

5. Within 60 days after completing implementation of the control measures to eliminate or reduce toxicity, the permittee shall submit to the Department (WSA) for approval a study plan to confirm the elimination or reduction of toxicity by using biomonitoring.

6. If, for any reason, the implemented measures do not result in compliance with the Department's toxicity limitations, the permittee shall continue the TRE.

M. MIXING ZONES AND POLLUTION PREVENTION AT OUTFALL 001

"Chesapeake 2000" is a comprehensive Agreement for the restoration of the Chesapeake Bay signed June 28, 2000 by the State of Maryland, Commonwealths of Virginia and Pennsylvania, the District of Columbia, U.S. Environmental Protection Agency and Chesapeake Bay Commission. Among its goals the Agreement includes the following:

"Through continual improvement of pollution prevention measures and other voluntary means, strive for zero release of chemical contaminants from point sources, ... Particular emphasis shall be placed on achieving ... elimination of mixing zones for persistent or bioaccumulative toxics."

To support attainment of this goal the permittee shall strive to meet water quality standards (WQS) for toxic substances at the point of discharge, including WQS for copper, through continual improvement of pollution prevention measures and other means. Beginning within 12 months after the effective date of this permit and continuing annually thereafter, the permittee shall report to the Department (WSA) on progress made toward the elimination of mixing zones for persistent or bioaccumulative toxics.

N. PROTECTION OF WATER QUALITY AT OUTFALL 001

It is a violation of this permit to discharge any substance not otherwise listed under the permit's "Effluent Limitations and Monitoring Requirements" special conditions at a level which would cause or contribute to any exceedance of the numerical water quality standards in COMAR 26.08.02.03

unless the level and the substance were disclosed in writing in the permit application prior to the issuance of the permit. If a discharge regulated by this permit causes or contributes to an exceedance of the water quality standards in COMAR 26.08.02.03, including but not limited to the general water quality standards, or if the discharge includes a pollutant that was not disclosed or addressed in the public record for the permit determination, the Department (WSA) is authorized to modify, suspend or revoke this permit or take enforcement action to address unlawful discharges of pollutants.

O. COMPLIANCE SCHEDULE FOR CYANIDE LIMITS AT OUTFALL 001

1. Every six months, the permittee shall submit to the Department (WSA) a status report detailing current plans for meeting cyanide limits in Special Condition A.1. This report is due six months after the effective date of the permit and every six months thereafter until compliance with the permit limits have been achieved or until a permit modification under condition O.2 has been implemented. The plans may include alternative treatment technologies or other discharge options which will result in compliance with the final discharge limitations.

2. No later than 24 months after the effective date of this permit, the permittee may apply for a permit modification to revise or remove the permit limit(s) based on any combination of the following options allowed under COMAR 26.08:

   Additional Data: As part of the application for a permit modification, the permittee may submit any new or additional data which demonstrates that there is no reasonable potential for violation of applicable water quality standards.

   Alternatives for making such a demonstration include, but are not limited to, the following:
   i. collection of effluent data using analytical methods which have lower detection levels;
   ii. collection of data using techniques designed to minimize the effects of contamination on sample results; and
   iii. collection of data utilizing alternate monitoring locations to show compliance with water quality standards.

P. ACTION LEVEL IMPLEMENTATION REQUIREMENTS

1. Lining of the stormdrains leading to Outfalls 002 and 004 has already been completed, and the requirements in Special Condition A.2 for action levels at these outfalls begin upon the effective date of the permit until the outfalls are removed from this permit in accordance with Special Condition T.

2. When lining of the storm drain leading to any specific Outfall (005, 006 or 013) is completed, the permittee shall notify the WSA-Compliance Program in writing within 14 days of lining completion for that outfall and shall:

   a. Include in the notification a copy of the Draft Construction Completion Report:
   b. Identify and label a discharge monitoring location for the completed outfall and provide a written location description to the Department's WSA-Compliance Program;
   c. Include updated status details for any remaining Outfalls not yet complete;
   d. Update the "Stormdrain Inspection and Maintenance Plan" as each outfall is completed: and

e. Begin action level monitoring in the first month following the notification of lining completion for that outfall, but no later than the dates specified in Special Condition A.2.5.

3. Special Condition A.2.4 specifies a pollutant action level concentration that is primarily for the permittee's use to determine the overall effectiveness of control measures and to assist the permittee in determining when additional corrective action(s) may be necessary to comply with the effluent limitations. The action level concentration is not an effluent limitation; an action level exceedance, therefore, is not a permit violation. However, if corrective action is required as a result of an action level exceedance, failure to conduct required corrective action is a permit violation.

4. In the event that an action level specified in Special Condition A.2.4 has been exceeded, the permittee shall take corrective actions as specified in Special Condition Q.

Q. CORRECTIVE ACTIONS AND DEADLINES.

The permittee must implement Immediate Actions (Q.1) and, if required, Subsequent Actions (Q.2) if control measures are not stringent enough for the discharge to meet the non-numeric effluent limits in this permit based on any sampling result exceeding an Action Level (see Special Condition P).

1. Immediate Actions. If corrective action is needed, the permittee must immediately take all reasonable steps necessary to minimize or prevent the discharge of pollutants until a permanent solution is installed and made operational. The permittee shall submit the actions taken and results together with a plan and schedule of any remaining corrective actions to the Department (WSA) for approval prior to the next required sampling event. In addition, if the concentration for Hexavalent Chromium is above 1.1 mg/L, the permittee must notify the Department (WSA) by telephone within 24 hours and written confirmation within 5 days.

   Note: In this context, the term "immediately" requires the permittee to, on the same day a condition requiring corrective action is found, take all reasonable steps to minimize or prevent the discharge of pollutants until a permanent solution is installed and made operational. However, if a problem is identified at a time in the work day when it is too late to initiate corrective action, the initiation of corrective action must begin no later than the following work day. "All reasonable steps" means that the permittee has undertaken initial actions to assess (such as immediate confirmatory sample) and correct the condition causing the discharge to exceed the action level, including, for example, making arrangements (i.e., scheduling) for a new BMP to be installed at a later date.

2. Subsequent Actions. If the permittee or the Department determines that additional actions are necessary beyond those implemented pursuant to Q.1, the permittee must complete the corrective actions (e.g., install a new or modified control and make it operational, complete the repair) before the next storm event if possible, and within 45 calendar days from the time of discovery of the corrective action condition. If it is infeasible to complete the corrective action within 45 calendar days, the permittee must document why it is infeasible to complete the corrective action within the 45-day timeframe. The permittee must also identify the permittee's schedule for completing the work, which must be done as soon as practicable after the 45-day timeframe. If the completion of corrective action will exceed the 45 day timeframe, the permittee may take the minimum additional time necessary to complete the corrective action, provided that the permittee notify the Department (WSA) of the permittee's intention to exceed 45 days, the permittee's rationale for an extension, and a completion date, which the permittee must also include in the permittee's corrective action documentation.

However, any schedule for completing the corrective action greater than 18 months after discovery must be submitted to the Department (WSA) in the form of a permit modification application which invokes the public participation process.

Where the permittee's corrective actions result in changes to any of the controls or procedures documented in the Stormdrain Inspection and Maintenance Plan, the permittee must modify the Stormdrain Inspection and Maintenance Plan accordingly within 14 calendar days of completing corrective action work.

R. HAZARDOUS WASTE PROGRAM REPORTING

The results of any new or additional effluent monitoring required by the Department's Land Restoration Program is required to be concurrently submitted via NetDMR as an attachment.

S. ILLICIT CYANIDE DISCHARGE DETECTION AND ELIMINATION (FOR OUTFALLS 002, 004, 005, 006 and 013).

If after the three (3) year compliance schedule for cyanide in Outfall 001 (Special Conditions I.A and O), the limits for cyanide are implemented and the source of cyanide is not from the treatment plant process itself, then the permittee must comply with this special condition. If the source of cyanide is from the treatment system, the permittee must notify the Department, with supporting documentation for review. If the Department concurs that the source of cyanide is the treatment system, this special condition is satisfied.

The permittee shall develop, implement, and maintain a program to identify and eliminate any illicit source(s) of cyanide from occurring in storm drain system connections and non-stormwater discharges to the maximum extent practicable. The program developed to satisfy this minimum control measure shall contain elements to field screen storm drain system outfalls, inspect the storm drain system for the purpose of identifying the source of any illicit discharges, eliminate any illegal connection or illicit discharge to the storm drain system, and enforce penalties where appropriate. The illicit discharge program shall also contain components to address illegal dumping and spills. This minimum control measure may be implemented and maintained by the permittee or by another responsible entity. Additionally, the permittee may coordinate its efforts to identify and eliminate non-stormwater discharges with those of the surrounding County performing similar activities. If the responsibilities for complying with this minimum control measure are to be shared between the permittee and another responsible entity, the relationship and specific duties of all participating entities shall be outlined in a notification to the Department (WSA).

At a minimum, a program developed to implement illicit cyanide discharge detection and elimination to satisfy this control measure shall contain the following:

1. A map showing the extent of the storm drain system;
2. The legal means to provide for entering onto private property to investigate and eliminate illicit storm drain system discharges;
3. Procedures to field screen storm drain outfalls on a consistent basis;
4. Inspection procedures for identifying the source of any suspected illicit discharges to the storm drain system;
5. Enforcement and penalty procedures;
6. Procedures to address spills and illegal dumping;
7. Means to inform public employees, businesses, and the general public of illegal discharges and improper waste disposal; and

8. Any other components deemed necessary to ensure that non-stormwater discharges to the municipal separate storm sewer system are either permitted by MDE under NPDES or eliminated.

Regardless of whether the permittee develops its own program or relies on another responsible entity to satisfy this minimum control measure, the permittee shall cooperate regarding discharges entering or leaving its jurisdictional boundaries or Waters of the State. The intent of this program is to control non-stormwater discharges to and from municipal separate storm sewer systems. Therefore, it is essential that the permittee cooperate actively in instances where storm drain systems are interconnected with entities covered under this or any other NPDES stormwater permit.

T. REMOVAL OF MS4 STORMDRAINS FROM COVERAGE UNDER THIS PERMIT

Upon demonstration to the Department (WSA) that the source of chromium from an outfall has been addressed through implementation of the permit's technology based non-numeric effluent limitations and resulting in uncontaminated groundwater infiltration (see definition B.25) for two consecutive years, the outfall may be removed from the permit only after a major permit modification limited to the specific Outfall(s) removal, including public participation. Any permit modification application for removing an outfall shall include submission of a report covering that outfall, which shall include data to support the removal, and a plan which includes any BMPs that may be used to monitor, prevent or reduce the discharge of chromium from the outfall to be implemented and reported pursuant to terms of the current MS4 permit (permit no. 05-SF-5501 or its successor).

U. IMPLEMENTATION OF DRY WEATHER DISCHARGE MONITORING REQUIREMENT (see Special Condition A.2)

The permittee must provide a plan to the Department (WSA), within 30 days of the permit effective date, on how dry weather discharges will be identified and how dry weather discharge samples will be obtained. The plan should ensure that a representative sample may be taken monthly or quarterly as required by Special Condition A.2, or, if there is no discharge, that it is verifiable. If there is no likelihood of a dry weather discharge due to the configuration of the outfall, related details should be provided as part of the plan submittal.

II. GENERAL CONDITIONS

A. MONITORING AND REPORTING

1. REPRESENTATIVE SAMPLING

Samples and measurements taken as required herein shall be taken at such times as to be representative of the quantity and quality of the discharges during the specified monitoring periods.

2. REPORTING-MONITORING RESULTS SUBMITTED QUARTERLY

Monitoring results obtained during each calendar month shall be summarized and submitted electronically using NetDMR. Results shall be submitted to the Department via NetDMR no later than the 28th of the month following the end of the reporting month. Specific requirements regarding submittal of data and reports in hard copy form and for submittal using NetDMR are described below:

a. NetDMR is a U.S. EPA tool allowing regulated Clean Water Act permittees to submit monitoring reports electronically via a secure Internet application. The permittee must obtain access to NetDMR at www.epa.gov/netdmr and register for a NetDMR Webinar. Before the permittee can submit official DMRs using NetDMR the permittee must attend a training Webinar and successfully set-up and submit test monitoring results electronically.

b. Hard copies of monitoring results obtained before the permittee obtains access to NetDMR, but not later than December 21, 2016, may be submitted postmarked no later than the 28th of the month following the end of the reporting month. Signed copies of the results shall be submitted to the Department at the following address:

Attention: Discharge Monitoring Reports
Water and Science Administration
Compliance Program
Maryland Department of the Environment
1800 Washington Boulevard, STE-425
Baltimore, MD 21230-1708

3. SAMPLING AND ANALYSIS METHODS

The analytical and sampling methods used shall conform to procedures for the analysis of pollutants as identified in Title 40 CFR Part 136 - "Guidelines Establishing Test Procedures for the Analysis of Pollutants" unless otherwise specified.

4. DATA RECORDING REQUIREMENTS

For each measurement or sample taken pursuant to the requirements of this permit, the permittee shall record the following information:

a. the exact place, date, and time of sampling or measurement;
b. the person(s) who performed the sampling or measurement;
c. the dates and times the analyses were performed;

d. the person(s) who performed the analyses;
e. the analytical techniques or methods used; and
f. the results of all required analyses.

5. MONITORING EQUIPMENT MAINTENANCE

The permittee shall periodically calibrate and perform maintenance procedures on all monitoring and analytical instrumentation to insure accuracy of measurements.

6. ADDITIONAL MONITORING BY PERMITTEE

If the permittee monitors any pollutant, using approved analytical methods as specified above, at the locations designated herein more frequently than required by this permit, the results of such monitoring, including the increased frequency, shall be included in the calculation and reporting of the values required in the Discharge Monitoring Report form (EPA No. 3320-1).

7. RECORDS RETENTION

All records and information resulting from the monitoring activities required by this permit, including all records of analyses performed, calibration and maintenance of instrumentation, and original recordings from continuous monitoring instrumentation shall be retained for a minimum of three years. This period shall be automatically extended during the course of litigation, or when requested by the Department (WSA).

B. MANAGEMENT REQUIREMENTS

1. CHANGE IN DISCHARGE

All discharges authorized herein shall be consistent with the terms and conditions of this permit. The discharge of any pollutant identified in this permit at a level in excess of that authorized shall constitute a violation of the terms and conditions of this permit. The permittee shall report any anticipated facility expansions, production increases, or process modifications which will result in new, different or an increased discharge of pollutants by submitting a new application at least 180 days prior to the commencement of the changed discharge except that if the change only affects a listed pollutant and will not violate the effluent limitations specified in this permit, by providing written notice to the Department (WSA). Following such notice, the permit may be modified by the Department (WSA) to include new effluent limitations on those pollutants.

2. NONCOMPLIANCE WITH EFFLUENT LIMITATIONS

If, for any reason, the permittee does not comply with or will be unable to comply with any daily maximum or daily minimum effluent limitation specified in this permit, the permittee shall notify the Inspection and Compliance Program by telephone at (410) 537-3510 within 24 hours of becoming aware of the noncompliance. Within five calendar days, the permittee shall provide the Department (WSA) with the following information in writing:

a. a description of the non-complying discharge including its impact upon the receiving waters;

b. cause of noncompliance;

c. anticipated time the condition of noncompliance is expected to continue or if such condition has been corrected, the duration of the period of noncompliance;

d. steps taken by the permittee to reduce and eliminate the non-complying discharge;

e. steps to be taken by the permittee to prevent recurrence of the condition of noncompliance; and

f. a description of the accelerated or additional monitoring by the permittee to determine the nature and impact of the noncomplying discharge.

3. FACILITIES OPERATION

All treatment, control and monitoring facilities, or systems installed or used by the permittee, are to be maintained in good working order and operated efficiently.

4. ADVERSE IMPACT

The permittee shall take all reasonable steps to minimize or prevent any adverse impact to waters of the State or to human health resulting from noncompliance with any effluent limitations specified in this permit, including such accelerated or additional monitoring as necessary to determine the nature and impact of the noncomplying discharge.

5. BYPASSING

Any bypass of treatment facilities necessary to maintain compliance with the terms and conditions of this permit is prohibited unless:

a. the bypass is unavoidable to prevent a loss of life, personal injury or substantial physical damage to property, damage to the treatment facilities which would cause them to become inoperable, or substantial and permanent loss of natural resources;

b. there are no feasible alternatives;

c. notification is received by the Department (WSA) within 24 hours (if orally notified, then followed by a written submission within five calendar days of the permittee's becoming aware of the bypass). Where the need for a bypass is known (or should have been known) in advance, this notification shall be submitted to the Department (WSA)for approval at least ten calendar days before the date of bypass or at the earliest possible date if the period of advance knowledge is less than ten calendar days; and

d. the bypass is allowed under conditions determined by the Department (WSA) to be necessary to minimize adverse effects.

6. CONDITIONS NECESSARY FOR DEMONSTRATION OF AN UPSET

An upset shall constitute an affirmative defense to an action brought for noncompliance with technology-based effluent limitations only if the permittee demonstrates, through properly signed, contemporaneous operating logs, or other relevant evidence, that:

a. an upset occurred and that the permittee can identify the specific cause(s) of the upset;

b. the permitted facility was at the time being operated in a prudent and workman-like manner and in compliance with proper operation and maintenance procedures;

c. the permittee submitted a 24-hour notification of upset in accordance with the reporting requirements of General Condition II.B.2 above;

d. the permittee submitted, within five (5) calendar days of becoming aware of the upset, documentation to support and justify the upset; and

e. the permittee complied with any remedial measures required to minimize adverse impact.

7. REMOVED SUBSTANCES

Wastes such as solids, sludges, or other pollutants removed from or resulting from treatment or control of wastewaters, or facility operations, shall be disposed of in a manner to prevent any removed substances or runoff from such substances from entering or from being placed in a location where they may enter the waters of the State.

8. POWER FAILURE

In order to maintain compliance with the effluent limitations and prohibitions of this permit, the permittee shall either:

a. provide an alternative power source sufficient to operate the wastewater collection and treatment facilities or,

b. halt, reduce or otherwise control production and all discharges upon the reduction, loss, or failure of the primary source of power to the wastewater collection and treatment facilities.

C. RESPONSIBILITIES

1. RIGHT OF ENTRY

The permittee shall permit the Secretary of the Department, the Regional Administrator for the Environmental Protection Agency, or their authorized representatives, upon the presentation of credentials to:

a. enter upon the permittee's premises where an effluent source is located or where any records are required to be kept under the terms and conditions of this permit;

b. access and copy, at reasonable times, any records required to be kept under the terms and conditions of this permit;

c. inspect, at reasonable times, any monitoring equipment or monitoring method required in this permit;

d. inspect, at reasonable times, any collection, treatment, pollution management, or discharge facilities required under this permit; and

e. sample, at reasonable times, any discharge of pollutants.

2. TRANSFER OF OWNERSHIP OR CONTROL OF FACILITIES

In the event of any change in ownership or control of facilities from which the authorized discharge emanates, the permit may be transferred to another person if:

a. the permittee notifies the Department in writing, of the proposed transfer;

b. a written agreement, indicating the specific date of proposed transfer of permit coverage and acknowledging responsibilities of current and new permittees for compliance with the liability for the terms and conditions of this permit, is submitted to the Department; and

c. neither the current permittee nor the new permittee receive notification from the Department, within 30 calendar days, of intent to modify, revoke, reissue or terminate the existing permit.

3. REAPPLICATION FOR A PERMIT – [Reserved]

4. AVAILABILITY OF REPORTS

Except for data determined to be confidential under Section 308 of the Clean Water Act, 33 U.S.C. § 1318, all submitted data shall be available for public inspection at the offices of the Department and the Regional Administrator of the Environmental Protection Agency.

5. PERMIT MODIFICATION

A permit may be modified by the Department (WSA) upon written request of the permittee and after notice and opportunity for a public hearing in accordance with and for the reasons set forth in 40 CFR § 122.62 and 122.63.

6. PERMIT MODIFICATION, SUSPENSION, OR REVOCATION

After notice and opportunity for a hearing, this permit may be modified, suspended, or revoked and reissued in whole or in part during its term, in accordance with the provisions set forth in COMAR 26.08.04.10, for causes including, but not limited to, the following:

a. violation of any terms or conditions of this permit;

b. obtaining this permit by misrepresentation or failure to disclose fully all relevant facts;

c. a change in any condition that requires either a temporary or permanent reduction or elimination of the authorized discharge; or

d. a determination that the permitted discharge poses a threat to human health or welfare or to the environment and can only be regulated to acceptable levels by permit modification or termination.

e. upon a final, unreviewable determination that the permittee lacks, or is in violation, of any federal, state, or local approval necessary to conduct the activities by this permit.

7. TOXIC POLLUTANTS

If a toxic effluent standard or prohibition (including any schedule of compliance specified in such toxic effluent standard or prohibition) is established by the U.S. Environmental Protection Agency, or pursuant to Section 9-314 of the Environment Article, Annotated Code of Maryland, for a toxic pollutant which is present in the discharges authorized herein and such standard is more stringent than any limitation upon such pollutant in this permit, this permit shall be revoked and reissued or modified in accordance with the toxic effluent standard or prohibition and the permittee so notified. Any effluent standard established in this case for a pollutant which is injurious to human health is effective and enforceable by the time set forth in the promulgated standard, even absent permit modification.

8. OIL AND HAZARDOUS SUBSTANCES PROHIBITED

Nothing in this permit shall be construed to preclude the institution of any legal action or relieve the permittee from any responsibility, liability, or penalties to which the permittee may be subject under Section 311 of the Clean Water Act (33. U.S.C. § 1321), or under the Annotated Code of Maryland.

9. CIVIL AND CRIMINAL LIABILITY

Except as provided in permit conditions on "bypassing," "upset," and "power failure," nothing in this permit shall be construed to preclude the institution of any legal action nor relieve the permittee from civil or criminal responsibilities and/or penalties for noncompliance with Title 9 of the Environment Article, Annotated Code of Maryland or any federal, local, or other State law or regulation.

10. PROPERTY RIGHTS/COMPLIANCE WITH OTHER REQUIREMENTS

The issuance of this permit does not convey any property rights in either real or personal property, or any exclusive privileges, nor does it authorize any injury to private property or any invasion of personal rights, nor any infringement of federal, State or local laws or regulations.

11. SEVERABILITY

The provisions of this permit are severable. If any provisions of this permit shall be held invalid for any reason, the remaining provisions shall remain in full force and effect. If the application of any provision of this permit to any circumstances is held invalid, its application to other circumstances shall not be affected.

12. WATER CONSTRUCTION AND OBSTRUCTION

This permit does not authorize the construction or placing of physical structures, facilities, or debris, or the undertaking of related activities in any waters of the State.

13. COMPLIANCE WITH WATER POLLUTION ABATEMENT STATUTES

The permittee shall comply at all times with the provisions of the Environment Article, Title 7, Subtitle 2 and Title 9, Subtitle 3 of the Annotated Code of Maryland and the Clean Water Act, 33 U.S.C. § 1251 et seq.

14. ACTION ON VIOLATIONS

The issue or reissue of this permit does not constitute a decision by the State not to proceed in administrative, civil, or criminal action for any violations of State law or regulations occurring before the issue or reissue of this permit, nor a waiver of the State's right to do so.

15. CIVIL PENALTIES FOR VIOLATIONS OF PERMIT CONDITIONS

In addition to civil penalties for violations of State water pollution control laws set forth in Section 9-342 of the Environment Article, Annotated Code of Maryland, the Clean Water Act, as adjusted pursuant to 40 C.F.R. § 19.4, provides that any person who violates Section 301, 302, 306, 307, 308, 318 or 405 of the Act, or any permit condition or limitation implementing any of such sections in a permit issued under Section 402 of the Act or in a permit issued under Section 404 of the Act, is subject to a civil penalty not to exceed $37,500 per day for each violation.

16. CRIMINAL PENALTIES FOR VIOLATIONS OF PERMIT CONDITIONS

In addition to criminal penalties for violations of State water pollution control laws set forth in Section 9-343 of the Environment Article, Annotated Code of Maryland, the Clean Water Act provides that:

a. any person who negligently violates Section 301, 302, 306, 307, 308, 318, or 405 of the Act, or any permit condition or limitation implementing any of such sections in a permit issued under Section 402 of the Act, or in a permit issued under Section 404 of the Act, is subject to a fine of not less than $2,500 nor more than $25,000 per day of violation, or by imprisonment for not more than one (1) year, or by both.

b. any person who knowingly violates Section 301, 302, 306, 307, 308, 318 or 405 of the Act, or any permit condition or limitation implementing any of such sections in a permit issued under Section 402 of the Act, or in a permit issued under Section 404 of the Act, is subject to a fine of not less than $5,000 nor more than $50,000 per day of violation, or by imprisonment for not more than three (3) years, or by both.

c. any person who knowingly violates Section 301, 302, 306, 307, 318 or 405 of the Act, or any permit condition or limitation implementing any of such sections in a permit issued under Section 402 of the Act, or in a permit issued under Section 404 of the Act, and who knows at that time that he thereby places another person in imminent danger of death or serious bodily injury, is subject to a fine of not more $250,000 or imprisonment of not more than 15 years, or both.

d. any person who knowingly makes any false material statement, representation, or certification in any application, record, report, plan, or other document filed or required to be maintained under the Act or who knowingly falsifies, tampers with or renders inaccurate any monitoring device or method required to be maintained under the Act, is subject to a fine of not more than $10,000 or by imprisonment for not more than two (2) years, or by both.

17. DUTY TO PROVIDE INFORMATION

The permittee shall furnish to the Director, within a reasonable time, any information which the Director may request to determine whether cause exists for modifying, revoking and reissuing, or terminating this permit, or to determine compliance with this permit. The permittee shall also furnish to the Director, upon request, copies of records required to be kept by this permit.

18. SIGNATORY REQUIREMENTS

All applications, reports, or information submitted to the Director shall be signed and certified as required by 40 CFR 122.22.

19. REOPENER CLAUSE FOR PERMITS

This permit shall be modified, or alternatively, revoked and reissued, to comply with any applicable effluent standard or limitation issued or approved under Sections 301, 304, and 307 of the Clean Water Act [33 USCS §§ 1311, 1314, 1317] if the effluent standard or limitation so issued or approved:

a. contains different conditions or is otherwise more stringent than any effluent limitation in this permit; or

b. controls any pollutant not limited in this permit.

This permit, as modified or reissued under this paragraph, shall also contain any other requirements of the Act then applicable.

D. AUTHORITY TO ISSUE NATIONAL POLLUTANT DISCHARGE ELIMINATION SYSTEM (NPDES) PERMITS

On September 5, 1974, the Administrator of the U.S. Environmental Protection Agency approved the proposal submitted by the State of Maryland for the operation of a permit program for discharges into navigable waters pursuant to Section 402 of the Clean Water Act, 33 U.S.C. Section 1342.

Pursuant to the aforementioned approval, this discharge permit is both a State of Maryland discharge permit and a NPDES permit.

This permit and the authorization to discharge shall expire at midnight on the expiration date. The permittee shall not discharge after that date unless a new application has been submitted to the Department in accordance with the renewal application provisions of this permit.

Virginia F Kearney/for
D. Lee Currey, Director
Water and Science Administration

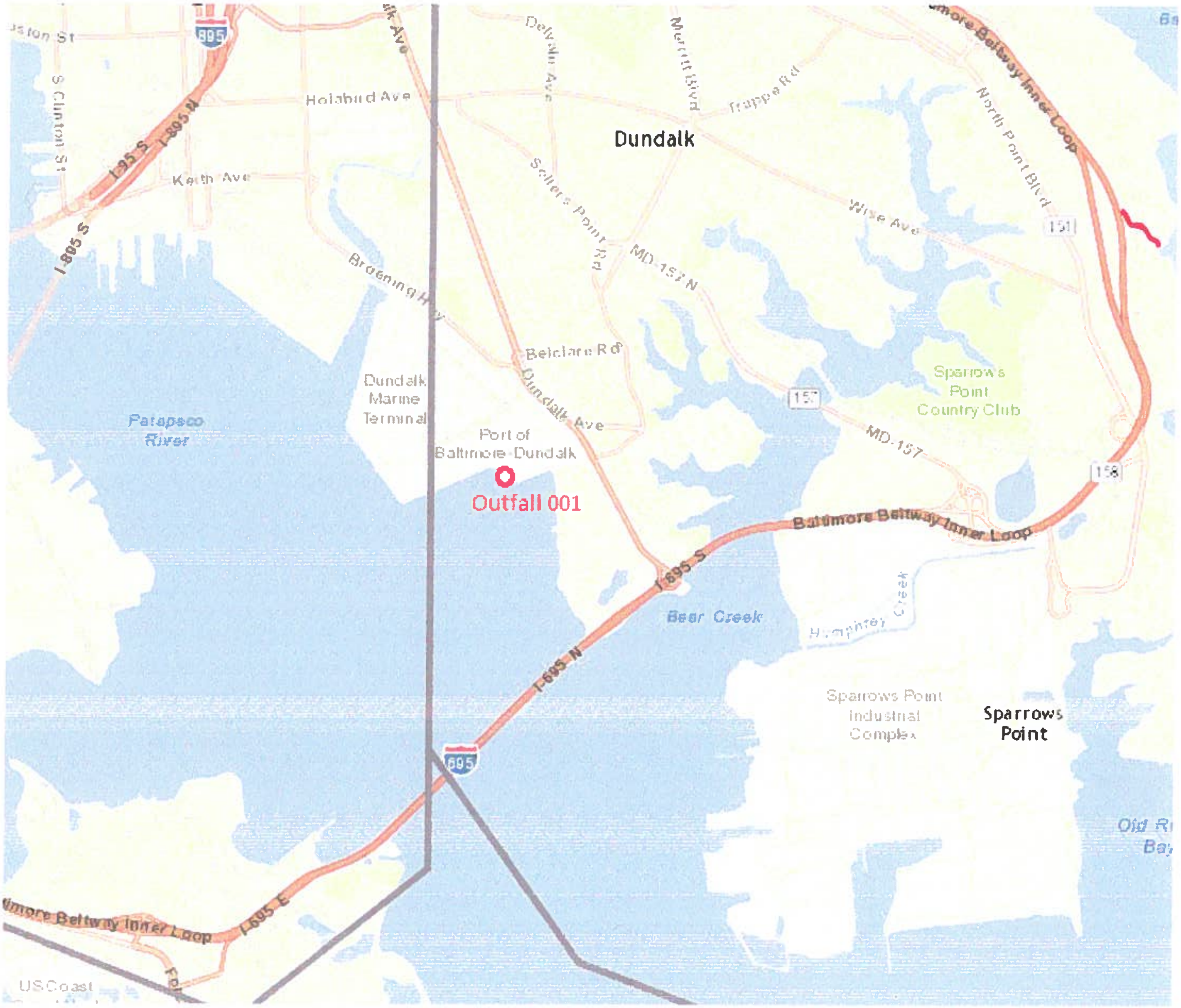


Figure 1 - Area Map showing Outfall Location

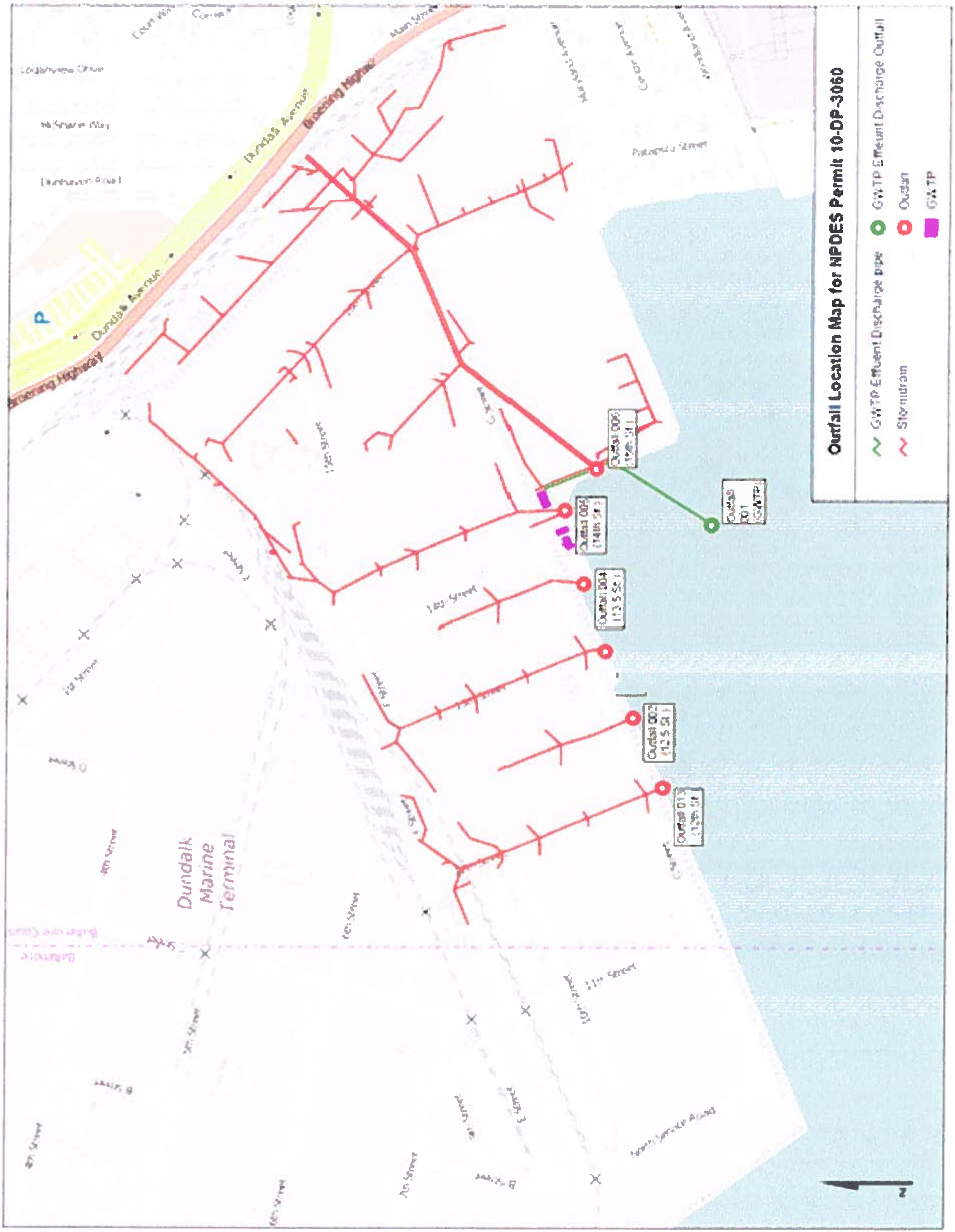


Figure 2 - Drainage Areas and Outfall Locations

Maryland
Department of
the Environment

Wes Moore, Governor
Aruna Miller, Lt. Governor

Serena McIlwain, Secretary Designate
Suzanne E. Dorsey, Deputy Secretary

STATE DISCHARGE PERMIT NUMBER	10-DP-3060B	NPDES PERMIT NUMBER	MD0066818
EFFECTIVE DATE	October 1, 2017	EXPIRATION DATE	September 30, 2022
MODIFICATION A DATE:	January 25, 2023	REAPPLICATION DATE	September 30, 2021

Pursuant to the provisions of Title 9 of the Environment Article, Annotated Code of Maryland, and regulations promulgated thereunder, and the provisions of the Clean Water Act, 33 U.S.C. § 1251 et seq. and implementing regulations 40 CFR Parts 122, 123, 124, and 125, the Department of the Environment, hereinafter referred to as the "Department," hereby authorizes

Maryland Port Administration
401 E. Pratt Street, Suite 1653
Baltimore, Maryland 21202

TO DISCHARGE FROM

a municipal separate storm sewer system (MS4) containing infiltrated groundwater and a wastewater treatment system at a terminal and cargo handling facility

LOCATED AT

2700 Broening Highway, Baltimore, Maryland

VIA OUTFALLS

001, 005, 006, and 013 as identified and described herein

TO

Patapsco River which is protected for (Use II) water contact recreation, fishing, aquatic life, wildlife in accordance with the following special and general conditions and map(s) made a part hereof.

Maryland
Department of
the Environment

Larry Hogan, Governor
Boyd K. Rutherford, Lt. Governor

Ben Grumbles, Secretary
Horacio Tablada, Deputy Secretary

Sep 24, 2020

CERTIFIED MAIL

Bill Richardson, Environmental
Maryland Port Administration
401 E. Pratt Street, Suite 1653
Baltimore, MD 21202

Re: State Discharge Permit No. 10DP3060A, NPDES Permit MD0066818

Dear Mr. Richardson,

Enclosed are the modified pages from your issued discharge permit, referenced above, with the effective and modified date indicated on the cover page. The permittee is responsible for complying with all permit conditions. You are therefore advised to read the permit carefully and become thoroughly familiar with the requirements.

If you have any other questions, please do not hesitate to call Paul Hlavinka, Industrial Stormwater Permits Division, at 410-537-3323.

Sincerely,

D. Lee Currey (Sep 24, 2020 16:06 EDT)

D. Lee Currey, Director
Water and Science Administration

Enclosures (2)

Cc: Arno Laud (delivered electronically)
WMA-Compliance, Central Division Chief

Maryland
Department of
the Environment

Larry Hogan, Governor
Boyd K. Rutherford, Lt. Governor

Ben Grumbles, Secretary
Horacio Tablada, Deputy Secretary

STATE DISCHARGE PERMIT NUMBER	10-DP-3060A	NPDES PERMIT NUMBER	MD0066818
EFFECTIVE DATE	October 1, 2017	EXPIRATION DATE	September 30, 2022
MODIFICATION A DATE:	Sep 24, 2020	REAPPLICATION DATE	September 30, 2021

Pursuant to the provisions of Title 9 of the Environment Article, Annotated Code of Maryland, and regulations promulgated thereunder, and the provisions of the Clean Water Act, 33 U.S.C. § 1251 et seq. and implementing regulations 40 CFR Parts 122, 123, 124, and 125, the Department of the Environment, hereinafter referred to as the "Department," hereby authorizes

Maryland Port Administration
401 E. Pratt Street, Suite 1653
Baltimore, Maryland 21202

TO DISCHARGE FROM

a municipal separate storm sewer system (MS4) containing infiltrated groundwater and a wastewater treatment system at a terminal and cargo handling facility

LOCATED AT

2700 Broening Highway, Baltimore, Maryland

VIA OUTFALLS

001, 005, 006, and 013 as identified and described herein

TO

Patapsco River which is protected for (Use II) water contact recreation, fishing, aquatic life, wildlife in accordance with the following special and general conditions and map(s) made a part hereof.

1. During the effective period of this permit, the permittee must select, design, install, and implement control measures (including best management practices) to minimize pollutant discharges of infiltrated contaminated ground water from the following MS4 stormdrains: Outfall 005 (14 Street Storm Drain), Outfall 006 (15 Street Storm Drain), and Outfall 013 (12 Street Storm Drain). The permittee must minimize exposure of stormwater to infiltrated contaminated groundwater by using available engineering practices as control measures (such as lining of the storm drains, capping the area, etc.).

2. The Dundalk Corrective Measures Alternatives Analysis (CMAA) resulted in an approved approach to reline storm drains leading to Outfalls 005, 006 and 013. The permittee shall submit to the Department (WSA) on a quarterly basis the current “Storm Drain Rehabilitation Schedule” (see Definition B.23) via NetDMR.

3. If the selected control measures are not achieving the intended effect of minimizing pollutant discharges as indicated by action level results required below, the permittee must modify these control measures per the corrective action requirements in Special Condition Q.

4. Beginning on the dates specified in paragraph A.2.5 below, such discharges shall be monitored by the permittee as specified below at the monitoring points established for the outfall pipes to the Patapsco River or, if inaccessible due to tidal influence, at the nearest manhole or tidal exclusion vault upstream of any tidal influence.

PARAMETER	ACTION LEVEL	UNITS	FREQUENCY OF ANALYSIS	SAMPLE	NOTES
Flow	Report	MGD	1/Month	Estimated	
Total Chromium (Wet Weather)	Report	mg/l	1/Month	Composite	(1) (2) (3)
Hexavalent Chromium (Wet Weather)	0.55	mg/l	1/Month	Composite	(1) (2) (3) (4)
Total Chromium (Dry Weather)	Report	mg/l	1/Month	Composite	(1) (4)
Hexavalent Chromium (Dry	0.55	mg/l	1/Month	Composite	(1) (3) (4)

(1) Sampling and reporting requirements apply to discharges from at least one *wet weather* event and one *dry weather* event (refer to Special Condition U) per sampling period for all outfalls except Outfalls 005 and 006. For Outfalls 005 and 006, only *wet weather* monitoring applies, since all *dry weather* flows must be pumped via the wastewater treatment system to Outfall 001 (Special Condition A.1), until such time that the treatment plant is closed and Outfall 001 is removed from the permit after a major permit modification. Sampling results from *dry weather* events shall be reported with the designation "-D" after the Outfall number, such as "Outfall 005-D", and results of *wet weather* events shall be reported with the designation "-W" after the outfall number, such as "Outfall 005-W". If a *dry weather* event or a *wet weather* event discharge does not occur during the reporting period, the permittee shall report "No Discharge" for the applicable parameter(s).

(2) Beginning on the effective date of the permit, the permittee shall monitor the discharges from Outfalls 005, 006, and 013 at a frequency of twice per year until the effective date of the Action Levels in paragraph A.2.5.

(3) See "Action Level Implementation Requirements" in Special Condition P. When an action level is exceeded see "Corrective Actions and Deadlines in Special Condition Q."

(4) Monthly monitoring of an outfall may be reduced to quarterly monitoring after 4 consecutive months of sampling in which all samples have concentrations of Hexavalent Chromium at or below the Action Level, by notifying the Department (WSA). However, if a quarterly sample exceeds the Action Level, monthly monitoring will again be required for a minimum of another 4 months.

5. Action Level monitoring shall begin no later than the following dates:

OUTFALL NUMBER	MONITORING START DATE
Outfall 013 (12 Street Storm Drain)	November 1, 2019
Outfall 005 (14 Street Storm Drain)	November 1, 2022
Outfall 006 (15 Street Storm Drain)	November 1, 2022

. SPECIAL CONDITIONS

B. DEFINITIONS

1. “Action Level”: This permit establishes pollutant action level concentrations applicable to discharges from this facility. The action level concentrations are not effluent limitations; and an action level exceedance therefore, is not a permit violation. Action level monitoring data is primarily for the permittee’s use to determine the overall effectiveness of control measures, and to indicate when additional corrective actions may be necessary.

2. "Bypass" means the intentional diversion of wastes from any portion of a treatment facility.

3. “Clean Water Act: means the Federal Water Pollution Control Act, as amended, 33 U.S.C. Section 1251 et seq.

4. “CFR” means the Code of Federal Regulations.

5. "Composite sample" means a combination of individual samples obtained at least at hourly intervals over a time period. Either the volume of each individual sample is proportional to discharge flow rates or the sampling interval (for constant volume samples) is proportional to the flow rates over the time period used to produce the composite.

C. TOXIC POLLUTANT REPORTING

The permittee shall notify the Department (WSA) as soon as it is known or suspected that any toxic pollutants at Outfall 001 which are not specifically limited by this permit have been discharged at levels specified in 40 CFR Part 122.42(a).

D. REMOVED SUBSTANCES

1. Within 30 days after notification by the Department (WSA), the permittee shall provide information on the disposal of any removed substances, as defined by General Condition B.7, including the following information:
    a. A suitable map showing all areas used for disposal of removed substances.

    b. The physical, chemical, and biological characteristics, as appropriate; quantities of any removed substances; and the method of disposal.

    c. If disposal is handled by persons other than the permittee, identification of the contractor or subcontractor, their mailing address, and the information specified in a and b above.

2. The Department's notification may also require the permittee to provide the above information prior to the use of new or additional disposal areas, contractors, or subcontractors.

E. ANALYTICAL LABORATORY

Within 30 days after the effective date of this permit, the permittee shall submit to the Department (WSA) the name and address of the analytical laboratory (including the permittee's own laboratory) which is used to perform the monitoring required by this permit.

If the laboratory changes during the effective period of this permit, the permittee shall notify the Department (WSA) of the new laboratory within 30 days after the change.

F. WASTEWATER OPERATOR CERTIFICATION

As of the effective date of this permit, the permittee's facility shall be operated by an industrial wastewater operator duly certified by the Maryland Board of Waterworks and Waste Systems Operators. Certification shall be for operation of a Class 6 industrial wastewater works, unless the Board determines that a different classification is appropriate. At no time during the effective period of this permit shall the treatment facilities be operated for more than two months without a certified operator.

G. FLOW MONITORING

In lieu of providing measured flow (defined in the Special Conditions Definitions section) at Outfalls 001, 005, 006 and 013, the permittee may estimate flows and submit the following information at the time of submission of the initial discharge monitoring report and/or upon any change in the methodology:

1. a description of the methodology used to estimate flow at each outfall where flow measurement equipment is not present;

unless the level and the substance were disclosed in writing in the permit application prior to the issuance of the permit. If a discharge regulated by this permit causes or contributes to an exceedance of the water quality standards in COMAR 26.08.02.03, including but not limited to the general water quality standards, or if the discharge includes a pollutant that was not disclosed or addressed in the public record for the permit determination, the Department (WSA) is authorized to modify, suspend or revoke this permit or take enforcement action to address unlawful discharges of pollutants.

O. COMPLIANCE SCHEDULE FOR CYANIDE LIMITS AT OUTFALL 001

1. Every six months, the permittee shall submit to the Department (WSA) a status report detailing current plans for meeting cyanide limits in Special Condition A.1. This report is due six months after the effective date of the permit and every six months thereafter until compliance with the permit limits have been achieved or until a permit modification under condition O.2 has been implemented. The plans may include alternative treatment technologies or other discharge options which will result in compliance with the final discharge limitations.

2. No later than 24 months after the effective date of this permit, the permittee may apply for a permit modification to revise or remove the permit limit(s) based on any combination of the following options allowed under COMAR 26.08:

   Additional Data: As part of the application for a permit modification, the permittee may submit any new or additional data which demonstrates that there is no reasonable potential for violation of applicable water quality standards.

   Alternatives for making such a demonstration include, but are not limited to, the following:
   i. collection of effluent data using analytical methods which have lower detection levels;
   ii. collection of data using techniques designed to minimize the effects of contamination on sample results; and
   iii. collection of data utilizing alternate monitoring locations to show compliance with water quality standards.

P. ACTION LEVEL IMPLEMENTATION REQUIREMENTS

1. When lining of the storm drain leading to any specific Outfall (005, 006 or 013) is completed, the permittee shall notify the WSA-Compliance Program in writing within 14 days of lining completion for that outfall and shall:

   a. Include in the notification a copy of the Draft Construction Completion Report:
   b. Identify and label a discharge monitoring location for the completed outfall and provide a written location description to the Department's WSA-Compliance Program;
   c. Include updated status details for any remaining Outfalls not yet complete;
   d. Update the "Stormdrain Inspection and Maintenance Plan" as each outfall is completed: and

(1) Beginning on the effective date of the permit, the permittee shall monitor the discharges from Outfalls 005, 006, and 013 at a frequency of twice per year until the effective date of the Action Levels in paragraph A.2.5.

(2) See "Action Level Implementation Requirements" in Special Condition P. When an action level is exceeded see "Corrective Actions and Deadlines in Special Condition Q."

(3) Monthly monitoring of an outfall may be reduced to quarterly monitoring after 4 consecutive months of sampling in which all samples have concentrations of Hexavalent Chromium at or below the Action Level, by notifying the Department (WSA). However, if a quarterly sample exceeds the Action Level, monthly monitoring will again be required for a minimum of another 4 months.

1. Action Level monitoring shall begin no later than the following dates:

OUTFALL NUMBER	MONITORING START DATE
Outfall 013 (12 Street Storm Drain)	November 1, 2019
Outfall 005 (14 Street Storm Drain)	November 1, 2022
Outfall 006 (15 Street Storm Drain)	February 1, 2023

. SPECIAL CONDITIONS

B. DEFINITIONS

1. “Action Level”: This permit establishes pollutant action level concentrations applicable to discharges from this facility. The action level concentrations are not effluent limitations; and an action level exceedance therefore, is not a permit violation. Action level monitoring data is primarily for the permittee’s use to determine the overall effectiveness of control measures, and to indicate when additional corrective actions may be necessary.

2. "Bypass" means the intentional diversion of wastes from any portion of a treatment facility.

3. “Clean Water Act: means the Federal Water Pollution Control Act, as amended, 33 U.S.C. Section 1251 et seq.

4. “CFR” means the Code of Federal Regulations.

5. "Composite sample" means a combination of individual samples obtained at least at hourly intervals over a time period. Either the volume of each individual sample is proportional to discharge flow rates or the sampling interval (for constant volume samples) is proportional to the flow rates over the time period used to produce the composite.

Appendix G
NPDES MS4 General Permit for Discharges from State and Federal Small Separate Storm Sewer Systems

MARYLAND DEPARTMENT OF THE ENVIRONMENT
WATER AND SCIENCE ADMINISTRATION

NATIONAL POLLUTANT DISCHARGE ELIMINATION SYSTEM GENERAL PERMIT FOR DISCHARGES FROM STATE AND FEDERAL SMALL MUNICIPAL SEPARATE STORM SEWER SYSTEMS

GENERAL DISCHARGE PERMIT NO. 13-SF-5501
GENERAL NPDES NO. MDR055501

Final Determination:	April 27, 2018
Effective Date:	October 31, 2018
Expiration Date:	October 30, 2023

This National Pollutant Discharge Elimination System (NPDES) general permit covers State and federal small municipal separate storm sewer systems (MS4s) in certain portions of the State of Maryland. MS4 owners and operators to be regulated under this general permit must submit a Notice of Intent (NOI) to MDE by October 31, 2018. An NOI serves as notification that the MS4 owner or operator intends to comply with the terms and conditions of this general permit.

PART I. COVERAGE UNDER THIS GENERAL PERMIT

A. Permit Area

This National Pollutant Discharge Elimination System (NPDES) general permit covers small municipal separate storm sewer systems (MS4s) owned or operated by the United States of America (U.S.) or the State of Maryland (State) in certain portions of the State of Maryland as defined under Title 40 of the Code of Federal Regulations (CFR) § 122.26(b)(16) and 122.32(a)(1).

B. Eligible Small MS4s

MS4s eligible for coverage under this general permit include those properties that:

1. Are owned or operated by the State of Maryland or the U.S. and located within an urbanized area; and

2. Serve developed land area greater than five acres and have at least ten percent impervious area property wide; or

3. Are already covered under an NPDES small MS4 Phase II general permit.

C. Obtaining Coverage

Owners or operators of MS4s regulated under this general permit must apply for coverage by submitting a Notice of Intent (NOI) according to requirements in Part II below, using the form provided by Maryland Department of the Environment (MDE) in Appendix C. A list of State and federal agencies eligible for permit coverage is found in Appendix A. Others not listed that meet eligibility criteria described in Appendix A are required to file an NOI as well. An NOI may represent:

1. An individual MS4 located on a State or federal property; or

2. MS4s located on multiple properties owned or operated by a single government agency.

D. Definitions

Terms used in this permit are defined in relevant chapters of 40 CFR § 122 or the Code of Maryland Regulations (COMAR) 26.08.01, 26.17.01, and 26.17.02. Terms not defined in CFR or COMAR shall have the meanings attributed by common use.

PART II. NOTICE OF INTENT REQUIREMENTS

A. Deadlines for Notification

Small MS4 owners or operators in State of Maryland and U.S. government properties that meet the designation criteria in Appendix A must apply for coverage under this general permit and submit to MDE an NOI that contains the information outlined in PART II.B by October 31, 2018.

B. Contents

An NOI serves as notification that the MS4 owner or operator intends to comply with this general permit. A permittee may file an application for an individual property or file a joint application that includes multiple MS4s owned, operated, or maintained by an individual government agency. The NOI form is provided in Appendix C of this permit. The NOI must contain the following:

1. The name and address of each property for which coverage under this general permit is being sought;

2. A brief description of each property. This must include the approximate size, land uses, a description of the stormwater conveyance system, and a list of properties owned or operated by the permittee covered under the Maryland General Permit for Stormwater Discharges Associated with Industrial Activity or an individual industrial surface water discharge permit;

3. The contact name, address, telephone number, and e-mail address of responsible personnel for the required MS4 programs listed in Parts IV and V of this general permit;

4. A brief description of any agreements with another entity when responsibilities for permit compliance are shared between the permittee and other entity. The relationship and specific duties of all parties must be provided;

5. An estimate of the anticipated expenditures to implement the required programs specified in this general permit; and

6. An authorized signature according to Part VII.O of this general permit.

C. Where to Submit

State of Maryland and U.S. government agencies applying for coverage under this general permit must submit NOIs to the following:

Maryland Department of the Environment
Water and Science Administration
Sediment, Stormwater, and Dam Safety Program
1800 Washington Boulevard
Suite 440
Baltimore, Maryland 21230-1708

PART III. WATER QUALITY

State and federal government agencies covered under this general permit must manage, implement, and enforce management programs for controlling all stormwater discharges in accordance with the CWA and corresponding stormwater NPDES regulations, 40 CFR § 122, to meet the following requirements:

1. Effectively prohibit pollutants in stormwater discharges or other unauthorized discharges into the MS4 as necessary to comply with Maryland's receiving water quality standards;

2. Attain applicable wasteload allocations (WLAs) for each established or approved Total Maximum Daily Load (TMDL) for each receiving water body, consistent with Title 33 of the U.S. Code (USC) 1342(p)(3)(B)(iii); 40 CFR § 122.44(k)(2) and (3); and

3. Comply with all other provisions and requirements contained in this general permit, and in plans and schedules developed in fulfillment of this permit.

Compliance with the conditions contained in Parts IV and V of this permit shall constitute compliance with Section 402(p)(3)(B)(iii) of the CWA and adequate progress toward compliance with Maryland's receiving water quality standards and any stormwater WLA approved by the United States (U.S.) Environmental Protection Agency (EPA) for this permit term.

PART IV. MINIMUM CONTROL MEASURES

Permittees must ensure that the following minimum control measures (MCMs) are implemented in the property(ies) served by the small MS4 covered under this permit. The six MCMs described below include Personnel Education and Outreach, Public or Personnel Involvement and Participation, Illicit Discharge Detection and Elimination, Construction Site Stormwater Runoff Control, Post Construction Stormwater Management, and Pollution Prevention and Good Housekeeping. Specific requirements for compliance with this general permit are outlined for each MCM below. Permittees must report on the status of implementation of these required programs in accordance with the MS4 Progress Report (Appendix D).

Any permittee renewing coverage under the general permit must continue to make progress on permit requirements and report information as described below. All new permittees must begin development of programs described below within the first year of permit issuance and initiate implementation of programs thereafter. Annual MS4 Progress Reports must document program development and demonstrate full implementation of all permit requirements by the end of the five-year permit term.

Permittees can choose to utilize partnerships or share responsibilities with other entities for compliance with any requirement of this general permit. This may entail establishing partnerships with the surrounding county or municipality performing similar activities under the requirements of an NPDES MS4 permit. If responsibilities for permit compliance are shared between the permittee and another entity, the relationship and specific duties of all participating entities must be described in the NOI and updated information provided in the MS4 Progress Report. However, the permittee shall remain responsible for compliance with all conditions of this general permit. For this reason, a legally binding contract, memorandum of understanding (MOU), or other similar means must be executed between the permittee and all other entities to avoid conflicts resulting from noncompliance with this general permit.

A. Public or Personnel Education and Outreach

Permittees are required to implement and maintain a personnel education and outreach program, and distribute education materials to the community and employees to help reduce the discharge of pollutants caused by stormwater runoff. This entails developing brochures, booklets, and training programs to educate personnel about the impacts of stormwater discharges on receiving waters, why controlling these discharges is important, and what personnel and the public and/or staff can do to reduce pollutants in stormwater runoff. These activities may be coordinated with other portions of the permittee's MS4 program or developed independent of other pollution control efforts.

Renewal permittees must update and continue to maintain their personnel education and outreach program. New permittees must begin development of this program within the first year of permit issuance and initiate implementation thereafter. All permittees must provide program updates in accordance with the MS4 Progress Report specified for this MCM. MS4 Progress Reports must document program development and demonstrate full implementation of all permit requirements by the end of the five-year permit term.

In order to comply with this MCM, all permittees must:

1. Develop a process by which the public and/or staff can report water quality complaints that must include a phone number, within one year of permit issuance;

2. Determine the target audience and develop materials to educate the audience on the impact of stormwater. These topics may include water conservation, chemical

application on lawns and landscaping, proper car wash procedures, proper disposal of paint and other household hazardous waste, recycling and trash pick-up, and proper pet waste disposal;

3. Distribute stormwater educational materials through newsletters, website, or other appropriate methods. Submit examples of educational material to MDE in accordance with reporting requirements;

4. Develop and implement an annual employee training program that addresses appropriate topics to prevent or reduce the discharge of stormwater pollution into the MS4. Submit example training materials and attendee list to MDE in accordance with reporting requirements; and

5. Briefly describe in reports to MDE how the education programs complement and strengthen other programs of the MS4 permit.

B. Public or Personnel Involvement and Participation

Permittees are required to create and foster opportunities for public and/or staff participation in the MS4 management program for controlling stormwater discharges. Recommended activities include adopt-a-stream programs, public and/or staff surveys, storm drain stenciling, stream cleanups, tree plantings, and Earth Day events. These activities may be coordinated with other portions of the permittee's MS4 program or developed independent of other pollution control efforts.

Renewal permittees must update and continue to maintain their public or personnel involvement and participation program. New permittees must begin development of this program within the first year of permit issuance and initiate implementation thereafter. All permittees must provide program updates in accordance with the MS4 Progress Report specified for this MCM. MS4 Progress Reports must document program development and demonstrate full implementation of all permit requirements by the end of the five-year permit term.

In order to comply with this MCM, all permittees must:

1. Determine the target audience to promote public and/or staff involvement and participation activities;

2. Specify activities appropriate for the target audience and promote participation;

3. Perform at least five public and/or staff participation events during the permit term and report to MDE in accordance with reporting requirements;

4. Provide public and staff access to the permittee's MS4 Progress Reports via website or other method and consider any substantive public and/or staff comments received concerning the permittee's MS4 program (a permittee may

reserve from public and staff review any information considered confidential or information that may compromise the security of an agency); and

5. Comply with all State and federal public notice requirements for any regulated activity associated with this general permit.

C. Illicit Discharge Detection and Elimination (IDDE)

Permittees are required to develop, implement, and enforce a program to detect and eliminate illicit discharges into the MS4 in accordance with 40 CFR § 122.34(b)(3). A permittee will satisfy this MCM by field screening outfalls, inspecting the MS4 to identify sources of illicit discharges, eliminating illegal connections or illicit discharges, and enforcing penalties where appropriate. The illicit discharge program must also address illegal dumping and spills. Additional guidance is provided in Appendix B, Section II to assist permittees with the development of an acceptable IDDE program.

Renewal permittees must update and continue to maintain their IDDE program. New permittees must begin development of this program within the first year of permit issuance and initiate implementation thereafter. All permittees must provide program updates in accordance with the MS4 Progress Report specified for this MCM. MS4 Progress Reports must document program development and demonstrate full implementation of all permit requirements by the end of the five-year permit term.

In order to comply with this MCM, all permittees must:

1. Develop and maintain an updated map of the MS4 that identifies all stormwater conveyances, outfalls, stormwater best management practices (BMPs), and waters of the U.S. receiving stormwater discharges;

2. Establish a policy or other agency directive that prohibits illicit discharges into the MS4;

3. Maintain the capability to access the storm sewer system across the entire property(ies) to investigate and eliminate illicit discharges (e.g., physical access, proper internal permissions);

4. Develop and implement written standard operating procedures (SOPs) that specify the following:

    a. An inspection checklist describing how outfalls are screened for dry weather flows (see Appendix B, Figure B.2 for an example of an outfall screening checklist);
    b. Frequency of outfall inspections; Screening efforts for State and federal properties may be tiered based on property size. For small properties (i.e., less than 100 acres), all outfalls must be screened each year. Medium size properties (i.e., 100 - 2,000 acres) must screen 50% of total outfalls.

Large properties (i.e., more than 2,000 acres) must screen 20% per year, up to 100 outfalls;

c. Procedures for identifying the source, and eliminating spills, illegal dumping, and other suspected illicit discharges;

d. Identification of priority areas for illicit discharge screening based on pollution potential;

e. Permittee policy to ensure illicit discharges are eliminated;

f. Procedures to inform employees, businesses, and the general public of the issues relating to illegal discharges and improper waste disposal; and

g. Coordination with adjacent MS4 operator(s).

5. Submit SOPs to MDE for review and approval within two years of permit issuance. MDE will review for consistency with guidance in Appendix B, Section II;

6. Document results of illicit discharge screening efforts, including a description of how screening locations were prioritized and any necessary follow-up investigations and remediation measures implemented to address any suspected discharge. Submit to MDE in accordance with reporting requirements; and

7. Maintain complete records of IDDE program investigations and make available to MDE during field reviews of the permittee's MS4 program.

D. Construction Site Stormwater Runoff Control

Permittees are required to comply with Environment Article, Title 4, Subtitle 1, Annotated Code of Maryland and State erosion and sediment control regulations under COMAR 26.17.01. The statute and COMAR specify the requirements for any construction activity that disturbs 5,000 square feet of land area or 100 cubic yards or more of earth movement. MDE considers compliance with the State statute to be compliance with this MCM of this general permit, and 40 CFR § 122.34(b)(4).

All permittees must provide program updates in accordance with the MS4 Progress Report specified for this MCM. MS4 Progress Reports must document program development and demonstrate full implementation of all permit requirements by the end of the five-year permit term. In order to comply with State and federal laws and regulations pertaining to an acceptable erosion and sediment control program, all permittees must:

1. Submit erosion and sediment control plans to MDE (or other authority when applicable) for review and approval in accordance with COMAR and with the *Maryland Stormwater Management and Erosion and Sediment Control Guidelines for State and Federal Projects* (February 2015);

2. Ensure compliance with requirements under MDE's *2011 Maryland Standards and Specifications for Soil Erosion and Sediment Control* or most recent revision and COMAR 26.17.01;

3. Ensure all necessary permits have been obtained, including MDE's General Permit for Stormwater Associated with Construction Activity for projects disturbing one acre or more, and local sediment and erosion control plan approval;

4. Develop a process for receiving, investigating, and resolving complaints from any interested party related to construction activities within the property(ies). Notify the complainant of the investigation and findings within seven days;

5. Track all active grading permits within each property covered under this general permit and report disturbed areas for all active grading permits to MDE in accordance with reporting requirements;

6. Ensure that construction site inspections and enforcement procedures are performed in accordance with COMAR. This will require ongoing communication and collaboration with MDE to ensure that any violations are properly addressed;

7. Incorporate procedures within property operations to effectively abate sediment pollution and comply with all applicable State and federal laws pertaining to erosion and sediment control practices; and

8. Ensure staff is adequately trained on proper procedures and actions to address potential discharge of pollutants into the MS4 as a result of any construction activity. The Responsible Personnel Certification on-line training course through MDE must be made available to appropriate staff.

E. Post Construction Stormwater Management

Permittees are required to maintain an acceptable stormwater management program in accordance with Environment Article, Title 4, Subtitle 2, Annotated Code of Maryland and State stormwater management regulations under COMAR 26.17.02. The statute and COMAR require that stormwater management must be addressed for new development and redevelopment for any proposed project that disturbs 5,000 square feet or more of land area. MDE considers compliance with the State statute to be compliance with this MCM of this general permit, and 40 CFR § 122.34(b)(5).

All permittees must provide program updates in accordance with the MS4 Progress Report specified for this MCM. MS4 Progress Reports must document program development and demonstrate full implementation of all permit requirements by the end of the five-year permit term. In order to comply with State and federal laws and regulations pertaining to an acceptable stormwater management program, all permittees must:

1. Submit stormwater management plans to MDE (or other authority when applicable) for review and approval in accordance with COMAR and with the *Maryland Stormwater Management and Erosion and Sediment Control Guidelines for State and Federal Projects* (February 2015) for compliance with State stormwater management requirements;

2. Implement the principles, methods, and practices found in the latest version of the *2000 Maryland Stormwater Design Manual, Volumes I & II* (Manual), and the latest version of MDE's *Maryland Stormwater Management Guidelines for State and Federal Projects*. This includes that environmental site design (ESD) be implemented to the maximum extent practicable (MEP);

3. Maintain stormwater program implementation information and provide updates in accordance with the MS4 Progress Report that include:

    a. Total number of plans submitted to MDE for review and approval;
    b. Total number of as-built plans submitted to MDE and approved;
    c. Verification that BMPs are maintained in accordance with MDE requirements outlined on approved plans.

4. Provide training to stormwater program staff and to staff responsible for proper BMP design, performance, inspection, and routine maintenance. Report the number of trainings offered, topics covered, and number of attendees; and

5. Maintain and submit an Urban BMP database in accordance with the database structure in Appendix B, Tables B.1.a, b, and c. This information shall be submitted to MDE with annual reports.

F. Pollution Prevention and Good Housekeeping

Permittees are required to develop and implement an operation and maintenance program that includes a training component, to prevent and reduce pollutant runoff from municipal operations in accordance with 40 CFR § 122.34(b)(6). A permittee will satisfy this MCM by developing, implementing, and maintaining procedures for pollution prevention and good housekeeping on permittee owned or operated property(ies) and roads as outlined below.

Renewal permittees must update and continue to maintain their pollution prevention and good housekeeping program. New permittees must begin development of this program within the first year of permit issuance and initiate implementation thereafter. All permittees must provide program updates in accordance with the MS4 Progress Report. MS4 Progress Reports must document program development and demonstrate full implementation of all permit requirements by the end of the five-year permit term.

In order to comply with this MCM, all permittees must:

1. Ensure that appropriate staff and contractors receive training at least annually. The training must be designed to reduce or eliminate the discharge of pollutants during property operations. Training may include in-person, online, toolbox talks, on-the-job, or other formats, and permittees may build on existing training activities to fulfill this requirement. Topics must include spill prevention and response, proper disposal of waste, and periodic visual inspections to detect and correct potential discharges at properties owned or operated by the permittee;

2. Develop, implement, and maintain a good housekeeping plan for permittee owned or operated properties where any of the following activities is performed: maintenance of vehicles or heavy equipment, and handling of any of the following materials: deicers, anti-icers, fertilizers, pesticides, road maintenance materials such as gravel and sand, or hazardous materials. A standard plan may be created to address multiple properties where similar activities are conducted, provided the below items are addressed. The plan must include:

   a. A description of site activities;
   b. A list of potential pollutants including their sources and locations on the site. The plan must consider conveyance of stormwater entering, flowing across, and leaving the site;
   c. Written good housekeeping procedures designed to prevent discharge of pollutants off site that include regular visual inspections to detect potential discharges;
   d. Written procedures for corrective actions to address any release, spill, or leak on site; and
   e. Documentation of any discharge, release, leak, or spill, including date, findings, and response actions.

3. Quantify and report pollution prevention efforts related to the following activities:

   a. Number of miles swept and pounds of material collected from street sweeping and inlet cleaning programs, as applicable;
   b. Good housekeeping methods for pesticide application such as integrated pest management plans or alternative techniques;
   c. Good housekeeping methods for fertilizer application such as chemical storage, landscaping with low maintenance/native species, and application procedures;
   d. Good housekeeping methods for snow and ice control such as use of pretreatement, truck calibration and storage, and salt dome storage and containment; and
   e. Other good housekeeping methods performed by the permittee not listed above.

4. Submit in the NOI a list of properties owned or operated by the permittee where the activities listed in this MCM are performed, and indicate which are covered under the Maryland General Permit for Stormwater Discharges Associated with Industrial Activity. Provide an update in annual reports if the status of industrial activity permit coverage changes for any property.

PART V. CHESAPEAKE BAY RESTORATION AND MEETING TOTAL MAXIMUM DAILY LOADS

Maryland's Watershed Implementation Plan (WIP) specifies the nutrient and sediment load reductions required to address the Chesapeake Bay TMDL by 2025. This general permit will make progress toward that strategy by requiring small MS4s to commence restoration efforts for twenty percent of existing developed lands that have little or no stormwater management. This five-year permit term requires permittees to develop planning strategies and work toward implementing water quality improvement projects. Restoration planning strategies and implementation schedules required under this general permit are consistent with addressing the water quality goals of the Chesapeake Bay TMDL by 2025. The conditions established below require permittees to perform watershed assessments, identify water quality improvement opportunities, secure appropriate funding, and develop an implementation schedule to show the twenty percent impervious area restoration requirement will be achieved by 2025. This constitutes adequate progress toward compliance with Maryland's receiving water quality standards and any stormwater WLA established or approved by the EPA for small MS4s regulated under this permit.

Restoration efforts may include the use of ESD practices, structural stormwater BMPs, retrofitting, stream restoration, or other alternative restoration practices. Trading with other sectors may also be considered as another method to achieve pollutant reductions, once a program has been established, regulations are adopted, public participation requirements are satisfied, and its use approved by EPA. Acceptable design criteria for stormwater BMPs are outlined in the Manual and the most recent version of the *Accounting for Stormwater Wasteload Allocations and Impervious Acres Treated*, referred to hereafter as the Accounting Guidance. Appendix B of this permit provides relevant guidance from the Accounting Guidance for small MS4 permittees to comply with these requirements. A permittee will demonstrate compliance with restoration requirements by performing the following:

A. Develop a Baseline Impervious Area Assessment

Permittees must determine the total impervious surface area within their property(ies) and delineate the portions that are treated with acceptable water quality BMPs. This analysis will provide the baseline used to calculate the twenty percent restoration requirement. This must be done in accordance with the guidance outlined in Appendix B, Section III of this permit (which is consistent with the Accounting Guidance). The impervious area baseline assessment must be submitted with the first year Progress Report for MDE review and approval. The following information must be submitted with this assessment:

1. Total impervious acres in accordance with the guidance in Appendix B, Section III of this general permit;
2. Total impervious acres treated by stormwater water quality BMPs;
3. Total impervious acres treated by BMPs providing partial water quality treatment;
4. Total impervious acres treated by nonstructural practices (i.e., rooftop disconnections, non-rooftop disconnections, or vegetated swales);
5. Verification that any impervious area draining to BMPs with missing inspection records are not considered treated; and
6. Total impervious acres untreated and twenty percent of this total area (i.e., the restoration requirement).

B. Develop and Implement an Impervious Area Restoration Work Plan

Permittees must submit a work plan with the first year MS4 Progress Report to describe the activities and milestones that will be performed over the permit term to show progress toward the twenty percent impervious area restoration requirement. This will form the basis of a long term plan; however, the plan may be adjusted and refined as part of the adaptive management process over the course of the permit term. A work plan, recommended in the format of Table 1 below, must be submitted to MDE annually to describe progress and any modifications necessary to remain on track with restoration requirements. A suggested work plan is provided in Table 1. Permittees may use the work plan or develop a custom plan that addresses the unique circumstances of individual permittees for MDE review and approval.

Table 1. Impervious Area Restoration Work Plan

Timeline	Management Strategies and Goals
Year 1	• Develop impervious area baseline assessment. • Develop restoration work plan for MDE review and approval. • Assess opportunities and timelines for implementing water quality BMPs. • Assess opportunities to develop partnerships with other NPDES permittees. • Determine funding needs and develop a long term budget.
Year 2	• Update and submit Urban BMP database. • Maintain inspection records for all BMPs. • Perform watershed assessments and identify water quality problems and opportunities for restoration. • Develop list of specific projects to be implemented for restoration and identify on the Restoration Activity Schedule (Table 2). • Incorporate future growth agency-wide/jurisdiction-wide master plans into restoration planning efforts. • Evaluate and refine budget needs for project implementation.

Timeline	Management Strategies and Goals
Year 3	• Update and submit Urban BMP database and documented maintenance and inspection status for all BMPs. • Develop adaptive management strategies for BMP implementation that identify opportunities for improved processes and procedures. • Continue to identify opportunities for water quality improvement projects and collaborative partnerships to meet restoration requirements.
Year 4	• Update and submit project implementation status in Table 2. • Update and submit Urban BMP database and documented maintenance and inspection status for all BMPs. • Submit narrative describing progress and updated adaptive management strategies toward implementing restoration projects.
Year 5	• Update and submit project implementation status in Table 2. • Provide complete list of specific projects needed to meet the twenty percent restoration requirement in Table 2 and include the projected implementation year (no later than 2025).

C. Develop a Restoration Activity Schedule

Permittees are required to develop a Restoration Activity Schedule (Table 2) and provide annual updates on the status of projects in the planning, construction, and final phase of implementation. A brief narrative must accompany Table 2 and describe progress of planned restoration activities. Table 2 below provides an example of how to submit the required information. The table outlines a schedule for various BMPs under different stages of implementation during the permit term. The impervious acre baseline is indicated as 100 acres and noted in year one. With the implementation of each BMP, the balance toward achieving the restoration requirement is recalculated in the Impervious Acre Restoration Target and Balance ("Imperv Acre Target and Balance") column. This plan must be continuously refined and updated over the duration of the permit term. By the end of the permit term, a complete list of projects required to meet the twenty percent restoration requirement must be provided. The projected implementation year must be no later than 2025.

Permittees may take credit for retrofit and redevelopment that has been implemented between January 1, 2006, and the beginning of the permit term. When the impervious area baseline analysis considers the drainage areas to these practices as untreated, then these projects may be credited toward impervious area restoration requirements. Credits may be reported using the Restoration Activity Schedule (Table 2) discussed below.

Impervious acre credits are based on the level of water quality treatment provided. When water quality BMPs treat one inch of rainfall, the impervious acres draining to the BMP will be considered restored. When the rainfall treated is less than one inch, a proportional acreage will be calculated for impervious acres treated based on the percentage of one inch of rainfall treated. When the rainfall treated is greater than one inch, credit is granted according to the Accounting Guidance. When alternative BMPs are implemented, acreage may be calculated based on an impervious acre equivalent identified in Appendix B, Table B.4. Additional information on BMP implementation and impervious acre credits may be found in the Accounting Guidance.

Table 2. Restoration Activity Schedule (Example)

Type of Restoration Project	BMP[1] Code	Cost ($K)[2]	Imperv Acres Treated	Imperv Acre Target and Balance	Project Status[3]	Year Complete or Projected Implementation Year (by 2025)	MD Grid Coordinates	
							Northing	Easting
				100				
Dry pond retrofit to wet	PWET	1,500	36	64	UC			
Bioretention	FBIO	260	6	58	P			
Bioswale	MSWB	100	2	56	P			
Dry pond retrofit to wet	PWET	800	10	46	P			
BMP retrofit	PWET	500	8	38	P			
Redevelopment	REDE	300	5	33	P			
Rain Gardens (4)	MRNG	20	2	31	P			
Disconn rooftop r/o	NDRR	200	10	21	P			
Stream restoration (1,000 linear feet)	STRE	500	10	11	P			
Outfall Stabilization	OUT	200	2	9	P			
Shallow marsh	WSHW	150	4	5	P			
Reforestation on Imperv	IMPF	100	3	2	P			
Green Roof, extensive	AGRE	100	0.5	1.5	P			
Perm pavement on existing pavement	APRP	150	2	-0.5	P			

[1] See Appendix B, Tables B.1.a, b, and c, Urban BMP database. BMP codes are identified under "MDE BMP Classification"

[2] Provide cost at project completion

[3] Project Status: Enter P for planning and design, UC for under construction, and C for complete

D. BMP Database Tracking

Permittees are required to develop a BMP inventory consistent with the required fields outlined in the BMP Database provided in Appendix B, Tables B.1.a, b, and c. A brief narrative must accompany the BMP database and provide verification that routine inspection and maintenance activities are up to date. The database fields for inspection and maintenance need to be completed and show that BMPs are inspected every three years and routinely maintained. If the required inspection and maintenance data are missing or incomplete then any credit previously applied must be removed.

PART VI. EVALUATION AND ASSESSMENT, RECORDKEEPING, REPORTING, AND PROGRAM REVIEW

A. Evaluation and Assessment

The permittee must evaluate progress toward achieving compliance with all permit requirements, and the appropriateness of implemented BMPs. This must be achieved through reporting to MDE as specified in Part VI.C below.

B. Recordkeeping

The permittee must keep records for at least three years after the termination of this general permit. In addition to the information required in MS4 Progress Reports specified below, permittees must submit any additional supporting documentation at the request of MDE. The permittee must make its MS4 program information, including records, available to the public during regular business hours.

C. Reporting

1. The required information specified in the MS4 Progress Report in Appendix D must be completed as described in this section. The reporting period must be based on State fiscal year, i.e., July 1 – June 30. MS4 Progress Reports are due no later than October 31 of each year with the first report due October 31, 2019.

2. Annually, the permittee must submit a report to MDE that evaluates progress toward meeting the twenty percent impervious area restoration requirement specified in Part V above. Restoration activity described in the MS4 Progress Report must be completed and include:

    a. An impervious area baseline analysis in accordance with Part V.A and the guidance in Appendix B, Section III. This analysis must be submitted with the first year MS4 Progress Report for MDE review and approval;
    b. The Impervious Area Restoration Work Plan (Table 1 or other format) must be submitted with the first year MS4 Progress Report and in annual updates. The work plan must include a narrative discussing progress made toward restoration efforts and a description of adaptive management strategies necessary to keep proposed implementation efforts on track;
    c. An updated Restoration Activity Schedule in accordance with Table 2 must be submitted annually. By the end of the permit term, a complete list of projects required to meet the twenty percent restoration requirement must be specified in Table 2. The projected implementation year must be no later than 2025; and
    d. An updated Urban BMP database in accordance with Appendix B, Tables B.1.a, b, and c in electronic format and a brief narrative discussing progress made toward completing the database and performing routine maintenance and inspections.

3. Reporting for the six MCMs specified in Part IV must be submitted in years 2 and 4 of the permit term and include all information requested in the MS4 Progress Report in Appendix D.

D. Program Review

In order to assess the effectiveness of the permittee's NPDES program for eliminating non-stormwater discharges and reducing the discharge of stormwater pollutants to the MEP, MDE will review program implementation as described in MS4 Progress Reports. Procedures for the review of local erosion and sediment control and stormwater management programs exist in Maryland's sediment control and stormwater management laws. Additional reviews of MCM implementation and the twenty percent restoration requirement may be conducted at any time to determine compliance with permit conditions.

PART VII. STANDARD PERMIT CONDITIONS

A. Duty to Comply

The permittee must comply with all conditions of this general permit. Any permit noncompliance constitutes a violation of the CWA and is grounds for enforcement action, permit coverage termination, revocation, or modification. The permittee must comply at all times with the provisions of the Environment Article, Title 4, Subtitles 1, 2, and 4; Title 7, Subtitle 2; and Title 9, Subtitle 3, Annotated Code of Maryland.

B. Failure to Notify

Agencies engaging in an activity under this general permit that fail to notify MDE of their intent to be covered under this general permit as described in PART II and who discharge to waters of the State without submitting an NOI application are in violation of the Environment Article, Annotated Code of Maryland and may be subject to penalties.

C. Limitations on Coverage

1. The following categories of non-stormwater discharges or flows must be addressed where such discharges are identified by the permittee as sources of pollutants to waters of the U.S.: landscape irrigation, diverted stream flows, rising groundwater, uncontaminated groundwater infiltration, uncontaminated pumped groundwater, foundation drains, air conditioning condensate, irrigation water, springs, water from crawl space pumps, footing drains, lawn watering runoff, flows from riparian habitats and wetlands, residual street wash water, and discharges or flows from fire fighting activities.

2. Non-stormwater sources, stormwater associated with industrial activity, or discharges associated with construction activities may be authorized to discharge

via the municipal separate storm sewer system if such discharges are specifically authorized under an applicable NPDES discharge permit.

3. Only stormwater discharges from municipal separate storm sewer systems are authorized to discharge under this general permit.

D. Penalties Under the CWA - Civil and Criminal

For violations of this permit, the permittee is subject to civil and criminal penalties as set forth in 33 U.S.C. 1319(c) and (d) of the Clean Water Act, as adjusted for inflation according to 40 CFR § 19.4.

E. Penalties Under the State's Environment Article - Civil and Criminal

Nothing in this permit shall be construed to preclude the institution of any legal action or relieve permittee from civil or criminal responsibilities and/or penalties for a violation of Title 4, Title 7, and Title 9 of the Environment Article, Annotated Code of Maryland, or any federal, local, or other State law or regulation. Section 9-342 of the Environment Article provides that a person who violates any condition of this permit is liable to a civil penalty of up to $10,000 per violation, to be collected in a civil action brought by MDE, and with each day a violation continues being a separate violation. Section 9-342 further authorizes MDE to impose upon any person who violates a permit condition, administrative civil penalties of up to $10,000 per violation, up to $100,000.

Section 9-343 of the Environment Article provides that any person who violates a permit condition is subject to a criminal penalty not exceeding $25,000 or imprisonment not exceeding one year, or both for a first offense. For a second offense, Section 9-343 provides for a fine not exceeding $50,000 and up to two years imprisonment.

The Environment Article, Section 9-343, Annotated Code of Maryland, provides that any person who tampers with, or knowingly renders inaccurate any monitoring device or method required to be maintained under this permit shall, upon conviction, be punished by a fine of not more than $50,000 per violation, or by imprisonment for not more than two years per violation, or both.

The Environment Article, Section 9-343, Annotated Code of Maryland, provides that any person who knowingly makes any false statement, representation, or certification in any records or other document submitted or required to be maintained under this permit, including monitoring reports or reports of compliance or noncompliance shall, upon conviction, be punished by a fine of not more than $50,000 per violation, or by imprisonment for not more than two years per violation, or both.

F. Need to Halt or Reduce Activity not a Defense

It shall not be a defense for a permittee in an enforcement action that it would have been necessary to halt or reduce the permitted activity in order to maintain compliance with the conditions of this permit.

G. Continuation of an Expired General Permit

An expired general permit continues in force and effect for all permittees covered under this general permit until a new general permit is issued or the general permit is revoked or withdrawn. Coverage for new permittees may not be granted under an expired general permit.

H. Duty to Mitigate

The permittee shall take all reasonable steps to minimize or prevent any discharge that has a reasonable likelihood of adversely affecting human health or the environment and is in violation of this general permit.

I. Duty to Provide Information

The permittee shall furnish to MDE any information that may be requested to determine compliance with this general permit. The permittee shall also furnish to MDE, upon request, copies of records required to be maintained in compliance with the conditions of this general permit.

J. Other Information

When a permittee becomes aware that it failed to submit any relevant facts or submitted incorrect information in the NOI or in any other report to MDE, it shall promptly notify MDE of the facts or information.

K. Requiring an Individual Permit

1. MDE may require any agency to apply for and/or obtain an individual NPDES permit. When MDE requires a permittee to apply for an individual NPDES permit, MDE will provide notification in writing that an application is required. This notification shall include a brief statement of the reasons for the decision, an application form, and a deadline for filing the application. Applications must be submitted to MDE. MDE may grant additional time to submit an application upon request of the applicant.

2. Any agency eligible for coverage under this general permit may request to be excluded from the coverage of this general permit by applying for an individual permit. In such cases, the agency must submit an individual application in

accordance with the requirements of 40 CFR § 122.26(c)(1)(ii), with reasons supporting the request, to MDE.

3. When an individual NPDES permit is issued to an agency eligible for coverage under this general permit, the applicability of this general permit to the individual NPDES permittee is automatically terminated on the effective date of the individual permit. When an individual NPDES permit is denied to an agency otherwise subject to this general permit, then coverage under this general permit may be terminated by MDE.

L. Property Rights

The issuance of this general permit does not convey any property rights of any sort, nor any exclusive privileges, nor does it authorize any injury to private property nor any invasion of personal rights, nor any infringement of federal, State, or local laws or regulations.

M. Severability

The provisions of this general permit are severable. If any provision of this general permit shall be held invalid for any reason, the remaining provisions shall remain in full force and effect. If the application of any provision of this general permit to any circumstances is held invalid, its application to other circumstances shall not be affected.

N. Permit Actions and Reopener Clause

This permit may be modified, revoked and reissued, or terminated for cause. The filing of a request by the Permittee for a permit modification, revocation and reissuance, or termination or a notification of planned changes or anticipated noncompliance does not stay any permit condition. The Environment Article, Section 9-330, Annotated Code of Maryland, provides that MDE may revoke coverage under this permit if it finds that:

1. False or inaccurate information was contained in the application;

2. Conditions or requirements of the discharge permit have been or are about to be violated;

3. Substantial deviation from the requirements has occurred;

4. MDE has been refused access for the purpose of inspecting to ensure compliance with the conditions of the discharge permit;

5. A change in conditions exists that requires temporary or permanent reduction or elimination of the permitted discharge;

6. Any State or federal water quality stream standard or effluent standard has been or is threatened to be violated; or

7. Any other good cause exists for revoking the discharge permit.

8. If there is evidence indicating that the stormwater discharges authorized by this general permit cause, or have the reasonable potential to cause or contribute to, a violation of a water quality standard, the permittee may be required to obtain an individual permit or the general permit may be modified to include specific limitations and/or requirements. Permit modification or revocation will be conducted according to 40 CFR § 122.62, 122.63, 122.64, and 124.5.

O. Signature of Authorized Administrator and Permittee

All NOIs, annual reports, and information submitted to MDE shall be signed as required by COMAR 26.08.04.01-1 and 40 CFR § 122.22. As in the case of municipal or other public properties, signatories shall be a principal executive officer, ranking elected official, or other duly authorized employee.

P. Inspection and Entry

The permittee shall allow representatives of MDE and EPA access at reasonable times to conduct an inspection of a regulated property or activity, or to review records that must be kept as a condition of this permit.

Q. Proper Operations and Maintenance

The permittee shall properly operate and maintain all BMPs and controls which are used to achieve compliance with the conditions of this permit.

R. Reporting Requirements

The permittee shall report any non-compliance which may endanger human health or the environment. Any information shall be provided orally within 24 hours from the time when the permittee becomes aware of the circumstances. A written submission shall also be provided within five days of the time the permittee becomes aware of the circumstances. The written submission shall contain a description of the non-compliance and its cause; the period of non-compliance, including exact dates and times; if the non-compliance has not been corrected, the anticipated time that it is expected to continue; and steps taken or planned to reduce, eliminate, and prevent reoccurrence of the non-compliance.

PART VIII. AUTHORITY TO ISSUE GENERAL NPDES PERMITS

In compliance with the provisions of the CWA, as amended (33 USC 1251 et seq. the Act), agencies that are defined in Parts I.B.1 and 2 of this general permit and that submit an NOI in accordance with Part II of this general permit are authorized to discharge in accordance with the conditions and requirements set forth herein.

D. Lee Currey
Director
Water and Science Administration

April 27, 2018
Date

APPENDIX A

Maryland Designation Criteria for Small Municipal Separate Storm Sewer Systems

Appendix A

Maryland Designation Criteria for Small Municipal Separate Storm Sewer Systems

Phase I of the U.S. Environmental Protection Agency's (EPA) stormwater program was promulgated in 1990 under the Clean Water Act (CWA). This program relies on National Pollutant Discharge Elimination System (NPDES) permit coverage to address polluted discharges from stormwater runoff from medium and large municipal separate storm sewer systems (MS4s) that serve populations of 100,000 or more. The Phase II program expands Phase I by requiring owners and operators of "small" MS4s in urbanized areas to implement programs to control stormwater runoff through the use of an NPDES permit. A small MS4 can be a municipally owned separate storm sewer system, but can also apply to State and federal agencies, and include transportation, universities, local sewer districts, hospitals, military bases, and prisons. This appendix describes the criteria for regulating small MS4 municipalities and State and federal properties.

Small Municipal Separate Storm Sewer Systems Permit Area

Parts I.A and I.B of the General Permits for Discharges From Small Municipal Separate Storm Sewer Systems for municipalities and for State and federal properties specify that small MS4s in the State of Maryland are regulated if located within the following geographical areas:

1. **Urbanized areas as determined by the latest Decennial Census by the U.S. Census Bureau**. Coverage is required for owners or operators of small MS4s located within the boundaries of an "urbanized area" (UA) based on the 2010 Decennial Census in accordance with 40 CFR § 122.32(a)(1). A map of designated urbanized areas is located at the following website: www.epa.gov/npdes/urbanized-area-maps-npdes-ms4-phase-ii-stormwater-permits

2. **Other areas determined by MDE to be eligible for coverage.** MDE has developed a set of designation criteria for small municipalities located outside of urbanized areas in accordance with 40 CFR § 122.26(a)(9) and 123.35(b)(2).

MS4 General Permit Waiver Criteria

The Code of Federal Regulations specifies that certain municipalities may be waived from permit coverage under the following conditions:

1. An MS4 serves a population of less than 1,000 within the urbanized area and does not contribute substantially to the pollutant loadings of a physically interconnected regulated MS4 and stormwater controls are not needed based on wasteload allocations (WLAs) in an EPA approved or established total maximum daily load (TMDL); or

2. An MS4 serves a population of less than 10,000 and the permitting authority has evaluated receiving waters and determined that additional stormwater controls are not

needed based on WLAs associated with an EPA approved TMDL or, if a TMDL has not been approved, an equivalent analysis that determines sources and allocations for the pollutants of concern; and has determined that future discharges from the MS4 do not have the potential to result in exceedances of water quality standards or other significant water quality impacts.

In addition to the above waiver criteria, municipalities that discharge stormwater runoff combined with municipal sewage (i.e., combined sewer systems (CSS)) are point sources that are not subject to MS4 requirements (40 CFR § 122.26(a)(7)).

Table A.1 below provides a list of all Maryland counties and their municipalities that are required to be regulated under the MS4 program. The municipalities designated for Phase II MS4 general permit coverage are identified in the table based on the criteria herein. A municipality may request co-permittee status with its respective Phase I or Phase II county. Approximately 40 small municipalities are currently regulated through the MS4 NPDES program as co-permittees within Carroll, Montgomery, and Prince George's Counties.

Table A.1. Phase II MS4 General Permit Designation by County

Counties and Baltimore City	Jurisdictions Designated for Phase II MS4 Coverage	Justification
Allegany	N/A	County has CSS
Anne Arundel	Annapolis	City is located w/in UA
Baltimore	N/A	Phase I permit covers entire county
Baltimore City	N/A	Phase I permit covers entire city
Calvert	Calvert County*	County is located w/in UA and meets MDE designation criteria
Caroline	N/A	Not located w/in UA
Carroll	N/A	Phase I permit covers all municipalities
Cecil	Cecil County, Elkton, North East*, Perryville*, and Rising Sun*	County and municipalities are located w/in UA; County also meets MDE designation criteria
Charles	Indian Head* and La Plata*	Towns are located w/in UA
Dorchester	N/A	Not located w/in UA
Frederick	Brunswick, Emmitsburg, Frederick, Middletown, Mount Airy, Myersville, Thurmont, and Walkersville	Middletown, Mount Airy, and Walkersville are located w/in UA; Brunswick, Emmitsburg, Thurmont, and Myersville meet MDE designation criteria
Garrett	N/A	Not located w/in UA
Harford	Aberdeen, Bel Air, and Havre de Grace	Towns and city are located w/in UA
Howard	N/A	Phase I permit covers entire county
Kent	N/A	Not located w/in UA
Montgomery	Gaithersburg, Rockville, and Takoma Park	Cities are located w/in UA; Phase I permit covers all other municipalities
Prince George’s	Bowie	City is located w/in UA; Phase I permit covers all other municipalities
Queen Anne’s	Queen Anne’s County*	County is located w/in UA and meets MDE designation criteria
St. Mary’s	St. Mary’s County*	County is located w/in UA and meets MDE designation criteria
Somerset	N/A	Not located w/in UA
Talbot	Easton*	Town meets MDE designation criteria
Washington	Washington County, Boonsboro*, Hagerstown, Smithsburg, and Williamsport*	County and municipalities are located w/in UA; County also meets MDE designation criteria
Wicomico	Wicomico County*, Fruitland*, and Salisbury	County and cities are located w/in UA; County also meets MDE designation criteria
Worcester	N/A	Not located w/in UA

* Indicates a county or municipality newly designated for coverage as a Phase II small MS4

Eligible State and Federal Properties for MS4 Permit Coverage

The definition of a small MS4 is noted under 40 CFR § 122.26(b)(16)(iii), and specifies these are: "[o]wned or operated by the United States, a State, city, town, borough, county, parish district, association, or other public body" and are "systems similar to separate storm sewer systems in municipalities, such as systems at military bases, large hospitals or prison complexes, and highways or other thoroughfares". Therefore, the CFR definition of a small MS4 indicates that regulated State and federal properties are similar to municipal systems. EPA clarifies that regulated small MS4s should be those that provide stormwater drainage service to human populations, and not to individual buildings (64 Federal Register 68749).

Other available documentation such as federal guidance defining urban areas and literature describing water resource impacts from developed lands are also an important consideration when determining eligibility criteria. For example, the U.S. Census Bureau defines "Nonresidential Urban Territory" in the Federal Register (volume 76, no. 164, August 24, 2011) as those areas that contain a "high degree of impervious surface", or twenty percent impervious area, and are within 0.25 miles of an urban area. Furthermore, documentation that evaluates the potential for properties to contribute pollutants to the MS4 is also considered. For example, *Impacts of Impervious Cover on Aquatic Systems* (Center for Watershed Protection, 2003) indicates that in-stream water quality declines when watershed impervious cover exceeds ten percent.

Based on this information, MDE has determined that an impervious area threshold is appropriate for establishing eligibility criteria for government properties for which agencies are required to obtain MS4 general permit coverage. Eligible properties will be those that have greater than ten percent impervious area. This is a conservative threshold when compared to the U.S. Census Bureau's urban area definition for non-residential urban territory, and considers water quality and natural resource protection. This threshold will allow the focus of the small MS4 program to concentrate on the most developed properties, such as military bases, hospitals, prison complexes, and highways, and is consistent with the intent of federal regulations.

MS4s eligible for coverage under this general permit include those properties that:

1. Are owned or operated by the State of Maryland or the U.S. and located within an urbanized area; and

2. Serve developed land area greater than five acres and have at least ten percent impervious area property wide; or

3. Are those properties already covered under an NPDES small MS4 Phase II general permit.

State and Federal MS4 General Permit Waiver Criteria

MDE may grant a waiver from permit coverage if a State or federal agency does not own or operate a system of conveyances on a property, consistent with the intent of EPA guidelines described above. The owner or operator must demonstrate that the property:

1. Is comprised of very discrete areas, such as individual buildings. For example, a small property containing few buildings that have associated parking and driveways with storm drains directly connected to a surrounding MS4 may be eligible for a waiver. On the other hand, properties with numerous buildings, interior roads, and interior storm sewer infrastructure would not qualify for a waiver; and

2. Does not discharge a significant amount of pollutants from its MS4; or

3. Is not a military base, large hospital complex, prison complex, highway, or thoroughfare, and meets MDE's waiver criteria one or two above.

A State or federal agency that owns or operates any property that meets the eligibility criteria above and is not eligible for a waiver must file an NOI and obtain coverage under the NPDES program and comply with all terms and conditions of this MS4 permit. A list of potential State and federal agencies that may be affected by the eligibility criteria is available in the general permit. Permittees may file joint applications and share responsibilities in an effort to efficiently comply with permit requirements.

Summary

In accordance with the CWA, the criteria described above will require general permit coverage for the small municipalities and State and federal properties that have the greatest likelihood of causing discharge of polluted stormwater runoff. Regulating these small MS4s under the NPDES program will allow implementation of stormwater programs to protect water quality. MDE will consider additional information from municipal, State, or federal MS4 owners or operators regarding eligibility of permit coverage, such as high population and growth areas, as well as whether a system discharges to sensitive waters, is contiguous to other regulated systems, or is a significant contributor of pollutant loadings to a physically interconnected MS4 that is regulated by the NPDES program.

Table A.2. Federal Agencies Potentially Eligible for Permit Coverage

Federal Agency	Property Name
Amtrak	Multiple properties
Architect of the Capitol	Library of Congress*
Army Reserves	1SG Adam S Brandt Memorial (Curtis Bay)*, Jachman USARC*, Jecelin USARC #1*, Prince George's County Memorial USARC*
Dept of Agriculture	Beltsville Agricultural Research Center* and National Plant Germplasm & Biotechnology Lab*
Dept of Defense, Air Force	Joint Base Andrews*
Dept of Defense, Army	Aberdeen Proving Grounds*, Fort Detrick*, Adelphi Lab*, Fort George G. Meade*, Washington Aqueduct*, and multiple properties
Dept of Defense, Navy	Indian Head*, Bethesda*, Carderock*, Naval Academy*, and multiple properties
Federal Bureau of Prisons	Multiple properties
National Security Agency	Fort Meade* and Friendship Annex
Dept of Homeland Security	FLETC Cheltenham Training Center* and multiple properties
National Park Service	Multiple properties
Dept of Veterans Affairs (VA)	Multiple properties (VA hospitals)
General Services Administration	Multiple properties
National Aeronautics and Space Administration	Goddard Space Flight Center*
National Institutes of Health	Bethesda Campus* and multiple properties
National Institute of Standards & Technology	Gaithersburg Campus*
Smithsonian Support Center	Suitland property
U.S. Coast Guard	Multiple properties
U.S. Postal Service	William F. Bolger Center* and multiple properties

* Indicates a federal property or agency currently regulated under the Phase II small MS4 program

Table A.3. State Agencies Potentially Eligible for Permit Coverage

State Agency	Property Name
MD Air National Guard	Multiple properties*
MD Army National Guard	Multiple properties*
MD Aviation Authority	Martin State Airport* and multiple properties
MD Dept of General Services	Ellicott City District Court* and multiple properties
MD Dept of Health	Multiple properties
MD Dept of Juvenile Services	Multiple properties
MD Dept of Public Safety & Correctional Services	Multiple properties
MD Dept of Transportation, Motor Vehicle Administration	Multiple properties* including Glen Burnie*
MD Dept of Transportation, Port Administration	Multiple properties*
MD Dept of Transportation, Transit Administration	Multiple properties*
MD Dept of Transportation, Transportation Authority	Multiple properties*
MD Food Center Authority	Multiple properties
MD National Capital Parks & Planning	Montgomery* and Prince George’s Parks
MD School for the Deaf	Columbia and Frederick campuses
MD Stadium Authority	Camden Yards Sports Complex*
MD State Police	Multiple properties
Universities	Towson University*, University of Maryland - College Park*, and numerous additional campuses
Washington Metropolitan Area Transit	Multiple Metro stations*
Washington Suburban Sanitary Commission	Multiple properties*

* Indicates a State property or agency currently regulated under the Phase II small MS4 program

APPENDIX B

Compliance with General Permit Requirements for Small Municipal Separate Storm Sewer Systems

Appendix B

Compliance with General Permit Requirements for Small Municipal Separate Storm Sewer Systems

The Maryland Department of the Environment (MDE) has issued two general discharge permits for small Municipal Separate Storm Sewer Systems (MS4s): one for small municipalities and another for State and federal agencies. These two permits require that management programs be developed to effectively control the discharge of pollutants from stormwater runoff and improve water quality. These small MS4 general permits are issued in accordance with the Clean Water Act (CWA) and corresponding National Pollutant Discharge Elimination System (NPDES) regulations, 40 Code of Federal Regulations (CFR) § 122.26. The permits establish the minimum requirements for municipal and State and federal agencies eligible for coverage under the NPDES program. This appendix provides guidance and additional information related to compliance with permit requirements. The guidance is organized into three sections as follows:

Section I:	*Describes management options for permit compliance;*
Section II:	*Provides guidance for developing an illicit discharge detection and elimination program; and*
Section III:	*Provides guidance for developing and implementing a restoration program to meet Chesapeake Bay water quality goals by 2025.*

Section I. Management Options for Permit Compliance

According to 40 CFR § 122.30, the U.S. Environmental Protection Agency (EPA) strongly encourages partnerships and the watershed approach as the management framework for efficiently, effectively, and consistently protecting water quality and restoring aquatic ecosystems. This regulation offers flexibility to regulated owners and operators for complying with permit requirements. Therefore, the following options may be considered by small MS4s during planning and implementation efforts. This will allow government agencies and small municipalities to combine resources and collaborate with other NPDES programs to most effectively and efficiently achieve the water quality goals intended in the CWA.

A. Options for filing a Notice of Intent (NOI) Application.

MDE will allow multiple options for filing an NOI to receive permit coverage. An NOI application may represent an individual government property or multiple properties owned or operated by a single agency. If an NOI represents all storm sewers owned, operated, or maintained by a single agency, the application must specify each individual property to be covered under the permit.

B. Qualifying Local Programs (State or local).

An applicant may develop programs to comply with all minimum control measures independently, or rely on another responsible entity, or rely on a qualifying local program to comply with permit requirements. Maryland has existing State statutes and local ordinances in place that already require implementation of specific management measures that are more stringent than the conditions in 40 CFR § 122. Therefore, the statewide regulatory requirements under the Environment Article, Title 4, Subtitle 1, Annotated Code of Maryland for erosion and sediment control and Title 4, Subtitle 2 for stormwater management are considered to be “qualifying local programs.” Compliance with these laws will meet the “Construction Site Stormwater Runoff Control” and “Post Construction Stormwater Management” permit requirements. The permittee remains responsible for the implementation of these measures through compliance with Maryland’s erosion and sediment control and stormwater management laws.

C. Sharing Responsibility.

A permittee may rely on another entity such as a State, federal, or municipal partner to satisfy one or more of the permit obligations. All permit obligations of each entity must be noted in the NOI submitted to MDE according to Part II of this general permit and 40 CFR § 122.35. Other responsible entities must implement control measures that are at least as stringent as the corresponding requirements found in this NPDES general permit. Additionally, the other entity must agree to implement the minimum control measures on the permittee’s behalf. However, the permittee remains responsible for all regulatory obligations. Therefore, MDE encourages the permittee to enter into a legally binding agreement such as a memorandum of understanding with the other entity to minimize uncertainty about compliance with the permit. This information must be specified in the NOI (Appendix C).

Section II. Illicit Discharge Detection and Elimination (IDDE) Program Guidance

Small municipalities and State and federal agencies covered under this NPDES MS4 permit are required to implement an IDDE program. The goal of this program is to find and eliminate pollutants entering the MS4. IDDE program activities include mapping the stormwater conveyance system, inspecting outfalls to discover polluted discharges, investigating the source of pollution, and taking steps to eliminate the discharge, which may include enforcement actions. Permittees are required to develop standard operating procedures (SOPs) that detail the steps to implement these activities. This section provides guidance that permittees may use as a starting point to develop and implement their programs.

A discharge to an MS4 is illicit if it is not composed entirely of stormwater (40 CFR § 122.26(b)(2)). Illicit discharges can originate from a number of different types of sources, including incorrect plumbing, broken infrastructure, inappropriate business practices, and illegal dumping. For example, sanitary sewer lines or car wash drains may be connected to the MS4 instead of the sanitary sewer system. Drinking water lines or sanitary sewer pipes may be broken and leaking effluent into the MS4. Businesses may be inappropriately washing vehicles, allowing wash water to drain into stormwater inlets. Illicit discharges may also result from purposeful dumping of pollutants into an MS4.

A. Mapping

As part of their IDDE programs, permittees must develop a map of the MS4 that they own or operate. Map features must include stormwater conveyances, outfalls, stormwater best management practices (BMPs), and waters of the U.S. receiving stormwater discharges. As defined in 40 CFR § 122.26(b)(9), an outfall is a point source "at the point where a municipal separate storm sewer discharges to waters of the United States" (see Figure B.1). Mapping outfalls, stormwater conveyances, and stormwater BMPs will assist the permittee with tracking the source of a suspected illicit discharge. In this permit term, permittees may prioritize their initial mapping efforts to areas with a higher potential to pollute, such as areas that are urbanized, commercial, or rapidly developing.

Figure B.1.*The above outfalls are examples of different types of outfalls that must be identified on MS4 maps and included in the permittee's screening program. Areas with highly developed land uses (e.g., commercial business complexes, aging infrastructure) have a greater potential to pollute and must be prioritized. Structural stability and erosion concerns should also be identified as part of an effective IDDE program.*

If submitting a map would compromise the operational security of a State or federal agency, the agency may indicate that the map is available for MDE review on site.

B. Standard Operating Procedures

Permittees must develop SOPs that outline methods to conduct dry weather outfall inspections, locate the source of a suspected illicit discharge, and address illicit discharges. Program implementation as detailed in the SOPs can be prioritized in the areas that have a higher potential to pollute (e.g., urbanized, commercial, or areas with older stormwater infrastructure), and must include a long-term schedule for completing a property(ies)-wide map. The SOPs must identify the number of outfalls to be investigated per year and include an inspection checklist to document the outfall screening. A good resource for developing the IDDE program and field checklist is found in the 2004 *Illicit Discharge Detection and Elimination: A Guidance Manual for Program Development and Technical Assessments*, authored by the Center for Watershed Protection and Dr. Robert Pitt. Figure B.2, the "Outfall Reconnaissance Inventory/Sample Collection Field Sheet", is one of several tools permittees may choose to use in their own programs. This checklist will assist a permittee in identifying any potential illicit discharge, determining the need for a more in-depth investigation, and noting any other outfall maintenance needs (e.g., cracks, erosion, excessive vegetation).

A Phase II MS4 municipality must screen 20% of total outfalls per year, up to 100 outfalls. Screening efforts for State and federal properties are tiered based on property size. For small properties (i.e., less than 100 acres), all outfalls must be screened each year. Medium size properties (i.e., 100 - 2,000 acres) must screen 50% of total outfalls. Large properties (i.e., more than 2,000 acres) must screen 20% per year, up to 100 outfalls. A tiered approach takes into consideration the scale of each State or federal property. For example, a small property with a total of five outfalls is expected to screen all five outfalls per year. Likewise, larger properties may screen a smaller percentage per year to account for the increased effort a greater number of outfalls would require.

C. Illicit Discharge Investigation

A dry weather screening is an outfall inspection conducted at a time when rain has not occurred recently (e.g., within the past 48 hours). During a period of dry weather, it is expected that any observed flow would be the result of some type of discharge other than precipitation. In some cases, the permittee may find that an outfall is not a useful inspection point to detect an illicit discharge (e.g., outfall is submerged, significant groundwater flow is present, the outfall serves a large drainage area). In these cases, the permittee has the discretion to pick an inspection point further up the system (e.g., a manhole or inlet, inflow to a stormwater BMP, or point source discharge in a commercial or industrial area) and document the adjustment in the inspection report. MDE encourages approaches where the permittee conducts screenings closer to the source of potential illicit discharges. When a dry weather flow is observed, a permittee must initiate an investigation to discover the source. If the source is determined to be illicit, the permittee is required to take corrective measures to eliminate the discharge and initiate enforcement actions when necessary. Two examples of illicit discharge investigations are provided below to illustrate outfall identification, mapping, and discharge source tracking. These examples are taken from a Phase I MS4 annual report.

Example 1: Illicit Discharge Investigation for Discovered Wash Water

During a dry weather screening of Outfall 1, a flow was observed dripping into green sudsy water that had an oily odor. A chemical test indicated a high level of detergents. In the process of tracking the source, a high level of detergents was detected at Outfall 2, as well. The source was traced to a car wash that was believed to be discharging wash water into the MS4.

Example 2: Illicit Discharge Investigation for Detergents

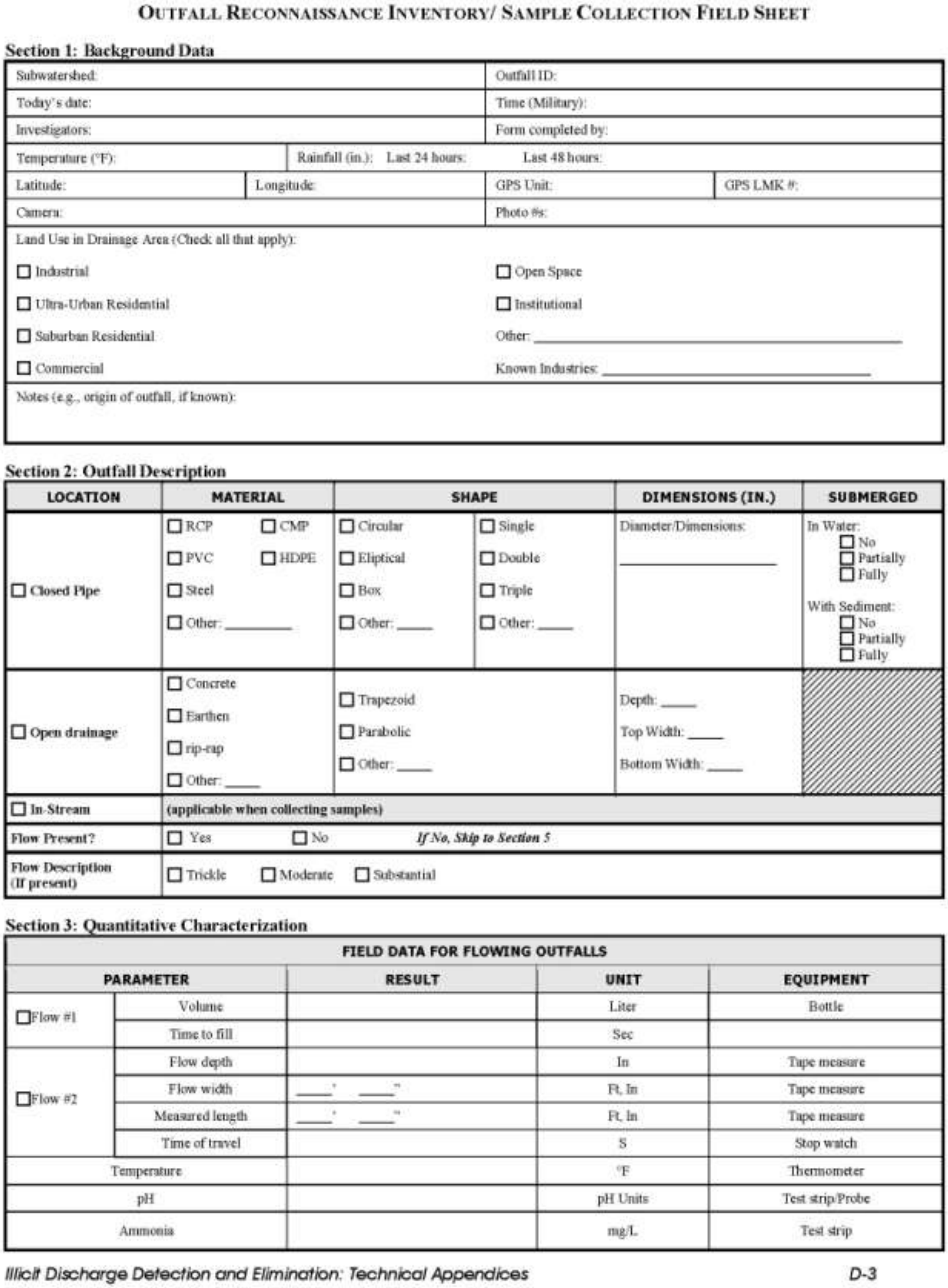
A dry weather flow was discovered at the outfall of a BMP. A chemical test revealed the presence of chlorine and a high pH. A chemical test at the pond inflow indicated a high level of detergents. Upslope manholes were inspected to determine the path of the discharge. Starting at the point of discharge and inspecting contributing segments of stormwater conveyance pipes (sometimes called a trunk investigation), a single point of flow that exceeded the acceptable level of detergents was isolated. The investigation revealed that the source of the discharge was located within the segment connected to inlets protected by berms on a private commercial business property yard.

D. Illicit Discharge Elimination and Enforcement

After identifying the source of an illicit discharge, a municipal permittee is required to provide notice to the property owner and require that the responsible party takes appropriate action to eliminate the source of the illicit discharge. The permittee may exercise its legal authority to access the property and utilize enforcement. State and federal permittees are required to take appropriate action to eliminate the source of the illicit discharge. These IDDE investigation procedures and enforcement actions must be specified in the permittee’s SOPs.

Figure B.2. Outfall Reconnaissance Inventory/Sample Collection Field Sheet

(from Center for Watershed Protection and Pitt, 2004)



OUTFALL RECONNAISSANCE INVENTORY/ SAMPLE COLLECTION FIELD SHEET

Section 1: Background Data

Subwatershed:		Outfall ID:	
Today's date:		Time (Military):	
Investigators:		Form completed by:	
Temperature (°F):	Rainfall (in.): Last 24 hours:	Last 48 hours:	
Latitude:	Longitude:	GPS Unit:	GPS LMK #:
Camera:		Photo #s:	

Land Use in Drainage Area (Check all that apply):

☐ Industrial

☐ Ultra-Urban Residential

☐ Suburban Residential

☐ Commercial

☐ Open Space

☐ Institutional

Other: ______________________________

Known Industries: ______________________

Notes (e.g., origin of outfall, if known):

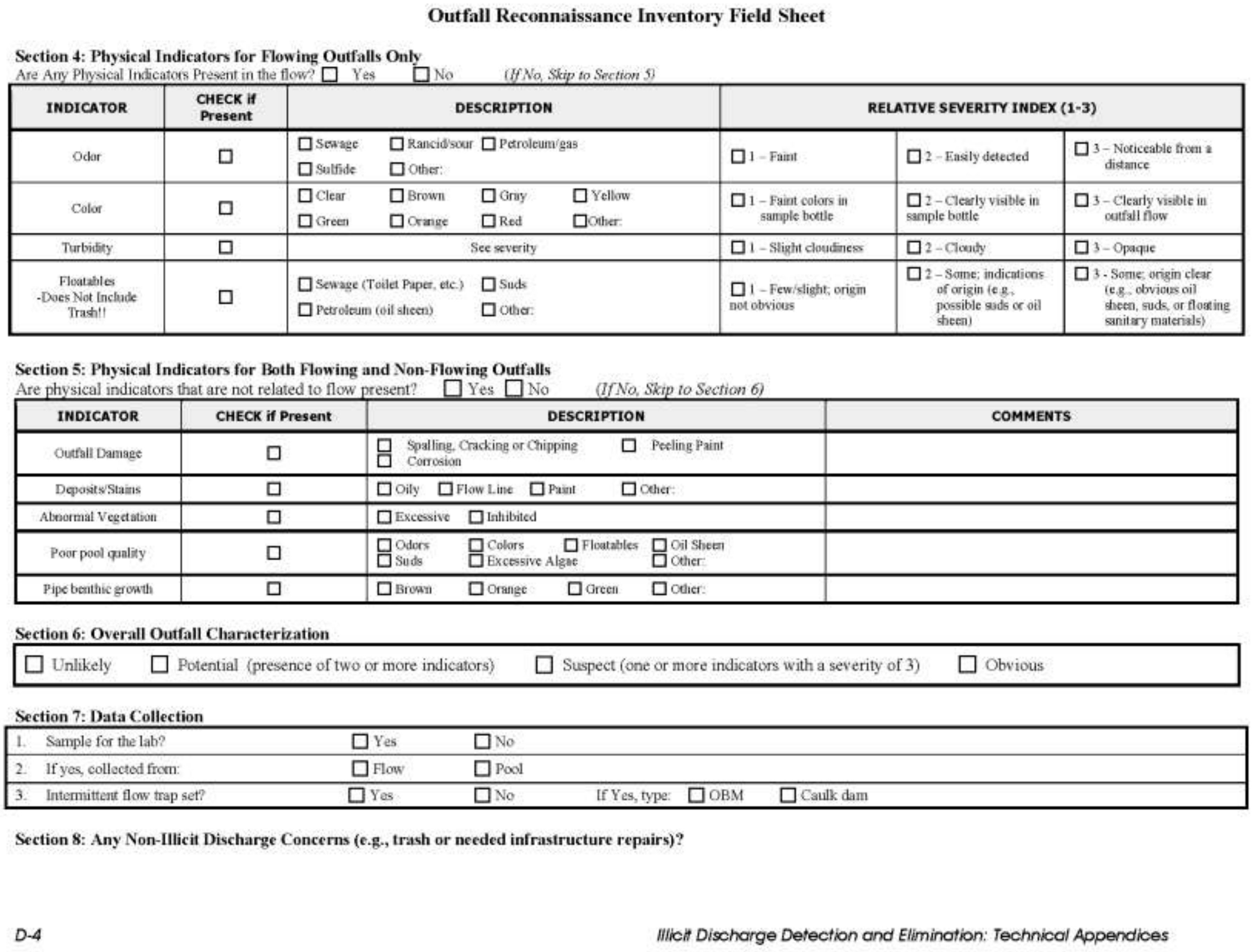
Section 2: Outfall Description

LOCATION	MATERIAL	SHAPE	DIMENSIONS (IN.)	SUBMERGED
☐ **Closed Pipe**	☐ RCP ☐ CMP ☐ PVC ☐ HDPE ☐ Steel ☐ Other: ________	☐ Circular ☐ Single ☐ Eliptical ☐ Double ☐ Box ☐ Triple ☐ Other: _____ ☐ Other: _____	Diameter/Dimensions: ____________________	In Water: ☐ No ☐ Partially ☐ Fully With Sediment: ☐ No ☐ Partially ☐ Fully
☐ **Open drainage**	☐ Concrete ☐ Earthen ☐ rip-rap ☐ Other: _____	☐ Trapezoid ☐ Parabolic ☐ Other: _____	Depth: _____ Top Width: _____ Bottom Width: _____	▨
☐ **In-Stream**	**(applicable when collecting samples)**			
Flow Present?	☐ Yes ☐ No *If No, Skip to Section 5*			
Flow Description (If present)	☐ Trickle ☐ Moderate ☐ Substantial			

Section 3: Quantitative Characterization

FIELD DATA FOR FLOWING OUTFALLS				
PARAMETER		RESULT	UNIT	EQUIPMENT
☐Flow #1	Volume		Liter	Bottle
	Time to fill		Sec	
☐Flow #2	Flow depth		In	Tape measure
	Flow width	____' ____"	Ft, In	Tape measure
	Measured length	____' ____"	Ft, In	Tape measure
	Time of travel		S	Stop watch
Temperature			°F	Thermometer
pH			pH Units	Test strip/Probe
Ammonia			mg/L	Test strip

Figure B.2. Outfall Reconnaissance Inventory/Sample Collection Field Sheet
(from Center for Watershed Protection and Pitt, 2004)



Outfall Reconnaissance Inventory Field Sheet

Section 4: Physical Indicators for Flowing Outfalls Only
Are Any Physical Indicators Present in the flow? ☐ Yes ☐ No *(If No, Skip to Section 5)*

INDICATOR	CHECK if Present	DESCRIPTION	RELATIVE SEVERITY INDEX (1-3)		
Odor	☐	☐ Sewage ☐ Rancid/sour ☐ Petroleum/gas ☐ Sulfide ☐ Other:	☐ 1 – Faint	☐ 2 – Easily detected	☐ 3 – Noticeable from a distance
Color	☐	☐ Clear ☐ Brown ☐ Gray ☐ Yellow ☐ Green ☐ Orange ☐ Red ☐Other:	☐ 1 – Faint colors in sample bottle	☐ 2 – Clearly visible in sample bottle	☐ 3 – Clearly visible in outfall flow
Turbidity	☐	See severity	☐ 1 – Slight cloudiness	☐ 2 – Cloudy	☐ 3 – Opaque
Floatables -Does Not Include Trash!!	☐	☐ Sewage (Toilet Paper, etc.) ☐ Suds ☐ Petroleum (oil sheen) ☐ Other:	☐ 1 – Few/slight; origin not obvious	☐ 2 – Some; indications of origin (e.g., possible suds or oil sheen)	☐ 3 - Some; origin clear (e.g., obvious oil sheen, suds, or floating sanitary materials)

Section 5: Physical Indicators for Both Flowing and Non-Flowing Outfalls
Are physical indicators that are not related to flow present? ☐ Yes ☐ No *(If No, Skip to Section 6)*

INDICATOR	CHECK if Present	DESCRIPTION	COMMENTS
Outfall Damage	☐	☐ Spalling, Cracking or Chipping ☐ Peeling Paint ☐ Corrosion	
Deposits/Stains	☐	☐ Oily ☐ Flow Line ☐ Paint ☐ Other:	
Abnormal Vegetation	☐	☐ Excessive ☐ Inhibited	
Poor pool quality	☐	☐ Odors ☐ Colors ☐ Floatables ☐ Oil Sheen ☐ Suds ☐ Excessive Algae ☐ Other:	
Pipe benthic growth	☐	☐ Brown ☐ Orange ☐ Green ☐ Other:	

Section 6: Overall Outfall Characterization

☐ Unlikely ☐ Potential (presence of two or more indicators) ☐ Suspect (one or more indicators with a severity of 3) ☐ Obvious

Section 7: Data Collection

1. Sample for the lab?	☐ Yes	☐ No		
2. If yes, collected from:	☐ Flow	☐ Pool		
3. Intermittent flow trap set?	☐ Yes	☐ No	If Yes, type: ☐ OBM	☐ Caulk dam

Section 8: Any Non-Illicit Discharge Concerns (e.g., trash or needed infrastructure repairs)?

Section III. Guidance for Impervious Area Restoration Program Development

Small MS4 owners and operators covered under this NPDES general permit are required to commence impervious area restoration for twenty percent of existing developed lands that have little or no stormwater management by the end of the permit term. This requirement supports the Maryland Watershed Implementation Plan (WIP) strategy for achieving nutrient and sediment load reductions on small MS4 properties to address Chesapeake Bay and local total maximum daily loads (TMDLs). Guidance for implementing restoration activities is available in the MDE document *Accounting for Stormwater Wasteload Allocations and Impervious Acres Treated* hereafter referred to as the Accounting Guidance. While the most recent version of the Accounting Guidance should be referenced by all stormwater permittees, the method below highlights the most relevant information from that document for small MS4 owners and operators. This provides a clear outline for compliance with impervious area restoration for small MS4s.

A. Establishing Baselines: Impervious Surface Area Assessment

Permittees must develop an impervious surface area baseline assessment and delineate the areas that are treated with acceptable water quality BMPs to the maximum extent practicable (MEP). This analysis will provide the baseline used to calculate the twenty percent restoration requirement. The following information is needed for this assessment:

1. **Land Use and Impervious Surface Area Analysis:** Evaluate the total impervious surface within a permittee's regulated permit area using the best available land use data that can be generated from the same source from year to year. BMPs designed in compliance with the water quality volume (WQ_v) treatment criteria found in the *2000 Maryland Stormwater Design Manual, Volumes I & II* (Manual) are considered to provide water quality treatment to the MEP. Therefore, the impervious area draining to BMPs designed and approved in accordance with the Manual does not need to be counted toward impervious area restoration requirements.

2. **Urban BMPs:** All municipalities and State and federal agencies are required to develop and maintain an Urban BMP database in accordance with Tables B.1.a, b, and c. The database identifies all existing stormwater BMPs along with design, construction, and inspection information. This database and accompanying field inspections must be used to verify the level of water quality treatment provided for an existing BMP. The following guidelines can be used to determine the level of water quality treatment provided by existing stormwater BMPs:

   - BMPs constructed according to the Manual for new development after the baseline year of 2002 provide acceptable water quality treatment. The impervious areas draining to these BMPs do not need to be counted in the impervious area required to be restored.

- BMPs implemented for new development after 2002 may not be used for credit toward impervious area restoration.
- BMPs implemented prior to 2002 may provide some water quality treatment. These include wet ponds, wetlands, and infiltration BMPs. In these cases, the original design parameters for each BMP are needed to verify the level of treatment provided. The impervious area treated is based on the volume provided in relation to the WQ_v (i.e., 1 inch of rainfall). For example, if a BMP was designed to treat a half inch of rainfall, the amount of impervious area treated is 50% of the actual impervious area draining to the BMP.
- BMPs designed for flood control do not provide water quality treatment. The impervious area draining to these BMPs must count toward the baseline.
- Where plans, design specifications, and complete inspection and maintenance records are not available, BMPs are not considered to provide acceptable water quality treatment. Impervious areas draining to these structures must count toward the baseline.
- The impervious area treated by BMPs implemented for retrofitting or redevelopment between January 1, 2002, and December 31, 2005, may be subtracted from the baseline number.

A useful tool for an initial assessment is the Stormwater Management by Era approach documented by MDE in 2009. The approach considers four distinct regulatory eras where stormwater management requirements correlate with a certain level of BMP performance. These eras are as follows:

- Prior to 1985. Stormwater management regulations came into effect after this era. Any development constructed in this time period is most likely untreated (unless retrofits were constructed in later years).
- Between 1985 and 2002. BMPs implemented during this time addressed flood control; however, individual BMP design criteria must be used to verify whether water quality is provided.
- Between 2002 and 2010. The Manual was fully implemented during this era. New development that meets the water quality requirements of the Manual is considered to have acceptable treatment.
- Post-2010. ESD to the MEP is required. Any development project that complied with State regulations in the third and fourth eras is considered to have acceptable water quality treatment.

This approach was used in the development of Maryland’s WIP for meeting Chesapeake Bay TMDLs. It can be used for identifying BMPs that provide water quality so that the treated impervious areas may be deducted from the baseline assessment. The stormwater management by era approach can also be valuable for long term planning and for targeting potential areas suitable for retrofitting.

3. **Impervious Surfaces in Rural Areas:** Many rural roads and residential subdivisions have open vegetated drainage systems, impervious area disconnections, and sheetflow to conservation areas that filter and infiltrate

stormwater runoff. Each permittee must conduct a systematic review of existing rural areas to determine the extent of water quality treatment already provided. This review will also aid in identifying opportunities for retrofitting.

Land use designation can help in selecting areas that are already adequately managed. For example, public roads and residential subdivisions in predominantly rural areas with low population densities (e.g., one or fewer dwelling unit per three acres) may have water quality design features equivalent to those defined in the Manual. Typically, areas that are less than fifteen percent impervious may meet ESD requirements according to the criteria for nonstructural practices in the Manual. These practices include rooftop disconnect, non-rooftop disconnect, and sheetflow to conservation areas. These practices promote sheetflow or treatment through vegetative filtering of runoff. If a permittee documents where conditions meet the Manual's criteria and adequate treatment is provided, then the impervious acres in these areas may be excluded from the baseline. Acceptable documentation can include a comprehensive GIS desktop analysis of land use and zoning conditions and local runoff patterns. Sufficient evidence to justify assumptions in the analysis must be included for MDE review and approval.

4. **Total Impervious Acres Not Treated to the MEP:** Subtract total impervious areas draining to water quality BMPs and nonstructural practices (determined above) from the total impervious land area owned or operated by the permittee as of the baseline year selected. Restoration requirements will apply to twenty percent of the remaining untreated impervious area at the start of the permit term.

B. Criteria for Impervious Area Restoration Crediting

The water quality objective for impervious area restoration is based on treating the WQ_v (i.e., 1 inch of rainfall) using BMPs defined in the Manual. Because of numerous constraints inherent in the urban environment, meeting the design standards specified in the Manual may not always be achievable. In these cases, retrofit opportunities that currently achieve less than the WQ_v must be pursued where they make sense. Applying impervious area treatment credit for these projects will be based on the proportion of the full WQ_v treated.

Where stormwater retrofits provide water quality treatment for existing unmanaged urban areas, impervious area restoration credit may be applied according to the following criteria:

- An acre for acre impervious credit will be given when a BMP is designed to provide treatment for the full WQ_v (i.e., 1 inch of rainfall); or
- A proportional acreage of credit will be given when less than the WQ_v is provided: (percent of the WQ_v achieved) x (drainage area impervious acres).
- When a BMP is designed to treat greater than one inch of rainfall, additional credit may be granted in accordance with the Accounting Guidance.

C. Acceptable Restoration Strategies

The following are acceptable restoration strategies for receiving impervious area restoration credit. Restoration BMPs may be implemented anywhere within the boundary of the property(ies). Permittees may submit alternative actions to comply with impervious area restoration requirements, subject to MDE approval.

1. **New Retrofit BMPs:** This includes new stormwater BMPs installed to provide water quality treatment for existing developed lands with no controls. Acceptable water quality BMPs and design criteria are provided in the Manual. When a BMP from this list is used and the full WQ_v is provided, the total impervious surface within the drainage area may be credited toward restoration.

2. **Existing BMP Retrofits:** These are existing BMPs that were not originally designed to provide water quality treatment (e.g., detention pond). As discussed previously, the impervious area draining to these BMPs may not be counted as treated. However, when retrofitted to an acceptable water quality BMP, such as converting a dry pond to a wetland, or providing additional WQ_v storage; the impervious acres draining to the BMP may be credited as restored.

3. **BMP Enhancement and Restoration:** Routine inspection and maintenance is essential to ensure optimal water quality treatment of any BMP. When BMP maintenance has not been performed, substantial structural problems will occur over time, undermining any water quality benefit intended from the practice. Therefore, when BMPs are not properly maintained they may not be considered to provide effective treatment for impervious surfaces. If credit was originally taken for water quality treatment, then future MS4 Progress Reports must remove that credit until the BMP is restored.

   MDE has published maintenance guidance for each BMP and specified time periods for inspection and corrective action. This guidance is posted on the MDE stormwater webpage. In addition, the Natural Resources Conservation Service of Maryland has published *Pond Code 378*, which includes an inspection checklist for ponds. Code 378 identifies areas that will cause significant problems if left unaddressed. When inspections and repairs are performed according to these guidelines (or others required by local review authorities), then the BMP is considered properly maintained.

   When a BMP has failed and significant structural problems exist, the BMP must be restored to receive proper restoration credit. Restoring a failed BMP must include providing the full WQ_v, and may entail increasing storage capacity, providing forebays, increasing the flow path by installing berms or other design enhancements, re-planting with desirable wetland and native vegetation, or significant sediment clean outs. This restoration credit may apply to failed structures that need water quality enhancements in accordance with Chapter 3 of

MDE's Manual. This is intended to ensure that BMPs are functioning as designed and that routine maintenance is addressed in order for the permittee to keep the credit.

4. **Alternative Stormwater BMPs**: The Accounting Guidance recognizes that new and innovative approaches to stormwater management are being developed on a continuous basis. Therefore, several alternative BMPs are documented that may be used for the purpose of impervious area restoration. Some of these alternative BMPs include street sweeping, buffer planting, reforestation, stream restoration, inlet cleaning, shoreline stabilization, and others. A list of these alternative BMPs is provided in Table B.3, below. The Accounting Guidance references acceptable criteria for BMP implementation and provides a method for translating pollutant load reductions from alternative BMPs into an impervious acre equivalent in order to credit these practices toward restoration requirements. When innovative practices are approved through Chesapeake Bay Program (CBP) expert panels or by MDE, the associated credits and design criteria may also be used for restoration credit.

   Impervious acres treated must be reported according to the "impervious acre equivalent" identified in Table B.4 for each alternative practice. As an example, where stream restoration is proposed, the impervious acre equivalent is equal to 0.01 acre per linear foot. This means that when 1,000 linear feet of stream are restored, then 10 acres of credit may be granted toward impervious area restoration.

5. **Trading**: MDE supports trading as a cost effective means for achieving pollutant load reductions. Adoption of new trading regulations in Maryland will include public participation and approval by EPA. Therefore, trading with other source sectors may be an option after formal regulatory procedures are satisfied.

6. **Redevelopment:** Maryland's stormwater management regulations for redeveloped lands are intended to gain water quality treatment on existing developed lands while supporting initiatives to improve urban areas. Therefore, when water quality treatment practices are provided to address State redevelopment regulations, the existing impervious area treated may be credited toward restoration requirements. In most cases the credit will be equivalent to 50% of the existing impervious area for the project. When additional volume above the regulatory requirements is provided, additional credit will be accepted on a proportional basis as described in Appendix B, Section III.A, above.

7. **Establishing Partnerships and Master Planning**: As discussed above, redevelopment activities may be credited toward restoration requirements. This presents an opportunity to develop future growth master plans to provide water quality treatment beyond regulatory requirements. This can be a cost effective solution for addressing Maryland's stormwater management regulations while

incorporating impervious area restoration initiatives into long-range planning efforts.

In addition, government agencies have the opportunity to collaborate with other watershed groups, and State, federal, or local entities to combine resources and facilitate implementation of restoration activities. As discussed in Section I of Appendix B, this could be a formal agreement with another entity and outlined in the NOI application, or this may be a partnership established for an individual project. Because the intent of the small MS4 general permit is to encourage partnerships to achieve the water quality goals of the CWA, MDE will remain flexible when any permittee pursues this option.

D. Urban Best Management Practice (BMP) Database and Codes

The data tables below provide a tracking system for all BMPs. BMP reporting requires populating data from three related tables as follows:

1. Table B.1.a: Information in this table must be completed for all structural, ESD, and alternative BMPs.

2. Table B.1.b: This table provides more specific information related to structural and ESD practices. The table is linked to Table B.1.a using the common field BMP_ID.

3. Table B.1.c: This table provides more specific information related to alternative BMPs. The table is linked to Table B.1.a using the common field BMP_ID.

Data must be submitted in Microsoft Excel spreadsheet format. A map using geographic information system (GIS) software is optional. An Excel spreadsheet template is provided on MDE's Phase II webpage to assist permittees in developing the database.

Some data for older BMPs may not be available, as the information was not required at the time of BMP construction. In these cases, an explanation must be provided. MDE expects that data development and verification will be an ongoing process throughout the permit term and baselines may be adjusted accordingly. Permittees may submit an adjusted impervious area baseline in MS4 Progress Reports to reflect updated information.

<u>Reporting for ESD Practices</u>

ESD practices may be entered as a single structure or as a system of practices. When numerous ESD practices are installed to collectively address stormwater requirements for a project, permittees may choose to enter these data as a system of ESD practices. Data for ESD systems may be captured by specifying:

- The common BMP_ID field will link ESD data in Table B.1.a to Table B.1.b.
- Table B.1.a requires Maryland grid coordinates for each BMP. For ESD systems this location must represent the most downstream point or practice.

- Table B.1.a requires the BMP type (BMP_Type). This is the most predominant BMP type in the ESD system.
- Table B.1.b requires the total number of BMPs (NUM_BMPS) implemented to address stormwater requirements for the ESD system of practices.
- Table B.1.b requires the total rainfall treated (PE_ADR). This represents the total rainfall treated for the collective number of BMPs in the ESD system.

Inspections for ESD Systems

Projects that meet the ESD to MEP requirement may be inspected as a collection of practices. Inspection and maintenance data in Table B.1.a. for ESD systems will represent the performance of the system of practices versus each individual practice. This is consistent with Code of Maryland Regulations 26.17.02.

Table B.1.a BMP Reporting Requirements

Description: This table is to be completed for all structural, ESD, and alternative BMPs.

Column Name	Data Type	Size	Description
BMP_ID	TEXT	13	Unique MDE BMP ID. (Ex: RO12BMP000001, Table B.2.a) (Ex: AOC12BMP00001, Table B.2.b)
REPORTING_YEAR	TEXT	4	State fiscal year (YYYY)
MD_NORTH	NUMERIC	8	Maryland grid coordinate Northing (NAD 83 meters)
MD_EAST	NUMERIC	8	Maryland grid coordinate Easting (NAD 83 meters)
PERMIT_NUM	TEXT	10	General Discharge Permit Number (municipal permittees use: 13-IM-5500. State and federal permittees use 13-SF-5501)
LOCAL_BMP_ID	TEXT	25	Local or State/federal project approval number (optional info)
BMP_NAME	TEXT	100	Use BMP names (e.g., Glendale Pond)
BMP_CLASS	TEXT	1	Use BMP classification noted in Table B.3 below (E, S, or A)
BMP_TYPE	TEXT	4	Use BMP Type or most predominant type in Table B.3 below
CON_PURPOSE	TEXT	4	Enter code for New Development (NEWD), Redevelopment (REDE), or Restoration (REST), Conversion (CONV)
LAST_INSP_DATE	DATE	8	Last inspection date (MM/DD/YYYY)
BMP_STATUS	TEXT	1	Enter P = Pass or F = Fail for BMP inspection status
MAIN_DATE	DATE	8	Last date maintenance was performed (MM/DD/YYYY); field is conditional on the BMP failing an inspection
REINSP_DATE	DATE	8	Next planned inspection date (MM/DD/YYYY)
REINSP_STATUS	TEXT	1	Re-inspection status (i.e., Pass/Fail); This is a follow-up inspection after a failed BMP has undergone maintenance
GEN_COMMENTS	TEXT	255	General comments - optional information

Table B.1.b Reporting Requirements for ESD and Structural Practices

Description: More specific data related to ESD and structural BMPs is populated in this table.

Column Name	Data Type	Size	Description
BMP_ID	TEXT	13	BMP_ID linking record to BMP_ID in Table B.1.a
NUM_BMPS	NUMERIC	2	Sum total of BMPs used to meet P_E (enter 1 for a single BMP)
ON_OFF_SITE	TEXT	10	Is the BMP located on the project site or off site
CONVERTED_FROM	TEXT	13	If conversion of existing BMP then prior BMP_ID must be entered here. Conditional on Con_Purpose = CONV
BMP_STATUS	TEXT	10	Enter "ACT" for active or "REM" for removed
BMP_DRAIN_AREA	NUMERIC	6	Total drainage area (acres) to a single BMP or ESD system
IMP_ACRES	NUMERIC	8	Total impervious area (acres) to a single BMP or ESD system
PE_ADR	NUMERIC	8	P_E addressed: Water quality treatment reported as rainfall (inches) treated for a single BMP or system of ESD practices within the drainage area
APPR_DATE	DATE	8	Permit approval date (MM/DD/YYYY)
BUILT_DATE	DATE	8	Construction completion date (MM/DD/YYYY)
GEN_COMMENTS	TEXT	255	General comments - optional information

Table B.1.c Reporting Requirements for Alternative BMPs

Description: More specific data related to alternative BMPs is populated in this table.

Column Name	Data Type	Size	Description
BMP_ID	TEXT	13	BMP_ID linking record to BMP_ID in Table B.1.a
PROJECT_DESC	TEXT	75	Description of project
PROJECT_LENGTH	NUMERIC	8	Length of stream restoration, shoreline or outfall stabilization in feet; Field is conditional on BMP_TYPE = OUT, SHST, or STRE
ACRES_SWEPT	NUMERIC	6	Acres swept for street sweeping (one pass); Field is conditional on BMP_TYPE = MSS or VSS
TIMES_SWEPT	NUMERIC	2	Number of times per year area is swept; Field is conditional on BMP_TYPE = MSS or VSS
ACRES_PLANTED	NUMERIC	6	Acres of trees planted; Field is conditional on BMP_TYPE = FPU or IMPF
IMP_ACR_ELIM	NUMERIC	6	Impervious acres removed to pervious land (IMPP); Field is conditional on BMP_TYPE = IMPP
EQU_IMP_ACR	NUMERIC	6	Equivalent impervious acres treated by alternative BMP (total acres of credit for the alt BMP)
INSTALL_DATE	DATE	8	BMP completion date (MM/DD/YYYY); Field is conditional on BMP_TYPE = OUT, SHST, STRE, SEPC, SEPD, or SEPP
IMPL_COMP_YR	TEXT	4	Year (calendar) of completed Project (YYYY); Field is conditional on BMP_TYPE = MSS, VSS, CBC, SDV, IMPF, IMPP, or FPU
GEN_COMMENTS	TEXT	255	General comments - optional information

BMP ID Field

The BMP_ID is a unique identifier assigned to each BMP or system of BMPs. An example of how to populate the BMP_ID field for a municipality using the required 13 characters is provided:

County or Municipal code + 2 digit year + BMP identifying code + 6 digit sequential number = 13 character BMP_ID code.

Table B.2.a

Municipality: City of Rockville	*RO*
	+
Year feature/record was captured: 2012	*12*
	+
Identifying code: BMP	*BMP*
	+
Record number: 1	*000001*
BMP_ID	***= RO12BMP000001***

County or Municipal Codes for Phase II Reporting:

Jurisdiction	Code
Aberdeen	AB
Annapolis	AN
Bel Air	BE
Bowie	BO
Calvert County	CV
Cecil County (includes North East, Perryville, and Rising Sun)	CE
Easton	EA
Elkton	EL
Frederick County (includes Brunswick, Emmitsburg, Middletown, Myersville, Thurmont, and Walkersville)	FR
City of Frederick	FC
Gaithersburg	GA
Hagerstown	HG
Havre de Grace	HV
Indian Head	IH
La Plata	LP
Queen Anne’s County	QA
Rockville	RO
Takoma Park	TP
Salisbury	SI
St. Mary’s County	SM
Wicomico County (includes Fruitland)	WI
Washington County (includes Boonsboro, Smithsburg, and Williamsport)	WA

State and federal permittees are also required to use a 13 character BMP_ID. Suggested agency codes are listed in the Excel spreadsheet template. If a permittee would like to use a different agency code than found in the template, MDE must approve that alternative agency code to ensure that it is not already in use.

Examples of how to populate the BMP_ID field for a State or federal permittee using the required 13 characters is provided:

Table B.2.b

Agency: Architect of the Capitol	*AOC*
	+
Year feature/record was captured: 2012	*12*
	+
Identifying code: BMP	*BMP*
	+
Record number: 1	*00001*
BMP_ID	***= AOC12BMP00001***

Agency: Maryland Army National Guard	*MARNG*
	+
Year feature/record was captured: 2012	*12*
	+
Identifying code: BMP	*BMP*
	+
Record number: 1	*001*
BMP_ID	***= MARNG12BMP001***

Table B.3 BMP Database Codes: BMP Class and BMP Type

BMP Class	BMP Type Code	BMP Type
Alternative Surfaces (A)		
E	AGRE	Green Roof – Extensive
E	AGRI	Green Roof – Intensive
E	APRP	Permeable Pavements
E	ARTF	Reinforced Turf
Nonstructural Techniques (N)		
E	NDRR	Disconnection of Rooftop Runoff
E	NDNR	Disconnection of Non-Rooftop Runoff
E	NSCA	Sheetflow to Conservation Areas
Micro-Scale Practices (M)		
E	MRWH	Rainwater Harvesting
E	MSGW	Submerged Gravel Wetlands
E	MILS	Landscape Infiltration
E	MIBR	Infiltration Berms
E	MIDW	Dry Wells
E	MMBR	Micro-Bioretention
E	MRNG	Rain Gardens
E	MSWG	Grass Swale
E	MSWW	Wet Swale
E	MSWB	Bio-Swale
E	MENF	Enhanced Filters
Ponds (P)		
S	PWED	Extended Detention Structure, Wet
S	PWET	Retention Pond (Wet Pond)
S	PMPS	Multiple Pond System
S	PPKT	Pocket Pond
S	PMED	Micropool Extended Detention Pond
Wetlands (W)		
S	WSHW	Shallow Marsh
S	WEDW	Extended Detention – Wetland
S	WPWS	Wet Pond – Wetland
S	WPKT	Pocket Wetland
Infiltration (I)		
S	IBAS	Infiltration Basin
S	ITRN	Infiltration Trench
Filtering Systems (F)		
S	FBIO	Bioretention
S	FSND	Sand Filter
S	FUND	Underground Filter
S	FPER	Perimeter (Sand) Filter

BMP Class	BMP Type Code	BMP Type
S	FORG	Organic Filter (Peat Filter)
S	FBIO	Bioretention
Open Channels (O)		
S	ODSW	Dry Swale
S	OWSW	Wet Swale
Other Practices (X)		
S	XDPD	Detention Structure (Dry Pond)
S	XDED	Extended Detention Structure, Dry
S	XFLD	Flood Management Area
S	XOGS	Oil Grit Separator
S	XOTH	Other

Alternative BMP Classification, Alternative BMP Type, and Alternative BMP Name

Alt. BMP Class	BMP Type Code	BMP Name
A	MSS	Mechanical Street Sweeping
A	VSS	Regenerative/Vacuum Street Sweeping
A	IMPP	Impervious Surface Elimination (to pervious)
A	IMPF	Impervious Surface Elimination (to forest)
A	FPU	Planting Trees or Forestation on Pervious Urban
A	CBC	Catch Basin Cleaning
A	SDV	Storm Drain Vacuuming
A	STRE	Stream Restoration
A	OUT	Outfall Stabilization
A	SPSC	Regenerative Step Pool Storm Conveyance
A	SHST	Shoreline Management
A	SEPP	Septic Pumping
A	SEPD	Septic Denitrification
A	SEPC	Septic Connections to WWTP
A	NNET	Nutrient Net (Agriculture Trading)
A	POTW	Publicly Owned Treatment Works (WWTP Trading)

Table B.4. Alternative Urban BMPs and Impervious Acre Credit

Alternative BMP	Calculating Impervious Acre Credit[1]	Impervious Acre Equivalent
Mechanical Street Sweeping	Acres swept multiplied by 0.07 = acres of credit	0.07
Regen/Vacuum Street Sweeping	Acres swept multiplied by 0.13 = acres of credit	0.13
Reforestation on Pervious Urban	Acres of reforested land multiplied by 0.38 = acres of credit	0.38
Impervious Urban to Pervious	Acres of reforested land multiplied by 0.75 = acres of credit	0.75
Impervious Urban to Forest	Acres of reforested land multiplied by 1.00 = acres of credit	1.00
Regenerative Step Pool Storm Conveyance (SPSC)[2]	Located in dry or ephemeral channels; credit is based on rainfall depth treated	Varies[2]
Catch Basin Cleaning	Tons of dry material collected multiplied by 0.40 = acres of credit	0.40
Storm Drain Vacuuming	Tons of dry material collected multiplied by 0.40 = acres of credit	0.40
Mechanical Street Sweeping	Tons of dry material collected multiplied by 0.40 = acres of credit	0.40
Regen/Vacuum Street Sweeping	Tons of dry material collected multiplied by 0.40 = acres of credit	0.40
Stream Restoration	Linear feet of stream restored multiplied by 0.01 = acres of credit	0.01
Outfall Stabilization	Linear feet of outfall stabilized multiplied by 0.01 = acres of credit; max credit is 2 acres per project	0.01
Shoreline Management	Linear feet of shoreline restored multiplied by 0.04 = acres of credit	0.04
Septic Pumping	Units pumped (annually) multiplied by 0.03 = acres of credit	0.03
Septic Denitrification	Units upgraded (w/denitrification) multiplied by 0.26 = acres of credit	0.26
Septic Connections to WWTP	Units connected to a WWTP multiplied by 0.39 = acres of credit	0.39

1. For more information on calculating credits for alternative BMPs, see *Accounting for Stormwater Wasteload Allocations and Impervious Acres Treated*.
2. Full impervious area credit is granted when practice treats 1 inch of rainfall. If the full WQ_v is not provided, then the impervious area credit is based on the percentage of 1 inch that is treated. Described in Appendix B, Section III.B.

APPENDIX C

State and Federal Small MS4
Notice of Intent Form
and
Waiver Form

State and Federal Small MS4 Notice of Intent

Maryland Department of the Environment (MDE)

National Pollutant Discharge Elimination System (NPDES) Small Municipal Separate Storm Sewer Systems (MS4) General Permit

This Notice of Intent (NOI) is intended for State and federal agencies applying for coverage under the General Discharge Permit (No. 13-SF-5501) for Small MS4s. Submitting this application constitutes notice that the agency below agrees to comply with all terms and conditions of the general permit. The information required in this NOI must be submitted to:

Maryland Department of the Environment, Water and Science Administration
Sediment, Stormwater, and Dam Safety Program
1800 Washington Boulevard, Baltimore, MD 21230-1708
Phone: 410-537-3543 FAX: 410-537-3553
Web Site: www.mde.maryland.gov

Contact Information

Permittee Name:
Responsible Personnel:
Mailing Address:

Phone Number(s):
Email address:

Additional Contact(s):
Mailing Address:

Phone Number(s):
Email address:

Signature of Responsible Personnel

I certify under penalty of law that this document and all attachments were prepared under my direction or supervision in accordance with a system designed to assure that qualified personnel properly gather and evaluate the information submitted. Based on my inquiry of the person or persons who manage the system, or those persons directly responsible for gathering the information, the information submitted is, to the best of my knowledge and belief, true, accurate, and complete. I am aware that there are significant penalties for submitting false information, including the possibility of fine and imprisonment for knowing violations.

Printed Name Signature Date

State and Federal Small MS4 Notice of Intent

Due Date: ☐ **Date of Submission:** ☐

Permittee Information:

Renewal Permittee: ☐

New Permittee: ☐

Check if sharing responsibilities with another entity: ☐ Yes ☐ No

Check if this NOI applies to multiple properties: ☐ Yes ☐ No

<u>Required Information:</u>

1. A brief description of property(ies) for which coverage is being sought (when multiple properties are covered under this general permit, provide a separate attachment identifying the specific information required below for each property):

2. The approximate size of property(ies) in acres: ☐

3. Population (or number of employees): ☐

4. Provide a list of properties owned or operated by the permittee covered under the Maryland General Permit for Stormwater Discharges Associated with Industrial Activity or an individual industrial surface water discharge permit:

5. Describe any programs that the applicant will share responsibilities for compliance with another entity. Describe the role of all parties and include a copy of a memorandum of agreement when applicable:

6. Anticipated expenditures to implement the terms and conditions of the permit:

State and Federal Small MS4 Waiver Application

Maryland Department of the Environment (MDE)

National Pollutant Discharge Elimination System (NPDES) Small Municipal Separate Storm Sewer Systems (MS4) General Permit

This Waiver Application is intended for State and federal agencies applying for a waiver of coverage under the General Discharge Permit (No. 13-SF-5501) for Small MS4s. The information required in this Waiver Application must be submitted to:

Maryland Department of the Environment, Water and Science Administration
Sediment, Stormwater, and Dam Safety Program
1800 Washington Boulevard, Baltimore, MD 21230-1708
Phone: 410-537-3543 FAX: 410-537-3553
Web Site: www.mde.maryland.gov

Contact Information

Agency Name and Property Name:

Responsible Personnel:

Mailing Address:

Phone Number(s):

Email address:

Additional Contact(s):

Mailing Address:

Phone Number(s):

Email address:

Signature of Responsible Personnel

I certify under penalty of law that this document and all attachments were prepared under my direction or supervision in accordance with a system designed to assure that qualified personnel properly gather and evaluate the information submitted. Based on my inquiry of the person or persons who manage the system, or those persons directly responsible for gathering the information, the information submitted is, to the best of my knowledge and belief, true, accurate, and complete. I am aware that there are significant penalties for submitting false information, including the possibility of fine and imprisonment for knowing violations.

Printed Name	Signature	Date

State and Federal Small MS4 Waiver Application

Due Date: ☐ **Date of Submission:** ☐

Permittee Information

Property(ies) for which the agency is requesting a waiver:

Size and Description of each property:

Justification for Waiver

If requesting a waiver for more than one property, answer all of the following questions on a separate sheet of paper for each additional property.

1. Attach a map of the property showing all directions of stormwater flow (indicate using arrows).
2. Does the site have interior roads? ☐ Yes ☐ No
3. Does the site discharge a significant amount of pollutants from its MS4? ☐ Yes ☐ No
4. If the answer to either Question 2 OR 3 is Yes, explain why the property qualifies for a waiver. Include a description of land use, site activities, storage of materials, and potential on-site pollution sources:
5. Describe any stormwater controls or pollution control programs implemented on the property:
6. Explain why the site will not contribute substantially to the downstream MS4, to justify the waiver request:

APPENDIX D

State and Federal Small MS4 Progress Report

Maryland Department of the Environment (MDE)

National Pollutant Discharge Elimination System (NPDES)
Small Municipal Separate Storm Sewer Systems (MS4) General Permit

This Progress Report is required for those State and federal agencies covered under General Discharge Permit No. 13-SF-5501. Progress Reports must be submitted to:

Maryland Department of the Environment, Water and Science Administration
Sediment, Stormwater, and Dam Safety Program
1800 Washington Boulevard, Suite 440, Baltimore, MD 21230-1708
Phone: 410-537-3543 FAX: 410-537-3553
Web Site: www.mde.maryland.gov

Contact Information

Permittee Name:

Responsible Personnel:

Mailing Address:

Phone Number(s):

Email address:

Additional Contact(s):

Mailing Address:

Phone Number(s):

Email address:

Signature of Responsible Personnel

I certify under penalty of law that this document and all attachments were prepared under my direction or supervision in accordance with a system designed to assure that qualified personnel properly gather and evaluate the information submitted. Based on my inquiry of the person or persons who manage the system, or those persons directly responsible for gathering the information, the information submitted is, to the best of my knowledge and belief, true, accurate, and complete. I am aware that there are significant penalties for submitting false information, including the possibility of fine and imprisonment for knowing violations.

Printed Name Signature Date

Reporting Period (State Fiscal Year): ☐

Due Date: ☐ **Date of Submission:** ☐

Type of Report Submitted:

Impervious Area Restoration Progress Report (Annual): ☐

Six Minimum Control Measures Progress (Years 2 and 4): ☐

Both: ☐

Permittee Information:

Renewal Permittee: ☐

New Permittee: ☐

Compliance with Reporting Requirements

Part VI of the Small MS4 General Discharge Permit (No. 13-SF-5501) specifies the reporting information that must be submitted to MDE to demonstrate compliance with permit conditions. The specific information required in this MS4 Progress Report includes:

1. Annual: Progress toward compliance with impervious area restoration requirements in accordance with Part V of the general permit. All requested information and supporting documentation must be submitted as specified in Section I of the Progress Report.
2. Years 2 and 4: Progress toward compliance with the six minimum control measures in accordance with Part IV of the general permit. All requested information and supporting documentation shall be reported as specified in Section II of the Progress Report. MDE may request more frequent reporting and/or a final report in year 5 if additional information is needed to demonstrate compliance with the permit.

Instructions for Completing Appendix D Reporting Forms

The reporting forms provided in Appendix D allow the user to electronically fill in answers to questions. Users may enter quantifiable information (e.g., number of outfalls inspected) in text boxes. When a more descriptive explanation is requested, the reporting forms will expand as the user types to allow as much information needed to fully answer the question. The permittee must indicate in the forms when attachments are included to provide sufficient information required in the MS4 Progress Report.

Section I: Impervious Area Restoration Reporting Form

Section I: Impervious Area Restoration Reporting

1. a. Was the impervious area baseline assessment submitted in year 1?
   ☐Yes ☐ No

   b. If No, describe the status of completing the required information and provide a date at which all information required by MDE will be submitted:

   c. Has the baseline been adjusted since the previous reporting year?
   ☐ Yes ☐ No
2. Complete the information below based on the most recent data:

   Total impervious acres of area covered under this permit: ☐

   Total impervious acres treated by stormwater water quality best management practices (BMPs): ☐

   Total impervious acres treated by BMPs providing partial water quality treatment (multiply acres treated by percent of water quality provided): ☐

   Total impervious acres treated by nonstructural practices (i.e., rooftop disconnections, non-rooftop disconnections, or vegetated swales): ☐

   Total impervious acres untreated: ☐

   Twenty percent of this total area (this is the restoration requirement): ☐

   Verify that all impervious area draining to BMPs with missing inspection records is not considered treated. Describe how this information was incorporated into the overall analysis:

3. Has an Impervious Area Restoration Work Plan been developed and submitted to MDE in accordance with Part V.B, Table 1 of the permit or other format?
   ☐ Yes ☐ No

   Has MDE approved the work plan?
   ☐ Yes ☐ No

   If the answer to either question is No, describe the status of submitting (or resubmitting) the work plan to MDE and provide a date at which all outstanding information will be available:

Section I: Impervious Area Restoration Reporting

Describe progress made toward restoration planning, design, and construction efforts and describe adaptive management strategies necessary to meet restoration requirements by the end of the permit term:

4. Has a Restoration Schedule been completed and submitted to MDE in accordance with Part V.B, Table 2 of the permit?
☐ Yes ☐ No

In year 5, has a complete restoration schedule been submitted including a complete list of projects and implementation dates for all BMPs needed to meet the twenty percent restoration requirement?
☐ Yes ☐ No

Are the projected implementation years for completion of all BMPs no later than 2025?
☐ Yes ☐ No

Describe actions planned to provide a complete list of projects in order to achieve compliance by the end of the permit term:

Describe the progress of restoration efforts (attach examples and photos of proposed or completed projects when available):

5. Has the BMP database been submitted to MDE in Microsoft Excel format in accordance with Appendix B, Tables B.1.a, b, and c?
☐ Yes ☐ No

Is the database complete?
☐ Yes ☐ No

If either answer is No, describe efforts underway to complete all data fields, and a date that MDE will receive the required information:

Section I: Impervious Area Restoration Reporting

6. Provide a summary of impervious area restoration activities planned for the next reporting cycle (attach additional information if necessary):

7. Describe coordination efforts with other agencies regarding the implementation of impervious area restoration activities:

8. List the total cost of developing and implementing impervious area restoration program during the permit term:

Section II: Minimum Control Measures Reporting Forms

MCM #1: Personnel Education and Outreach

1. Does the permittee maintain a process and phone number for the public and/or staff to report water quality complaints?
   ☐ Yes ☐ No

   Number of complaints received: ☐

   Describe the actions taken to address the complaints:

2. Describe training to employees to reduce pollutants to the MS4:

3. Describe the target audience(s):

4. Are examples of educational/training materials attached with this report?
   ☐ Yes ☐ No

   Provide the number and type of educational materials distributed:

   Describe how the personnel education program is appropriate for the target audience(s):

5. Describe how stormwater education materials were distributed to the public and/or staff (e.g., newsletters, website):

6. Describe how educational programs facilitated efforts to reduce pollutants in stormwater runoff:

7. Provide a summary of activities planned for the next reporting cycle:

8. List the total cost of implementing this MCM over the permit term:

MCM #2: Public or Personnel Involvement and Participation

1. Describe how the public or personnel involvement and participation program is appropriate for the target audience(s):

2. Quantify and report public and/or staff involvement and participation efforts as shown below where applicable.

   Number of participants at public and/or staff events:

   Quantity of trash and debris removed at clean up events:

   Number of employee volunteers participating in sponsored events:

   Number of trees planted:

   Length of stream cleaned (feet):

   Number of storm drains stenciled:

   Number of public notices published to facilitate public and/or staff participation:

   Number of public and/or staff meetings organized:

   Total number of attendees at all public and/or staff meetings:

   Describe the agenda, items discussed, and collaboration efforts with interested parties for public and/or staff meetings:

   Describe how public and/or staff comments have been incorporated into the permittee's MS4 program, including water quality improvement projects to address impervious area restoration requirements:

   Describe any additional events and activities if applicable:

MCM #2: Public or Personnel Involvement and Participation

3. Provide a summary of activities planned for the next reporting cycle:
4. List the total cost of implementing this MCM for the permit term:

MCM #3: Illicit Discharge Detection and Elimination (IDDE)

1. Does the permittee maintain a map of the MS4 owned or operated by the permittee, including stormwater conveyances, outfalls, stormwater best management practices (BMPs), and waters of the U.S. receiving stormwater discharges?
   ☐ Yes ☐ No

   If Yes, attach the map to this report and provide a progress update on any features that are still being mapped. (If submitting a map would compromise the operational security of an agency, indicate that the map is available for MDE review on site.) If No, detail the current status of map development and provide an estimated date of submission to MDE:

2. Does the permittee have a policy, or other agency directive, that prohibits illicit discharges?
   ☐ Yes ☐ No

   If Yes, describe the policy utilized for enforcement by the permittee (alternatively, a link may be provided to the permittee's webpage where this information is available). If No, describe the permittee's plan, including approximate time frame, to establish a policy that prohibits illicit discharges into the storm sewer system:

3. Did the permittee submit to MDE standard operating procedures (SOPs) in accordance with Part IV.C of the permit?
   ☐ Yes ☐ No

   If No, provide a proposed date that SOPs will be submitted to MDE. MDE may require more frequent reports for delays in program development:

   Did MDE approve the submitted SOPs?
   ☐ Yes ☐ No

   If No, describe the status of requested SOP revisions and approximate date of resubmission for MDE approval:

4. Describe how the permittee prioritized screening locations in areas of high pollutant potential and identify the areas within which screenings were conducted during this reporting period:

MCM #3: Illicit Discharge Detection and Elimination (IDDE)

5. Answers to the following questions must reflect this two-year reporting period.

   How many outfalls were identified on the map? ☐

   How many outfalls were required to be screened for dry weather flows to meet the minimum numeric requirement based on property size? ☐

   How many outfalls were screened for dry weather flows? ☐

   Per the permittee's SOP, how frequently were outfalls required to be screened?

   At what frequency were outfalls screened during the reporting period?

   How many dry weather flows were observed? ☐

   If dry weather flows were observed, how many were determined to be illicit discharges? ☐

   Describe the investigation process to track and eliminate each suspected illicit discharge and report the status of resolution:

6. Describe maintenance or corrective actions undertaken during this reporting period to address erosion, debris buildup, sediment accumulation, or blockage problems:

7. Is the permittee maintaining all IDDE inspection records and are they available to MDE during site inspections?
   ☐ Yes ☐ No

8. If spills, illicit discharges, and illegal dumping occurred during this reporting period, describe the corrective actions taken, including enforcement activities, and indicate the status of resolution:

9. Attach to this report specific examples of educational materials distributed to the public and/or staff related to illicit discharge reporting, illegal dumping, and spill prevention. If these are not available, describe plans to develop public and/or staff education

MCM #3: Illicit Discharge Detection and Elimination (IDDE)

materials and submit examples with the next Progress Report:

10. Specify the number of employees trained in illicit discharge detection and spill prevention:

11. Provide examples of training materials. If not available, describe plans to develop employee training and submit examples with the next Progress Report:

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12. List the cost of implementing this MCM during this permit term:

MCM #4: Construction Site Stormwater Runoff Control

1. Does the permittee have a process for receiving, investigating, and resolving complaints from interested parties related to construction activities and erosion and sediment control?
   ☐ Yes ☐ No

   Describe the process:

   Provide a list of all complaints and a summary of actions taken to resolve them:

2. Total number of active construction projects within the reporting period: ☐

   Provide a list of all construction projects and tabulate the total disturbed area:

3. Total number of violation notices issued by MDE related to this MCM on the agency's property: ☐

   Describe the status of enforcement activities:

   Describe how the permittee communicates and collaborates with MDE to maintain compliance with this MCM for all active construction projects on the agency's property:

   Are erosion and sediment control inspection records retained and available to MDE during field review of the agency MS4 program?
   ☐ Yes ☐ No

   If No, explain:

4. Number of staff trained in MDE's Responsible Personnel Certification: ☐

5. Describe the coordination with other entities regarding implementation of this MCM:

MCM #4: Construction Site Stormwater Runoff Control

6. List the total cost of implementing this MCM over the permit term:

MCM #5: Post Construction Stormwater Management

1. Has an Urban BMP database been submitted in accordance with the database structure in Appendix B, Tables B.1.a, b, and c as a Microsoft Excel file?
   ☐ Yes ☐ No

   Describe the status of the database, efforts to complete all data fields, and provide a date as to when the required information will be submitted to MDE:

2. Total number of plans submitted to MDE for review and approval: ☐

   Total number of as-built plans submitted to MDE: ☐

   Number of submitted as-built plans approved by MDE: ☐

3. Total number of BMPs located on each property covered under the general permit (list individual property, and total BMPs for that property – provide separate attachment if necessary):

   Does the permittee perform inspections for all structural BMPs in accordance with the Dam Inspection Checklist in Maryland Pond Code 378 at least once every three years?
   ☐ Yes ☐ No

   If No, describe efforts to train staff and develop a program to perform these required inspections on a triennial basis:

   Are BMP inspection records retained and available to MDE during field review of local programs?
   ☐ Yes ☐ No

4. Provide a summary of routine maintenance activities for all BMPs:

   Are BMP maintenance procedures consistent with maintenance requirements on MDE approved plans?
   ☐ Yes ☐ No

MCM #5: Post Construction Stormwater Management

Are completed BMP maintenance checklists available to MDE during field review of local programs?
☐ Yes ☐ No

If either answer is No, describe planned actions to implement maintenance checklists and procedures and provide formal documentation of these activities:

Describe all problems discovered during routine maintenance operations and repair work performed to restore the function of the BMP(s) (attach photos and additional documentation as needed):

5. Number of staff trained in proper BMP design, performance, inspection, and routine maintenance: ☐

6. Provide a summary of activities planned for the next reporting cycle:

7. List the total cost of implementing this MCM over the permit term:

MCM #6: Pollution Prevention and Good Housekeeping

1. Provide a list of topics covered during the last training session related to pollution prevention and good housekeeping, and attach to this report specific examples of training materials:

   List all training dates within this two-year reporting period:

   Number of staff attended: ☐

2. Are the good housekeeping plan and inspection records at each property retained and available to MDE during field review of the local program? ☐ Yes ☐ No

   If No, explain:

   Provide details of all discharges, releases, leaks, or spills that occurred in the past reporting period using the following format (attach additional sheets if necessary).

   Property Name: Date:

   Describe observations:

   Describe permittee's response:

3. Quantify and report property management efforts as shown below, where applicable (attach additional sheets if necessary).

   Number of miles swept: ☐

   Amount of debris collected from sweeping (indicate units): ☐

   If roads and streets are swept, describe the strategy the permittee has implemented to maximize efficiency and target high priority areas:

   Number of inlets cleaned: ☐

   Amount of debris collected from inlet cleaning (indicate units): ☐

MCM #6: Pollution Prevention and Good Housekeeping

Describe how trash and hazardous waste materials are disposed of at permittee owned and operated property(ies), including debris collected from street sweeping and inlet cleaning:

Does the permittee have a current State of Maryland public agency permit to apply pesticides?
☐ Yes ☐ No

If No, explain (e.g., contractor applies pesticides):

Does the permittee employ at least one individual certified in pesticide application?
☐ Yes ☐ No

If Yes, list name(s):

If the permittee applied pesticides during the reporting year, describe good housekeeping methods (e.g., integrated pest management, alternative materials/techniques):

If the permittee applied fertilizer during the reporting year, describe good housekeeping methods (e.g., application methods, chemical storage, native or low maintenance species, training):

If the permittee applied materials for snow and ice control during the reporting year, describe good housekeeping methods (e.g., pre-treatment, truck calibration and storage, salt domes):

Describe good housekeeping BMP alternatives not listed above:

4. If applicable, provide a status update for permittee owned or operated properties regarding coverage under the Maryland General Permit for Stormwater Discharges Associated with Industrial Activity or an individual industrial surface water discharge permit:

5. List the total cost of implementing this MCM over the permit term: