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Construction Certification Report

Brickhaven No.2 Mine Tract "A"
Structural Fill – Cell 1, Subcell 1C

Permit 1910-STRUCT-2015

Charah, Inc.

Moncure, North Carolina

April 19, 2016

NORTH CAROLINA PROFESSIONAL SEAL 025495 ENGINEER MICHAEL D. PLUMMER
4/19/16

HDR Engineering, Inc. of the Carolinas
440 S. Church St. Suite 1000, Charlotte NC 28202
704.338.6700
NC License F0116

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Abstract

This Certification Report addresses the construction documentation of the approximate 5.6 acre Subcell 1C of Cell 1 for the Brickhaven No. 2 Mine Tract “A” Structural Fill.

The Brickhaven No.2 Mine Tract “A” is located off Moncure-Flatwood Road in Chatham County, North Carolina. The site is owned by Green Meadow, LLC and operated by Charah, Inc. under North Carolina Department of Environmental Quality (NCDEQ) Division of Waste Management (DWM) Structural Fill Permit 1910 issued June 5, 2015, in conjunction with the North Carolina Division of Energy Mineral and Land Resource (NCDEMLR) Mining Permit 19-25. The Brickhaven No. 2 Mine Tract “A” structural fill project has been permitted and constructed in general accordance with the North Carolina Coal Ash Management Act of 2014 (CAMA) and NCDEQ structural fill rules.

The composite lined structural fill cell was constructed between May 2015 and April 2016. During this time, HDR provided Construction Quality Control and Assurance (CQC/CQA) services to Charah, Inc. for monitoring and testing of soils and geosynthetic components installed in the Cell 1, Subcell 1C area. The following components of the construction were included in HDR’s CQC/CQA services.

- Berms and embankments
- Subgrade preparation
- Soil liner/subbase
- Geosynthetic clay liner
- Geomembrane liner
- Geocomposite drainage layer
- Leachate collection piping system
- Separator geotextile

The conformance of the construction materials and installation methods with the requirements of the Construction Quality Assurance (CQA) Plan and the Technical Specifications were documented during the construction of each component. Materials, site conditions, or test results that indicated non-conformance were identified, reported and remediated. Remediation activities were monitored and documented. HDR reviewed as-built survey information as provided by McAdams Company to verify conformance with the construction limits and tolerances specified.

Certification

Based on HDR's observations during construction, the test results and as-built documentation presented in this report, it is our opinion that Cell 1, Subcell 1C of the Brickhaven No. 2 Mine Tract "A" Structural Fill was constructed in general accordance with:

- The Technical Specifications, Quality Assurance Plan, and Permit Drawings, as amended.
- The conditions of Permit to Construct No. 1910-STRUCT-2015, issued June 5, 2015, as amended.
- The requirements of Article 9, Chapter 130A-309.218, of the General Statutes of North Carolina.
- Acceptable engineering practices.

The services provided for this project were performed with the care and skill ordinarily exercised by reputable members of the profession practicing under similar conditions at the same time and the same or similar locality. No warranty, expressed or implied, is made or intended by rendition of these consulting services or by furnishing oral or written reports of the findings made. This report has been prepared for the exclusive use of Charah, Inc.

Michael D. Plummer, P.E.
Project Engineer
HDR Engineering, Inc. of the Carolinas
N.C. P.E. # 025495

1 Introduction

1.1 General

HDR was contracted to perform construction quality control and assurance services for construction of the Brickhaven Mine Structural Fill Subcell 1C of Cell 1, located in Moncure, North Carolina. The mine is operated by Charah, Inc. and is permitted to be reclaimed as a coal ash structural fill regulated by North Carolina Department of Environmental Quality (NCDEQ). This certification is the second for the Brickhaven site and is for approximately 5.6 acres of the approximately 145 acre permitted area approved for construction and operation under NCDEQ Structural Fill Permit No. 1910, issued June 5, 2015. Construction of Cell 1, Subcell 1C began in May 2015, and was deemed complete in April 2016.

1.2 Background

The Brickhaven No. 2 Mine located in Chatham County, off Moncure-Flatwood Road in Moncure, North Carolina, originally permitted in August 1985 according to information on the NCDEQ website, was previously owned and operated by General Shale, Inc. The mine permit was subdivided into Tract “A” and “B” in October 2014 and Tract “A” was subsequently sold to Green Meadow, LLC. The mine property under NCDEQ Mine Permit No. 19-25, consists of approximately 301 acres.

A permit modification was submitted to North Carolina Division of Energy Mineral and Land Resource (NCDEMLR) in March 2015 to change the mine reclamation to be an encapsulated coal ash structural fill. At the same time a coal ash structural fill permit application was submitted to NCDEQ Division of Waste Management (DWM). Both permits were issued on June 5, 2015.

The structural fill, including associated perimeter berms, channels, and haul roads, encompasses approximately 166 acres, of which approximately 145 acres will be covered with a composite liner system for subsequent coal combustion products (CCP) placement.

Figure 1 shows various site features including the proposed structural fill cells and the current property boundaries.

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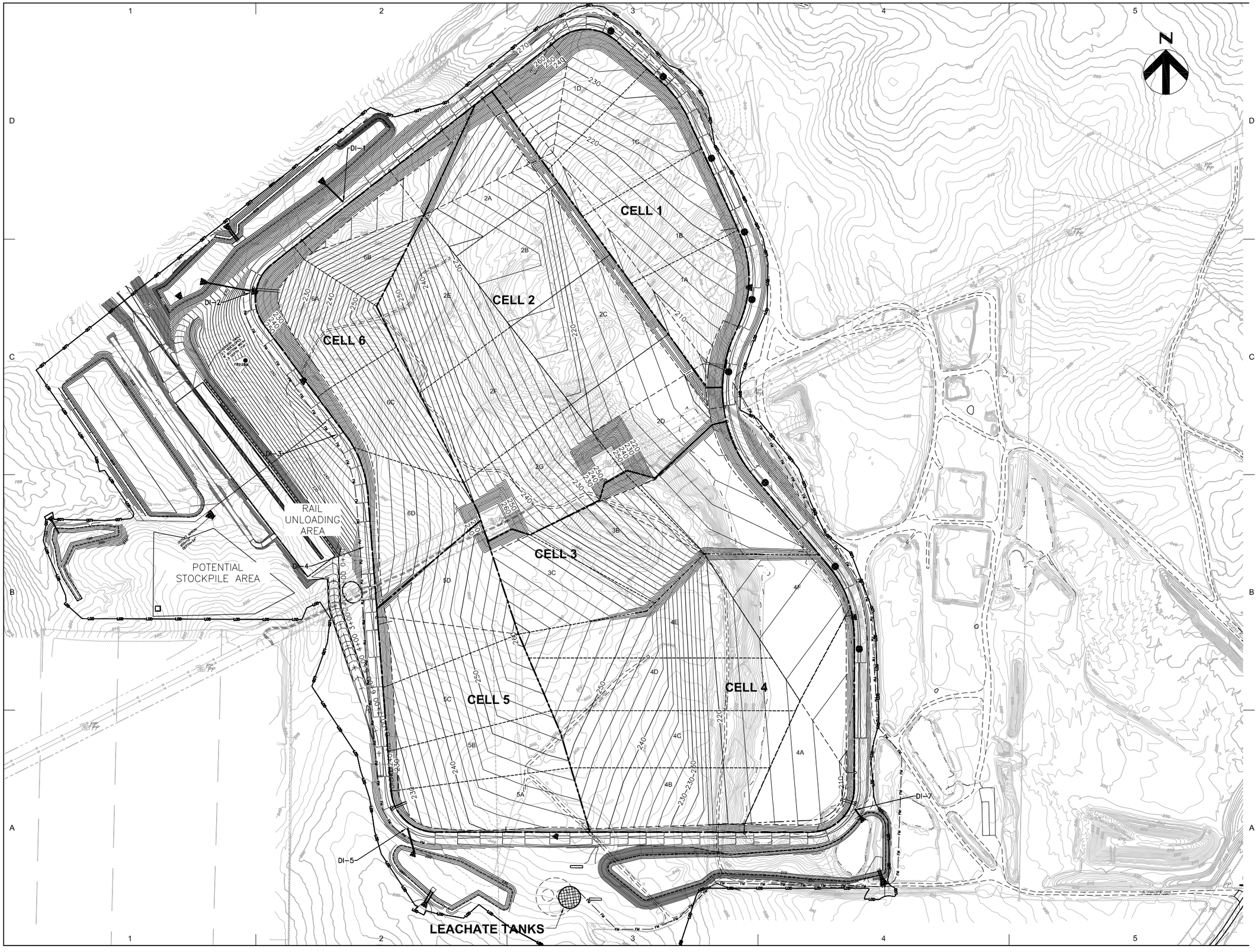

PROJECT FOR

MARK	DATE	DESCRIPTION

PROJECT NUMBER	
ORIGINAL ISSUE	ORGISSUE

PROJECT MANAGER	MDP
PROJECT DESIGNER	
PROJECT ARCHITECT	
LANDSCAPE ARCHITECT	
CIVIL ENGINEER	
STRUCTURAL ENGINEER	
MECHANICAL ENGINEER	
ELECTRICAL ENGINEER	
INTERIOR DESIGNER	
EQUIPMENT PLANNER	
WAYFINDING	
DRAWN BY	

SHEET NAME

FIGURE1-SITE-PLAN

SCALE	SCALE

SHEET NUMBER

1

FILE NAME	FILENAME

FIGURE1

C:\pwworking\tpa\d0565688\Figure 1 - Certification 1B.dwg, Plot, 2/18/2016 11:48:44 AM, cmettler

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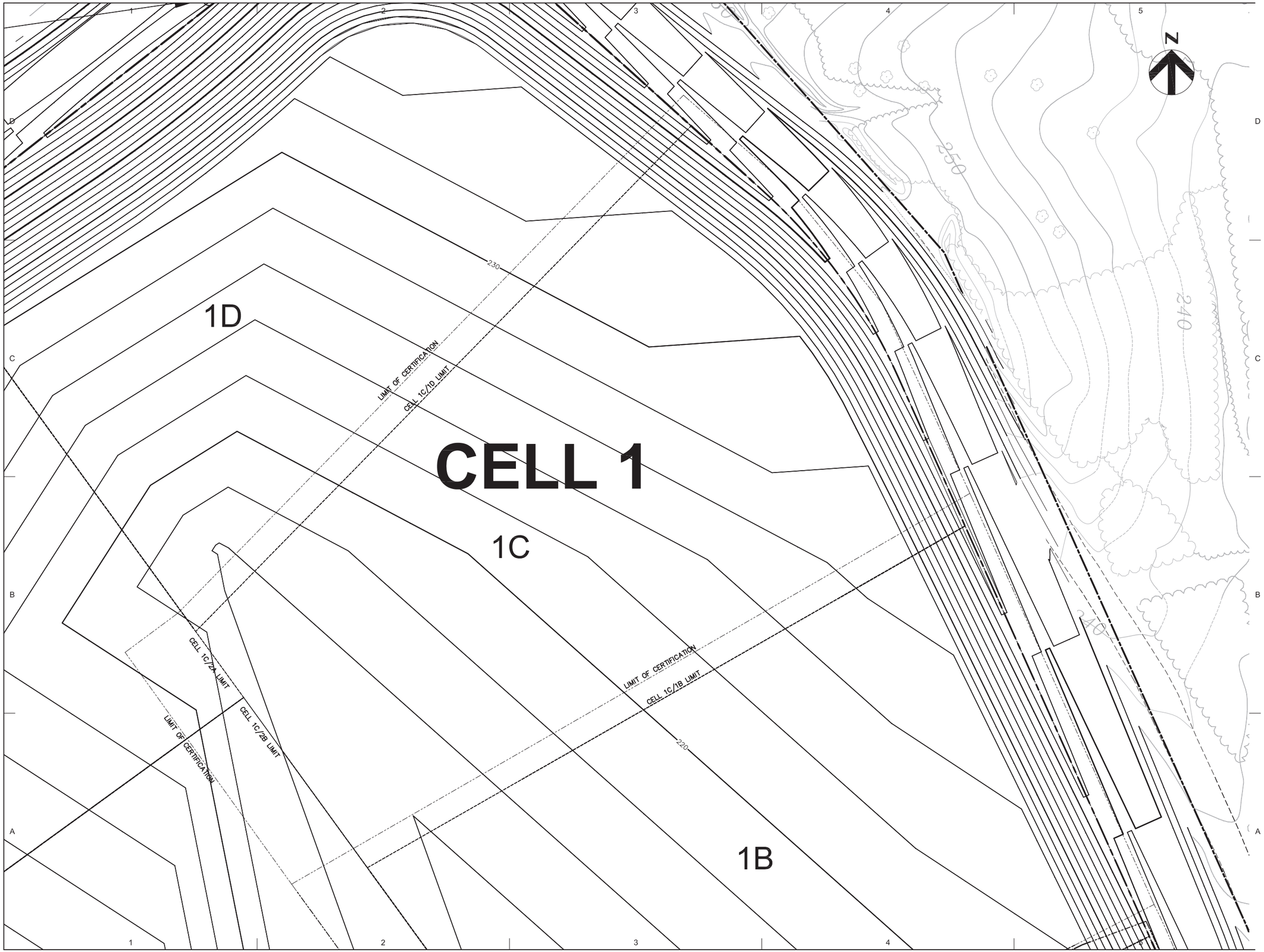

HDR

PROJECT FOR

MARK	DATE	DESCRIPTION

PROJECT NUMBER	
ORIGINAL ISSUE	ORGISSUE

PROJECT MANAGER	MDP
PROJECT DESIGNER	
PROJECT ARCHITECT	
LANDSCAPE ARCHITECT	
CIVIL ENGINEER	
STRUCTURAL ENGINEER	
MECHANICAL ENGINEER	
ELECTRICAL ENGINEER	
INTERIOR DESIGNER	
EQUIPMENT PLANNER	
WAYFINDING	
DRAWN BY	

SHEET NAME

FIGURE2-SUBCELL-1C

SCALE	SCALE

SHEET NUMBER

2

FILE NAME	FILENAME

FIGURE2

C:\pwworking\tpo\d0565588\Figure 2 - Certification Cell 1C.dwg, Plot, 4/19/2016 1:41:54 PM, cmetter

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1.3 Project Description

The approximately 5.6-acre Cell 1, Subcell 1C is a soil and synthetically lined facility located north of previously permitted Subcell 1B and Duke Energy transmission line right of way.

The structural fill was designed with a composite liner system, which consists of the following components in descending order:

- HDPE leachate collection pipe wrapped in stone and a separator geotextile
- Geocomposite drainage net
- 60-mil HDPE geomembrane
- Geosynthetic clay liner
- 18-inch compacted soil liner (K<1x10-5 cm/sec)

Construction of Cell 1, Subcell 1C was completed in general accordance with the requirements of the Permitted Plans and Specifications prepared by HDR Engineering, Inc. of the Carolinas.

Support documentation including field and laboratory testing reports, material certifications, inspection forms and documentation, and as-built drawings are provided in the appendices of this report.

2 Construction Quality Programs

2.1 Purpose and Scope

This certification report presents the results of the construction quality control (CQC) and construction quality assurance (CQA) documentation related to observations and test data compiled during construction of the Brickhaven Cell 1, Subcell 1C area. This report has been prepared as required by and in accordance with the Brickhaven No. 2 Mine Tract “A” Structural Fill Permit - 1910-STRUC-2015. This certification is being submitted as required by Attachment 3, condition 25b of the permit.

CQC is an in depth means to measure and regulate the characteristics of an item or service to the specified project requirements. CQC refers to those actions taken by contractors, manufacturers, fabricators, installers, or subcontractors to ensure that the materials and the workmanship meet the requirements of the CQA plan and the technical specifications for the project.

CQA is a planned and systematic pattern of all means and actions designed to provide confidence that items or services meet contractual and regulatory requirements, and will perform satisfactorily in service. CQA refers to means and actions employed outside of the CQC requirements to assure the conformity of the earthwork, liner system, leachate collection system, and other pertinent components with the CQA plan and technical specifications for the project.

The owner and permittee for this project is Green Meadow LLC, a subsidiary of Charah, Inc. For this project, Charah has performed as the contractor. HDR has performed as the design engineer and the CQC/CQA consultant. CQA and CQC consultant services were consolidated as allowed under the approved CQA Plan. Figure 3 identifies the lines of authority and communication for this project.

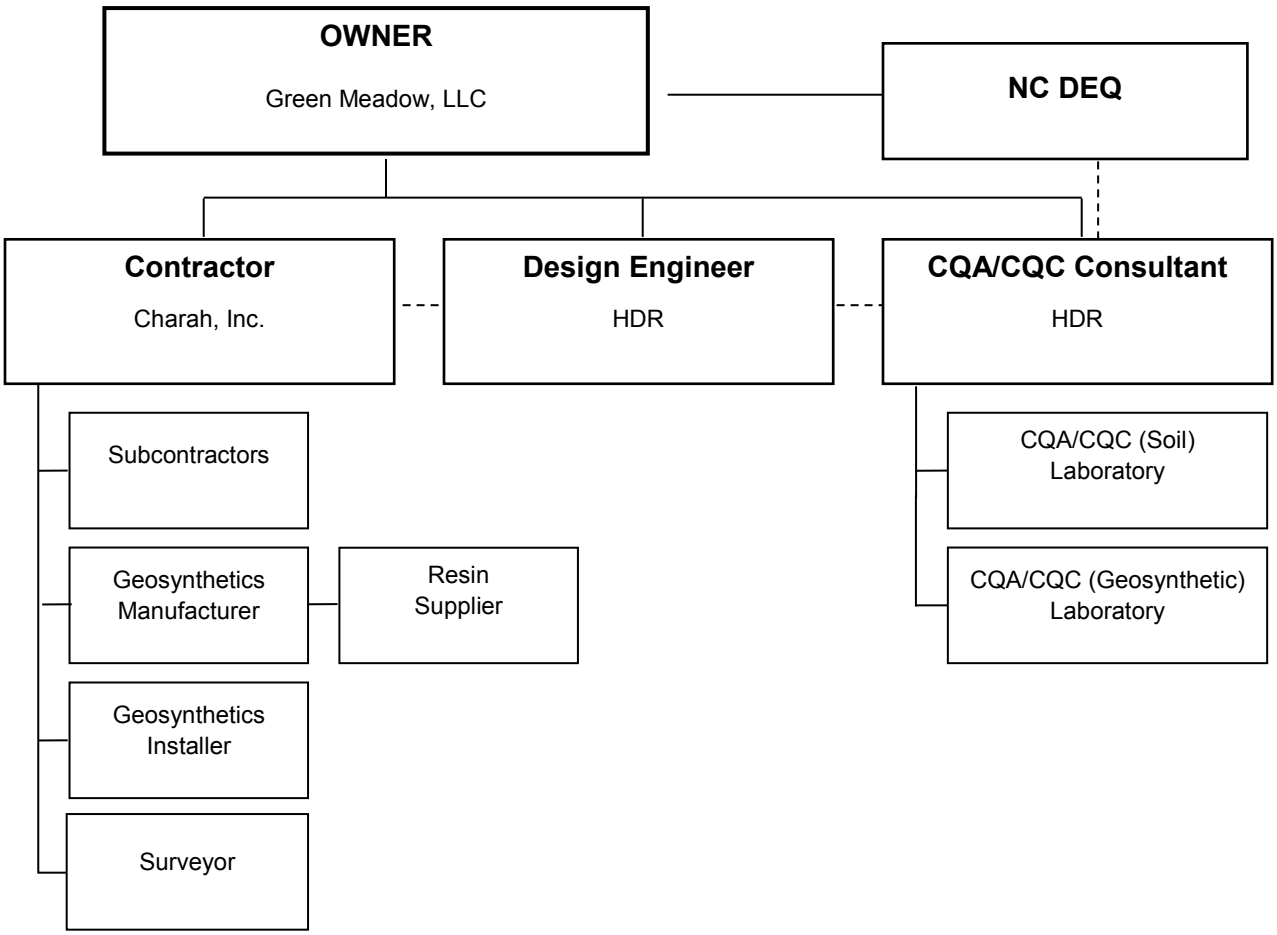


Figure 3 CQA/CQC Lines of Authority and Communication

2.2 Project Criteria

Construction of the Cell 1, Subcell 1C area was performed under the guidance of the following documents:

- NCDEQ Facility Permit 1910-STRUC-2015 and approved modifications.
- Article 9, Chapter 130A-309.218, of the General Statutes of North Carolina

The project was governed by adherence to the project plans, specifications, and drawings contained in Permit No. 1910-STRUC-2015 as amended through construction. The soil fill

material and installation of the liner system was governed by adherence to the Technical Specifications including the project specific CQA Plan. Construction and CQA/CQC activities were conducted in accordance with the Contract Plans and Technical Specifications. Documentation of the construction activities and the results of quality assurance and quality control testing are contained in the following sections and appendices of this report.

2.3 Contributing Entities and Personnel

HDR was contracted by Green Meadow/Charah to conduct both CQA and CQC services. HDR provided CQA/CQC monitoring services during construction of the Cell 1, Subcell 1C area which included the following services.

- Overall coordination between all parties including the owner/contractor, consultants, soils and geosynthetic laboratory, and surveyor.
- Resident inspection during periods of major work.
- Verification testing in the form of laboratory hydraulic conductivity, density testing, water content, and index testing for the clay liner.
- Laboratory peel and shear (destructive seam strength) testing of geomembrane liner seams.
- Preparation (or acquisition) of documentation associated with installation of the geomembrane liner, as outlined in Section 4.0 of this report.

Geotechnics, Inc. (Geotechnics) of Raleigh, North Carolina, under contract with HDR, provided inspection and testing services required during construction of the Cell 1, Subcell 1C area. Field and laboratory test results associated with the earthwork and geosynthetics are presented in the appendices.

Charah was the general contractor for the structural fill Cell 1, Subcell 1C area. All earthwork construction and installation of the leachate collection system services were provided by Charah or their subcontractors.

McAdams Company (McAdams) of Durham, North Carolina, under contract with Charah, provided surveying services required during construction of Cell 1, Subcell 1C.

Chesapeake Containment Systems, Inc. (Chesapeake) of Middle River, Maryland, under contract with Charah, provided installation and testing of the geomembrane, drainage composite, and geotextiles.

Key representatives of the parties involved were as follows:

- HDR (Design and Certifying Engineer)
    - Michael D. Plummer, P.E. – Design Engineer, Project Manager and Certifying Engineer
    - Michael Batten, P.E. – Geotechnical Engineer
    - Scott Mitchell - Resident Project Representative

- Geotechnics (CQA Field & Laboratory Services)

  - Mike Smith – Regional Manager
  - JP Kline, P.E. – Laboratory Director

- Green Meadow/Charah, Inc. (Owner/Contractor)
  - Erik West –Project Manager
  - Glenn Amey – Engineering Manager
  - Norman Divers – Engineering & Environmental Manager
  - Jacob Buda – Field Representative
  - Nathan Nickerson – Field Representative

- McAdams Company (CQC Surveying Services)
  - Greg Bewley, PLS – Director of Geomatics and Construction Administration

- Chesapeake Containment Systems, Inc. (Synthetics Installer)
  - Ryan Clark – Project Manager

3 Earthwork

3.1 Scope

This section provides information regarding earthwork activities associated with the construction of the Brickhaven Cell 1, Subcell 1C structural fill project. Observations and monitoring of installation of the structural/embankment fill and soil clay liner components are described, as well as conformance, field, and laboratory testing for earthwork materials.

3.2 Material Source Testing

3.2.1 Structural/Embankment Fill

The soil used as structural/embankment fill material was obtained from an on-site borrow source. The laboratory test data is presented in Appendix B. As indicated by the test data, the material was suitable for use as structural/embankment fill.

3.2.2 Soil Liner

The Brickhaven Mine Site No. 2, Tract “A” is a former clay mine; on-site material was utilized in construction of the soil liner.

The material used for the construction of the soil liner was obtained during excavation of adjacent cells, segregated and deposited in an on-site borrow source, or excavated and hauled directly to the subcell during soil liner grading operations. Preconstruction testing of the clay liner soil consisted of laboratory and field analyses of six bulk soil samples that were taken from test pits in April 2015 and were performed in areas where deep cuts were expected in adjacent cells and cut areas for the leachate tanks. The locations where these test pits were performed were based on a site wide determination for potential use as a borrow site. All remolded

hydraulic conductivity tests performed on these six soil samples well exceeded (I.e., were less conductive than) the $1x10^{-5}$ cm/sec hydraulic conductivity design requirement.

Atterberg Limits testing was performed on all six of the aforementioned samples in general accordance with ASTM D4318, and plasticity indices of certain bulk samples were determined to be in excess of the original maximum allowed value of 30, according to the soil liner system technical specification. Higher plasticity index values are typically associated with soils that exhibit lower permeabilities, and tend to be more difficult to place and compact, which is why they were initially limited with an upper bound in the Technical Specifications. This specification was revised and resubmitted to the NCDEQ DWM Solid Waste Section to give allowance for higher plasticity index values because the earthwork contractor demonstrated that the minimum compaction requirements were readily achieved without excessive compactive effort, and all hydraulic conductivity tests achieved the $1x10^{-5}$ cm/sec hydraulic conductivity requirement without issue. The NCDEQ Solid Waste Section provided approval of this modification on July 27, 2015.

3.2.3 Leachate Collection Stone

As specified, stone meeting the requirements of North Carolina Department of Transportation (NCDOT) No. 5 stone was used around the leachate pipes within the cells. Laboratory test data for the leachate collection stone is provided in Appendix B. As indicated by the test data, the granular materials were consistent with the specifications for use in the construction of the leachate collection system.

3.3 Inspection and In-Place Testing of Earthwork

3.3.1 Structural/Embankment Fill

Structural/embankment fill included construction of site earthwork including roadways, trench backfills, landfill area and berm embankments, but excluding soil clay liner. Prior to the placement of structural fill on in-situ soil the observation wells were abandoned and the prepared subgrade was proofrolled and observed by CQA/CQC personnel. The structural fill was placed in relatively uniform eight-inch loose lifts, then compacted to 95 percent of the maximum Standard Proctor dry density. Compaction was primarily accomplished using a Caterpillar 815 compactor. CQA/CQC personnel visually observed placement and compaction of the structural fill. Compaction quality was monitored by CQA/CQC personnel through in-place confirmation testing using drive cylinder and nuclear gauge density testing, in general accordance with ASTM's D2937 and ASTM D6938, respectively.

Based on a comparison of an as-built survey to initial topographic information on-site, approximately 1,100 cubic yards of fill was placed.

A summary of the moisture/density test data is presented in Appendix B. As indicated, the testing frequency of 1 test per 185 CY and 95% compaction requirements for the structural fill, were exceeded. The field density test results in Appendix B verify that the structural/embankment fills were constructed in general accordance with the compaction requirements of the Technical Specifications.

A deviation was allowed for the structural fill grading tolerances. The specifications required a tolerance of 0.25 feet. HDR allowed Charah a tolerance of -0.25 feet to +0.25 feet from design grade. Areas that were below the design subgrade elevation were brought up to grade with additional clay.

3.3.2 Subgrade Inspection

A geologic subgrade evaluation was performed prior to placement of soil liner materials in areas that were cut to grade. The evaluation determined that resistant materials were present at the subgrade elevation, which were geologically consistent with the resistant materials noted in the piezometer boring installation logs for nearby piezometers. HDR conducted an inspection of the exposed excavated areas of Cell 1, Subcell 1C and found no pertinent geologic features. See Appendix C for more detail regarding HDR's evaluations.

3.3.3 Soil Liner Test Strip

Due to construction installation, compaction methods, personnel/equipment and source material for Subcell 1A and 1B remained the same as for Subcell 1C therefore HDR is confident that the soil liner test strip constructed in Subcell 1A is representative for Subcell 1C. The test pad testing results from Subcell 1A is included in this report as a reference for the test pad testing.

3.3.4 Soil Liner

Soil liner material was spread in relatively uniform eight-inch loose lifts and compacted to at least 95 percent of the maximum Standard Proctor dry density. A wide range of moisture contents were determined to meet the $1x10^{-5}$ cm/sec hydraulic conductivity requirement based on laboratory tests performed on undisturbed samples of soil liner taken from fills compacted at widely varying moisture contents. Compaction was accomplished using a CAT 815 compactor and rubber tired self-propelled tamping foot rollers. Compaction quality was monitored by visual and quantitative means (density and moisture content by nuclear gauge and drive tube samples, in general accordance with ASTM's D6938 and ASTM D2937, respectively). CQA/CQC personnel observed the placement, compaction, and field testing activities for the soil liner. All placed materials were visually checked for oversized particles or void areas in the soil liner, and to confirm the soil liner was firm and uniform after compaction without deleterious material on the surface. Holes in the soil liner created as a result of sampling were backfilled using bentonite powder.

In-place testing of the compacted soil liner consisted of moisture content and density determination using a nuclear gauge with drive tube density checks. The CQA laboratory, Geotechnics, performed hydraulic conductivity tests on undisturbed soil liner samples to verify hydraulic conductivity passing results in addition to moisture content tests, Atterberg limits, and wash sieve analyses for fines content.

Summaries of the in-place test results and laboratory test data are presented in Appendix B. As indicated by the test data, the performance requirements for the soil liner were achieved or exceeded.

Visual checks of the subbase lift thickness were made at random locations for the duration of the soil liner construction.

McAdams provided the survey of construction activities with horizontal and vertical control of the subgrade and soil liner placement. Top of clay spot elevations were surveyed after the construction was completed for verification with the design elevations. As-built survey information is provided in Appendix G. The point list on the Clay As-Built in Appendix G indicated the 18-inch minimum thickness of soil liner was achieved.

3.3.5 Leachate Collection Stone

Leachate collection stone was carefully placed on top of the geocomposite in such a way to prevent damage to the geocomposite and underlying geomembrane and wrapped with a geotextile. A sacrificial layer of geotextile was placed on top of the geocomposite prior to a small rubber tracked dump truck being used to dump the leachate collection stone on the geocomposite, and a small rubber tracked mini excavator was used to spread the stone on the geocomposite. Turning of equipment was limited to avoid wrinkling the geocomposite.

3.4 Anchor Trench Backfill

Prior to the installation of the geosynthetic materials, the anchor trench was excavated, then cleared of any deleterious or loose material. After installation of the geosynthetic liner components, soil liner material was used to backfill the anchor trench and compacted using a tamper.

4 Geosynthetics

4.1 Scope

This section provides information regarding the geosynthetic installation associated with the construction of the Brickhaven Cell 1, Subcell 1C structural fill project. Observations and monitoring of installation of the geosynthetic components are described, as well as conformance, field, and laboratory testing for each geosynthetic component.

4.2 Interface Friction Testing

Interface shear strength tests were performed for the interface between the geosynthetic clay liner (GCL) and two different samples of soil clay liner in general accordance with ASTM D6243. The test results indicated interface shear strengths of 17.9 degrees/159 psf adhesion and 21.2 degrees/187 psf adhesion, respectively for each soil sample. A triaxial compression test was also performed on a remolded clay sample in general accordance with ASTM D4767, and this clay sample corresponds to the clay soil liner sample used in the 17.9 degrees/159 psf adhesion interface friction testing result, and similar shear strengths were obtained on the clay soil liner sample tested by itself in the triaxial compression test (17.8 degrees friction angle, 153 psf cohesion). The triaxial test performed on this clay soil liner sample indicated that the clay soil liner material is the limiting factor, resulting in an interface shear friction angle less than the 26 degrees (with zero adhesion) originally required by the Technical Specifications. Stability and geosynthetic stress calculations were re-evaluated and confirmed that adequate factors of safety were achieved with material meeting a minimum friction angle of 13 degrees and minimum adhesion of 100 psf for the interface between the GCL and the soil clay liner. The special conditions technical specification was revised to require a minimum friction angle of 13

degrees and minimum adhesion of 100 psf. The NCDEQ DWM Solid Waste Section provided approval of this modification on July 27, 2015. Interface friction test results are provided in Appendix D5.

4.3 Manufacturers Certification of Geosynthetics

The geosynthetics used in the construction of the Cell 1, Subcell 1C construction included: 60 mil textured HDPE geomembrane; double-sided drainage composite; 8 oz/sy nonwoven geotextile separator used to wrap the NCDOT No. 5 stone gravel column; and Geosynthetic Clay Liner (GCL) underlying the geomembrane.

The quality control testing for each geosynthetic material is described below.

4.3.1 Geosynthetic Clay Liner

Geosynthetic clay liner (GCL) manufactured by GSE was used in the construction as a part of the primary liner system. Manufacturer's certifications for the GCL used on the slopes and on the floor of the cell are provided in Appendix D1. The manufacturer tested the physical properties of the GCL such as: cap non woven geotextile, carrier woven geotextile, hydraulic conductivity, index flux, bentonite content (at 0% moisture), hydrated internal shear strength, free swell, fluid loss, peel strength, tensile strength. As indicated by the certifications, the supplied GCL met the project requirements.

4.3.2 Geomembrane

Quality control testing was conducted by Agru America, Inc. (Agru) of Georgetown, SC, during the manufacturing of the geomembrane material. The quality control testing certificates are included in Appendix D2. The HDPE geomembrane was tested for sheet thickness, sheet density, yield stress, break stress, elongation at yield, elongation at break, min. tear resistance initiation, carbon black, carbon black dispersion, puncture resistance, oxidative induction time and asperity height. In addition to quality control testing performed on the rolls themselves, quality control testing of the HDPE resin used to manufacture the geomembrane was also performed by Agru. Each resin batch was tested for density and melt index. Results from quality control testing of the raw resin are provided as part of the quality control testing certificates. On the basis of the quality control test results, the geomembrane is shown to conform to the project requirements for use as the high-density polyethylene (HDPE) geomembrane.

The extrusion rod used in the installation of the HDPE geomembrane liner, is of the same type of resin and is compatible with the geomembrane. The extrusion rod was tested for density, melt index, carbon black content, and dispersion. Testing results and frequency conform to the project specifications.

4.3.3 Drainage Composite

GSE CoalDrain Fabrinet drainage composite with a minimum average transmissivity of 3.3 E-3 m^2/sec was used to construct the leachate collection system on the floor and slopes of the Cell 1, Subcell 1C area. The drainage composite material was tested for transmissivity and ply adhesion. The HDPE geonet core was tested for polymer density, polymer melt index, carbon black content, thickness, tensile strength, and compressive strength. Conformance of the

geotextiles on either side of the geonet is covered in Section 4.3.4. The quality control performed by GSE is provided in Appendix D3.

On the basis of the quality control test results, the GSE drainage composite was shown to conform to the project requirements.

4.3.4 Geotextile

GSE manufactured the geotextiles attached to the geonet for the drainage composite. The top is a 14 oz/sy Hybrid monolithic woven-nonwoven needle punched geotextile and the bottom is an 8 oz/sy nonwoven geotextile. The top geotextile was tested for composite mass per unit area, grab tensile strength, puncture strength, trapezoidal tear strength, apparent opening size, permittivity, flow rate and UV resistance. The bottom geotextile was tested for mass per unit area, grab tensile strength, grab elongation, puncture strength, trapezoidal tear strength, apparent opening size, permittivity, flow rate and UV resistance.

Quality control testing of the geotextile was performed by GSE, test results were shown to comply with the project requirements.

Crown Resources provided the 8 oz/sy geotextile used as a separator geotextile between the primary collection system gravel column (NCDOT No. 5 stone) and the drainage composite. The separator geotextile was tested for unit weight, grab tensile strength, elongation, puncture strength, maximum apparent opening size, and permittivity. Quality control testing of the geotextile was performed by Geotechnics, test results were shown to comply with the project requirements.

4.4 Installation, Monitoring, and Testing

4.4.1 Geosynthetic Clay Liner

Prior to deployment of the GCL panels, the lines and grades of the compacted soil liner were verified. The subbase was sealed using a 10-ton smooth drum roller. The surface was then inspected by the Chesapeake CQC Inspector and HDR CQA/CQC personnel for stones larger than 3/4-inch, grade stakes, roots, and for any conditions that might be detrimental to the GCL and geomembrane installation. All areas of the subbase were reviewed and accepted for liner placement.

Prior to deployment by Chesapeake, the storage and handling of the GCL rolls were verified by the CQA/CQC consultant. GCL panel deployment was accomplished using a track forklift equipped with a spreader bar. As panels were placed, each seam was oriented to overlap down slope and bentonite powder was applied to each seam. As each panel was deployed, the panel number was written on the panel by Chesapeake's CQC representative. Each panel was visually inspected, and surface defects (if any) were identified and repaired. Completed copies of Chesapeake subbase acceptance forms are included in Appendix E1. A GCL as-built panel layout plan is included in Appendix G.

4.4.2 Geomembrane Panel Deployment

Rolls of 60-mil textured HDPE geomembrane were installed in the Cell 1, Subcell 1C area from the on-site stockpile of quality control tested material. Geomembrane panel deployment was accomplished using a track forklift equipped with a spreader bar. As each panel was deployed, the roll number, date of deployment, and panel number were written on the panel by Chesapeake's CQC representative. Each panel was visually inspected, and surface defects (if any) were identified for repair.

The panel placement summaries and repair log, including vacuum testing of each repair, are presented in Appendix E3.

An as-built panel layout plan of the geomembrane prepared by McAdams is included in Appendix G.

4.4.3 Trial Seams

Chesapeake's welding technicians prepared trial seams prior to initiating panel seaming. At a minimum, trial seams were performed twice per day, at the start of work each morning and after each lunch break. Each welding device and welding technician was required to complete a successful trial seam before initiating panel seaming. The date, welding technician, welder number, speed, and welding temperature were recorded on daily trial seam reports. Trial seam reports for the geomembrane are presented in Appendix E3.

Each trial seam was tested for peel and shear strength by Chesapeake personnel. HDR observed the trial seam testing. A minimum of two specimens was tested for peel adhesion (two for each side of the double fusion welds) and two for shear strength. The testing was done with a calibrated tensiometer. The tensiometer calibration certification is included in Appendix E. The minimum specifications for trial seam specimens were as follows:

- A film tear bond (FTB) type failure on both of the specimens in peel and shear.
- A minimum yield stress of 91 pounds per inch (ppi) for peel adhesion of a fusion weld (ASTM D6392).
- A minimum yield stress of 78 pounds per inch (ppi) for peel adhesion of an extrusion weld (ASTM D6392).
- A minimum yield stress of 120 ppi for bonded shear strength (ASTM D6392).

No seaming was performed until the trial seams passed the qualification criteria.

4.4.4 Panel Seaming

All geomembrane panels were seamed on the day they were placed. Geomembrane seaming and repairs were accomplished by one of two seaming methods.

- Double fusion – melts the HDPE along the weld lines on the overlapped panels forming an air channel between two welds; or
- Extrusion – a welding rod is applied as a welded bead at the edge of two overlapped panels, resulting in a welded seam.

Generally, Chesapeake used a double fusion-seaming device for panel seaming and an extrusion-seaming device for patches, intersections, and repairs.

The seam number, machine number, welder, time of seaming, and seaming parameters (seam length, temperature setting, and fusion welder speed) were recorded for each seam. The seam number represents the two panels incorporated into the seam. For instance, Field Seam 1/2 identifies the field seam formed by Panels 1 and 2. A summary of all panel seams is included in Appendix E.

Prior to fusion seaming, Chesapeake technicians inspected the overlap area and cleaned the seam area with dry cloths. HDR visually observed each seam and marked areas where defects were observed. These areas were later repaired by Chesapeake, and the repairs approved by HDR. Seam repair logs are included in Appendix E.

Extrusion seam areas were prepared by beveling the edges of the HDPE patch and grinding the seam area to remove any oxidation, irregularities, etc. Patches, repairs, and tie-in seams were first bonded using hot air Leister equipment, before the extrusion seam was completed.

4.4.5 Nondestructive Seam Testing

Nondestructive testing of all field seams was conducted by Chesapeake. Air pressure testing was the primary method for testing of the double fusion weld continuity. Vacuum box testing was used on all extrusion welds to determine the general quality and integrity of the seams. Nondestructive seam testing was performed by Chesapeake and monitored by HDR.

Double fusion seams were air pressure tested and the beginning air pressure, test duration, seam length, and final air pressures were recorded. The air channel pressure was monitored for five minutes. A minimum beginning air pressure of 30 pounds per square inch (psi) was used for testing. The maximum allowable pressure drop during the five-minute monitoring period was three psi. No failures were detected.

Chesapeake performed vacuum box testing of all extrusion welds. Vacuum testing of each weld was performed using a soapy solution and a vacuum of five psi applied to the welded seam. No failures were detected.

Nondestructive testing information was recorded on the CQC Nondestructive Test Logs presented in Appendix E.

4.4.6 Destructive Seam Testing

Destructive seam evaluations were performed on panel seams as required by the contract documents. Chesapeake removed samples at locations selected by HDR. Destructive seam strength test samples were removed from completed liner seams at the minimum frequency of one sample per 500 feet of seam. The total geomembrane seam length including the material within the anchor trench was approximately 11,802 feet (requiring a minimum of 24 destructive tests). HDR tested 25 destructive samples, exceeding the minimum required frequency. Samples from the seams were approximately 42 inches long by 12 inches wide. The seam sample was then divided into three portions. One portion was tested by Geotechnics

(independent CQA laboratory), the second was subject to destructive testing by Chesapeake on-site, and the third portion (archive sample) is stored on-site.

A minimum of ten one-inch wide die cut specimens were removed from each seam sample. At least five specimens were tested for both peel adhesion (five for each side of the double fusion welds) and bonded shear strength.

The qualifying criteria for destructive seam evaluations are as follows:

- A film tear bond (FTB) type failure on all of the specimens in peel and shear.
- A minimum yield stress of 91 ppi for peel adhesion of a fusion welds (ASTM D4437).
- A minimum yield stress of 78 ppi for peel adhesion of an extrusion weld (ASTM D6392).
- A minimum yield stress of 120 ppi for bonded shear strength (ASTM D4437).
- A test procedure strain rate equal to 2 inches per minute.

Throughout the destructive testing, Chesapeake tested samples prior to HDR sending samples to the laboratory for testing. After testing was performed by Chesapeake, samples were sent to Geotechnics where all 25 destructive samples resulted in passing tests. The locations of the geomembrane destructive samples taken are included on the CQC Repair Logs presented in Appendix E, and on the as-built panel placement drawing contained in Appendix G. Destructive seam strength test results are also provided in Appendix E.

4.4.7 Drainage Composite Installation Monitoring

The leachate collection drainage composite was installed directly on top of the textured geomembrane of Cell 1, Subcell 1C by manually unrolling the material from a spreader bar attached to a forklift. The individual panels of drainage composite were placed such that the roll direction was generally parallel to the flow direction. The geonet components were attached to each other using polyethylene ties spaced every five feet along seams extending along the length of the panels, and 1 foot across butt seams. After the polyethylene ties were installed, the top geotextile of adjacent panels were continuously heat bonded together along the seams.

HDR's CQA/CQC personnel visually examined the drainage composite placement, tying, and seaming activities. Each panel was also visually examined for damage during placement. Damaged areas of the geotextile component of the composite were capped by placing and securing a patch of 8 oz/sy geotextile over the affected area using a Leister gun. The installation of the leachate collection zone drainage composites was accomplished in accordance with accepted industry practices.

5 Leachate Systems

5.1 Scope

The leachate system collects contact water in perforated pipes from the lined area. Pumps remove the liquid from the sump of the lined area in solid pipes to the leachate enclosure. The leachate enclosure contains the electrical controls for the sump pumps, displays the status of liquid levels in the cell, and metrics of the pumping operations. The liquid is transported from the

enclosure to one of two tanks (with a nominal capacity of 0.5 million gallons each) through a dual contained HDPE forcemain. The liquid in the tanks will be pumped periodically to tanker trucks which will transport to a wastewater treatment plant connection. This certification confirms the operability of the installed system.

5.2 Collection Pipe

A single perforated collection pipe on the floor of the lined area is connected to the leachate pipe system in Cell 1B. At the subcell interfaces, a pipe valve is used to contain both contact stormwater and leachate within the lined area. Video inspection of the pipe was conducted and the resulting documentation reviewed to ensure that the pipes were installed and will function as intended. The video inspection was made by Jet Clean America showing no obstructions. Photos of the video are included in Appendix F.

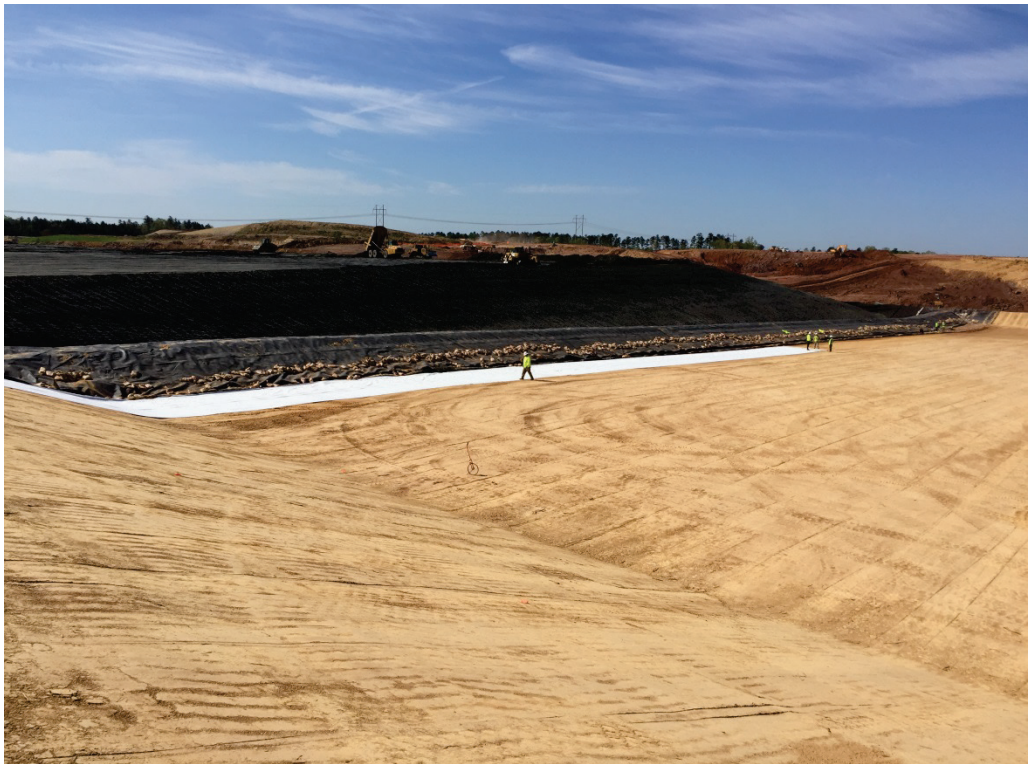
6 Photographic Documentation

Representative construction photographs are provided in this section.

Preparation of Subcell 1C Subgrade.

Installation of Subcell 1C Soil Liner

Cell 1, Subcell 1C Soil Liner



Chesapeake installing first panel of GCL on Cell 1, Subcell 1C Soil Liner

Chesapeake installing GCL over soil liner

Cell 1, Subcell 1B/1C HDPE Liner Tie-in

Trial weld of HDPE 60 mil Liner

Installing HDPE Liner

Welding of HDPE Liner

HDPE Liner

Installing GCL Panels

Installing HDPE Panels

Cell 1C looking East

Chesapeake Installing GCL Panels on the Floor of Cell 1C

Chesapeake installing HDPE panels

Cell 1C looking South

Cell 1B/1C Tie-in

Chesapeake installing GCL and HDPE liner

Cell 1C looking East

Cell 1C looking West

Panel intersection with repair patch

Extrusion welding repair for destructive sample

Chesapeake testing destructive samples before being sent to lab.

Cell 1C looking West

Chesapeake performing vacuum testing over extrusion weld

Chesapeake installing geocomposite under subcell divider berm

Installation of rain flap at the subcell divider berm

Geocomposite installation over liner

Welding of HDPE perforated pipe

Installation of composite and leachate collection pipe.

Leachate collection pipe with separator geotextile.

Installation of subcell divider berm

Installation of geocomposite on east slope.

Leachate pipe connection to existing leachate pipe

Leachate stone column installation

Grading material in subcell divider berm

Installation of subcell divider berm

JetClean America leachate pipe video inspection

Cell 1C looking North

Composite installed in Cell 1C

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A

Appendix A – Related Correspondence

A1 – Permits
A2 – Well Abandonment Records

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A1

A1 – Permits

NCDEQ Permit 1910 Structural Fill Permit
NCDEQ Permit 19-25 Mine Permit
NCDEQ Permit 1910 Tech. Spec Permit Mod
NCDEQ Permit 1910 GW/Basegrade Permit Mod
City of Sanford Wastewater Discharge Permit
NCDEQ Pump and Haul Permit
NCDEQ 401 Water Quality Certification #4026
USACE 404 Wetlands Permit

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North Carolina Department of Environment and Natural Resources

Pat McCrory
Governor

Donald R. van der Vaart
Secretary

June 5, 2015

Mr. Charles Price, Owner
Green Meadow, LLC and Charah, Inc.
12601 Plantside Drive
Louisville, Kentucky 40299

Subject: Permit to Construct/Permit to Operate, New Permit; Issuance
Permit No. 1910-STRUCT-2015, Brickhaven No. 2
Chatham County, DIN 24467

Dear Mr. Price:

Enclosed you will find a copy of Permit No. 1910-STRUCT-2015, dated June 5, 2015, DIN 23656. This permit action approves the construction and operation of the Brickhaven No.2 Mine Tract "A" Mine Structural Fill. Make note of the following items;

- Read your permit carefully, make note of items that are time sensitive, and should you have any questions contact me immediately.
- The approved documents related to this permit may be found on the Section's website at http://portal.ncdenr.org/web/wm/sw, see the link labeled Documents (Tracker).
- Copies of this permit, the approved plans, and all records, are required to be maintained by the permittee at the facility and made available to the Section upon request during normal business hours.

Should you have any questions regarding this matter you may contact me at (828) 296-4704 or at larry.frost@ncdenr.gov.

Sincerely,

Digitally signed by LYF
DN: cn=LYF, o=DWM, ou=SWS, email=larry.frost@ncdenr.gov, c=US
Date: 2015.06.05 09:38:43 -04'00'

Larry Frost, Engineering Project Manager
Permitting Branch, Solid Waste Section
Division of Waste Management, NCDENR

ec: Shawn McKee – SWS/RCO

NCDENR

North Carolina Department of Environment and Natural Resources
Division of Waste Management

Pat McCrory
Governor

Donald R. van der Vaart
Secretary

STATE OF NORTH CAROLINA
DEPARTMENT OF ENVIRONMENT AND NATURAL RESOURCES
DIVISION OF WASTE MANAGEMENT
SOLID WASTE SECTION

SOLID WASTE MANAGEMENT FACILITY STRUCTURAL FILL, MINE RECLAMATION Permit No. 1910

Green Meadow, LLC and Charah, Inc.
are hereby issued a

PERMIT TO CONSTRUCT AND OPERATE

1910-STRUC-2015
BRICKHAVEN NO.2 MINE TRACT "A" MINE STRUCTURAL FILL

in conjunction with

NCDENR DEMLR MINE PERMIT 19-25

Located *6 miles south of the Moncure Community off of Moncure-Flatwood Road in Chatham County*, North Carolina, in accordance with Article 9, Chapter 130A, of the General Statutes of North Carolina and all rules promulgated thereunder and subject to the conditions set forth in this permit. The legal description of the site is identified on the deeds recorded for this property listed in Attachment No. 1 of this permit.

Digitally signed by Edward F. Mussler III P.E.
DN: cn=Edward F. Mussler III P.E., o=Division of Waste Management, ou=Solid Waste Section, email=ed.mussler@ncdenr.gov, c=US
Date: 2015.06.05 12:30:36 -04'00'

Edward F. Mussler, III, P.E., Supervisor
Permitting Branch, Solid Waste Section
Division of Waste Management, NCDENR

ATTACHMENT 1
GENERAL PERMIT CONDITIONS/INFORMATION

Permit to Operate Date Table

Permit	Issuance	Review	Expiration	DIN
1910-STRUCT-2015, Brickhaven No.2 Mine Tract "A"	June 5, 2015	June 5, 2020	June 5, 2025	23655

General Conditions

1. This permit is issued by the North Carolina Department of Environment and Natural Resources (NCDENR), Division of Waste Management, Solid Waste Section (Section) in accordance with North Carolina General Statute §130A-309.218. The construction must be implemented in accordance with Attachment 2 of this permit. The operation must be implemented in accordance with Attachment 3 of this permit.
2. The persons to whom this permit is issued ("permittee") are the owners and operators of the coal combustion products structural fill.
3. The owner of land where coal combustion products have been used shall file a statement of the volume and locations of the coal combustion residuals or products with the Register of Deeds in the county or counties where the property is located. The statement shall identify the parcel of land according to the complete legal description on the recorded deed, either by metes and bounds or by reference to a recorded plat map. The statement shall be signed and acknowledged by the landowners in the form prescribed by G.S. 47-38 through G.S. 47-43. Recordation shall be required within 90 days after completion of a structural fill project using coal combustion residuals or products. A copy of the recordation shall be forwarded to the department.
4. When this property is sold, leased, conveyed, or transferred in any manner, the deed or other instrument of transfer shall contain in the description section in no smaller type than that used in the body of the deed or instrument a statement that coal combustion products have been used as structural fill material on the property.
5. Operation of this structural fill shall be in accordance with the Solid Waste Management Rules, 15A NCAC 13B, Article 9 of the Chapter 130A of the North Carolina General Statutes, the conditions contained in this permit, and the approved plan. Should the approved plan and the rules conflict, §130A Part 2I, Coal Ash Management Act shall take precedence unless specifically addressed by permit condition. Failure to comply shall be a violation and may result in enforcement or permit revocation.
6. This permit is issued based on the documents submitted in support of the application for permitting the facility including those identified in Attachment 1, "List of Documents for Approved Plan", and which constitute the approved plan for the facility. Where discrepancies exist, the most recent submittals and the Conditions of Permit shall govern.
7. This permit may be transferred only with the approval of the department, through the issuance of a new or substantially amended permit in accordance with applicable statutes and

rules. In accordance with NCGS §130A-295.2(g) the permittee must notify the department thirty (30) days prior to any significant change in the identity or business structure of either the owner or the operator, including but not limited to a proposed transfer of ownership of the facility or a change in the parent company of the owner or operator of the facility.

8. The permittee is responsible for obtaining all permits and approvals necessary for the development of this project including approval from appropriate agencies for a mining permit, a general or individual NPDES Stormwater Discharge Permit. Issuance of this permit does not remove the permittee's responsibilities for compliance with any other local, state or federal rule, regulation or statute.

Properties Approved for the Solid Waste Management Facility

Chatham County, N.C. Register of Deeds			
Book	Page	Property Owner	Acres
1770	99 - 108	Green Meadows, LLC	333.55
		Total Site Acreage:	333.55 acres

Permitting History

Permit Type	Date Issued	DIN
Brickhaven No.2 Mine Tract "A", Mine Reclamation, Original Issuance	June 5, 2015	23655

List of Documents for Approved Plan

DIN	Description
24022	Application. Prepared for Green Meadows. Prepared by HDR. March 2015.
24023	Operations Plan. Prepared for Green Meadows. Prepared by HDR. March 2015.*(extracted from the Application)*
24024	Water Quality Monitoring Plan. Prepared for Green Meadows. Prepared by HDR. March 2015. *(extracted from the Application)*
22482	*North Carolina Special Warranty Deed.* Prepared by Green Meadows, LLC. December 2014.
24032	*Establishment of Financial Assurance Mechanisms for Proposed Structural Fill Sites – Brickhaven and Colon Mines.* Prepared by NCDENR. March 2015.

~ End of Section ~

ATTACHMENT 2

CONDITIONS OF CONSTRUCTION

General

1. Upon issuance of this permit any further modification or amendment to approved plans, including the water quality monitoring, sampling, and analysis plans, will require written Section approval prior to implementation.
2. Construction of all structural fill phases and cells within this facility must be in accordance with the pertinent approved plans and only for those phases of development approved for construction as described in Attachment 1, List of Documents for the Approved Plan.
3. Financial assurance prepared in accordance with §130A-309.221 must be in place and funded in its entirety prior to issuance of the permit. Financial assurance shall be provided in the amounts specified in the document provided in Attachment 1, List of Documents for Approved Plan.
4. In areas with streams and/or wetlands, the permittee shall provide to the Section the approved 404/401 from U.S. Army Corps of Engineers and/or the NCDENR Division of Water Resources, in electronic format (pdf) prior to construction in the affected areas. The following table lists the cells in which stream and/or wetlands have been noted, that the permittee must provide 404/401 approval prior to construction;

Cell	Area (acres)	Status
3	30.2	Proposed
4	17.3	Proposed

5. Prior to construction of the phase or cell(s) within the phase, all piezometers, borings, and groundwater monitoring wells within the footprint must be properly abandoned in accordance with 15A NCAC 2C .0113(b)(1) and (d), entitled "Abandonment of Wells".
6. In areas where soil is to be undercut, abandoned piezometers, monitoring wells and borings must not be grouted to pre-grade land surface, but to the proposed base grade surface to prevent having to cut excess grout and possibly damage the wells.
7. A Licensed Geologist must report any pertinent geological feature(s) exposed during phase or cell excavation. Prior to placing any structural fill liner, the geologist must submit to the Section hydrogeologist a written report that includes an accurate description of the exposed geological feature(s) and effect of the geological feature(s) on the design, construction, and operation of the cell, phase, or unit.
8. Within thirty (30) days of the completed permanent abandonment of a piezometer, monitoring well or boring, the well abandonment record (Division of Water Resources Form GW-30) and any additional information included in the abandonment record must be submitted to the Section in electronic format (pdf). The well abandonment records must be submitted to the Section in accordance with 15A NCAC 2C .0114(b) and be certified by a Licensed Geologist.

9. Within 30 days of completed construction of each new groundwater monitoring well, a well construction record (Division of Water Resources Form GW-1b), typical well schematic, boring log, field log and notes, and description of well development activities must be submitted to the Section in electronic format (pdf).
10. A Licensed Geologist must supervise installation of groundwater monitoring wells and surface water sampling stations.
11. Any modification to the approved water quality monitoring plan must be submitted to the Section Hydrogeologist for review.
12. The permittee must submit a plan sheet-sized, scaled topographical map, showing the location and identification of new, existing and abandoned groundwater monitoring wells and piezometers in electronic format (pdf).
13. Burning of land-clearing debris generated on site as a result of construction activities requires approval by the Section prior to initiating the burn. In addition, the facility must ensure the activity is in compliance with all air pollution and open burning laws, regulations, and ordinances.
14. All sedimentation and erosion control activities must be conducted in accordance with the Sedimentation Control Act N.C.G.S. §113A-50, et seq., rules promulgated under 15A NCAC 4, and mining permit, whichever is applicable. The facility must furnish a copy of the approved Sedimentation and Erosion Control Plan from the Land Quality Section of the NCDENR Division of Mining, Energy and Land Resources (DEMLR) to the Section.
15. All required sedimentation and erosion control measures must be installed and operable to mitigate excessive on-site erosion and to prevent silt from leaving the area of the structural fill unit during the service life of the facility.
16. Modifications to the approved sedimentation and erosion control activities require approval by the NCDENR DEMLR Land Quality Section. The Section must be notified of any sedimentation and erosion control plan modifications.
17. Facility construction, operations or practices must not cause or result in a discharge of pollution, dredged material, and/or fill material into waters of the state in violation of the requirements under Sections 401 and 404 of the Clean Water Act, as amended.
18. The following conditions must be met prior to approval for operation of the initial phase, cell or construction sequence of the structural fill;
    a. A leachate disposal permit must be provided, in electronic format (pdf).
    b. The permittee must contact the Section, arrange, hold and document a pre-operative meeting with key operations personnel and representatives of the Section.
19. The pre-operative conditions of Attachment 3 must be met prior to placing coal combustion products in a newly constructed area. See Attachment 3, Condition 25.

~ End of Section ~

ATTACHMENT 3

CONDITIONS OF OPERATIONS

General

1. Upon issuance of the permit, any further modification or amendment to approved plans will require Section approval prior to implementation.
2. Financial assurance must be continuously maintained for the duration of the facility in accordance with §130A-309.221. The owner and operator must annually adjust cost estimates for inflation.
3. Copies of this permit, the approved plans, and all records required to be maintained in the operating record by the permittee must be maintained at the facility, unless otherwise approved by the Section, and made available to the Section upon request during normal business hours.
4. All forms, reports, maps, plans, and data submitted to the Section must include an electronic (pdf) copy.
5. A responsible individual trained in facility operations must be on-site at all times during all operating hours of the facility.

Monitoring

6. Monitoring and Reporting shall be accomplished in accordance with the approved Operations Plan listed in Attachment I, List of Documents for the Approved Plan.
7. Prior to placement of waste, at a minimum one (1) independent background sample from each of the compliance groundwater monitoring wells and surface water sampling locations shall be sampled and analyzed for constituents listed in Appendix III and IV in accordance with 40 CFR 257.94(b). In addition, during the first year of operation eight (8) independent samples from each of the compliance groundwater monitoring wells and surface water sampling locations shall be sampled and analyzed for the Appendix III and IV constituents.
8. Compliance groundwater monitoring wells, surface water locations and leachate monitoring ports shall be sampled semi-annually and analyzed for constituents listed in the approved Water Quality Monitoring Plan listed in Attachment 1, List of Documents for Approved Plan.
9. A readily accessible unobstructed path shall be cleared and maintained so that four-wheel vehicles may access monitoring locations, at all times.
10. A field log book which details all development, sampling, repair, and all other pertinent activities associated with each groundwater sampling location shall be kept as part of the permanent facility record.

Coal Combustion Products

11. The permit holder shall establish financial assurance that will ensure that sufficient funds are available for facility closure, post-closure maintenance and monitoring, any corrective action that the Department may require, and to satisfy any potential liability for sudden and nonsudden accidental occurrences, and subsequent costs incurred by the Department in response to an incident at a structural fill project, even if the applicant or permit holder

becomes insolvent or ceases to reside, be incorporated, do business, or maintain assets in the State.

12. Coal combustion products shall be collected and transported in a manner that will prevent nuisances and hazards to public health and safety. Coal combustion products shall be moisture conditioned, as necessary, and transported in trucks with adequate measures to prevent dusting.
13. The structural fill project shall be operated with sufficient dust control measures to minimize airborne emissions and to prevent dust from creating a nuisance or safety hazard and shall not violate applicable air quality regulations.
14. Coal combustion products utilized on an exterior slope of a structural fill shall not be placed with a slope greater than 3.0 horizontal to 1.0 vertical.
15. Coal combustion products must not be placed in standing water. Surface water must be diverted away from the operational area and must not be impounded over or in coal combustion product.
16. Water that contacts coal combustion products shall be leachate and handled as such. Leachate must be properly managed on site using best management practices.
17. The coal combustion products structural fill project shall be effectively maintained and operated as a non-discharge system to prevent discharge of leachate to surface water resulting from the project.
18. The coal combustion products structural fill project shall be effectively maintained and operated to ensure no violations of groundwater standards adopted by the Commission pursuant to Article 2L of Chapter 143 of the General Statutes due to the project.
19. The coal combustion products generator location must be provided for each generator site, in electronic format (pdf) and maintained in the facility operating record.
20. A Toxicity Characteristic Leaching Procedure (TCLP) analysis report must be submitted for each new coal combustion products generator site identified, each change in source at a generator, and a minimum of once per year from each generator and each source at said site, in electronic format (pdf) and maintained in the facility operating record.

Specific Conditions

21. This structural fill is mine reclamation under the state mining act and shall be subject to the terms and conditions of Mining Permit No. 19-25.
22. This permit approves the operation of Cells 1 through 5 and any sub-cells of the structural fill as well as the onsite environmental management and protection facilities as described in the approved plans. Operation of cells or sub-cells is subject to the pre-operative conditions of this attachment.
23. This permit shall expire June 5, 2025. A request to extend the life of the permit must be submitted to the department not later than December 5, 2024.
24. This permit is subject to review by June 5, 2020. The permit must request the five-year limited review on or before December 5, 2019. A five-year review of the 10-year permit includes review of the facility plans, operations plan, closure plan, post-closure plan, financial assurance cost estimates, environmental monitoring plans and any other applicable plans for the facility.

25. The following conditions must be met prior to approval for operation of any phase, cell or construction sequence of the structural fill;
    a. Financial assurance must be made current if any adjustment is warranted.
    b. A construction quality assurance documentation report shall be prepared in accordance with the approved plan and submitted to the Section for review prior to placement of coal ash.
    c. New groundwater monitoring wells associated with each new phase or cell shall be installed and background sampling shall be completed for the constituents listed in the approved Water Quality Monitoring Plan listed in Attachment 1, List of Documents for Approved Plan.
26. The following table lists the estimated coal combustion product capacity, acreage and status details for the structural fill.

Cell	Area (acres)	Status
1	33.9	Proposed
2	28.3	Proposed
3	30.2	Proposed
4	17.3	Proposed
5	34.8	Proposed
	Total area - 144.5 acres	Note: CCP capacity - 9.2 million cubic yards (1.25 tons per cy)

27. On or before August 1 annually, the Permittee must submit an annual facility report to the Section, on forms prescribed by the Section.
    a. The reporting period shall be for the previous year beginning July 1 and ending June 30.
    b. The owner or operator must maintain a record of the amount of coal combustion residues received at the structural fill, compiled on a monthly basis. Scales must be used routinely to weigh the amount of waste received.
    c. A measurement of volume utilized in the structural fill cells must be performed during the second quarter of the calendar year. The date and volumes, in cubic yards, must be included in the report.
    d. The amount of coal combustion products (tons), placed in the structural fill cells from June 5, 2015 through the date of the annual volume survey must be included in the report.
28. Within 90 days of issuance of this permit the permittee shall provide the Section with a revised operations plan including the following information;
    a. On April 1, 2015, the U.S. Fish and Wildlife Service announced it is protecting the northern long-eared bat as a threatened species under the Endangered Species Act (ESA). The operations plan shall include all revisions necessary to ensure compliance with this listing.
    b. The operations plan shall contain a coal ash transportation plan that includes at a minimum;

i) Loading, transfer in-route and offloading of coal ash,
ii) monitoring of vehicles along transportation routes (as much as is reasonably possible),
iii) emergency response should ash be released during transportation to the fill sites, and
iv) clean-up standards.
v) documentation of spills and any supporting documents should be retained as part of the facility's operational record and
vi) documentation and records should be made available for review and inspection by Section staff upon request.

c. The operations plan shall include a dust control plan with sufficient dust control measures to minimize airborne emissions and prevent dust from becoming a nuisance or safety hazard, along with any supporting documents.

~ End of Section ~

ATTACHMENT 4

CONDITIONS OF PERMIT FOR CLOSURE AND POST-CLOSURE

1. Closure or partial closure of any structural fill unit must be in accordance with the Closure Plans described in the approved plans. Proposed changes to the approved Closure Plans must be submitted to the Section at least 90 days prior to implementation.
2. Closure Construction Quality Assurance reports must be submitted to the Section at least annually and maintained in the operating record of the facility.
3. Final Closure of the structural fill and initiation of the 30-year post-closure period commences upon the engineer's certification that the closure of the fill is complete.
4. Post-closure use of the property must not disturb the integrity of the cap system, base liner system, or any other components of the containment system or the function of the monitoring systems. The Department may approve disturbance if the constructor or operator demonstrates that disturbance of the cap system, base liner system, or other component of the containment system will not increase the potential threat to public health, safety, and welfare; the environment; and natural resources.

~ End of Conditions ~

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NCDENR
North Carolina Department of Environment and Natural Resources

Pat McCrory
Governor

Donald R. van der Vaart
Secretary

June 5, 2015

Mr. Charles Price
Green Meadow, LLC
12601 Plantside Drive
Louisville, Kentucky 40299

RE: Mining Permit No. 19-25
Brickhaven No. 2 Mine Tract "A"
Chatham County
Cape Fear River Basin

Dear Mr. Price:

Your application for renewal and modification of the above referenced mining permit has been approved. The modification is to redesign the erosion and sedimentation control measures throughout the site and reduce the affected acreage to 267 acres as indicated on the Mine Maps last revised December 31, 2014. The modification also includes changing the method for reclaiming the mine by constructing structural fill using Coal Combustion Byproducts (CCBs) in accordance with the provisions of the Coal Ash Management Act of 2014 and the terms and conditions of Permit to Construct and Operate Brickhaven No. 2 Mine Tract "A" Mine Structural Fill Permit No. 1910-STRUC-2015 issued by the Division of Waste Management on June 5, 2015. A copy of the renewed and modified mining permit is enclosed. The new expiration date is June 5, 2025.

The conditions in the renewed and modified permit were based primarily upon the initial application. Modifications were made as indicated by the renewal and modification requests and as required to insure compliance with The Mining Act of 1971. I would like to draw your particular attention to the following conditions where minor additions or changes were made: Operating Condition Nos. 1B, 1C, 3C, 3D, 4B, 4C, 5, 10B, and 12A and Reclamation Condition Nos. 1, 2A, 2E, 3, 4A and 4B.

G.S. 74-65 states that any actions taken under the Mining Act of 1971, such as the issuance of mining permits, shall not be construed to supersede or otherwise affect or prevent the enforcement of any zoning regulation or ordinance duly adopted by an incorporated city or county or by any agency or department of the State of North Carolina, except insofar as a provision of said regulation or ordinance is in direct conflict with the Mining Act of 1971. Thus, the responsibility of compliance with any applicable zoning regulations lies with you.

As a reminder, your permitted acreage at this site is 301 acres and the amount of land you are allowed to disturb is 267 acres.

Please review the renewed and modified mining permit and contact Ms. Judy Wehner, Assistant State Mining Specialist, at (919) 707-9220 should you have any questions concerning this matter.

Sincerely,

Tracy E. Davis, PE, CPM
Director
Division of Energy, Mineral, and Land Resources

TED/jw

Enclosures

cc: Mr. John Holley, PE, DEMLR Raleigh Regional Office Supervisor
Mr. Bradley Bennett, DEMLR Stormwater Permitting Supervisor
Ms. Janet Boyer, PE, DEMLR State Mining Specialist
Mr. Ed Mussler, PE, Division of Waste Management Permitting Supervisor
Mr. Jay Zimmerman, Director, Division of Water Resources
Mr. William Gerringer-Mine and Quarry Bureau, w/o enclosures

DEPARTMENT OF ENVIRONMENT AND NATURAL RESOURCES

DIVISION OF ENERGY, MINERAL AND LAND RESOURCES

LAND QUALITY SECTION

P E R M I T

for the operation of a mining activity

In accordance with the provisions of G.S. 74-46 through 68, "The Mining Act of 1971," Mining Permit Rule 15A NCAC 5 B, and other applicable laws, rules and regulations

Permission is hereby granted to:

Green Meadow, LLC

Brickhaven No. 2 Mine Tract "A"

Chatham County - Permit No. 19-25

for the operation of a

Clay Mine

which shall provide that the usefulness, productivity and scenic values of all lands and waters affected by this mining operation will receive the greatest practical degree of protection and restoration.

MINING PERMIT EXPIRATION DATE: June 5, 2025

In accordance with the application for this mining permit, which is hereby approved by the Department of Environment and Natural Resources, hereinafter referred to as the Department, and in conformity with the approved Reclamation Plan attached to and incorporated as part of this permit, provisions must be made for the protection of the surrounding environment and for reclamation of the land and water affected by the permitted mining operation. This permit is expressly conditioned upon compliance with all the requirements of the approved Reclamation Plan. However, completed performance of the approved Reclamation Plan is a separable obligation, secured by the bond or other security on file with the Department, and may survive the expiration, revocation or suspension of this permit.

This permit is not transferable by the permittee with the following exception: If another operator succeeds to the interest of the permittee in the permitted mining operation, by virtue of a sale, lease, assignment or otherwise, the Department may release the permittee from the duties imposed upon him by the conditions of his permit and by the Mining Act with reference to the permitted operation, and transfer the permit to the successor operator, provided that both operators have complied with the requirements of the Mining Act and that the successor operator agrees to assume the duties of the permittee with reference to reclamation of the affected land and posts a suitable bond or other security.

In the event that the Department determines that the permittee or permittee's successor is not complying with the Reclamation Plan or other terms and conditions of this permit, or is failing to achieve the purposes and requirements of the Mining Act, the Department may give the operator written notice of its intent to modify, revoke or suspend the permit, or its intent to modify the Reclamation Plan as incorporated in the permit. The operator shall have right to a hearing at a designated time and place on any proposed modification, revocation or suspension by the Department. Alternatively and in addition to the above, the Department may institute other enforcement procedures authorized by law.

Definitions

Wherever used or referred to in this permit, unless the context clearly indicates otherwise, terms shall have the same meaning as supplied by the Mining Act, N.C.G.S. 74-49.

Modifications

October 5, 1995: This permit has been modified to increase the affected acreage from 17 acres to 83.5 acres, approve the pit expansion and the upgrading of the associated sediment and erosion control measures as per the Mine Site Map dated August 27, 1995, and allow modification to the spray irrigation system as approved by the Division of Water Quality.

August 2, 1996: This permit has been modified to change the corporate name from Cherokee Sanford Group, Inc. to Cherokee Sanford Group, LLC.

September 24, 1998: This permit has been modified to allow the temporary use (two year approval) of Photafloc polymer for enhanced sediment control experimentation purposes, with stipulations as outlined in the approval letter.

November 4, 1999: This permit has been modified to increase the affected acreage at the site to 337 acres as indicated on the mine map dated September 9, 1999. This modification also includes the revised erosion and sediment control plan dated September 22, 1999 and allows the use of Calgon Catr-Floc DL for flocculation of fine particles in the basins onsite.

April 6, 2005: This permit has been modified to change the corporate name from Cherokee Sanford Group, LLC to General Shale Brick, Inc.

October 10, 2007: This permit has been modified to increase the permitted acreage to 648.65 acres and the affected acreage at this site to 590.89 acres as indicated on the Mine Details Map last revised April 23, 2007. The modification includes the addition of several tracts to the east and south of the existing permit boundaries. In addition, the modification includes expansion of the mine excavation area into said tracts and installation and includes the maintenance of all associated erosion and sediment control measures.

October 20, 2014: This permit has been modified to establish the permitted acreage as 301 acres and the affected acreage at this site as 270.16 acres as indicated on the Tract "A" Overall Site Topography Map dated September 3, 2014. Mining Permit No. 19-08 has been split into two separate mining permits, Brickhaven No.2 Mine Tract "A" (mining permit No. 19-25) and Brickhaven No. 2 Mine Tract "B" (Mining Permit No. 19-08).

January 23, 2015: This permit has been transferred in its entirety from General Shale Brick, Inc. to Green Meadow, LLC.

April 23, 2015: This permit has been modified to replace the flocculant currently permitted with FLOC-UL8 and GT Clear, manufactured by Green Technologies, to improve settling efficiency of suspended solids in the mine discharge water at this site provided these products are used in accordance with the manufacturer's instructions as outlined in the letter and supplemental information received by the Land Quality Section on April 10, 2015.

June 5, 2015: This permit has been modified to redesign the erosion and sedimentation control measures throughout the site and reduce the affected acreage to 267 acres as indicated on the Mine Maps last revised December 31, 2014. The modification also includes changing the method for reclaiming the mine by constructing structural fill using Coal Combustion Byproducts (CCBs) in accordance with the provisions of the Coal Ash Management Act of 2014 and the terms and conditions of Permit to Construct and Operate Brickhaven No. 2 Mine Tract "A" Mine Structural Fill Permit No. 1910-STRUC-2015 issued by the Division of Waste Management on June 5, 2015.

Expiration Date

This permit shall be effective from the date of its issuance until June 5, 2025.

Conditions

This permit shall be subject to the provisions of the Mining Act, N.C.G.S. 74-46, et. seq., and to the following conditions and limitations:

OPERATING CONDITIONS:

1. A. Any wastewater processing or mine dewatering shall be in accordance with the permitting requirements and rules promulgated by the N.C. Environmental Management Commission. **GS 74-51 (d) (3)**

   B. Any approvals or permits required to collect, handle, and properly dispose of any water contacting Coal Combustion Byproducts (CCBs) shall be obtained prior to any placement of CCBs within the mining permit boundary. **GS 74-51 (d) (3)**

   C. Any stormwater runoff from the affected areas at the site shall be managed in accordance with any applicable permit requirements and regulations promulgated by the Environmental Management Commission. It shall be the permittee's responsibility to contact the Stormwater Program to secure any necessary stormwater permits, permit modifications, or other approval documents. The terms and conditions of NPDES General Permit No. NCG020354 last revised December 16, 2014 shall be followed. **GS 74-51 (d) (3)**

2. A. Any mining process producing air contamination emissions shall be subject to the permitting requirements and rules promulgated by the N.C. Environmental Management Commission and enforced by the Division of Air Quality. **GS 74-51 (d) (3)**

   B. During mining operations, water trucks or other means that may be necessary shall be utilized to prevent dust from leaving the permitted area. **GS 74-51 (d) (3)**

3. A. Sufficient buffer shall be maintained between any affected land and any adjoining waterway or wetland to prevent sedimentation of that waterway or wetland from erosion of the affected land and to preserve the integrity of the natural watercourse or wetland. **GS 74-51 (d) (2)**

   B. Any mining activity affecting waters of the State, waters of the U. S., or wetlands shall be in accordance with the requirements and regulations promulgated and enforced by the N. C. Environmental Management Commission. **GS 74-51 (d) (2)**

   C. Buffers shall be maintained as indicated on the Mine Maps last revised December 31, 2014. **GS 74-51 (d) (2)**

D. No land disturbing activities shall be allowed within 50 feet of any wetland or waterway until proof has been submitted to the Land Quality Section that all necessary permits/certifications have been obtained from the US Army Corps of Engineers and the Division of Water Resources. **GS 74-51 (d) (2)**

4. A. Adequate mechanical barriers including but not limited to diversions, earthen dikes, check dams, sediment retarding structures, rip rap pits, or ditches shall be provided in the initial stages of any land disturbance and maintained to prevent sediment from discharging onto adjacent surface areas or into any lake, wetland or natural watercourse in proximity to the affected land. **GS 74-51 (d) (6)**

B. In order to improve settling efficiency of suspended solids in the mine discharge water at this site, the operator shall use the flocculants FLOC-UL8 and GT Clear, manufactured by Green Technologies, provided these products are used in accordance with the manufacturer's instructions as outlined in the letter and supplemental information received by the Land Quality Section on April 10, 2015. **GS 74-51 (d) (6)**

C. All mining activities and any land disturbing activities conducted within the mining permit boundary associated with the construction of the Coal Combustion Byproducts (CCBs) structural fill, including the installation and maintenance of all associated erosion and sediment control measures, shall be conducted as indicated on the Mine Maps last revised December 31, 2014 and the supplemental information received by the Land Quality Section on November 21, 2014, January 6, 2015 and March 17, 2015. **GS 74-51 (d) (1-7)**

5. Groundwater monitoring and sampling prior to, during and post-disposal of Coal Combustion Byproducts (CCBs) into the mined pits shall be implemented as outlined in the Coal Ash Management Act and per the plan prepared for and approved by the Division of Waste Management through Permit to Construct and Operate Brickhaven No. 2 Mine Tract "A" Mine Structural Fill Permit No. 1910-STRUC-2015 issued on June 5, 2015. **GS 74-51 (d) (2 and 3)**

6. All affected area boundaries (267 acres) shall be permanently marked at the site on 100-foot intervals unless the line of sight allows for larger spacing intervals. **GS 74-51 (d) (4)**

7. The angle for graded slopes and fills shall be no greater than the angle that can be retained by vegetative cover or other adequate erosion control measure, structure, or device. In any event, exposed slopes or any excavated channels, the erosion of which may cause off-site damage because of siltation, shall be planted or otherwise provided with ground cover, devices or structures sufficient to restrain such erosion. **GS 74-51 (d) (4)**

8. The affected land shall be graded so as to prevent collection of pools of water that are, or likely to become, noxious or foul. Necessary structures such as drainage ditches or conduits shall be constructed or installed when required to prevent such conditions. **GS 74-51 (d) (2)**

9. Existing vegetation or vegetated earthen berms shall be maintained between the mine and public thoroughfares whenever practical to screen the operation from the public. **GS 74-51 (d) (4)**

10. A. Sufficient buffer shall be maintained between any excavation and any mining permit boundary to protect adjacent property. **GS 74-51 (d) (4)**

    B. Buffers shall be maintained as indicated on the Mine Maps last revised December 31, 2014. **GS 74-51 (d) (4)**

11. A physical barrier consisting of a fence or earthen berm, etc., shall be maintained around the perimeter of any highwall. **GS 74-51 (d) (4)**

12. A. The on-site disposal of Coal Combustion Byproducts (CCBs) as structural fill within the mining permit boundary shall be conducted in accordance with the Coal Ash Management Act and Permit to Construct and Operate Brickhaven No. 2 Mine Tract "A" Mine Structural Fill Permit No. 1910-STRUC-2015 issued by the Division of Waste Management on June 5, 2015. **GS 74-51 (d) (7)**

    B. Notwithstanding the above condition, no on-site disposal of refuse or other solid waste that is generated outside of the mining permit area shall be allowed within the boundaries of the mining permit area <u>unless</u> authorization to conduct said disposal has first been obtained from both the Division of Waste Management and the Land Quality Section, Department of Environment and Natural Resources. The method of disposal shall be consistent with the approved reclamation plan. **GS 74-51 (d) (7)**

    C. Mining refuse as defined by G.S. 74-49 (14) of The Mining Act of 1971 generated on-site and directly associated with the mining activity may be disposed of in a designated refuse area. All other waste products must be disposed of in a disposal facility approved by the Division of Waste Management. No petroleum products, acids, solvents or their storage containers or any other material that may be considered hazardous shall be disposed of within the permitted area. **GS 74-51 (d) (7)**

    D. For the purposes of this permit, the Division of Energy, Mineral and Land Resources considers the following materials to be "mining refuse" (in addition to those specifically listed under G.S. 74-49 (14) of the N.C. Mining Act of 1971): **GS 74-51 (d) (7)**

1. on-site generated land clearing debris
2. conveyor belts
3. wire cables
4. v-belts
5. steel reinforced air hoses
6. drill steel

E. If mining refuse is to be permanently disposed within the mining permit boundary, the following information must be provided to and approved by the Division of Energy, Mineral, and Land Resources prior to commencement of such disposal: **GS 74-51 (d) (7)**

1. the approximate boundaries and size of the refuse disposal area;
2. a list of refuse items to be disposed;
3. verification that a minimum of 4 feet of cover will be provided over the refuse;
4. verification that the refuse will be disposed at least 4 feet above the seasonally high water table; and,
5. verification that a permanent vegetative groundcover will be established.

13. An Annual Reclamation Report shall be submitted on a form supplied by the Department by February 1 of each year until reclamation is completed and approved. **GS 74-55**

14. The operator shall notify the Department in writing of the desire to delete, modify or otherwise change any part of the mining, reclamation, or erosion/sediment control plan contained in the approved application for a mining permit or any approved revision to it. Approval to implement such changes must be obtained from the Department prior to on-site implementation of the revisions. **GS 74-52 (a)**

15. The security, which was posted pursuant to N.C.G.S. 74-54 in the form of a $500,000.00 blanket bond, is sufficient to cover the operation as indicated in the approved application. This security must remain in force for this permit to be valid. The total affected land shall not exceed the bonded acreage. **GS 74-54**

16. A. Authorized representatives of the Division of Archives and History shall be granted access to the site to determine the presence of significant archaeological resources. **GS-74-50 (b3) (7)**

B. Pursuant to N. C. G. S. 70 Article 3, "The Unmarked Human Burial and Human Skeletal Remains Protection Act," should the operator or any person in his employ encounter human skeletal remains, immediate notification shall be provided to the county medical examiner and the chief archaeologist, North Carolina Division of Archives and History. **GS-70-3**

APPROVED RECLAMATION PLAN

The Mining Permit incorporates this Reclamation Plan, the performance of which is a condition on the continuing validity of that Mining Permit. Additionally, the Reclamation Plan is a separable obligation of the permittee, which continues beyond the terms of the Mining Permit.

The approved plan provides:

Minimum Standards As Provided By G.S. 74-53

1. The final slopes in all excavations in soil, sand, gravel and other unconsolidated materials shall be at such an angle as to minimize the possibility of slides and be consistent with the future use of the land.

2. Provisions for safety to persons and to adjoining property must be provided in all excavations in rock.

3. All overburden and spoil shall be left in a configuration which is in accordance with accepted conservation practices and which is suitable for the proposed subsequent use of the land.

4. No small pools of water shall be allowed to collect or remain on the mined area that are, or are likely to become noxious, odious or foul.

5. The revegetation plan shall conform to accepted and recommended agronomic and reforestation practices as established by the North Carolina Agricultural Experiment Station and the North Carolina Forest Service.

6. Permittee shall conduct reclamation activities pursuant to the Reclamation Plan herein incorporated. These activities shall be conducted according to the time schedule included in the plan, which shall to the extent feasible provide reclamation simultaneous with mining operations and in any event, provide reclamation at the earliest practicable time after completion or termination of mining on any segment of the permit area and shall be completed within two years after completion or termination of mining.

RECLAMATION CONDITIONS:

1. Provided further, and subject to the reclamation schedule, the planned reclamation shall be to backfill the mine excavation with Coal Combustion Byproducts (CCBs) in accordance with the Coal Ash Management Act and Permit to Construct and Operate Brickhaven No. 2 Mine Tract "A" Mine Structural Fill Permit No. 1910-STRUC-2015 issued by the Division of Waste Management on June 5, 2015. In addition, any disturbed areas shall be regraded and revegetated as indicated on the Reclamation Plan, Sheet 03C-02, dated November 2014. **GS 74-53**

2. The specifications for surface gradient restoration to a surface suitable for the planned future use are as follows: **GS 74-53**

A. All the final perimeter side slopes shall be graded to a 3 horizontal to 1 vertical or flatter slope.

B. Any settling ponds or sediment basins shall be backfilled and stabilized.

C. The processing, stockpile, and other disturbed areas neighboring the mine excavation shall be leveled and smoothed.

D. Compacted surfaces shall be disced, subsoiled or otherwise prepared before revegetation.

E. Materials not specifically approved within this mining permit shall not be permanently disposed of at the mine site. On-site disposal of Coal Combustion Byproducts (CCBs) and mining refuse shall be conducted in accordance with Operating Condition Nos. 11A through 11E.

F. The affected land shall be graded to prevent the collection of noxious or foul water.

3. Revegetation Plan:

After site preparation, all disturbed land areas shall be revegetated as per the Seeding Plan submitted on the Erosion and Sedimentation Control Details, Sheet 3 of 3, last revised December 31, 2014. **GS 74-53**

Whenever possible, disturbed areas should be vegetated with native warm season grasses such as switch grass, Indian grass, bluestem and gamma grass. **GS 74-51 (d) (2)**

In addition, the permittee shall consult with a professional wildlife biologist with the N.C. Wildlife Resources Commission to enhance post-project wildlife habitat at the site. **GS 74-51 (d) (2)**

4. Reclamation Plan:

A. Reclamation shall be conducted simultaneously with mining to the extent feasible. In any event, reclamation shall be initiated as soon as feasible after completion or termination of mining of any mine segment under permit. **GS 74-53**

B. Specific reclamation phases and schedules shall be followed as described in the Reclamation Timeline, Section C, submitted with the supplemental information received by the Land Quality Section on January 6, 2015 as follows: **GS 74-53**

		Acres	Estimated Completion
Phase 1	(Cells1 and 2)	62.5	December 2019
Phase 2	(Cells 3 and 4)	47.5	July 2021
Phase 3	(Cell 5)	34.8	August 2022

This permit, issued to Cherokee Brick Company on August 30, 1985, transferred to Cherokee Sanford Group on November 4, 1988, simultaneously renewed and modified October 5, 1995, modified August 2, 1996, September 24, 1998, November 4, 1999, and April 6, 2005, renewed September 15, 2005, modified October 10, 2007 and October 20, 2014, transferred to Green Meadow LLC January 23, 2015, and modified April 23, 2015, is hereby simultaneously renewed and modified this 5th day of June, 2015 pursuant to **G.S. 74-52.**

By:_____

Tracy E. Davis, PE, CPM, Director
Division of Energy, Mineral, and Land Resources
By Authority of the Secretary
Of the Department of Environment and Natural Resources

North Carolina Department of Environment and Natural Resources

Pat McCrory
Governor

Donald R. van der Vaart
Secretary

July 27, 2015

DELIVERED BY EMAIL

Mr. Michael Plummer, Project Manager
HDR Inc.
440 South Church Street, Suite 1000
Charlotte, North Carolina 28202-2075

Subject: Technical Specification Updates, Approval
Permit No. 1910-STRUCT-2015, Brickhaven No. 2
Chatham County, DIN 24794

Dear Mr. Plummer:

On July 22, 2015 the Division of Waste Management, Solid Waste Section (Section) received Green Meadow, LLC's and Charah Inc.'s proposes updates, entitled;

Technical Specification Updates. Prepared for Green Meadow, LLC and Charah, Inc. Prepared by HDR. July 2015. DIN 24772.

The updates proposed to the existing plans for the Brickhaven No. 2 Mine Tract A, Structural Fill, include;

- MODIFICATION TO THE TECHNICAL SPECIFICATIONS SECTION 01060 SPECIAL CONDITIONS, Section 2.1 INTERFACE FRICTION TESTS, Subsection B.1.
- MODIFICATION TO THE TECHNICAL SPECIFICATIONS SECTION 02276 SOIL LINER SYSTEM, Section 2.1 MATERIALS, Subsection B.4.b.
- MODIFICATION TO THE TECHNICAL SPECIFICATIONS SECTION 02777 DRAINAGE COMPOSITE, Section 2.2 MATERIALS AND MANUFACTURE, Subsection C.2.

The Section has reviewed the proposed technical specifications and hereby approves the immediate implementation of the updates for the plan at the Brickhaven site (Facility). Green Meadow, LLC and Charah Inc. shall consider the referenced updates (DIN 24772) as an approved document. The Facility should construct in this manner until the current facility permit is either amended or modified. Therefore, the next time the Facility prepares either a permit amendment or modification it is expected to submit updated technical specifications which include these updated specifications.

Should you have any questions regarding this matter contact me at (828) 296-4704 or larry.frost@ncdenr.gov.

Sincerely,

Digitally signed by LYF
DN: cn=LYF, o=DWM, ou=SWS, email=larry.frost@ncdenr.gov, c=US
Date: 2015.07.27 15:21:32 -04'00'

Larry Frost, Engineering Project Manager
Permitting Branch, Solid Waste Section
Division of Waste Management, NCDENR

ec: Ed Mussler – SWS/RCO
John Murray – SWS/CAMA

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North Carolina Department of Environment and Natural Resources

Pat McCrory
Governor

Donald R. van der Vaart
Secretary

July 27, 2015

Sent via Email – ndivers@charah.com

Mr. Norman Divers, Environmental Manager
Charah, Inc. and Green Meadow, LLC
Post Office Box 287
Belmont, North Carolina 28012

Re: Approval of Supplemental Groundwater Gauging Data and Base Grade Updates
Brickhaven No. 2 Mine Track "A"
1910-STRUCT-2015
Chatham County
DIN 24779

Dear Mr. Divers,

On July 23, 2015, the Solid Waste Section (Section) received a supplemental data report entitled:

Supplemental Groundwater Gauging Data and Base Grade Updates. Prepared for Charah, Inc. Prepared by HDR, Inc. July 23, 2015. DIN 24776

The Section has reviewed the report and has no further comment. Therefore, the Section approves the revised seasonal high groundwater surface and updated base grades. The facility may proceed with the construction process.

Please don't hesitate to contact me with any questions or comments via email elizabeth.werner@ncdenr.gov or phone 919-707-8253.

Sincerely,

Elizabeth S. Werner

Digitally signed by Elizabeth S Werner
DN: cn=Elizabeth S Werner, o=DWM-Solid Waste, ou=NCDENR, email=elizabeth.werner@ncdenr.gov, c=US
Date: 2015.07.27 13:21:33 -04'00'

Elizabeth S. Werner
Permitting Hydrogeologist
Solid Waste Section

Cc: Joe Readling, P.E. - HDR
Mike Plummer, P.E. - HDR
Ed Mussler, P.E. – SWS, Permitting Branch Head
Larry Frost – SWS, Permitting Engineer
Shannon Aufman – SWS, Permitting Engineer
John Murray – SWS, Permitting Engineer
Shawn McKee – SWS, Senior Environmental Specialist

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CITY OF SANFORD

Control Authority and/or Municipality

PERMIT

Industrial User Pretreatment Permit (IUP)
To Discharge Wastewater Under the
Industrial Pretreatment Program

000035

IUP Number

40 CFR Category(if Applicable)

In compliance with the provisions of North Carolina General Statute 143-215.1, any applicable federal categorical pretreatment regulations, all other lawful standards and regulations promulgated and adopted by the North Carolina Environmental Management Commission, and the Control Authority and/or Municipality Sewer Use Ordinance. The following Industry hereafter referred to by name or as the permittee:

Industry name, permittee: CHARAH, INCORPORATED
Facility Located at Street Address 1604 Colon Road
City Sanford

is hereby authorized to discharge wastewater from the facility located at the above listed address into the sanitary sewer collection system and the wastewater treatment facility of the Control Authority and/or Municipality listed below:

IUP Control Authority and/or Municipality WWTP name: City of Sanford Big Buffalo Creek WWTP
NPDES Number: NC 0024147
WWTP Address: 5327 Iron Furnace Road
City, State, Zip Sanford, North Carolina 27331-3729

in accordance with effluent limitations, monitoring requirements, and all other conditions set forth in Parts I, II, and III of this Industrial User Pretreatment Permit (IUP).

Effective date, this permit and the authorization to discharge shall become effective at midnight on this date:. July 22, 2015
Expiration date, this permit and the authorization to discharge shall expire at midnight on this date: September 30, 2019

7.22.15

Date signed

Director of Public Works

IUP, PART I, OUTLINE:

A.) IUP Basic Information
B.) IUP Modification History
C.) Authorization Statement
D.) Description of Discharges
E.) Schematic and Monitoring Locations
F.) Effluent Limits & Monitoring Requirements
G.) Definitions and Limit Page(s) notes

A. IUP Basic Information:

Receiving Control Authority & WWTP name : City of Sanford Big Buffalo WWTP	POTW NPDES # : NC 0024147
IUP Name : Charah, Incorporated	IUP Number : 000035
IUP Effective date : July 1, 2015	Pipe Numbers, list all regulated pipes: Pipe 01
IUP Expiration date : September 30, 2019	IUP 40 CFR # (if applicable), or N/A: N/A

B. IUP History.

Effective Date	Renewal or Modification	Description of changes over previous IUP.
July 1, 2015	New Permit	Permit issued to regulate the discharge/leachate from coal ash mining sites

C.) Authorization Statement:

1.) The Permittee is hereby authorized to discharge wastewater in accordance with the effluent limitations, monitoring requirements, and all other conditions set forth in this Industrial User Pretreatment Permit (IUP) into the sewer collection system and wastewater treatment facility of the Control Authority and/or Municipality.

2.) The Permittee is hereby authorized to continue operation of and discharge wastewater from the following treatment or pretreatment facilities. These facilities must correspond to the treatment units listed on both the application and inspection forms.

IU Treatment Units	
List all Treatment Units:	Descriptions:
2 grit chambers	**2 grit chambers with potential flocculent addition for TSS control and pH control**
Spill Protection	**1 million gallon storage tank and control valve to monitor flow and head off any spillage**

3.) The Permittee is hereby authorized to, if required by the Control Authority and/or Municipality and after receiving Authorization to Construct (A to C) from the Control Authority and/or Municipality, construct and operate additional pretreatment units as needed to meet final effluent limitations.

D.) Description of IUP Discharge(s):

1. Describe the discharge(s) from all regulated pipes.

Pipe # 01, Description of Discharge: Discharge consists of coal combustion by-products, including run-off via rainfall, from two sites. Leachate from one site will be trucked to the second site and discharged to 1 million gallon storage tank prior to pumping to collection system.

E.) Monitoring Locations and Schematic:

The sampling point for Pipe 01 shall be in the discharge pipe at the triple pump station, closest to the public sewer.

IUP, Part 1 Section F:

Effluent Limits and Monitoring Requirements

The Permittee may discharge from this specific Pipe number according to these specific dates, effluent limits, and monitoring requirements

Receiving POTW name =>	*Big Buffalo WWTP*	*IU name =>*	**Charah INC**
Receiving POTW NPDES # =>	NC 0024147	IUP # =>	**000035**
Effective date for these Limits =>	July 1, 2015	Pipe # =>	**01**
Expiration date for these Limits =>	September 1, 2019	40 CFR # =>	**N/A**
			if not applicable put N/A

THE LIMITS ON THIS PAGE ARE, (Check one below):

LIMITS for ENTIRE permit period =>	X
INTERIM Limits for period # 1 =>	
INTERIM Limits for period # 2 =>	
FINAL Limits Page =>	

		Concentration Limits		Mass-Based Limits			Monitoring Frequency			
		Daily Max	Units	Daily Max	Monthly Average	Units	By Industry	By City	Sample Collection Method (C or G)	Required Laboratory Detection Level in mg/L
1	Flow	0.288	MGD		0.144	MGD	Daily & Each Composite Sampling Event	Each Composite Sampling Event	Metered	
2	pH (Range Min./Max.)	6.0-10.5	Std. Units			lb/d	2 per week	2/6 months	Grab	Std. Units
3	Ammonia	M&R	mg/L			lb/d	2 per week	Once/year	Composite	0.1
4	TSS	M&R	mg/L			lb/d	2 per week	Once/year	Composite	2.5
5	Temperature	60	°C			lb/d	1 per six months	Once/year	Instantaneous	°C
6	Aluminum	M&R	mg/L			lb/d	2 per week	Once/year	Composite	0.001
7	Antimony	M&R	mg/			lb/d	2 per week	Once/year	Composite	0.001
8	Arsenic		mg/L		0.24	lb/d	2 per week	Once/year	Composite	0.005
9	Barium		mg/L		7.21	lb/d	2 per week	Once/year	Composite	0.002
10	Beryllium	M&R	mg/L			lb/d	2 per week	Once/year	Composite	0.01
11	Bromide	M&R	mg/L			lb/d	2 per week	Once/year	Composite	0.04
12	Cadmium	M&R	mg/L			lb/d	2 per week	Once/year	Composite	0.002
13	Chromium		mg/L		0.031	lb/d	2 per week	Once/year	Composite	0.005
14	Copper	M&R	mg/L			lb/d	2 per week	Once/year	Composite	0.005
15	Cyanide	M&R	mg/L			lb/d	2 per week	Once/year	Grab	0.01
16	Iron	M&R	mg/L			lb/d	2 per week	Once/year	Composite	0.005

		Concentration Limits		Mass-Based Limits			Monitoring Frequency			
		Daily Max	Units	Daily Max	Monthly Average	Units	By Industry	By City	Sample Collection Method (C or G)	Required Laboratory Detection Level in mg/L
17	Lead	M&R	mg/L			lb/d	2 per week	Once/year	Composite	0.001
18	Low Level Mercury		mg/L		0.002	lb/d	2 per week	Once/year	Grab	0.000001
19	Molybdenum		mg/L		0.048	lb/d	2 per week	Once/year	Composite	0.001
20	Nickel		mg/L		0.053	lb/d	2 per week	Once/year	Composite	0.005
21	Selenium		mg/L		0.240	lb/d	2 per week	Once/year	Composite	0.002
22	Silver	M&R	mg/L			lb/d	2 per week	Once/year	Composite	0.001
23	Strontium	M&R	mg/L			lb/d	2 per week	Once/year	Composite	0.001
24	Zinc		mg/L		0.103	lb/d	2 per week	Once/year	Composite	0.0005
25	TDS	M&R	mg/L			lb/d	1 per week	Once/year	Composite	
26	624/625	M&R	mg/L			lb/d	1 per six months	Once/year	Grab	
27	PCBs	M&R	mg/L			lb/d	1 per six months	Random	Grab	0.001
28	Radium 226/228	M&R	pCi/L					Random	Grab	
29	Uranium	M&R	µg/L					Random	Grab	

** Charah Inc. will be responsible for any monitoring cost incurred by Big Buffalo WWTP as it relates to this project. This will include any monitoring done at Big Buffalo WWTP to determine interference and/or pass through***.**

*** M&R is defined as Monitoring and Report.*

**** TDS shall mean Total Dissolved Solids to consist of sulfate, chloride, bicarbonate, sodium, potassium, magnesium, and calcium.*

1. **Startup conditions:**
   a. **After 6 consecutive months of test data have been received, the parameters subject to monitoring and reporting requirements will be subject to a review by the City of Sanford to determine if a permit limit is necessary in lieu of monitoring and reporting requirements.**

   b. **After 6 consecutive months of test data have been received, the permittee can submit a written request to the City of Sanford to review the test results to determine if a reduction in monitoring frequency would be appropriate.**

G.) Definitions and Limit Page(s) notes:

In addition to the definitions in the City of Sanford Sewer Use Ordinance the following definitions and requirements apply:

1. Composite Sample:

A composite sample for the monitoring requirements of this IUP, is defined as the automatic or manual collection of one grab sample of constant volume, not less than 100 ml, collected every hour during the entire discharge period on the sampling day. Sampling day shall be a typical production, and discharge day.

2. Daily Monitoring Frequency

Daily Monitoring Frequency as specified in this IUP shall mean each day of discharge.

3. Grab Sample

Grab sample for the monitoring requirements of this IUP, is defined as a single "dip and take" sample collected at a representative point in the discharge stream.

4. Instantaneous measurement

An Instantaneous measurement for the monitoring requirements of this IUP is defined as a single reading, observation, or measurement.

Industrial User Pretreatment Permit (IUP)

PART II

General Conditions

Outline of PART II,

1. Representative Sampling
2. Reporting
3. Test Procedures
4. Additional Monitoring by Permittee
5. Duty to comply
6. Duty to Mitigate
7. Facilities Operation, Bypass
8. Removed substances
9. Upset Conditions
10. Right of Entry
11. Availability of Records
12. Duty to provide information
13. Signatory Requirements
14. Toxic Pollutants
15. Civil and Criminal Liability
16. Federal and/or State Laws
17. Penalties
18. Need to Halt or Reduce
19. Transferability
20. Property Rights
21. Severability
22. Modification, Revocation, Termination
23. Reapplication
24. Dilution Prohibition
25. Reports of Changed Conditions
26. Construction of pretreatment facilities
27. Reopener
28. Categorical Reopener
29. General Prohibitive Standards
30. Reports of Potential Problems

1. Representative Sampling

Samples and measurements taken as required herein shall be representative of the volume and nature of the monitored discharge. All samples shall be taken at the monitoring points specified in this permit and, unless otherwise specified, before the effluent joins or is diluted by any other wastestream, body of water, or substance. Monitoring points shall not be changed without notification to, and approval by, the permit issuing authority.

2. Reporting

a.) Monitoring results obtained by the permittee shall be reported on forms specified by the Control Authority and/or Municipality post marked no later than 20 days following the month in which the data was received from the Certified Lab. If no discharge occurs during a reporting period (herein defined as each calendar month) in which a sampling event was to have occurred, a form with the phrase "no discharge" shall be submitted. Copies of these and all other reports required herein shall be submitted to the Control Authority and/or Municipality and shall be sent to the following address:

Sarah Jordan
Pretreatment Coordinator
City of Sanford Wastewater Management Facility
P.O. Box 3729
Sanford, North Carolina 27331-3729

b.) If the sampling performed by the permittee indicates a violation, the permittee shall notify the Control Authority and/or Municipality within 24 hours of becoming aware of the violation. The permittee shall also repeat the sampling and analysis and submit the results of the repeat analysis to the Control Authority and/or Municipality within 30 days after becoming aware of the violation.

c.) If no self-monitoring is required by this IUP, and the sampling performed by the Control Authority and/or Municipality indicates a violation, the Control Authority and/or Municipality shall notify the permittee within 24 hours of becoming aware of the violation, and the permittee shall sample for the applicable parameter and submit the results of this analysis within 30 days after the POTW became aware of the violation.

3. Test Procedures

Test procedures for the analysis of pollutants shall be performed in accordance with the techniques prescribed in 40 CFR part 136 and amendments thereto unless specified otherwise in the monitoring conditions of this permit.

4. Additional Monitoring by Permittee

If the permittee monitors any pollutant at the location(s) designated herein more frequently than required by this permit, using approved analytical methods as specified above, the results of such monitoring shall be submitted to the Control Authority and/or Municipality. The Control Authority and/or Municipality may require more frequent monitoring or the monitoring of other pollutants not required in this permit by written notification.

5. Duty to Comply

The permittee must comply with all conditions of this permit. Any permit noncompliance constitutes a violation of the Control Authority and/or Municipality Sewer Use Ordinance and is grounds for possible enforcement action.

6. Duty to Mitigate - Prevention of Adverse Impact

The permittee shall take all reasonable steps to minimize or prevent any discharge in violation of this permit which has a reasonable likelihood of adversely affecting human health, the POTW, the waters receiving the POTW's discharge, or the environment.

7. Facilities Operation, Bypass

The permittee shall at all times maintain in good working order and operate as efficiently as possible, all control facilities or systems installed or used by the permittee to achieve compliance with the terms and conditions of this permit. Bypass of treatment facilities is prohibited except when approved in advance by the Control Authority and/or Municipality. Bypass approval shall be given only when such bypass is in compliance with 40 CFR 403.17.

8. Removed Substances

Solids, sludges, filter backwash, or other pollutants removed in the course of treatment or control of wastewaters shall be disposed of in a manner such as to prevent any pollutants from such materials from entering the sewer system. The permittee is responsible for assuring its compliance with any requirements regarding the generation, treatment, storage, and/or disposal of "Hazardous waste" as defined under the Federal Resource Conservation and Recovery Act.

9. Upset Conditions

An "upset" means an exceptional incident in which there is an unintentional and temporary noncompliance with the effluent limitations of this permit 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 or inadequate treatment facilities, lack of preventative maintenance, or careless or improper operations.

An upset may constitute an affirmative defense for action brought for the noncompliance. The permittee has the burden of proof to provide evidence and demonstrate that none of the factors specifically listed above were responsible for the noncompliance.

10. Right of Entry

The permittee shall allow the staff of the State of North Carolina Department of Environment and Natural Resources, Division of Water Resources, the Regional Administrator of the Environmental Protection Agency, the Control Authority and/or Municipality, and/or their authorized representatives, upon the presentation of credentials:

1. To enter upon the permittee's premises where a real or potential discharge is located or in which records are required to be kept under the terms and conditions of this permit; and
2. At reasonable times to have access to and copy records required to be kept under the terms and conditions of this permit; to inspect any monitoring equipment or monitoring method required in this permit; and to sample any discharge of pollutants.

11. Availability of Records and Reports

The permittee shall retain records of all monitoring information, including all calibration and maintenance records as well as copies of reports and information used to complete the application for this permit for at least three years. All records that pertain to matters that are subject to any type of enforcement action shall be retained and preserved by the permittee until all enforcement activities have concluded and all periods of limitation with respect to any and all appeals have expired.

Except for data determined to be confidential under the Sewer Use Ordinance, all reports prepared in accordance with terms of this permit shall be available for public inspection at the Control Authority and/or Municipality. As required by the Sewer Use Ordinance, effluent data shall not be considered confidential.

12. Duty to Provide Information

The permittee shall furnish to the Director of Public Works or his/her designees, within a reasonable time, any information which the Director, his/her designee, or the Division of Water Resources 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, upon request, copies of records required to be kept by this permit.

13. Signatory Requirements

All reports or information submitted pursuant to the requirements of this permit must be signed and certified by the Authorized Representative as defined under the Sewer Use Ordinance. If the designation of an Authorized Representative is no longer accurate because a different individual or position has responsibility for the overall operation of the facility, or overall responsibility for environmental matters for the company, a new authorization satisfying the requirements of this section must be submitted to City of Sanford Pretreatment Coordinator prior to or together with any reports to be signed by an authorized representative.

14. Toxic Pollutants

If a toxic effluent standard or prohibition (including any schedule of compliance specified in such effluent standard or prohibition) is established under Section 307(a) of the Federal Clean Water Act for a toxic pollutant which is present in the discharge and such standard or prohibition is more stringent than any limitation for such pollutant in this permit, this permit may be revised or

modified in accordance with the toxic effluent standard or prohibition and the permittee so notified.

15. Civil and Criminal Liability

Nothing in this permit shall be construed to relieve the permittee from civil or criminal penalties for noncompliance.

16. Federal and/or State Laws

Nothing in this permit shall be construed to preclude the institution of any legal action or relieve the permittee from any responsibilities, liabilities, or penalties established pursuant to any applicable Federal and/or State law or regulation.

17. Penalties

The Sewer Use Ordinance of the Control Authority and/or Municipality provides that any person who violates a permit condition is subject to a civil penalty not to exceed $25,000 dollars per day of such violation.

Under state law, (NCGS 143-215.6B), under certain circumstances it is a crime to violate terms, conditions, or requirements of pretreatment permits. It is a crime to knowingly make any false statement, representation, or certification in any record or other document submitted or required to be maintained under this permit, including monitoring reports or reports of compliance or noncompliance. These crimes are enforced at the prosecutorial discretion of the local District Attorney.

18. Need to Halt or Reduce 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 to maintain compliance with the conditions of the permit.

19. Transferability

This permit shall not be reassigned or transferred or sold to a new owner, new user, different premises, or a new or changed operation without approval of the Town.

20. Property Rights

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.

21. Severability

The provisions of this permit are severable and, if any provision of this permit or the application of any provision of this permit to any circumstance is held invalid, the application of such provision to other circumstances and the remainder of this permit shall not be affected thereby.

22. Permit Modification, Revocation, Termination

This permit may be modified, revoked and reissued or terminated with cause in accordance to the requirements of the Control Authority and/or Municipality Sewer Use Ordinance and North Carolina General Statute or implementing regulations.

23. Re-Application for Permit Renewal

The permittee is responsible for filing an application for reissuance of this permit at least 180 days prior to its expiration date.

24. Dilution Prohibition

The permittee shall not increase the use of potable or process water or in any other way attempt to dilute the discharge as a partial or complete substitute for adequate treatment to achieve compliance with the limitations contained in this permit.

25. Reports of Changed Conditions

The permittee shall give notice to the Control Authority and/or Municipality of any planned significant changes to the permittee's operations or system which might alter the nature, quality, or volume of its wastewater at least 180 days before the change. The permittee shall not begin the changes until receiving written approval from the Control Authority and/or Municipality. Also see Part II, 30 below for additional reporting requirements for spill/slug issues.

Significant changes may include but are not limited to

(a) increases or decreases to production;
(b) increases in discharge of previously reported pollutants;
(c) discharge of pollutants not previously reported to the Control Authority and/or Municipality;
(d) new or changed product lines;
(e) new or changed manufacturing processes and/or chemicals; or
(f) new or changed customers.

26. Construction

No construction of pretreatment facilities or additions thereto shall be begun until Final Plans and Specifications have been submitted to the Control Authority and/or Municipality and written approval and an Authorization to Construct (A to C) have been issued.

27. Reopener

The permit shall be modified or, alternatively, revoked and reissued to comply with any applicable effluent standard or limitation for the control of any pollutant shown to contribute to toxicity of the WWTP effluent or any pollutant that is otherwise limited by the POTW discharge permit. The permit as modified or reissued under this paragraph may also contain any other requirements of State or Federal pretreatment regulations then applicable.

28. Categorical Reopener

This permit shall be modified, or alternatively, revoked and reissued, to comply with any applicable effluent standard or limitation issued or approved under Sections 302(b)(2)(C) and (D), 304(b)(2), and 307(a)(2) of the Clean Water Act, if the effluent standard or limitation so issued or approved:

1.) contains different conditions or is otherwise more stringent than any effluent limitation in this permit; or
2.) controls any pollutant not limited in this permit.

The permit as modified or reissued under this paragraph shall also contain any other requirements of the Act then applicable.

29. General Prohibitive Standards

The permittee shall comply with the general prohibitive discharge standards in 40 CFR 403.5 (a) and (b) of the Federal pretreatment regulations.

30. Potential Problems

The permittee shall provide protection from accidental and slug discharges of prohibited materials and other substances regulated by this permit. The permittee shall also notify the POTW immediately of any changes at its facility affecting the potential for spills and other accidental discharge, discharge of a non-routine, episodic nature, a non-customary batch discharge, or a slug load as defined in the Sewer Use Ordinance.

Additionally, the permittee shall notify by telephone the Control Authority and/or Municipality immediately of all discharges that could cause problems to the POTW including any slug loadings as defined in the Sewer Use Ordinance. If the permittee experiences such a discharge, they shall inform the Control Authority and/or Municipality immediately upon the first awareness of the commencement of the discharge. Notification shall include location of the discharge, type of waste, concentration and volume if known and corrective actions taken by the permittee. A written follow-up report thereof shall be filed by the permittee within five (5) days, unless waived by the Control Authority and/or Municipality.

1. Slug/Spill Control Measures

In addition to the requirements in Part II, 30, the Permittee shall complete installation and/or commence implementation, operation, and/or maintenance of the following specific protection Measures, Activities, Plans. Etc. (Items without specific completion dates, or marked as "Continuous." must be performed for the entire duration of the permit):

Description of Measure, Activity, Plan, etc.	Required Completion/ Implementation Date
Implement Spill Control Plan	Continuous
Implement Toxic Organic Management Plan	Continuous

The permittee shall provide updates to the Control Authority as required by Part II, 30, of this IUP. Modifications to the measures shall be approved by the Control Authority prior to installation/implementation. If a measure fails, the Control Authority shall be notified within 24 hours.

2. Sludge Management Plan

Ninety days prior to the initial disposal of sludge generated by any pretreatment facility (e.g., grit or any solids through pretreatment facility), the permittee shall submit a sludge management plan to the Control Authority.

3. Flow Measurement Requirements

The permittee shall maintain appropriate discharge flow measurement devices and methods consistent with approved scientific practices to ensure the accuracy and reliability of measurements of the volume of monitored discharges. Devices installed shall be a flow meter capable of measuring flows with a maximum deviation of less than 5% from true discharge rates throughout the range of expected discharge volumes. The devices shall be installed, calibrated, and maintained to ensure accuracy. The totalizer shall be non-resettable. At the time of issuance of the permit, this method consists of Pipe 01 consist of a magnetic flowmeter. The permittee shall provide access to the Control Authority for meter reading.

Pipe 01's meter shall be calibrated annually by a non-affiliated third party that must be approved by the Control Authority. Modifications to the flow metering equipment shall be approved by the Control Authority prior to installation. If a required flow measurement device fails, the Control Authority shall be notified within 24 hours.

4. Suspension or Revocation of Permit

This permit may be modified, suspended, or revoked in whole or in part during its term including, but not limited to, the following:

1. Violation of any terms or conditions of this permit, the Sewer Use Ordinance and/or the State and Federal General Pretreatment Regulations for Existing and New Sources of Pollution.

2. Obtaining this permit by misrepresentation or failure to disclose fully all relevant facts.

3. A change in any condition that requires either a temporary or permanent reduction or elimination of the regulated discharge.

4. Falsifying self-monitoring reports, tampering with monitoring equipment, or refusing timely access to the facility premises and records.

5. Failure to comply with effluent limitations set forth in Part I Section F of this permit.

6. As necessary to reallocate industrial discharge limitations to allow new industrial customers to discharge to the system.

7. The Control Authority may modify or reissue this permit as local, state or federal regulations change or as needed to prevent pass through or interference of the City's wastewater treatment plant or to prevent violations of the City's wastewater discharge permits or any permits to operate or manage biosolids regardless of the expiration date.

5. Certified Laboratory Analysis

Pollutant analysis shall be performed by a North Carolina Division of Water Resources Certified Laboratory that is certified in the analysis of the pollutant in wastewater.

6. Certified Operator

Pursuant to Chapter 90A-44 of North Carolina General Statutes, and upon classification of the facility by the Certification Commission, the permittee shall employ a certified wastewater pretreatment plant operator in responsible charge (ORC) of the wastewater treatment facilities. Such operator must hold a certification of the type and grade equivalent to, or greater than the classification assigned to the wastewater treatment facilities by the Certification Commission. The permittee must also employ a certified backup operator of the appropriate type and grade to comply with the conditions of Title 15A, Chapter 8A .0202. The ORC of the facility must visit the wastewater facility as required; must properly manage and document daily operation and maintenance of the facility; and must comply with all other conditions of Title 15A, Chapter 8A .0202. The permittee shall submit a letter designating the operator in responsible charge to

the Certification Commission or their designee within thirty days after facility classification.

7. Hauled Liquid Waste Transporter Requirements

- Maintain tanks, pumps, valves, hoses, racks, cylinders, diaphragms, pipes, connections, and other appurtenances on a vehicle in good repair and free from leaks
- Provide a safety plug or cap for each tank
- Ensure that the vehicle exterior is clean at the beginning of each work day (prior to entry to the POTW)
- Clean the inside of tanks to ensure that non-permitted residual waters are not left in the tank and allowed to mix with permitted waste
- The sample tank/truck shall be an integral part of a vehicle to transport liquid/solid waste. Portable tanks or other containers temporarily installed in vehicles are prohibited (unless prior approval is obtained by the City of Sanford, e.g. portable toilets)
- Piping valves, and connections (excluding the discharge hose) shall be permanently attached to the tank and/or vehicle
- Tanks/trucks must be liquid tight and tanks/trucks constructed so that every interior and exterior portion can be cleaned
- Opening of tank to be constructed so that collected waster will not spill during filling, transfer, transport, or disposal
- Outlet connections to be constructed so that no liquid waste will spill, leak, or run out from the vehicle
- Outlets to be of a design and type suitable for the liquid waste handled and capable of controlling flow or discharge without spillage and undue spray on or flooding of immediate surroundings while in use
- Pumps, valves, cylinders, diaphragms, and other appurtenances to be of a design and type suitable for the type of waste handled, capable of operation without spillage, spray, or leakage, and capable of being disassembled for cleaning
- A permanent stencil or data plate shall be displayed indicating the tanker volume. The volume shall be certified by a licensed calibration or by the manufacturer's plate compliant with the Code of Federal Regulations
- Hauling discharge should not exceed flow limit outlined in the limits section of this permit (Discharge is not to be greater than .288 MGD)
- Pump and haul discharge to the POTW ceases upon completion of construction of piping from the Colon Mine Site to the Big Buffalo Wastewater Treatment Plan

MAILED 9/22/15

North Carolina Department of Environmental Quality

Pat McCrory
Governor

Donald R. van der Vaart
Secretary

September 22, 2015

Charles Price, CEO
Green Meadow, LLC
12601 Plantside Dr.
Louisville, KY 40299

Subject: Approval for Pump and Haul
Brickhaven Mine
Chatham County

Dear Mr. Price:

In response to your request, the Division of Water Resources Raleigh Regional Office hereby grants approval for up to 80,000 gallons per day of coal ash stormwater leachate wastewater to be pumped and hauled from on-site storage tanks at the Brickhaven mine as follows:

1) Green Meadow LLC (a subsidiary of Charah Inc.) to pump industrial wastewater (leachate) from the Brickhaven Mine facility in Chatham County and haul to the City of Sanford's treatment facility for treatment and disposal into the City of Sanford's Big Buffalo Creek Wastewater Treatment Plant pursuant to your application dated September 16, 2015.

2) VLS Recovery Services LLC of Mauldin, South Carolina to pump industrial wastewater from the Brickhaven Mine facility in Chatham County and haul to VLS Recovery Services LLC's Mauldin, SC treatment facility pursuant to your application dated September 16, 2015.

This approval shall become voidable unless the agreements between: 1) Green Meadow LLC and the City and Sanford and 2) between Green Meadow LLC and VLS Recovery Services LLC for the hauling and final treatment of the wastewater are in full force and effect.

Your application did not address the Colon Mine facility or any leachate storage or pumping from that facility. Accordingly, this approval does not address the Colon Mine site. You will need to modify your application and receive approval to pump and haul wastewater to that facility, as appropriate.

In addition, coal ash leachate wastewater generated from the proposed rail unloading area at the Brichaven Mine and the respective changes to storage capacities is not currently designed and was not included in your application. Accordingly, this approval does not include this wastewater. You will need to modify you application and receive approval to pump and haul wastewater from the rail and loading area, as appropriate.

The pumping and hauling herein described shall be performed in accordance with the description, terms, and conditions specified in the application and in this document. If any parts, requirements, or limitations contained in this approval are unacceptable, please provide a written response within ten days of your receipt of this approval,

describing your concerns. This cover letter shall be considered a part of this approval and is therefore incorporated therein by reference.

If you have any questions regarding this approval or require any additional information, please contact Jason Robinson at (919) 791-4200, or by e-mail to jason.t.robinson@ncdenr.gov.

Sincerely,

S. Daniel Smith

for S. Jay Zimmerman, P.G.
Director, Division of Water Resources

by S. Daniel Smith, Regional Supervisor
Water Quality Regional Operations Section
Raleigh Regional Office
Division of Water Resources, NCDEQ

cc: RRO SWP
Chatham County Public Health Department: P.O. Box 1809, Pittsboro, NC 27312

PERMISSION IS HEREBY GRANTED TO
Green Meadow, LLC
Chatham County

for the operation of an industrial wastewater pump and haul activity which will consist of the storage and pumping of up to 80,000 gallons per day of primarily coal ash stormwater leachate wastewater from the Brickhaven Mine in Chatham County and hauling to the City of Sanford's Big Buffalo Creek Wastewater Treatment Plant for final treatment and disposal This approval shall become voidable unless the agreements between Green Meadow LLC and the City of Sanford for the hauling and final treatment of the wastewater are in full force and effect.

Permission is also hereby granted to Green Meadow, LLC for VLS Recovery Services LLC of Mauldin, South Carolina to pump and haul the wastewater from the Brickhaven Mine in Chatham County to VLS Recovery Services LLC's wastewater treatment facility in Mauldin, South Carolina, pursuant to your application dated September 16, 2015. In addition, this approval shall become voidable unless the agreements between Green Meadow LLC and VLS Recovery Services LLC for the hauling and final treatment of the wastewater are in full force and effect.

This approval shall be subject to the following specified conditions and limitations:

1. This approval shall become voidable unless the pump and haul activities are carried out in a manner that has been approved by the Division of Water Resources (the Division).

2. This approval is effective only with respect to the nature and volume of wastewater described in your September 16 application of 80,000 gpd from the Brickhaven Mine in Chatham County

3. The facilities for wastewater storage shall be properly operated, maintained and inspected at all times.

4. This approval is not transferable. In the event of sale, name change, ownership transfer or similar activities, a formal request for change must be submitted to the Division.

5. No type of wastewater other than that generated by coal ash stormwater leachate from the Brickhaven Mine in Chatham County shall be included in this pump and haul activity. **This approval specifically prohibits the inclusion of any domestic wastewater in the pump and haul activity.**

6. In the event that the facilities fail to perform satisfactorily, including the creation of nuisance conditions, Green Meadow LLC shall cease operation of all pump and haul activities and take such immediate corrective actions as may be required by this Division.

7. Green Meadow LLC is liable for any damages caused by a spill or failure of the pump and haul operations carried out within their premises.

8. Green Meadow LLC shall keep a daily inspection log or summary including, as a minimum, the date and time of inspections, observations made, and any maintenance, repairs, or corrective actions taken by Green Meadow LLC affecting any aspect of the pump and haul process including any significant changes which could affect the type or character of the wastewater.

9. An accurate record of the pump and haul activities from the Brickhaven Mine in Chatham County must be maintained by Green Meadow LLC indicating:

    a) The date wastewater is removed from the facility,
    b) The name and permit number of the carrier (hauler) of the wastewater,
    c) The name of the facility receiving the wastewater, and
    d) The volume of wastewater removed

The records as required in paragraphs 8 and 9 shall be submitted quarterly to the Supervisor of the Water Quality Regional Operations, Raleigh Regional Office, Division of Water Resources, 1628 Mail Service Center, Raleigh, NC 27699-1628. The records must be submitted within 30 days of the end of each quarter. (Quarters end on the last day of March, June, September, and December).

10. Any duly authorized officer, employee, or representative of the Division of Water Resources may, upon presentation of credentials, enter and inspect any property, premises, or place on or related to the pump and haul collection facilities at any reasonable time for the purpose of determining compliance with the Division's approval; may inspect or copy any records that must be maintained under the terms and conditions of this approval; and may obtain samples.

13. Failure to abide by the conditions and limitations contained in this approval may subject Green Meadow LLC to appropriate enforcement actions available to the Division.

14. The granting of this approval does not preclude Green Meadow LLC from complying with any and all statutes, rules, regulations, or ordinances that may be imposed by other government agencies (local, state, and federal) that have jurisdiction.

Noncompliance Notification:

Green Meadow LLC shall report by telephone to the Raleigh Regional Office, telephone number 919-791-4200, as soon as possible, but in no case more than twenty-four (24) hours or on the next working day following the occurrence or first knowledge of the occurrence of any of the following:

a. Any process unit failure, due to known or unknown reasons, that render the facility incapable of adequate wastewater pre-treatment such as mechanical or electrical failures of pumps, aerators, compressors, etc.

b. Any failure of a pumping station, force main, gravity line, etc., resulting in a by-pass directly or indirectly to receiving waters without treatment of all or any portion of the influent to such station or facility.

Persons reporting such occurrences by telephone shall also file a written report in letter form within five (5) days following first knowledge of the occurrence. This report must outline the actions taken or proposed to be taken to ensure that the problem does not recur.

Approval granted this the 22st day of September, 2015.

for S. Jay Zimmerman, P.G.
Director, Division of Water Resources

by S. Daniel Smith, Regional Supervisor
Water Quality Regional Operations Section
Raleigh Regional Office
Division of Water Resources, NCDEQ

North Carolina Department of Environment and Natural Resources

Pat McCrory
Governor

Donald R. van der Vaart
Secretary

July 31, 2015

DWR # 15-0041 and 0042
Chatham and Lee Counties

Green Meadows, LLC
Attn: Mr. Charles Price
12601 Plantside Drive
Louisville, KY 40299

Subject: Approval of Individual 401 Water Quality Certification and Isolated and Other Non-404 Jurisdictional Wetlands and Waters General Permit with Additional Conditions
Brickhaven and Sanford Mines
USACE Action ID. No. SAW-2014-02254

Dear Mr. Price:

Attached hereto is a copy of Certification No. 4026 issued to Mr. Charles Price and Green Meadows, LLC, dated July 31, 2015 and the Isolated and Other Non-404 Jurisdictional Wetlands and Waters General Permit (IWGP100000). Please note that you should get any other federal, state or local permits before proceeding with the subject project, including those required by (but not limited to) Sediment and Erosion Control, Non-Discharge, and Water Supply Watershed regulations.

This approval and its conditions are final and binding unless contested. This Certification can be contested as provided in Articles 3 and 4 of General Statute 150B by filing a written petition for an administrative hearing to the Office of Administrative Hearings (hereby known as OAH) **within sixty (60) calendar days**.

A petition form may be obtained from the OAH at http://www.ncoah.com/ or by calling the OAH Clerk's Office at (919) 431-3000 for information. A petition is considered filed when the original and one (1) copy along with any applicable OAH filing fee is received in the OAH during normal office hours (Monday through Friday between 8:00am and 5:00pm, excluding official state holidays).

The petition may be faxed to the OAH at (919) 431-3100, provided the original and one copy of the petition along with any applicable OAH filing fee is received by the OAH within five (5) business days following the faxed transmission.

Division of Water Resources
1617 Mail Service Center, Raleigh, North Carolina 27699-1617
Location: 512 N Salisbury St, Raleigh, North Carolina 27604
Phone: 919-807-6300 \ FAX: 919-807-6492
Internet: www.ncwaterquality.org
An Equal Opportunity \ Affirmative Action Employer – Made in part by recycled paper

Mailing address for the OAH:

If sending via US Postal Service:

Office of Administrative Hearings
6714 Mail Service Center
Raleigh, NC 27699-6714

If sending via delivery service (UPS, FedEx, etc):

Office of Administrative Hearings
1711 New Hope Church Road
Raleigh, NC 27609-6285

One (1) copy of the petition must also be served to DENR:

Sam M. Hayes, General Counsel
Department of Environment and Natural Resources
1601 Mail Service Center
Raleigh, NC 27699-1601

Unless such a petition is filed, this Certification shall be final and binding.

This certification completes the review of the Division under section 401 of the Clean Water Act, 15A NCAC 02H .0500 and 15A NCAC 02H .1300. Please contact Jennifer Burdette at 919-807-6364 or jennifer.burdette@ncdenr.gov or me at 919-807-6360 or karen.higgins@ncdenr.gov if you have any questions or concerns.

Sincerely,

S. Jay Zimmerman, P.G.
Director, Division of Water Resources

Attachments: Certification #4026, IWGP100000

cc: Clement Riddle, ClearWater Environmental Consultants, Inc., 224 South Grove Street, Ste F, Hendersonville, NC 28792
USACE Raleigh Regulatory Field Office
Todd Bowers, EPA, Sam Nunn Federal Center, 61 Forsyth Street SW, Atlanta, GA 30303
Janet Boyer, DEMR State Mining Specialist
Ed Mussler, PE, DWM Permitting Supervisor
DWR RRO 401 file
DWR 401 & Buffer Permitting Unit file

Filename: 150041-42SandfordBrickhavenMines(LeeChatham)_401_IC.docx

DEPARTMENT OF THE ARMY
WILMINGTON DISTRICT, CORPS OF ENGINEERS
69 DARLINGTON AVENUE
WILMINGTON, NORTH CAROLINA 28403-1343

REPLY TO
ATTENTION OF

September 3, 2015

Regulatory Division/1200A

Action ID: SAW-2014-02254

Mr. Charles Price
Green Meadow, LLC
12601 Plantside Drive
Louisville, KY 40299

Dear Mr. Price:

In accordance with your written request of February 18, 2015, along with additional information received by email, and the ensuing administrative record, enclosed are two copies of a permit to discharge fill material into 1,716 linear feet of jurisdictional stream and 1.11 acres of jurisdictional wetlands at the Sanford Mine in Lee County, North Carolina and 2,540 linear feet of jurisdictional stream and 0.052 acre of jurisdictional wetlands at the Brickhaven Mine in Chatham County, North Carolina. Specifically, this permit authorizes a total of 4,256 linear feet of jurisdictional stream impacts and 1.162 acres of jurisdictional wetlands subject to our regulatory authority pursuant to Section 404 of the Clean Water Act through the discharge of fill material associated with the site preparation necessary for mine reclamation and subsequent coal ash disposal.

Any deviation in the authorized work will likely require modification of this permit. If a change in the authorized work is necessary, you should promptly submit revised plans to the Corps showing the proposed changes. You may not undertake the proposed changes until the Corps notified you that your permit has been modified.

Carefully read your permit. The general and special conditions are important. Your failure to comply with these conditions could result in a violation of Federal law. Certain significant general conditions require that:

a. You must complete construction before December 31, 2020.

b. You must notify this office in advance as to when you intend to commence and complete work.

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c. You must allow representatives from this office to make periodic visits to your worksite as deemed necessary to assure compliance with permit plans and conditions.

You should address all questions regarding this authorization to Mr. David E. Bailey, in the Raleigh Regulatory Field Office, telephone number (919) 554-4884, extension 30.

Thank you in advance for completing our Customer Survey Form. This can be accomplished by visiting our web-site at http://regulatory.usacesurvey.com and completing the survey on-line. We value your comments and appreciate your taking the time to complete a survey each time you interact with our office.

Sincerely,

Jean B. Gibbs

for Kevin P. Landers Sr.
Colonel, U.S. Army
District Commander

Enclosures

Copy Furnished (with enclosures):

Chief, Source Data Unit
NOAA/National Ocean Service
Attn: Sharon Tear N/CS261
1315 East-West Hwy., Rm 7316
Silver Spring, Maryland 20910-3282

Copies Furnished with special conditions and plans:

Mr. Pete Benjamin
U.S. Fish and Wildlife Service
Raleigh Ecological Service Field Office
Post Office Box 33726
Raleigh, North Carolina 27636-3726

Printed on Recycled Paper

Mr. Fritz Rohde
Habitat Conservation Division – Atlantic Branch
101 Pivers Island Road
Beaufort, North Carolina 28516

Mr. William Cox
Wetlands and Marine Regulatory Section
U.S. Environmental Protection Agency – Region 4
Sam Nunn Atlanta Federal Center
61 Forsyth Street, SW
Atlanta, Georgia 30303-8931

Mr. Doug Huggett
Division Coastal Management
N.C. Department of Environment and Natural Resources
400 Commerce Avenue
Morehead City, North Carolina 28557

Dr. Pace Wilber
Habitat Conservation Division – Atlantic Branch
NOAA Fisheries Service
219 Fort Johnston Road
Charleston, South Carolina 29412

Mr. Tony Able
Wetlands Regulatory Section
U.S. Environmental Protection Agency – Region 4
Sam Nunn Atlanta Federal Center
61 Forsyth Street, SW
Atlanta, Georgia 30303

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A2

A2 – Well Abandonment Records

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Buxton Environmental, Inc.

1101 South Blvd., Suite 101 ~ Charlotte, North Carolina 28203
Phone (704) 344-1450 ~ Fax (704) 344-1451 ~ e-mail: buxtonenv@bellsouth.net

June 26, 2015

Mr. Mike Plummer, PE
HDR Engineering of the Carolinas, Inc.
440 South Church Street, Suite 1000
Charlotte, North Carolina 28202

Subject: ***Report of Abandonment of Piezometers at Cells 1 and 2***
Brickhaven No. 2 Mine Tract "A" Structural Fill
1315 Moncure-Flatwood Road (new address: 1271 Moncure-Flatwood Road)
Moncure, North Carolina

Dear Mr. Plummer,

Buxton Environmental, Inc. respectfully submits this report documenting the abandonment of piezometers located within and adjacent to the footprint of Cells 1 and 2 at the Brickhaven No. 2 Mine Tract "A" Structural Fill site located at 1315 Moncure-Flatwood Road (new address: 1271 Moncure-Flatwood Road) in Moncure, North Carolina. The piezometers were installed during the Design Hydrogeologic Report investigation conducted at the site by Buxton Environmental, Inc. The abandonment activities were conducted prior to construction of Cells 1 and 2 on behalf of HDR Engineering of the Carolinas, Inc. The piezometer abandonment activities were conducted in accordance with North Carolina Well Construction Standards (15A NCAC 02C .0113) by a North Carolina Registered Driller, and North Carolina Department of Environment and Natural Resources-Solid Waste Section (NCSWS) guidelines.

From May 26 through June 23, 2015, Mr. Steve Poloniewicz (North Carolina Well Contractor Certification # 2284-A) with SAEDACCO, Inc. conducted the abandonment of nine (9) single stand-alone shallow piezometers (PZM-5, PZM-10, PZM-11, PZM-12, PZM-13, PZM-15, PZM-16, PZM-18 and, PZM-29) and four (4) shallow/deep nested piezometer pairs (PZM-2 and PZM-2D, PZM-7s and PZM-7, PZM-14s and PZM-14, and PZM-17s and PZM-17) with oversight by Mr. Ross Klingman, P.G. (North Carolina Geologist License #1266) with Buxton Environmental, Inc. (North Carolina Corporate License #C-278). Prior to the abandonment of the piezometers, the protective steel stand-up well covers and concrete pads were removed. Each shallow piezometer was abandoned by over-drilling by advancing 8-inch outer diameter (4.25-inch inner diameter) hollow-stem augers over the piezometer (to keep boring centered) to the base of the piezometer (with the exception of PZM-5 as explained below), removing the PVC piezometer material, and tremie-grouting the boring from the base of the piezometer to the ground surface with neat cement grout. At PZM-5, auger refusal was encountered before reaching the total 27-foot depth of the piezometer (auger refusal occurred at 12-feet below grade). Each nested piezometer pair was abandoned by over-drilling by first pulling the shallow piezometer, then advancing 8-inch outer diameter (4.25-inch inner diameter) hollow-stem augers over the piezometer (to keep boring centered) to the base of the piezometer, removing the PVC piezometer material, and tremie-grouting the boring from the base of the piezometer to the ground surface with neat cement grout. Removed piezometer materials were properly disposed at an off-site facility by SAEDACCO, Inc. The Well Abandonment Records (Form GW-30) and original boring logs are attached in Appendix A. Reference Figure 3 in the Design Hydrogeologic Report section of the Brickhaven No.2 Mine Tract "A" Structural Fill permit application for abandoned piezometer locations.

If you have any further questions concerning these matters, please give me a call at (704) 344-1450.

Sincerely,
Buxton Environmental, Inc.

Ross Klingman, P.G.

NORTH CAROLINA
LICENSED
SEAL
1266
GEOLOGIST
CHARLES ROSS KLINGMAN

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APPENDIX A
WELL ABANDONMENT RECORDS AND BORING LOGS

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Buxton Environmental, Inc.
Consulting Services
1101 South Blvd., Suite 101
Charlotte, North Carolina 28203
Ph (704) 344-1450 Fax (704) 344-1451
buxtonenv@bellsouth.net

Boring Log, PZM-5

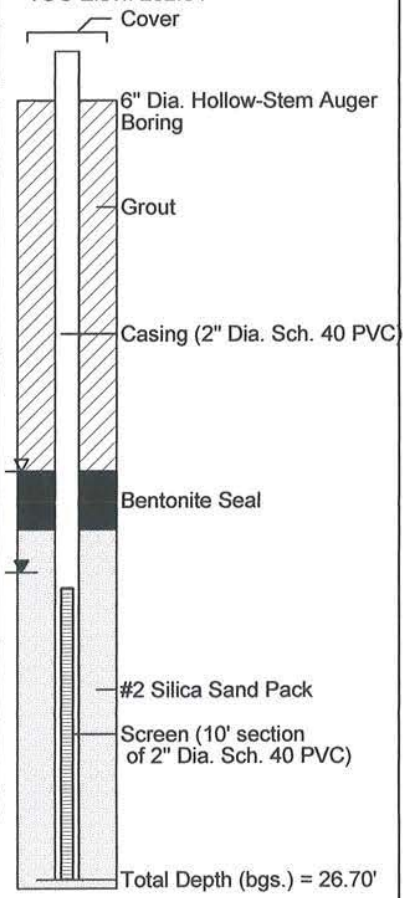
Moncure Mine Reclamation Site
1315 Moncure-Flatwood Road
Moncure, North Carolina

Date Started:	: 8/6/14	Logged By:	: Sean Quarry (HDR)
Date Completed:	: 8/6/14	Drilling Method:	: HSA; CME-550
Drilling Company:	: HPC Land Services	Top-of-Casing Elev.:	: 232.34'(Lawrence Survey)
Drillers Name:	: Jason Cain	Ground Surface Elev.:	: 229.26'(Lawrence Survey)
NC Driller Certification:	: 3112A	Natural, Cut, Fill Grade::	natural

Water Levels
▼ 1 Hour = 15.95'
▽ 24 Hours = 12.49'

Sample Type
SS = Split Spoon
ST = Shelby Tube
RC = Rock Core
BAG = Bag Sample

Depth (feet bgs.)	Elevation (feet asl.)	Blow Count/6-inches	Sampler Type	Recovery (in.)	Lithologic Description
0	229.26		SS,BAG	18	moist; stiff; reddish brown (5 YR 4/4) with gray; fine sandy silty clay; medium plasticity; cohesive; Residuum; (Lab Results: PZM-5 Bag (0-1.5'); USCS=CL; Gravel=15.7; Sand=21.4%; Silt=48.3%; Clay=14.6%; Effective Porosity=15%; Atterberg Limits: PL=22, LL=35, PI=13)
5	224.26				
		50/1"	SS	4	moist; very hard; reddish brown (5YR 4/4) with gray; fine sandy silty clay; medium plasticity; cohesive; Partially Weathered Rock
10	219.26				
15	214.26				
		50/0.5"	SS	0	soil cuttings; moist; very hard; reddish brown (5YR 4/4); fine sandy silty clay; medium plasticity; cohesive; Partially Weathered Rock
20	209.26				
		50/0.5"	SS	0	soil cuttings; wet; very hard; dark reddish brown (5YR 3/3); fine sandy silty clay' medium plastic; cohesive; Partially Weathered Rock
25	204.26				
					Auger Refusal @ 27'
30	199.26				
35	194.26				
40	189.26				
45					



WELL ABANDONMENT RECORD

This form can be used for single or multiple wells

1. Well Contractor Information:

Steve Poloniewicz

Well Contractor Name (or well owner personally abandoning well on his/her property)

2284-A

NC Well Contractor Certification Number

SAEDACCO Inc

Company Name

2. Well Construction Permit #: , ,

List all applicable well permits (i.e. County, State, Variance, Injection, etc.) if known

3. Well use (check well use):

Water Supply Well:	
☐Agricultural	☐Municipal/Public
☐Geothermal (Heating/Cooling Supply)	☐Residential Water Supply (single)
☐Industrial/Commercial	☐Residential Water Supply (shared)
☐Irrigation	
Non-Water Supply Well:	
☒Monitoring	☐Recovery
Injection Well:	
☐Aquifer Recharge	☐Groundwater Remediation
☐Aquifer Storage and Recovery	☐Salinity Barrier
☐Aquifer Test	☐Stormwater Drainage
☐Experimental Technology	☐Subsidence Control
☐Geothermal (Closed Loop)	☐Tracer
☐Geothermal (Heating/Cooling Return)	☐Other (explain under 7g)

4. Date well(s) abandoned: 05/30/2015

5a. Well location:

Green Meadows LLC c/o Buxton Environmental

Facility/Owner Name — Facility ID# (if applicable)

1315 Moncure-Flatwood Road Moncure, NC 27559 Chath

Physical Address, City, and Zip

Chatham

County — Parcel Identification No. (PIN)

5b. Latitude and longitude in degrees/minutes/seconds or decimal degrees:
(if well field, one lat/long is sufficient)

35.594601 N 79.011080 W

CONSTRUCTION DETAILS OF WELL(S) BEING ABANDONED

*Attach well construction record(s) if available. For multiple injection or non-water supply wells **ONLY** with the same construction/abandonment, you can submit one form.*

6a. Well ID#: PZM-5

6b. Total well depth: 28 **(ft.)**

6c. Borehole diameter: 2" **(in.)**

6d. Water level below ground surface: _____ **(ft.)**

6e. Outer casing length (if known): 28' **(ft.)**

6f. Inner casing/tubing length (if known): _____ **(ft.)**

6g. Screen length (if known): _____ **(ft.)**

For Internal Use ONLY:

WELL ABANDONMENT DETAILS

7a. Number of wells being abandoned: 1

*For multiple injection or non-water supply wells **ONLY** with the same construction/abandonment, you can submit one form.*

7b. Approximate volume of water remaining in well(s): _____ **(gal.)**

FOR WATER SUPPLY WELLS ONLY:

7c. Type of disinfectant used: _____

7d. Amount of disinfectant used: _____

7e. Sealing materials used (check all that apply):

☒ Neat Cement Grout	☐ Bentonite Chips or Pellets
☐ Sand Cement Grout	☐ Dry Clay
☐ Concrete Grout	☐ Drill Cuttings
☐ Specialty Grout	☐ Gravel
☐ Bentonite Slurry	☐ Other (explain under 7g)

7f. For each material selected above, provide amount of materials used:

Neat Cem.:94lb ,Wtr:7gal. Sand Cem.:lb ,Wtr:gal.

Neat cememt Amount:~75 gallons

7g. Provide a brief description of the abandonment procedure:

Overdrill with 8" outer diameter HSA to base of well, remove PVC well, tremmie grout from bottom to grade. SEE TEXT For clarification. RK

8. Certification:

Steve Poloniewicz — 6/17/2015

Signature of Certified Well Contractor or Well Owner — Date

By signing this form, I hereby certify that the well(s) was (were) abandoned in accordance with 15A NCAC 02C .0100 or 2C .0200 Well Construction Standards and that a copy of this record has been provided to the well owner.

9. Site diagram or additional well details:
You may use the back of this page to provide additional well site details or well abandonment details. You may also attach additional pages if necessary.

SUBMITTAL INSTRUCTIONS

10a. For All Wells: Submit this form within 30 days of completion of well abandonment to the following:

Division of Water Resources, Information Processing Unit,
1617 Mail Service Center, Raleigh, NC 27699-1617

10b. For Injection Wells: In addition to sending the form to the address in 10a above, also submit one copy of this form within 30 days of completion of well abandonment to the following:

Division of Water Resources, Underground Injection Control Program,
1636 Mail Service Center, Raleigh, NC 27699-1636

10c. For Water Supply & Injection Wells: In addition to sending the form to the address(es) above, also submit one copy of this form within 30 days of completion of well abandonment to the county health department of the county where abandoned.

Buxton Environmental, Inc.
Consulting Services
1101 South Blvd., Suite 101
Charlotte, North Carolina 28203
Ph (704) 344-1450 Fax (704) 344-1451
buxtonenv@bellsouth.net

Boring Log, PZM-10

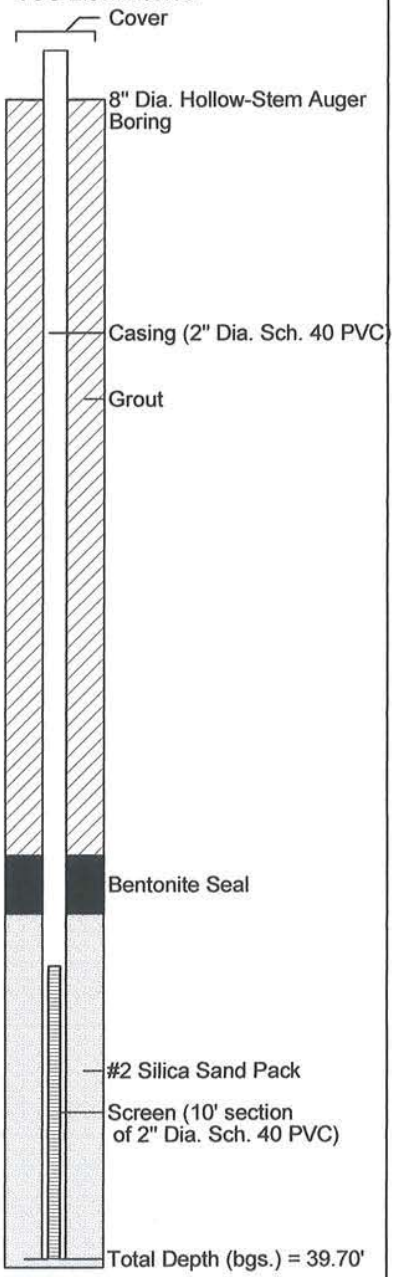
Moncure Mine Reclamation Site
1315 Moncure-Flatwood Road
Moncure, North Carolina

Date Started:	: 8/12/14	Logged By:	: Sean Quarry (HDR)
Date Completed:	: 8/12/14	Drilling Method:	: HSA; CME-550
Drilling Company:	: Summit Engineering	Top-of-Casing Elev.:	: 265.06'(Lawrence Survey)
Drillers Name:	: Robert Cassell	Ground Surface Elev.:	: 262.23'(Lawrence Survey)
NC Driller Certification:	: 4143A	Natural, Cut, Fill Grade::	cut

Water Levels
▼ 1 Hour = dry
▽ 24 Hours = dry

Sample Type
SS = Split Spoon
ST = Shelby Tube
RC = Rock Core
BAG = Bag Sample

Depth (feet bgs.)	Elevation (feet asl.)	Blow Count/6-inches	Sampler Type	Recovery (in.)	Lithologic Description
0	262.23	4 4 6	SS	20	moist; stiff; dark reddish brown (5YR 3/4) with gray; silty clay; medium plasticity; cohesive; Residuum
5	257.23	7 11 14	SS	17	moist; very stiff; dark reddish brown (5YR 3/4) with gray; horizontal fissile; sandy silty clay; medium plasticity; cohesive; Residuum
10	252.23	7 9 22	SS	16	moist; very stiff; dark reddish brown (5YR 3/3) with gray, yellow and black; silty sandy clay; medium plasticity; cohesive; Residuum
15	247.23	24 50/5"	SS	13	moist; very hard; reddish brown (5YR 4/3) with gray; horizontal fissle; sandy silty clay; low plasticity; cohesive; Partially Weathered Rock
20	242.23	25 50/5"	SS,BAG	11	moist; very hard; reddish brown (5YR 6/3) with gray; sandy silty clay; low plasticity; cohesive; Partially Weathered Rock; (Lab Results: PZM-10 Bag (18.5-20'); USCS=CL; Sand=11.9%; Silt=59.1%; Clay=29%; Effective Porosity=4%; Atterberg Limits: PL=19, LL=30, PI=11)
25	237.23	50/5"	SS	5	moist; very hard; dark reddish gray (5YR 4/2); horizontal fissle; silty sandy clay; low plasticity; cohesive; Partially Weathered Rock
30	232.23	50/2"	SS	2	moist; very hard; dark reddish gray (5YR 4/2); silty clay; low plasticity; cohesive; Partially Weathered Rock
35	227.23	43 50/2"	SS	10	moist/wet; very hard; yellowish red (5YR 4/6); silty clay; low plasticity; cohesive; Partially Weathered Rock
40	222.23	50/0.5"	SS	1	wet; very hard; yellowish red (5YR 4/6); silty clay; low plasticity; cohesive; Partially Weathered Rock
45					



WELL ABANDONMENT RECORD

This form can be used for single or multiple wells

1. Well Contractor Information:

Steve Poloniewicz

Well Contractor Name (or well owner personally abandoning well on his/her property)

2284-A

NC Well Contractor Certification Number

SAEDACCO Inc

Company Name

2. Well Construction Permit #: , ,

List all applicable well permits (i.e. County, State, Variance, Injection, etc.) if known

3. Well use (check well use):

Water Supply Well:	
☐Agricultural	☐Municipal/Public
☐Geothermal (Heating/Cooling Supply)	☐Residential Water Supply (single)
☐Industrial/Commercial	☐Residential Water Supply (shared)
☐Irrigation	
Non-Water Supply Well:	
☒Monitoring	☐Recovery
Injection Well:	
☐Aquifer Recharge	☐Groundwater Remediation
☐Aquifer Storage and Recovery	☐Salinity Barrier
☐Aquifer Test	☐Stormwater Drainage
☐Experimental Technology	☐Subsidence Control
☐Geothermal (Closed Loop)	☐Tracer
☐Geothermal (Heating/Cooling Return)	☐Other (explain under 7g)

4. Date well(s) abandoned: 06/17/2015

5a. Well location:

Green Meadows LLC c/o Buxton Environmental

Facility/Owner Name — Facility ID# (if applicable)

1315 Moncure-Flatwood Road Moncure, NC 27559 Chath

Physical Address, City, and Zip

Chatham

County — Parcel Identification No. (PIN)

5b. Latitude and longitude in degrees/minutes/seconds or decimal degrees:
(if well field, one lat/long is sufficient)

35.594601 N 79.011080 W

CONSTRUCTION DETAILS OF WELL(S) BEING ABANDONED

*Attach well construction record(s) if available. For multiple injection or non-water supply wells **ONLY** with the same construction/abandonment, you can submit one form.*

6a. Well ID#: PZM-10

6b. Total well depth: 40 **(ft.)**

6c. Borehole diameter: 2" **(in.)**

6d. Water level below ground surface: _____ **(ft.)**

6e. Outer casing length (if known): 40' **(ft.)**

6f. Inner casing/tubing length (if known): _____ **(ft.)**

6g. Screen length (if known): _____ **(ft.)**

For Internal Use ONLY:

WELL ABANDONMENT DETAILS

7a. Number of wells being abandoned: 1

*For multiple injection or non-water supply wells **ONLY** with the same construction/abandonment, you can submit one form.*

7b. Approximate volume of water remaining in well(s): _____ **(gal.)**

FOR WATER SUPPLY WELLS ONLY:

7c. Type of disinfectant used: _____

7d. Amount of disinfectant used: _____

7e. Sealing materials used (check all that apply):

☒ Neat Cement Grout	☐ Bentonite Chips or Pellets
☐ Sand Cement Grout	☐ Dry Clay
☐ Concrete Grout	☐ Drill Cuttings
☐ Specialty Grout	☐ Gravel
☐ Bentonite Slurry	☐ Other (explain under 7g)

7f. For each material selected above, provide amount of materials used:

Neat Cem.:94lb ,Wtr:7gal. Sand Cem.:lb ,Wtr:gal.

Neat cememt Amount:~105 gallor

7g. Provide a brief description of the abandonment procedure:

Overdrill with 8" outer diameter HSA to base of well, remove PVC well, tremmie grout from bottom to grade.

8. Certification:

Signature of Certified Well Contractor or Well Owner — Date: 6/17/2015

By signing this form, I hereby certify that the well(s) was (were) abandoned in accordance with 15A NCAC 02C .0100 or 2C .0200 Well Construction Standards and that a copy of this record has been provided to the well owner.

9. Site diagram or additional well details:
You may use the back of this page to provide additional well site details or well abandonment details. You may also attach additional pages if necessary.

SUBMITTAL INSTRUCTIONS

10a. For All Wells: Submit this form within 30 days of completion of well abandonment to the following:

Division of Water Resources, Information Processing Unit,
1617 Mail Service Center, Raleigh, NC 27699-1617

10b. For Injection Wells: In addition to sending the form to the address in 10a above, also submit one copy of this form within 30 days of completion of well abandonment to the following:

Division of Water Resources, Underground Injection Control Program,
1636 Mail Service Center, Raleigh, NC 27699-1636

10c. For Water Supply & Injection Wells: In addition to sending the form to the address(es) above, also submit one copy of this form within 30 days of completion of well abandonment to the county health department of the county where abandoned.

Buxton Environmental, Inc.
Consulting Services
1101 South Blvd., Suite 101
Charlotte, North Carolina 28203
Ph (704) 344-1450 Fax (704) 344-1451
buxtonenv@bellsouth.net

Boring Log, PZM-11

Moncure Mine Reclamation Site
1315 Moncure-Flatwood Road
Moncure, North Carolina

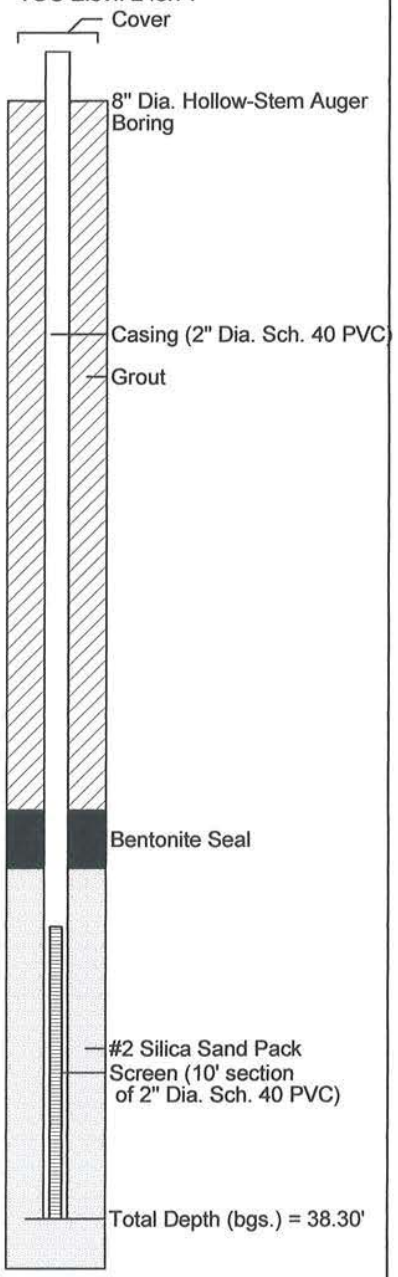
Date Started:	: 8/12/14	Logged By:	: Sean Quarry (HDR)
Date Completed:	: 8/12/14	Drilling Method:	: HSA; CME-550
Drilling Company:	: Summit Engineering	Top-of-Casing Elev.:	: 248.71'(Lawrence Survey)
Drillers Name:	: Robert Cassell	Ground Surface Elev.:	: 246.27'(Lawrence Survey)
NC Driller Certification:	: 4143A	Natural, Cut, Fill Grade::	cut

Water Levels
▼ 1 Hour = dry
▽ 24 Hours = dry

Sample Type
SS = Split Spoon
ST = Shelby Tube
RC = Rock Core
BAG = Bag Sample

Depth (feet bgs.)	Elevation (feet asl.)	Blow Count/6-inches	Sampler Type	Recovery (in.)	Lithologic Description
0	246.27	8 8 17	SS	17	moist; very stiff; gray (5YR 6/1) with yellow mottles; silty clay; low plasticity; cohesive; Residuum
5	241.27	14 50/3"	SS	10	moist; very hard; gray (5YR 6/2); fine sandy silty clay; low plasticity; cohesive; Partially Weathered Rock
10	236.27	50/3"	SS	3	moist; very hard; grayish green (Gley 1 4/2); weathered sandstone; Partially Weathered Rock
15	231.27	50/6"	SS	6	dry; very hard; grayish green (Gley 1 4/1) with gray; fine sandy silty clay and weathered mudstone; low plasticity; cohesive; Partially Weathered Rock
20	226.27	50/4"	SS	4	dry; redish brown (5YR 4/4); horizontal fissile; silty clay; low plasticity; cohesive; Partially Weathered Rock
25	221.27	24 50/4"	SS	8	moist; very hard; dark gray (5YR 4/1) with gray and yellow mottles; silty clay with thin weathered mudstone; medium plasticity; cohesive; Partially Weathered Rock
30	216.27	50/3"	SS	4	moist; very hard; reddish brown (5YR 4/3); silty clay with mudstone; low plasticity; cohesive; Partially Weathered Rock
35	211.27	50/1"	SS	1	moist; very hard; reddish brown (5YR 4/3); silty clay with mudstone; low plasticity; cohesive; Partially Weathered Rock
40	206.27	50/3"	SS,BAG	2	moist; very hard; reddish brown (5YR 4/3); silty clay with mudstone; low plasticity; cohesive; Partially Weathered Rock; (Lab Results: PZM-11 Bag (38.5-40'); USCS=CL; Gravel=4.6%; Sand=12.6%; Silt=62.4%; Clay=20.4%; Effective Porosity=7%; Atterberg Limits: PL=21, LL=37, PI=16)
45					

Well: PZM-11
TOC Elev.: 248.71'



WELL ABANDONMENT RECORD

This form can be used for single or multiple wells

1. Well Contractor Information:

Steve Poloniewicz

Well Contractor Name (or well owner personally abandoning well on his/her property)

2284-A

NC Well Contractor Certification Number

SAEDACCO Inc

Company Name

2. Well Construction Permit #: , ,

List all applicable well permits (i.e. County, State, Variance, Injection, etc.) if known

3. Well use (check well use):

Water Supply Well:	
☐Agricultural	☐Municipal/Public
☐Geothermal (Heating/Cooling Supply)	☐Residential Water Supply (single)
☐Industrial/Commercial	☐Residential Water Supply (shared)
☐Irrigation	
Non-Water Supply Well:	
☒Monitoring	☐Recovery
Injection Well:	
☐Aquifer Recharge	☐Groundwater Remediation
☐Aquifer Storage and Recovery	☐Salinity Barrier
☐Aquifer Test	☐Stormwater Drainage
☐Experimental Technology	☐Subsidence Control
☐Geothermal (Closed Loop)	☐Tracer
☐Geothermal (Heating/Cooling Return)	☐Other (explain under 7g)

4. Date well(s) abandoned: 05/30/2015

5a. Well location:

Green Meadows LLC c/o Buxton Environmental

Facility/Owner Name — Facility ID# (if applicable)

1315 Moncure-Flatwood Road Moncure, NC 27559 Chath

Physical Address, City, and Zip

Chatham

County — Parcel Identification No. (PIN)

5b. Latitude and longitude in degrees/minutes/seconds or decimal degrees:
(if well field, one lat/long is sufficient)

35.594601 N 79.011080 W

CONSTRUCTION DETAILS OF WELL(S) BEING ABANDONED

*Attach well construction record(s) if available. For multiple injection or non-water supply wells **ONLY** with the same construction/abandonment, you can submit one form.*

6a. Well ID#: PZM-11

6b. Total well depth: 38 **(ft.)**

6c. Borehole diameter: 2" **(in.)**

6d. Water level below ground surface: _____ **(ft.)**

6e. Outer casing length (if known): 28' **(ft.)**

6f. Inner casing/tubing length (if known): _____ **(ft.)**

6g. Screen length (if known): 10' **(ft.)**

For Internal Use ONLY:

WELL ABANDONMENT DETAILS

7a. Number of wells being abandoned: 1

*For multiple injection or non-water supply wells **ONLY** with the same construction/abandonment, you can submit one form.*

7b. Approximate volume of water remaining in well(s): _____ **(gal.)**

FOR WATER SUPPLY WELLS ONLY:

7c. Type of disinfectant used: _____

7d. Amount of disinfectant used: _____

7e. Sealing materials used (check all that apply):

☒ Neat Cement Grout	☐ Bentonite Chips or Pellets
☐ Sand Cement Grout	☐ Dry Clay
☐ Concrete Grout	☐ Drill Cuttings
☐ Specialty Grout	☐ Gravel
☐ Bentonite Slurry	☐ Other (explain under 7g)

7f. For each material selected above, provide amount of materials used:

Neat Cem.:94lb ,Wtr:7gal. Sand Cem.:lb ,Wtr:gal.

Neat cememt Amount:~110 gallon

7g. Provide a brief description of the abandonment procedure:

Overdrill with 8" outer diameter HSA to base of well, remove PVC well, tremmie grout from bottom to grade.

8. Certification:

Signature of Certified Well Contractor or Well Owner — Date: 05/30/2015

By signing this form, I hereby certify that the well(s) was (were) abandoned in accordance with 15A NCAC 02C .0100 or 2C .0200 Well Construction Standards and that a copy of this record has been provided to the well owner.

9. Site diagram or additional well details:
You may use the back of this page to provide additional well site details or well abandonment details. You may also attach additional pages if necessary.

SUBMITTAL INSTRUCTIONS

10a. For All Wells: Submit this form within 30 days of completion of well abandonment to the following:

Division of Water Resources, Information Processing Unit,
1617 Mail Service Center, Raleigh, NC 27699-1617

10b. For Injection Wells: In addition to sending the form to the address in 10a above, also submit one copy of this form within 30 days of completion of well abandonment to the following:

Division of Water Resources, Underground Injection Control Program,
1636 Mail Service Center, Raleigh, NC 27699-1636

10c. For Water Supply & Injection Wells: In addition to sending the form to the address(es) above, also submit one copy of this form within 30 days of completion of well abandonment to the county health department of the county where abandoned.

Buxton Environmental, Inc.
Consulting Services
1101 South Blvd., Suite 101
Charlotte, North Carolina 28203
Ph (704) 344-1450 Fax (704) 344-1451
buxtonenv@bellsouth.net

Boring Log, PZM-12

Moncure Mine Reclamation Site
1315 Moncure-Flatwood Road
Moncure, North Carolina

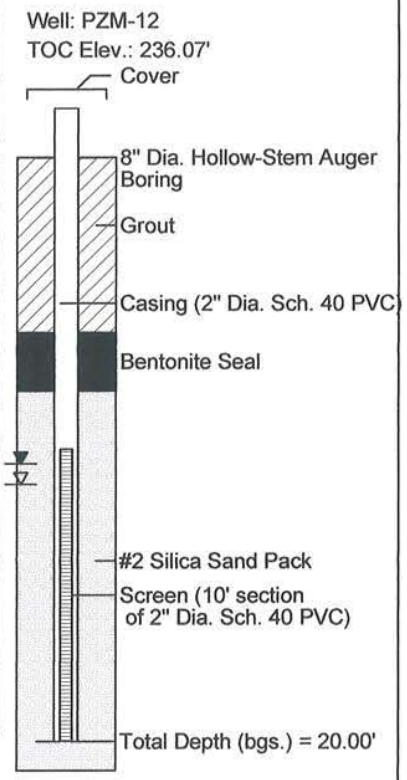
Date Started:	: 8/14/14	Logged By:	: Ross Klingman, P.G.
Date Completed:	: 8/14/14	Drilling Method:	: HSA; CME-550
Drilling Company:	: Summit Engineering	Top-of-Casing Elev.:	: 236.07'(Lawrence Survey)
Drillers Name:	: Robert Cassell	Ground Surface Elev.:	: 233.21'(Lawrence Survey)
NC Driller Certification:	: 4143A	Natural, Cut, Fill Grade::	cut

Water Levels
▼ 1 Hour = 10.50' bgs
▽ 24 Hours = 11.20' bgs

Sample Type
SS = Split Spoon
ST = Shelby Tube
RC = Rock Core
BAG = Bag Sample

Depth (feet bgs.)	Elevation (feet asl.)	Blow Count/6-inches	Sampler Type	Recovery (in.)	Lithologic Description
0	233.21	11 12 18	SS,ST	18	dry; very stiff; red (2.5YR 4/6) with black hroizontal planes; silty clay and weathered mudstone; no plasticity; cohesive; Residuum; (Lab Results: PZM-12 UD (0.5-1.5'); USCS=CL; Sand=16.3%; Silt=71.3%; Clay=12.4%; Specific Gravity=2.68; Hydraulic Conductivity=2.36 x 10-6 cm/sec; Total Porosity=19.2%; Effective Porosity=9%; Atterberg Limits: PL=20, LL=31, PI=11)
		22 50/5"	SS	16	
5	228.21				dry; very hard; red (2.5YR 4/6); horizontal to 5 degree fissile; silty clay and weathered mudstone; no plasticity; cohesive; Partially Weathered Rock
		21 50/6"	SS	13	dry; very hard; red (2.5YR 4/6) with light pink horizontal layers; highly horizontal fissile; silty clay and weathered mudstone; ; no plasticity; cohesive; Partially Weathered Rock
10	223.21				
		50/4"	SS	6	dry; very hard; reddish brown (2.5YR 4/4); highly horizontal fissile; weathered mudstone; Partially Weathered Rock hard rock layer 16-18.5'
15	218.21				
		32 50/3"	SS	20	wet; hard; reddish brown (2.5YR 4/4); highly horizontal fissile; weathered mudstone; Partially Weathered Rock
20	213.21				
25	208.21				
30	203.21				
35	198.21				
40	193.21				
45					

Auger Refusal @ 21'



WELL ABANDONMENT RECORD

This form can be used for single or multiple wells

1. Well Contractor Information:

Steve Poloniewicz

Well Contractor Name (or well owner personally abandoning well on his/her property)

2284-A

NC Well Contractor Certification Number

SAEDACCO Inc

Company Name

2. Well Construction Permit #: , ,

List all applicable well permits (i.e. County, State, Variance, Injection, etc.) if known

3. Well use (check well use):

Water Supply Well:	
☐ Agricultural	☐ Municipal/Public
☐ Geothermal (Heating/Cooling Supply)	☐ Residential Water Supply (single)
☐ Industrial/Commercial	☐ Residential Water Supply (shared)
☐ Irrigation	
Non-Water Supply Well:	
☒ Monitoring	☐ Recovery
Injection Well:	
☐ Aquifer Recharge	☐ Groundwater Remediation
☐ Aquifer Storage and Recovery	☐ Salinity Barrier
☐ Aquifer Test	☐ Stormwater Drainage
☐ Experimental Technology	☐ Subsidence Control
☐ Geothermal (Closed Loop)	☐ Tracer
☐ Geothermal (Heating/Cooling Return)	☐ Other (explain under 7g)

4. Date well(s) abandoned: 05/30/2015

5a. Well location:

Green Meadows LLC c/o Buxton Environmental

Facility/Owner Name — Facility ID# (if applicable)

1315 Moncure-Flatwood Road Moncure, NC 27559 Chath

Physical Address, City, and Zip

Chatham

County — Parcel Identification No. (PIN)

5b. Latitude and longitude in degrees/minutes/seconds or decimal degrees:
(if well field, one lat/long is sufficient)

35.594601 N 79.011080 W

CONSTRUCTION DETAILS OF WELL(S) BEING ABANDONED

*Attach well construction record(s) if available. For multiple injection or non-water supply wells **ONLY** with the same construction/abandonment, you can submit one form.*

6a. Well ID#: PZM-12

6b. Total well depth: 20 **(ft.)**

6c. Borehole diameter: 2" **(in.)**

6d. Water level below ground surface: _____ **(ft.)**

6e. Outer casing length (if known): 10' **(ft.)**

6f. Inner casing/tubing length (if known): _____ **(ft.)**

6g. Screen length (if known): 10' **(ft.)**

For Internal Use ONLY:

WELL ABANDONMENT DETAILS

7a. Number of wells being abandoned: 1

*For multiple injection or non-water supply wells **ONLY** with the same construction/abandonment, you can submit one form.*

7b. Approximate volume of water remaining in well(s): _____ **(gal.)**

FOR WATER SUPPLY WELLS ONLY:

7c. Type of disinfectant used: _____

7d. Amount of disinfectant used: _____

7e. Sealing materials used (check all that apply):

☒ Neat Cement Grout	☐ Bentonite Chips or Pellets
☐ Sand Cement Grout	☐ Dry Clay
☐ Concrete Grout	☐ Drill Cuttings
☐ Specialty Grout	☐ Gravel
☐ Bentonite Slurry	☐ Other (explain under 7g)

7f. For each material selected above, provide amount of materials used:

Neat Cem.:94lb ,Wtr:7gal. Sand Cem.:lb ,Wtr:gal.

Neat cememt Amount:~65 gallons

7g. Provide a brief description of the abandonment procedure:

Overdrill with 8" outer diameter HSA to base of well, remove PVC well, tremmie grout from bottom to grade.

8. Certification:

Steve Poloniewicz — 05/30/2015

Signature of Certified Well Contractor or Well Owner — Date

By signing this form, I hereby certify that the well(s) was (were) abandoned in accordance with 15A NCAC 02C .0100 or 2C .0200 Well Construction Standards and that a copy of this record has been provided to the well owner.

9. Site diagram or additional well details:
You may use the back of this page to provide additional well site details or well abandonment details. You may also attach additional pages if necessary.

SUBMITTAL INSTRUCTIONS

10a. For All Wells: Submit this form within 30 days of completion of well abandonment to the following:

Division of Water Resources, Information Processing Unit,
1617 Mail Service Center, Raleigh, NC 27699-1617

10b. For Injection Wells: In addition to sending the form to the address in 10a above, also submit one copy of this form within 30 days of completion of well abandonment to the following:

Division of Water Resources, Underground Injection Control Program,
1636 Mail Service Center, Raleigh, NC 27699-1636

10c. For Water Supply & Injection Wells: In addition to sending the form to the address(es) above, also submit one copy of this form within 30 days of completion of well abandonment to the county health department of the county where abandoned.

Buxton Environmental, Inc.
Consulting Services
1101 South Blvd., Suite 101
Charlotte, North Carolina 28203
Ph (704) 344-1450 Fax (704) 344-1451
buxtonenv@bellsouth.net

Boring Log, PZM-13

Moncure Mine Reclamation Site
1315 Moncure-Flatwood Road
Moncure, North Carolina

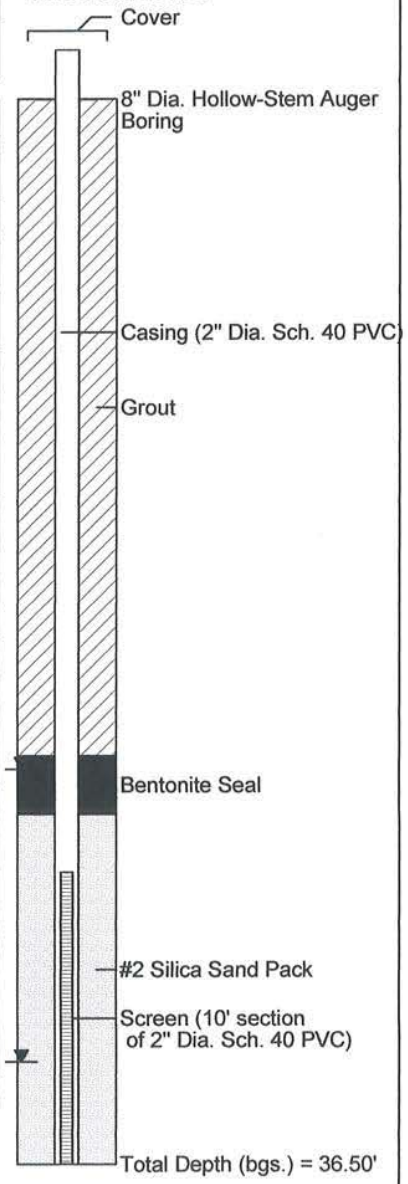
Date Started:	: 8/12/14	Logged By:	: Sean Quarry (HDR)
Date Completed:	: 8/12/14	Drilling Method:	: HSA; CME-550
Drilling Company:	: Summit Engineering	Top-of-Casing Elev.:	: 251.23'(Lawrence Survey)
Drillers Name:	: Robert Cassell	Ground Surface Elev.:	: 249.19'(Lawrence Survey)
NC Driller Certification:	: 4143A	Natural, Cut, Fill Grade::	natural

Water Levels
1 Hour = 33.00' bgs
24 Hours =22.96' bgs

Sample Type
SS = Split Spoon
ST = Shelby Tube
RC = Rock Core
BAG = Bag Sample

Depth (feet bgs.)	Elevation (feet asl.)	Blow Count/6-inches	Sampler Type	Recovery (in.)	Lithologic Description
0	249.19	3 3 6	SS	19	moist; medium; reddish brown (5YR 5); silty clay; medium plasticity; cohesive; Soil Horizon
5	244.19	22 50/3"	SS	8	moist; very hard; reddish brown (5YR 4/3) with gray and yellow; sandy silty clay; low plasticity; cohesive; Partially Weathered Rock
10	239.19	5 7 14	SS,BAG	16	moist; very stiff; light gray (10YR 7/2) with red brown bands; silty sandy clay; low plasticity; cohesive; Residuum; (Lab Results: PZM-13 Bag (8.5-10'); USCS=CL; Sand=16.4%; Silt=59.8%; Clay=23.8%; Effective Porosity=4%; Atterberg Limits: PL=16, LL=31, PI=15)
15	234.19	50/1"	SS	1	moist; very hard; light gray (10YR 7/2) with red brown; silty sandy clay; low plasticity; cohesive; Partially Weathered Rock
20	229.19	50/6"	SS	5	moist; very harr; dark reddish brown (5YR 4/3) with gray; horizontal fissile; silty clay; low plasticity; cohesive; Partially Weathered Rock
25	224.19	50/4"	SS	3	dry; very hard; reddish brown (5YR 4/3); silty clay with weathered muddy sandstone; low plasticity; cohesive; Partially Weathered Rock
30	219.19	50/4"	SS	3	dry; very hard; gray; horizontal fissile; silty clay with weathered mudstone; low plasticity; cohesive; Partially Weathered Rock
35	214.19	50/3"	SS	2	dry; very hard; gray; weathered mudstone; Partially Weathered Rock
40	209.19				
45					

Auger Refusal @ 36.5'



WELL ABANDONMENT RECORD

This form can be used for single or multiple wells

1. Well Contractor Information:

Steve Poloniewicz

Well Contractor Name (or well owner personally abandoning well on his/her property)

2284-A

NC Well Contractor Certification Number

SAEDACCO Inc

Company Name

2. Well Construction Permit #: , ,

List all applicable well permits (i.e. County, State, Variance, Injection, etc.) if known

3. Well use (check well use):

Water Supply Well:	
☐Agricultural	☐Municipal/Public
☐Geothermal (Heating/Cooling Supply)	☐Residential Water Supply (single)
☐Industrial/Commercial	☐Residential Water Supply (shared)
☐Irrigation	
Non-Water Supply Well:	
☒Monitoring	☐Recovery
Injection Well:	
☐Aquifer Recharge	☐Groundwater Remediation
☐Aquifer Storage and Recovery	☐Salinity Barrier
☐Aquifer Test	☐Stormwater Drainage
☐Experimental Technology	☐Subsidence Control
☐Geothermal (Closed Loop)	☐Tracer
☐Geothermal (Heating/Cooling Return)	☐Other (explain under 7g)

4. Date well(s) abandoned: 06/18/2015

5a. Well location:

Green Meadows LLC c/o Buxton Environmental

Facility/Owner Name — Facility ID# (if applicable)

1315 Moncure-Flatwood Road Moncure, NC 27559 Chath

Physical Address, City, and Zip

Chatham

County — Parcel Identification No. (PIN)

5b. Latitude and longitude in degrees/minutes/seconds or decimal degrees:
(if well field, one lat/long is sufficient)

35.594601 N 79.011080 W

CONSTRUCTION DETAILS OF WELL(S) BEING ABANDONED

*Attach well construction record(s) if available. For multiple injection or non-water supply wells **ONLY** with the same construction/abandonment, you can submit one form.*

6a. Well ID#: PZM-13

6b. Total well depth: 36.5' **(ft.)**

6c. Borehole diameter: 2" **(in.)**

6d. Water level below ground surface: _____ **(ft.)**

6e. Outer casing length (if known): 36.5' **(ft.)**

6f. Inner casing/tubing length (if known): _____ **(ft.)**

6g. Screen length (if known): _____ **(ft.)**

For Internal Use ONLY:

WELL ABANDONMENT DETAILS

7a. Number of wells being abandoned: 1

*For multiple injection or non-water supply wells **ONLY** with the same construction/abandonment, you can submit one form.*

7b. Approximate volume of water remaining in well(s): _____ **(gal.)**

FOR WATER SUPPLY WELLS ONLY:

7c. Type of disinfectant used: _____

7d. Amount of disinfectant used: _____

7e. Sealing materials used (check all that apply):

☒ Neat Cement Grout	☐ Bentonite Chips or Pellets
☐ Sand Cement Grout	☐ Dry Clay
☐ Concrete Grout	☐ Drill Cuttings
☐ Specialty Grout	☐ Gravel
☐ Bentonite Slurry	☐ Other (explain under 7g)

7f. For each material selected above, provide amount of materials used:

Neat Cem.:94lb ,Wtr:7gal. Sand Cem.:lb ,Wtr:gal.

Neat cememt Amount:~105 gallor

7g. Provide a brief description of the abandonment procedure:

Overdrill with 8" outer diameter HSA to base of well, remove PVC well, tremmie grout from bottom to grade.

8. Certification:

Steve Poloniewicz — 6/18/2015

Signature of Certified Well Contractor or Well Owner — Date

By signing this form, I hereby certify that the well(s) was (were) abandoned in accordance with 15A NCAC 02C .0100 or 2C .0200 Well Construction Standards and that a copy of this record has been provided to the well owner.

9. Site diagram or additional well details:
You may use the back of this page to provide additional well site details or well abandonment details. You may also attach additional pages if necessary.

SUBMITTAL INSTRUCTIONS

10a. For All Wells: Submit this form within 30 days of completion of well abandonment to the following:

Division of Water Resources, Information Processing Unit,
1617 Mail Service Center, Raleigh, NC 27699-1617

10b. For Injection Wells: In addition to sending the form to the address in 10a above, also submit one copy of this form within 30 days of completion of well abandonment to the following:

Division of Water Resources, Underground Injection Control Program,
1636 Mail Service Center, Raleigh, NC 27699-1636

10c. For Water Supply & Injection Wells: In addition to sending the form to the address(es) above, also submit one copy of this form within 30 days of completion of well abandonment to the county health department of the county where abandoned.

Buxton Environmental, Inc.
Consulting Services
1101 South Blvd., Suite 101
Charlotte, North Carolina 28203
Ph (704) 344-1450 Fax (704) 344-1451
buxtonenv@bellsouth.net

Boring Log, PZM-15

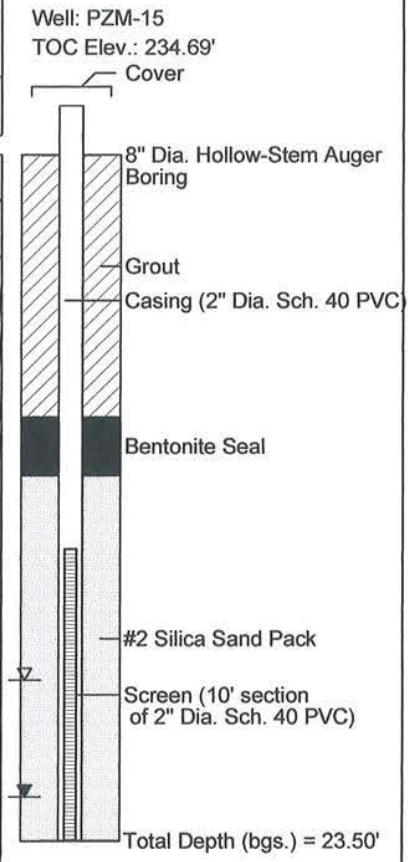
Moncure Mine Reclamation Site
1315 Moncure-Flatwood Road
Moncure, North Carolina

Date Started:	: 8/13/14	Logged By:	: Sean Quarry (HDR)
Date Completed:	: 8/13/14	Drilling Method:	: HSA; CME-550
Drilling Company:	: Summit Engineering	Top-of-Casing Elev.:	: 234.69'(Lawrence Survey)
Drillers Name:	: Robert Cassell	Ground Surface Elev.:	: 231.82'(Lawrence Survey)
NC Driller Certification:	: 4143A	Natural, Cut, Fill Grade::	natural

Water Levels
- 1 Hour = 22.00' bgs
- 24 Hours = 18.00' bgs

Sample Type
- SS = Split Spoon
- ST = Shelby Tube
- RC = Rock Core
- BAG = Bag Sample

Depth (feet bgs.)	Elevation (feet asl.)	Blow Count/6-inches	Sampler Type	Recovery (in.)	Lithologic Description
0	231.82	2 2 5	SS	13	moist; medium; strong brown (7YR 5/6) with mottles; sandy silty clay with roots; low plasticity; cohesive; Soil Horizon
			ST	10	moist; reddish gray (5YR 5/2); silty clay; low plasticity; cohesive; Residuum; (Lab Results: PZM-15 UD (3.5-4.5'); USCS=CL; Sand=12.1%; Silt=39.6%; Clay=48.3%; Specific Gravity=2.72; Hydraulic Conductivity=3.69 x 10-9 cm/sec; Total Porosity=39.2%; Effective Porosity=1%; Atterberg Limits: PL=19, LL=39, PI=20)
5	226.82	8 11 36	SS	18	
		22 50/3"	SS	11	moist; very hard; reddish gray (5YR 5/2); horizontal fissile; silty clay; low plasticity; cohesive; Residuum
10	221.82				moist; very hard; reddish gray (5YR 5/2); horizontal fissile; silty clay; low plasticity; cohesive; Partially Weathered Rock
		50/2"	SS	1	moist; very hard; reddish brown (5YR 4/4); fine sandy clayey silt; low plasticity; cohesive; Partially Weathered Rock
15	216.82				
		50/2"	SS	2	moist; very hard; light reddish brown (5YR 6/3); horizontal fissile; fine sandy silt with weathered; low plasticity; cohesive; Partially Weathered Rock
20	211.82				
		50/3"	SS,BAG	3	wet; very hard; very dark gray; silty clay; medium plasticity; cohesive; Partially Weathered Rock; (Lab Results: PZM-15 Bag (23.5-25'): USCS=CL; Sand=6.3%; Silt=60.7%; Clay=33%; Effective Porosity=3%; Atterberg Limits: PL=17, LL=36, PI=33)
25	206.82				
					Auger Refusal @ 23.5'
30	201.82				
35	196.82				
40	191.82				
45					



WELL ABANDONMENT RECORD

This form can be used for single or multiple wells

1. Well Contractor Information:

Steve Poloniewicz

Well Contractor Name (or well owner personally abandoning well on his/her property)

2284-A

NC Well Contractor Certification Number

SAEDACCO Inc

Company Name

2. Well Construction Permit #: , ,

List all applicable well permits (i.e. County, State, Variance, Injection, etc.) if known

3. Well use (check well use):

Water Supply Well:	
☐Agricultural	☐Municipal/Public
☐Geothermal (Heating/Cooling Supply)	☐Residential Water Supply (single)
☐Industrial/Commercial	☐Residential Water Supply (shared)
☐Irrigation	
Non-Water Supply Well:	
☒Monitoring	☐Recovery
Injection Well:	
☐Aquifer Recharge	☐Groundwater Remediation
☐Aquifer Storage and Recovery	☐Salinity Barrier
☐Aquifer Test	☐Stormwater Drainage
☐Experimental Technology	☐Subsidence Control
☐Geothermal (Closed Loop)	☐Tracer
☐Geothermal (Heating/Cooling Return)	☐Other (explain under 7g)

4. Date well(s) abandoned: 06/23/2015

5a. Well location:

Green Meadows LLC c/o Buxton Environmental

Facility/Owner Name — Facility ID# (if applicable)

1315 Moncure-Flatwood Road Moncure, NC 27559 Chath

Physical Address, City, and Zip

Chatham

County — Parcel Identification No. (PIN)

5b. Latitude and longitude in degrees/minutes/seconds or decimal degrees:
(if well field, one lat/long is sufficient)

35.594601 N 79.011080 W

CONSTRUCTION DETAILS OF WELL(S) BEING ABANDONED

*Attach well construction record(s) if available. For multiple injection or non-water supply wells **ONLY** with the same construction/abandonment, you can submit one form.*

6a. Well ID#: PZM-15

6b. Total well depth: 23.5 **(ft.)**

6c. Borehole diameter: 2" **(in.)**

6d. Water level below ground surface: _____ **(ft.)**

6e. Outer casing length (if known): 23.5' **(ft.)**

6f. Inner casing/tubing length (if known): _____ **(ft.)**

6g. Screen length (if known): _____ **(ft.)**

For Internal Use ONLY:

WELL ABANDONMENT DETAILS

7a. Number of wells being abandoned: 1

*For multiple injection or non-water supply wells **ONLY** with the same construction/abandonment, you can submit one form.*

7b. Approximate volume of water remaining in well(s): _____ **(gal.)**

FOR WATER SUPPLY WELLS ONLY:

7c. Type of disinfectant used: _____

7d. Amount of disinfectant used: _____

7e. Sealing materials used (check all that apply):

☒ Neat Cement Grout	☐ Bentonite Chips or Pellets
☐ Sand Cement Grout	☐ Dry Clay
☐ Concrete Grout	☐ Drill Cuttings
☐ Specialty Grout	☐ Gravel
☐ Bentonite Slurry	☐ Other (explain under 7g)

7f. For each material selected above, provide amount of materials used:

Neat Cem.:94lb ,Wtr:7gal. Sand Cem.:lb ,Wtr:gal.

Neat cememt Amount:~75 gallons

7g. Provide a brief description of the abandonment procedure:

Overdrill with 8" outer diameter HSA to base of well, remove PVC well, tremmie grout from bottom to grade.

8. Certification:

Steve Poloniewicz — 6/24/2015

Signature of Certified Well Contractor or Well Owner — Date

By signing this form, I hereby certify that the well(s) was (were) abandoned in accordance with 15A NCAC 02C .0100 or 2C .0200 Well Construction Standards and that a copy of this record has been provided to the well owner.

9. Site diagram or additional well details:
You may use the back of this page to provide additional well site details or well abandonment details. You may also attach additional pages if necessary.

SUBMITTAL INSTRUCTIONS

10a. For All Wells: Submit this form within 30 days of completion of well abandonment to the following:

Division of Water Resources, Information Processing Unit,
1617 Mail Service Center, Raleigh, NC 27699-1617

10b. For Injection Wells: In addition to sending the form to the address in 10a above, also submit one copy of this form within 30 days of completion of well abandonment to the following:

Division of Water Resources, Underground Injection Control Program,
1636 Mail Service Center, Raleigh, NC 27699-1636

10c. For Water Supply & Injection Wells: In addition to sending the form to the address(es) above, also submit one copy of this form within 30 days of completion of well abandonment to the county health department of the county where abandoned.

Buxton Environmental, Inc.
Consulting Services
1101 South Blvd., Suite 101
Charlotte, North Carolina 28203
Ph (704) 344-1450 Fax (704) 344-1451
buxtonenv@bellsouth.net

Boring Log, PZM-16

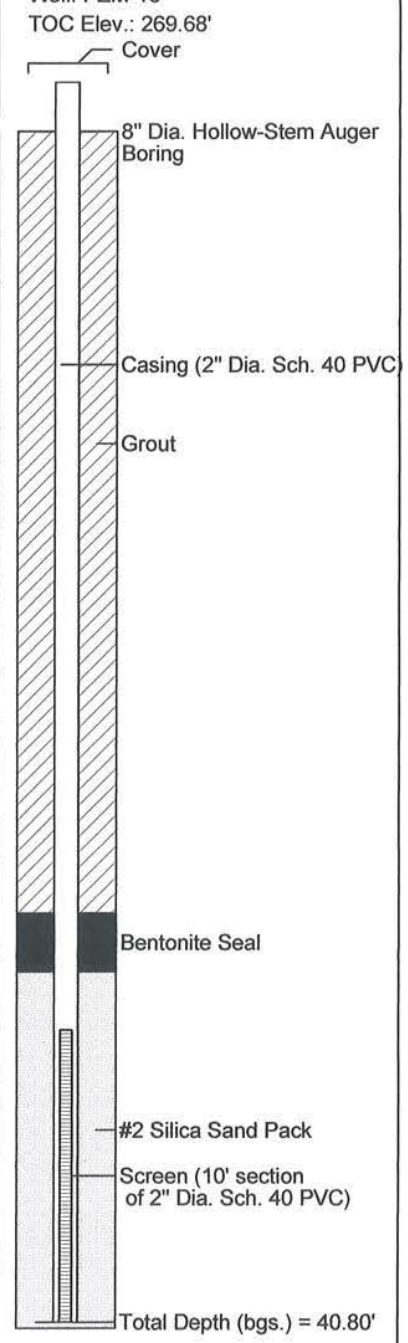
Moncure Mine Reclamation Site
1315 Moncure-Flatwood Road
Moncure, North Carolina

Date Started:	: 8/14/14	Logged By:	: Ross Klingman, P.G.
Date Completed:	: 8/14/14	Drilling Method:	: HSA; CME-550
Drilling Company:	: Summit Engineering	Top-of-Casing Elev.:	: 269.68'(Lawrence Survey)
Drillers Name:	: Robert Cassell	Ground Surface Elev.:	: 267.41'(Lawrence Survey)
NC Driller Certification:	: 4143A	Natural, Cut, Fill Grade::	natural

Water Levels
- 1 Hour = dry
- 24 Hours = dry

Sample Type
- SS = Split Spoon
- ST = Shelby Tube
- RC = Rock Core
- BAG = Bag Sample

Depth (feet bgs.)	Elevation (feet asl.)	Blow Count/6-inches	Sampler Type	Recovery (in.)	Lithologic Description
0	267.41	3 5 6	SS	1	very moist; stiff; yellowish brown (10YR 6/6); fine to coarse sandy silty clay with quartz cobbles; medium plasticity; cohesive; Soil Horizon
5	262.41	4 5 8	SS	16	moist; stiff; light yellowish brown (2.5YR 6/4) with red orange mottles; clay; high plasticity; cohesive; Soil Horizon
10	257.41	2 3 4	SS	17	moist; medium; light yellowish brown (2.5YR 6/4) with red orange mottles; silty clay; medium plasticity; cohesive; Soil Horizon
			ST	10	moist; light yellowish brown (2.5YR 6/4) with red orange mottles; silty clay; medium plasticity; cohesive; Soil Horizon; (Lab Results: PZM-16 UD (10-11'); USCS=MH; Gravel=0.1%; Sand=7.2%; Silt=51.1%; Clay=47.9%; Specific Gravity=2.70; Hydraulic Conductivity=2.86 x 10-7 cm/sec; Total Porosity=48%; Effective Porosity=1%; Atterberg Limits: PL=32, LL=56, PI=24)
15	252.41	8 10 16	SS	18	moist; very stiff; weak red (10YR 4/3) with ligh gray and yellow stringers; silty clay; medium plasticity; cohesive; Residuum
20	247.41	8 16 27	SS	20	moist; hard; gray (10YR 6/1) with light orange and light maroon mottles and stringers; silty clay; no plasticity; cohesive; Residuum
25	242.41	21 50/6"	SS	14	moist; very hard; gray (10YR 6/1) with light orange and light maroon mottles and stringers; silty clay; no plasticity; cohesive; Partially Weathered Rock
30	237.41	22 50/2"	SS	14	moist; very hard; reddish brown (2.5YR 4/4); wavey horizontal fissile; silty clay; no plasticity; cohesive; Partially Weathered Rock; (Lab Results: PZM-16 Bag (28.5-30'): USCS=CL; Sand=21.3%; Silt=61.8%; Clay=16.9%; Effective Porosity=10; Atterberg Limits: PL=17, LL=32, PI=15)
35	232.41	50/6"	SS	10	dry; very hard; pinkish gray (7.5YR 6/2); highly horizontal fissile; weathered mudstone; Partially Weathered Rock
40	227.41	50/1"	SS	3	dry; very hard; pinkish gray (7.5YR 6/2); highly horizontal fissile; weathered sandy mudstone; Partially Weathered Rock
45					Auger Refusal @ 41'



WELL ABANDONMENT RECORD

This form can be used for single or multiple wells

1. Well Contractor Information:

Steve Poloniewicz

Well Contractor Name (or well owner personally abandoning well on his/her property)

2284-A

NC Well Contractor Certification Number

SAEDACCO Inc

Company Name

2. Well Construction Permit #: , ,

List all applicable well permits (i.e. County, State, Variance, Injection, etc.) if known

3. Well use (check well use):

Water Supply Well:	
☐Agricultural	☐Municipal/Public
☐Geothermal (Heating/Cooling Supply)	☐Residential Water Supply (single)
☐Industrial/Commercial	☐Residential Water Supply (shared)
☐Irrigation	
Non-Water Supply Well:	
☒Monitoring	☐Recovery
Injection Well:	
☐Aquifer Recharge	☐Groundwater Remediation
☐Aquifer Storage and Recovery	☐Salinity Barrier
☐Aquifer Test	☐Stormwater Drainage
☐Experimental Technology	☐Subsidence Control
☐Geothermal (Closed Loop)	☐Tracer
☐Geothermal (Heating/Cooling Return)	☐Other (explain under 7g)

4. Date well(s) abandoned: 05/29/2015

5a. Well location:

Green Meadows LLC c/o Buxton Environmental

Facility/Owner Name — Facility ID# (if applicable)

1315 Moncure-Flatwood Road Moncure, NC 27559 Chath

Physical Address, City, and Zip

Chatham

County — Parcel Identification No. (PIN)

5b. Latitude and longitude in degrees/minutes/seconds or decimal degrees:
(if well field, one lat/long is sufficient)

35.594601 N 79.011080 W

CONSTRUCTION DETAILS OF WELL(S) BEING ABANDONED

*Attach well construction record(s) if available. For multiple injection or non-water supply wells **ONLY** with the same construction/abandonment, you can submit one form.*

6a. Well ID#: PZM-16

6b. Total well depth: 42 **(ft.)**

6c. Borehole diameter: 2" **(in.)**

6d. Water level below ground surface: _____ **(ft.)**

6e. Outer casing length (if known): 32' **(ft.)**

6f. Inner casing/tubing length (if known): _____ **(ft.)**

6g. Screen length (if known): 10' **(ft.)**

For Internal Use ONLY:

WELL ABANDONMENT DETAILS

7a. Number of wells being abandoned: 1

*For multiple injection or non-water supply wells **ONLY** with the same construction/abandonment, you can submit one form.*

7b. Approximate volume of water remaining in well(s): _____ **(gal.)**

FOR WATER SUPPLY WELLS ONLY:

7c. Type of disinfectant used: _____

7d. Amount of disinfectant used: _____

7e. Sealing materials used (check all that apply):

☒ Neat Cement Grout	☐ Bentonite Chips or Pellets
☐ Sand Cement Grout	☐ Dry Clay
☐ Concrete Grout	☐ Drill Cuttings
☐ Specialty Grout	☐ Gravel
☐ Bentonite Slurry	☐ Other (explain under 7g)

7f. For each material selected above, provide amount of materials used:

Neat Cem.:94lb ,Wtr:7gal. Sand Cem.:lb ,Wtr:gal.

Neat cememt Amount:~115 gallon

7g. Provide a brief description of the abandonment procedure:

Overdrill with 8" outer diameter HSA to base of well, remove PVC well, tremmie grout from bottom to grade.

8. Certification:

Signature of Certified Well Contractor or Well Owner — Date: 6/17/2015

By signing this form, I hereby certify that the well(s) was (were) abandoned in accordance with 15A NCAC 02C .0100 or 2C .0200 Well Construction Standards and that a copy of this record has been provided to the well owner.

9. Site diagram or additional well details:
You may use the back of this page to provide additional well site details or well abandonment details. You may also attach additional pages if necessary.

SUBMITTAL INSTRUCTIONS

10a. For All Wells: Submit this form within 30 days of completion of well abandonment to the following:

Division of Water Resources, Information Processing Unit,
1617 Mail Service Center, Raleigh, NC 27699-1617

10b. For Injection Wells: In addition to sending the form to the address in 10a above, also submit one copy of this form within 30 days of completion of well abandonment to the following:

Division of Water Resources, Underground Injection Control Program,
1636 Mail Service Center, Raleigh, NC 27699-1636

10c. For Water Supply & Injection Wells: In addition to sending the form to the address(es) above, also submit one copy of this form within 30 days of completion of well abandonment to the county health department of the county where abandoned.

Buxton Environmental, Inc.
Consulting Services
1101 South Blvd., Suite 101
Charlotte, North Carolina 28203
Ph (704) 344-1450 Fax (704) 344-1451
buxtonenv@bellsouth.net

Boring Log, PZM-18

Moncure Mine Reclamation Site
1315 Moncure-Flatwood Road
Moncure, North Carolina

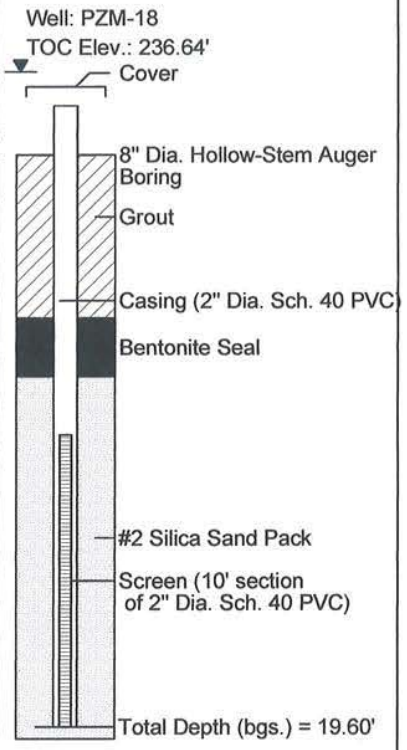
Date Started:	: 8/13/14	Logged By:	: Ross Klingman, P.G.
Date Completed:	: 8/13/14	Drilling Method:	: HSA; Geoprobe 8040DT
Drilling Company:	: Geologic Exploration	Top-of-Casing Elev.:	: 236.64'(Lawrence Survey)
Drillers Name:	: Johnny Burr	Ground Surface Elev.:	: 233.78'(Lawrence Survey)
NC Driller Certification:	: 3098A	Natural, Cut, Fill Grade::	cut

Water Levels
▼ 1 Hour = dry
▽ 24 Hours = dry

Sample Type
SS = Split Spoon
ST = Shelby Tube
RC = Rock Core
BAG = Bag Sample

Depth (feet bgs.)	Elevation (feet asl.)	Blow Count/6-inches	Sampler Type	Recovery (in.)	Lithologic Description
0	233.78	11 12 14	SS	24	dry; very stiff; yellowish red (5YR 4/6) with light gray specks; silty clay with mudstone fragments; no plasticity; cohesive; Residuum
5	228.78	2 8 12	SS	18	dry; very stiff; gray (7.5YR 6/1) with brown and light gray mottles; horizontal fissile; silty clay; no plasticity; cohesive; Residuum
10	223.78	2 4 14	SS,BAG	24	moist; very stiff; grayish brown (10YR 5/2); silty clay with weathered mudstone fragments; no plasticity; cohesive; Residuum; (Lab Results: PZM-18 Bag (8.5-10'); USCS=CL; Sand=7.2%; Silt=56.3%; Clay=36.5%; Effective Porosity=3; PL=20, LL=39; PI=19)
15	218.78	50/2"	SS	8	moist; very hard; dark greenish gray (Gley 2 3/1); weathered sandy mudstone; Partially Weathered Rock
20	213.78	23 50/1"	SS	14	dry; very hard; gray (7.5YR 6/1) with maroon mottles; clayey silt with mudstone fragments; no plasticity; cohesive; Partially Weathered Rock
25	208.78				
30	203.78				
35	198.78				
40	193.78				
45					

Auger Refusal @ 20'



WELL ABANDONMENT RECORD

This form can be used for single or multiple wells

1. Well Contractor Information:

Steve Poloniewicz

Well Contractor Name (or well owner personally abandoning well on his/her property)

2284-A

NC Well Contractor Certification Number

SAEDACCO Inc

Company Name

2. Well Construction Permit #: , ,

List all applicable well permits (i.e. County, State, Variance, Injection, etc.) if known

3. Well use (check well use):

Water Supply Well:	
☐Agricultural	☐Municipal/Public
☐Geothermal (Heating/Cooling Supply)	☐Residential Water Supply (single)
☐Industrial/Commercial	☐Residential Water Supply (shared)
☐Irrigation	
Non-Water Supply Well:	
☒Monitoring	☐Recovery
Injection Well:	
☐Aquifer Recharge	☐Groundwater Remediation
☐Aquifer Storage and Recovery	☐Salinity Barrier
☐Aquifer Test	☐Stormwater Drainage
☐Experimental Technology	☐Subsidence Control
☐Geothermal (Closed Loop)	☐Tracer
☐Geothermal (Heating/Cooling Return)	☐Other (explain under 7g)

4. Date well(s) abandoned: 05/30/2015

5a. Well location:

Green Meadows LLC c/o Buxton Environmental

Facility/Owner Name — Facility ID# (if applicable)

1315 Moncure-Flatwood Road Moncure, NC 27559 Chath

Physical Address, City, and Zip

Chatham

County — Parcel Identification No. (PIN)

5b. Latitude and longitude in degrees/minutes/seconds or decimal degrees:
(if well field, one lat/long is sufficient)

35.594601 N 79.011080 W

CONSTRUCTION DETAILS OF WELL(S) BEING ABANDONED

*Attach well construction record(s) if available. For multiple injection or non-water supply wells **ONLY** with the same construction/abandonment, you can submit one form.*

6a. Well ID#: PZM-18

6b. Total well depth: 20 **(ft.)**

6c. Borehole diameter: 2" **(in.)**

6d. Water level below ground surface: _____ **(ft.)**

6e. Outer casing length (if known): 10' **(ft.)**

6f. Inner casing/tubing length (if known): _____ **(ft.)**

6g. Screen length (if known): 10' **(ft.)**

For Internal Use ONLY:

WELL ABANDONMENT DETAILS

7a. Number of wells being abandoned: 1

*For multiple injection or non-water supply wells **ONLY** with the same construction/abandonment, you can submit one form.*

7b. Approximate volume of water remaining in well(s): _____ **(gal.)**

FOR WATER SUPPLY WELLS ONLY:

7c. Type of disinfectant used: _____

7d. Amount of disinfectant used: _____

7e. Sealing materials used (check all that apply):

☒ Neat Cement Grout	☐ Bentonite Chips or Pellets
☐ Sand Cement Grout	☐ Dry Clay
☐ Concrete Grout	☐ Drill Cuttings
☐ Specialty Grout	☐ Gravel
☐ Bentonite Slurry	☐ Other (explain under 7g)

7f. For each material selected above, provide amount of materials used:

Neat Cem.:94lb ,Wtr:7gal. Sand Cem.:lb ,Wtr:gal.

Neat cememt Amount:~65 gallons

7g. Provide a brief description of the abandonment procedure:

Overdrill with 8" outer diameter HSA to base of well, remove PVC well, tremmie grout from bottom to grade.

8. Certification:

Signature of Certified Well Contractor or Well Owner — Date: 05/30/2015

By signing this form, I hereby certify that the well(s) was (were) abandoned in accordance with 15A NCAC 02C .0100 or 2C .0200 Well Construction Standards and that a copy of this record has been provided to the well owner.

9. Site diagram or additional well details:
You may use the back of this page to provide additional well site details or well abandonment details. You may also attach additional pages if necessary.

SUBMITTAL INSTRUCTIONS

10a. For All Wells: Submit this form within 30 days of completion of well abandonment to the following:

Division of Water Resources, Information Processing Unit,
1617 Mail Service Center, Raleigh, NC 27699-1617

10b. For Injection Wells: In addition to sending the form to the address in 10a above, also submit one copy of this form within 30 days of completion of well abandonment to the following:

Division of Water Resources, Underground Injection Control Program,
1636 Mail Service Center, Raleigh, NC 27699-1636

10c. For Water Supply & Injection Wells: In addition to sending the form to the address(es) above, also submit one copy of this form within 30 days of completion of well abandonment to the county health department of the county where abandoned.

Buxton Environmental, Inc.
Consulting Services
1101 South Blvd., Suite 101
Charlotte, North Carolina 28203
Ph (704) 344-1450 Fax (704) 344-1451
buxtonenv@bellsouth.net

Boring Log, PZM-29

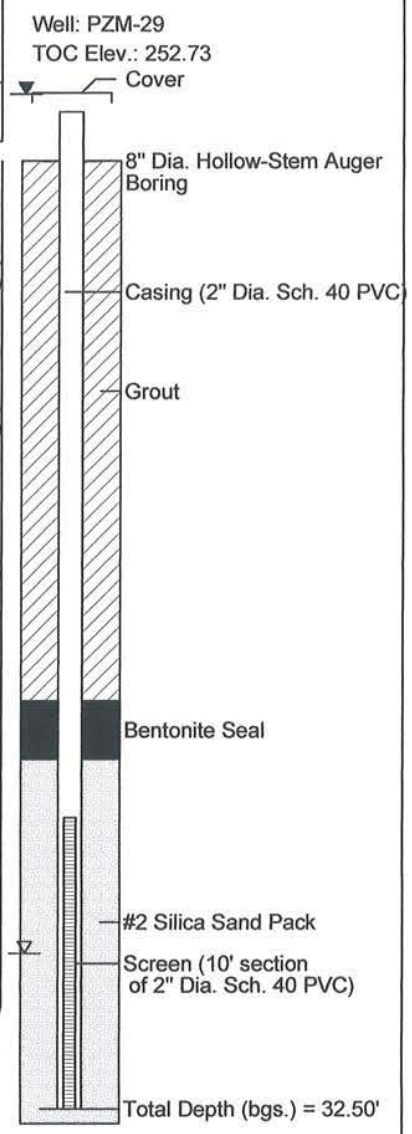
Brickhaven Mine Reclamation Site
1315 Moncure-Flatwood Road
Moncure, North Carolina

Date Started:	: 12/2/14	Logged By:	: Ross Klingman, P.G.
Date Completed:	: 12/2/14	Drilling Method:	: HSA; CME-550
Drilling Company:	: Summit Engineering	Top-of-Casing Elev.:	: 252.73'(Lawrence Survey)
Drillers Name:	: Robert Cassell	Ground Surface Elev.:	: 250.44'(Lawrence Survey)
NC Driller Certification:	: 4143A	Natural, Cut, Fill Grade::	~12' cut

Water Levels
▼ 1 Hour = dry
▽ 24 Hours = 27.16' bgs

Sample Type
SS = Split Spoon
ST = Shelby Tube
RC = Rock Core
BAG = Bag Sample

Depth (feet bgs.)	Elevation (feet asl.)	Blow Count/6-inches	Sampler Type	Recovery (in.)	Lithologic Description
0	250.44				
		50/4"	SS	4	moist; very hard; weak red (10R 4/4); highly horizontal fissile; weathered mudstone; Partially Weathered Rock
5	245.44				
		50/4"	SS	6	moist; very hard; weak red (10R 4/4); highly horizontal fissile; weathered mudstone; Partially Weathered Rock
10	240.44				
		50/1"	SS	4	moist; very hard; dark red (10R 3/4); blocky; weathered sandy mudstone; Partially Weathered Rock
15	235.44				
		50/3"	SS	4	moist; very hard; dark red (10R 3/4); highly horizontal fissile; weathered sandy mudstone; Partially Weathered Rock
20	230.44				
		50/4"	SS	3	moist; very hard; dark reddish gray (10R 4/1); highly horizontal fissile; weathered sandy mudstone; Partially Weathered Rock
25	225.44				
		50/3"	SS	6	moist; very hard; weak red (10R 4/2); blocky; weathered sandy mudstone; Partially Weathered Rock
30	220.44				
					Auger Refusal @ 33'
35	215.44				
40	210.44				
45					



WELL ABANDONMENT RECORD

This form can be used for single or multiple wells

1. Well Contractor Information:

Steve Poloniewicz

Well Contractor Name (or well owner personally abandoning well on his/her property)

2284-A

NC Well Contractor Certification Number

SAEDACCO Inc

Company Name

2. Well Construction Permit #: , ,

List all applicable well permits (i.e. County, State, Variance, Injection, etc.) if known

3. Well use (check well use):

Water Supply Well:	
☐Agricultural	☐Municipal/Public
☐Geothermal (Heating/Cooling Supply)	☐Residential Water Supply (single)
☐Industrial/Commercial	☐Residential Water Supply (shared)
☐Irrigation	
Non-Water Supply Well:	
☒Monitoring	☐Recovery
Injection Well:	
☐Aquifer Recharge	☐Groundwater Remediation
☐Aquifer Storage and Recovery	☐Salinity Barrier
☐Aquifer Test	☐Stormwater Drainage
☐Experimental Technology	☐Subsidence Control
☐Geothermal (Closed Loop)	☐Tracer
☐Geothermal (Heating/Cooling Return)	☐Other (explain under 7g)

4. Date well(s) abandoned: 05/26/2015

5a. Well location:

Green Meadows LLC c/o Buxton Environmental

Facility/Owner Name — Facility ID# (if applicable)

1315 Moncure-Flatwood Road Moncure, NC 27559 Chath

Physical Address, City, and Zip

Chatham

County — Parcel Identification No. (PIN)

5b. Latitude and longitude in degrees/minutes/seconds or decimal degrees:
(if well field, one lat/long is sufficient)

35.594601 N 79.011080 W

CONSTRUCTION DETAILS OF WELL(S) BEING ABANDONED

*Attach well construction record(s) if available. For multiple injection or non-water supply wells **ONLY** with the same construction/abandonment, you can submit one form.*

6a. Well ID#: PZM-29

6b. Total well depth: 32' (ft.)

6c. Borehole diameter: 2" (in.)

6d. Water level below ground surface: _____ (ft.)

6e. Outer casing length (if known): 22' (ft.)

6f. Inner casing/tubing length (if known): _____ (ft.)

6g. Screen length (if known): 10' (ft.)

For Internal Use ONLY:

WELL ABANDONMENT DETAILS

7a. Number of wells being abandoned: 1

*For multiple injection or non-water supply wells **ONLY** with the same construction/abandonment, you can submit one form.*

7b. Approximate volume of water remaining in well(s): _____ (gal.)

FOR WATER SUPPLY WELLS ONLY:

7c. Type of disinfectant used: _____

7d. Amount of disinfectant used: _____

7e. Sealing materials used (check all that apply):

☒ Neat Cement Grout	☐ Bentonite Chips or Pellets
☐ Sand Cement Grout	☐ Dry Clay
☐ Concrete Grout	☐ Drill Cuttings
☐ Specialty Grout	☐ Gravel
☐ Bentonite Slurry	☐ Other (explain under 7g)

7f. For each material selected above, provide amount of materials used:

Neat Cem.:752lb ,Wtr:90gal. Sand Cem.:lb ,Wtr:gal.

Neat cememt Amount:~100 gallon

7g. Provide a brief description of the abandonment procedure:

Overdrill with 8" outer diameter HSA to base of well, remove PVC well, tremmie grout from bottom to grade.

8. Certification:

Steve Poloniewicz — 05/26/15

Signature of Certified Well Contractor or Well Owner — Date

By signing this form, I hereby certify that the well(s) was (were) abandoned in accordance with 15A NCAC 02C .0100 or 2C .0200 Well Construction Standards and that a copy of this record has been provided to the well owner.

9. Site diagram or additional well details:
You may use the back of this page to provide additional well site details or well abandonment details. You may also attach additional pages if necessary.

SUBMITTAL INSTRUCTIONS

10a. For All Wells: Submit this form within 30 days of completion of well abandonment to the following:

Division of Water Resources, Information Processing Unit,
1617 Mail Service Center, Raleigh, NC 27699-1617

10b. For Injection Wells: In addition to sending the form to the address in 10a above, also submit one copy of this form within 30 days of completion of well abandonment to the following:

Division of Water Resources, Underground Injection Control Program,
1636 Mail Service Center, Raleigh, NC 27699-1636

10c. For Water Supply & Injection Wells: In addition to sending the form to the address(es) above, also submit one copy of this form within 30 days of completion of well abandonment to the county health department of the county where abandoned.

Buxton Environmental, Inc.
Consulting Services
1101 South Blvd., Suite 101
Charlotte, North Carolina 28203
Ph (704) 344-1450 Fax (704) 344-1451
buxtonenv@bellsouth.net

Boring Log, PZM-2 and 2D

Moncure Mine Reclamation Site
1315 Moncure-Flatwood Road
Moncure, North Carolina

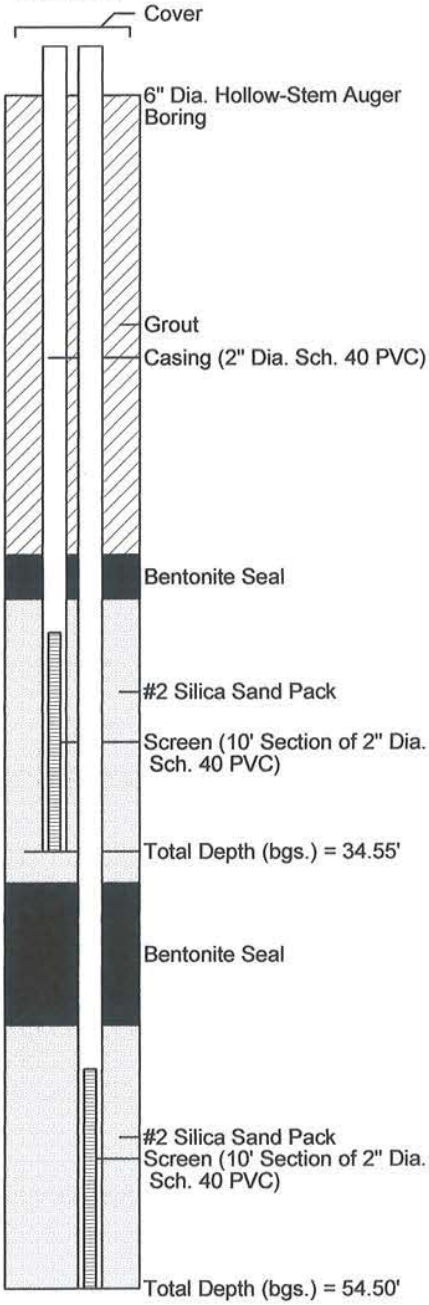
Date Started:	: 8/6/14	Logged By:	: Ross Klingman, P.G.
Date Completed:	: 8/6/14	Drilling Method:	: HSA; CME-550
Drilling Company:	: HPC Land Services	Top-of-Casing Elev.:	: 222.37'/222.40'
Drillers Name:	: Jason Cain	Ground Surface Elev.:	: 219.73
NC Driller Certification:	: 3112A	Natural, Cut, Fill Grade::	fill, road bed

Water Levels
▼ 1 Hour = 32.00' bgs/dry
▽ 24 Hours = 16.76'/29.49' bgs

Sample Type
SS = Split Spoon
ST = Shelby Tube
RC = Rock Core
BAG = Bag Sample

Well1: PZM-2
Well2: PZM-2D
TOC Elev.:

Depth (feet bgs.)	Elevation (feet asl.)	Blow Count/6-inches	Sampler Type	Recovery (in.)	Lithologic Description
0	219.73	9 7 13	SS	10	moist/dry; very stiff; strong brown (7.5YR 5/6) with orange mottles; quartz gravelly clayey silt; no plasticity; cohesive; Fill
5	214.73	4 5 6	SS	8	wet; stiff; strong brown (7.5YR 5/6) with orange mottles; quartz gravelly silty clay with brick fragments; no plasticity; cohesive; Fill
10	209.73	3 5 6	SS	16	moist; stiff; light brownish gray (10YR 6/2) with orange mottles; silty fat clay with roots; high plastcity; cohesive; Soil Horizon
15	204.73	4 11 12	SS	24	moist; very stiff; reddish brown (5YR 4/4) with black mottles; medium horizontal fissile; silty clay; low plasticity; Residuum
20	199.73	50/4"	SS	8	moist; reddish gray (5YR 5/2); highly horizontal fissile; clayey silt; no plasticity; cohesive; Partially Weathered Rock
25	194.73	50/6"	SS,BAG	10	moist; very hard; reddish gray (5YR 5/2) with green flecks; medium horizontal fissile; silty clay; no plasticity; cohesive; Partially Weathered Rock; (Lab Results: PZM-2 Bag (23.5-24); USCS=CL; Gravel=4.7%; Sand=19.9%; Silt=50.3%; Clay=25.1%; Effective Porosity=5%; Atterberg Limits: PL=20, LL=38, PI=18)
30	189.73	50/4"	SS	8	moist; very hard; reddish gray (5YR 5/2) with green flecks; highly horizontal fissile; weathered mudstone; Partially Weathered Rock
35	184.73	50/2"	SS	6	dry; very hard; dark reddish gray (5YR 4/2); highly horizontal fissile; weathered mudstone; Partially Weathered Rock
40	179.73	50/1"	SS	6	dry; very hard; dark reddish gray (5YR 4/2); highly horizontal fissile; weathered mudstone; Partially Weathered Rock
45	174.73	50/2"	SS	6	dry; very hard; dark reddish gray (5YR 4/2); highly horizontal fissile; weathered mudstone; Partially Weathered Rock
50	169.73	50/3"	SS	8	dry; very hard; dark reddish gray (5/YR 4/2); highly horizontal fissile; weathered mudstone; Partially Weathered Rock
55	164.73	50/3"	SS	4	dry; vary hard; dark reddish gray (5YR 4/2); highly horizontal fissile; weathered mudstone; Partially Weathered Rock
60					



WELL ABANDONMENT RECORD

This form can be used for single or multiple wells

1. Well Contractor Information:

Steve Poloniewicz

Well Contractor Name (or well owner personally abandoning well on his/her property)

2284-A

NC Well Contractor Certification Number

SAEDACCO Inc

Company Name

2. Well Construction Permit #: , ,

List all applicable well permits (i.e. County, State, Variance, Injection, etc.) if known

3. Well use (check well use):

Water Supply Well:	
☐Agricultural	☐Municipal/Public
☐Geothermal (Heating/Cooling Supply)	☐Residential Water Supply (single)
☐Industrial/Commercial	☐Residential Water Supply (shared)
☐Irrigation	
Non-Water Supply Well:	
☒Monitoring	☐Recovery
Injection Well:	
☐Aquifer Recharge	☐Groundwater Remediation
☐Aquifer Storage and Recovery	☐Salinity Barrier
☐Aquifer Test	☐Stormwater Drainage
☐Experimental Technology	☐Subsidence Control
☐Geothermal (Closed Loop)	☐Tracer
☐Geothermal (Heating/Cooling Return)	☐Other (explain under 7g)

4. Date well(s) abandoned: 06/17/2015

5a. Well location:

Green Meadows LLC c/o Buxton Environmental

Facility/Owner Name — Facility ID# (if applicable)

1315 Moncure-Flatwood Road Moncure, NC 27559 Chath

Physical Address, City, and Zip

Chatham

County — Parcel Identification No. (PIN)

5b. Latitude and longitude in degrees/minutes/seconds or decimal degrees:
(if well field, one lat/long is sufficient)

35.594601 N 79.011080 W

CONSTRUCTION DETAILS OF WELL(S) BEING ABANDONED

*Attach well construction record(s) if available. For multiple injection or non-water supply wells **ONLY** with the same construction/abandonment, you can submit one form.*

6a. Well ID#: PZM-2/PZM2B

6b. Total well depth: 54.5 **(ft.)**

6c. Borehole diameter: 2" **(in.)**

6d. Water level below ground surface: _____ **(ft.)**

6e. Outer casing length (if known): 54.5 **(ft.)**

6f. Inner casing/tubing length (if known): _____ **(ft.)**

6g. Screen length (if known): _____ **(ft.)**

For Internal Use ONLY:

WELL ABANDONMENT DETAILS

7a. Number of well(s) being abandoned: 2

*For multiple injection or non-water supply wells **ONLY** with the same construction/abandonment, you can submit one form.*

7b. Approximate volume of water remaining in well(s): _____ **(gal.)**

FOR WATER SUPPLY WELLS ONLY:

7c. Type of disinfectant used: _____

7d. Amount of disinfectant used: _____

7e. Sealing materials used (check all that apply):

☒ Neat Cement Grout	☐ Bentonite Chips or Pellets
☐ Sand Cement Grout	☐ Dry Clay
☐ Concrete Grout	☐ Drill Cuttings
☐ Specialty Grout	☐ Gravel
☐ Bentonite Slurry	☐ Other (explain under 7g)

7f. For each material selected above, provide amount of materials used:

Neat Cem.:94lb ,Wtr:7gal. Sand Cem.:lb ,Wtr:gal.

Neat cememt Amount:~140 gallon

7g. Provide a brief description of the abandonment procedure:

Overdrill with 8" outer diameter HSA to base of well, remove PVC well, tremmie grout from bottom to grade.

8. Certification:

Signature of Certified Well Contractor or Well Owner — Date: 6/17/2015

By signing this form, I hereby certify that the well(s) was (were) abandoned in accordance with 15A NCAC 02C .0100 or 2C .0200 Well Construction Standards and that a copy of this record has been provided to the well owner.

9. Site diagram or additional well details:
You may use the back of this page to provide additional well site details or well abandonment details. You may also attach additional pages if necessary.

SUBMITTAL INSTRUCTIONS

10a. For All Wells: Submit this form within 30 days of completion of well abandonment to the following:

Division of Water Resources, Information Processing Unit,
1617 Mail Service Center, Raleigh, NC 27699-1617

10b. For Injection Wells: In addition to sending the form to the address in 10a above, also submit one copy of this form within 30 days of completion of well abandonment to the following:

Division of Water Resources, Underground Injection Control Program,
1636 Mail Service Center, Raleigh, NC 27699-1636

10c. For Water Supply & Injection Wells: In addition to sending the form to the address(es) above, also submit one copy of this form within 30 days of completion of well abandonment to the county health department of the county where abandoned.

Buxton Environmental, Inc.
Consulting Services
1101 South Blvd., Suite 101
Charlotte, North Carolina 28203
Ph (704) 344-1450 Fax (704) 344-1451
buxtonenv@bellsouth.net

Boring Log, PZM-7s and 7

Moncure Mine Reclamation Site
1315 Moncure-Flatwood Road
Moncure, North Carolina

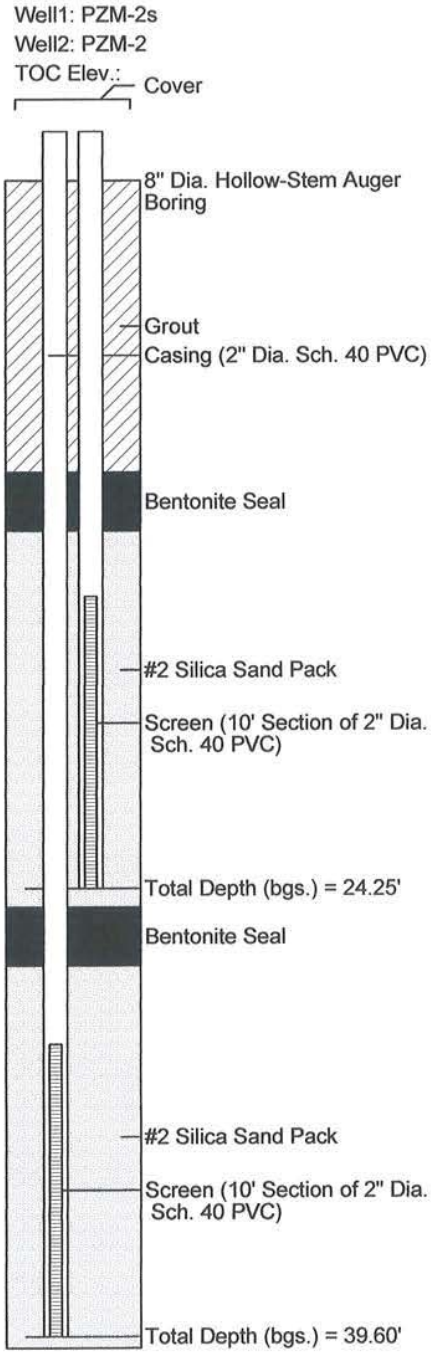
Date Started:	: 8/11/14	Logged By:	: Ross Klingman, P.G.
Date Completed:	: 8/11/14	Drilling Method:	: HSA; CME-550
Drilling Company:	: Summit Engineering	Top-of-Casing Elev.:	: 266.04'/265.79'
Drillers Name:	: Robert Cassell	Ground Surface Elev.:	: 263.59'
NC Driller Certification:	: 4143A	Natural, Cut, Fill Grade::	slight cut

Water Levels
▼ 1 Hour = dry/dry
▽ 24 Hours = dry/dry

Sample Type
SS = Split Spoon
ST = Shelby Tube
RC = Rock Core
BAG = Bag Sample

Depth (feet bgs.)	Elevation (feet asl.)	Blow Count/6-inches	Sampler Type	Recovery (in.)	Lithologic Description
0	263.59	3 3 7	SS	18	moist; stiff; yellowish red (5YR 4/6) with yellow and orange mottles; silty clay; medium plasticity; cohesive; Soil Horizon
5	258.59	5 7 15	SS,ST	24/4	moist; very stiff; weak red (2.5YR 5/2) with light green mottles; silty clay; no plasticity; cohesive; Residuum; (Lab Results: PZM-7 UD (5-5.5'); USCS=CL; Sand=2.2%; Silt=59.5%; Clay=38.3%; Specific Gravity=2.66; Hydraulic Conductivity=4.94 x 10-8 cm/sec; Total Porosity=22.7%; Effective Porosity=2%; Atterberg Limits: PL=22, LL=38; PI=16)
10	253.59	22 50/5"	SS	18	moist; very hard; weak red (10R 5/2) with orange yellow mottles; wavey horizontal fissile; silty clay; no plasticity; cohesive; Partially Weathered Rock
15	248.59	50/4"	SS	10	moist; very hard; weak red (10R 5/2) with orange yellow mottles; wavey horizontal fissile; weathered mudstone; Partially Weathered Rock
20	243.59	50/4"	SS	10	moist; very hard; weak red (10R 5/2); highly horizontal fissile; weathered mudstone; Partially Weathered Rock
25	238.59	50/3"	SS	14	moist; very hard; red (2.5YR 4/6) with light green specks; highly horizontal fissile; weathered mudstone and sandstone layers; Partially Weathered Rock
30	233.59	50/3"	SS	6	moist; very hard; dark blueish gray (Glay 2 4/1); horizontal blocky; weathered mudstone; Partially Weathered Rock
35	228.59	50/0"	SS	3	dry; very hard; reddish brown (2.5YR 4/3) with light green specks; blocky; weathered mudstone; Partially Weathered Rock
40	223.59	50/0"	SS	1	wet; very hard; reddish brown (2.5YR 4/3) with light green specks; blocky; weathered mudstone; Partially Weathered Rock
45					

Auger Refusal @ 40'



WELL ABANDONMENT RECORD

This form can be used for single or multiple wells

1. Well Contractor Information:

Steve Poloniewicz

Well Contractor Name (or well owner personally abandoning well on his/her property)

2284-A

NC Well Contractor Certification Number

SAEDACCO Inc

Company Name

2. Well Construction Permit #: , ,

List all applicable well permits (i.e. County, State, Variance, Injection, etc.) if known

3. Well use (check well use):

Water Supply Well:	
☐Agricultural	☐Municipal/Public
☐Geothermal (Heating/Cooling Supply)	☐Residential Water Supply (single)
☐Industrial/Commercial	☐Residential Water Supply (shared)
☐Irrigation	
Non-Water Supply Well:	
☒Monitoring	☐Recovery
Injection Well:	
☐Aquifer Recharge	☐Groundwater Remediation
☐Aquifer Storage and Recovery	☐Salinity Barrier
☐Aquifer Test	☐Stormwater Drainage
☐Experimental Technology	☐Subsidence Control
☐Geothermal (Closed Loop)	☐Tracer
☐Geothermal (Heating/Cooling Return)	☐Other (explain under 7g)

4. Date well(s) abandoned: 05/26/2015

5a. Well location:

Green Meadows LLC c/o Buxton Environmental

Facility/Owner Name — Facility ID# (if applicable)

1315 Moncure-Flatwood Road Moncure, NC 27559

Physical Address, City, and Zip

Chatham

County — Parcel Identification No. (PIN)

5b. Latitude and longitude in degrees/minutes/seconds or decimal degrees:
(if well field, one lat/long is sufficient)

35.594601 N 79.011080 W

CONSTRUCTION DETAILS OF WELL(S) BEING ABANDONED

*Attach well construction record(s) if available. For multiple injection or non-water supply wells **ONLY** with the same construction/abandonment, you can submit one form.*

6a. Well ID#: PZM-7s/ PZM-7

6b. Total well depth: 39 **(ft.)**

6c. Borehole diameter: 2" **(in.)**

6d. Water level below ground surface: _____ **(ft.)**

6e. Outer casing length (if known): 29' **(ft.)**

6f. Inner casing/tubing length (if known): _____ **(ft.)**

6g. Screen length (if known): 10' **(ft.)**

For Internal Use ONLY:

WELL ABANDONMENT DETAILS

7a. Number of wells being abandoned: 2

*For multiple injection or non-water supply wells **ONLY** with the same construction/abandonment, you can submit one form.*

7b. Approximate volume of water remaining in well(s): _____ **(gal.)**

FOR WATER SUPPLY WELLS ONLY:

7c. Type of disinfectant used: _____

7d. Amount of disinfectant used: _____

7e. Sealing materials used (check all that apply):

☒ Neat Cement Grout	☐ Bentonite Chips or Pellets
☐ Sand Cement Grout	☐ Dry Clay
☐ Concrete Grout	☐ Drill Cuttings
☐ Specialty Grout	☐ Gravel
☐ Bentonite Slurry	☐ Other (explain under 7g)

7f. For each material selected above, provide amount of materials used:

Neat Cem.:94lb ,Wtr:7gal. Sand Cem.:lb ,Wtr:gal.

Neat cememt Amount:~110 gallor

7g. Provide a brief description of the abandonment procedure:

Overdrill with 8" outer diameter HSA to base of well, remove PVC well, tremmie grout from bottom to grade.

8. Certification:

Signature of Certified Well Contractor or Well Owner — Date: 5/26/15

By signing this form, I hereby certify that the well(s) was (were) abandoned in accordance with 15A NCAC 02C .0100 or 2C .0200 Well Construction Standards and that a copy of this record has been provided to the well owner.

9. Site diagram or additional well details:
You may use the back of this page to provide additional well site details or well abandonment details. You may also attach additional pages if necessary.

SUBMITTAL INSTRUCTIONS

10a. For All Wells: Submit this form within 30 days of completion of well abandonment to the following:

Division of Water Resources, Information Processing Unit,
1617 Mail Service Center, Raleigh, NC 27699-1617

10b. For Injection Wells: In addition to sending the form to the address in 10a above, also submit one copy of this form within 30 days of completion of well abandonment to the following:

Division of Water Resources, Underground Injection Control Program,
1636 Mail Service Center, Raleigh, NC 27699-1636

10c. For Water Supply & Injection Wells: In addition to sending the form to the address(es) above, also submit one copy of this form within 30 days of completion of well abandonment to the county health department of the county where abandoned.

Buxton Environmental, Inc.
Consulting Services
1101 South Blvd., Suite 101
Charlotte, North Carolina 28203
Ph (704) 344-1450 Fax (704) 344-1451
buxtonenv@bellsouth.net

Boring Log, PZM-14s and 14

Moncure Mine Reclamation Site
1315 Moncure-Flatwood Road
Moncure, North Carolina

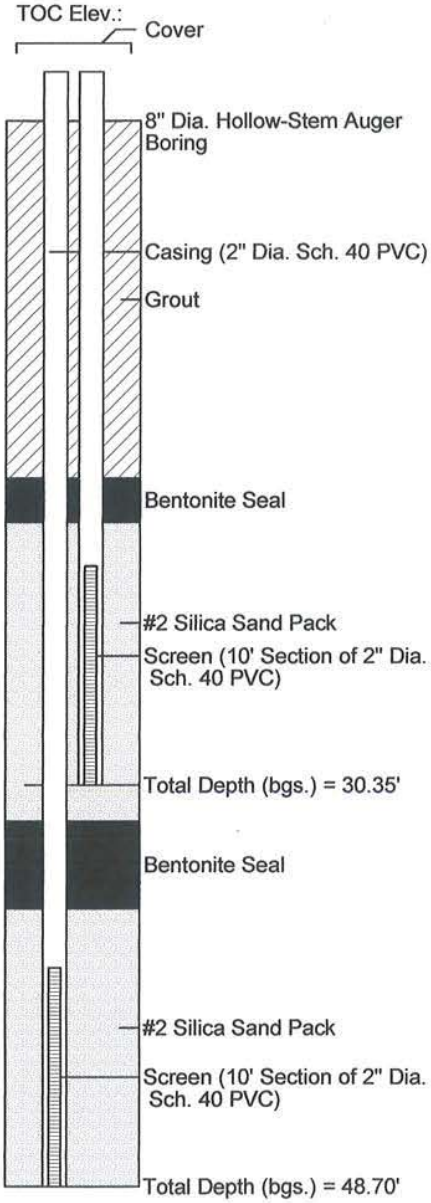
Date Started:	: 8/13/14	Logged By:	: Sean Quarry (HDR)
Date Completed:	: 8/13/14	Drilling Method:	: HSA; CME-550
Drilling Company:	: Summit Engineering	Top-of-Casing Elev.:	: 277.90'/277.75'
Drillers Name:	: Robert Cassell	Ground Surface Elev.:	: 274.79'
NC Driller Certification:	: 4143A	Natural, Cut, Fill Grade::	natural

Water Levels
▼ 1 Hour = dry/dry
▽ 24 Hours = dry/dry

Sample Type
SS = Split Spoon
ST = Shelby Tube
RC = Rock Core
BAG = Bag Sample

Depth (feet bgs.)	Elevation (feet asl.)	Blow Count/6-inches	Sampler Type	Recovery (in.)	Lithologic Description
0	274.79	3 5 5	SS	6	moist; medium; light reddish brown (5YR 6/4); sandy silty clay with rocks, gravel and roots; low plastiticy, cohesive; Soil Horizon
5	269.79	5 5 10	SS	18	moist; very stiff; yellowish red (5YR 4/6) with yellow and gray mottles; silty sandy clay; low plasticity; cohesive; Soil Horizon
10	264.79	10 14 19	SS	17	moist; hard; dark gray with red brown; silty clay; medium plasticity; cohesive; Residuum
15	259.79	13 25 50/6"	SS	17	moist; very hard; dark reddish brown (5YR 3/4) with gray; sandy silty clay; medium plasticity; cohesive; Residuum
20	254.79	8 20 50/6"	SS	15	moist; very hard; dark reddish brown (5YR 3/4) with gray; silty clay; medium plasticity; cohesive; Residuum
25	249.79	39 50/2"	SS	10	moist; very hard; reddish brown (5YR 4/3); horizontal fissile; silty clay; low plasticity; cohesive; Partially Weathered Rock
30	244.79	50/2"	SS	6	moist; very hard; reddish brown (5YR 4/3) with yellow mottles; horizontal fissile; silty clay; low plasticity; cohesive; Partially Weathered Rock
35	239.79	50/3"	SS	3	moist; very hard; reddish brown (5YR 4/3) with yellow mottles; horizontal fissile; silty clay; low plasticity; cohesive; Partially Weathered Rock
40	234.79	35 50/2"	SS	7	moist; very hard; reddish brown (5YR 4/4) with gray; horizontal fissile; silty clay; low plasticity; cohesive; Partially Weathered Rock
45	229.79	50/4"	SS	3	wet; very hard; reddish brown (5YR 4/4) with gray; horizontal fissile; low plasticity; cohesive; Partially Weathered Rock
50	224.79	50/6"	SS,BAG	5	wet; very hard, reddish brown (5YR 4/4) with gray and olive; horizontal fissile; silty clay; low plastcity; cohesive; Partially Weathered Rock; (Lab Results: PZM-14 Bag (48-50'): USCS=CL; Sand=1.3%; Silt=66%; Clay=32.7%; Effective Porosity=3%; Atterberg Limits: PL=19, LL=35, PI=16)
55	219.79				
60					

Well1: PZM-14s
Well2: PZM-14
TOC Elev.:



WELL ABANDONMENT RECORD

This form can be used for single or multiple wells

1. Well Contractor Information:

Steve Poloniewicz

Well Contractor Name (or well owner personally abandoning well on his/her property)

2284-A

NC Well Contractor Certification Number

SAEDACCO Inc

Company Name

2. Well Construction Permit #: , ,

List all applicable well permits (i.e. County, State, Variance, Injection, etc.) if known

3. Well use (check well use):

Water Supply Well:	
☐Agricultural	☐Municipal/Public
☐Geothermal (Heating/Cooling Supply)	☐Residential Water Supply (single)
☐Industrial/Commercial	☐Residential Water Supply (shared)
☐Irrigation	
Non-Water Supply Well:	
☒Monitoring	☐Recovery
Injection Well:	
☐Aquifer Recharge	☐Groundwater Remediation
☐Aquifer Storage and Recovery	☐Salinity Barrier
☐Aquifer Test	☐Stormwater Drainage
☐Experimental Technology	☐Subsidence Control
☐Geothermal (Closed Loop)	☐Tracer
☐Geothermal (Heating/Cooling Return)	☐Other (explain under 7g)

4. Date well(s) abandoned: 06/18/2015

5a. Well location:

Green Meadows LLC c/o Buxton Environmental

Facility/Owner Name — Facility ID# (if applicable)

1315 Moncure-Flatwood Road Moncure, NC 27559 Chath

Physical Address, City, and Zip

Chatham

County — Parcel Identification No. (PIN)

5b. Latitude and longitude in degrees/minutes/seconds or decimal degrees:
(if well field, one lat/long is sufficient)

35.594601 N 79.011080 W

CONSTRUCTION DETAILS OF WELL(S) BEING ABANDONED

*Attach well construction record(s) if available. For multiple injection or non-water supply wells **ONLY** with the same construction/abandonment, you can submit one form.*

6a. Well ID#: PZM-14s/14

6b. Total well depth: 49' (ft.)

6c. Borehole diameter: 2" (in.)

6d. Water level below ground surface: _____ (ft.)

6e. Outer casing length (if known): 49' (ft.)

6f. Inner casing/tubing length (if known): _____ (ft.)

6g. Screen length (if known): _____ (ft.)

For Internal Use ONLY:

WELL ABANDONMENT DETAILS

7a. Number of wells being abandoned: 2

*For multiple injection or non-water supply wells **ONLY** with the same construction/abandonment, you can submit one form.*

7b. Approximate volume of water remaining in well(s): _____ (gal.)

FOR WATER SUPPLY WELLS ONLY:

7c. Type of disinfectant used: _____

7d. Amount of disinfectant used: _____

7e. Sealing materials used (check all that apply):

☒ Neat Cement Grout	☐ Bentonite Chips or Pellets
☐ Sand Cement Grout	☐ Dry Clay
☐ Concrete Grout	☐ Drill Cuttings
☐ Specialty Grout	☐ Gravel
☐ Bentonite Slurry	☐ Other (explain under 7g)

7f. For each material selected above, provide amount of materials used:

Neat Cem.:94lb ,Wtr:7gal. Sand Cem.:lb ,Wtr:gal.

Neat cememt Amount:~120 gallor

7g. Provide a brief description of the abandonment procedure:

Overdrill with 8" outer diameter HSA to base of well, remove PVC well, tremmie grout from bottom to grade.

8. Certification:

Signature of Certified Well Contractor or Well Owner — Date 06/18/2015

By signing this form, I hereby certify that the well(s) was (were) abandoned in accordance with 15A NCAC 02C .0100 or 2C .0200 Well Construction Standards and that a copy of this record has been provided to the well owner.

9. Site diagram or additional well details:
You may use the back of this page to provide additional well site details or well abandonment details. You may also attach additional pages if necessary.

SUBMITTAL INSTRUCTIONS

10a. For All Wells: Submit this form within 30 days of completion of well abandonment to the following:

Division of Water Resources, Information Processing Unit,
1617 Mail Service Center, Raleigh, NC 27699-1617

10b. For Injection Wells: In addition to sending the form to the address in 10a above, also submit one copy of this form within 30 days of completion of well abandonment to the following:

Division of Water Resources, Underground Injection Control Program,
1636 Mail Service Center, Raleigh, NC 27699-1636

10c. For Water Supply & Injection Wells: In addition to sending the form to the address(es) above, also submit one copy of this form within 30 days of completion of well abandonment to the county health department of the county where abandoned.

Buxton Environmental, Inc.
Consulting Services
1101 South Blvd., Suite 101
Charlotte, North Carolina 28203
Ph (704) 344-1450 Fax (704) 344-1451
buxtonenv@bellsouth.net

Boring Log, PZM-17s and 17

Moncure Mine Reclamation Site
1315 Moncure-Flatwood Road
Moncure, North Carolina

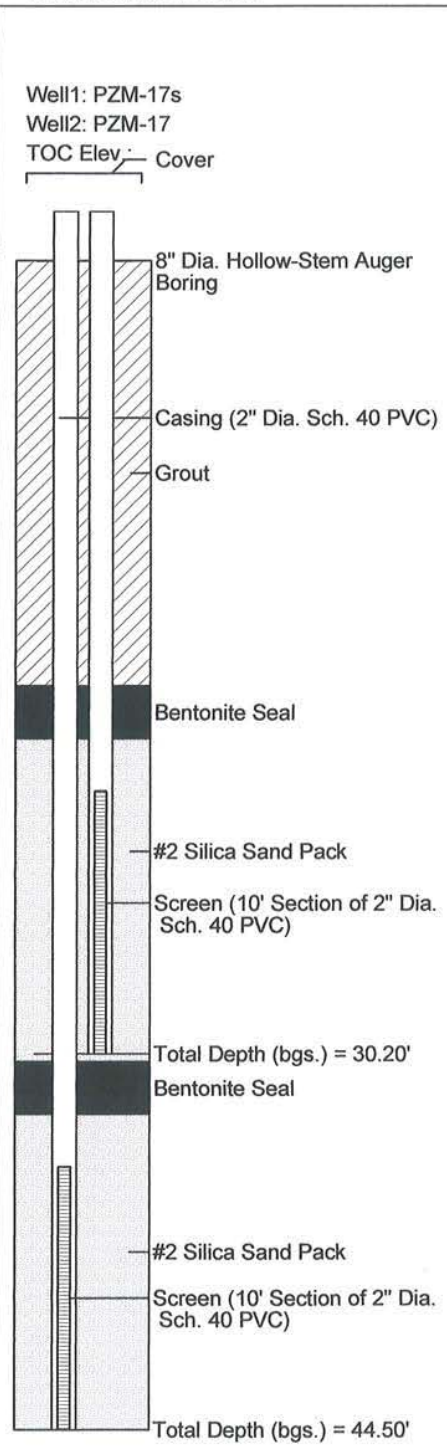
Date Started:	: 8/14/14	Logged By:	: Ross Klingman, P.G
Date Completed:	: 8/14/14	Drilling Method:	: HSA; CME-550
Drilling Company:	: Summit Engineering	Top-of-Casing Elev.:	: 266.74'/266.85'
Drillers Name:	: Robert Cassell	Ground Surface Elev.:	: 263.78'
NC Driller Certification:	: 4143A	Natural, Cut, Fill Grade::	cut

Water Levels
▼ 1 Hour = dry/dry
▽ 24 Hours = dry/dry

Sample Type
SS = Split Spoon
ST = Shelby Tube
RC = Rock Core
BAG = Bag Sample

Depth (feet bgs.)	Elevation (feet asl.)	Blow Count/6-inches	Sampler Type	Recovery (in.)	Lithologic Description
0	263.78	4 7 10	SS	24	moist; very stiff; dark reddish brown (2.5YR 3/4) with tan and light gray mottles; sandy clay, clayey silt and clayey sand; no plasticity; cohesive; Soil Horizon
5	258.78	8 17 24	SS	18	moist; hard; dark red (2.5YR 3/6) with light green gray mottles; silty clay; no plasticity; cohesive; Residuum
10	253.78	8 11 29	SS	19	moist; hard; dark red (2.5YR 3/6) with light green gray mottles; silty clay; no plasticity; cohesive; Residuum
15	248.78	23 15 17	SS,BAG	14	moist; hard; dark red (2.5YR 3/6) with light green gray mottles; blocky horizontal fissile; silty clay; no plasticity; cohesive; Residuum; (Lab Results PZM-17 Bag (13.5-15'); USCS=CL; Sand 1.5%; Silt=75%; Clay 23.5%; Effective Porosity=4%; Atterberg Limits: PL=19, LL=35, PI=16)
20	243.78	50/3"	SS	10	moist; very hard; dark red (2.5YR 3/6); blocky horizontal fissile; silty clay; no plasticity, cohesive; Partially Weathered Rock
25	238.78	50/4"	SS	6	moist; very hard; dark red (2.5YR 3/6); blocky horizontal fissile; silty clay; no plasticity; cohesive; Partially Weathered Rock
30	233.78	50/4"	SS	6	moist; very hard; reddish brown (2.5YR 4/4); highly horizontal fissile; weathered sandy mudstone; Partially Weathered Rock
35	228.78	50/1"	SS	3	moist; very hard; dark red (2.5YR 3/6); silty clay with rock fragments; no plasticity; cohesive; Partially Weathered Rock
40	223.78	50/2"	SS	8	dry; very hard; weak red (10R 4/4); highly horizontal fissile; weathered mudstone; Partially Weathered Rock
45	218.78	50/1"	SS	6	wet; very hard; dark red (2.5YR 3/6); silty clay; no plasticity; cohesive; Partially Weathered Rock
50					

Auger Refusal @ 44.5'



WELL ABANDONMENT RECORD

This form can be used for single or multiple wells

1. Well Contractor Information:

Steve Poloniewicz

Well Contractor Name (or well owner personally abandoning well on his/her property)

2284-A

NC Well Contractor Certification Number

SAEDACCO Inc

Company Name

2. Well Construction Permit #: , ,

List all applicable well permits (i.e. County, State, Variance, Injection, etc.) if known

3. Well use (check well use):

Water Supply Well:	
☐Agricultural	☐Municipal/Public
☐Geothermal (Heating/Cooling Supply)	☐Residential Water Supply (single)
☐Industrial/Commercial	☐Residential Water Supply (shared)
☐Irrigation	
Non-Water Supply Well:	
☒Monitoring	☐Recovery
Injection Well:	
☐Aquifer Recharge	☐Groundwater Remediation
☐Aquifer Storage and Recovery	☐Salinity Barrier
☐Aquifer Test	☐Stormwater Drainage
☐Experimental Technology	☐Subsidence Control
☐Geothermal (Closed Loop)	☐Tracer
☐Geothermal (Heating/Cooling Return)	☐Other (explain under 7g)

4. Date well(s) abandoned: 05/29/2015

5a. Well location:

Green Meadows LLC c/o Buxton Environmental

Facility/Owner Name — Facility ID# (if applicable)

1315 Moncure-Flatwood Road Moncure, NC 27559 Chath

Physical Address, City, and Zip

Chatham

County — Parcel Identification No. (PIN)

5b. Latitude and longitude in degrees/minutes/seconds or decimal degrees:
(if well field, one lat/long is sufficient)

35.594601 N 79.011080 W

CONSTRUCTION DETAILS OF WELL(S) BEING ABANDONED

*Attach well construction record(s) if available. For multiple injection or non-water supply wells **ONLY** with the same construction/abandonment, you can submit one form.*

6a. Well ID#: PZM-17s/ PZM-17

6b. Total well depth: 44.5 **(ft.)**

6c. Borehole diameter: 2" **(in.)**

6d. Water level below ground surface: _____ **(ft.)**

6e. Outer casing length (if known): 29.5' **(ft.)**

6f. Inner casing/tubing length (if known): _____ **(ft.)**

6g. Screen length (if known): _____ **(ft.)**

For Internal Use ONLY:

WELL ABANDONMENT DETAILS

7a. Number of wells being abandoned: 2

*For multiple injection or non-water supply wells **ONLY** with the same construction/abandonment, you can submit one form.*

7b. Approximate volume of water remaining in well(s): _____ **(gal.)**

FOR WATER SUPPLY WELLS ONLY:

7c. Type of disinfectant used: _____

7d. Amount of disinfectant used: _____

7e. Sealing materials used (check all that apply):

☒ Neat Cement Grout	☐ Bentonite Chips or Pellets
☐ Sand Cement Grout	☐ Dry Clay
☐ Concrete Grout	☐ Drill Cuttings
☐ Specialty Grout	☐ Gravel
☐ Bentonite Slurry	☐ Other (explain under 7g)

7f. For each material selected above, provide amount of materials used:

Neat Cem.:94lb ,Wtr:7gal. Sand Cem.:lb ,Wtr:gal.

Neat cememt Amount:~120 gallon

7g. Provide a brief description of the abandonment procedure:

Overdrill with 8" outer diameter HSA to base of well, remove PVC well, tremmie grout from bottom to grade.

8. Certification:

Steve Poloniewicz — 05/29/2015

Signature of Certified Well Contractor or Well Owner — Date

By signing this form, I hereby certify that the well(s) was (were) abandoned in accordance with 15A NCAC 02C .0100 or 2C .0200 Well Construction Standards and that a copy of this record has been provided to the well owner.

9. Site diagram or additional well details:
You may use the back of this page to provide additional well site details or well abandonment details. You may also attach additional pages if necessary.

SUBMITTAL INSTRUCTIONS

10a. For All Wells: Submit this form within 30 days of completion of well abandonment to the following:

Division of Water Resources, Information Processing Unit,
1617 Mail Service Center, Raleigh, NC 27699-1617

10b. For Injection Wells: In addition to sending the form to the address in 10a above, also submit one copy of this form within 30 days of completion of well abandonment to the following:

Division of Water Resources, Underground Injection Control Program,
1636 Mail Service Center, Raleigh, NC 27699-1636

10c. For Water Supply & Injection Wells: In addition to sending the form to the address(es) above, also submit one copy of this form within 30 days of completion of well abandonment to the county health department of the county where abandoned.

Buxton Environmental, Inc.

1101 South Blvd., Suite 101 ~ Charlotte, North Carolina 28203
Phone (704) 344-1450 ~ Fax (704) 344-1451 ~ e-mail: buxtonenv@bellsouth.net

August 27, 2015

Mr. Mike Plummer, PE
HDR Engineering of the Carolinas, Inc.
440 South Church Street, Suite 1000
Charlotte, North Carolina 28202

Subject: ***Report of Abandonment of Nested Piezometer PZM-9s/9***
Brickhaven No. 2 Mine Tract "A" Structural Fill
1271 Moncure-Flatwood Road
Moncure, North Carolina

Dear Mr. Plummer,

Buxton Environmental, Inc. respectfully submits this report documenting the abandonment of nested piezometer PZM-9s/9 located outside and adjacent to the footprint of Cells 1 and 2 (under construction) at the Brickhaven No. 2 Mine Tract "A" Structural Fill site located at 1271 Moncure-Flatwood Road in Moncure, North Carolina. The piezometers were installed during the Design Hydrogeologic Report investigation conducted at the site by Buxton Environmental, Inc. The piezometer abandonment activities were conducted on behalf of HDR Engineering of the Carolinas, Inc., and in accordance with North Carolina Well Construction Standards (15A NCAC 02C .0113) and North Carolina Department of Environment and Natural Resources-Solid Waste Section (NCSWS) guidelines.

On July 30, 2015, Mr. Steve Poloniewicz (North Carolina Well Contractor Certification # 2284-A) with SAEDACCO, Inc. located in Fort Mill, South Carolina conducted the abandonment of nested piezometers PZM-9s/9. The abandonment activities were conducted with oversight by Mr. Ross Klingman, P.G. (North Carolina Geologist License #1266) with Buxton Environmental, Inc. (North Carolina Corporate License #C-278). The piezometers were abandoned utilizing the over-drilling method by advancing a 5 7/8-inch diameter roller-cone bit attached to air-drilling rods from the ground surface to near the base of the piezometer, and tremie-grouting the boring from the base of the piezometer to the ground surface with neat cement grout. Due to difficult drilling conditions, the drill bit was only able to be advanced to 36-feet below grade, which was prior to reaching the total depth of 39-feet below grade. The Well Abandonment Record (Form GW-30) and original boring log are attached in Appendix A. Reference Figure 3 in the Design Hydrogeologic Report section of the Brickhaven No.2 Mine Tract "A" Structural Fill permit application for abandoned piezometer location.

If you have any further questions concerning these matters, please give me a call at (704) 344-1450.

Sincerely,
Buxton Environmental, Inc.

Ross Klingman, P.G.

NORTH CAROLINA
LICENSED
SEAL
1266
8-27-15
GEOLOGIST
CHARLES ROSS KLINGMAN

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Buxton Environmental, Inc.
Consulting Services
1101 South Blvd., Suite 101
Charlotte, North Carolina 28203
Ph (704) 344-1450 Fax (704) 344-1451
buxtonenv@bellsouth.net

Boring Log, PZM-9s and 9

Moncure Mine Reclamation Site
1315 Moncure-Flatwood Road
Moncure, North Carolina

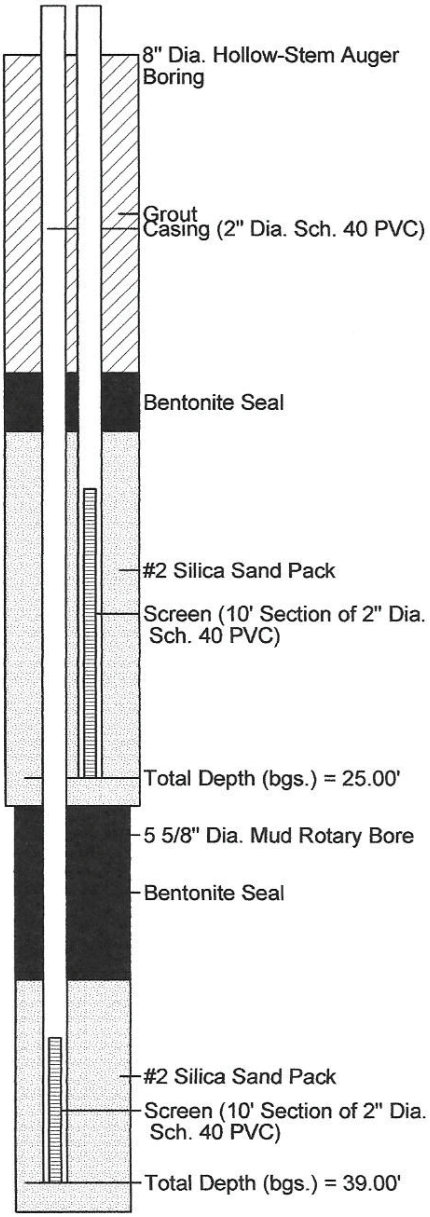
Date Started:	: 8/12/14	Logged By:	: Ross Klingman, P.G.
Date Completed:	: 8/12/14	Drilling Method:	: Geoprobe 8040DT
Drilling Company:	: Geologic Exploration	Top-of-Casing Elev.:	: 227.03'/227.20'
Drillers Name:	: Johnny Burr	Ground Surface Elev.:	: 224.24'
NC Driller Certification:	: 3098A	Natural, Cut, Fill Grade::	slight cut

Water Levels
▼ 1 Hour = dry/dry
▽ 24 Hours = dry/dry

Sample Type
SS = Split Spoon
ST = Shelby Tube
RC = Rock Core
BAG = Bag Sample

Depth (feet bgs.)	Elevation (feet asl.)	Blow Count/6-inches	Sampler Type	Recovery (in.)	Lithologic Description
0	224.24	5 19 15	SS	24	moist; hard; brownish yellow (10YR 6/6) with brown gray mottles; highly horizontal fissle; clayey silt; no plasticity; cohesive; Residuum
5	219.24	1 39 43	SS	24	very moist; very hard; yellowish brown (10YR 5/6) with gray and rust mottles; cleyey silt; no plasticity; cohesive; Residuum
10	214.24	6 8 39	SS	8	moist; hard; yellowish brown (10YR 5/6) with gray and rust mottles; silty clay; no plasticity; cohesive; Residuum
15	209.24	15 28 50/5"	SS	9	moist; very hard; dusky red (10R 3/2); silty clay; no plasticity; cohesive; Residuum
20	204.24	28 34 50/3"	SS,BAG	17	moist; very hard; dusky red (10R 3/2) with gray and yellow mottles; silty clay; no plasticity; cohesive; Partially Weathered Rock; (Lab Results: PZM-9 Bag (18.5-20'); USCS=CL; Sand=2%; Silt=54.5%; Clay=43.5%; Effective Porosity=1%; Atterberg Limits: PL=22; LL=41; PI=19)
25	199.24	17 50/2"	SS	17	moist; very hard; dark greenish gray (Gley 2); highly horizontal fissile; weathered mudstone; Partially Weathered Rock
					Auger Refusal @ 26'
					Advance 5 5/8" Diameter Mud-Rotay Bit from 26-29' (solid rock)
30	194.24				Advance HQ rock core (3 5/8" outer diameter) from 29-30.75' (21" total), then break-through rock into muddy material clogging rock core barrel; remove rock core drilling equipment.
					1st Run from 29-30.75' (21" Recovery; RQD=47.6%; Rock Mass Quality=Poor)
35	189.24				Upper 6" core (light gray blocky mudstone; rock (with 60 degree fracture) and Partially Weathered Rock (ground into gravel))
40	184.24				Lower 15" (light gray tan; alternating layers of muddy cross-bedded sandstone with sandy mudstone; with horizontal, 60 degree and near vertical fractures)
					Advance bore with 5 5/8" diameter mud-rotary drilling from 31.5-40'; in and out of rock layers to terminus of the boring.
45					

Well1: PZM-9s
Well2: PZM-9
TOC Elev.: — Cover



WELL ABANDONMENT RECORD

This form can be used for single or multiple wells

1. Well Contractor Information:

Steve Poloniewicz

Well Contractor Name (or well owner personally abandoning well on his/her property)

2284-A

NC Well Contractor Certification Number

SAEDACCO Inc

Company Name

2. Well Construction Permit #: , ,

List all applicable well permits (i.e. County, State, Variance, Injection, etc.) if known

3. Well use (check well use):

Water Supply Well:	
☐ Agricultural	☐ Municipal/Public
☐ Geothermal (Heating/Cooling Supply)	☐ Residential Water Supply (single)
☐ Industrial/Commercial	☐ Residential Water Supply (shared)
☐ Irrigation	
Non-Water Supply Well:	
☒ Monitoring	☐ Recovery
Injection Well:	
☐ Aquifer Recharge	☐ Groundwater Remediation
☐ Aquifer Storage and Recovery	☐ Salinity Barrier
☐ Aquifer Test	☐ Stormwater Drainage
☐ Experimental Technology	☐ Subsidence Control
☐ Geothermal (Closed Loop)	☐ Tracer
☐ Geothermal (Heating/Cooling Return)	☐ Other (explain under 7g)

4. Date well(s) abandoned: 07/30/2015

5a. Well location:

Ross Klingman , Buxton Environmental

Facility/Owner Name — Facility ID# (if applicable)

1315 Moncure-Flatwood Road Moncure, NC 27559 Chath

Physical Address, City, and Zip

Chatham

County — Parcel Identification No. (PIN)

5b. Latitude and longitude in degrees/minutes/seconds or decimal degrees:
(if well field, one lat/long is sufficient)

35.594601 N 79.011080 W

CONSTRUCTION DETAILS OF WELL(S) BEING ABANDONED

*Attach well construction record(s) if available. For multiple injection or non-water supply wells **ONLY** with the same construction/abandonment, you can submit one form.*

6a. Well ID#: PZM-9S, 9

6b. Total well depth: 39' (ft.)

6c. Borehole diameter: 2' (in.)

6d. Water level below ground surface: _____ (ft.)

6e. Outer casing length (if known): _____ (ft.)

6f. Inner casing/tubing length (if known): _____ (ft.)

6g. Screen length (if known): _____ (ft.)

For Internal Use ONLY:

WELL ABANDONMENT DETAILS

7a. Number of wells being abandoned: 2

*For multiple injection or non-water supply wells **ONLY** with the same construction/abandonment, you can submit one form.*

7b. Approximate volume of water remaining in well(s): _____ (gal.)

FOR WATER SUPPLY WELLS ONLY:

7c. Type of disinfectant used: _____

7d. Amount of disinfectant used: _____

7e. Sealing materials used (check all that apply):

☒ Neat Cement Grout	☐ Bentonite Chips or Pellets
☐ Sand Cement Grout	☐ Dry Clay
☐ Concrete Grout	☐ Drill Cuttings
☐ Specialty Grout	☐ Gravel
☐ Bentonite Slurry	☐ Other (explain under 7g)

7f. For each material selected above, provide amount of materials used:

Neat Cem.:423lb ,Wtr:40gal. Sand Cem.:lb ,Wtr:gal.

portland cement Amount:9 47lb

7g. Provide a brief description of the abandonment procedure:

Overdrill with air drilling equipped w/ 5 7/8" roller-cone bit to 36' feet; tremmie grout from bottom to grade.

8. Certification:

Signature of Certified Well Contractor or Well Owner — Date: 7/31/2015

By signing this form, I hereby certify that the well(s) was (were) abandoned in accordance with 15A NCAC 02C .0100 or 2C .0200 Well Construction Standards and that a copy of this record has been provided to the well owner.

9. Site diagram or additional well details:
You may use the back of this page to provide additional well site details or well abandonment details. You may also attach additional pages if necessary.

SUBMITTAL INSTRUCTIONS

10a. For All Wells: Submit this form within 30 days of completion of well abandonment to the following:

Division of Water Resources, Information Processing Unit,
1617 Mail Service Center, Raleigh, NC 27699-1617

10b. For Injection Wells: In addition to sending the form to the address in 10a above, also submit one copy of this form within 30 days of completion of well abandonment to the following:

Division of Water Resources, Underground Injection Control Program,
1636 Mail Service Center, Raleigh, NC 27699-1636

10c. For Water Supply & Injection Wells: In addition to sending the form to the address(es) above, also submit one copy of this form within 30 days of completion of well abandonment to the county health department of the county where abandoned.

B

Appendix B – Field and Laboratory Test Reports (Geotechnics)

B1 – Test Pad Data
B2 – HDR Structural Fill Summary Table
B3 – Structural Fill Laboratory Testing
B4 – Structural Fill Field Nuclear Gauge Testing
B5 – HDR Soil Liner Summary Table
B6 – Clay Liner Laboratory Testing
B7 – Clay Liner Field Nuclear Gauge Testing
B8 – Leachate Collection Stone
B9 – Daily Field Reports
B10 – Cell 1C Testing Grid Map

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B1

B1 – Test Pad Data

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August 31, 2015

Project No. 2015-664-16

Mr. Michael Plummer, P.E.
HDR Engineering, Inc.
440 South Church St., Suite 1000
Charlotte, NC 28202

Transmittal
Laboratory Test Results
Brickhaven No. 2 Mine

Please find attached the laboratory test results for the above referenced project. The tests were outlined on the Project Verification Form that was transmitted to your firm prior to the testing. The testing was performed in general accordance with the methods listed on the enclosed data sheets. The test results are believed to be representative of the samples that were submitted for testing and are indicative only of the specimens which were evaluated. We imply no position with regard to the nature of the test results, i.e. pass/fail and no claims as to the suitability of the material for its intended use.

The test data and all associated project information provided shall be held in strict confidence and disclosed to other parties only with authorization by our Client. The test data submitted herein is considered integral with this report and is not to be reproduced except in whole and only with the authorization of the Client and Geotechnics. The remaining sample materials for this project will be retained for a minimum of 90 days as directed by the Geotechnics' Quality Program.

We are pleased to provide these testing services. Should you have any questions or if we may be of further assistance, please contact our office.

Respectively submitted,
Geotechnics, Inc.

Michael P. Smith
Regional Manager

We understand that you have a choice in your laboratory services and we thank you for choosing Geotechnics.

DCN: Data Transmittal Letter Date: 1/28/05 Rev.: 1

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MOISTURE CONTENT

ASTM D 2216-10

Client:	HDR, INC.
Client Reference:	BRICKHAVEN NO. 2 MINE
Project No.:	2015-664-016

Lab ID:	001	002
Boring No.:	TEST PAD	TEST PAD
Depth (ft):	LIFT 1	LIFT 2
Sample No.:	ST-TP-L1	ST-TP-L2
Tare Number	8	841
Wt. of Tare & Wet Sample (g)	160.64	457.23
Wt. of Tare & Dry Sample (g)	141.02	418.26
Weight of Tare (g)	36.39	259.67
Weight of Water (g)	19.62	38.97
Weight of Dry Sample (g)	104.63	158.59
Water Content (%)	**18.8**	**24.6**

Lab ID	.013	014
Boring No.	TEST PAD	TEST PAD
Depth (ft)	LIFT 2	LIFT 2
Sample No.	TP-L2-1	TP-L2-2
Tare Number	835	837
Wt. of Tare & Wet Sample (g)	1087.49	1216.55
Wt. of Tare & Dry Sample (g)	919.34	1019.13
Weight of Tare (g)	255.52	261.08
Weight of Water (g)	168.15	197.42
Weight of Dry Sample (g)	663.82	758.05
Water Content (%)	**25.3**	**26.0**

Notes :

Tested By *SFS* *Date* *7/28/15* *Checked By* *GEM* *Date* *7/30/15*

DCN: CT-S1 DATE: 3/18/13 REVISION: 4

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MOISTURE CONTENT

ASTM D 2216-10

Client: HDR, INC.
Client Reference: BRICKHAVEN NO. 2 MINE
Project No.: 2015-664-016

Lab ID:	013	014	015
Boring No.:	TEST PAD	TEST PAD	TEST PAD
Depth (ft):	LIFT 1	LIFT 2	LIFT 3
Sample No.:	TP-L1	TP-L2	TP-L3
Tare Number	816	300	822
Wt. of Tare & Wet Sample (g)	508.89	624.87	459.53
Wt. of Tare & Dry Sample (g)	446.19	519.25	387.91
Weight of Tare (g)	134.56	110.54	138.15
Weight of Water (g)	62.70	105.62	71.62
Weight of Dry Sample (g)	311.63	408.71	249.76
Water Content (%)	**20.1**	**25.8**	**28.7**

Notes :

Tested By *NPL* *Date* *8/6/15* *Checked By* *GEM* *Date* *8/11/15*

DCN: CT-S1 DATE: 3/18/13 REVISION: 4

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MOISTURE CONTENT

ASTM D 2216-10

Client: HDR, INC.
Client Reference: BRICKHAVEN NO. 2 MINE
Project No.: 2015-664-016

Lab ID:	003	004	005	006	007
Boring No.:	TEST PAD	TEST PAD	TEST PAD	TEST PAD	TEST PAD
Depth (ft):	LIFT 1	LIFT 1	LIFT 1	LIFT 1	LIFT 1
Sample No.:	TP-L1-1	TP-L1-2	TP-L1-3	TP-L1-4	TP-L1-5
Tare Number	213	832	840	839	203
Wt. of Tare & Wet Sample (g)	952.33	1013.79	786.87	915.70	790.40
Wt. of Tare & Dry Sample (g)	836.47	886.79	697.65	812.47	682.41
Weight of Tare (g)	173.27	259.00	263.02	258.26	170.86
Weight of Water (g)	115.86	127.00	89.22	103.23	107.99
Weight of Dry Sample (g)	663.20	627.79	434.63	554.21	511.55
Water Content (%)	**17.5**	**20.2**	**20.5**	**18.6**	**21.1**

Lab ID	.008	009	010	011	012
Boring No.	TEST PAD	TEST PAD	TEST PAD	TEST PAD	TEST PAD
Depth (ft)	LIFT 2	LIFT 2	LIFT 2	LIFT 2	LIFT 2
Sample No.	TP-L2-1	TP-L2-2	TP-L2-3	TP-L2-4	TP-L2-5
Tare Number	835	837	209	NOT	202
Wt. of Tare & Wet Sample (g)	1087.49	1216.55	1106.07	1043.74	1184.32
Wt. of Tare & Dry Sample (g)	919.34	1019.13	908.85	914.80	995.03
Weight of Tare (g)	255.52	261.08	171.67	171.32	197.24
Weight of Water (g)	168.15	197.42	197.22	128.94	189.29
Weight of Dry Sample (g)	663.82	758.05	737.18	743.48	797.79
Water Content (%)	**25.3**	**26.0**	**26.8**	**17.3**	**23.7**

Notes :

Tested By *HM* *Date* *7/30/15* *Checked By* *GEM* *Date* *7/30/15*

DCN: CT-S1 DATE: 3/18/13 REVISION: 4

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ATTERBERG LIMITS

ASTM D 4318-10 / AASHTO T89-10

Client:	HDR ENGINEERING, INC.	Boring No.:	TESTPAD
Client Reference:	BRICKHAVEN NO. 2 MINE	Depth (ft):	LIFT 1
Project No.:	2015-664-16	Sample No.:	ST-TP-L1
Lab ID:	2015-664-16-001	Soil Description:	**RED SILT**

Note: The USCS symbol used with this test refers only to the minus No. 40 sieve material. See the "Sieve and Hydrometer Analysis" graph page for the complete material description. (Minus No. 40 sieve material, Airdried)

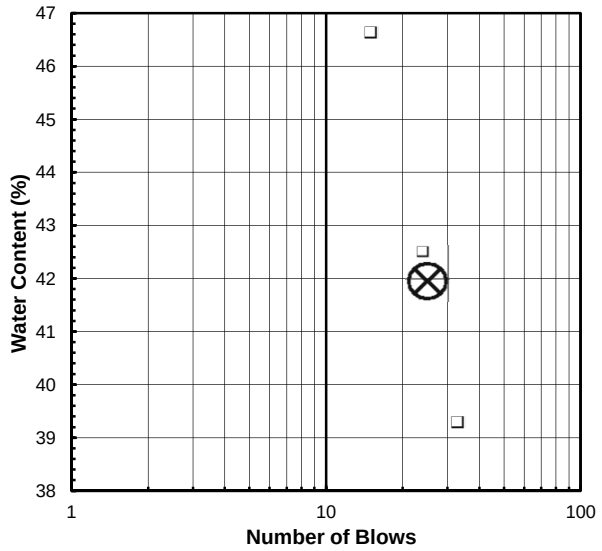
Liquid Limit Test	**1**	**2**	**3**	
Tare Number	R	I	J	**MULTIPOINT**
Wt. of Tare & Wet Sample (g)	27.62	26.97	27.55	
Wt. of Tare & Dry Sample (g)	24.12	23.49	23.61	
Wt. of Tare (g)	15.21	15.30	15.16	
Wt. of Water (g)	3.5	3.5	3.9	
Wt. of Dry Sample (g)	8.9	8.2	8.5	
Moisture Content (%)	**39.3**	**42.5**	**46.6**	
Number of Blows	**33**	**24**	**15**	

Plastic Limit Test	**1**	**2**	**Range**
Tare Number	A-K	V	
Wt. of Tare & Wet Sample (g)	22.64	21.96	
Wt. of Tare & Dry Sample (g)	21.09	20.45	
Wt. of Tare (g)	15.56	15.24	
Wt. of Water (g)	1.6	1.5	
Wt. of Dry Sample (g)	5.5	5.2	
Moisture Content (%)	**28.0**	**29.0**	**-1.0**

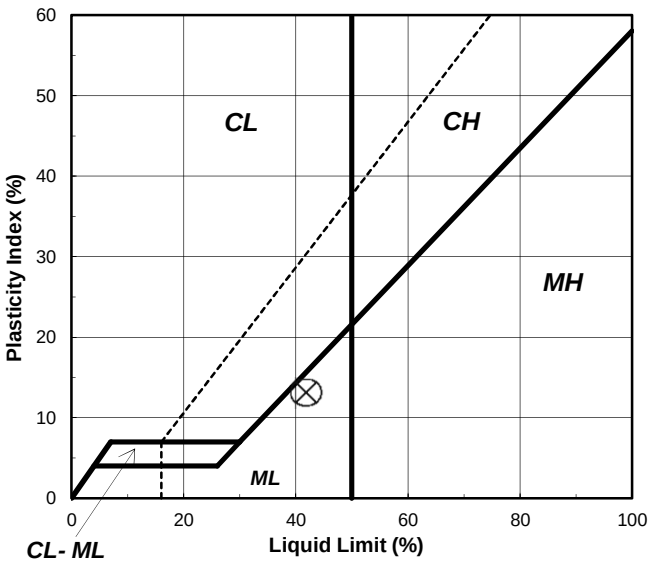
Note: The acceptable range of the two Moisture contents is ± 2.6

Test Results	
Liquid Limit (%)	**42**
Plastic Limit (%)	**29**
Plasticity Index (%)	**13**
USCS Symbol	**ML**

Flow Curve



Plasticity Chart



Tested By	*BW*	*Date*	*8/10/15*	*Checked By*	*GEM*	*Date*	8/11/15

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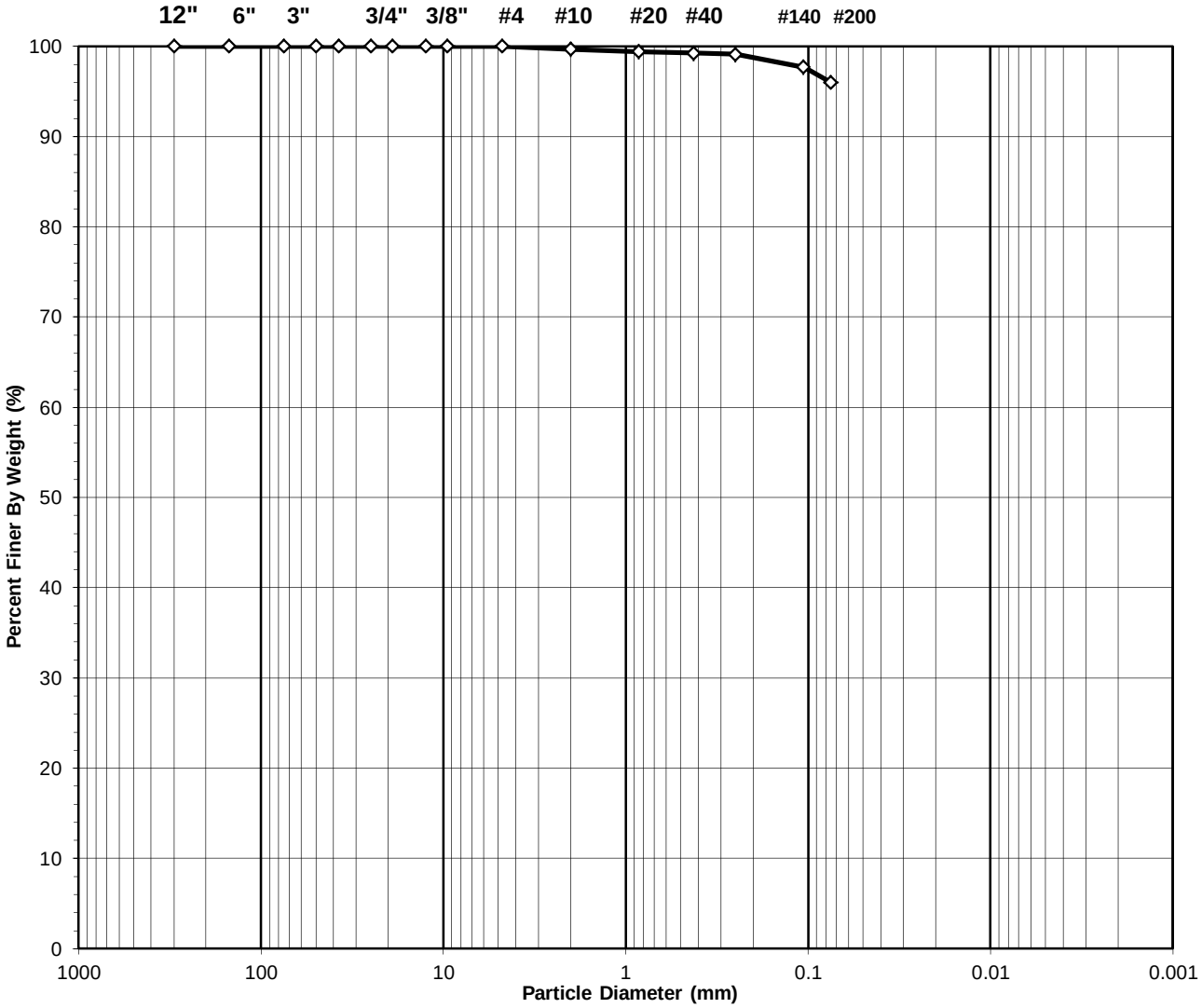
SIEVE ANALYSIS

ASTM D 422-63 (2007)

Client:	HDR ENGINEERING, INC.	Boring No.:	TEST PAD
Client Reference:	BRICKHAVEN NO. 2 MINE	Depth (ft):	LIFT 1
Project No.:	2015-664-16	Sample No.:	ST-TP-L1
Lab ID:	2015-664-16-001	Soil Color:	RED

	SIEVE ANALYSIS		*HYDROMETER*
USCS	**gravel**	**sand**	**silt and clay**



USCS Symbol: ***ML, TESTED***

USCS Classification: ***SILT***

Tested By SMS Date 8/5/15 Checked By GEM Date 8/11/15

 DCN: CT-S3C DATE 3/20/13 REVISION: 3

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WASH SIEVE ANALYSIS

ASTM D 422-63 (2007)

Client:	HDR ENGINEERING, INC.	Boring No.:	TEST PAD
Client Reference:	BRICKHAVEN NO. 2 MINE	Depth (ft):	LIFT 1
Project No.:	2015-664-16	Sample No.:	ST-TP-L1
Lab ID:	2015-664-16-001	Soil Color:	RED

Moisture Content of Passing 3/4" Sample		Water Content of Retained 3/4" Sample	
Tare No.	835	Tare No.	NA
Wt. of Tare & Wet Sample (g)	750.37	Weight of Tare & Wet Sample (g)	NA
Wt. of Tare & Dry Sample (g)	671.67	Weight of Tare & Dry Sample (g)	NA
Weight of Tare (g)	255.52	Weight of Tare (g)	NA
Weight of Water (g)	78.70	Weight of Water (g)	NA
Weight of Dry Sample (g)	416.15	Weight of Dry Sample (g)	NA
Moisture Content (%)	**18.9**	**Moisture Content (%)**	**NA**

Wet Weight of -3/4" Sample (g)	NA	Weight of the Dry Sample (g)	416.15
Dry Weight of - 3/4" Sample (g)	16.7	Weight of - #200 Sample (g)	399.44
Wet Weight of +3/4" Sample (g)	NA	Weight of + #200 Sample (g)	16.71
Dry Weight of + 3/4" Sample (g)	0.00		
Total Dry Weight of Sample (g)	NA		

Sieve Size	Sieve Opening (mm)	Weight of Soil Retained (g)	Percent Retained (%)	Accumulated Percent Retained (%)	Percent Finer (%)	Accumulated Percent Finer (%)
12"	300	0.00	0.00	0.00	100.00	**100.00**
6"	150	0.00	0.00	0.00	100.00	**100.00**
3"	75	0.00	0.00	0.00	100.00	**100.00**
2"	50	0.00	0.00	0.00	100.00	**100.00**
1 1/2"	37.5	0.00	0.00	0.00	100.00	**100.00**
1"	25.0	0.00	0.00	0.00	100.00	**100.00**
3/4"	19.0	0.00	0.00	0.00	100.00	**100.00**
1/2"	12.50	0.00	0.00	0.00	100.00	**100.00**
3/8"	9.50	0.00	0.00	0.00	100.00	**100.00**
#4	4.75	0.00	0.00	0.00	100.00	**100.00**
#10	2.00	1.34	0.32	0.32	99.68	**99.68**
#20	0.850	1.07	0.26	0.58	99.42	**99.42**
#40	0.425	0.67	0.16	0.74	99.26	**99.26**
#60	0.250	0.55	0.13	0.87	99.13	**99.13**
#140	0.106	5.91	1.42	2.29	97.71	**97.71**
#200	0.075	7.17	1.72	4.02	95.98	**95.98**
Pan	-	399.44	95.98	100.00	-	**-**

Tested By SMS Date 8/5/15 Checked By GEM Date 8/11/15

DCN: CT-S3C DATE 3/20/13 REVISION: 3

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PERMEABILITY TEST

ASTM D 5084-10

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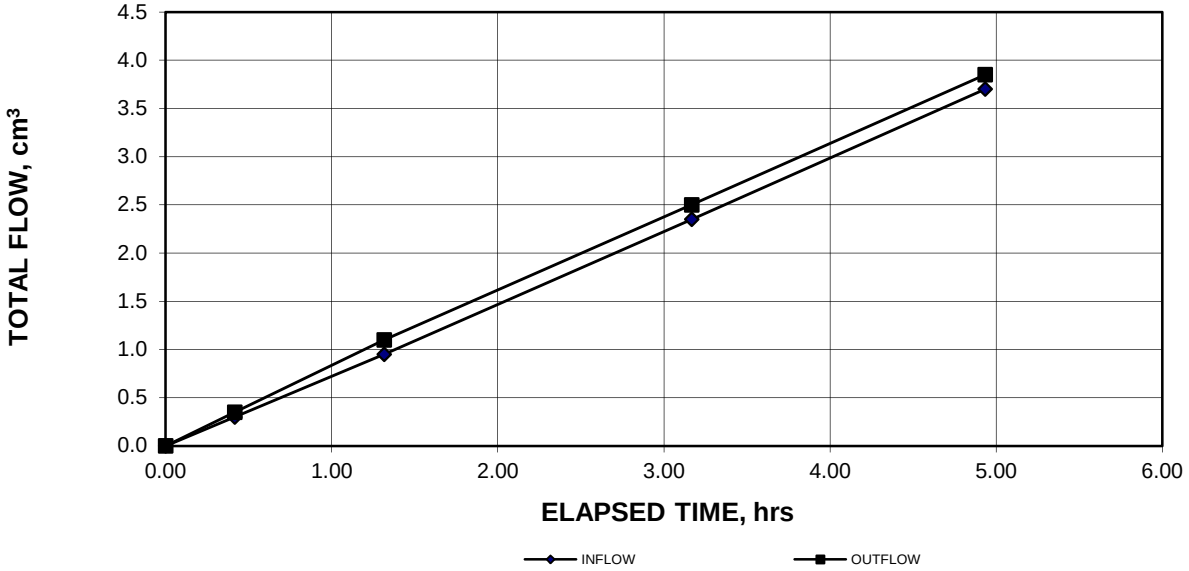
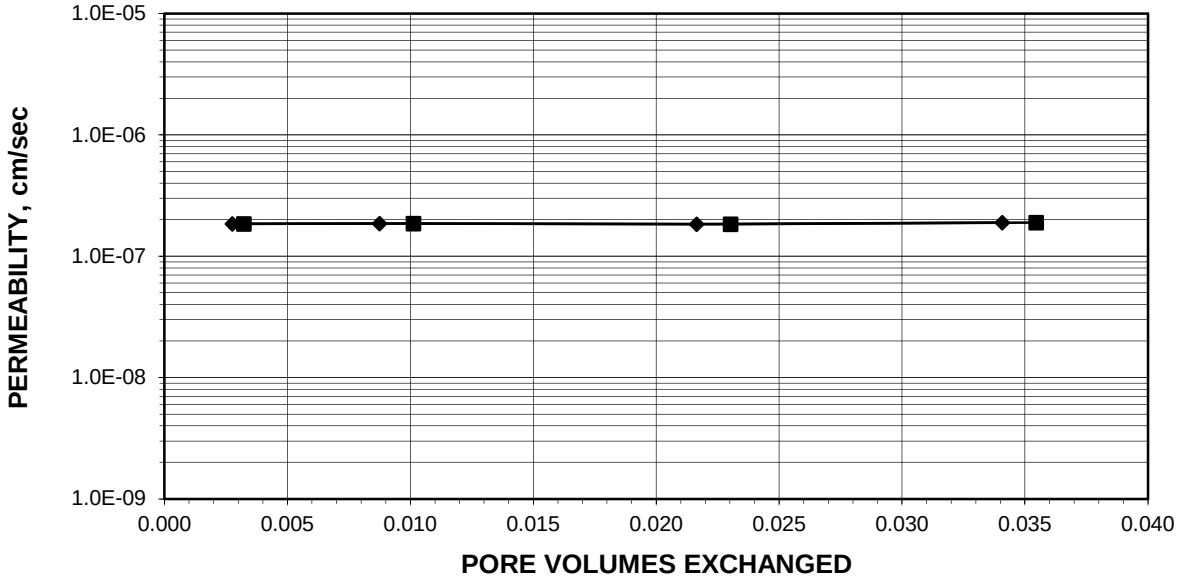
Client	HDR ENGINEERING, INC.	Boring No.	TESTPAD
Client Project	Brickhaven No.2 Mine	Depth (ft.)	LIFT 1
Project No.	2015-664-016	Sample No.	ST-TP-L1
Lab ID No.	2015-664-016-001		

AVERAGE PERMEABILITY = 1.9E-07 cm/sec @ 20°C
AVERAGE PERMEABILITY = 1.9E-09 m/sec @ 20°C

TOTAL FLOW vs. ELAPSED TIME



PORE VOLUMES EXCHANGED vs. PERMEABILITY



Tested By: MPS Date: 7/28/15 Checked By: GEM Date: 7/30/15

DCN: CT-22 DATE: 2/20/2015 REVISION: 0 S:\2015 JOBS\2015-664 HDR ENGINEERING - BRICKHAVEN\[2015-664-16-001 PERMflow.xls]Sheet1

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PERMEABILITY TEST

ASTM D 5084-10

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Client	HDR ENGINEERING, INC.	Boring No.	TESTPAD
Client Project	Brickhaven No.2 Mine	Depth (ft.)	LIFT 1
Project No.	2015-664-016	Sample No.	ST-TP-L1
Lab ID No.	2015-664-016-001		

Specific Gravity	2.70	Assumed
Sample Condition		Remolded

Visual Description: BROWNISH RED CLAY

MOISTURE CONTENT:	BEFORE TEST	AFTER TEST
Tare Number	8	806
Wt. of Tare & WS (gm.)	160.64	357.78
Wt. of Tare & DS (gm.)	141.02	300.89
Wt. of Tare (gm.)	36.39	100.28
Wt. of Water (gm.)	19.62	56.89
Wt. of DS (gm.)	104.63	200.61
Moisture Content (%)	**18.8**	**28.4**

SPECIMEN:	BEFORE TEST	AFTER TEST
Wt. of Tube & WS (gm.)	473.14	NA
Wt. of Tube (gm.)	0.00	NA
Wt. of WS (calc.)(gm.)	473.14	511.42
Length 1 (in.)	2.362	2.382
Length 2 (in.)	2.346	2.395
Length 3 (in.)	2.377	2.405
Top Diameter (in.)	2.856	2.881
Middle Diameter (in.)	2.843	2.887
Bottom Diameter (in.)	2.833	2.882
Average Length (in.)	2.36	2.39
Average Area (in.^{2})	6.35	6.53
Sample Volume (cm^3)	245.85	256.16
Unit Wet Wt. (gm./ cm^3)	1.92	2.00
Unit Wet Wt. (pcf)	120.1	124.6
Unit Dry Wt. (pcf)	101.2	97.1
Unit Dry Wt. (gm./ cm^3)	1.62	1.56
Void Ratio, e	0.67	0.74
Porosity, n	0.40	0.42
Pore Volume (cm^3)	98.3	108.6
Total Wgt. Of Sample After Test		496.60

Tested By: MPS Date: 7/28/15 Checked By: GEM Date: 7/30/15

DCN: CT-22 DATE: 2/2/10 REVISION: 0 T:\PROJECTS\2015-664 HDR ENGINEERING - BRICKHAVEN\[2015-664-16-001 PERMflow.xls]Sheet1

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PERMEABILITY TEST

ASTM D 5084-10

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Client	HDR ENGINEERING, INC.	Boring No.	TESTPAD
Client Project	Brickhaven No.2 Mine	Depth (ft.)	LIFT 1
Project No.	2015-664-016	Sample No.	ST-TP-L1
Lab ID No.	2015-664-016-001		

Pressure Heads (Constant)		Final Sample Dimensions	
Top Cap (psi)	39.0	Sample Length (cm), L	6.08
Bottom Cap (psi)	41.0	Sample Diameter (cm)	7.32
Cell (psi)	50.0	Sample Area (cm^2), A	42.13
Total Pressure Head (cm)	140.6	Inflow Burette Area (cm^2), a-in	0.865
Hydraulic Gradient	23.12	Outflow Burette Area (cm^2), a-out	0.905
		B Parameter (%)	96

AVERAGE PERMEABILITY = 1.9E-07 cm/sec @ 20°C

AVERAGE PERMEABILITY = 1.9E-09 m/sec @ 20°C

DATE (mm/dd/yy)	TIME (hr)	TIME (min)	ELAPSED TIME t (hr)	TOTAL INFLOW (cm^3)	TOTAL OUTFLOW (cm^3)	TOTAL HEAD h (cm)	FLOW (0 flow) (1 stop)	TEMP. (°C)	INCREMENTAL PERMEABILITY @ 20°C (cm/sec)
7/29/15	12	48	0.00	0.0	0.0	153.8	0	23.4	NA
7/29/15	13	13	0.42	0.3	0.4	153.0	0	23.4	1.8E-07
7/29/15	14	7	1.32	1.0	1.1	151.5	0	23.4	1.9E-07
7/29/15	15	58	3.17	2.4	2.5	148.4	0	23.4	1.8E-07
7/29/15	17	44	4.93	3.7	3.9	145.4	1	23.4	1.9E-07

Tested By: MPS Date: 7/28/15 Checked By: GEM Date: 7/30/15

DCN: CT-22 DATE: 2/2/10 REVISION: 0 T:\PROJECTS\2015-664 HDR ENGINEERING - BRICKHAVEN\[2015-664-16-001 PERMflow.xls]Sheet1

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ATTERBERG LIMITS

ASTM D 4318-10 / AASHTO T89-10

Client:	HDR ENGINEERING, INC.	Boring No.:	TESTPAD
Client Reference:	BRICKHAVEN NO. 2 MINE	Depth (ft):	LIFT 2
Project No.:	2015-664-16	Sample No.:	ST-TP-L2
Lab ID:	2015-664-16-002	Soil Description:	**ORANGE FAT CLAY**

Note: The USCS symbol used with this test refers only to the minus No. 40 sieve material. See the "Sieve and Hydrometer Analysis" graph page for the complete material description.

(Minus No. 40 sieve material, Airdried)

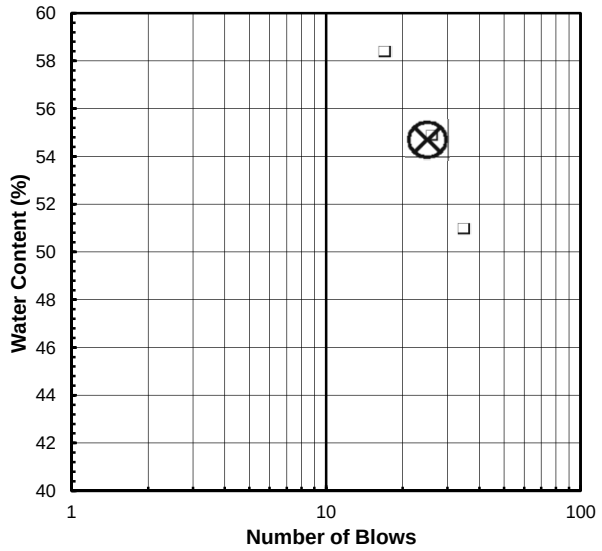
Liquid Limit Test	**1**	**2**	**3**	
Tare Number	B3	Y	A-Q	**M U L T I P O I N T**
Wt. of Tare & Wet Sample (g)	30.19	29.43	30.06	
Wt. of Tare & Dry Sample (g)	25.34	24.57	24.69	
Wt. of Tare (g)	15.82	15.71	15.49	
Wt. of Water (g)	4.9	4.9	5.4	
Wt. of Dry Sample (g)	9.5	8.9	9.2	
Moisture Content (%)	**50.9**	**54.9**	**58.4**	
Number of Blows	**35**	**26**	**17**	

Plastic Limit Test	**1**	**2**	**Range**
Tare Number	A-M	5M	
Wt. of Tare & Wet Sample (g)	21.44	21.72	
Wt. of Tare & Dry Sample (g)	20.08	20.37	
Wt. of Tare (g)	15.39	15.65	
Wt. of Water (g)	1.4	1.4	
Wt. of Dry Sample (g)	4.7	4.7	
Moisture Content (%)	**29.0**	**28.6**	**0.4**

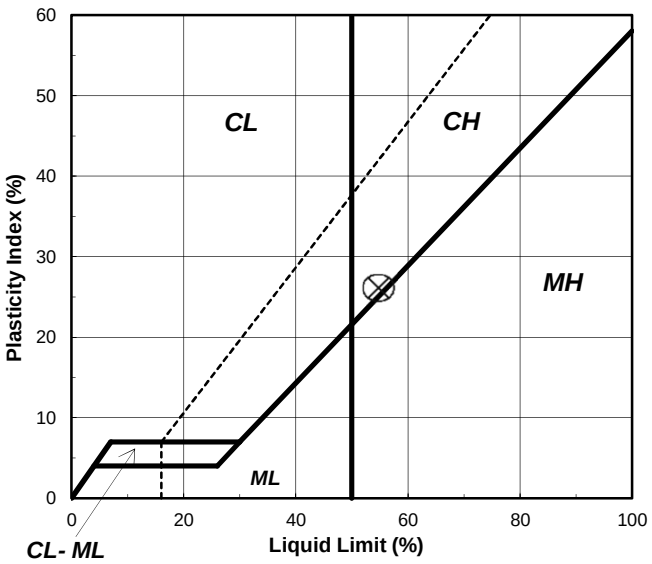
Note: The acceptable range of the two Moisture contents is ± 2.6

Test Results	
Liquid Limit (%)	**55**
Plastic Limit (%)	**29**
Plasticity Index (%)	**26**
USCS Symbol	**CH**

Flow Curve



Plasticity Chart



Tested By	*HM*	*Date*	*8/5/15*	*Checked By*	*GEM*	*Date*	8/6/15

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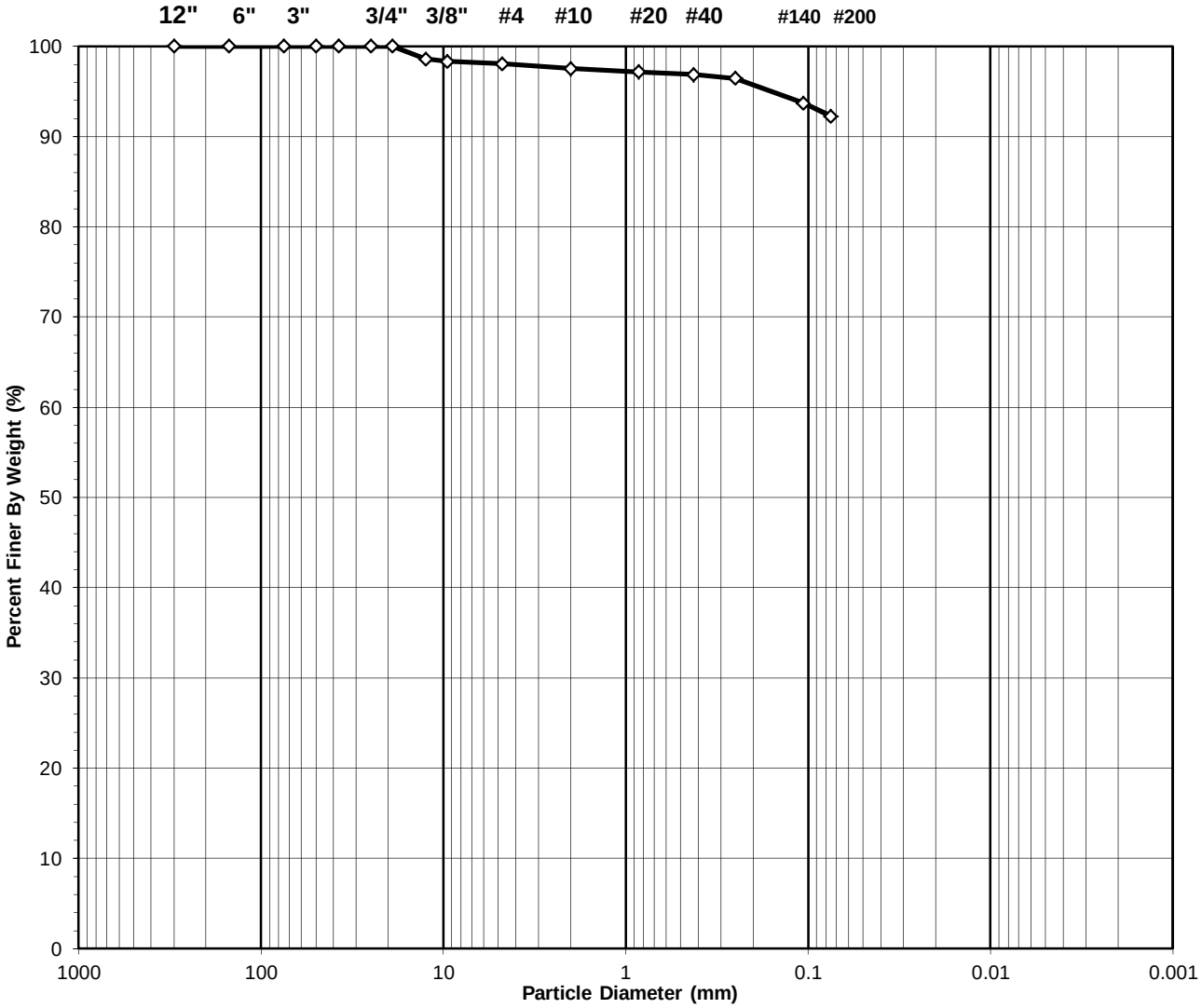
SIEVE ANALYSIS

ASTM D 422-63 (2007)

Client:	HDR ENGINEERING, INC.	Boring No.:	TEST PAD
Client Reference:	BRICKHAVEN NO. 2 MINE	Depth (ft):	LIFT 2
Project No.:	2015-664-16	Sample No.:	ST-TP-L2
Lab ID:	2015-664-16-002	Soil Color:	ORANGE

	SIEVE ANALYSIS		*HYDROMETER*
USCS	**gravel**	**sand**	**silt and clay**



USCS Symbol: ***CH, TESTED***

USCS Classification: ***FAT CLAY***

Tested By SMS Date 8/5/15 Checked By GEM Date 8/6/15

DCN: CT-S3C DATE 3/20/13 REVISION: 3

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WASH SIEVE ANALYSIS

ASTM D 422-63 (2007)

Client:	HDR ENGINEERING, INC.	Boring No.:	TEST PAD
Client Reference:	BRICKHAVEN NO. 2 MINE	Depth (ft):	LIFT 2
Project No.:	2015-664-16	Sample No.:	ST-TP-L2
Lab ID:	2015-664-16-002	Soil Color:	ORANGE

Moisture Content of Passing 3/4" Sample		Water Content of Retained 3/4" Sample	
Tare No.	834	Tare No.	NA
Wt. of Tare & Wet Sample (g)	954.70	Weight of Tare & Wet Sample (g)	NA
Wt. of Tare & Dry Sample (g)	814.23	Weight of Tare & Dry Sample (g)	NA
Weight of Tare (g)	259.76	Weight of Tare (g)	NA
Weight of Water (g)	140.47	Weight of Water (g)	NA
Weight of Dry Sample (g)	554.47	Weight of Dry Sample (g)	NA
Moisture Content (%)	**25.3**	**Moisture Content (%)**	**NA**

Wet Weight of -3/4" Sample (g)	NA	Weight of the Dry Sample (g)	554.47
Dry Weight of - 3/4" Sample (g)	42.9	Weight of - #200 Sample (g)	511.57
Wet Weight of +3/4" Sample (g)	NA	Weight of + #200 Sample (g)	42.90
Dry Weight of + 3/4" Sample (g)	0.00		
Total Dry Weight of Sample (g)	NA		

Sieve Size	Sieve Opening (mm)	Weight of Soil Retained (g)	Percent Retained (%)	Accumulated Percent Retained (%)	Percent Finer (%)	Accumulated Percent Finer (%)
12"	300	0.00	0.00	0.00	100.00	**100.00**
6"	150	0.00	0.00	0.00	100.00	**100.00**
3"	75	0.00	0.00	0.00	100.00	**100.00**
2"	50	0.00	0.00	0.00	100.00	**100.00**
1 1/2"	37.5	0.00	0.00	0.00	100.00	**100.00**
1"	25.0	0.00	0.00	0.00	100.00	**100.00**
3/4"	19.0	0.00	0.00	0.00	100.00	**100.00**
1/2"	12.50	7.77	1.40	1.40	98.60	**98.60**
3/8"	9.50	1.49	0.27	1.67	98.33	**98.33**
#4	4.75	1.42	0.26	1.93	98.07	**98.07**
#10	2.00	2.96	0.53	2.46	97.54	**97.54**
#20	0.850	2.05	0.37	2.83	97.17	**97.17**
#40	0.425	1.68	0.30	3.13	96.87	**96.87**
#60	0.250	2.38	0.43	3.56	96.44	**96.44**
#140	0.106	15.15	2.73	6.29	93.71	**93.71**
#200	0.075	8.00	1.44	7.74	92.26	**92.26**
Pan	-	511.57	92.26	100.00	-	**-**

Tested By SMS Date 8/5/15 Checked By GEM Date 8/6/15

DCN: CT-S3C DATE 3/20/13 REVISION: 3

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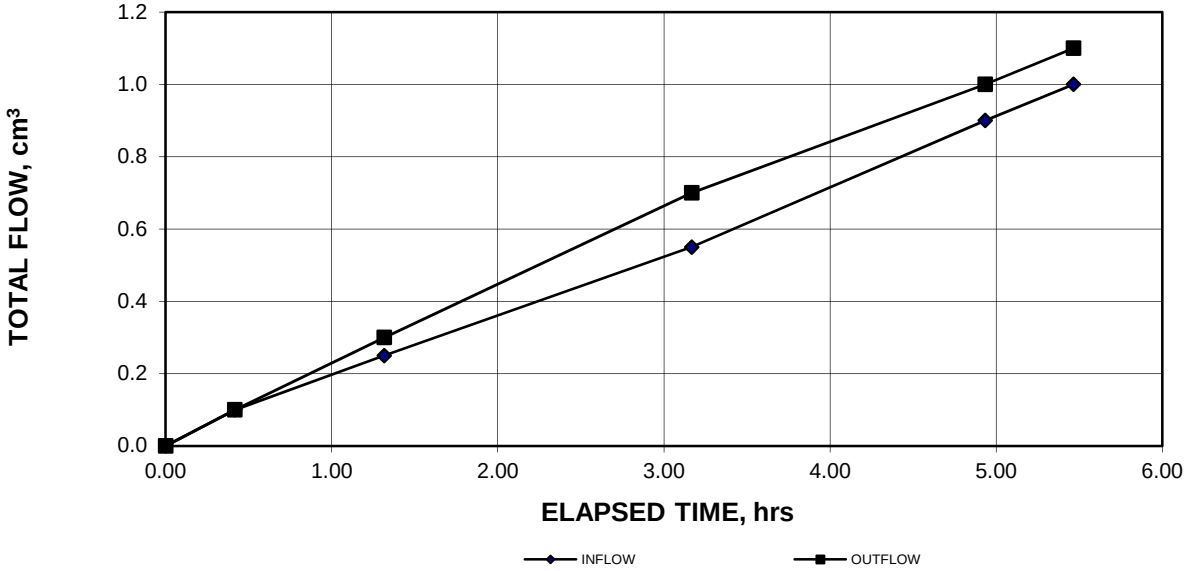
PERMEABILITY TEST

ASTM D 5084-10

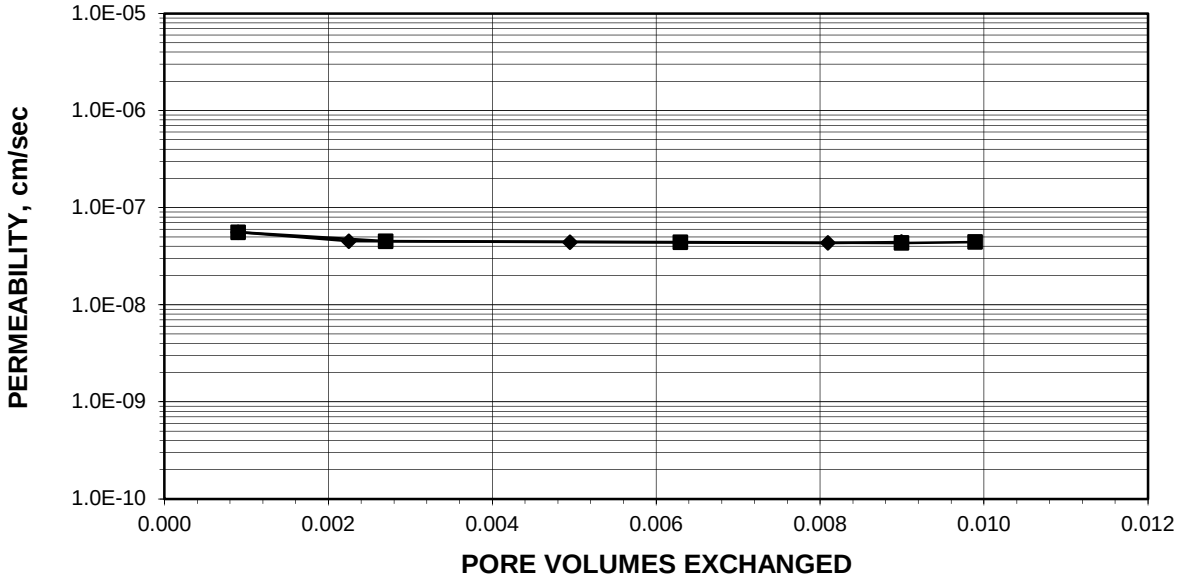
Client	HDR ENGINEERING, INC.	Boring No.	TESTPAD
Client Project	Brickhaven No.2 Mine	Depth (ft.)	LIFT 2
Project No.	2015-664-016	Sample No.	ST-TP-L2
Lab ID No.	2015-664-016-002		

AVERAGE PERMEABILITY = 4.4E-08 cm/sec @ 20°C
AVERAGE PERMEABILITY = 4.4E-10 m/sec @ 20°C

TOTAL FLOW vs. ELAPSED TIME



PORE VOLUMES EXCHANGED vs. PERMEABILITY



Tested By: MPS Date: 7/28/15 Checked By: GEM Date: 7/30/15

DCN: CT-22 DATE: 2/20/2015 REVISION: 0 S:\2015 PROJECTS\2015-664 HDR ENGINEERING - BRICKHAVEN\[2015-664-16-002 PERMflow.xls]Sheet1

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PERMEABILITY TEST

ASTM D 5084-10

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Client	HDR ENGINEERING, INC.	Boring No.	TESTPAD
Client Project	Brickhaven No.2 Mine	Depth (ft.)	LIFT 2
Project No.	2015-664-016	Sample No.	ST-TP-L2
Lab ID No.	2015-664-016-002		

Specific Gravity	2.70	Assumed
Sample Condition		Remolded

Visual Description: BROWNISH RED CLAY

MOISTURE CONTENT:	BEFORE TEST	AFTER TEST
Tare Number	841	813
Wt. of Tare & WS (gm.)	457.23	385.25
Wt. of Tare & DS (gm.)	418.26	322.56
Wt. of Tare (gm.)	259.67	109.35
Wt. of Water (gm.)	38.97	62.69
Wt. of DS (gm.)	158.59	213.21
Moisture Content (%)	**24.6**	**29.4**

SPECIMEN:	BEFORE TEST	AFTER TEST
Wt. of Tube & WS (gm.)	491.69	NA
Wt. of Tube (gm.)	0.00	NA
Wt. of WS (calc.)(gm.)	491.69	510.75
Length 1 (in.)	2.401	2.380
Length 2 (in.)	2.399	2.414
Length 3 (in.)	2.366	2.419
Top Diameter (in.)	2.862	2.896
Middle Diameter (in.)	2.846	2.880
Bottom Diameter (in.)	2.851	2.876
Average Length (in.)	2.39	2.40
Average Area (in.^{2})	6.39	6.53
Sample Volume (cm^3)	250.24	257.38
Unit Wet Wt. (gm./ cm^3)	1.96	1.98
Unit Wet Wt. (pcf)	122.7	123.9
Unit Dry Wt. (pcf)	98.5	95.7
Unit Dry Wt. (gm./ cm^3)	1.58	1.53
Void Ratio, e	0.71	0.76
Porosity, n	0.42	0.43
Pore Volume (cm^3)	104.1	111.2
Total Wgt. Of Sample After Test		505.19

Tested By: MPS Date: 7/28/15 Checked By: GEM Date: 7/30/15

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PERMEABILITY TEST

ASTM D 5084-10

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Client	HDR ENGINEERING, INC.	Boring No.	TESTPAD
Client Project	Brickhaven No.2 Mine	Depth (ft.)	LIFT 2
Project No.	2015-664-016	Sample No.	ST-TP-L2
Lab ID No.	2015-664-016-002		

Pressure Heads (Constant)		Final Sample Dimensions	
Top Cap (psi)	39.0	Sample Length (cm), L	6.11
Bottom Cap (psi)	41.0	Sample Diameter (cm)	7.33
Cell (psi)	50.0	Sample Area (cm^2), A	42.15
Total Pressure Head (cm)	140.6	Inflow Burette Area (cm^2), a-in	0.871
Hydraulic Gradient	23.02	Outflow Burette Area (cm^2), a-out	0.880
		B Parameter (%)	99

AVERAGE PERMEABILITY = 4.4E-08 cm/sec @ 20°C

AVERAGE PERMEABILITY = 4.4E-10 m/sec @ 20°C

DATE (mm/dd/yy)	TIME (hr)	TIME (min)	ELAPSED TIME t (hr)	TOTAL INFLOW (cm^3)	TOTAL OUTFLOW (cm^3)	TOTAL HEAD h (cm)	FLOW (0 flow) (1 stop)	TEMP. (°C)	INCREMENTAL PERMEABILITY @ 20°C (cm/sec)
7/29/15	12	48	0.00	0.0	0.0	158.2	0	23.4	NA
7/29/15	13	13	0.42	0.1	0.1	157.9	0	23.4	5.6E-08
7/29/15	14	7	1.32	0.3	0.3	157.5	0	23.4	4.5E-08
7/29/15	15	58	3.17	0.6	0.7	156.7	0	23.4	4.4E-08
7/29/15	17	44	4.93	0.9	1.0	156.0	0	23.4	4.3E-08
7/29/15	18	16	5.47	1.0	1.1	155.8	1	23.4	4.4E-08

Tested By: MPS Date: 7/28/15 Checked By: GEM Date: 7/30/15

DCN: CT-22 DATE: 2/2/10 REVISION: 0 T:\PROJECTS\2015-664 HDR ENGINEERING - BRICKHAVEN\[2015-664-16-002 PERMflow.xls]Sheet1

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ATTERBERG LIMITS

ASTM D 4318-10 / AASHTO T89-10

Client:	HDR ENGINEERING, INC.	Boring No.:	TESTPAD
Client Reference:	BRICKHAVEN NO. 2 MINE	Depth (ft):	LIFT 1
Project No.:	2015-664-16	Sample No.:	TP-L1
Lab ID:	2015-664-16-013	Soil Description:	**REDDISH BROWN SILT**

Note: The USCS symbol used with this test refers only to the minus No. 40 sieve material. See the "Sieve and Hydrometer Analysis" graph page for the complete material description.

(Minus No. 40 sieve material, Airdried)

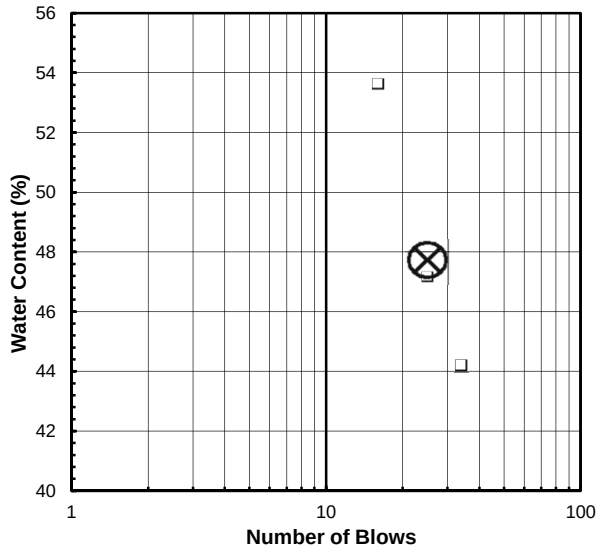
Liquid Limit Test	**1**	**2**	**3**	
				M
Tare Number	O	K-P	2M	**U**
Wt. of Tare & Wet Sample (g)	31.96	31.32	29.07	**L**
Wt. of Tare & Dry Sample (g)	26.84	26.27	24.39	**T**
Wt. of Tare (g)	15.25	15.56	15.66	**I**
Wt. of Water (g)	5.1	5.1	4.7	**P**
Wt. of Dry Sample (g)	11.6	10.7	8.7	**O**
				I
Moisture Content (%)	**44.2**	**47.2**	**53.6**	**N**
Number of Blows	**34**	**25**	**16**	**T**

Plastic Limit Test	**1**	**2**	**Range**
Tare Number	3M	P	
Wt. of Tare & Wet Sample (g)	21.91	21.65	
Wt. of Tare & Dry Sample (g)	20.49	20.24	
Wt. of Tare (g)	15.58	15.24	
Wt. of Water (g)	1.4	1.4	
Wt. of Dry Sample (g)	4.9	5.0	
Moisture Content (%)	**28.9**	**28.2**	**0.7**

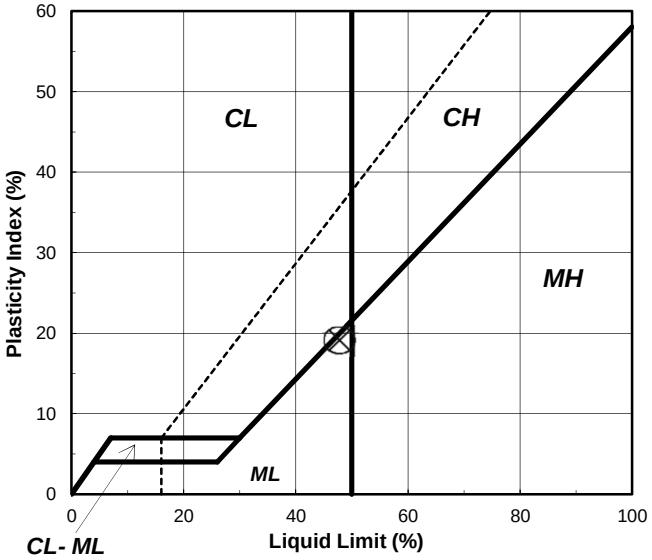
Note: The acceptable range of the two Moisture contents is ± 2.6

Test Results	
Liquid Limit (%)	**48**
Plastic Limit (%)	**29**
Plasticity Index (%)	**19**
USCS Symbol	**ML**

Flow Curve



Plasticity Chart



Tested By	*HM*	*Date*	*8/5/15*	*Checked By*	*GEM*	*Date*	8/6/15

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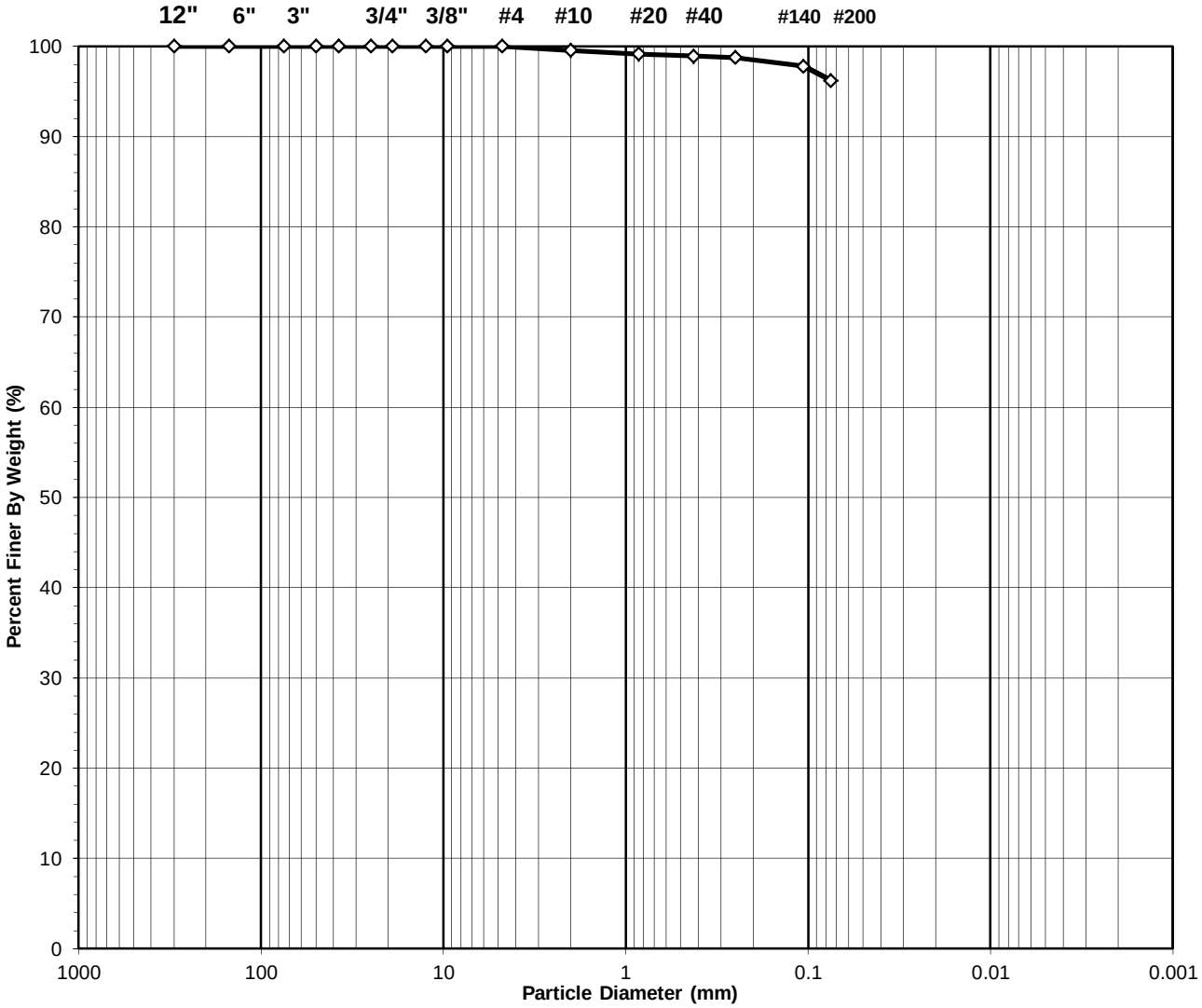
SIEVE ANALYSIS

ASTM D 422-63 (2007)

Client:	HDR ENGINEERING, INC.	Boring No.:	TEST PAD
Client Reference:	BRICKHAVEN NO. 2 MINE	Depth (ft):	LIFT 1
Project No.:	2015-664-16	Sample No.:	TP-L1
Lab ID:	2015-664-16-013	Soil Color:	REDDISH BROWN

	SIEVE ANALYSIS		*HYDROMETER*
USCS	**gravel**	**sand**	**silt and clay**



USCS Symbol: ***ML, TESTED***

USCS Classification: ***SILT***

Tested By APG Date 8/3/15 Checked By GEM Date 8/6/15

DCN: CT-S3C DATE 3/20/13 REVISION: 3

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WASH SIEVE ANALYSIS

ASTM D 422-63 (2007)

Client:	HDR ENGINEERING, INC.	Boring No.:	TEST PAD
Client Reference:	BRICKHAVEN NO. 2 MINE	Depth (ft):	LIFT 1
Project No.:	2015-664-16	Sample No.:	TP-L1
Lab ID:	2015-664-16-013	Soil Color:	REDDISH BROWN

Moisture Content of Passing 3/4" Sample		Water Content of Retained 3/4" Sample	
Tare No.	816	Tare No.	NA
Wt. of Tare & Wet Sample (g)	508.89	Weight of Tare & Wet Sample (g)	NA
Wt. of Tare & Dry Sample (g)	446.19	Weight of Tare & Dry Sample (g)	NA
Weight of Tare (g)	134.56	Weight of Tare (g)	NA
Weight of Water (g)	62.70	Weight of Water (g)	NA
Weight of Dry Sample (g)	311.63	Weight of Dry Sample (g)	NA
Moisture Content (%)	**20.1**	**Moisture Content (%)**	**NA**

Wet Weight of -3/4" Sample (g)	NA	Weight of the Dry Sample (g)	311.63
Dry Weight of - 3/4" Sample (g)	11.8	Weight of - #200 Sample (g)	299.86
Wet Weight of +3/4" Sample (g)	NA	Weight of + #200 Sample (g)	11.77
Dry Weight of + 3/4" Sample (g)	0.00		
Total Dry Weight of Sample (g)	NA		

Sieve Size	Sieve Opening (mm)	Weight of Soil Retained (g)	Percent Retained (%)	Accumulated Percent Retained (%)	Percent Finer (%)	Accumulated Percent Finer (%)
12"	300	0.00	0.00	0.00	100.00	**100.00**
6"	150	0.00	0.00	0.00	100.00	**100.00**
3"	75	0.00	0.00	0.00	100.00	**100.00**
2"	50	0.00	0.00	0.00	100.00	**100.00**
1 1/2"	37.5	0.00	0.00	0.00	100.00	**100.00**
1"	25.0	0.00	0.00	0.00	100.00	**100.00**
3/4"	19.0	0.00	0.00	0.00	100.00	**100.00**
1/2"	12.50	0.00	0.00	0.00	100.00	**100.00**
3/8"	9.50	0.00	0.00	0.00	100.00	**100.00**
#4	4.75	0.00	0.00	0.00	100.00	**100.00**
#10	2.00	1.42	0.46	0.46	99.54	**99.54**
#20	0.850	1.24	0.40	0.85	99.15	**99.15**
#40	0.425	0.66	0.21	1.07	98.93	**98.93**
#60	0.250	0.51	0.16	1.23	98.77	**98.77**
#140	0.106	3.02	0.97	2.20	97.80	**97.80**
#200	0.075	4.92	1.58	3.78	96.22	**96.22**
Pan	-	299.86	96.22	100.00	-	**-**

Tested By APG Date 8/3/15 Checked By GEM Date 8/6/15

DCN: CT-S3C DATE 3/20/13 REVISION: 3

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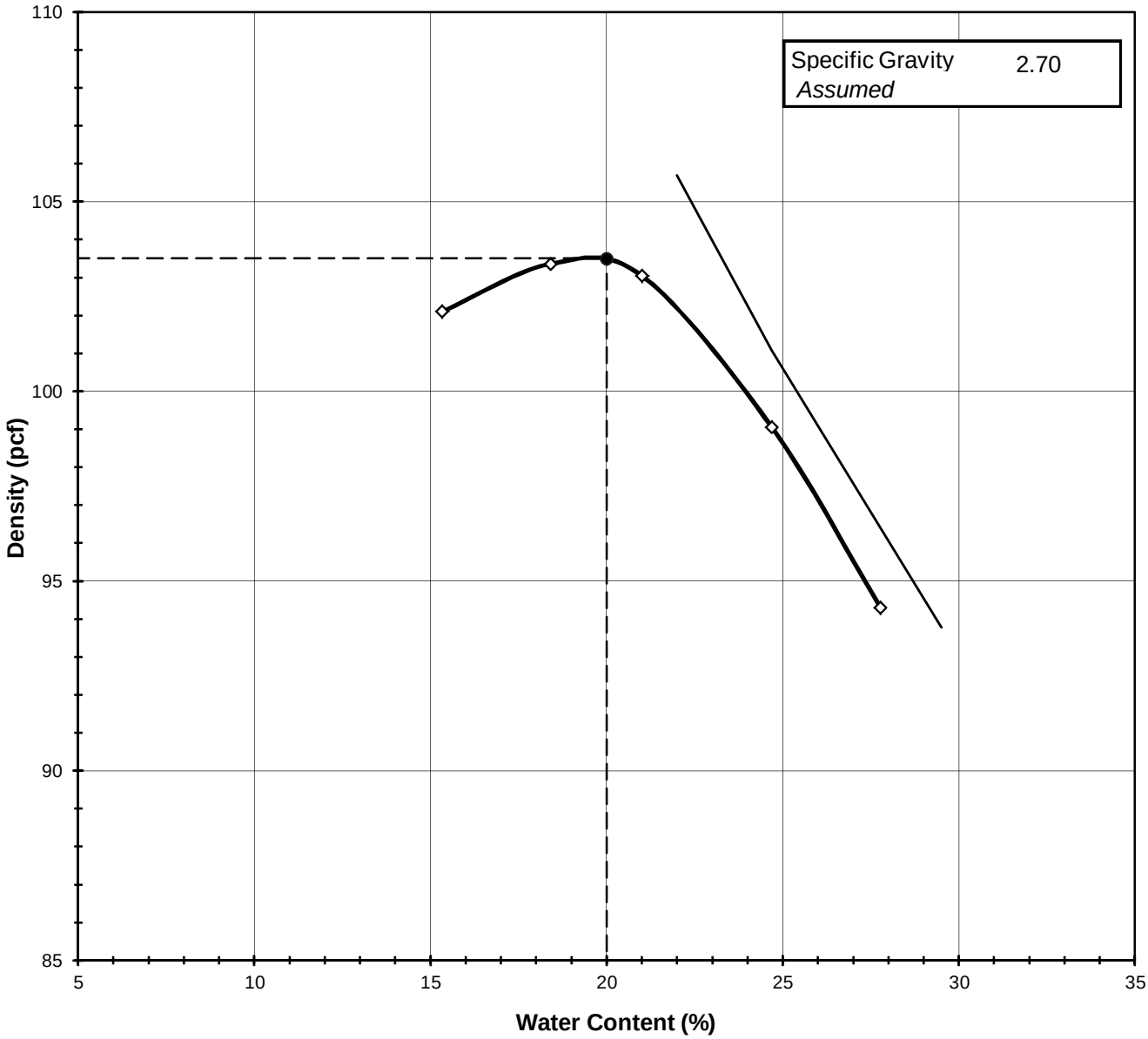
MOISTURE DENSITY RELATIONSHIP

ASTM D698-12

Client:	HDR ENGINEERING, INC.	Boring No.:	TESTPAD
Client Reference:	BRICKHAVEN NO. 2 MINE	Depth (ft):	LIFT 1
Project No.:	2015-664-16	Sample No.:	TP-L1
Lab ID:	2015-664-16-013	Test Method	**STANDARD**

Visual Description: REDDISH BROWN CLAYEY SILT

Optimum Water Content	**20.0**
Maximum Dry Density	**103.5**



Tested By *NPL* *Date* *8/5/15* *Checked By* *GEM* *Date* 8/6/15

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MOISTURE - DENSITY RELATIONSHIP

ASTM D698-12

Client:	HDR ENGINEERING, INC.	Boring No.:	TESTPAD
Client Reference:	BRICKHAVEN NO. 2 MINE	Depth (ft):	LIFT 1
Project No.:	2015-664-16	Sample No.:	TP-L1
Lab ID:	2015-664-16-013		

Visual Description: REDDISH BROWN CLAYEY SILT

Total Weight of the Sample (g)	20700
As Received Water Content (%)	NA
Assumed Specific Gravity	2.70
Percent Retained on 3/4"	NA
Percent Retained on 3/8"	NA
Percent Retained on #4	NA
Oversize Material	Not included
Procedure Used	A

Test Type		**STANDARD**
Rammer Weight (lb)		5.5
Rammer Drop (in)		12
Rammer Type		MECHANICAL
Machine ID	R	174
Mold ID	R	461
Mold diameter		4"
Weight of the Mold (g)		4169
Volume of the Mold (cm^3)		942

Mold / Specimen

Point No.	**1**	**2**	**3**	**4**	**5**
Wt. of Mold & Wet Sample (g)	5946	6016	6051	6033	5988
Wt.of Mold (g)	4169	4169	4169	4169	4169
Wt. of Wet Sample (g)	1777	1847	1882	1864	1819
Mold Volume (cm^3)	942	942	942	942	942

Moisture Content / Density

Tare Number	6	808	823	821	824
Wt. of Tare & Wet Sample (g)	152.58	147.50	521.80	523.40	463.00
Wt. of Tare & Dry Sample (g)	137.02	130.23	454.70	445.90	392.10
Wt. of Tare (g)	35.51	36.43	135.30	132.00	136.80
Wt. of Water (g)	15.56	17.27	67.10	77.50	70.90
Wt. of Dry Sample (g)	101.51	93.80	319.40	313.90	255.30

Wet Density (g/cm^3)	1.89	1.96	2.00	1.98	1.93
Wet Density (pcf)	117.8	122.4	124.7	123.5	120.5
Moisture Content (%)	**15.3**	**18.4**	**21.0**	**24.7**	**27.8**
Dry Density (pcf)	**102.1**	**103.4**	**103.0**	**99.1**	**94.3**

Zero Air Voids

Moisture Content (%)	22.0	24.7	29.5
Dry Unit Weight (pcf)	105.7	101.1	93.8

Tested By *NPL* *Date* *8/5/15* *Checked By* *GEM* *Date* 8/6/15

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FLEXIBLE WALL PERMEABILITY TEST

PERMOMETER METHOD

ASTM D 5084-10

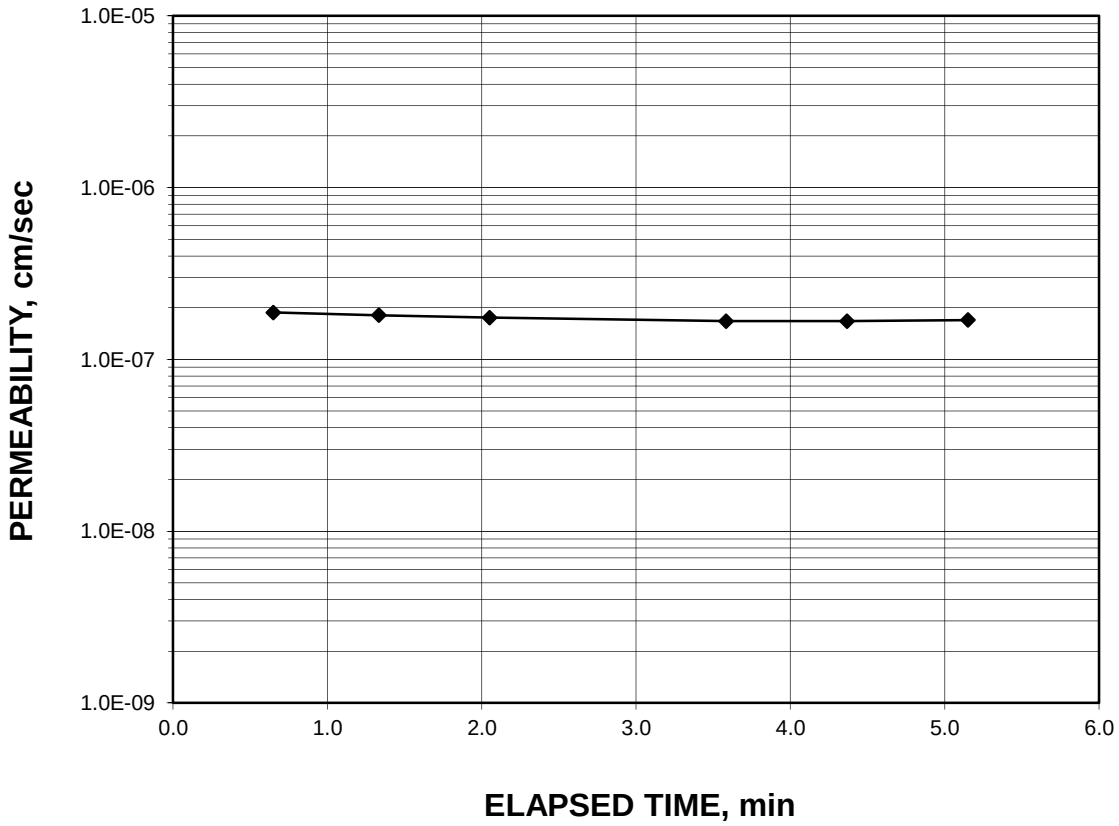
Client	HDR ENGINEERING, INC.	Boring No.	TESTPAD
Client Project	Brickhaven No.2 Mine	Depth (ft.)	LIFT 1
Project No.	2015-664-016	Sample No.	TP-L1
Lab ID No.	2015-664-016-013		

Visual Description: REDDISH BROWN SILT

AVERAGE PERMEABILITY = 1.7E-07 cm/sec @ 20°C

AVERAGE PERMEABILITY = 1.7E-09 m/sec @ 20°C

PERMEABILITY vs. TIME



Tested By: SFS Date: 8/31/15 Checked By: GEM Date: 9/2/15

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FLEXIBLE WALL PERMEABILITY TEST

PERMOMETER METHOD

ASTM D 5084-10

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Client	HDR ENGINEERING, INC.	Boring No.	TESTPAD
Client Project	Brickhaven No.2 Mine	Depth (ft.)	LIFT 1
Project No.	2015-664-016	Sample No.	TP-L1
Lab ID No.	2015-664-016-013		

Specific Gravity	2.70	Assumed
Sample Condition		Remolded

Visual Description: REDDISH BROWN SILT

MOISTURE CONTENT:	BEFORE TEST	AFTER TEST
Tare Number	824	800
Wt. of Tare & WS (gm.)	428.26	553.43
Wt. of Tare & DS (gm.)	371.74	457.09
Wt. of Tare (gm.)	136.66	103.4
Wt. of Water (gm.)	56.52	96.34
Wt. of DS (gm.)	235.08	353.69
Moisture Content (%)	**24.0**	**27.2**

SPECIMEN:	BEFORE TEST	AFTER TEST
Wt. of Tube & WS (gm.)	2472.22	NA
Wt. of Tube (gm.)	1632.00	NA
Wt. of WS (calc.) (gm.)	840.22	861.87
Length 1 (in.)	4.005	4.036
Length 2 (in.)	4.005	4.044
Length 3 (in.)	4.005	4.049
Top Diameter (in.)	2.867	2.888
Middle Diameter (in.)	2.867	2.883
Bottom Diameter (in.)	2.867	2.894
Average Length (in.)	4.01	4.04
Average Area (in.^{2})	6.46	6.55
Sample Volume (cm^3)	423.69	434.10
Unit Wet Wt. (gm./ cm^3)	1.983	1.985
Unit Wet Wt. (pcf)	123.8	123.9
Unit Dry Wt. (pcf)	99.8	97.4
Unit Dry Wt. (gm./ cm^3)	1.599	1.560
Void Ratio, e	0.689	0.730
Porosity, n	0.408	0.422
Pore Volume (cm^3)	172.8	183.2
Total Wt. Of Sample After Test		858.52

Tested By: SFS Date: 8/31/15 Checked By: GEM Date: 9/2/15

DCN: CT-22A DATE:2-2-2010 REVISION:5 T:\JOBS\PROJECTS\2015-664 HDR ENGINEERING - BRICKHAVEN\[2015-664-016-013 Permometer.xls]Sheet1

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FLEXIBLE WALL PERMEABILITY TEST
PERMOMETER METHOD

ASTM D 5084-10

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Client	HDR ENGINEERING, INC.	Boring No.	TESTPAD
Client Project	Brickhaven No.2 Mine	Depth (ft.)	LIFT 1
Project No.	2015-664-016	Sample No.	TP-L1
Lab ID No.	2015-664-016-013		

Test Pressures		Final Sample Dimensions	
Cell Pressure(psi)	60.0	Sample Length (cm), L	10.27
Back Pressure(psi)	50.0	Sample Area (cm^2), A	42.27
Eff. Cons. Pressure(psi)	10.0	Pipette Area (cm^2), a_p	0.03142
Response (%)	99	Annulus Area (cm^2), a_a	0.76712
		Equilibrium Level (cm), R_{eq}	1

AVERAGE PERMEABILITY = 1.7E-07 cm/sec @ 20°C
AVERAGE PERMEABILITY = 1.7E-09 m/sec @ 20°C

DATE			TIME		ELAPSED TIME t	PIPETTE READI NG R_p	INCREMENT GRADIENT i	TEMP.	INCREMENTAL PERMEABILITY @ 20°C
(mm/dd/yy)	(hr)	(min)	(sec)	(min)	(min)	(cm)	(cm/cm)	(°C)	(cm/sec)
9/1/15	14	21	29	21.48	0.000	8.4	9.4	23.5	NA
9/1/15	14	22	8	22.13	0.650	8.3	9.3	23.5	1.9E-07
9/1/15	14	22	49	22.82	1.333	8.2	9.2	23.5	1.8E-07
9/1/15	14	23	32	23.53	2.050	8.1	9.0	23.5	1.7E-07
9/1/15	14	25	4	25.07	3.583	7.9	8.8	23.5	1.7E-07
9/1/15	14	25	51	25.85	4.367	7.8	8.6	23.5	1.7E-07
9/1/15	14	26	38	26.63	5.150	7.7	8.5	23.5	1.7E-07

Tested By: SFS Date: 8/31/15 Checked By: GEM Date: 9/2/15

DCN: CT-22A DATE:2-7-2012 REVISION:5 F:\2015 PROJECTS\2015-664 HDR ENGINEERING - BRICKHAVEN\[2015-664-016-013 Permometer.xls]Sheet1

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ATTERBERG LIMITS

ASTM D 4318-10 / AASHTO T89-10

Client:	HDR ENGINEERING, INC.	Boring No.:	TESTPAD
Client Reference:	BRICKHAVEN NO. 2 MINE	Depth (ft):	LIFT 2
Project No.:	2015-664-16	Sample No.:	TP-L2
Lab ID:	2015-664-16-014	Soil Description:	**BROWN FAT CLAY**

Note: The USCS symbol used with this test refers only to the minus No. 40 sieve material. See the "Sieve and Hydrometer Analysis" graph page for the complete material description. (Minus No. 40 sieve material, Airdried)

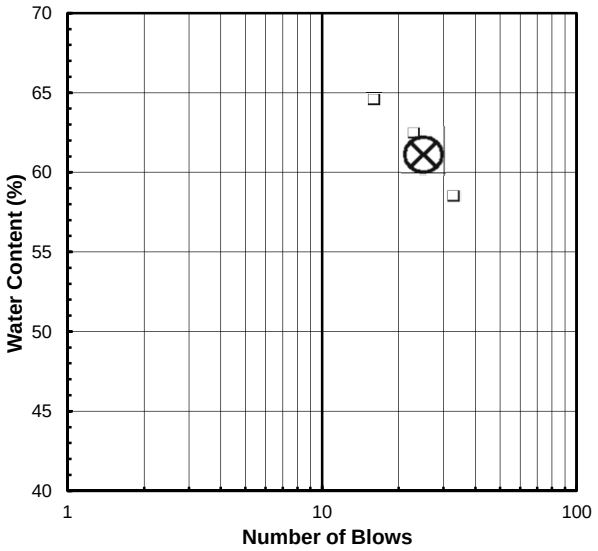
Liquid Limit Test	**1**	**2**	**3**	
				M
Tare Number	W-2	1M	U	**U**
Wt. of Tare & Wet Sample (g)	28.37	28.78	29.15	**L**
Wt. of Tare & Dry Sample (g)	23.75	23.83	23.67	**T**
Wt. of Tare (g)	15.85	15.90	15.18	**I**
Wt. of Water (g)	4.6	5.0	5.5	**P**
Wt. of Dry Sample (g)	7.9	7.9	8.5	**O**
				I
Moisture Content (%)	**58.5**	**62.4**	**64.5**	**N**
Number of Blows	**33**	**23**	**16**	**T**

Plastic Limit Test	**1**	**2**	**Range**
Tare Number	T	Q	
Wt. of Tare & Wet Sample (g)	22.15	21.17	
Wt. of Tare & Dry Sample (g)	20.57	19.81	
Wt. of Tare (g)	15.24	15.17	
Wt. of Water (g)	1.6	1.4	
Wt. of Dry Sample (g)	5.3	4.6	
Moisture Content (%)	**29.6**	**29.3**	**0.3**

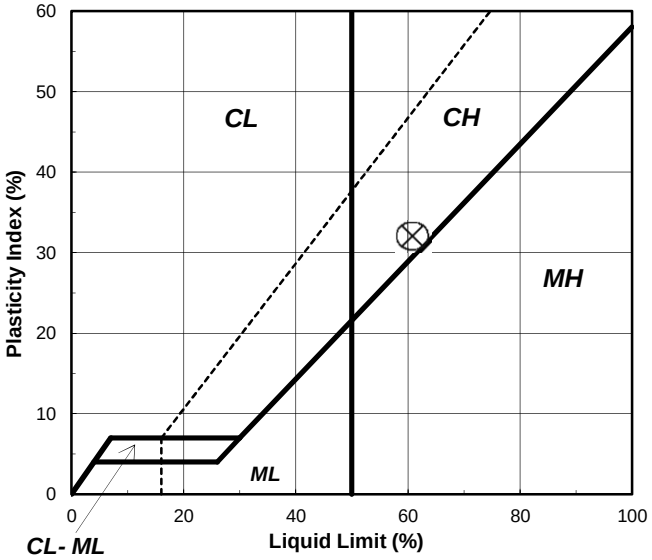
Note: The acceptable range of the two Moisture contents is ± 2.6

Test Results	
Liquid Limit (%)	**61**
Plastic Limit (%)	**29**
Plasticity Index (%)	**32**
USCS Symbol	**CH**

Flow Curve



Plasticity Chart



Tested By	*HM*	*Date*	*8/4/15*	*Checked By*	*GEM*	*Date*	8/5/15

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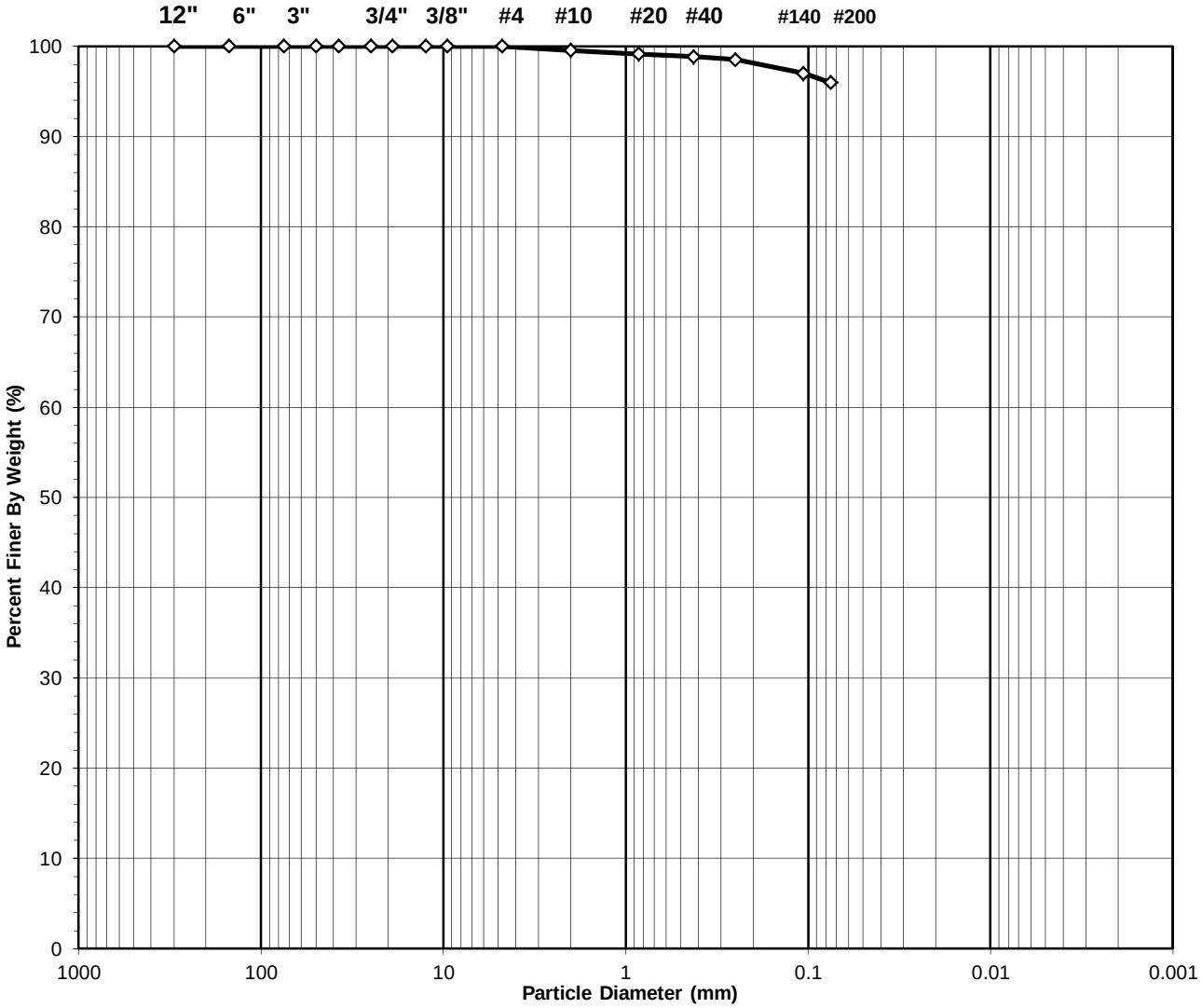
SIEVE ANALYSIS

ASTM D 422-63 (2007)

Client:	HDR ENGINEERING, INC.	Boring No.:	TEST PAD
Client Reference:	BRICKHAVEN NO. 2 MINE	Depth (ft):	LIFT 2
Project No.:	2015-664-16	Sample No.:	TP-L2
Lab ID:	2015-664-16-014	Soil Color:	LIGHT BROWN

	SIEVE ANALYSIS		*HYDROMETER*
USCS	**gravel**	**sand**	**silt and clay**



USCS Symbol: ***CH, TESTED***

USCS Classification: ***FAT CLAY***

Tested By SMS Date 8/5/15 Checked By GEM Date 8/6/15

DCN: CT-S3C DATE 3/20/13 REVISION: 3

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WASH SIEVE ANALYSIS

ASTM D 422-63 (2007)

Client:	HDR ENGINEERING, INC.	Boring No.:	TEST PAD
Client Reference:	BRICKHAVEN NO. 2 MINE	Depth (ft):	LIFT 2
Project No.:	2015-664-16	Sample No.:	TP-L2
Lab ID:	2015-664-16-014	Soil Color:	LIGHT BROWN

Moisture Content of Passing 3/4" Sample		Water Content of Retained 3/4" Sample	
Tare No.	300	Tare No.	NA
Wt. of Tare & Wet Sample (g)	624.87	Weight of Tare & Wet Sample (g)	NA
Wt. of Tare & Dry Sample (g)	519.25	Weight of Tare & Dry Sample (g)	NA
Weight of Tare (g)	110.54	Weight of Tare (g)	NA
Weight of Water (g)	105.62	Weight of Water (g)	NA
Weight of Dry Sample (g)	408.71	Weight of Dry Sample (g)	NA
Moisture Content (%)	**25.8**	**Moisture Content (%)**	**NA**

Wet Weight of -3/4" Sample (g)	NA	Weight of the Dry Sample (g)	408.71
Dry Weight of - 3/4" Sample (g)	16.4	Weight of - #200 Sample (g)	392.28
Wet Weight of +3/4" Sample (g)	NA	Weight of + #200 Sample (g)	16.43
Dry Weight of + 3/4" Sample (g)	0.00		
Total Dry Weight of Sample (g)	NA		

Sieve Size	Sieve Opening (mm)	Weight of Soil Retained (g)	Percent Retained (%)	Accumulated Percent Retained (%)	Percent Finer (%)	Accumulated Percent Finer (%)
12"	300	0.00	0.00	0.00	100.00	**100.00**
6"	150	0.00	0.00	0.00	100.00	**100.00**
3"	75	0.00	0.00	0.00	100.00	**100.00**
2"	50	0.00	0.00	0.00	100.00	**100.00**
1 1/2"	37.5	0.00	0.00	0.00	100.00	**100.00**
1"	25.0	0.00	0.00	0.00	100.00	**100.00**
3/4"	19.0	0.00	0.00	0.00	100.00	**100.00**
1/2"	12.50	0.00	0.00	0.00	100.00	**100.00**
3/8"	9.50	0.00	0.00	0.00	100.00	**100.00**
#4	4.75	0.00	0.00	0.00	100.00	**100.00**
#10	2.00	1.90	0.46	0.46	99.54	**99.54**
#20	0.850	1.52	0.37	0.84	99.16	**99.16**
#40	0.425	1.30	0.32	1.15	98.85	**98.85**
#60	0.250	1.24	0.30	1.46	98.54	**98.54**
#140	0.106	6.22	1.52	2.98	97.02	**97.02**
#200	0.075	4.25	1.04	4.02	95.98	**95.98**
Pan	-	392.28	95.98	100.00	-	**-**

Tested By SMS Date 8/5/15 Checked By GEM Date 8/6/15

DCN: CT-S3C DATE 3/20/13 REVISION: 3

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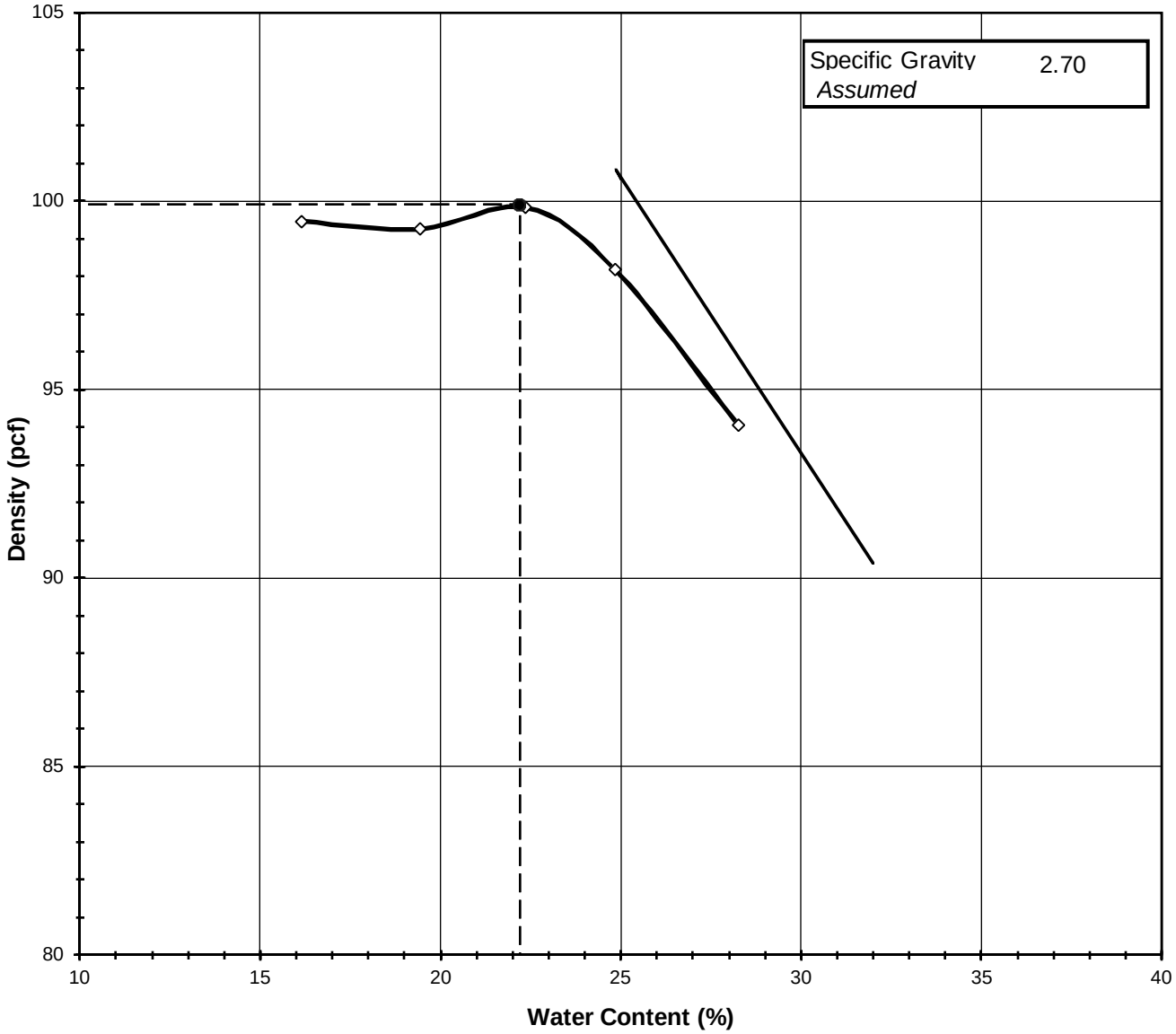
MOISTURE DENSITY RELATIONSHIP

ASTM D698-12

Client:	HDR ENGINEERING, INC.	Boring No.:	TESTPAD
Client Reference:	BRICKHAVEN NO. 2 MINE	Depth (ft):	LIFT 2
Project No.:	2015-664-16	Sample No.:	TP-L2
Lab ID:	2015-664-16-014	Test Method	**STANDARD**

Visual Description: LIGHT BROWN FAT CLAY

Optimum Water Content	**22.2**
Maximum Dry Density	**99.9**



Tested By NPL *Date* 8/6/15 *Checked By* GEM *Date* 8/11/15

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MOISTURE - DENSITY RELATIONSHIP

ASTM D698-12

Client:	HDR ENGINEERING, INC.	Boring No.:	TESTPAD
Client Reference:	BRICKHAVEN NO. 2 MINE	Depth (ft):	LIFT 2
Project No.:	2015-664-16	Sample No.:	TP-L2
Lab ID:	2015-664-16-014		

Visual Description: LIGHT BROWN FAT CLAY

Total Weight of the Sample (g)	21700
As Received Water Content (%)	NA
Assumed Specific Gravity	2.70
Percent Retained on 3/4"	1
Percent Retained on 3/8"	NA
Percent Retained on #4	NA
Oversize Material	Not included
Procedure Used	A

Test Type		**STANDARD**
Rammer Weight (lb)		5.5
Rammer Drop (in)		12
Rammer Type		MECHANICAL
Machine ID	R	174
Mold ID	R	461
Mold diameter		4"
Weight of the Mold (g)		4169
Volume of the Mold (cm^3)		942

Mold / Specimen

Point No.	**1**	**2**	**3**	**4**	**5**
Wt. of Mold & Wet Sample (g)	5913	5958	6013	6019	5990
Wt.of Mold (g)	4169	4169	4169	4169	4169
Wt. of Wet Sample (g)	1744	1789	1844	1850	1821
Mold Volume (cm^3)	942	942	942	942	942

Moisture Content / Density

Tare Number	1010	8	305	314	317
Wt. of Tare & Wet Sample (g)	110.74	98.77	484.80	467.20	507.50
Wt. of Tare & Dry Sample (g)	100.24	88.62	411.70	391.00	414.20
Wt. of Tare (g)	35.21	36.38	84.90	84.30	84.10
Wt. of Water (g)	10.50	10.15	73.10	76.20	93.30
Wt. of Dry Sample (g)	65.03	52.24	326.80	306.70	330.10

Wet Density (g/cm^3)	1.85	1.90	1.96	1.96	1.93
Wet Density (pcf)	115.5	118.5	122.2	122.6	120.6
Moisture Content (%)	**16.1**	**19.4**	**22.4**	**24.8**	**28.3**
Dry Density (pcf)	**99.4**	**99.3**	**99.8**	**98.2**	**94.0**

Zero Air Voids

Moisture Content (%)	25.0	24.8	32.0
Dry Unit Weight (pcf)	100.6	100.8	90.4

Tested By *NPL* *Date* *8/6/15* *Checked By* *GEM* *Date* 8/11/15

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FLEXIBLE WALL PERMEABILITY TEST

PERMOMETER METHOD

ASTM D 5084-10

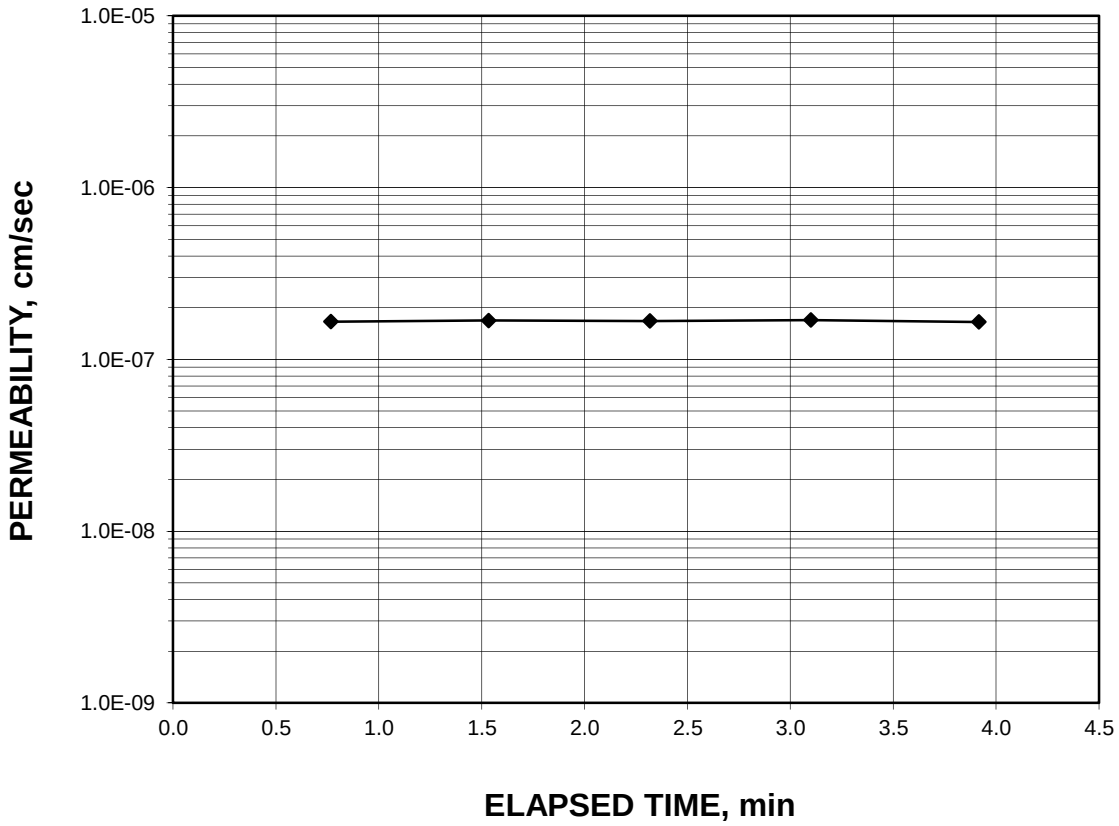
Client	HDR ENGINEERING, INC.	Boring No.	TESTPAD
Client Project	Brickhaven No.2 Mine	Depth (ft.)	LIFT 2
Project No.	2015-664-016	Sample No.	TP-L2
Lab ID No.	2015-664-016-014		

Visual Description: LIGHT BROWN SANDY CLAY

AVERAGE PERMEABILITY = 1.7E-07 cm/sec @ 20°C

AVERAGE PERMEABILITY = 1.7E-09 m/sec @ 20°C

PERMEABILITY vs. TIME



Tested By: SFS Date: 8/25/15 Checked By: GEM Date: 8/28/15

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FLEXIBLE WALL PERMEABILITY TEST

PERMOMETER METHOD

ASTM D 5084-10

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Client	HDR ENGINEERING, INC.	Boring No.	TESTPAD
Client Project	Brickhaven No.2 Mine	Depth (ft.)	LIFT 2
Project No.	2015-664-016	Sample No.	TP-L2
Lab ID No.	2015-664-016-014		

Specific Gravity	2.70	Assumed
Sample Condition		Remolded

Visual Description: LIGHT BROWN SANDY CLAY

MOISTURE CONTENT:	BEFORE TEST	AFTER TEST
Tare Number	811	8010
Wt. of Tare & WS (gm.)	346.31	537.28
Wt. of Tare & DS (gm.)	298.00	442.47
Wt. of Tare (gm.)	100.80	131.19
Wt. of Water (gm.)	48.31	94.81
Wt. of DS (gm.)	197.20	311.28
Moisture Content (%)	**24.5**	**30.5**

SPECIMEN:	BEFORE TEST	AFTER TEST
Wt. of Tube & WS (gm.)	2449.32	NA
Wt. of Tube (gm.)	1632.00	NA
Wt. of WS (calc.) (gm.)	817.32	856.45
Length 1 (in.)	4.005	4.050
Length 2 (in.)	4.005	4.070
Length 3 (in.)	4.005	4.058
Top Diameter (in.)	2.867	2.902
Middle Diameter (in.)	2.867	2.885
Bottom Diameter (in.)	2.867	2.891
Average Length (in.)	4.01	4.06
Average Area (in.^{2})	6.46	6.57
Sample Volume (cm^3)	423.69	437.16
Unit Wet Wt. (gm./ cm^3)	1.929	1.959
Unit Wet Wt. (pcf)	120.4	122.3
Unit Dry Wt. (pcf)	96.7	93.7
Unit Dry Wt. (gm./ cm^3)	1.549	1.502
Void Ratio, e	0.743	0.798
Porosity, n	0.426	0.444
Pore Volume (cm^3)	180.5	194.0
Total Wt. Of Sample After Test		850.46

Tested By: SFS Date: 8/25/15 Checked By: GEM Date: 8/28/15

DCN: CT-22A DATE:2-2-2010 REVISION:5 T:\2015 PROJECTS\2015-664 HDR ENGINEERING - BRICKHAVEN\[2015-664-016-014 Permometer.xls]Sheet1

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FLEXIBLE WALL PERMEABILITY TEST
PERMOMETER METHOD

ASTM D 5084-10

Client	HDR ENGINEERING, INC.	Boring No.	TESTPAD
Client Project	Brickhaven No.2 Mine	Depth (ft.)	LIFT 2
Project No.	2015-664-016	Sample No.	TP-L2
Lab ID No.	2015-664-016-014		

Test Pressures		Final Sample Dimensions	
Cell Pressure(psi)	60.0	Sample Length (cm), L	10.31
Back Pressure(psi)	50.0	Sample Area (cm^2), A	42.40
Eff. Cons. Pressure(psi)	10.0	Pipette Area (cm^2), a_p	0.03142
Response (%)	97	Annulus Area (cm^2), a_a	0.76712
		Equilibrium Level (cm), R_{eq}	1

AVERAGE PERMEABILITY = 1.7E-07 cm/sec @ 20°C
AVERAGE PERMEABILITY = 1.7E-09 m/sec @ 20°C

DATE		TIME			ELAPSED TIME **t**	PIPETTE READI NG **R_p**	INCREMENT GRADIENT **i**	TEMP.	INCREMENTAL PERMEABILITY @ 20°C
(mm/dd/yy)	(hr)	(min)	(sec)	(min)	(min)	(cm)	(cm/cm)	(°C)	(cm/sec)
8/26/15	17	46	42	46.70	0.000	8.1	9.0	23.5	NA
8/26/15	17	47	28	47.47	0.767	8.0	8.9	23.5	1.7E-07
8/26/15	17	48	14	48.23	1.533	7.9	8.7	23.5	1.7E-07
8/26/15	17	49	1	49.02	2.317	7.8	8.6	23.5	1.7E-07
8/26/15	17	49	48	49.80	3.100	7.7	8.5	23.5	1.7E-07
8/26/15	17	50	37	50.62	3.917	7.6	8.4	23.5	1.7E-07

Tested By: SFS Date: 8/25/15 Checked By: GEM Date: 8/28/15

DCN: CT-22A DATE:2-2-2012 REVISION:5 T:\PROJECTS\2015-664 HDR ENGINEERING - BRICKHAVEN\[2015-664-016-014 Permometer.xls]Sheet1

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ATTERBERG LIMITS

ASTM D 4318-10 / AASHTO T89-10

Client:	HDR ENGINEERING, INC.	Boring No.:	TESTPAD
Client Reference:	BRICKHAVEN NO. 2 MINE	Depth (ft):	LIFT 3
Project No.:	2015-664-16	Sample No.:	TP-L3
Lab ID:	2015-664-16-015	Soil Description:	**TAN FAT CLAY**

Note: The USCS symbol used with this test refers only to the minus No. 40 sieve material. See the "Sieve and Hydrometer Analysis" graph page for the complete material description. (Minus No. 40 sieve material, Airdried)

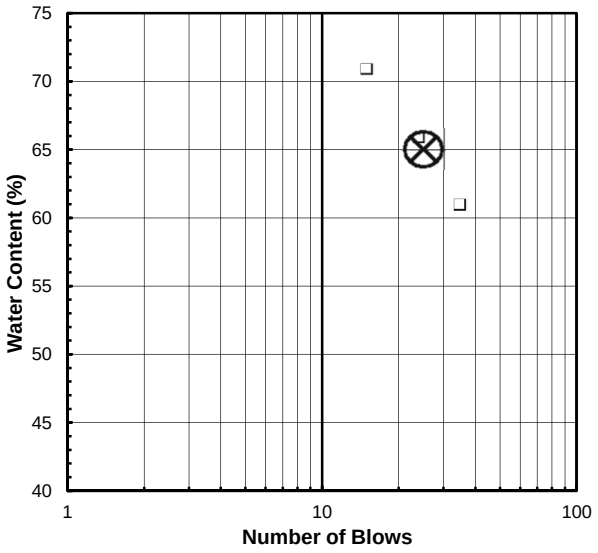
Liquid Limit Test	**1**	**2**	**3**	
				M
Tare Number	A-L	A-T	W-5	**U**
Wt. of Tare & Wet Sample (g)	31.36	29.48	29.24	**L**
Wt. of Tare & Dry Sample (g)	25.41	23.97	23.60	**T**
Wt. of Tare (g)	15.64	15.60	15.64	**I**
Wt. of Water (g)	6.0	5.5	5.6	**P**
Wt. of Dry Sample (g)	9.8	8.4	8.0	**O**
				I
Moisture Content (%)	**60.9**	**65.8**	**70.9**	**N**
Number of Blows	**35**	**24**	**15**	**T**

Plastic Limit Test	**1**	**2**	**Range**
Tare Number	X-9	H	
Wt. of Tare & Wet Sample (g)	21.90	22.14	
Wt. of Tare & Dry Sample (g)	20.49	20.52	
Wt. of Tare (g)	15.71	15.18	
Wt. of Water (g)	1.4	1.6	
Wt. of Dry Sample (g)	4.8	5.3	
Moisture Content (%)	**29.5**	**30.3**	**-0.8**

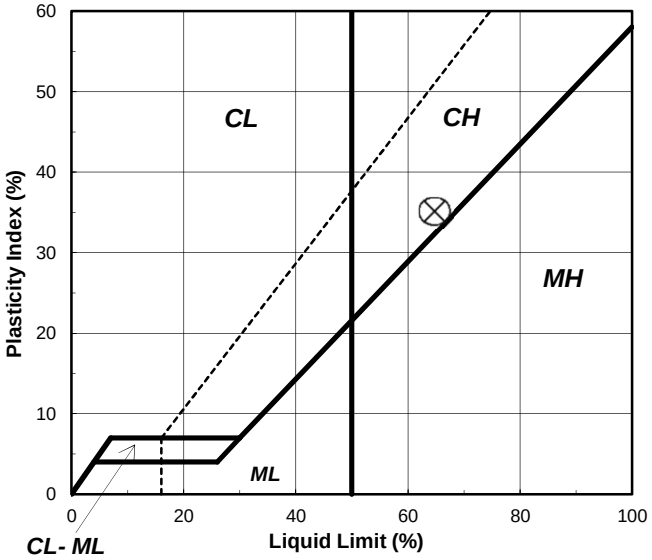
Note: The acceptable range of the two Moisture contents is ± 2.6

Test Results	
Liquid Limit (%)	**65**
Plastic Limit (%)	**30**
Plasticity Index (%)	**35**
USCS Symbol	**CH**

Flow Curve



Plasticity Chart



Tested By	*HM*	*Date*	*8/5/15*	*Checked By*	*GEM*	*Date*	8/6/15

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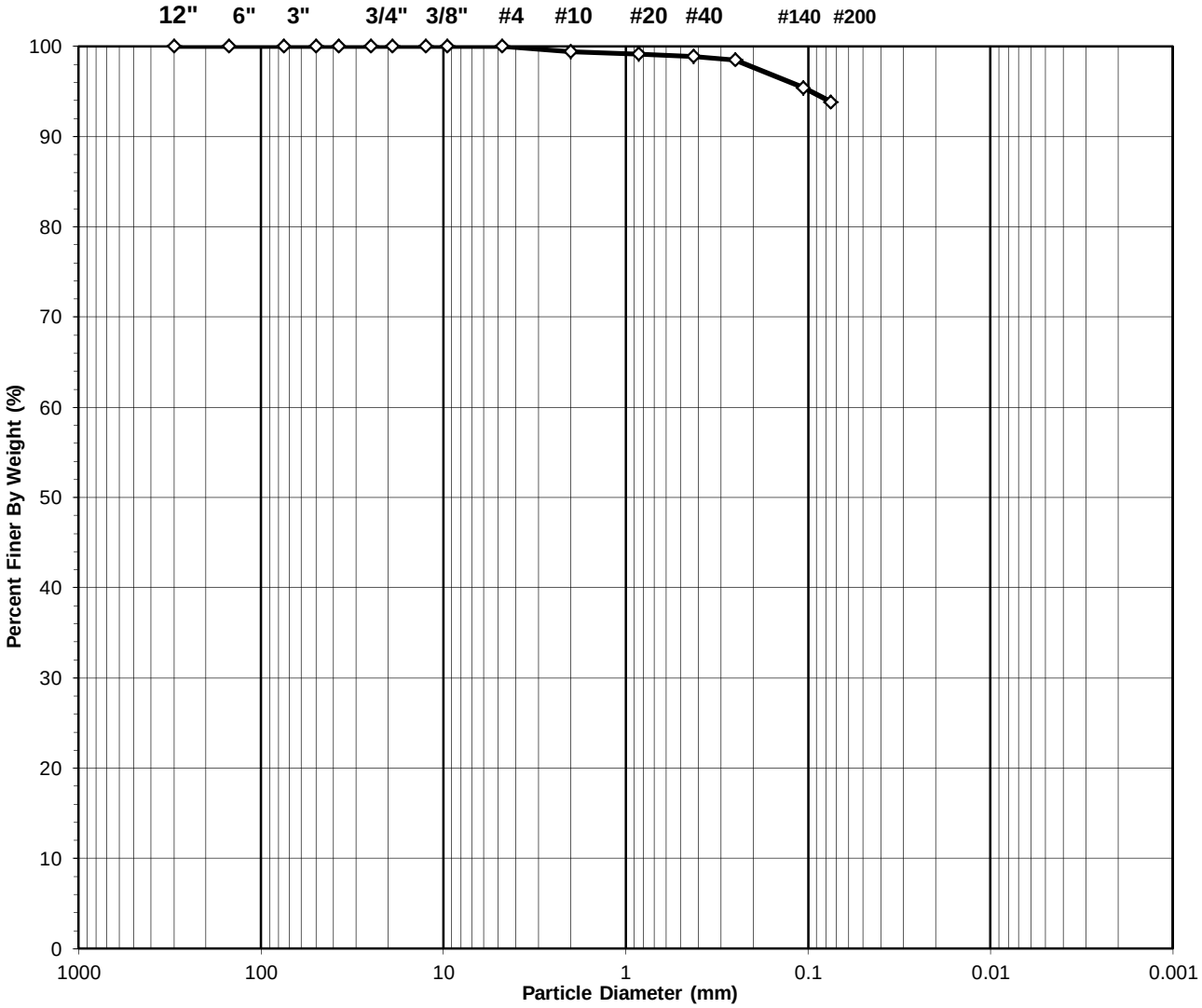
SIEVE ANALYSIS

ASTM D 422-63 (2007)

Client:	HDR ENGINEERING, INC.	Boring No.:	TEST PAD
Client Reference:	BRICKHAVEN NO. 2 MINE	Depth (ft):	LIFT 3
Project No.:	2015-664-16	Sample No.:	TP-L3
Lab ID:	2015-664-16-015	Soil Color:	TAN

	SIEVE ANALYSIS		*HYDROMETER*
USCS	**gravel**	**sand**	**silt and clay**



USCS Symbol: ***CH, TESTED***

USCS Classification: ***FAT CLAY***

Tested By APG Date 8/3/15 Checked By GEM Date 8/5/15

DCN: CT-S3C DATE 3/20/13 REVISION: 3

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WASH SIEVE ANALYSIS

ASTM D 422-63 (2007)

Client:	HDR ENGINEERING, INC.	Boring No.:	TEST PAD
Client Reference:	BRICKHAVEN NO. 2 MINE	Depth (ft):	LIFT 3
Project No.:	2015-664-16	Sample No.:	TP-L3
Lab ID:	2015-664-16-015	Soil Color:	TAN

Moisture Content of Passing 3/4" Sample		Water Content of Retained 3/4" Sample	
Tare No.	822	Tare No.	NA
Wt. of Tare & Wet Sample (g)	459.53	Weight of Tare & Wet Sample (g)	NA
Wt. of Tare & Dry Sample (g)	387.91	Weight of Tare & Dry Sample (g)	NA
Weight of Tare (g)	138.15	Weight of Tare (g)	NA
Weight of Water (g)	71.62	Weight of Water (g)	NA
Weight of Dry Sample (g)	249.76	Weight of Dry Sample (g)	NA
Moisture Content (%)	**28.7**	**Moisture Content (%)**	**NA**

Wet Weight of -3/4" Sample (g)	NA	Weight of the Dry Sample (g)	249.76
Dry Weight of - 3/4" Sample (g)	15.4	Weight of - #200 Sample (g)	234.38
Wet Weight of +3/4" Sample (g)	NA	Weight of + #200 Sample (g)	15.38
Dry Weight of + 3/4" Sample (g)	0.00		
Total Dry Weight of Sample (g)	NA		

Sieve Size	Sieve Opening (mm)	Weight of Soil Retained (g)	Percent Retained (%)	Accumulated Percent Retained (%)	Percent Finer (%)	Accumulated Percent Finer (%)
12"	300	0.00	0.00	0.00	100.00	**100.00**
6"	150	0.00	0.00	0.00	100.00	**100.00**
3"	75	0.00	0.00	0.00	100.00	**100.00**
2"	50	0.00	0.00	0.00	100.00	**100.00**
1 1/2"	37.5	0.00	0.00	0.00	100.00	**100.00**
1"	25.0	0.00	0.00	0.00	100.00	**100.00**
3/4"	19.0	0.00	0.00	0.00	100.00	**100.00**
1/2"	12.50	0.00	0.00	0.00	100.00	**100.00**
3/8"	9.50	0.00	0.00	0.00	100.00	**100.00**
#4	4.75	0.00	0.00	0.00	100.00	**100.00**
#10	2.00	1.42	0.57	0.57	99.43	**99.43**
#20	0.850	0.72	0.29	0.86	99.14	**99.14**
#40	0.425	0.60	0.24	1.10	98.90	**98.90**
#60	0.250	1.02	0.41	1.51	98.49	**98.49**
#140	0.106	7.65	3.06	4.57	95.43	**95.43**
#200	0.075	3.97	1.59	6.16	93.84	**93.84**
Pan	-	234.38	93.84	100.00	-	**-**

Tested By APG Date 8/3/15 Checked By GEM Date 8/5/15

DCN: CT-S3C DATE 3/20/13 REVISION: 3

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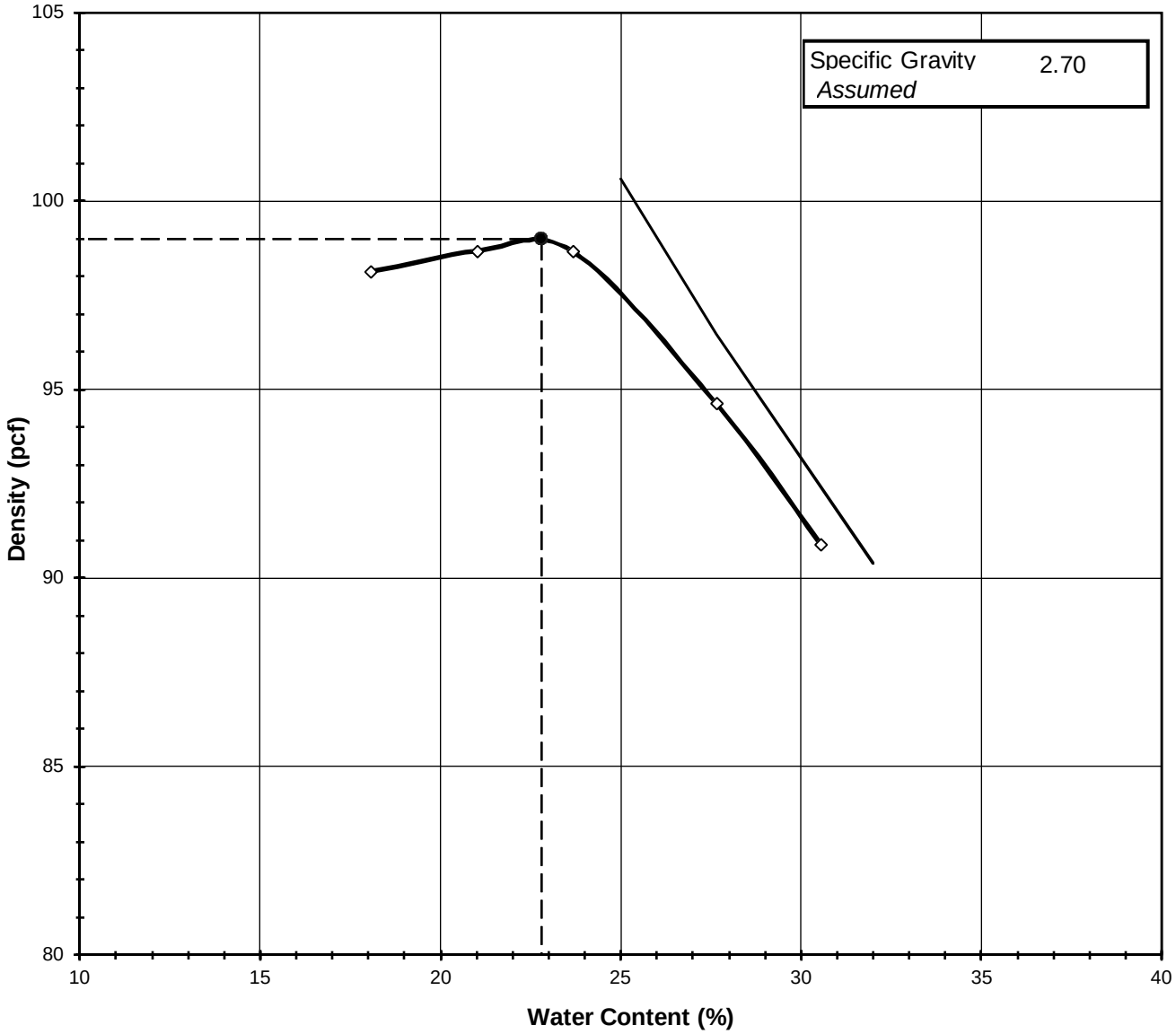
MOISTURE DENSITY RELATIONSHIP

ASTM D698-12

Client:	HDR ENGINEERING, INC.	Boring No.:	TESTPAD
Client Reference:	BRICKHAVEN NO. 2 MINE	Depth (ft):	LIFT 3
Project No.:	2015-664-16	Sample No.:	TP-L3
Lab ID:	2015-664-16-015	Test Method	**STANDARD**

Visual Description: TAN FAT CLAY

Optimum Water Content	**22.8**
Maximum Dry Density	**99.0**



Tested By NPL *Date* 8/5/15 *Checked By* GEM *Date* 8/28/15

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MOISTURE - DENSITY RELATIONSHIP

ASTM D698-12

Client:	HDR ENGINEERING, INC.	Boring No.:	TESTPAD
Client Reference:	BRICKHAVEN NO. 2 MINE	Depth (ft):	LIFT 3
Project No.:	2015-664-16	Sample No.:	TP-L3
Lab ID:	2015-664-16-015		

Visual Description: TAN FAT CLAY

Total Weight of the Sample (g)	24850
As Received Water Content (%)	NA
Assumed Specific Gravity	2.70
Percent Retained on 3/4"	NA
Percent Retained on 3/8"	NA
Percent Retained on #4	NA
Oversize Material	Not included
Procedure Used	A

Test Type		**STANDARD**
Rammer Weight (lb)		5.5
Rammer Drop (in)		12
Rammer Type		MECHANICAL
Machine ID	R	174
Mold ID	R	461
Mold diameter		4"
Weight of the Mold (g)		4169
Volume of the Mold (cm^3)		942

Mold / Specimen

Point No.	**1**	**2**	**3**	**4**	**5**
Wt. of Mold & Wet Sample (g)	5918	5972	6011	5992	5960
Wt.of Mold (g)	4169	4169	4169	4169	4169
Wt. of Wet Sample (g)	1749	1803	1842	1823	1791
Mold Volume (cm^3)	942	942	942	942	942

Moisture Content / Density

Tare Number	8010	398	310	317	314
Wt. of Tare & Wet Sample (g)	473.00	515.50	491.40	504.20	529.10
Wt. of Tare & Dry Sample (g)	420.70	440.50	418.30	413.20	425.00
Wt. of Tare (g)	131.20	83.90	109.70	84.20	84.40
Wt. of Water (g)	52.30	75.00	73.10	91.00	104.10
Wt. of Dry Sample (g)	289.50	356.60	308.60	329.00	340.60

Wet Density (g/cm^3)	1.86	1.91	1.96	1.94	1.90
Wet Density (pcf)	115.8	119.4	122.0	120.8	118.7
Moisture Content (%)	**18.1**	**21.0**	**23.7**	**27.7**	**30.6**
Dry Density (pcf)	**98.1**	**98.7**	**98.6**	**94.6**	**90.9**

Zero Air Voids

Moisture Content (%)	25.0	27.7	32.0
Dry Unit Weight (pcf)	100.6	96.5	90.4

Tested By *NPL* *Date* *8/5/15* *Checked By* *GEM* *Date* 8/28/15

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FLEXIBLE WALL PERMEABILITY TEST

PERMOMETER METHOD

ASTM D 5084-10

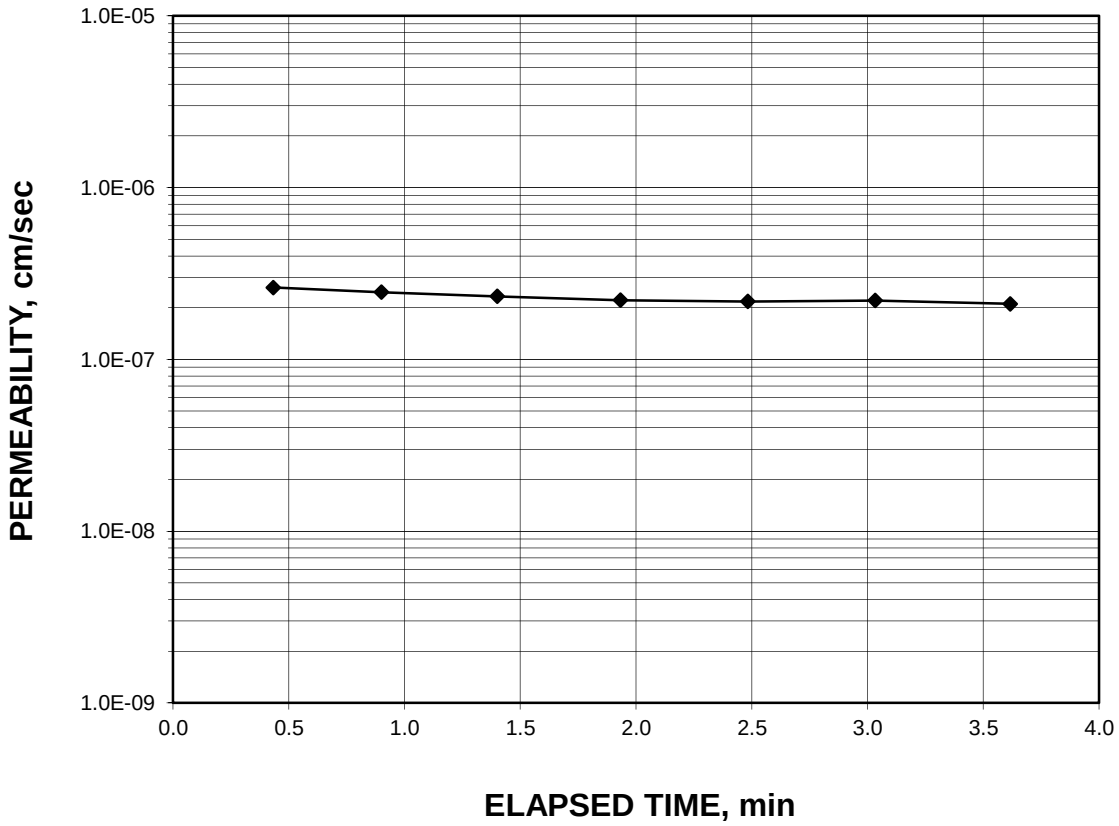
Client	HDR ENGINEERING, INC.	Boring No.	TESTPAD
Client Project	Brickhaven No.2 Mine	Depth (ft.)	LIFT 3
Project No.	2015-664-016	Sample No.	TP-L3
Lab ID No.	2015-664-016-015		

Visual Description: RED SANDY CLAY

AVERAGE PERMEABILITY = 2.2E-07 cm/sec @ 20°C

AVERAGE PERMEABILITY = 2.2E-09 m/sec @ 20°C

PERMEABILITY vs. TIME



Tested By: SFS Date: 8/25/15 Checked By: GEM Date: 8/28/15

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FLEXIBLE WALL PERMEABILITY TEST

PERMOMETER METHOD

ASTM D 5084-10

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Client	HDR ENGINEERING, INC.	Boring No.	TESTPAD
Client Project	Brickhaven No.2 Mine	Depth (ft.)	LIFT 3
Project No.	2015-664-016	Sample No.	TP-L3
Lab ID No.	2015-664-016-015		

Specific Gravity	2.70	Assumed
Sample Condition		Remolded

Visual Description: RED SANDY CLAY

MOISTURE CONTENT:	BEFORE TEST	AFTER TEST
Tare Number	812	802
Wt. of Tare & WS (gm.)	429.61	509.14
Wt. of Tare & DS (gm.)	366.69	412.62
Wt. of Tare (gm.)	106.20	102.51
Wt. of Water (gm.)	62.92	96.52
Wt. of DS (gm.)	260.49	310.11
Moisture Content (%)	**24.2**	**31.1**

SPECIMEN:	BEFORE TEST	AFTER TEST
Wt. of Tube & WS (gm.)	2435.57	NA
Wt. of Tube (gm.)	1632.00	NA
Wt. of WS (calc.) (gm.)	803.57	848.68
Length 1 (in.)	4.005	4.062
Length 2 (in.)	4.005	4.067
Length 3 (in.)	4.005	4.089
Top Diameter (in.)	2.867	2.907
Middle Diameter (in.)	2.867	2.910
Bottom Diameter (in.)	2.867	2.908
Average Length (in.)	4.01	4.07
Average Area (in.^{2})	6.46	6.64
Sample Volume (cm^3)	423.69	443.36
Unit Wet Wt. (gm./ cm^3)	1.897	1.914
Unit Wet Wt. (pcf)	118.4	119.5
Unit Dry Wt. (pcf)	95.4	91.1
Unit Dry Wt. (gm./ cm^3)	1.528	1.460
Void Ratio, e	0.767	0.850
Porosity, n	0.434	0.459
Pore Volume (cm^3)	184.0	203.6
Total Wt. Of Sample After Test		855.35

Tested By: SFS Date: 8/25/15 Checked By: GEM Date: 8/28/15

DCN: CT-22A DATE:2-2-2010 REVISION:5 T:\2015 PROJECTS\2015-664 HDR ENGINEERING - BRICKHAVEN\[2015-664-016-015 Permometer.xls]Sheet1

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FLEXIBLE WALL PERMEABILITY TEST
PERMOMETER METHOD

ASTM D 5084-10

Client	HDR ENGINEERING, INC.	Boring No.	TESTPAD
Client Project	Brickhaven No.2 Mine	Depth (ft.)	LIFT 3
Project No.	2015-664-016	Sample No.	TP-L3
Lab ID No.	2015-664-016-015		

Test Pressures		Final Sample Dimensions	
Cell Pressure(psi)	60.0	Sample Length (cm), L	10.34
Back Pressure(psi)	50.0	Sample Area (cm^2), A	42.86
Eff. Cons. Pressure(psi)	10.0	Pipette Area (cm^2), a_p	0.03142
Response (%)	99	Annulus Area (cm^2), a_a	0.76712
		Equilibrium Level (cm), R_{eq}	1

AVERAGE PERMEABILITY = 2.2E-07 cm/sec @ 20°C
AVERAGE PERMEABILITY = 2.2E-09 m/sec @ 20°C

DATE			TIME		ELAPSED TIME **t**	PIPETTE READI NG **R_p**	INCREMENT GRADIENT **i**	TEMP.	INCREMENTAL PERMEABILITY @ 20°C
(mm/dd/yy)	(hr)	(min)	(sec)	(min)	(min)	(cm)	(cm/cm)	(°C)	(cm/sec)
8/26/15	18	38	51	38.85	0.000	8.9	10.0	23.5	NA
8/26/15	18	39	17	39.28	0.433	8.8	9.8	23.5	2.6E-07
8/26/15	18	39	45	39.75	0.900	8.7	9.7	23.5	2.5E-07
8/26/15	18	40	15	40.25	1.400	8.6	9.6	23.5	2.3E-07
8/26/15	18	40	47	40.78	1.933	8.5	9.5	23.5	2.2E-07
8/26/15	18	41	20	41.33	2.483	8.4	9.3	23.5	2.2E-07
8/26/15	18	41	53	41.88	3.033	8.3	9.2	23.5	2.2E-07
8/26/15	18	42	28	42.47	3.617	8.2	9.1	23.5	2.1E-07

Tested By: SFS Date: 8/25/15 Checked By: GEM Date: 8/28/15

DCN: CT-22A DATE:2-7-2012 REVISION:5 F:\2015 PROJECTS\2015-664 HDR ENGINEERING - BRICKHAVEN\[2015-664-016-015 Permometer.xls]Sheet1

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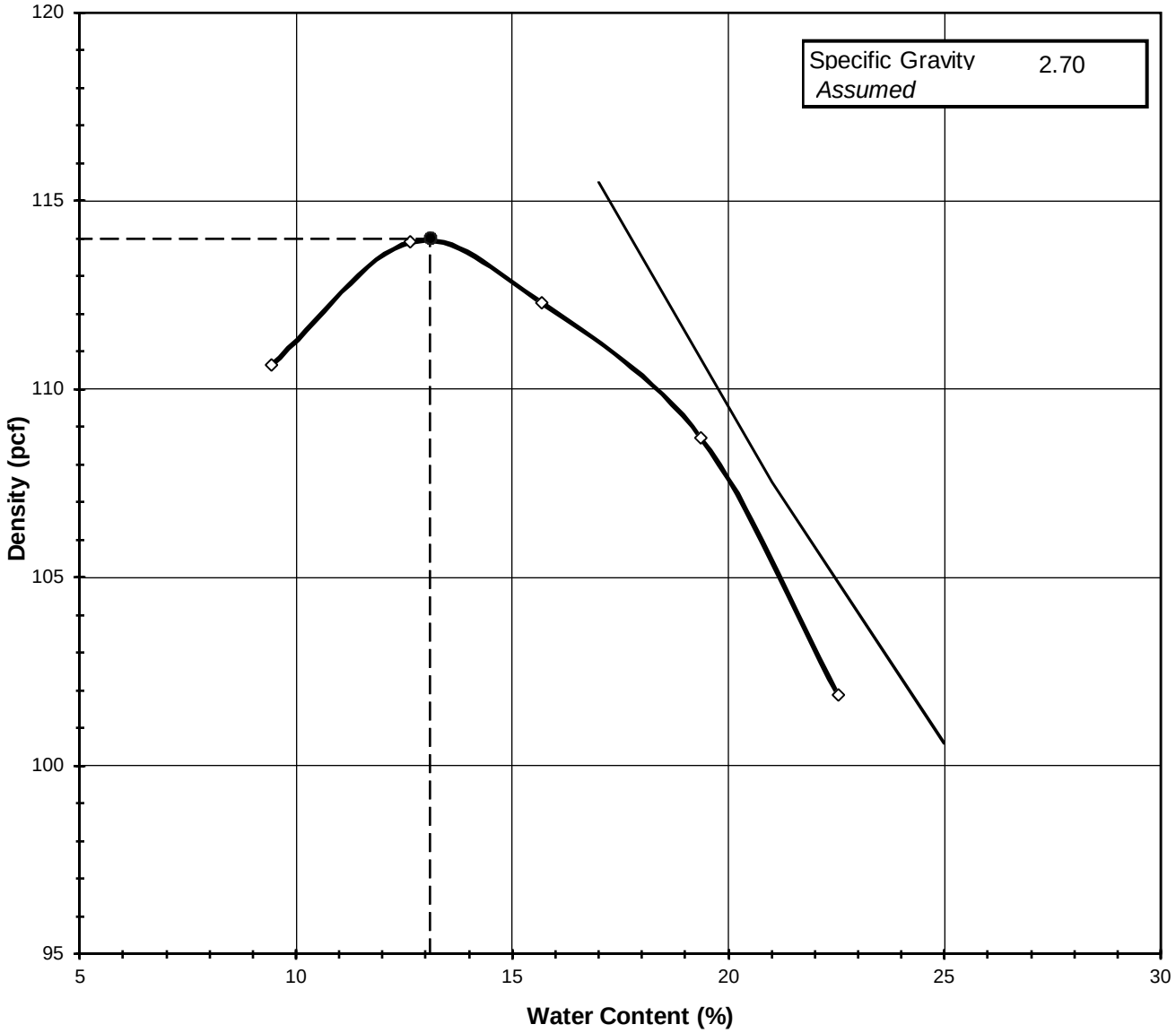
MOISTURE DENSITY RELATIONSHIP

ASTM D1557-12

Client:	HDR ENGINEERING, INC.	Boring No.:	TESTPAD
Client Reference:	BRICKHAVEN NO. 2 MINE	Depth (ft):	LIFT 3
Project No.:	2015-664-16	Sample No.:	TP-COMBINED
Lab ID:	2015-664-16-016	Test Method	**MODIFIED**

Visual Description: BROWN SILTY CLAY

Optimum Water Content	**13.1**
Maximum Dry Density	**114.0**



Tested By SS *Date* *8/20/15* *Checked By* GEM *Date* 8/21/15

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MOISTURE - DENSITY RELATIONSHIP

ASTM D1557-12

Client:	HDR ENGINEERING, INC.	Boring No.:	TESTPAD
Client Reference:	BRICKHAVEN NO. 2 MINE	Depth (ft):	LIFT 3
Project No.:	2015-664-16	Sample No.:	TP-COMBINED
Lab ID:	2015-664-16-016		

Visual Description: BROWN SILTY CLAY

Total Weight of the Sample (g)	NA
As Received Water Content (%)	NA
Assumed Specific Gravity	2.70
Percent Retained on 3/4"	NA
Percent Retained on 3/8"	NA
Percent Retained on #4	NA
Oversize Material	Not included
Procedure Used	B

Test Type		**MODIFIED**
Rammer Weight (lb)		10.0
Rammer Drop (in)		18
Rammer Type		MECHANICAL
Machine ID	R	174
Mold ID	R	461
Mold diameter		4"
Weight of the Mold (g)		4169
Volume of the Mold (cm^3)		942

Mold / Specimen

Point No.	**1**	**2**	**3**	**4**	**5**
Wt. of Mold & Wet Sample (g)	5996	6106	6130	6128	6053
Wt.of Mold (g)	4169	4169	4169	4169	4169
Wt. of Wet Sample (g)	1827	1937	1961	1959	1884
Mold Volume (cm^3)	942	942	942	942	942

Moisture Content / Density

Tare Number	842	836	837	841	834
Wt. of Tare & Wet Sample (g)	765.70	772.00	681.30	732.20	745.00
Wt. of Tare & Dry Sample (g)	721.80	714.60	624.30	655.50	655.70
Wt. of Tare (g)	256.10	260.90	261.00	259.60	259.50
Wt. of Water (g)	43.90	57.40	57.00	76.70	89.30
Wt. of Dry Sample (g)	465.70	453.70	363.30	395.90	396.20

Wet Density (g/cm^3)	1.94	2.06	2.08	2.08	2.00
Wet Density (pcf)	121.1	128.3	129.9	129.8	124.8
Moisture Content (%)	**9.4**	**12.7**	**15.7**	**19.4**	**22.5**
Dry Density (pcf)	**110.6**	**113.9**	**112.3**	**108.7**	**101.9**

Zero Air Voids

Moisture Content (%)	17.0	21.0	25.0
Dry Unit Weight (pcf)	115.5	107.5	100.6

Tested By SS *Date* *8/20/15* *Checked By* *GEM* *Date* 8/21/15

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August 7, 2015

Project No. 2015-664-17

Mr. Michael Plummer, P.E.
HDR Engineering, Inc.
440 South Church St., Suite 1000
Charlotte, NC 28202

Transmittal
Laboratory Test Results
Brickhaven No. 2 Mine

Please find attached the laboratory test results for the above referenced project. The tests were outlined on the Project Verification Form that was transmitted to your firm prior to the testing. The testing was performed in general accordance with the methods listed on the enclosed data sheets. The test results are believed to be representative of the samples that were submitted for testing and are indicative only of the specimens which were evaluated. We imply no position with regard to the nature of the test results, i.e. pass/fail and no claims as to the suitability of the material for its intended use.

The test data and all associated project information provided shall be held in strict confidence and disclosed to other parties only with authorization by our Client. The test data submitted herein is considered integral with this report and is not to be reproduced except in whole and only with the authorization of the Client and Geotechnics. The remaining sample materials for this project will be retained for a minimum of 90 days as directed by the Geotechnics' Quality Program.

We are pleased to provide these testing services. Should you have any questions or if we may be of further assistance, please contact our office.

Respectively submitted,
Geotechnics, Inc.

Michael P. Smith
Regional Manager

We understand that you have a choice in your laboratory services and we thank you for choosing Geotechnics.

DCN: Data Transmittal Letter Date: 1/28/05 Rev.: 1

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MOISTURE CONTENT

ASTM D 2216-10

Client: HDR ENGINEERING, INC.
Client Reference: BRICKHAVEN NO. 2 MINE
Project No.: 2015-664-017

Lab ID:	001	002	003	004	005
Boring No.:	TEST PAD	TEST PAD	TEST PAD	TEST PAD	TEST PAD
Depth (ft):	LIFT 3	LIFT 3	LIFT 3	LIFT 3	LIFT 3
Sample No.:	TP-L3-1	TP-L3-2	TP-L3-3	TP-L3-4	TP-L3-5
Tare Number	841	834	831	838	836
Wt. of Tare & Wet Sample (g)	974.87	879.29	895.49	909.35	928.91
Wt. of Tare & Dry Sample (g)	834.39	752.79	766.92	770.81	788.54
Weight of Tare (g)	259.63	259.70	262.68	262.17	260.80
Weight of Water (g)	140.48	126.50	128.57	138.54	140.37
Weight of Dry Sample (g)	574.76	493.09	504.24	508.64	527.74
Water Content (%)	**24.4**	**25.7**	**25.5**	**27.2**	**26.6**

Notes :

Tested By *HM* *Date* *7/29/15* *Checked By* *GEM* *Date* *7/31/15*

DCN: CT-S1 DATE: 3/18/13 REVISION: 4

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MOISTURE CONTENT

ASTM D 2216-10

Client: HDR ENGINEERING, INC.
Client Reference: BRICKHAVEN NO. 2 MINE
Project No.: 2015-664-017

Lab ID:	006	007	008	009	010
Boring No.:	TEST PAD	CELL 1A ACRE A1	CELL 1A ACRE A1	CELL 1A ACRE A2	CELL 1A ACRE A2
Depth (ft):	LIFT 3	LIFT 1	LIF T2	LIFT 1	LIFT 2
Sample No.:	ST-TP-L3	ST-1A-A1-L1	ST-1A-A1-L2	ST-1A-A2-L1	ST-1A-A2-L2
Tare Number	826	805	803	117	444
Wt. of Tare & Wet Sample (g)	425.82	526.66	433.38	166.08	193.26
Wt. of Tare & Dry Sample (g)	364.09	458.96	366.11	142.89	161.24
Weight of Tare (g)	134.14	102.87	102.20	32.63	37.99
Weight of Water (g)	61.73	67.70	67.27	23.19	32.02
Weight of Dry Sample (g)	229.95	356.09	263.91	110.26	123.25
Water Content (%)	**26.8**	**19.0**	**25.5**	**21.0**	**26.0**

Notes :

Tested By *SFS* *Date* *7/29/15* *Checked By* *GEM* *Date* *8/4/15*

DCN: CT-S1 DATE: 3/18/13 REVISION: 4

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ATTERBERG LIMITS

ASTM D 4318-10 / AASHTO T89-10

Client:	HDR ENGINEERING, INC.	Boring No.:	TESTPAD
Client Reference:	BRICKHAVEN NO. 2 MINE	Depth (ft):	LIFT 3
Project No.:	2015-664-17	Sample No.:	ST-TP-L3
Lab ID:	2015-664-17-006	Soil Description:	**YELLOW FAT CLAY**

Note: The USCS symbol used with this test refers only to the minus No. 40 sieve material. See the "Sieve and Hydrometer Analysis" graph page for the complete material description. (Minus No. 40 sieve material, Airdried)

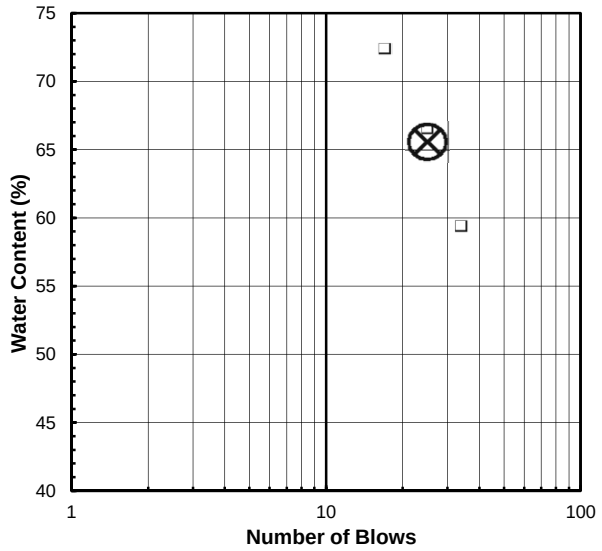
Liquid Limit Test	**1**	**2**	**3**	
Tare Number	KP	2M	P	**MULTIPOINT**
Wt. of Tare & Wet Sample (g)	33.09	30.32	29.51	
Wt. of Tare & Dry Sample (g)	26.56	24.47	23.52	
Wt. of Tare (g)	15.55	15.67	15.24	
Wt. of Water (g)	6.5	5.9	6.0	
Wt. of Dry Sample (g)	11.0	8.8	8.3	
Moisture Content (%)	**59.3**	**66.5**	**72.3**	
Number of Blows	**34**	**25**	**17**	

Plastic Limit Test	**1**	**2**	**Range**
Tare Number	3M	O	
Wt. of Tare & Wet Sample (g)	23.58	21.97	
Wt. of Tare & Dry Sample (g)	21.76	20.37	
Wt. of Tare (g)	15.58	15.25	
Wt. of Water (g)	1.8	1.6	
Wt. of Dry Sample (g)	6.2	5.1	
Moisture Content (%)	**29.4**	**31.3**	**-1.8**

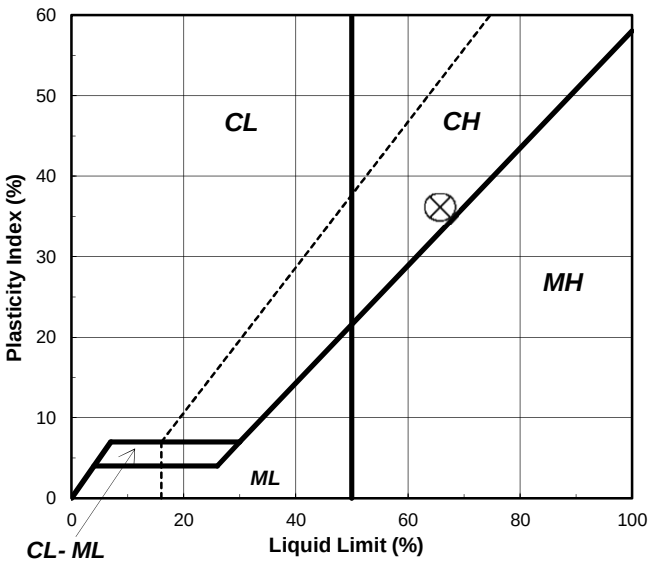
Note: The acceptable range of the two Moisture contents is ± 2.6

Test Results	
Liquid Limit (%)	**66**
Plastic Limit (%)	**30**
Plasticity Index (%)	**36**
USCS Symbol	**CH**

Flow Curve



Plasticity Chart



Tested By	*HM*	*Date*	*8/4/15*	*Checked By*	*GEM*	*Date*	8/5/15

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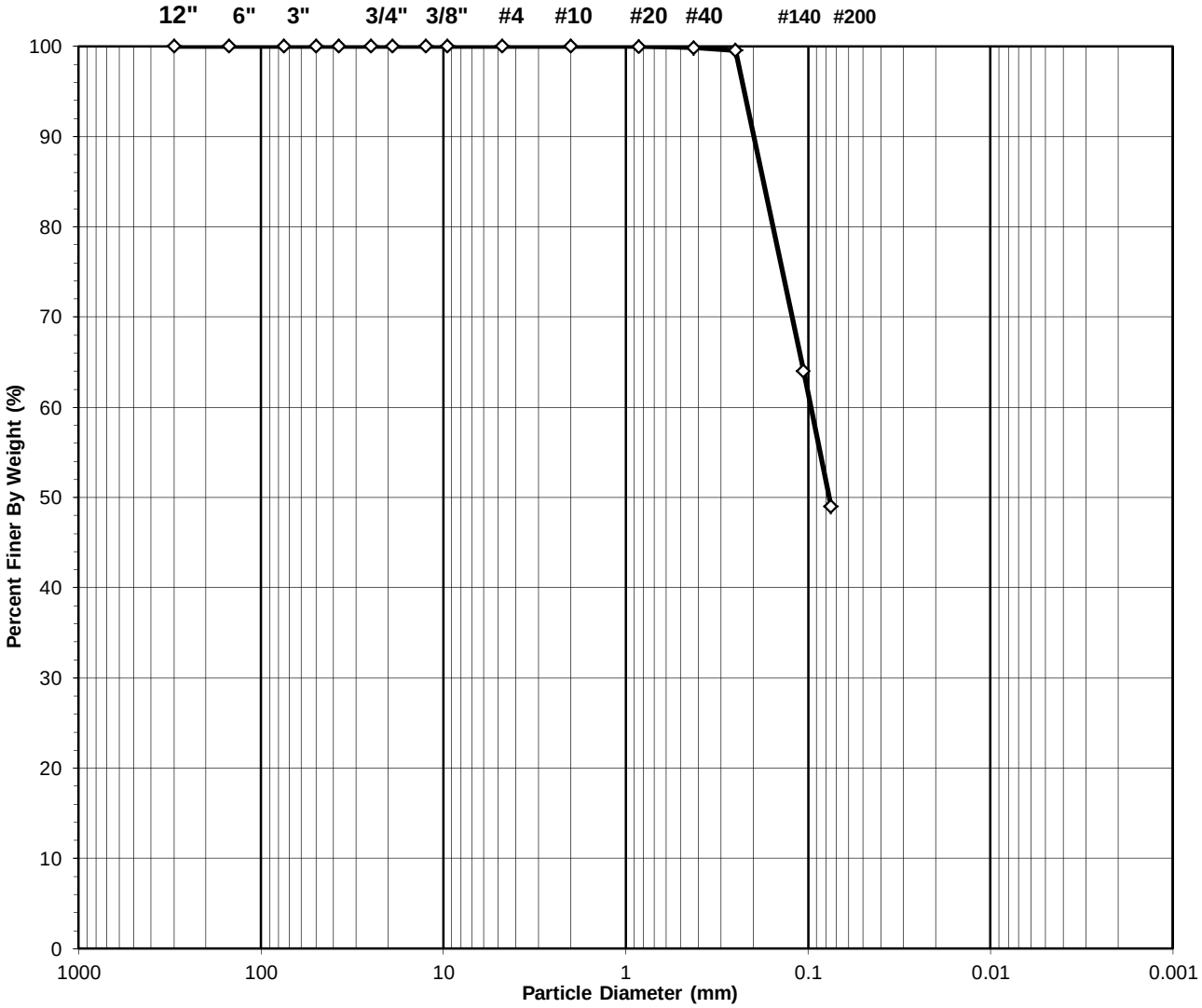
SIEVE ANALYSIS

ASTM D 422-63 (2007)

Client:	HDR ENGINEERING, INC.	Boring No.:	TESTPAD
Client Reference:	BRICKHAVEN NO. 2 MINE	Depth (ft):	LIFT 3
Project No.:	2015-664-17	Sample No.:	ST-TP-L3
Lab ID:	2015-664-17-006	Soil Color:	YELLOW

	SIEVE ANALYSIS		HYDROMETER
USCS	gravel	sand	silt and clay



USCS Symbol: ***SC, TESTED***

USCS Classification: ***CLAYEY SAND***

Tested By SMS Date 8/5/15 Checked By GEM Date 8/6/15

DCN: CT-S3C DATE 3/20/13 REVISION: 3

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WASH SIEVE ANALYSIS

ASTM D 422-63 (2007)

Client:	HDR ENGINEERING, INC.	Boring No.:	TESTPAD
Client Reference:	BRICKHAVEN NO. 2 MINE	Depth (ft):	LIFT 3
Project No.:	2015-664-17	Sample No.:	ST-TP-L3
Lab ID:	2015-664-17-006	Soil Color:	YELLOW

Moisture Content of Passing 3/4" Sample		Water Content of Retained 3/4" Sample	
Tare No.	832	Tare No.	NA
Wt. of Tare & Wet Sample (g)	844.24	Weight of Tare & Wet Sample (g)	NA
Wt. of Tare & Dry Sample (g)	665.26	Weight of Tare & Dry Sample (g)	NA
Weight of Tare (g)	260.76	Weight of Tare (g)	NA
Weight of Water (g)	178.98	Weight of Water (g)	NA
Weight of Dry Sample (g)	404.50	Weight of Dry Sample (g)	NA
Moisture Content (%)	**44.2**	**Moisture Content (%)**	**NA**

Wet Weight of -3/4" Sample (g)	NA	Weight of the Dry Sample (g)	404.50
Dry Weight of - 3/4" Sample (g)	206.2	Weight of - #200 Sample (g)	198.30
Wet Weight of +3/4" Sample (g)	NA	Weight of + #200 Sample (g)	206.20
Dry Weight of + 3/4" Sample (g)	0.00		
Total Dry Weight of Sample (g)	NA		

Sieve Size	Sieve Opening (mm)	Weight of Soil Retained (g)	Percent Retained (%)	Accumulated Percent Retained (%)	Percent Finer (%)	Accumulated Percent Finer (%)
12"	300	0.00	0.00	0.00	100.00	**100.00**
6"	150	0.00	0.00	0.00	100.00	**100.00**
3"	75	0.00	0.00	0.00	100.00	**100.00**
2"	50	0.00	0.00	0.00	100.00	**100.00**
1 1/2"	37.5	0.00	0.00	0.00	100.00	**100.00**
1"	25.0	0.00	0.00	0.00	100.00	**100.00**
3/4"	19.0	0.00	0.00	0.00	100.00	**100.00**
1/2"	12.50	0.00	0.00	0.00	100.00	**100.00**
3/8"	9.50	0.00	0.00	0.00	100.00	**100.00**
#4	4.75	0.00	0.00	0.00	100.00	**100.00**
#10	2.00	0.00	0.00	0.00	100.00	**100.00**
#20	0.850	0.14	0.03	0.03	99.97	**99.97**
#40	0.425	0.51	0.13	0.16	99.84	**99.84**
#60	0.250	1.17	0.29	0.45	99.55	**99.55**
#140	0.106	143.70	35.53	35.98	64.02	**64.02**
#200	0.075	60.68	15.00	50.98	49.02	**49.02**
Pan	-	198.30	49.02	100.00	-	**-**

Tested By SMS Date 8/5/15 Checked By GEM Date 8/6/15

DCN: CT-S3C DATE 3/20/13 REVISION: 3

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PERMEABILITY TEST

ASTM D 5084-10

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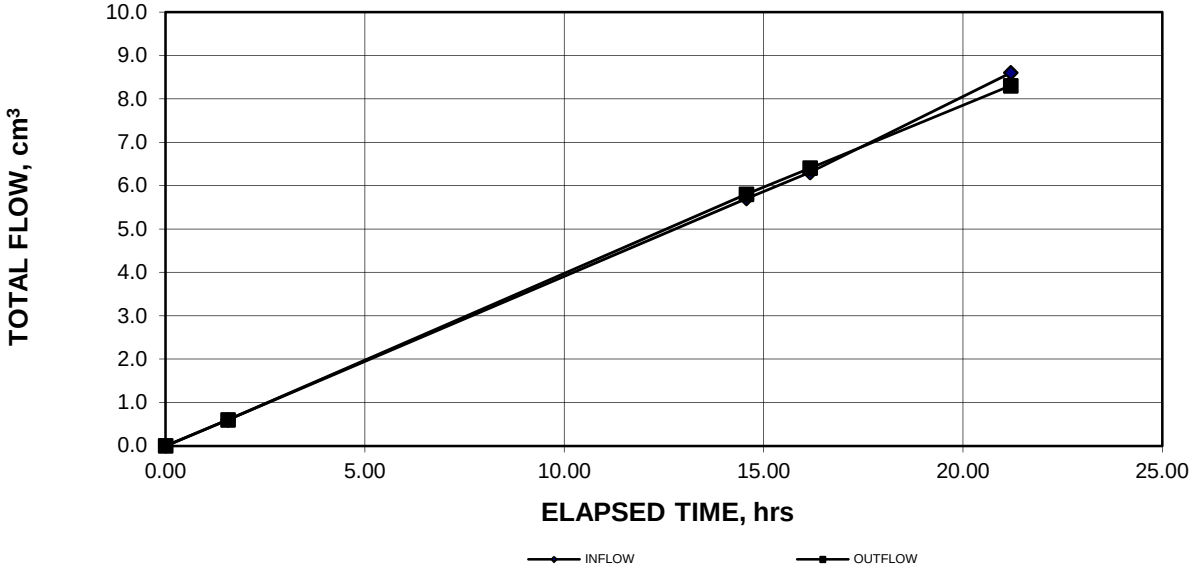
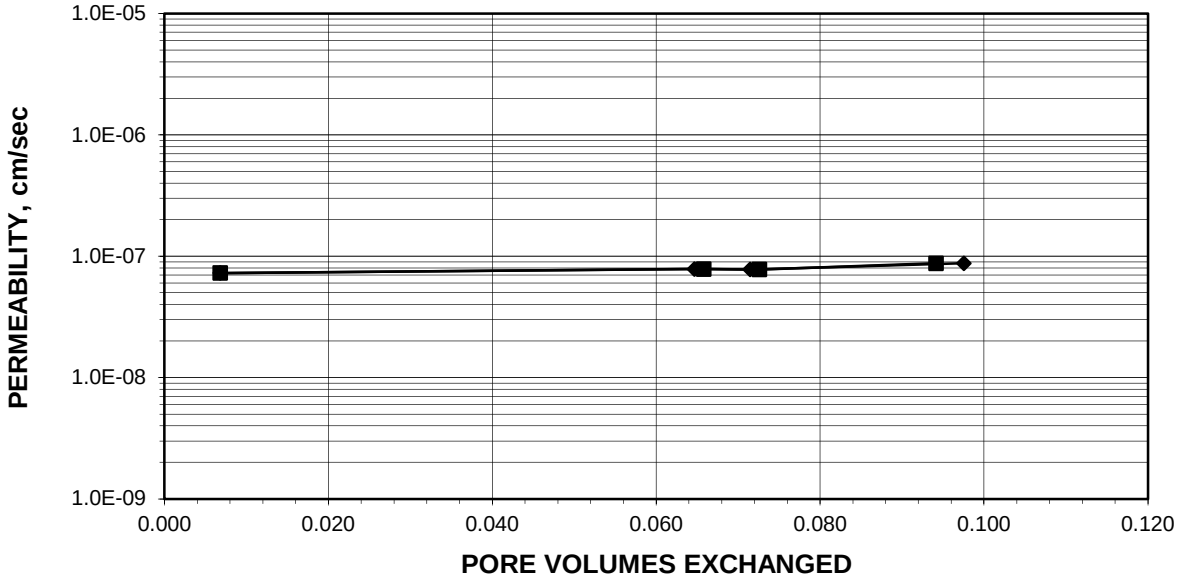
Client	HDR ENGINEERING, INC.	Boring No.	TEST PAD
Client Project	Brickhaven No.2 Mine	Depth (ft.)	LIFT 3
Project No.	2015-664-016	Sample No.	ST-TP-L3
Lab ID No.	2015-664-017-006		

AVERAGE PERMEABILITY = 7.9E-08 cm/sec @ 20°C
AVERAGE PERMEABILITY = 7.9E-10 m/sec @ 20°C

TOTAL FLOW vs. ELAPSED TIME



PORE VOLUMES EXCHANGED vs. PERMEABILITY



Tested By: MPS Date: 7/29/15 Checked By: GEM Date: 8/3/15

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PERMEABILITY TEST

ASTM D 5084-10

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Client	HDR ENGINEERING, INC.	Boring No.	TEST PAD
Client Project	Brickhaven No.2 Mine	Depth (ft.)	LIFT 3
Project No.	2015-664-016	Sample No.	ST-TP-L3
Lab ID No.	2015-664-017-006		

Specific Gravity	2.70	Assumed
Sample Condition		Remolded

Visual Description: BROWN SILTY CLAY

MOISTURE CONTENT:	BEFORE TEST	AFTER TEST
Tare Number	826	826
Wt. of Tare & WS (gm.)	425.82	364.43
Wt. of Tare & DS (gm.)	364.09	311.74
Wt. of Tare (gm.)	134.14	134.16
Wt. of Water (gm.)	61.73	52.69
Wt. of DS (gm.)	229.95	177.58
Moisture Content (%)	**26.8**	**29.7**

SPECIMEN:	BEFORE TEST	AFTER TEST
Wt. of Tube & WS (gm.)	383.12	NA
Wt. of Tube (gm.)	0.00	NA
Wt. of WS (calc.)(gm.)	383.12	391.66
Length 1 (in.)	1.903	1.872
Length 2 (in.)	1.906	1.891
Length 3 (in.)	1.909	1.892
Top Diameter (in.)	2.842	2.864
Middle Diameter (in.)	2.835	2.874
Bottom Diameter (in.)	2.843	2.876
Average Length (in.)	1.91	1.89
Average Area (in.^{2})	6.33	6.48
Sample Volume (cm^3)	197.86	200.02
Unit Wet Wt. (gm./ cm^3)	1.94	1.96
Unit Wet Wt. (pcf)	120.9	122.2
Unit Dry Wt. (pcf)	95.3	94.3
Unit Dry Wt. (gm./ cm^3)	1.53	1.51
Void Ratio, e	0.77	0.79
Porosity, n	0.43	0.44
Pore Volume (cm^3)	86.0	88.2
Total Wgt. Of Sample After Test		392.13

Tested By: MPS Date: 7/29/15 Checked By: GEM Date: 8/3/15

DCN: CT-22 DATE\2015 REVISION 01 2015-664 HDR ENGINEERING - BRICKHAVEN\[2015-664-17-006 updated PERMflow.xls]Sheet1

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PERMEABILITY TEST

ASTM D 5084-10

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Client	HDR ENGINEERING, INC.	Boring No.	TEST PAD
Client Project	Brickhaven No.2 Mine	Depth (ft.)	LIFT 3
Project No.	2015-664-016	Sample No.	ST-TP-L3
Lab ID No.	2015-664-017-006		

Pressure Heads (Constant)		Final Sample Dimensions	
Top Cap (psi)	49.0	Sample Length (cm), L	4.79
Bottom Cap (psi)	51.0	Sample Diameter (cm)	7.29
Cell (psi)	60.0	Sample Area (cm^2), A	41.78
Total Pressure Head (cm)	140.6	Inflow Burette Area (cm^2), a-in	0.852
Hydraulic Gradient	29.37	Outflow Burette Area (cm^2), a-out	0.856
		B Parameter (%)	97

AVERAGE PERMEABILITY = 7.9E-08 cm/sec @ 20°C

AVERAGE PERMEABILITY = 7.9E-10 m/sec @ 20°C

DATE (mm/dd/yy)	TIME (hr)	TIME (min)	ELAPSED TIME **t** (hr)	TOTAL INFLOW (cm^3)	TOTAL OUTFLOW (cm^3)	TOTAL HEAD **h** (cm)	FLOW (0 flow) (1 stop)	TEMP. (°C)	INCREMENTAL PERMEABILITY @ 20°C (cm/sec)
7/30/15	17	51	0.00	0.0	0.0	156.9	0	22.8	NA
7/30/15	19	25	1.57	0.6	0.6	155.5	0	22.7	7.3E-08
7/31/15	8	25	14.57	5.7	5.8	143.6	0	22.8	7.8E-08
7/31/15	10	1	16.17	6.3	6.4	142.2	0	22.8	7.8E-08
7/31/15	15	3	21.20	8.6	8.3	137.3	1	23.2	8.7E-08

Tested By: MPS Date: 7/29/15 Checked By: GEM Date: 8/3/15

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Client: HDR
Project Name : BRICKHAVEN NO. 2 MINE TRACT A
Project Number : 2015-664

Field Density Report

Report Number :	**CCLFDR-01**	Geotechnics Representative :	Matt Taylor	Page :	1 of 3
Date (s) :	07/27/2015-08/1/02015	Reviewed By :	Shannon Sisell	Date :	8/12/15

Contractor :	Charah, Inc.	Borrow Source :	On-site

Compaction Equipment :	CAT815 Sheepsfoot Roller, CAT Smoothdrum Roller

Test Number	Northing	Easting	Elev.	Proctor I.D. No.	Proctor Data		Measured In Place			Compaction		Comments
					MDD pcf	Opt. %M	WD (pcf)	% M	DD (pcf)	% C	% Req.	
CCLND- TP-01	676166.7	1994343.2	LIFT 1	664-01-05	93.9	27.6	**121.3**	**27.8**	**94.9**	**101.1%**	**95%**	7/28/15
DC TP-01	676166.7	1994343.2	LIFT 1	664-01-05	93.9	27.6	**119.9**	**26.4**	**94.8**	**101.0%**	**95%**	7/28/15
CCLND- TP-02	673737.1	1994362.4	LIFT 1	664-01-05	93.9	27.6	**123.2**	**28.7**	**95.7**	**101.9%**	**95%**	7/28/15 SHELBY TUBE
CCLND- TP-03	673688.0	1994359.8	LIFT 1	664-01-05	93.9	27.6	**124.0**	**28.6**	**96.4**	**102.7%**	**95%**	7/28/15
CCLND- TP-04	673642.4	1994346.7	LIFT 1	664-01-05	93.9	27.6	**122.5**	**29.8**	**94.4**	**100.5%**	**95%**	7/28/15
CCLND- TP-05	673637.3	1994364.5	LIFT 1	664-01-05	93.9	27.6	**121.0**	**27.7**	**94.8**	**100.9%**	**95%**	7/28/15
CCLND- TP-06	676166.7	1994343.2	LIFT 2	664-01-05	93.9	27.6	**123.9**	**28.6**	**96.3**	**102.6%**	**95%**	7/28/15
CCLND- TP-07	673737.1	1994362.4	LIFT 2	664-01-05	93.9	27.6	**120.2**	**24.7**	**96.4**	**102.7%**	**95%**	7/28/15 SHELBY TUBE
CCLND- TP-08	673688.0	1994359.8	LIFT 2	664-01-05	93.9	27.6	**120.8**	**25.0**	**96.6**	**102.9%**	**95%**	7/28/15
CCLND- TP-09	673642.4	1994346.7	LIFT 2	664-01-05	93.9	27.6	**119.5**	**23.7**	**96.6**	**102.9%**	**95%**	7/28/15
DC TP-09	673642.4	1994346.7	LIFT 2	664-01-05	93.9	27.6	**120.6**	**25.9**	**95.8**	**102.0%**	**95%**	7/28/15
CCLND- TP-10	673637.3	1994364.5	LIFT 2	664-01-05	93.9	27.6	**120.5**	**27.8**	**94.3**	**100.4%**	**95%**	7/28/15
CCLND- TP-11	676166.7	1994343.2	LIFT 3	664-01-05	93.9	27.6	**124.1**	**31.0**	**94.7**	**100.9%**	**95%**	7/29/15
CCLND- TP-12	673737.1	1994362.4	LIFT 3	664-01-05	93.9	27.6	**120.7**	**32.3**	**91.2**	**97.2%**	**95%**	7/29/15
CCLND- TP-13	673688.0	1994359.8	LIFT 3	664-01-05	93.9	27.6	**122.1**	**27.9**	**95.5**	**101.7%**	**95%**	7/29/15 SHELBY TUBE
CCLND- TP-14	673642.4	1994346.7	LIFT 3	664-01-05	93.9	27.6	**120.1**	**31.0**	**91.7**	**97.6%**	**95%**	7/29/15
CCLND- TP-15	673637.3	1994364.5	LIFT 3	664-01-05	93.9	27.6	**120.9**	**30.9**	**92.4**	**98.4%**	**95%**	7/29/15
DC TP-15	673637.3	1994364.5	LIFT 3	664-01-05	93.9	27.6	**120.3**	**23.8**	**97.1**	**103.5%**	**95%**	7/29/15
CCLND- 1	673559.9	1994353.0	214.6	664-01-05	93.9	27.6	**117.4**	**24.9**	**94.0**	**100.1%**	**95%**	7/28/15
CCLND- 2	673472.5	1994302.6	212.4	664-01-05	93.9	27.6	**118.5**	**27.3**	**93.1**	**99.1%**	**95%**	7/28/15
CCLND- 3	673318.4	1994254.1	208.1	664-01-05	93.9	27.6	**121.3**	**22.5**	**99.0**	**105.5%**	**95%**	7/28/15 SHELBY TUBE
CCLND- 4	673324.4	1994175.6	209.1	664-01-05	93.9	27.6	**119.5**	**25.9**	**94.9**	**101.1%**	**95%**	7/28/15
CCLND- 5	673433.9	1994221.1	208.9	664-01-05	93.9	27.6	**123.6**	**28.2**	**96.4**	**102.7%**	**95%**	7/28/15
CCLND- 6	673571.2	1994275.5	213.9	664-01-02	105.6	17.5	**126.5**	**17.5**	**107.7**	**102.0%**	**95%**	7/28/15

Gauge Number	Gauge Model	Density Count	Moisture Count
24656	3430	1960	582

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B2

B2 – HDR Structural Fill Summary Table

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Project Name : BRICKHAVEN NO. 2 MINE TRACT A SUBCELL 1C
Project Number : 2015-664

Field Density Reports

Material (SF or CL)	Field Report	Test Type	Test Number	Northing (NC State Plane)	Easting (NC State Plane)	Elev.	Proctor I.D. No.	Proctor MDD pcf	Proctor Opt. %M	Wet Density (pcf)	Moisture Content	Dry Density (pcf)	Compaction	Comments	Location Description on Report	Test Date
SF	SFFDR-1 Cell 1C	ND-	1	674071.886	1993793.246	Subgrade	664-01-06	126.8	10.2	137.1	13.6	120.7	95.2%		2/10/16, Subcell 2	
SF	SFFDR-1 Cell 1C	ND-	2	674122.829	1993858.654	Subgrade	664-01-06	126.8	10.2	137.1	13.6	120.7	95.2%		2/10/16, Subcell 5	
SF	SFFDR-1 Cell 1C	ND-	3	674148.292	1993930.001	Subgrade	664-01-06	126.8	10.2	140.4	14.6	122.5	96.6%		2/10/16, Subcell 6	
SF	SFFDR-1 Cell 1C	ND-	4	674191.953	1994010.269	Subgrade	664-01-06	126.8	10.2	139.8	15.4	121.1	95.5%		2/10/16, Subcell 8	
SF	SFFDR-1 Cell 1C	ND-	5	674235.613	1994093.510	Subgrade	664-01-06	126.8	10.2	136.0	12.5	120.9	95.3%		2/10/16, Subcell 7	
SF	SFFDR-1 Cell 1C	DC-	1	674279.273	1994176.751	Subgrade	664-01-06	126.8	10.2	136.1	13.1	120.3	95.0%		2/10/16, Subcell 7	
SF	SFFDR-1 Cell 1C	ND-	6	674279.273	1994176.751	Subgrade	664-01-06	126.8	10.2	136.9	13.4	120.7	95.2%		2/10/16, Subcell 18	
SF	SFFDR-1 Cell 1C	ND-	7	674362.995	1994141.096	Subgrade	664-01-06	126.8	10.2	137.4	11.6	123.1	97.1%		2/10/16, Subcell 19	
SF	SFFDR-1 Cell 1C	ND-	8	674435.798	1994096.523	Subgrade	664-01-06	126.8	10.2	135.5	12.2	120.8	95.2%		2/10/16, Subcell 26	
SF	SFFDR-1 Cell 1C	ND-	9	674322.964	1994108.390	Subgrade	664-01-06	126.8	10.2	139.8	12.3	124.5	98.2%		2/10/16, Subcell 17	
SF	SFFDR-1 Cell 1C	ND-	10	674312.059	1994037.047	Subgrade	664-01-06	126.8	10.2	139.1	11.8	124.4	98.1%		2/10/16, Subcell 16	
SF	SFFDR-1 Cell 1C	DC-	2	674253.842	1993944.885	Subgrade	664-01-06	126.8	10.2	137.3	12.0	122.6	96.7%		2/10/16, Subcell 16	
SF	SFFDR-1 Cell 1C	ND-	11	674253.842	1993944.885	Subgrade	664-01-06	126.8	10.2	138.3	10.9	124.7	98.3%		2/10/16, Subcell 9	
SF	SFFDR-1 Cell 1C	ND-	12	674239.300	1993861.650	Subgrade	664-01-06	126.8	10.2	138.2	13.1	122.2	96.4%		2/10/16, Subcell 10	
SF	SFFDR-1 Cell 1C	ND-	13	674170.161	1993787.322	Subgrade	664-01-06	126.8	10.2	140.0	12.6	124.3	98.1%		2/10/16, Subcell 4	
SF	SFFDR-1 Cell 1C	ND-	14	674235.676	1993787.335	Subgrade	664-01-06	126.8	10.2	138.2	11.7	123.7	97.6%		2/10/16, Subcell 11	
SF	SFFDR-1 Cell 1C	ND-	15	674297.537	1993858.690	Subgrade	664-01-06	126.8	10.2	139.7	12.5	124.2	97.9%		2/10/16, Subcell 14	
SF	SFFDR-1 Cell 1C	DC-	3	674337.559	1993930.040	Subgrade	664-01-06	126.8	10.2	138.2	12.9	122.4	96.5%		2/10/16, Subcell 14	
SF	SFFDR-1 Cell 1C	ND-	16	674337.559	1993930.040	Subgrade	664-01-06	126.8	10.2	137.7	12.3	122.6	96.7%		2/10/16, Subcell 21	
SF	SFFDR-1 Cell 1C	ND-	17	674381.220	1994007.335	Subgrade	664-01-06	126.8	10.2	139.5	14.0	122.4	96.5%		2/10/16, Subcell 25	
SF	SFFDR-1 Cell 1C	ND-	18	674315.700	1994031.102	Subgrade	664-01-06	126.8	10.2	140.1	11.5	125.7	99.1%		2/10/16, Subcell 20	
SF	SFFDR-1 Cell 1C	ND-	19	674290.237	1993956.783	Subgrade	664-01-06	126.8	10.2	138.5	12.5	123.1	97.1%		2/10/16, Subcell 15	
SF	SFFDR-1 Cell 1C	ND-	20	674563.204	1994025.207	Subgrade	664-01-06	126.8	10.2	134.9	11.0	121.5	95.8%		2/12/16, Subcell 27	
SF	SFFDR-1 Cell 1C	DC-	4	674563.204	1994025.207	Subgrade	664-01-06	126.8	10.2	134.5	11.8	120.3	95.0%		2/12/16, Subcell 27	
SF	SFFDR-1 Cell 1C	ND-	21	674159.184	1994066.742	Subgrade	664-01-06	126.8	10.2	136.9	12.6	121.6	95.9%		2/12/16, Subcell 25	
SF	SFFDR-2 Cell 1C	ND-	22	674537.741	1993947.916	Subgrade	664-01-06	126.8	10.2	137.8	10.9	124.3	98.0%		2/19/16, Subcell 28	
SF	SFFDR-2 Cell 1C	ND-	23	674155.574	1993921.085	Subgrade	664-01-06	126.8	10.2	137.4	13.6	121.0	95.4%		2/19/16, Subcell 24	
SF	SFFDR-2 Cell 1C	ND-	24	674432.207	1993858.718	Subgrade	664-01-06	126.8	10.2	135.2	11.7	121.0	95.5%		2/19/16, Subcell 23	
SF	SFFDR-2 Cell 1C	ND-	25	674392.172	1993849.792	Subgrade	664-01-06	126.8	10.2	136.9	13.2	120.9	95.4%		2/19/16, Subcell 22	
SF	SFFDR-2 Cell 1C	DC-	5	674392.172	1993849.792	Subgrade	664-01-06	126.8	10.2	136.4	13.5	120.1	95.0%		2/19/16, Subcell 22	
SF	SFFDR-2 Cell 1C	ND-	26	674246.613	1993701.133	Subgrade	664-01-06	126.8	10.2	140.3	10.7	126.7	100.0%		2/19/16, Subcell 13	
SF	SFFDR-2 Cell 1C	ND-	27	674221.144	1993659.512	Subgrade	664-01-06	126.8	10.2	139.5	10.2	126.6	99.8%		2/19/16, Subcell 12	
SF	SFFDR-2 Cell 1C	ND-	28	674148.335	1993724.893	Subgrade	664-01-06	126.8	10.2	136.7	13.2	120.8	95.2%		2/19/16, Subcell 3	
SF	SFFDR-2 Cell 1C	ND-	29	674101.008	1993775.417	Subgrade	664-01-06	126.8	10.2	137.7	11.9	123.1	97.0%		2/19/16, Subcell 1	
SF	SFFDR-2 Cell 1C	ND-	30	674082.797	1993834.865	Subgrade	664-01-06	126.8	10.2	137.0	12.3	122.0	96.2%		2/19/16, Subcell 2	
SF	SFFDR-2 Cell 1C	DC-	6	674082.797	1993834.865	Subgrade	664-01-06	126.8	10.2	137.3	12.9	121.6	95.9%		2/19/16, Subcell 2	

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B3

B3 – Structural Fill Laboratory Testing

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9/17/15

pg.1

Structural Fill
HDR Engineering, Inc.
Brickhaven

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	Soil Sample ID	Boring	Depth	LL	PL	PI	USCS Symbol	% Passing #200 Sieve	Maximum Dry Density	Optimum Moisture Content	Permeability	Location of Sample	Date Sample Taken	Comments
2015-664-01-01	TP-01		0-5	75	34	41	CH	82.3	96.4	23.8			4/27/15	map saved
2015-664-01-02	TP-02		0-5	56	23	33	CH	91.35	105.6	17.5			4/27/15	as TP-01_02
2015-664-01-03	SF-01		0-5	34	22	12	CL	80.11	119.7	13.3		Map	4/27/15	& SF-01 to
2015-664-01-04	SF-02		0-5	71	21	50	CH	90.01	96.5	24		sent 8/27	4/27/15	SF-04
2015-664-01-05	SF-03		0-5	69	33	36	CH	95.11	93.9	27.6			4/27/15	(664-01)
2015-664-01-06	SF-04		0-5	30	20	10	CL	80.33	126.8	10.2			4/27/15	
2015-664-04-01	CSL-01		1-6	45	24	21	CL	78.53	106	18.9		Map	6/1/15	map saved
2015-664-04-02	CSL-02		NA	36	26	10	ML	7.93	116.9	12.9		sent 8/27	6/1/15	as CSL-01,02
2015-664-07-01	SF-05								126.8	9.2		Sed.Basin 1	6/14/15	
2015-664-09-01	NA	NA	SF-06						102.6	19.8		Map with	6/22/15	on CSL-01 &
2015-664-09-02	NA	NA	SF-07						96.9	24.8		CSL-01	6/22/15	SF-06_07
2015-664-11-01	Wakestone	Stockpile	#5-01											12"perm, carbonat/C-136
2015-664-14-01	SF-08			35	18	17	CL	61.9	130.8	8.5				
2015-664-15-01	SF-09			37	23	14	CL	82.1	124.9	11.9				

May 15, 2015

Project No. 2015-664-01

Mr. Michael Plummer, P.E.
HDR Engineering, Inc.
440 South Church St., Suite 1000
Charlotte, NC 28202

Transmittal
Laboratory Test Results
Brickhaven No. 2 Mine

Please find attached the laboratory test results for the above referenced project. The tests were outlined on the Project Verification Form that was transmitted to your firm prior to the testing. The testing was performed in general accordance with the methods listed on the enclosed data sheets. The test results are believed to be representative of the samples that were submitted for testing and are indicative only of the specimens which were evaluated. We imply no position with regard to the nature of the test results, i.e. pass/fail and no claims as to the suitability of the material for its intended use.

The test data and all associated project information provided shall be held in strict confidence and disclosed to other parties only with authorization by our Client. The test data submitted herein is considered integral with this report and is not to be reproduced except in whole and only with the authorization of the Client and Geotechnics. The remaining sample materials for this project will be retained for a minimum of 90 days as directed by the Geotechnics' Quality Program.

We are pleased to provide these testing services. Should you have any questions or if we may be of further assistance, please contact our office.

Respectively submitted,
Geotechnics, Inc.

Michael P. Smith
Regional Manager

We understand that you have a choice in your laboratory services and we thank you for choosing Geotechnics.

DCN: Data Transmittal Letter Date: 1/28/05 Rev.: 1

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MOISTURE CONTENT

ASTM D 2216-10

Client: HDR ENGINEERING, INC.
Client Reference: Brickhaven No.2 Mine
Project No.: 2015-664-01

Lab ID:	-01	-02	-03	-04	-05
Boring No.:	N/A	N/A	N/A	N/A	N/A
Depth (ft):	0-5	0-5	0-5	0-5	0-5
Sample No.:	TP-01	TP-01	SF-01	SF-02	SF-03
Tare Number	832	841	212	839	831
Wt. of Tare & Wet Sample (g)	1046.30	874.30	1161.48	775.30	842.90
Wt. of Tare & Dry Sample (g)	864.36	747.63	1065.28	668.75	715.16
Weight of Tare (g)	258.97	259.39	171.26	258.15	262.57
Weight of Water (g)	181.94	126.67	96.20	106.55	127.74
Weight of Dry Sample (g)	605.39	488.24	894.02	410.60	452.59
Water Content (%)	**30.1**	**25.9**	**10.8**	**25.9**	**28.2**

Lab ID	-06
Boring No.	N/A
Depth (ft)	0-5
Sample No.	SF-04
Tare Number	317
Wt. of Tare & Wet Sample (g)	612.67
Wt. of Tare & Dry Sample (g)	582.57
Weight of Tare (g)	84.24
Weight of Water (g)	30.10
Weight of Dry Sample (g)	498.33
Water Content (%)	**6.0**

Notes :

Tested By *BT* *Date* *5/12/15* *Checked By* *SFS* *Date* *5/13/15*

DCN: CT-S1 DATE: 3/18/13 REVISION: 4

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ATTERBERG LIMITS

ASTM D 4318-10 / AASHTO T89-10

Client:	HDR ENGINEERING, INC.	Boring No.:	N/A
Client Reference:	Brickhaven No.2 Mine	Depth (ft):	0-5
Project No.:	2015-664-01	Sample No.:	TP-01
Lab ID:	2015-664-01-01	Soil Description:	**LIGHT BROWN FAT CLAY**

Note: The USCS symbol used with this test refers only to the minus No. 40 sieve material. See the "Sieve and Hydrometer Analysis" graph page for the complete material description. (Minus No. 40 sieve material, Airdried)

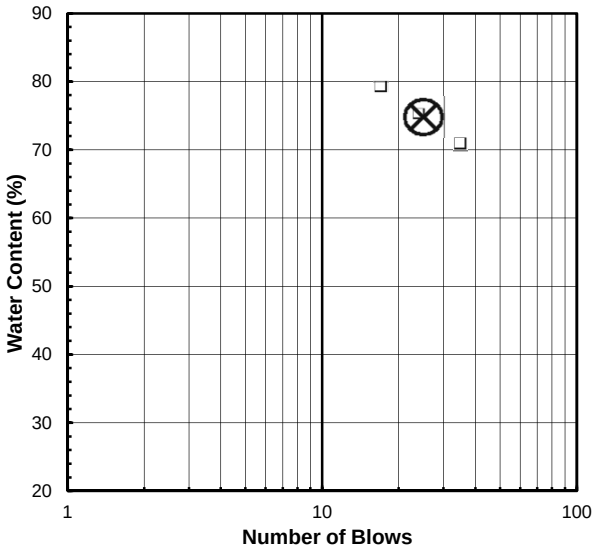
Liquid Limit Test	**1**	**2**	**3**	
Tare Number	K	1M	Z-4	**MULTIPOINT**
Wt. of Tare & Wet Sample (g)	27.98	30.11	27.45	
Wt. of Tare & Dry Sample (g)	22.69	24.01	22.22	
Wt. of Tare (g)	15.22	15.89	15.62	
Wt. of Water (g)	5.3	6.1	5.2	
Wt. of Dry Sample (g)	7.5	8.1	6.6	
Moisture Content (%)	**70.8**	**75.1**	**79.2**	
Number of Blows	**35**	**24**	**17**	

Plastic Limit Test	**1**	**2**	**Range**
Tare Number	B3	1	
Wt. of Tare & Wet Sample (g)	22.51	22.04	
Wt. of Tare & Dry Sample (g)	20.82	20.43	
Wt. of Tare (g)	15.82	15.63	
Wt. of Water (g)	1.7	1.6	
Wt. of Dry Sample (g)	5.0	4.8	
Moisture Content (%)	**33.8**	**33.5**	**0.3**

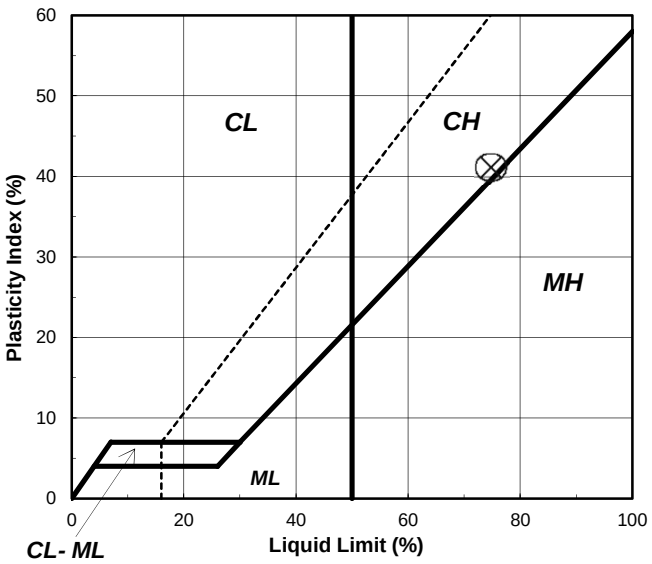
Note: The acceptable range of the two Moisture contents is ± 2.6

Test Results	
Liquid Limit (%)	**75**
Plastic Limit (%)	**34**
Plasticity Index (%)	**41**
USCS Symbol	**CH**

Flow Curve



Plasticity Chart



Tested By	*BW*	*Date*	*5/13/15*	*Checked By*	*SFS*	*Date*	5/14/15

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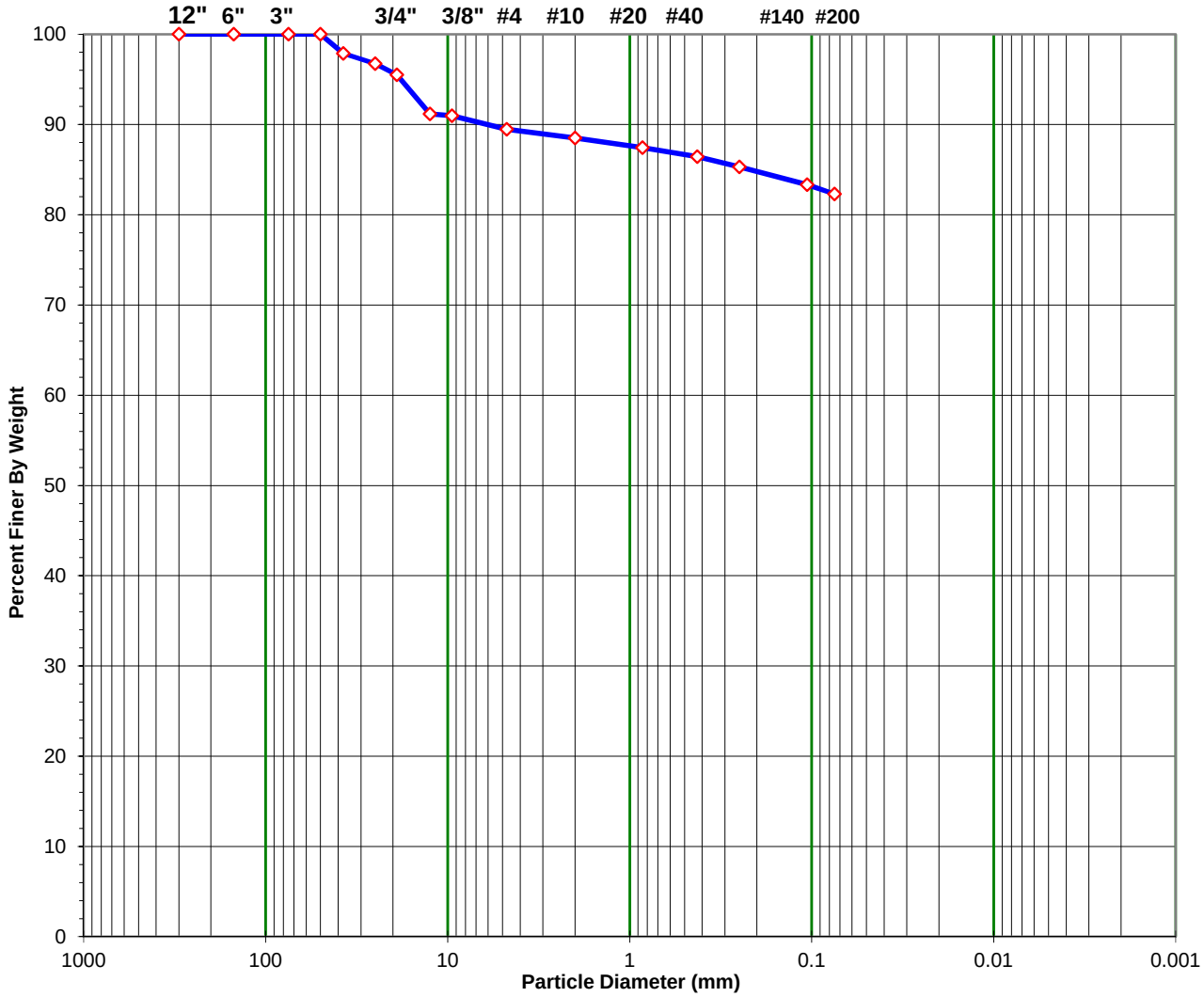
SIEVE ANALYSIS
ASTM D 422-63 (2007)

Client	HDR ENGINEERING, INC.	Boring No.	NA
Client Reference	BRICKHAVEN NO. 2 MINE	Depth (ft)	NA
Project No.	2015-664-01	Sample No.	TP-01
Lab ID	2015-664-01-01	Soil Color	**LIGHT BROWN**

	SIEVE ANALYSIS		***HYDROMETER***
USCS	**gravel**	**sand**	**silt and clay**



USCS Symbol ***CH, TESTED***

USCS Classification ***FAT CLAY WITH GRAVEL***

Tested By BT Date 5/11/15 Checked By GEM Date 5/14/15

DCN: CT-S3A DATE 6-25-98 REVISION 2 *2015 PROJECTS\2015-664 HDR ENGINEERING - BRICKHAVEN\[2015-664-01-01 J-SIEVEON.xls]Sheet1*

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WASH SIEVE ANALYSIS

ASTM D 422-63 (2007)

Client	HDR ENGINEERING, INC.	Boring No.	NA
Client Reference	BRICKHAVEN NO. 2 MINE	Depth (ft)	NA
Project No.	2015-664-01	Sample No.	TP-01
Lab ID	2015-664-01-01	Soil Color	**LIGHT BROWN**

Moisture Content of Passing 3/4" Material		Water Content of Retained 3/4" Material	
Tare No.	832	Tare No.	319
Wgt.Tare + Wet Specimen (gm)	1046.30	Wgt.Tare + Wet Specimen (gm)	1595.96
Wgt.Tare + Dry Specimen (gm)	864.36	Wgt.Tare + Dry Specimen (gm)	1576.69
Weight of Tare (gm)	258.97	Weight of Tare (gm)	208.97
Weight of Water (gm)	181.94	Weight of Water (gm)	19.27
Weight of Dry Soil (gm)	605.39	Weight of Dry Soil (gm)	1367.72
Moisture Content (%)	**30.1**	**Moisture Content (%)**	**1.4**

Wet Weight -3/4" Sample (gm)	33263	Weight of the Dry Specimen (gm)	605.39
Dry Weight - 3/4" Sample (gm)	25576.4	Weight of minus #200 material (gm)	521.60
Wet Weight +3/4" Sample (gm)	1217.68	Weight of plus #200 material (gm)	83.79
Dry Weight + 3/4" Sample (gm)	1200.76		
Total Dry Weight Sample (gm)	26777.2	**J - Factor (Percent Finer than 3/4")**	**0.9552**

Sieve Size	Sieve Opening (mm)	Wgt.of Soil Retained (gm)		Percent Retained (%)	Accumulated Percent Retained (%)	Percent Finer (%)	**Accumulated Percent Finer (%)**
12"	300	0.00		0.0	0.0	100.0	**100.0**
6"	150	0.00		0.0	0.0	100.0	**100.0**
3"	75	0.00		0.0	0.0	100.0	**100.0**
2"	50	0.00	(*)	0.0	0.0	100.0	**100.0**
1 1/2"	37.5	578.05		2.1	2.1	97.9	**97.9**
1"	25	307.45		1.1	3.3	96.7	**96.7**
3/4"	19	332.18		1.2	4.5	95.5	**95.5**
1/2"	12.5	27.51		4.5	4.5	95.5	**91.2**
3/8"	9.5	1.20		0.2	4.7	95.3	**91.0**
#4	4.75	9.70		1.6	6.3	93.7	**89.5**
#10	2	6.06		1.0	7.3	92.7	**88.5**
#20	0.85	6.74	(**)	1.1	8.5	91.5	**87.4**
#40	0.425	6.32		1.0	9.5	90.5	**86.4**
#60	0.25	7.26		1.2	10.7	89.3	**85.3**
#140	0.106	12.42		2.1	12.8	87.2	**83.3**
#200	0.075	6.58		1.1	13.8	86.2	**82.3**
Pan	-	521.60		86.2	100.0	-	**-**

Notes : *(*) The + 3/4" sieve analysis is based on the Total Dry Weight of the Sample*
*(**) The - 3/4" sieve analysis is based on the Weight of the Dry Specimen*

Tested By BT Date 5/11/15 Checked By GEM Date 5/14/15

DCN: CT-S3A DATE 5-17-00 REVISION 3 *N:\2015 PROJECTS\2015-664 HDR ENGINEERING - BRICKHAVEN\[2015-664-01-01 J-SIEVEON.xls]Sheet1*

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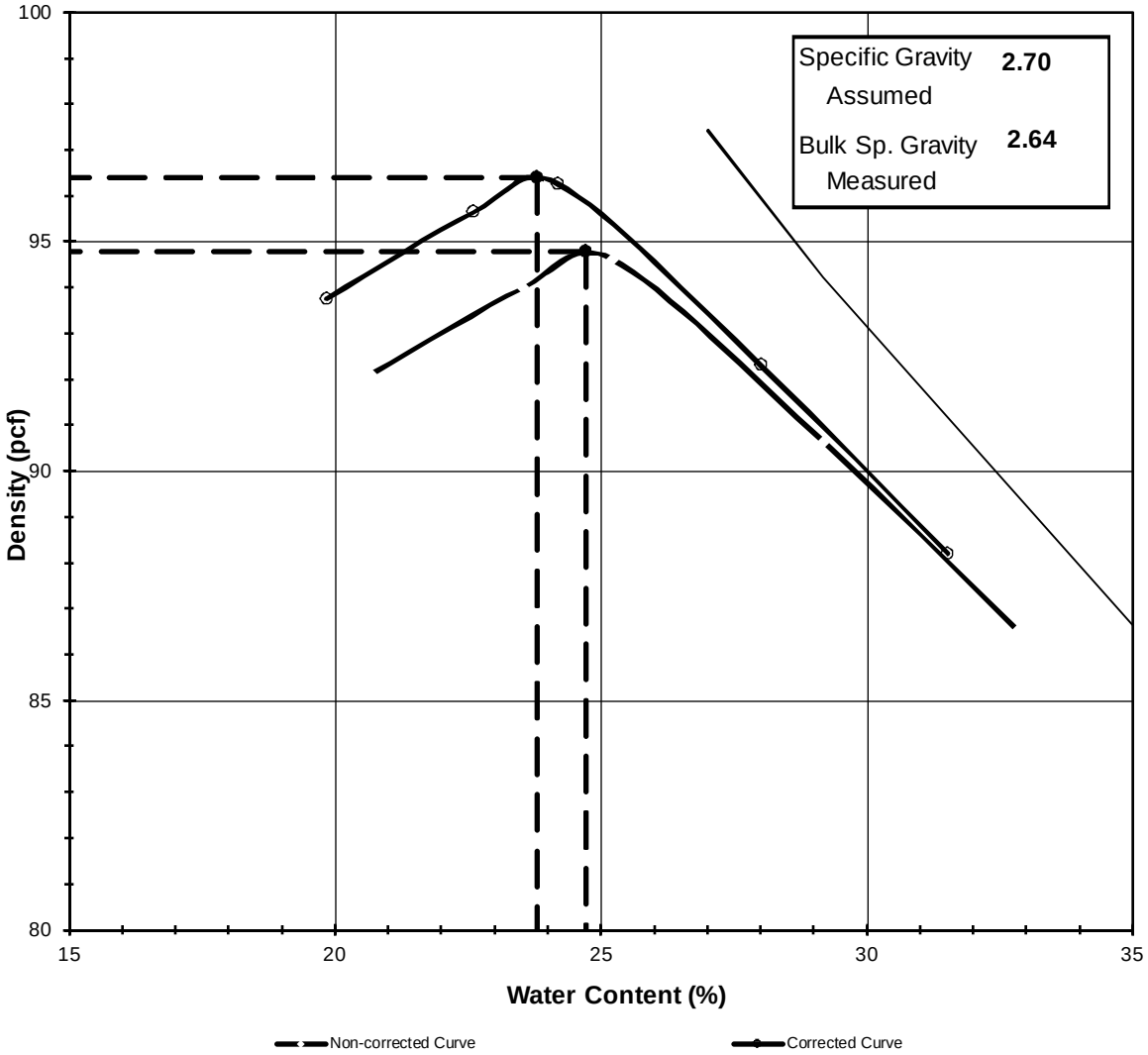
MOISTURE - DENSITY RELATIONSHIP
(Corrected for Oversize Particles)

ASTM D 4718-87, D 698-07e1

Client	HDR ENGINEERING, INC.	Boring No.	NA
Client Reference	BRICKHAVEN No. 2 Mine	Depth (ft)	0-5
Project No.	2015-664-01	Sample No.	TP-01
Lab ID	2015-664-01-01	Test Method	STANDARD

Visual Description LIGHT BROWN FAT CLAY WITH GRAVEL

Optimum Water Content	**24.7**	**Corrected Water Content**	**23.8**
Maximum Dry Density	**94.8**	**Corrected Dry Density**	**96.4**



Tested By *SFS* *Date* *5/12/15* *Checked By* *GEM* *Date* 5/13/15

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MOISTURE - DENSITY RELATIONSHIP
(Corrected for Oversize Particles)

ASTM D 4718-87, D 698-07e1

Client	HDR ENGINEERING, INC.	Boring No.	NA
Client Reference	BRICKHAVEN No. 2 Mine	Depth (ft)	0-5
Project No.	2015-664-01	Sample No.	TP-01
Lab ID	2015-664-01-01		

Visual Description LIGHT BROWN FAT CLAY WITH GRAVEL

Total Weight of the Sample (gm)	34650
As Received Water Content(%)	NA
Assumed Specific Gravity(gm/cc)	2.70

Percent Retained on 3/4" (Dry)	4.00
Percent Retained on 3/8" (Dry)	NA
Percent Retained on #4 (Dry)	NA
Oversize Material	Not included
Procedure Used	C

TestType		**STANDARD**
Rammer Weight (lbs)		5.5
Rammer Drop (in)		12
Rammer Type		Mechanical
Machine ID	R	174
Mold ID	R	173
Mold diameter		6"
Weight of the Mold		5536
Volume Of the Mold		2119

Mold/Specimen

Point No.	**1**	**2**	**3**	**4**	**5**
Wt. of Mold & WS (gm)	9311	9480	9560	9513	9440
Wt.of Mold (gm)	5536	5536	5536	5536	5536
Wt. of WS	3775	3944	4024	3977	3904
Mold Volume (cc)	2119	2119	2119	2119	2119

Moisture Content/Density

Tare Number	300	317	310	399	303
Wt. of Tare & WS (gm)	638.60	704.60	1025.60	1033.80	1054.40
Wt. of Tare & DS (gm)	548.20	586.40	841.20	819.90	815.40
Wt. of Tare (gm)	110.60	84.00	109.50	86.60	87.30
Wt. of Water (gm)	90.40	118.20	184.40	213.90	239.00
Wt. of DS (gm)	437.60	502.40	731.70	733.30	728.10

Wet Density (gm/cc)	1.78	1.86	1.90	1.88	1.84
Wet Density (pcf)	111.1	116.1	118.5	117.1	114.9
Moisture Content (%)	**20.7**	**23.5**	**25.2**	**29.2**	**32.8**
Dry Density (pcf)	**92.1**	**94.0**	**94.6**	**90.6**	**86.5**

Zero Air Voids

Moisture Content (%)	27.0	29.2	35.0
Dry Unit Weight (pcf)	97.4	94.3	86.6

Tested By *SFS* *Date* *5/12/15* *Checked By* *GEM* *Date* 5/13/15

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ATTERBERG LIMITS

ASTM D 4318-10 / AASHTO T89-10

Client:	HDR ENGINEERING, INC.	Boring No.:	NA
Client Reference:	BRICKHAVEN NO. 2 MINE	Depth (ft):	0-5
Project No.:	2015-664-01	Sample No.:	TP-02
Lab ID:	2015-664-01-02	Soil Description:	**LIGHT BROWN FAT CLAY**

Note: The USCS symbol used with this test refers only to the minus No. 40 sieve material. See the "Sieve and Hydrometer Analysis" graph page for the complete material description. (Minus No. 40 sieve material, Airdried)

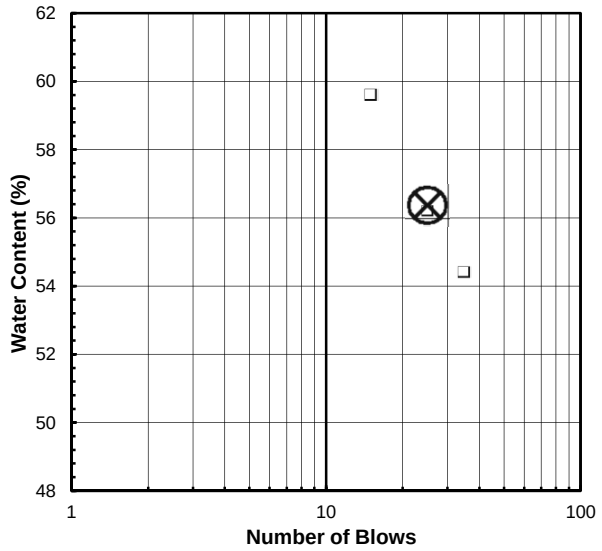
Liquid Limit Test	**1**	**2**	**3**	
Tare Number	A-H	A-K	A-T	**MULTIPOINT**
Wt. of Tare & Wet Sample (g)	27.55	28.95	27.96	
Wt. of Tare & Dry Sample (g)	23.34	24.14	23.36	
Wt. of Tare (g)	15.60	15.58	15.64	
Wt. of Water (g)	4.2	4.8	4.6	
Wt. of Dry Sample (g)	7.7	8.6	7.7	
Moisture Content (%)	**54.4**	**56.2**	**59.6**	
Number of Blows	**35**	**25**	**15**	

Plastic Limit Test	**1**	**2**	**Range**
Tare Number	B4	V-2	
Wt. of Tare & Wet Sample (g)	22.32	22.15	
Wt. of Tare & Dry Sample (g)	21.00	20.94	
Wt. of Tare (g)	15.46	15.68	
Wt. of Water (g)	1.3	1.2	
Wt. of Dry Sample (g)	5.5	5.3	
Moisture Content (%)	**23.8**	**23.0**	**0.8**

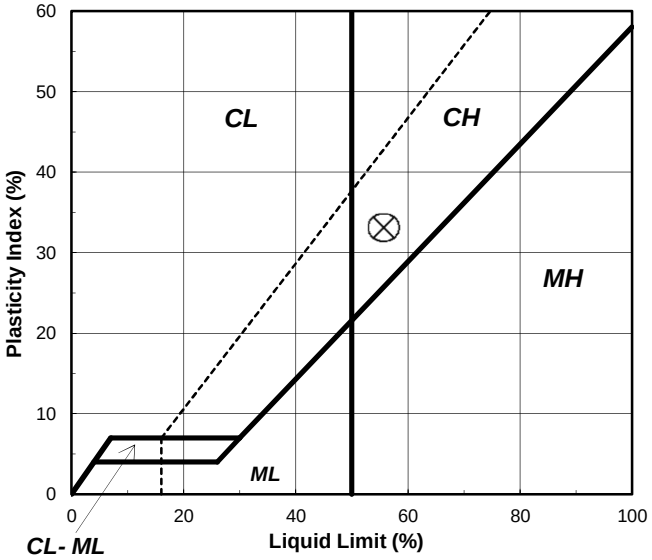
Note: The acceptable range of the two Moisture contents is ± 2.6

Test Results	
Liquid Limit (%)	**56**
Plastic Limit (%)	**23**
Plasticity Index (%)	**33**
USCS Symbol	**CH**

Flow Curve



Plasticity Chart



Tested By	*BW*	*Date*	*5/12/15*	*Checked By*	*GEM*	*Date*	5/13/15

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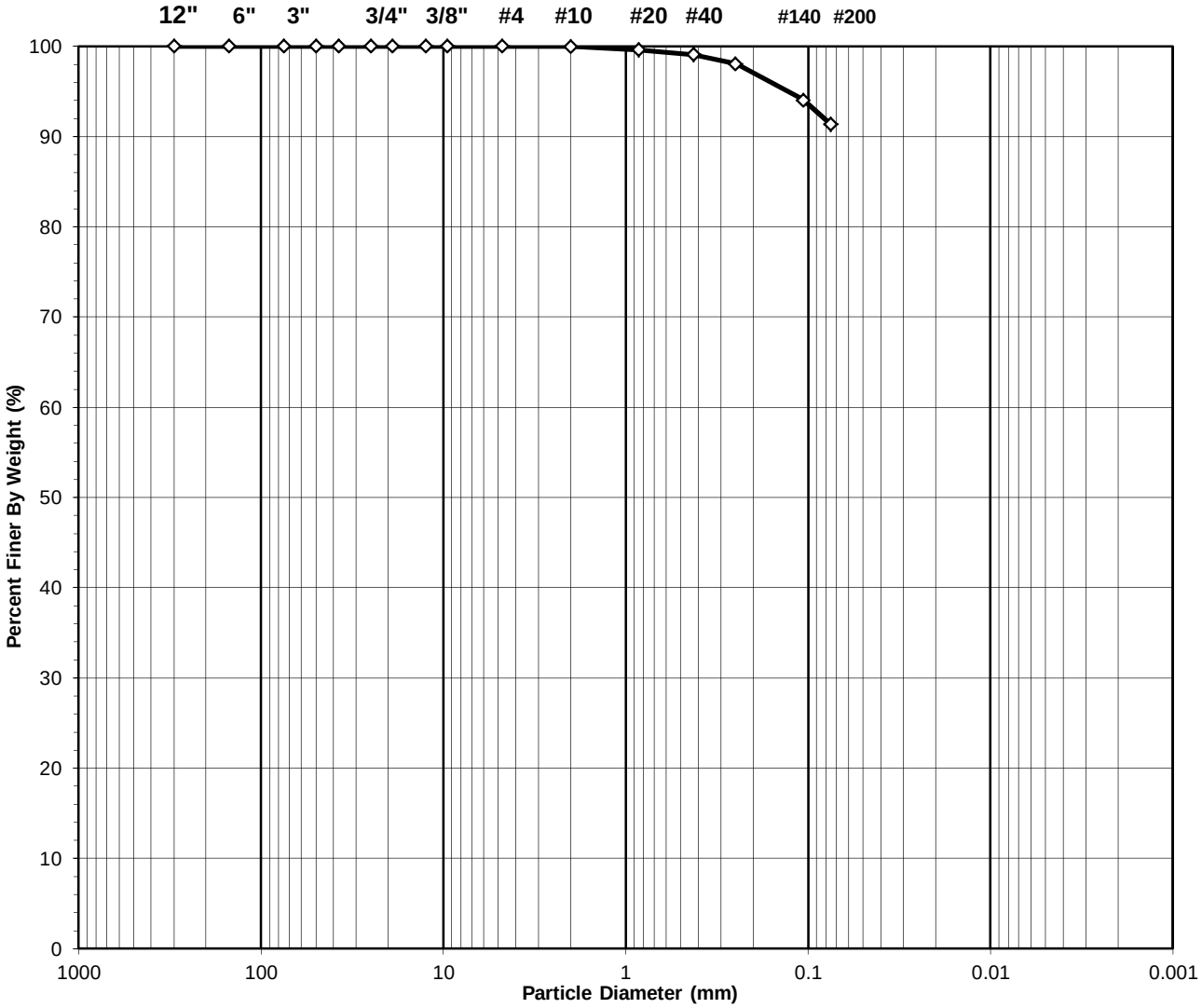
SIEVE ANALYSIS

ASTM D 422-63 (2007)

Client:	HDR ENGINEERING, INC.	Boring No.:	NA
Client Reference:	BRICKHAVEN NO. 2 MINE	Depth (ft):	0-5
Project No.:	2015-664-01	Sample No.:	TP-02
Lab ID:	2015-664-01-02	Soil Color:	LIGHT BROWN

	SIEVE ANALYSIS		*HYDROMETER*
USCS	**gravel**	**sand**	**silt and clay**



USCS Symbol: ***CH, TESTED***

USCS Classification: ***FAT CLAY***

Tested By BW Date 5/6/15 Checked By GEM Date 5/13/15

DCN: CT-S3C DATE 3/20/13 REVISION: 3

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WASH SIEVE ANALYSIS

ASTM D 422-63 (2007)

Client:	HDR ENGINEERING, INC.	Boring No.:	NA
Client Reference:	BRICKHAVEN NO. 2 MINE	Depth (ft):	0-5
Project No.:	2015-664-01	Sample No.:	TP-02
Lab ID:	2015-664-01-02	Soil Color:	LIGHT BROWN

Moisture Content of Passing 3/4" Sample		Water Content of Retained 3/4" Sample	
Tare No.	841	Tare No.	NA
Wt. of Tare & Wet Sample (g)	874.30	Weight of Tare & Wet Sample (g)	NA
Wt. of Tare & Dry Sample (g)	747.63	Weight of Tare & Dry Sample (g)	NA
Weight of Tare (g)	259.39	Weight of Tare (g)	NA
Weight of Water (g)	126.67	Weight of Water (g)	NA
Weight of Dry Sample (g)	488.24	Weight of Dry Sample (g)	NA
Moisture Content (%)	**25.9**	**Moisture Content (%)**	**NA**

Wet Weight of -3/4" Sample (g)	NA	Weight of the Dry Sample (g)	488.24
Dry Weight of - 3/4" Sample (g)	42.2	Weight of - #200 Sample (g)	446.01
Wet Weight of +3/4" Sample (g)	NA	Weight of + #200 Sample (g)	42.23
Dry Weight of + 3/4" Sample (g)	0.00		
Total Dry Weight of Sample (g)	NA		

Sieve Size	Sieve Opening (mm)	Weight of Soil Retained (g)	Percent Retained (%)	Accumulated Percent Retained (%)	Percent Finer (%)	Accumulated Percent Finer (%)
12"	300	0.00	0.00	0.00	100.00	**100.00**
6"	150	0.00	0.00	0.00	100.00	**100.00**
3"	75	0.00	0.00	0.00	100.00	**100.00**
2"	50	0.00	0.00	0.00	100.00	**100.00**
1 1/2"	37.5	0.00	0.00	0.00	100.00	**100.00**
1"	25.0	0.00	0.00	0.00	100.00	**100.00**
3/4"	19.0	0.00	0.00	0.00	100.00	**100.00**
1/2"	12.50	0.00	0.00	0.00	100.00	**100.00**
3/8"	9.50	0.00	0.00	0.00	100.00	**100.00**
#4	4.75	0.00	0.00	0.00	100.00	**100.00**
#10	2.00	0.05	0.01	0.01	99.99	**99.99**
#20	0.850	1.84	0.38	0.39	99.61	**99.61**
#40	0.425	2.58	0.53	0.92	99.08	**99.08**
#60	0.250	4.92	1.01	1.92	98.08	**98.08**
#140	0.106	19.66	4.03	5.95	94.05	**94.05**
#200	0.075	13.18	2.70	8.65	91.35	**91.35**
Pan	-	446.01	91.35	100.00	-	**-**

Tested By BW Date 5/6/15 Checked By GEM Date 5/13/15

DCN: CT-S3C DATE 3/20/13 REVISION: 3

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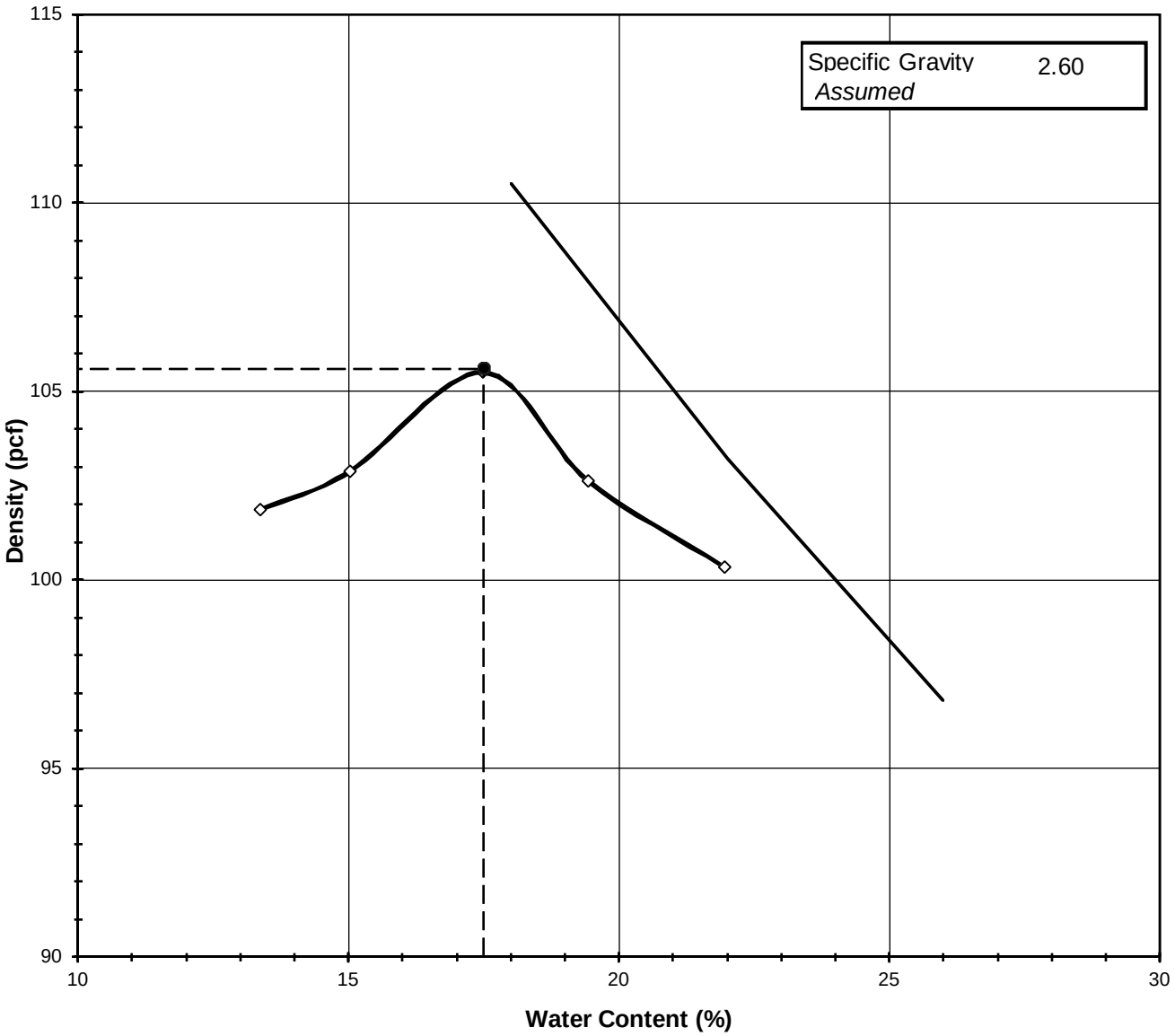
MOISTURE DENSITY RELATIONSHIP

ASTM D698-12

Client:	HDR ENGINEERING, INC.	Boring No.:	N/A
Client Reference:	Brickhaven No.2 Mine	Depth (ft):	0-5
Project No.:	2015-664-01	Sample No.:	TP-02
Lab ID:	2015-664-01-02	Test Method	**STANDARD**

Visual Description: LIGHT BROWN FAT CLAY

Optimum Water Content	**17.5**
Maximum Dry Density	**105.6**



Tested By *BW/BT* *Date* *5/7/15* *Checked By* *SFS* *Date* 5/13/15

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MOISTURE - DENSITY RELATIONSHIP

ASTM D698-12

Client:	HDR ENGINEERING, INC.	Boring No.:	N/A
Client Reference:	Brickhaven No.2 Mine	Depth (ft):	0-5
Project No.:	2015-664-01	Sample No.:	TP-02
Lab ID:	2015-664-01-02		

Visual Description: LIGHT BROWN FAT CLAY

Total Weight of the Sample (g)	22300
As Received Water Content (%)	NA
Assumed Specific Gravity	2.60
Percent Retained on 3/4"	NA
Percent Retained on 3/8"	NA
Percent Retained on #4	NA
Oversize Material	Not included
Procedure Used	A

Test Type		**STANDARD**
Rammer Weight (lb)		5.5
Rammer Drop (in)		12
Rammer Type		MECHANICAL
Machine ID	R	174
Mold ID	R	461
Mold diameter		4"
Weight of the Mold (g)		4174
Volume of the Mold (cm^3)		942

Mold / Specimen

Point No.	**1**	**2**	**3**	**4**	**5**
Wt. of Mold & Wet Sample (g)	5917	5960	6045	6024	6021
Wt.of Mold (g)	4174	4174	4174	4174	4174
Wt. of Wet Sample (g)	1743	1786	1871	1850	1847
Mold Volume (cm^3)	942	942	942	942	942

Moisture Content / Density

Tare Number	310	314	305	310	866
Wt. of Tare & Wet Sample (g)	574.90	461.00	471.00	543.50	408.90
Wt. of Tare & Dry Sample (g)	520.10	411.80	413.50	472.90	350.90
Wt. of Tare (g)	110.00	84.30	84.70	109.60	86.60
Wt. of Water (g)	54.80	49.20	57.50	70.60	58.00
Wt. of Dry Sample (g)	410.10	327.50	328.80	363.30	264.30

Wet Density (g/cm^3)	1.85	1.90	1.99	1.96	1.96
Wet Density (pcf)	115.5	118.3	124.0	122.6	122.4
Moisture Content (%)	**13.4**	**15.0**	**17.5**	**19.4**	**21.9**
Dry Density (pcf)	**101.9**	**102.9**	**105.5**	**102.6**	**100.3**

Zero Air Voids

Moisture Content (%)	18.0	22.0	26.0
Dry Unit Weight (pcf)	110.5	103.2	96.8

Tested By *BW/BT* *Date* *5/7/15* *Checked By* *SFS* *Date* 5/13/15

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ATTERBERG LIMITS

ASTM D 4318-10 / AASHTO T89-10

Client:	HDR ENGINEERING, INC.	Boring No.:	NA
Client Reference:	BRICKHAVEN NO. 2 MINE	Depth (ft):	0-5
Project No.:	2015-664-01	Sample No.:	SF-01
Lab ID:	2015-664-01-03	Soil Description:	**RED LEAN CLAY**

Note: The USCS symbol used with this test refers only to the minus No. 40 sieve material. See the "Sieve and Hydrometer Analysis" graph page for the complete material description.

(Minus No. 40 sieve material, Airdried)

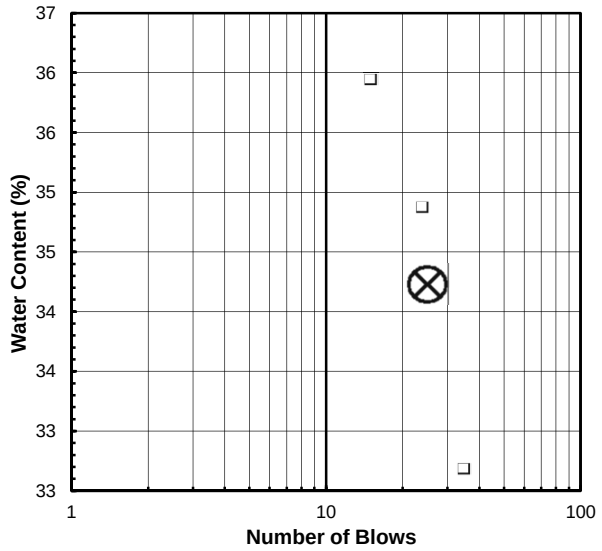
Liquid Limit Test	**1**	**2**	**3**	
Tare Number	I	E	R	**MULTIPOINT**
Wt. of Tare & Wet Sample (g)	28.88	28.49	26.31	
Wt. of Tare & Dry Sample (g)	25.54	25.08	23.37	
Wt. of Tare (g)	15.32	15.30	15.19	
Wt. of Water (g)	3.3	3.4	2.9	
Wt. of Dry Sample (g)	10.2	9.8	8.2	
Moisture Content (%)	**32.7**	**34.9**	**35.9**	
Number of Blows	**35**	**24**	**15**	

Plastic Limit Test	**1**	**2**	**Range**
Tare Number	V	X-9	
Wt. of Tare & Wet Sample (g)	22.76	22.03	
Wt. of Tare & Dry Sample (g)	21.42	20.91	
Wt. of Tare (g)	15.25	15.73	
Wt. of Water (g)	1.3	1.1	
Wt. of Dry Sample (g)	6.2	5.2	
Moisture Content (%)	**21.7**	**21.6**	**0.1**

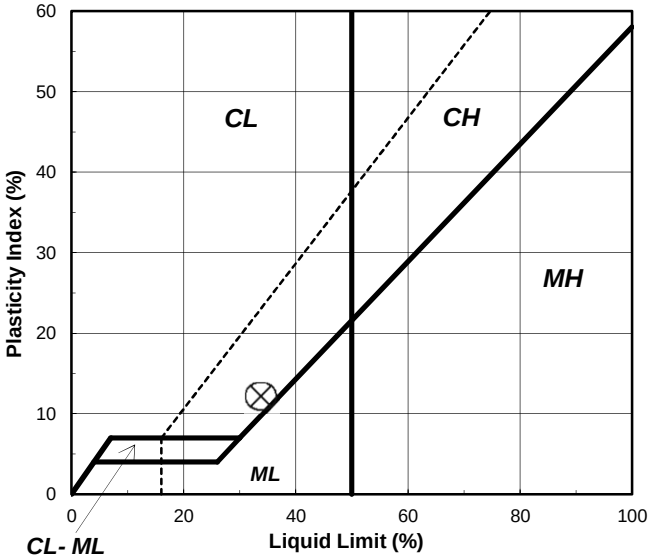
Note: The acceptable range of the two Moisture contents is ± 2.6

Test Results	
Liquid Limit (%)	**34**
Plastic Limit (%)	**22**
Plasticity Index (%)	**12**
USCS Symbol	**CL**

Flow Curve



Plasticity Chart



Tested By	*BW*	*Date*	*5/12/15*	*Checked By*	*GEM*	*Date*	5/13/15

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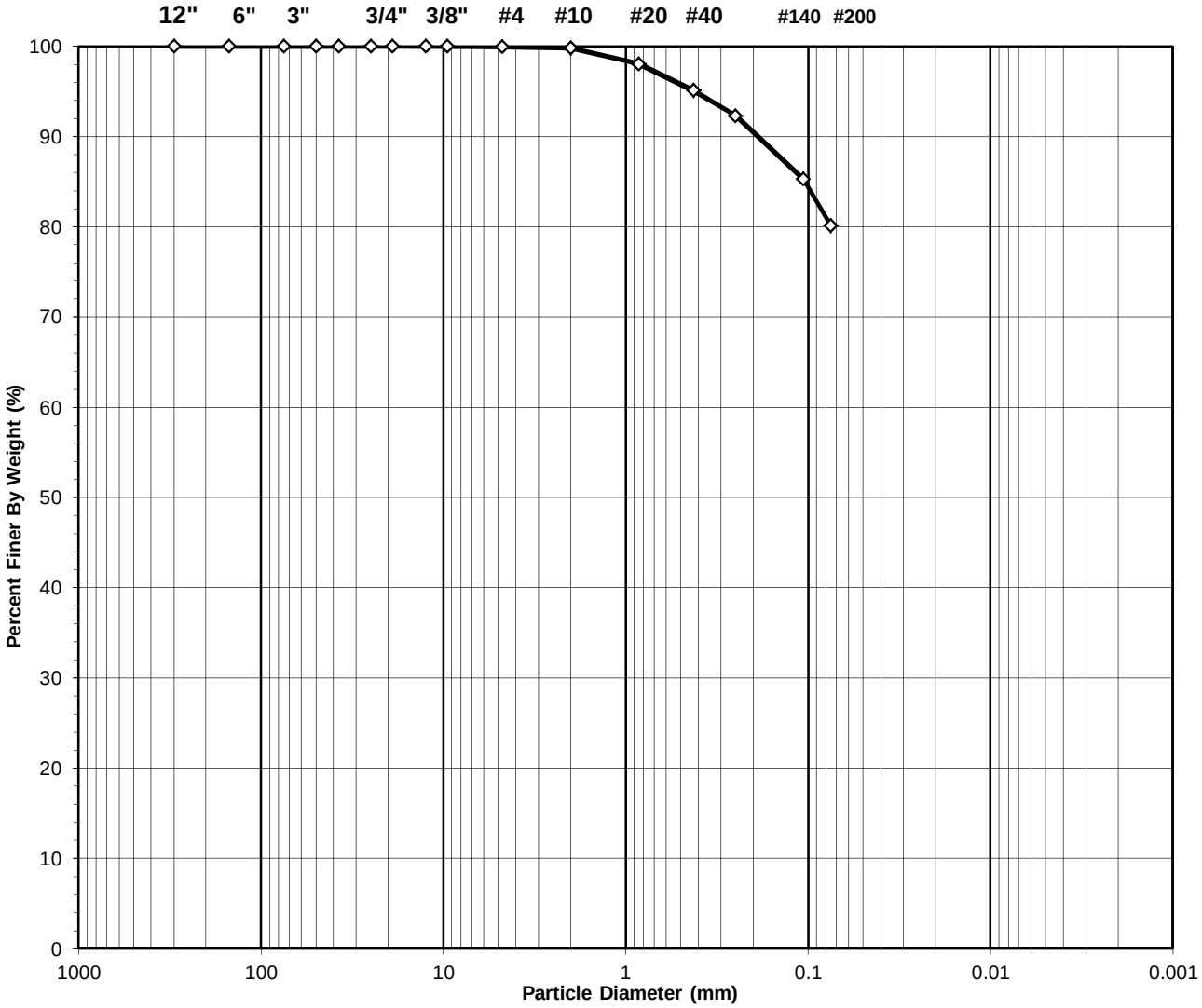
SIEVE ANALYSIS

ASTM D 422-63 (2007)

Client:	HDR ENGINEERING, INC.	Boring No.:	NA
Client Reference:	BRICKHAVEN NO. 2 MINE	Depth (ft):	0-5
Project No.:	2015-664-01	Sample No.:	SF-01
Lab ID:	2015-664-01-03	Soil Color:	RED

	SIEVE ANALYSIS		*HYDROMETER*
USCS	**gravel**	**sand**	**silt and clay**



USCS Symbol: ***CL, TESTED***

USCS Classification: ***LEAN CLAY WITH SAND***

Tested By BW Date 5/6/15 Checked By GEM Date 5/13/15

DCN: CT-S3C DATE 3/20/13 REVISION: 3

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WASH SIEVE ANALYSIS

ASTM D 422-63 (2007)

Client:	HDR ENGINEERING, INC.	Boring No.:	NA
Client Reference:	BRICKHAVEN NO. 2 MINE	Depth (ft):	0-5
Project No.:	2015-664-01	Sample No.:	SF-01
Lab ID:	2015-664-01-03	Soil Color:	RED

Moisture Content of Passing 3/4" Sample		Water Content of Retained 3/4" Sample	
Tare No.	212	Tare No.	NA
Wt. of Tare & Wet Sample (g)	1161.48	Weight of Tare & Wet Sample (g)	NA
Wt. of Tare & Dry Sample (g)	1065.28	Weight of Tare & Dry Sample (g)	NA
Weight of Tare (g)	171.26	Weight of Tare (g)	NA
Weight of Water (g)	96.20	Weight of Water (g)	NA
Weight of Dry Sample (g)	894.02	Weight of Dry Sample (g)	NA
Moisture Content (%)	**10.8**	**Moisture Content (%)**	**NA**

Wet Weight of -3/4" Sample (g)	NA	Weight of the Dry Sample (g)	894.02
Dry Weight of - 3/4" Sample (g)	177.8	Weight of - #200 Sample (g)	716.20
Wet Weight of +3/4" Sample (g)	NA	Weight of + #200 Sample (g)	177.82
Dry Weight of + 3/4" Sample (g)	0.00		
Total Dry Weight of Sample (g)	NA		

Sieve Size	Sieve Opening (mm)	Weight of Soil Retained (g)	Percent Retained (%)	Accumulated Percent Retained (%)	Percent Finer (%)	Accumulated Percent Finer (%)
12"	300	0.00	0.00	0.00	100.00	**100.00**
6"	150	0.00	0.00	0.00	100.00	**100.00**
3"	75	0.00	0.00	0.00	100.00	**100.00**
2"	50	0.00	0.00	0.00	100.00	**100.00**
1 1/2"	37.5	0.00	0.00	0.00	100.00	**100.00**
1"	25.0	0.00	0.00	0.00	100.00	**100.00**
3/4"	19.0	0.00	0.00	0.00	100.00	**100.00**
1/2"	12.50	0.00	0.00	0.00	100.00	**100.00**
3/8"	9.50	0.00	0.00	0.00	100.00	**100.00**
#4	4.75	0.36	0.04	0.04	99.96	**99.96**
#10	2.00	1.32	0.15	0.19	99.81	**99.81**
#20	0.850	15.71	1.76	1.95	98.05	**98.05**
#40	0.425	26.10	2.92	4.86	95.14	**95.14**
#60	0.250	25.33	2.83	7.70	92.30	**92.30**
#140	0.106	62.85	7.03	14.73	85.27	**85.27**
#200	0.075	46.15	5.16	19.89	80.11	**80.11**
Pan	-	716.20	80.11	100.00	-	**-**

Tested By BW Date 5/6/15 Checked By GEM Date 5/13/15

DCN: CT-S3C DATE 3/20/13 REVISION: 3

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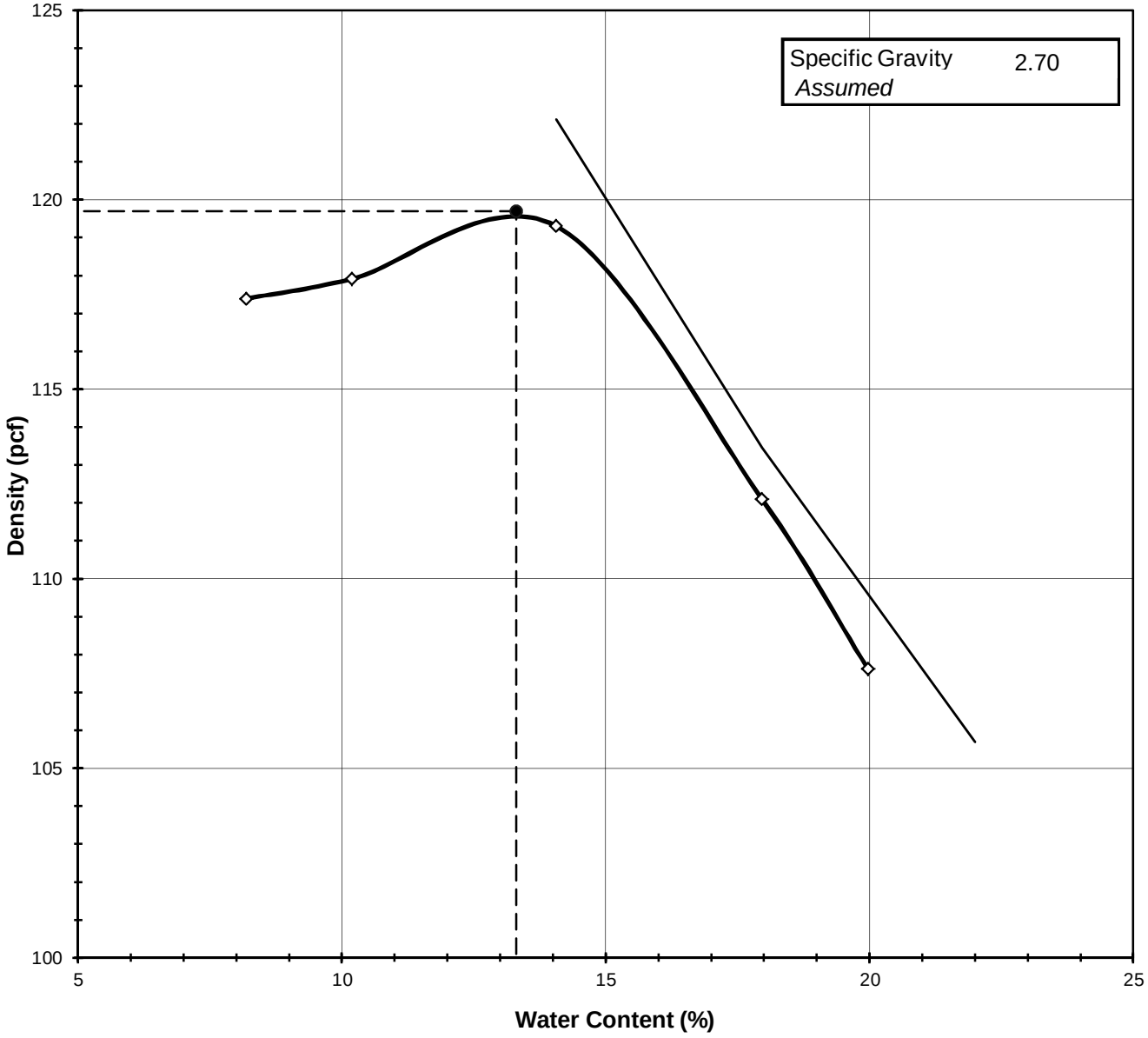
MOISTURE DENSITY RELATIONSHIP

ASTM D698-12

Client:	HDR ENGINEERING, INC.	Boring No.:	N/A
Client Reference:	Brickhaven No.2 Mine	Depth (ft):	0-5
Project No.:	2015-664-01	Sample No.:	SF-01
Lab ID:	2015-664-01-03	Test Method	**STANDARD**

Visual Description: RED LEAN CLAY WITH SAND

Optimum Water Content	**13.3**
Maximum Dry Density	**119.7**



Tested By *BLT* *Date* *5/5/15* *Checked By* *SFS* *Date* 5/13/15

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MOISTURE - DENSITY RELATIONSHIP

ASTM D698-12

Client:	HDR ENGINEERING, INC.	Boring No.:	N/A
Client Reference:	Brickhaven No.2 Mine	Depth (ft):	0-5
Project No.:	2015-664-01	Sample No.:	SF-01
Lab ID:	2015-664-01-03		

Visual Description: RED LEAN CLAY WITH SAND

Total Weight of the Sample (g)	29950
As Received Water Content (%)	10.8
Assumed Specific Gravity	2.70
Percent Retained on 3/4"	NA
Percent Retained on 3/8"	NA
Percent Retained on #4	NA
Oversize Material	Not included
Procedure Used	A

Test Type		**STANDARD**
Rammer Weight (lb)		5.5
Rammer Drop (in)		12
Rammer Type		MECHANICAL
Machine ID	R	174
Mold ID	R	461
Mold diameter		4"
Weight of the Mold (g)		4173
Volume of the Mold (cm^3)		942

Mold / Specimen

Point No.	**1**	**2**	**3**	**4**	**5**
Wt. of Mold & Wet Sample (g)	6090	6134	6227	6169	6122
Wt.of Mold (g)	4173	4173	4173	4173	4173
Wt. of Wet Sample (g)	1917	1961	2054	1996	1949
Mold Volume (cm^3)	942	942	942	942	942

Moisture Content / Density

Tare Number	399	866	303	304	305
Wt. of Tare & Wet Sample (g)	602.00	844.00	488.30	597.90	612.20
Wt. of Tare & Dry Sample (g)	563.00	774.00	441.70	523.70	524.40
Wt. of Tare (g)	86.80	86.80	110.30	110.60	84.80
Wt. of Water (g)	39.00	70.00	46.60	74.20	87.80
Wt. of Dry Sample (g)	476.20	687.20	331.40	413.10	439.60

Wet Density (g/cm^3)	2.04	2.08	2.18	2.12	2.07
Wet Density (pcf)	127.0	129.9	136.1	132.2	129.1
Moisture Content (%)	**8.2**	**10.2**	**14.1**	**18.0**	**20.0**
Dry Density (pcf)	**117.4**	**117.9**	**119.3**	**112.1**	**107.6**

Zero Air Voids

Moisture Content (%)	14.1	18.0	22.0
Dry Unit Weight (pcf)	122.1	113.5	105.7

Tested By *BLT* *Date* *5/5/15* *Checked By* *SFS* *Date* 5/13/15

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ATTERBERG LIMITS

ASTM D 4318-10 / AASHTO T89-10

Client:	HDR ENGINEERING, INC.	Boring No.:	NA
Client Reference:	BRICKHAVEN NO. 2 MINE	Depth (ft):	0-5
Project No.:	2015-664-01	Sample No.:	SF-02
Lab ID:	2015-664-01-04	Soil Description:	**GRAY FAT CLAY**

Note: The USCS symbol used with this test refers only to the minus No. 40 sieve material. See the "Sieve and Hydrometer Analysis" graph page for the complete material description. (Minus No. 40 sieve material, Airdried)

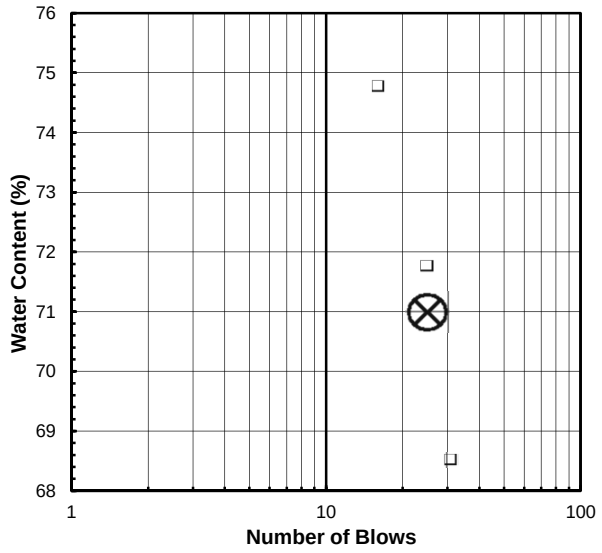
Liquid Limit Test	**1**	**2**	**3**	
				M
Tare Number	K	Z-4	1M	**U**
Wt. of Tare & Wet Sample (g)	27.11	25.97	27.39	**L**
Wt. of Tare & Dry Sample (g)	22.28	21.65	22.47	**T**
Wt. of Tare (g)	15.23	15.63	15.89	**I**
Wt. of Water (g)	4.8	4.3	4.9	**P**
Wt. of Dry Sample (g)	7.1	6.0	6.6	**O**
				I
Moisture Content (%)	**68.5**	**71.8**	**74.8**	**N**
Number of Blows	**31**	**25**	**16**	**T**

Plastic Limit Test	**1**	**2**	**Range**
Tare Number	1	B3	
Wt. of Tare & Wet Sample (g)	22.23	22.21	
Wt. of Tare & Dry Sample (g)	21.11	21.06	
Wt. of Tare (g)	15.63	15.82	
Wt. of Water (g)	1.1	1.2	
Wt. of Dry Sample (g)	5.5	5.2	
Moisture Content (%)	**20.4**	**21.9**	**-1.5**

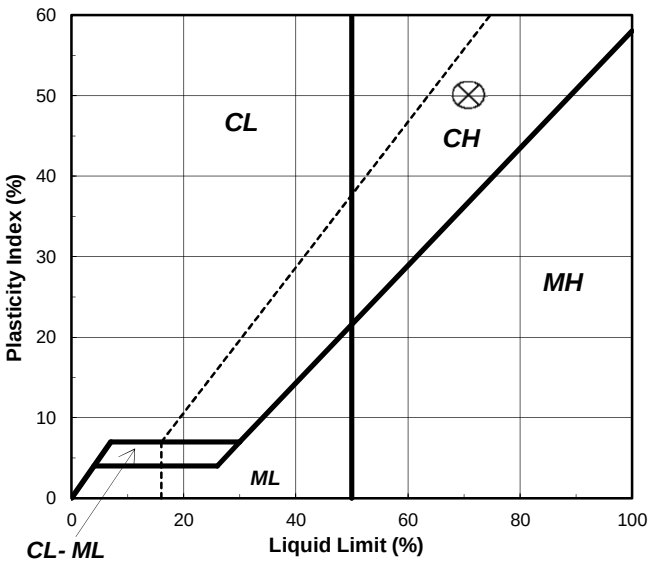
Note: The acceptable range of the two Moisture contents is ± 2.6

Test Results	
Liquid Limit (%)	**71**
Plastic Limit (%)	**21**
Plasticity Index (%)	**50**
USCS Symbol	**CH**

Flow Curve



Plasticity Chart



Tested By	*BW*	*Date*	*5/12/15*	*Checked By*	*GEM*	*Date*	5/13/15

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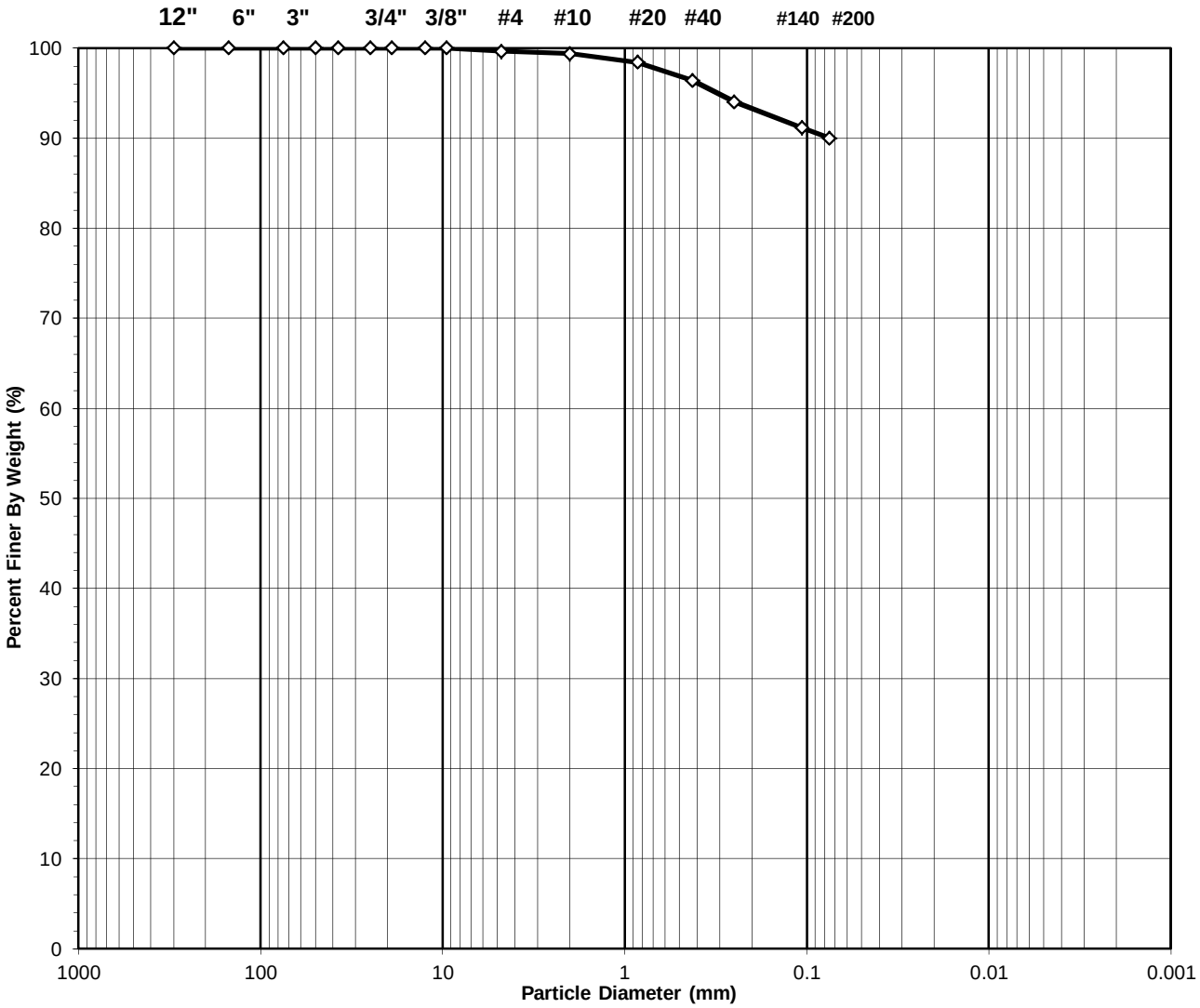
SIEVE ANALYSIS

ASTM D 422-63 (2007)

Client:	HDR ENGINEERING, INC.	Boring No.:	NA
Client Reference:	BRICKHAVEN NO. 2 MINE	Depth (ft):	0-5
Project No.:	2015-664-01	Sample No.:	SF-02
Lab ID:	2015-664-01-04	Soil Color:	GRAY

	SIEVE ANALYSIS		*HYDROMETER*
USCS	**gravel**	**sand**	**silt and clay**



USCS Symbol: ***CH, TESTED***

USCS Classification: ***FAT CLAY***

Tested By BT Date 5/11/15 Checked By GEM Date 5/13/15

DCN: CT-S3C DATE 3/20/13 REVISION: 3

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WASH SIEVE ANALYSIS

ASTM D 422-63 (2007)

Client:	HDR ENGINEERING, INC.	Boring No.:	NA
Client Reference:	BRICKHAVEN NO. 2 MINE	Depth (ft):	0-5
Project No.:	2015-664-01	Sample No.:	SF-02
Lab ID:	2015-664-01-04	Soil Color:	GRAY

Moisture Content of Passing 3/4" Sample		Water Content of Retained 3/4" Sample	
Tare No.	839	Tare No.	NA
Wt. of Tare & Wet Sample (g)	775.30	Weight of Tare & Wet Sample (g)	NA
Wt. of Tare & Dry Sample (g)	668.75	Weight of Tare & Dry Sample (g)	NA
Weight of Tare (g)	258.15	Weight of Tare (g)	NA
Weight of Water (g)	106.55	Weight of Water (g)	NA
Weight of Dry Sample (g)	410.60	Weight of Dry Sample (g)	NA
Moisture Content (%)	**25.9**	**Moisture Content (%)**	**NA**

Wet Weight of -3/4" Sample (g)	NA	Weight of the Dry Sample (g)	410.60
Dry Weight of - 3/4" Sample (g)	41.0	Weight of - #200 Sample (g)	369.57
Wet Weight of +3/4" Sample (g)	NA	Weight of + #200 Sample (g)	41.03
Dry Weight of + 3/4" Sample (g)	0.00		
Total Dry Weight of Sample (g)	NA		

Sieve Size	Sieve Opening (mm)	Weight of Soil Retained (g)	Percent Retained (%)	Accumulated Percent Retained (%)	Percent Finer (%)	Accumulated Percent Finer (%)
12"	300	0.00	0.00	0.00	100.00	**100.00**
6"	150	0.00	0.00	0.00	100.00	**100.00**
3"	75	0.00	0.00	0.00	100.00	**100.00**
2"	50	0.00	0.00	0.00	100.00	**100.00**
1 1/2"	37.5	0.00	0.00	0.00	100.00	**100.00**
1"	25.0	0.00	0.00	0.00	100.00	**100.00**
3/4"	19.0	0.00	0.00	0.00	100.00	**100.00**
1/2"	12.50	0.00	0.00	0.00	100.00	**100.00**
3/8"	9.50	0.00	0.00	0.00	100.00	**100.00**
#4	4.75	1.45	0.35	0.35	99.65	**99.65**
#10	2.00	1.10	0.27	0.62	99.38	**99.38**
#20	0.850	3.89	0.95	1.57	98.43	**98.43**
#40	0.425	8.25	2.01	3.58	96.42	**96.42**
#60	0.250	9.85	2.40	5.98	94.02	**94.02**
#140	0.106	11.81	2.88	8.85	91.15	**91.15**
#200	0.075	4.68	1.14	9.99	90.01	**90.01**
Pan	-	369.57	90.01	100.00	-	**-**

Tested By BT Date 5/11/15 Checked By GEM Date 5/13/15

DCN: CT-S3C DATE 3/20/13 REVISION: 3

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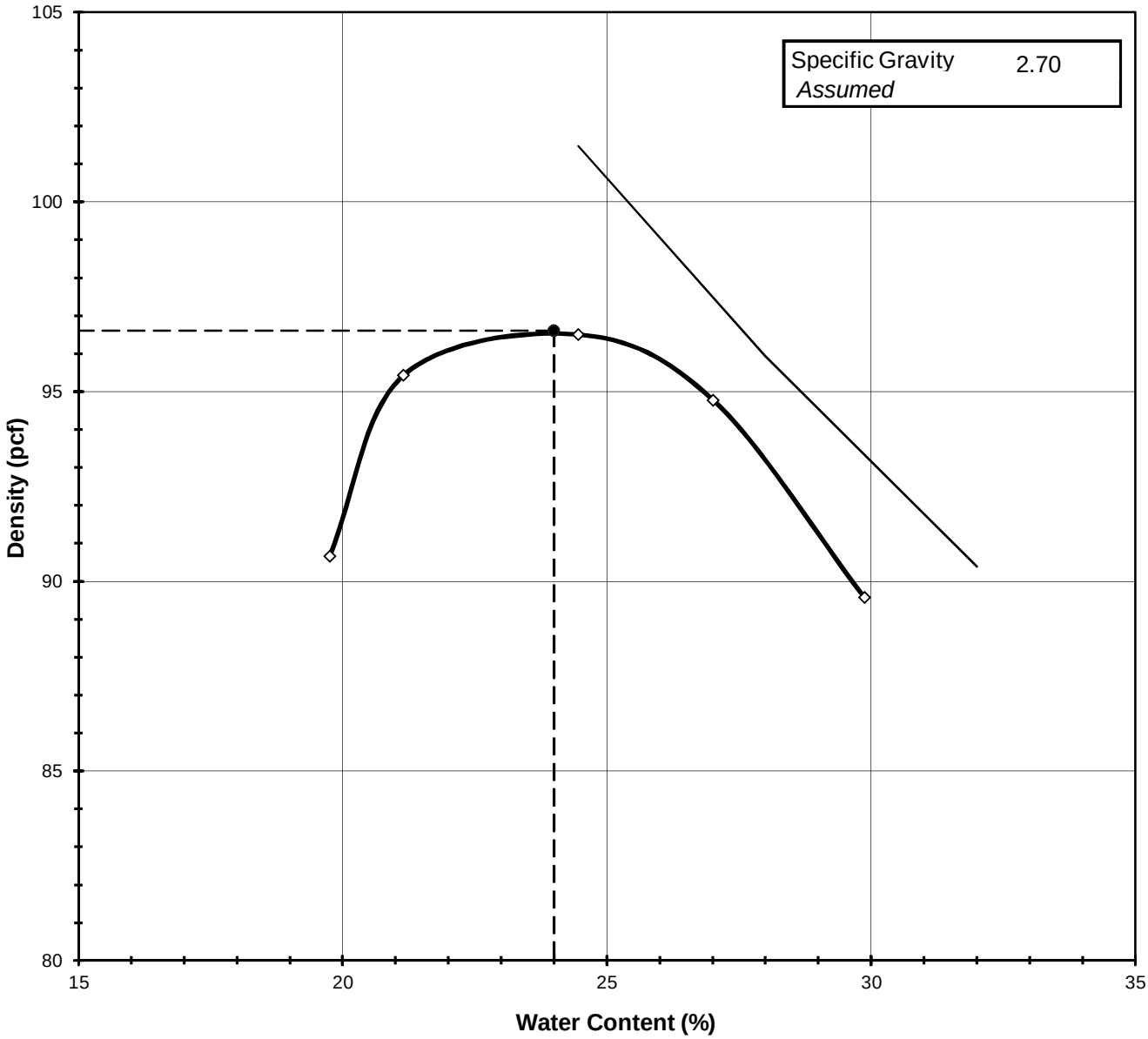
MOISTURE DENSITY RELATIONSHIP

ASTM D698-12

Client:	HDR ENGINEERING, INC.	Boring No.:	N/A
Client Reference:	Brickhaven No.2 Mine	Depth (ft):	0-5
Project No.:	2015-664-01	Sample No.:	SF-02
Lab ID:	2015-664-01-04	Test Method	**STANDARD**

Visual Description: GRAY FAT CLAY

Optimum Water Content	**24.0**
Maximum Dry Density	**96.6**



Tested By *BT* *Date* *5/12/15* *Checked By* *SFS* *Date* 5/13/15

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MOISTURE - DENSITY RELATIONSHIP

ASTM D698-12

Client:	HDR ENGINEERING, INC.	Boring No.:	N/A
Client Reference:	Brickhaven No.2 Mine	Depth (ft):	0-5
Project No.:	2015-664-01	Sample No.:	SF-02
Lab ID:	2015-664-01-04		

Visual Description: GRAY FAT CLAY

Total Weight of the Sample (g)	22450
As Received Water Content (%)	NA
Assumed Specific Gravity	2.70
Percent Retained on 3/4"	NA
Percent Retained on 3/8"	NA
Percent Retained on #4	NA
Oversize Material	Not included
Procedure Used	B

Test Type		**STANDARD**
Rammer Weight (lb)		5.5
Rammer Drop (in)		12
Rammer Type		MECHANICAL
Machine ID	R	174
Mold ID	R	461
Mold diameter		4"
Weight of the Mold (g)		4174
Volume of the Mold (cm^3)		942

Mold / Specimen

Point No.	**1**	**2**	**3**	**4**	**5**
Wt. of Mold & Wet Sample (g)	5813	5919	5987	5991	5930
Wt.of Mold (g)	4174	4174	4174	4174	4174
Wt. of Wet Sample (g)	1639	1745	1813	1817	1756
Mold Volume (cm^3)	942	942	942	942	942

Moisture Content / Density

Tare Number	304	398	368	866	305
Wt. of Tare & Wet Sample (g)	616.30	408.70	435.20	463.70	421.60
Wt. of Tare & Dry Sample (g)	532.90	352.00	371.50	383.50	344.10
Wt. of Tare (g)	110.80	83.90	111.10	86.60	84.70
Wt. of Water (g)	83.40	56.70	63.70	80.20	77.50
Wt. of Dry Sample (g)	422.10	268.10	260.40	296.90	259.40

Wet Density (g/cm^3)	1.74	1.85	1.92	1.93	1.86
Wet Density (pcf)	108.6	115.6	120.1	120.4	116.3
Moisture Content (%)	**19.8**	**21.1**	**24.5**	**27.0**	**29.9**
Dry Density (pcf)	**90.7**	**95.4**	**96.5**	**94.8**	**89.6**

Zero Air Voids

Moisture Content (%)	24.5	28.0	32.0
Dry Unit Weight (pcf)	101.5	95.9	90.4

Tested By *BT* *Date* *5/12/15* *Checked By* *SFS* *Date* 5/13/15

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ATTERBERG LIMITS

ASTM D 4318-10 / AASHTO T89-10

Client:	HDR ENGINEERING, INC.	Boring No.:	NA
Client Reference:	BRICKHAVEN NO. 2 MINE	Depth (ft):	0-5
Project No.:	2015-664-01	Sample No.:	SF-03
Lab ID:	2015-664-01-05	Soil Description:	**ORANGE FAT CLAY**

Note: The USCS symbol used with this test refers only to the minus No. 40 sieve material. See the "Sieve and Hydrometer Analysis" graph page for the complete material description. (Minus No. 40 sieve material, Airdried)

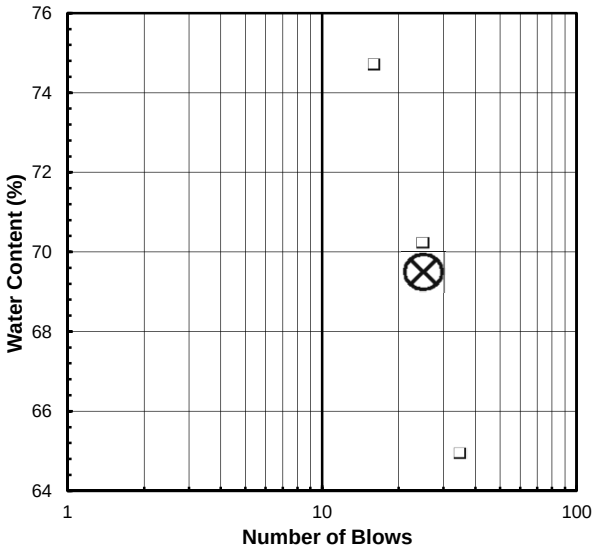
Liquid Limit Test	**1**	**2**	**3**	
Tare Number	W-2	T	U	**MULTIPOINT**
Wt. of Tare & Wet Sample (g)	25.96	25.63	26.36	
Wt. of Tare & Dry Sample (g)	21.98	21.34	21.58	
Wt. of Tare (g)	15.85	15.23	15.18	
Wt. of Water (g)	4.0	4.3	4.8	
Wt. of Dry Sample (g)	6.1	6.1	6.4	
Moisture Content (%)	**64.9**	**70.2**	**74.7**	
Number of Blows	**35**	**25**	**16**	

Plastic Limit Test	**1**	**2**	**Range**
Tare Number	3	Q	
Wt. of Tare & Wet Sample (g)	22.28	22.32	
Wt. of Tare & Dry Sample (g)	20.57	20.52	
Wt. of Tare (g)	15.43	15.17	
Wt. of Water (g)	1.7	1.8	
Wt. of Dry Sample (g)	5.1	5.4	
Moisture Content (%)	**33.3**	**33.6**	**-0.4**

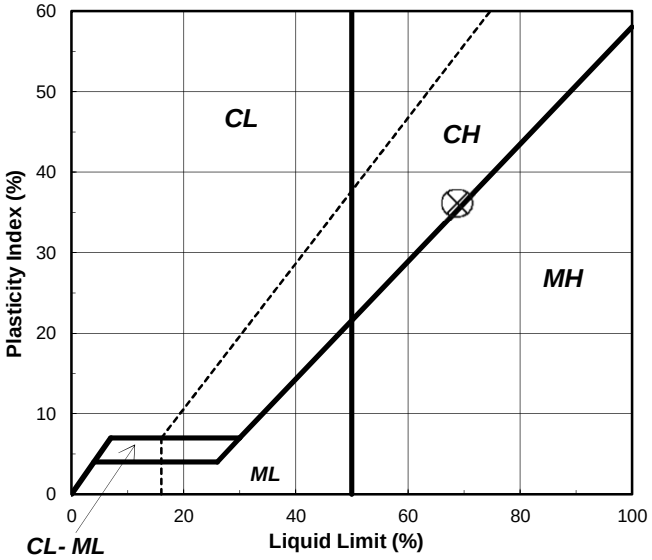
Note: The acceptable range of the two Moisture contents is ± 2.6

Test Results	
Liquid Limit (%)	**69**
Plastic Limit (%)	**33**
Plasticity Index (%)	**36**
USCS Symbol	**CH**

Flow Curve



Plasticity Chart



Tested By	*BW*	*Date*	*5/12/15*	*Checked By*	*GEM*	*Date*	5/13/15

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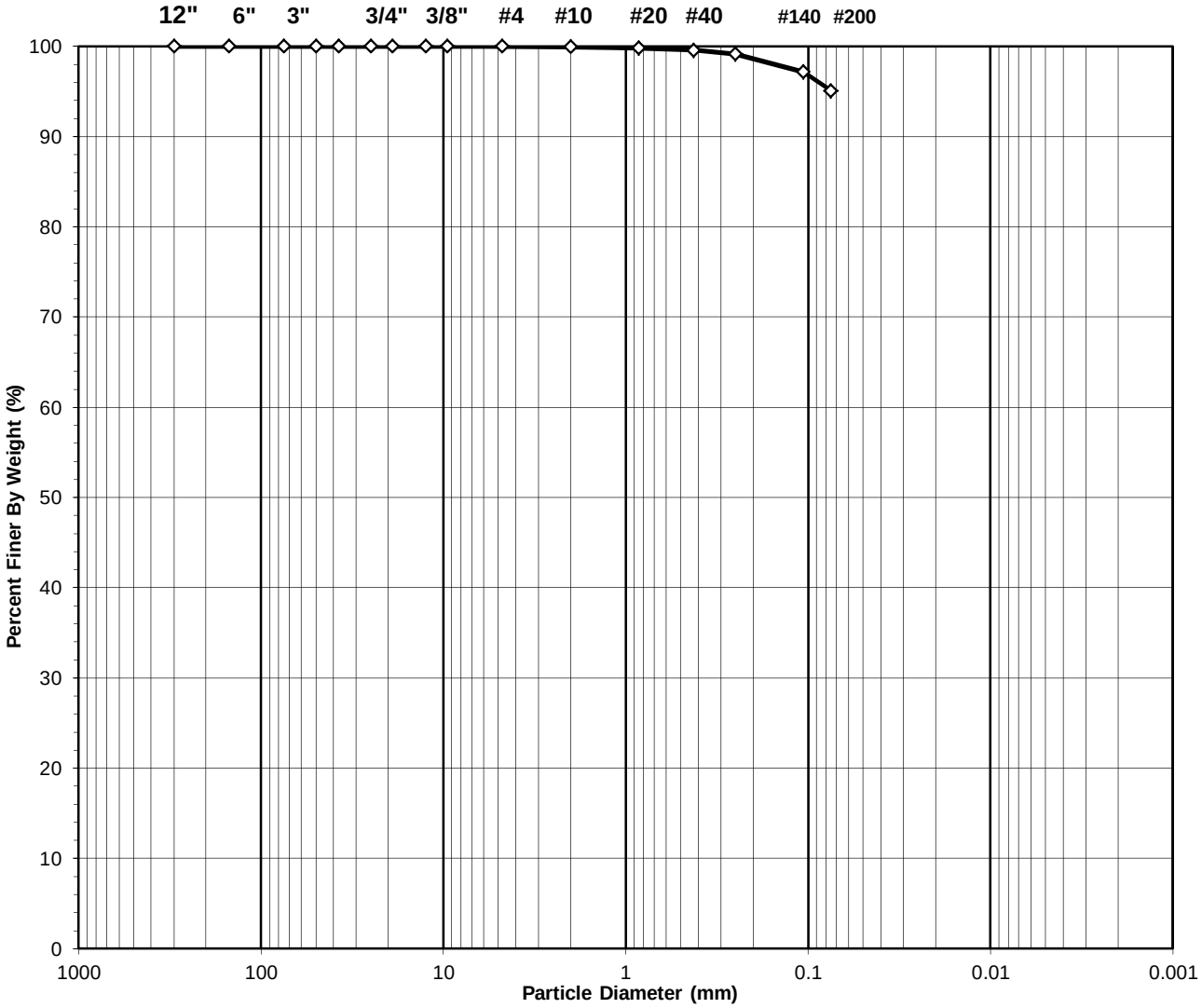
SIEVE ANALYSIS

ASTM D 422-63 (2007)

Client:	HDR ENGINEERING, INC.	Boring No.:	NA
Client Reference:	BRICKHAVEN NO. 2 MINE	Depth (ft):	0-5
Project No.:	2015-664-01	Sample No.:	SF-03
Lab ID:	2015-664-01-05	Soil Color:	ORANGE

	SIEVE ANALYSIS		HYDROMETER
USCS	gravel	sand	silt and clay



USCS Symbol: ***CH, TESTED***

USCS Classification: ***FAT CLAY***

Tested By	BW	Date	5/6/15	Checked By	GEM	Date	5/13/15

DCN: CT-S3C DATE 3/20/13 REVISION: 3

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WASH SIEVE ANALYSIS

ASTM D 422-63 (2007)

Client:	HDR ENGINEERING, INC.	Boring No.:	NA
Client Reference:	BRICKHAVEN NO. 2 MINE	Depth (ft):	0-5
Project No.:	2015-664-01	Sample No.:	SF-03
Lab ID:	2015-664-01-05	Soil Color:	ORANGE

Moisture Content of Passing 3/4" Sample		Water Content of Retained 3/4" Sample	
Tare No.	831	Tare No.	NA
Wt. of Tare & Wet Sample (g)	842.90	Weight of Tare & Wet Sample (g)	NA
Wt. of Tare & Dry Sample (g)	715.16	Weight of Tare & Dry Sample (g)	NA
Weight of Tare (g)	262.57	Weight of Tare (g)	NA
Weight of Water (g)	127.74	Weight of Water (g)	NA
Weight of Dry Sample (g)	452.59	Weight of Dry Sample (g)	NA
Moisture Content (%)	**28.2**	**Moisture Content (%)**	**NA**

Wet Weight of -3/4" Sample (g)	NA	Weight of the Dry Sample (g)	452.59
Dry Weight of - 3/4" Sample (g)	22.2	Weight of - #200 Sample (g)	430.44
Wet Weight of +3/4" Sample (g)	NA	Weight of + #200 Sample (g)	22.15
Dry Weight of + 3/4" Sample (g)	0.00		
Total Dry Weight of Sample (g)	NA		

Sieve Size	Sieve Opening (mm)	Weight of Soil Retained (g)	Percent Retained (%)	Accumulated Percent Retained (%)	Percent Finer (%)	Accumulated Percent Finer (%)
12"	300	0.00	0.00	0.00	100.00	**100.00**
6"	150	0.00	0.00	0.00	100.00	**100.00**
3"	75	0.00	0.00	0.00	100.00	**100.00**
2"	50	0.00	0.00	0.00	100.00	**100.00**
1 1/2"	37.5	0.00	0.00	0.00	100.00	**100.00**
1"	25.0	0.00	0.00	0.00	100.00	**100.00**
3/4"	19.0	0.00	0.00	0.00	100.00	**100.00**
1/2"	12.50	0.00	0.00	0.00	100.00	**100.00**
3/8"	9.50	0.00	0.00	0.00	100.00	**100.00**
#4	4.75	0.00	0.00	0.00	100.00	**100.00**
#10	2.00	0.30	0.07	0.07	99.93	**99.93**
#20	0.850	0.48	0.11	0.17	99.83	**99.83**
#40	0.425	1.04	0.23	0.40	99.60	**99.60**
#60	0.250	2.01	0.44	0.85	99.15	**99.15**
#140	0.106	8.93	1.97	2.82	97.18	**97.18**
#200	0.075	9.39	2.07	4.89	95.11	**95.11**
Pan	-	430.44	95.11	100.00	-	**-**

Tested By BW Date 5/6/15 Checked By GEM Date 5/13/15

DCN: CT-S3C DATE 3/20/13 REVISION: 3

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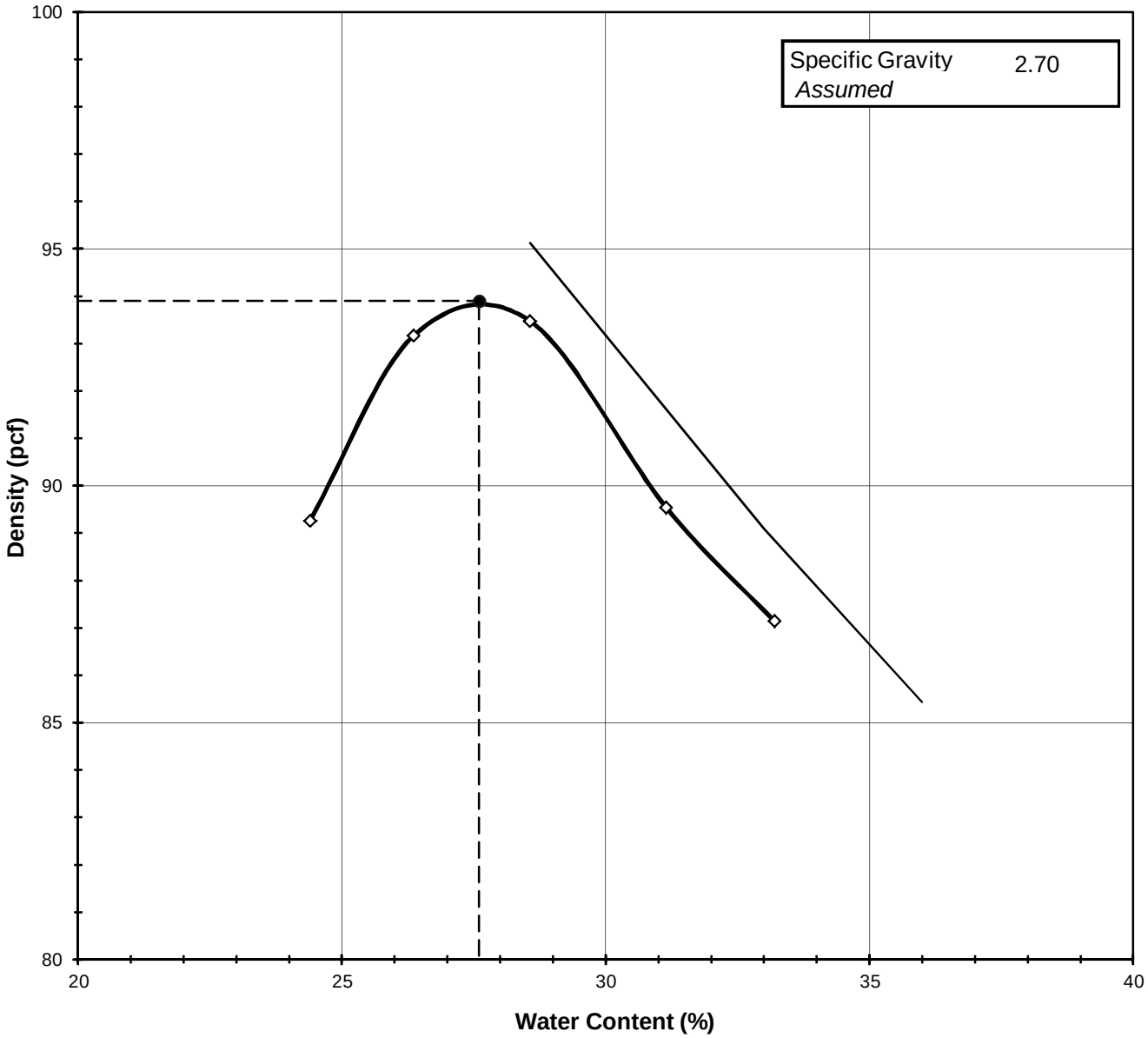
MOISTURE DENSITY RELATIONSHIP

ASTM D698-12

Client:	HDR ENGINEERING, INC.	Boring No.:	N/A
Client Reference:	Brickhaven No.2 Mine	Depth (ft):	0-5
Project No.:	2015-664-01	Sample No.:	SF-03
Lab ID:	2015-664-01-05	Test Method	**STANDARD**

Visual Description: ORANGE FAT CLAY

Optimum Water Content	**27.6**
Maximum Dry Density	**93.9**



Tested By	*BLT*	*Date*	*5/5/15*	*Checked By*	*SFS*	*Date*	5/6/15

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MOISTURE - DENSITY RELATIONSHIP

ASTM D698-12

Client:	HDR ENGINEERING, INC.	Boring No.:	N/A
Client Reference:	Brickhaven No.2 Mine	Depth (ft):	0-5
Project No.:	2015-664-01	Sample No.:	SF-03
Lab ID:	2015-664-01-05		

Visual Description: ORANGE FAT CLAY

Total Weight of the Sample (g)	23200
As Received Water Content (%)	28.2
Assumed Specific Gravity	2.70
Percent Retained on 3/4"	NA
Percent Retained on 3/8"	NA
Percent Retained on #4	NA
Oversize Material	Not included
Procedure Used	A

Test Type		**STANDARD**
Rammer Weight (lb)		5.5
Rammer Drop (in)		12
Rammer Type		MECHANICAL
Machine ID	R	174
Mold ID	R	461
Mold diameter		4"
Weight of the Mold (g)		4173
Volume of the Mold (cm^3)		942

Mold / Specimen

Point No.	**1**	**2**	**3**	**4**	**5**
Wt. of Mold & Wet Sample (g)	5849	5950	5987	5946	5925
Wt.of Mold (g)	4173	4173	4173	4173	4173
Wt. of Wet Sample (g)	1676	1777	1814	1773	1752
Mold Volume (cm^3)	942	942	942	942	942

Moisture Content / Density

Tare Number	301	398	311	300	368
Wt. of Tare & Wet Sample (g)	553.20	527.00	463.10	666.90	435.30
Wt. of Tare & Dry Sample (g)	461.30	434.60	379.00	534.76	354.50
Wt. of Tare (g)	84.60	84.10	84.60	110.50	111.10
Wt. of Water (g)	91.90	92.40	84.10	132.14	80.80
Wt. of Dry Sample (g)	376.70	350.50	294.40	424.26	243.40

Wet Density (g/cm^3)	1.78	1.89	1.93	1.88	1.86
Wet Density (pcf)	111.0	117.7	120.2	117.4	116.1
Moisture Content (%)	**24.4**	**26.4**	**28.6**	**31.1**	**33.2**
Dry Density (pcf)	**89.3**	**93.2**	**93.5**	**89.5**	**87.1**

Zero Air Voids

Moisture Content (%)	28.6	33.0	36.0
Dry Unit Weight (pcf)	95.1	89.1	85.4

Tested By *BLT* *Date* *5/5/15* *Checked By* *SFS* *Date* 5/6/15

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ATTERBERG LIMITS

ASTM D 4318-10 / AASHTO T89-10

Client:	HDR ENGINEERING, INC.	Boring No.:	NA
Client Reference:	BRICKHAVEN NO. 2 MINE	Depth (ft):	0-5
Project No.:	2015-664-01	Sample No.:	SF-04
Lab ID:	2015-664-01-06	Soil Description:	**RED LEAN CLAY**

Note: The USCS symbol used with this test refers only to the minus No. 40 sieve material. See the "Sieve and Hydrometer Analysis" graph page for the complete material description.

(Minus No. 40 sieve material, Airdried)

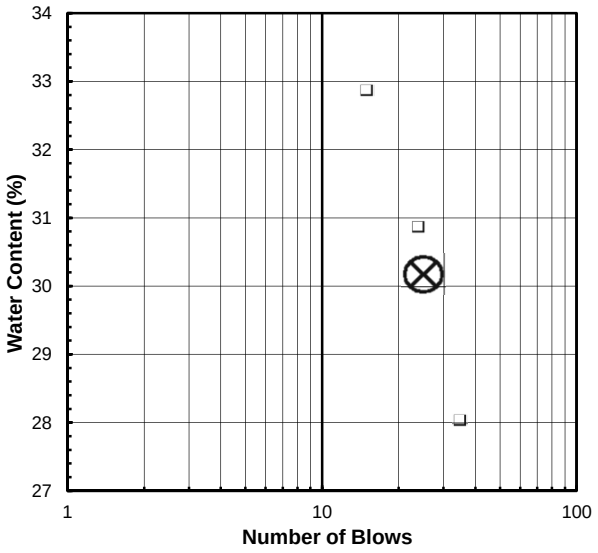
Liquid Limit Test	**1**	**2**	**3**	
Tare Number	D-1	G	A-B	**MULTIPOINT**
Wt. of Tare & Wet Sample (g)	30.11	27.21	28.61	
Wt. of Tare & Dry Sample (g)	26.87	24.35	25.39	
Wt. of Tare (g)	15.31	15.08	15.59	
Wt. of Water (g)	3.2	2.9	3.2	
Wt. of Dry Sample (g)	11.6	9.3	9.8	
Moisture Content (%)	**28.0**	**30.9**	**32.9**	
Number of Blows	**35**	**24**	**15**	

Plastic Limit Test	**1**	**2**	**Range**
Tare Number	AQ	AM	
Wt. of Tare & Wet Sample (g)	22.66	22.58	
Wt. of Tare & Dry Sample (g)	21.44	21.37	
Wt. of Tare (g)	15.47	15.41	
Wt. of Water (g)	1.2	1.2	
Wt. of Dry Sample (g)	6.0	6.0	
Moisture Content (%)	**20.4**	**20.3**	**0.1**

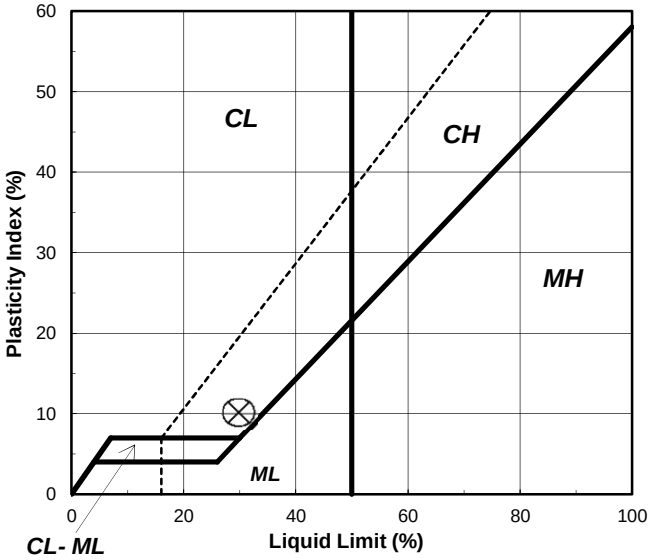
Note: The acceptable range of the two Moisture contents is ± 2.6

Test Results	
Liquid Limit (%)	**30**
Plastic Limit (%)	**20**
Plasticity Index (%)	**10**
USCS Symbol	**CL**

Flow Curve



Plasticity Chart



Tested By	*BW*	*Date*	*5/12/15*	*Checked By*	*GEM*	*Date*	5/13/15

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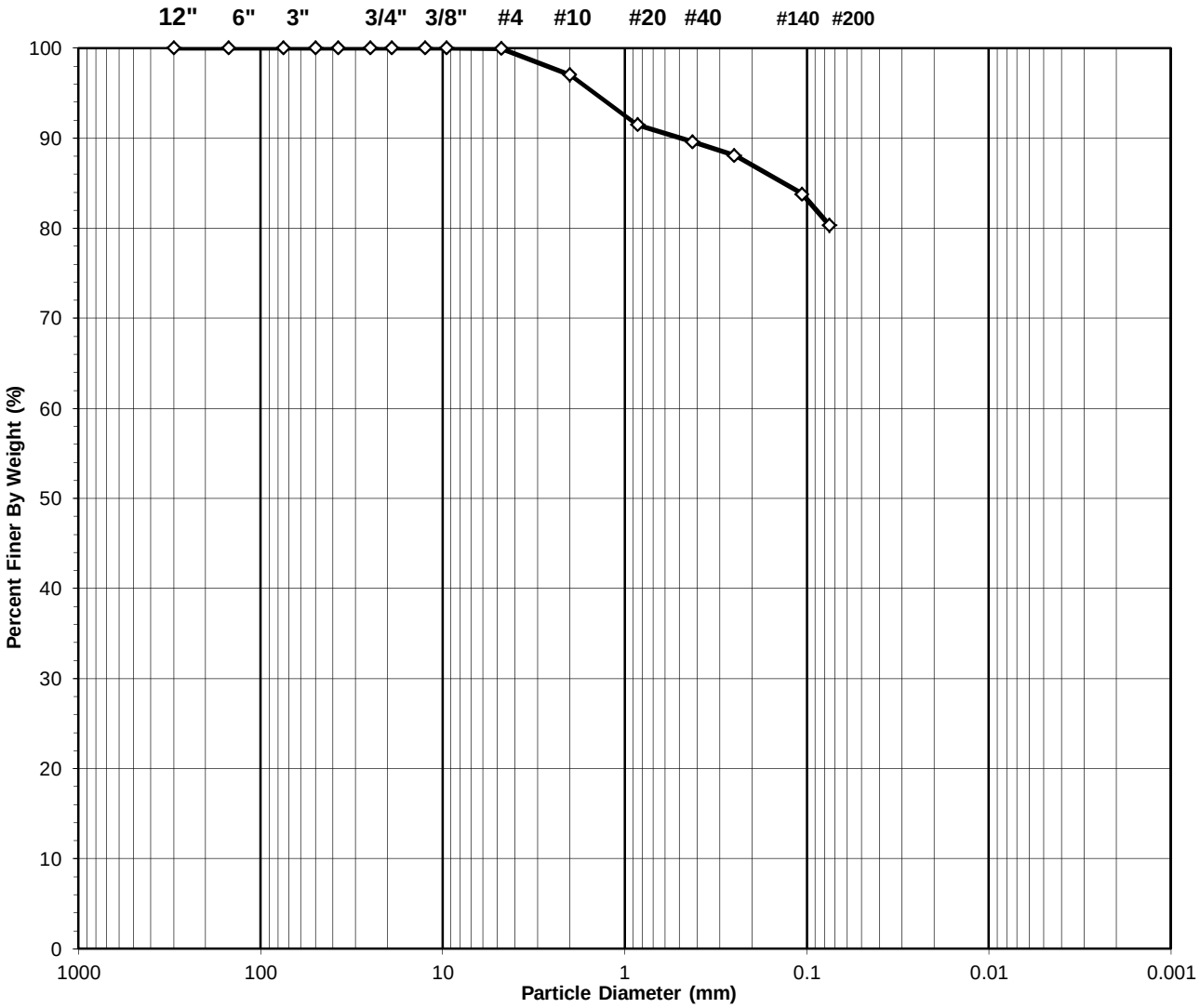
SIEVE ANALYSIS

ASTM D 422-63 (2007)

Client:	HDR ENGINEERING, INC.	Boring No.:	NA
Client Reference:	BRICKHAVEN NO. 2 MINE	Depth (ft):	0-5
Project No.:	2015-664-01	Sample No.:	SF-04
Lab ID:	2015-664-01-06	Soil Color:	RED

	SIEVE ANALYSIS		*HYDROMETER*
USCS	**gravel**	**sand**	**silt and clay**



USCS Symbol: ***CL, TESTED***

USCS Classification: ***LEAN CLAY WITH SAND***

Tested By BT Date 5/11/15 Checked By GEM Date 5/13/15

DCN: CT-S3C DATE 3/20/13 REVISION: 3

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WASH SIEVE ANALYSIS

ASTM D 422-63 (2007)

Client:	HDR ENGINEERING, INC.	Boring No.:	NA
Client Reference:	BRICKHAVEN NO. 2 MINE	Depth (ft):	0-5
Project No.:	2015-664-01	Sample No.:	SF-04
Lab ID:	2015-664-01-06	Soil Color:	RED

Moisture Content of Passing 3/4" Sample		Water Content of Retained 3/4" Sample	
Tare No.	317	Tare No.	NA
Wt. of Tare & Wet Sample (g)	612.67	Weight of Tare & Wet Sample (g)	NA
Wt. of Tare & Dry Sample (g)	582.57	Weight of Tare & Dry Sample (g)	NA
Weight of Tare (g)	84.24	Weight of Tare (g)	NA
Weight of Water (g)	30.10	Weight of Water (g)	NA
Weight of Dry Sample (g)	498.33	Weight of Dry Sample (g)	NA
Moisture Content (%)	**6.0**	**Moisture Content (%)**	**NA**

Wet Weight of -3/4" Sample (g)	NA	Weight of the Dry Sample (g)	498.33
Dry Weight of - 3/4" Sample (g)	98.0	Weight of - #200 Sample (g)	400.29
Wet Weight of +3/4" Sample (g)	NA	Weight of + #200 Sample (g)	98.04
Dry Weight of + 3/4" Sample (g)	0.00		
Total Dry Weight of Sample (g)	NA		

Sieve Size	Sieve Opening (mm)	Weight of Soil Retained (g)	Percent Retained (%)	Accumulated Percent Retained (%)	Percent Finer (%)	Accumulated Percent Finer (%)
12"	300	0.00	0.00	0.00	100.00	**100.00**
6"	150	0.00	0.00	0.00	100.00	**100.00**
3"	75	0.00	0.00	0.00	100.00	**100.00**
2"	50	0.00	0.00	0.00	100.00	**100.00**
1 1/2"	37.5	0.00	0.00	0.00	100.00	**100.00**
1"	25.0	0.00	0.00	0.00	100.00	**100.00**
3/4"	19.0	0.00	0.00	0.00	100.00	**100.00**
1/2"	12.50	0.00	0.00	0.00	100.00	**100.00**
3/8"	9.50	0.00	0.00	0.00	100.00	**100.00**
#4	4.75	0.22	0.04	0.04	99.96	**99.96**
#10	2.00	14.61	2.93	2.98	97.02	**97.02**
#20	0.850	27.61	5.54	8.52	91.48	**91.48**
#40	0.425	9.33	1.87	10.39	89.61	**89.61**
#60	0.250	7.63	1.53	11.92	88.08	**88.08**
#140	0.106	21.45	4.30	16.22	83.78	**83.78**
#200	0.075	17.19	3.45	19.67	80.33	**80.33**
Pan	-	400.29	80.33	100.00	-	**-**

Tested By BT Date 5/11/15 Checked By GEM Date 5/13/15

DCN: CT-S3C DATE 3/20/13 REVISION: 3

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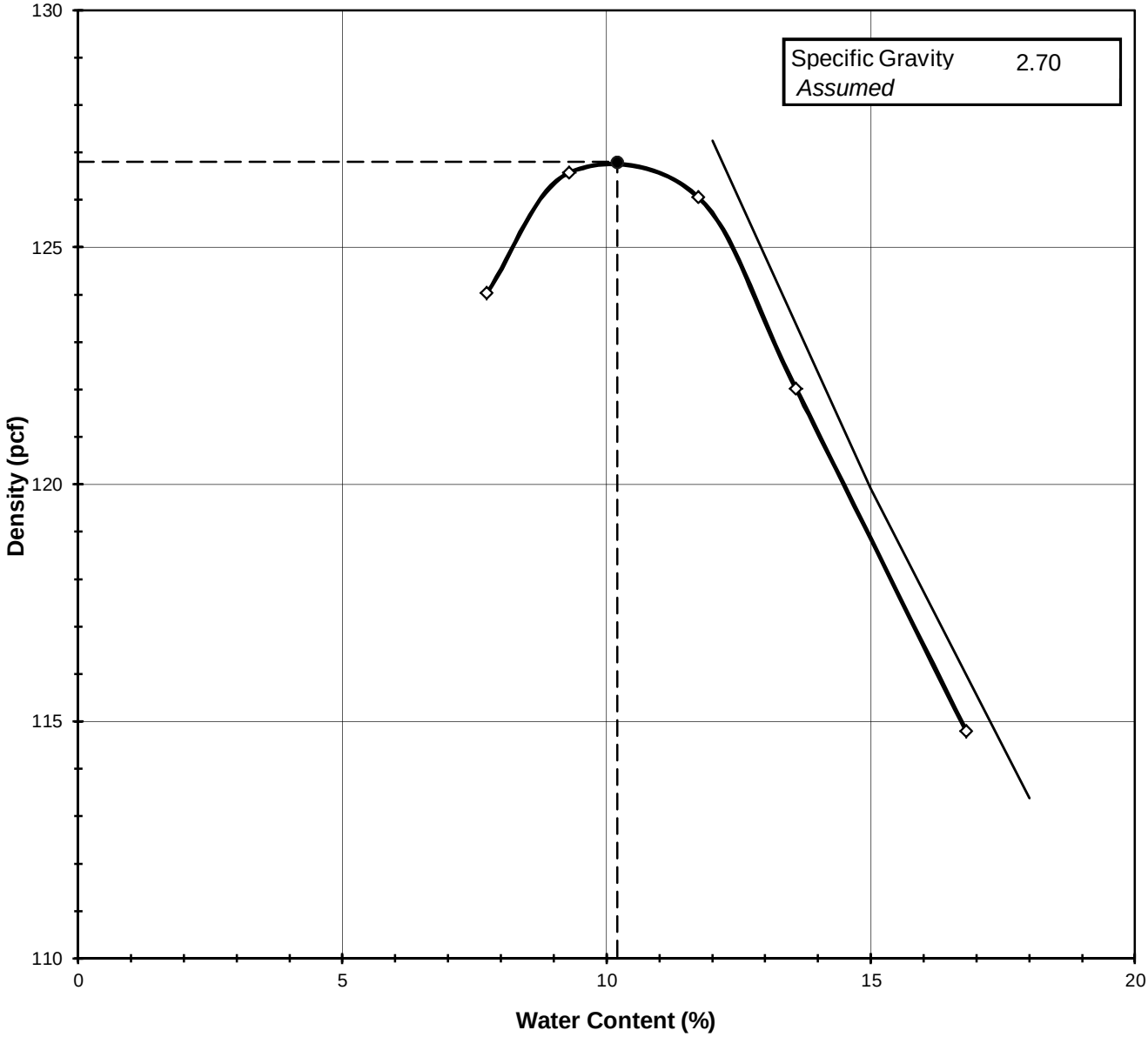
MOISTURE DENSITY RELATIONSHIP

ASTM D698-12

Client:	HDR ENGINEERING, INC.	Boring No.:	N/A
Client Reference:	Brickhaven No.2 Mine	Depth (ft):	0-5
Project No.:	2015-664-01	Sample No.:	SF-04
Lab ID:	2015-664-01-06	Test Method	**STANDARD**

Visual Description: RED LEAN CLAY WITH SAND

Optimum Water Content	**10.2**
Maximum Dry Density	**126.8**



Tested By *BT* *Date* *5/7/15* *Checked By* *SFS* *Date* 5/13/15

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MOISTURE - DENSITY RELATIONSHIP

ASTM D698-12

Client:	HDR ENGINEERING, INC.	Boring No.:	N/A
Client Reference:	Brickhaven No.2 Mine	Depth (ft):	0-5
Project No.:	2015-664-01	Sample No.:	SF-04
Lab ID:	2015-664-01-06		

Visual Description: RED LEAN CLAY WITH SAND

Total Weight of the Sample (g)	20850
As Received Water Content (%)	NA
Assumed Specific Gravity	2.70
Percent Retained on 3/4"	NA
Percent Retained on 3/8"	NA
Percent Retained on #4	NA
Oversize Material	Not included
Procedure Used	A

Test Type		**STANDARD**
Rammer Weight (lb)		5.5
Rammer Drop (in)		12
Rammer Type		MECHANICAL
Machine ID	R	174
Mold ID	R	461
Mold diameter		4"
Weight of the Mold (g)		4174
Volume of the Mold (cm^3)		942

Mold / Specimen

Point No.	**1**	**2**	**3**	**4**	**5**
Wt. of Mold & Wet Sample (g)	6191	6262	6300	6266	6198
Wt.of Mold (g)	4174	4174	4174	4174	4174
Wt. of Wet Sample (g)	2017	2088	2126	2092	2024
Mold Volume (cm^3)	942	942	942	942	942

Moisture Content / Density

Tare Number	300	311	368	312	398
Wt. of Tare & Wet Sample (g)	502.00	472.50	560.30	579.20	613.60
Wt. of Tare & Dry Sample (g)	473.90	439.50	513.10	520.00	537.40
Wt. of Tare (g)	110.60	84.30	111.00	84.10	83.90
Wt. of Water (g)	28.10	33.00	47.20	59.20	76.20
Wt. of Dry Sample (g)	363.30	355.20	402.10	435.90	453.50

Wet Density (g/cm^3)	2.14	2.22	2.26	2.22	2.15
Wet Density (pcf)	133.6	138.3	140.8	138.6	134.1
Moisture Content (%)	**7.7**	**9.3**	**11.7**	**13.6**	**16.8**
Dry Density (pcf)	**124.0**	**126.6**	**126.1**	**122.0**	**114.8**

Zero Air Voids

Moisture Content (%)	12.0	15.0	18.0
Dry Unit Weight (pcf)	127.3	119.9	113.4

Tested By *BT* *Date* *5/7/15* *Checked By* *SFS* *Date* 5/13/15

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June 11, 2015

Project No. 2015-664-04

Mr. Michael Plummer, P.E.
HDR Engineering, Inc.
440 South Church St., Suite 1000
Charlotte, NC 28202

Transmittal
Laboratory Test Results
Brickhaven No. 2 Mine

Please find attached the laboratory test results for the above referenced project. The tests were outlined on the Project Verification Form that was transmitted to your firm prior to the testing. The testing was performed in general accordance with the methods listed on the enclosed data sheets. The test results are believed to be representative of the samples that were submitted for testing and are indicative only of the specimens which were evaluated. We imply no position with regard to the nature of the test results, i.e. pass/fail and no claims as to the suitability of the material for its intended use.

The test data and all associated project information provided shall be held in strict confidence and disclosed to other parties only with authorization by our Client. The test data submitted herein is considered integral with this report and is not to be reproduced except in whole and only with the authorization of the Client and Geotechnics. The remaining sample materials for this project will be retained for a minimum of 90 days as directed by the Geotechnics' Quality Program.

We are pleased to provide these testing services. Should you have any questions or if we may be of further assistance, please contact our office.

Respectively submitted,
Geotechnics, Inc.

Michael P. Smith
Regional Manager

We understand that you have a choice in your laboratory services and we thank you for choosing Geotechnics.

DCN: Data Transmittal Letter Date: 1/28/05 Rev.: 1

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ATTERBERG LIMITS

ASTM D 4318-10 / AASHTO T89-10

Client:	HDR ENGINEERING, INC.	Boring No.:	NA
Client Reference:	BRICKHAVEN NO. 2 MINE	Depth (ft):	1-6
Project No.:	2015-664-04	Sample No.:	CSL-01
Lab ID:	2015-664-04-01	Soil Description:	**BROWN LEAN CLAY**

Note: The USCS symbol used with this test refers only to the minus No. 40 sieve material. See the "Sieve and Hydrometer Analysis" graph page for the complete material description. (Minus No. 40 sieve material, Airdried)

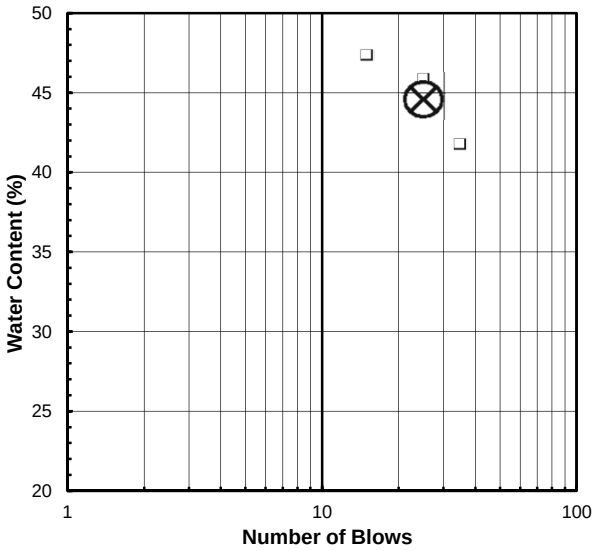
Liquid Limit Test	**1**	**2**	**3**	
Tare Number	A-N	2M	M	**MULTIPOINT**
Wt. of Tare & Wet Sample (g)	28.09	28.36	30.27	
Wt. of Tare & Dry Sample (g)	24.37	24.37	25.43	
Wt. of Tare (g)	15.45	15.67	15.20	
Wt. of Water (g)	3.7	4.0	4.8	
Wt. of Dry Sample (g)	8.9	8.7	10.2	
Moisture Content (%)	**41.7**	**45.9**	**47.3**	
Number of Blows	**35**	**25**	**15**	

Plastic Limit Test	**1**	**2**	**Range**
Tare Number	Y-3	3M	
Wt. of Tare & Wet Sample (g)	22.49	22.86	
Wt. of Tare & Dry Sample (g)	21.18	21.47	
Wt. of Tare (g)	15.65	15.59	
Wt. of Water (g)	1.3	1.4	
Wt. of Dry Sample (g)	5.5	5.9	
Moisture Content (%)	**23.7**	**23.6**	**0.0**

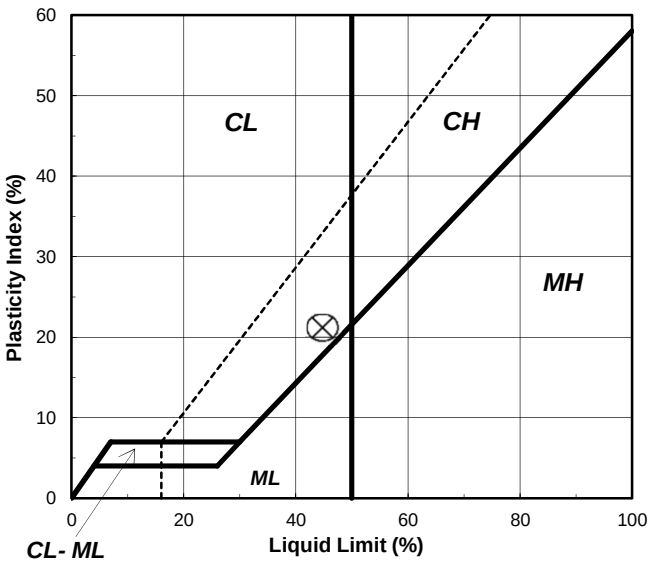
Note: The acceptable range of the two Moisture contents is ± 2.6

Test Results	
Liquid Limit (%)	**45**
Plastic Limit (%)	**24**
Plasticity Index (%)	**21**
USCS Symbol	**CL**

Flow Curve



Plasticity Chart



Tested By	*BW*	*Date*	*6/4/15*	*Checked By*	*GEM*	*Date*	6/5/15

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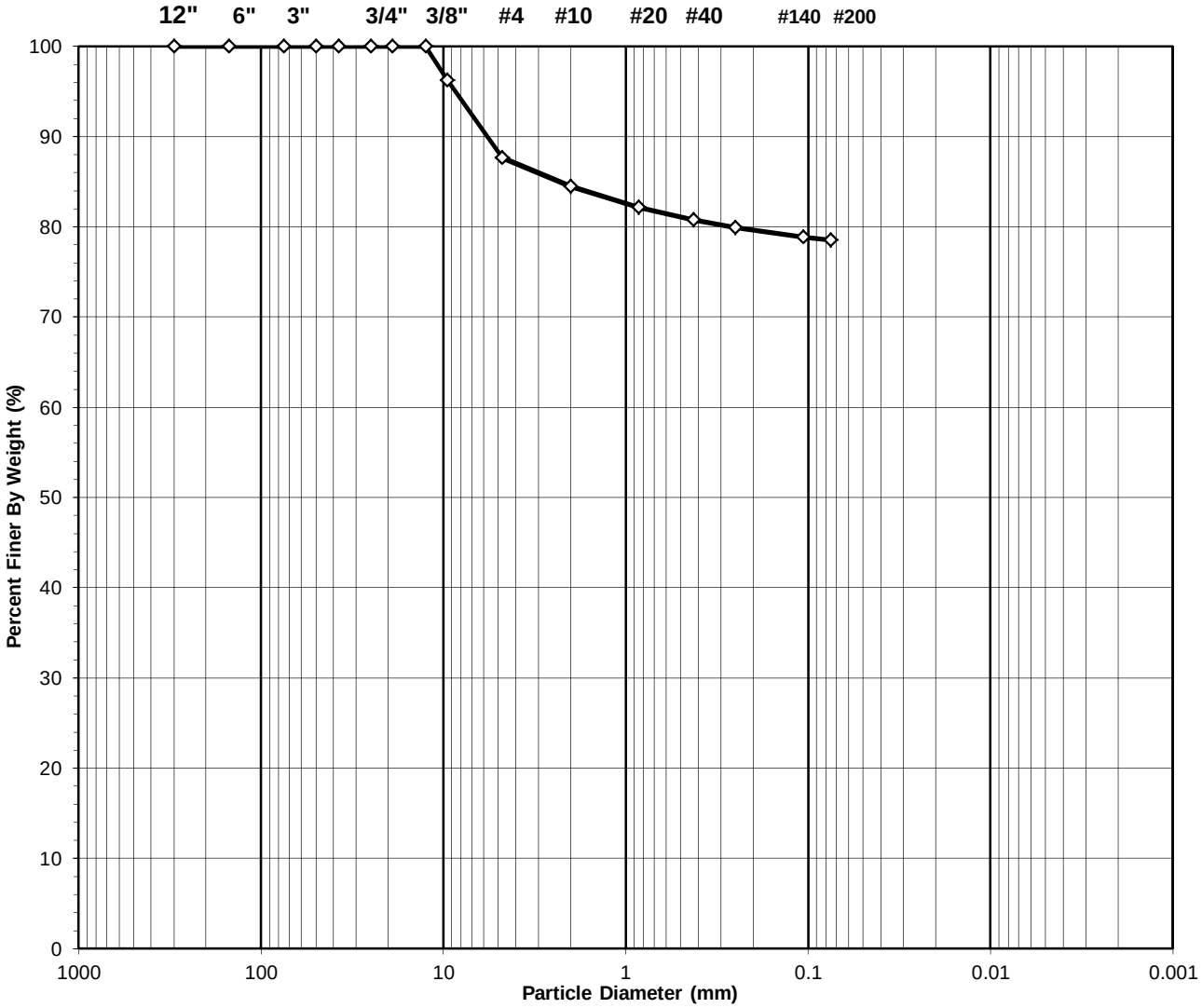
SIEVE ANALYSIS

ASTM D 422-63 (2007)

Client:	HDR ENGINEERING, INC.	Boring No.:	6/1/15
Client Reference:	BRICKHAVEN NO. 2 MINE	Depth (ft):	1-6
Project No.:	2015-664-04	Sample No.:	CSL-01
Lab ID:	2015-664-04-01	Soil Color:	BROWN

	SIEVE ANALYSIS		*HYDROMETER*
USCS	**gravel**	**sand**	**silt and clay**



USCS Symbol: ***CL, TESTED***

USCS Classification: ***LEAN CLAY WITH GRAVEL***

Tested By BT Date 6/4/15 Checked By GEM Date 6/5/15

DCN: CT-S3C DATE 3/20/13 REVISION: 3

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WASH SIEVE ANALYSIS

ASTM D 422-63 (2007)

Client:	HDR ENGINEERING, INC.	Boring No.:	6/1/15
Client Reference:	BRICKHAVEN NO. 2 MINE	Depth (ft):	1-6
Project No.:	2015-664-04	Sample No.:	CSL-01
Lab ID:	2015-664-04-01	Soil Color:	BROWN

Moisture Content of Passing 3/4" Sample		Water Content of Retained 3/4" Sample	
Tare No.	839	Tare No.	NA
Wt. of Tare & Wet Sample (g)	1150.40	Weight of Tare & Wet Sample (g)	NA
Wt. of Tare & Dry Sample (g)	997.06	Weight of Tare & Dry Sample (g)	NA
Weight of Tare (g)	258.00	Weight of Tare (g)	NA
Weight of Water (g)	153.34	Weight of Water (g)	NA
Weight of Dry Sample (g)	739.06	Weight of Dry Sample (g)	NA
Moisture Content (%)	**20.7**	**Moisture Content (%)**	**NA**

Wet Weight of -3/4" Sample (g)	NA	Weight of the Dry Sample (g)	739.06
Dry Weight of - 3/4" Sample (g)	158.7	Weight of - #200 Sample (g)	580.35
Wet Weight of +3/4" Sample (g)	NA	Weight of + #200 Sample (g)	158.71
Dry Weight of + 3/4" Sample (g)	0.00		
Total Dry Weight of Sample (g)	NA		

Sieve Size	Sieve Opening (mm)	Weight of Soil Retained (g)	Percent Retained (%)	Accumulated Percent Retained (%)	Percent Finer (%)	Accumulated Percent Finer (%)
12"	300	0.00	0.00	0.00	100.00	**100.00**
6"	150	0.00	0.00	0.00	100.00	**100.00**
3"	75	0.00	0.00	0.00	100.00	**100.00**
2"	50	0.00	0.00	0.00	100.00	**100.00**
1 1/2"	37.5	0.00	0.00	0.00	100.00	**100.00**
1"	25.0	0.00	0.00	0.00	100.00	**100.00**
3/4"	19.0	0.00	0.00	0.00	100.00	**100.00**
1/2"	12.50	0.00	0.00	0.00	100.00	**100.00**
3/8"	9.50	27.64	3.74	3.74	96.26	**96.26**
#4	4.75	63.47	8.59	12.33	87.67	**87.67**
#10	2.00	23.62	3.20	15.52	84.48	**84.48**
#20	0.850	16.98	2.30	17.82	82.18	**82.18**
#40	0.425	10.41	1.41	19.23	80.77	**80.77**
#60	0.250	6.26	0.85	20.08	79.92	**79.92**
#140	0.106	7.80	1.06	21.13	78.87	**78.87**
#200	0.075	2.53	0.34	21.47	78.53	**78.53**
Pan	-	580.35	78.53	100.00	-	**-**

Tested By BT Date 6/4/15 Checked By GEM Date 6/5/15

DCN: CT-S3C DATE 3/20/13 REVISION: 3

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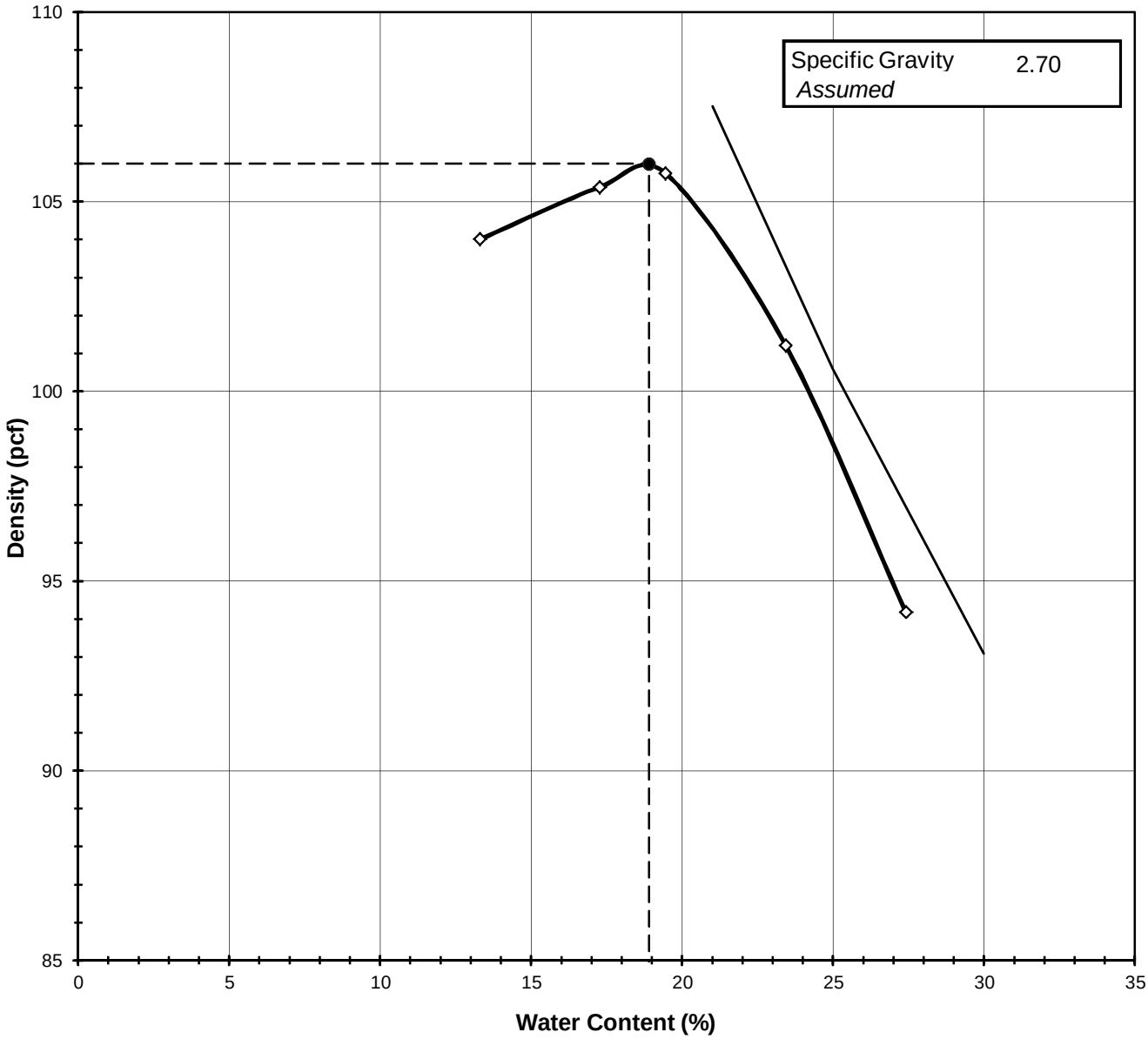
MOISTURE DENSITY RELATIONSHIP

ASTM D698-12

Client:	HDR ENGINEERING, INC.	Boring No.:	N/A
Client Reference:	Brickhaven No.2 Mine	Depth (ft):	1-6
Project No.:	2015-664-04	Sample No.:	CSL-01
Lab ID:	2015-664-04-01	Test Method	**STANDARD**

Visual Description: BROWN LEAN CLAY WITH GRAVEL

Optimum Water Content	**18.9**
Maximum Dry Density	**106.0**



Tested By *LW* *Date* *6/5/15* *Checked By* *GEM* *Date* 6/8/15

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MOISTURE - DENSITY RELATIONSHIP

ASTM D698-12

Client:	HDR ENGINEERING, INC.	Boring No.:	N/A
Client Reference:	Brickhaven No.2 Mine	Depth (ft):	1-6
Project No.:	2015-664-04	Sample No.:	CSL-01
Lab ID:	2015-664-04-01		

Visual Description: BROWN LEAN CLAY WITH GRAVEL

Total Weight of the Sample (g)	19350
As Received Water Content (%)	28.2
Assumed Specific Gravity	2.70
Percent Retained on 3/4"	3
Percent Retained on 3/8"	NA
Percent Retained on #4	NA
Oversize Material	Not included
Procedure Used	A

Test Type		**STANDARD**
Rammer Weight (lb)		5.5
Rammer Drop (in)		12
Rammer Type		MECHANICAL
Machine ID	R	174
Mold ID	R	461
Mold diameter		4"
Weight of the Mold (g)		4172
Volume of the Mold (cm^3)		942

Mold / Specimen

Point No.	**1**	**2**	**3**	**4**	**5**
Wt. of Mold & Wet Sample (g)	5951	6037	6079	6058	5983
Wt.of Mold (g)	4172	4172	4172	4172	4172
Wt. of Wet Sample (g)	1779	1865	1907	1886	1811
Mold Volume (cm^3)	942	942	942	942	942

Moisture Content / Density

Tare Number	303	317	398	399	368
Wt. of Tare & Wet Sample (g)	728.70	589.40	666.30	574.30	622.40
Wt. of Tare & Dry Sample (g)	656.10	515.00	571.50	481.70	512.42
Wt. of Tare (g)	110.70	84.10	83.90	86.40	111.20
Wt. of Water (g)	72.60	74.40	94.80	92.60	109.98
Wt. of Dry Sample (g)	545.40	430.90	487.60	395.30	401.22

Wet Density (g/cm^3)	1.89	1.98	2.02	2.00	1.92
Wet Density (pcf)	117.9	123.6	126.3	124.9	120.0
Moisture Content (%)	**13.3**	**17.3**	**19.4**	**23.4**	**27.4**
Dry Density (pcf)	**104.0**	**105.4**	**105.8**	**101.2**	**94.2**

Zero Air Voids

Moisture Content (%)	21.0	25.0	30.0
Dry Unit Weight (pcf)	107.5	100.6	93.1

Tested By *LW* *Date* *6/5/15* *Checked By* *GEM* *Date* 6/8/15

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ATTERBERG LIMITS

ASTM D 4318-10 / AASHTO T89-10

Client:	HDR ENGINEERING, INC.	Boring No.:	NA
Client Reference:	BRICKHAVEN NO. 2 MINE	Depth (ft):	NA
Project No.:	2015-664-04	Sample No.:	CSL-02
Lab ID:	2015-664-04-02	Soil Description:	**BROWN SILT**

Note: The USCS symbol used with this test refers only to the minus No. 40 sieve material. See the "Sieve and Hydrometer Analysis" graph page for the complete material description. (Minus No. 40 sieve material, Airdried)

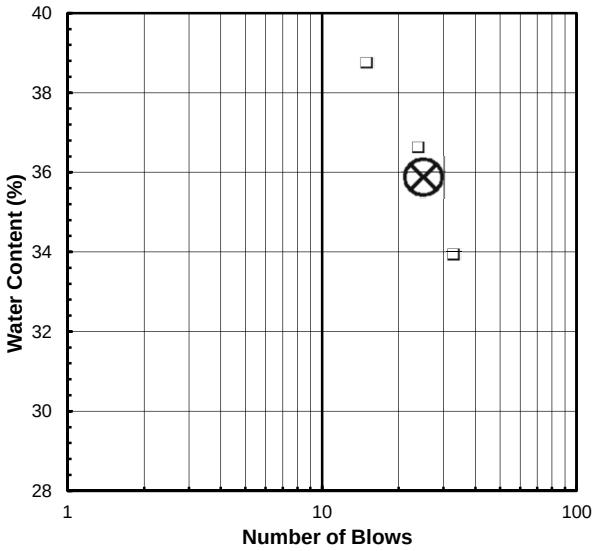
Liquid Limit Test	**1**	**2**	**3**	
Tare Number	W-2	IM	U	**MULTIPOINT**
Wt. of Tare & Wet Sample (g)	26.52	27.44	25.06	
Wt. of Tare & Dry Sample (g)	23.82	24.35	22.31	
Wt. of Tare (g)	15.86	15.91	15.21	
Wt. of Water (g)	2.7	3.1	2.8	
Wt. of Dry Sample (g)	8.0	8.4	7.1	
Moisture Content (%)	**33.9**	**36.6**	**38.7**	
Number of Blows	**33**	**24**	**15**	

Plastic Limit Test	**1**	**2**	**Range**
Tare Number	Q	T	
Wt. of Tare & Wet Sample (g)	22.60	22.82	
Wt. of Tare & Dry Sample (g)	21.07	21.24	
Wt. of Tare (g)	15.18	15.24	
Wt. of Water (g)	1.5	1.6	
Wt. of Dry Sample (g)	5.9	6.0	
Moisture Content (%)	**26.0**	**26.3**	**-0.4**

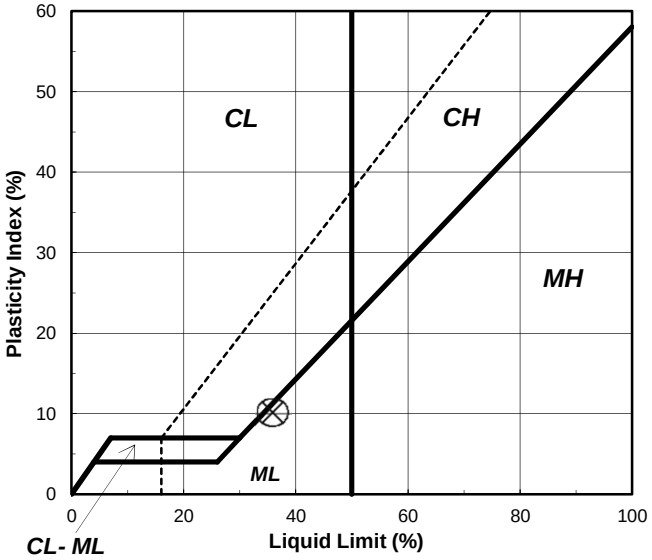
Note: The acceptable range of the two Moisture contents is ± 2.6

Test Results	
Liquid Limit (%)	**36**
Plastic Limit (%)	**26**
Plasticity Index (%)	**10**
USCS Symbol	**ML**

Flow Curve



Plasticity Chart



Tested By	*BW*	*Date*	*6/11/15*	*Checked By*	*GEM*	*Date*	6/12/15

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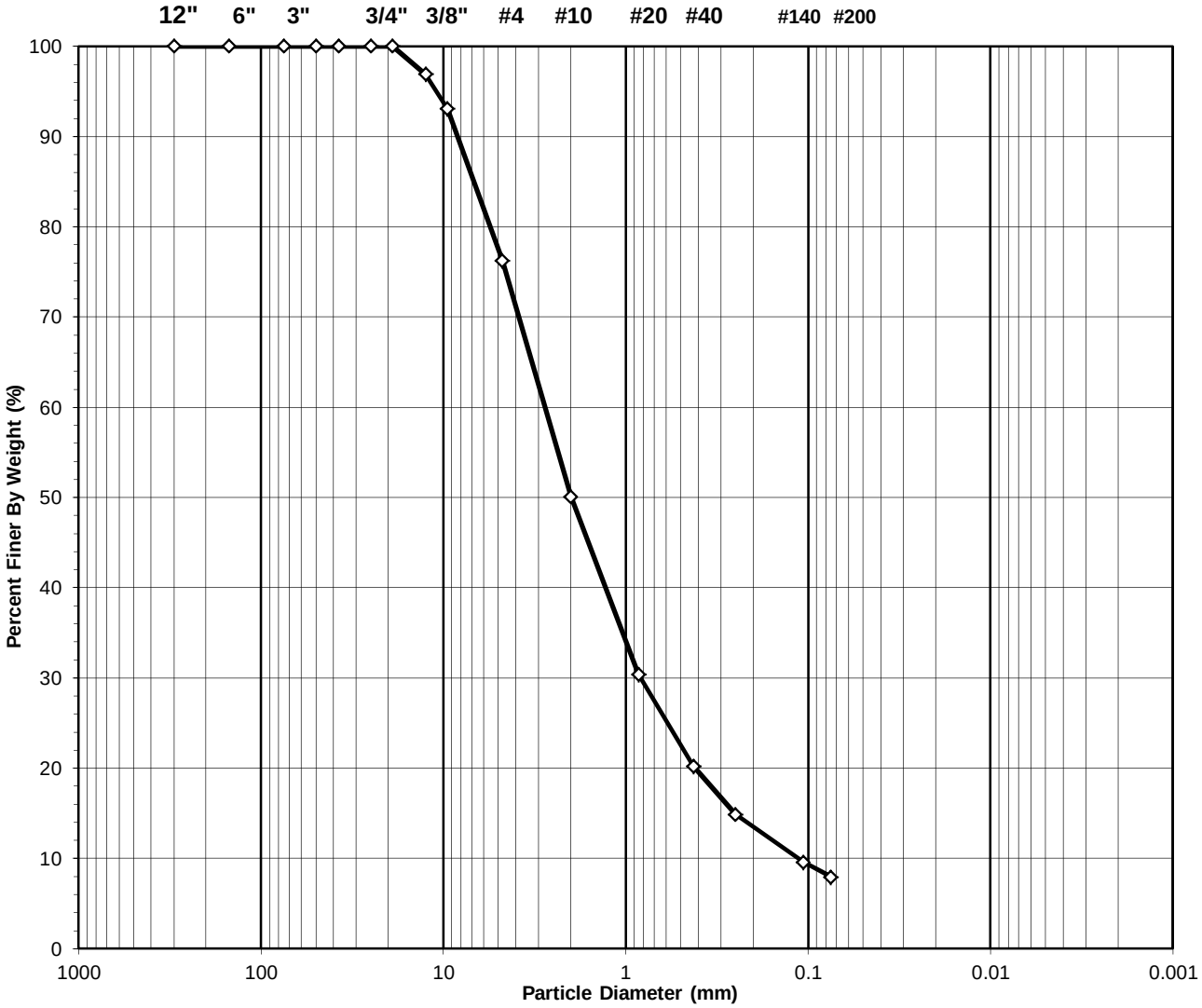
SIEVE ANALYSIS

ASTM D 422-63 (2007)

Client:	HDR ENGINEERING, INC.	Boring No.:	NA
Client Reference:	BRICKHAVEN NO. 2 MINE	Depth (ft):	NA
Project No.:	2015-664-04	Sample No.:	CSL-02
Lab ID:	2015-664-04-02	Soil Color:	BROWN

	SIEVE ANALYSIS		HYDROMETER
USCS	gravel	sand	silt and clay



USCS Symbol: ***SW-SM, TESTED***

USCS Classification: ***WELL-GRADED SAND WITH SILT AND GRAVEL***

D60 =	**2.78**	**CC =**	**2.17**
D30 =	**0.83**	**CU =**	**24.51**
D10 =	**0.11**		

Tested By BT Date 6/2/15 Checked By GEM Date 6/12/15

DCN: CT-S3C DATE 3/20/13 REVISION: 3

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WASH SIEVE ANALYSIS

ASTM D 422-63 (2007)

Client:	HDR ENGINEERING, INC.	Boring No.:	NA
Client Reference:	BRICKHAVEN NO. 2 MINE	Depth (ft):	NA
Project No.:	2015-664-04	Sample No.:	CSL-02
Lab ID:	2015-664-04-02	Soil Color:	BROWN

Moisture Content of Passing 3/4" Sample		Water Content of Retained 3/4" Sample	
Tare No.	822	Tare No.	NA
Wt. of Tare & Wet Sample (g)	490.00	Weight of Tare & Wet Sample (g)	NA
Wt. of Tare & Dry Sample (g)	463.49	Weight of Tare & Dry Sample (g)	NA
Weight of Tare (g)	137.80	Weight of Tare (g)	NA
Weight of Water (g)	26.51	Weight of Water (g)	NA
Weight of Dry Sample (g)	325.69	Weight of Dry Sample (g)	NA
Moisture Content (%)	**8.1**	**Moisture Content (%)**	**NA**

Wet Weight of -3/4" Sample (g)	NA	Weight of the Dry Sample (g)	325.69
Dry Weight of - 3/4" Sample (g)	299.9	Weight of - #200 Sample (g)	25.83
Wet Weight of +3/4" Sample (g)	NA	Weight of + #200 Sample (g)	299.86
Dry Weight of + 3/4" Sample (g)	0.00		
Total Dry Weight of Sample (g)	NA		

Sieve Size	Sieve Opening (mm)	Weight of Soil Retained (g)	Percent Retained (%)	Accumulated Percent Retained (%)	Percent Finer (%)	Accumulated Percent Finer (%)
12"	300	0.00	0.00	0.00	100.00	**100.00**
6"	150	0.00	0.00	0.00	100.00	**100.00**
3"	75	0.00	0.00	0.00	100.00	**100.00**
2"	50	0.00	0.00	0.00	100.00	**100.00**
1 1/2"	37.5	0.00	0.00	0.00	100.00	**100.00**
1"	25.0	0.00	0.00	0.00	100.00	**100.00**
3/4"	19.0	0.00	0.00	0.00	100.00	**100.00**
1/2"	12.50	10.10	3.10	3.10	96.90	**96.90**
3/8"	9.50	12.50	3.84	6.94	93.06	**93.06**
#4	4.75	54.70	16.80	23.73	76.27	**76.27**
#10	2.00	85.30	26.19	49.92	50.08	**50.08**
#20	0.850	64.06	19.67	69.59	30.41	**30.41**
#40	0.425	33.19	10.19	79.78	20.22	**20.22**
#60	0.250	17.39	5.34	85.12	14.88	**14.88**
#140	0.106	17.21	5.28	90.41	9.59	**9.59**
#200	0.075	5.41	1.66	92.07	7.93	**7.93**
Pan	-	25.83	7.93	100.00	-	**-**

Tested By BT Date 6/2/15 Checked By GEM Date 6/12/15

DCN: CT-S3C DATE 3/20/13 REVISION: 3

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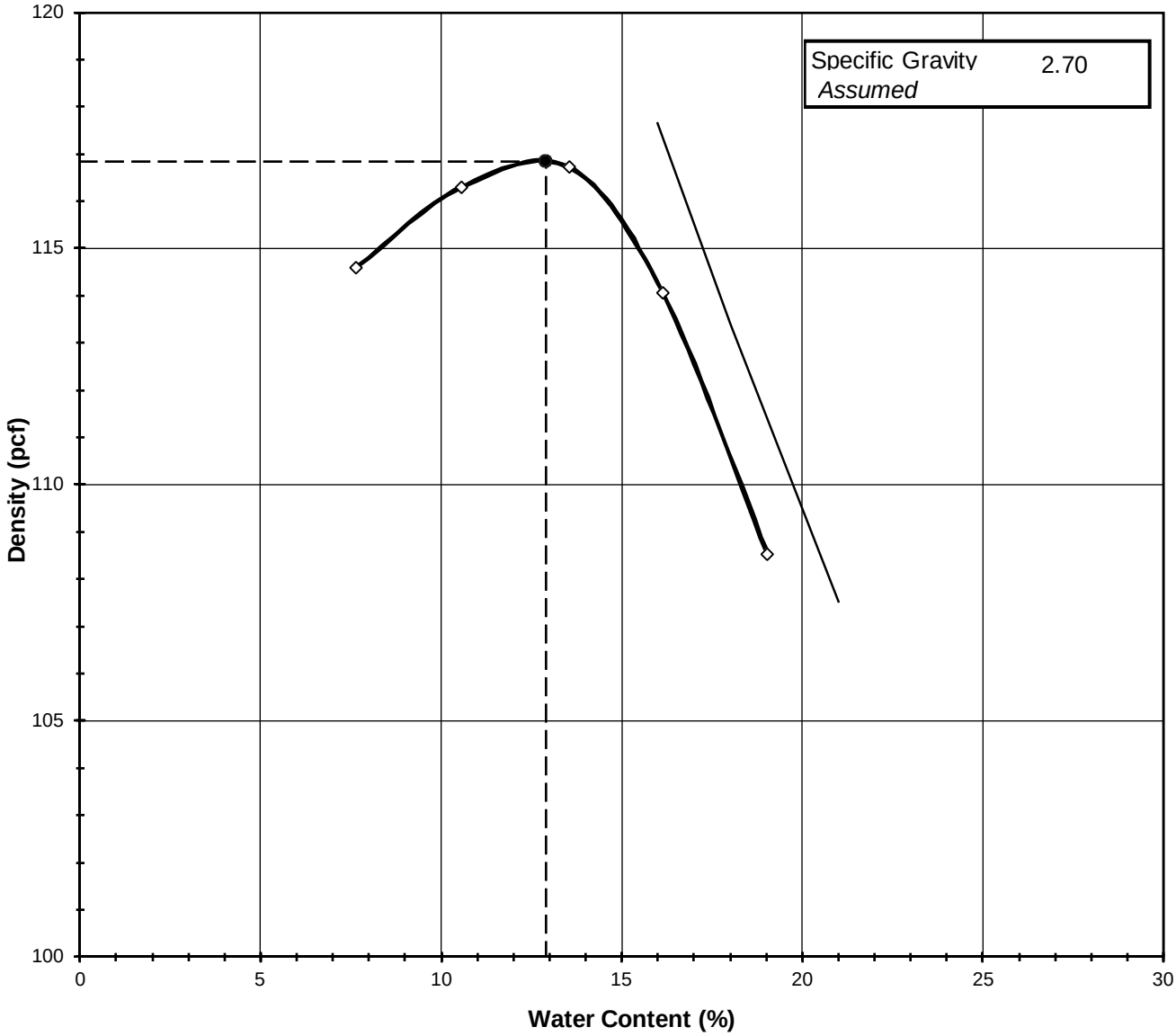
MOISTURE DENSITY RELATIONSHIP

ASTM D698-12

Client:	HDR ENGINEERING, INC.	Boring No.:	N/A
Client Reference:	Brickhaven No.2 Mine	Depth (ft):	N/A
Project No.:	2015-664-04	Sample No.:	CSL-02
Lab ID:	2015-664-04-02	Test Method	**STANDARD**

Visual Description: BROWN WELL GRADED SAND WITH SILT & GRAVEL

Optimum Water Content	**12.9**
Maximum Dry Density	**116.9**



Tested By *LW* *Date* *6/10/15* *Checked By* *GEM* *Date* 6/12/15

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MOISTURE - DENSITY RELATIONSHIP

ASTM D698-12

Client:	HDR ENGINEERING, INC.	Boring No.:	N/A
Client Reference:	Brickhaven No.2 Mine	Depth (ft):	N/A
Project No.:	2015-664-04	Sample No.:	CSL-02
Lab ID:	2015-664-04-02		

Visual Description: BROWN WELL GRADED SAND WITH SILT & GRAVEL

Total Weight of the Sample (g)	NA
As Received Water Content (%)	NA
Assumed Specific Gravity	2.70
Percent Retained on 3/4"	NA
Percent Retained on 3/8"	NA
Percent Retained on #4	NA
Oversize Material	Not included
Procedure Used	A

Test Type		**STANDARD**
Rammer Weight (lb)		5.5
Rammer Drop (in)		12
Rammer Type		MECHANICAL
Machine ID	R	174
Mold ID	R	461
Mold diameter		4"
Weight of the Mold (g)		4172
Volume of the Mold (cm^3)		942

Mold / Specimen

Point No.	**1**	**2**	**3**	**4**	**5**
Wt. of Mold & Wet Sample (g)	6034	6113	6173	6172	6122
Wt.of Mold (g)	4172	4172	4172	4172	4172
Wt. of Wet Sample (g)	1862	1941	2001	2000	1950
Mold Volume (cm^3)	942	942	942	942	942

Moisture Content / Density

Tare Number	866	303	398	317	816
Wt. of Tare & Wet Sample (g)	551.70	752.40	613.10	643.80	593.00
Wt. of Tare & Dry Sample (g)	518.70	691.10	549.90	566.00	519.70
Wt. of Tare (g)	86.40	110.60	83.80	83.90	134.60
Wt. of Water (g)	33.00	61.30	63.20	77.80	73.30
Wt. of Dry Sample (g)	432.30	580.50	466.10	482.10	385.10

Wet Density (g/cm^3)	1.98	2.06	2.12	2.12	2.07
Wet Density (pcf)	123.3	128.6	132.5	132.5	129.2
Moisture Content (%)	**7.6**	**10.6**	**13.6**	**16.1**	**19.0**
Dry Density (pcf)	**114.6**	**116.3**	**116.7**	**114.1**	**108.5**

Zero Air Voids

Moisture Content (%)	16.0	18.0	21.0
Dry Unit Weight (pcf)	117.7	113.4	107.5

Tested By *LW* *Date* *6/10/15* *Checked By* *GEM* *Date* 6/12/15

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June 19, 2015

Project No. 2015-664-07

Mr. Michael Plummer, P.E.
HDR Engineering, Inc.
440 South Church St., Suite 1000
Charlotte, NC 28202

Transmittal
Laboratory Test Results
Brickhaven No. 2 Mine

Please find attached the laboratory test results for the above referenced project. The tests were outlined on the Project Verification Form that was transmitted to your firm prior to the testing. The testing was performed in general accordance with the methods listed on the enclosed data sheets. The test results are believed to be representative of the samples that were submitted for testing and are indicative only of the specimens which were evaluated. We imply no position with regard to the nature of the test results, i.e. pass/fail and no claims as to the suitability of the material for its intended use.

The test data and all associated project information provided shall be held in strict confidence and disclosed to other parties only with authorization by our Client. The test data submitted herein is considered integral with this report and is not to be reproduced except in whole and only with the authorization of the Client and Geotechnics. The remaining sample materials for this project will be retained for a minimum of 90 days as directed by the Geotechnics' Quality Program.

We are pleased to provide these testing services. Should you have any questions or if we may be of further assistance, please contact our office.

Respectively submitted,
Geotechnics, Inc.

Michael P. Smith
Regional Manager

We understand that you have a choice in your laboratory services and we thank you for choosing Geotechnics.

DCN: Data Transmittal Letter Date: 1/28/05 Rev.: 1

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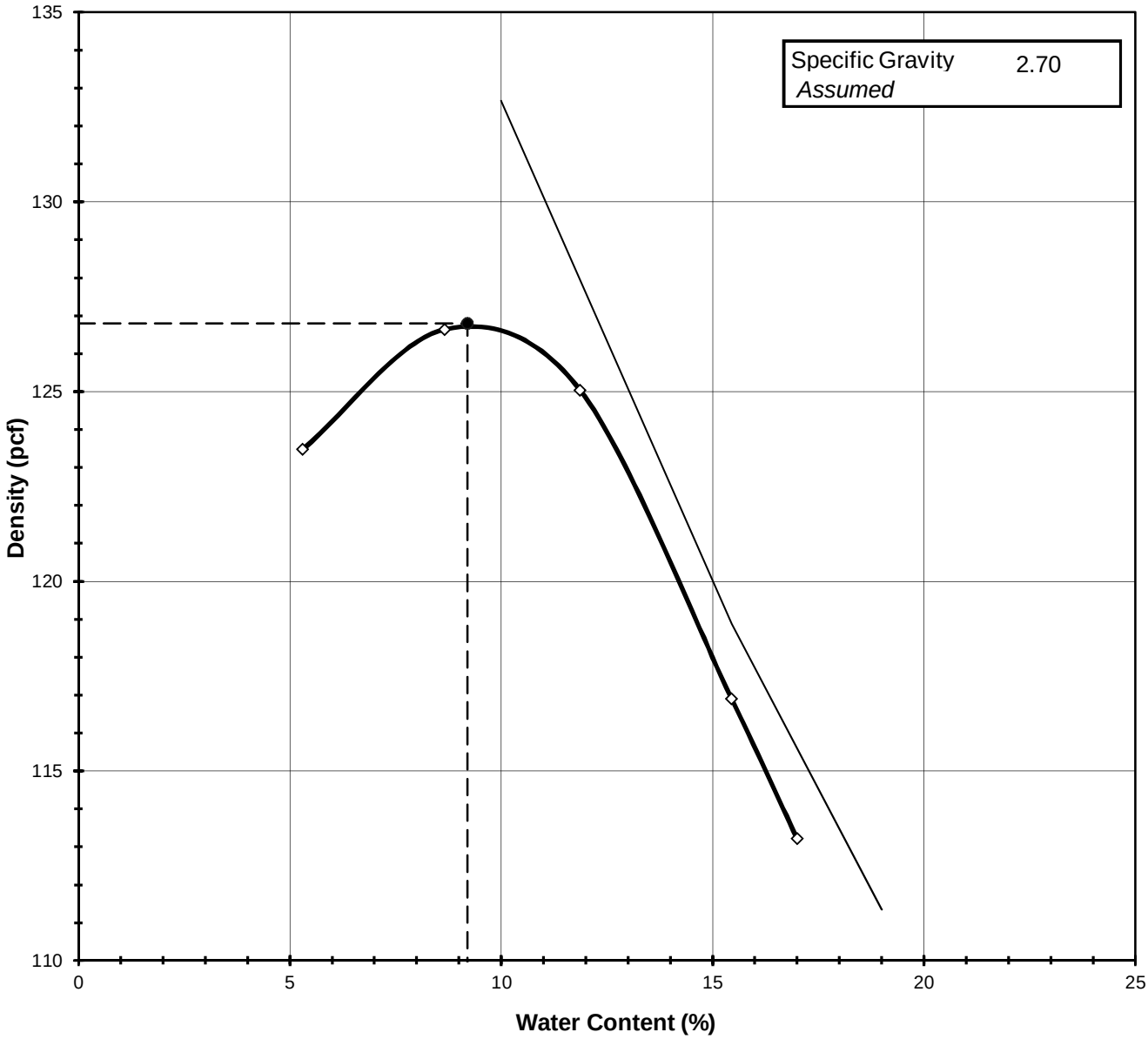
MOISTURE DENSITY RELATIONSHIP

ASTM D698-12

Client:	HDR ENGINEERING, INC.	Boring No.:	N/A
Client Reference:	Brickhaven No.2 Mine	Depth (ft):	N/A
Project No.:	2015-664-07	Sample No.:	SF-05
Lab ID:	2015-664-07-01	Test Method	**STANDARD**

Visual Description: RED SANDY SILT

Optimum Water Content	**9.2**
Maximum Dry Density	**126.8**



Tested By *LW* *Date* *6/18/15* *Checked By* *SFS* *Date* 6/19/15

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MOISTURE - DENSITY RELATIONSHIP

ASTM D698-12

Client:	HDR ENGINEERING, INC.	Boring No.:	N/A
Client Reference:	Brickhaven No.2 Mine	Depth (ft):	N/A
Project No.:	2015-664-07	Sample No.:	SF-05
Lab ID:	2015-664-07-01		

Visual Description: RED SANDY SILT

Total Weight of the Sample (g)	33700
As Received Water Content (%)	NA
Assumed Specific Gravity	2.70
Percent Retained on 3/4"	NA
Percent Retained on 3/8"	NA
Percent Retained on #4	NA
Oversize Material	Not included
Procedure Used	C

Test Type		**STANDARD**
Rammer Weight (lb)		5.5
Rammer Drop (in)		12
Rammer Type		MECHANICAL
Machine ID	R	174
Mold ID	R	173
Mold diameter		4"
Weight of the Mold (g)		5535
Volume of the Mold (cm^3)		2119

Mold / Specimen

Point No.	**1**	**2**	**3**	**4**	**5**
Wt. of Mold & Wet Sample (g)	9951	10209	10286	10119	10034
Wt.of Mold (g)	5535	5535	5535	5535	5535
Wt. of Wet Sample (g)	4416	4674	4751	4584	4499
Mold Volume (cm^3)	2119	2119	2119	2119	2119

Moisture Content / Density

Tare Number	866	399	307	310	317
Wt. of Tare & Wet Sample (g)	885.30	1148.80	833.70	958.20	964.20
Wt. of Tare & Dry Sample (g)	845.10	1064.10	756.90	844.60	836.30
Wt. of Tare (g)	86.60	86.50	109.70	109.50	84.00
Wt. of Water (g)	40.20	84.70	76.80	113.60	127.90
Wt. of Dry Sample (g)	758.50	977.60	647.20	735.10	752.30

Wet Density (g/cm^3)	2.08	2.21	2.24	2.16	2.12
Wet Density (pcf)	130.0	137.6	139.9	135.0	132.5
Moisture Content (%)	**5.3**	**8.7**	**11.9**	**15.5**	**17.0**
Dry Density (pcf)	**123.5**	**126.6**	**125.0**	**116.9**	**113.2**

Zero Air Voids

Moisture Content (%)	10.0	15.5	19.0
Dry Unit Weight (pcf)	132.7	118.9	111.4

Tested By *LW* *Date* *6/18/15* *Checked By* *SFS* *Date* 6/19/15

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July 3, 2015

Project No. 2015-664-09

Mr. Michael Plummer, P.E.
HDR Engineering, Inc.
440 South Church St., Suite 1000
Charlotte, NC 28202

Transmittal
Laboratory Test Results
Brickhaven No. 2 Mine

Please find attached the laboratory test results for the above referenced project. The tests were outlined on the Project Verification Form that was transmitted to your firm prior to the testing. The testing was performed in general accordance with the methods listed on the enclosed data sheets. The test results are believed to be representative of the samples that were submitted for testing and are indicative only of the specimens which were evaluated. We imply no position with regard to the nature of the test results, i.e. pass/fail and no claims as to the suitability of the material for its intended use.

The test data and all associated project information provided shall be held in strict confidence and disclosed to other parties only with authorization by our Client. The test data submitted herein is considered integral with this report and is not to be reproduced except in whole and only with the authorization of the Client and Geotechnics. The remaining sample materials for this project will be retained for a minimum of 90 days as directed by the Geotechnics' Quality Program.

We are pleased to provide these testing services. Should you have any questions or if we may be of further assistance, please contact our office.

Respectively submitted,
Geotechnics, Inc.

Michael P. Smith
Regional Manager

We understand that you have a choice in your laboratory services and we thank you for choosing Geotechnics.

DCN: Data Transmittal Letter Date: 1/28/05 Rev.: 1

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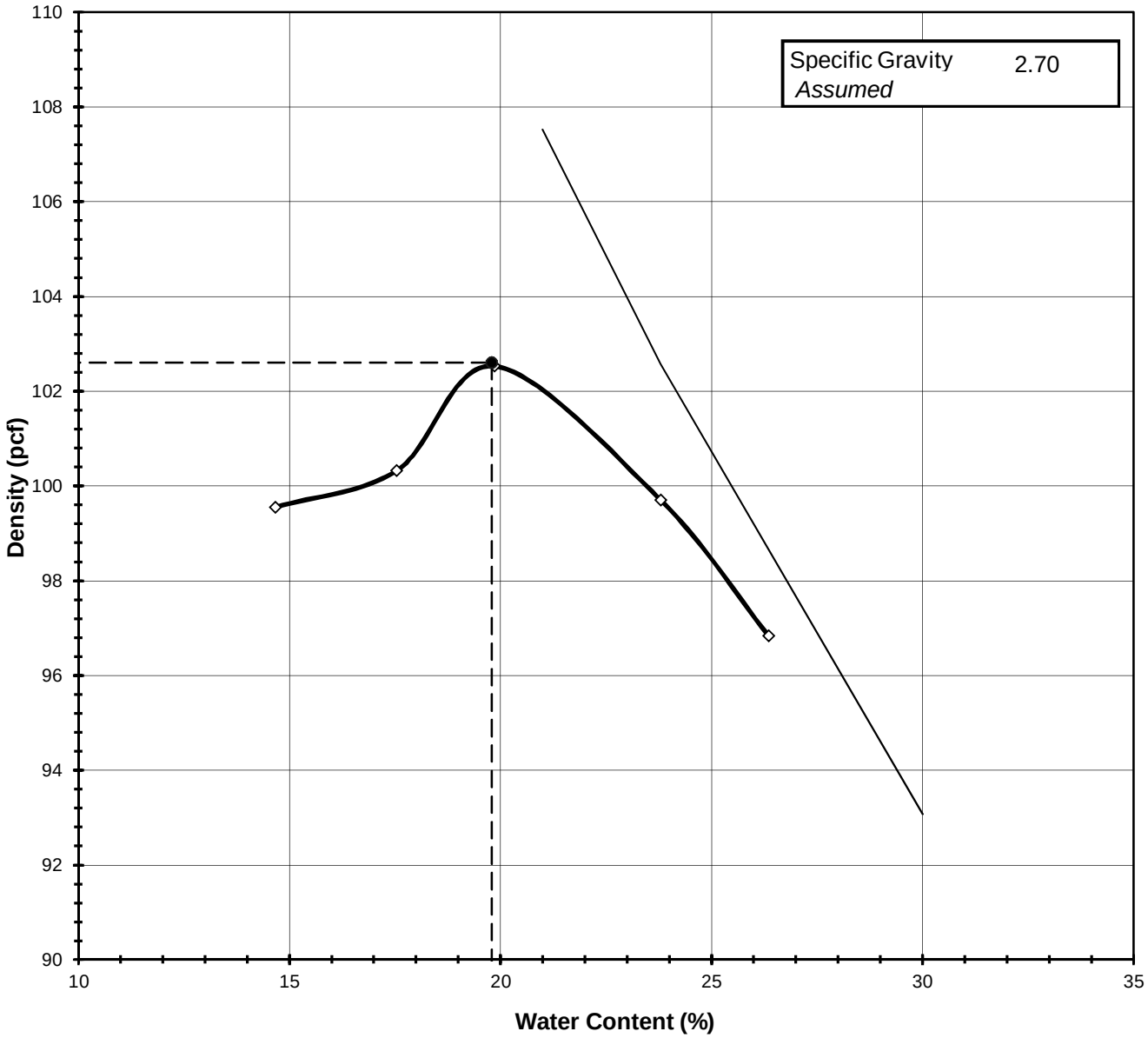
MOISTURE DENSITY RELATIONSHIP

ASTM D698-12

Client:	HDR ENGINEERING, INC.	Boring No.:	N/A
Client Reference:	Brickhaven No.2 Mine	Depth (ft):	N/A
Project No.:	2015-664-09	Sample No.:	SF-06
Lab ID:	2015-664-09-01	Test Method	**STANDARD**

Visual Description: REDDISH CLAY

Optimum Water Content	**19.8**
Maximum Dry Density	**102.6**



Tested By *BW* *Date* *7/1/15* *Checked By* *SFS* *Date* 7/2/15

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MOISTURE - DENSITY RELATIONSHIP

ASTM D698-12

Client:	HDR ENGINEERING, INC.	Boring No.:	N/A
Client Reference:	Brickhaven No.2 Mine	Depth (ft):	N/A
Project No.:	2015-664-09	Sample No.:	SF-06
Lab ID:	2015-664-09-01		

Visual Description: REDDISH CLAY

Total Weight of the Sample (g)	24800
As Received Water Content (%)	NA
Assumed Specific Gravity	2.70
Percent Retained on 3/4"	NA
Percent Retained on 3/8"	NA
Percent Retained on #4	NA
Oversize Material	Not included
Procedure Used	A

Test Type		**STANDARD**
Rammer Weight (lb)		5.5
Rammer Drop (in)		12
Rammer Type		MECHANICAL
Machine ID	R	174
Mold ID	R	461
Mold diameter		4"
Weight of the Mold (g)		4174
Volume of the Mold (cm^3)		942

Mold / Specimen

Point No.	**1**	**2**	**3**	**4**	**5**
Wt. of Mold & Wet Sample (g)	5897	5954	6029	6037	6021
Wt.of Mold (g)	4174	4174	4174	4174	4174
Wt. of Wet Sample (g)	1723	1780	1855	1863	1847
Mold Volume (cm^3)	942	942	942	942	942

Moisture Content / Density

Tare Number	305	368	866	312	307
Wt. of Tare & Wet Sample (g)	546.70	468.20	467.30	502.90	497.80
Wt. of Tare & Dry Sample (g)	487.60	414.90	404.20	422.40	416.90
Wt. of Tare (g)	84.60	111.10	86.50	84.10	109.90
Wt. of Water (g)	59.10	53.30	63.10	80.50	80.90
Wt. of Dry Sample (g)	403.00	303.80	317.70	338.30	307.00

Wet Density (g/cm^3)	1.83	1.89	1.97	1.98	1.96
Wet Density (pcf)	114.1	117.9	122.9	123.4	122.4
Moisture Content (%)	**14.7**	**17.5**	**19.9**	**23.8**	**26.4**
Dry Density (pcf)	**99.5**	**100.3**	**102.5**	**99.7**	**96.8**

Zero Air Voids

Moisture Content (%)	21.0	23.8	30.0
Dry Unit Weight (pcf)	107.5	102.6	93.1

Tested By *BW* *Date* *7/1/15* *Checked By* *SFS* *Date* 7/2/15

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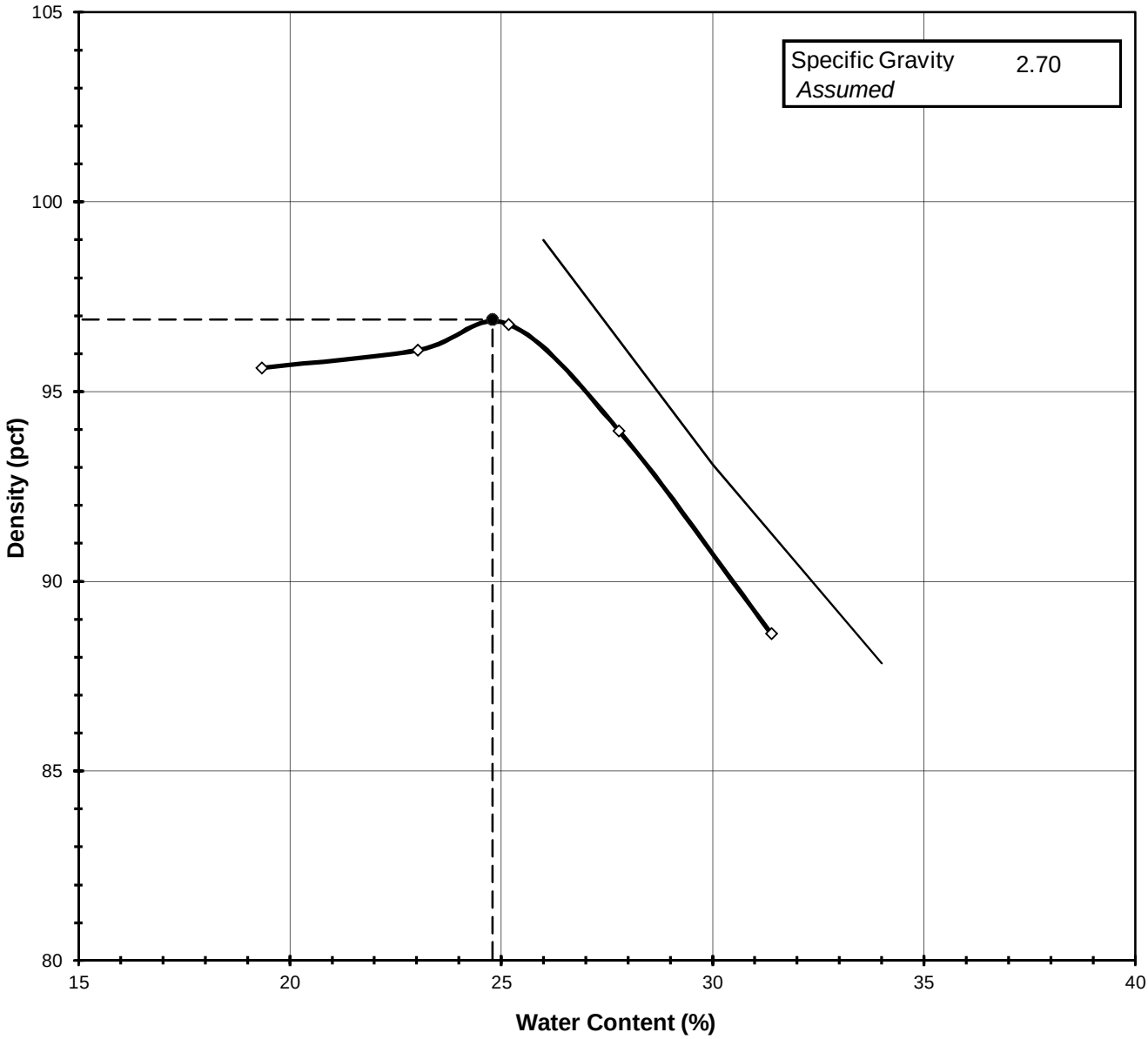
MOISTURE DENSITY RELATIONSHIP

ASTM D698-12

Client:	HDR ENGINEERING, INC.	Boring No.:	N/A
Client Reference:	Brickhaven No.2 Mine	Depth (ft):	N/A
Project No.:	2015-664-09	Sample No.:	SF-07
Lab ID:	2015-664-09-02	Test Method	**STANDARD**

Visual Description: REDDISH CLAY

Optimum Water Content	**24.8**
Maximum Dry Density	**96.9**



Tested By *LW/BW* *Date* *6/30/15* *Checked By* *SFS* *Date* 7/3/15

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MOISTURE - DENSITY RELATIONSHIP

ASTM D698-12

Client:	HDR ENGINEERING, INC.	Boring No.:	N/A
Client Reference:	Brickhaven No.2 Mine	Depth (ft):	N/A
Project No.:	2015-664-09	Sample No.:	SF-07
Lab ID:	2015-664-09-02		

Visual Description: REDDISH CLAY

Total Weight of the Sample (g)	24400
As Received Water Content (%)	NA
Assumed Specific Gravity	2.70
Percent Retained on 3/4"	NA
Percent Retained on 3/8"	NA
Percent Retained on #4	NA
Oversize Material	Not included
Procedure Used	A

Test Type		**STANDARD**
Rammer Weight (lb)		5.5
Rammer Drop (in)		12
Rammer Type		MECHANICAL
Machine ID	R	174
Mold ID	R	461
Mold diameter		4"
Weight of the Mold (g)		4174
Volume of the Mold (cm^3)		942

Mold / Specimen

Point No.	**1**	**2**	**3**	**4**	**5**
Wt. of Mold & Wet Sample (g)	5896	5958	6002	5986	5931
Wt.of Mold (g)	4174	4174	4174	4174	4174
Wt. of Wet Sample (g)	1723	1785	1829	1813	1758
Mold Volume (cm^3)	942	942	942	942	942

Moisture Content / Density

Tare Number	819	826	866	307	312
Wt. of Tare & Wet Sample (g)	426.50	461.00	428.50	559.90	492.20
Wt. of Tare & Dry Sample (g)	378.60	399.80	359.70	462.00	394.70
Wt. of Tare (g)	130.90	134.10	86.50	109.70	84.10
Wt. of Water (g)	47.90	61.20	68.80	97.90	97.50
Wt. of Dry Sample (g)	247.70	265.70	273.20	352.30	310.60

Wet Density (g/cm^3)	1.83	1.89	1.94	1.92	1.87
Wet Density (pcf)	114.1	118.2	121.1	120.1	116.4
Moisture Content (%)	**19.3**	**23.0**	**25.2**	**27.8**	**31.4**
Dry Density (pcf)	**95.6**	**96.1**	**96.8**	**94.0**	**88.6**

Zero Air Voids

Moisture Content (%)	26.0	30.0	34.0
Dry Unit Weight (pcf)	99.0	93.1	87.8

Tested By *LW/BW* *Date* *6/30/15* *Checked By* *SFS* *Date* 7/3/15

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July 21, 2015

Project No. 2015-664-14

Mr. Michael Plummer, P.E.
HDR Engineering, Inc.
440 South Church St., Suite 1000
Charlotte, NC 28202

Transmittal
Laboratory Test Results
Brickhaven No. 2 Mine

Please find attached the laboratory test results for the above referenced project. The tests were outlined on the Project Verification Form that was transmitted to your firm prior to the testing. The testing was performed in general accordance with the methods listed on the enclosed data sheets. The test results are believed to be representative of the samples that were submitted for testing and are indicative only of the specimens which were evaluated. We imply no position with regard to the nature of the test results, i.e. pass/fail and no claims as to the suitability of the material for its intended use.

The test data and all associated project information provided shall be held in strict confidence and disclosed to other parties only with authorization by our Client. The test data submitted herein is considered integral with this report and is not to be reproduced except in whole and only with the authorization of the Client and Geotechnics. The remaining sample materials for this project will be retained for a minimum of 90 days as directed by the Geotechnics' Quality Program.

We are pleased to provide these testing services. Should you have any questions or if we may be of further assistance, please contact our office.

Respectively submitted,
Geotechnics, Inc.

Michael P. Smith
Regional Manager

We understand that you have a choice in your laboratory services and we thank you for choosing Geotechnics.

DCN: Data Transmittal Letter Date: 1/28/05 Rev.: 1

ATTERBERG LIMITS

ASTM D 4318-10 / AASHTO T89-10

Client:	HDR ENGINEERING, INC.	Boring No.:	N/A
Client Reference:	Brickhaven No.2 Mine	Depth (ft):	N/A
Project No.:	2015-664-14	Sample No.:	SF-08
Lab ID:	2015-664-14-01	Soil Description:	**RED LEAN CLAY**

Note: The USCS symbol used with this test refers only to the minus No. 40 sieve material. See the "Sieve and Hydrometer Analysis" graph page for the complete material description. (Minus No. 40 sieve material, Airdried)

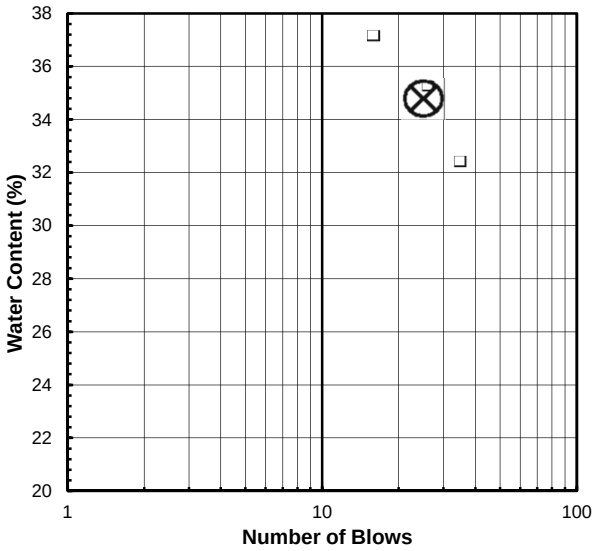
Liquid Limit Test	**1**	**2**	**3**	
Tare Number	B-B	S	F	**MULTIPOINT**
Wt. of Tare & Wet Sample (g)	33.96	31.89	31.88	
Wt. of Tare & Dry Sample (g)	29.47	27.54	27.35	
Wt. of Tare (g)	15.61	15.19	15.15	
Wt. of Water (g)	4.5	4.4	4.5	
Wt. of Dry Sample (g)	13.9	12.4	12.2	
Moisture Content (%)	**32.4**	**35.2**	**37.1**	
Number of Blows	**35**	**26**	**16**	

Plastic Limit Test	**1**	**2**	**Range**
Tare Number	A-P	B	
Wt. of Tare & Wet Sample (g)	22.01	22.29	
Wt. of Tare & Dry Sample (g)	21.03	21.20	
Wt. of Tare (g)	15.65	15.22	
Wt. of Water (g)	1.0	1.1	
Wt. of Dry Sample (g)	5.4	6.0	
Moisture Content (%)	**18.2**	**18.2**	**0.0**

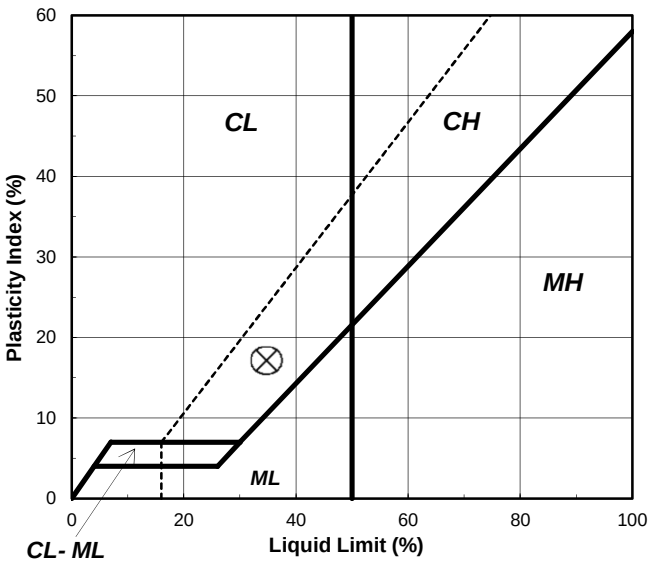
Note: The acceptable range of the two Moisture contents is ± 2.6

Test Results	
Liquid Limit (%)	**35**
Plastic Limit (%)	**18**
Plasticity Index (%)	**17**
USCS Symbol	**CL**

Flow Curve



Plasticity Chart



Tested By	*HM*	*Date*	*7/16/15*	*Checked By*	*SFS*	*Date*	7/17/15

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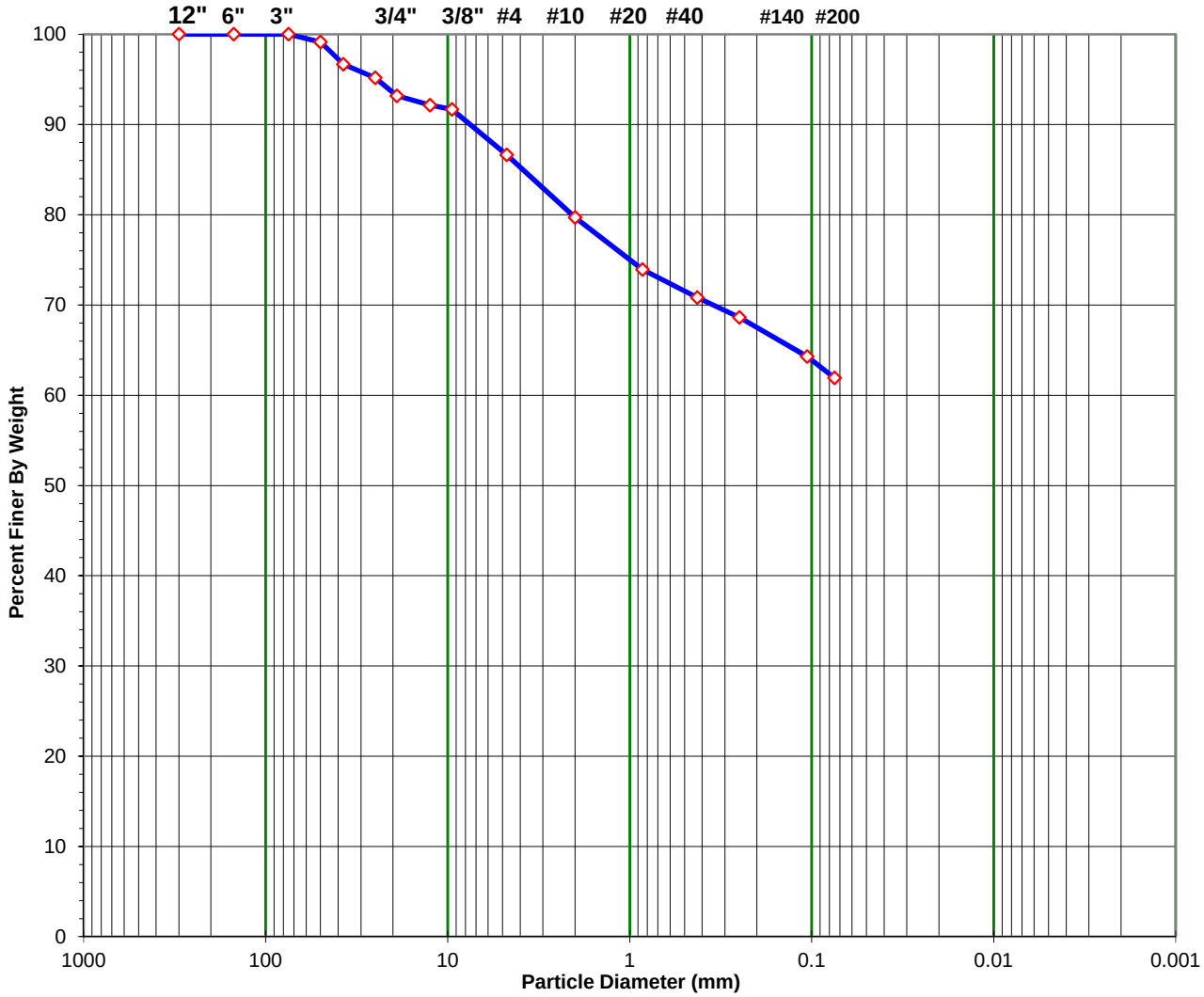
SIEVE ANALYSIS
ASTM D 422-63 (2007)

Client	HDR ENGINEERING, INC.	Boring No.:	N/A
Client Reference	Brickhaven No.2 Mine	Depth (ft):	N/A
Project No.	2015-664-14	Sample No.:	SF-08
Lab ID	2015-664-14-001	Soil Color:	**RED**

	SIEVE ANALYSIS		*HYDROMETER*
USCS	**gravel**	**sand**	**silt and clay**



USCS Symbol ***CL, TESTED***

USCS Classification ***SANDY LEAN CLAY***

Tested By HM Date 7/20/15 Checked By SFS Date 7/21/15

DCN: CT-S3A DATE 6-25-98 REVISION 2 *2015 PROJECTS\2015-664 HDR ENGINEERING - BRICKHAVEN\[2015-664-14-01 J-SIEVEON.xls]Sheet1*

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WASH SIEVE ANALYSIS

ASTM D 422-63 (2007)

Client	HDR ENGINEERING, INC.	Boring No.:	N/A
Client Reference	Brickhaven No.2 Mine	Depth (ft):	N/A
Project No.	2015-664-14	Sample No.:	SF-08
Lab ID	2015-664-14-001	Soil Color:	RED

Moisture Content of Passing 3/4" Material		Water Content of Retained 3/4" Material	
Tare No.	319	Tare No.	163
Wgt.Tare + Wet Specimen (gm)	1459.31	Wgt.Tare + Wet Specimen (gm)	1500.00
Wgt.Tare + Dry Specimen (gm)	1400.06	Wgt.Tare + Dry Specimen (gm)	1456.96
Weight of Tare (gm)	208.93	Weight of Tare (gm)	240.30
Weight of Water (gm)	59.25	Weight of Water (gm)	43.04
Weight of Dry Soil (gm)	1191.13	Weight of Dry Soil (gm)	1216.66
Moisture Content (%)	**5.0**	**Moisture Content (%)**	**3.5**

Wet Weight -3/4" Sample (gm)	17000	Weight of the Dry Specimen (gm)	1191.13
Dry Weight - 3/4" Sample (gm)	16194.4	Weight of minus #200 material (gm)	791.32
Wet Weight +3/4" Sample (gm)	1225.61	Weight of plus #200 material (gm)	399.81
Dry Weight + 3/4" Sample (gm)	1183.73		
Total Dry Weight Sample (gm)	17378.2	**J - Factor (Percent Finer than 3/4")**	**0.9319**

Sieve Size	Sieve Opening (mm)	Wgt.of Soil Retained (gm)		Percent Retained (%)	Accumulated Percent Retained (%)	Percent Finer (%)	**Accumulated Percent Finer (%)**
12"	300	0.00		0.0	0.0	100.0	**100.0**
6"	150	0.00		0.0	0.0	100.0	**100.0**
3"	75	0.00		0.0	0.0	100.0	**100.0**
2"	50	151.36	(*)	0.8	0.8	99.2	**99.2**
1 1/2"	37.5	447.97		2.5	3.3	96.7	**96.7**
1"	25	269.75		1.5	4.8	95.2	**95.2**
3/4"	19	356.53		2.0	6.8	93.2	**93.2**
1/2"	12.5	13.39		1.1	1.1	98.9	**92.1**
3/8"	9.5	6.14		0.5	1.6	98.4	**91.7**
#4	4.75	64.05		5.4	7.0	93.0	**86.6**
#10	2	88.80		7.5	14.5	85.5	**79.7**
#20	0.85	73.61	(**)	6.2	20.7	79.3	**73.9**
#40	0.425	39.67		3.3	24.0	76.0	**70.8**
#60	0.25	28.16		2.4	26.3	73.7	**68.6**
#140	0.106	55.60		4.7	31.0	69.0	**64.3**
#200	0.075	30.39		2.6	33.6	66.4	**61.9**
Pan	-	791.32		66.4	100.0	-	**-**

Notes : *(*) The + 3/4" sieve analysis is based on the Total Dry Weight of the Sample*
*(**) The - 3/4" sieve analysis is based on the Weight of the Dry Specimen*

Tested By HM Date 7/20/15 Checked By SFS Date 7/21/15

DCN: CT-S3A DATE 5-17-00 REVISION 3 *2015 PROJECTS\2015-664 HDR ENGINEERING - BRICKHAVEN\[2015-664-14-01 J-SIEVEON.xls]Sheet1*

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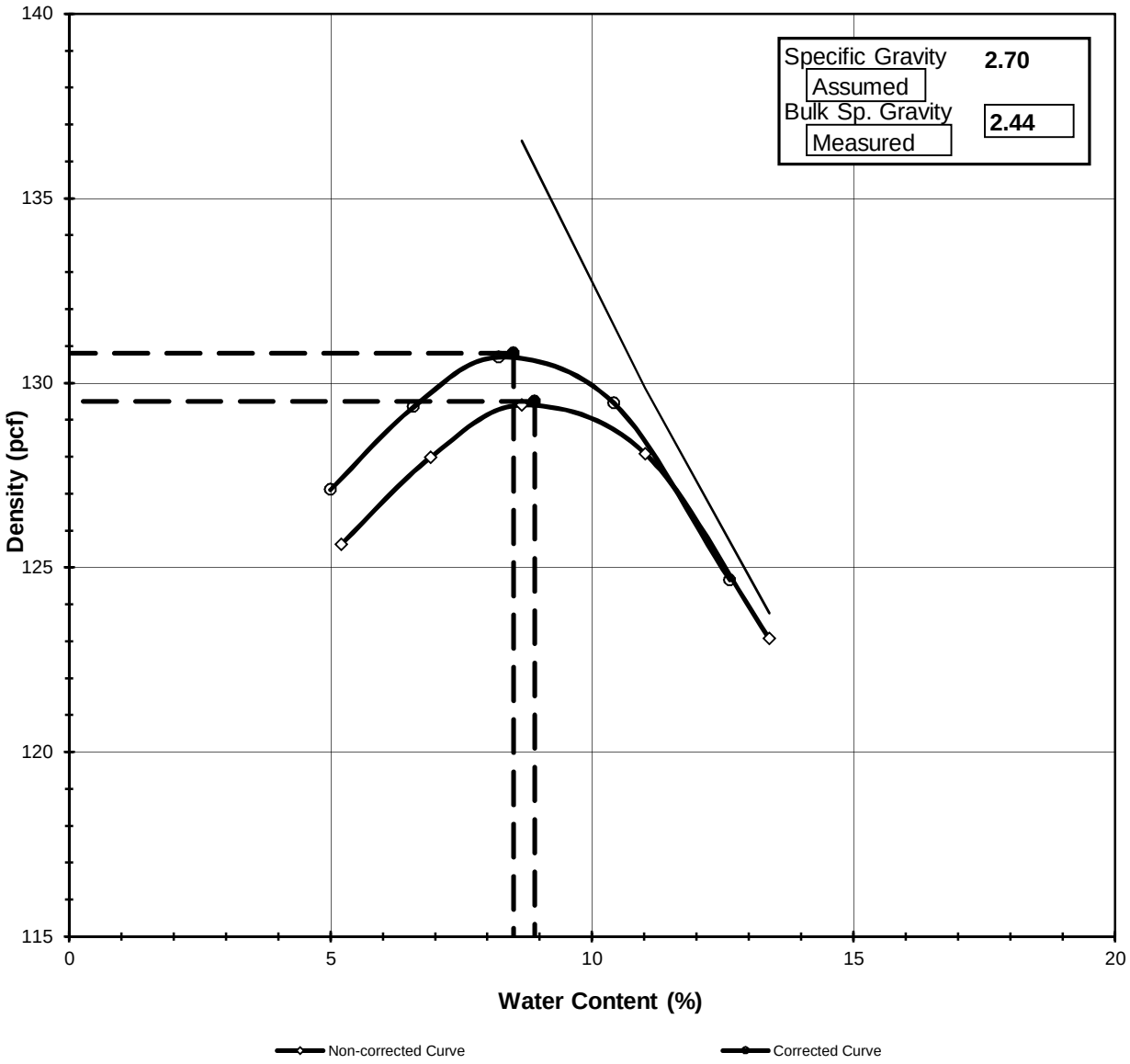
MOISTURE - DENSITY RELATIONSHIP
ASTM D 4718, D 698-91 (SOP-S12,S39)

ASTM D 4718-87, D 698-07e1

Client	HDR ENGINEERING, INC.	Boring No.	N/A
Client Reference	Brickhaven No.2 Mine	Depth (ft)	N/A
Project No.	2015-664-14	Sample No.	SF-08
Lab ID	2015-664-14-01	Test Method	STANDARD

Visual Description DARK RED CLAY WITH ROCK

Optimum Water Content	**8.9**	**Corrected Water Content**	**8.5**
Maximum Dry Density	**129.5**	**Corrected Dry Density**	**130.8**



Tested By EL *Date* 7/14/15 *Checked By* GEM *Date* 7/18/15

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MOISTURE - DENSITY RELATIONSHIP
ASTM D 4718, D 698-91 (SOP-S12,S39)

ASTM D 4718-87, D 698-07e1

Client	HDR ENGINEERING, INC.	Boring No.	N/A
Client Reference	Brickhaven No.2 Mine	Depth (ft)	N/A
Project No.	2015-664-14	Sample No.	SF-08
Lab ID	2015-664-14-01		

Visual Description DARK RED CLAY WITH ROCK

Total Weight of the Sample (gm)	19700
As Received Water Content(%)	NA
Assumed Specific Gravity(gm/cc)	2.70

Percent Retained on 3/4" (Dry)	6.60
Percent Retained on 3/8" (Dry)	NA
Percent Retained on #4 (Dry)	NA
Oversize Material	Not included
Procedure Used	C

TestType		**STANDARD**
Rammer Weight (lbs)		5.5
Rammer Drop (in)		12
Rammer Type		Mechanical
Machine ID	R	174
Mold ID	R	173
Mold diameter		6"
Weight of the Mold		5534
Volume Of the Mold		2119

Mold/Specimen

Point No.	**1**	**2**	**3**	**4**	**5**
Wt. of Mold & WS (gm)	10024	10182	10310	10364	10274
Wt.of Mold (gm)	5534	5534	5534	5534	5534
Wt. of WS	4489	4648	4775	4830	4740
Mold Volume (cc)	2119	2119	2119	2119	2119

Moisture Content/Density

Tare Number	310	310	300	398	300
Wt. of Tare & WS (gm)	751.14	752.60	761.20	754.40	725.33
Wt. of Tare & DS (gm)	719.40	711.03	709.38	687.89	652.78
Wt. of Tare (gm)	109.70	109.50	110.70	83.90	110.70
Wt. of Water (gm)	31.74	41.57	51.82	66.51	72.55
Wt. of DS (gm)	609.70	601.53	598.68	603.99	542.08

Wet Density (gm/cc)	2.12	2.19	2.25	2.28	2.24
Wet Density (pcf)	132.2	136.8	140.6	142.2	139.6
Moisture Content (%)	**5.2**	**6.9**	**8.7**	**11.0**	**13.4**
Dry Density (pcf)	**125.6**	**128.0**	**129.4**	**128.1**	**123.1**

Zero Air Voids

Moisture Content (%)	8.7	11.0	13.4
Dry Unit Weight (pcf)	136.6	129.9	123.8

Tested By *EL* *Date* *7/14/15* *Checked By* *MPS* *Date* 7/18/15

DCN:CT-S 39 DATE:2/28/01 Revision 6 *Z:\2015 PROJECTS\2015-664 HDR ENGINEERING - BRICKHAVEN\[2015-664-14-01 Proctor rock correction.xls]Sheet1*

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SPECIFIC GRAVITY OF OVERSIZE PARTICLES
FOR CORRECTION OF MOISTURE - DENSITY RELATIONSHIP

ASTM C127-07

Client	HDR ENGINEERING, INC.	Boring No.	N/A
Client Reference	Brickhaven No.2 Mine	Depth (ft)	N/A
Project No.	2015-664-14	Sample No.	SF-08
Lab ID	2015-664-14-01		

Visual Description: DARK BROWN GRAVEL

Total dry weight of sample 19700.0

COARSE PORTION			**FINE PORTION**	
Total wet wt. of +3/4" portion	1300.0	(gm)	Total wet wt. of -3/4" portion	18400.0
Total dry wt. of +3/4" portion	1300.00	(gm)	Total dry wt. of -3/4" portion	18400.00
% +3/4" by dry weight	6.6		% -3/4" by dry weight	93.40

MOISTURE CONTENT OF +3/4" PORTION		*MOISTURE CONTENT OF -3/4" PORTION*	
Tare Number	NA	Tare Number	NA
Wt. of Tare & WS (gm)	NA	Wt. of Tare & WS (gm)	NA
Wt. of Tare & DS (gm)	NA	Wt. of Tare & DS (gm)	NA
Wt. of Tare (gm)	NA	Wt. of Tare (gm)	NA
Wt. of Water (gm)	NA	Wt. of Water (gm)	NA
Wt. of DS (gm)	NA	Wt. of DS (gm)	NA
Water Content (%)	NA		NA

SPECIFIC GRAVITY DETERMINATION

Weight of Basket in Air (gm)	1274
Weight of Saturated Surface Dried Sample + Basket in Air (gm)	2546
Weight of Saturated Surface Dried Sample in Air (gm)	1273
Weight of Basket in Water (gm)	1100
Weight of Saturated Sample + Basket in Water (gm)	1875
Weight of Saturated Sample in Water (gm)	775
Tare No.	163
Weight of Tare and Dried Sample (gm)	1456.96
Weight of Tare (gm)	240.3
Weight of Dried Soil (gm)	1216.7

Bulk Specific Gravity(+3/4") **2.44**

Tested By *BW* *Date* *7/16/15* *Checked By* *SFS* *Date* 7/17/15

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August 7, 2015

Project No. 2015-664-15

Mr. Michael Plummer, P.E.
HDR Engineering, Inc.
440 South Church St., Suite 1000
Charlotte, NC 28202

Transmittal
Laboratory Test Results
Brickhaven No. 2 Mine

Please find attached the laboratory test results for the above referenced project. The tests were outlined on the Project Verification Form that was transmitted to your firm prior to the testing. The testing was performed in general accordance with the methods listed on the enclosed data sheets. The test results are believed to be representative of the samples that were submitted for testing and are indicative only of the specimens which were evaluated. We imply no position with regard to the nature of the test results, i.e. pass/fail and no claims as to the suitability of the material for its intended use.

The test data and all associated project information provided shall be held in strict confidence and disclosed to other parties only with authorization by our Client. The test data submitted herein is considered integral with this report and is not to be reproduced except in whole and only with the authorization of the Client and Geotechnics. The remaining sample materials for this project will be retained for a minimum of 90 days as directed by the Geotechnics' Quality Program.

We are pleased to provide these testing services. Should you have any questions or if we may be of further assistance, please contact our office.

Respectively submitted,
Geotechnics, Inc.

Michael P. Smith
Regional Manager

We understand that you have a choice in your laboratory services and we thank you for choosing Geotechnics.

DCN: Data Transmittal Letter Date: 1/28/05 Rev.: 1

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MOISTURE CONTENT

ASTM D 2216-10

Client:	HDR, INC.
Client Reference:	BRICKHAVEN NO. 2 MINE
Project No.:	2015-664-015

Lab ID:	001
Boring No.:	NA
Depth (ft):	NA
Sample No.:	SF-09
Tare Number	842
Wt. of Tare & Wet Sample (g)	890.73
Wt. of Tare & Dry Sample (g)	840.98
Weight of Tare (g)	256.14
Weight of Water (g)	49.75
Weight of Dry Sample (g)	584.84
Water Content (%)	**8.5**

Notes :

Tested By	*NPL*	*Date*	*8/6/15*	*Checked By*	*GEM*	*Date*	*8/7/15*

DCN: CT-S1 DATE: 3/18/13 REVISION: 4

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ATTERBERG LIMITS

ASTM D 4318-10 / AASHTO T89-10

Client:	HDR ENGINEERING, INC.	Boring No.:	NA
Client Reference:	BRICKHAVEN NO. 2 MINE	Depth (ft):	NA
Project No.:	2015-664-15	Sample No.:	SF-09
Lab ID:	2015-664-15-001	Soil Description:	**BROWN LEAN CLAY**

Note: The USCS symbol used with this test refers only to the minus No. 40 sieve material. See the "Sieve and Hydrometer Analysis" graph page for the complete material description. (Minus No. 40 sieve material, Airdried)

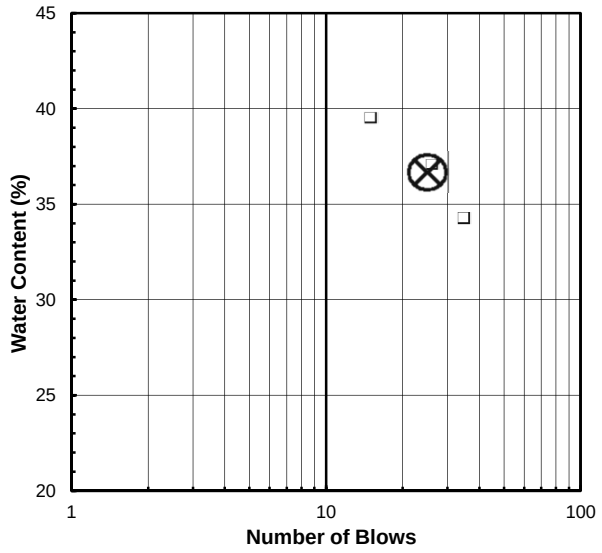
Liquid Limit Test	**1**	**2**	**3**	
Tare Number	L	A-O	A-C	**MULTIPOINT**
Wt. of Tare & Wet Sample (g)	27.92	26.73	27.88	
Wt. of Tare & Dry Sample (g)	24.71	23.69	24.41	
Wt. of Tare (g)	15.33	15.48	15.62	
Wt. of Water (g)	3.2	3.0	3.5	
Wt. of Dry Sample (g)	9.4	8.2	8.8	
Moisture Content (%)	**34.2**	**37.0**	**39.5**	
Number of Blows	**35**	**26**	**15**	

Plastic Limit Test	**1**	**2**	**Range**
Tare Number	B1	B2	
Wt. of Tare & Wet Sample (g)	22.15	23.01	
Wt. of Tare & Dry Sample (g)	20.95	21.58	
Wt. of Tare (g)	15.63	15.41	
Wt. of Water (g)	1.2	1.4	
Wt. of Dry Sample (g)	5.3	6.2	
Moisture Content (%)	**22.6**	**23.2**	**-0.6**

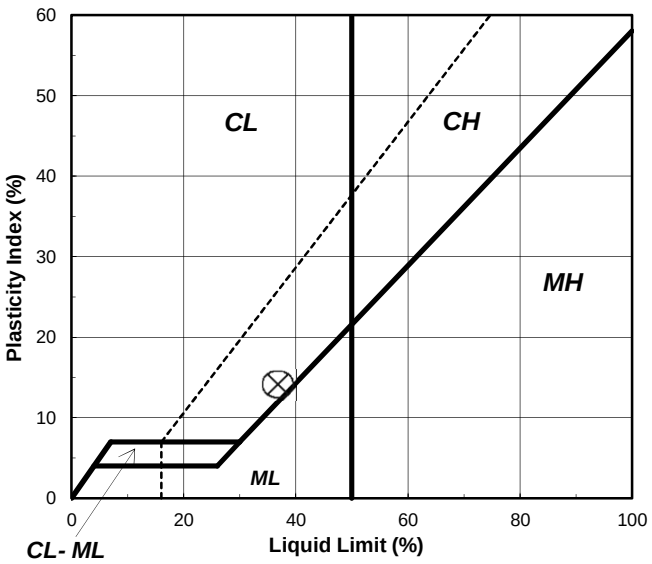
Note: The acceptable range of the two Moisture contents is ± 2.6

Test Results	
Liquid Limit (%)	**37**
Plastic Limit (%)	**23**
Plasticity Index (%)	**14**
USCS Symbol	**CL**

Flow Curve



Plasticity Chart



Tested By	*BW*	*Date*	*8/4/15*	*Checked By*	*GEM*	*Date*	8/5/15

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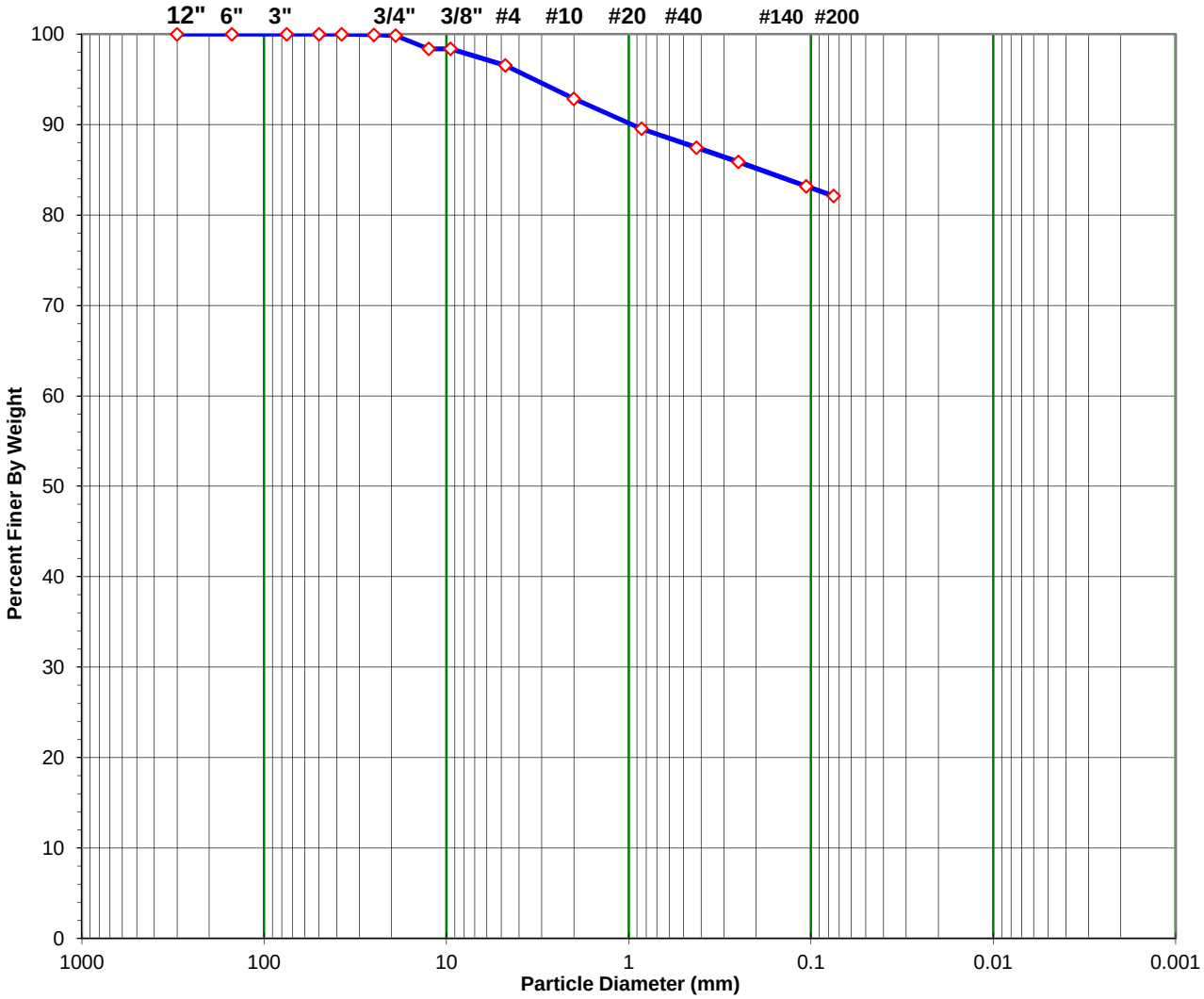
SIEVE ANALYSIS
ASTM D 422-63 (2007)

Client	HDR ENGINEERING, INC.	Boring No.	NA
Client Reference	BRICKHAVEN NO. 2 MINE	Depth (ft)	NA
Project No.	2015-664-15	Sample No.	SF-09
Lab ID	2015-664-15-001	Soil Color	**BROWN**

	SIEVE ANALYSIS		***HYDROMETER***
USCS	**gravel**	**sand**	**silt and clay**



USCS Symbol ***CL, TESTED***

USCS Classification ***LEAN CLAY WITH SAND***

Tested By APG Date 8/3/15 Checked By GEM Date 8/5/15

DCN: CT-S3A DATE 6-25-98 REVISION 2 *N:\2015 PROJECTS\2015-664 HDR ENGINEERING - BRICKHAVEN\[2015-664-15-001 J-SIEVEON.xls]Sheet1*

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WASH SIEVE ANALYSIS

ASTM D 422-63 (2007)

Client	HDR ENGINEERING, INC.	Boring No.	NA
Client Reference	BRICKHAVEN NO. 2 MINE	Depth (ft)	NA
Project No.	2015-664-15	Sample No.	SF-09
Lab ID	2015-664-15-001	Soil Color	**BROWN**

Moisture Content of Passing 3/4" Material		Water Content of Retained 3/4" Material	
Tare No.	217	Tare No.	216
Wgt.Tare + Wet Specimen (gm)	1969.34	Wgt.Tare + Wet Specimen (gm)	1764.07
Wgt.Tare + Dry Specimen (gm)	1838.50	Wgt.Tare + Dry Specimen (gm)	1681.23
Weight of Tare (gm)	170.95	Weight of Tare (gm)	170.47
Weight of Water (gm)	130.84	Weight of Water (gm)	82.84
Weight of Dry Soil (gm)	1667.55	Weight of Dry Soil (gm)	1510.76
Moisture Content (%)	**7.8**	**Moisture Content (%)**	**5.5**

Wet Weight -3/4" Sample (gm)	24989	Weight of the Dry Specimen (gm)	1667.55
Dry Weight - 3/4" Sample (gm)	23171.0	Weight of minus #200 material (gm)	1371.42
Wet Weight +3/4" Sample (gm)	39.30	Weight of plus #200 material (gm)	296.13
Dry Weight + 3/4" Sample (gm)	37.26		
Total Dry Weight Sample (gm)	23208.2	**J - Factor (Percent Finer than 3/4")**	**0.9984**

Sieve Size	Sieve Opening (mm)	Wgt.of Soil Retained (gm)		Percent Retained (%)	Accumulated Percent Retained (%)	Percent Finer (%)	**Accumulated Percent Finer (%)**
12"	300	0.00		0.0	0.0	100.0	**100.0**
6"	150	0.00		0.0	0.0	100.0	**100.0**
3"	75	0.00		0.0	0.0	100.0	**100.0**
2"	50	0.00	(*)	0.0	0.0	100.0	**100.0**
1 1/2"	37.5	0.00		0.0	0.0	100.0	**100.0**
1"	25	18.94		0.1	0.1	99.9	**99.9**
3/4"	19	20.36		0.1	0.2	99.8	**99.8**
1/2"	12.5	24.49		1.5	1.5	98.5	**98.4**
3/8"	9.5	0.00		0.0	1.5	98.5	**98.4**
#4	4.75	30.62		1.8	3.3	96.7	**96.5**
#10	2	61.37		3.7	7.0	93.0	**92.9**
#20	0.85	55.42	(**)	3.3	10.3	89.7	**89.5**
#40	0.425	35.00		2.1	12.4	87.6	**87.5**
#60	0.25	26.35		1.6	14.0	86.0	**85.9**
#140	0.106	45.15		2.7	16.7	83.3	**83.2**
#200	0.075	17.73		1.1	17.8	82.2	**82.1**
Pan	-	1371.42		82.2	100.0	-	**-**

Notes : *(*) The + 3/4" sieve analysis is based on the Total Dry Weight of the Sample*
*(**) The - 3/4" sieve analysis is based on the Weight of the Dry Specimen*

Tested By APG Date 8/3/15 Checked By GEM Date 8/5/15

DCN: CT-S3A DATE 5-17-00 REVISION 3 *2015 PROJECTS\2015-664 HDR ENGINEERING - BRICKHAVEN\[2015-664-15-001 J-SIEVEON.xls]Sheet1*

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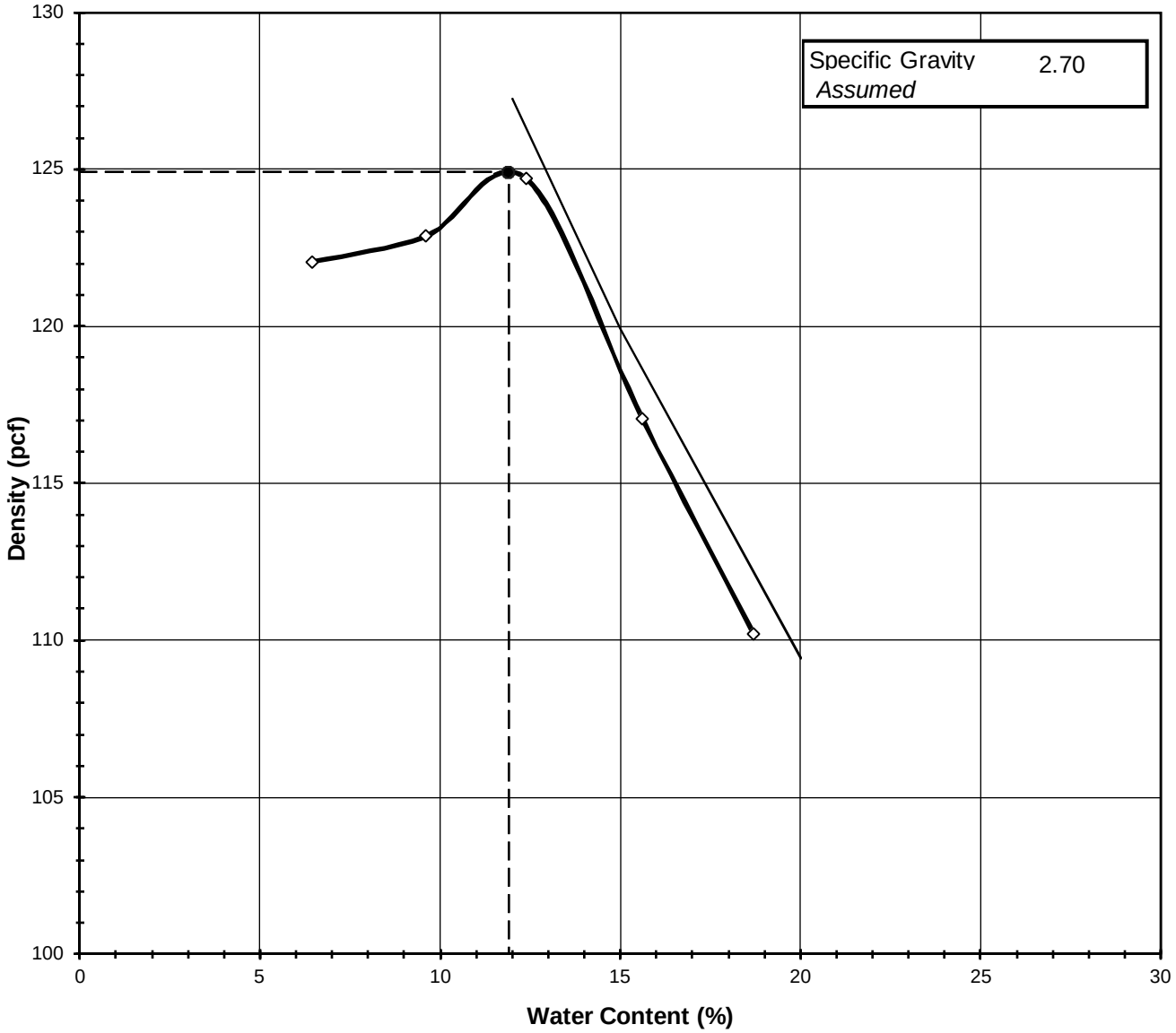
MOISTURE DENSITY RELATIONSHIP

ASTM D698-12

Client:	HDR ENGINEERING, INC.	Boring No.:	NA
Client Reference:	BRICKHAVEN NO. 2 MINE	Depth (ft):	NA
Project No.:	2015-664-15	Sample No.:	SF-09
Lab ID:	2015-664-15-001	Test Method	**STANDARD**

Visual Description: BROWN LEAN CLAY WITH SAND

Optimum Water Content	**11.9**
Maximum Dry Density	**124.9**



Tested By NPL *Date* 8/5/15 *Checked By* GEM *Date* 8/6/15

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MOISTURE - DENSITY RELATIONSHIP

ASTM D698-12

Client:	HDR ENGINEERING, INC.	Boring No.:	NA
Client Reference:	BRICKHAVEN NO. 2 MINE	Depth (ft):	NA
Project No.:	2015-664-15	Sample No.:	SF-09
Lab ID:	2015-664-15-001		

Visual Description: BROWN LEAN CLAY WITH SAND

Total Weight of the Sample (g)	25100
As Received Water Content (%)	NA
Assumed Specific Gravity	2.70
Percent Retained on 3/4"	NA
Percent Retained on 3/8"	NA
Percent Retained on #4	NA
Oversize Material	Not included
Procedure Used	C

Test Type		**STANDARD**
Rammer Weight (lb)		5.5
Rammer Drop (in)		12
Rammer Type		MECHANICAL
Machine ID	R	174
Mold ID	R	173
Mold diameter		4"
Weight of the Mold (g)		5534
Volume of the Mold (cm^3)		2119

Mold / Specimen

Point No.	**1**	**2**	**3**	**4**	**5**
Wt. of Mold & Wet Sample (g)	9947	10108	10294	10130	9977
Wt.of Mold (g)	5534	5534	5534	5534	5534
Wt. of Wet Sample (g)	4413	4574	4760	4596	4443
Mold Volume (cm^3)	2119	2119	2119	2119	2119

Moisture Content / Density

Tare Number	312	826	819	822	816
Wt. of Tare & Wet Sample (g)	563.60	520.80	497.40	463.80	493.60
Wt. of Tare & Dry Sample (g)	534.50	486.90	457.00	419.80	437.00
Wt. of Tare (g)	84.30	134.20	130.80	138.10	134.40
Wt. of Water (g)	29.10	33.90	40.40	44.00	56.60
Wt. of Dry Sample (g)	450.20	352.70	326.20	281.70	302.60

Wet Density (g/cm^3)	2.08	2.16	2.25	2.17	2.10
Wet Density (pcf)	129.9	134.7	140.1	135.3	130.8
Moisture Content (%)	**6.5**	**9.6**	**12.4**	**15.6**	**18.7**
Dry Density (pcf)	**122.0**	**122.9**	**124.7**	**117.0**	**110.2**

Zero Air Voids

Moisture Content (%)	12.0	15.0	20.0
Dry Unit Weight (pcf)	127.3	119.9	109.4

Tested By *NPL* *Date* *8/5/15* *Checked By* *GEM* *Date* 8/6/15

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B4

B4 – Structural Fill Field Nuclear Gauge Testing

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Client: HDR, Inc.
Project Name : Brickhaven
Project Number : 2016-600

Field Density Report

Report Number :	**SFFDR-1 Cell 1C**	Geotechnics Representative :	Erik Lindquist	Page :	1 of 1
Date (s) :	2/7/16-2/13/16	Reviewed By :	Shannon Sisell	Date :	2/22/16

Contractor :	Charah	Borrow Source :	On Site

Compaction Equipment :	Cat D6N Dozer, Sheeps foot -CAT CP56B, Case SV212 Smooth drum roller

Test Number	Northing	Easting	Elevation/ Lift	Rod Depth	Proctor I.D. No.	Proctor Data		Measured In Place			Compaction		Comments, Subcell
						MDD pcf	Opt. %M	WD (pcf)	% M	DD (pcf)	% C	% Req.	
ND- 1	674071.886	1993793.246	Subgrade	6"	664-01-06	126.8	10.2	**137.1**	**13.6**	**120.7**	**95.2%**	**95.0%**	2/10/16, Subcell 2
ND- 2	674122.829	1993858.654	Subgrade	6"	664-01-06	126.8	10.2	**137.1**	**13.6**	**120.7**	**95.2%**	**95.0%**	2/10/16, Subcell 5
ND- 3	674148.292	1993930.001	Subgrade	6"	664-01-06	126.8	10.2	**140.4**	**14.6**	**122.5**	**96.6%**	**95.0%**	2/10/16, Subcell 6
ND- 4	674191.953	1994010.269	Subgrade	6"	664-01-06	126.8	10.2	**139.8**	**15.4**	**121.1**	**95.5%**	**95.0%**	2/10/16, Subcell 8
ND- 5	674235.613	1994093.510	Subgrade	6"	664-01-06	126.8	10.2	**136.0**	**12.5**	**120.9**	**95.3%**	**95.0%**	2/10/16, Subcell 7
DC- 1	674279.273	1994176.751	Subgrade	6"	664-01-06	126.8	10.2	**136.1**	**13.1**	**120.3**	**95.0%**	**95.0%**	2/10/16, Subcell 7
ND- 6	674279.273	1994176.751	Subgrade	6"	664-01-06	126.8	10.2	**136.9**	**13.4**	**120.7**	**95.2%**	**95.0%**	2/10/16, Subcell 18
ND- 7	674362.995	1994141.096	Subgrade	6"	664-01-06	126.8	10.2	**137.4**	**11.6**	**123.1**	**97.1%**	**95.0%**	2/10/16, Subcell 19
ND- 8	674435.798	1994096.523	Subgrade	6"	664-01-06	126.8	10.2	**135.5**	**12.2**	**120.8**	**95.2%**	**95.0%**	2/10/16, Subcell 26
ND- 9	674322.964	1994108.390	Subgrade	6"	664-01-06	126.8	10.2	**139.8**	**12.3**	**124.5**	**98.2%**	**95.0%**	2/10/16, Subcell 17
ND- 10	674312.059	1994037.047	Subgrade	6"	664-01-06	126.8	10.2	**139.1**	**11.8**	**124.4**	**98.1%**	**95.0%**	2/10/16, Subcell 16
DC- 2	674253.842	1993944.885	Subgrade	6"	664-01-06	126.8	10.2	**137.3**	**12.0**	**122.6**	**96.7%**	**95.0%**	2/10/16, Subcell 16
ND- 11	674253.842	1993944.885	Subgrade	6"	664-01-06	126.8	10.2	**138.3**	**10.9**	**124.7**	**98.3%**	**95.0%**	2/10/16, Subcell 9
ND- 12	674239.300	1993861.650	Subgrade	6"	664-01-06	126.8	10.2	**138.2**	**13.1**	**122.2**	**96.4%**	**95.0%**	2/10/16, Subcell 10
ND- 13	674170.161	1993787.322	Subgrade	6"	664-01-06	126.8	10.2	**140.0**	**12.6**	**124.3**	**98.1%**	**95.0%**	2/10/16, Subcell 4
ND- 14	674235.676	1993787.335	Subgrade	6"	664-01-06	126.8	10.2	**138.2**	**11.7**	**123.7**	**97.6%**	**95.0%**	2/10/16, Subcell 11
ND- 15	674297.537	1993858.690	Subgrade	6"	664-01-06	126.8	10.2	**139.7**	**12.5**	**124.2**	**97.9%**	**95.0%**	2/10/16, Subcell 14
DC- 3	674337.559	1993930.040	Subgrade	6"	664-01-06	126.8	10.2	**138.2**	**12.9**	**122.4**	**96.5%**	**95.0%**	2/10/16, Subcell 14
ND- 16	674337.559	1993930.040	Subgrade	6"	664-01-06	126.8	10.2	**137.7**	**12.3**	**122.6**	**96.7%**	**95.0%**	2/10/16, Subcell 21
ND- 17	674381.220	1994007.335	Subgrade	6"	664-01-06	126.8	10.2	**139.5**	**14.0**	**122.4**	**96.5%**	**95.0%**	2/10/16, Subcell 25
ND- 18	674315.700	1994031.102	Subgrade	6"	664-01-06	126.8	10.2	**140.1**	**11.5**	**125.7**	**99.1%**	**95.0%**	2/10/16, Subcell 20
ND- 19	674290.237	1993956.783	Subgrade	6"	664-01-06	126.8	10.2	**138.5**	**12.5**	**123.1**	**97.1%**	**95.0%**	2/10/16, Subcell 15
ND- 20	674563.204	1994025.207	Subgrade	6"	664-01-06	126.8	10.2	**134.9**	**11.0**	**121.5**	**95.8%**	**95.0%**	2/12/16, Subcell 27
DC- 4	674563.204	1994025.207	Subgrade	6"	664-01-06	126.8	10.2	**134.5**	**11.8**	**120.3**	**95.0%**	**95.0%**	2/12/16, Subcell 27
ND- 21	674159.184	1994066.742	Subgrade	6"	664-01-06	126.8	10.2	**136.9**	**12.6**	**121.6**	**95.9%**	**95.0%**	2/12/16, Subcell 25

Gauge Number	Gauge Model	Density Count	Moisture Count
31574	3440	2171	711

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Client: HDR, Inc.
Project Name : Brickhaven
Project Number : 2016-600

Field Density Report

Report Number :	**SFFDR-02 Cell 1C**	Geotechnics Representative :	Erik Lindquist	Page :	1 of 1
Date (s) :	2/19/16	Reviewed By :	Shannon Sisell	Date :	3/1/16

Contractor :	Charah	Borrow Source :	On Site

Compaction Equipment :	Sheeps foot -CAT CP56B, Case SV212 Smooth drum roller

Test Number	Northing	Easting	Elevation/ Lift	Rod Depth	Proctor I.D. No.	Proctor Data		Measured In Place			Compaction		Comments, subcell
						MDD pcf	Opt. %M	WD (pcf)	% M	DD (pcf)	% C	% Req.	
ND- 22	674537.741	1993947.916	Subgrade	6"	664-01-06	126.8	10.2	**137.8**	**10.9**	**124.3**	**98.0%**	**95.0%**	2/19/16, Subcell 28
ND- 23	674155.574	1993921.085	Subgrade	6"	664-01-06	126.8	10.2	**137.4**	**13.6**	**121.0**	**95.4%**	**95.0%**	2/19/16, Subcell 24
ND- 24	674432.207	1993858.718	Subgrade	6"	664-01-06	126.8	10.2	**135.2**	**11.7**	**121.0**	**95.5%**	**95.0%**	2/19/16, Subcell 23
ND- 25	674392.172	1993849.792	Subgrade	6"	664-01-06	126.8	10.2	**136.9**	**13.2**	**120.9**	**95.4%**	**95.0%**	2/19/16, Subcell 22
DC- 5	674392.172	1993849.792	Subgrade	NA	664-01-06	126.8	10.2	**136.4**	**13.5**	**120.1**	**95.0%**	**95.0%**	2/19/16, Subcell 22
ND- 26	674246.613	1993701.133	Subgrade	6"	664-01-06	126.8	10.2	**140.3**	**10.7**	**126.7**	**100.0%**	**95.0%**	2/19/16, Subcell 13
ND- 27	674221.144	1993659.512	Subgrade	6"	664-01-06	126.8	10.2	**139.5**	**10.2**	**126.6**	**99.8%**	**95.0%**	2/19/16, Subcell 12
ND- 28	674148.335	1993724.893	Subgrade	6"	664-01-06	126.8	10.2	**136.7**	**13.2**	**120.8**	**95.2%**	**95.0%**	2/19/16, Subcell 3
ND- 29	674101.008	1993775.417	Subgrade	6"	664-01-06	126.8	10.2	**137.7**	**11.9**	**123.1**	**97.0%**	**95.0%**	2/19/16, Subcell 1
ND- 30	674082.797	1993834.865	Subgrade	6"	664-01-06	126.8	10.2	**137.0**	**12.3**	**122.0**	**96.2%**	**95.0%**	2/19/16, Subcell 2
DC- 6	674082.797	1993834.865	Subgrade	NA	664-01-06	126.8	10.2	**137.3**	**12.9**	**121.6**	**95.9%**	**95.0%**	2/19/16, Subcell 2

Gauge Number	Gauge Model	Density Count	Moisture Count
31574	3440	2201	711

B5

B5 – HDR Soil Liner Summary Table

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Project Name : BRICKHAVEN NO. 2 MINE TRACT A SUBCELL 1C
Project Number : 2015-664

Field Density Reports

Material (SF or CL)	Field Report	Test Type	Test Number	Northing (NC State Plane)	Easting (NC State Plane)	Elev.	Proctor I.D. No.	Proctor MDD pcf	Proctor Opt. %M	Wet Density (pcf)	Moisture Content	Dry Density (pcf)	Compaction	Comments	Location Description on Report	Test Date
CL	CCLFDR-01-Cell 1C	ND-	1	673514.92	1994218.22	Lift 1	664-001-005	93.9	27.6	120.7	31.2	92.0	98.0%		2/27/16, Subcell 18	
CL	CCLFDR-01-Cell 1C	ND-	2	674257.45	1994120.27	Lift 1	664-001-001	96.4	23.8	121.5	28.0	94.9	98.5%		2/27/16, Subcell 7 *some rock	
CL	CCLFDR-01-Cell 1C	DC-	1	674257.45	1994120.27	Lift 1	664-001-001	96.4	23.8	123.0	26.5	97.2	100.9%		2/27/16, Subcell 7 *some rock	
CL	CCLFDR-01-Cell 1C	ND-	3	674228.34	1994045.95	Lift 1	664-001-005	93.9	27.6	122.8	30.5	94.1	100.2%		2/27/16, Subcell 17 *some rock	
CL	CCLFDR-01-Cell 1C	ND-	4	674206.52	1993986.49	Lift 1	664-001-005	93.9	27.6	120.4	31.1	91.8	97.8%		2/27/16, Subcell 8	
CL	CCLFDR-01-Cell 1C	ND-	5	674166.49	1993932.98	Lift 1	664-001-001	96.4	23.8	113.6	23.4	92.1	95.5%		2/27/16, Subcell 6	
CL	CCLFDR-01-Cell 1C	ND-	6	674115.55	1993834.87	Lift 1	664-001-005	93.9	27.6	122.8	32.2	92.9	98.9%		2/27/16, Subcell 5	
CL	CCLFDR-01-Cell 1C	ND-	7	674333.88	1994102.45	Lift 1	664-001-005	93.9	27.6	121.9	29.9	93.8	99.9%		2/27/16, Subcell 19	
CL	CCLFDR-01-Cell 1C	DC-	2	674333.88	1994102.45	Lift 1	664-001-005	93.9	27.6	120.0	28.2	93.6	99.7%		2/27/16, Subcell 19	
CL	CCLFDR-01-Cell 1C	ND-	8	674308.42	1994042.99	Lift 1	664-001-005	93.9	27.6	121.2	29.8	93.4	99.4%		2/27/16, Subcell 16	
CL	CCLFDR-01-Cell 1C	ND-	9	674268.39	1993983.53	Lift 1	664-001-005	93.9	27.6	115.1	28.5	89.6	95.4%		2/27/16, Subcell 15	
CL	CCLFDR-01-Cell 1C	ND-	10	674202.89	1993935.96	Lift 1	664-001-005	93.9	27.6	117.1	28.8	90.9	96.8%		2/27/16, Subcell 9	
CL	CCLFDR-01-Cell 1C	ND-	11	674195.63	1993825.97	Lift 1	664-001-005	93.9	27.6	115.2	27.7	90.2	96.1%		2/27/16, Subcell 10	
CL	CCLFDR-01-Cell 1C	DC-	3	674195.63	1993825.97	Lift 1	664-001-005	93.9	27.6	118.2	27.5	92.7	98.7%		2/27/16, Subcell 10	
CL-	CCLFDR-02-Cell 1C	ND-	12	674457.64	1994078.69	Lift 1	664-001-005	93.9	27.6	116.7	30.0	89.8	95.6%		2/29/16, GL 26	
CL-	CCLFDR-02-Cell 1C	ND-	13	674068.25	1993778.38	Lift 1	664-016-014	99.9	22.2	117.6	20.1	97.9	98.0%		2/29/16, GL 2	
CL-	CCLFDR-02-Cell 1C	DC-	4	674068.25	1993778.38	Lift 1	664-016-014	99.9	22.2	118.0	21.5	97.1	97.2%		2/29/16, GL 2	
CL-	CCLFDR-02-Cell 1C	ND-	14	674020.95	1993692.17	Lift 1	664-016-014	99.9	22.2	120.4	22.4	98.4	98.5%		2/29/16, GL 1; perm taken (A1)	
CL-	CCLFDR-02-Cell 1C	ND-	15	674079.20	1993644.62	Lift 1	664-016-014	99.9	22.2	116.5	19.6	97.4	97.5%		2/29/16, GL 4	
CL-	CCLFDR-02-Cell 1C	ND-	16	674130.16	1993614.90	Lift 1	664-016-014	99.9	22.2	118.0	21.8	96.9	97.0%		2/29/16, GL 3	
CL-	CCLFDR-02-Cell 1C	ND-	17	674195.66	1993701.12	Lift 1	664-016-014	99.9	22.2	119.7	22.3	97.9	98.0%		2/29/16, GL 11; perm taken (A4)	
CL-	CCLFDR-02-Cell 1C	ND-	18	674195.67	1993623.84	Lift 1	664-016-014	99.9	22.2	119.2	22.0	97.7	97.8%		2/29/16, GL 12	
CL-	CCLFDR-02-Cell 1C	DC-	5	674195.67	1993623.84	Lift 1	664-016-014	99.9	22.2	119.8	23.3	97.2	97.3%		2/29/16, GL 12	
CL-	CCLFDR-02-Cell 1C	ND-	19	674555.95	1993915.22	Lift 1	664-016-014	99.9	22.2	121.1	23.0	98.5	98.6%		3/1/16, GL 28	
CL-	CCLFDR-02-Cell 1C	ND-	20	674497.71	1993915.21	Lift 1	664-016-014	99.9	22.2	120.0	22.7	97.8	97.9%		3/1/16, GL 24	
CL-	CCLFDR-02-Cell 1C	ND-	21	674461.32	1993861.70	Lift 1	664-016-014	99.9	22.2	122.2	23.5	98.9	99.0%		3/1/16, GL 23	
CL-	CCLFDR-02-Cell 1C	DC-	6	674461.32	1993861.70	Lift 1	664-016-014	99.9	22.2	122.8	25.2	98.1	98.2%		3/1/16, GL 23	
CL-	CCLFDR-02-Cell 1C	ND-	22	674355.77	1993879.51	Lift 1	664-016-014	99.9	22.2	119.2	23.0	96.9	97.0%		3/1/16, GL 21	
CL-	CCLFDR-02-Cell 1C	ND-	23	674392.18	1993802.23	Lift 1	664-016-014	99.9	22.2	120.9	22.4	98.8	98.9%		3/1/16, GL 22; perm taken (A5)	
CL-	CCLFDR-02-Cell 1C	ND-	24	674286.64	1993742.76	Lift 1	664-016-014	99.9	22.2	121.3	24.1	97.7	97.8%		3/1/16, GL 13	
CL-	CCLFDR-02-Cell 1C	ND-	25	674312.10	1993817.08	Lift 1	664-016-014	99.9	22.2	123.2	24.6	98.9	99.0%		3/1/16, GL 14; perm taken (A3)	
CL-	CCLFDR-02-Cell 1C	ND-	26	674545.02	1993977.64	Lift 1	664-016-014	99.9	22.2	118.3	22.0	97.0	97.1%		3/1/16, GL 27	
CL-	CCLFDR-02-Cell 1C	DC-	7	674545.02	1993977.64	Lift 1	664-016-014	99.9	22.2	119.5	24.8	95.8	95.8%		3/1/16, GL 27	
CL-	CCLFDR-02-Cell 1C	ND-	27	674483.15	1993909.26	Lift 1	664-016-014	99.9	22.2	120.9	23.7	97.7	97.8%		3/1/16, GL 25	
CL-	CCLFDR-02-Cell 1C	ND-	28	674384.87	1993980.58	Lift 1	664-016-014	99.9	22.2	122.1	24.3	98.2	98.3%		3/1/16, GL 20; perm taken (A6)	
CL-	CCLFDR-02-Cell 1C	ND-	29	674253.80	1994173.77	Lift 2	664-016-014	99.9	22.2	121.0	23.2	98.2	98.3%		3/1/16 , GL 18	
CL-	CCLFDR-02-Cell 1C	DC-	8	674253.80	1994173.77	Lift 2	664-016-014	99.9	22.2	121.5	24.9	97.3	97.4%		3/1/16 , GL 18	
CL-	CCLFDR-02-Cell 1C	ND-	30	674148.25	1994126.19	Lift 2	664-016-014	99.9	22.2	120.9	23.5	97.9	98.0%		3/1/16, GL 7, perm taken (A2)	
CL-	CCLFDR-02-Cell 1C	ND-	31	674184.67	1994025.13	Lift 2	664-016-014	99.9	22.2	121.6	24.4	97.7	97.8%		3/1/16, GL 8	
CL-	CCLFDR-02-Cell 1C	ND-	32	674122.82	1993924.05	Lift 2	664-016-014	99.9	22.2	124.0	23.5	100.4	100.5%		3/1/16, GL 6	
CL-	CCLFDR-02-Cell 1C	ND-	33	674075.52	1993831.89	Lift 2	664-016-014	99.9	22.2	119.3	21.3	98.4	98.4%		3/1/16, GL 5	
CL-	CCLFDR-02-Cell 1C	DC-	9	674075.52	1993831.89	Lift 2	664-016-014	99.9	22.2	118.9	23.0	96.7	96.8%		3/1/16, GL 5	
CL-	CCLFDR-02-Cell 1C	ND-	34	674031.86	1993760.54	Lift 2	664-016-014	99.9	22.2	120.5	23.0	98.0	98.1%		3/1/16, GL 2	
CL-	CCLFDR-02-Cell 1C	ND-	35	674013.66	1993739.73	Lift 2	664-016-014	99.9	22.2	120.7	20.7	100.0	100.1%		3/2/16, GL 1, perm taken (A1)	
CL-	CCLFDR-02-Cell 1C	ND-	36	674293.85	1994072.71	Lift 2	664-016-014	99.9	22.2	120.3	21.3	99.2	99.3%		3/2/16, GL 17	
CL-	CCLFDR-02-Cell 1C	ND-	37	674242.90	1994037.03	Lift 2	664-016-014	99.9	22.2	123.6	24.1	99.6	99.7%		3/2/16, GL 16	
CL-	CCLFDR-02-Cell 1C	DC-	10	674242.90	1994037.03	Lift 2	664-016-014	99.9	22.2	123.9	25.8	98.5	98.6%		3/2/16, GL 16	
CL-	CCLFDR-02-Cell 1C	ND-	38	674151.93	1993947.84	Lift 2	664-016-014	99.9	22.2	122.9	24.3	98.9	99.0%		3/2/16, GL 9	
CL-	CCLFDR-02-Cell 1C	ND-	39	674101.01	1993784.34	Lift 2	664-016-014	99.9	22.2	122.7	22.7	100.0	100.1%		3/2/16, GL 10, perm taken (A3)	
CL-	CCLFDR-02-Cell 1C	ND-	40	674028.23	1993680.28	Lift 2	664-016-014	99.9	22.2	121.5	23.9	98.1	98.2%		3/2/16, GL 4	
CL-	CCLFDR-02-Cell 1C	ND-	41	674071.91	1993668.40	Lift 2	664-016-014	99.9	22.2	122.5	21.9	100.5	100.6%		3/2/16, GL 3	
CL-	CCLFDR-02-Cell 1C	ND-	42	674403.06	1994001.39	Lift 2	664-016-014	99.9	22.2	121.5	21.3	100.2	100.3%		3/2/16, GL 20	
CL-	CCLFDR-02-Cell 1C	DC-	11	674403.06	1994001.39	Lift 2	664-016-014	99.9	22.2	121.2	22.9	98.6	98.7%		3/2/16, GL 20	
CL-	CCLFDR-02-Cell 1C	ND-	43	674239.31	1993834.90	Lift 2	664-016-014	99.9	22.2	121.5	22.6	99.1	99.2%		3/2/16, GL 15	
CL-	CCLFDR-02-Cell 1C	ND-	44	674282.99	1993825.99	Lift 2	664-016-014	99.9	22.2	119.9	22.3	98.0	98.1%		3/2/16, GL 14	
CL-	CCLFDR-02-Cell 1C	ND-	45	674202.93	1993718.96	Lift 2	664-016-014	99.9	22.2	121.6	23.6	98.4	98.5%		3/2/16, GL 11	
CL-	CCLFDR-02-Cell 1C	ND-	46	674170.19	1993662.47	Lift 2	664-016-014	99.9	22.2	122.4	22.7	99.8	99.9%		3/2/16, GL 12, perm taken (A4)	

Project Name : BRICKHAVEN NO. 2 MINE TRACT A SUBCELL 1C
Project Number : 2015-664

Field Density Reports

Material (SF or CL)	Field Report	Test Type	Test Number	Northing (NC State Plane)	Easting (NC State Plane)	Elev.	Proctor I.D. No.	Proctor MDD pcf	Proctor Opt. %M	Wet Density (pcf)	Moisture Content	Dry Density (pcf)	Compaction	Comments	Location Description on Report	Test Date
CL-	CCLFDR-02-Cell 1C	ND-	47	674283.01	1993727.89	Lift 2	664-016-014	99.9	22.2	120.7	22.0	98.9	99.0%		3/2/16, GL 13	
CL-	CCLFDR-02-Cell 1C	ND-	48	674388.53	1993840.87	Lift 2	664-016-014	99.9	22.2	119.5	21.4	98.4	98.5%		3/2/16, GL 22	
CL-	CCLFDR-02-Cell 1C	DC-	12	674388.53	1993840.87	Lift 2	664-016-014	99.9	22.2	119.9	23.1	97.4	97.5%		3/2/16, GL 22	
CL-	CCLFDR-02-Cell 1C	ND-	49	674454.05	1993861.70	Lift 2	664-016-014	99.9	22.2	122.3	24.5	98.2	98.3%		3/2/16, GL 23	
CL-	CCLFDR-02-Cell 1C	ND-	50	674501.34	1993968.72	Lift 2	664-016-014	99.9	22.2	122.9	24.6	98.6	98.7%		3/2/16, GL 24	
CL-	CCLFDR-02-Cell 1C	ND-	51	674559.57	1993983.59	Lift 2	664-016-014	99.9	22.2	122.5	23.2	99.4	99.5%		3/2/16, GL 28	
CL-	CCLFDR-02-Cell 1C	ND-	52	674512.25	1994013.31	Lift 2	664-016-014	99.9	22.2	122.7	22.3	100.3	100.4%		3/2/16, GL 27	
CL-	CCLFDR-02-Cell 1C	ND-	53	674337.56	1993909.23	Lift 2	664-016-014	99.9	22.2	120.3	22.6	98.1	98.2%		3/2/16, GL 26	
CL-	CCLFDR-02-Cell 1C	DC-	13	674337.56	1993909.23	Lift 2	664-016-014	99.9	22.2	119.9	24.3	96.5	96.6%		3/2/16, GL 26	
CL-	CCLFDR-02-Cell 1C	ND-	54	674341.16	1994147.04	Lift 2	664-016-014	99.9	22.2	121.2	22.5	98.9	99.0%		3/2/16, GL 19	
CL-	CCLFDR-02-Cell 1C	ND-	55	674356.10	1992455.66	Lift 2	664-016-014	99.9	22.2	121.8	22.4	99.5	99.6%		3/2/16, GL 21, perm taken (A5)	
CL-	CCLFDR-02-Cell 1C	ND-	56	674479.51	1993912.23	Lift 2	664-016-014	99.9	22.2	121.3	22.0	99.4	99.5%		3/2/16, GL 25, perm taken (A6)	
CL-	CCLFDR-02-Cell 1C	ND-	57	674242.87	1994191.61	Lift 3	664-009-001	102.6	19.8	122.1	21.5	100.5	97.9%		3/3/16, GL 18	
CL-	CCLFDR-02-Cell 1C	DC-	14	674242.87	1994191.61	Lift 3	664-009-001	102.6	19.8	123.4	23.3	100.1	97.5%		3/3/16, GL 18	
CL-	CCLFDR-02-Cell 1C	ND-	58	674297.48	1994144.06	Lift 3	664-009-001	102.6	19.8	121.4	22.7	98.9	96.4%		3/3/16, GL 17, perm taken (A2)	
CL-	CCLFDR-02-Cell 1C	ND-	59	674224.69	1994132.15	Lift 3	664-009-001	102.6	19.8	123.6	21.6	101.6	99.1%		3/3/16, GL 7	
CL-	CCLFDR-02-Cell 1C	ND-	60	674257.46	1994051.90	Lift 3	664-009-001	102.6	19.8	119.2	21.0	98.5	96.0%		3/3/16, GL 16	
CL-	CCLFDR-02-Cell 1C	ND-	61	674166.47	1994037.02	Lift 3	664-009-001	102.6	19.8	120.6	22.9	98.1	95.6%		3/3/16, GL 8	
CL-	CCLFDR-02-Cell 1C	ND-	62	674151.93	1993932.97	Lift 3	664-009-001	102.6	19.8	121.5	20.1	101.2	98.6%		3/3/16, GL 9	
CL-	CCLFDR-02-Cell 1C	DC-	15	674151.93	1993932.97	Lift 3	664-009-001	102.6	19.8	121.1	21.9	99.3	96.8%		3/3/16, GL 9	
CL-	CCLFDR-02-Cell 1C	ND-	63	674093.70	1993891.35	Lift 3	664-009-001	102.6	19.8	122.9	20.7	101.8	99.2%		3/3/16, GL 6	
CL-	CCLFDR-02-Cell 1C	ND-	64	674159.23	1993825.96	Lift 3	664-009-001	102.6	19.8	119.9	22.2	98.1	95.6%		3/3/16, GL 14, perm taken (A3)	
CL-	CCLFDR-02-Cell 1C	ND-	65	674090.08	1993802.17	Lift 3	664-009-001	102.6	19.8	122.1	21.8	100.2	97.7%		3/3/16, GL 5	
CL-	CCLFDR-02-Cell 1C	ND-	66	674046.41	1993796.21	Lift 3	664-009-001	102.6	19.8	117.6	19.3	98.6	96.1%		3/3/16, GL 2	
CL-	CCLFDR-02-Cell 1C	ND-	67	673995.47	1993692.16	Lift 3	664-009-001	102.6	19.8	121.2	22.6	98.9	96.4%		3/3/16, GL 1	
CL-	CCLFDR-02-Cell 1C	ND-	68	674060.99	1993707.04	Lift 3	664-009-001	102.6	19.8	121.0	21.2	99.8	97.3%		3/3/16, GL 4, perm taken (A1)	
CL-	CCLFDR-02-Cell 1C	DC-	16	674060.99	1993707.04	Lift 3	664-009-001	102.6	19.8	122.2	23.1	99.3	96.8%		3/3/16, GL 4	
CL-	CCLFDR-02-Cell 1C	ND-	69	674111.96	1993611.93	Lift 3	664-009-001	102.6	19.8	120.6	23.5	97.7	95.2%		3/3/16, GL 3	
CL-	CCLFDR-02-Cell 1C	ND-	70	674181.12	1993594.11	Lift 3	664-009-001	102.6	19.8	122.2	24.5	98.2	95.7%		3/3/16, GL 12, perm taken (A4)	
CL-	CCLFDR-02-Cell 1C	ND-	71	674122.87	1993689.22	Lift 3	664-009-001	102.6	19.8	120.3	22.9	97.9	95.4%		3/3/16, GL 11	
CL-	CCLFDR-02-Cell 1C	ND-	72	674264.81	1993724.92	Lift 3	664-009-001	102.6	19.8	123.3	21.9	101.1	98.6%		3/3/16, GL 13	
CL-	CCLFDR-02-Cell 1C	ND-	73	674151.96	1993808.13	Lift 3	664-009-001	102.6	19.8	120.4	21.6	99.0	96.5%		3/3/16, GL 10	
CL-	CCLFDR-02-Cell 1C	DC-	17	674151.96	1993808.13	Lift 3	664-009-001	102.6	19.8	120.0	22.7	97.8	95.3%		3/3/16, GL 10	
CL-	CCLFDR-02-Cell 1C	ND-	74	674239.29	1993909.21	Lift 3	664-009-001	102.6	19.8	121.9	22.8	99.3	96.8%		3/3/16, GL 15	
CL-	CCLFDR-02-Cell 1C	ND-	75	674323.04	1993763.57	Lift 3	664-009-001	102.6	19.8	122.5	24.3	98.6	96.1%		3/3/16,GL 22	
CL-	CCLFDR-02-Cell 1C	ND-	76	674337.56	1993906.26	Lift 3	664-009-001	102.6	19.8	127.1	21.1	105.0	102.3%		3/3/16, GL 21, perm taken (A5)	
CL-	CCLFDR-02-Cell 1C	ND-	77	674461.31	1993915.20	Lift 3	664-009-001	102.6	19.8	118.8	19.5	99.4	96.9%		3/3/16, GL 24	
CL-	CCLFDR-02-Cell 1C	ND-	78	674563.22	1993971.70	Lift 3	664-009-001	102.6	19.8	116.9	19.0	98.2	95.7%		3/3/16, GL 28	
CL-	CCLFDR-02-Cell 1C	DC-	18	674563.22	1993971.70	Lift 3	664-009-001	102.6	19.8	118.5	21.3	97.7	95.2%		3/3/16, GL 28	
CL-	CCLFDR-02-Cell 1C	ND-	79	674432.17	1994037.07	Lift 3	664-009-001	102.6	19.8	119.7	21.6	98.4	95.9%		3/3/16, GL 27	
CL-	CCLFDR-02-Cell 1C	ND-	80	674421.24	1994117.33	Lift 3	664-009-001	102.6	19.8	120.7	23.5	97.7	95.3%		3/3/16, GL 26	
CL-	CCLFDR-02-Cell 1C	ND-	81	674461.30	1994007.35	Lift 3	664-009-001	102.6	19.8	120.6	22.0	98.9	96.3%		3/3/16, GL 25	
CL-	CCLFDR-02-Cell 1C	ND-	82	674348.43	1994150.01	Lift 3	664-009-001	102.6	19.8	120.6	22.1	98.8	96.3%		3/3/16, GL 19	
CL-	CCLFDR-02-Cell 1C	DC-	19	674348.43	1994150.01	Lift 3	664-009-001	102.6	19.8	121.2	23.9	97.8	95.3%		3/3/16, GL 19	
CL-	CCLFDR-02-Cell 1C	ND-	83	674352.08	1994111.37	Lift 3	664-009-001	102.6	19.8	120.9	22.3	98.9	96.4%		3/3/16, GL 20, perm taken (A6)	
CL-	CCLFDR-02-Cell 1C	ND-	84	674410.33	1994031.72	Lift 3	664-009-001	102.6	19.8	122.5	23.5	99.2	96.7%		3/3/16, GL 23	

B6

B6 – Clay Liner Laboratory Testing

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Client: HDR, Inc.
Project Name : Brickhaven Cell 1C
Project Number : 2016-600

Clay Soil Samples

Geotechnics Lab ID	Soil Sample ID	Boring	Depth	LL	PL	PI	USCS Symbol	% Passing #200 Sieve	Max Dry Density	Opt. Moisture Content	Dry Density	Moisture	Permeability	Nuclear Test No.	Location of Sample N	Location of Sample E	Date Sample Taken/ start date
2016-600-002-001	BULK 1C-L1	CELL 1C	LIFT 1	N/A	N/A	N/A	N/A	N/A	98.4	22.2	N/A	N/A	N/A	N/A	674257.446	1994120.267	2/26/16
2016-600-003-001	ST-1CA2-L1	CELL 1C A2	LIFT 1	49	23	26	CL	74.7	N/A	N/A	94.4	25.4	5.2E-08	CL-2	674257.446	1994120.267	2/29/16
2016-600-004-001	ST-1CA1-L1	CELL 1C A1	LIFT 1	69	26	43	CH	95.4	N/A	N/A	92.9	27.6	1.4E-07	CL-14	674020.951	1993692.167	3/1/16
2016-600-004-002	ST-1CA4-L1	CELL 1C A4	LIFT 1	69	26	43	CH	81.4	N/A	N/A	102.6	21.3	3.7E-08	CL-17	674195.657	1993701.122	3/1/16
2016-600-005-001	ST-1CA5-L1	CELL 1C A5	LIFT 1	55	28	27	CH	75.8	N/A	N/A	100.2	20.4	5.5E-08	CL-23	674392.182	1993802.231	3/2/16
2016-600-005-002	ST-1CA3-L1	CELL 1C A3	LIFT 1	68	29	39	CH	84.1	N/A	N/A	98.3	24.6	2.5E-08	CL-25	674312.104	1993817.077	3/2/16
2016-600-005-003	ST-1CA6-L1	CELL 1C A6	LIFT 1	62	25	37	CH	72.2	N/A	N/A	97.1	21.3	3.6E-08	CL-28	674384.865	1993980.583	3/2/16
2016-600-005-004	ST-1CA2-L2	CELL 1C A2	LIFT 2	67	26	41	CH	85.1	N/A	N/A	96.3	23	9.8E-08	CL-30	674148.253	1994126.191	3/2/16
2016-600-005-005	ST-1CA3-L2	CELL 1C 3	LIFT 2	62	24	38	CH	85.2	N/A	N/A	98.2	23.2	2.3E-08	CL-39	674101.006	1993784.335	3/2/16
2016-600-006-001	ST-1CA1-L2	CELL 1C A1	LIFT 2	61	25	36	CH	82.9	N/A	N/A	102.3	18.9	2.0E-08	CL-35	674013.662	1993739.727	3/3/16
2016-600-006-002	ST-1CA4-L2	CELL 1C A4	LIFT 2	57	27	30	CH	83.5	N/A	N/A	98.7	19.3	1.3E-07	CL-46	674170.187	1993662.474	3/3/16
2016-600-006-003	ST-1CA5-L2	CELL 1C A5	LIFT 2	59	26	33	CH	84.8	N/A	N/A	99.7	22.2	2.1E-08	CL-55	674356.098	1992455.656	3/3/16
2016-600-006-004	ST-1CA6-L2	CELL 1C A6	LIFT 2	61	25	36	CH	85.6	N/A	N/A	94	24.8	2.2E-07	CL-56	674479.513	1993912.234	3/3/16
2016-600-007-001	ST-1CA1-L3	CELL 1C A1	LIFT 3	61	27	34	CH	80.3	N/A	N/A	97.1	22.6	9.2E-08	CL-68	674060.985	1993707.039	3/4/16
2016-600-007-002	ST-1CA2-L3	CELL 1C A2	LIFT 3	61	29	32	CH	85.7	N/A	N/A	96.8	22.9	1.3E-07	CL-58	674297.479	1994144.056	3/4/16
2016-600-007-003	ST-1CA3-L3	CELL 1C A3	LIFT 3	69	31	38	CH	88.3	N/A	N/A	96.4	24.1	7.5E-08	CL-64	674159.233	1993825.963	3/4/16
2016-600-007-004	ST-1CA4-L3	CELL 1C A4	LIFT 3	61	31	30	CH	88.0	N/A	N/A	99.3	24	8.1E-08	CL-70	674181.121	1993594.107	3/4/16
2016-600-007-005	ST-1CA5-L3	CELL 1C A5	LIFT 3	63	30	33	CH	86.2	N/A	N/A	99.9	22.5	3.9E-08	CL-76	674337.564	1993906.259	3/4/16
2016-600-007-006	ST-1CA6-L3	CELL 1C A6	LIFT 3	63	27	36	CH	84.6	N/A	N/A	96.6	24.5	3.5E-08	CL-83	674352.081	1994111.369	3/4/16
2016-600-007-007	BULK -L2	CELL 1C	LIFT 2	N/A	N/A	N/A	N/A	N/A	95.6	22.5	N/A	N/A	N/A	N/A	674479.513	1993912.234	3/4/16
2016-600-007-008	BULK -L3	CELL 1C	LIFT 3	N/A	N/A	N/A	N/A	N/A	102.5	20	N/A	N/A	N/A	N/A	674297.479	1994144.056	3/4/16

March 4, 2016

Project No. 2016-600-002

Mr. Michael Plummer, P.E.
HDR Engineering, Inc.
440 South Church St., Suite 1000
Charlotte, NC 28202

Transmittal
Laboratory Test Results
Brickhaven No. 2 Mine

Please find attached the laboratory test results for the above referenced project. The tests were outlined on the Project Verification Form that was transmitted to your firm prior to the testing. The testing was performed in general accordance with the methods listed on the enclosed data sheets. The test results are believed to be representative of the samples that were submitted for testing and are indicative only of the specimens which were evaluated. We imply no position with regard to the nature of the test results, i.e. pass/fail and no claims as to the suitability of the material for its intended use.

The test data and all associated project information provided shall be held in strict confidence and disclosed to other parties only with authorization by our Client. The test data submitted herein is considered integral with this report and is not to be reproduced except in whole and only with the authorization of the Client and Geotechnics. The remaining sample materials for this project will be retained for a minimum of 90 days as directed by the Geotechnics' Quality Program.

We are pleased to provide these testing services. Should you have any questions or if we may be of further assistance, please contact our office.

Respectively submitted,
Geotechnics, Inc.

Michael P. Smith
Regional Manager

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MOISTURE CONTENT

ASTM D 2216-10

Client:	HDR ENGINEERING, INC.
Client Reference:	BRICKHAVEN NO. 2 MINE
Project No.:	2016-600-002

Lab ID:	001
Boring No.:	CELL 1C
Depth (ft):	LIFT 1
Sample No.:	BULK-1C-L1
Tare Number	806
Wt. of Tare & Wet Sample (g)	435.02
Wt. of Tare & Dry Sample (g)	351.41
Weight of Tare (g)	100.18
Weight of Water (g)	83.61
Weight of Dry Sample (g)	251.23
Water Content (%)	**33.3**

Notes :

Tested By	*BW*	*Date*	*3/1/16*	*Checked By*	*GEM*	*Date*	*3/3/16*

DCN: CT-S1 DATE: 3/18/13 REVISION: 4

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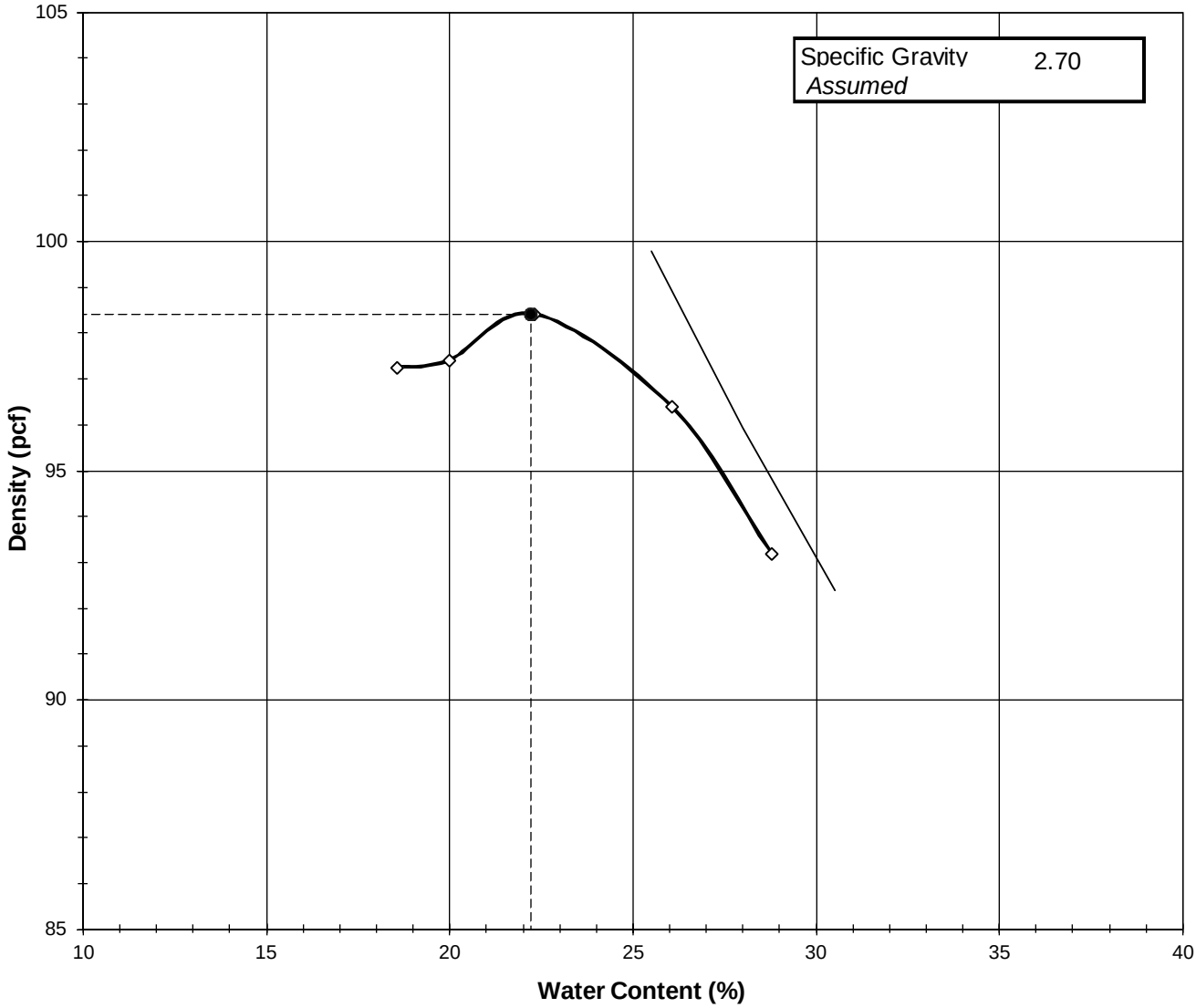
MOISTURE DENSITY RELATIONSHIP

ASTM D698-12

Client:	HDR ENGINEERING, INC.	Boring No.:	CELL 1C
Client Reference:	BRICKHAVEN NO. 2 MINE	Depth (ft):	LIFT 1
Project No.:	2016-600-002	Sample No.:	BULK-1C-L1
Lab ID:	2016-600-002-001	Test Method	**STANDARD**

Visual Description: LIGHT BROWN LEAN CLAY

Optimum Water Content	**22.2**
Maximum Dry Density	**98.4**



Tested By	*BW*	*Date*	*3/1/16*	*Checked By*	*GEM*	*Date*	*3/2/16*

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MOISTURE - DENSITY RELATIONSHIP

ASTM D698-12

Client:	HDR ENGINEERING, INC.	Boring No.:	CELL 1C
Client Reference:	BRICKHAVEN NO. 2 MINE	Depth (ft):	LIFT 1
Project No.:	2016-600-002	Sample No.:	BULK-1C-L1
Lab ID:	2016-600-002-001		

Visual Description: LIGHT BROWN LEAN CLAY

Total Weight of the Sample (g)	19900
As Received Water Content (%)	NA
Assumed Specific Gravity	2.70
Percent Retained on 3/4"	NA
Percent Retained on 3/8"	NA
Percent Retained on #4	NA
Oversize Material	Not included
Procedure Used	A

Test Type		**STANDARD**
Rammer Weight (lb)		5.5
Rammer Drop (in)		12
Rammer Type		MECHANICAL
Machine ID	R	174
Mold ID	R	461
Mold diameter		4"
Weight of the Mold (g)		4160
Volume of the Mold (cm^3)		942

Mold / Specimen

Point No.	**1**	**2**	**3**	**4**	**5**
Wt. of Mold & Wet Sample (g)	5900	5924	5977	5994	5972
Wt.of Mold (g)	4160	4160	4160	4160	4160
Wt. of Wet Sample (g)	1740	1764	1817	1834	1812
Mold Volume (cm^3)	942	942	942	942	942

Moisture Content / Density

Tare Number	317	311	300	398	368
Wt. of Tare & Wet Sample (g)	484.10	481.20	469.50	479.50	519.10
Wt. of Tare & Dry Sample (g)	421.50	415.10	404.00	397.80	427.90
Wt. of Tare (g)	84.20	84.30	110.60	84.30	111.20
Wt. of Water (g)	62.60	66.10	65.50	81.70	91.20
Wt. of Dry Sample (g)	337.30	330.80	293.40	313.50	316.70

Wet Density (g/cm^3)	1.85	1.87	1.93	1.95	1.92
Wet Density (pcf)	115.3	116.9	120.4	121.5	120.0
Moisture Content (%)	**18.6**	**20.0**	**22.3**	**26.1**	**28.8**
Dry Density (pcf)	**97.3**	**97.4**	**98.4**	**96.4**	**93.2**

Zero Air Voids

Moisture Content (%)	25.5	28.0	30.5
Dry Unit Weight (pcf)	99.8	95.9	92.4

Tested By *BW* *Date* *3/1/16* *Checked By* *GEM* *Date* 3/2/16

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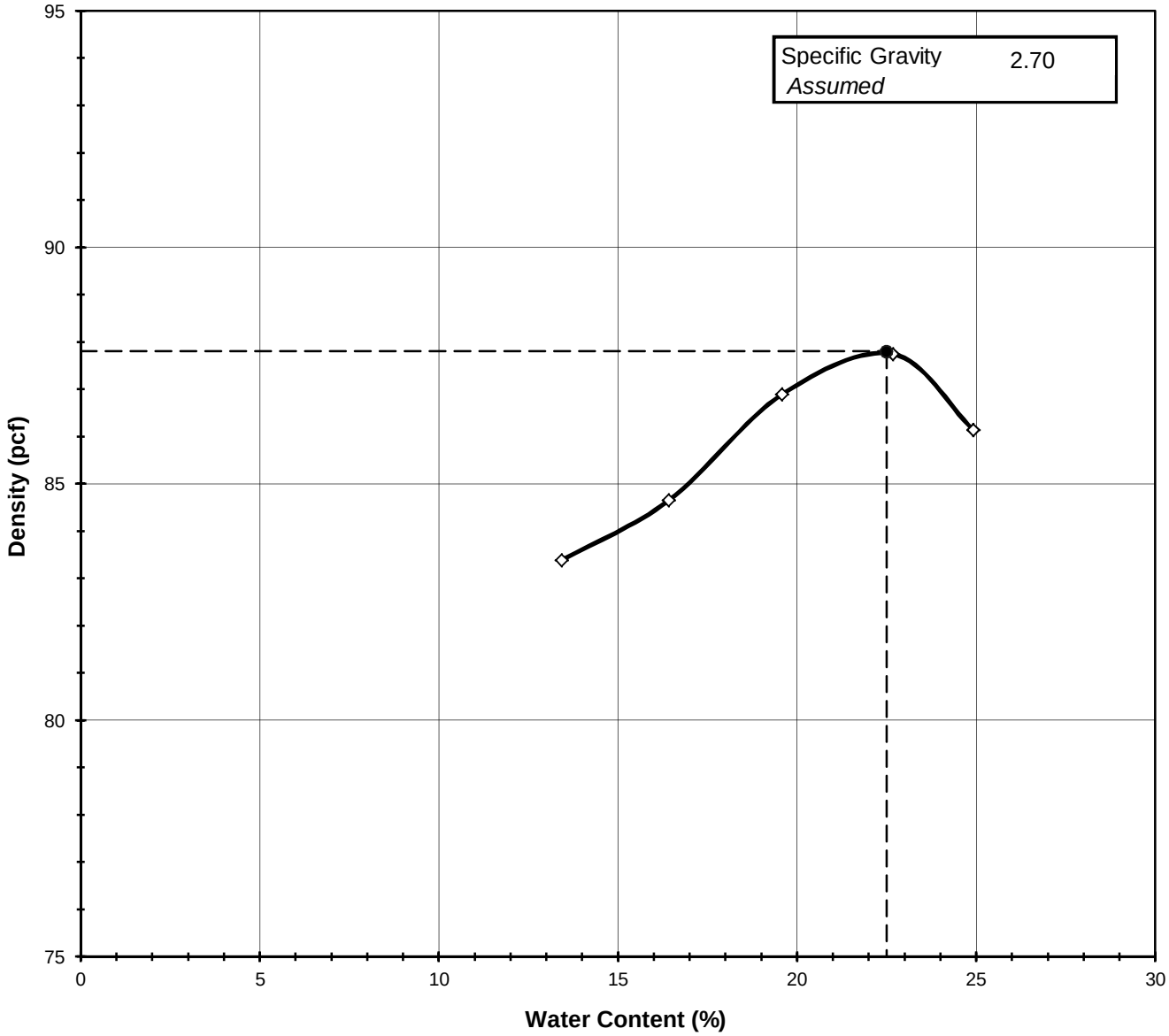
MOISTURE DENSITY RELATIONSHIP

ASTM D698-12

Client:	HDR ENGINEERING, INC.	Boring No.:	RIVERBEND
Client Reference:	BRICKHAVEN NO. 2 MINE	Depth (ft):	NA
Project No.:	2016-600-002	Sample No.:	BULK-ASH
Lab ID:	2016-600-002-002	Test Method	**STANDARD**

Visual Description: GRAY ASH

Optimum Water Content	**22.5**
Maximum Dry Density	**87.8**



Tested By	*BW*	*Date*	*3/3/16*	*Checked By*	*GEM*	*Date*	*3/4/16*

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MOISTURE - DENSITY RELATIONSHIP

ASTM D698-12

Client:	HDR ENGINEERING, INC.	Boring No.:	RIVERBEND
Client Reference:	BRICKHAVEN NO. 2 MINE	Depth (ft):	NA
Project No.:	2016-600-002	Sample No.:	BULK-ASH
Lab ID:	2016-600-002-002		

Visual Description: GRAY ASH

Total Weight of the Sample (g)	16500
As Received Water Content (%)	NA
Assumed Specific Gravity	2.70
Percent Retained on 3/4"	NA
Percent Retained on 3/8"	NA
Percent Retained on #4	NA
Oversize Material	Not included
Procedure Used	C

Test Type		**STANDARD**
Rammer Weight (lb)		5.5
Rammer Drop (in)		12
Rammer Type		MECHANICAL
Machine ID	R	174
Mold ID	R	173
Mold diameter		6'
Weight of the Mold (g)		5529
Volume of the Mold (cm^3)		2119

Mold / Specimen

Point No.	**1**	**2**	**3**	**4**	**5**
Wt. of Mold & Wet Sample (g)	8741	8876	9058	9185	9183
Wt.of Mold (g)	5529	5529	5529	5529	5529
Wt. of Wet Sample (g)	3213	3347	3529	3656	3655
Mold Volume (cm^3)	2119	2119	2119	2119	2119

Moisture Content / Density

Tare Number	TB-11	TB-02	TB-09	832	837
Wt. of Tare & Wet Sample (g)	442.00	439.30	469.20	706.00	759.50
Wt. of Tare & Dry Sample (g)	405.60	396.30	414.30	623.40	660.12
Wt. of Tare (g)	134.80	134.50	134.00	259.20	261.40
Wt. of Water (g)	36.40	43.00	54.90	82.60	99.38
Wt. of Dry Sample (g)	270.80	261.80	280.30	364.20	398.72

Wet Density (g/cm^3)	1.52	1.58	1.67	1.73	1.72
Wet Density (pcf)	94.6	98.6	103.9	107.6	107.6
Moisture Content (%)	**13.4**	**16.4**	**19.6**	**22.7**	**24.9**
Dry Density (pcf)	**83.4**	**84.7**	**86.9**	**87.7**	**86.1**

Zero Air Voids

Moisture Content (%)	19.6	22.7	24.9
Dry Unit Weight (pcf)	110.2	104.5	100.7

Tested By *BW* *Date* *3/3/16* *Checked By* *GEM* *Date* 3/4/16

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March 3, 2016

Project No. 2016-600-003

Mr. Michael Plummer, P.E.
HDR Engineering, Inc.
440 South Church St., Suite 1000
Charlotte, NC 28202

Transmittal
Laboratory Test Results
Brickhaven No. 2 Mine

Please find attached the laboratory test results for the above referenced project. The tests were outlined on the Project Verification Form that was transmitted to your firm prior to the testing. The testing was performed in general accordance with the methods listed on the enclosed data sheets. The test results are believed to be representative of the samples that were submitted for testing and are indicative only of the specimens which were evaluated. We imply no position with regard to the nature of the test results, i.e. pass/fail and no claims as to the suitability of the material for its intended use.

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MOISTURE CONTENT

ASTM D 2216-10

Client:	HDR ENGINEERING, INC.
Client Reference:	Brickhaven No.2 Mine
Project No.:	2016-600-003

Lab ID:	001
Boring No.:	CELL 1C ACRE 2
Depth (ft):	LIFT 1
Sample No.:	ST-1CA2-L1
Tare Number	826
Wt. of Tare & Wet Sample (g)	450.86
Wt. of Tare & Dry Sample (g)	386.57
Weight of Tare (g)	133.78
Weight of Water (g)	64.29
Weight of Dry Sample (g)	252.79
Water Content (%)	**25.4**

Notes :

Tested By	*AF*	*Date*	*2/29/16*	*Checked By*	*GEM*	*Date*	*3/2/16*

DCN: CT-S1 DATE: 3/18/13 REVISION: 4

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PERCENT PASSING # 200 SIEVE

ASTM D 1140-00

Client	HDR ENGINEERING, INC.
Client Reference	BRICKHAVEN NO. 2 MINE
Project No.	2016-600-003

Lab Id.	.001
Boring No.	CELL 1C ACRE 2
Depth (ft)	LIFT 1
Sample No.	ST-1CA2-L1
Tare Number	826
Wt. of Tare & WS (gm)	450.86
Wt. of Tare & DS (gm)	386.57
Wt. of Tare (gm)	133.78
Wt. of Water (gm)	64.29
Wt. of DS (gm)	252.79
Water Content (%)	**25.4**
Wt. of Washed Soil & Tare	197.74
Percent Passing #200	**74.7**

Tested By AF *Date* 2/29/16 *Checked By* GEM *Date* 3/2/16

DCN: CT-S54 DATE: 7-8-98 REVISION:2

T:\2016 PROJECTS\2016-600 HDR - BRICKHAVEN NO.2 MINE\[2016-600-003 PASS #200.xls]Sheet1

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ATTERBERG LIMITS

ASTM D 4318-10 / AASHTO T89-10

Client:	HDR ENGINEERING, INC.	Boring No.:	CELL 1C ACRE 2
Client Reference:	BRICKHAVEN NO. 2 MINE	Depth (ft):	LIFT 1
Project No.:	2016-600-003	Sample No.:	ST-1CA2-L1
Lab ID:	2016-600-003-001	Soil Description:	**TAN LEAN CLAY**

Note: The* USCS *symbol used with this test refers only to the minus No. 40 sieve material. See the "Sieve and Hydrometer Analysis" graph page for the complete material description.

(Minus No. 40 sieve material, Airdried)

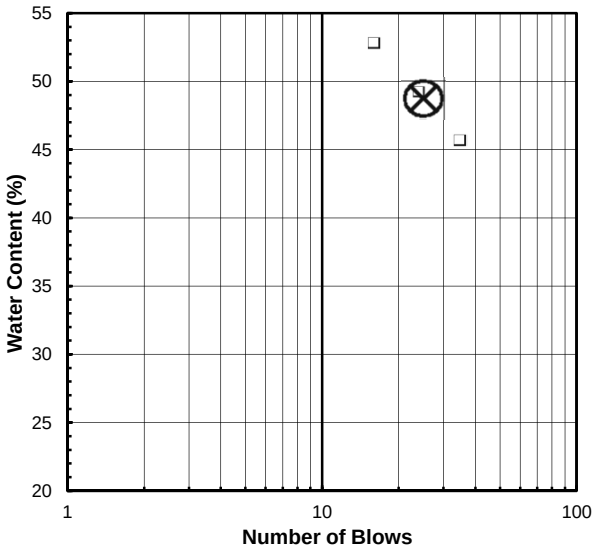
Liquid Limit Test	**1**	**2**	**3**	
				M
Tare Number	V-2	Z-4	R	**U**
Wt. of Tare & Wet Sample (g)	26.68	28.24	26.43	**L**
Wt. of Tare & Dry Sample (g)	23.22	24.07	22.53	**T**
Wt. of Tare (g)	15.64	15.59	15.14	**I**
Wt. of Water (g)	3.5	4.2	3.9	**P**
Wt. of Dry Sample (g)	7.6	8.5	7.4	**O**
				I
Moisture Content (%)	**45.6**	**49.2**	**52.8**	**N**
Number of Blows	**35**	**24**	**16**	**T**

Plastic Limit Test	**1**	**2**	**Range**
Tare Number	B4	AK	
Wt. of Tare & Wet Sample (g)	22.22	21.82	
Wt. of Tare & Dry Sample (g)	20.96	20.65	
Wt. of Tare (g)	15.45	15.55	
Wt. of Water (g)	1.3	1.2	
Wt. of Dry Sample (g)	5.5	5.1	
Moisture Content (%)	**22.9**	**22.9**	**-0.1**

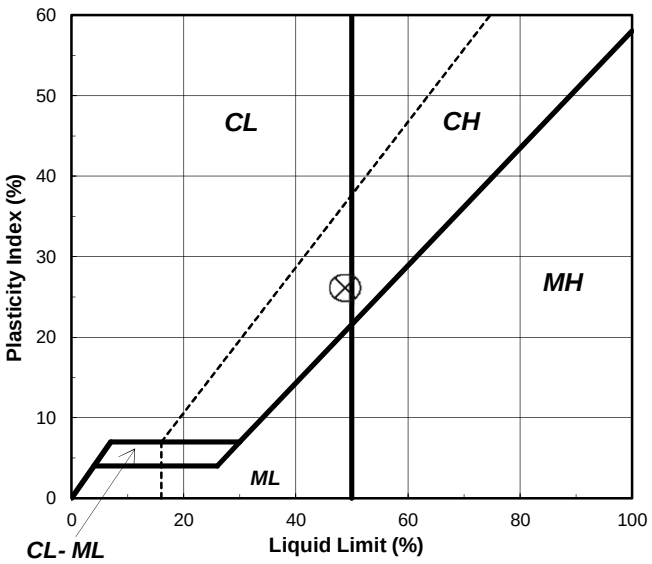
Note: The acceptable range of the two Moisture contents is ± 2.6

Test Results	
Liquid Limit (%)	**49**
Plastic Limit (%)	**23**
Plasticity Index (%)	**26**
USCS Symbol	**CL**

Flow Curve



Plasticity Chart



Tested By	*BW*	*Date*	*3/2/16*	*Checked By*	*GEM*	*Date*	3/3/16

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FLEXIBLE WALL PERMEABILITY TEST

PERMOMETER METHOD

ASTM D 5084-10

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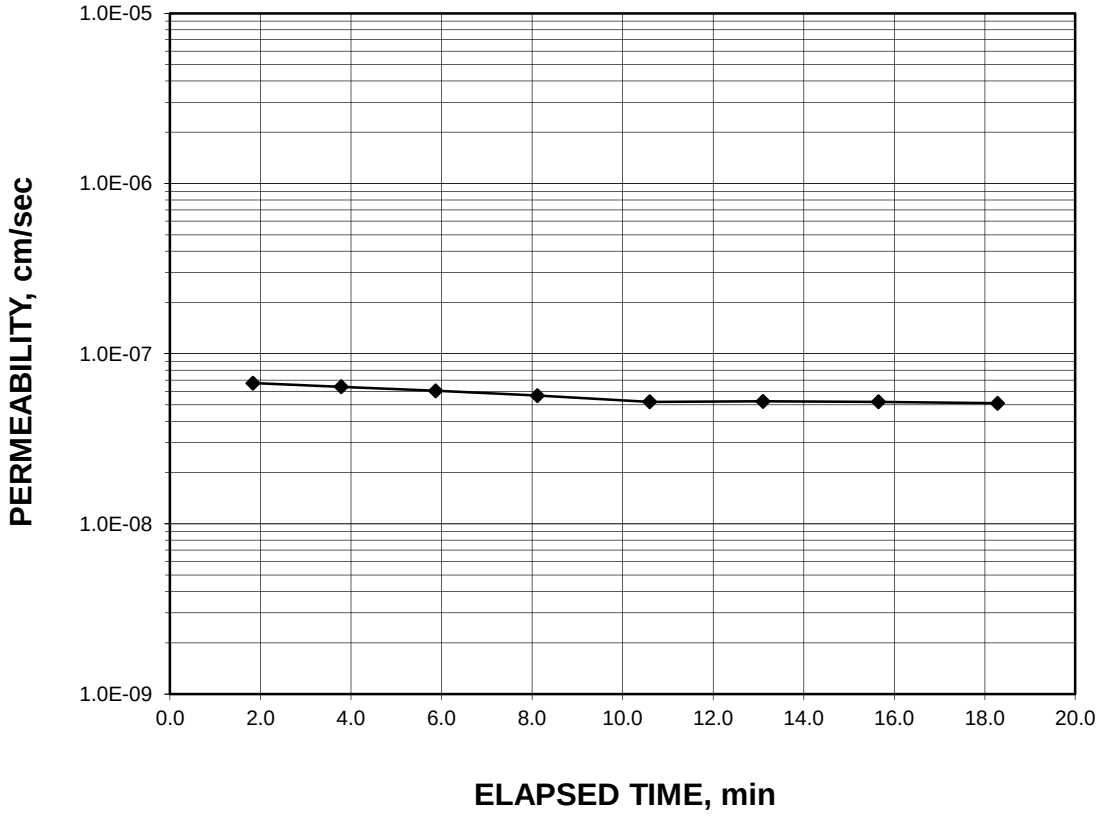
Client	HDR ENGINEERING, INC.	Boring No.	CELL 1C ACRE 2
Client Project	Brickhaven No.2 Mine	Depth (ft.)	LIFT 1
Project No.	2016-600-003	Sample No.	ST-1CA2-L1
Lab ID No.	2016-600-003-001	Nuc. Test No.	CL-2

Visual Description: BROWN SANDY CLAY

AVERAGE PERMEABILITY = 5.2E-08 cm/sec @ 20°C

AVERAGE PERMEABILITY = 5.2E-10 m/sec @ 20°C

PERMEABILITY vs. TIME



Tested By: AF Date: 2/29/16 Checked By: GEM Date: 3/2/16

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FLEXIBLE WALL PERMEABILITY TEST

PERMOMETER METHOD

ASTM D 5084-10

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Client	HDR ENGINEERING, INC.	Boring No.	CELL 1C ACRE 2	
Client Project	Brickhaven No.2 Mine	Depth (ft.)	LIFT 1	
Project No.	2016-600-003	Sample No.	ST-1CA2-L1	
Lab ID No.	2016-600-003-001	Nuc. Test No.	CL-2	
		Specific Gravity	2.70	Assumed
		Sample Condition		Undisturbed

Visual Description: BROWN SANDY CLAY

MOISTURE CONTENT:	BEFORE TEST	AFTER TEST
Tare Number	826	806
Wt. of Tare & WS (gm.)	450.86	489.21
Wt. of Tare & DS (gm.)	386.57	406.6
Wt. of Tare (gm.)	133.78	100.24
Wt. of Water (gm.)	64.29	82.61
Wt. of DS (gm.)	252.79	306.36
Moisture Content (%)	**25.4**	**27.0**

SPECIMEN:	BEFORE TEST	AFTER TEST
Wt. of Tube & WS (gm.)	888.05	NA
Wt. of Tube (gm.)	0.00	NA
Wt. of WS (calc.) (gm.)	888.05	898.90
Length 1 (in.)	4.478	4.444
Length 2 (in.)	4.466	4.443
Length 3 (in.)	4.484	4.452
Top Diameter (in.)	2.858	2.865
Middle Diameter (in.)	2.859	2.813
Bottom Diameter (in.)	2.834	2.834
Average Length (in.)	4.48	4.45
Average Area (in.^{2})	6.38	6.32
Sample Volume (cm^3)	468.03	460.70
Unit Wet Wt. (gm./ cm^3)	1.897	1.951
Unit Wet Wt. (pcf)	118.4	121.8
Unit Dry Wt. (pcf)	94.4	95.9
Unit Dry Wt. (gm./ cm^3)	1.513	1.537
Void Ratio, e	0.785	0.757
Porosity, n	0.440	0.431
Pore Volume (cm^3)	205.8	198.5
Total Wt. Of Sample After Test		897.35

Tested By: AF Date: 2/29/16 Checked By: GEM Date: 3/2/16

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FLEXIBLE WALL PERMEABILITY TEST
PERMOMETER METHOD

ASTM D 5084-10

Client	HDR ENGINEERING, INC.	Boring No.	CELL 1C ACRE 2
Client Project	Brickhaven No.2 Mine	Depth (ft.)	LIFT 1
Project No.	2016-600-003	Sample No.	ST-1CA2-L1
Lab ID No.	2016-600-003-001	Nuc. Test No.	CL-2

Test Pressures		Final Sample Dimensions	
Cell Pressure(psi)	60.0	Sample Length (cm), L	11.29
Back Pressure(psi)	50.0	Sample Area (cm^2), A	40.79
Eff. Cons. Pressure(psi)	10.0	Pipette Area (cm^2), a_p	0.03142
Response (%)	98	Annulus Area (cm^2), a_a	0.76712
		Equilibrium Level (cm), R_{eq}	1

AVERAGE PERMEABILITY = 5.2E-08 cm/sec @ 20°C
AVERAGE PERMEABILITY = 5.2E-10 m/sec @ 20°C

DATE	TIME				ELAPSED TIME t	PIPETTE READI NG R_p	INCREMENT GRADIENT i	TEMP.	INCREMENTAL PERMEABILITY @ 20°C
(mm/dd/yy)	(hr)	(min)	(sec)	(min)	(min)	(cm)	(cm/cm)	(°C)	(cm/sec)
3/1/16	15	6	43	6.72	0.000	9.2	9.5	24.3	NA
3/1/16	15	8	33	8.55	1.833	9.1	9.4	24.3	6.7E-08
3/1/16	15	10	30	10.50	3.783	9.0	9.3	24.3	6.4E-08
3/1/16	15	12	35	12.58	5.867	8.9	9.1	24.3	6.1E-08
3/1/16	15	14	50	14.83	8.117	8.8	9.0	24.3	5.7E-08
3/1/16	15	17	19	17.32	10.600	8.7	8.9	24.3	5.2E-08
3/1/16	15	19	49	19.82	13.100	8.6	8.8	24.3	5.2E-08
3/1/16	15	22	22	22.37	15.650	8.5	8.7	24.3	5.2E-08
3/1/16	15	25	0	25.00	18.283	8.4	8.6	24.3	5.1E-08

Tested By: AF Date: 2/29/16 Checked By: GEM Date: 3/2/16

DCN: CT-22A DATE:2-2-10 REVISION:0 Z:\PROJECTS\2016-600 HDR - BRICKHAVEN NO.2 MINE\[2016-600-003-001 Permometer.xlsm]Sheet1

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March 3, 2016

Project No. 2016-600-004

Mr. Michael Plummer, P.E.
HDR Engineering, Inc.
440 South Church St., Suite 1000
Charlotte, NC 28202

Transmittal
Laboratory Test Results
Brickhaven No. 2 Mine

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Michael P. Smith
Regional Manager

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DCN: Data Transmittal Letter Date: 1/28/05 Rev.: 1

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MOISTURE CONTENT

ASTM D 2216-10

Client:	HDR ENGINEERING, INC.
Client Reference:	Brickhaven No.2 Mine
Project No.:	2016-600-004

Lab ID:	001	002
Boring No.:	CELL 1C ACRE 1	CELL 1C ACRE 4
Depth (ft):	LIFT 1	LIFT 1
Sample No.:	ST-1CA1-L1	ST-1CA4-L1
Tare Number	801	808
Wt. of Tare & Wet Sample (g)	326.57	238.59
Wt. of Tare & Dry Sample (g)	277.04	214.81
Weight of Tare (g)	97.82	103.38
Weight of Water (g)	49.53	23.78
Weight of Dry Sample (g)	179.22	111.43
Water Content (%)	**27.6**	**21.3**

Notes :

Tested By	*AF*	*Date*	*3/1/16*	*Checked By*	*GEM*	*Date*	*3/3/16*

DCN: CT-S1 DATE: 3/18/13 REVISION: 4

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PERCENT PASSING # 200 SIEVE

ASTM D 1140-00

Client	HDR ENGINEERING, INC.
Client Reference	Brickhaven No.2 Mine
Project No.	2016-600-004

Lab Id.	.001	.002
Boring No.	CELL 1C ACRE 1	CELL 1C ACRE 4
Depth (ft)	LIFT 1	LIFT 1
Sample No.	ST-1CA1-L1	ST-1CA4-L1
Tare Number	801	808
Wt. of Tare & WS (gm)	326.57	238.59
Wt. of Tare & DS (gm)	277.04	214.81
Wt. of Tare (gm)	97.82	103.38
Wt. of Water (gm)	49.53	23.78
Wt. of DS (gm)	179.22	111.43
Water Content (%)	**27.6**	**21.3**
Wt. of Washed Soil & Tare	106	124.06
Percent Passing #200	**95.4**	**81.4**

Tested By AF *Date* 3/1/16 *Checked By* GEM *Date* 3/3/16

DCN: CT-S54 DATE: 7-8-98 REVISION:2

T:\2016 PROJECTS\2016-600 HDR - BRICKHAVEN NO.2 MINE\[2016-600-004 PASS #200.xls]Sheet1

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ATTERBERG LIMITS

ASTM D 4318-10 / AASHTO T89-10

Client:	HDR ENGINEERING, INC.	Boring No.:	CELL 1C ACRE 1
Client Reference:	BRICKHAVEN NO. 2 MINE	Depth (ft):	LIFT 1
Project No.:	2016-600-004	Sample No.:	ST-1CA1-L1
Lab ID:	2016-600-004-001	Soil Description:	**TAN GRAY FAT CLAY**

Note: The USCS symbol used with this test refers only to the minus No. 40 sieve material. See the "Sieve and Hydrometer Analysis" graph page for the complete material description.

(Minus No. 40 sieve material, Airdried)

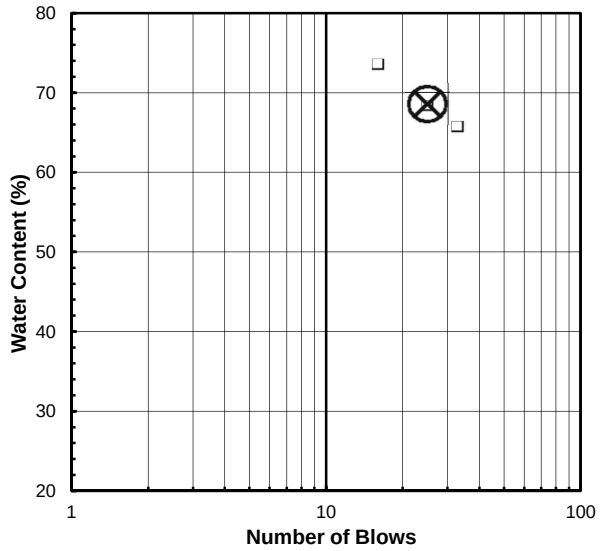
Liquid Limit Test	**1**	**2**	**3**	
Tare Number	Y	U	K-P	**MULTIPOINT**
Wt. of Tare & Wet Sample (g)	29.37	30.15	28.64	
Wt. of Tare & Dry Sample (g)	23.92	24.08	23.09	
Wt. of Tare (g)	15.62	15.19	15.54	
Wt. of Water (g)	5.5	6.1	5.6	
Wt. of Dry Sample (g)	8.3	8.9	7.6	
Moisture Content (%)	**65.7**	**68.3**	**73.5**	
Number of Blows	**33**	**25**	**16**	

Plastic Limit Test	**1**	**2**	**Range**
Tare Number	A-P	A-M	
Wt. of Tare & Wet Sample (g)	21.21	21.22	
Wt. of Tare & Dry Sample (g)	20.04	20.00	
Wt. of Tare (g)	15.54	15.38	
Wt. of Water (g)	1.2	1.2	
Wt. of Dry Sample (g)	4.5	4.6	
Moisture Content (%)	**26.0**	**26.4**	**-0.4**

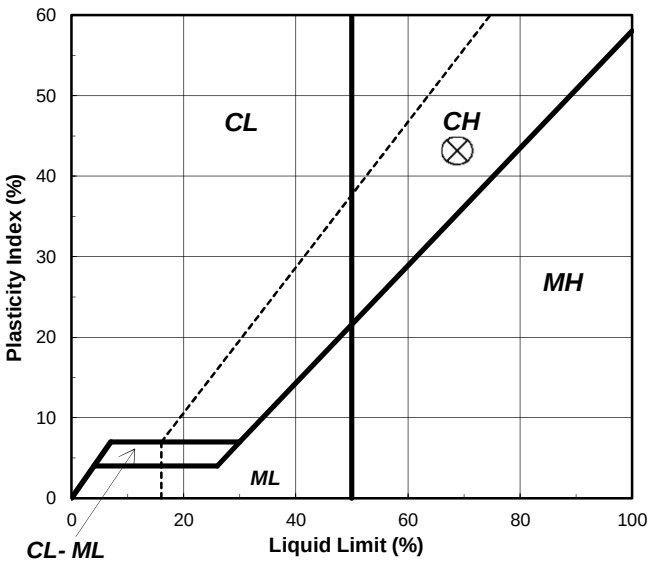
Note: The acceptable range of the two Moisture contents is ± 2.6

Test Results	
Liquid Limit (%)	**69**
Plastic Limit (%)	**26**
Plasticity Index (%)	**43**
USCS Symbol	**CH**

Flow Curve



Plasticity Chart



Tested By	*HM*	*Date*	*3/2/16*	*Checked By*	*GEM*	*Date*	3/3/16

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FLEXIBLE WALL PERMEABILITY TEST

PERMOMETER METHOD

ASTM D 5084-10

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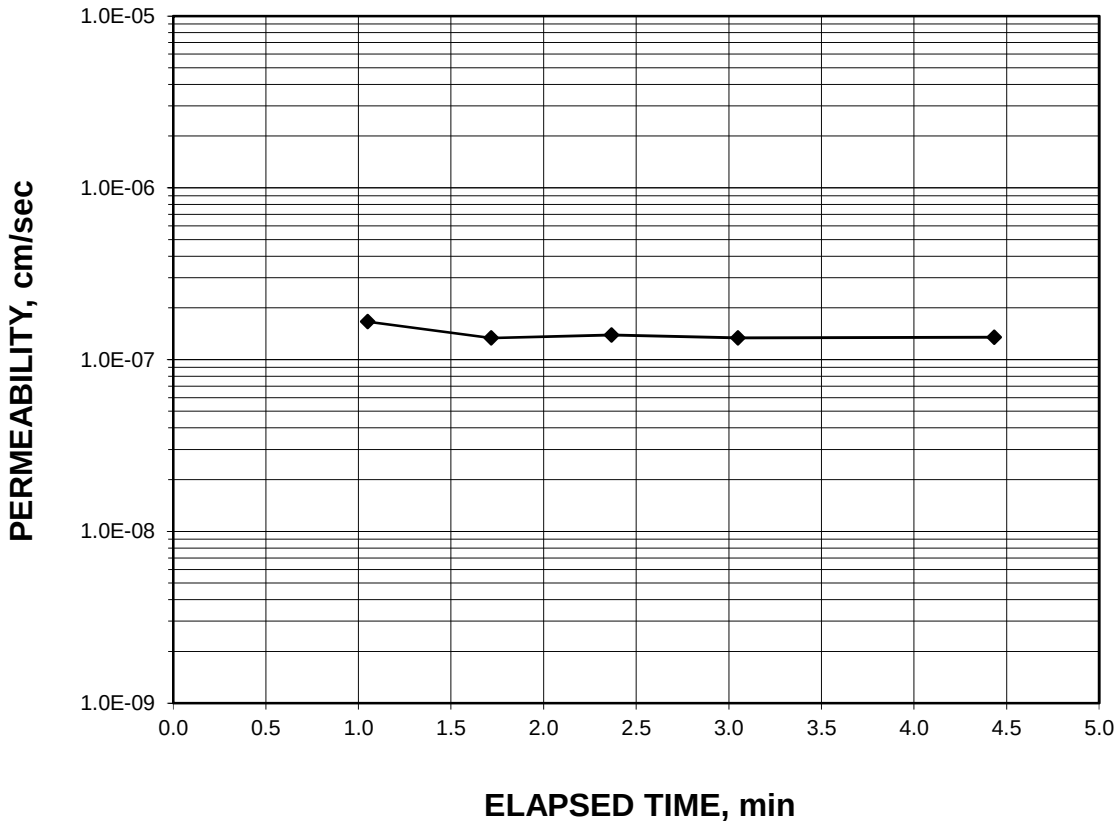
Client	HDR ENGINEERING, INC.	Boring No.	CELL 1C ACRE 1
Client Project	Brickhaven No.2 Mine	Depth (ft.)	LIFT 1
Project No.	2016-600-004	Sample No.	ST-1CA1-L1
Lab ID No.	2016-600-004-001	Nuc. Test No.	CL-14

Visual Description: TAN AND GRAY SANDY CLAY

AVERAGE PERMEABILITY = 1.4E-07 cm/sec @ 20°C

AVERAGE PERMEABILITY = 1.4E-09 m/sec @ 20°C

PERMEABILITY vs. TIME



Tested By: AF Date: 3/1/16 Checked By: GEM Date: 3/3/16

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FLEXIBLE WALL PERMEABILITY TEST

PERMOMETER METHOD

ASTM D 5084-10

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Client	HDR ENGINEERING, INC.	Boring No.	CELL 1C ACRE 1
Client Project	Brickhaven No.2 Mine	Depth (ft.)	LIFT 1
Project No.	2016-600-004	Sample No.	ST-1CA1-L1
Lab ID No.	2016-600-004-001	Nuc. Test No.	CL-14

Specific Gravity	2.70	Assumed
Sample Condition		Undisturbed

Visual Description: TAN AND GRAY SANDY CLAY

MOISTURE CONTENT:	BEFORE TEST	AFTER TEST
Tare Number	801	812
Wt. of Tare & WS (gm.)	326.57	694.59
Wt. of Tare & DS (gm.)	277.04	555.59
Wt. of Tare (gm.)	97.82	105.96
Wt. of Water (gm.)	49.53	139.00
Wt. of DS (gm.)	179.22	449.63
Moisture Content (%)	**27.6**	**30.9**

SPECIMEN:	BEFORE TEST	AFTER TEST
Wt. of Tube & WS (gm.)	570.48	NA
Wt. of Tube (gm.)	0.00	NA
Wt. of WS (calc.) (gm.)	570.48	585.13
Length 1 (in.)	2.865	2.905
Length 2 (in.)	2.891	2.910
Length 3 (in.)	2.872	2.898
Top Diameter (in.)	2.854	2.900
Middle Diameter (in.)	2.844	2.818
Bottom Diameter (in.)	2.849	2.869
Average Length (in.)	2.88	2.90
Average Area (in.^{2})	6.37	6.43
Sample Volume (cm^3)	300.44	306.25
Unit Wet Wt. (gm./ cm^3)	1.899	1.911
Unit Wet Wt. (pcf)	118.5	119.3
Unit Dry Wt. (pcf)	92.9	91.1
Unit Dry Wt. (gm./ cm^3)	1.488	1.459
Void Ratio, e	0.815	0.850
Porosity, n	0.449	0.459
Pore Volume (cm^3)	134.9	140.7
Total Wt. Of Sample After Test		590.98

Tested By: AF Date: 3/1/16 Checked By: GEM Date: 3/3/16

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PERMOMETER METHOD

ASTM D 5084-10

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Client	HDR ENGINEERING, INC.	Boring No.	CELL 1C ACRE 1
Client Project	Brickhaven No.2 Mine	Depth (ft.)	LIFT 1
Project No.	2016-600-004	Sample No.	ST-1CA1-L1
Lab ID No.	2016-600-004-001	Nuc. Test No.	CL-14

Test Pressures		Final Sample Dimensions	
Cell Pressure(psi)	60.0	Sample Length (cm), L	7.38
Back Pressure(psi)	50.0	Sample Area (cm^2), A	41.51
Eff. Cons. Pressure(psi)	10.0	Pipette Area (cm^2), a_p	0.03142
Response (%)	98	Annulus Area (cm^2), a_a	0.76712
		Equilibrium Level (cm), R_{eq}	1

AVERAGE PERMEABILITY = 1.4E-07 cm/sec @ 20°C
AVERAGE PERMEABILITY = 1.4E-09 m/sec @ 20°C

DATE			TIME		ELAPSED TIME t	PIPETTE READI NG R_p	INCREMENT GRADIENT i	TEMP.	INCREMENTAL PERMEABILITY @ 20°C
(mm/dd/yy)	(hr)	(min)	(sec)	(min)	(min)	(cm)	(cm/cm)	(°C)	(cm/sec)
3/2/16	8	40	37	40.62	0.000	8.7	13.6	23.0	NA
3/2/16	8	41	40	41.67	1.050	8.5	13.3	23.0	1.7E-07
3/2/16	8	42	20	42.33	1.717	8.4	13.1	23.0	1.3E-07
3/2/16	8	42	59	42.98	2.367	8.3	12.9	23.0	1.4E-07
3/2/16	8	43	40	43.67	3.050	8.2	12.7	23.0	1.3E-07
3/2/16	8	45	3	45.05	4.433	8.0	12.4	23.0	1.4E-07

Tested By: AF Date: 3/1/16 Checked By: GEM Date: 3/3/16

DCN: CT-22A DATE:2-2-12 Z:\BEMS\PROJECTS\2016-600 HDR - BRICKHAVEN NO.2 MINE\[2016-600-004-001 Permometer.xlsm]Sheet1

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ATTERBERG LIMITS

ASTM D 4318-10 / AASHTO T89-10

Client:	HDR ENGINEERING, INC.	Boring No.:	CELL 1C ACRE 4
Client Reference:	BRICKHAVEN NO. 2 MINE	Depth (ft):	LIFT 1
Project No.:	2016-600-004	Sample No.:	ST-1CA4-L1
Lab ID:	2016-600-004-002	Soil Description:	**TAN FAT CLAY**

Note: The USCS symbol used with this test refers only to the minus No. 40 sieve material. See the "Sieve and Hydrometer Analysis" graph page for the complete material description. (Minus No. 40 sieve material, Airdried)

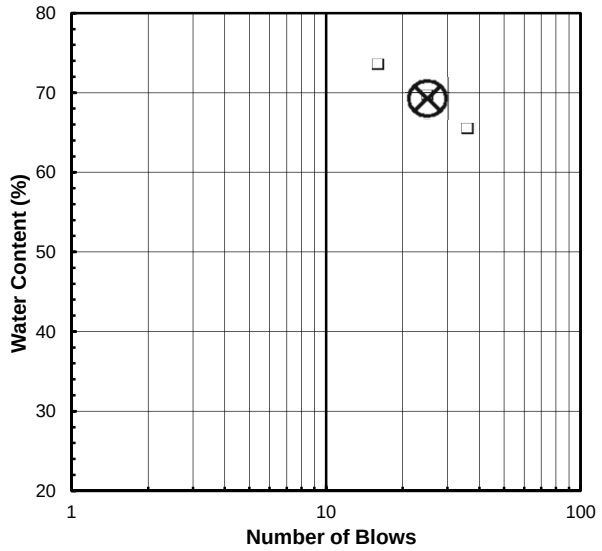
Liquid Limit Test	**1**	**2**	**3**	
Tare Number	L	V	A-Q	**MULTIPOINT**
Wt. of Tare & Wet Sample (g)	30.63	28.83	30.82	
Wt. of Tare & Dry Sample (g)	24.57	23.26	24.32	
Wt. of Tare (g)	15.30	15.26	15.48	
Wt. of Water (g)	6.1	5.6	6.5	
Wt. of Dry Sample (g)	9.3	8.0	8.8	
Moisture Content (%)	**65.4**	**69.6**	**73.5**	
Number of Blows	**36**	**25**	**16**	

Plastic Limit Test	**1**	**2**	**Range**
Tare Number	H	P	
Wt. of Tare & Wet Sample (g)	20.88	21.64	
Wt. of Tare & Dry Sample (g)	19.25	20.38	
Wt. of Tare (g)	13.17	15.24	
Wt. of Water (g)	1.6	1.3	
Wt. of Dry Sample (g)	6.1	5.1	
Moisture Content (%)	**26.8**	**24.5**	**2.3**

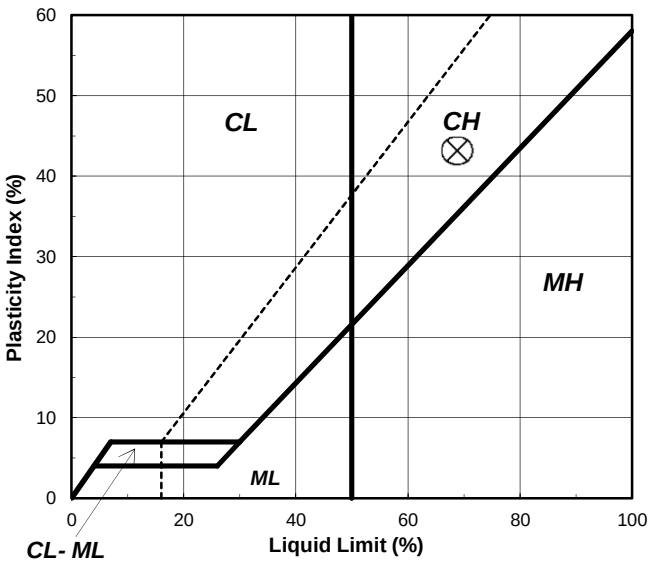
Note: The acceptable range of the two Moisture contents is ± 2.6

Test Results	
Liquid Limit (%)	**69**
Plastic Limit (%)	**26**
Plasticity Index (%)	**43**
USCS Symbol	**CH**

Flow Curve



Plasticity Chart



Tested By	*HM*	*Date*	*3/2/16*	*Checked By*	*GEM*	*Date*	3/3/16

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FLEXIBLE WALL PERMEABILITY TEST

PERMOMETER METHOD

ASTM D 5084-10

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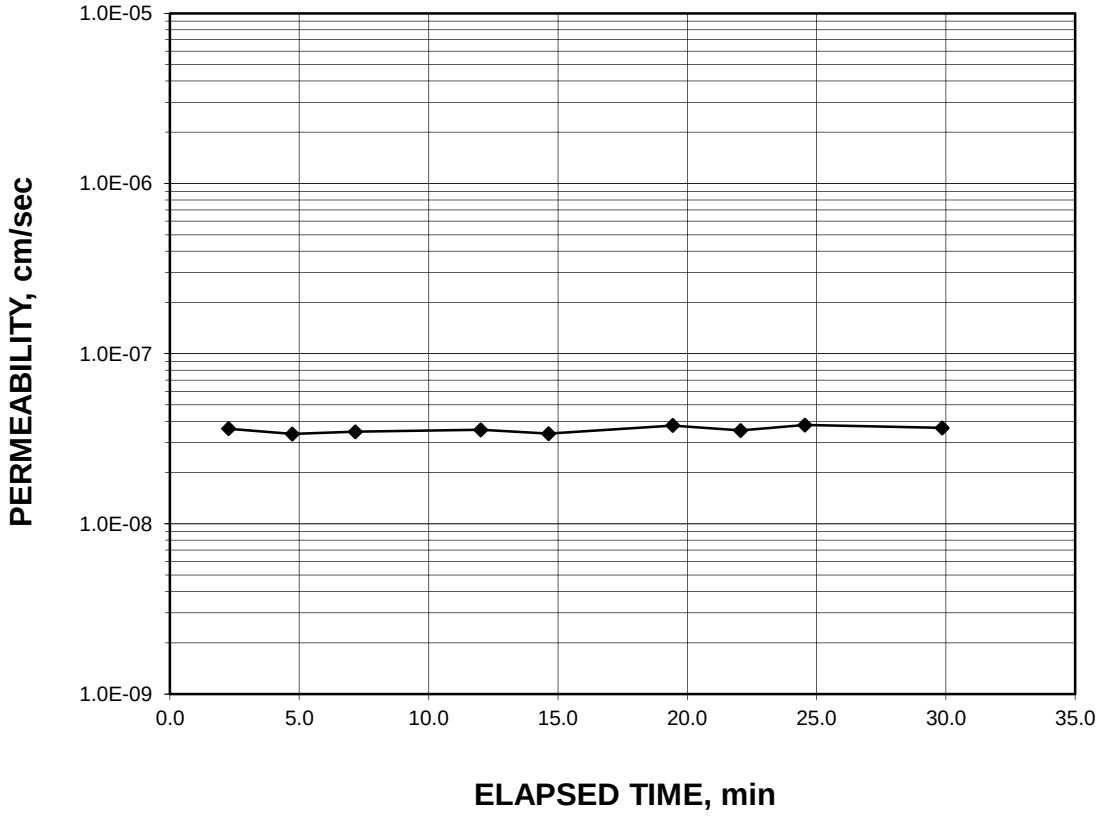
Client	HDR ENGINEERING, INC.	Boring No.	CELL 1C ACRE 4
Client Project	Brickhaven No.2 Mine	Depth (ft.)	LIFT 1
Project No.	2016-600-004	Sample No.	ST-1CA4-L1
Lab ID No.	2016-600-004-002	Nuc. Test No.	CL-17

Visual Description: TAN SANDY CLAY

AVERAGE PERMEABILITY = 3.7E-08 cm/sec @ 20°C

AVERAGE PERMEABILITY = 3.7E-10 m/sec @ 20°C

PERMEABILITY vs. TIME



Tested By: AF Date: 3/1/16 Checked By: GEM Date: 1/14/14

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FLEXIBLE WALL PERMEABILITY TEST

PERMOMETER METHOD

ASTM D 5084-10

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Client	HDR ENGINEERING, INC.	Boring No.	CELL 1C ACRE 4	
Client Project	Brickhaven No.2 Mine	Depth (ft.)	LIFT 1	
Project No.	2016-600-004	Sample No.	ST-1CA4-L1	
Lab ID No.	2016-600-004-002	Nuc. Test No.	CL-17	
		Specific Gravity	2.70	Assumed
		Sample Condition		Undisturbed

Visual Description: TAN SANDY CLAY

MOISTURE CONTENT:	BEFORE TEST	AFTER TEST
Tare Number	808	825
Wt. of Tare & WS (gm.)	238.59	650.18
Wt. of Tare & DS (gm.)	214.81	549.1
Wt. of Tare (gm.)	103.38	137.26
Wt. of Water (gm.)	23.78	101.08
Wt. of DS (gm.)	111.43	411.84
Moisture Content (%)	**21.3**	**24.5**

SPECIMEN:	BEFORE TEST	AFTER TEST
Wt. of Tube & WS (gm.)	503.10	NA
Wt. of Tube (gm.)	0.00	NA
Wt. of WS (calc.) (gm.)	503.10	516.38
Length 1 (in.)	2.417	2.439
Length 2 (in.)	2.434	2.433
Length 3 (in.)	2.419	2.430
Top Diameter (in.)	2.832	2.843
Middle Diameter (in.)	2.853	2.865
Bottom Diameter (in.)	2.848	2.865
Average Length (in.)	2.42	2.43
Average Area (in.^{2})	6.35	6.41
Sample Volume (cm^3)	252.33	255.82
Unit Wet Wt. (gm./ cm^3)	1.994	2.019
Unit Wet Wt. (pcf)	124.5	126.0
Unit Dry Wt. (pcf)	102.6	101.2
Unit Dry Wt. (gm./ cm^3)	1.643	1.621
Void Ratio, e	0.643	0.666
Porosity, n	0.391	0.400
Pore Volume (cm^3)	98.8	102.3
Total Wt. Of Sample After Test		513.44

Tested By: AF Date: 3/1/16 Checked By: GEM Date: 1/14/14

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PERMOMETER METHOD

ASTM D 5084-10

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Client	HDR ENGINEERING, INC.	Boring No.	CELL 1C ACRE 4
Client Project	Brickhaven No.2 Mine	Depth (ft.)	LIFT 1
Project No.	2016-600-004	Sample No.	ST-1CA4-L1
Lab ID No.	2016-600-004-002	Nuc. Test No.	CL-17

Test Pressures		Final Sample Dimensions	
Cell Pressure(psi)	60.0	Sample Length (cm), L	6.18
Back Pressure(psi)	50.0	Sample Area (cm^2), A	41.38
Eff. Cons. Pressure(psi)	10.0	Pipette Area (cm^2), a_p	0.03142
Response (%)	99	Annulus Area (cm^2), a_a	0.76712
		Equilibrium Level (cm), R_{eq}	1

AVERAGE PERMEABILITY = 3.7E-08 cm/sec @ 20°C
AVERAGE PERMEABILITY = 3.7E-10 m/sec @ 20°C

DATE (mm/dd/yy)	TIME (hr)	(min)	(sec)	(min)	ELAPSED TIME t (min)	PIPETTE READI NG R_p (cm)	INCREMENT GRADIENT i (cm/cm)	TEMP. (°C)	INCREMENTAL PERMEABILITY @ 20°C (cm/sec)
3/2/16	9	23	34	23.57	0.000	7.8	14.4	23.3	NA
3/2/16	9	25	50	25.83	2.267	7.7	14.2	23.3	3.6E-08
3/2/16	9	28	18	28.30	4.733	7.6	13.9	23.3	3.4E-08
3/2/16	9	30	44	30.73	7.167	7.5	13.7	23.3	3.5E-08
3/2/16	9	35	35	35.58	12.017	7.3	13.3	23.3	3.6E-08
3/2/16	9	38	12	38.20	14.633	7.2	13.1	23.3	3.4E-08
3/2/16	9	43	0	43.00	19.433	7.0	12.7	23.3	3.8E-08
3/2/16	9	45	38	45.63	22.067	6.9	12.5	23.3	3.5E-08
3/2/16	9	48	7	48.12	24.550	6.8	12.3	23.3	3.8E-08
3/2/16	9	53	25	53.42	29.850	6.6	11.8	23.3	3.7E-08

Tested By: AF Date: 3/1/16 Checked By: GEM Date: 1/14/14

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March 8, 2016

Project No. 2016-600-005

Mr. Michael Plummer, P.E.
HDR Engineering, Inc.
440 South Church St., Suite 1000
Charlotte, NC 28202

Transmittal
Laboratory Test Results
Brickhaven No. 2 Mine

Please find attached the laboratory test results for the above referenced project. The tests were outlined on the Project Verification Form that was transmitted to your firm prior to the testing. The testing was performed in general accordance with the methods listed on the enclosed data sheets. The test results are believed to be representative of the samples that were submitted for testing and are indicative only of the specimens which were evaluated. We imply no position with regard to the nature of the test results, i.e. pass/fail and no claims as to the suitability of the material for its intended use.

The test data and all associated project information provided shall be held in strict confidence and disclosed to other parties only with authorization by our Client. The test data submitted herein is considered integral with this report and is not to be reproduced except in whole and only with the authorization of the Client and Geotechnics. The remaining sample materials for this project will be retained for a minimum of 90 days as directed by the Geotechnics' Quality Program.

We are pleased to provide these testing services. Should you have any questions or if we may be of further assistance, please contact our office.

Respectively submitted,
Geotechnics, Inc.

Michael P. Smith
Regional Manager

We understand that you have a choice in your laboratory services and we thank you for choosing Geotechnics.

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MOISTURE CONTENT

ASTM D 2216-10

Client: HDR ENGINEERING, INC.
Client Reference: Brickhaven No.2 Mine
Project No.: 2016-600-005

Lab ID:	001	002	003	004	005
Boring No.:	CELL 1C ACRE 5	CELL 1C ACRE 3	CELL 1C ACRE 6	CELL 1C ACRE 2	CELL 1C ACRE 3
Depth (ft):	LIFT 1	LIFT 1	LIFT 1	LIFT 2	LIFT 2
Sample No.:	ST-1CA5-L1	ST-1CA3-L1	ST-1CA6-L1	ST-1CA2-L2	ST-1CA3-L2
Tare Number	815	8010	802	828	821
Wt. of Tare & Wet Sample (g)	362.92	315.58	405.51	422.25	380.63
Wt. of Tare & Dry Sample (g)	324.78	278.63	352.16	368.47	333.63
Weight of Tare (g)	138.09	128.37	101.84	134.93	130.62
Weight of Water (g)	38.14	36.95	53.35	53.78	47.00
Weight of Dry Sample (g)	186.69	150.26	250.32	233.54	203.01
Water Content (%)	**20.4**	**24.6**	**21.3**	**23.0**	**23.2**

Notes :

Tested By *AF* *Date* *3/2/16* *Checked By* *GEM* *Date* *3/8/16*

DCN: CT-S1 DATE: 3/18/13 REVISION: 4

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PERCENT PASSING # 200 SIEVE

ASTM D 1140-00

Client	HDR ENGINEERING, INC.
Client Reference	Brickhaven No.2 Mine
Project No.	2016-600-005

Lab Id.	.001	.002	.003	.004	.005
Boring No.	CELL 1C ACRE 5	CELL 1C ACRE 3	CELL 1C ACRE 6	CELL 1C ACRE 2	CELL 1C ACRE 3
Depth (ft)	LIFT 1	LIFT 1	LIFT 1	LIFT 2	LIFT 2
Sample No.	ST-1CA5-L1	ST-1CA3-L1	ST-1CA6-L1	ST-1CA2-L2	ST-1CA3-L2
Tare Number	815	8010	802	828	821
Wt. of Tare & WS (gm)	362.92	315.58	405.51	422.25	380.63
Wt. of Tare & DS (gm)	324.78	278.63	352.16	368.47	333.63
Wt. of Tare (gm)	138.09	128.37	101.84	134.93	130.62
Wt. of Water (gm)	38.14	36.95	53.35	53.78	47
Wt. of DS (gm)	186.69	150.26	250.32	233.54	203.01
Water Content (%)	**20.4**	**24.6**	**21.3**	**23.0**	**23.2**
Wt. of Washed Soil & Tare	183.36	152.21	171.44	169.7	160.62
Percent Passing #200	**75.8**	**84.1**	**72.2**	**85.1**	**85.2**

Tested By AF *Date* 3/4/16 *Checked By* GEM *Date* 3/9/16

DCN: CT-S54 DATE: 7-8-98 REVISION:2

T:\2016 PROJECTS\2016-600 HDR - BRICKHAVEN NO.2 MINE\[2016-600-005 PASS

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ATTERBERG LIMITS

ASTM D 4318-10 / AASHTO T89-10

Client:	HDR ENGINEERING, INC.	Boring No.:	CELL 1C ACRE 5
Client Reference:	BRICKHAVEN NO. 2 MINE	Depth (ft):	LIFT 1
Project No.:	2016-600-005	Sample No.:	ST-1CA5-L1
Lab ID:	2016-600-005-001	Soil Description:	**TAN GRAY FAT CLAY**

Note: The* USCS *symbol used with this test refers only to the minus No. 40 sieve material. See the "Sieve and Hydrometer Analysis" graph page for the complete material description.

(Minus No. 40 sieve material, Airdried)

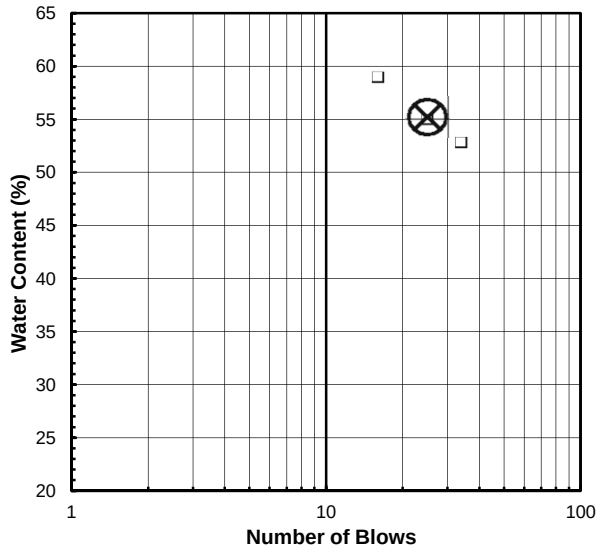
Liquid Limit Test	**1**	**2**	**3**	
Tare Number	A-Q	H	P	**MULTIPOINT**
Wt. of Tare & Wet Sample (g)	31.95	28.60	31.48	
Wt. of Tare & Dry Sample (g)	26.26	23.84	25.46	
Wt. of Tare (g)	15.48	15.17	15.24	
Wt. of Water (g)	5.7	4.8	6.0	
Wt. of Dry Sample (g)	10.8	8.7	10.2	
Moisture Content (%)	**52.8**	**54.9**	**58.9**	
Number of Blows	**34**	**25**	**16**	

Plastic Limit Test	**1**	**2**	**Range**
Tare Number	A-P	A-M	
Wt. of Tare & Wet Sample (g)	21.79	21.56	
Wt. of Tare & Dry Sample (g)	20.41	20.22	
Wt. of Tare (g)	15.53	15.37	
Wt. of Water (g)	1.4	1.3	
Wt. of Dry Sample (g)	4.9	4.9	
Moisture Content (%)	**28.3**	**27.6**	**0.6**

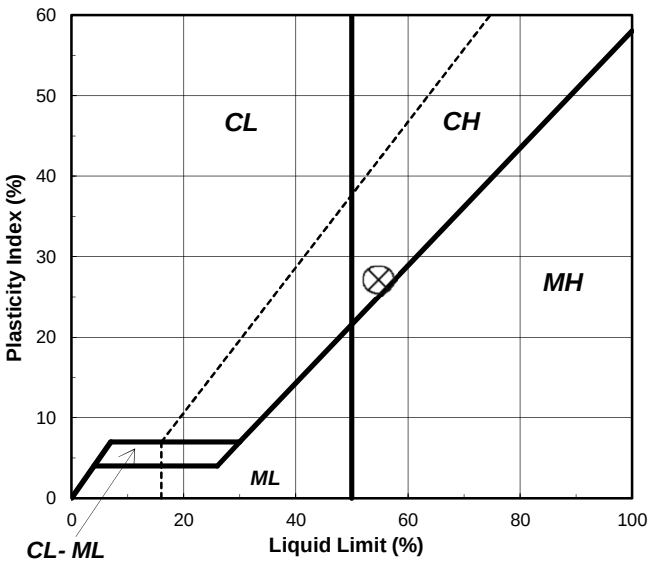
Note: The acceptable range of the two Moisture contents is ± 2.6

Test Results	
Liquid Limit (%)	**55**
Plastic Limit (%)	**28**
Plasticity Index (%)	**27**
USCS Symbol	**CH**

Flow Curve



Plasticity Chart



Tested By	*TB*	*Date*	*3/7/16*	*Checked By*	*GEM*	*Date*	3/8/16

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FLEXIBLE WALL PERMEABILITY TEST

PERMOMETER METHOD

ASTM D 5084-10

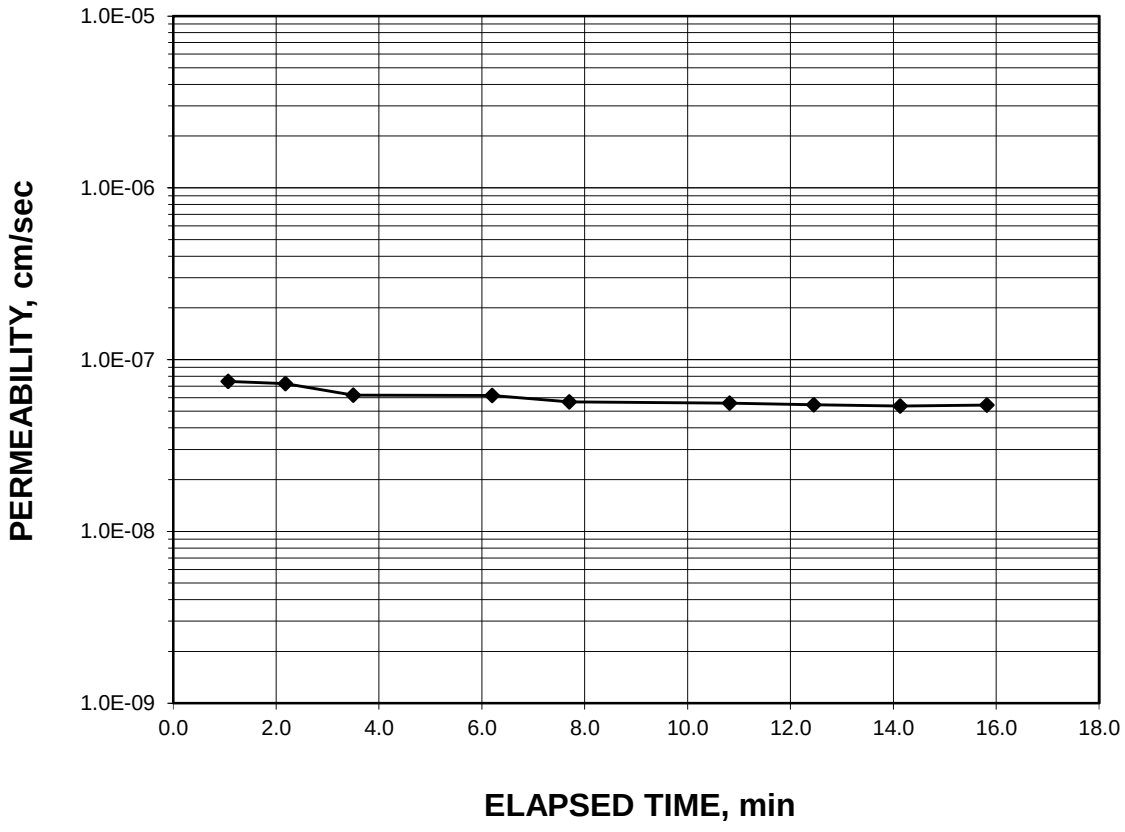
Client	HDR ENGINEERING, INC.	Boring No.	CELL 1C ACRE 5
Client Project	Brickhaven No.2 Mine	Depth (ft.)	LIFT 1
Project No.	2016-600-005	Sample No.	ST-1CA5-L1
Lab ID No.	2016-600-005-001	Nuc. Test No.	CL-23

Visual Description: TAN AND GRAY SANDY CLAY

AVERAGE PERMEABILITY = 5.5E-08 cm/sec @ 20°C

AVERAGE PERMEABILITY = 5.5E-10 m/sec @ 20°C

PERMEABILITY vs. TIME



Tested By: AF Date: 3/3/16 Checked By: GEM Date: 3/4/16

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FLEXIBLE WALL PERMEABILITY TEST

PERMOMETER METHOD

ASTM D 5084-10

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Client	HDR ENGINEERING, INC.	Boring No.	CELL 1C ACRE 5
Client Project	Brickhaven No.2 Mine	Depth (ft.)	LIFT 1
Project No.	2016-600-005	Sample No.	ST-1CA5-L1
Lab ID No.	2016-600-005-001	Nuc. Test No.	CL-23

Specific Gravity	2.70	Assumed
Sample Condition		Undisturbed

Visual Description: TAN AND GRAY SANDY CLAY

MOISTURE CONTENT:	BEFORE TEST	AFTER TEST
Tare Number	815	819
Wt. of Tare & WS (gm.)	362.92	668.68
Wt. of Tare & DS (gm.)	324.78	551.89
Wt. of Tare (gm.)	138.09	129.76
Wt. of Water (gm.)	38.14	116.79
Wt. of DS (gm.)	186.69	422.13
Moisture Content (%)	**20.4**	**27.7**

SPECIMEN:	BEFORE TEST	AFTER TEST
Wt. of Tube & WS (gm.)	530.23	NA
Wt. of Tube (gm.)	0.00	NA
Wt. of WS (calc.) (gm.)	530.23	562.09
Length 1 (in.)	2.696	2.665
Length 2 (in.)	2.650	2.626
Length 3 (in.)	2.688	2.628
Top Diameter (in.)	2.843	2.871
Middle Diameter (in.)	2.777	2.865
Bottom Diameter (in.)	2.842	2.825
Average Length (in.)	2.68	2.64
Average Area (in.^{2})	6.25	6.40
Sample Volume (cm^3)	274.22	276.66
Unit Wet Wt. (gm./ cm^3)	1.934	2.032
Unit Wet Wt. (pcf)	120.7	126.8
Unit Dry Wt. (pcf)	100.2	99.3
Unit Dry Wt. (gm./ cm^3)	1.606	1.591
Void Ratio, e	0.682	0.697
Porosity, n	0.405	0.411
Pore Volume (cm^3)	111.2	113.6
Total Wt. Of Sample After Test		539.14

Tested By: AF Date: 3/3/16 Checked By: GEM Date: 3/4/16

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FLEXIBLE WALL PERMEABILITY TEST
PERMOMETER METHOD

ASTM D 5084-10

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Client	HDR ENGINEERING, INC.	Boring No.	CELL 1C ACRE 5
Client Project	Brickhaven No.2 Mine	Depth (ft.)	LIFT 1
Project No.	2016-600-005	Sample No.	ST-1CA5-L1
Lab ID No.	2016-600-005-001	Nuc. Test No.	CL-23

Test Pressures		Final Sample Dimensions	
Cell Pressure(psi)	60.0	Sample Length (cm), L	6.70
Back Pressure(psi)	50.0	Sample Area (cm^2), A	41.26
Eff. Cons. Pressure(psi)	10.0	Pipette Area (cm^2), a_p	0.03142
Response (%)	100	Annulus Area (cm^2), a_a	0.76712
		Equilibrium Level (cm), R_{eq}	1

AVERAGE PERMEABILITY = 5.5E-08 cm/sec @ 20°C
AVERAGE PERMEABILITY = 5.5E-10 m/sec @ 20°C

DATE			TIME		ELAPSED TIME **t**	PIPETTE READI NG **R_p**	INCREMENT GRADIENT **i**	TEMP.	INCREMENTAL PERMEABILITY @ 20°C
(mm/dd/yy)	(hr)	(min)	(sec)	(min)	(min)	(cm)	(cm/cm)	(°C)	(cm/sec)
3/3/16	14	57	47	57.78	0.000	8.7	15.0	22.8	NA
3/3/16	14	58	51	58.85	1.067	8.6	14.8	22.8	7.5E-08
3/3/16	14	59	58	59.97	2.183	8.5	14.6	22.8	7.2E-08
3/3/16	15	1	17	1.28	3.500	8.4	14.4	22.8	6.2E-08
3/3/16	15	3	59	3.98	6.200	8.2	14.0	22.8	6.2E-08
3/3/16	15	5	29	5.48	7.700	8.1	13.8	22.8	5.7E-08
3/3/16	15	8	36	8.60	10.817	7.9	13.4	22.8	5.6E-08
3/3/16	15	10	14	10.23	12.450	7.8	13.2	22.8	5.4E-08
3/3/16	15	11	55	11.92	14.133	7.7	13.1	22.8	5.4E-08
3/3/16	15	13	36	13.60	15.817	7.6	12.9	22.8	5.4E-08

Tested By: AF Date: 3/3/16 Checked By: GEM Date: 3/4/16

DCN: CT-22A DATE:2-2-12 Z:\REVISIONS\PROJECTS\2016-600 HDR - BRICKHAVEN NO.2 MINE\[2016-600-005-001 Permometer.xlsm]Sheet1

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ATTERBERG LIMITS

ASTM D 4318-10 / AASHTO T89-10

Client:	HDR ENGINEERING, INC.	Boring No.:	CELL 1C ACRE 3
Client Reference:	BRICKHAVEN NO. 2 MINE	Depth (ft):	LIFT 1
Project No.:	2016-600-005	Sample No.:	ST-1CA3-L1
Lab ID:	2016-600-005-002	Soil Description:	**TAN GRAY FAT CLAY**

Note: The USCS symbol used with this test refers only to the minus No. 40 sieve material. See the "Sieve and Hydrometer Analysis" graph page for the complete material description. (Minus No. 40 sieve material, Airdried)

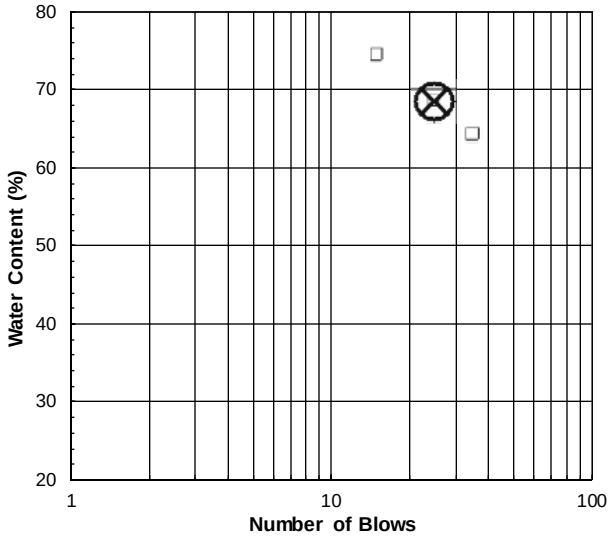
Liquid Limit Test	**1**	**2**	**3**	
Tare Number	V-2	R	Z-4	**M U L T I P O I N T**
Wt. of Tare & Wet Sample (g)	29.23	30.67	30.27	
Wt. of Tare & Dry Sample (g)	23.91	24.36	24.01	
Wt. of Tare (g)	15.64	15.15	15.60	
Wt. of Water (g)	5.3	6.3	6.3	
Wt. of Dry Sample (g)	8.3	9.2	8.4	
Moisture Content (%)	**64.3**	**68.5**	**74.4**	
Number of Blows	**35**	**25**	**15**	

Plastic Limit Test	**1**	**2**	**Range**
Tare Number	A-K	B-4	
Wt. of Tare & Wet Sample (g)	25.17	25.53	
Wt. of Tare & Dry Sample (g)	23.03	23.21	
Wt. of Tare (g)	15.56	15.46	
Wt. of Water (g)	2.1	2.3	
Wt. of Dry Sample (g)	7.5	7.8	
Moisture Content (%)	**28.6**	**29.9**	**-1.3**

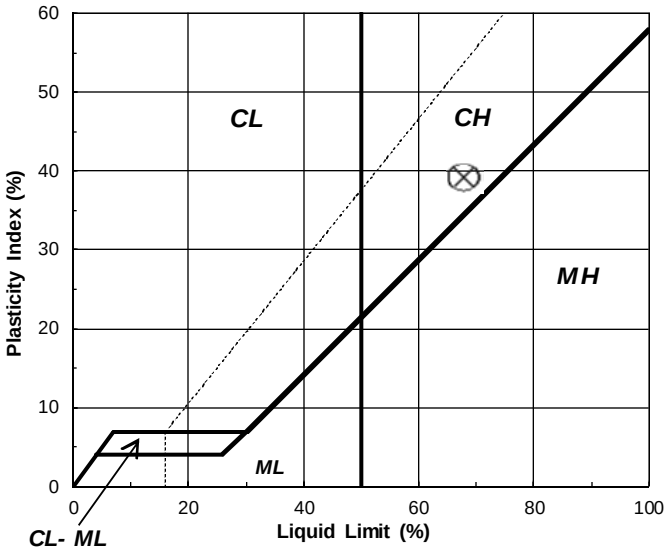
Note: The acceptable range of the two Moisture contents is ± 2.6

Test Results	
Liquid Limit (%)	**68**
Plastic Limit (%)	**29**
Plasticity Index (%)	**39**
USCS Symbol	**CH**

Flow Curve



Plasticity Chart



Tested By	*BW*	*Date*	*3/3/16*	*Checked By*	*GEM*	*Date*	3/7/16

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FLEXIBLE WALL PERMEABILITY TEST

PERMOMETER METHOD

ASTM D 5084-10

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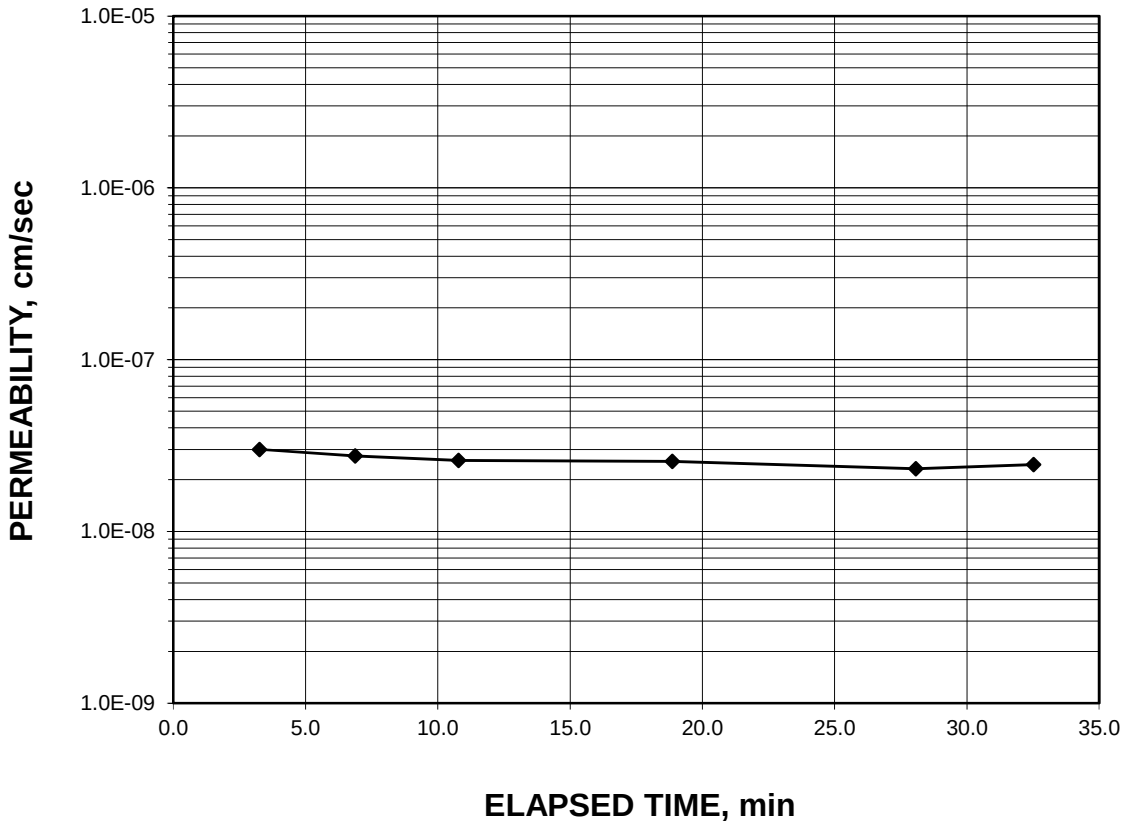
Client	HDR ENGINEERING, INC.	Boring No.	CELL 1C ACRE 3
Client Project	Brickhaven No.2 Mine	Depth (ft.)	LIFT 1
Project No.	2016-600-005	Sample No.	ST-1CA3-L1
Lab ID No.	2016-600-005-002	Nuc. Test No.	CL-25

Visual Description: TAN AND GRAY SANDY CLAY

AVERAGE PERMEABILITY = 2.5E-08 cm/sec @ 20°C

AVERAGE PERMEABILITY = 2.5E-10 m/sec @ 20°C

PERMEABILITY vs. TIME



Tested By: AF Date: 3/3/16 Checked By: GEM Date: 3/4/16

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FLEXIBLE WALL PERMEABILITY TEST

PERMOMETER METHOD

ASTM D 5084-10

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Client	HDR ENGINEERING, INC.	Boring No.	CELL 1C ACRE 3
Client Project	Brickhaven No.2 Mine	Depth (ft.)	LIFT 1
Project No.	2016-600-005	Sample No.	ST-1CA3-L1
Lab ID No.	2016-600-005-002	Nuc. Test No.	CL-25
		Specific Gravity	2.70 Assumed
		Sample Condition	Undisturbed

Visual Description: TAN AND GRAY SANDY CLAY

MOISTURE CONTENT:	BEFORE TEST	AFTER TEST
Tare Number	8010	825
Wt. of Tare & WS (gm.)	315.58	751.37
Wt. of Tare & DS (gm.)	278.63	623.34
Wt. of Tare (gm.)	128.37	137.26
Wt. of Water (gm.)	36.95	128.03
Wt. of DS (gm.)	150.26	486.08
Moisture Content (%)	**24.6**	**26.3**

SPECIMEN:	BEFORE TEST	AFTER TEST
Wt. of Tube & WS (gm.)	609.59	NA
Wt. of Tube (gm.)	0.00	NA
Wt. of WS (calc.) (gm.)	609.59	618.15
Length 1 (in.)	2.964	2.956
Length 2 (in.)	2.957	2.953
Length 3 (in.)	2.960	2.934
Top Diameter (in.)	2.855	2.885
Middle Diameter (in.)	2.866	2.857
Bottom Diameter (in.)	2.844	2.872
Average Length (in.)	2.96	2.95
Average Area (in.^{2})	6.40	6.48
Sample Volume (cm^3)	310.56	312.78
Unit Wet Wt. (gm./ cm^3)	1.963	1.976
Unit Wet Wt. (pcf)	122.5	123.4
Unit Dry Wt. (pcf)	98.3	97.6
Unit Dry Wt. (gm./ cm^3)	1.575	1.564
Void Ratio, e	0.714	0.726
Porosity, n	0.416	0.421
Pore Volume (cm^3)	129.3	131.6
Total Wt. Of Sample After Test		616.76

Tested By: AF Date: 3/3/16 Checked By: GEM Date: 3/4/16

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FLEXIBLE WALL PERMEABILITY TEST
PERMOMETER METHOD

ASTM D 5084-10

Client	HDR ENGINEERING, INC.	Boring No.	CELL 1C ACRE 3
Client Project	Brickhaven No.2 Mine	Depth (ft.)	LIFT 1
Project No.	2016-600-005	Sample No.	ST-1CA3-L1
Lab ID No.	2016-600-005-002	Nuc. Test No.	CL-25

Test Pressures		Final Sample Dimensions	
Cell Pressure(psi)	60.0	Sample Length (cm), L	7.49
Back Pressure(psi)	50.0	Sample Area (cm^2), A	41.78
Eff. Cons. Pressure(psi)	10.0	Pipette Area (cm^2), a_p	0.03142
Response (%)	100	Annulus Area (cm^2), a_a	0.76712
		Equilibrium Level (cm), R_{eq}	1

AVERAGE PERMEABILITY = 2.5E-08 cm/sec @ 20°C
AVERAGE PERMEABILITY = 2.5E-10 m/sec @ 20°C

DATE			TIME		ELAPSED TIME **t**	PIPETTE READI NG **R_p**	INCREMENT GRADIENT **i**	TEMP.	INCREMENTAL PERMEABILITY @ 20°C
(mm/dd/yy)	(hr)	(min)	(sec)	(min)	(min)	(cm)	(cm/cm)	(°C)	(cm/sec)
3/3/16	15	27	46	27.77	0.000	7.9	12.0	22.9	NA
3/3/16	15	31	2	31.03	3.267	7.8	11.9	22.9	3.0E-08
3/3/16	15	34	39	34.65	6.883	7.7	11.7	22.9	2.7E-08
3/3/16	15	38	33	38.55	10.783	7.6	11.5	22.9	2.6E-08
3/3/16	15	46	38	46.63	18.867	7.4	11.2	22.9	2.6E-08
3/3/16	15	55	50	55.83	28.067	7.2	10.8	22.9	2.3E-08
3/3/16	16	0	17	0.28	32.517	7.1	10.6	22.9	2.5E-08

Tested By: AF Date: 3/3/16 Checked By: GEM Date: 3/4/16

DCN: CT-22A DATE:2-2-12 Z:\BEVERLY\PROJECTS\2016-600 HDR - BRICKHAVEN NO.2 MINE\[2016-600-005-002 Permometer.xlsm]Sheet1

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ATTERBERG LIMITS

ASTM D 4318-10 / AASHTO T89-10

Client:	HDR ENGINEERING, INC.	Boring No.:	CELL 1C ACRE 6
Client Reference:	BRICKHAVEN NO. 2 MINE	Depth (ft):	LIFT 1
Project No.:	2016-600-005	Sample No.:	ST-1CA6-L1
Lab ID:	2016-600-005-003	Soil Description:	**TAN GRAY FAT CLAY**

Note: The* USCS *symbol used with this test refers only to the minus No. 40 sieve material. See the "Sieve and Hydrometer Analysis" graph page for the complete material description.

(Minus No. 40 sieve material, Airdried)

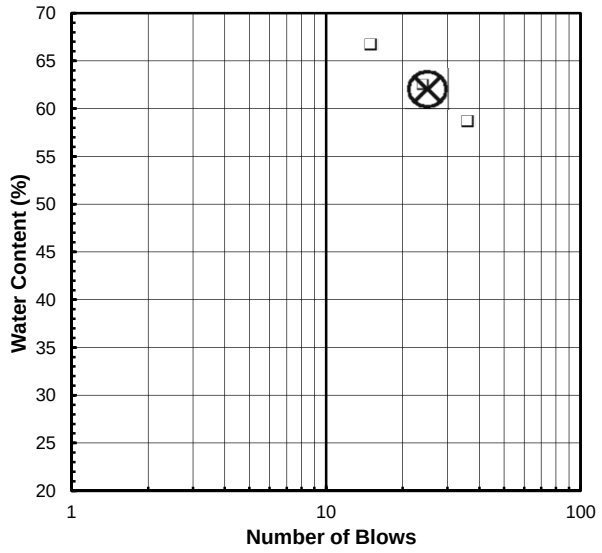
Liquid Limit Test	**1**	**2**	**3**	
Tare Number	U	K-P	A-M	**MULTIPOINT**
Wt. of Tare & Wet Sample (g)	32.09	32.15	29.17	
Wt. of Tare & Dry Sample (g)	25.85	25.77	23.66	
Wt. of Tare (g)	15.20	15.55	15.39	
Wt. of Water (g)	6.2	6.4	5.5	
Wt. of Dry Sample (g)	10.7	10.2	8.3	
Moisture Content (%)	**58.6**	**62.4**	**66.6**	
Number of Blows	**36**	**24**	**15**	

Plastic Limit Test	**1**	**2**	**Range**
Tare Number	Y	A-P	
Wt. of Tare & Wet Sample (g)	26.54	25.98	
Wt. of Tare & Dry Sample (g)	24.37	23.88	
Wt. of Tare (g)	15.63	15.55	
Wt. of Water (g)	2.2	2.1	
Wt. of Dry Sample (g)	8.7	8.3	
Moisture Content (%)	**24.8**	**25.2**	**-0.4**

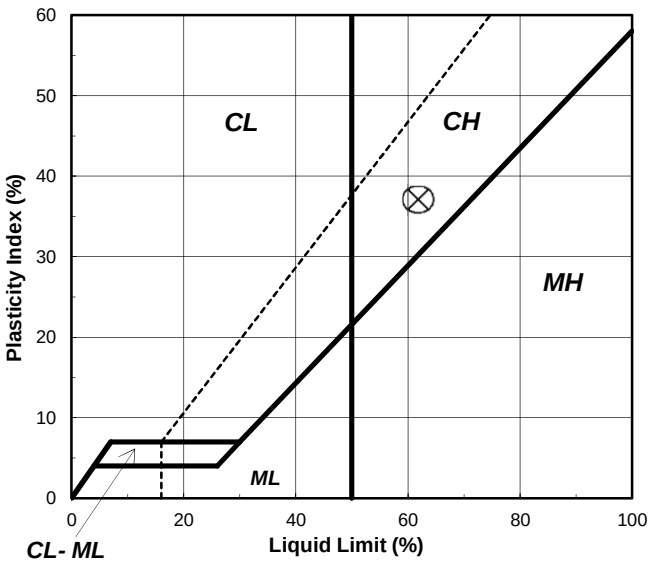
Note: The acceptable range of the two Moisture contents is ± 2.6

Test Results	
Liquid Limit (%)	**62**
Plastic Limit (%)	**25**
Plasticity Index (%)	**37**
USCS Symbol	**CH**

Flow Curve



Plasticity Chart



Tested By	*TB*	*Date*	*3/7/16*	*Checked By*	*GEM*	*Date*	3/8/16

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FLEXIBLE WALL PERMEABILITY TEST

PERMOMETER METHOD

ASTM D 5084-10

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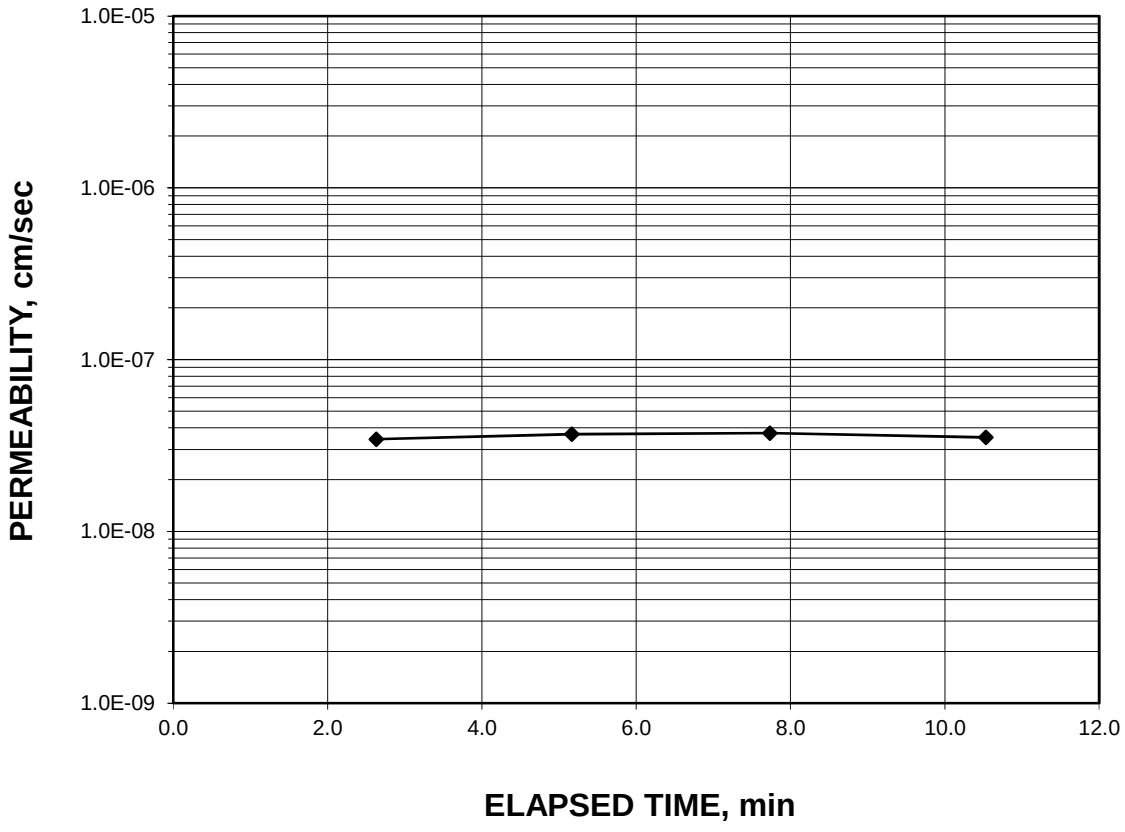
Client	HDR ENGINEERING, INC.	Boring No.	CELL 1C ACRE 6
Client Project	Brickhaven No.2 Mine	Depth (ft.)	LIFT 1
Project No.	2016-600-005	Sample No.	ST-1CA6-L1
Lab ID No.	2016-600-005-003	Nuc. Test No.	CL-28

Visual Description: TAN AND GRAY SANDY CLAY

AVERAGE PERMEABILITY = 3.6E-08 cm/sec @ 20°C

AVERAGE PERMEABILITY = 3.6E-10 m/sec @ 20°C

PERMEABILITY vs. TIME



Tested By: AF Date: 3/3/16 Checked By: GEM Date: 3/4/16

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FLEXIBLE WALL PERMEABILITY TEST

PERMOMETER METHOD

ASTM D 5084-10

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Client	HDR ENGINEERING, INC.	Boring No.	CELL 1C ACRE 6
Client Project	Brickhaven No.2 Mine	Depth (ft.)	LIFT 1
Project No.	2016-600-005	Sample No.	ST-1CA6-L1
Lab ID No.	2016-600-005-003	Nuc. Test No.	CL-28

Specific Gravity	2.70	Assumed
Sample Condition		Undisturbed

Visual Description: TAN AND GRAY SANDY CLAY

MOISTURE CONTENT:	BEFORE TEST	AFTER TEST
Tare Number	802	826
Wt. of Tare & WS (gm.)	405.51	416.92
Wt. of Tare & DS (gm.)	352.16	351.51
Wt. of Tare (gm.)	101.84	133.71
Wt. of Water (gm.)	53.35	65.41
Wt. of DS (gm.)	250.32	217.80
Moisture Content (%)	**21.3**	**30.0**

SPECIMEN:	BEFORE TEST	AFTER TEST
Wt. of Tube & WS (gm.)	281.05	NA
Wt. of Tube (gm.)	0.00	NA
Wt. of WS (calc.) (gm.)	281.05	301.25
Length 1 (in.)	1.447	1.385
Length 2 (in.)	1.438	1.446
Length 3 (in.)	1.397	1.408
Top Diameter (in.)	2.849	2.827
Middle Diameter (in.)	2.846	2.849
Bottom Diameter (in.)	2.847	2.842
Average Length (in.)	1.43	1.41
Average Area (in.^{2})	6.37	6.33
Sample Volume (cm^3)	148.93	146.61
Unit Wet Wt. (gm./ cm^3)	1.887	2.055
Unit Wet Wt. (pcf)	117.8	128.3
Unit Dry Wt. (pcf)	97.1	98.6
Unit Dry Wt. (gm./ cm^3)	1.556	1.580
Void Ratio, e	0.736	0.709
Porosity, n	0.424	0.415
Pore Volume (cm^3)	63.1	60.8
Total Wt. Of Sample After Test		284.02

Tested By: AF Date: 3/3/16 Checked By: GEM Date: 3/4/16

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FLEXIBLE WALL PERMEABILITY TEST
PERMOMETER METHOD

ASTM D 5084-10

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Client	HDR ENGINEERING, INC.	Boring No.	CELL 1C ACRE 6
Client Project	Brickhaven No.2 Mine	Depth (ft.)	LIFT 1
Project No.	2016-600-005	Sample No.	ST-1CA6-L1
Lab ID No.	2016-600-005-003	Nuc. Test No.	CL-28

Test Pressures		Final Sample Dimensions	
Cell Pressure(psi)	60.0	Sample Length (cm), L	3.59
Back Pressure(psi)	50.0	Sample Area (cm^2), A	40.85
Eff. Cons. Pressure(psi)	10.0	Pipette Area (cm^2), a_p	0.03142
Response (%)	99	Annulus Area (cm^2), a_a	0.76712
		Equilibrium Level (cm), R_{eq}	1

AVERAGE PERMEABILITY = 3.6E-08 cm/sec @ 20°C
AVERAGE PERMEABILITY = 3.6E-10 m/sec @ 20°C

DATE			TIME		ELAPSED TIME **t**	PIPETTE READI NG **R_p**	INCREMENT GRADIENT **i**	TEMP.	INCREMENTAL PERMEABILITY @ 20°C
(mm/dd/yy)	(hr)	(min)	(sec)	(min)	(min)	(cm)	(cm/cm)	(°C)	(cm/sec)
3/3/16	14	30	37	30.62	0.000	4.7	13.5	22.7	NA
3/3/16	14	33	15	33.25	2.633	4.6	13.1	22.7	3.4E-08
3/3/16	14	35	47	35.78	5.167	4.5	12.7	22.7	3.7E-08
3/3/16	14	38	21	38.35	7.733	4.4	12.4	22.7	3.7E-08
3/3/16	14	41	9	41.15	10.533	4.3	12.0	22.7	3.5E-08

Tested By: AF Date: 3/3/16 Checked By: GEM Date: 3/4/16

DCN: CT-22A DATE:2-2-12 Z:\BEMS\PROJECTS\2016-600 HDR - BRICKHAVEN NO.2 MINE\[2016-600-005-003 Permometer.xlsm]Sheet1

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ATTERBERG LIMITS

ASTM D 4318-10 / AASHTO T89-10

Client:	HDR ENGINEERING, INC.	Boring No.:	CELL 1C ACRE 2
Client Reference:	BRICKHAVEN NO. 2 MINE	Depth (ft):	LIFT 2
Project No.:	2016-600-005	Sample No.:	ST-1CA2-L2
Lab ID:	2016-600-005-004	Soil Description:	**TAN GRAY FAT CLAY**

Note: The USCS symbol used with this test refers only to the minus No. 40 sieve material. See the "Sieve and Hydrometer Analysis" graph page for the complete material description.

(Minus No. 40 sieve material, Airdried)

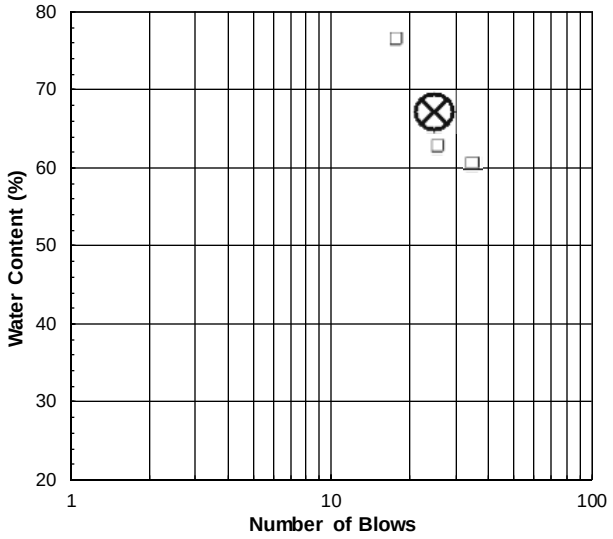
Liquid Limit Test	**1**	**2**	**3**	
Tare Number	L	H	V	**MULTIPOINT**
Wt. of Tare & Wet Sample (g)	26.70	25.72	27.18	
Wt. of Tare & Dry Sample (g)	22.40	21.65	22.45	
Wt. of Tare (g)	15.30	15.16	16.26	
Wt. of Water (g)	4.3	4.1	4.7	
Wt. of Dry Sample (g)	7.1	6.5	6.2	
Moisture Content (%)	**60.6**	**62.7**	**76.4**	
Number of Blows	**35**	**26**	**18**	

Plastic Limit Test	**1**	**2**	**Range**
Tare Number	P	A-Q	
Wt. of Tare & Wet Sample (g)	22.73	21.77	
Wt. of Tare & Dry Sample (g)	21.18	20.48	
Wt. of Tare (g)	15.24	15.48	
Wt. of Water (g)	1.6	1.3	
Wt. of Dry Sample (g)	5.9	5.0	
Moisture Content (%)	**26.1**	**25.8**	**0.3**

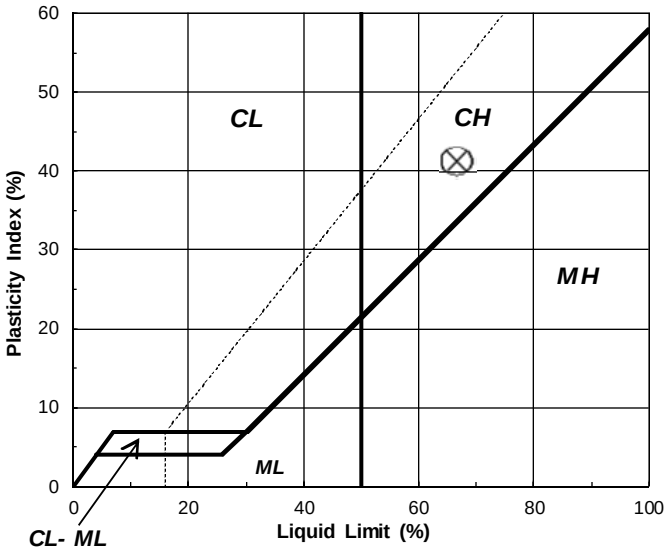
Note: The acceptable range of the two Moisture contents is ± 2.6

Test Results	
Liquid Limit (%)	**67**
Plastic Limit (%)	**26**
Plasticity Index (%)	**41**
USCS Symbol	**CH**

Flow Curve



Plasticity Chart



Tested By	*BW*	*Date*	*3/3/16*	*Checked By*	*GEM*	*Date*	3/7/16

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FLEXIBLE WALL PERMEABILITY TEST

PERMOMETER METHOD

ASTM D 5084-10

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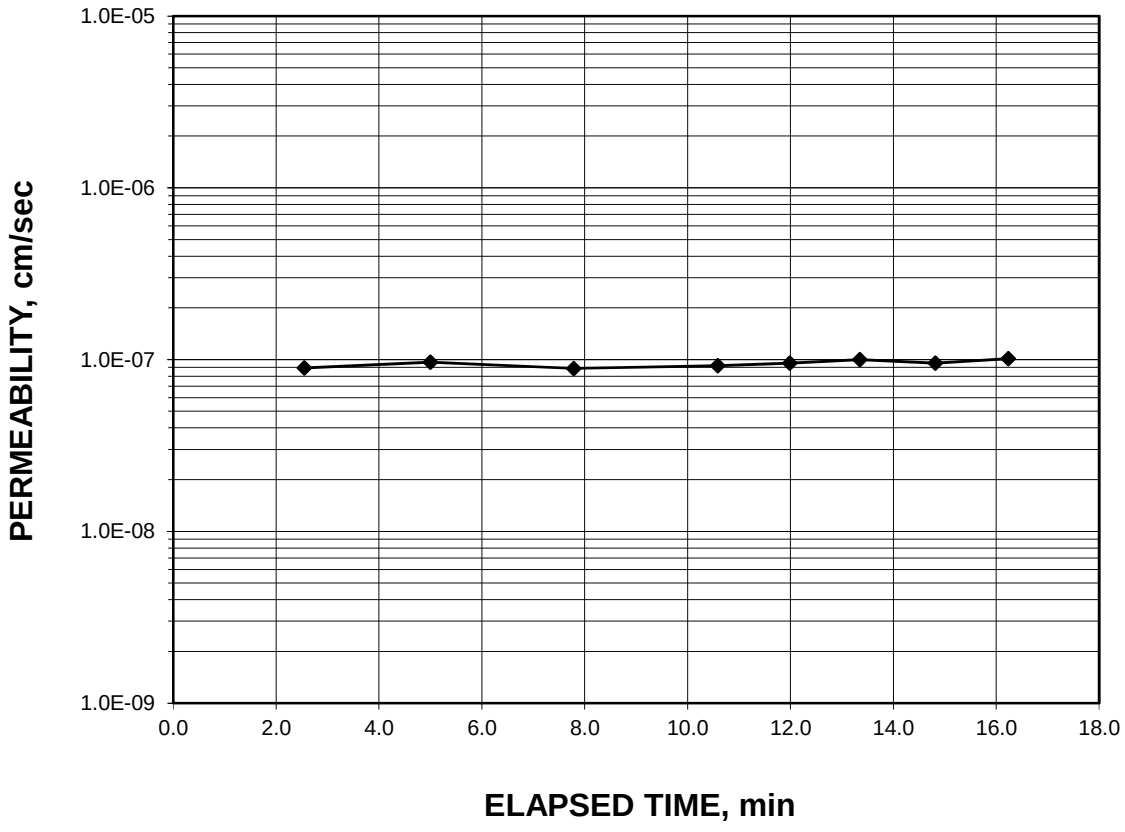
Client	HDR ENGINEERING, INC.	Boring No.	CELL 1C ACRE 2
Client Project	Brickhaven No.2 Mine	Depth (ft.)	LIFT 2
Project No.	2016-600-005	Sample No.	ST-1CA2-L2
Lab ID No.	2016-600-005-004	Nuc. Test No.	CL-30

Visual Description: TAN AND GRAY SANDY CLAY

AVERAGE PERMEABILITY = 9.8E-08 cm/sec @ 20°C

AVERAGE PERMEABILITY = 9.8E-10 m/sec @ 20°C

PERMEABILITY vs. TIME



Tested By: AF Date: 3/3/16 Checked By: GEM Date: 3/4/16

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FLEXIBLE WALL PERMEABILITY TEST

PERMOMETER METHOD

ASTM D 5084-10

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Client	HDR ENGINEERING, INC.	Boring No.	CELL 1C ACRE 2
Client Project	Brickhaven No.2 Mine	Depth (ft.)	LIFT 2
Project No.	2016-600-005	Sample No.	ST-1CA2-L2
Lab ID No.	2016-600-005-004	Nuc. Test No.	CL-30
		Specific Gravity	2.70 Assumed
		Sample Condition	Undisturbed

Visual Description: TAN AND GRAY SANDY CLAY

MOISTURE CONTENT:	BEFORE TEST	AFTER TEST
Tare Number	828	806
Wt. of Tare & WS (gm.)	422.25	616.18
Wt. of Tare & DS (gm.)	368.47	509.83
Wt. of Tare (gm.)	134.93	100.09
Wt. of Water (gm.)	53.78	106.35
Wt. of DS (gm.)	233.54	409.74
Moisture Content (%)	**23.0**	**26.0**

SPECIMEN:	BEFORE TEST	AFTER TEST
Wt. of Tube & WS (gm.)	501.43	NA
Wt. of Tube (gm.)	0.00	NA
Wt. of WS (calc.) (gm.)	501.43	513.36
Length 1 (in.)	2.547	2.470
Length 2 (in.)	2.525	2.535
Length 3 (in.)	2.549	2.516
Top Diameter (in.)	2.849	2.873
Middle Diameter (in.)	2.842	2.835
Bottom Diameter (in.)	2.836	2.851
Average Length (in.)	2.54	2.51
Average Area (in.^{2})	6.35	6.39
Sample Volume (cm^3)	264.14	262.63
Unit Wet Wt. (gm./ cm^3)	1.898	1.955
Unit Wet Wt. (pcf)	118.5	122.0
Unit Dry Wt. (pcf)	96.3	96.9
Unit Dry Wt. (gm./ cm^3)	1.543	1.552
Void Ratio, e	0.750	0.740
Porosity, n	0.429	0.425
Pore Volume (cm^3)	113.2	111.7
Total Wt. Of Sample After Test		516.24

Tested By: AF Date: 3/3/16 Checked By: GEM Date: 3/4/16

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FLEXIBLE WALL PERMEABILITY TEST
PERMOMETER METHOD

ASTM D 5084-10

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Client	HDR ENGINEERING, INC.	Boring No.	CELL 1C ACRE 2
Client Project	Brickhaven No.2 Mine	Depth (ft.)	LIFT 2
Project No.	2016-600-005	Sample No.	ST-1CA2-L2
Lab ID No.	2016-600-005-004	Nuc. Test No.	CL-30

Test Pressures		Final Sample Dimensions	
Cell Pressure(psi)	60.0	Sample Length (cm), L	6.37
Back Pressure(psi)	50.0	Sample Area (cm^2), A	41.24
Eff. Cons. Pressure(psi)	10.0	Pipette Area (cm^2), a_p	0.03142
Response (%)	100	Annulus Area (cm^2), a_a	0.76712
		Equilibrium Level (cm), R_{eq}	1

AVERAGE PERMEABILITY = 9.8E-08 cm/sec @ 20°C
AVERAGE PERMEABILITY = 9.8E-10 m/sec @ 20°C

DATE			TIME		ELAPSED TIME **t**	PIPETTE READI NG **R_p**	INCREMENT GRADIENT **i**	TEMP.	INCREMENTAL PERMEABILITY @ 20°C
(mm/dd/yy)	(hr)	(min)	(sec)	(min)	(min)	(cm)	(cm/cm)	(°C)	(cm/sec)
3/3/16	14	31	39	31.65	0.000	6.2	10.7	22.7	NA
3/3/16	14	34	12	34.20	2.550	6.0	10.3	22.7	8.9E-08
3/3/16	14	36	39	36.65	5.000	5.8	9.8	22.7	9.7E-08
3/3/16	14	39	26	39.43	7.783	5.6	9.4	22.7	8.9E-08
3/3/16	14	42	14	42.23	10.583	5.4	9.0	22.7	9.2E-08
3/3/16	14	43	38	43.63	11.983	5.3	8.8	22.7	9.5E-08
3/3/16	14	45	0	45.00	13.350	5.2	8.6	22.7	1.0E-07
3/3/16	14	46	28	46.47	14.817	5.1	8.4	22.7	9.5E-08
3/3/16	14	47	53	47.88	16.233	5.0	8.2	22.7	1.0E-07

Tested By: AF Date: 3/3/16 Checked By: GEM Date: 3/4/16

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ATTERBERG LIMITS

ASTM D 4318-10 / AASHTO T89-10

Client:	HDR ENGINEERING, INC.	Boring No.:	CELL 1C ACRE 3
Client Reference:	BRICKHAVEN NO. 2 MINE	Depth (ft):	LIFT 2
Project No.:	2016-600-005	Sample No.:	ST-1CA3-L2
Lab ID:	2016-600-005-005	Soil Description:	**TAN GRAY FAT CLAY**

Note: The USCS symbol used with this test refers only to the minus No. 40 sieve material. See the "Sieve and Hydrometer Analysis" graph page for the complete material description. (Minus No. 40 sieve material, Airdried)

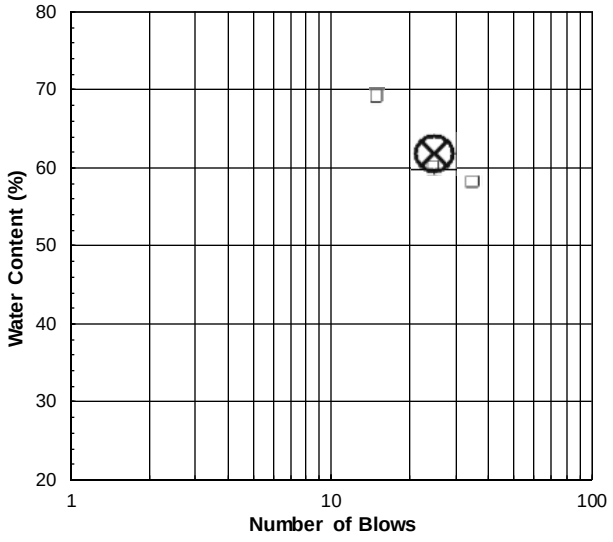
Liquid Limit Test	**1**	**2**	**3**	
Tare Number	B-B	I	J	**MULTIPOINT**
Wt. of Tare & Wet Sample (g)	31.57	29.24	29.88	
Wt. of Tare & Dry Sample (g)	25.70	24.15	23.88	
Wt. of Tare (g)	15.59	15.68	15.19	
Wt. of Water (g)	5.9	5.1	6.0	
Wt. of Dry Sample (g)	10.1	8.5	8.7	
Moisture Content (%)	**58.1**	**60.1**	**69.0**	
Number of Blows	**35**	**25**	**15**	

Plastic Limit Test	**1**	**2**	**Range**
Tare Number	F	K	
Wt. of Tare & Wet Sample (g)	24.24	23.22	
Wt. of Tare & Dry Sample (g)	22.46	21.66	
Wt. of Tare (g)	15.13	15.24	
Wt. of Water (g)	1.8	1.6	
Wt. of Dry Sample (g)	7.3	6.4	
Moisture Content (%)	**24.3**	**24.3**	**0.0**

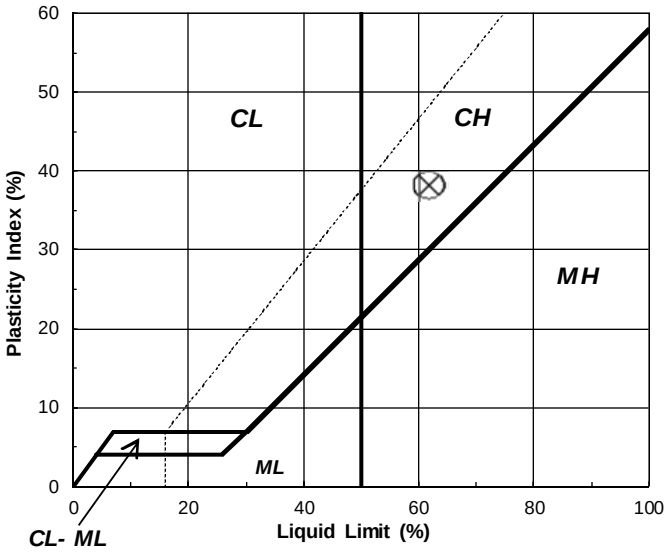
Note: The acceptable range of the two Moisture contents is ± 2.6

Test Results	
Liquid Limit (%)	**62**
Plastic Limit (%)	**24**
Plasticity Index (%)	**38**
USCS Symbol	**CH**

Flow Curve



Plasticity Chart



Tested By *TB* *Date* *3/3/16* *Checked By* *GEM* *Date* 3/7/16

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FLEXIBLE WALL PERMEABILITY TEST

PERMOMETER METHOD

ASTM D 5084-10

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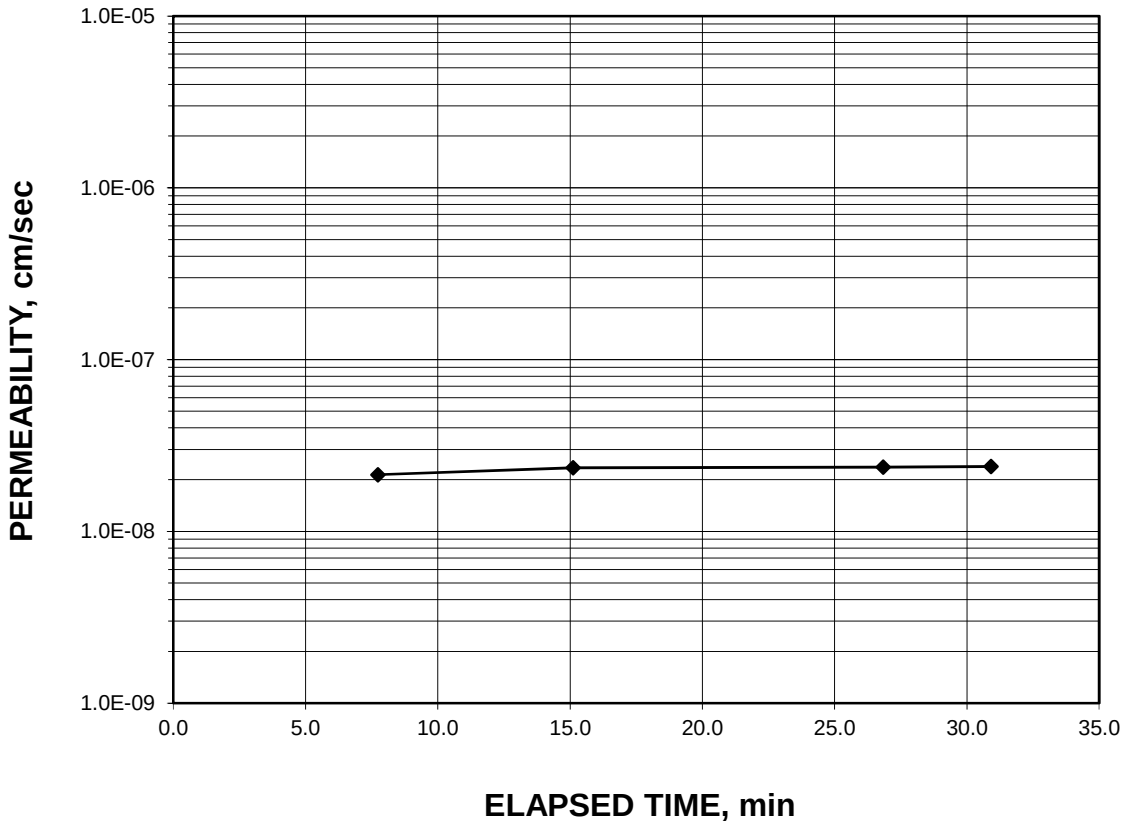
Client	HDR ENGINEERING, INC.	Boring No.	CELL 1C ACRE 3
Client Project	Brickhaven No.2 Mine	Depth (ft.)	LIFT 2
Project No.	2016-600-005	Sample No.	ST-1CA3-L2
Lab ID No.	2016-600-005-005	Nuc. Test No.	CL-39

Visual Description: TAN AND GRAY SANDY CLAY

AVERAGE PERMEABILITY = 2.3E-08 cm/sec @ 20°C

AVERAGE PERMEABILITY = 2.3E-10 m/sec @ 20°C

PERMEABILITY vs. TIME



Tested By: AF Date: 3/3/16 Checked By: GEM Date: 3/4/16

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FLEXIBLE WALL PERMEABILITY TEST

PERMOMETER METHOD

ASTM D 5084-10

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Client	HDR ENGINEERING, INC.	Boring No.	CELL 1C ACRE 3
Client Project	Brickhaven No.2 Mine	Depth (ft.)	LIFT 2
Project No.	2016-600-005	Sample No.	ST-1CA3-L2
Lab ID No.	2016-600-005-005	Nuc. Test No.	CL-39
		Specific Gravity	2.70 Assumed
		Sample Condition	Undisturbed

Visual Description: TAN AND GRAY SANDY CLAY

MOISTURE CONTENT:	BEFORE TEST	AFTER TEST
Tare Number	821	TB-07
Wt. of Tare & WS (gm.)	380.63	462.21
Wt. of Tare & DS (gm.)	333.63	389.12
Wt. of Tare (gm.)	130.62	134.23
Wt. of Water (gm.)	47.00	73.09
Wt. of DS (gm.)	203.01	254.89
Moisture Content (%)	**23.2**	**28.7**

SPECIMEN:	BEFORE TEST	AFTER TEST
Wt. of Tube & WS (gm.)	320.18	NA
Wt. of Tube (gm.)	0.00	NA
Wt. of WS (calc.) (gm.)	320.18	334.54
Length 1 (in.)	1.583	1.565
Length 2 (in.)	1.575	1.573
Length 3 (in.)	1.590	1.546
Top Diameter (in.)	2.847	2.894
Middle Diameter (in.)	2.863	2.876
Bottom Diameter (in.)	2.837	2.872
Average Length (in.)	1.58	1.56
Average Area (in.^{2})	6.37	6.52
Sample Volume (cm^3)	165.34	166.75
Unit Wet Wt. (gm./ cm^3)	1.937	2.006
Unit Wet Wt. (pcf)	120.9	125.2
Unit Dry Wt. (pcf)	98.2	97.3
Unit Dry Wt. (gm./ cm^3)	1.572	1.559
Void Ratio, e	0.717	0.732
Porosity, n	0.418	0.423
Pore Volume (cm^3)	69.0	70.5
Total Wt. Of Sample After Test		328.04

Tested By: AF Date: 3/3/16 Checked By: GEM Date: 3/4/16

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FLEXIBLE WALL PERMEABILITY TEST
PERMOMETER METHOD

ASTM D 5084-10

Client	HDR ENGINEERING, INC.	Boring No.	CELL 1C ACRE 3
Client Project	Brickhaven No.2 Mine	Depth (ft.)	LIFT 2
Project No.	2016-600-005	Sample No.	ST-1CA3-L2
Lab ID No.	2016-600-005-005	Nuc. Test No.	CL-39

Test Pressures		Final Sample Dimensions	
Cell Pressure(psi)	60.0	Sample Length (cm), L	3.97
Back Pressure(psi)	50.0	Sample Area (cm^2), A	42.05
Eff. Cons. Pressure(psi)	10.0	Pipette Area (cm^2), a_p	0.03142
Response (%)	100	Annulus Area (cm^2), a_a	0.76712
		Equilibrium Level (cm), R_{eq}	1

AVERAGE PERMEABILITY = 2.3E-08 cm/sec @ 20°C
AVERAGE PERMEABILITY = 2.3E-10 m/sec @ 20°C

DATE			TIME		ELAPSED TIME t	PIPETTE READI NG R_p	INCREMENT GRADIENT i	TEMP.	INCREMENTAL PERMEABILITY @ 20°C
(mm/dd/yy)	(hr)	(min)	(sec)	(min)	(min)	(cm)	(cm/cm)	(°C)	(cm/sec)
3/3/16	15	54	37	54.62	0.000	5.4	14.5	22.6	NA
3/3/16	16	2	21	2.35	7.733	5.2	13.8	22.6	2.1E-08
3/3/16	16	9	44	9.73	15.117	5.0	13.2	22.6	2.3E-08
3/3/16	16	21	27	21.45	26.833	4.7	12.2	22.6	2.4E-08
3/3/16	16	25	32	25.53	30.917	4.6	11.9	22.6	2.4E-08

Tested By: AF Date: 3/3/16 Checked By: GEM Date: 3/4/16

DCN: CT-22A DATE:2-2-12 Z:\REVISIONS\PROJECTS\2016-600 HDR - BRICKHAVEN NO.2 MINE\[2016-600-005-005 Permometer.xlsm]Sheet1

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March 8, 2016

Project No. 2016-600-006

Mr. Michael Plummer, P.E.
HDR Engineering, Inc.
440 South Church St., Suite 1000
Charlotte, NC 28202

Transmittal
Laboratory Test Results
Brickhaven No. 2 Mine

Please find attached the laboratory test results for the above referenced project. The tests were outlined on the Project Verification Form that was transmitted to your firm prior to the testing. The testing was performed in general accordance with the methods listed on the enclosed data sheets. The test results are believed to be representative of the samples that were submitted for testing and are indicative only of the specimens which were evaluated. We imply no position with regard to the nature of the test results, i.e. pass/fail and no claims as to the suitability of the material for its intended use.

The test data and all associated project information provided shall be held in strict confidence and disclosed to other parties only with authorization by our Client. The test data submitted herein is considered integral with this report and is not to be reproduced except in whole and only with the authorization of the Client and Geotechnics. The remaining sample materials for this project will be retained for a minimum of 90 days as directed by the Geotechnics' Quality Program.

We are pleased to provide these testing services. Should you have any questions or if we may be of further assistance, please contact our office.

Respectively submitted,
Geotechnics, Inc.

Michael P. Smith
Regional Manager

We understand that you have a choice in your laboratory services and we thank you for choosing Geotechnics.

DCN: Data Transmittal Letter Date: 1/28/05 Rev.: 1

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MOISTURE CONTENT

ASTM D 2216-10

Client: HDR ENGINEERING, INC.
Client Reference: Brickhaven No.2 Mine
Project No.: 2016-600-006

Lab ID:	001	002	003	004
Boring No.:	CELL 1C ACRE 1	CELL 1C ACRE 4	CELL 1C ACRE 5	CELL 1C ACRE 6
Depth (ft):	LIFT 2	LIFT 2	LIFT 2	LIFT 2
Sample No.:	ST-1CA1-L2	ST-C1A4-L2	ST-1CA5-L2	ST-1CA6-L2
Tare Number	810	800	808	801
Wt. of Tare & Wet Sample (g)	504.24	225.45	486.22	327.63
Wt. of Tare & Dry Sample (g)	442.07	205.62	416.63	281.99
Weight of Tare (g)	112.82	103.02	103.27	97.65
Weight of Water (g)	62.17	19.83	69.59	45.64
Weight of Dry Sample (g)	329.25	102.60	313.36	184.34
Water Content (%)	**18.9**	**19.3**	**22.2**	**24.8**

Notes :

Tested By *AF* *Date* *3/3/16* *Checked By* *GEM* *Date* *3/7/16*

DCN: CT-S1 DATE: 3/18/13 REVISION: 4

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PERCENT PASSING # 200 SIEVE

ASTM D 1140-00

Client	HDR ENGINEERING, INC.
Client Reference	BRICKHAVEN NO. 2 MINE
Project No.	2016-600-006

Lab Id.	.001	.002	.003	.004
Boring No.	CELL 1C ACRE 1	CELL 1C ACRE 4	CELL 1C ACRE 5	CELL 1C ACRE 6
Depth (ft)	LIFT 2	LIFT 2	LIFT 2	LIFT 2
Sample No.	ST-1CA1-L2	ST-C1A4-L2	ST-1CA5-L2	ST-1CA6-L2
Tare Number	810	800	808	801
Wt. of Tare & WS (gm)	504.24	225.45	486.22	327.63
Wt. of Tare & DS (gm)	442.07	205.62	416.63	281.99
Wt. of Tare (gm)	112.82	103.02	103.27	97.65
Wt. of Water (gm)	62.17	19.83	69.59	45.64
Wt. of DS (gm)	329.25	102.6	313.36	184.34
Water Content (%)	**18.9**	**19.3**	**22.2**	**24.8**
Wt. of Washed Soil & Tare	168.98	119.91	150.78	124.14
Percent Passing #200	**82.9**	**83.5**	**84.8**	**85.6**

Tested By AF *Date* 3/3/16 *Checked By* GEM *Date* 3/7/16

DCN: CT-S54 DATE: 7-8-98 REVISION:2

T:\2016 PROJECTS\2016-600 HDR - BRICKHAVEN NO.2 MINE\[2016-600-006 PASS #200.xls]Sheet1

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ATTERBERG LIMITS

ASTM D 4318-10 / AASHTO T89-10

Client:	HDR ENGINEERING, INC.	Boring No.:	CELL 1C ACRE 1
Client Reference:	BRICKHAVEN NO. 2 MINE	Depth (ft):	LIFT 2
Project No.:	2016-600-006	Sample No.:	ST-1CA1-L2
Lab ID:	2016-600-006-001	Soil Description:	**TAN GRAY FAT CLAY**

Note: The USCS symbol used with this test refers only to the minus No. 40 sieve material. See the "Sieve and Hydrometer Analysis" graph page for the complete material description.

(Minus No. 40 sieve material, Airdried)

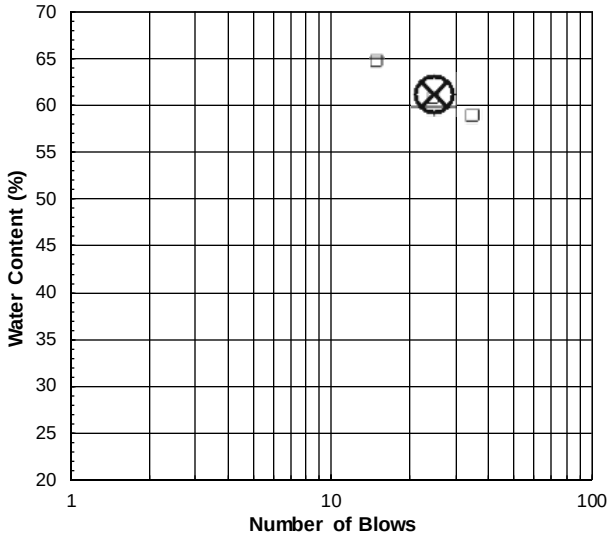
Liquid Limit Test	**1**	**2**	**3**	
				M
Tare Number	4M	1M	A-B	**U**
Wt. of Tare & Wet Sample (g)	30.04	29.32	29.03	**L**
Wt. of Tare & Dry Sample (g)	24.69	24.23	23.76	**T**
Wt. of Tare (g)	15.61	15.84	15.60	**I**
Wt. of Water (g)	5.4	5.1	5.3	**P**
Wt. of Dry Sample (g)	9.1	8.4	8.2	**O**
				I
Moisture Content (%)	**58.9**	**60.7**	**64.6**	**N**
Number of Blows	**35**	**25**	**15**	**T**

Plastic Limit Test	**1**	**2**	**Range**
Tare Number	O	I	
Wt. of Tare & Wet Sample (g)	24.55	23.06	
Wt. of Tare & Dry Sample (g)	22.69	21.44	
Wt. of Tare (g)	15.18	15.24	
Wt. of Water (g)	1.9	1.6	
Wt. of Dry Sample (g)	7.5	6.2	
Moisture Content (%)	**24.8**	**26.1**	**-1.4**

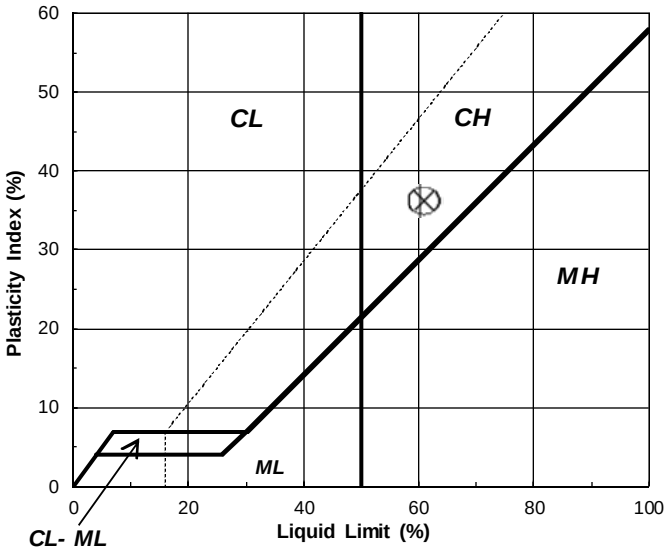
Note: The acceptable range of the two Moisture contents is ± 2.6

Test Results	
Liquid Limit (%)	**61**
Plastic Limit (%)	**25**
Plasticity Index (%)	**36**
USCS Symbol	**CH**

Flow Curve



Plasticity Chart



Tested By	*TB*	*Date*	*3/4/16*	*Checked By*	*GEM*	*Date*	3/7/16

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FLEXIBLE WALL PERMEABILITY TEST

PERMOMETER METHOD

ASTM D 5084-10

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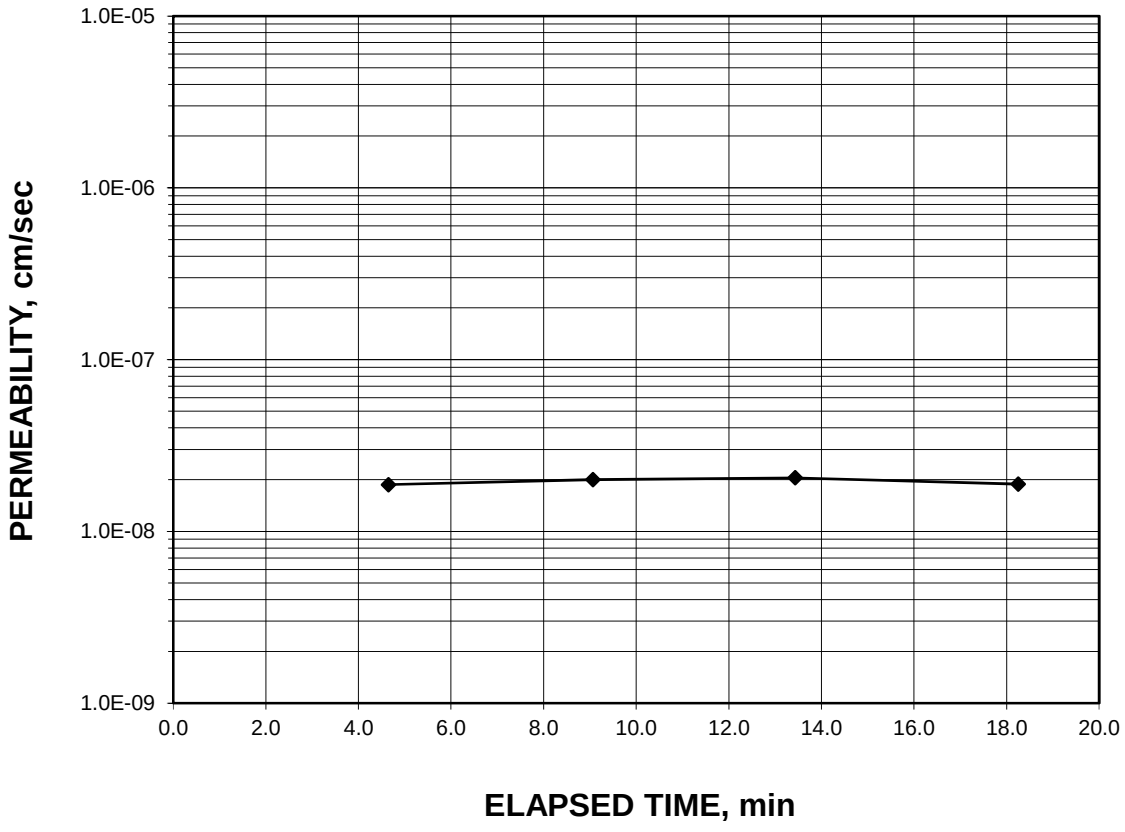
Client	HDR ENGINEERING, INC.	Boring No.	CELL 1C ACRE 1
Client Project	Brickhaven No.2 Mine	Depth (ft.)	LIFT 2
Project No.	2016-600-006	Sample No.	ST-1CA1-L2
Lab ID No.	2016-600-006-001	Nuc. Test No.	CL-35

Visual Description: TAN AND GRAY SANDY CLAY

AVERAGE PERMEABILITY = 2.0E-08 cm/sec @ 20°C

AVERAGE PERMEABILITY = 2.0E-10 m/sec @ 20°C

PERMEABILITY vs. TIME



Tested By: AF Date: 3/3/16 Checked By: GEM Date: 3/7/16

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FLEXIBLE WALL PERMEABILITY TEST

PERMOMETER METHOD

ASTM D 5084-10

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Client	HDR ENGINEERING, INC.	Boring No.	CELL 1C ACRE 1
Client Project	Brickhaven No.2 Mine	Depth (ft.)	LIFT 2
Project No.	2016-600-006	Sample No.	ST-1CA1-L2
Lab ID No.	2016-600-006-001	Nuc. Test No.	CL-35

Specific Gravity	2.70	Assumed
Sample Condition		Undisturbed

Visual Description: TAN AND GRAY SANDY CLAY

MOISTURE CONTENT:	BEFORE TEST	AFTER TEST
Tare Number	810	TB-01
Wt. of Tare & WS (gm.)	504.24	687.11
Wt. of Tare & DS (gm.)	442.07	573.3
Wt. of Tare (gm.)	112.82	135.18
Wt. of Water (gm.)	62.17	113.81
Wt. of DS (gm.)	329.25	438.12
Moisture Content (%)	**18.9**	**26.0**

SPECIMEN:	BEFORE TEST	AFTER TEST
Wt. of Tube & WS (gm.)	541.01	NA
Wt. of Tube (gm.)	0.00	NA
Wt. of WS (calc.) (gm.)	541.01	573.30
Length 1 (in.)	2.633	2.636
Length 2 (in.)	2.664	2.617
Length 3 (in.)	2.668	2.637
Top Diameter (in.)	2.855	2.867
Middle Diameter (in.)	2.850	2.867
Bottom Diameter (in.)	2.848	2.854
Average Length (in.)	2.66	2.63
Average Area (in.^{2})	6.38	6.44
Sample Volume (cm^3)	277.75	277.39
Unit Wet Wt. (gm./ cm^3)	1.948	2.067
Unit Wet Wt. (pcf)	121.6	129.0
Unit Dry Wt. (pcf)	102.3	102.4
Unit Dry Wt. (gm./ cm^3)	1.638	1.641
Void Ratio, e	0.648	0.646
Porosity, n	0.393	0.392
Pore Volume (cm^3)	109.2	108.8
Total Wt. Of Sample After Test		552.15

Tested By: AF Date: 3/3/16 Checked By: GEM Date: 3/7/16

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FLEXIBLE WALL PERMEABILITY TEST
PERMOMETER METHOD

ASTM D 5084-10

Client	HDR ENGINEERING, INC.	Boring No.	CELL 1C ACRE 1
Client Project	Brickhaven No.2 Mine	Depth (ft.)	LIFT 2
Project No.	2016-600-006	Sample No.	ST-1CA1-L2
Lab ID No.	2016-600-006-001	Nuc. Test No.	CL-35

Test Pressures		Final Sample Dimensions	
Cell Pressure(psi)	60.0	Sample Length (cm), L	6.68
Back Pressure(psi)	50.0	Sample Area (cm^2), A	41.52
Eff. Cons. Pressure(psi)	10.0	Pipette Area (cm^2), a_p	0.03142
Response (%)	100	Annulus Area (cm^2), a_a	0.76712
		Equilibrium Level (cm), R_{eq}	1

AVERAGE PERMEABILITY = 2.0E-08 cm/sec @ 20°C
AVERAGE PERMEABILITY = 2.0E-10 m/sec @ 20°C

DATE			TIME		ELAPSED TIME t	PIPETTE READI NG R_p	INCREMENT GRADIENT i	TEMP.	INCREMENTAL PERMEABILITY @ 20°C
(mm/dd/yy)	(hr)	(min)	(sec)	(min)	(min)	(cm)	(cm/cm)	(°C)	(cm/sec)
3/4/16	15	14	40	14.67	0.000	8.1	13.9	22.1	NA
3/4/16	15	19	19	19.32	4.650	8.0	13.7	22.1	1.9E-08
3/4/16	15	23	44	23.73	9.067	7.9	13.5	22.1	2.0E-08
3/4/16	15	28	6	28.10	13.433	7.8	13.3	22.1	2.1E-08
3/4/16	15	32	55	32.92	18.250	7.7	13.1	22.1	1.9E-08

Tested By: AF Date: 3/3/16 Checked By: GEM Date: 3/7/16

DCN: CT-22A DATE:2-2-12 Z:\BEMS\PROJECTS\2016-600 HDR - BRICKHAVEN NO.2 MINE\[2016-600-006-001 Permometer.xlsm]Sheet1

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ATTERBERG LIMITS

ASTM D 4318-10 / AASHTO T89-10

Client:	HDR ENGINEERING, INC.	Boring No.:	CELL 1C ACRE 4
Client Reference:	BRICKHAVEN NO. 2 MINE	Depth (ft):	LIFT 2
Project No.:	2016-600-006	Sample No.:	ST-1CA4-L2
Lab ID:	2016-600-006-002	Soil Description:	**TAN GRAY FAT CLAY**

Note: The USCS symbol used with this test refers only to the minus No. 40 sieve material. See the "Sieve and Hydrometer Analysis" graph page for the complete material description.

(Minus No. 40 sieve material, Airdried)

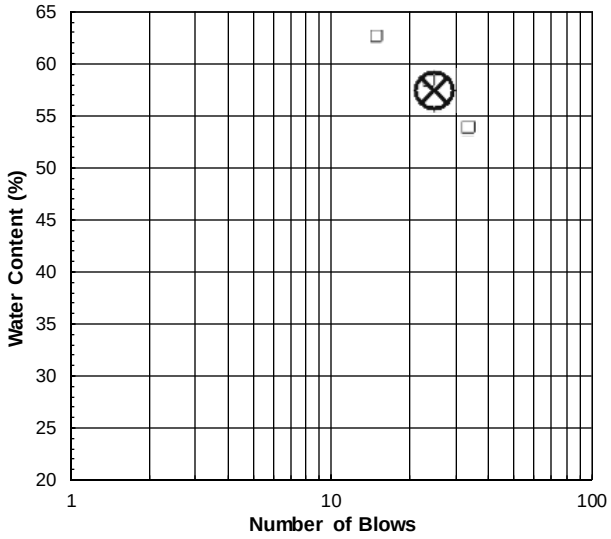
Liquid Limit Test	**1**	**2**	**3**	
Tare Number	KP	A-M	A-P	**M U L T I P O I N T**
Wt. of Tare & Wet Sample (g)	28.80	30.46	32.55	
Wt. of Tare & Dry Sample (g)	24.16	24.91	26.00	
Wt. of Tare (g)	15.55	15.37	15.53	
Wt. of Water (g)	4.6	5.6	6.6	
Wt. of Dry Sample (g)	8.6	9.5	10.5	
Moisture Content (%)	**53.9**	**58.2**	**62.6**	
Number of Blows	**34**	**24**	**15**	

Plastic Limit Test	**1**	**2**	**Range**
Tare Number	U	Y	
Wt. of Tare & Wet Sample (g)	24.78	23.86	
Wt. of Tare & Dry Sample (g)	22.75	22.10	
Wt. of Tare (g)	15.21	15.65	
Wt. of Water (g)	2.0	1.8	
Wt. of Dry Sample (g)	7.5	6.5	
Moisture Content (%)	**26.9**	**27.3**	**-0.4**

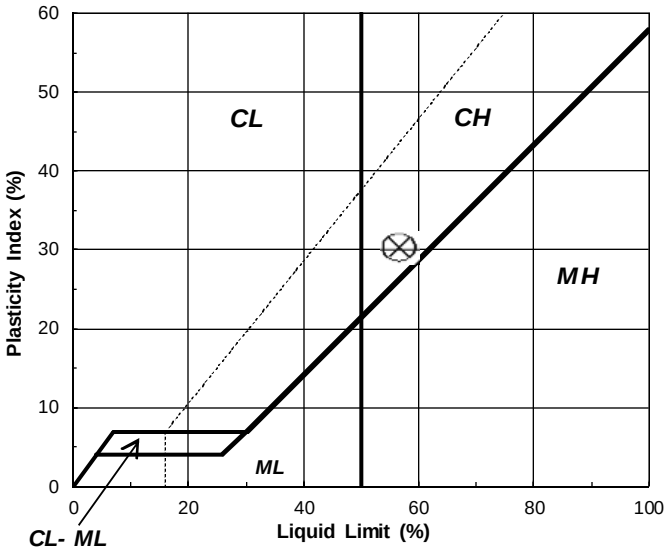
Note: The acceptable range of the two Moisture contents is ± 2.6

Test Results	
Liquid Limit (%)	**57**
Plastic Limit (%)	**27**
Plasticity Index (%)	**30**
USCS Symbol	**CH**

Flow Curve



Plasticity Chart



Tested By *TB* *Date* *3/4/16* *Checked By* *GEM* *Date* 3/7/16

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FLEXIBLE WALL PERMEABILITY TEST

PERMOMETER METHOD

ASTM D 5084-10

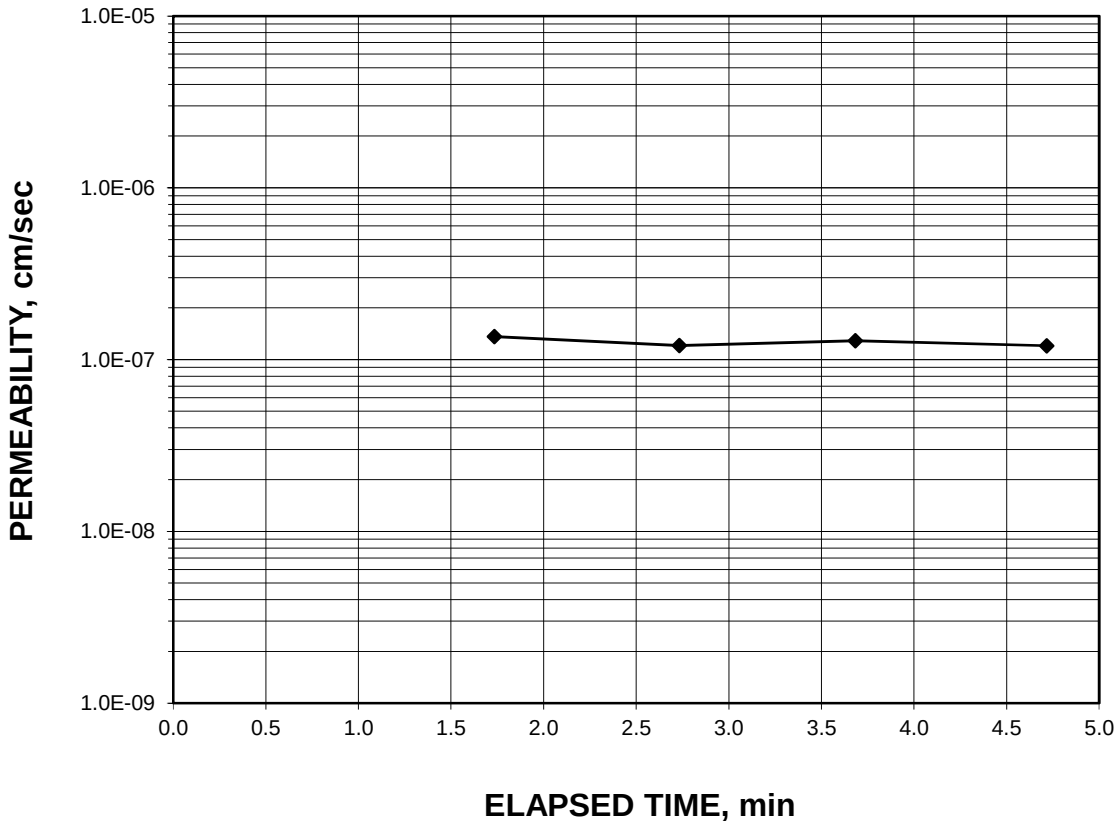
Client	HDR ENGINEERING, INC.	Boring No.	CELL 1C ACRE 4
Client Project	Brickhaven No.2 Mine	Depth (ft.)	LIFT 2
Project No.	2016-600-006	Sample No.	ST-C1A4-L2
Lab ID No.	2016-600-006-002	Nuc. Test No.	CL-46

Visual Description: TAN AND GRAY SANDY CLAY

AVERAGE PERMEABILITY = 1.3E-07 cm/sec @ 20°C

AVERAGE PERMEABILITY = 1.3E-09 m/sec @ 20°C

PERMEABILITY vs. TIME



Tested By: AF Date: 3/3/16 Checked By: GEM Date: 3/7/16

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FLEXIBLE WALL PERMEABILITY TEST

PERMOMETER METHOD

ASTM D 5084-10

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Client	HDR ENGINEERING, INC.	Boring No.	CELL 1C ACRE 4
Client Project	Brickhaven No.2 Mine	Depth (ft.)	LIFT 2
Project No.	2016-600-006	Sample No.	ST-C1A4-L2
Lab ID No.	2016-600-006-002	Nuc. Test No.	CL-46

Specific Gravity 2.70 Assumed

Sample Condition Undisturbed

Visual Description: TAN AND GRAY SANDY CLAY

MOISTURE CONTENT:	BEFORE TEST	AFTER TEST
Tare Number	800	TB-11
Wt. of Tare & WS (gm.)	225.45	508.09
Wt. of Tare & DS (gm.)	205.62	427.42
Wt. of Tare (gm.)	103.02	134.89
Wt. of Water (gm.)	19.83	80.67
Wt. of DS (gm.)	102.60	292.53
Moisture Content (%)	**19.3**	**27.6**

SPECIMEN:	BEFORE TEST	AFTER TEST
Wt. of Tube & WS (gm.)	684.42	NA
Wt. of Tube (gm.)	0.00	NA
Wt. of WS (calc.) (gm.)	684.42	731.73
Length 1 (in.)	3.447	3.434
Length 2 (in.)	3.457	3.443
Length 3 (in.)	3.452	3.482
Top Diameter (in.)	2.868	2.892
Middle Diameter (in.)	2.836	2.847
Bottom Diameter (in.)	2.869	2.866
Average Length (in.)	3.45	3.45
Average Area (in.^{2})	6.41	6.46
Sample Volume (cm^3)	362.81	365.63
Unit Wet Wt. (gm./ cm^3)	1.886	2.001
Unit Wet Wt. (pcf)	117.8	124.9
Unit Dry Wt. (pcf)	98.7	97.9
Unit Dry Wt. (gm./ cm^3)	1.581	1.569
Void Ratio, e	0.708	0.721
Porosity, n	0.414	0.419
Pore Volume (cm^3)	150.4	153.2
Total Wt. Of Sample After Test		716.66

Tested By: AF Date: 3/3/16 Checked By: GEM Date: 3/7/16

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FLEXIBLE WALL PERMEABILITY TEST
PERMOMETER METHOD

ASTM D 5084-10

Client	HDR ENGINEERING, INC.	Boring No.	CELL 1C ACRE 4
Client Project	Brickhaven No.2 Mine	Depth (ft.)	LIFT 2
Project No.	2016-600-006	Sample No.	ST-C1A4-L2
Lab ID No.	2016-600-006-002	Nuc. Test No.	CL-46

Test Pressures		Final Sample Dimensions	
Cell Pressure(psi)	60.0	Sample Length (cm), L	8.77
Back Pressure(psi)	50.0	Sample Area (cm^2), A	41.69
Eff. Cons. Pressure(psi)	10.0	Pipette Area (cm^2), a_p	0.03142
Response (%)	100	Annulus Area (cm^2), a_a	0.76712
		Equilibrium Level (cm), R_{eq}	1

AVERAGE PERMEABILITY = 1.3E-07 cm/sec @ 20°C
AVERAGE PERMEABILITY = 1.3E-09 m/sec @ 20°C

DATE			TIME		ELAPSED TIME **t**	PIPETTE READI NG **R_p**	INCREMENT GRADIENT **i**	TEMP.	INCREMENTAL PERMEABILITY @ 20°C
(mm/dd/yy)	(hr)	(min)	(sec)	(min)	(min)	(cm)	(cm/cm)	(°C)	(cm/sec)
3/4/16	15	36	18	36.30	0.000	7.9	10.3	22.1	NA
3/4/16	15	38	2	38.03	1.733	7.7	10.0	22.1	1.4E-07
3/4/16	15	39	2	39.03	2.733	7.6	9.8	22.1	1.2E-07
3/4/16	15	39	59	39.98	3.683	7.5	9.7	22.1	1.3E-07
3/4/16	15	41	1	41.02	4.717	7.4	9.5	22.1	1.2E-07

Tested By: AF Date: 3/3/16 Checked By: GEM Date: 3/7/16

DCN: CT-22A DATE:2-2-12 Z:\BEMS\PROJECTS\2016-600 HDR - BRICKHAVEN NO.2 MINE\[2016-600-006-002 Permometer.xlsm]Sheet1

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ATTERBERG LIMITS

ASTM D 4318-10 / AASHTO T89-10

Client:	HDR ENGINEERING, INC.	Boring No.:	CELL 1C ACRE 5
Client Reference:	BRICKHAVEN NO. 2 MINE	Depth (ft):	LIFT 2
Project No.:	2016-600-006	Sample No.:	ST-1CA5-L2
Lab ID:	2016-600-006-003	Soil Description:	**TAN GRAY FAT CLAY**

Note: The USCS symbol used with this test refers only to the minus No. 40 sieve material. See the "Sieve and Hydrometer Analysis" graph page for the complete material description. (Minus No. 40 sieve material, Airdried)

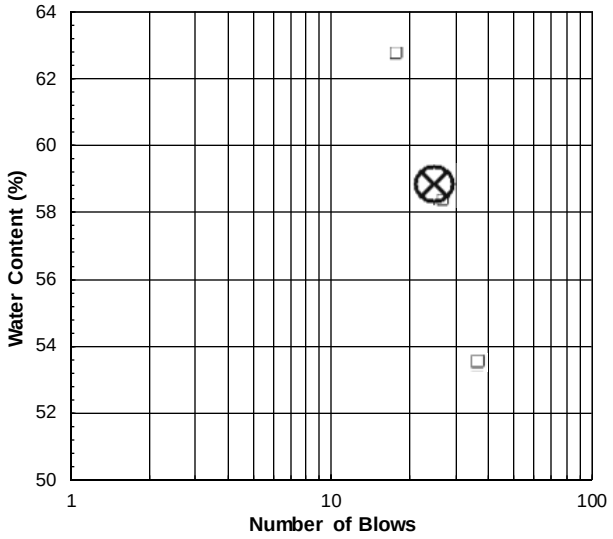
Liquid Limit Test	**1**	**2**	**3**	
Tare Number	K	B-B	J	**M U L T I P O I N T**
Wt. of Tare & Wet Sample (g)	25.30	24.45	25.02	
Wt. of Tare & Dry Sample (g)	21.79	21.18	21.22	
Wt. of Tare (g)	15.23	15.58	15.16	
Wt. of Water (g)	3.5	3.3	3.8	
Wt. of Dry Sample (g)	6.6	5.6	6.1	
Moisture Content (%)	**53.5**	**58.4**	**62.7**	
Number of Blows	**37**	**27**	**18**	

Plastic Limit Test	**1**	**2**	**Range**
Tare Number	1	F	
Wt. of Tare & Wet Sample (g)	21.46	21.92	
Wt. of Tare & Dry Sample (g)	20.26	20.53	
Wt. of Tare (g)	15.68	15.12	
Wt. of Water (g)	1.2	1.4	
Wt. of Dry Sample (g)	4.6	5.4	
Moisture Content (%)	**26.2**	**25.7**	**0.5**

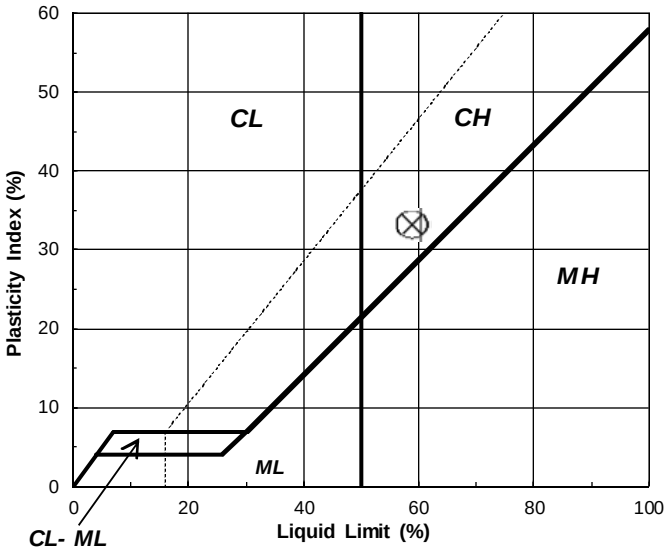
Note: The acceptable range of the two Moisture contents is ± 2.6

Test Results	
Liquid Limit (%)	**59**
Plastic Limit (%)	**26**
Plasticity Index (%)	**33**
USCS Symbol	**CH**

Flow Curve



Plasticity Chart



Tested By *NE* *Date* *3/7/16* *Checked By* *GEM* *Date* 3/8/16

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FLEXIBLE WALL PERMEABILITY TEST

PERMOMETER METHOD

ASTM D 5084-10

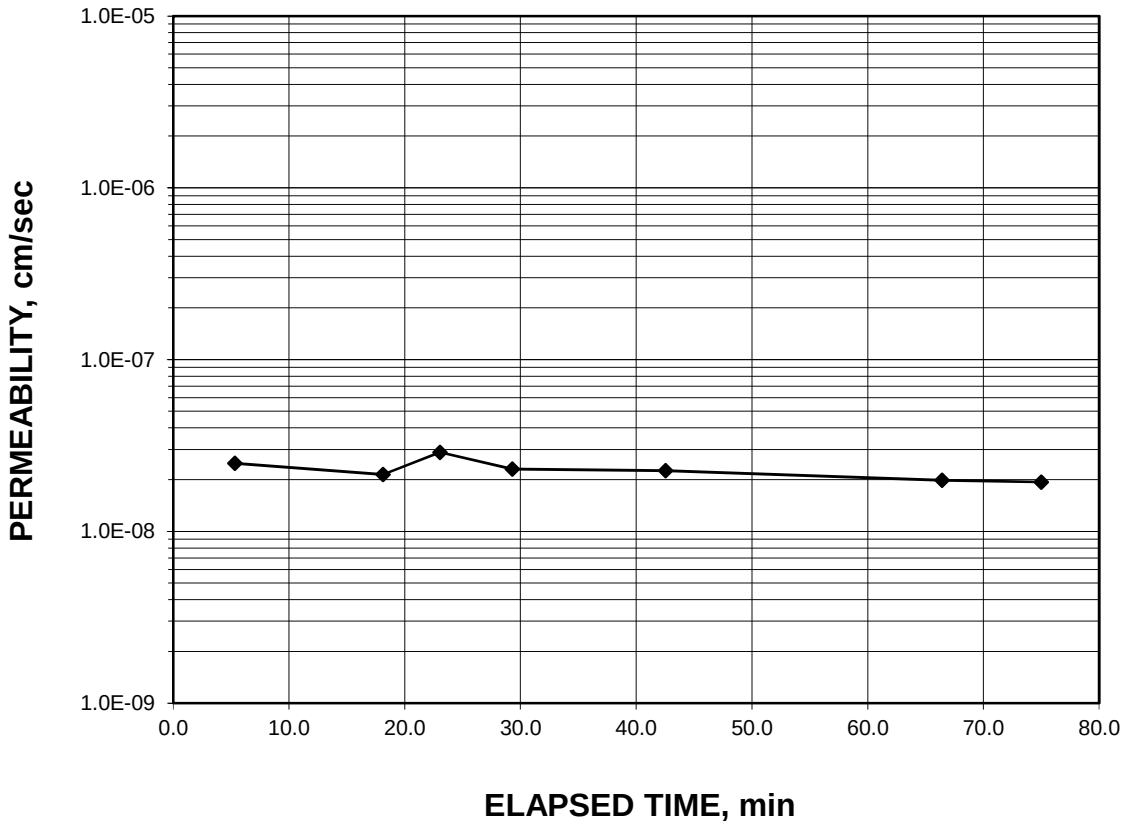
Client	HDR ENGINEERING, INC.	Boring No.	CELL 1C ACRE 5
Client Project	Brickhaven No.2 Mine	Depth (ft.)	LIFT 2
Project No.	2016-600-006	Sample No.	ST-1CA5-L2
Lab ID No.	2016-600-006-003	Nuc. Test No.	CL-55

Visual Description: TAN AND GRAY SANDY CLAY

AVERAGE PERMEABILITY = 2.1E-08 cm/sec @ 20°C

AVERAGE PERMEABILITY = 2.1E-10 m/sec @ 20°C

PERMEABILITY vs. TIME



Tested By: AF Date: 3/3/16 Checked By: GEM Date: 3/7/16

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FLEXIBLE WALL PERMEABILITY TEST

PERMOMETER METHOD

ASTM D 5084-10

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Client	HDR ENGINEERING, INC.	Boring No.	CELL 1C ACRE 5
Client Project	Brickhaven No.2 Mine	Depth (ft.)	LIFT 2
Project No.	2016-600-006	Sample No.	ST-1CA5-L2
Lab ID No.	2016-600-006-003	Nuc. Test No.	CL-55
		Specific Gravity	2.70 Assumed
		Sample Condition	Undisturbed

Visual Description: TAN AND GRAY SANDY CLAY

MOISTURE CONTENT:	BEFORE TEST	AFTER TEST
Tare Number	808	TB-09
Wt. of Tare & WS (gm.)	486.22	433.35
Wt. of Tare & DS (gm.)	416.63	371.71
Wt. of Tare (gm.)	103.27	134.11
Wt. of Water (gm.)	69.59	61.64
Wt. of DS (gm.)	313.36	237.60
Moisture Content (%)	**22.2**	**25.9**

SPECIMEN:	BEFORE TEST	AFTER TEST
Wt. of Tube & WS (gm.)	596.58	NA
Wt. of Tube (gm.)	0.00	NA
Wt. of WS (calc.) (gm.)	596.58	614.81
Length 1 (in.)	2.920	2.904
Length 2 (in.)	2.911	2.916
Length 3 (in.)	2.909	2.908
Top Diameter (in.)	2.860	2.893
Middle Diameter (in.)	2.859	2.869
Bottom Diameter (in.)	2.848	2.862
Average Length (in.)	2.91	2.91
Average Area (in.^{2})	6.40	6.49
Sample Volume (cm^3)	305.77	309.43
Unit Wet Wt. (gm./ cm^3)	1.951	1.987
Unit Wet Wt. (pcf)	121.8	124.0
Unit Dry Wt. (pcf)	99.7	98.5
Unit Dry Wt. (gm./ cm^3)	1.597	1.578
Void Ratio, e	0.691	0.711
Porosity, n	0.409	0.416
Pore Volume (cm^3)	125.0	128.6
Total Wt. Of Sample After Test		608.11

Tested By: AF Date: 3/3/16 Checked By: GEM Date: 3/7/16

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FLEXIBLE WALL PERMEABILITY TEST
PERMOMETER METHOD

ASTM D 5084-10

Client	HDR ENGINEERING, INC.	Boring No.	CELL 1C ACRE 5
Client Project	Brickhaven No.2 Mine	Depth (ft.)	LIFT 2
Project No.	2016-600-006	Sample No.	ST-1CA5-L2
Lab ID No.	2016-600-006-003	Nuc. Test No.	CL-55

Test Pressures		Final Sample Dimensions	
Cell Pressure(psi)	60.0	Sample Length (cm), L	7.39
Back Pressure(psi)	50.0	Sample Area (cm^2), A	41.87
Eff. Cons. Pressure(psi)	10.0	Pipette Area (cm^2), a_p	0.03142
Response (%)	99	Annulus Area (cm^2), a_a	0.76712
		Equilibrium Level (cm), R_{eq}	1

AVERAGE PERMEABILITY = 2.1E-08 cm/sec @ 20°C
AVERAGE PERMEABILITY = 2.1E-10 m/sec @ 20°C

DATE			TIME		ELAPSED TIME t	PIPETTE READI NG R_p	INCREMENT GRADIENT i	TEMP.	INCREMENTAL PERMEABILITY @ 20°C
(mm/dd/yy)	(hr)	(min)	(sec)	(min)	(min)	(cm)	(cm/cm)	(°C)	(cm/sec)
3/4/16	15	44	28	44.47	0.000	6.1	9.0	22.2	NA
3/4/16	15	49	48	49.80	5.333	6.0	8.8	22.2	2.5E-08
3/4/16	16	2	36	2.60	18.133	5.8	8.5	22.2	2.1E-08
3/4/16	16	7	30	7.50	23.033	5.7	8.3	22.2	2.9E-08
3/4/16	16	13	46	13.77	29.300	5.6	8.1	22.2	2.3E-08
3/4/16	16	27	0	27.00	42.533	5.4	7.8	22.2	2.3E-08
3/4/16	16	50	54	50.90	66.433	5.1	7.2	22.2	2.0E-08
3/4/16	16	59	28	59.47	75.000	5.0	7.1	22.2	1.9E-08

Tested By: AF Date: 3/3/16 Checked By: GEM Date: 3/7/16

DCN: CT-22A DATE:2-2-12 Z:\BEMS\PROJECTS\2016-600 HDR - BRICKHAVEN NO.2 MINE\[2016-600-006-003 Permometer.xlsm]Sheet1

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ATTERBERG LIMITS

ASTM D 4318-10 / AASHTO T89-10

Client:	HDR ENGINEERING, INC.	Boring No.:	CELL 1C ACRE 6
Client Reference:	BRICKHAVEN NO. 2 MINE	Depth (ft):	LIFT 2
Project No.:	2016-600-006	Sample No.:	ST-1CA6-L2
Lab ID:	2016-600-006-004	Soil Description:	**TAN GRAY FAT CLAY**

Note: The USCS symbol used with this test refers only to the minus No. 40 sieve material. See the "Sieve and Hydrometer Analysis" graph page for the complete material description. (Minus No. 40 sieve material, Airdried)

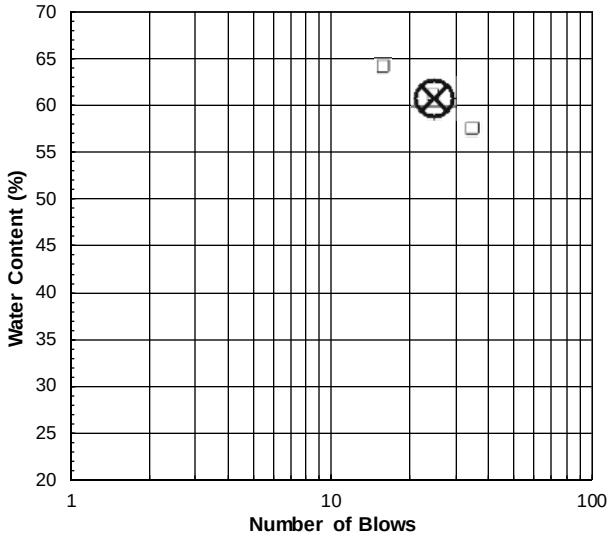
Liquid Limit Test	**1**	**2**	**3**	
Tare Number	A-T	17	A-C	**M U L T I P O I N T**
Wt. of Tare & Wet Sample (g)	29.13	30.90	29.34	
Wt. of Tare & Dry Sample (g)	24.20	25.06	23.96	
Wt. of Tare (g)	15.63	15.48	15.56	
Wt. of Water (g)	4.9	5.8	5.4	
Wt. of Dry Sample (g)	8.6	9.6	8.4	
Moisture Content (%)	**57.5**	**61.0**	**64.0**	
Number of Blows	**35**	**25**	**16**	

Plastic Limit Test	**1**	**2**	**Range**
Tare Number	2M	A	
Wt. of Tare & Wet Sample (g)	24.70	23.50	
Wt. of Tare & Dry Sample (g)	22.88	21.85	
Wt. of Tare (g)	15.61	15.28	
Wt. of Water (g)	1.8	1.7	
Wt. of Dry Sample (g)	7.3	6.6	
Moisture Content (%)	**25.0**	**25.1**	**-0.1**

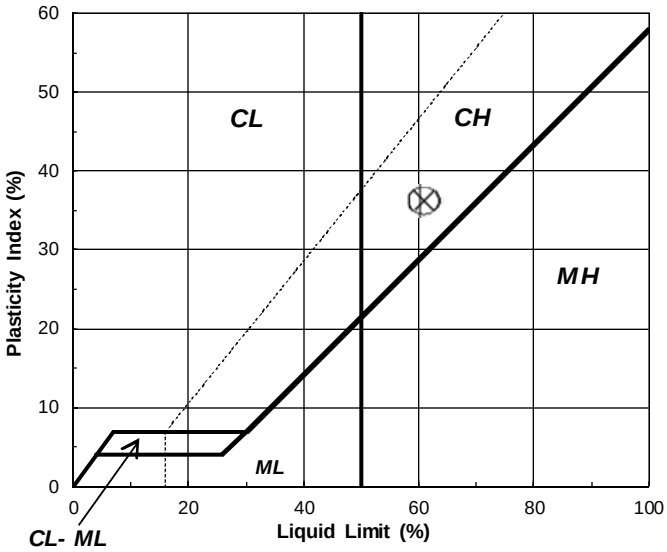
Note: The acceptable range of the two Moisture contents is ± 2.6

Test Results	
Liquid Limit (%)	**61**
Plastic Limit (%)	**25**
Plasticity Index (%)	**36**
USCS Symbol	**CH**

Flow Curve



Plasticity Chart



Tested By *TB* *Date* *3/4/16* *Checked By* *GEM* *Date* 3/7/16

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FLEXIBLE WALL PERMEABILITY TEST

PERMOMETER METHOD

ASTM D 5084-10

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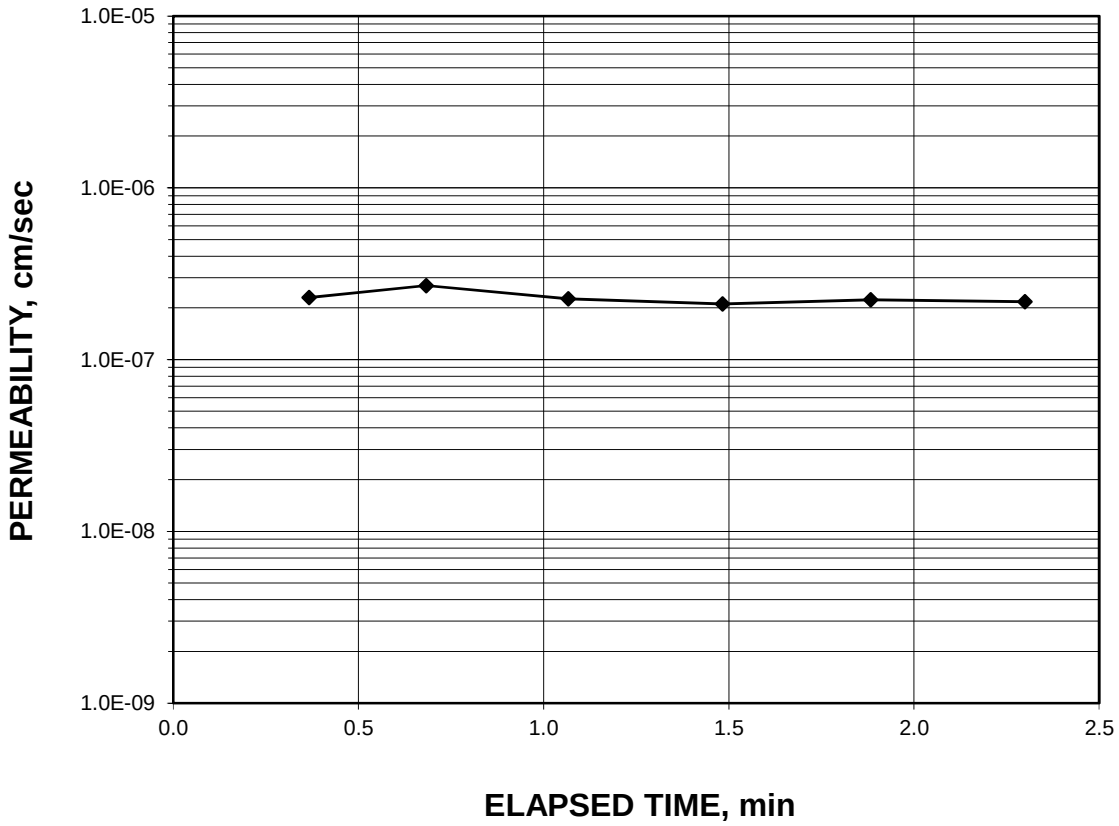
Client	HDR ENGINEERING, INC.	Boring No.	CELL 1C ACRE 6
Client Project	Brickhaven No.2 Mine	Depth (ft.)	LIFT 2
Project No.	2016-600-006	Sample No.	ST-1CA6-L2
Lab ID No.	2016-600-006-004	Nuc. Test No.	CL-56

Visual Description: TAN AND GRAY SANDY CLAY

AVERAGE PERMEABILITY = 2.2E-07 cm/sec @ 20°C

AVERAGE PERMEABILITY = 2.2E-09 m/sec @ 20°C

PERMEABILITY vs. TIME



Tested By: AF Date: 3/3/16 Checked By: GEM Date: 3/7/16

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FLEXIBLE WALL PERMEABILITY TEST

PERMOMETER METHOD

ASTM D 5084-10

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Client	HDR ENGINEERING, INC.	Boring No.	CELL 1C ACRE 6
Client Project	Brickhaven No.2 Mine	Depth (ft.)	LIFT 2
Project No.	2016-600-006	Sample No.	ST-1CA6-L2
Lab ID No.	2016-600-006-004	Nuc. Test No.	CL-56

Specific Gravity	2.70	Assumed
Sample Condition		Undisturbed

Visual Description: TAN AND GRAY SANDY CLAY

MOISTURE CONTENT:	BEFORE TEST	AFTER TEST
Tare Number	801	TB-02
Wt. of Tare & WS (gm.)	327.63	652.89
Wt. of Tare & DS (gm.)	281.99	540.03
Wt. of Tare (gm.)	97.65	134.52
Wt. of Water (gm.)	45.64	112.86
Wt. of DS (gm.)	184.34	405.51
Moisture Content (%)	**24.8**	**27.8**

SPECIMEN:	BEFORE TEST	AFTER TEST
Wt. of Tube & WS (gm.)	506.56	NA
Wt. of Tube (gm.)	0.00	NA
Wt. of WS (calc.) (gm.)	506.56	519.04
Length 1 (in.)	2.546	2.519
Length 2 (in.)	2.551	2.563
Length 3 (in.)	2.578	2.545
Top Diameter (in.)	2.863	2.878
Middle Diameter (in.)	2.863	2.887
Bottom Diameter (in.)	2.859	2.876
Average Length (in.)	2.56	2.54
Average Area (in.^{2})	6.43	6.52
Sample Volume (cm^3)	269.64	271.46
Unit Wet Wt. (gm./ cm^3)	1.879	1.912
Unit Wet Wt. (pcf)	117.3	119.4
Unit Dry Wt. (pcf)	94.0	93.4
Unit Dry Wt. (gm./ cm^3)	1.506	1.496
Void Ratio, e	0.793	0.805
Porosity, n	0.442	0.446
Pore Volume (cm^3)	119.3	121.1
Total Wt. Of Sample After Test		520.25

Tested By: AF Date: 3/3/16 Checked By: GEM Date: 3/7/16

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FLEXIBLE WALL PERMEABILITY TEST
PERMOMETER METHOD

ASTM D 5084-10

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Client	HDR ENGINEERING, INC.	Boring No.	CELL 1C ACRE 6
Client Project	Brickhaven No.2 Mine	Depth (ft.)	LIFT 2
Project No.	2016-600-006	Sample No.	ST-1CA6-L2
Lab ID No.	2016-600-006-004	Nuc. Test No.	CL-56

Test Pressures		Final Sample Dimensions	
Cell Pressure(psi)	60.0	Sample Length (cm), L	6.46
Back Pressure(psi)	50.0	Sample Area (cm^2), A	42.04
Eff. Cons. Pressure(psi)	10.0	Pipette Area (cm^2), a_p	0.03142
Response (%)	96	Annulus Area (cm^2), a_a	0.76712
		Equilibrium Level (cm), R_{eq}	1

AVERAGE PERMEABILITY = 2.2E-07 cm/sec @ 20°C
AVERAGE PERMEABILITY = 2.2E-09 m/sec @ 20°C

DATE			TIME		ELAPSED TIME t	PIPETTE READI NG R_p	INCREMENT GRADIENT i	TEMP.	INCREMENTAL PERMEABILITY @ 20°C
(mm/dd/yy)	(hr)	(min)	(sec)	(min)	(min)	(cm)	(cm/cm)	(°C)	(cm/sec)
3/4/16	15	47	43	47.72	0.000	8.0	14.2	22.2	NA
3/4/16	15	48	5	48.08	0.367	7.9	14.0	22.2	2.3E-07
3/4/16	15	48	24	48.40	0.683	7.8	13.8	22.2	2.7E-07
3/4/16	15	48	47	48.78	1.067	7.7	13.6	22.2	2.3E-07
3/4/16	15	49	12	49.20	1.483	7.6	13.3	22.2	2.1E-07
3/4/16	15	49	36	49.60	1.883	7.5	13.1	22.2	2.2E-07
3/4/16	15	50	1	50.02	2.300	7.4	12.9	22.2	2.2E-07

Tested By: AF Date: 3/3/16 Checked By: GEM Date: 3/7/16

DCN: CT-22A DATE:2-2-12 Z:\BEVERLY\PROJECTS\2016-600 HDR - BRICKHAVEN NO.2 MINE\[2016-600-006-004 Permometer.xlsm]Sheet1

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March 11, 2016

Project No. 2016-600-007

Mr. Michael Plummer, P.E.
HDR Engineering, Inc.
440 South Church St., Suite 1000
Charlotte, NC 28202

Transmittal
Laboratory Test Results
Brickhaven No. 2 Mine

Please find attached the laboratory test results for the above referenced project. The tests were outlined on the Project Verification Form that was transmitted to your firm prior to the testing. The testing was performed in general accordance with the methods listed on the enclosed data sheets. The test results are believed to be representative of the samples that were submitted for testing and are indicative only of the specimens which were evaluated. We imply no position with regard to the nature of the test results, i.e. pass/fail and no claims as to the suitability of the material for its intended use.

The test data and all associated project information provided shall be held in strict confidence and disclosed to other parties only with authorization by our Client. The test data submitted herein is considered integral with this report and is not to be reproduced except in whole and only with the authorization of the Client and Geotechnics. The remaining sample materials for this project will be retained for a minimum of 90 days as directed by the Geotechnics' Quality Program.

We are pleased to provide these testing services. Should you have any questions or if we may be of further assistance, please contact our office.

Respectively submitted,
Geotechnics, Inc.

Michael P. Smith
Regional Manager

We understand that you have a choice in your laboratory services and we thank you for choosing Geotechnics.

DCN: Data Transmittal Letter Date: 1/28/05 Rev.: 1

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MOISTURE CONTENT

ASTM D 2216-10

Client: HDR ENGINEERING, INC.
Client Reference: BRICKHAVEN NO. 2 MINE
Project No.: 2016-600-007

Lab ID:	001	002	003	004	005
Boring No.:	CELL 1C ACRE 1	CELL 1C ACRE 2	CELL 1C ACRE 3	CELL 1C ACRE 4	CELL 1C ACRE 5
Depth (ft):	LIFT 3	LIFT 3	LIFT 3	LIFT 3	LIFT 3
Sample No.:	ST-1CA1-L3	ST-1CA2-L3	ST-1CA3-L3	ST-1CA4-L3	ST-1CA5-L3
Tare Number	8010	819	806	TB-04	TB-07
Wt. of Tare & Wet Sample (g)	513.06	433.32	313.72	379.44	300.36
Wt. of Tare & Dry Sample (g)	442.13	376.78	272.30	332.16	269.83
Weight of Tare (g)	128.34	129.78	100.10	134.79	134.27
Weight of Water (g)	70.93	56.54	41.42	47.28	30.53
Weight of Dry Sample (g)	313.79	247.00	172.20	197.37	135.56
Water Content (%)	**22.6**	**22.9**	**24.1**	**24.0**	**22.5**

Lab ID	006
Boring No.	CELL 1C ACRE 6
Depth (ft)	LIFT 3
Sample No.	ST-1CA6-L3
Tare Number	TB-12
Wt. of Tare & Wet Sample (g)	305.43
Wt. of Tare & Dry Sample (g)	271.87
Weight of Tare (g)	135.10
Weight of Water (g)	33.56
Weight of Dry Sample (g)	136.77
Water Content (%)	**24.5**

Notes :

Tested By *AF* *Date* *3/4/16* *Checked By* *GEM* *Date* *3/8/16*

DCN: CT-S1 DATE: 3/18/13 REVISION: 4

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PERCENT PASSING # 200 SIEVE

ASTM D 1140-00

Client	HDR ENGINEERING, INC.
Client Reference	BRICKHAVEN NO. 2 MINE
Project No.	2016-600-007

Lab Id.	.001	.002	.003	.004	.005
Boring No.	CELL 1C ACRE 1	CELL 1C ACRE 2	CELL 1C ACRE 3	CELL 1C ACRE 4	CELL 1C ACRE 5
Depth (ft)	LIFT 3	LIFT 3	LIFT 3	LIFT 3	LIFT 3
Sample No.	ST-1CA1-L3	ST-1CA2-L3	ST-1CA3-L3	ST-1CA4-L3	ST-1CA5-L3
Tare Number	8010	819	806	TB-04	TB-07
Wt. of Tare & WS (gm)	513.06	433.32	313.72	379.44	300.36
Wt. of Tare & DS (gm)	442.13	376.78	272.30	332.16	269.83
Wt. of Tare (gm)	128.34	129.78	100.10	134.79	134.27
Wt. of Water (gm)	70.93	56.54	41.42	47.28	30.53
Wt. of DS (gm)	313.79	247	172.2	197.37	135.56
Water Content (%)	**22.6**	**22.9**	**24.1**	**24.0**	**22.5**
Wt. of Washed Soil & Tare	190.22	165.01	120.26	158.48	152.93
Percent Passing #200	**80.3**	**85.7**	**88.3**	**88.0**	**86.2**

Lab Id.	.006
Boring No.	CELL 1C ACRE 6
Depth (ft)	LIFT 3
Sample No.	ST-1CA6-L3
Tare Number	TB-12
Wt. of Tare & WS (gm)	305.43
Wt. of Tare & DS (gm)	271.87
Wt. of Tare (gm)	135.10
Wt. of Water (gm)	33.56
Wt. of DS (gm)	136.77
Water Content (%)	**24.5**
Wt. of Washed Soil & Tare	156.16
Percent Passing #200	**84.6**

Tested By AF *Date* 3/4/16 *Checked By* GEM *Date* 3/8/16

DCN: CT-S54 DATE: 7-8-98 REVISION:2 *T:\2016 PROJECTS\2016-600 HDR - BRICKHAVEN NO.2 MINE\[2016-600-007 PASS #200.xls]Sheet1*

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ATTERBERG LIMITS

ASTM D 4318-10 / AASHTO T89-10

Client:	HDR ENGINEERING, INC.	Boring No.:	CELL 1C ACRE 1
Client Reference:	BRICKHAVEN NO. 2 MINE	Depth (ft):	LIFT 3
Project No.:	2016-600-007	Sample No.:	ST-1CA1-L3
Lab ID:	2016-600-007-001	Soil Description:	**TAN GRAY FAT CLAY**

Note: The USCS symbol used with this test refers only to the minus No. 40 sieve material. See the "Sieve and Hydrometer Analysis" graph page for the complete material description. (Minus No. 40 sieve material, Airdried)

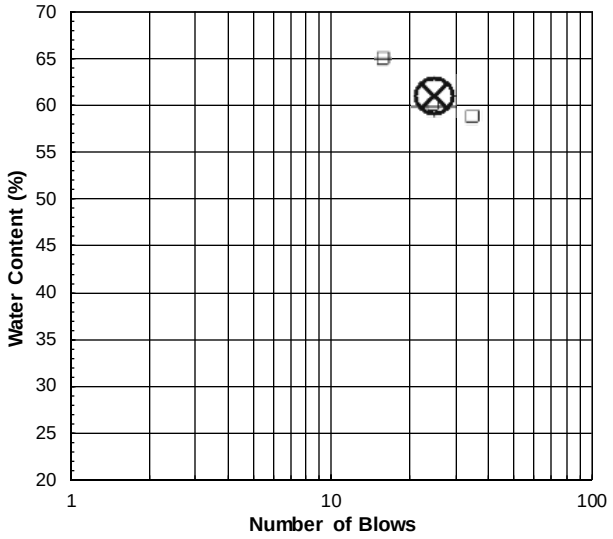
Liquid Limit Test	**1**	**2**	**3**	
Tare Number	AT	17	A-C	**M**
Wt. of Tare & Wet Sample (g)	31.90	30.34	31.11	**U**
Wt. of Tare & Dry Sample (g)	25.88	24.77	24.99	**L**
Wt. of Tare (g)	15.63	15.49	15.56	**T**
Wt. of Water (g)	6.0	5.6	6.1	**I**
Wt. of Dry Sample (g)	10.3	9.3	9.4	**P**
				O
				I
Moisture Content (%)	**58.7**	**60.0**	**64.9**	**N**
Number of Blows	**35**	**25**	**16**	**T**

Plastic Limit Test	**1**	**2**	**Range**
Tare Number	2M	A	
Wt. of Tare & Wet Sample (g)	25.89	25.56	
Wt. of Tare & Dry Sample (g)	23.66	23.38	
Wt. of Tare (g)	15.61	15.26	
Wt. of Water (g)	2.2	2.2	
Wt. of Dry Sample (g)	8.1	8.1	
Moisture Content (%)	**27.7**	**26.8**	**0.9**

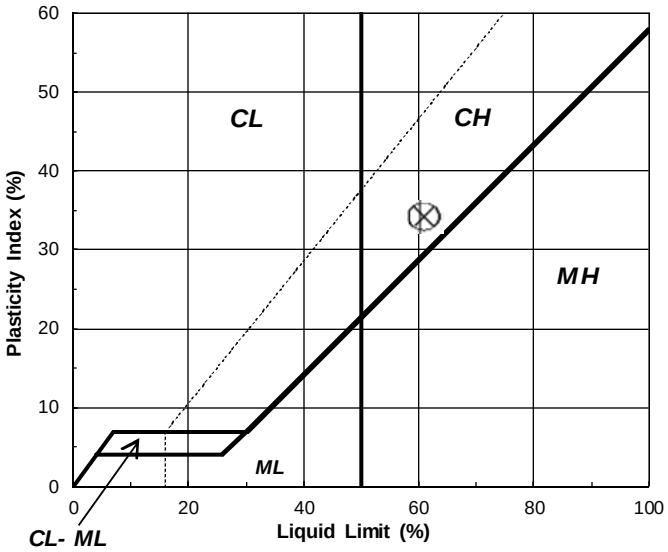
Note: The acceptable range of the two Moisture contents is ± 2.6

Test Results	
Liquid Limit (%)	**61**
Plastic Limit (%)	**27**
Plasticity Index (%)	**34**
USCS Symbol	**CH**

Flow Curve



Plasticity Chart



Tested By *TB* *Date* *3/7/16* *Checked By* *GEM* *Date* 3/8/16

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FLEXIBLE WALL PERMEABILITY TEST

PERMOMETER METHOD

ASTM D 5084-10

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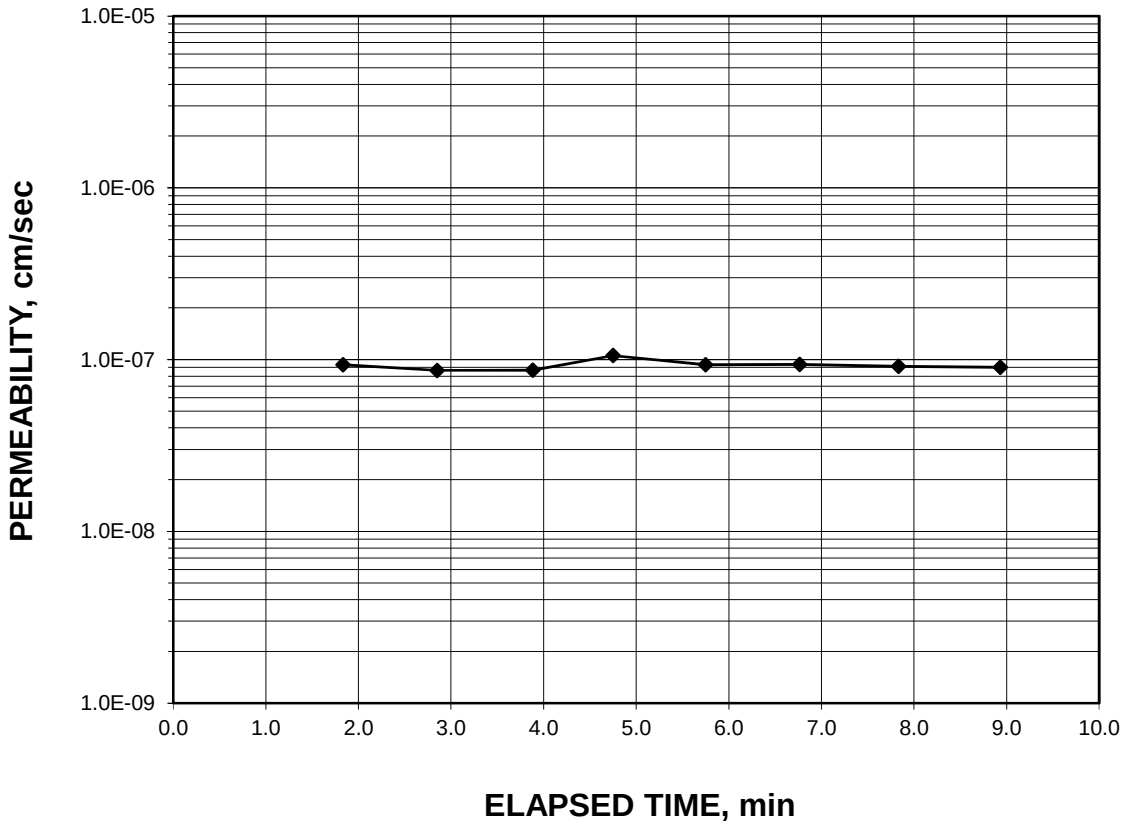
Client	HDR ENGINEERING. INC.	Boring No.	CELL 1C ACRE 1
Client Project	Brickhaven No.2 Mine	Depth (ft.)	LIFT 3
Project No.	2016-600-007	Sample No.	ST-1CA1-L3
Lab ID No.	2016-600-007-001	Nuc. Test No.	CL-68

Visual Description: TAN AND GRAY SANDY CLAY

AVERAGE PERMEABILITY = 9.2E-08 cm/sec @ 20°C

AVERAGE PERMEABILITY = 9.2E-10 m/sec @ 20°C

PERMEABILITY vs. TIME



Tested By: AF Date: 3/4/16 Checked By: GEM Date: 3/8/16

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FLEXIBLE WALL PERMEABILITY TEST

PERMOMETER METHOD

ASTM D 5084-10

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Client	HDR ENGINEERING. INC.	Boring No.	CELL 1C ACRE 1
Client Project	Brickhaven No.2 Mine	Depth (ft.)	LIFT 3
Project No.	2016-600-007	Sample No.	ST-1CA1-L3
Lab ID No.	2016-600-007-001	Nuc. Test No.	CL-68

Specific Gravity	2.70	Assumed
Sample Condition		Undisturbed

Visual Description: TAN AND GRAY SANDY CLAY

MOISTURE CONTENT:	BEFORE TEST	AFTER TEST
Tare Number	8010	828
Wt. of Tare & WS (gm.)	513.06	566.65
Wt. of Tare & DS (gm.)	442.13	468.49
Wt. of Tare (gm.)	128.34	134.96
Wt. of Water (gm.)	70.93	98.16
Wt. of DS (gm.)	313.79	333.53
Moisture Content (%)	**22.6**	**29.4**

SPECIMEN:	BEFORE TEST	AFTER TEST
Wt. of Tube & WS (gm.)	415.53	NA
Wt. of Tube (gm.)	0.00	NA
Wt. of WS (calc.) (gm.)	415.53	438.67
Length 1 (in.)	2.067	2.081
Length 2 (in.)	2.109	2.047
Length 3 (in.)	2.099	2.098
Top Diameter (in.)	2.842	2.888
Middle Diameter (in.)	2.839	2.863
Bottom Diameter (in.)	2.852	2.909
Average Length (in.)	2.09	2.08
Average Area (in.^{2})	6.35	6.54
Sample Volume (cm^3)	217.79	222.57
Unit Wet Wt. (gm./ cm^3)	1.908	1.971
Unit Wet Wt. (pcf)	119.1	123.0
Unit Dry Wt. (pcf)	97.1	95.1
Unit Dry Wt. (gm./ cm^3)	1.556	1.523
Void Ratio, e	0.735	0.773
Porosity, n	0.424	0.436
Pore Volume (cm^3)	92.3	97.0
Total Wt. Of Sample After Test		431.87

Tested By: AF Date: 3/4/16 Checked By: GEM Date: 3/8/16

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FLEXIBLE WALL PERMEABILITY TEST
PERMOMETER METHOD

ASTM D 5084-10

Client	HDR ENGINEERING. INC.	Boring No.	CELL 1C ACRE 1
Client Project	Brickhaven No.2 Mine	Depth (ft.)	LIFT 3
Project No.	2016-600-007	Sample No.	ST-1CA1-L3
Lab ID No.	2016-600-007-001	Nuc. Test No.	CL-68

Test Pressures		Final Sample Dimensions	
Cell Pressure(psi)	60.0	Sample Length (cm), L	5.27
Back Pressure(psi)	50.0	Sample Area (cm^2), A	42.22
Eff. Cons. Pressure(psi)	10.0	Pipette Area (cm^2), a_p	0.03142
Response (%)	99	Annulus Area (cm^2), a_a	0.76712
		Equilibrium Level (cm), R_{eq}	1

AVERAGE PERMEABILITY = 9.2E-08 cm/sec @ 20°C
AVERAGE PERMEABILITY = 9.2E-10 m/sec @ 20°C

DATE			TIME		ELAPSED TIME **t**	PIPETTE READI NG **R_p**	INCREMENT GRADIENT **i**	TEMP.	INCREMENTAL PERMEABILITY @ 20°C
(mm/dd/yy)	(hr)	(min)	(sec)	(min)	(min)	(cm)	(cm/cm)	(°C)	(cm/sec)
3/7/16	13	38	57	38.95	0.000	6.5	13.6	23.4	NA
3/7/16	13	40	47	40.78	1.833	6.3	13.1	23.4	9.3E-08
3/7/16	13	41	48	41.80	2.850	6.2	12.9	23.4	8.7E-08
3/7/16	13	42	50	42.83	3.883	6.1	12.6	23.4	8.7E-08
3/7/16	13	43	42	43.70	4.750	6.0	12.4	23.4	1.1E-07
3/7/16	13	44	42	44.70	5.750	5.9	12.1	23.4	9.3E-08
3/7/16	13	45	43	45.72	6.767	5.8	11.9	23.4	9.4E-08
3/7/16	13	46	47	46.78	7.833	5.7	11.6	23.4	9.1E-08
3/7/16	13	47	53	47.88	8.933	5.6	11.4	23.4	9.0E-08

Tested By: AF Date: 3/4/16 Checked By: GEM Date: 3/8/16

DCN: CT-22A DATE:2-2-12 REVISION:5 Z:\BEMS\PROJECTS\2016-600 HDR - BRICKHAVEN NO.2 MINE\[2016-600-007-001 Permometer.xlsm]Sheet1

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ATTERBERG LIMITS

ASTM D 4318-10 / AASHTO T89-10

Client:	HDR ENGINEERING, INC.	Boring No.:	CELL 1C ACRE 2
Client Reference:	BRICKHAVEN NO. 2 MINE	Depth (ft):	LIFT 3
Project No.:	2016-600-007	Sample No.:	ST-1CA2-L3
Lab ID:	2016-600-007-002	Soil Description:	**GRAY TAN FAT CLAY**

Note: The USCS symbol used with this test refers only to the minus No. 40 sieve material. See the "Sieve and Hydrometer Analysis" graph page for the complete material description. (Minus No. 40 sieve material, Airdried)

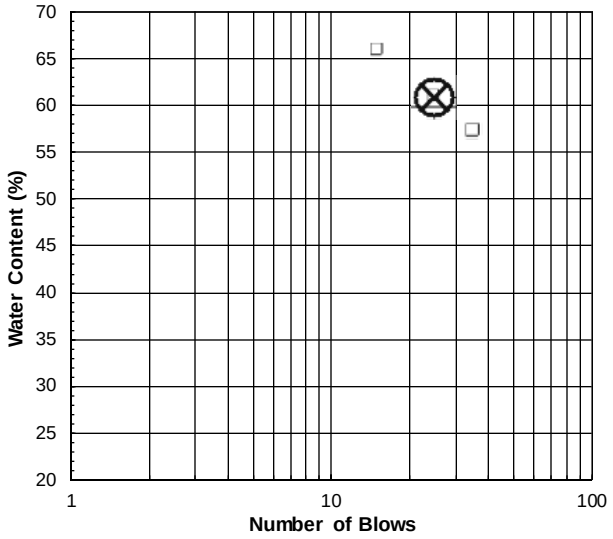
Liquid Limit Test	**1**	**2**	**3**	
Tare Number	F	B-B	I	**M U L T I P O I N T**
Wt. of Tare & Wet Sample (g)	29.60	30.34	30.58	
Wt. of Tare & Dry Sample (g)	24.33	24.75	24.66	
Wt. of Tare (g)	15.13	15.58	15.67	
Wt. of Water (g)	5.3	5.6	5.9	
Wt. of Dry Sample (g)	9.2	9.2	9.0	
Moisture Content (%)	**57.3**	**61.0**	**65.9**	
Number of Blows	**35**	**25**	**15**	

Plastic Limit Test	**1**	**2**	**Range**
Tare Number	J	K	
Wt. of Tare & Wet Sample (g)	25.32	25.42	
Wt. of Tare & Dry Sample (g)	23.05	23.08	
Wt. of Tare (g)	15.19	15.24	
Wt. of Water (g)	2.3	2.3	
Wt. of Dry Sample (g)	7.9	7.8	
Moisture Content (%)	**28.9**	**29.8**	**-1.0**

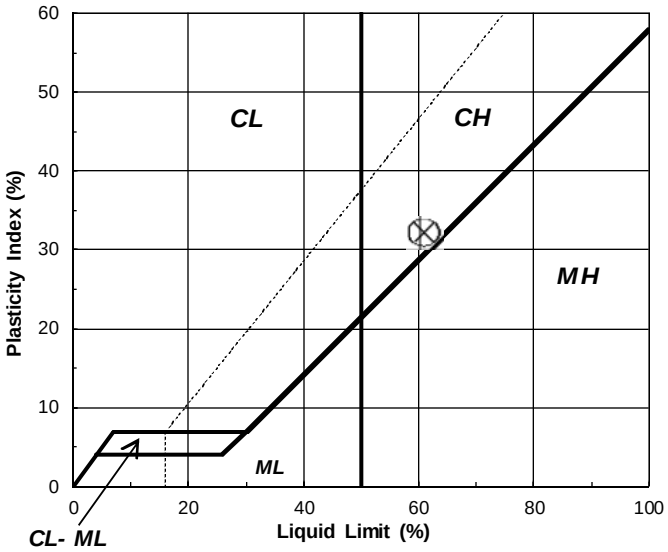
Note: The acceptable range of the two Moisture contents is ± 2.6

Test Results	
Liquid Limit (%)	**61**
Plastic Limit (%)	**29**
Plasticity Index (%)	**32**
USCS Symbol	**CH**

Flow Curve



Plasticity Chart



Tested By *TB* *Date* *3/8/16* *Checked By* *GEM* *Date* 3/9/16

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FLEXIBLE WALL PERMEABILITY TEST

PERMOMETER METHOD

ASTM D 5084-10

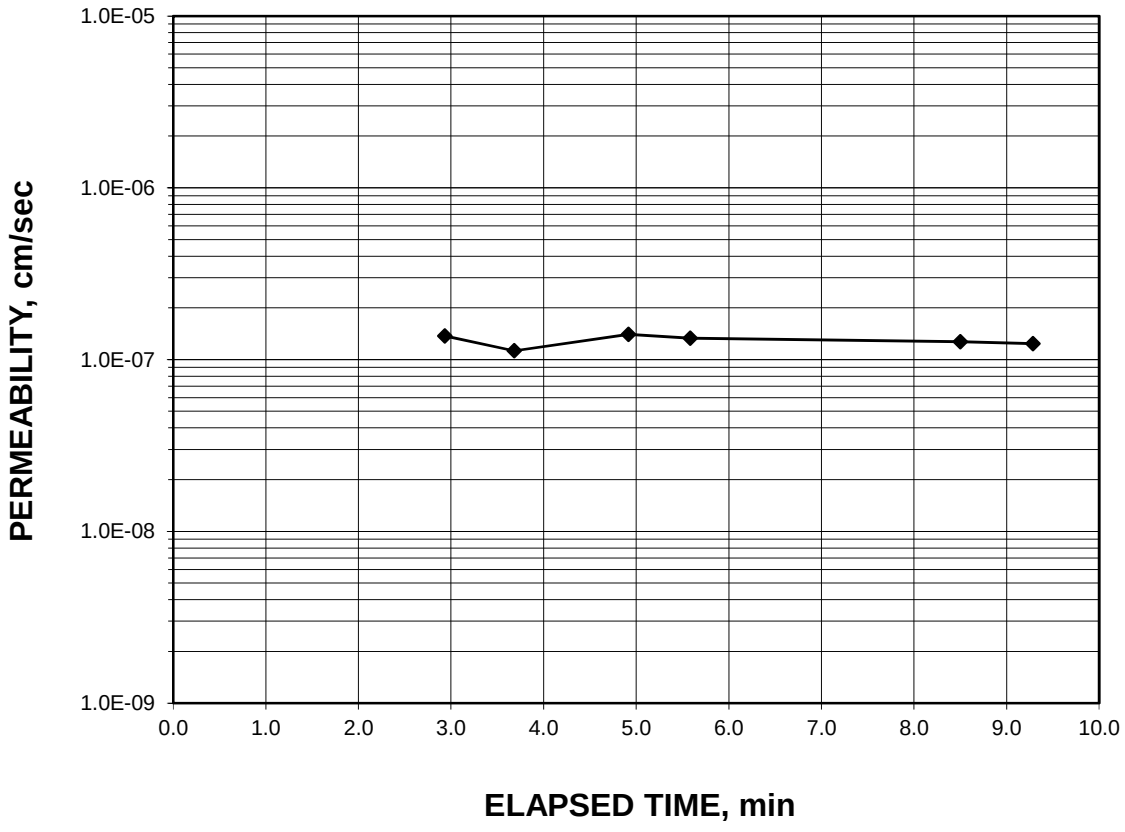
Client	HDR ENGINEERING, INC.	Boring No.	CELL 1C ACRE 2
Client Project	Brickhaven No.2 Mine	Depth (ft.)	LIFT 3
Project No.	2016-600-007	Sample No.	ST-1CA2-L3
Lab ID No.	2016-600-007-002	Nuc. Test No.	CL-58

Visual Description: TAN AND GRAY SANDY CLAY

AVERAGE PERMEABILITY = 1.3E-07 cm/sec @ 20°C

AVERAGE PERMEABILITY = 1.3E-09 m/sec @ 20°C

PERMEABILITY vs. TIME



Tested By: AF Date: 3/4/16 Checked By: GEM Date: 3/8/16

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FLEXIBLE WALL PERMEABILITY TEST

PERMOMETER METHOD

ASTM D 5084-10

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Client	HDR ENGINEERING, INC.	Boring No.	CELL 1C ACRE 2
Client Project	Brickhaven No.2 Mine	Depth (ft.)	LIFT 3
Project No.	2016-600-007	Sample No.	ST-1CA2-L3
Lab ID No.	2016-600-007-002	Nuc. Test No.	CL-58

Specific Gravity	2.70	Assumed
Sample Condition		Undisturbed

Visual Description: TAN AND GRAY SANDY CLAY

MOISTURE CONTENT:	BEFORE TEST	AFTER TEST
Tare Number	819	TB-08
Wt. of Tare & WS (gm.)	433.32	596.1
Wt. of Tare & DS (gm.)	376.78	487.51
Wt. of Tare (gm.)	129.78	135.38
Wt. of Water (gm.)	56.54	108.59
Wt. of DS (gm.)	247.00	352.13
Moisture Content (%)	**22.9**	**30.8**

SPECIMEN:	BEFORE TEST	AFTER TEST
Wt. of Tube & WS (gm.)	450.50	NA
Wt. of Tube (gm.)	0.00	NA
Wt. of WS (calc.) (gm.)	450.50	479.63
Length 1 (in.)	2.255	2.272
Length 2 (in.)	2.282	2.253
Length 3 (in.)	2.276	2.287
Top Diameter (in.)	2.836	2.873
Middle Diameter (in.)	2.852	2.871
Bottom Diameter (in.)	2.845	2.883
Average Length (in.)	2.27	2.27
Average Area (in.^{2})	6.35	6.49
Sample Volume (cm^3)	236.47	241.67
Unit Wet Wt. (gm./ cm^3)	1.905	1.985
Unit Wet Wt. (pcf)	118.9	123.9
Unit Dry Wt. (pcf)	96.8	94.7
Unit Dry Wt. (gm./ cm^3)	1.550	1.517
Void Ratio, e	0.742	0.780
Porosity, n	0.426	0.438
Pore Volume (cm^3)	100.7	105.9
Total Wt. Of Sample After Test		462.22

Tested By: AF Date: 3/4/16 Checked By: GEM Date: 3/8/16

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FLEXIBLE WALL PERMEABILITY TEST
PERMOMETER METHOD

ASTM D 5084-10

Client	HDR ENGINEERING, INC.	Boring No.	CELL 1C ACRE 2
Client Project	Brickhaven No.2 Mine	Depth (ft.)	LIFT 3
Project No.	2016-600-007	Sample No.	ST-1CA2-L3
Lab ID No.	2016-600-007-002	Nuc. Test No.	CL-58

Test Pressures		Final Sample Dimensions	
Cell Pressure(psi)	60.0	Sample Length (cm), L	5.77
Back Pressure(psi)	50.0	Sample Area (cm^2), A	41.90
Eff. Cons. Pressure(psi)	10.0	Pipette Area (cm^2), a_p	0.03142
Response (%)	100	Annulus Area (cm^2), a_a	0.76712
		Equilibrium Level (cm), R_{eq}	1

AVERAGE PERMEABILITY = 1.3E-07 cm/sec @ 20°C
AVERAGE PERMEABILITY = 1.3E-09 m/sec @ 20°C

DATE		TIME			ELAPSED TIME t	PIPETTE READI NG R_p	INCREMENT GRADIENT i	TEMP.	INCREMENTAL PERMEABILITY @ 20°C
(mm/dd/yy)	(hr)	(min)	(sec)	(min)	(min)	(cm)	(cm/cm)	(°C)	(cm/sec)
3/7/16	13	8	5	8.08	0.000	7.6	14.9	23.3	NA
3/7/16	13	11	1	11.02	2.933	7.1	13.8	23.3	1.4E-07
3/7/16	13	11	46	11.77	3.683	7.0	13.6	23.3	1.1E-07
3/7/16	13	13	0	13.00	4.917	6.8	13.1	23.3	1.4E-07
3/7/16	13	13	40	13.67	5.583	6.7	12.9	23.3	1.3E-07
3/7/16	13	16	35	16.58	8.500	6.3	12.0	23.3	1.3E-07
3/7/16	13	17	22	17.37	9.283	6.2	11.8	23.3	1.2E-07

Tested By: AF Date: 3/4/16 Checked By: GEM Date: 3/8/16

DCN: CT-22A DATE: 2/12/15 REVISION: 6 T:\2016-600 HDR\BRICKHAVEN NO.2 MINE\Cell 1C clay\[Brickhaven Cell 1c soil lab test summary mar 4.xlsx]Sheet1

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ATTERBERG LIMITS

ASTM D 4318-10 / AASHTO T89-10

Client:	HDR ENGINEERING, INC.	Boring No.:	CELL 1C ACRE 3
Client Reference:	BRICKHAVEN NO. 2 MINE	Depth (ft):	LIFT 3
Project No.:	2016-600-007	Sample No.:	ST-1CA3-L3
Lab ID:	2016-600-007-003	Soil Description:	**TAN GRAY FAT CLAY**

Note: The USCS symbol used with this test refers only to the minus No. 40 sieve material. See the "Sieve and Hydrometer Analysis" graph page for the complete material description. (Minus No. 40 sieve material, Airdried)

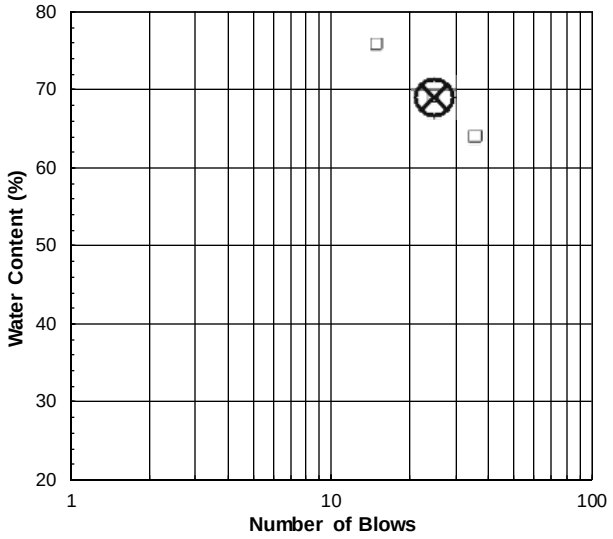
Liquid Limit Test	**1**	**2**	**3**	
Tare Number	I	O	4M	**M U L T I P O I N T**
Wt. of Tare & Wet Sample (g)	29.30	33.36	32.33	
Wt. of Tare & Dry Sample (g)	23.82	25.93	25.13	
Wt. of Tare (g)	15.25	15.18	15.62	
Wt. of Water (g)	5.5	7.4	7.2	
Wt. of Dry Sample (g)	8.6	10.8	9.5	
Moisture Content (%)	**63.9**	**69.1**	**75.7**	
Number of Blows	**36**	**25**	**15**	

Plastic Limit Test	**1**	**2**	**Range**
Tare Number	A-B	1M	
Wt. of Tare & Wet Sample (g)	23.73	23.99	
Wt. of Tare & Dry Sample (g)	21.81	22.06	
Wt. of Tare (g)	15.60	15.84	
Wt. of Water (g)	1.9	1.9	
Wt. of Dry Sample (g)	6.2	6.2	
Moisture Content (%)	**30.9**	**31.0**	**-0.1**

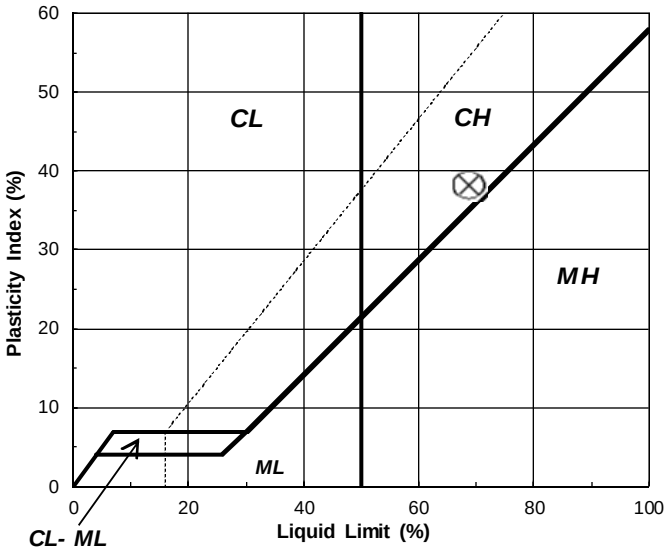
Note: The acceptable range of the two Moisture contents is ± 2.6

Test Results	
Liquid Limit (%)	**69**
Plastic Limit (%)	**31**
Plasticity Index (%)	**38**
USCS Symbol	**CH**

Flow Curve



Plasticity Chart



Tested By	*TB*	*Date*	*3/7/16*	*Checked By*	*GEM*	*Date*	3/8/16

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FLEXIBLE WALL PERMEABILITY TEST

PERMOMETER METHOD

ASTM D 5084-10

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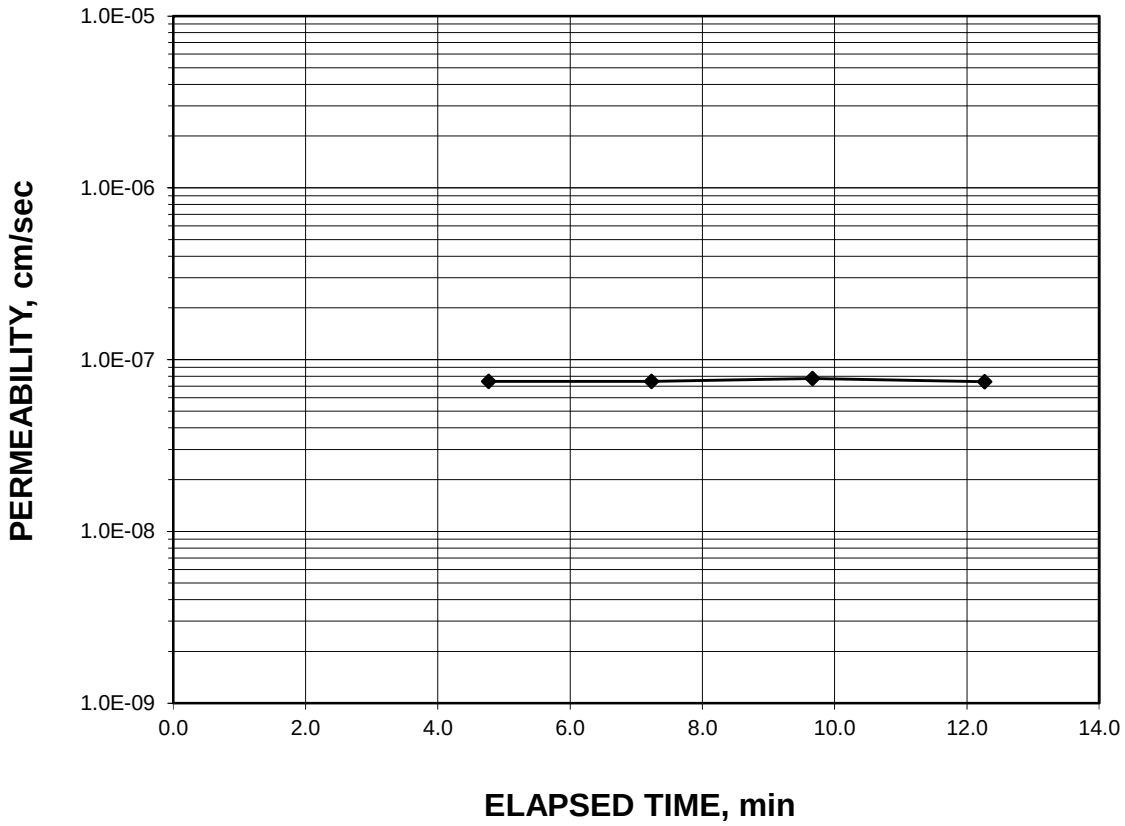
Client	HDR ENGINEERING, INC.	Boring No.	CELL 1C ACRE 3
Client Project	Brickhaven No.2 Mine	Depth (ft.)	LIFT 3
Project No.	2016-600-007	Sample No.	ST-1CA3-L3
Lab ID No.	2016-600-007-003	Nuc. Test No.	CL-64

Visual Description: TAN AND GRAY SANDY CLAY

AVERAGE PERMEABILITY = 7.5E-08 cm/sec @ 20°C

AVERAGE PERMEABILITY = 7.5E-10 m/sec @ 20°C

PERMEABILITY vs. TIME



Tested By: AF Date: 3/7/16 Checked By: GEM Date: 3/8/16

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FLEXIBLE WALL PERMEABILITY TEST

PERMOMETER METHOD

ASTM D 5084-10

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Client	HDR ENGINEERING, INC.	Boring No.	CELL 1C ACRE 3
Client Project	Brickhaven No.2 Mine	Depth (ft.)	LIFT 3
Project No.	2016-600-007	Sample No.	ST-1CA3-L3
Lab ID No.	2016-600-007-003	Nuc. Test No.	CL-64

Specific Gravity	2.70	Assumed
Sample Condition		Undisturbed

Visual Description: TAN AND GRAY SANDY CLAY

MOISTURE CONTENT:	BEFORE TEST	AFTER TEST
Tare Number	806	826
Wt. of Tare & WS (gm.)	313.72	538.98
Wt. of Tare & DS (gm.)	272.30	447.4
Wt. of Tare (gm.)	100.10	133.76
Wt. of Water (gm.)	41.42	91.58
Wt. of DS (gm.)	172.20	313.64
Moisture Content (%)	**24.1**	**29.2**

SPECIMEN:	BEFORE TEST	AFTER TEST
Wt. of Tube & WS (gm.)	724.76	NA
Wt. of Tube (gm.)	0.00	NA
Wt. of WS (calc.) (gm.)	724.76	754.82
Length 1 (in.)	3.611	3.627
Length 2 (in.)	3.615	3.613
Length 3 (in.)	3.610	3.634
Top Diameter (in.)	2.860	2.897
Middle Diameter (in.)	2.848	2.890
Bottom Diameter (in.)	2.852	2.867
Average Length (in.)	3.61	3.62
Average Area (in.^{2})	6.39	6.54
Sample Volume (cm^3)	378.48	388.20
Unit Wet Wt. (gm./ cm^3)	1.915	1.944
Unit Wet Wt. (pcf)	119.5	121.4
Unit Dry Wt. (pcf)	96.4	93.9
Unit Dry Wt. (gm./ cm^3)	1.544	1.505
Void Ratio, e	0.749	0.794
Porosity, n	0.428	0.443
Pore Volume (cm^3)	162.1	171.8
Total Wt. Of Sample After Test		757.27

Tested By: AF Date: 3/7/16 Checked By: GEM Date: 3/8/16

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FLEXIBLE WALL PERMEABILITY TEST
PERMOMETER METHOD

ASTM D 5084-10

Client	HDR ENGINEERING, INC.	Boring No.	CELL 1C ACRE 3
Client Project	Brickhaven No.2 Mine	Depth (ft.)	LIFT 3
Project No.	2016-600-007	Sample No.	ST-1CA3-L3
Lab ID No.	2016-600-007-003	Nuc. Test No.	CL-64

Test Pressures		Final Sample Dimensions	
Cell Pressure(psi)	60.0	Sample Length (cm), L	9.21
Back Pressure(psi)	50.0	Sample Area (cm^2), A	42.16
Eff. Cons. Pressure(psi)	10.0	Pipette Area (cm^2), a_p	0.03142
Response (%)	100	Annulus Area (cm^2), a_a	0.76712
		Equilibrium Level (cm), R_{eq}	1

AVERAGE PERMEABILITY = 7.5E-08 cm/sec @ 20°C
AVERAGE PERMEABILITY = 7.5E-10 m/sec @ 20°C

DATE			TIME		ELAPSED TIME t	PIPETTE READI NG R_p	INCREMENT GRADIENT i	TEMP.	INCREMENTAL PERMEABILITY @ 20°C
(mm/dd/yy)	(hr)	(min)	(sec)	(min)	(min)	(cm)	(cm/cm)	(°C)	(cm/sec)
3/7/16	14	45	56	45.93	0.000	5.6	6.5	23.7	NA
3/7/16	14	50	42	50.70	4.767	5.4	6.2	23.7	7.5E-08
3/7/16	14	53	10	53.17	7.233	5.3	6.1	23.7	7.5E-08
3/7/16	14	55	36	55.60	9.667	5.2	6.0	23.7	7.8E-08
3/7/16	14	58	12	58.20	12.267	5.1	5.8	23.7	7.4E-08

Tested By: AF Date: 3/7/16 Checked By: GEM Date: 3/8/16

DCN: CT-22A DATE: 2/12/15 REVISION: 6 T:\2016-600 HDR\BRICKHAVEN NO.2 MINE\Cell 1C clay\[Brickhaven Cell 1c soil lab test summary mar 4.xlsx]Sheet1

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ATTERBERG LIMITS

ASTM D 4318-10 / AASHTO T89-10

Client:	HDR ENGINEERING, INC.	Boring No.:	CELL 1C ACRE 4
Client Reference:	Brickhaven No.2 Mine	Depth (ft):	LIFT 3
Project No.:	2016-600-007	Sample No.:	ST-1CA4-L3
Lab ID:	2016-600-007-004	Soil Description:	**TAN/BROWN FAT CLAY**

Note: The USCS symbol used with this test refers only to the minus No. 40 sieve material. See the "Sieve and Hydrometer Analysis" graph page for the complete material description. (Minus No. 40 sieve material, Airdried)

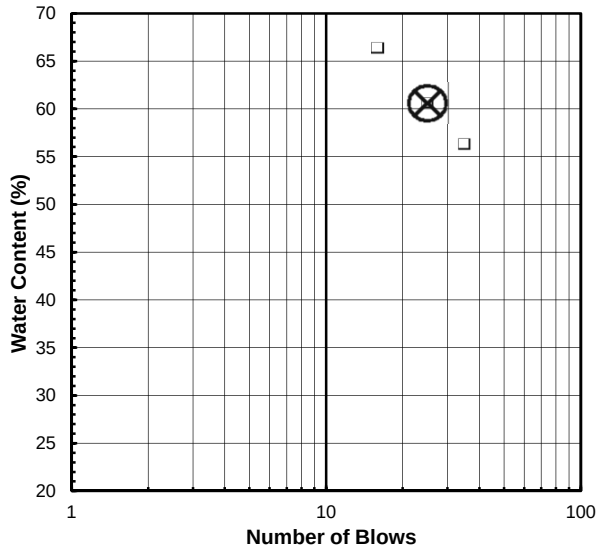
Liquid Limit Test	**1**	**2**	**3**	
Tare Number	K	J	F	**M U L T I P O I N T**
Wt. of Tare & Wet Sample (g)	31.25	31.85	31.25	
Wt. of Tare & Dry Sample (g)	25.49	25.56	24.82	
Wt. of Tare (g)	15.24	15.17	15.12	
Wt. of Water (g)	5.8	6.3	6.4	
Wt. of Dry Sample (g)	10.3	10.4	9.7	
Moisture Content (%)	**56.2**	**60.5**	**66.3**	
Number of Blows	**35**	**25**	**16**	

Plastic Limit Test	**1**	**2**	**Range**
Tare Number	I	B-B	
Wt. of Tare & Wet Sample (g)	24.90	25.35	
Wt. of Tare & Dry Sample (g)	22.75	23.05	
Wt. of Tare (g)	15.68	15.58	
Wt. of Water (g)	2.2	2.3	
Wt. of Dry Sample (g)	7.1	7.5	
Moisture Content (%)	**30.4**	**30.8**	**-0.4**

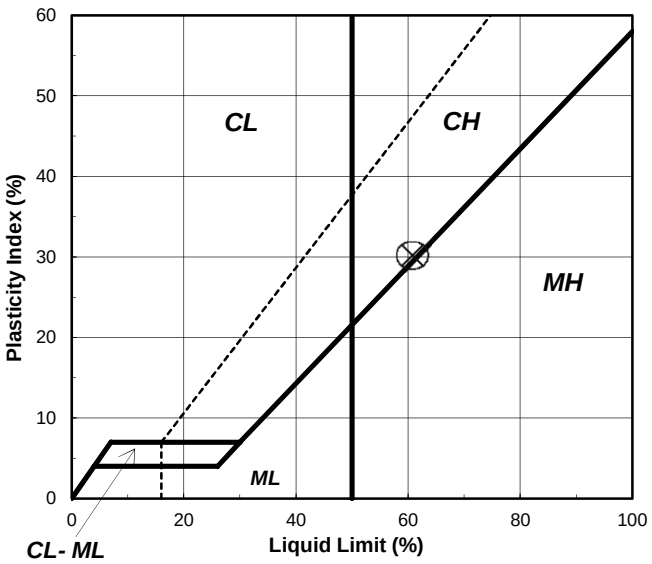
Note: The acceptable range of the two Moisture contents is ± 2.6

Test Results	
Liquid Limit (%)	**61**
Plastic Limit (%)	**31**
Plasticity Index (%)	**30**
USCS Symbol	**CH**

Flow Curve



Plasticity Chart



Tested By	*TB*	*Date*	*3/9/16*	*Checked By*	*SFS*	*Date*	3/10/16

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FLEXIBLE WALL PERMEABILITY TEST

PERMOMETER METHOD

ASTM D 5084-10

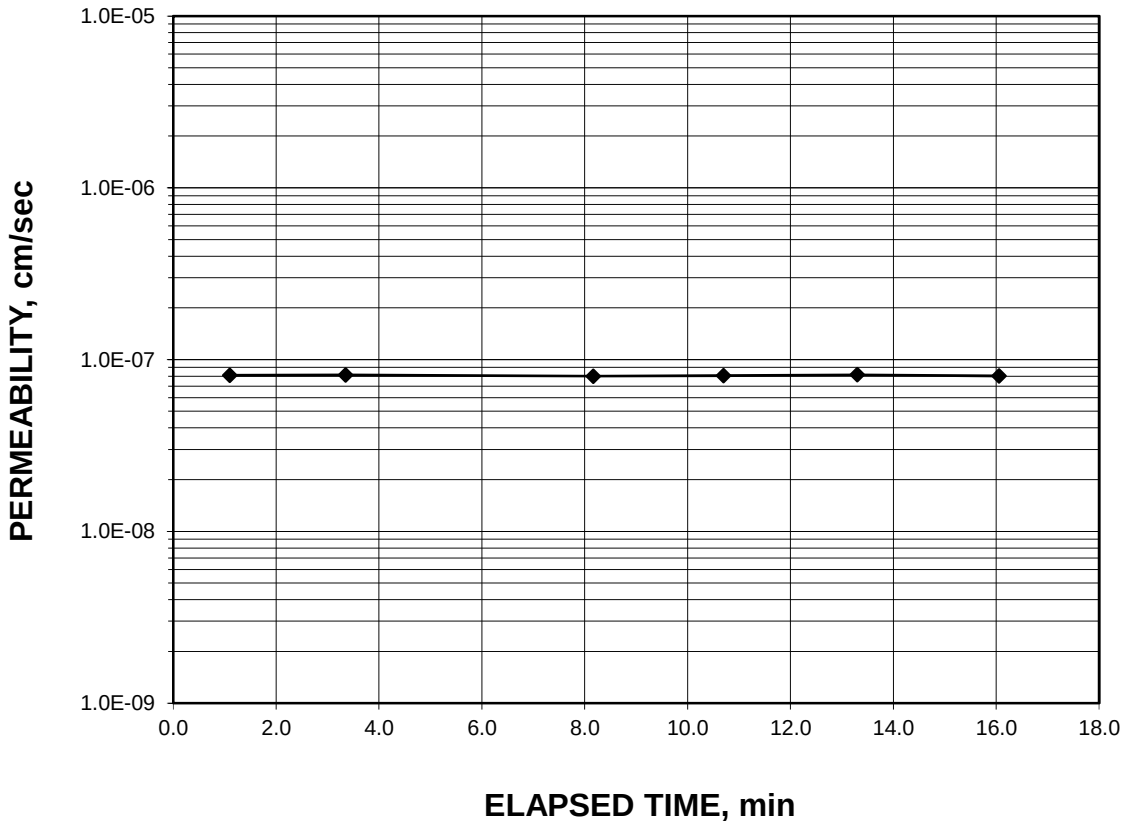
Client	HDR ENGINEERING, INC.	Boring No.	CELL 1C ACRE 4
Client Project	Brickhaven No.2 Mine	Depth (ft.)	LIFT 3
Project No.	2016-600-007	Sample No.	ST-1CA4-L3
Lab ID No.	2016-600-007-004	Nuc. Test No.	CL-70

Visual Description: TAN AND GRAY SANDY CLAY

AVERAGE PERMEABILITY = 8.1E-08 cm/sec @ 20°C

AVERAGE PERMEABILITY = 8.1E-10 m/sec @ 20°C

PERMEABILITY vs. TIME



Tested By: AF Date: 3/4/16 Checked By: GEM Date: 3/8/16

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FLEXIBLE WALL PERMEABILITY TEST

PERMOMETER METHOD

ASTM D 5084-10

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Client	HDR ENGINEERING, INC.	Boring No.	CELL 1C ACRE 4
Client Project	Brickhaven No.2 Mine	Depth (ft.)	LIFT 3
Project No.	2016-600-007	Sample No.	ST-1CA4-L3
Lab ID No.	2016-600-007-004	Nuc. Test No.	CL-70

Specific Gravity	2.70	Assumed
Sample Condition		Undisturbed

Visual Description: TAN AND GRAY SANDY CLAY

MOISTURE CONTENT:	BEFORE TEST	AFTER TEST
Tare Number	TB-04	807
Wt. of Tare & WS (gm.)	379.44	586.92
Wt. of Tare & DS (gm.)	332.16	482.99
Wt. of Tare (gm.)	134.79	102.89
Wt. of Water (gm.)	47.28	103.93
Wt. of DS (gm.)	197.37	380.10
Moisture Content (%)	**24.0**	**27.3**

SPECIMEN:	BEFORE TEST	AFTER TEST
Wt. of Tube & WS (gm.)	468.30	NA
Wt. of Tube (gm.)	0.00	NA
Wt. of WS (calc.) (gm.)	468.30	481.10
Length 1 (in.)	2.349	2.339
Length 2 (in.)	2.334	2.330
Length 3 (in.)	2.339	2.339
Top Diameter (in.)	2.807	2.852
Middle Diameter (in.)	2.810	2.851
Bottom Diameter (in.)	2.805	2.860
Average Length (in.)	2.34	2.34
Average Area (in.^{2})	6.19	6.40
Sample Volume (cm^3)	237.42	244.95
Unit Wet Wt. (gm./ cm^3)	1.972	1.964
Unit Wet Wt. (pcf)	123.1	122.6
Unit Dry Wt. (pcf)	99.3	96.3
Unit Dry Wt. (gm./ cm^3)	1.591	1.542
Void Ratio, e	0.697	0.751
Porosity, n	0.411	0.429
Pore Volume (cm^3)	97.5	105.0
Total Wt. Of Sample After Test		484.12

Tested By: AF Date: 3/4/16 Checked By: GEM Date: 3/8/16

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FLEXIBLE WALL PERMEABILITY TEST
PERMOMETER METHOD

ASTM D 5084-10

Client	HDR ENGINEERING, INC.	Boring No.	CELL 1C ACRE 4
Client Project	Brickhaven No.2 Mine	Depth (ft.)	LIFT 3
Project No.	2016-600-007	Sample No.	ST-1CA4-L3
Lab ID No.	2016-600-007-004	Nuc. Test No.	CL-70

Test Pressures		Final Sample Dimensions	
Cell Pressure(psi)	60.0	Sample Length (cm), L	5.93
Back Pressure(psi)	50.0	Sample Area (cm^2), A	41.28
Eff. Cons. Pressure(psi)	10.0	Pipette Area (cm^2), a_p	0.03142
Response (%)	97	Annulus Area (cm^2), a_a	0.76712
		Equilibrium Level (cm), R_{eq}	1

AVERAGE PERMEABILITY = 8.1E-08 cm/sec @ 20°C
AVERAGE PERMEABILITY = 8.1E-10 m/sec @ 20°C

DATE			TIME		ELAPSED TIME t	PIPETTE READI NG R_p	INCREMENT GRADIENT i	TEMP.	INCREMENTAL PERMEABILITY @ 20°C
(mm/dd/yy)	(hr)	(min)	(sec)	(min)	(min)	(cm)	(cm/cm)	(°C)	(cm/sec)
3/7/16	13	55	17	55.28	0.000	7.0	13.2	23.5	NA
3/7/16	13	56	23	56.38	1.100	6.9	13.0	23.5	8.1E-08
3/7/16	13	58	38	58.63	3.350	6.7	12.5	23.5	8.1E-08
3/7/16	14	3	27	3.45	8.167	6.3	11.7	23.5	8.0E-08
3/7/16	14	5	59	5.98	10.700	6.1	11.2	23.5	8.1E-08
3/7/16	14	8	35	8.58	13.300	5.9	10.8	23.5	8.2E-08
3/7/16	14	11	20	11.33	16.050	5.7	10.3	23.5	8.0E-08

Tested By: AF Date: 3/4/16 Checked By: GEM Date: 3/8/16

DCN: CT-22A DATE: 2/12/15 REVISION: 6 T:\2016-600 HDR ENGINEERING\BRICKHAVEN NO.2 MINE\Cell 1C clay\[Brickhaven Cell 1c soil lab test summary mar 4.xlsx]Sheet1

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ATTERBERG LIMITS

ASTM D 4318-10 / AASHTO T89-10

Client:	HDR ENGINEERING, INC.	Boring No.:	CELL 1C ACRE 5
Client Reference:	BRICKHAVEN NO. 2 MINE	Depth (ft):	LIFT 3
Project No.:	2016-600-007	Sample No.:	ST-1CA5-L3
Lab ID:	2016-600-007-005	Soil Description:	**GRAY TAN FAT CLAY**

Note: The USCS symbol used with this test refers only to the minus No. 40 sieve material. See the "Sieve and Hydrometer Analysis" graph page for the complete material description. (Minus No. 40 sieve material, Airdried)

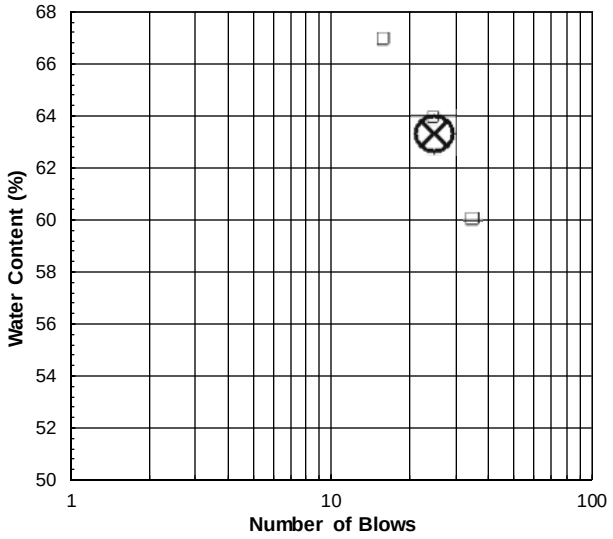
Liquid Limit Test	**1**	**2**	**3**	
Tare Number	AM	KP	AP	**M**
Wt. of Tare & Wet Sample (g)	30.76	31.45	31.13	**U**
Wt. of Tare & Dry Sample (g)	25.00	25.25	24.88	**L**
Wt. of Tare (g)	15.40	15.55	15.54	**T**
Wt. of Water (g)	5.8	6.2	6.3	**I**
Wt. of Dry Sample (g)	9.6	9.7	9.3	**P**
				O
				I
Moisture Content (%)	**60.0**	**63.9**	**66.9**	**N**
Number of Blows	**35**	**25**	**16**	**T**

Plastic Limit Test	**1**	**2**	**Range**
Tare Number	U	Y	
Wt. of Tare & Wet Sample (g)	25.54	27.97	
Wt. of Tare & Dry Sample (g)	23.15	25.10	
Wt. of Tare (g)	15.20	15.64	
Wt. of Water (g)	2.4	2.9	
Wt. of Dry Sample (g)	8.0	9.5	
Moisture Content (%)	**30.1**	**30.3**	**-0.3**

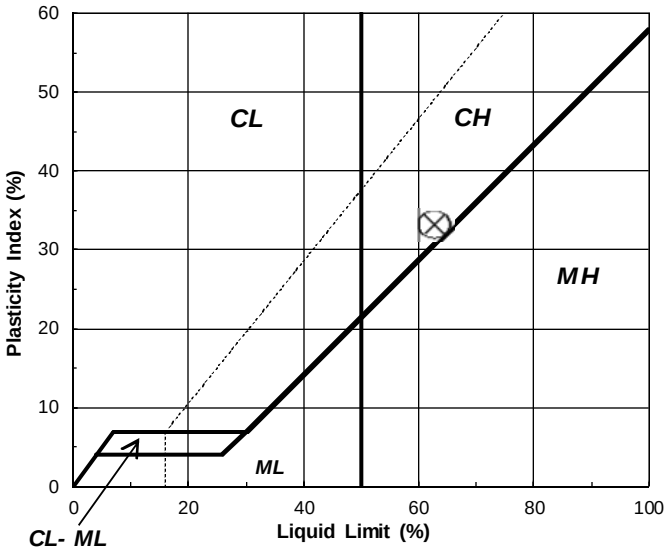
Note: The acceptable range of the two Moisture contents is ± 2.6

Test Results	
Liquid Limit (%)	**63**
Plastic Limit (%)	**30**
Plasticity Index (%)	**33**
USCS Symbol	**CH**

Flow Curve



Plasticity Chart



Tested By *TB* *Date* *3/8/16* *Checked By* *GEM* *Date* 3/9/16

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FLEXIBLE WALL PERMEABILITY TEST

PERMOMETER METHOD

ASTM D 5084-10

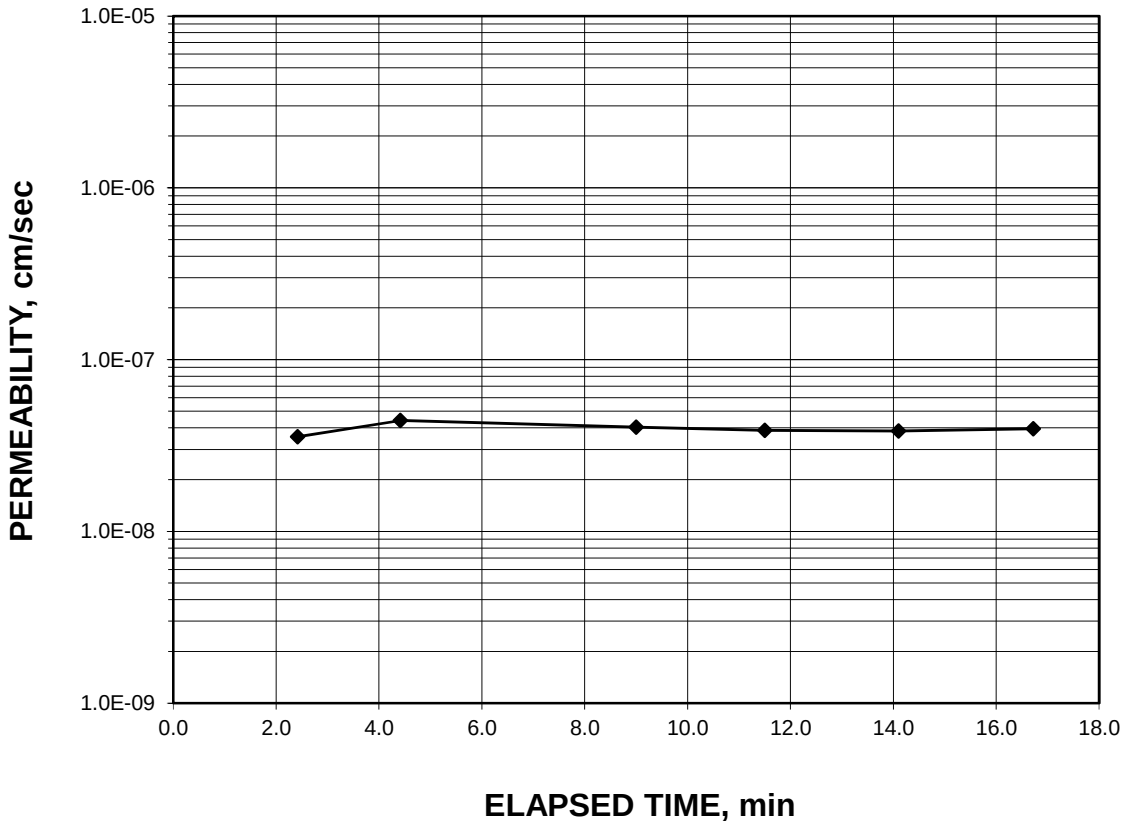
Client	HDR ENGINEERING, INC.	Boring No.	CELL 1C ACRE 5
Client Project	Brickhaven No.2 Mine	Depth (ft.)	LIFT 3
Project No.	2016-600-007	Sample No.	ST-1CA5-L3
Lab ID No.	2016-600-007-005	Nuc. Test No.	CL-76

Visual Description: TAN AND GRAY SANDY CLAY

AVERAGE PERMEABILITY = 3.9E-08 cm/sec @ 20°C

AVERAGE PERMEABILITY = 3.9E-10 m/sec @ 20°C

PERMEABILITY vs. TIME



Tested By: AF Date: 3/4/16 Checked By: GEM Date: 3/8/16

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FLEXIBLE WALL PERMEABILITY TEST

PERMOMETER METHOD

ASTM D 5084-10

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Client	HDR ENGINEERING, INC.	Boring No.	CELL 1C ACRE 5
Client Project	Brickhaven No.2 Mine	Depth (ft.)	LIFT 3
Project No.	2016-600-007	Sample No.	ST-1CA5-L3
Lab ID No.	2016-600-007-005	Nuc. Test No.	CL-76

Specific Gravity	2.70	Assumed
Sample Condition		Undisturbed

Visual Description: TAN AND GRAY SANDY CLAY

MOISTURE CONTENT:	BEFORE TEST	AFTER TEST
Tare Number	TB-07	812
Wt. of Tare & WS (gm.)	300.36	386.84
Wt. of Tare & DS (gm.)	269.83	326.8
Wt. of Tare (gm.)	134.27	105.89
Wt. of Water (gm.)	30.53	60.04
Wt. of DS (gm.)	135.56	220.91
Moisture Content (%)	**22.5**	**27.2**

SPECIMEN:	BEFORE TEST	AFTER TEST
Wt. of Tube & WS (gm.)	273.24	NA
Wt. of Tube (gm.)	0.00	NA
Wt. of WS (calc.) (gm.)	273.24	283.63
Length 1 (in.)	1.349	1.336
Length 2 (in.)	1.337	1.375
Length 3 (in.)	1.375	1.356
Top Diameter (in.)	2.832	2.883
Middle Diameter (in.)	2.815	2.870
Bottom Diameter (in.)	2.837	2.849
Average Length (in.)	1.35	1.36
Average Area (in.^{2})	6.28	6.46
Sample Volume (cm^3)	139.34	143.45
Unit Wet Wt. (gm./ cm^3)	1.961	1.977
Unit Wet Wt. (pcf)	122.4	123.4
Unit Dry Wt. (pcf)	99.9	97.0
Unit Dry Wt. (gm./ cm^3)	1.601	1.555
Void Ratio, e	0.687	0.737
Porosity, n	0.407	0.424
Pore Volume (cm^3)	56.7	60.9
Total Wt. Of Sample After Test		282.87

Tested By: AF Date: 3/4/16 Checked By: GEM Date: 3/8/16

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FLEXIBLE WALL PERMEABILITY TEST
PERMOMETER METHOD

ASTM D 5084-10

Client	HDR ENGINEERING, INC.	Boring No.	CELL 1C ACRE 5
Client Project	Brickhaven No.2 Mine	Depth (ft.)	LIFT 3
Project No.	2016-600-007	Sample No.	ST-1CA5-L3
Lab ID No.	2016-600-007-005	Nuc. Test No.	CL-76

Test Pressures		Final Sample Dimensions	
Cell Pressure(psi)	60.0	Sample Length (cm), L	3.44
Back Pressure(psi)	50.0	Sample Area (cm^2), A	41.66
Eff. Cons. Pressure(psi)	10.0	Pipette Area (cm^2), a_p	0.03142
Response (%)	100	Annulus Area (cm^2), a_a	0.76712
		Equilibrium Level (cm), R_{eq}	1

AVERAGE PERMEABILITY = 3.9E-08 cm/sec @ 20°C
AVERAGE PERMEABILITY = 3.9E-10 m/sec @ 20°C

DATE	TIME				ELAPSED TIME	PIPETTE READI NG	INCREMENT GRADIENT	TEMP.	INCREMENTAL PERMEABILITY @ 20°C
					t	**R_p**	**i**		
(mm/dd/yy)	(hr)	(min)	(sec)	(min)	(min)	(cm)	(cm/cm)	(°C)	(cm/sec)
3/7/16	13	53	5	53.08	0.000	4.6	13.7	23.5	NA
3/7/16	13	55	30	55.50	2.417	4.5	13.3	23.5	3.6E-08
3/7/16	13	57	30	57.50	4.417	4.4	12.9	23.5	4.4E-08
3/7/16	14	2	5	2.08	9.000	4.2	12.1	23.5	4.0E-08
3/7/16	14	4	35	4.58	11.500	4.1	11.8	23.5	3.9E-08
3/7/16	14	7	11	7.18	14.100	4.0	11.4	23.5	3.8E-08
3/7/16	14	9	48	9.80	16.717	3.9	11.0	23.5	4.0E-08

Tested By: AF Date: 3/4/16 Checked By: GEM Date: 3/8/16

DCN: CT-22A DATE: 2/12/15 REVISION: 6 T:\2016-600 HDR\BRICKHAVEN NO.2 MINE\Cell 1C clay\[Brickhaven Cell 1c soil lab test summary mar 4.xlsx]Sheet1

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ATTERBERG LIMITS

ASTM D 4318-10 / AASHTO T89-10

Client:	HDR ENGINEERING, INC.	Boring No.:	CELL 1C ACRE 6
Client Reference:	BRICKHAVEN NO. 2 MINE	Depth (ft):	LIFT 3
Project No.:	2016-600-007	Sample No.:	ST-1CA6-L3
Lab ID:	2016-600-007-006	Soil Description:	**GRAY TAN FAT CLAY**

Note: The USCS symbol used with this test refers only to the minus No. 40 sieve material. See the "Sieve and Hydrometer Analysis" graph page for the complete material description. (Minus No. 40 sieve material, Airdried)

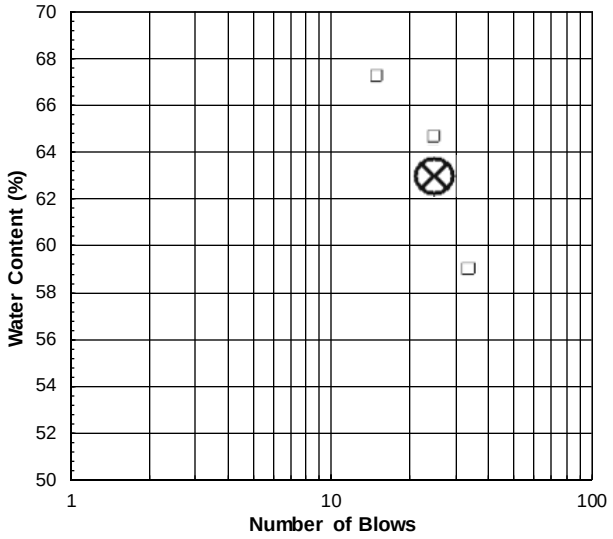
Liquid Limit Test	**1**	**2**	**3**	
				M
Tare Number	D-1	Y-3	W-5	**U**
Wt. of Tare & Wet Sample (g)	27.94	33.06	29.15	**L**
Wt. of Tare & Dry Sample (g)	23.25	26.22	23.70	**T**
Wt. of Tare (g)	15.29	15.64	15.59	**I**
Wt. of Water (g)	4.7	6.8	5.5	**P**
Wt. of Dry Sample (g)	8.0	10.6	8.1	**O**
				I
Moisture Content (%)	**58.9**	**64.7**	**67.2**	**N**
Number of Blows	**34**	**25**	**15**	**T**

Plastic Limit Test	**1**	**2**	**Range**
Tare Number	M	A-N	
Wt. of Tare & Wet Sample (g)	28.41	28.80	
Wt. of Tare & Dry Sample (g)	25.59	25.95	
Wt. of Tare (g)	15.16	15.43	
Wt. of Water (g)	2.8	2.9	
Wt. of Dry Sample (g)	10.4	10.5	
Moisture Content (%)	**27.0**	**27.1**	**-0.1**

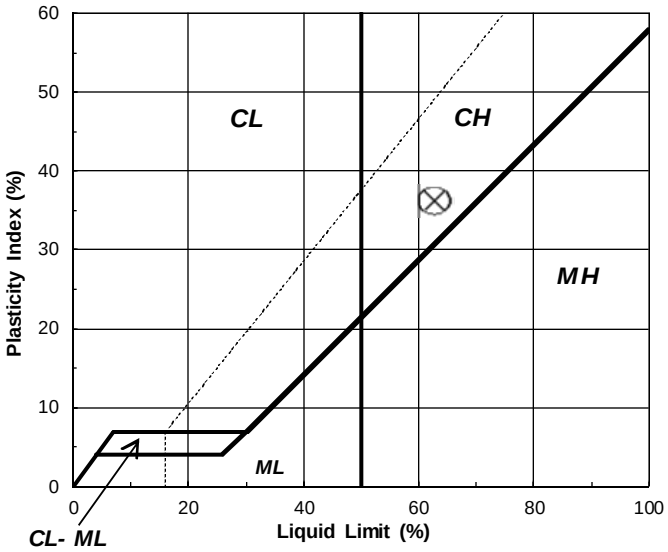
Note: The acceptable range of the two Moisture contents is ± 2.6

Test Results	
Liquid Limit (%)	**63**
Plastic Limit (%)	**27**
Plasticity Index (%)	**36**
USCS Symbol	**CH**

Flow Curve



Plasticity Chart



Tested By *TB* *Date* *3/8/16* *Checked By* *GEM* *Date* 3/9/16

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FLEXIBLE WALL PERMEABILITY TEST

PERMOMETER METHOD

ASTM D 5084-10

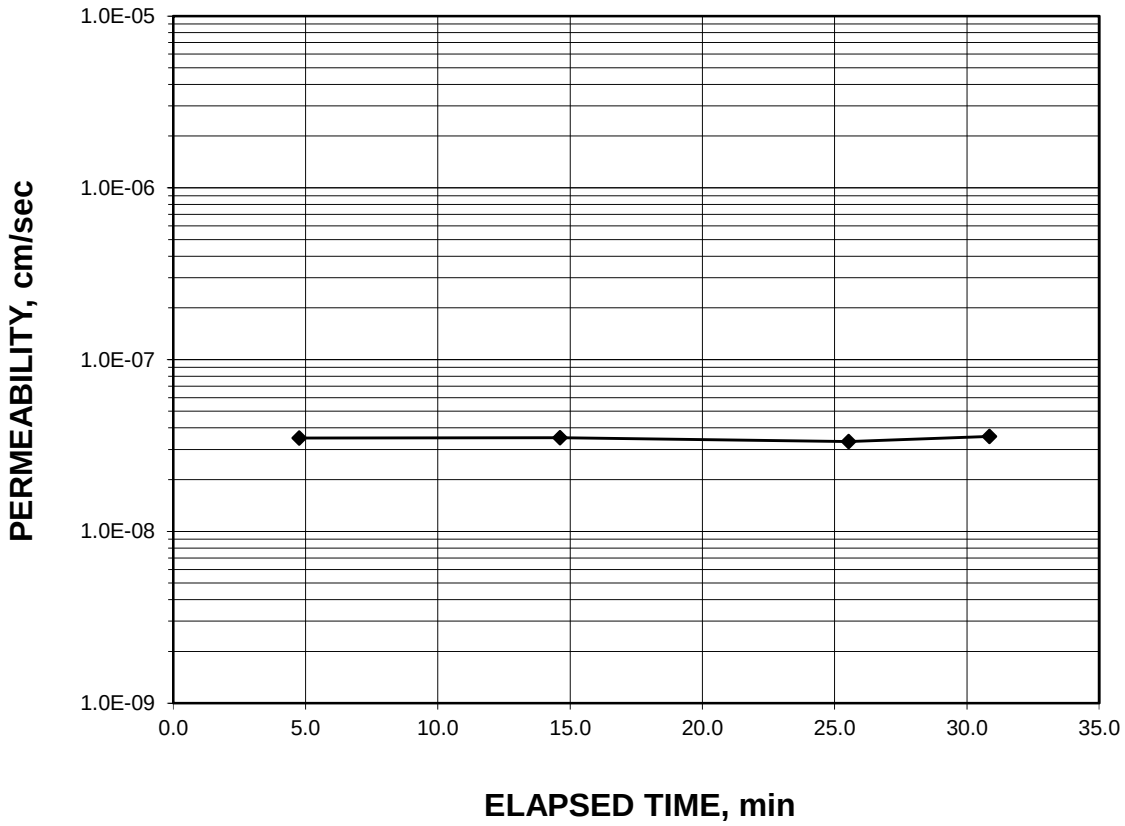
Client	HDR ENGINEERING, INC.	Boring No.	CELL 1C ACRE 6
Client Project	Brickhaven No.2 Mine	Depth (ft.)	LIFT 3
Project No.	2016-600-007	Sample No.	ST-1CA6-L3
Lab ID No.	2016-600-007-006	Nuc. Test No.	CL-83

Visual Description: TAN AND GRAY SANDY CLAY

AVERAGE PERMEABILITY = 3.5E-08 cm/sec @ 20°C

AVERAGE PERMEABILITY = 3.5E-10 m/sec @ 20°C

PERMEABILITY vs. TIME



Tested By: AF Date: 3/4/16 Checked By: GEM Date: 3/8/16

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FLEXIBLE WALL PERMEABILITY TEST

PERMOMETER METHOD

ASTM D 5084-10

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Client	HDR ENGINEERING, INC.	Boring No.	CELL 1C ACRE 6
Client Project	Brickhaven No.2 Mine	Depth (ft.)	LIFT 3
Project No.	2016-600-007	Sample No.	ST-1CA6-L3
Lab ID No.	2016-600-007-006	Nuc. Test No.	CL-83
		Specific Gravity	2.70 Assumed
		Sample Condition	Undisturbed

Visual Description: TAN AND GRAY SANDY CLAY

MOISTURE CONTENT:	BEFORE TEST	AFTER TEST
Tare Number	TB-12	800
Wt. of Tare & WS (gm.)	305.43	723.82
Wt. of Tare & DS (gm.)	271.87	591.19
Wt. of Tare (gm.)	135.10	103.06
Wt. of Water (gm.)	33.56	132.63
Wt. of DS (gm.)	136.77	488.13
Moisture Content (%)	**24.5**	**27.2**

SPECIMEN:	BEFORE TEST	AFTER TEST
Wt. of Tube & WS (gm.)	600.62	NA
Wt. of Tube (gm.)	0.00	NA
Wt. of WS (calc.) (gm.)	600.62	613.32
Length 1 (in.)	2.968	2.965
Length 2 (in.)	2.988	2.985
Length 3 (in.)	3.004	2.981
Top Diameter (in.)	2.862	2.865
Middle Diameter (in.)	2.833	2.869
Bottom Diameter (in.)	2.845	2.876
Average Length (in.)	2.99	2.98
Average Area (in.^{2})	6.36	6.47
Sample Volume (cm^3)	311.49	315.60
Unit Wet Wt. (gm./ cm^3)	1.928	1.943
Unit Wet Wt. (pcf)	120.4	121.3
Unit Dry Wt. (pcf)	96.6	95.4
Unit Dry Wt. (gm./ cm^3)	1.548	1.528
Void Ratio, e	0.744	0.767
Porosity, n	0.427	0.434
Pore Volume (cm^3)	132.9	137.0
Total Wt. Of Sample After Test		620.90

Tested By: AF Date: 3/4/16 Checked By: GEM Date: 3/8/16

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FLEXIBLE WALL PERMEABILITY TEST
PERMOMETER METHOD

ASTM D 5084-10

Client	HDR ENGINEERING, INC.	Boring No.	CELL 1C ACRE 6
Client Project	Brickhaven No.2 Mine	Depth (ft.)	LIFT 3
Project No.	2016-600-007	Sample No.	ST-1CA6-L3
Lab ID No.	2016-600-007-006	Nuc. Test No.	CL-83

Test Pressures		Final Sample Dimensions	
Cell Pressure(psi)	60.0	Sample Length (cm), L	7.56
Back Pressure(psi)	50.0	Sample Area (cm^2), A	41.74
Eff. Cons. Pressure(psi)	10.0	Pipette Area (cm^2), a_p	0.03142
Response (%)	99	Annulus Area (cm^2), a_a	0.76712
		Equilibrium Level (cm), R_{eq}	1

AVERAGE PERMEABILITY = 3.5E-08 cm/sec @ 20°C
AVERAGE PERMEABILITY = 3.5E-10 m/sec @ 20°C

DATE			TIME		ELAPSED TIME t	PIPETTE READI NG R_p	INCREMENT GRADIENT i	TEMP.	INCREMENTAL PERMEABILITY @ 20°C
(mm/dd/yy)	(hr)	(min)	(sec)	(min)	(min)	(cm)	(cm/cm)	(°C)	(cm/sec)
3/7/16	12	59	53	59.88	0.000	5.1	7.1	23.2	NA
3/7/16	13	4	39	4.65	4.767	5.0	6.9	23.2	3.5E-08
3/7/16	13	14	30	14.50	14.617	4.8	6.6	23.2	3.5E-08
3/7/16	13	25	25	25.42	25.533	4.6	6.2	23.2	3.3E-08
3/7/16	13	30	44	30.73	30.850	4.5	6.0	23.2	3.6E-08

Tested By: AF Date: 3/4/16 Checked By: GEM Date: 3/8/16

DCN: CT-22A DATE: 2/12/15 REVISION: 6 T:\2016-600 HDR BRICKHAVEN NO.2 MINE\Cell 1C clay\[Brickhaven Cell 1c soil lab test summary mar 4.xlsx]Sheet1

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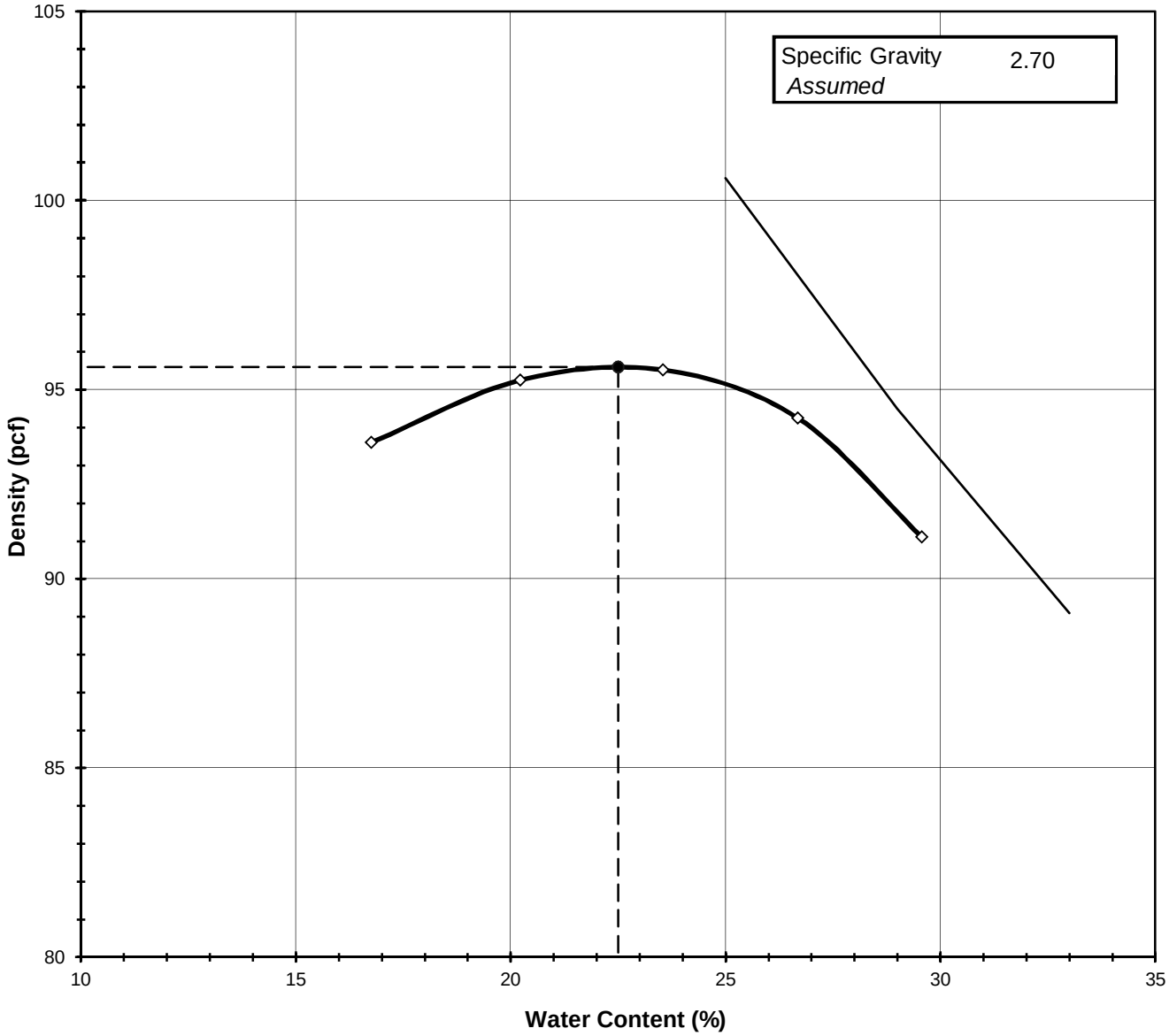
MOISTURE DENSITY RELATIONSHIP

ASTM D698-12

Client:	HDR ENGINEERING, INC.	Boring No.:	CELL 1C
Client Reference:	Brickhaven No.2 Mine	Depth (ft):	LIFT 2
Project No.:	2016-600-007	Sample No.:	BULK-L2
Lab ID:	2016-600-007-007	Test Method	**STANDARD**

Visual Description: BROWN CLAY AND ROCK FRAGMENTS

Optimum Water Content	**22.5**
Maximum Dry Density	**95.6**



Tested By	*TB*	*Date*	*3/9/16*	*Checked By*	*SFS*	*Date*	*3/10/16*

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MOISTURE - DENSITY RELATIONSHIP

ASTM D698-12

Client:	HDR ENGINEERING, INC.	Boring No.:	CELL 1C
Client Reference:	Brickhaven No.2 Mine	Depth (ft):	LIFT 2
Project No.:	2016-600-007	Sample No.:	BULK-L2
Lab ID:	2016-600-007-007		

Visual Description: BROWN CLAY AND ROCK FRAGMENTS

Total Weight of the Sample (g)	19300
As Received Water Content (%)	NA
Assumed Specific Gravity	2.70
Percent Retained on 3/4"	3.7
Percent Retained on 3/8"	1.3
Percent Retained on #4	NA
Oversize Material	Not included
Procedure Used	C

Test Type		**STANDARD**
Rammer Weight (lb)		5.5
Rammer Drop (in)		12
Rammer Type		MECHANICAL
Machine ID	R	174
Mold ID	R	173
Mold diameter		6"
Weight of the Mold (g)		5527
Volume of the Mold (cm^3)		2119

Mold / Specimen

Point No.	**1**	**2**	**3**	**4**	**5**
Wt. of Mold & Wet Sample (g)	9239	9416	9535	9582	9536
Wt.of Mold (g)	5527	5527	5527	5527	5527
Wt. of Wet Sample (g)	3712	3889	4008	4055	4009
Mold Volume (cm^3)	2119	2119	2119	2119	2119

Moisture Content / Density

Tare Number	304	318	317	307	305
Wt. of Tare & Wet Sample (g)	412.00	393.20	435.10	422.70	418.20
Wt. of Tare & Dry Sample (g)	368.70	341.60	368.20	356.80	342.10
Wt. of Tare (g)	110.40	86.40	84.10	109.80	84.70
Wt. of Water (g)	43.30	51.60	66.90	65.90	76.10
Wt. of Dry Sample (g)	258.30	255.20	284.10	247.00	257.40

Wet Density (g/cm^3)	1.75	1.84	1.89	1.91	1.89
Wet Density (pcf)	109.3	114.5	118.0	119.4	118.0
Moisture Content (%)	**16.8**	**20.2**	**23.5**	**26.7**	**29.6**
Dry Density (pcf)	**93.6**	**95.2**	**95.5**	**94.2**	**91.1**

Zero Air Voids

Moisture Content (%)	25.0	29.0	33.0
Dry Unit Weight (pcf)	100.6	94.5	89.1

Tested By *TB* *Date* *3/9/16* *Checked By* *SFS* *Date* 3/10/16

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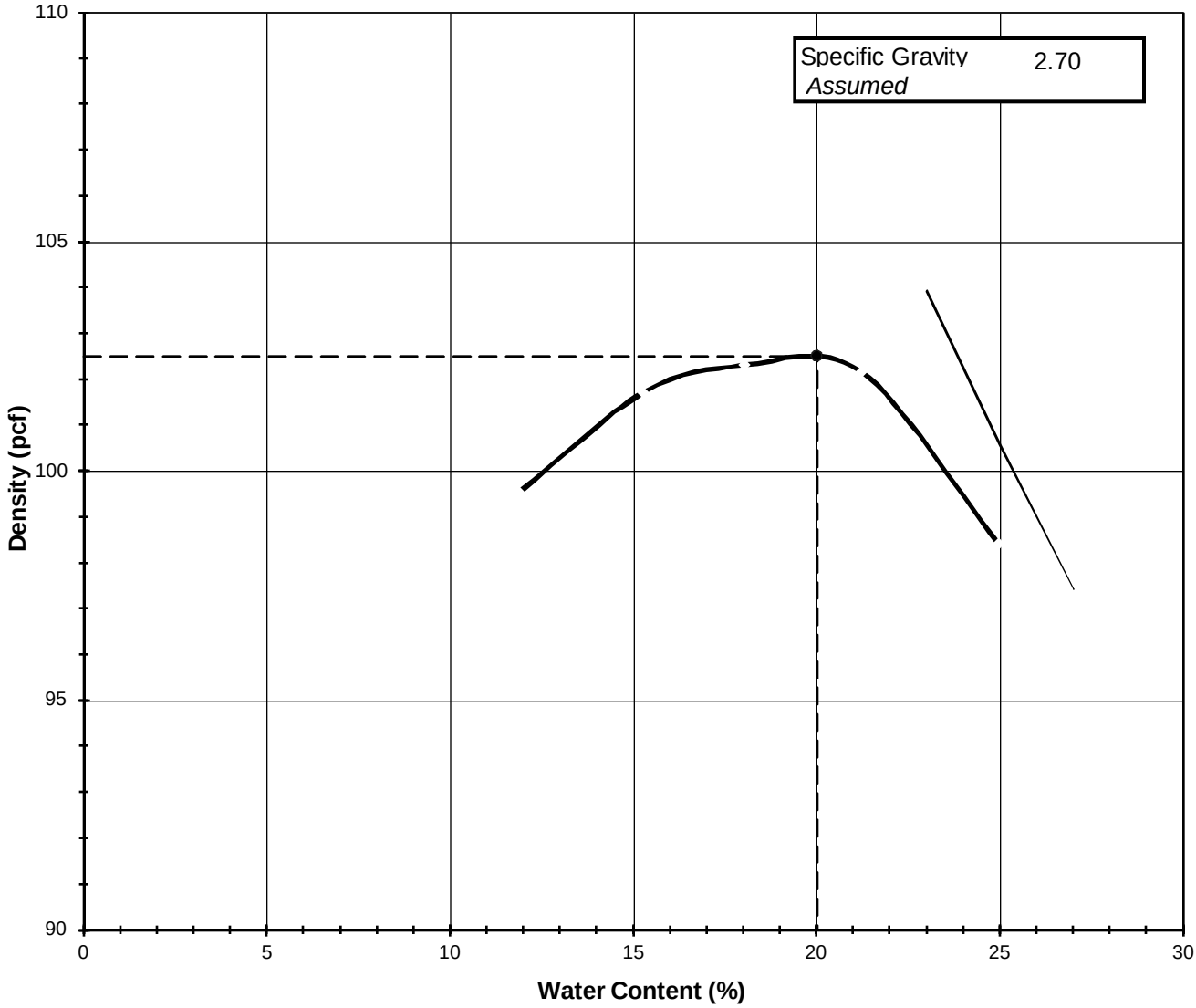
MOISTURE DENSITY RELATIONSHIP

ASTM D698-12

Client:	HDR ENGINEERING, INC.	Boring No.:	CELL 1C
Client Reference:	Brickhaven No.2 Mine	Depth (ft):	LIFT 3
Project No.:	2016-600-007	Sample No.:	BULK L-3
Lab ID:	2016-600-007-008	Test Method	**STANDARD**

Visual Description: BROWN SILTY CLAY

Optimum Water Content	**20.0**
Maximum Dry Density	**102.5**



Tested By	*BW*	*Date*	*3/8/16*	*Checked By*	*GEM*	*Date*	*3/8/16*

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MOISTURE - DENSITY RELATIONSHIP

ASTM D698-12

Client:	HDR ENGINEERING, INC.	Boring No.:	CELL 1C
Client Reference:	Brickhaven No.2 Mine	Depth (ft):	LIFT 3
Project No.:	2016-600-007	Sample No.:	BULK L-3
Lab ID:	2016-600-007-008		

Visual Description: BROWN SILTY CLAY

Total Weight of the Sample (g)	17850
As Received Water Content (%)	NA
Assumed Specific Gravity	2.70
Percent Retained on 3/4"	3
Percent Retained on 3/8"	5
Percent Retained on #4	NA
Oversize Material	Not included
Procedure Used	C

Test Type		**STANDARD**
Rammer Weight (lb)		5.5
Rammer Drop (in)		12
Rammer Type		MECHANICAL
Machine ID	R	174
Mold ID	R	173
Mold diameter		6'
Weight of the Mold (g)		5528
Volume of the Mold (cm^3)		2119

Mold / Specimen

Point No.	**1**	**2**	**3**	**4**	**5**
Wt. of Mold & Wet Sample (g)	9310	9511	9629	9734	9706
Wt.of Mold (g)	5528	5528	5528	5528	5528
Wt. of Wet Sample (g)	3782	3983	4101	4206	4178
Mold Volume (cm^3)	2119	2119	2119	2119	2119

Moisture Content / Density

Tare Number	312	317	866	314	304
Wt. of Tare & Wet Sample (g)	582.50	553.30	528.20	552.10	524.60
Wt. of Tare & Dry Sample (g)	529.60	491.10	460.80	470.30	441.90
Wt. of Tare (g)	84.00	84.00	86.50	84.50	110.50
Wt. of Water (g)	52.90	62.20	67.40	81.80	82.70
Wt. of Dry Sample (g)	445.60	407.10	374.30	385.80	331.40

Wet Density (g/cm^3)	1.78	1.88	1.93	1.98	1.97
Wet Density (pcf)	111.4	117.3	120.7	123.8	123.0
Moisture Content (%)	**11.9**	**15.3**	**18.0**	**21.2**	**25.0**
Dry Density (pcf)	**99.5**	**101.7**	**102.3**	**102.2**	**98.4**

Zero Air Voids

Moisture Content (%)	23.0	25.0	27.0
Dry Unit Weight (pcf)	103.9	100.6	97.4

Tested By *BW* *Date* *3/8/16* *Checked By* *GEM* *Date* 3/8/16

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B7

B7 – Clay Liner Field Nuclear Gauge Testing

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Client: HDR, Inc.
Project Name : Brickhaven
Project Number : 2016-600

Field Density Report

Report Number :	**CCLFDR-01**	Geotechnics Representative :	Erik Lindquist	Page :	1 of 1
Date (s) :	2/27/16	Reviewed By :	Shannon Sisell	Date :	3/3/16

Contractor :	Charah	Borrow Source :	On Site

Compaction Equipment :	Sheeps foot -CAT CP56B,

Test Number	Northing	Easting	Elevation/ Lift	Rod Depth	Proctor I.D. No.	Proctor Data		Measured In Place			Compaction		Comments, Subcell
						MDD pcf	Opt. %M	WD (pcf)	% M	DD (pcf)	% C	% Req.	
CL- 1	673514.919	1994218.217	Lift 1	6"	664-001-005	93.9	27.6	**120.7**	**31.2**	**92.0**	**98.0%**	**95.0%**	2/27/16, Subcell 18
CL- 2	674257.446	1994120.267	Lift 1	6"	664-001-001	96.4	23.8	**121.5**	**28.0**	**94.9**	**98.5%**	**95.0%**	2/27/16, Subcell 7 *some rock (perm)
CLDC- 1	674257.446	1994120.267	Lift 1	NA	664-001-001	96.4	23.8	**123.0**	**26.5**	**97.2**	**100.9%**	**95.0%**	2/27/16, Subcell 7 *some rock
CL- 3	674228.343	1994045.947	Lift 1	6"	664-001-005	93.9	27.6	**122.8**	**30.5**	**94.1**	**100.2%**	**95.0%**	2/27/16, Subcell 17 *some rock
CL- 4	674206.517	1993986.492	Lift 1	6"	664-001-005	93.9	27.6	**120.4**	**31.1**	**91.8**	**97.8%**	**95.0%**	2/27/16, Subcell 8
CL- 5	674166.491	1993932.977	Lift 1	6"	664-001-001	96.4	23.8	**113.6**	**23.4**	**92.1**	**95.5%**	**95.0%**	2/27/16, Subcell 6
CL- 6	674115.554	1993834.871	Lift 1	6"	664-001-005	93.9	27.6	**122.8**	**32.2**	**92.9**	**98.9%**	**95.0%**	2/27/16, Subcell 5
CL- 7	674333.884	1994102.447	Lift 1	6"	664-001-005	93.9	27.6	**121.9**	**29.9**	**93.8**	**99.9%**	**95.0%**	2/27/16, Subcell 19
CLDC- 2	674333.884	1994102.447	Lift 1	NA	664-001-005	93.9	27.6	**120.0**	**28.2**	**93.6**	**99.7%**	**95.0%**	2/27/16, Subcell 19
CL- 8	674308.418	1994042.991	Lift 1	6"	664-001-005	93.9	27.6	**121.2**	**29.8**	**93.4**	**99.4%**	**95.0%**	2/27/16, Subcell 16
CL- 9	674268.393	1993983.532	Lift 1	6"	664-001-005	93.9	27.6	**115.1**	**28.5**	**89.6**	**95.4%**	**95.0%**	2/27/16, Subcell 15
CL- 10	674202.887	1993935.957	Lift 1	6"	664-001-005	93.9	27.6	**117.1**	**28.8**	**90.9**	**96.8%**	**95.0%**	2/27/16, Subcell 9
CL- 11	674195.631	1993825.971	Lift 1	6"	664-001-005	93.9	27.6	**115.2**	**27.7**	**90.2**	**96.1%**	**95.0%**	2/27/16, Subcell 10
CLDC- 3	674195.631	1993825.971	Lift 1	NA	664-001-005	93.9	27.6	**118.2**	**27.5**	**92.7**	**98.7%**	**95.0%**	2/27/16, Subcell 10

Gauge Number		Gauge Model	Density Count	Moisture Count
31574		3440	2153	709

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Client: HDR, Inc.
Project Name : Brickhaven
Project Number : 2016-600

Field Density Report

Report Number :	**CLFDR-02 Cell 1C**	Geotechnics Representative :	Aaron Smith	Page :	1 of 4
Date (s) :	2/29/16-3/4/16	Reviewed By :	Shannon Sisell	Date :	3/8/16

Contractor :	Charah, Inc.	Borrow Source :	On Site

Compaction Equipment :	Sheeps foot -CAT CP56B, Case SV212 Smooth drum roller, CAT 815 F2 Sheepsfoot

Test Number	Northing	Easting	Elevation/ Lift	Rod Depth	Proctor I.D. No.	Proctor Data		Measured In Place			Compaction		Comments, Grid Location= GL, Acre= A
						MDD pcf	Opt. %M	WD (pcf)	% M	DD (pcf)	% C	% Req.	
CL- 12	674457.640	1994078.692	Lift 1	4"	664-001-005	93.9	27.6	**116.7**	**30.0**	**89.8**	**95.6%**	**95.0%**	2/29/16, GL 26
CL- 13	674068.250	1993778.382	Lift 1	4"	664-016-014	99.9	22.2	**117.6**	**20.1**	**97.9**	**98.0%**	**95.0%**	2/29/16, GL 2
CLDC- 4	674068.250	1993778.382	Lift 1	NA	664-016-014	99.9	22.2	**118.0**	**21.5**	**97.1**	**97.2%**	**95.0%**	2/29/16, GL 2
CL- 14	674020.951	1993692.167	Lift 1	4"	664-016-014	99.9	22.2	**120.4**	**22.4**	**98.4**	**98.5%**	**95.0%**	2/29/16, GL 1; perm taken (A1)
CL- 15	674079.197	1993644.619	Lift 1	4"	664-016-014	99.9	22.2	**116.5**	**19.6**	**97.4**	**97.5%**	**95.0%**	2/29/16, GL 4
CL- 16	674130.160	1993614.904	Lift 1	4"	664-016-014	99.9	22.2	**118.0**	**21.8**	**96.9**	**97.0%**	**95.0%**	2/29/16, GL 3
CL- 17	674195.657	1993701.122	Lift 1	4"	664-016-014	99.9	22.2	**119.7**	**22.3**	**97.9**	**98.0%**	**95.0%**	2/29/16, GL 11; perm taken (A4)
CL- 18	674195.674	1993623.836	Lift 1	4"	664-016-014	99.9	22.2	**119.2**	**22.0**	**97.7**	**97.8%**	**95.0%**	2/29/16, GL 12
CLDC- 5	674195.674	1993623.836	Lift 1	NA	664-016-014	99.9	22.2	**119.8**	**23.3**	**97.2**	**97.3%**	**95.0%**	2/29/16, GL 12
CL- 19	674555.947	1993915.222	Lift 1	4"	664-016-014	99.9	22.2	**121.1**	**23.0**	**98.5**	**98.6%**	**95.0%**	3/1/16, GL 28
CL- 20	674497.711	1993915.210	Lift 1	4"	664-016-014	99.9	22.2	**120.0**	**22.7**	**97.8**	**97.9%**	**95.0%**	3/1/16, GL 24
CL- 21	674461.324	1993861.697	Lift 1	4"	664-016-014	99.9	22.2	**122.2**	**23.5**	**98.9**	**99.0%**	**95.0%**	3/1/16, GL 23
CLDC- 6	674461.324	1993861.697	Lift 1	NA	664-016-014	99.9	22.2	**122.8**	**25.2**	**98.1**	**98.2%**	**95.0%**	3/1/16, GL 23
CL- 22	674355.768	1993879.510	Lift 1	4"	664-016-014	99.9	22.2	**119.2**	**23.0**	**96.9**	**97.0%**	**95.0%**	3/1/16, GL 21
CL- 23	674392.182	1993802.231	Lift 1	4"	664-016-014	99.9	22.2	**120.9**	**22.4**	**98.8**	**98.9%**	**95.0%**	3/1/16, GL 22; perm taken (A5)
CL- 24	674286.642	1993742.758	Lift 1	4"	664-016-014	99.9	22.2	**121.3**	**24.1**	**97.7**	**97.8%**	**95.0%**	3/1/16, GL 13
CL- 25	674312.104	1993817.077	Lift 1	4"	664-016-014	99.9	22.2	**123.2**	**24.6**	**98.9**	**99.0%**	**95.0%**	3/1/16, GL 14; perm taken (A3)
CL- 26	674545.015	1993977.643	Lift 1	4"	664-016-014	99.9	22.2	**118.3**	**22.0**	**97.0**	**97.1%**	**95.0%**	3/1/16, GL 27
CLDC- 7	674545.015	1993977.643	Lift 1	NA	664-016-014	99.9	22.2	**119.5**	**24.8**	**95.8**	**95.8%**	**95.0%**	3/1/16, GL 27
CL- 27	674483.153	1993909.262	Lift 1	4"	664-016-014	99.9	22.2	**120.9**	**23.7**	**97.7**	**97.8%**	**95.0%**	3/1/16, GL 25
CL- 28	674384.865	1993980.583	Lift 1	4"	664-016-014	99.9	22.2	**122.1**	**24.3**	**98.2**	**98.3%**	**95.0%**	3/1/16, GL 20; perm taken (A6)
CL- 29	674253.796	1994173.773	Lift 2	6"	664-016-014	99.9	22.2	**121.0**	**23.2**	**98.2**	**98.3%**	**95.0%**	3/1/16 , GL 18
CLDC- 8	674253.796	1994173.773	Lift 2	NA	664-016-014	99.9	22.2	**121.5**	**24.9**	**97.3**	**97.4%**	**95.0%**	3/1/16 , GL 18
CL- 30	674148.253	1994126.191	Lift 2	6"	664-016-014	99.9	22.2	**120.9**	**23.5**	**97.9**	**98.0%**	**95.0%**	3/1/16, GL 7, perm taken (A2)

Gauge Number	Gauge Model	Density Count	Moisture Count
31574	3440	2172	621

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Client: HDR, Inc.
Project Name : Brickhaven
Project Number : 2016-600

Field Density Report

Report Number :	**CLFDR-02 Cell 1C**	Geotechnics Representative :	Aaron Smith	Page :	2 of 4
Date (s) :	2/29/16-3/4/16	Reviewed By :	Shannon Sisell	Date :	3/8/16

Contractor :	Charah, Inc.	Borrow Source :	On Site

Compaction Equipment :	Sheeps foot -CAT CP56B, Case SV212 Smooth drum roller, CAT 815 F2 Sheepsfoot

Test Number	Northing	Easting	Elevation/ Lift	Rod Depth	Proctor I.D. No.	Proctor Data		Measured In Place			Compaction		Comments, GL= Grid Location, Acre=A
						MDD pcf	Opt. %M	WD (pcf)	% M	DD (pcf)	% C	% Req.	
CL- 31	674184.670	1994025.131	Lift 2	6"	664-016-014	99.9	22.2	**121.6**	**24.4**	**97.7**	**97.8%**	**95.0%**	3/1/16, GL 8
CL- 32	674122.815	1993924.050	Lift 2	6"	664-016-014	99.9	22.2	**124.0**	**23.5**	**100.4**	**100.5%**	**95.0%**	3/1/16, GL 6
CL- 33	674075.518	1993831.891	Lift 2	6"	664-016-014	99.9	22.2	**119.3**	**21.3**	**98.4**	**98.4%**	**95.0%**	3/1/16, GL 5
CLDC- 9	674075.518	1993831.891	Lift 2	NA	664-016-014	99.9	22.2	**118.9**	**23.0**	**96.7**	**96.8%**	**95.0%**	3/1/16, GL 5
CL- 34	674031.856	1993760.539	Lift 2	6"	664-016-014	99.9	22.2	**120.5**	**23.0**	**98.0**	**98.1%**	**95.0%**	3/1/16, GL 2
CL- 35	674013.662	1993739.727	Lift 2	6"	664-016-014	99.9	22.2	**120.7**	**20.7**	**100.0**	**100.1%**	**95.0%**	3/2/16, GL 1, perm taken (A1)
CL- 36	674293.853	1994072.714	Lift 2	6"	664-016-014	99.9	22.2	**120.3**	**21.3**	**99.2**	**99.3%**	**95.0%**	3/2/16, GL 17
CL- 37	674242.904	1994037.033	Lift 2	6"	664-016-014	99.9	22.2	**123.6**	**24.1**	**99.6**	**99.7%**	**95.0%**	3/2/16, GL 16
CLDC- 10	674242.904	1994037.033	Lift 2	NA	664-016-014	99.9	22.2	**123.9**	**25.8**	**98.5**	**98.6%**	**95.0%**	3/2/16, GL 16
CL- 38	674151.929	1993947.837	Lift 2	6"	664-016-014	99.9	22.2	**122.9**	**24.3**	**98.9**	**99.0%**	**95.0%**	3/2/16, GL 9
CL- 39	674101.006	1993784.335	Lift 2	6"	664-016-014	99.9	22.2	**122.7**	**22.7**	**100.0**	**100.1%**	**95.0%**	3/2/16, GL 10, perm taken (A3)
CL- 40	674028.233	1993680.279	Lift 2	6"	664-016-014	99.9	22.2	**121.5**	**23.9**	**98.1**	**98.2%**	**95.0%**	3/2/16, GL 4
CL- 41	674071.913	1993668.398	Lift 2	6"	664-016-014	99.9	22.2	**122.5**	**21.9**	**100.5**	**100.6%**	**95.0%**	3/2/16, GL 3
CL- 42	674403.060	1994001.394	Lift 2	6"	664-016-014	99.9	22.2	**121.5**	**21.3**	**100.2**	**100.3%**	**95.0%**	3/2/16, GL 20
CLDC- 11	674403.060	1994001.394	Lift 2	NA	664-016-014	99.9	22.2	**121.2**	**22.9**	**98.6**	**98.7%**	**95.0%**	3/2/16, GL 20
CL- 43	674239.306	1993834.897	Lift 2	6"	664-016-014	99.9	22.2	**121.5**	**22.6**	**99.1**	**99.2%**	**95.0%**	3/2/16, GL 15
CL- 44	674282.985	1993825.989	Lift 2	6"	664-016-014	99.9	22.2	**119.9**	**22.3**	**98.0**	**98.1%**	**95.0%**	3/2/16, GL 14
CL- 45	674202.933	1993718.959	Lift 2	6"	664-016-014	99.9	22.2	**121.6**	**23.6**	**98.4**	**98.5%**	**95.0%**	3/2/16, GL 11
CL- 46	674170.187	1993662.474	Lift 2	6"	664-016-014	99.9	22.2	**122.4**	**22.7**	**99.8**	**99.9%**	**95.0%**	3/2/16, GL 12, perm taken (A4)
CL- 47	674283.005	1993727.894	Lift 2	6"	664-016-014	99.9	22.2	**120.7**	**22.0**	**98.9**	**99.0%**	**95.0%**	3/2/16, GL 13
CL- 48	674388.534	1993840.874	Lift 2	6"	664-016-014	99.9	22.2	**119.5**	**21.4**	**98.4**	**98.5%**	**95.0%**	3/2/16, GL 22
CLDC- 12	674388.534	1993840.874	Lift 2	NA	664-016-014	99.9	22.2	**119.9**	**23.1**	**97.4**	**97.5%**	**95.0%**	3/2/16, GL 22
CL- 49	674454.045	1993861.695	Lift 2	6"	664-016-014	99.9	22.2	**122.3**	**24.5**	**98.2**	**98.3%**	**95.0%**	3/2/16, GL 23
CL- 50	674501.340	1993968.716	Lift 2	6"	664-016-014	99.9	22.2	**122.9**	**24.6**	**98.6**	**98.7%**	**95.0%**	3/2/16, GL 24

Gauge Number	Gauge Model	Density Count	Moisture Count
31574	3440	2172	621

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Client: HDR, Inc.
Project Name : Brickhaven
Project Number : 2016-600

Field Density Report

Report Number :	**CLFDR-02 Cell 1C**	Geotechnics Representative :	Aaron Smith	Page :	3 of 4
Date (s) :	2/29/16-3/4/16	Reviewed By :	Shannon Sisell	Date :	3/8/16

Contractor :	Charah, Inc.	Borrow Source :	On Site

Compaction Equipment :	Sheeps foot -CAT CP56B, Case SV212 Smooth drum roller, CAT 815 F2 Sheepsfoot

Test Number	Northing	Easting	Elevation/ Lift	Rod Depth	Proctor I.D. No.	Proctor Data		Measured In Place			Compaction		Comments, GL= Grid Location, Acre=A
						MDD pcf	Opt. %M	WD (pcf)	% M	DD (pcf)	% C	% Req.	
CL- 51	674559.572	1993983.591	Lift 2	6"	664-016-014	99.9	22.2	**122.5**	**23.2**	**99.4**	**99.5%**	**95.0%**	3/2/16, GL 28
CL- 52	674512.250	1994013.307	Lift 2	6"	664-016-014	99.9	22.2	**122.7**	**22.3**	**100.3**	**100.4%**	**95.0%**	3/2/16, GL 27
CL- 53	674337.563	1993909.232	Lift 2	6"	664-016-014	99.9	22.2	**120.3**	**22.6**	**98.1**	**98.2%**	**95.0%**	3/2/16, GL 26
CLDC- 13	674337.563	1993909.232	Lift 2	NA	664-016-014	99.9	22.2	**119.9**	**24.3**	**96.5**	**96.6%**	**95.0%**	3/2/16, GL 26
CL- 54	674341.155	1994147.037	Lift 2	6"	664-016-014	99.9	22.2	**121.2**	**22.5**	**98.9**	**99.0%**	**95.0%**	3/2/16, GL 19
CL- 55	674356.098	1992455.656	Lift 2	6"	664-016-014	99.9	22.2	**121.8**	**22.4**	**99.5**	**99.6%**	**95.0%**	3/2/16, GL 21, perm taken (A5)
CL- 56	674479.513	1993912.234	Lift 2	6"	664-016-014	99.9	22.2	**121.3**	**22.0**	**99.4**	**99.5%**	**95.0%**	3/2/16, GL 25, perm taken (A6)
CL- 57	674242.873	1994191.606	Lift 3	6"	664-009-001	102.6	19.8	**122.1**	**21.5**	**100.5**	**97.9%**	**95.0%**	3/3/16, GL 18
CLDC- 14	674242.873	1994191.606	Lift 3	NA	664-009-001	102.6	19.8	**123.4**	**23.3**	**100.1**	**97.5%**	**95.0%**	3/3/16, GL 18
CL- 58	674297.479	1994144.056	Lift 3	6"	664-009-001	102.6	19.8	**121.4**	**22.7**	**98.9**	**96.4%**	**95.0%**	3/3/16, GL 17, perm taken (A2)
CL- 59	674224.686	1994132.151	Lift 3	6"	664-009-001	102.6	19.8	**123.6**	**21.6**	**101.6**	**99.1%**	**95.0%**	3/3/16, GL 7
CL- 60	674257.460	1994051.898	Lift 3	6"	664-009-001	102.6	19.8	**119.2**	**21.0**	**98.5**	**96.0%**	**95.0%**	3/3/16, GL 16
CL- 61	674166.469	1994037.017	Lift 3	6"	664-009-001	102.6	19.8	**120.6**	**22.9**	**98.1**	**95.6%**	**95.0%**	3/3/16, GL 8
CL- 62	674151.932	1993932.974	Lift 3	6"	664-009-001	102.6	19.8	**121.5**	**20.1**	**101.2**	**98.6%**	**95.0%**	3/3/16, GL 9
CLDC- 15	674151.932	1993932.974	Lift 3	NA	664-009-001	102.6	19.8	**121.1**	**21.9**	**99.3**	**96.8%**	**95.0%**	3/3/16, GL 9
CL- 63	674093.704	1993891.346	Lift 3	6"	664-009-001	102.6	19.8	**122.9**	**20.7**	**101.8**	**99.2%**	**95.0%**	3/3/16, GL 6
CL- 64	674159.233	1993825.963	Lift 3	6"	664-009-001	102.6	19.8	**119.9**	**22.2**	**98.1**	**95.6%**	**95.0%**	3/3/16, GL 14, perm taken (A3)
CL- 65	674090.083	1993802.168	Lift 3	6"	664-009-001	102.6	19.8	**122.1**	**21.8**	**100.2**	**97.7%**	**95.0%**	3/3/16, GL 5
CL- 66	674046.407	1993796.213	Lift 3	6"	664-009-001	102.6	19.8	**117.6**	**19.3**	**98.6**	**96.1%**	**95.0%**	3/3/16, GL 2
CL- 67	673995.473	1993692.162	Lift 3	6"	664-009-001	102.6	19.8	**121.2**	**22.6**	**98.9**	**96.4%**	**95.0%**	3/3/16, GL 1
CL- 68	674060.985	1993707.039	Lift 3	6"	664-009-001	102.6	19.8	**121.0**	**21.2**	**99.8**	**97.3%**	**95.0%**	3/3/16, GL 4, perm taken (A1)
CLDC- 16	674060.985	1993707.039	Lift 3	NA	664-009-001	102.6	19.8	**122.2**	**23.1**	**99.3**	**96.8%**	**95.0%**	3/3/16, GL 4
CL- 69	674111.962	1993611.927	Lift 3	6"	664-009-001	102.6	19.8	**120.6**	**23.5**	**97.7**	**95.2%**	**95.0%**	3/3/16, GL 3
CL- 70	674181.121	1993594.107	Lift 3	6"	664-009-001	102.6	19.8	**122.2**	**24.5**	**98.2**	**95.7%**	**95.0%**	3/3/16, GL 12, perm taken (A4)

Gauge Number	Gauge Model	Density Count	Moisture Count
31574	3440	2172	621

Client: HDR, Inc.
Project Name : Brickhaven
Project Number : 2016-600

Field Density Report

Report Number :	**CLFDR-02 Cell 1C**	Geotechnics Representative :	Aaron Smith	Page :	4 of 4
Date (s) :	2/29/16-3/4/16	Reviewed By :	Shannon Sisell	Date :	3/8/16

Contractor :	Charah, Inc.	Borrow Source :	On Site

Compaction Equipment :	Sheeps foot -CAT CP56B, Case SV212 Smooth drum roller

Test Number	Northing	Easting	Elevation/ Lift	Rod Depth	Proctor I.D. No.	Proctor Data		Measured In Place			Compaction		Comments, GL= Grid Location, Acre=A
						MDD pcf	Opt. %M	WD (pcf)	% M	DD (pcf)	% C	% Req.	
CL- 71	674122.865	1993689.217	Lift 3	6"	664-009-001	102.6	19.8	**120.3**	**22.9**	**97.9**	**95.4%**	**95.0%**	3/3/16, GL 11
CL- 72	674264.807	1993724.918	Lift 3	6"	664-009-001	102.6	19.8	**123.3**	**21.9**	**101.1**	**98.6%**	**95.0%**	3/3/16, GL 13
CL- 73	674151.958	1993808.126	Lift 3	6"	664-009-001	102.6	19.8	**120.4**	**21.6**	**99.0**	**96.5%**	**95.0%**	3/3/16, GL 10
CLDC- 17	674151.958	1993808.126	Lift 3	NA	664-009-001	102.6	19.8	**120.0**	**22.7**	**97.8**	**95.3%**	**95.0%**	3/3/16, GL 10
CL- 74	674239.290	1993909.212	Lift 3	6"	664-009-001	102.6	19.8	**121.9**	**22.8**	**99.3**	**96.8%**	**95.0%**	3/3/16, GL 15
CL- 75	674323.035	1993763.573	Lift 3	6"	664-009-001	102.6	19.8	**122.5**	**24.3**	**98.6**	**96.1%**	**95.0%**	3/3/16,GL 22
CL- 76	674337.564	1993906.259	Lift 3	6"	664-009-001	102.6	19.8	**127.1**	**21.1**	**105.0**	**102.3%**	**95.0%**	3/3/16, GL 21, perm taken (A5)
CL- 77	674461.313	1993915.202	Lift 3	6"	664-009-001	102.6	19.8	**118.8**	**19.5**	**99.4**	**96.9%**	**95.0%**	3/3/16, GL 24
CL- 78	674563.215	1993971.702	Lift 3	6"	664-009-001	102.6	19.8	**116.9**	**19.0**	**98.2**	**95.7%**	**95.0%**	3/3/16, GL 28
CLDC- 18	674563.215	1993971.702	Lift 3	NA	664-009-001	102.6	19.8	**118.5**	**21.3**	**97.7**	**95.2%**	**95.0%**	3/3/16, GL 28
CL- 79	674432.171	1994037.071	Lift 3	6"	664-009-001	102.6	19.8	**119.7**	**21.6**	**98.4**	**95.9%**	**95.0%**	3/3/16, GL 27
CL- 80	674421.235	1994117.328	Lift 3	6"	664-009-001	102.6	19.8	**120.7**	**23.5**	**97.7**	**95.3%**	**95.0%**	3/3/16, GL 26
CL- 81	674461.295	1994007.351	Lift 3	6"	664-009-001	102.6	19.8	**120.6**	**22.0**	**98.9**	**96.3%**	**95.0%**	3/3/16, GL 25
CL- 82	674348.434	1994150.011	Lift 3	6"	664-009-001	102.6	19.8	**120.6**	**22.1**	**98.8**	**96.3%**	**95.0%**	3/3/16, GL 19
CLDC- 19	674348.434	1994150.011	Lift 3	NA	664-009-001	102.6	19.8	**121.2**	**23.9**	**97.8**	**95.3%**	**95.0%**	3/3/16, GL 19
CL- 83	674352.081	1994111.369	Lift 3	6"	664-009-001	102.6	19.8	**120.9**	**22.3**	**98.9**	**96.4%**	**95.0%**	3/3/16, GL 20, perm taken (A6)
CL- 84	674410.333	1994031.716	Lift 3	6"	664-009-001	102.6	19.8	**122.5**	**23.5**	**99.2**	**96.7%**	**95.0%**	3/3/16, GL 23

Gauge Number	Gauge Model	Density Count	Moisture Count
31574	3440	2172	621

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B8

B8 – Leachate Collection Stone

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July 16, 2015

Project No. 2015-664-11

Mr. Michael Plummer, P.E.
HDR Engineering, Inc.
440 South Church St., Suite 1000
Charlotte, NC 28202

Transmittal
Laboratory Test Results
Brickhaven No. 2 Mine

Please find attached the laboratory test results for the above referenced project. The tests were outlined on the Project Verification Form that was transmitted to your firm prior to the testing. The testing was performed in general accordance with the methods listed on the enclosed data sheets. The test results are believed to be representative of the samples that were submitted for testing and are indicative only of the specimens which were evaluated. We imply no position with regard to the nature of the test results, i.e. pass/fail and no claims as to the suitability of the material for its intended use.

The test data and all associated project information provided shall be held in strict confidence and disclosed to other parties only with authorization by our Client. The test data submitted herein is considered integral with this report and is not to be reproduced except in whole and only with the authorization of the Client and Geotechnics. The remaining sample materials for this project will be retained for a minimum of 90 days as directed by the Geotechnics' Quality Program.

We are pleased to provide these testing services. Should you have any questions or if we may be of further assistance, please contact our office.

Respectively submitted,
Geotechnics, Inc.

Michael P. Smith
Regional Manager

We understand that you have a choice in your laboratory services and we thank you for choosing Geotechnics.

DCN: Data Transmittal Letter Date: 1/28/05 Rev.: 1

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CARBONATE CONTENT

ASTM D 3042-09

Client:	HDR Engineering, Inc.	Boring No.:	Wake Stone
Client Reference:	Brickhaven No. 2 Mine	Depth (ft):	Stockpile
Project No.:	2015-664-11	Sample No.:	#5-01
Lab ID:	2015-664-11-01		

Visual Description: Gray Stone

Washed and Dried Specimen (+ #200 Material), Total % Carbonate only

Tare No.	924
Weight of Tare (g)	99.66
Weight of Washed, Dry Sample & Tare Before Acid Wash (g)	932.87
Weight of Washed, Dry Sample & Tare After Acid Wash (g)	915.50
Weight of Dry Sample Before Acid Wash (g)	833.21
Weight of Dry Sample After Acid Wash (g)	815.84

Carbonate Content 2.1%

Tested By	KBL	Date	7/15/15	Checked By	CLK	Date	7/16/15

DCN: CT-S47 DATE :5/1/13 REVISION: 2

RVER\Data Drive\2015 GEOTECHNICAL PROJECTS\HDR Engineering, Inc\2015-664-11 BRICKHAVEN No. 2 MINE\[2015-664-011-01 Carbonate Content.XLS]Sheet1

WASH SIEVE ANALYSIS OF AGGREGATES

ASTM C117-13 / C136-14

Client:	HDR Engineering, Inc.	Boring No.:	Wake Stone
Client Reference:	Brickhaven No. 2 Mine	Depth (ft):	Stockpile
Project No.:	2015-664-11	Sample No.:	#5-01
Lab ID:	2015-664-11-01	Color:	Gray

USCS Symbol:
GP

Fineness Modulus:
7.68

D60 =	**21.56**		
D30 =	**19.07**	**CC =**	**1.18**
D10 =	**14.28**	**CU =**	**1.51**

USCS Classification:
POORLY GRADED GRAVEL

Tested By	SGB	Date	7/15/15	Checked By	KC	Date	7/15/15

DCN: CT-S42A4 DATE: 3/19/14 REVISION: 2

0

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WASH SIEVE ANALYSIS OF AGGREGATES

ASTM C117-13 / C136-14

Client:	HDR Engineering, Inc.	Boring No.:	Wake Stone
Client Reference:	Brickhaven No. 2 Mine	Depth (ft):	Stockpile
Project No.:	2015-664-11	Sample No.:	#5-01
Lab ID:	2015-664-11-01	Color:	Gray

Tare No.:	A	Weight of Dry Sample (g):	10223.00
Wt. of Tare & Dry Sample (Pre-Wash), (g):	11218.00	Weight of + #200 Sample (g):	10190.19
Weight of Tare & Dry,Washed Sample (g):	11194.00	Weight of - #200 Sample (g):	33.99
Weight of Tare (g):	995.00		
Weight of Dry,Washed Sample (g):	10199.00	% Passing #200 Sieve by Washing (%):	0.2
		Total Weight Retained After Sieving (g):	10200.18

The % Difference in Weight of the Dry,Washed Sample vs the Total Weight Retained After Sieving (%): 0.0

(% Difference must not be more than 0.3)

Sieve	Sieve Opening (mm)	Weight Retained (g)	Percent Retained (%)	Accumulated Percent Retained (%)	Percent Finer (%)
6"	150	0.00	0	0	100
4"	100	0.00	0	0	100
3"	75	0.00	0	0	100
2 1/2"	63	0.00	0	0	100
2"	50	0.00	0	0	100
1 1/2"	37.50	0.00	0	0	100
1"	25.00	379.00	4	4	96
3/4"	19.00	6873.00	67	71	29
1/2"	12.50	2859.00	28	99	1
3/8"	9.50	45.00	0	99	1
#4	4.75	16.00	0	100	0
#8	2.36	1.67	0	100	0
#16	1.18	1.36	0	100	0
#30	0.60	1.43	0	100	0
#50	0.30	2.05	0	100	0
#100	0.15	3.89	0	100	0
#200	0.075	7.79	0.1	99.7	0.3
Pan	-	9.99	0	100	-

Tested By	SGB	Date	7/15/15	Checked By	KC	Date	7/15/15

DCN: CT-S42A4 DATE: 3/19/14 REVISION: 2

0

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RIGID WALL CONSTANT HEAD PERMEABILITY

ASTM D 2434-68 (SOP-S35) Modified

Client	HDR Engineering, Inc.	Boring No.	Wake Stone
Client Reference	Brickhaven No. 2 Mine	Depth(ft.)	Stockpile
Project No.	2015-664-11	Sample No.	#5-01
Lab ID	2015-664-11-01	Visual	Gray Stone

Unit Weight

Wt. of Wet Material (gm)	13216
Average Length (in)	12.2
Permeameter Diameter (in)	7.5
Sample Volume (cc)	8832.3
Unit Dry Weight (gm/cc)	1.49
Unit Dry Weight (pcf)	93.1

Water Content

Tare Number	1450
Wt. of Tare & Wet Mat.(gm)	1411.40
Wt. of Tare & Dry Mat.(gm)	1407.50
Wt. of Tare (gm)	145.07
Wt. Water (gm)	3.90
Wt. of Dry Material (gm)	1262.43

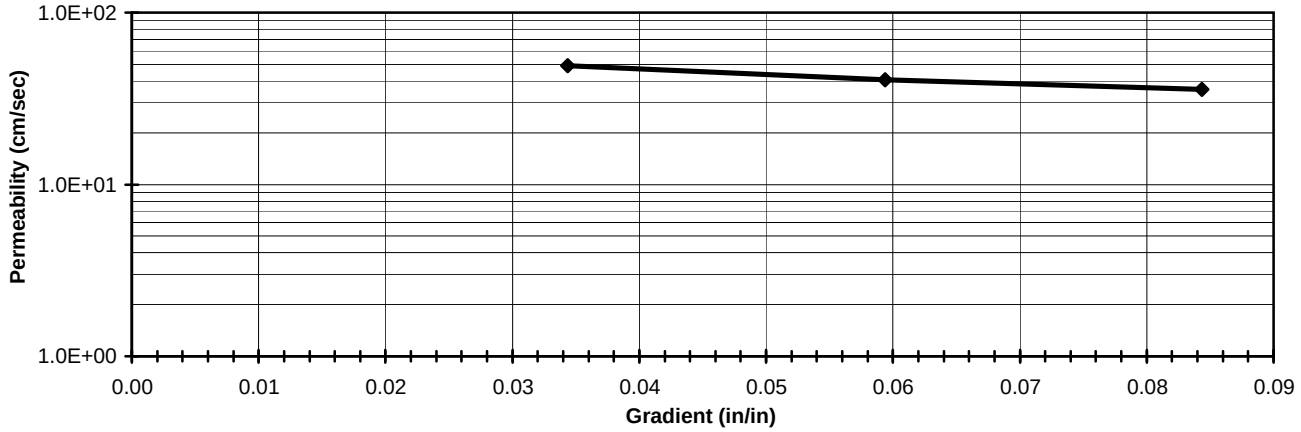
	Test 1	Test 2	Test 3
Piezometer Spacing (in)	***8***	***8***	***8***
Temperature (^{o} C)	*23.5*	*23.5*	*23.5*
Temp. Correction Factor	*0.9203*	*0.9203*	*0.9203*

Water Content (%) ***0.3***

(Measured)

Load (psf) ***NA***

Test No.	Replicate No.	Head (in)	Gradient (in/in)	Elapsed Time (sec)	Collection Tube (divisions)	Collected Volume (cc)	Permeability 20° C (cm/s)	Average Permeability (cm/s)
1	1	0.28	0.03	27.5	10	14441	4.9E+01	
1	2	0.28	0.03	27.8	10	14441	4.9E+01	**4.9E+01**
1	3	0.28	0.03	27.6	10	14441	4.9E+01	
2	1	0.48	0.06	19.6	10	14441	4.0E+01	
2	2	0.48	0.06	19.3	10	14441	4.1E+01	**4.0E+01**
2	3	0.48	0.06	19.4	10	14441	4.1E+01	
3	1	0.68	0.08	15.4	10	14441	3.6E+01	
3	2	0.68	0.08	15.5	10	14441	3.6E+01	**3.6E+01**
3	3	0.68	0.08	15.5	10	14441	3.6E+01	



Tested By BB Date 9/24/12 Checked By KC Date 7/15/15

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B9

B9 – Daily Field Reports

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Day: Wednesday
Date: 2/10/16
Log No.: 5
Page: 1 of 1

Daily Field Report

Project Name:	Brickhaven	**Project No.:**	2016-600
Client Name:	HDR, Inc.	**Client Contact:**	Mike Batten
Site Location:	Moncure, NC	**Time on Site:**	**Arrived:** 2:00 PM **Departed:** 5:00 PM
General Contractor:	Charah, Inc.	**Superintendent:**	Jeff Howell, Scott Boatright

Other Firms / Sub-Contractor Represented On Site

Firm / Sub-Contractor	Representative's Name and Title
HDR, Inc.	Scott Mitchell

Weather Conditions: Sunny **Temperature:** 39-43

Contractor's Equipment: 1 CAT D555 Dozer, 1 CAT D6T Dozer, Dumptruck- CAT 740B, Dumptruck- Terex TA300, Case SV212 Smooth drum roller

Contractor's Personnel: ~6

Description of Daily Activities & Events

- Geotechnics representative, Erik Lindquist, arrived on site.
- Performed Nuclear Density Testing in Cell 1C subgrade.
- Geotechnics rep. departed site.

Prepared By: EL **Date:** 2/10/16 **Checked By:** SFS **Date:** 2/22/16

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Day: Friday
Date: 2/12/16
Log No.: 7
Page: 1 of 1

Daily Field Report

Project Name:	Brickhaven	**Project No.:**	2016-600
Client Name:	HDR, Inc.	**Client Contact:**	Mike Batten
Site Location:	Moncure, NC	**Time on Site:**	**Arrived:** 8:00 AM **Departed:** 10:00 AM
General Contractor:	Charah, Inc.	**Superintendent:**	Jeff Howell, Scott Boatright

Other Firms / Sub-Contractor Represented On Site

Firm / Sub-Contractor	Representative's Name and Title
HDR, Inc.	Scott Mitchell

Weather Conditions: Cloudy **Temperature:** 28-36

Contractor's Equipment: 1 CAT D555 Dozer, 1 CAT D6T Dozer, 1 Sheeps foot -CAT CP56B
1 CAT 320E Excavator, 1 CAT 336E Excavator, 1 Hyundai 480LC98 Excavtor, 1 Dumptruck- CAT 740B
1 Dumptruck- Terex TA300, 1 CAT D4K2 Dozer, 1 Komatsu D39PX Dozer, Case SV212 Smooth drum roller

Contractor's Personnel: ~9

Description of Daily Activities & Events

- Geotechnics representative, Erik Lindquist, arrived on site.
- Geotechnics rep. performed Nuclear Density Testing on Cell 1C subgrade.
- Geotechnics rep. departed site.

Prepared By: EL **Date:** 2/12/16 **Checked By:** SFS **Date:** 2/22/16

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Day: Friday
Date: 2/19/16
Log No.: 11
Page: 1 of 1

Daily Field Report

Project Name:	Brickhaven	**Project No.:**	2016-600
Client Name:	HDR, Inc.	**Client Contact:**	Mike Batten
Site Location:	Moncure, NC	**Time on Site:**	**Arrived:** 9:45 AM **Departed:** 1:00 PM
General Contractor:	Charah	**Superintendent:**	Scott Boatright, Jeff Howell

Other Firms / Sub-Contractor Represented On Site

Firm / Sub-Contractor	Representative's Name and Title
HDR, Inc.	Scott Mitchell

Weather Conditions:	Sunny	**Temperature:**	37-50

Contractor's Equipment: 1 CAT D555 Dozer, 1 CAT D6T Dozer, 1 Dumptruck- CAT 740B, 1 Dumptruck- Terex TA300
Case SV212 Smooth drum roller

Contractor's Personnel: ~9

Description of Daily Activities & Events

- Geotechnics representative, Erik Lindquist, arrived on site.
- Geotechnics rep. performed One-Point Proctor on Orange Clay material when arriving on site.
- Geotechnics rep. performed Nuclear Density testing on Clay Liner in Cell 1C. In addition, a Drive Cylinder sample was collected to verify Nuclear Density Gauge.
- Geotechnics rep. departed site.

Prepared By:	EL	**Date:**	2/19/16	**Checked By:**	SFS	**Date:**	3/1/16

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Day: Friday
Date: 2/26/16
Log No.: 14
Page: 1 of 1

Daily Field Report

Project Name:	Brickhaven	**Project No.:**	2016-600
Client Name:	HDR, Inc.	**Client Contact:**	Mike Batten
Site Location:	Moncure, NC	**Time on Site:**	**Arrived:** 8:00 AM **Departed:** 2:30 PM
General Contractor:	Charah	**Superintendent:**	Scott Boatright, Jeff Howell

Other Firms / Sub-Contractor Represented On Site

Firm / Sub-Contractor	Representative's Name and Title
HDR, Inc.	Scott Mitchell

Weather Conditions: Sunny **Temperature:** 36-48

Contractor's Equipment: 1 CAT D6N Dozer, 1 Sheeps foot -CAT CP56
3 Dumptruck- Terex TA300, 1 Hyundai 480LC98 Excavator
Case SV212 Smooth drum roller

Contractor's Personnel: ~8

Description of Daily Activities & Events

- Geotechnics representative, Erik Lindquist, arrived on site.
- Geotechnics rep. witnessed Charah reps. proof roll subgrade in Cell 1C by a loaded Terex TA300 dumptruck. No rutting, pumping, cracking, deflection, or other signs of unsuitable compaction were observed.
- Geotechnics rep. performed a One-Point Proctor and collected a sample for laboratory compaction testing on Cell 1C clay liner material.
- Geotechnics rep. gathered a proctor sample of coal ash material delivered from Riverbend for laboratory compaction testing.
- Geotechnics rep. departed site.

Prepared By:	EL	**Date:**	2/26/16	**Checked By:**	SFS	**Date:**	3/3/16

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Day: Saturday
Date: 2/27/16
Log No.: 15
Page: 1 of 1

Daily Field Report

Project Name:	Brickhaven	**Project No.:**	2016-600
Client Name:	HDR, Inc.	**Client Contact:**	Mike Batten
Site Location:	Moncure, NC	**Time on Site:**	**Arrived:** 8:00 AM **Departed:** 3:30 PM
General Contractor:	Charah	**Superintendent:**	Scott Boatright, Jeff Howell

Other Firms / Sub-Contractor Represented On Site

Firm / Sub-Contractor	Representative's Name and Title
HDR, Inc.	Scott Mitchell

Weather Conditions: Sunny **Temperature:** 36-48

Contractor's Equipment: 1 CAT D6N Dozer, 1 Sheeps foot -CAT CP56
3 Dumptruck- Terex TA300, 1 Hyundai 480LC98 Excavator
Case SV212 Smooth drum roller

Contractor's Personnel: ~8

Description of Daily Activities & Events

- Geotechnics representative, Erik Lindquist, arrived on site.
- Charah began placing the first 6" lift of clay liner in Cell 1C, Geotechnics rep. performed One-Point Proctor on the clay material being used.
- Geotechnics rep. performed nuclear density testing and collected drive cylinders, and shelby tubes of the clay. There were no problems meeting compaction.
- Some small rounded rocks were mixed in with clay, larger rocks and some woody debri were removed by geotechnics rep. and/or Charah personal.
- Geotechnics rep. performed nuclear density testing on coal ash in Cell 1A. Collected oven moisture samples for %M correction.

  Geotechnics rep. departed site.

Prepared By:	EL	**Date:**	2/27/16	**Checked By:**	SFS	**Date:**	3/3/16

geotechnics
geotechnical & geosynthetic testing

Day: Monday
Date: 2/29/16
Log No.: 16
Page: 1 of 2

Daily Field Report

Project Name:	Brickhaven	**Project No.:**	2016-600
Client Name:	HDR, Inc.	**Client Contact:**	Mike Batten
Site Location:	Moncure, NC	**Time on Site:**	**Arrived:** 8:00 AM **Departed:** 6:15 PM
General Contractor:	Charah	**Superintendent:**	Scott Boatright, Jeff Howell

Other Firms / Sub-Contractor Represented On Site

Firm / Sub-Contractor	Representative's Name and Title
HDR, Inc.	Scott Mitchell

Weather Conditions: Sunny **Temperature:** 43-72 F

Contractor's Equipment: 1 CAT D555 Dozer, 1 CAT D6T Dozer, 1 Sheeps foot -CAT CP56B, 1 CAT 320E Excavator, 1 CAT 336E Excavator, 1 Hyundai 480LC98 Excavtor, 1 Dumptruck- CAT 740B, 1 Dumptruck- Terex TA300
1 CAT D4K2 Dozer, 1 Komatsu D39PX Dozer, Case SV212 Smooth drum roller

Contractor's Personnel: ~12

Description of Daily Activities & Events

- Geotechnics representative, Erik Lindquist, arrived on site.
- Witnessed proof roll of the south edge of Cell 1C following certification by McAdams by a loaded Terex TA300 dumptruck. No rutting, pumping, cracking, deflection, or any other signs of unsuitable compaction were observed.
- Walked the clay placed so far removing larger rocks and woody debri.
- Geotechnics representative, Aaron Smith, arrived on site. Representative, Erik Lindquist, departed site.
- Charah placing lift one of clay liner in Cell 1C. Shelby tubes were taken in acres 1, 4 and one nuclear density test was taken per 10,000 ft2 area. Rocks were observed within the clay material, HDR rep notified.
- Geotechnics representatives departed from site.

Prepared By:	EL/AMS	**Date:**	2/29/16	**Checked By:**	SFS	**Date:**	3/11/16

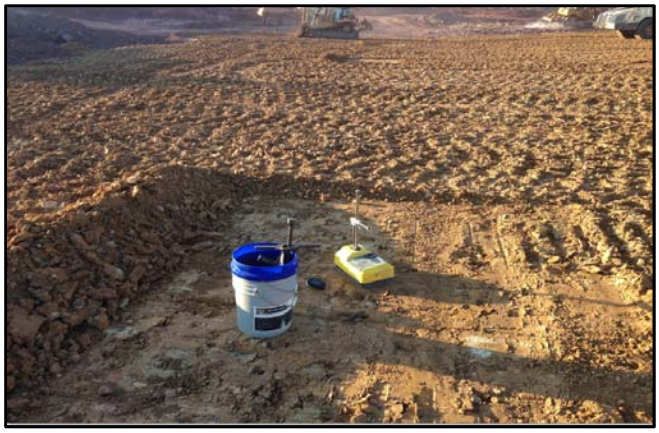
geotechnics
geotechnical & geosynthetic testing

Day: Mon
Date: 2/29/16
Log No.: 16
Page: 2 of 2

Daily Field Report

Project Name:	Brickhaven	**Project No.:**	2016-600
Client Name:	HDR, Inc.	**Client Contact:**	Mike Batten
Site Location:	Moncure, NC	**Time on Site:**	**Arrived:** 8:00 AM **Departed:** 6:15 PM
General Contractor:	Charah	**Superintendent:**	Scott Boatright, Jeff Howell
Weather Conditions:	Sunny	**Temperature:**	43-72 F

- Top: Geotechnics representative had Charah dozer operator blade off many places for nuclear density testing to be performed. As the picture shows, the ground was very hard with minimal deflection occuring under the weight of heavy machinery.
- Bottom: Landscape view of the first lift (facing cell 1D).



Prepared By:	AMS	**Date:**	2/29/16	**Checked By:**	SFS	**Date:**	3/11/16

geotechnics
geotechnical & geosynthetic testing

Day: Tuesday
Date: 3/1/16
Log No.: 17
Page: 2 of 2

Daily Field Report

Project Name:	Brickhaven	**Project No.:**	2016-600
Client Name:	HDR, Inc.	**Client Contact:**	Mike Batten
Site Location:	Moncure, NC	**Time on Site:**	**Arrived:** 8:00 AM **Departed:** 5:15 PM
General Contractor:	Charah	**Superintendent:**	Scott Boatright, Jeff Howell
Weather Conditions:	Sunny	**Temperature:**	52-72 F

- Top Left: Bladed off area being tested by nuclear density gauge.
- Top Right: Lift two in the process of being placed. Scott Mitchell and a couple Charah workers picked out the organic material that they could find in the clay liner.
- Bottom: Shelby tubes being taken from bladed out section of a subcell. Bentonite used to fill in the void created.

Prepared By:	AMS	**Date:**	3/1/16	**Checked By:**	SFS	**Date:**	3/11/16

geotechnics
geotechnical & geosynthetic testing

Day: Wednesday
Date: 3/2/16
Log No.: 18
Page: 1 of 2

Daily Field Report

Project Name:	Brickhaven	**Project No.:**	2016-600
Client Name:	HDR, Inc.	**Client Contact:**	Mike Batten
Site Location:	Moncure, NC	**Time on Site:**	**Arrived:** 8:30 AM **Departed:** 5:00 PM
General Contractor:	Charah	**Superintendent:**	Scott Boatright, Jeff Howell

Other Firms / Sub-Contractor Represented On Site

Firm / Sub-Contractor	Representative's Name and Title
HDR, Inc.	Scott Mitchell

Weather Conditions: Sunny **Temperature:** 52-72 F

Contractor's Equipment: 1 CAT D555 Dozer, 1 CAT D6T Dozer, 1 Dumptruck- CAT 740B, 1 Dumptruck- Terex TA300 Case SV212 Smooth drum roller, CAT CP 56 Sheepsfoot, CAT Klein K-500 Water Truck, CAT 815 F2 Sheepsfoot

Contractor's Personnel: ~12

Description of Daily Activities & Events

- Geotechnics representative, Aaron Smith, arrived on site.
- Remaining Shelby tubes taken for lift 2 in Cell 1C. Rocks still observed in clay material.
- One point proctor taken and matched with an appropriate proctor curve to ensure Charah is hitting compaction.
- Charah begins to place lift three today; nuclear density testing was performed in areas geotechnics representative told Dozer to blade off.
- Geotechnics representative departs from site.

Prepared By:	AMS	**Date:**	3/2/16	**Checked By:**	SFS	**Date:**	3/11/16

geotechnics
geotechnical & geosynthetic testing

Day: Wednesday
Date: 3/2/16
Log No.: 18
Page: 2 of 2

Daily Field Report

Project Name:	Brickhaven	**Project No.:**	2016-600
Client Name:	HDR, Inc.	**Client Contact:**	Mike Batten
Site Location:	Moncure, NC	**Time on Site:**	**Arrived:** 8:30 AM **Departed:** 5:00 PM
General Contractor:	Charah	**Superintendent:**	Scott Boatright, Jeff Howell
Weather Conditions:	Sunny	**Temperature:**	52-72 F

- Top: Shelby Tube getting ready to be driven into the ground for permeability testing
- Bottom: Bladed out portion of lift two ready to be tested. Ground extremely hard.

Prepared By:	AMS	**Date:**	3/2/16	**Checked By:**	SFS	**Date:**	3/11/16

geotechnics
geotechnical & geosynthetic testing

Day: Friday
Date: 3/4/16
Log No.: 19
Page: 1 of 2

Daily Field Report

Project Name:	Brickhaven	**Project No.:**	2016-600
Client Name:	HDR, Inc.	**Client Contact:**	Mike Batten
Site Location:	Moncure, NC	**Time on Site:**	**Arrived:** 9:45 AM **Departed:** 1:00 PM
General Contractor:	Charah	**Superintendent:**	Scott Boatright, Jeff Howell

Other Firms / Sub-Contractor Represented On Site

Firm / Sub-Contractor	Representative's Name and Title
HDR, Inc.	Scott Mitchell

Weather Conditions:	Sunny	**Temperature:**	37-50

Contractor's Equipment: 1 CAT D555 Dozer, 1 CAT D6T Dozer, 1 Dumptruck- CAT 740B, 1 Dumptruck- Terex TA300
Case SV212 Smooth drum roller

Contractor's Personnel: ~9

Description of Daily Activities & Events

- Geotechnics representative, Aaron Smith, arrived on site.
- Geotechnics rep. performed One-Point Proctor on Orange Clay material when arriving on site.
- Geotechnics rep. performed Nuclear Density testing on Clay Liner lift 3 in Cell 1C. In addition, drive cylinder samples were collected to verify Nuclear Density Gauge. Shelby tubes collected.
  Rocks being hand picked by Charah reps.
- Ash testing tested for moisture and compaction from Riverbend Power Plant.
- Geotechnics representative departed from site.

Prepared By:	AMS	**Date:**	3/3/16	**Checked By:**	SFS	**Date:**	3/11/16

geotechnics
geotechnical & geosynthetic testing

Day: Friday
Date: 3/4/16
Log No.: 19
Page: 2 of 2

Daily Field Report

Project Name:	Brickhaven	**Project No.:**	2016-600
Client Name:	HDR, Inc.	**Client Contact:**	Mike Batten
Site Location:	Moncure, NC	**Time on Site:**	**Arrived:** 9:45 AM **Departed:** 1:00 PM
General Contractor:	Charah	**Superintendent:**	Scott Boatright, Jeff Howell
Weather Conditions:	Sunny	**Temperature:**	37-50

- Top: Cell 1C complete with three 6" layers of clay making up the clay liner.
- Bottom: Cell 1D being prepared by breaking up rock and getting the base of the subcell prepared.

Prepared By:	AMS	**Date:**	3/3/16	**Checked By:**	SFS	**Date:**	3/11/16

B10

B10 – Cell 1C Testing Grid Map

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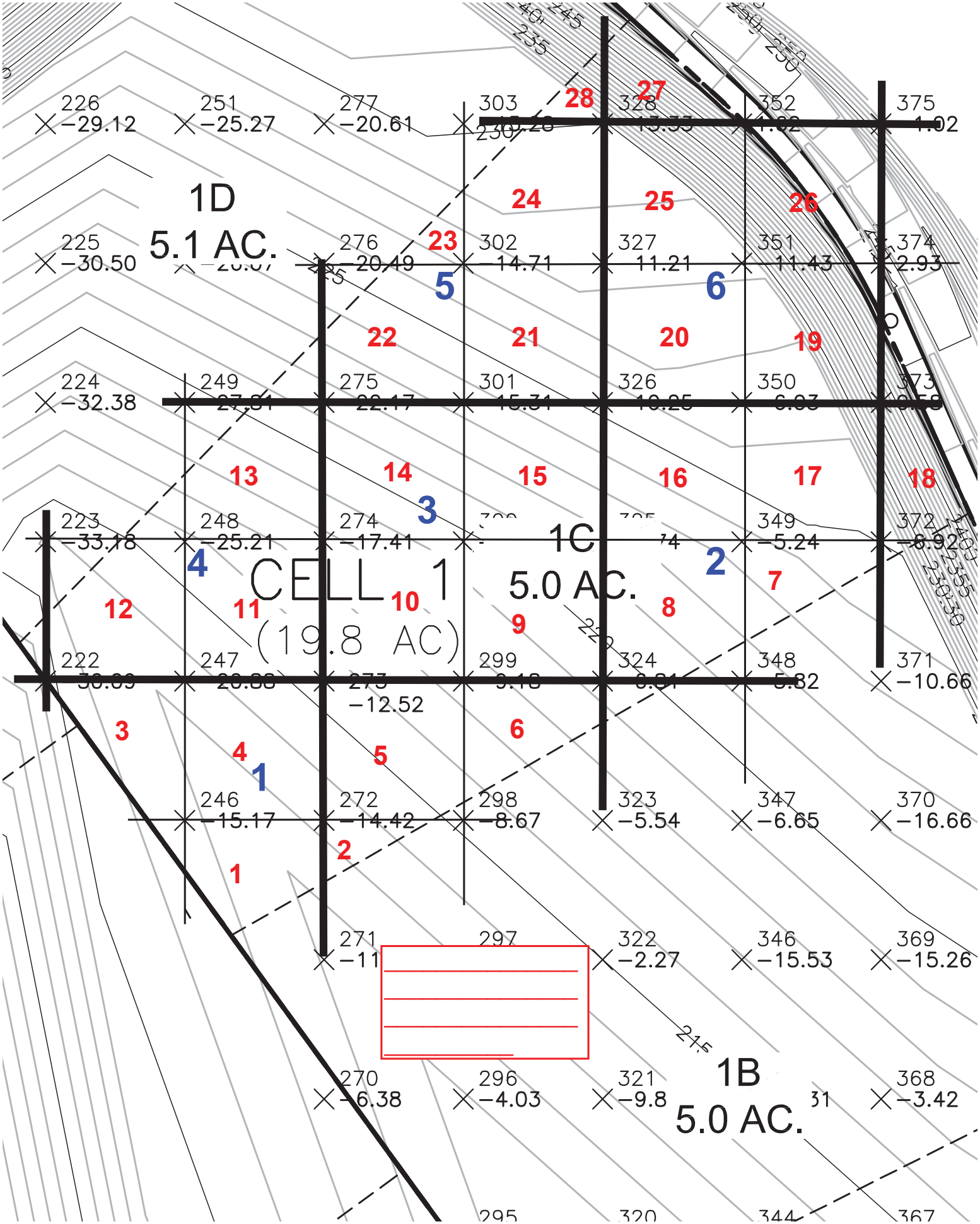
1D
5.1 AC.
1C
5.0 AC.
CELL 1
(19.8 AC)
1B
5.0 AC.
226 −29.12
251 −25.27
277 −20.61
303
328
352
375
225 −30.50
276 −20.49
302 14.71
327 11.21
351 11.43
374 2.93
224 −32.38
249
275
301
326
350
373
223 −33.18
248 −25.21
274 −17.41
349 −5.24
372 −8.92
222
247
273 −12.52
299
324
348 5.82
371 −10.66
246 −15.17
272 −14.42
298 −8.67
323 −5.54
347 −6.65
370 −16.66
271
297
322 −2.27
346 −15.53
369 −15.26
270 −6.38
296 −4.03
321 −9.8
368 −3.42
295
320
344
367

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C

Appendix C – Geologic Subgrade Evaluation

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February 2, 2016

Mr. Glenn Amey, P.G.
Charah, Inc.
Brickhaven No.2 Mine Tract
1271 Moncure-Flatwood Road
Moncure, NC 27559

Via email gamey@charah.com

Subject: Geologic Evaluation of Cell 1C
Brickhaven No. 2 Mine Tract "A" Structural Fill Site
Permit No.: 1910-STRUCT-2015

Dear Mr. Amey,

HDR respectfully submits this geologic evaluation of Cell 1C at the Brickhaven No. 2 Mine Tract "A" Structural Fill site located at 1271 Moncure-Flatwood Road in Moncure, North Carolina. This evaluation was conducted on behalf of Charah, Inc. and the property owner, Green Meadows, LLC, and in general accordance with the requirements of Article 9, Chapter 130A-309.218 of the General Statutes of North Carolina in addition to Attachment 2 - Conditions of Construction - Line Number 7 in the Permit to Construct/Permit of Operate. This permit was issued for the site by the North Carolina Department of Environmental Quality (formerly North Carolina Department of Environmental and Natural Resources), Solid Waste Section (SWS) on June 5, 2015. The purpose of this evaluation is to report any pertinent geological features exposed during cell excavation. A Cell Configuration Map is provided as **Figure 1**.

The subject site is located in the Triassic Basin Belt of the Piedmont Physiographic Province, according to the 1985 North Carolina Geologic Map prepared by the North Carolina Geological Survey. The structural fill portion of the subject property is located with the Sanford Formation, which is composed of sedimentary rocks consisting of conglomerate, fanglomerate, sandstone and mudstone.

Geologic Evaluation of Cell 1C

The geologic evaluation was based on information obtained by Sean Quarry with HDR from the Design Hydrogeologic Report (HDR, 2015) at the site, conversations with Charah, Inc., and a geologic inspection of Cell 1C conducted by HDR on January 21, 2016. Cell 1C is 5.0 acres in size and is located along the northeast boundary of the structural fill area to the immediate north of Cell 1B. A photographic log from the January 21, 2016, inspection is included as **Attachment 1**.

Based on the January 21, 2016 inspection by HDR and conversation with Charah, Inc., Cell 1C was excavated down to the subgrade using a track-hoe in areas with softer materials (approximately 75% of Cell 1C); coupled with ripping with a D-8 bull dozer and hoe-ramming in areas with more resistant materials (approximately 25% of Cell 1C). At the time of the January 21, 2016 inspection,

Cell 1C had been entirely excavated to the landfill basegrade, with the exception of approximately 0.25 acres of the southwestern portion which was actively being excavated during the inspection to remove the remaining four to five vertical feet of material to reach the subgrade. The lithology of the excavated materials primarily consisted of blocky and thin fissle inter-layered red and gray mudstone. Thin fractures oriented approximately N 60° East (dipping 60° southwest) was also observed within the mudstone. During the inspection, no obvious geologic or hydrogeologic features (including, but not limited to, active or remnant faults, diabase dikes or groundwater seepage) which may alter previous hydrogeologic interpretation of the site were observed within Cell 1C.

Based on the findings of this evaluation, the geological features encountered within Cell 1C do not appear to adversely affect the design, construction or operation of the cell, phase, or unit.

HDR appreciates the opportunity to be of service to you. If there are any questions regarding these matters, please do not hesitate to contact us.

Sincerely,
HDR Engineering, Inc. of the Carolinas

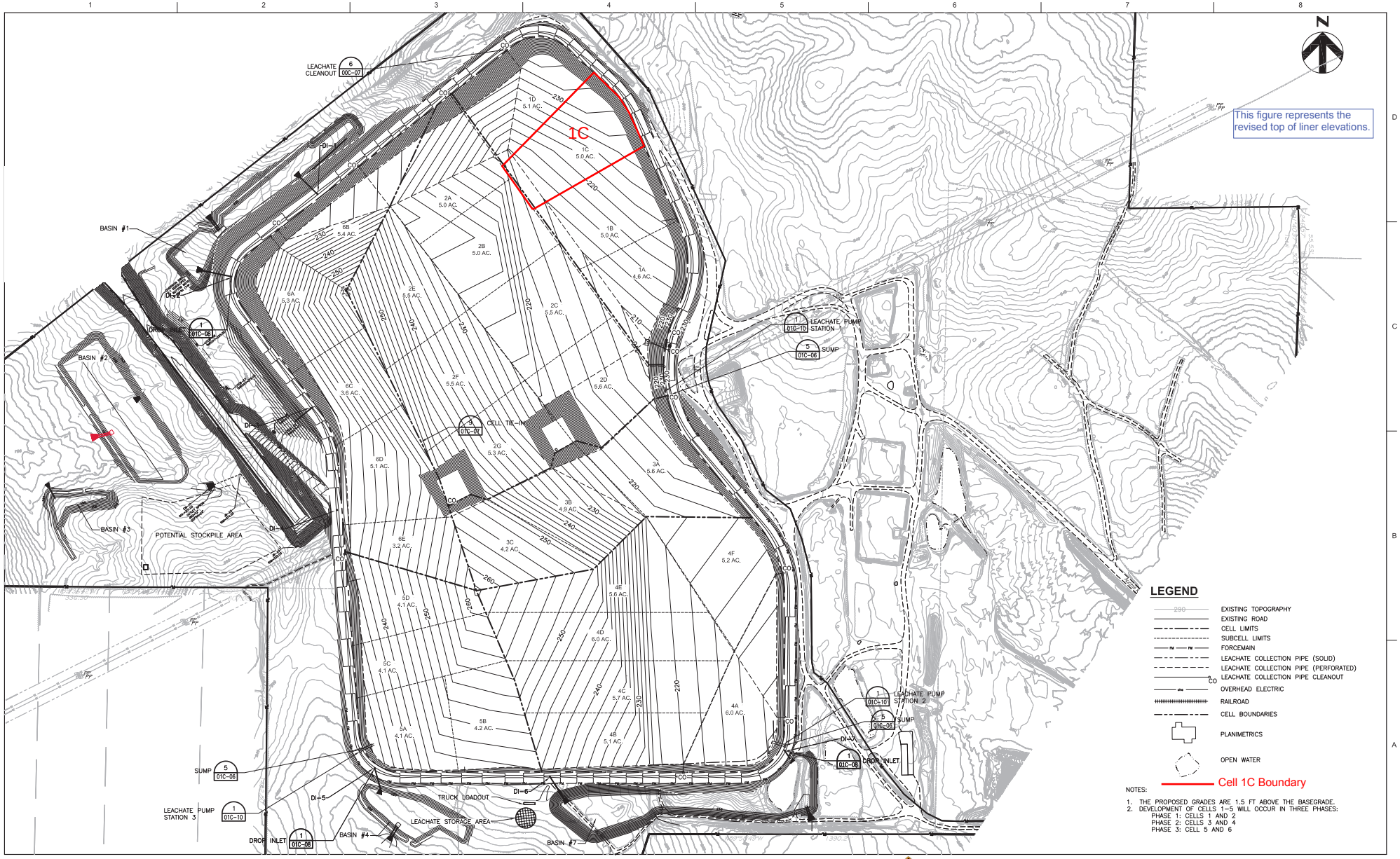
Sean Quarry
Environmental Specialist

Mark Filardi, L.G.
Project Manager/Senior Geologist

NORTH CAROLINA LICENSED SEAL 1888 GEOLOGIST MARK FILARDI

Attachments:
Figure 1 – Cell Configuration Map
Attachment 1 – Photographic Log

cc: James Easter, Charah, Inc.
Collin Mummert, Charah, Inc.
Michael Plummer, HDR, Inc.
Michael Batten, HDR, Inc.



NOTES:

1. THE PROPOSED GRADES ARE 1.5 FT ABOVE THE BASEGRADE.
2. DEVELOPMENT OF CELLS 1–5 WILL OCCUR IN THREE PHASES:
   PHASE 1: CELLS 1 AND 2
   PHASE 2: CELLS 3 AND 4
   PHASE 3: CELL 5 AND 6

HDR

HDR Engineering Inc.
of the Carolinas

440 S. Church St. Suite 1000
Charlotte, NC 28202-2075
704.338.6700

N.C.B.E.L.S. License Number F-0116

ISSUE	DATE	DESCRIPTION
D	07/2015	REVISED BASED ON ADDITIONAL GROUNDWATER READINGS
C	03/2015	RESIZED SUBCELL BOUNDARIES AND BASIN #7
B	12/31/14	REVISED PER NCDENR COMMENTS
A	11/2014	ISSUED FOR APPROVAL

PROJECT MANAGER	M.D. PLUMMER, P.E.
DESIGNED BY	P. WESTMORELAND, P.E.
DRAWN BY	J. GAUL
CHECKED BY	J. READLING, P.E.
PROJECT NUMBER	453925–237673–018

Charah®

BRICKHAVEN No. 2 MINE TRACT "A" MINE
STRUCTURAL FILL
MONCURE, NC

Figure 1 - Cell 1C Site Location

0 1" 2"

FILENAME 01C–03.dwg

SCALE 1"=200'

Photographic Log

Client Name/Contract	Site Location:	Project No.
Charah, Inc. – Green Meadows, LLC	Brickhaven No. 2 Mine Tract “A” Structural Fill Site Geologic Evaluation of Cell 1C	018-237673

Photo No.	Date:
1	01/21/16

Description

Cell 1C Active Excavation

Southwest

Photo No.	Date:
2	01/21/16

Description:

Cell 1C Active Excavation

South

Photographic Log

Client Name/Contract	Site Location:	Project No.
Charah, Inc. – Green Meadows, LLC	Brickhaven No. 2 Mine Tract "A" Structural Fill Site Geologic Evaluation of Cell 1C	018-237673

Photo No.	Date:
3	01/21/16

Description

Cell 1C bedrock

South

Photo No.	Date:
4	01/21/16

Description:

Cell 1C Progress

West

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D

Appendix D – Geosynthetic Pre-Installation Data

D1 – GCL Manufacturer Certifications
D2 – Geomembrane Manufacturer Certifications
D3 – Drainage Manufacturer Composite Certs
D4 – Geotextile Manufacturer Certifications
D5 – Interface Friction Tests
D6 – Welding Rod

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D1

D1 – GCL Manufacturer Certifications

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514 Barbara Sue Ln
Mt. Washington, KY 40047

[O] 502.209.0325
[TF] 800.435.2008

GSE ENVIRONMENTAL™

June 15, 2015

Ryan Clark
Chesapeake Containment Systems
352 Earls Road
Middle River, Maryland 21220

RE: CAR BentoLiner CNSL GCL MQC Submittal
Brickhaven No. 2 Mine Tract "A" Structural Fill, Phase 1
Moncure, North Carolina

Dear Mr. Clark,

As requested, GSE Environmental, LLC has enclosed MQC testing and certification documentation for the Geosynthetic Clay Liner (GCL) manufactured in association with Sales Order No. SO-076037 for the above referenced project.

As required by Specification Section 02800 Geosynthetic Clay Liner (GCL), the documentation noted below has been enclosed with this letter:

1) Bentonite supplier quality control certificates.
2) BentoLiner Manufacturing Certification.
3) Manufacturer Roll Allocation List.
4) Manufacturer quality control test results demonstrating compliance with the property values.

Should you wish to discuss or require additional information, please do not hesitate to contact me at (502) 209-0325. Thank you for your business.

Respectfully,

Steven Mayes, P.E.
Senior Technical Manager, North America

Report Date
6/15/2015

BentoLiner Manufacturing Certification

Sales Order: 76037

Customer: Chesapeake

Project: CCS Brickhaven Mine Site

Product Type: BLI-075-06N-03S-D3CR Bentoliner CNSL CAR

The GCL purchased and shipped for the above referenced project does meet or exceed the project specifications.

The GCL supplied to this project has been continuously inspected for the presence of needles and is certified to be needle free.

Rick Schaefer
Director of Quality

Roll Allocation List

Sales Order SO-076037
Customer Name Chesapeake Containment Systems, Inc.
Project Name CCS Brickhaven Mine Site

Serial number	Item Number	Roll width	Top	Bottom	Clay	Manufacturing date	Length
135033768	BLI-075-06N-03S-D3CR	15.50	130482032	2023904072	30412151A	5/14/2015	150.00
135033769	BLI-075-06N-03S-D3CR	15.50	130482032	2023904072	30412151A	5/14/2015	150.00
135033770	BLI-075-06N-03S-D3CR	15.50	130482032	2023904072	30412151A	5/14/2015	150.00
135033771	BLI-075-06N-03S-D3CR	15.50	130482032	2023904072	30412151A	5/14/2015	150.00
135033772	BLI-075-06N-03S-D3CR	15.50	130482032	2023904072	30412151A	5/14/2015	150.00
135033773	BLI-075-06N-03S-D3CR	15.50	130482032	2023904072	30412151A	5/14/2015	150.00
135033774	BLI-075-06N-03S-D3CR	15.50	130482032	2023904072	30412151A	5/14/2015	150.00
135033775	BLI-075-06N-03S-D3CR	15.50	130483444	2023904072	30412151A	5/14/2015	150.00
135033776	BLI-075-06N-03S-D3CR	15.50	130483444	2023904072	30412151A	5/14/2015	150.00
135033777	BLI-075-06N-03S-D3CR	15.50	130483444	2023904072	30412151A	5/14/2015	150.00
135033778	BLI-075-06N-03S-D3CR	15.50	130483444	2023904072	30412151A	5/14/2015	150.00
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135033780	BLI-075-06N-03S-D3CR	15.50	130483444	2023904072	30412152A	5/15/2015	150.00
135033781	BLI-075-06N-03S-D3CR	15.50	130483444	2023904072	30412152A	5/15/2015	150.00
135033782	BLI-075-06N-03S-D3CR	15.50	130483444	2023904072	30412152A	5/15/2015	150.00
135033783	BLI-075-06N-03S-D3CR	15.50	130483444	2023904072	30412152A	5/15/2015	150.00
135033784	BLI-075-06N-03S-D3CR	15.50	130483444	2023904072	30412152A	5/15/2015	150.00
135033785	BLI-075-06N-03S-D3CR	15.50	130483448	2023904072	30412152A	5/15/2015	150.00
135033786	BLI-075-06N-03S-D3CR	15.50	130483448	2023904072	30412152A	5/15/2015	150.00
135033787	BLI-075-06N-03S-D3CR	15.50	130483448	2023904072	30412152A	5/15/2015	150.00
135033788	BLI-075-06N-03S-D3CR	15.50	130483448	2023904072	30412152A	5/15/2015	150.00
135033789	BLI-075-06N-03S-D3CR	15.50	130483448	2023904072	30412152A	5/15/2015	150.00
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135033794	BLI-075-06N-03S-D3CR	15.50	130483448	2023892865	30412152A	5/15/2015	150.00
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135033797	BLI-075-06N-03S-D3CR	15.50	130483443	2023892865	30412152A	5/15/2015	150.00
135033798	BLI-075-06N-03S-D3CR	15.50	130483443	2023892865	30412152A	5/15/2015	150.00
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135033800	BLI-075-06N-03S-D3CR	15.50	130483443	2023892865	30412152A	5/15/2015	150.00
135033801	BLI-075-06N-03S-D3CR	15.50	130483443	2023892865	30412152A	5/15/2015	150.00
135033802	BLI-075-06N-03S-D3CR	15.50	130483443	2023892865	30412152A	5/15/2015	150.00
135033803	BLI-075-06N-03S-D3CR	15.50	130483443	2023892865	30412152A	5/15/2015	150.00
135033804	BLI-075-06N-03S-D3CR	15.50	130483443	2023892865	30412152A	5/15/2015	150.00
135033805	BLI-075-06N-03S-D3CR	15.50	130483443	2023892865	30412151A	5/18/2015	150.00
135033806	BLI-075-06N-03S-D3CR	15.50	130483464	2023892865	30412151A	5/18/2015	150.00
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135033808	BLI-075-06N-03S-D3CR	15.50	130483464	2023892865	30412151A	5/18/2015	150.00
135033809	BLI-075-06N-03S-D3CR	15.50	130483464	2023892865	30412151A	5/18/2015	150.00
135033810	BLI-075-06N-03S-D3CR	15.50	130483449	2023892865	30412151A	5/18/2015	150.00

Roll Allocation List

Sales Order SO-076037
Customer Name Chesapeake Containment Systems, Inc.
Project Name CCS Brickhaven Mine Site

Serial number	Item Number	Roll width	Top	Bottom	Clay	Manufacturing date	Length
135033811	BLI-075-06N-03S-D3CR	15.50	130483449	2023892865	30412151A	5/18/2015	150.00
135033812	BLI-075-06N-03S-D3CR	15.50	130483449	2023892865	30412151A	5/18/2015	150.00
135033813	BLI-075-06N-03S-D3CR	15.50	130483449	2023892865	30412151A	5/18/2015	150.00
135033814	BLI-075-06N-03S-D3CR	15.50	130483449	2023892865	30412151B	5/18/2015	150.00
135033815	BLI-075-06N-03S-D3CR	15.50	130483449	2023892865	30412151B	5/18/2015	150.00
135033816	BLI-075-06N-03S-D3CR	15.50	130483449	2023876315	30412151B	5/18/2015	150.00
135033817	BLI-075-06N-03S-D3CR	15.50	130483449	2023876315	30412151B	5/18/2015	150.00
135033819	BLI-075-06N-03S-D3CR	15.50	130483449	2023876315	30412151B	5/18/2015	150.00
135033820	BLI-075-06N-03S-D3CR	15.50	130483449	2023876315	30412151B	5/18/2015	130.00
135033821	BLI-075-06N-03S-D3CR	15.50	130483449	2023876315	30412151B	5/18/2015	150.00
135033822	BLI-075-06N-03S-D3CR	15.50	130484859	2023876315	30412151B	5/18/2015	150.00
135033823	BLI-075-06N-03S-D3CR	15.50	130484859	2023876315	30412151B	5/18/2015	150.00
135033824	BLI-075-06N-03S-D3CR	15.50	130484859	2023876315	30412151B	5/18/2015	150.00
135033825	BLI-075-06N-03S-D3CR	15.50	130484859	2023876315	30412151B	5/18/2015	150.00
135033826	BLI-075-06N-03S-D3CR	15.50	130484859	2023876315	30412151B	5/18/2015	150.00
135033827	BLI-075-06N-03S-D3CR	15.50	130484859	2023876315	30412151B	5/18/2015	150.00
135033828	BLI-075-06N-03S-D3CR	15.50	130484859	2023876315	30412151B	5/18/2015	150.00
135033829	BLI-075-06N-03S-D3CR	15.50	130484859	2023876315	30412151B	5/18/2015	150.00
135033830	BLI-075-06N-03S-D3CR	15.50	130484846	2023876315	30412151B	5/19/2015	150.00
135033831	BLI-075-06N-03S-D3CR	15.50	130484846	2023876315	30412151B	5/19/2015	150.00
135033832	BLI-075-06N-03S-D3CR	15.50	130484846	2023876315	30412151B	5/19/2015	150.00
135033833	BLI-075-06N-03S-D3CR	15.50	130484846	2023876315	30412151B	5/19/2015	150.00
135033834	BLI-075-06N-03S-D3CR	15.50	130484846	2023876315	30412151B	5/19/2015	150.00
135033835	BLI-075-06N-03S-D3CR	15.50	130484846	2023876315	30412151B	5/19/2015	150.00
135033836	BLI-075-06N-03S-D3CR	15.50	130484846	2023876315	30420151B	5/19/2015	150.00
135033837	BLI-075-06N-03S-D3CR	15.50	130484846	2023876315	30420151B	5/19/2015	150.00
135033838	BLI-075-06N-03S-D3CR	15.50	130484845	2023876315	30420151B	5/19/2015	150.00
135033839	BLI-075-06N-03S-D3CR	15.50	130484845	2023876315	30420151B	5/19/2015	150.00
135033840	BLI-075-06N-03S-D3CR	15.50	130484845	2023876315	30420151B	5/19/2015	150.00
135033841	BLI-075-06N-03S-D3CR	15.50	130484845	2023893708	30420151B	5/19/2015	150.00
135033842	BLI-075-06N-03S-D3CR	15.50	130484845	2023893708	30420151B	5/19/2015	150.00
135033843	BLI-075-06N-03S-D3CR	15.50	130484845	2023893708	30420151B	5/19/2015	150.00
135033844	BLI-075-06N-03S-D3CR	15.50	130484845	2023893708	30420151B	5/19/2015	150.00
135033845	BLI-075-06N-03S-D3CR	15.50	130484845	2023893708	30420151B	5/19/2015	150.00
135033846	BLI-075-06N-03S-D3CR	15.50	130484845	2023893708	30420151B	5/19/2015	150.00
135033847	BLI-075-06N-03S-D3CR	15.50	130484845	2023893708	30420151B	5/19/2015	150.00
135033848	BLI-075-06N-03S-D3CR	15.50	130484839	2023893708	30420151B	5/19/2015	150.00
135033849	BLI-075-06N-03S-D3CR	15.50	130484839	2023893708	30420151B	5/19/2015	150.00
135033850	BLI-075-06N-03S-D3CR	15.50	130484839	2023893708	30412151A	5/19/2015	150.00
135033851	BLI-075-06N-03S-D3CR	15.50	130484839	2023893708	30412151B	5/19/2015	150.00
135033852	BLI-075-06N-03S-D3CR	15.50	130484839	2023893708	30412151B	5/19/2015	150.00
135033853	BLI-075-06N-03S-D3CR	15.50	130484839	2023893708	30412151B	5/19/2015	150.00
135033854	BLI-075-06N-03S-D3CR	15.50	130484839	2023893708	30412151B	5/19/2015	150.00

Roll Allocation List

Sales Order SO-076037
Customer Name Chesapeake Containment Systems, Inc.
Project Name CCS Brickhaven Mine Site

Serial number	Item Number	Roll width	Top	Bottom	Clay	Manufacturing date	Length
135033855	BLI-075-06N-03S-D3CR	15.50	130484839	2023893708	30412151B	5/19/2015	150.00
135033856	BLI-075-06N-03S-D3CR	15.50	130484839	2023893708	30412151B	5/19/2015	150.00
135033857	BLI-075-06N-03S-D3CR	15.50	130484839	2023893708	30412151B	5/19/2015	150.00
135033858	BLI-075-06N-03S-D3CR	15.50	130484837	2023893708	30412151B	5/19/2015	150.00
135033859	BLI-075-06N-03S-D3CR	15.50	130484837	2023893708	30412151B	5/19/2015	150.00
135033860	BLI-075-06N-03S-D3CR	15.50	130484837	2023893708	30412151B	5/19/2015	150.00
135033861	BLI-075-06N-03S-D3CR	15.50	130484837	2023893708	30412151B	5/19/2015	150.00
135033862	BLI-075-06N-03S-D3CR	15.50	130484837	2023893708	30412151B	5/19/2015	150.00
135033863	BLI-075-06N-03S-D3CR	15.50	130484837	2023893708	30412151B	5/19/2015	150.00
135033864	BLI-075-06N-03S-D3CR	15.50	130484837	2023893708	30412151B	5/19/2015	150.00
135033865	BLI-075-06N-03S-D3CR	15.50	130484837	2023909431	30412151B	5/19/2015	150.00
135033866	BLI-075-06N-03S-D3CR	15.50	130484837	2023909431	30412151B	5/19/2015	150.00
135033867	BLI-075-06N-03S-D3CR	15.50	130484837	2023909431	30412151B	5/19/2015	150.00
135033868	BLI-075-06N-03S-D3CR	15.50	130484840	2023909431	30412151B	5/19/2015	150.00
135033869	BLI-075-06N-03S-D3CR	15.50	130484840	2023909431	30412151B	5/19/2015	150.00
135033870	BLI-075-06N-03S-D3CR	15.50	130484840	2023909431	30412151B	5/19/2015	150.00
135033871	BLI-075-06N-03S-D3CR	15.50	130484840	2023909431	30412151B	5/19/2015	150.00
135033872	BLI-075-06N-03S-D3CR	15.50	130484840	2023909431	30412151B	5/19/2015	150.00
135033873	BLI-075-06N-03S-D3CR	15.50	130484840	2023909431	30412151B	5/19/2015	150.00
135033874	BLI-075-06N-03S-D3CR	15.50	130484840	2023909431	30412151B	5/19/2015	150.00
135033875	BLI-075-06N-03S-D3CR	15.50	130484840	2023909431	30412151B	5/19/2015	150.00
135033876	BLI-075-06N-03S-D3CR	15.50	130484840	2023909431	30412151B	5/19/2015	150.00
135033877	BLI-075-06N-03S-D3CR	15.50	130484840	2023909431	30424151A	5/19/2015	150.00
135033878	BLI-075-06N-03S-D3CR	15.50	130484841	2023909431	30424151A	5/19/2015	150.00
135033879	BLI-075-06N-03S-D3CR	15.50	130484841	2023909431	30424151A	5/19/2015	150.00
135033880	BLI-075-06N-03S-D3CR	15.50	130484841	2023909431	30424151A	5/19/2015	150.00
135033881	BLI-075-06N-03S-D3CR	15.50	130484841	2023909431	30424151A	5/19/2015	150.00
135033882	BLI-075-06N-03S-D3CR	15.50	130484841	2023909431	30424151A	5/19/2015	150.00
135033883	BLI-075-06N-03S-D3CR	15.50	130484841	2023909431	30424151A	5/19/2015	150.00
135033884	BLI-075-06N-03S-D3CR	15.50	130484841	2023909431	30424151A	5/19/2015	150.00
135033885	BLI-075-06N-03S-D3CR	15.50	130484841	2023909431	30424151A	5/19/2015	150.00
135033886	BLI-075-06N-03S-D3CR	15.50	130484841	2023909431	30424151A	5/20/2015	150.00
135033887	BLI-075-06N-03S-D3CR	15.50	130484841	2023909431	30424151A	5/20/2015	150.00
135033888	BLI-075-06N-03S-D3CR	15.50	130484843	2023909431	30424151A	5/20/2015	150.00
135033889	BLI-075-06N-03S-D3CR	15.50	130484843	2023839780	30424151A	5/20/2015	150.00
135033890	BLI-075-06N-03S-D3CR	15.50	130484843	2023839780	30424151A	5/20/2015	100.00
135033891	BLI-075-06N-03S-D3CR	15.50	130484843	2023839780	30424151A	5/20/2015	150.00
135033892	BLI-075-06N-03S-D3CR	15.50	130484843	2023839780	30424151A	5/20/2015	150.00
135033893	BLI-075-06N-03S-D3CR	15.50	130484843	2023839780	30424151A	5/20/2015	150.00
135033894	BLI-075-06N-03S-D3CR	15.50	130484843	2023839780	30424151A	5/20/2015	150.00
135033895	BLI-075-06N-03S-D3CR	15.50	130484843	2023839780	30424151A	5/20/2015	150.00
135033896	BLI-075-06N-03S-D3CR	15.50	130484843	2023839780	30424151A	5/20/2015	150.00
135033897	BLI-075-06N-03S-D3CR	15.50	130484843	2023839780	30424151A	5/20/2015	150.00

Roll Allocation List

Sales Order SO-076037
Customer Name Chesapeake Containment Systems, Inc.
Project Name CCS Brickhaven Mine Site

Serial number	Item Number	Roll width	Top	Bottom	Clay	Manufacturing date	Length
135033898	BLI-075-06N-03S-D3CR	15.50	130484842	2023839780	30424151A	5/20/2015	150.00
135033899	BLI-075-06N-03S-D3CR	15.50	130484842	2023839780	30424151A	5/20/2015	150.00
135033900	BLI-075-06N-03S-D3CR	15.50	130484842	2023839780	30424151A	5/20/2015	150.00
135033901	BLI-075-06N-03S-D3CR	15.50	130484842	2023839780	30424151A	5/20/2015	150.00
135033902	BLI-075-06N-03S-D3CR	15.50	130484842	2023839780	30424151A	5/20/2015	150.00
135033903	BLI-075-06N-03S-D3CR	15.50	130484842	2023839780	30424151A	5/20/2015	150.00
135033904	BLI-075-06N-03S-D3CR	15.50	130484842	2023839780	30424151A	5/20/2015	150.00
135033905	BLI-075-06N-03S-D3CR	15.50	130484842	2023839780	30424151A	5/20/2015	150.00
135033906	BLI-075-06N-03S-D3CR	15.50	130484842	2023839780	30424151A	5/20/2015	150.00
135033907	BLI-075-06N-03S-D3CR	15.50	130484842	2023839780	30424151A	5/20/2015	150.00
135033908	BLI-075-06N-03S-D3CR	15.50	130484842	2023839780	30424151A	5/20/2015	150.00
135033909	BLI-075-06N-03S-D3CR	15.50	130484830	2023839780	30424151A	5/20/2015	150.00
135033910	BLI-075-06N-03S-D3CR	15.50	130484830	2023839780	30424151A	5/20/2015	150.00
135033911	BLI-075-06N-03S-D3CR	15.50	130484830	2023839780	30424151A	5/20/2015	150.00
135033912	BLI-075-06N-03S-D3CR	15.50	130484830	2023839780	30424151A	5/20/2015	150.00
135033913	BLI-075-06N-03S-D3CR	15.50	130484830	2023810811	30424151A	5/20/2015	150.00
135033914	BLI-075-06N-03S-D3CR	15.50	130484830	2023810811	30424151A	5/20/2015	150.00
135033915	BLI-075-06N-03S-D3CR	15.50	130484830	2023810811	30424151A	5/20/2015	150.00
135033916	BLI-075-06N-03S-D3CR	15.50	130484830	2023810811	30424151A	5/20/2015	150.00
135033917	BLI-075-06N-03S-D3CR	15.50	130484830	2023810811	30424151A	5/20/2015	150.00
135033918	BLI-075-06N-03S-D3CR	15.50	130484830	2023810811	30424151A	5/20/2015	150.00
135033919	BLI-075-06N-03S-D3CR	15.50	130484844	2023810811	30424151A	5/20/2015	150.00
135033921	BLI-075-06N-03S-D3CR	15.50	130484844	2023810811	30424151A	5/20/2015	116.00
135033922	BLI-075-06N-03S-D3CR	15.50	130484844	2023810811	30424151A	5/20/2015	150.00
135033923	BLI-075-06N-03S-D3CR	15.50	130484844	2023810811	30424151A	5/20/2015	150.00
135033924	BLI-075-06N-03S-D3CR	15.50	130484844	2023810811	30424151A	5/20/2015	150.00
135033925	BLI-075-06N-03S-D3CR	15.50	130484844	2023810811	30424151A	5/20/2015	150.00
135033926	BLI-075-06N-03S-D3CR	15.50	130484844	2023810811	30424151B	5/20/2015	150.00
135033927	BLI-075-06N-03S-D3CR	15.50	130484844	2023810811	30424151B	5/20/2015	150.00
135033928	BLI-075-06N-03S-D3CR	15.50	130484844	2023810811	30424151B	5/20/2015	150.00
135033929	BLI-075-06N-03S-D3CR	15.50	130484844	2023810811	30424151B	5/20/2015	150.00
135033930	BLI-075-06N-03S-D3CR	15.50	130484844	2023810811	30424151B	5/20/2015	150.00
135033931	BLI-075-06N-03S-D3CR	15.50	130484836	2023810811	30424151B	5/20/2015	150.00
135033932	BLI-075-06N-03S-D3CR	15.50	130484836	2023810811	30424151B	5/20/2015	150.00
135033933	BLI-075-06N-03S-D3CR	15.50	130484836	2023810811	30424151B	5/20/2015	150.00
135033934	BLI-075-06N-03S-D3CR	15.50	130484836	2023810811	30424151B	5/20/2015	150.00
135033935	BLI-075-06N-03S-D3CR	15.50	130484836	2023810811	30424151B	5/20/2015	150.00
135033936	BLI-075-06N-03S-D3CR	15.50	130484836	2023810811	30424151B	5/20/2015	150.00
135033937	BLI-075-06N-03S-D3CR	15.50	130484836	2023810811	30424151B	5/20/2015	150.00
135033938	BLI-075-06N-03S-D3CR	15.50	130484836	2023894109	30424151B	5/20/2015	150.00
135033939	BLI-075-06N-03S-D3CR	15.50	130484836	2023894109	30424151B	5/20/2015	150.00
135033940	BLI-075-06N-03S-D3CR	15.50	130484836	2023894109	30424151B	5/20/2015	150.00
135033941	BLI-075-06N-03S-D3CR	15.50	130484828	2023894109	30424151B	5/20/2015	150.00

Roll Allocation List

Sales Order SO-076037
Customer Name Chesapeake Containment Systems, Inc.
Project Name CCS Brickhaven Mine Site

Serial number	Item Number	Roll width	Top	Bottom	Clay	Manufacturing date	Length
135033942	BLI-075-06N-03S-D3CR	15.50	130484828	2023894109	30424151B	5/20/2015	150.00
135033943	BLI-075-06N-03S-D3CR	15.50	130484828	2023894109	30424151B	5/20/2015	150.00
135033944	BLI-075-06N-03S-D3CR	15.50	130484828	2023894109	30424151B	5/20/2015	150.00
135033945	BLI-075-06N-03S-D3CR	15.50	130484828	2023894109	30424151B	5/20/2015	150.00
135033946	BLI-075-06N-03S-D3CR	15.50	130484828	2023894109	30424151B	5/20/2015	150.00
135033947	BLI-075-06N-03S-D3CR	15.50	130484828	2023894109	30424151B	5/20/2015	150.00
135033948	BLI-075-06N-03S-D3CR	15.50	130484828	2023894109	30424151B	5/20/2015	150.00
135033949	BLI-075-06N-03S-D3CR	15.50	130484828	2023894109	30424151B	5/20/2015	150.00
135033950	BLI-075-06N-03S-D3CR	15.50	130484828	2023894109	30424151B	5/20/2015	150.00
135033951	BLI-075-06N-03S-D3CR	15.50	130484838	2023894109	30424151B	5/20/2015	150.00
135033952	BLI-075-06N-03S-D3CR	15.50	130484838	2023894109	30424151B	5/20/2015	150.00
135033953	BLI-075-06N-03S-D3CR	15.50	130484838	2023894109	30424151B	5/20/2015	150.00
135033954	BLI-075-06N-03S-D3CR	15.50	130484838	2023894109	30424151B	5/20/2015	150.00
135033955	BLI-075-06N-03S-D3CR	15.50	130484838	2023894109	30424151B	5/20/2015	150.00
135033956	BLI-075-06N-03S-D3CR	15.50	130484838	2023894109	30424151B	5/20/2015	150.00
135033957	BLI-075-06N-03S-D3CR	15.50	130484838	2023894109	30424151B	5/20/2015	150.00
135033958	BLI-075-06N-03S-D3CR	15.50	130484838	2023894109	30424151B	5/20/2015	150.00
135033959	BLI-075-06N-03S-D3CR	15.50	130484838	2023894109	30424151B	5/20/2015	150.00
135033960	BLI-075-06N-03S-D3CR	15.50	130484829	2023894109	30424151B	5/20/2015	150.00
135033961	BLI-075-06N-03S-D3CR	15.50	130484829	2023894109	30424151B	5/21/2015	150.00
135033962	BLI-075-06N-03S-D3CR	15.50	130484829	2023893946	30424151B	5/21/2015	150.00
135033963	BLI-075-06N-03S-D3CR	15.50	130484829	2023893946	30424151B	5/21/2015	150.00
135033964	BLI-075-06N-03S-D3CR	15.50	130484829	2023893946	30424151B	5/21/2015	150.00
135033965	BLI-075-06N-03S-D3CR	15.50	130484829	2023893946	30424151B	5/21/2015	150.00
135033966	BLI-075-06N-03S-D3CR	15.50	130484829	2023893946	30424151B	5/21/2015	150.00
135033967	BLI-075-06N-03S-D3CR	15.50	130484829	2023893946	30424151B	5/21/2015	150.00
135033968	BLI-075-06N-03S-D3CR	15.50	130484829	2023893946	30424151B	5/21/2015	150.00
135033969	BLI-075-06N-03S-D3CR	15.50	130484829	2023893946	30424151B	5/21/2015	150.00
135033970	BLI-075-06N-03S-D3CR	15.50	130484813	2023893946	30424151B	5/21/2015	150.00
135033971	BLI-075-06N-03S-D3CR	15.50	130484813	2023893946	30424151B	5/21/2015	150.00
135033972	BLI-075-06N-03S-D3CR	15.50	130484813	2023893946	30421152A	5/21/2015	150.00
135033973	BLI-075-06N-03S-D3CR	15.50	130484813	2023893946	30421152A	5/21/2015	150.00
135033974	BLI-075-06N-03S-D3CR	15.50	130484813	2023893946	30421152A	5/21/2015	150.00
135033975	BLI-075-06N-03S-D3CR	15.50	130484813	2023893946	30421152A	5/21/2015	150.00
135033976	BLI-075-06N-03S-D3CR	15.50	130484813	2023893946	30421152A	5/21/2015	150.00
135033977	BLI-075-06N-03S-D3CR	15.50	130484813	2023893946	30421152A	5/21/2015	150.00
135033978	BLI-075-06N-03S-D3CR	15.50	130484813	2023893946	30421152A	5/21/2015	150.00
135033979	BLI-075-06N-03S-D3CR	15.50	130484817	2023893946	30421152A	5/21/2015	150.00
135033980	BLI-075-06N-03S-D3CR	15.50	130484817	2023893946	30421152A	5/21/2015	150.00
135033981	BLI-075-06N-03S-D3CR	15.50	130484817	2023893946	30421152A	5/21/2015	150.00
135033982	BLI-075-06N-03S-D3CR	15.50	130484817	2023893946	30421152A	5/21/2015	150.00
135033983	BLI-075-06N-03S-D3CR	15.50	130484817	2023893946	30421152A	5/21/2015	150.00
135033984	BLI-075-06N-03S-D3CR	15.50	130484817	2023893946	30421152A	5/21/2015	150.00

Roll Allocation List

Sales Order SO-076037
Customer Name Chesapeake Containment Systems, Inc.
Project Name CCS Brickhaven Mine Site

Serial number	Item Number	Roll width	Top	Bottom	Clay	Manufacturing date	Length
135033985	BLI-075-06N-03S-D3CR	15.50	130484817	2023893946	30421152A	5/21/2015	150.00
135033986	BLI-075-06N-03S-D3CR	15.50	130484817	2023893946	30421152A	5/21/2015	150.00
135033987	BLI-075-06N-03S-D3CR	15.50	130484817	2023893946	30421152A	5/21/2015	150.00
135033988	BLI-075-06N-03S-D3CR	15.50	130484817	2023893946	30421152A	5/21/2015	150.00
135033989	BLI-075-06N-03S-D3CR	15.50	130484810	2023893946	30421152A	5/21/2015	150.00
135033990	BLI-075-06N-03S-D3CR	15.50	130484810	2023894108	30421152A	5/21/2015	150.00
135033991	BLI-075-06N-03S-D3CR	15.50	130484810	2023894108	30421152A	5/21/2015	150.00
135033992	BLI-075-06N-03S-D3CR	15.50	130484810	2023894108	30421152A	5/21/2015	150.00
135033993	BLI-075-06N-03S-D3CR	15.50	130484810	2023894108	30421152A	5/21/2015	150.00
135033994	BLI-075-06N-03S-D3CR	15.50	130484810	2023894108	30421152A	5/21/2015	150.00
135033995	BLI-075-06N-03S-D3CR	15.50	130484810	2023894108	30421152A	5/21/2015	150.00
135033996	BLI-075-06N-03S-D3CR	15.50	130484810	2023894108	30421152A	5/21/2015	150.00
135033997	BLI-075-06N-03S-D3CR	15.50	130484810	2023894108	30421152A	5/21/2015	150.00
135033998	BLI-075-06N-03S-D3CR	15.50	130484810	2023894108	30421152A	5/21/2015	150.00
135033999	BLI-075-06N-03S-D3CR	15.50	130484808	2023894108	30421152A	5/21/2015	150.00
135034000	BLI-075-06N-03S-D3CR	15.50	130484808	2023894108	30421152A	5/21/2015	150.00
135034001	BLI-075-06N-03S-D3CR	15.50	130484808	2023894108	30421152A	5/21/2015	150.00
135034002	BLI-075-06N-03S-D3CR	15.50	130484808	2023894108	30421152A	5/21/2015	150.00
135034003	BLI-075-06N-03S-D3CR	15.50	130484808	2023894108	30421152A	5/21/2015	150.00
135034004	BLI-075-06N-03S-D3CR	15.50	130484808	2023894108	30421152A	5/21/2015	150.00
135034005	BLI-075-06N-03S-D3CR	15.50	130484808	2023894108	30421152A	5/21/2015	150.00
135034006	BLI-075-06N-03S-D3CR	15.50	130484808	2023894108	30421152A	5/21/2015	150.00
135034007	BLI-075-06N-03S-D3CR	15.50	130484808	2023894108	30421152A	5/21/2015	150.00
135034008	BLI-075-06N-03S-D3CR	15.50	130484808	2023894108	30421152A	5/21/2015	150.00
135034009	BLI-075-06N-03S-D3CR	15.50	130484833	2023894108	30421152A	5/21/2015	150.00
135034010	BLI-075-06N-03S-D3CR	15.50	130484833	2023894108	30421152A	5/21/2015	150.00
135034011	BLI-075-06N-03S-D3CR	15.50	130484833	2023894108	30421152A	5/21/2015	150.00
135034012	BLI-075-06N-03S-D3CR	15.50	130484833	2023894108	30421152A	5/21/2015	150.00
135034013	BLI-075-06N-03S-D3CR	15.50	130484833	2023894108	30421152A	5/21/2015	150.00
135034014	BLI-075-06N-03S-D3CR	15.50	130484833	2023894108	30421152A	5/21/2015	150.00
135034015	BLI-075-06N-03S-D3CR	15.50	130484833	2023894108	30421152A	5/21/2015	150.00
135034016	BLI-075-06N-03S-D3CR	15.50	130484833	2023894108	30421152A	5/21/2015	150.00
135034017	BLI-075-06N-03S-D3CR	15.50	130484833	2023894108	30421152A	5/21/2015	150.00
135034018	BLI-075-06N-03S-D3CR	15.50	130484833	2023894108	30421152A	5/21/2015	150.00
135034019	BLI-075-06N-03S-D3CR	15.50	130484801	2023894108	30421152B	5/21/2015	150.00
135034020	BLI-075-06N-03S-D3CR	15.50	130484801	2023894108	30421152B	5/21/2015	150.00
135034021	BLI-075-06N-03S-D3CR	15.50	130484801	2023894108	30421152B	5/21/2015	150.00
135034022	BLI-075-06N-03S-D3CR	15.50	130484801	2023894108	30421152B	5/21/2015	150.00
135034023	BLI-075-06N-03S-D3CR	15.50	130484801	2023894108	30421152B	5/21/2015	150.00
135034024	BLI-075-06N-03S-D3CR	15.50	130484801	2023838336	30421152B	5/21/2015	150.00
135034025	BLI-075-06N-03S-D3CR	15.50	130484801	2023838336	30421152B	5/21/2015	150.00
135034026	BLI-075-06N-03S-D3CR	15.50	130484801	2023838336	30421152B	5/21/2015	150.00
135034027	BLI-075-06N-03S-D3CR	15.50	130484801	2023838336	30421152B	5/21/2015	150.00

Roll Allocation List

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Customer Name Chesapeake Containment Systems, Inc.
Project Name CCS Brickhaven Mine Site

Serial number	Item Number	Roll width	Top	Bottom	Clay	Manufacturing date	Length
135034028	BLI-075-06N-03S-D3CR	15.50	130484801	2023838336	30421152B	5/21/2015	150.00
135034029	BLI-075-06N-03S-D3CR	15.50	130484801	2023838336	30421152B	5/21/2015	150.00
135034030	BLI-075-06N-03S-D3CR	15.50	130484801	2023838336	30421152B	5/21/2015	150.00
135034031	BLI-075-06N-03S-D3CR	15.50	130484831	2023838336	30421152B	5/21/2015	150.00
135034032	BLI-075-06N-03S-D3CR	15.50	130484831	2023838336	30421152B	5/21/2015	150.00
135034033	BLI-075-06N-03S-D3CR	15.50	130484831	2023838336	30421152B	5/21/2015	150.00
135034034	BLI-075-06N-03S-D3CR	15.50	130484831	2023838336	30421152B	5/21/2015	150.00
135034035	BLI-075-06N-03S-D3CR	15.50	130484831	2023838336	30421152B	5/21/2015	150.00
135034036	BLI-075-06N-03S-D3CR	15.50	130484831	2023838336	30421152B	5/21/2015	150.00
135034037	BLI-075-06N-03S-D3CR	15.50	130484831	2023838336	30421152B	5/22/2015	150.00
135034038	BLI-075-06N-03S-D3CR	15.50	130484831	2023838336	30421152B	5/22/2015	150.00
135034039	BLI-075-06N-03S-D3CR	15.50	130484831	2023838336	30421152B	5/22/2015	150.00
135034040	BLI-075-06N-03S-D3CR	15.50	130484831	2023838336	30421152B	5/22/2015	150.00
135034041	BLI-075-06N-03S-D3CR	15.50	130484818	2023838336	30421152B	5/22/2015	150.00
135034042	BLI-075-06N-03S-D3CR	15.50	130484818	2023838336	30421152B	5/22/2015	150.00
135034043	BLI-075-06N-03S-D3CR	15.50	130484818	2023845145	30421152B	5/22/2015	150.00
135034044	BLI-075-06N-03S-D3CR	15.50	130484818	2023845145	30421152B	5/22/2015	150.00
135034045	BLI-075-06N-03S-D3CR	15.50	130484818	2023845145	30421152B	5/22/2015	150.00
135034046	BLI-075-06N-03S-D3CR	15.50	130484818	2023845145	30421152B	5/22/2015	150.00
135034047	BLI-075-06N-03S-D3CR	15.50	130484818	2023845145	30421152B	5/22/2015	150.00
135034048	BLI-075-06N-03S-D3CR	15.50	130484818	2023845145	30421152B	5/22/2015	150.00
135034049	BLI-075-06N-03S-D3CR	15.50	130484818	2023845145	30421152B	5/22/2015	150.00
135034050	BLI-075-06N-03S-D3CR	15.50	130484818	2023845145	30421152B	5/22/2015	150.00
135034051	BLI-075-06N-03S-D3CR	15.50	130484818	2023845145	30421152B	5/22/2015	150.00
135034052	BLI-075-06N-03S-D3CR	15.50	130484823	2023845145	30421152B	5/22/2015	150.00
135034053	BLI-075-06N-03S-D3CR	15.50	130484823	2023845145	30421152B	5/22/2015	150.00
135034054	BLI-075-06N-03S-D3CR	15.50	130484823	2023845145	30421152B	5/22/2015	150.00
135034055	BLI-075-06N-03S-D3CR	15.50	130484823	2023845145	30421152B	5/22/2015	150.00
135034056	BLI-075-06N-03S-D3CR	15.50	130484823	2023845145	30421152B	5/22/2015	150.00
135034057	BLI-075-06N-03S-D3CR	15.50	130484823	2023845145	30421152B	5/22/2015	150.00
135034058	BLI-075-06N-03S-D3CR	15.50	130484823	2023845145	30421152B	5/22/2015	150.00
135034059	BLI-075-06N-03S-D3CR	15.50	130484823	2023845145	30421152B	5/25/2015	150.00
135034060	BLI-075-06N-03S-D3CR	15.50	130484823	2023845145	30421152B	5/25/2015	150.00
135034061	BLI-075-06N-03S-D3CR	15.50	130484823	2023845145	30421152B	5/25/2015	150.00
135034062	BLI-075-06N-03S-D3CR	15.50	130484807	2023845145	30421152B	5/25/2015	150.00
135034063	BLI-075-06N-03S-D3CR	15.50	130484807	2023845145	30421152B	5/25/2015	150.00
135034064	BLI-075-06N-03S-D3CR	15.50	130484807	2023845145	30421152B	5/25/2015	150.00
135034065	BLI-075-06N-03S-D3CR	15.50	130484807	2023845145	30415152A	5/25/2015	150.00
135034066	BLI-075-06N-03S-D3CR	15.50	130484807	2023845145	30415152A	5/25/2015	150.00
135034067	BLI-075-06N-03S-D3CR	15.50	130484807	2023845145	30415152A	5/25/2015	150.00
135034068	BLI-075-06N-03S-D3CR	15.50	130484807	2023895663	30415152A	5/25/2015	150.00
135034069	BLI-075-06N-03S-D3CR	15.50	130484807	2023895663	30415152A	5/25/2015	150.00
135034070	BLI-075-06N-03S-D3CR	15.50	130484807	2023895663	30415152A	5/25/2015	150.00

Roll Allocation List

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Customer Name Chesapeake Containment Systems, Inc.
Project Name CCS Brickhaven Mine Site

Serial number	Item Number	Roll width	Top	Bottom	Clay	Manufacturing date	Length
135034071	BLI-075-06N-03S-D3CR	15.50	130484807	2023895663	30415152A	5/25/2015	150.00
135034072	BLI-075-06N-03S-D3CR	15.50	130484805	2023895663	30415152A	5/25/2015	150.00
135034073	BLI-075-06N-03S-D3CR	15.50	130484805	2023895663	30415152A	5/25/2015	150.00
135034074	BLI-075-06N-03S-D3CR	15.50	130484805	2023895663	30415152A	5/25/2015	150.00
135034075	BLI-075-06N-03S-D3CR	15.50	130484805	2023895663	30415152A	5/25/2015	150.00
135034076	BLI-075-06N-03S-D3CR	15.50	130484805	2023895663	30415152A	5/25/2015	150.00
135034077	BLI-075-06N-03S-D3CR	15.50	130484805	2023895663	30415152A	5/25/2015	150.00
135034078	BLI-075-06N-03S-D3CR	15.50	130484805	2023895663	30415152A	5/25/2015	150.00
135034079	BLI-075-06N-03S-D3CR	15.50	130484805	2023895663	30415152A	5/25/2015	150.00
135034080	BLI-075-06N-03S-D3CR	15.50	130484805	2023895663	30415152A	5/25/2015	150.00
135034081	BLI-075-06N-03S-D3CR	15.50	130484805	2023895663	30415152A	5/25/2015	150.00
135034082	BLI-075-06N-03S-D3CR	15.50	130484832	2023895663	30415152A	5/25/2015	150.00
135034083	BLI-075-06N-03S-D3CR	15.50	130484832	2023895663	30415152A	5/26/2015	150.00
135034084	BLI-075-06N-03S-D3CR	15.50	130484832	2023895663	30415152A	5/26/2015	150.00
135034085	BLI-075-06N-03S-D3CR	15.50	130484832	2023895663	30415152A	5/26/2015	150.00
135034086	BLI-075-06N-03S-D3CR	15.50	130484832	2023895663	30415152A	5/26/2015	150.00
135034087	BLI-075-06N-03S-D3CR	15.50	130484832	2023895663	30415152A	5/26/2015	150.00
135034088	BLI-075-06N-03S-D3CR	15.50	130484832	2023895663	30415152A	5/26/2015	150.00
135034089	BLI-075-06N-03S-D3CR	15.50	130484832	2023895663	30415152A	5/26/2015	150.00
135034090	BLI-075-06N-03S-D3CR	15.50	130484832	2023895663	30415152A	5/26/2015	150.00
135034091	BLI-075-06N-03S-D3CR	15.50	130484832	2023895663	30415152A	5/26/2015	150.00
135034092	BLI-075-06N-03S-D3CR	15.50	130484825	2023895663	30415152A	5/26/2015	150.00
135034093	BLI-075-06N-03S-D3CR	15.50	130484825	2023895663	30415152A	5/26/2015	150.00
135034094	BLI-075-06N-03S-D3CR	15.50	130484825	2023895663	30415152A	5/26/2015	150.00
135034095	BLI-075-06N-03S-D3CR	15.50	130484825	2023949635	30415152A	5/26/2015	150.00
135034096	BLI-075-06N-03S-D3CR	15.50	130484825	2023949635	30415152A	5/26/2015	150.00
135034097	BLI-075-06N-03S-D3CR	15.50	130484825	2023949635	30415152A	5/26/2015	150.00
135034098	BLI-075-06N-03S-D3CR	15.50	130484825	2023949635	30415152A	5/26/2015	150.00
135034099	BLI-075-06N-03S-D3CR	15.50	130484825	2023949635	30415152A	5/27/2015	150.00
135034100	BLI-075-06N-03S-D3CR	15.50	130484825	2023949635	30415152A	5/27/2015	150.00
135034101	BLI-075-06N-03S-D3CR	15.50	130484834	2023949635	30415152A	5/27/2015	150.00
135034102	BLI-075-06N-03S-D3CR	15.50	130484834	2023949635	30415152A	5/27/2015	150.00
135034103	BLI-075-06N-03S-D3CR	15.50	130484834	2023949635	30415152A	5/27/2015	150.00
135034104	BLI-075-06N-03S-D3CR	15.50	130484834	2023949635	30415152A	5/27/2015	150.00
135034105	BLI-075-06N-03S-D3CR	15.50	130484834	2023949635	30415152A	5/27/2015	150.00
135034106	BLI-075-06N-03S-D3CR	15.50	130484834	2023949635	30415152A	5/27/2015	150.00
135034111	BLI-075-06N-03S-D3CR	15.50	130484834	2023949635	30415152A	5/27/2015	150.00
135034112	BLI-075-06N-03S-D3CR	15.50	130484804	2023949635	30415152A	5/27/2015	150.00
135034113	BLI-075-06N-03S-D3CR	15.50	130484804	2023949635	30415152A	5/27/2015	150.00
135034114	BLI-075-06N-03S-D3CR	15.50	130484804	2023949635	30415152B	5/27/2015	150.00
135034115	BLI-075-06N-03S-D3CR	15.50	130484804	2023949635	30415152B	5/27/2015	150.00
135034116	BLI-075-06N-03S-D3CR	15.50	130484804	2023949635	30415152B	5/27/2015	150.00
135034117	BLI-075-06N-03S-D3CR	15.50	130484804	2023949635	30415152B	5/27/2015	150.00

Roll Allocation List

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Customer Name Chesapeake Containment Systems, Inc.
Project Name CCS Brickhaven Mine Site

Serial number	Item Number	Roll width	Top	Bottom	Clay	Manufacturing date	Length
135034118	BLI-075-06N-03S-D3CR	15.50	130484804	2023949635	30415152B	5/27/2015	150.00
135034119	BLI-075-06N-03S-D3CR	15.50	130484804	2023949635	30415152B	5/27/2015	150.00
135034120	BLI-075-06N-03S-D3CR	15.50	130484804	2023949635	30415152B	5/27/2015	110.00
135034121	BLI-075-06N-03S-D3CR	15.50	130484794	2023894595	30415152B	5/27/2015	150.00
135034122	BLI-075-06N-03S-D3CR	15.50	130484794	2023894595	30415152B	5/27/2015	150.00
135034123	BLI-075-06N-03S-D3CR	15.50	130484794	2023894595	30415152B	5/27/2015	150.00
135034124	BLI-075-06N-03S-D3CR	15.50	130484794	2023894595	30415152B	5/27/2015	150.00
135034125	BLI-075-06N-03S-D3CR	15.50	130484794	2023894595	30415152B	5/28/2015	150.00
135034126	BLI-075-06N-03S-D3CR	15.50	130484794	2023894595	30415152B	5/28/2015	150.00
135034127	BLI-075-06N-03S-D3CR	15.50	130484794	2023894595	30415152B	5/28/2015	150.00
135034128	BLI-075-06N-03S-D3CR	15.50	130484794	2023894595	30415152B	5/28/2015	150.00
135034129	BLI-075-06N-03S-D3CR	15.50	130484794	2023894595	30415152B	5/28/2015	150.00
135034130	BLI-075-06N-03S-D3CR	15.50	130484794	2023894595	30415152B	5/28/2015	150.00
135034131	BLI-075-06N-03S-D3CR	15.50	130484806	2023894595	30415152B	5/28/2015	150.00
135034132	BLI-075-06N-03S-D3CR	15.50	130484806	2023894595	30415152B	5/28/2015	150.00
135034133	BLI-075-06N-03S-D3CR	15.50	130484806	2023894595	30415152B	5/28/2015	190.00
135034141	BLI-075-06N-03S-D3CR	15.50	130484809	2023894595	30415152B	5/28/2015	150.00
135034142	BLI-075-06N-03S-D3CR	15.50	130484809	2023894595	30415152B	5/28/2015	150.00
135034143	BLI-075-06N-03S-D3CR	15.50	130484809	2023894595	30415152B	5/28/2015	150.00
135034144	BLI-075-06N-03S-D3CR	15.50	130484809	2023893947	30415152B	5/28/2015	150.00
135034145	BLI-075-06N-03S-D3CR	15.50	130484809	2023893947	30415152B	5/29/2015	150.00
135034146	BLI-075-06N-03S-D3CR	15.50	130484809	2023893947	30415152B	5/29/2015	150.00
135034147	BLI-075-06N-03S-D3CR	15.50	130484809	2023893947	30415152B	5/29/2015	150.00
135034180	BLI-075-06N-03S-D3CR	15.50	130485445	2023893947	30415152B	5/29/2015	150.00
135034181	BLI-075-06N-03S-D3CR	15.50	130485445	2023893947	30415152B	5/29/2015	150.00
135034182	BLI-075-06N-03S-D3CR	15.50	130485445	2023893947	30415152B	5/29/2015	150.00
135034183	BLI-075-06N-03S-D3CR	15.50	130485445	2023893947	30415152B	5/29/2015	150.00
135034184	BLI-075-06N-03S-D3CR	15.50	130485445	2023893947	30415152B	5/29/2015	150.00
135034185	BLI-075-06N-03S-D3CR	15.50	130485445	2023893947	30419152A	5/29/2015	150.00
135034186	BLI-075-06N-03S-D3CR	15.50	130485445	2023893947	30419152A	5/29/2015	150.00
135034187	BLI-075-06N-03S-D3CR	15.50	130485445	2023893947	30419152A	5/29/2015	150.00
135034188	BLI-075-06N-03S-D3CR	15.50	130485445	2023893947	30419152A	5/29/2015	150.00
135034189	BLI-075-06N-03S-D3CR	15.50	130485445	2023893947	30419152A	5/29/2015	150.00
135034190	BLI-075-06N-03S-D3CR	15.50	130485451	2023893947	30419152A	5/29/2015	150.00
135034191	BLI-075-06N-03S-D3CR	15.50	130485451	2023893947	30419152A	5/29/2015	150.00
135034192	BLI-075-06N-03S-D3CR	15.50	130485451	2023894110	30419152A	5/29/2015	150.00
135034193	BLI-075-06N-03S-D3CR	15.50	130485451	2023894110	30419152A	5/29/2015	150.00
135034194	BLI-075-06N-03S-D3CR	15.50	130485451	2023894110	30419152A	5/29/2015	150.00
135034195	BLI-075-06N-03S-D3CR	15.50	130485451	2023894110	30419152A	5/29/2015	150.00
135034196	BLI-075-06N-03S-D3CR	15.50	130485451	2023894110	30419152A	5/29/2015	150.00
135034197	BLI-075-06N-03S-D3CR	15.50	130485451	2023894110	30419152A	5/29/2015	150.00
135034198	BLI-075-06N-03S-D3CR	15.50	130485451	2023894110	30419152A	5/29/2015	150.00
135034199	BLI-075-06N-03S-D3CR	15.50	130485451	2023894110	30419152A	5/29/2015	150.00

Roll Allocation List

Sales Order SO-076037
Customer Name Chesapeake Containment Systems, Inc.
Project Name CCS Brickhaven Mine Site

Serial number	Item Number	Roll width	Top	Bottom	Clay	Manufacturing date	Length
135034200	BLI-075-06N-03S-D3CR	15.50	130485449	2023894110	30419152A	5/29/2015	150.00
135034201	BLI-075-06N-03S-D3CR	15.50	130485449	2023894110	30419152A	5/29/2015	150.00
135034202	BLI-075-06N-03S-D3CR	15.50	130485449	2023894110	30419152A	5/29/2015	150.00
135034203	BLI-075-06N-03S-D3CR	15.50	130485449	2023894110	30419152A	5/29/2015	150.00
135034204	BLI-075-06N-03S-D3CR	15.50	130485449	2023894110	30419152A	5/29/2015	150.00
135034205	BLI-075-06N-03S-D3CR	15.50	130485449	2023894110	30419152A	5/29/2015	150.00
135034206	BLI-075-06N-03S-D3CR	15.50	130485449	2023894110	30419152A	5/29/2015	150.00
135034207	BLI-075-06N-03S-D3CR	15.50	130485449	2023894110	30419152A	5/29/2015	150.00
135034208	BLI-075-06N-03S-D3CR	15.50	130485449	2023894110	30419152A	5/29/2015	150.00
135034209	BLI-075-06N-03S-D3CR	15.50	130485454	2023894110	30419152A	5/29/2015	150.00
135034210	BLI-075-06N-03S-D3CR	15.50	130485454	2023894110	30419152A	5/29/2015	150.00
135034211	BLI-075-06N-03S-D3CR	15.50	130485454	2023894110	30419152A	5/29/2015	150.00
135034212	BLI-075-06N-03S-D3CR	15.50	130485454	2023894110	30419152A	5/29/2015	150.00
135034213	BLI-075-06N-03S-D3CR	15.50	130485454	2023894110	30419152A	5/29/2015	150.00
135034214	BLI-075-06N-03S-D3CR	15.50	130485454	2023894110	30419152A	5/29/2015	150.00
135034215	BLI-075-06N-03S-D3CR	15.50	130485454	2023894110	30419152A	5/29/2015	150.00
135034216	BLI-075-06N-03S-D3CR	15.50	130485454	2023894110	30419152A	5/29/2015	150.00
135034217	BLI-075-06N-03S-D3CR	15.50	130485454	2023893709	30419152A	5/29/2015	150.00
135034218	BLI-075-06N-03S-D3CR	15.50	130484354	2023893709	30419152A	5/30/2015	150.00
135034220	BLI-075-06N-03S-D3CR	15.50	130484354	2023893709	30419152A	5/30/2015	150.00
135034221	BLI-075-06N-03S-D3CR	15.50	130485459	2023893709	30419152A	5/30/2015	150.00
135034222	BLI-075-06N-03S-D3CR	15.50	130485459	2023893709	30419152A	5/30/2015	150.00
135034223	BLI-075-06N-03S-D3CR	15.50	130485459	2023893709	30419152A	5/30/2015	150.00
135034224	BLI-075-06N-03S-D3CR	15.50	130485459	2023893709	30419152A	5/30/2015	150.00
135034225	BLI-075-06N-03S-D3CR	15.50	130485459	2023893709	30419152A	5/30/2015	150.00
135034226	BLI-075-06N-03S-D3CR	15.50	130485459	2023893709	30419152A	5/30/2015	150.00
135034227	BLI-075-06N-03S-D3CR	15.50	130485459	2023893709	30419152B	5/30/2015	150.00
135034228	BLI-075-06N-03S-D3CR	15.50	130485459	2023893709	30419152B	5/30/2015	150.00
135034229	BLI-075-06N-03S-D3CR	15.50	130485459	2023893709	30419152B	5/30/2015	150.00
135034230	BLI-075-06N-03S-D3CR	15.50	130485468	2023893709	30419152B	5/30/2015	150.00
135034231	BLI-075-06N-03S-D3CR	15.50	130485468	2023893709	30419152B	5/30/2015	150.00
135034232	BLI-075-06N-03S-D3CR	15.50	130485468	2023893709	30419152B	5/30/2015	150.00
135034233	BLI-075-06N-03S-D3CR	15.50	130485468	2023893709	30419152B	5/30/2015	150.00
135034234	BLI-075-06N-03S-D3CR	15.50	130485468	2023893709	30419152B	5/30/2015	150.00
135034235	BLI-075-06N-03S-D3CR	15.50	130485468	2023893709	30419152B	5/30/2015	150.00
135034236	BLI-075-06N-03S-D3CR	15.50	130485468	2023893709	30419152B	5/30/2015	150.00
135034237	BLI-075-06N-03S-D3CR	15.50	130485468	2023893709	30419152B	5/30/2015	150.00
135034238	BLI-075-06N-03S-D3CR	15.50	130485468	2023893709	30419152B	5/30/2015	150.00
135034239	BLI-075-06N-03S-D3CR	15.50	130485482	2023893709	30419152B	5/30/2015	150.00
135034240	BLI-075-06N-03S-D3CR	15.50	130485482	2023893709	30419152B	5/30/2015	150.00
135034241	BLI-075-06N-03S-D3CR	15.50	130485482	2023893709	30419152B	5/30/2015	150.00
135034242	BLI-075-06N-03S-D3CR	15.50	130485482	2023893709	30419152B	5/30/2015	150.00
135034243	BLI-075-06N-03S-D3CR	15.50	130485482	2023936411	30419152B	5/30/2015	150.00

Roll Allocation List

Sales Order SO-076037
Customer Name Chesapeake Containment Systems, Inc.
Project Name CCS Brickhaven Mine Site

Serial number	Item Number	Roll width	Top	Bottom	Clay	Manufacturing date	Length
135034244	BLI-075-06N-03S-D3CR	15.50	130485482	2023936411	30419152B	5/30/2015	150.00
135034245	BLI-075-06N-03S-D3CR	15.50	130485482	2023936411	30419152B	5/30/2015	150.00
135034246	BLI-075-06N-03S-D3CR	15.50	130485482	2023936411	30419152B	5/30/2015	150.00
135034247	BLI-075-06N-03S-D3CR	15.50	130485482	2023936411	30419152B	5/30/2015	150.00
135034248	BLI-075-06N-03S-D3CR	15.50	130485482	2023936411	30419152B	5/30/2015	150.00
135034249	BLI-075-06N-03S-D3CR	15.50	130485482	2023936411	30419152B	5/30/2015	150.00
135034250	BLI-075-06N-03S-D3CR	15.50	130485477	2023936411	30419152B	5/30/2015	150.00
135034251	BLI-075-06N-03S-D3CR	15.50	130485477	2023936411	30419152B	5/30/2015	150.00
135034252	BLI-075-06N-03S-D3CR	15.50	130485477	2023936411	30419152B	5/30/2015	150.00
135034253	BLI-075-06N-03S-D3CR	15.50	130485477	2023936411	30419152B	5/30/2015	150.00
135034254	BLI-075-06N-03S-D3CR	15.50	130485477	2023936411	30419152B	5/30/2015	150.00
135034255	BLI-075-06N-03S-D3CR	15.50	130485477	2023936411	30419152B	5/30/2015	150.00
135034256	BLI-075-06N-03S-D3CR	15.50	130485477	2023936411	30419152B	5/30/2015	150.00
135034257	BLI-075-06N-03S-D3CR	15.50	130485477	2023936411	30419152B	5/30/2015	150.00
135034258	BLI-075-06N-03S-D3CR	15.50	130485477	2023936411	30419152B	5/30/2015	150.00
135034260	BLI-075-06N-03S-D3CR	15.50	130485489	2023936411	30419152B	5/30/2015	150.00
135034261	BLI-075-06N-03S-D3CR	15.50	130485489	2023936411	30419152B	5/30/2015	150.00
135034264	BLI-075-06N-03S-D3CR	15.50	130485489	2023936411	30419152B	5/30/2015	150.00
135034265	BLI-075-06N-03S-D3CR	15.50	130485489	2023936411	30419152B	5/30/2015	150.00
135034266	BLI-075-06N-03S-D3CR	15.50	130485489	2023936411	30419152B	5/31/2015	150.00
135034267	BLI-075-06N-03S-D3CR	15.50	130485489	2023936411	30419152B	5/31/2015	150.00
135034268	BLI-075-06N-03S-D3CR	15.50	130485489	2023936411	30419152B	5/31/2015	150.00
135034269	BLI-075-06N-03S-D3CR	15.50	130485489	2023936411	30419152B	5/31/2015	150.00
135034270	BLI-075-06N-03S-D3CR	15.50	130485489	2023936411	30419152B	5/31/2015	150.00
135034271	BLI-075-06N-03S-D3CR	15.50	130485490	2023936411	30419152B	5/31/2015	150.00
135034272	BLI-075-06N-03S-D3CR	15.50	130485490	2023936411	30419152B	5/31/2015	150.00
135034273	BLI-075-06N-03S-D3CR	15.50	130485490	2023936411	30419152B	5/31/2015	150.00
135034274	BLI-075-06N-03S-D3CR	15.50	130485490	2023912051	30419152B	5/31/2015	150.00
135034275	BLI-075-06N-03S-D3CR	15.50	130485490	2023912051	30419152B	5/31/2015	150.00
135034276	BLI-075-06N-03S-D3CR	15.50	130485490	2023912051	30423151A	5/31/2015	150.00
135034277	BLI-075-06N-03S-D3CR	15.50	130485490	2023912051	30423151A	5/31/2015	150.00
135034278	BLI-075-06N-03S-D3CR	15.50	130485490	2023912051	30423151A	5/31/2015	150.00
135034279	BLI-075-06N-03S-D3CR	15.50	130485490	2023912051	30423151A	5/31/2015	150.00
135034280	BLI-075-06N-03S-D3CR	15.50	130485484	2023912051	30423151A	5/31/2015	150.00
135034281	BLI-075-06N-03S-D3CR	15.50	130485484	2023912051	30423151A	5/31/2015	150.00
135034282	BLI-075-06N-03S-D3CR	15.50	130485484	2023912051	30423151A	5/31/2015	150.00
135034283	BLI-075-06N-03S-D3CR	15.50	130485484	2023912051	30423151A	5/31/2015	150.00
135034284	BLI-075-06N-03S-D3CR	15.50	130485484	2023912051	30423151A	5/31/2015	150.00
135034285	BLI-075-06N-03S-D3CR	15.50	130485484	2023912051	30423151A	5/31/2015	150.00
135034286	BLI-075-06N-03S-D3CR	15.50	130485484	2023912051	30423151A	5/31/2015	150.00
135034287	BLI-075-06N-03S-D3CR	15.50	130485484	2023912051	30423151A	5/31/2015	150.00
135034288	BLI-075-06N-03S-D3CR	15.50	130485471	2023912051	30423151A	5/31/2015	150.00
135034289	BLI-075-06N-03S-D3CR	15.50	130485471	2023912051	30423151A	5/31/2015	150.00

Roll Allocation List

Sales Order SO-076037
Customer Name Chesapeake Containment Systems, Inc.
Project Name CCS Brickhaven Mine Site

Serial number	Item Number	Roll width	Top	Bottom	Clay	Manufacturing date	Length
135034290	BLI-075-06N-03S-D3CR	15.50	130485471	2023912051	30423151A	5/31/2015	150.00
135034291	BLI-075-06N-03S-D3CR	15.50	130485471	2023912051	30423151A	5/31/2015	150.00
135034292	BLI-075-06N-03S-D3CR	15.50	130485471	2023912051	30423151A	5/31/2015	150.00
135034293	BLI-075-06N-03S-D3CR	15.50	130485471	2023912051	30423151A	5/31/2015	150.00
135034294	BLI-075-06N-03S-D3CR	15.50	130485471	2023912051	30423151A	5/31/2015	150.00
135034295	BLI-075-06N-03S-D3CR	15.50	130485471	2023912051	30423151A	5/31/2015	150.00
135034297	BLI-075-06N-03S-D3CR	15.50	130485471	2023912051	30423151A	5/31/2015	150.00
135034298	BLI-075-06N-03S-D3CR	15.50	130485471	2023912051	30423151A	6/1/2015	150.00
135034299	BLI-075-06N-03S-D3CR	15.50	130485563	2023912051	30423151A	6/1/2015	150.00
135034300	BLI-075-06N-03S-D3CR	15.50	130485563	2023912051	30423151A	6/1/2015	150.00
135034301	BLI-075-06N-03S-D3CR	15.50	130485563	2023912051	30423151A	6/1/2015	150.00
135034302	BLI-075-06N-03S-D3CR	15.50	130485563	2023910145	30423151A	6/1/2015	150.00
135034303	BLI-075-06N-03S-D3CR	15.50	130485563	2023910145	30423151A	6/1/2015	130.00
135034305	BLI-075-06N-03S-D3CR	15.50	130485563	2023910145	30423151A	6/1/2015	150.00
135034306	BLI-075-06N-03S-D3CR	15.50	130485563	2023910145	30423151A	6/1/2015	150.00
135034307	BLI-075-06N-03S-D3CR	15.50	130485563	2023910145	30423151A	6/1/2015	150.00
135034308	BLI-075-06N-03S-D3CR	15.50	130485563	2023910145	30423151A	6/1/2015	150.00
135034309	BLI-075-06N-03S-D3CR	15.50	130485563	2023910145	30423151A	6/1/2015	150.00
135034310	BLI-075-06N-03S-D3CR	15.50	130485563	2023910145	30423151A	6/1/2015	150.00
135034311	BLI-075-06N-03S-D3CR	15.50	130485554	2023910145	30423151A	6/1/2015	150.00
135034312	BLI-075-06N-03S-D3CR	15.50	130485554	2023910145	30423151A	6/1/2015	150.00
135034313	BLI-075-06N-03S-D3CR	15.50	130485554	2023910145	30423151A	6/1/2015	150.00
135034314	BLI-075-06N-03S-D3CR	15.50	130485554	2023910145	30423151A	6/1/2015	150.00
135034315	BLI-075-06N-03S-D3CR	15.50	130485554	2023910145	30423151A	6/1/2015	150.00
135034316	BLI-075-06N-03S-D3CR	15.50	130485554	2023910145	30423151A	6/1/2015	150.00
135034317	BLI-075-06N-03S-D3CR	15.50	130485554	2023910145	30423151A	6/1/2015	150.00
135034318	BLI-075-06N-03S-D3CR	15.50	130485554	2023910145	30423151A	6/1/2015	150.00
135034319	BLI-075-06N-03S-D3CR	15.50	130485554	2023910145	30423151A	6/1/2015	150.00
135034320	BLI-075-06N-03S-D3CR	15.50	130485554	2023910145	30423151A	6/1/2015	150.00
135034321	BLI-075-06N-03S-D3CR	15.50	130484259	2023910145	30423151A	6/1/2015	150.00
135034322	BLI-075-06N-03S-D3CR	15.50	130484259	2023910145	30423151A	6/1/2015	150.00
135034323	BLI-075-06N-03S-D3CR	15.50	130484259	2023910145	30423151A	6/1/2015	150.00
135034324	BLI-075-06N-03S-D3CR	15.50	130484259	2023910145	30423151A	6/1/2015	150.00
135034325	BLI-075-06N-03S-D3CR	15.50	130484259	2023911216	30423151A	6/1/2015	150.00
135034326	BLI-075-06N-03S-D3CR	15.50	130484259	2023911216	30423151A	6/1/2015	150.00
135034327	BLI-075-06N-03S-D3CR	15.50	130484259	2023911216	30423151A	6/1/2015	150.00
135034328	BLI-075-06N-03S-D3CR	15.50	130484259	2023911216	30423151A	6/2/2015	150.00
135034329	BLI-075-06N-03S-D3CR	15.50	130485562	2023911216	30423151B	6/2/2015	150.00
135034330	BLI-075-06N-03S-D3CR	15.50	130485562	2023911216	30423151B	6/2/2015	150.00
135034331	BLI-075-06N-03S-D3CR	15.50	130485562	2023911216	30423151B	6/2/2015	150.00
135034332	BLI-075-06N-03S-D3CR	15.50	130485562	2023911216	30423151B	6/2/2015	150.00
135034333	BLI-075-06N-03S-D3CR	15.50	130485562	2023911216	30423151B	6/2/2015	150.00
135034334	BLI-075-06N-03S-D3CR	15.50	130485562	2023946874	30423151B	6/2/2015	150.00

Roll Allocation List

Sales Order SO-076037
Customer Name Chesapeake Containment Systems, Inc.
Project Name CCS Brickhaven Mine Site

Serial number	Item Number	Roll width	Top	Bottom	Clay	Manufacturing date	Length
135034335	BLI-075-06N-03S-D3CR	15.50	130485562	2023946874	30423151B	6/2/2015	150.00
135034336	BLI-075-06N-03S-D3CR	15.50	130485562	2023946874	30423151B	6/2/2015	150.00
135034337	BLI-075-06N-03S-D3CR	15.50	130485562	2023946874	30423151B	6/2/2015	150.00
135034338	BLI-075-06N-03S-D3CR	15.50	130485571	2023946874	30423151B	6/2/2015	150.00
135034339	BLI-075-06N-03S-D3CR	15.50	130485571	2023946874	30423151B	6/2/2015	150.00
135034340	BLI-075-06N-03S-D3CR	15.50	130485571	2023946874	30423151B	6/2/2015	150.00
135034341	BLI-075-06N-03S-D3CR	15.50	130485571	2023946874	30423151B	6/2/2015	150.00
135034342	BLI-075-06N-03S-D3CR	15.50	130485571	2023946874	30423151B	6/2/2015	150.00
135034343	BLI-075-06N-03S-D3CR	15.50	130485571	2023946874	30423151B	6/2/2015	150.00
135034344	BLI-075-06N-03S-D3CR	15.50	130485571	2023946874	30423151B	6/2/2015	150.00
135034345	BLI-075-06N-03S-D3CR	15.50	130485571	2023946874	30423151B	6/2/2015	150.00
135034346	BLI-075-06N-03S-D3CR	15.50	130485571	2023946874	30423151B	6/2/2015	150.00
135034347	BLI-075-06N-03S-D3CR	15.50	130485571	2023946874	30423151B	6/2/2015	150.00
135034348	BLI-075-06N-03S-D3CR	15.50	130485571	2023946874	30423151B	6/2/2015	150.00
135034349	BLI-075-06N-03S-D3CR	15.50	130485570	2023946874	30423151B	6/2/2015	150.00
135034350	BLI-075-06N-03S-D3CR	15.50	130485570	2023946874	30423151B	6/2/2015	150.00
135034351	BLI-075-06N-03S-D3CR	15.50	130485570	2023946874	30423151B	6/2/2015	150.00
135034352	BLI-075-06N-03S-D3CR	15.50	130485570	2023946874	30423151B	6/2/2015	150.00
135034353	BLI-075-06N-03S-D3CR	15.50	130485570	2023946874	30423151B	6/2/2015	150.00
135034354	BLI-075-06N-03S-D3CR	15.50	130485570	2023946874	30423151B	6/2/2015	150.00
135034355	BLI-075-06N-03S-D3CR	15.50	130485570	2023946874	30423151B	6/2/2015	150.00
135034356	BLI-075-06N-03S-D3CR	15.50	130485570	2023946874	30423151B	6/2/2015	150.00
135034357	BLI-075-06N-03S-D3CR	15.50	130485570	2023946874	30423151B	6/2/2015	150.00
135034358	BLI-075-06N-03S-D3CR	15.50	130485570	2023946874	30423151B	6/2/2015	150.00
135034359	BLI-075-06N-03S-D3CR	15.50	130485565	2023946874	30423151B	6/2/2015	150.00
135034360	BLI-075-06N-03S-D3CR	15.50	130485565	2023946874	30423151B	6/2/2015	150.00
135034361	BLI-075-06N-03S-D3CR	15.50	130485565	2023946874	30423151B	6/2/2015	150.00
135034362	BLI-075-06N-03S-D3CR	15.50	130485565	2023946874	30423151B	6/2/2015	150.00
135034363	BLI-075-06N-03S-D3CR	15.50	130485565	2023946874	30423151B	6/2/2015	150.00
135034364	BLI-075-06N-03S-D3CR	15.50	130485565	2023893661	30423151B	6/2/2015	150.00
135034365	BLI-075-06N-03S-D3CR	15.50	130485565	2023893661	30423151B	6/2/2015	150.00
135034366	BLI-075-06N-03S-D3CR	15.50	130485565	2023893661	30423151B	6/2/2015	150.00
135034367	BLI-075-06N-03S-D3CR	15.50	130485565	2023893661	30423151B	6/2/2015	150.00
135034368	BLI-075-06N-03S-D3CR	15.50	130485565	2023893661	30423151B	6/2/2015	150.00
135034369	BLI-075-06N-03S-D3CR	15.50	130485475	2023893661	30423151B	6/2/2015	150.00
135034370	BLI-075-06N-03S-D3CR	15.50	130485475	2023893661	30423151B	6/2/2015	150.00
135034371	BLI-075-06N-03S-D3CR	15.50	130485475	2023893661	30423151B	6/2/2015	150.00
135034372	BLI-075-06N-03S-D3CR	15.50	130485475	2023893661	30504151B	6/2/2015	150.00
135034373	BLI-075-06N-03S-D3CR	15.50	130485475	2023893661	30504151B	6/2/2015	150.00
135034374	BLI-075-06N-03S-D3CR	15.50	130485475	2023893661	30504151B	6/2/2015	150.00
135034375	BLI-075-06N-03S-D3CR	15.50	130485475	2023893661	30504151B	6/2/2015	150.00
135034376	BLI-075-06N-03S-D3CR	15.50	130485475	2023893661	30504151B	6/2/2015	150.00
135034377	BLI-075-06N-03S-D3CR	15.50	130485475	2023893661	30504151B	6/2/2015	150.00

Roll Allocation List

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Customer Name Chesapeake Containment Systems, Inc.
Project Name CCS Brickhaven Mine Site

Serial number	Item Number	Roll width	Top	Bottom	Clay	Manufacturing date	Length
135034378	BLI-075-06N-03S-D3CR	15.50	130485475	2023893661	30504151B	6/2/2015	150.00
135034379	BLI-075-06N-03S-D3CR	15.50	130479889	2023893661	30504151B	6/3/2015	150.00
135034380	BLI-075-06N-03S-D3CR	15.50	130479889	2023893661	30504151B	6/3/2015	150.00
135034381	BLI-075-06N-03S-D3CR	15.50	130479889	2023893661	30504151B	6/3/2015	150.00
135034382	BLI-075-06N-03S-D3CR	15.50	130479889	2023893661	30504151B	6/3/2015	150.00
135034383	BLI-075-06N-03S-D3CR	15.50	130479889	2023893661	30504151B	6/3/2015	150.00
135034384	BLI-075-06N-03S-D3CR	15.50	130479889	2023893661	30504151B	6/3/2015	150.00
135034385	BLI-075-06N-03S-D3CR	15.50	130479889	2023893661	30504151B	6/3/2015	150.00
135034386	BLI-075-06N-03S-D3CR	15.50	130479889	2023954412	30504151B	6/3/2015	126.00
135034387	BLI-075-06N-03S-D3CR	15.50	130479889	2023954412	30504151B	6/3/2015	150.00
135034388	BLI-075-06N-03S-D3CR	15.50	130479889	2023954412	30504151B	6/3/2015	150.00
135034389	BLI-075-06N-03S-D3CR	15.50	130479889	2023954412	30504151B	6/3/2015	150.00
135034390	BLI-075-06N-03S-D3CR	15.50	130479889	2023954412	30504151B	6/3/2015	150.00
135034391	BLI-075-06N-03S-D3CR	15.50	130485574	2023954412	30504151B	6/3/2015	150.00
135034392	BLI-075-06N-03S-D3CR	15.50	130485574	2023954412	30504151B	6/3/2015	150.00
135034393	BLI-075-06N-03S-D3CR	15.50	130485574	2023954412	30504151B	6/3/2015	150.00
135034394	BLI-075-06N-03S-D3CR	15.50	130485574	2023954412	30504151B	6/3/2015	150.00
135034395	BLI-075-06N-03S-D3CR	15.50	130485574	2023954412	30504151B	6/3/2015	150.00
135034396	BLI-075-06N-03S-D3CR	15.50	130485574	2023954412	30504151B	6/3/2015	150.00
135034397	BLI-075-06N-03S-D3CR	15.50	130485574	2023954412	30504151B	6/3/2015	150.00
135034398	BLI-075-06N-03S-D3CR	15.50	130485574	2023954412	30504151B	6/3/2015	150.00
135034399	BLI-075-06N-03S-D3CR	15.50	130485574	2023954412	30504151B	6/3/2015	150.00
135034400	BLI-075-06N-03S-D3CR	15.50	130485574	2023954412	30504151B	6/3/2015	150.00
135034401	BLI-075-06N-03S-D3CR	15.50	130485480	2023954412	30504151B	6/3/2015	150.00
135034402	BLI-075-06N-03S-D3CR	15.50	130485480	2023954412	30504151B	6/3/2015	150.00
135034403	BLI-075-06N-03S-D3CR	15.50	130485480	2023954412	30504151B	6/3/2015	150.00
135034404	BLI-075-06N-03S-D3CR	15.50	130485480	2023954412	30504151B	6/3/2015	150.00
135034405	BLI-075-06N-03S-D3CR	15.50	130485480	2023954412	30504151B	6/3/2015	150.00
135034406	BLI-075-06N-03S-D3CR	15.50	130485480	2023954412	30504151B	6/3/2015	150.00
135034407	BLI-075-06N-03S-D3CR	15.50	130485480	2023954412	30504151B	6/3/2015	150.00
135034408	BLI-075-06N-03S-D3CR	15.50	130485480	2023954412	30504151B	6/3/2015	150.00
135034409	BLI-075-06N-03S-D3CR	15.50	130485480	2023954412	30504151B	6/3/2015	150.00
135034410	BLI-075-06N-03S-D3CR	15.50	130485480	2023954412	30504151B	6/3/2015	150.00
135034411	BLI-075-06N-03S-D3CR	15.50	130485479	2023937392	30504151B	6/3/2015	150.00
135034412	BLI-075-06N-03S-D3CR	15.50	130485479	2023937392	30504151B	6/3/2015	150.00
135034413	BLI-075-06N-03S-D3CR	15.50	130485479	2023937392	30504151B	6/3/2015	150.00
135034414	BLI-075-06N-03S-D3CR	15.50	130485479	2023937392	30504151B	6/3/2015	150.00
135034415	BLI-075-06N-03S-D3CR	15.50	130485479	2023937392	30504151B	6/3/2015	150.00
135034416	BLI-075-06N-03S-D3CR	15.50	130485479	2023937392	30503151A	6/3/2015	150.00
135034417	BLI-075-06N-03S-D3CR	15.50	130485479	2023937392	30503151A	6/3/2015	150.00
135034418	BLI-075-06N-03S-D3CR	15.50	130485479	2023937392	30503151A	6/3/2015	150.00
135034419	BLI-075-06N-03S-D3CR	15.50	130485479	2023937392	30503151A	6/3/2015	150.00
135034420	BLI-075-06N-03S-D3CR	15.50	130485479	2023937392	30503151A	6/3/2015	150.00

Roll Allocation List

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Customer Name Chesapeake Containment Systems, Inc.
Project Name CCS Brickhaven Mine Site

Serial number	Item Number	Roll width	Top	Bottom	Clay	Manufacturing date	Length
135034421	BLI-075-06N-03S-D3CR	15.50	130485479	2023937392	30503151A	6/3/2015	150.00
135034422	BLI-075-06N-03S-D3CR	15.50	130485567	2023937392	30503151A	6/3/2015	150.00
135034423	BLI-075-06N-03S-D3CR	15.50	130485567	2023937392	30503151A	6/3/2015	150.00
135034424	BLI-075-06N-03S-D3CR	15.50	130485567	2023937392	30503151A	6/3/2015	150.00
135034425	BLI-075-06N-03S-D3CR	15.50	130485567	2023937392	30503151A	6/3/2015	150.00
135034426	BLI-075-06N-03S-D3CR	15.50	130485567	2023937392	30503151A	6/3/2015	150.00
135034427	BLI-075-06N-03S-D3CR	15.50	130485567	2023937392	30503151A	6/3/2015	150.00
135034428	BLI-075-06N-03S-D3CR	15.50	130485567	2023937392	30503151A	6/3/2015	150.00
135034429	BLI-075-06N-03S-D3CR	15.50	130485567	2023937392	30503151A	6/3/2015	150.00
135034430	BLI-075-06N-03S-D3CR	15.50	130485567	2023937392	30503151A	6/3/2015	150.00
135034431	BLI-075-06N-03S-D3CR	15.50	130485483	2023937392	30503151A	6/3/2015	150.00
135034432	BLI-075-06N-03S-D3CR	15.50	130485483	2023937392	30503151A	6/3/2015	150.00
135034433	BLI-075-06N-03S-D3CR	15.50	130485483	2023937392	30503151A	6/3/2015	150.00
135034434	BLI-075-06N-03S-D3CR	15.50	130485483	2023937392	30503151A	6/3/2015	150.00
135034435	BLI-075-06N-03S-D3CR	15.50	130485483	2023937392	30503151A	6/3/2015	150.00
135034436	BLI-075-06N-03S-D3CR	15.50	130485483	2023937392	30503151A	6/3/2015	150.00
135034437	BLI-075-06N-03S-D3CR	15.50	130485483	2023911207	30503151A	6/3/2015	150.00
135034438	BLI-075-06N-03S-D3CR	15.50	130485483	2023911207	30503151A	6/3/2015	150.00
135034439	BLI-075-06N-03S-D3CR	15.50	130485483	2023911207	30503151A	6/3/2015	150.00
135034440	BLI-075-06N-03S-D3CR	15.50	130485483	2023911207	30503151A	6/3/2015	150.00
135034441	BLI-075-06N-03S-D3CR	15.50	130485472	2023911207	30503151A	6/3/2015	150.00
135034443	BLI-075-06N-03S-D3CR	15.50	130485472	2023911207	30503151A	6/3/2015	150.00
135034444	BLI-075-06N-03S-D3CR	15.50	130485472	2023911207	30503151A	6/3/2015	150.00
135034445	BLI-075-06N-03S-D3CR	15.50	130485472	2023911207	30503151A	6/3/2015	150.00
135034446	BLI-075-06N-03S-D3CR	15.50	130485472	2023911207	30503151A	6/3/2015	150.00
135034447	BLI-075-06N-03S-D3CR	15.50	130485472	2023911207	30503151A	6/3/2015	150.00
135034448	BLI-075-06N-03S-D3CR	15.50	130485472	2023911207	30503151A	6/3/2015	150.00
135034449	BLI-075-06N-03S-D3CR	15.50	130485472	2023911207	30503151A	6/3/2015	150.00
135034450	BLI-075-06N-03S-D3CR	15.50	130485472	2023911207	30503151A	6/3/2015	80.00
135034451	BLI-075-06N-03S-D3CR	15.50	130485472	2023911207	30503151A	6/3/2015	150.00
135034452	BLI-075-06N-03S-D3CR	15.50	130485472	2023911207	30503151A	6/3/2015	150.00
135034453	BLI-075-06N-03S-D3CR	15.50	130485457	2023911207	30503151A	6/3/2015	150.00
135034454	BLI-075-06N-03S-D3CR	15.50	130485457	2023911207	30503151A	6/3/2015	150.00
135034455	BLI-075-06N-03S-D3CR	15.50	130485457	2023911207	30503151A	6/3/2015	150.00
135034456	BLI-075-06N-03S-D3CR	15.50	130485457	2023911207	30503151A	6/3/2015	150.00
135034457	BLI-075-06N-03S-D3CR	15.50	130485457	2023911207	30503151A	6/3/2015	150.00
135034458	BLI-075-06N-03S-D3CR	15.50	130485457	2023911207	30503151A	6/4/2015	150.00
135034459	BLI-075-06N-03S-D3CR	15.50	130485457	2023911207	30503151A	6/4/2015	150.00
135034460	BLI-075-06N-03S-D3CR	15.50	130485457	2023911207	30503151A	6/4/2015	150.00
135034461	BLI-075-06N-03S-D3CR	15.50	130485457	2023911207	30503151A	6/4/2015	150.00
135034463	BLI-075-06N-03S-D3CR	15.50	130485485	2023911207	30503151A	6/4/2015	150.00
135034464	BLI-075-06N-03S-D3CR	15.50	130485485	2023911207	30503151A	6/4/2015	150.00
135034465	BLI-075-06N-03S-D3CR	15.50	130485485	2023946873	30503151A	6/4/2015	150.00

Roll Allocation List

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Customer Name Chesapeake Containment Systems, Inc.
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Serial number	Item Number	Roll width	Top	Bottom	Clay	Manufacturing date	Length
135034466	BLI-075-06N-03S-D3CR	15.50	130485485	2023946873	30503151B	6/4/2015	150.00
135034467	BLI-075-06N-03S-D3CR	15.50	130485485	2023946873	30503151B	6/4/2015	150.00
135034468	BLI-075-06N-03S-D3CR	15.50	130485485	2023946873	30503151B	6/4/2015	150.00
135034469	BLI-075-06N-03S-D3CR	15.50	130485485	2023946873	30503151B	6/4/2015	150.00
135034470	BLI-075-06N-03S-D3CR	15.50	130485485	2023946873	30503151B	6/4/2015	150.00
135034471	BLI-075-06N-03S-D3CR	15.50	130485476	2023946873	30503151B	6/4/2015	150.00
135034472	BLI-075-06N-03S-D3CR	15.50	130485476	2023946873	30503151B	6/4/2015	150.00
135034473	BLI-075-06N-03S-D3CR	15.50	130485476	2023946873	30503151B	6/4/2015	150.00
135034474	BLI-075-06N-03S-D3CR	15.50	130485476	2023946873	30503151B	6/4/2015	150.00
135034475	BLI-075-06N-03S-D3CR	15.50	130485476	2023946873	30503151B	6/4/2015	150.00
135034476	BLI-075-06N-03S-D3CR	15.50	130485476	2023946873	30503151B	6/4/2015	150.00
135034477	BLI-075-06N-03S-D3CR	15.50	130485476	2023946873	30503151B	6/4/2015	150.00
135034478	BLI-075-06N-03S-D3CR	15.50	130485476	2023946873	30503151B	6/4/2015	150.00
135034479	BLI-075-06N-03S-D3CR	15.50	130485476	2023946873	30503151B	6/4/2015	150.00
135034480	BLI-075-06N-03S-D3CR	15.50	130485476	2023946873	30503151B	6/4/2015	150.00
135034481	BLI-075-06N-03S-D3CR	15.50	130485473	2023946873	30503151B	6/4/2015	150.00
135034482	BLI-075-06N-03S-D3CR	15.50	130485473	2023946873	30503151B	6/4/2015	150.00
135034483	BLI-075-06N-03S-D3CR	15.50	130485473	2023946873	30503151B	6/4/2015	150.00
135034484	BLI-075-06N-03S-D3CR	15.50	130485473	2023946873	30503151B	6/4/2015	150.00
135034485	BLI-075-06N-03S-D3CR	15.50	130485473	2023946873	30503151B	6/4/2015	150.00
135034486	BLI-075-06N-03S-D3CR	15.50	130485473	2023946873	30503151B	6/4/2015	150.00
135034487	BLI-075-06N-03S-D3CR	15.50	130485473	2023946873	30503151B	6/4/2015	150.00
135034488	BLI-075-06N-03S-D3CR	15.50	130485473	2023946873	30503151B	6/4/2015	150.00
135034489	BLI-075-06N-03S-D3CR	15.50	130485473	2023946873	30503151B	6/4/2015	150.00
135034490	BLI-075-06N-03S-D3CR	15.50	130485473	2023941985	30503151B	6/4/2015	150.00
135034491	BLI-075-06N-03S-D3CR	15.50	130485568	2023941985	30503151B	6/4/2015	150.00
135034492	BLI-075-06N-03S-D3CR	15.50	130485568	2023941985	30503151B	6/4/2015	150.00
135034493	BLI-075-06N-03S-D3CR	15.50	130485568	2023941985	30503151B	6/4/2015	150.00
135034494	BLI-075-06N-03S-D3CR	15.50	130485568	2023941985	30503151B	6/4/2015	150.00
135034495	BLI-075-06N-03S-D3CR	15.50	130485568	2023941985	30503151B	6/4/2015	150.00
135034496	BLI-075-06N-03S-D3CR	15.50	130485568	2023941985	30503151B	6/4/2015	150.00
135034497	BLI-075-06N-03S-D3CR	15.50	130485568	2023941985	30503151B	6/4/2015	150.00
135034498	BLI-075-06N-03S-D3CR	15.50	130485568	2023941985	30503151B	6/4/2015	150.00
135034499	BLI-075-06N-03S-D3CR	15.50	130485568	2023941985	30503151B	6/4/2015	150.00
135034500	BLI-075-06N-03S-D3CR	15.50	130485572	2023941985	30503151B	6/4/2015	150.00
135034501	BLI-075-06N-03S-D3CR	15.50	130485572	2023941985	30503151B	6/4/2015	150.00
135034502	BLI-075-06N-03S-D3CR	15.50	130485572	2023941985	30503151B	6/4/2015	150.00
135034503	BLI-075-06N-03S-D3CR	15.50	130485572	2023941985	30503151B	6/4/2015	150.00
135034504	BLI-075-06N-03S-D3CR	15.50	130485572	2023941985	30503151B	6/4/2015	150.00
135034505	BLI-075-06N-03S-D3CR	15.50	130485572	2023941985	30503151B	6/4/2015	150.00
135034506	BLI-075-06N-03S-D3CR	15.50	130485572	2023941985	30503151B	6/4/2015	150.00
135034507	BLI-075-06N-03S-D3CR	15.50	130485572	2023941985	30503151B	6/4/2015	150.00
135034508	BLI-075-06N-03S-D3CR	15.50	130485572	2023941985	30503151B	6/4/2015	150.00

Roll Allocation List

Sales Order SO-076037
Customer Name Chesapeake Containment Systems, Inc.
Project Name CCS Brickhaven Mine Site

Serial number	Item Number	Roll width	Top	Bottom	Clay	Manufacturing date	Length
135034509	BLI-075-06N-03S-D3CR	15.50	130485572	2023941985	30503151B	6/4/2015	150.00
135034510	BLI-075-06N-03S-D3CR	15.50	130485542	2023941985	30503151B	6/4/2015	150.00
135034511	BLI-075-06N-03S-D3CR	15.50	130485542	2023941985	30503151B	6/4/2015	150.00
135034512	BLI-075-06N-03S-D3CR	15.50	130485542	2023941985	30503151B	6/4/2015	150.00
135034513	BLI-075-06N-03S-D3CR	15.50	130485542	2023941985	30503151B	6/4/2015	150.00
135034514	BLI-075-06N-03S-D3CR	15.50	130485542	2023941985	30503151B	6/4/2015	150.00
135034515	BLI-075-06N-03S-D3CR	15.50	130485542	2023911886	30503151B	6/4/2015	150.00
135034516	BLI-075-06N-03S-D3CR	15.50	130485542	2023911886	30503151B	6/4/2015	150.00
135034517	BLI-075-06N-03S-D3CR	15.50	130485542	2023911886	30503151B	6/4/2015	150.00
135034518	BLI-075-06N-03S-D3CR	15.50	130485542	2023911886	30503151B	6/5/2015	150.00
135034519	BLI-075-06N-03S-D3CR	15.50	130485542	2023911886	30508151A	6/5/2015	150.00
135034520	BLI-075-06N-03S-D3CR	15.50	130485531	2023911886	30508151A	6/5/2015	150.00
135034521	BLI-075-06N-03S-D3CR	15.50	130485531	2023911886	30508151A	6/5/2015	150.00
135034522	BLI-075-06N-03S-D3CR	15.50	130485531	2023911886	30508151A	6/5/2015	150.00
135034523	BLI-075-06N-03S-D3CR	15.50	130485531	2023911886	30508151A	6/5/2015	150.00
135034524	BLI-075-06N-03S-D3CR	15.50	130485531	2023911886	30508151A	6/5/2015	150.00
135034525	BLI-075-06N-03S-D3CR	15.50	130485531	2023911886	30508151A	6/5/2015	150.00
135034526	BLI-075-06N-03S-D3CR	15.50	130485531	2023911886	30508151A	6/5/2015	150.00
135034527	BLI-075-06N-03S-D3CR	15.50	130485531	2023911886	30508151B	6/5/2015	150.00
135034528	BLI-075-06N-03S-D3CR	15.50	130485531	2023911886	30508151B	6/5/2015	150.00
135034529	BLI-075-06N-03S-D3CR	15.50	130485531	2023911886	30508151B	6/5/2015	150.00
135034530	BLI-075-06N-03S-D3CR	15.50	130485532	2023911886	30508151B	6/5/2015	150.00
135034531	BLI-075-06N-03S-D3CR	15.50	130485532	2023911886	30508151B	6/5/2015	150.00
135034532	BLI-075-06N-03S-D3CR	15.50	130485532	2023911886	30508151B	6/5/2015	150.00
135034533	BLI-075-06N-03S-D3CR	15.50	130485532	2023911886	30508151B	6/5/2015	150.00
135034534	BLI-075-06N-03S-D3CR	15.50	130485532	2023911886	30508151B	6/5/2015	150.00
135034535	BLI-075-06N-03S-D3CR	15.50	130485532	2023911886	30508151B	6/5/2015	150.00
135034536	BLI-075-06N-03S-D3CR	15.50	130485532	2023911886	30508151B	6/5/2015	150.00
135034537	BLI-075-06N-03S-D3CR	15.50	130485532	2023911886	30508151B	6/5/2015	150.00
135034538	BLI-075-06N-03S-D3CR	15.50	130485532	2023911886	30508151B	6/5/2015	150.00
135034539	BLI-075-06N-03S-D3CR	15.50	130485532	2023911886	30508151B	6/5/2015	150.00
135034540	BLI-075-06N-03S-D3CR	15.50	130485573	2023892855	30508151B	6/5/2015	150.00
135034541	BLI-075-06N-03S-D3CR	15.50	130485573	2023892855	30508151B	6/5/2015	150.00
135034542	BLI-075-06N-03S-D3CR	15.50	130485573	2023892855	30508151B	6/5/2015	150.00
135034543	BLI-075-06N-03S-D3CR	15.50	130485573	2023892855	30508151B	6/5/2015	150.00
135034544	BLI-075-06N-03S-D3CR	15.50	130485573	2023892855	30508151B	6/5/2015	150.00
135034545	BLI-075-06N-03S-D3CR	15.50	130485573	2023892855	30508151B	6/5/2015	150.00
135034546	BLI-075-06N-03S-D3CR	15.50	130485573	2023892855	30508151B	6/5/2015	150.00
135034547	BLI-075-06N-03S-D3CR	15.50	130485573	2023892855	30508151B	6/5/2015	150.00
135034548	BLI-075-06N-03S-D3CR	15.50	130485520	2023892855	30508151B	6/5/2015	150.00
135034549	BLI-075-06N-03S-D3CR	15.50	130485520	2023892855	30508151B	6/5/2015	150.00
135034550	BLI-075-06N-03S-D3CR	15.50	130485520	2023892855	30508151B	6/5/2015	150.00
135034551	BLI-075-06N-03S-D3CR	15.50	130485520	2023892855	30508151B	6/5/2015	150.00

Roll Allocation List

Sales Order SO-076037
Customer Name Chesapeake Containment Systems, Inc.
Project Name CCS Brickhaven Mine Site

Serial number	Item Number	Roll width	Top	Bottom	Clay	Manufacturing date	Length
135034552	BLI-075-06N-03S-D3CR	15.50	130485520	2023892855	30508151B	6/5/2015	150.00
135034553	BLI-075-06N-03S-D3CR	15.50	130485520	2023892855	30508151B	6/5/2015	150.00
135034554	BLI-075-06N-03S-D3CR	15.50	130485520	2023892855	30508151B	6/5/2015	150.00
135034555	BLI-075-06N-03S-D3CR	15.50	130485520	2023892855	30508151B	6/6/2015	150.00
135034556	BLI-075-06N-03S-D3CR	15.50	130485520	2023892855	30508151B	6/6/2015	150.00
135034557	BLI-075-06N-03S-D3CR	15.50	130485520	2023892855	30508151B	6/6/2015	150.00
135034558	BLI-075-06N-03S-D3CR	15.50	130485443	2023892855	30508151B	6/6/2015	150.00
135034559	BLI-075-06N-03S-D3CR	15.50	130485443	2023892855	30508151B	6/6/2015	150.00
135034560	BLI-075-06N-03S-D3CR	15.50	130485443	2023892855	30508151B	6/6/2015	150.00
135034561	BLI-075-06N-03S-D3CR	15.50	130485443	2023892855	30508151B	6/6/2015	150.00
135034562	BLI-075-06N-03S-D3CR	15.50	130485443	2023892855	30508151B	6/6/2015	150.00
135034563	BLI-075-06N-03S-D3CR	15.50	130485443	2023892855	30508151B	6/6/2015	150.00
135034564	BLI-075-06N-03S-D3CR	15.50	130485443	2023941879	30508151B	6/6/2015	150.00
135034565	BLI-075-06N-03S-D3CR	15.50	130485443	2023941879	30508151B	6/6/2015	150.00
135034566	BLI-075-06N-03S-D3CR	15.50	130485443	2023941879	30508151B	6/6/2015	150.00
135034567	BLI-075-06N-03S-D3CR	15.50	130485443	2023941879	30508151B	6/6/2015	150.00
135034568	BLI-075-06N-03S-D3CR	15.50	130485523	2023941879	30508151B	6/6/2015	150.00
135034569	BLI-075-06N-03S-D3CR	15.50	130485523	2023941879	30508151B	6/6/2015	150.00
135034570	BLI-075-06N-03S-D3CR	15.50	130485523	2023941879	30508151B	6/6/2015	150.00
135034571	BLI-075-06N-03S-D3CR	15.50	130485523	2023941879	30508151B	6/6/2015	150.00
135034572	BLI-075-06N-03S-D3CR	15.50	130485523	2023941879	30508151B	6/6/2015	150.00
135034573	BLI-075-06N-03S-D3CR	15.50	130485523	2023941879	30508151B	6/6/2015	150.00
135034574	BLI-075-06N-03S-D3CR	15.50	130485523	2023941879	30517151B	6/6/2015	150.00
135034575	BLI-075-06N-03S-D3CR	15.50	130485523	2023941879	30517151B	6/6/2015	150.00
135034576	BLI-075-06N-03S-D3CR	15.50	130485523	2023941879	30517151B	6/6/2015	150.00
135034577	BLI-075-06N-03S-D3CR	15.50	130485523	2023941879	30517151B	6/6/2015	150.00
135034578	BLI-075-06N-03S-D3CR	15.50	130485522	2023941879	30517151B	6/6/2015	150.00
135034579	BLI-075-06N-03S-D3CR	15.50	130485522	2023941879	30517151B	6/6/2015	150.00
135034580	BLI-075-06N-03S-D3CR	15.50	130485522	2023941879	30517151B	6/6/2015	150.00
135034581	BLI-075-06N-03S-D3CR	15.50	130485522	2023941879	30517151B	6/6/2015	150.00
135034582	BLI-075-06N-03S-D3CR	15.50	130485522	2023941879	30517151B	6/6/2015	150.00
135034583	BLI-075-06N-03S-D3CR	15.50	130485522	2023941879	30517151B	6/6/2015	150.00
135034584	BLI-075-06N-03S-D3CR	15.50	130485522	2023941879	30517151B	6/6/2015	150.00
135034585	BLI-075-06N-03S-D3CR	15.50	130485522	2023941879	30517151B	6/6/2015	150.00
135034586	BLI-075-06N-03S-D3CR	15.50	130485522	2023941879	30517151B	6/6/2015	150.00
135034587	BLI-075-06N-03S-D3CR	15.50	130485522	2023941879	30517151B	6/6/2015	150.00
135034588	BLI-075-06N-03S-D3CR	15.50	130485522	2023941879	30517151B	6/6/2015	150.00
135034589	BLI-075-06N-03S-D3CR	15.50	130485522	2023941879	30517151B	6/6/2015	150.00
135034590	BLI-075-06N-03S-D3CR	15.50	130485522	2023941879	30517151B	6/6/2015	150.00
135034591	BLI-075-06N-03S-D3CR	15.50	130485518	2023940972	30517151B	6/6/2015	150.00
135034592	BLI-075-06N-03S-D3CR	15.50	130485518	2023940972	30517151B	6/6/2015	150.00
135034593	BLI-075-06N-03S-D3CR	15.50	130485518	2023940972	30517151B	6/6/2015	150.00
135034594	BLI-075-06N-03S-D3CR	15.50	130485518	2023940972	30517151B	6/6/2015	150.00

Roll Allocation List

Sales Order SO-076037
Customer Name Chesapeake Containment Systems, Inc.
Project Name CCS Brickhaven Mine Site

Serial number	Item Number	Roll width	Top	Bottom	Clay	Manufacturing date	Length
135034595	BLI-075-06N-03S-D3CR	15.50	130485518	2023940972	30517151B	6/6/2015	150.00
135034596	BLI-075-06N-03S-D3CR	15.50	130485518	2023940972	30517151B	6/6/2015	150.00
135034597	BLI-075-06N-03S-D3CR	15.50	130485518	2023940972	30517151B	6/6/2015	150.00
135034598	BLI-075-06N-03S-D3CR	15.50	130485518	2023940972	30517151B	6/6/2015	150.00
135034599	BLI-075-06N-03S-D3CR	15.50	130485518	2023940972	30517151B	6/7/2015	150.00
135034600	BLI-075-06N-03S-D3CR	15.50	130485518	2023940972	30517151B	6/7/2015	150.00
135034601	BLI-075-06N-03S-D3CR	15.50	130485521	2023940972	30517151B	6/7/2015	150.00
135034602	BLI-075-06N-03S-D3CR	15.50	130485521	2023940972	30517151B	6/7/2015	150.00
135034603	BLI-075-06N-03S-D3CR	15.50	130485521	2023940972	30517151B	6/7/2015	150.00
135034604	BLI-075-06N-03S-D3CR	15.50	130485521	2023940972	30517151B	6/7/2015	150.00
135034605	BLI-075-06N-03S-D3CR	15.50	130485521	2023940972	30517151B	6/7/2015	150.00

GSE Environmental, LLC

ROLL TEST DATA REPORT

GSE QC APPROVED

Report Date: Jun/15/2015

Sales Order No.	Customer Name	Project Location	Product Name	BOL Number
SO−076037	Chesapeake Containment Systems, Inc.	Moncure NC US	BLI−075−06N−03S−D3CR	

Roll Number	ASTM D4632 Grab Strength (lbs)	ASTM D4632 Peel Strength (lbs)	ASTM D6768 Tensile Strength (ppi)	ASTM D6496 Peel Strength (ppi)	ASTM D5993 Clay Content @ 0% Moisture (lbs/sf)	ASTM D5890 Free Swell (ml/2g)	ASTM D2216 Moisture Content (%)	ASTM D5891 Fluid Loss (ml)
135033768	207	49	61.1	8.3	0.87	27.0	9.7	15.6
135033769	169	38	54.7	6.1	0.85	27.0	9.7	15.6
135033770	169	38	54.7	6.1	0.85	27.0	9.7	15.6
135033771	169	38	54.7	6.1	0.85	27.0	9.7	15.6
135033772	169	38	54.7	6.1	0.85	27.0	9.7	15.6
135033773	169	38	54.7	6.1	0.85	27.0	9.7	15.6
135033774	169	38	54.7	6.1	0.85	27.0	9.7	15.6
135033775	169	38	54.7	6.1	0.85	27.0	9.7	15.6
135033776	169	38	54.7	6.1	0.85	27.0	9.7	15.6
135033777	169	38	54.7	6.1	0.85	27.0	9.7	15.6
135033778	169	38	54.7	6.1	0.85	27.0	9.7	15.6
135033779	169	38	54.7	6.1	0.85	27.0	9.7	15.6
135033780	169	38	54.7	6.1	0.85	27.0	9.7	15.6
135033781	169	38	54.7	6.1	0.85	27.0	9.7	15.6
135033782	169	38	54.7	6.1	0.85	27.0	9.7	15.6
135033783	169	38	54.7	6.1	0.85	27.0	9.7	15.6
135033784	169	38	54.7	6.1	0.85	27.0	9.7	15.6
135033785	135	39	46.9	7.2	0.91	27.0	9.7	15.6
135033786	135	39	46.9	7.2	0.91	27.0	9.7	15.6
135033787	135	39	46.9	7.2	0.91	27.0	9.7	15.6
135033788	135	39	46.9	7.2	0.91	27.0	9.7	15.6
135033789	135	39	46.9	7.2	0.91	27.0	9.7	15.6
135033790	135	39	46.9	7.2	0.91	27.0	9.7	15.6
135033791	135	39	46.9	7.2	0.91	27.0	9.7	15.6
135033792	135	39	46.9	7.2	0.91	27.0	9.7	15.6
135033793	135	39	46.9	7.2	0.91	27.0	9.7	15.6
135033794	135	39	46.9	7.2	0.91	27.0	9.7	15.6
135033795	135	39	46.9	7.2	0.91	27.0	9.7	15.6
135033796	135	39	46.9	7.2	0.91	27.0	9.7	15.6
135033797	135	39	46.9	7.2	0.91	27.0	9.7	15.6
135033798	135	39	46.9	7.2	0.91	27.0	9.7	15.6
135033799	135	39	46.9	7.2	0.91	27.0	9.7	15.6
135033800	135	39	46.9	7.2	0.91	27.0	9.7	15.6
135033801	146	47	44.0	8.4	0.87	27.0	9.7	15.6

GSE Environmental, LLC

ROLL TEST DATA REPORT

GSE QC APPROVED

Report Date: Jun/15/2015

Sales Order No.	Customer Name	Project Location	Product Name	BOL Number
SO−076037	Chesapeake Containment Systems, Inc.	Moncure NC US	BLI−075−06N−03S−D3CR	

Roll Number	ASTM D4632 Grab Strength (lbs)	ASTM D4632 Peel Strength (lbs)	ASTM D6768 Tensile Strength (ppi)	ASTM D6496 Peel Strength (ppi)	ASTM D5993 Clay Content @ 0% Moisture (lbs/sf)	ASTM D5890 Free Swell (ml/2g)	ASTM D2216 Moisture Content (%)	ASTM D5891 Fluid Loss (ml)
135033802	146	47	44.0	8.4	0.87	27.0	9.7	15.6
135033803	146	47	44.0	8.4	0.87	27.0	9.7	15.6
135033804	146	47	44.0	8.4	0.87	27.0	9.7	15.6
135033805	177	43	50.3	7.7	0.84	27.0	9.7	15.6
135033806	147	49	45.9	8.5	0.83	27.0	9.7	15.6
135033807	147	49	45.9	8.5	0.83	28.0	9.4	14.8
135033808	147	49	45.9	8.5	0.83	28.0	9.4	14.8
135033809	147	49	45.9	8.5	0.83	28.0	9.4	14.8
135033810	147	49	45.9	8.5	0.83	28.0	9.4	14.8
135033811	147	49	45.9	8.5	0.83	28.0	9.4	14.8
135033812	147	49	45.9	8.5	0.83	28.0	9.4	14.8
135033813	147	49	45.9	8.5	0.83	28.0	9.4	14.8
135033814	147	49	45.9	8.5	0.83	28.0	9.4	14.8
135033815	147	49	45.9	8.5	0.83	28.0	9.4	14.8
135033816	147	49	45.9	8.5	0.83	28.0	9.4	14.8
135033817	147	49	45.9	8.5	0.83	28.0	9.4	14.8
135033819	147	49	45.9	8.5	0.83	30.0	9.7	14.0
135033820	147	49	45.9	8.5	0.83	28.0	9.4	14.8
135033821	147	49	45.9	8.5	0.83	28.0	9.4	14.8
135033822	141	40	45.9	7.3	0.89	30.0	9.7	14.0
135033823	141	40	45.9	7.3	0.89	30.0	9.7	14.0
135033824	141	40	45.9	7.3	0.89	30.0	9.7	14.0
135033825	141	40	45.9	7.3	0.89	30.0	9.7	14.0
135033826	141	40	45.9	7.3	0.89	30.0	9.7	14.0
135033827	141	40	45.9	7.3	0.89	30.0	9.7	14.0
135033828	141	40	45.9	7.3	0.89	30.0	9.7	14.0
135033829	141	40	45.9	7.3	0.89	30.0	9.7	14.0
135033830	141	40	45.9	7.3	0.89	30.0	9.7	14.0
135033831	141	40	45.9	7.3	0.89	30.0	9.7	14.0
135033832	141	40	45.9	7.3	0.89	30.0	9.7	14.0
135033833	141	40	45.9	7.3	0.89	30.0	9.7	14.0
135033834	141	40	45.9	7.3	0.89	30.0	9.7	14.0
135033835	141	40	45.9	7.3	0.89	30.0	9.7	14.0
135033836	141	40	45.9	7.3	0.89	30.0	9.7	14.0

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Sales Order No.	Customer Name	Project Location	Product Name	BOL Number
SO−076037	Chesapeake Containment Systems, Inc.	Moncure NC US	BLI−075−06N−03S−D3CR	

Roll Number	ASTM D4632 Grab Strength (lbs)	ASTM D4632 Peel Strength (lbs)	ASTM D6768 Tensile Strength (ppi)	ASTM D6496 Peel Strength (ppi)	ASTM D5993 Clay Content @ 0% Moisture (lbs/sf)	ASTM D5890 Free Swell (ml/2g)	ASTM D2216 Moisture Content (%)	ASTM D5891 Fluid Loss (ml)
135033837	141	40	45.9	7.3	0.89	30.0	9.7	14.0
135033838	163	43	61.7	6.9	0.84	28.0	9.4	14.8
135033839	163	43	61.7	6.9	0.84	28.0	9.4	14.8
135033840	163	43	61.7	6.9	0.84	28.0	9.4	14.8
135033841	163	43	61.7	6.9	0.84	28.0	9.4	14.8
135033842	163	43	61.7	6.9	0.84	28.0	9.4	14.8
135033843	163	43	61.7	6.9	0.84	28.0	9.4	14.8
135033844	163	43	61.7	6.9	0.84	28.0	9.4	14.8
135033845	163	43	61.7	6.9	0.84	28.0	9.4	14.8
135033846	163	43	61.7	6.9	0.84	28.0	9.4	14.8
135033847	163	43	61.7	6.9	0.84	28.0	9.4	14.8
135033848	163	43	61.7	6.9	0.84	28.0	9.4	14.8
135033849	163	43	61.7	6.9	0.84	28.0	9.4	14.8
135033850	163	43	61.7	6.9	0.84	28.0	9.4	14.8
135033851	163	43	61.7	6.9	0.84	28.0	9.4	14.8
135033852	163	43	61.7	6.9	0.84	28.0	9.4	14.8
135033853	163	43	61.7	6.9	0.84	28.0	9.4	14.8
135033854	202	46	67.9	7.9	0.84	28.0	9.4	14.8
135033855	202	46	67.9	7.9	0.84	28.0	9.4	14.8
135033856	202	46	67.9	7.9	0.84	28.0	9.4	14.8
135033857	202	46	67.9	7.9	0.84	28.0	9.4	14.8
135033858	202	46	67.9	7.9	0.84	28.0	9.4	14.8
135033859	202	46	67.9	7.9	0.84	28.0	9.4	14.8
135033860	202	46	67.9	7.9	0.84	28.0	9.4	14.8
135033861	202	46	67.9	7.9	0.84	28.0	9.4	14.8
135033862	202	46	67.9	7.9	0.84	28.0	9.4	14.8
135033863	202	46	67.9	7.9	0.84	28.0	9.4	14.8
135033864	202	46	67.9	7.9	0.84	28.0	9.4	14.8
135033865	202	46	67.9	7.9	0.84	28.0	9.4	14.8
135033866	202	46	67.9	7.9	0.84	28.0	9.4	14.8
135033867	202	46	67.9	7.9	0.84	28.0	9.4	14.8
135033868	202	46	67.9	7.9	0.84	28.0	9.4	14.8
135033869	202	46	67.9	7.9	0.84	28.0	9.4	14.8
135033870	168	41	59.4	6.4	0.85	27.0	9.4	14.4

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SO−076037	Chesapeake Containment Systems, Inc.	Moncure NC US	BLI−075−06N−03S−D3CR	

Roll Number	ASTM D4632 Grab Strength (lbs)	ASTM D4632 Peel Strength (lbs)	ASTM D6768 Tensile Strength (ppi)	ASTM D6496 Peel Strength (ppi)	ASTM D5993 Clay Content @ 0% Moisture (lbs/sf)	ASTM D5890 Free Swell (ml/2g)	ASTM D2216 Moisture Content (%)	ASTM D5891 Fluid Loss (ml)
135033871	168	41	59.4	6.4	0.85	27.0	9.4	14.4
135033872	168	41	59.4	6.4	0.85	27.0	9.4	14.4
135033873	168	41	59.4	6.4	0.85	27.0	9.4	14.4
135033874	168	41	59.4	6.4	0.85	27.0	9.4	14.4
135033875	168	41	59.4	6.4	0.85	27.0	9.4	14.4
135033876	168	41	59.4	6.4	0.85	27.0	9.4	14.4
135033877	168	41	59.4	6.4	0.85	27.0	9.4	14.4
135033878	168	41	59.4	6.4	0.85	27.0	9.4	14.4
135033879	168	41	59.4	6.4	0.85	27.0	9.4	14.4
135033880	168	41	59.4	6.4	0.85	27.0	9.4	14.4
135033881	168	41	59.4	6.4	0.85	27.0	9.4	14.4
135033882	168	41	59.4	6.4	0.85	27.0	9.4	14.4
135033883	168	41	59.4	6.4	0.85	27.0	9.4	14.4
135033884	168	41	59.4	6.4	0.85	27.0	9.4	14.4
135033885	168	41	59.4	6.4	0.85	27.0	9.4	14.4
135033886	144	40	54.9	7.0	0.83	27.0	9.4	14.4
135033887	144	40	54.9	7.0	0.83	27.0	9.4	14.4
135033888	144	40	54.9	7.0	0.83	27.0	9.4	14.4
135033889	144	40	54.9	7.0	0.83	27.0	9.4	14.4
135033890	144	40	54.9	7.0	0.83	27.0	9.4	14.4
135033891	144	40	54.9	7.0	0.83	27.0	9.4	14.4
135033892	144	40	54.9	7.0	0.83	27.0	9.4	14.4
135033893	144	40	54.9	7.0	0.83	27.0	9.4	14.4
135033894	144	40	54.9	7.0	0.83	27.0	9.4	14.4
135033895	144	40	54.9	7.0	0.83	27.0	9.4	14.4
135033896	144	40	54.9	7.0	0.83	27.0	9.4	14.4
135033897	144	40	54.9	7.0	0.83	27.0	9.4	14.4
135033898	144	40	54.9	7.0	0.83	27.0	9.4	14.4
135033899	144	40	54.9	7.0	0.83	27.0	9.4	14.4
135033900	144	40	54.9	7.0	0.83	27.0	9.4	14.4
135033901	144	40	54.9	7.0	0.83	27.0	9.4	14.4
135033902	174	47	64.5	7.5	0.83	27.0	9.4	14.4
135033903	174	47	64.5	7.5	0.83	27.0	9.4	14.4
135033904	174	47	64.5	7.5	0.83	27.0	9.4	14.4

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SO−076037	Chesapeake Containment Systems, Inc.	Moncure NC US	BLI−075−06N−03S−D3CR	

Roll Number	ASTM D4632 Grab Strength (lbs)	ASTM D4632 Peel Strength (lbs)	ASTM D6768 Tensile Strength (ppi)	ASTM D6496 Peel Strength (ppi)	ASTM D5993 Clay Content @ 0% Moisture (lbs/sf)	ASTM D5890 Free Swell (ml/2g)	ASTM D2216 Moisture Content (%)	ASTM D5891 Fluid Loss (ml)
135033905	174	47	64.5	7.5	0.83	27.0	9.4	14.4
135033906	174	47	64.5	7.5	0.83	27.0	9.4	14.4
135033907	174	47	64.5	7.5	0.83	27.0	9.4	14.4
135033908	174	47	64.5	7.5	0.83	27.0	9.4	14.4
135033909	174	47	64.5	7.5	0.83	27.0	9.4	14.4
135033910	174	47	64.5	7.5	0.83	27.0	9.4	14.4
135033911	174	47	64.5	7.5	0.83	27.0	9.4	14.4
135033912	174	47	64.5	7.5	0.83	27.0	9.4	14.4
135033913	174	47	64.5	7.5	0.83	27.0	9.4	14.4
135033914	174	47	64.5	7.5	0.83	27.0	9.4	14.4
135033915	174	47	64.5	7.5	0.83	27.0	9.4	14.4
135033916	174	47	64.5	7.5	0.83	27.0	9.4	14.4
135033917	174	47	64.5	7.5	0.83	27.0	9.4	14.4
135033918	162	57	63.6	9.5	0.90	28.0	9.4	13.6
135033919	162	57	63.6	9.5	0.90	28.0	9.4	13.6
135033921	162	57	63.6	9.5	0.90	28.0	9.4	13.6
135033922	162	57	63.6	9.5	0.90	28.0	9.4	13.6
135033923	162	57	63.6	9.5	0.90	28.0	9.4	13.6
135033924	162	57	63.6	9.5	0.90	28.0	9.4	13.6
135033925	162	57	63.6	9.5	0.90	28.0	9.4	13.6
135033926	162	57	63.6	9.5	0.90	28.0	9.4	13.6
135033927	162	57	63.6	9.5	0.90	28.0	9.4	13.6
135033928	162	57	63.6	9.5	0.90	28.0	9.4	13.6
135033929	162	57	63.6	9.5	0.90	28.0	9.4	13.6
135033930	162	57	63.6	9.5	0.90	28.0	9.4	13.6
135033931	162	57	63.6	9.5	0.90	28.0	9.4	13.6
135033932	162	57	63.6	9.5	0.90	28.0	9.4	13.6
135033933	162	57	63.6	9.5	0.90	28.0	9.4	13.6
135033934	187	40	64.4	6.4	0.85	28.0	9.4	13.6
135033935	187	40	64.4	6.4	0.85	28.0	9.4	13.6
135033936	187	40	64.4	6.4	0.85	28.0	9.4	13.6
135033937	187	40	64.4	6.4	0.85	28.0	9.4	13.6
135033938	187	40	64.4	6.4	0.85	28.0	9.4	13.6
135033939	187	40	64.4	6.4	0.85	28.0	9.4	13.6

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SO−076037	Chesapeake Containment Systems, Inc.	Moncure NC US	BLI−075−06N−03S−D3CR	

Roll Number	ASTM D4632 Grab Strength (lbs)	ASTM D4632 Peel Strength (lbs)	ASTM D6768 Tensile Strength (ppi)	ASTM D6496 Peel Strength (ppi)	ASTM D5993 Clay Content @ 0% Moisture (lbs/sf)	ASTM D5890 Free Swell (ml/2g)	ASTM D2216 Moisture Content (%)	ASTM D5891 Fluid Loss (ml)
135033940	187	40	64.4	6.4	0.85	28.0	9.4	13.6
135033941	187	40	64.4	6.4	0.85	28.0	9.4	13.6
135033942	187	40	64.4	6.4	0.85	28.0	9.4	13.6
135033943	187	40	64.4	6.4	0.85	28.0	9.4	13.6
135033944	187	40	64.4	6.4	0.85	28.0	9.4	13.6
135033945	187	40	64.4	6.4	0.85	28.0	9.4	13.6
135033946	187	40	64.4	6.4	0.85	28.0	9.4	13.6
135033947	187	40	64.4	6.4	0.85	28.0	9.4	13.6
135033948	187	40	64.4	6.4	0.85	28.0	9.4	13.6
135033949	187	40	64.4	6.4	0.85	28.0	9.4	13.6
135033950	188	46	70.5	7.6	0.87	28.0	9.4	13.6
135033951	188	46	70.5	7.6	0.87	28.0	9.4	13.6
135033952	188	46	70.5	7.6	0.87	28.0	9.4	13.6
135033953	188	46	70.5	7.6	0.87	28.0	9.4	13.6
135033954	188	46	70.5	7.6	0.87	28.0	9.4	13.6
135033955	188	46	70.5	7.6	0.87	28.0	9.4	13.6
135033956	188	46	70.5	7.6	0.87	28.0	9.4	13.6
135033957	188	46	70.5	7.6	0.87	28.0	9.4	13.6
135033958	188	46	70.5	7.6	0.87	28.0	9.4	13.6
135033959	188	46	70.5	7.6	0.87	28.0	9.4	13.6
135033960	188	46	70.5	7.6	0.87	28.0	9.4	13.6
135033961	188	46	70.5	7.6	0.87	28.0	9.4	13.6
135033962	188	46	70.5	7.6	0.87	28.0	9.4	13.6
135033963	188	46	70.5	7.6	0.87	28.0	9.4	13.6
135033964	188	46	70.5	7.6	0.87	28.0	9.4	13.6
135033965	188	46	70.5	7.6	0.87	28.0	9.4	13.6
135033966	148	38	54.0	7.1	0.81	30.0	11.9	14.2
135033967	148	38	54.0	7.1	0.81	30.0	11.9	14.2
135033968	148	38	54.0	7.1	0.81	30.0	11.9	14.2
135033969	148	38	54.0	7.1	0.81	30.0	11.9	14.2
135033970	148	38	54.0	7.1	0.81	30.0	11.9	14.2
135033971	148	38	54.0	7.1	0.81	30.0	11.9	14.2
135033972	148	38	54.0	7.1	0.81	30.0	11.9	14.2
135033973	148	38	54.0	7.1	0.81	30.0	11.9	14.2

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Roll Number	ASTM D4632 Grab Strength (lbs)	ASTM D4632 Peel Strength (lbs)	ASTM D6768 Tensile Strength (ppi)	ASTM D6496 Peel Strength (ppi)	ASTM D5993 Clay Content @ 0% Moisture (lbs/sf)	ASTM D5890 Free Swell (ml/2g)	ASTM D2216 Moisture Content (%)	ASTM D5891 Fluid Loss (ml)
135033974	148	38	54.0	7.1	0.81	30.0	11.9	14.2
135033975	148	38	54.0	7.1	0.81	30.0	11.9	14.2
135033976	148	38	54.0	7.1	0.81	30.0	11.9	14.2
135033977	148	38	54.0	7.1	0.81	30.0	11.9	14.2
135033978	148	38	54.0	7.1	0.81	30.0	11.9	14.2
135033979	148	38	54.0	7.1	0.81	30.0	11.9	14.2
135033980	148	38	54.0	7.1	0.81	30.0	11.9	14.2
135033981	148	38	54.0	7.1	0.81	30.0	11.9	14.2
135033982	158	42	58.1	7.9	0.79	30.0	11.9	14.2
135033983	158	42	58.1	7.9	0.79	30.0	11.9	14.2
135033984	158	42	58.1	7.9	0.79	30.0	11.9	14.2
135033985	158	42	58.1	7.9	0.79	30.0	11.9	14.2
135033986	158	42	58.1	7.9	0.79	30.0	11.9	14.2
135033987	158	42	58.1	7.9	0.79	30.0	11.9	14.2
135033988	158	42	58.1	7.9	0.79	30.0	11.9	14.2
135033989	158	42	58.1	7.9	0.79	30.0	11.9	14.2
135033990	158	42	58.1	7.9	0.79	30.0	11.9	14.2
135033991	158	42	58.1	7.9	0.79	30.0	11.9	14.2
135033992	158	42	58.1	7.9	0.79	30.0	11.9	14.2
135033993	158	42	58.1	7.9	0.79	30.0	11.9	14.2
135033994	158	42	58.1	7.9	0.79	30.0	11.9	14.2
135033995	158	42	58.1	7.9	0.79	30.0	11.9	14.2
135033996	158	42	58.1	7.9	0.79	30.0	11.9	14.2
135033997	158	42	58.1	7.9	0.79	30.0	11.9	14.2
135033998	144	40	59.6	6.7	0.83	30.0	11.9	14.2
135033999	144	40	59.6	6.7	0.83	30.0	11.9	14.2
135034000	144	40	59.6	6.7	0.83	30.0	11.9	14.2
135034001	144	40	59.6	6.7	0.83	30.0	11.9	14.2
135034002	144	40	59.6	6.7	0.83	30.0	11.9	14.2
135034003	144	40	59.6	6.7	0.83	30.0	11.9	14.2
135034004	144	40	59.6	6.7	0.83	30.0	11.9	14.2
135034005	144	40	59.6	6.7	0.83	30.0	11.9	14.2
135034006	144	40	59.6	6.7	0.83	30.0	11.9	14.2
135034007	144	40	59.6	6.7	0.83	30.0	11.9	14.2

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Roll Number	ASTM D4632 Grab Strength (lbs)	ASTM D4632 Peel Strength (lbs)	ASTM D6768 Tensile Strength (ppi)	ASTM D6496 Peel Strength (ppi)	ASTM D5993 Clay Content @ 0% Moisture (lbs/sf)	ASTM D5890 Free Swell (ml/2g)	ASTM D2216 Moisture Content (%)	ASTM D5891 Fluid Loss (ml)
135034008	144	40	59.6	6.7	0.83	30.0	11.9	14.2
135034009	144	40	59.6	6.7	0.83	30.0	11.9	14.2
135034010	144	40	59.6	6.7	0.83	30.0	11.9	14.2
135034011	144	40	59.6	6.7	0.83	30.0	11.9	14.2
135034012	144	40	59.6	6.7	0.83	30.0	11.9	14.2
135034013	144	40	59.6	6.7	0.83	30.0	11.9	14.2
135034014	147	37	47.0	6.3	0.90	31.0	8.2	14.6
135034015	147	37	47.0	6.3	0.90	31.0	8.2	14.6
135034016	147	37	47.0	6.3	0.90	31.0	8.2	14.6
135034017	147	37	47.0	6.3	0.90	31.0	8.2	14.6
135034018	147	37	47.0	6.3	0.90	31.0	8.2	14.6
135034019	147	37	47.0	6.3	0.90	31.0	8.2	14.6
135034020	147	37	47.0	6.3	0.90	31.0	8.2	14.6
135034021	147	37	47.0	6.3	0.90	31.0	8.2	14.6
135034022	147	37	47.0	6.3	0.90	31.0	8.2	14.6
135034023	147	37	47.0	6.3	0.90	31.0	8.2	14.6
135034024	147	37	47.0	6.3	0.90	31.0	8.2	14.6
135034025	147	37	47.0	6.3	0.90	31.0	8.2	14.6
135034026	147	37	47.0	6.3	0.90	31.0	8.2	14.6
135034027	147	37	47.0	6.3	0.90	31.0	8.2	14.6
135034028	147	37	47.0	6.3	0.90	31.0	8.2	14.6
135034029	147	37	47.0	6.3	0.90	31.0	8.2	14.6
135034030	145	39	56.9	7.0	0.84	31.0	8.2	14.6
135034031	145	39	56.9	7.0	0.84	31.0	8.2	14.6
135034032	145	39	56.9	7.0	0.84	31.0	8.2	14.6
135034033	145	39	56.9	7.0	0.84	31.0	8.2	14.6
135034034	145	39	56.9	7.0	0.84	31.0	8.2	14.6
135034035	145	39	56.9	7.0	0.84	31.0	8.2	14.6
135034036	145	39	56.9	7.0	0.84	31.0	8.2	14.6
135034037	145	39	56.9	7.0	0.84	31.0	8.2	14.6
135034038	145	39	56.9	7.0	0.84	31.0	8.2	14.6
135034039	145	39	56.9	7.0	0.84	31.0	8.2	14.6
135034040	145	39	56.9	7.0	0.84	31.0	8.2	14.6
135034041	145	39	56.9	7.0	0.84	31.0	8.2	14.6

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Sales Order No.	Customer Name	Project Location	Product Name	BOL Number
SO−076037	Chesapeake Containment Systems, Inc.	Moncure NC US	BLI−075−06N−03S−D3CR	

Roll Number	ASTM D4632 Grab Strength (lbs)	ASTM D4632 Peel Strength (lbs)	ASTM D6768 Tensile Strength (ppi)	ASTM D6496 Peel Strength (ppi)	ASTM D5993 Clay Content @ 0% Moisture (lbs/sf)	ASTM D5890 Free Swell (ml/2g)	ASTM D2216 Moisture Content (%)	ASTM D5891 Fluid Loss (ml)
135034042	145	39	56.9	7.0	0.84	31.0	8.2	14.6
135034043	145	39	56.9	7.0	0.84	31.0	8.2	14.6
135034044	145	39	56.9	7.0	0.84	31.0	8.2	14.6
135034045	145	39	56.9	7.0	0.84	31.0	8.2	14.6
135034046	186	37	47.9	5.7	0.84	31.0	8.2	14.6
135034047	186	37	47.9	5.7	0.84	31.0	8.2	14.6
135034048	186	37	47.9	5.7	0.84	31.0	8.2	14.6
135034049	186	37	47.9	5.7	0.84	31.0	8.2	14.6
135034050	186	37	47.9	5.7	0.84	31.0	8.2	14.6
135034051	186	37	47.9	5.7	0.84	31.0	8.2	14.6
135034052	186	37	47.9	5.7	0.84	31.0	8.2	14.6
135034053	186	37	47.9	5.7	0.84	31.0	8.2	14.6
135034054	186	37	47.9	5.7	0.84	31.0	8.2	14.6
135034055	186	37	47.9	5.7	0.84	31.0	8.2	14.6
135034056	186	37	47.9	5.7	0.84	31.0	8.2	14.6
135034057	186	37	47.9	5.7	0.84	31.0	8.2	14.6
135034058	170	46	48.9	7.8	0.82	31.0	8.2	14.6
135034059	170	46	48.9	7.8	0.82	31.0	8.2	14.6
135034060	197	40	46.2	6.3	0.85	28.0	10.1	13.8
135034061	197	40	46.2	6.3	0.85	28.0	10.1	13.8
135034062	197	40	46.2	6.3	0.85	28.0	10.1	13.8
135034063	197	40	46.2	6.3	0.85	28.0	10.1	13.8
135034064	197	40	46.2	6.3	0.85	28.0	10.1	13.8
135034065	197	40	46.2	6.3	0.85	28.0	10.1	13.8
135034066	197	40	46.2	6.3	0.85	28.0	10.1	13.8
135034067	197	40	46.2	6.3	0.85	28.0	10.1	13.8
135034068	197	40	46.2	6.3	0.85	28.0	10.1	13.8
135034069	197	40	46.2	6.3	0.85	28.0	10.1	13.8
135034070	197	40	46.2	6.3	0.85	28.0	10.1	13.8
135034071	197	40	46.2	6.3	0.85	28.0	10.1	13.8
135034072	197	40	46.2	6.3	0.85	28.0	10.1	13.8
135034073	197	40	46.2	6.3	0.85	28.0	10.1	13.8
135034074	197	40	46.2	6.3	0.85	28.0	10.1	13.8
135034075	197	40	46.2	6.3	0.85	28.0	10.1	13.8

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SO−076037	Chesapeake Containment Systems, Inc.	Moncure NC US	BLI−075−06N−03S−D3CR	

Roll Number	ASTM D4632 Grab Strength (lbs)	ASTM D4632 Peel Strength (lbs)	ASTM D6768 Tensile Strength (ppi)	ASTM D6496 Peel Strength (ppi)	ASTM D5993 Clay Content @ 0% Moisture (lbs/sf)	ASTM D5890 Free Swell (ml/2g)	ASTM D2216 Moisture Content (%)	ASTM D5891 Fluid Loss (ml)
135034076	194	37	54.5	5.9	0.86	28.0	10.1	13.8
135034077	194	37	54.5	5.9	0.86	28.0	10.1	13.8
135034078	194	37	54.5	5.9	0.86	28.0	10.1	13.8
135034079	194	37	54.5	5.9	0.86	28.0	10.1	13.8
135034080	194	37	54.5	5.9	0.86	28.0	10.1	13.8
135034081	194	37	54.5	5.9	0.86	28.0	10.1	13.8
135034082	194	37	54.5	5.9	0.86	28.0	10.1	13.8
135034083	143	62	60.7	10.5	0.79	28.0	10.1	13.8
135034084	173	44	61.2	7.8	0.80	28.0	10.1	13.8
135034085	173	44	61.2	7.8	0.80	28.0	10.1	13.8
135034086	173	44	61.2	7.8	0.80	28.0	10.1	13.8
135034087	173	44	61.2	7.8	0.80	28.0	10.1	13.8
135034088	173	44	61.2	7.8	0.80	28.0	10.1	13.8
135034089	173	44	61.2	7.8	0.80	28.0	10.1	13.8
135034090	173	44	61.2	7.8	0.80	28.0	10.1	13.8
135034091	173	44	61.2	7.8	0.80	28.0	10.1	13.8
135034092	173	44	61.2	7.8	0.80	28.0	10.1	13.8
135034093	173	44	61.2	7.8	0.80	28.0	10.1	13.8
135034094	173	44	61.2	7.8	0.80	28.0	10.1	13.8
135034095	173	44	61.2	7.8	0.80	28.0	10.1	13.8
135034096	173	44	61.2	7.8	0.80	28.0	10.1	13.8
135034097	173	44	61.2	7.8	0.80	28.0	10.1	13.8
135034098	173	44	61.2	7.8	0.80	28.0	10.1	13.8
135034099	181	39	63.2	7.8	0.86	28.0	10.1	13.8
135034100	187	47	51.8	7.4	0.86	28.0	10.1	13.8
135034101	187	47	51.8	7.4	0.86	28.0	10.1	13.8
135034102	187	47	51.8	7.4	0.86	28.0	10.1	13.8
135034103	187	47	51.8	7.4	0.86	28.0	10.1	13.8
135034104	187	47	51.8	7.4	0.86	28.0	10.1	13.8
135034105	187	47	51.8	7.4	0.86	28.0	10.1	13.8
135034106	187	47	51.8	7.4	0.86	28.0	10.1	13.8
135034111	189	54	55.7	9.5	0.83	28.0	10.1	13.8
135034112	172	41	60.6	7.7	0.87	29.0	9.6	14.4
135034113	172	41	60.6	7.7	0.87	29.0	9.6	14.4

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SO−076037	Chesapeake Containment Systems, Inc.	Moncure NC US	BLI−075−06N−03S−D3CR	

Roll Number	ASTM D4632 Grab Strength (lbs)	ASTM D4632 Peel Strength (lbs)	ASTM D6768 Tensile Strength (ppi)	ASTM D6496 Peel Strength (ppi)	ASTM D5993 Clay Content @ 0% Moisture (lbs/sf)	ASTM D5890 Free Swell (ml/2g)	ASTM D2216 Moisture Content (%)	ASTM D5891 Fluid Loss (ml)
135034114	172	41	60.6	7.7	0.87	29.0	9.6	14.4
135034115	172	41	60.6	7.7	0.87	29.0	9.6	14.4
135034116	172	41	60.6	7.7	0.87	29.0	9.6	14.4
135034117	172	41	60.6	7.7	0.87	29.0	9.6	14.4
135034118	172	41	60.6	7.7	0.87	29.0	9.6	14.4
135034119	172	41	60.6	7.7	0.87	29.0	9.6	14.4
135034120	172	41	60.6	7.7	0.87	29.0	9.6	14.4
135034121	172	41	60.6	7.7	0.87	29.0	9.6	14.4
135034122	172	41	60.6	7.7	0.87	29.0	9.6	14.4
135034123	172	41	60.6	7.7	0.87	29.0	9.6	14.4
135034124	172	41	60.6	7.7	0.87	29.0	9.6	14.4
135034125	173	40	60.0	7.1	0.85	29.0	9.6	14.4
135034126	174	37	58.4	5.5	0.93	29.0	9.6	14.4
135034127	174	37	58.4	5.5	0.93	29.0	9.6	14.4
135034128	174	37	58.4	5.5	0.93	29.0	9.6	14.4
135034129	174	37	58.4	5.5	0.93	29.0	9.6	14.4
135034130	174	37	58.4	5.5	0.93	29.0	9.6	14.4
135034131	174	37	58.4	5.5	0.93	29.0	9.6	14.4
135034132	174	37	58.4	5.5	0.93	29.0	9.6	14.4
135034133	174	37	58.4	5.5	0.93	29.0	9.6	14.4
135034141	173	41	52.2	7.3	0.86	29.0	9.6	14.4
135034142	206	39	50.8	7.3	0.87	29.0	9.6	14.4
135034143	206	39	50.8	7.3	0.87	29.0	9.6	14.4
135034144	206	39	50.8	7.3	0.87	29.0	9.6	14.4
135034145	206	39	50.8	7.3	0.87	29.0	9.6	14.4
135034146	206	39	50.8	7.3	0.87	29.0	9.6	14.4
135034147	206	39	50.8	7.3	0.87	29.0	9.6	14.4
135034180	198	41	63.5	7.3	0.93	29.0	9.6	14.4
135034181	190	38	58.2	6.4	0.93	29.0	9.6	14.4
135034182	190	38	58.2	6.4	0.93	29.0	9.6	14.4
135034183	190	38	58.2	6.4	0.93	29.0	9.6	14.4
135034184	190	38	58.2	6.4	0.93	29.0	9.6	14.4
135034185	190	38	58.2	6.4	0.93	28.0	8.7	14.6
135034186	190	38	58.2	6.4	0.93	28.0	8.7	14.6

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SO−076037	Chesapeake Containment Systems, Inc.	Moncure NC US	BLI−075−06N−03S−D3CR	

Roll Number	ASTM D4632 Grab Strength (lbs)	ASTM D4632 Peel Strength (lbs)	ASTM D6768 Tensile Strength (ppi)	ASTM D6496 Peel Strength (ppi)	ASTM D5993 Clay Content @ 0% Moisture (lbs/sf)	ASTM D5890 Free Swell (ml/2g)	ASTM D2216 Moisture Content (%)	ASTM D5891 Fluid Loss (ml)
135034187	190	38	58.2	6.4	0.93	28.0	8.7	14.6
135034188	190	38	58.2	6.4	0.93	28.0	8.7	14.6
135034189	190	38	58.2	6.4	0.93	28.0	8.7	14.6
135034190	190	38	58.2	6.4	0.93	28.0	8.7	14.6
135034191	190	38	58.2	6.4	0.93	28.0	8.7	14.6
135034192	190	38	58.2	6.4	0.93	28.0	8.7	14.6
135034193	190	38	58.2	6.4	0.93	28.0	8.7	14.6
135034194	190	38	58.2	6.4	0.93	28.0	8.7	14.6
135034195	190	38	58.2	6.4	0.93	28.0	10.1	13.8
135034196	190	38	58.2	6.4	0.93	28.0	8.7	14.6
135034197	181	48	58.3	8.8	0.86	28.0	8.7	14.6
135034198	181	48	58.3	8.8	0.86	28.0	8.7	14.6
135034199	181	48	58.3	8.8	0.86	28.0	8.7	14.6
135034200	181	48	58.3	8.8	0.86	28.0	8.7	14.6
135034201	181	48	58.3	8.8	0.86	28.0	8.7	14.6
135034202	181	48	58.3	8.8	0.86	28.0	8.7	14.6
135034203	181	48	58.3	8.8	0.86	28.0	8.7	14.6
135034204	181	48	58.3	8.8	0.86	28.0	8.7	14.6
135034205	181	48	58.3	8.8	0.86	28.0	8.7	14.6
135034206	181	48	58.3	8.8	0.86	28.0	8.7	14.6
135034207	181	48	58.3	8.8	0.86	28.0	8.7	14.6
135034208	181	48	58.3	8.8	0.86	28.0	8.7	14.6
135034209	181	48	58.3	8.8	0.86	28.0	8.7	14.6
135034210	181	48	58.3	8.8	0.86	28.0	8.7	14.6
135034211	181	48	58.3	8.8	0.86	28.0	8.7	14.6
135034212	181	48	58.3	8.8	0.86	28.0	8.7	14.6
135034213	167	52	50.1	8.5	0.86	29.0	11.4	14.6
135034214	167	52	50.1	8.5	0.86	29.0	11.4	14.6
135034215	167	52	50.1	8.5	0.86	29.0	11.4	14.6
135034216	167	52	50.1	8.5	0.86	29.0	11.4	14.6
135034217	167	52	50.1	8.5	0.86	29.0	11.4	14.6
135034218	167	52	50.1	8.5	0.86	29.0	11.4	14.6
135034220	167	52	50.1	8.5	0.86	29.0	11.4	14.6
135034221	167	52	50.1	8.5	0.86	29.0	11.4	14.6

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SO−076037	Chesapeake Containment Systems, Inc.	Moncure NC US	BLI−075−06N−03S−D3CR	

Roll Number	ASTM D4632 Grab Strength (lbs)	ASTM D4632 Peel Strength (lbs)	ASTM D6768 Tensile Strength (ppi)	ASTM D6496 Peel Strength (ppi)	ASTM D5993 Clay Content @ 0% Moisture (lbs/sf)	ASTM D5890 Free Swell (ml/2g)	ASTM D2216 Moisture Content (%)	ASTM D5891 Fluid Loss (ml)
135034222	167	52	50.1	8.5	0.86	29.0	11.4	14.6
135034223	167	52	50.1	8.5	0.86	29.0	11.4	14.6
135034224	167	52	50.1	8.5	0.86	29.0	11.4	14.6
135034225	167	52	50.1	8.5	0.86	29.0	11.4	14.6
135034226	167	52	50.1	8.5	0.86	29.0	11.4	14.6
135034227	167	52	50.1	8.5	0.86	29.0	11.4	14.6
135034228	167	52	50.1	8.5	0.86	29.0	11.4	14.6
135034229	176	37	54.4	7.2	0.84	29.0	11.4	14.6
135034230	176	37	54.4	7.2	0.84	29.0	11.4	14.6
135034231	176	37	54.4	7.2	0.84	29.0	11.4	14.6
135034232	176	37	54.4	7.2	0.84	29.0	11.4	14.6
135034233	176	37	54.4	7.2	0.84	29.0	11.4	14.6
135034234	176	37	54.4	7.2	0.84	29.0	11.4	14.6
135034235	176	37	54.4	7.2	0.84	29.0	11.4	14.6
135034236	176	37	54.4	7.2	0.84	29.0	11.4	14.6
135034237	176	37	54.4	7.2	0.84	29.0	11.4	14.6
135034238	176	37	54.4	7.2	0.84	29.0	11.4	14.6
135034239	176	37	54.4	7.2	0.84	29.0	11.4	14.6
135034240	176	37	54.4	7.2	0.84	29.0	11.4	14.6
135034241	176	37	54.4	7.2	0.84	29.0	11.4	14.6
135034242	176	37	54.4	7.2	0.84	29.0	11.4	14.6
135034243	176	37	54.4	7.2	0.84	29.0	11.4	14.6
135034244	176	37	54.4	7.2	0.84	29.0	11.4	14.6
135034245	135	40	49.7	7.1	0.90	29.0	11.4	14.6
135034246	135	40	49.7	7.1	0.90	29.0	11.4	14.6
135034247	135	40	49.7	7.1	0.90	29.0	11.4	14.6
135034248	135	40	49.7	7.1	0.90	29.0	11.4	14.6
135034249	135	40	49.7	7.1	0.90	29.0	11.4	14.6
135034250	135	40	49.7	7.1	0.90	29.0	11.4	14.6
135034251	135	40	49.7	7.1	0.90	29.0	11.4	14.6
135034252	135	40	49.7	7.1	0.90	29.0	11.4	14.6
135034253	135	40	49.7	7.1	0.90	29.0	11.4	14.6
135034254	135	40	49.7	7.1	0.90	29.0	11.4	14.6
135034255	135	40	49.7	7.1	0.90	29.0	11.4	14.6

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Roll Number	ASTM D4632 Grab Strength (lbs)	ASTM D4632 Peel Strength (lbs)	ASTM D6768 Tensile Strength (ppi)	ASTM D6496 Peel Strength (ppi)	ASTM D5993 Clay Content @ 0% Moisture (lbs/sf)	ASTM D5890 Free Swell (ml/2g)	ASTM D2216 Moisture Content (%)	ASTM D5891 Fluid Loss (ml)
135034256	135	40	49.7	7.1	0.90	29.0	11.4	14.6
135034257	135	40	49.7	7.1	0.90	29.0	11.4	14.6
135034258	135	40	49.7	7.1	0.90	29.0	11.4	14.6
135034260	135	40	49.7	7.1	0.90	29.0	11.4	14.6
135034261	135	44	53.5	8.7	0.83	29.0	11.4	14.6
135034264	135	44	53.5	8.7	0.83	29.0	11.4	14.6
135034265	135	44	53.5	8.7	0.83	29.0	11.4	14.6
135034266	169	46	55.0	9.2	0.85	28.0	8.8	13.2
135034267	132	59	48.8	10.7	0.88	28.0	8.8	13.2
135034268	132	59	48.8	10.7	0.88	28.0	8.8	13.2
135034269	132	59	48.8	10.7	0.88	28.0	8.8	13.2
135034270	132	59	48.8	10.7	0.88	28.0	8.8	13.2
135034271	132	59	48.8	10.7	0.88	28.0	8.8	13.2
135034272	132	59	48.8	10.7	0.88	28.0	8.8	13.2
135034273	132	59	48.8	10.7	0.88	28.0	8.8	13.2
135034274	132	59	48.8	10.7	0.88	28.0	8.8	13.2
135034275	132	59	48.8	10.7	0.88	28.0	8.8	13.2
135034276	132	59	48.8	10.7	0.88	28.0	8.8	13.2
135034277	132	59	48.8	10.7	0.88	28.0	8.8	13.2
135034278	132	59	48.8	10.7	0.88	28.0	8.8	13.2
135034279	132	59	48.8	10.7	0.88	28.0	8.8	13.2
135034280	132	59	48.8	10.7	0.88	28.0	8.8	13.2
135034281	132	59	48.8	10.7	0.88	28.0	8.8	13.2
135034282	132	59	48.8	10.7	0.88	28.0	8.8	13.2
135034283	130	58	44.3	10.0	0.85	28.0	8.8	13.2
135034284	130	58	44.3	10.0	0.85	28.0	8.8	13.2
135034285	130	58	44.3	10.0	0.85	28.0	8.8	13.2
135034286	130	58	44.3	10.0	0.85	28.0	8.8	13.2
135034287	130	58	44.3	10.0	0.85	28.0	8.8	13.2
135034288	130	58	44.3	10.0	0.85	28.0	8.8	13.2
135034289	130	58	44.3	10.0	0.85	28.0	8.8	13.2
135034290	130	58	44.3	10.0	0.85	28.0	8.8	13.2
135034291	130	58	44.3	10.0	0.85	28.0	8.8	13.2
135034292	130	58	44.3	10.0	0.85	28.0	8.8	13.2

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Sales Order No.	Customer Name	Project Location	Product Name	BOL Number
SO−076037	Chesapeake Containment Systems, Inc.	Moncure NC US	BLI−075−06N−03S−D3CR	

Roll Number	ASTM D4632 Grab Strength (lbs)	ASTM D4632 Peel Strength (lbs)	ASTM D6768 Tensile Strength (ppi)	ASTM D6496 Peel Strength (ppi)	ASTM D5993 Clay Content @ 0% Moisture (lbs/sf)	ASTM D5890 Free Swell (ml/2g)	ASTM D2216 Moisture Content (%)	ASTM D5891 Fluid Loss (ml)
135034293	130	58	44.3	10.0	0.85	28.0	8.8	13.2
135034294	130	58	44.3	10.0	0.85	28.0	8.8	13.2
135034295	130	58	44.3	10.0	0.85	28.0	8.8	13.2
135034297	130	58	44.3	10.0	0.85	28.0	8.8	13.2
135034298	134	38	56.8	6.7	0.84	28.0	8.8	13.2
135034299	209	45	57.9	8.2	0.87	28.0	8.8	13.2
135034300	209	45	57.9	8.2	0.87	28.0	8.8	13.2
135034301	209	45	57.9	8.2	0.87	28.0	8.8	13.2
135034302	209	45	57.9	8.2	0.87	28.0	8.8	13.2
135034303	209	45	57.9	8.2	0.87	28.0	8.8	13.2
135034305	209	45	57.9	8.2	0.87	28.0	8.8	13.2
135034306	209	45	57.9	8.2	0.87	28.0	8.8	13.2
135034307	209	45	57.9	8.2	0.87	28.0	8.8	13.2
135034308	209	45	57.9	8.2	0.87	28.0	8.8	13.2
135034309	209	45	57.9	8.2	0.87	28.0	8.8	13.2
135034310	209	45	57.9	8.2	0.87	28.0	8.8	13.2
135034311	209	45	57.9	8.2	0.87	28.0	8.8	13.2
135034312	209	45	57.9	8.2	0.87	28.0	8.8	13.2
135034313	209	45	57.9	8.2	0.87	28.0	8.8	13.2
135034314	209	45	57.9	8.2	0.87	28.0	8.8	13.2
135034315	175	39	50.3	7.1	0.83	28.0	8.8	13.2
135034316	175	39	50.3	7.1	0.83	28.0	8.8	13.2
135034317	175	39	50.3	7.1	0.83	28.0	8.8	13.2
135034318	175	39	50.3	7.1	0.83	28.0	8.8	13.2
135034319	175	39	50.3	7.1	0.83	28.0	8.8	13.2
135034320	175	39	50.3	7.1	0.83	28.0	8.8	13.2
135034321	175	39	50.3	7.1	0.83	28.0	8.8	13.2
135034322	175	39	50.3	7.1	0.83	28.0	8.8	13.2
135034323	175	39	50.3	7.1	0.83	28.0	8.8	13.2
135034324	175	39	50.3	7.1	0.83	28.0	8.8	13.2
135034325	175	39	50.3	7.1	0.83	28.0	8.8	13.2
135034326	175	39	50.3	7.1	0.83	28.0	8.8	13.2
135034327	175	39	50.3	7.1	0.83	28.0	8.8	13.2
135034328	190	37	55.8	6.3	0.83	28.0	8.8	13.2

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SO−076037	Chesapeake Containment Systems, Inc.	Moncure NC US	BLI−075−06N−03S−D3CR	

Roll Number	ASTM D4632 Grab Strength (lbs)	ASTM D4632 Peel Strength (lbs)	ASTM D6768 Tensile Strength (ppi)	ASTM D6496 Peel Strength (ppi)	ASTM D5993 Clay Content @ 0% Moisture (lbs/sf)	ASTM D5890 Free Swell (ml/2g)	ASTM D2216 Moisture Content (%)	ASTM D5891 Fluid Loss (ml)
135034329	168	43	50.4	7.6	0.87	30.0	9.0	13.6
135034330	168	43	50.4	7.6	0.87	30.0	9.0	13.6
135034331	168	43	50.4	7.6	0.87	30.0	9.0	13.6
135034332	168	43	50.4	7.6	0.87	30.0	9.0	13.6
135034333	168	43	50.4	7.6	0.87	30.0	9.0	13.6
135034334	168	43	50.4	7.6	0.87	30.0	9.0	13.6
135034335	168	43	50.4	7.6	0.87	30.0	9.0	13.6
135034336	168	43	50.4	7.6	0.87	30.0	9.0	13.6
135034337	168	43	50.4	7.6	0.87	30.0	9.0	13.6
135034338	168	43	50.4	7.6	0.87	30.0	9.0	13.6
135034339	168	43	50.4	7.6	0.87	30.0	9.0	13.6
135034340	168	43	50.4	7.6	0.87	30.0	9.0	13.6
135034341	168	43	50.4	7.6	0.87	30.0	9.0	13.6
135034342	168	43	50.4	7.6	0.87	30.0	9.0	13.6
135034343	168	43	50.4	7.6	0.87	30.0	9.0	13.6
135034344	168	43	50.4	7.6	0.87	30.0	9.0	13.6
135034345	152	41	48.5	8.1	0.88	30.0	9.0	13.6
135034346	152	41	48.5	8.1	0.88	30.0	9.0	13.6
135034347	152	41	48.5	8.1	0.88	30.0	9.0	13.6
135034348	152	41	48.5	8.1	0.88	30.0	9.0	13.6
135034349	152	41	48.5	8.1	0.88	30.0	9.0	13.6
135034350	152	41	48.5	8.1	0.88	30.0	9.0	13.6
135034351	152	41	48.5	8.1	0.88	30.0	9.0	13.6
135034352	152	41	48.5	8.1	0.88	30.0	9.0	13.6
135034353	152	41	48.5	8.1	0.88	30.0	9.0	13.6
135034354	152	41	48.5	8.1	0.88	30.0	9.0	13.6
135034355	152	41	48.5	8.1	0.88	30.0	9.0	13.6
135034356	152	41	48.5	8.1	0.88	30.0	9.0	13.6
135034357	152	41	48.5	8.1	0.88	30.0	9.0	13.6
135034358	152	41	48.5	8.1	0.88	30.0	9.0	13.6
135034359	152	41	48.5	8.1	0.88	30.0	9.0	13.6
135034360	152	41	48.5	8.1	0.88	30.0	9.0	13.6
135034361	124	38	64.2	7.1	0.84	30.0	9.0	13.6
135034362	124	38	64.2	7.1	0.84	30.0	9.0	13.6

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SO−076037	Chesapeake Containment Systems, Inc.	Moncure NC US	BLI−075−06N−03S−D3CR	

Roll Number	ASTM D4632 Grab Strength (lbs)	ASTM D4632 Peel Strength (lbs)	ASTM D6768 Tensile Strength (ppi)	ASTM D6496 Peel Strength (ppi)	ASTM D5993 Clay Content @ 0% Moisture (lbs/sf)	ASTM D5890 Free Swell (ml/2g)	ASTM D2216 Moisture Content (%)	ASTM D5891 Fluid Loss (ml)
135034363	124	38	64.2	7.1	0.84	30.0	9.0	13.6
135034364	124	38	64.2	7.1	0.84	30.0	9.0	13.6
135034365	124	38	64.2	7.1	0.84	30.0	9.0	13.6
135034366	124	38	64.2	7.1	0.84	30.0	9.0	13.6
135034367	124	38	64.2	7.1	0.84	30.0	9.0	13.6
135034368	124	38	64.2	7.1	0.84	30.0	9.0	13.6
135034369	124	38	64.2	7.1	0.84	30.0	9.0	13.6
135034370	124	38	64.2	7.1	0.84	30.0	9.0	13.6
135034371	124	38	64.2	7.1	0.84	30.0	9.0	13.6
135034372	124	38	64.2	7.1	0.84	30.0	9.0	13.6
135034373	124	38	64.2	7.1	0.84	30.0	9.0	13.6
135034374	124	38	64.2	7.1	0.84	30.0	9.0	13.6
135034375	124	38	64.2	7.1	0.84	30.0	9.0	13.6
135034376	124	38	64.2	7.1	0.84	30.0	9.0	13.6
135034377	95	41	50.1	7.5	0.82	28.0	8.6	14.2
135034378	95	41	50.1	7.5	0.82	28.0	8.6	14.2
135034379	95	41	50.1	7.5	0.82	28.0	8.6	14.2
135034380	95	41	50.1	7.5	0.82	28.0	8.6	14.2
135034381	95	41	50.1	7.5	0.82	28.0	8.6	14.2
135034382	95	41	50.1	7.5	0.82	28.0	8.6	14.2
135034383	95	41	50.1	7.5	0.82	28.0	8.6	14.2
135034384	95	41	50.1	7.5	0.82	28.0	8.6	14.2
135034385	95	41	50.1	7.5	0.82	28.0	8.6	14.2
135034386	95	41	50.1	7.5	0.82	28.0	8.6	14.2
135034387	95	41	50.1	7.5	0.82	28.0	8.6	14.2
135034388	95	41	50.1	7.5	0.82	28.0	8.6	14.2
135034389	95	41	50.1	7.5	0.82	28.0	8.6	14.2
135034390	95	41	50.1	7.5	0.82	28.0	8.6	14.2
135034391	95	41	50.1	7.5	0.82	28.0	8.6	14.2
135034392	95	41	50.1	7.5	0.82	28.0	8.6	14.2
135034393	122	44	53.2	8.1	0.81	28.0	8.6	14.2
135034394	122	44	53.2	8.1	0.81	28.0	8.6	14.2
135034395	122	44	53.2	8.1	0.81	28.0	8.6	14.2
135034396	122	44	53.2	8.1	0.81	28.0	8.6	14.2

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SO−076037	Chesapeake Containment Systems, Inc.	Moncure NC US	BLI−075−06N−03S−D3CR	

Roll Number	ASTM D4632 Grab Strength (lbs)	ASTM D4632 Peel Strength (lbs)	ASTM D6768 Tensile Strength (ppi)	ASTM D6496 Peel Strength (ppi)	ASTM D5993 Clay Content @ 0% Moisture (lbs/sf)	ASTM D5890 Free Swell (ml/2g)	ASTM D2216 Moisture Content (%)	ASTM D5891 Fluid Loss (ml)
135034397	122	44	53.2	8.1	0.81	28.0	8.6	14.2
135034398	122	44	53.2	8.1	0.81	28.0	8.6	14.2
135034399	122	44	53.2	8.1	0.81	28.0	8.6	14.2
135034400	122	44	53.2	8.1	0.81	28.0	8.6	14.2
135034401	122	44	53.2	8.1	0.81	28.0	8.6	14.2
135034402	122	44	53.2	8.1	0.81	28.0	8.6	14.2
135034403	122	44	53.2	8.1	0.81	28.0	8.6	14.2
135034404	122	44	53.2	8.1	0.81	28.0	8.6	14.2
135034405	122	44	53.2	8.1	0.81	28.0	8.6	14.2
135034406	122	44	53.2	8.1	0.81	28.0	8.6	14.2
135034407	122	44	53.2	8.1	0.81	28.0	8.6	14.2
135034408	122	44	53.2	8.1	0.81	28.0	8.6	14.2
135034409	183	45	49.8	8.2	0.92	29.0	8.3	13.4
135034410	183	45	49.8	8.2	0.92	29.0	8.3	13.4
135034411	183	45	49.8	8.2	0.92	29.0	8.3	13.4
135034412	183	45	49.8	8.2	0.92	29.0	8.3	13.4
135034413	183	45	49.8	8.2	0.92	29.0	8.3	13.4
135034414	183	45	49.8	8.2	0.92	29.0	8.3	13.4
135034415	183	45	49.8	8.2	0.92	29.0	8.3	13.4
135034416	183	45	49.8	8.2	0.92	29.0	8.3	13.4
135034417	183	45	49.8	8.2	0.92	29.0	8.3	13.4
135034418	183	45	49.8	8.2	0.92	29.0	8.3	13.4
135034419	183	45	49.8	8.2	0.92	29.0	8.3	13.4
135034420	183	45	49.8	8.2	0.92	29.0	8.3	13.4
135034421	183	45	49.8	8.2	0.92	29.0	8.3	13.4
135034422	183	45	49.8	8.2	0.92	29.0	8.3	13.4
135034423	183	45	49.8	8.2	0.92	29.0	8.3	13.4
135034424	183	45	49.8	8.2	0.92	29.0	8.3	13.4
135034425	127	39	50.8	6.9	0.82	29.0	8.3	13.4
135034426	127	39	50.8	6.9	0.82	29.0	8.3	13.4
135034427	127	39	50.8	6.9	0.82	29.0	8.3	13.4
135034428	127	39	50.8	6.9	0.82	29.0	8.3	13.4
135034429	127	39	50.8	6.9	0.82	29.0	8.3	13.4
135034430	127	39	50.8	6.9	0.82	29.0	8.3	13.4

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SO−076037	Chesapeake Containment Systems, Inc.	Moncure NC US	BLI−075−06N−03S−D3CR	

Roll Number	ASTM D4632 Grab Strength (lbs)	ASTM D4632 Peel Strength (lbs)	ASTM D6768 Tensile Strength (ppi)	ASTM D6496 Peel Strength (ppi)	ASTM D5993 Clay Content @ 0% Moisture (lbs/sf)	ASTM D5890 Free Swell (ml/2g)	ASTM D2216 Moisture Content (%)	ASTM D5891 Fluid Loss (ml)
135034431	127	39	50.8	6.9	0.82	29.0	8.3	13.4
135034432	127	39	50.8	6.9	0.82	29.0	8.3	13.4
135034433	127	39	50.8	6.9	0.82	29.0	8.3	13.4
135034434	127	39	50.8	6.9	0.82	29.0	8.3	13.4
135034435	127	39	50.8	6.9	0.82	29.0	8.3	13.4
135034436	127	39	50.8	6.9	0.82	29.0	8.3	13.4
135034437	127	39	50.8	6.9	0.82	29.0	8.3	13.4
135034438	127	39	50.8	6.9	0.82	29.0	8.3	13.4
135034439	127	39	50.8	6.9	0.82	29.0	8.3	13.4
135034440	127	39	50.8	6.9	0.82	29.0	8.3	13.4
135034441	134	49	57.1	8.3	0.82	29.0	8.3	13.4
135034443	134	49	57.1	8.3	0.82	29.0	8.3	13.4
135034444	134	49	57.1	8.3	0.82	29.0	8.3	13.4
135034445	134	49	57.1	8.3	0.82	29.0	8.3	13.4
135034446	134	49	57.1	8.3	0.82	29.0	8.3	13.4
135034447	134	49	57.1	8.3	0.82	29.0	8.3	13.4
135034448	134	49	57.1	8.3	0.82	29.0	8.3	13.4
135034449	134	49	57.1	8.3	0.82	29.0	8.3	13.4
135034450	134	49	57.1	8.3	0.82	29.0	8.3	13.4
135034451	134	49	57.1	8.3	0.82	29.0	8.3	13.4
135034452	134	49	57.1	8.3	0.82	29.0	8.3	13.4
135034453	134	49	57.1	8.3	0.82	29.0	8.3	13.4
135034454	134	49	57.1	8.3	0.82	29.0	8.3	13.4
135034455	134	49	57.1	8.3	0.82	29.0	8.3	13.4
135034456	134	49	57.1	8.3	0.82	29.0	8.3	13.4
135034457	177	41	59.7	7.8	0.84	30.0	8.8	13.8
135034458	177	41	59.7	7.8	0.84	30.0	8.8	13.8
135034459	177	41	59.7	7.8	0.84	30.0	8.8	13.8
135034460	177	41	59.7	7.8	0.84	30.0	8.8	13.8
135034461	177	41	59.7	7.8	0.84	30.0	8.8	13.8
135034463	177	41	59.7	7.8	0.84	30.0	8.8	13.8
135034464	177	41	59.7	7.8	0.84	30.0	8.8	13.8
135034465	177	41	59.7	7.8	0.84	30.0	8.8	13.8
135034466	177	41	59.7	7.8	0.84	30.0	8.8	13.8

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SO−076037	Chesapeake Containment Systems, Inc.	Moncure NC US	BLI−075−06N−03S−D3CR	

Roll Number	ASTM D4632 Grab Strength (lbs)	ASTM D4632 Peel Strength (lbs)	ASTM D6768 Tensile Strength (ppi)	ASTM D6496 Peel Strength (ppi)	ASTM D5993 Clay Content @ 0% Moisture (lbs/sf)	ASTM D5890 Free Swell (ml/2g)	ASTM D2216 Moisture Content (%)	ASTM D5891 Fluid Loss (ml)
135034467	177	41	59.7	7.8	0.84	30.0	8.8	13.8
135034468	177	41	59.7	7.8	0.84	30.0	8.8	13.8
135034469	177	41	59.7	7.8	0.84	30.0	8.8	13.8
135034470	177	41	59.7	7.8	0.84	30.0	8.8	13.8
135034471	177	41	59.7	7.8	0.84	30.0	8.8	13.8
135034472	177	41	59.7	7.8	0.84	30.0	8.8	13.8
135034473	161	42	58.5	7.5	0.88	30.0	8.8	13.8
135034474	161	42	58.5	7.5	0.88	30.0	8.8	13.8
135034475	161	42	58.5	7.5	0.88	30.0	8.8	13.8
135034476	161	42	58.5	7.5	0.88	30.0	8.8	13.8
135034477	161	42	58.5	7.5	0.88	30.0	8.8	13.8
135034478	161	42	58.5	7.5	0.88	30.0	8.8	13.8
135034479	161	42	58.5	7.5	0.88	30.0	8.8	13.8
135034480	161	42	58.5	7.5	0.88	30.0	8.8	13.8
135034481	161	42	58.5	7.5	0.88	30.0	8.8	13.8
135034482	161	42	58.5	7.5	0.88	30.0	8.8	13.8
135034483	161	42	58.5	7.5	0.88	30.0	8.8	13.8
135034484	161	42	58.5	7.5	0.88	30.0	8.8	13.8
135034485	161	42	58.5	7.5	0.88	30.0	8.8	13.8
135034486	161	42	58.5	7.5	0.88	30.0	8.8	13.8
135034487	161	42	58.5	7.5	0.88	30.0	8.8	13.8
135034488	161	42	58.5	7.5	0.88	30.0	8.8	13.8
135034489	138	42	52.5	7.6	0.86	30.0	8.8	13.8
135034490	138	42	52.5	7.6	0.86	30.0	8.8	13.8
135034491	138	42	52.5	7.6	0.86	30.0	8.8	13.8
135034492	138	42	52.5	7.6	0.86	30.0	8.8	13.8
135034493	138	42	52.5	7.6	0.86	30.0	8.8	13.8
135034494	138	42	52.5	7.6	0.86	30.0	8.8	13.8
135034495	138	42	52.5	7.6	0.86	30.0	8.8	13.8
135034496	138	42	52.5	7.6	0.86	30.0	8.8	13.8
135034497	138	42	52.5	7.6	0.86	30.0	8.8	13.8
135034498	138	42	52.5	7.6	0.86	30.0	8.8	13.8
135034499	138	42	52.5	7.6	0.86	30.0	8.8	13.8
135034500	138	42	52.5	7.6	0.86	30.0	8.8	13.8

GSE Environmental, LLC

ROLL TEST DATA REPORT

GSE QC APPROVED

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Sales Order No.	Customer Name	Project Location	Product Name	BOL Number
SO−076037	Chesapeake Containment Systems, Inc.	Moncure NC US	BLI−075−06N−03S−D3CR	

Roll Number	ASTM D4632 Grab Strength (lbs)	ASTM D4632 Peel Strength (lbs)	ASTM D6768 Tensile Strength (ppi)	ASTM D6496 Peel Strength (ppi)	ASTM D5993 Clay Content @ 0% Moisture (lbs/sf)	ASTM D5890 Free Swell (ml/2g)	ASTM D2216 Moisture Content (%)	ASTM D5891 Fluid Loss (ml)
135034501	138	42	52.5	7.6	0.86	30.0	8.8	13.8
135034502	138	42	52.5	7.6	0.86	30.0	8.8	13.8
135034503	138	42	52.5	7.6	0.86	30.0	8.8	13.8
135034504	138	42	52.5	7.6	0.86	30.0	8.8	13.8
135034505	117	51	42.0	9.8	0.93	30.0	8.8	13.8
135034506	117	51	42.0	9.8	0.93	30.0	8.8	13.8
135034507	117	51	42.0	9.8	0.93	30.0	8.8	13.8
135034508	117	51	42.0	9.8	0.93	30.0	8.8	13.8
135034509	117	51	42.0	9.8	0.93	30.0	8.8	13.8
135034510	117	51	42.0	9.8	0.93	30.0	8.8	13.8
135034511	117	51	42.0	9.8	0.93	30.0	8.8	13.8
135034512	117	51	42.0	9.8	0.93	30.0	8.8	13.8
135034513	117	51	42.0	9.8	0.93	30.0	8.8	13.8
135034514	117	51	42.0	9.8	0.93	30.0	8.8	13.8
135034515	117	51	42.0	9.8	0.93	30.0	8.8	13.8
135034516	117	51	42.0	9.8	0.93	30.0	8.8	13.8
135034517	117	51	42.0	9.8	0.93	30.0	8.8	13.8
135034518	173	60	53.7	10.9	0.84	30.0	8.8	13.8
135034519	175	47	52.9	9.6	0.84	27.0	10.1	14.8
135034520	175	47	52.9	9.6	0.84	27.0	10.1	14.8
135034521	175	47	52.9	9.6	0.84	27.0	10.1	14.8
135034522	175	47	52.9	9.6	0.84	27.0	10.1	14.8
135034523	175	47	52.9	9.6	0.84	27.0	10.1	14.8
135034524	175	47	52.9	9.6	0.84	27.0	10.1	14.8
135034525	175	47	52.9	9.6	0.84	27.0	10.1	14.8
135034526	175	47	52.9	9.6	0.84	27.0	10.1	14.8
135034527	175	47	52.9	9.6	0.84	27.0	10.3	14.4
135034528	175	47	52.9	9.6	0.84	27.0	10.3	14.4
135034529	175	47	52.9	9.6	0.84	27.0	10.3	14.4
135034530	175	47	52.9	9.6	0.84	27.0	10.3	14.4
135034531	175	47	52.9	9.6	0.84	27.0	10.3	14.4
135034532	175	47	52.9	9.6	0.84	27.0	10.3	14.4
135034533	175	47	52.9	9.6	0.84	27.0	10.3	14.4
135034534	175	47	52.9	9.6	0.84	27.0	10.3	14.4

GSE Environmental, LLC

ROLL TEST DATA REPORT

GSE QC APPROVED

Report Date: Jun/15/2015

Sales Order No.	Customer Name	Project Location	Product Name	BOL Number
SO−076037	Chesapeake Containment Systems, Inc.	Moncure NC US	BLI−075−06N−03S−D3CR	

Roll Number	ASTM D4632 Grab Strength (lbs)	ASTM D4632 Peel Strength (lbs)	ASTM D6768 Tensile Strength (ppi)	ASTM D6496 Peel Strength (ppi)	ASTM D5993 Clay Content @ 0% Moisture (lbs/sf)	ASTM D5890 Free Swell (ml/2g)	ASTM D2216 Moisture Content (%)	ASTM D5891 Fluid Loss (ml)
135034535	172	56	52.0	11.0	0.82	27.0	10.3	14.4
135034536	172	56	52.0	11.0	0.82	27.0	10.3	14.4
135034537	172	56	52.0	11.0	0.82	27.0	10.3	14.4
135034538	172	56	52.0	11.0	0.82	27.0	10.3	14.4
135034539	172	56	52.0	11.0	0.82	27.0	10.3	14.4
135034540	172	56	52.0	11.0	0.82	27.0	10.3	14.4
135034541	172	56	52.0	11.0	0.82	27.0	10.3	14.4
135034542	172	56	52.0	11.0	0.82	27.0	10.3	14.4
135034543	172	56	52.0	11.0	0.82	27.0	10.3	14.4
135034544	172	56	52.0	11.0	0.82	27.0	10.3	14.4
135034545	172	56	52.0	11.0	0.82	27.0	10.3	14.4
135034546	172	56	52.0	11.0	0.82	27.0	10.3	14.4
135034547	172	56	52.0	11.0	0.82	27.0	10.3	14.4
135034548	172	56	52.0	11.0	0.82	27.0	10.3	14.4
135034549	172	56	52.0	11.0	0.82	27.0	10.3	14.4
135034550	172	56	52.0	11.0	0.82	27.0	10.3	14.4
135034551	204	61	54.4	11.0	0.82	27.0	10.3	14.4
135034552	204	61	54.4	11.0	0.82	27.0	10.3	14.4
135034553	204	61	54.4	11.0	0.82	27.0	10.3	14.4
135034554	204	61	54.4	11.0	0.82	27.0	10.3	14.4
135034555	120	54	51.2	11.1	0.83	27.0	10.3	14.4
135034556	119	52	52.6	8.8	0.85	27.0	10.3	14.4
135034557	119	52	52.6	8.8	0.85	27.0	10.3	14.4
135034558	119	52	52.6	8.8	0.85	27.0	10.3	14.4
135034559	119	52	52.6	8.8	0.85	27.0	10.3	14.4
135034560	119	52	52.6	8.8	0.85	27.0	10.3	14.4
135034561	119	52	52.6	8.8	0.85	27.0	10.3	14.4
135034562	119	52	52.6	8.8	0.85	27.0	10.3	14.4
135034563	119	52	52.6	8.8	0.85	27.0	10.3	14.4
135034564	119	52	52.6	8.8	0.85	27.0	10.3	14.4
135034565	119	52	52.6	8.8	0.85	27.0	10.3	14.4
135034566	119	52	52.6	8.8	0.85	27.0	10.3	14.4
135034567	119	52	52.6	8.8	0.85	27.0	10.3	14.4
135034568	119	52	52.6	8.8	0.85	27.0	10.3	14.4

GSE Environmental, LLC

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GSE QC APPROVED

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Sales Order No.	Customer Name	Project Location	Product Name	BOL Number
SO−076037	Chesapeake Containment Systems, Inc.	Moncure NC US	BLI−075−06N−03S−D3CR	

Roll Number	ASTM D4632 Grab Strength (lbs)	ASTM D4632 Peel Strength (lbs)	ASTM D6768 Tensile Strength (ppi)	ASTM D6496 Peel Strength (ppi)	ASTM D5993 Clay Content @ 0% Moisture (lbs/sf)	ASTM D5890 Free Swell (ml/2g)	ASTM D2216 Moisture Content (%)	ASTM D5891 Fluid Loss (ml)
135034569	119	52	52.6	8.8	0.85	27.0	10.3	14.4
135034570	119	52	52.6	8.8	0.85	27.0	10.3	14.4
135034571	119	52	52.6	8.8	0.85	27.0	10.3	14.4
135034572	159	54	55.9	9.2	0.86	24.0	9.1	14.8
135034573	159	54	55.9	9.2	0.86	24.0	9.1	14.8
135034574	159	54	55.9	9.2	0.86	24.0	9.1	14.8
135034575	159	54	55.9	9.2	0.86	24.0	9.1	14.8
135034576	159	54	55.9	9.2	0.86	24.0	9.1	14.8
135034577	159	54	55.9	9.2	0.86	24.0	9.1	14.8
135034578	159	54	55.9	9.2	0.86	24.0	9.1	14.8
135034579	159	54	55.9	9.2	0.86	24.0	9.1	14.8
135034580	159	54	55.9	9.2	0.86	24.0	9.1	14.8
135034581	159	54	55.9	9.2	0.86	24.0	9.1	14.8
135034582	159	54	55.9	9.2	0.86	24.0	9.1	14.8
135034583	159	54	55.9	9.2	0.86	24.0	9.1	14.8
135034584	159	54	55.9	9.2	0.86	24.0	9.1	14.8
135034585	159	54	55.9	9.2	0.86	24.0	9.1	14.8
135034586	159	54	55.9	9.2	0.86	24.0	9.1	14.8
135034587	178	50	58.4	8.8	0.86	24.0	9.1	14.8
135034588	178	50	58.4	8.8	0.86	24.0	9.1	14.8
135034589	178	50	58.4	8.8	0.86	24.0	9.1	14.8
135034590	178	50	58.4	8.8	0.86	24.0	9.1	14.8
135034591	178	50	58.4	8.8	0.86	24.0	9.1	14.8
135034592	178	50	58.4	8.8	0.86	24.0	9.1	14.8
135034593	178	50	58.4	8.8	0.86	24.0	9.1	14.8
135034594	178	50	58.4	8.8	0.86	24.0	9.1	14.8
135034595	178	50	58.4	8.8	0.86	24.0	9.1	14.8
135034596	178	50	58.4	8.8	0.86	24.0	9.1	14.8
135034597	178	50	58.4	8.8	0.86	24.0	9.1	14.8
135034598	178	50	58.4	8.8	0.86	24.0	9.1	14.8
135034599	178	50	58.4	8.8	0.86	24.0	9.1	14.8
135034600	178	50	58.4	8.8	0.86	24.0	9.1	14.8
135034601	178	50	58.4	8.8	0.86	24.0	9.1	14.8
135034602	178	50	58.4	8.8	0.86	24.0	9.1	14.8

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Sales Order No.	Customer Name	Project Location	Product Name	BOL Number
SO−076037	Chesapeake Containment Systems, Inc.	Moncure NC US	BLI−075−06N−03S−D3CR	

Roll Number	ASTM D4632 Grab Strength (lbs)	ASTM D4632 Peel Strength (lbs)	ASTM D6768 Tensile Strength (ppi)	ASTM D6496 Peel Strength (ppi)	ASTM D5993 Clay Content @ 0% Moisture (lbs/sf)	ASTM D5890 Free Swell (ml/2g)	ASTM D2216 Moisture Content (%)	ASTM D5891 Fluid Loss (ml)
135034603	164	46	60.8	8.1	0.87	24.0	9.1	14.8
135034604	164	46	60.8	8.1	0.87	24.0	9.1	14.8
135034605	164	46	60.8	8.1	0.87	24.0	9.1	14.8

Laboratory Manager _____

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Sales Order No.	Customer Name	Project Location	Product Name	BOL Number
SO−076037	Chesapeake Containment Systems, Inc.	Moncure , NC US	BLI−GEO−NW−060	

Roll Number	Mass per Unit Area ASTM D5261 (oz/yd²)	ASTM D4632 Grab Strength (lbs) MD	ASTM D4632 Grab Strength (lbs) TD	ASTM D4632 Grab Elongation (%) MD	ASTM D4632 Grab Elongation (%) TD
130479889	7.4	103	202	165	125
130482032	7.2	129	198	134	145
130483443	7.1	81	191	135	124
130483444	7.1	81	191	135	124
130483448	7.7	170	259	132	125
130483449	7.7	126	163	120	116
130483464	7.3	83	119	167	157
130484259	7.1	114	193	175	130
130484354	8.8	122	179	170	178
130484794	7.9	116	218	164	141
130484801	8.5	133	178	147	148
130484804	7.6	117	219	163	131
130484805	7.6	117	219	163	131
130484806	6.9	116	177	159	139
130484807	6.9	116	177	159	139
130484808	6.9	116	177	159	139
130484809	7.2	116	198	168	139
130484810	7.2	116	198	168	139
130484813	7.6	120	189	164	132
130484817	7.1	110	185	171	157
130484818	7.7	119	172	149	142
130484823	7.4	114	204	181	126
130484825	8.7	120	257	173	126
130484828	7.7	111	206	188	141
130484829	7.7	111	206	188	141
130484830	7.3	108	212	178	128
130484831	7.3	108	212	178	128
130484832	7.3	108	212	178	128
130484833	7.2	142	199	164	153
130484834	7.2	142	199	164	153
130484836	7.3	141	227	170	137
130484837	7.3	141	227	170	137
130484838	7.3	141	227	170	137
130484839	7.2	118	182	183	130

GSE Environmental, LLC

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Sales Order No.	Customer Name	Project Location	Product Name	BOL Number
SO−076037	Chesapeake Containment Systems, Inc.	Moncure , NC US	BLI−GEO−NW−060	

Roll Number	Mass per Unit Area ASTM D5261 (oz/yd²)	ASTM D4632 Grab Strength (lbs) MD	ASTM D4632 Grab Strength (lbs) TD	ASTM D4632 Grab Elongation (%) MD	ASTM D4632 Grab Elongation (%) TD
130484840	7.2	118	182	183	130
130484841	7.2	118	182	183	130
130484842	7.2	132	187	169	146
130484843	7.2	132	187	169	146
130484844	7.2	132	187	169	146
130484845	7.8	121	190	169	141
130484846	7.8	121	190	169	141
130484859	7.6	128	204	156	140
130485443	7.3	91	140	196	165
130485445	7.6	99	186	168	172
130485449	7.2	91	131	181	177
130485451	7.1	87	117	194	171
130485454	6.9	76	114	185	183
130485457	7.4	92	97	174	188
130485459	7.4	92	97	174	188
130485468	7.4	75	119	175	161
130485471	8.2	102	128	167	202
130485472	7.3	92	83	186	192
130485473	7.3	92	83	186	192
130485475	7.5	94	124	172	175
130485476	7.5	94	124	172	175
130485477	7.5	94	124	172	175
130485479	7.1	84	105	171	171
130485480	7.1	84	105	171	171
130485482	7.5	113	125	149	160
130485483	7.5	113	125	149	160
130485484	7.3	122	150	149	169
130485485	7.3	122	150	149	169
130485489	7.4	96	138	143	145
130485490	8.2	115	189	165	148
130485518	8.4	125	170	151	155
130485520	8.9	134	192	153	169
130485521	8.9	134	192	153	169
130485522	8.9	134	192	153	169

GSE Environmental, LLC

ROLL TEST DATA REPORT

GSE QC APPROVED

Report Date: Jun/15/2015

Sales Order No.	Customer Name	Project Location	Product Name	BOL Number
SO−076037	Chesapeake Containment Systems, Inc.	Moncure , NC US	BLI−GEO−NW−060	

Roll Number	Mass per Unit Area ASTM D5261 (oz/yd²)	ASTM D4632 Grab Strength (lbs) MD	ASTM D4632 Grab Strength (lbs) TD	ASTM D4632 Grab Elongation (%) MD	ASTM D4632 Grab Elongation (%) TD
130485523	7.2	106	132	157	162
130485531	7.2	97	136	146	148
130485532	7.1	102	142	161	162
130485542	7.2	117	97	174	151
130485554	8.5	132	182	169	155
130485562	7.6	111	138	152	167
130485563	7.6	111	138	152	167
130485565	7.6	104	151	149	146
130485567	7.6	104	151	149	146
130485568	7.6	126	139	157	168
130485570	7.6	126	139	157	168
130485571	8.4	126	150	144	154
130485572	8.4	126	150	144	154
130485573	8.4	126	150	144	154
130485574	8.3	146	119	143	156

Laboratory Manager _____

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GSE Bentoliner Clay Lining Technology, Co.

CERTIFICATE OF ANALYSIS

PRODUCT: National 30

Shipped From: **Bentonite Performance Minerals LLC**
789 Hwy. 14-A East
Lovell, WY 82431

Car Number	Shippers Number	LOAD DATE	LOT CODE	MOIST 12 max	F.L. 18 max	MBC MEQ	Free Swell 25 min	PWA 750 min	Mesh % + 20 (15.0 Max)	Mesh % - 200 (10.0 Max)
BNSF 422165	**902282337**	**4/12/2015**	**30412151**	**9.4**	**16.8**	**100**	**25**	**760**	**0.94**	**5.40**
BNSF 422622	**902282338**	**4/12/2015**	**30412152**	**9.4**	**16.8**	**102**	**25**	**775**	**1.25**	**4.70**

YTD NUMBER OF CARS/TRKS		% MOIST 12 max	F.L. 18 max	MBC MEQ	Free Swell 25 min	PWA 750 min	Mesh % + 20 (15.0 Max)	Mesh % - 200 (10.0 Max)
	M AVG	**9.44**	**16.72**	**100.76**	**25.97**	**764.10**	**1.78**	**2.99**
29	STD DEV	**0.33**	**0.75**	**2.36**	**1.05**	**12.37**	**0.76**	**1.58**

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1245 Eastland Ave.
Kingstree SC 29556

Shipped To: **GSE Clay Lining Technology, Co.**
1245 Eastland Ave.
Kingstree SC 29556

Attn: Jodie Williams
Stephen Williamson
Edgardo Cornejo
Ed Zimmel

Q A Supervisor
Allen Harvey

4/14/2015

CC: Blair Akers
File

GSE Bentoliner Clay Lining Technology, Co.

CERTIFICATE OF ANALYSIS

PRODUCT: National 30

Shipped From: **Bentonite Performance Minerals LLC**
789 Hwy. 14-A East
Lovell, WY 82431

Car Number	Shippers Number	LOAD DATE	LOT CODE	MOIST 12 max	F.L. 18 max	MBC MEQ	Free Swell 25 min	PWA 750 min	Mesh % + 20 (15.0 Max)	Mesh % - 200 (10.0 Max)
BNSF 420405	**902282344**	**4/21/2015**	**30420151**	**9.2**	**16.8**	**102**	**25**	**838**	**1.53**	**2.11**

YTD NUMBER OF CARS/TRKS		% MOIST 12 max	F.L. 18 max	MBC MEQ	Free Swell 25 min	PWA 750 min	Mesh % + 20 (15.0 Max)	Mesh % - 200 (10.0 Max)
	M AVG	**9.45**	**16.75**	**101.12**	**25.82**	**767.32**	**1.71**	**3.13**
34	STD DEV	**0.33**	**0.70**	**2.42**	**1.03**	**18.12**	**0.73**	**1.54**

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Stephen Williamson
Edgardo Cornejo
Ed Zimmel

Q A Supervisor
Allen Harvey

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CERTIFICATE OF ANALYSIS

PRODUCT: National 30

Shipped From: **Bentonite Performance Minerals LLC**
789 Hwy. 14-A East
Lovell, WY 82431

Car Number	Shippers Number	LOAD DATE	LOT CODE	MOIST 12 max	F.L. 18 max	MBC MEQ	Free Swell 25 min	PWA 750 min	Mesh % + 20 (15.0 Max)	Mesh % - 200 (10.0 Max)
ATSF 315039	**902339043**	**4/25/2015**	**30424151**	**9.2**	**15.6**	**100**	**26**	**793**	**2.13**	**2.81**

YTD NUMBER OF CARS/TRKS		% MOIST 12 max	F.L. 18 max	MBC MEQ	Free Swell 25 min	PWA 750 min	Mesh % + 20 (15.0 Max)	Mesh % - 200 (10.0 Max)
	M AVG	**9.40**	**16.64**	**101.13**	**25.90**	**775.10**	**1.70**	**3.17**
39	STD DEV	**0.34**	**0.73**	**2.28**	**1.05**	**28.53**	**0.70**	**1.48**

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Stephen Williamson
Edgardo Cornejo
Ed Zimmel

Q A Supervisor
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CERTIFICATE OF ANALYSIS

PRODUCT: National 30

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Lovell, WY 82431

Car Number	Shippers Number	LOAD DATE	LOT CODE	MOIST 12 max	F.L. 18 max	MBC MEQ	Free Swell 25 min	PWA 750 min	Mesh % + 20 (15.0 Max)	Mesh % - 200 (10.0 Max)
ATSF 314400	**902282345**	**4/22/2015**	**30421152**	**8.9**	**16.0**	**102**	**25**	**880**	**1.61**	**3.42**

YTD NUMBER OF CARS/TRKS		% MOIST 12 max	F.L. 18 max	MBC MEQ	Free Swell 25 min	PWA 750 min	Mesh % + 20 (15.0 Max)	Mesh % - 200 (10.0 Max)
	M AVG	**9.44**	**16.73**	**101.14**	**25.80**	**770.54**	**1.71**	**3.14**
35	STD DEV	**0.34**	**0.70**	**2.39**	**1.02**	**26.10**	**0.72**	**1.52**

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1245 Eastland Ave.
Kingstree SC 29556

Attn: Jodie Williams
Stephen Williamson
Edgardo Cornejo
Ed Zimmel

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CERTIFICATE OF ANALYSIS

PRODUCT: National 30

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Lovell, WY 82431

Car Number	Shippers Number	LOAD DATE	LOT CODE	MOIST 12 max	F.L. 18 max	MBC MEQ	Free Swell 25 min	PWA 750 min	Mesh % + 20 (15.0 Max)	Mesh % - 200 (10.0 Max)
BNSF 422510	**902282342**	**4/15/2015**	**30415152**	**9.8**	**16.8**	**102**	**25**	**760**	**1.11**	**4.24**

YTD NUMBER OF CARS/TRKS		% MOIST 12 max	F.L. 18 max	MBC MEQ	Free Swell 25 min	PWA 750 min	Mesh % + 20 (15.0 Max)	Mesh % - 200 (10.0 Max)
	M AVG	**9.47**	**16.74**	**101.00**	**25.88**	**764.38**	**1.74**	**3.13**
32	STD DEV	**0.33**	**0.72**	**2.44**	**1.04**	**12.69**	**0.74**	**1.57**

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Attn: Jodie Williams
Stephen Williamson
Edgardo Cornejo
Ed Zimmel

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PRODUCT: National 30

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789 Hwy. 14-A East
Lovell, WY 82431

Car Number	Shippers Number	LOAD DATE	LOT CODE	MOIST 12 max	F.L. 18 max	MBC MEQ	Free Swell 25 min	PWA 750 min	Mesh % + 20 (15.0 Max)	Mesh % - 200 (10.0 Max)
BNSF 403548	**902282343**	**4/20/2015**	**30419152**	**9.3**	**17.2**	**104**	**25**	**791**	**1.00**	**4.01**

YTD NUMBER OF CARS/TRKS		% MOIST 12 max	F.L. 18 max	MBC MEQ	Free Swell 25 min	PWA 750 min	Mesh % + 20 (15.0 Max)	Mesh % - 200 (10.0 Max)
	M AVG	**9.46**	**16.75**	**101.09**	**25.85**	**765.18**	**1.72**	**3.16**
33	STD DEV	**0.33**	**0.71**	**2.45**	**1.03**	**13.33**	**0.74**	**1.55**

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Stephen Williamson
Edgardo Cornejo
Ed Zimmel

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CERTIFICATE OF ANALYSIS

PRODUCT: National 30

Shipped From: **Bentonite Performance Minerals LLC**
789 Hwy. 14-A East
Lovell, WY 82431

Car Number	Shippers Number	LOAD DATE	LOT CODE	MOIST 12 max	F.L. 18 max	MBC MEQ	Free Swell 25 min	PWA 750 min	Mesh % + 20 (15.0 Max)	Mesh % - 200 (10.0 Max)
BNSF 422309	**902339040**	**4/22/2015**	**30422152**	**9.0**	**16.0**	**102**	**27**	**825**	**1.17**	**4.19**
BNSF 422379	**902339041**	**4/23/2015**	**30423151**	**8.9**	**15.6**	**102**	**28**	**824**	**2.15**	**2.17**
ATSF 315024	**902339042**	**4/23/2015**	**30423152**	**9.2**	**16.0**	**100**	**26**	**818**	**1.06**	**4.74**

YTD NUMBER OF CARS/TRKS		% MOIST 12 max	F.L. 18 max	MBC MEQ	Free Swell 25 min	PWA 750 min	Mesh % + 20 (15.0 Max)	Mesh % - 200 (10.0 Max)
	M AVG	**9.40**	**16.66**	**101.16**	**25.89**	**774.63**	**1.69**	**3.18**
38	STD DEV	**0.34**	**0.71**	**2.31**	**1.06**	**28.76**	**0.70**	**1.50**

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Stephen Williamson
Edgardo Cornejo
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CERTIFICATE OF ANALYSIS

PRODUCT: National 30

Shipped From: **Bentonite Performance Minerals LLC**
789 Hwy. 14-A East
Lovell, WY 82431

Car Number	Shippers Number	LOAD DATE	LOT CODE	MOIST 12 max	F.L. 18 max	MBC MEQ	Free Swell 25 min	PWA 750 min	Mesh % + 20 (15.0 Max)	Mesh % - 200 (10.0 Max)
BNSF 422655	**902357031**	**5/4/2015**	**30504151**	**8.9**	**16.8**	**100**	**27**	**768**	**0.73**	**3.00**

YTD NUMBER OF CARS/TRKS		% MOIST 12 max	F.L. 18 max	MBC MEQ	Free Swell 25 min	PWA 750 min	Mesh % + 20 (15.0 Max)	Mesh % - 200 (10.0 Max)
	M AVG	**9.38**	**16.64**	**101.05**	**26.07**	**775.31**	**1.72**	**3.12**
42	STD DEV	**0.34**	**0.70**	**2.22**	**1.24**	**27.67**	**0.76**	**1.44**

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1245 Eastland Ave.
Kingstree SC 29556

Attn: Jodie Williams
Stephen Williamson
Edgardo Cornejo
Ed Zimmel

Q A Supervisor
Allen Harvey

5/6/2015

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CERTIFICATE OF ANALYSIS

PRODUCT: National 30

Shipped From: **Bentonite Performance Minerals LLC**
789 Hwy. 14-A East
Lovell, WY 82431

Car Number	Shippers Number	LOAD DATE	LOT CODE	MOIST 12 max	F.L. 18 max	MBC MEQ	Free Swell 25 min	PWA 750 min	Mesh % + 20 (15.0 Max)	Mesh % - 200 (10.0 Max)
BNSF 422318	**902357029**	**5/2/2015**	**30502151**	**9.2**	**16.4**	**100**	**30**	**795**	**1.41**	**1.93**
BNSF 420692	**902357030**	**5/3/2015**	**30503151**	**9.3**	**16.8**	**100**	**28**	**771**	**3.68**	**2.26**

YTD NUMBER OF CARS/TRKS		% MOIST 12 max	F.L. 18 max	MBC MEQ	Free Swell 25 min	PWA 750 min	Mesh % + 20 (15.0 Max)	Mesh % - 200 (10.0 Max)
	M AVG	**9.39**	**16.63**	**101.07**	**26.05**	**775.49**	**1.74**	**3.12**
41	STD DEV	**0.33**	**0.71**	**2.24**	**1.24**	**27.99**	**0.75**	**1.46**

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1245 Eastland Ave.
Kingstree SC 29556

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Stephen Williamson
Edgardo Cornejo
Ed Zimmel

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PRODUCT: National 30

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Lovell, WY 82431

Car Number	Shippers Number	LOAD DATE	LOT CODE	MOIST 12 max	F.L. 18 max	MBC MEQ	Free Swell 25 min	PWA 750 min	Mesh % + 20 (15.0 Max)	Mesh % - 200 (10.0 Max)
BNSF 422599	**902357033**	**5/8/2015**	**30508151**	**9.6**	**16.8**	**102**	**26**	**756**	**0.58**	**1.31**

YTD NUMBER OF CARS/TRKS		% MOIST 12 max	F.L. 18 max	MBC MEQ	Free Swell 25 min	PWA 750 min	Mesh % + 20 (15.0 Max)	Mesh % - 200 (10.0 Max)
	M AVG	**9.38**	**16.63**	**101.18**	**26.09**	**775.77**	**1.70**	**3.02**
44	STD DEV	**0.33**	**0.69**	**2.30**	**1.22**	**27.84**	**0.76**	**1.47**

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Stephen Williamson
Edgardo Cornejo
Ed Zimmel

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5/11/2015

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CERTIFICATE OF ANALYSIS

PRODUCT: National 30

Shipped From: **Bentonite Performance Minerals LLC**
789 Hwy. 14-A East
Lovell, WY 82431

Car Number	Shippers Number	LOAD DATE	LOT CODE	MOIST 12 max	F.L. 18 max	MBC MEQ	Free Swell 25 min	PWA 750 min	Mesh % + 20 (15.0 Max)	Mesh % - 200 (10.0 Max)
BNSF 422225	**902357035**	**5/18/2015**	**30517151**	**9.3**	**15.6**	**96**	**25**	**758**	**2.45**	**1.69**

YTD NUMBER OF CARS/TRKS		% MOIST 12 max	F.L. 18 max	MBC MEQ	Free Swell 25 min	PWA 750 min	Mesh % + 20 (15.0 Max)	Mesh % - 200 (10.0 Max)
	M AVG	**9.39**	**16.61**	**101.00**	**26.07**	**775.80**	**1.72**	**2.95**
46	STD DEV	**0.33**	**0.69**	**2.41**	**1.20**	**27.49**	**0.75**	**1.48**

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Stephen Williamson
Edgardo Cornejo
Ed Zimmel

Q A Supervisor
Allen Harvey

5/19/2015

CC: Blair Akers
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Large Scale Direct Shear Report

Project Name: CCS Brickhaven Mine Site

Sales Order No. 76037

Profile:

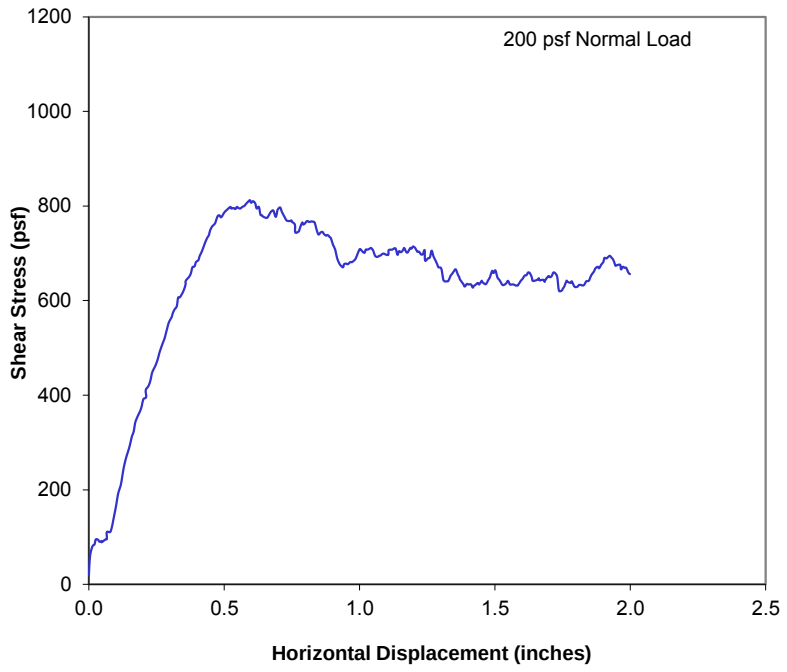
Testing Date: 5/19/2015

Internal Shear of BentoLiner CNSL CAR, Roll # 135033768 Lot #35051400
BLI-075-06N-03S-D3CR

DISPLACEMENT vs SHEAR STRESS

Normal Stress (psf)	*Peak Stress (psf)*	*L.D. Stress (psf)*
200	812	656

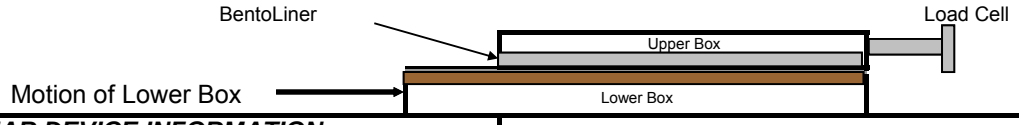
The gripper plate slipped against the GCL with a peak shear stress of 812 psf. There was no internal failure of the GCL.



TESTING INFORMATION:

1. Tests were conducted in general accordance with ASTM 6243.
2. Tests were conducted with the profile immersed in tap water.
3. The GCL was hydrated for 24 hours at 200 psf before the start of shearing.
4. Testing Speed: 0.04 in/min
5. Large Displacement (LD): 2.0 inches
6. The 200 psf normal load was applied with a dead weight load.

TEST ORIENTATION



SHEAR DEVICE INFORMATION:

1. Manufactured by GeoSyntec Consultants
2. Upper box dimensions: 12" x 12" x 3"
3. Lower box dimensions: 12" x 16" x 3"
4. Large Displacement: Up to 4"

GSE

GSE Lining Technology, Inc.

19103 Gundle Road
Houston, Texas 77073
800-435-2008
281-443-8564
Fax: 281-230-8650

June 4, 2007

Chesapeake Containment Systems, Inc.
4622 Wilmslow Road
Baltimore, MD 21210

CERTIFICATION

This letter is to certify that **Chesapeake Containment Systems, Inc.** has been provided with a copy of GSE's proprietary product manual containing the data sheets of all GSE's products for this project, and the GSE Field Installation Quality Assurance Manual.

With the information provided by GSE referenced herein, and the use of qualified technical field personnel, **Chesapeake Containment Systems, Inc.** can undertake this installation of GSE's products. GSE's Technical Department representatives are available to respond to questions on specifications and installation techniques.

Regards,

David Leggett
V.P. NA Sales Product Division

DL:kd

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D2

D2 – Geomembrane Manufacturer Certifications

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cust: Chesapeake Containment
PO#: 15065 Brickhaven Mine Site
dest: Brickhaven, NC

doc 29035

324 rolls 60 HD micro (505)

English Dimensions

roll #	wid	len	area	check weld rod qty (if ordered)		wgt	resin lot #
G15F065049	23	505	11,615	60HD micro	324tot 1	3484	HEN820690
G15F066050	23	505	11,615	60HD micro	324tot 2	3494	HEN820690
G15F066051	23	505	11,615	60HD micro	324tot 3	3494	HEN820690
G15F066052	23	505	11,615	60HD micro	324tot 4	3214	HEN820690
G15F066053	23	505	11,615	60HD micro	324tot 5	3498	HEN820690
G15F066054	23	505	11,615	60HD micro	324tot 6	3508	HEN820690
G15F066055	23	505	11,615	60HD micro	324tot 7	3507	HEN820690
G15F066056	23	505	11,615	60HD micro	324tot 8	3502	HEN820700
G15F066057	23	505	11,615	60HD micro	324tot 9	3508	HEN820700
G15F066058	23	505	11,615	60HD micro	324tot 10	3502	HEN820700
G15F066059	23	505	11,615	60HD micro	324tot 11	3498	HEN820700
G15F066060	23	505	11,615	60HD micro	324tot 12	3502	HEN820700
G15F066061	23	505	11,615	60HD micro	324tot 13	3504	HEN820700
G15F066062	23	505	11,615	60HD micro	324tot 14	3506	HEN820700
G15F067063	23	505	11,615	60HD micro	324tot 15	3500	HEN820700
G15F067064	23	505	11,615	60HD micro	324tot 16	3502	HEN820700
G15F067065	23	505	11,615	60HD micro	324tot 17	3502	HEN820700
G15F067066	23	505	11,615	60HD micro	324tot 18	3498	HEN820700
G15F067067	23	505	11,615	60HD micro	324tot 19	3510	HEN820700
G15F067068	23	505	11,615	60HD micro	324tot 20	3506	HEN820700
G15F067069	23	505	11,615	60HD micro	324tot 21	3508	HEN820700
G15F067070	23	505	11,615	60HD micro	324tot 22	3498	HEN820700
G15F067071	23	505	11,615	60HD micro	324tot 23	3510	HEN820700
G15F067072	23	505	11,615	60HD micro	324tot 24	3502	HEN820700
G15F067073	23	505	11,615	60HD micro	324tot 25	3496	HEN820700
G15F067074	23	505	11,615	60HD micro	324tot 26	3498	HEN820700
G15F067075	23	505	11,615	60HD micro	324tot 27	3498	HEN820700
G15F067076	23	505	11,615	60HD micro	324tot 28	3502	HEN820700
G15F071001	23	505	11,615	60HD micro	324tot 29	3500	HEN820700
G15F071002	23	505	11,615	60HD micro	324tot 30	3502	HEN820700
G15F071003	23	505	11,615	60HD micro	324tot 31	3498	HEN820700
G15F071004	23	505	11,615	60HD micro	324tot 32	3502	HEN820700
G15F071005	23	505	11,615	60HD micro	324tot 33	3502	HEN820700
G15F071006	23	505	11,615	60HD micro	324tot 34	3480	HEN820700
G15F071007	23	505	11,615	60HD micro	324tot 35	3494	HEN820700
G15F071008	23	505	11,615	60HD micro	324tot 36	3496	HEN820700
G15F071009	23	505	11,615	60HD micro	324tot 37	3496	HEN820700
G15F071010	23	505	11,615	60HD micro	324tot 38	3498	HEN820700
G15F071011	23	505	11,615	60HD micro	324tot 39	3504	HEN820700
G15F071012	23	505	11,615	60HD micro	324tot 40	3508	HEN820700
G15F071013	23	505	11,615	60HD micro	324tot 41	3508	HEN820700
G15F072014	23	505	11,615	60HD micro	324tot 42	3520	HEN820700
G15F072015	23	505	11,615	60HD micro	324tot 43	3526	HEN820700
G15F072016	23	505	11,615	60HD micro	324tot 44	3512	HEN820700
G15F072017	23	505	11,615	60HD micro	324tot 45	3514	HEN820700
G15F072018	23	505	11,615	60HD micro	324tot 46	3514	HEN820700
G15F072019	23	505	11,615	60HD micro	324tot 47	3512	HEN820700
G15F072020	23	505	11,615	60HD micro	324tot 48	3514	HEN820700
G15F072021	23	505	11,615	60HD micro	324tot 49	3514	HEN820700
G15F072022	23	505	11,615	60HD micro	324tot 50	3512	HEN820700
G15F072023	23	505	11,615	60HD micro	324tot 51	3512	HEN820700
G15F072024	23	505	11,615	60HD micro	324tot 52	3584	HEN820700
G15D072021	23	505	11,615	60HD micro	324tot 53	3834	HFA610170
G15D072022	23	505	11,615	60HD micro	324tot 54	3740	HFA610170
G15D072023	23	505	11,615	60HD micro	324tot 55	3646	HFA610170
G15D072024	23	505	11,615	60HD micro	324tot 56	3654	HFA610170
G15D072025	23	505	11,615	60HD micro	324tot 57	3667	HFA610170
G15D072026	23	505	11,615	60HD micro	324tot 58	3665	HFA610170
G15D072027	23	505	11,615	60HD micro	324tot 59	3670	HFA610170
G15D072028	23	505	11,615	60HD micro	324tot 60	3672	HFA610170
G15D072029	23	505	11,615	60HD micro	324tot 61	3670	HFA610170
G15D073030	23	505	11,615	60HD micro	324tot 62	3678	HFA610170
G15D073031	23	505	11,615	60HD micro	324tot 63	3670	HFA610170
G15D073032	23	505	11,615	60HD micro	324tot 64	3670	HFA610170
G15D073033	23	505	11,615	60HD micro	324tot 65	3670	HFA610170
G15D073034	23	505	11,615	60HD micro	324tot 66	3680	HFA610170

cust: Chesapeake Containment
PO#: 15065 Brickhaven Mine Site
dest: Brickhaven, NC

doc 29035

324 rolls 60 HD micro (505)

English Dimensions

roll #	wid	len	area	check weld rod qty (if ordered)	wgt	resin lot #
G15D073035	23	505	11,615	60HD micro 324tot 67	3679	HFA610170
G15D073036	23	505	11,615	60HD micro 324tot 68	3670	HFA610170
G15D073037	23	505	11,615	60HD micro 324tot 69	3672	HFA610170
G15D073038	23	505	11,615	60HD micro 324tot 70	3682	HFA610170
G15D073039	23	505	11,615	60HD micro 324tot 71	3670	HFA610170
G15D073040	23	505	11,615	60HD micro 324tot 72	3674	HFA610170
G15D073041	23	505	11,615	60HD micro 324tot 73	3659	HFA610170
G15D073042	23	505	11,615	60HD micro 324tot 74	3667	HFA610170
G15D073043	23	505	11,615	60HD micro 324tot 75	3668	HFA610170
G15D226084	23	505	11,615	60HD micro 324tot 76	3838	HFE710440
G15D226085	23	505	11,615	60HD micro 324tot 77	3842	HFE710440
G15D226086	23	505	11,615	60HD micro 324tot 78	3746	HFE710440
G15D226087	23	505	11,615	60HD micro 324tot 79	3722	HFE710440
G15D227088	23	505	11,615	60HD micro 324tot 80	3734	HFE710440
G15D227089	23	505	11,615	60HD micro 324tot 81	3716	HFE710440
G15D227090	23	505	11,615	60HD micro 324tot 82	3678	HFE710440
G15D227091	23	505	11,615	60HD micro 324tot 83	3676	HFE710440
G15D227092	23	505	11,615	60HD micro 324tot 84	3720	HFE710340
G15D227093	23	505	11,615	60HD micro 324tot 85	3708	HFE710340
G15D227094	23	505	11,615	60HD micro 324tot 86	3676	HFE710340
G15D227095	23	505	11,615	60HD micro 324tot 87	3668	HFE710340
G15D227096	23	505	11,615	60HD micro 324tot 88	3668	HFE710340
G15D227097	23	505	11,615	60HD micro 324tot 89	3668	HFE710340
G15D227098	23	505	11,615	60HD micro 324tot 90	3664	HFE710340
G15D227099	23	505	11,615	60HD micro 324tot 91	3672	HFE710340
G15D227100	23	505	11,615	60HD micro 324tot 92	3664	HFE710340
G15D227101	23	505	11,615	60HD micro 324tot 93	3668	HFE710340
G15D227102	23	505	11,615	60HD micro 324tot 94	3680	HFE710340
G15D231001	23	505	11,615	60HD micro 324tot 95	3676	HFE710340
G15D231002	23	505	11,615	60HD micro 324tot 96	3662	HFE710340
G15D231003	23	505	11,615	60HD micro 324tot 97	3652	HFE710340
G15D231004	23	505	11,615	60HD micro 324tot 98	3648	HFE710340
G15D231005	23	505	11,615	60HD micro 324tot 99	3680	HFE710340
G15D231006	23	505	11,615	60HD micro 324tot 100	3672	HFE710340
G15D231007	23	505	11,615	60HD micro 324tot 101	3662	HFE710340
G15D231008	23	505	11,615	60HD micro 324tot 102	3670	HFE710340
G15D231009	23	505	11,615	60HD micro 324tot 103	3672	HFE710340
G15D231010	23	505	11,615	60HD micro 324tot 104	3662	HFE710340
G15D231011	23	505	11,615	60HD micro 324tot 105	3542	HFE710340
G15D231012	23	505	11,615	60HD micro 324tot 106	3542	HFE710340
G15D231013	23	505	11,615	60HD micro 324tot 107	3552	HFE710340
G15D231014	23	505	11,615	60HD micro 324tot 108	3556	HFE710340
G15D231015	23	505	11,615	60HD micro 324tot 109	3550	HFE710340
G15D232016	23	505	11,615	60HD micro 324tot 110	3556	HFE710340
G15D232017	23	505	11,615	60HD micro 324tot 111	3554	HFE710340
G15D232018	23	505	11,615	60HD micro 324tot 112	3558	HFE710340
G15D232019	23	505	11,615	60HD micro 324tot 113	3556	HFE710340
G15D232020	23	505	11,615	60HD micro 324tot 114	3558	HFE710340
G15D232021	23	505	11,615	60HD micro 324tot 115	3552	HFE710340
G15D232022	23	505	11,615	60HD micro 324tot 116	3544	HFE710340
G15D232023	23	505	11,615	60HD micro 324tot 117	3542	HFE710340
G15D232024	23	505	11,615	60HD micro 324tot 118	3540	HFE710340
G15D232025	23	505	11,615	60HD micro 324tot 119	3548	HFE710340
G15D232026	23	505	11,615	60HD micro 324tot 120	3536	HFE710340
G15D232027	23	505	11,615	60HD micro 324tot 121	3538	HFE710340
G15D232031	23	505	11,615	60HD micro 324tot 122	3596	HFE710340
G15D233032	23	505	11,615	60HD micro 324tot 123	3594	HFE710340
G15D233033	23	505	11,615	60HD micro 324tot 124	3590	HFE710340
G15D233034	23	505	11,615	60HD micro 324tot 125	3592	HFE710340
G15D233035	23	505	11,615	60HD micro 324tot 126	3594	HFE710340
G15D233036	23	505	11,615	60HD micro 324tot 127	3592	HFE710340
G15D233037	23	505	11,615	60HD micro 324tot 128	3590	HFE710340
G15D233038	23	505	11,615	60HD micro 324tot 129	3592	HFE710340
G15D233039	23	505	11,615	60HD micro 324tot 130	3584	HFE710340
G15D233040	23	505	11,615	60HD micro 324tot 131	3588	HFE710340
G15D233041	23	505	11,615	60HD micro 324tot 132	3592	HFE710340

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ROLL # G15F065049 **LOT #** HEN820690 **LINER TYPE** **60 HD MICROSPIKE**

		METRIC	ENGLISH		METRIC	ENGLISH
Thickness Measurement ASTM D5994 (Modified)	MIN	**1.40** mm	**55** mil	Thickness	**1.52** mm	**60** mil
	MAX	**1.56** mm	**61** mil	Length	**153.926** m	**505** feet
	AVE	**1.47** mm	**58** mil	Width	**7.01** m	**23** feet

OIT(Standard) ASTM D 3895					**189** minutes
Asperity ASTM D7466	Average	Top		**.66** mm	**26** mil
		Bottom		**.89** mm	**35** mil
Specific Gravity ASTM D792	Average Density			g/cc	**.944**
MFI ASTM D1238 COND. E Grade **K307**	Melt Flow Index 190C/2160 g - g/10 min				**.25**
Carbon Black Content ASTM D4218	Range			%	**2.2**
Carbon Black Dispersion ASTM D5596	Category				**10 in Category 1**
Tensile Strength ASTM D6693 (2 inches / minute)	Average Strength @ Yield	MD	**24** N/mm	**139** ppi	**2309** psi
		TD	**25** N/mm	**143** ppi	**2385** psi
	Average Strength @ Break	MD	**34** N/mm	**195** ppi	**3247** psi
		TD	**29** N/mm	**163** ppi	**2724** psi
Tensile Elongation ASTM D6693 (2 inches / minute) Lo = 1.3" Yield Lo = 2.0" Break	Average Elongation @ Yield	MD		%	**21**
		TD		%	**15**
	Average Elongation @Break	MD		%	**418**
		TD		%	**526**
Dimensional Stability ASTM D1204 (Modified)	Average Dimensional Change			%	**-0.46**
Tear Resistance ASTM D1004 (Modified)	Average Tear Resistance	MD		**209.1** N	**47** lbs
		TD		**226.8** N	**51** lbs
Puncture Resistance FTMS 101 Method 2065 Modified					**CERTIFIED**
Puncture Resistance ASTM D4833 (Modified)	Average Peak Load			**587.1** N	**132** lbs
ESCR ASTM D1693	Minumum Hrs w/o Failures			1500 Hrs	**CERTIFIED**
Notched Constant Tensile Load ASTM D5397	Pass/Fail @ 30%			500 Hrs	**PASS**

Customer Chesapeake Containment
PO 15065 Brickhaven Mine Site
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ROLL # G15F066050 **LOT #** HEN820690 **LINER TYPE** **60 HD MICROSPIKE**

		METRIC	ENGLISH		METRIC	ENGLISH
Thickness Measurement ASTM D5994 (Modified)	MIN	**1.35** mm	**53** mil	Thickness	**1.52** mm	**60** mil
	MAX	**1.55** mm	**61** mil	Length	**153.926** m	**505** feet
	AVE	**1.46** mm	**58** mil	Width	**7.01** m	**23** feet

OIT(Standard) ASTM D 3895					**189** minutes
Asperity ASTM D7466	Average	Top		**.66** mm	**26** mil
		Bottom		**.91** mm	**36** mil
Specific Gravity ASTM D792	Average Density			g/cc	**.943**
MFI ASTM D1238 COND. E Grade **K307**	Melt Flow Index 190C/2160 g - g/10 min				**.25**
Carbon Black Content ASTM D4218	Range			%	**2.2**
Carbon Black Dispersion ASTM D5596	Category				**10 in Category 1**
Tensile Strength ASTM D6693 (2 inches / minute)	Average Strength @ Yield	MD	**24** N/mm	**138** ppi	**2304** psi
		TD	**26** N/mm	**149** ppi	**2491** psi
	Average Strength @ Break	MD	**36** N/mm	**207** ppi	**3450** psi
		TD	**31** N/mm	**179** ppi	**2990** psi
Tensile Elongation ASTM D6693 (2 inches / minute) Lo = 1.3" Yield Lo = 2.0" Break	Average Elongation @ Yield	MD		%	**20**
		TD		%	**16**
	Average Elongation @Break	MD		%	**457**
		TD		%	**556**
Dimensional Stability ASTM D1204 (Modified)	Average Dimensional Change			%	**-0.46**
Tear Resistance ASTM D1004 (Modified)	Average Tear Resistance	MD		**222.4** N	**50** lbs
		TD		**200.2** N	**45** lbs
Puncture Resistance FTMS 101 Method 2065 Modified					**CERTIFIED**
Puncture Resistance ASTM D4833 (Modified)	Average Peak Load			**533.8** N	**120** lbs
ESCR ASTM D1693	Minumum Hrs w/o Failures			1500 Hrs	**CERTIFIED**
Notched Constant Tensile Load ASTM D5397	Pass/Fail @ 30%			500 Hrs	**PASS**

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ROLL # G15F066051 **LOT #** HEN820690 **LINER TYPE** **60 HD MICROSPIKE**

		METRIC	ENGLISH		METRIC	ENGLISH
Thickness Measurement ASTM D5994 (Modified)	MIN	**1.43** mm	**56** mil	Thickness	**1.52** mm	**60** mil
	MAX	**1.49** mm	**59** mil	Length	**153.926** m	**505** feet
	AVE	**1.46** mm	**58** mil	Width	**7.01** m	**23** feet

OIT(Standard) ASTM D 3895				**189** minutes
Asperity ASTM D7466	Average	Top	**.66** mm	**26** mil
		Bottom	**.91** mm	**36** mil
Specific Gravity ASTM D792	Average Density		g/cc	**.943**
MFI ASTM D1238 COND. E Grade **K307**	Melt Flow Index 190C/2160 g - g/10 min			**.25**
Carbon Black Content ASTM D4218	Range		%	**2.2**
Carbon Black Dispersion ASTM D5596	Category			**10 in Category 1**
Tensile Strength ASTM D6693 (2 inches / minute)	Average Strength @ Yield	MD	**24** N/mm **138** ppi	**2304** psi
		TD	**26** N/mm **149** ppi	**2491** psi
	Average Strength @ Break	MD	**36** N/mm **207** ppi	**3450** psi
		TD	**31** N/mm **179** ppi	**2990** psi
Tensile Elongation ASTM D6693 (2 inches / minute) Lo = 1.3" Yield Lo = 2.0" Break	Average Elongation @ Yield	MD	%	**20**
		TD	%	**16**
	Average Elongation @Break	MD	%	**457**
		TD	%	**556**
Dimensional Stability ASTM D1204 (Modified)	Average Dimensional Change		%	**-0.46**
Tear Resistance ASTM D1004 (Modified)	Average Tear Resistance	MD	**222.4** N	**50** lbs
		TD	**200.2** N	**45** lbs
Puncture Resistance FTMS 101 Method 2065 Modified				**CERTIFIED**
Puncture Resistance ASTM D4833 (Modified)	Average Peak Load		**533.8** N	**120** lbs
ESCR ASTM D1693	Minumum Hrs w/o Failures		1500 Hrs	**CERTIFIED**
Notched Constant Tensile Load ASTM D5397	Pass/Fail @ 30%		500 Hrs	**PASS**

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ROLL # G15F066052 **LOT #** HEN820690 **LINER TYPE** **60 HD MICROSPIKE**

		METRIC	ENGLISH		METRIC	ENGLISH
Thickness Measurement ASTM D5994 (Modified)	MIN	**1.42** mm	**56** mil	Thickness	**1.52** mm	**60** mil
	MAX	**1.56** mm	**61** mil	Length	**153.926** m	**505** feet
	AVE	**1.47** mm	**58** mil	Width	**7.01** m	**23** feet

OIT(Standard) ASTM D 3895				**189** minutes
Asperity ASTM D7466	Average	Top	**.61** mm	**24** mil
		Bottom	**.86** mm	**34** mil
Specific Gravity ASTM D792	Average Density		g/cc	**.943**
MFI ASTM D1238 COND. E Grade **K307**	Melt Flow Index 190C/2160 g - g/10 min			**.25**
Carbon Black Content ASTM D4218	Range		%	**2.2**
Carbon Black Dispersion ASTM D5596	Category			**10 in Category 1**
Tensile Strength ASTM D6693 (2 inches / minute)	Average Strength @ Yield	MD	**24** N/mm **138** ppi	**2304** psi
		TD	**26** N/mm **149** ppi	**2491** psi
	Average Strength @ Break	MD	**36** N/mm **207** ppi	**3450** psi
		TD	**31** N/mm **179** ppi	**2990** psi
Tensile Elongation ASTM D6693 (2 inches / minute) Lo = 1.3" Yield Lo = 2.0" Break	Average Elongation @ Yield	MD	%	**20**
		TD	%	**16**
	Average Elongation @Break	MD	%	**457**
		TD	%	**556**
Dimensional Stability ASTM D1204 (Modified)	Average Dimensional Change		%	**-0.46**
Tear Resistance ASTM D1004 (Modified)	Average Tear Resistance	MD	**222.4** N	**50** lbs
		TD	**200.2** N	**45** lbs
Puncture Resistance FTMS 101 Method 2065 Modified				**CERTIFIED**
Puncture Resistance ASTM D4833 (Modified)	Average Peak Load		**533.8** N	**120** lbs
ESCR ASTM D1693	Minumum Hrs w/o Failures		1500 Hrs	**CERTIFIED**
Notched Constant Tensile Load ASTM D5397	Pass/Fail @ 30%		500 Hrs	**PASS**

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ROLL # G15F066053 **LOT #** HEN820690 **LINER TYPE** **60 HD MICROSPIKE**

		METRIC	ENGLISH		METRIC	ENGLISH
Thickness Measurement ASTM D5994 (Modified)	MIN	**1.37** mm	**54** mil	Thickness	**1.52** mm	**60** mil
	MAX	**1.57** mm	**62** mil	Length	**153.926** m	**505** feet
	AVE	**1.45** mm	**57** mil	Width	**7.01** m	**23** feet

OIT(Standard) ASTM D 3895				**189** minutes
Asperity ASTM D7466	Average	Top	**.74** mm	**29** mil
		Bottom	**.86** mm	**34** mil
Specific Gravity ASTM D792	Average Density		g/cc	**.943**
MFI ASTM D1238 COND. E Grade **K307**	Melt Flow Index 190C/2160 g - g/10 min			**.25**
Carbon Black Content ASTM D4218	Range		%	**2.3**
Carbon Black Dispersion ASTM D5596	Category			**10 in Category 1**
Tensile Strength ASTM D6693 (2 inches / minute)	Average Strength @ Yield	MD	**24** N/mm **138** ppi	**2304** psi
		TD	**26** N/mm **149** ppi	**2491** psi
	Average Strength @ Break	MD	**36** N/mm **207** ppi	**3450** psi
		TD	**31** N/mm **179** ppi	**2990** psi
Tensile Elongation ASTM D6693 (2 inches / minute) Lo = 1.3" Yield Lo = 2.0" Break	Average Elongation @ Yield	MD	%	**20**
		TD	%	**16**
	Average Elongation @Break	MD	%	**457**
		TD	%	**556**
Dimensional Stability ASTM D1204 (Modified)	Average Dimensional Change		%	**-0.46**
Tear Resistance ASTM D1004 (Modified)	Average Tear Resistance	MD	**222.4** N	**50** lbs
		TD	**200.2** N	**45** lbs
Puncture Resistance FTMS 101 Method 2065 Modified				**CERTIFIED**
Puncture Resistance ASTM D4833 (Modified)	Average Peak Load		**533.8** N	**120** lbs
ESCR ASTM D1693	Minumum Hrs w/o Failures		1500 Hrs	**CERTIFIED**
Notched Constant Tensile Load ASTM D5397	Pass/Fail @ 30%		500 Hrs	**PASS**

Customer Chesapeake Containment
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ROLL # G15F066054 **LOT #** HEN820690 **LINER TYPE** **60 HD MICROSPIKE**

		METRIC	ENGLISH		METRIC	ENGLISH
Thickness Measurement ASTM D5994 (Modified)	MIN	**1.44** mm	**57** mil	Thickness	**1.52** mm	**60** mil
	MAX	**1.53** mm	**60** mil	Length	**153.926** m	**505** feet
	AVE	**1.49** mm	**59** mil	Width	**7.01** m	**23** feet

OIT(Standard) ASTM D 3895					**189** minutes
Asperity ASTM D7466	Average	Top		**.71** mm	**28** mil
		Bottom		**.86** mm	**34** mil
Specific Gravity ASTM D792	Average Density			g/cc	**.943**
MFI ASTM D1238 COND. E Grade **K307**	Melt Flow Index 190C/2160 g - g/10 min				**.25**
Carbon Black Content ASTM D4218	Range			%	**2.3**
Carbon Black Dispersion ASTM D5596	Category				**10 in Category 1**
Tensile Strength ASTM D6693 (2 inches / minute)	Average Strength @ Yield	MD	**24** N/mm	**138** ppi	**2304** psi
		TD	**26** N/mm	**149** ppi	**2491** psi
	Average Strength @ Break	MD	**36** N/mm	**207** ppi	**3450** psi
		TD	**31** N/mm	**179** ppi	**2990** psi
Tensile Elongation ASTM D6693 (2 inches / minute) Lo = 1.3" Yield Lo = 2.0" Break	Average Elongation @ Yield	MD		%	**20**
		TD		%	**16**
	Average Elongation @Break	MD		%	**457**
		TD		%	**556**
Dimensional Stability ASTM D1204 (Modified)	Average Dimensional Change			%	**-0.46**
Tear Resistance ASTM D1004 (Modified)	Average Tear Resistance	MD		**222.4** N	**50** lbs
		TD		**200.2** N	**45** lbs
Puncture Resistance FTMS 101 Method 2065 Modified					**CERTIFIED**
Puncture Resistance ASTM D4833 (Modified)	Average Peak Load			**533.8** N	**120** lbs
ESCR ASTM D1693	Minumum Hrs w/o Failures			1500 Hrs	**CERTIFIED**
Notched Constant Tensile Load ASTM D5397	Pass/Fail @ 30%			500 Hrs	**PASS**

Customer Chesapeake Containment
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ROLL # G15F066055 **LOT #** HEN820690 **LINER TYPE** **60 HD MICROSPIKE**

		METRIC	ENGLISH		METRIC	ENGLISH
Thickness Measurement ASTM D5994 (Modified)	MIN	**1.44** mm	**57** mil	Thickness	**1.52** mm	**60** mil
	MAX	**1.57** mm	**62** mil	Length	**153.926** m	**505** feet
	AVE	**1.51** mm	**59** mil	Width	**7.01** m	**23** feet

OIT(Standard) ASTM D 3895				**189** minutes
Asperity ASTM D7466	Average	Top	**.74** mm	**29** mil
		Bottom	**.84** mm	**33** mil
Specific Gravity ASTM D792	Average Density		g/cc	**.943**
MFI ASTM D1238 COND. E Grade **K307**	Melt Flow Index 190C/2160 g - g/10 min			**.25**
Carbon Black Content ASTM D4218	Range		%	**2.3**
Carbon Black Dispersion ASTM D5596	Category			**10 in Category 1**
Tensile Strength ASTM D6693 (2 inches / minute)	Average Strength @ Yield	MD	**23** N/mm	**134** ppi	**2230** psi
		TD	**25** N/mm	**142** ppi	**2362** psi
	Average Strength @ Break	MD	**34** N/mm	**193** ppi	**3212** psi
		TD	**31** N/mm	**179** ppi	**2979** psi
Tensile Elongation ASTM D6693 (2 inches / minute) Lo = 1.3" Yield Lo = 2.0" Break	Average Elongation @ Yield	MD	%	**19**
		TD	%	**16**
	Average Elongation @Break	MD	%	**448**
		TD	%	**570**
Dimensional Stability ASTM D1204 (Modified)	Average Dimensional Change		%	**-0.46**
Tear Resistance ASTM D1004 (Modified)	Average Tear Resistance	MD	**222.4** N	**50** lbs
		TD	**209.1** N	**47** lbs
Puncture Resistance FTMS 101 Method 2065 Modified				**CERTIFIED**
Puncture Resistance ASTM D4833 (Modified)	Average Peak Load		**560.4** N	**126** lbs
ESCR ASTM D1693	Minumum Hrs w/o Failures		1500 Hrs	**CERTIFIED**
Notched Constant Tensile Load ASTM D5397	Pass/Fail @ 30%		500 Hrs	**PASS**

Customer Chesapeake Containment
PO 15065 Brickhaven Mine Site
Destination Brickhaven, NC

Date **2/7/2015** OA# **29035**

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ROLL # G15F066056 **LOT #** HEN820700 **LINER TYPE** **60 HD MICROSPIKE**

		METRIC	ENGLISH		METRIC	ENGLISH
Thickness Measurement ASTM D5994 (Modified)	MIN	**1.43** mm	**56** mil	Thickness	**1.52** mm	**60** mil
	MAX	**1.54** mm	**61** mil	Length	**153.926** m	**505** feet
	AVE	**1.47** mm	**58** mil	Width	**7.01** m	**23** feet

OIT(Standard) ASTM D 3895					**185** minutes
Asperity ASTM D7466	Average	Top		**.61** mm	**24** mil
		Bottom		**.84** mm	**33** mil
Specific Gravity ASTM D792	Average Density			g/cc	**.945**
MFI ASTM D1238 COND. E Grade **K307**	Melt Flow Index 190C/2160 g - g/10 min				**.28**
Carbon Black Content ASTM D4218	Range			%	**2.3**
Carbon Black Dispersion ASTM D5596	Category				**10 in Category 1**
Tensile Strength ASTM D6693 (2 inches / minute)	Average Strength @ Yield	MD	**23** N/mm	**134** ppi	**2230** psi
		TD	**25** N/mm	**142** ppi	**2362** psi
	Average Strength @ Break	MD	**34** N/mm	**193** ppi	**3212** psi
		TD	**31** N/mm	**179** ppi	**2979** psi
Tensile Elongation ASTM D6693 (2 inches / minute) Lo = 1.3" Yield Lo = 2.0" Break	Average Elongation @ Yield	MD		%	**19**
		TD		%	**16**
	Average Elongation @Break	MD		%	**448**
		TD		%	**570**
Dimensional Stability ASTM D1204 (Modified)	Average Dimensional Change			%	**-0.58**
Tear Resistance ASTM D1004 (Modified)	Average Tear Resistance	MD		**222.4** N	**50** lbs
		TD		**209.1** N	**47** lbs
Puncture Resistance FTMS 101 Method 2065 Modified					**CERTIFIED**
Puncture Resistance ASTM D4833 (Modified)	Average Peak Load			**560.4** N	**126** lbs
ESCR ASTM D1693	Minumum Hrs w/o Failures			1500 Hrs	**CERTIFIED**
Notched Constant Tensile Load ASTM D5397	Pass/Fail @ 30%			500 Hrs	**PASS**

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ROLL # G15F066057 **LOT #** HEN820700 **LINER TYPE** **60 HD MICROSPIKE**

		METRIC	ENGLISH		METRIC	ENGLISH
Thickness Measurement ASTM D5994 (Modified)	MIN	**1.42** mm	**56** mil	Thickness	**1.52** mm	**60** mil
	MAX	**1.59** mm	**62** mil	Length	**153.926** m	**505** feet
	AVE	**1.50** mm	**59** mil	Width	**7.01** m	**23** feet

OIT(Standard) ASTM D 3895					**185** minutes
Asperity ASTM D7466	Average	Top		**.64** mm	**25** mil
		Bottom		**.84** mm	**33** mil
Specific Gravity ASTM D792	Average Density			g/cc	**.945**
MFI ASTM D1238 COND. E Grade **K307**	Melt Flow Index 190C/2160 g - g/10 min				**.28**
Carbon Black Content ASTM D4218	Range			%	**2.3**
Carbon Black Dispersion ASTM D5596	Category				**10 in Category 1**
Tensile Strength ASTM D6693 (2 inches / minute)	Average Strength @ Yield	MD	**23** N/mm	**134** ppi	**2230** psi
		TD	**25** N/mm	**142** ppi	**2362** psi
	Average Strength @ Break	MD	**34** N/mm	**193** ppi	**3212** psi
		TD	**31** N/mm	**179** ppi	**2979** psi
Tensile Elongation ASTM D6693 (2 inches / minute) Lo = 1.3" Yield Lo = 2.0" Break	Average Elongation @ Yield	MD		%	**19**
		TD		%	**16**
	Average Elongation @Break	MD		%	**448**
		TD		%	**570**
Dimensional Stability ASTM D1204 (Modified)	Average Dimensional Change			%	**-0.58**
Tear Resistance ASTM D1004 (Modified)	Average Tear Resistance	MD		**222.4** N	**50** lbs
		TD		**209.1** N	**47** lbs
Puncture Resistance FTMS 101 Method 2065 Modified					**CERTIFIED**
Puncture Resistance ASTM D4833 (Modified)	Average Peak Load			**560.4** N	**126** lbs
ESCR ASTM D1693	Minumum Hrs w/o Failures			1500 Hrs	**CERTIFIED**
Notched Constant Tensile Load ASTM D5397	Pass/Fail @ 30%			500 Hrs	**PASS**

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ROLL # G15F066058 **LOT #** HEN820700 **LINER TYPE** **60 HD MICROSPIKE**

		METRIC	ENGLISH		METRIC	ENGLISH
Thickness Measurement ASTM D5994 (Modified)	MIN	**1.42** mm	**56** mil	Thickness	**1.52** mm	**60** mil
	MAX	**1.51** mm	**60** mil	Length	**153.926** m	**505** feet
	AVE	**1.46** mm	**58** mil	Width	**7.01** m	**23** feet

OIT(Standard) ASTM D 3895					**185** minutes
Asperity ASTM D7466	Average	Top		**.61** mm	**24** mil
		Bottom		**.89** mm	**35** mil
Specific Gravity ASTM D792	Average Density			g/cc	**.945**
MFI ASTM D1238 COND. E Grade **K307**	Melt Flow Index 190C/2160 g - g/10 min				**.28**
Carbon Black Content ASTM D4218	Range			%	**2.2**
Carbon Black Dispersion ASTM D5596	Category				**10 in Category 1**
Tensile Strength ASTM D6693 (2 inches / minute)	Average Strength @ Yield	MD	**23** N/mm	**134** ppi	**2230** psi
		TD	**25** N/mm	**142** ppi	**2362** psi
	Average Strength @ Break	MD	**34** N/mm	**193** ppi	**3212** psi
		TD	**31** N/mm	**179** ppi	**2979** psi
Tensile Elongation ASTM D6693 (2 inches / minute) Lo = 1.3" Yield Lo = 2.0" Break	Average Elongation @ Yield	MD		%	**19**
		TD		%	**16**
	Average Elongation @Break	MD		%	**448**
		TD		%	**570**
Dimensional Stability ASTM D1204 (Modified)	Average Dimensional Change			%	**-0.58**
Tear Resistance ASTM D1004 (Modified)	Average Tear Resistance	MD		**222.4** N	**50** lbs
		TD		**209.1** N	**47** lbs
Puncture Resistance FTMS 101 Method 2065 Modified					**CERTIFIED**
Puncture Resistance ASTM D4833 (Modified)	Average Peak Load			**560.4** N	**126** lbs
ESCR ASTM D1693	Minumum Hrs w/o Failures			1500 Hrs	**CERTIFIED**
Notched Constant Tensile Load ASTM D5397	Pass/Fail @ 30%			500 Hrs	**PASS**

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ROLL # G15F066059 **LOT #** HEN820700 **LINER TYPE** **60 HD MICROSPIKE**

		METRIC	ENGLISH		METRIC	ENGLISH
Thickness Measurement ASTM D5994 (Modified)	MIN	**1.45** mm	**57** mil	Thickness	**1.52** mm	**60** mil
	MAX	**1.60** mm	**63** mil	Length	**153.926** m	**505** feet
	AVE	**1.50** mm	**59** mil	Width	**7.01** m	**23** feet

OIT(Standard) ASTM D 3895					**185** minutes
Asperity ASTM D7466	Average	Top		**.61** mm	**24** mil
		Bottom		**.84** mm	**33** mil
Specific Gravity ASTM D792	Average Density			g/cc	**.945**
MFI ASTM D1238 COND. E Grade **K307**	Melt Flow Index 190C/2160 g - g/10 min				**.28**
Carbon Black Content ASTM D4218	Range			%	**2.2**
Carbon Black Dispersion ASTM D5596	Category				**10 in Category 1**
Tensile Strength ASTM D6693 (2 inches / minute)	Average Strength @ Yield	MD	**23** N/mm	**134** ppi	**2230** psi
		TD	**25** N/mm	**142** ppi	**2362** psi
	Average Strength @ Break	MD	**34** N/mm	**193** ppi	**3212** psi
		TD	**31** N/mm	**179** ppi	**2979** psi
Tensile Elongation ASTM D6693 (2 inches / minute) Lo = 1.3" Yield Lo = 2.0" Break	Average Elongation @ Yield	MD		%	**19**
		TD		%	**16**
	Average Elongation @Break	MD		%	**448**
		TD		%	**570**
Dimensional Stability ASTM D1204 (Modified)	Average Dimensional Change			%	**-0.58**
Tear Resistance ASTM D1004 (Modified)	Average Tear Resistance	MD		**222.4** N	**50** lbs
		TD		**209.1** N	**47** lbs
Puncture Resistance FTMS 101 Method 2065 Modified					**CERTIFIED**
Puncture Resistance ASTM D4833 (Modified)	Average Peak Load			**560.4** N	**126** lbs
ESCR ASTM D1693	Minumum Hrs w/o Failures			1500 Hrs	**CERTIFIED**
Notched Constant Tensile Load ASTM D5397	Pass/Fail @ 30%			500 Hrs	**PASS**

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ROLL # G15F066060 **LOT #** HEN820700 **LINER TYPE** **60 HD MICROSPIKE**

		METRIC	ENGLISH		METRIC	ENGLISH
Thickness Measurement ASTM D5994 (Modified)	MIN	**1.41** mm	**56** mil	Thickness	**1.52** mm	**60** mil
	MAX	**1.53** mm	**60** mil	Length	**153.926** m	**505** feet
	AVE	**1.47** mm	**58** mil	Width	**7.01** m	**23** feet

OIT(Standard) ASTM D 3895					**185** minutes
Asperity ASTM D7466	Average	Top		**.66** mm	**26** mil
		Bottom		**.97** mm	**38** mil
Specific Gravity ASTM D792	Average Density			g/cc	**.946**
MFI ASTM D1238 COND. E Grade **K307**	Melt Flow Index 190C/2160 g - g/10 min				**.28**
Carbon Black Content ASTM D4218	Range			%	**2.3**
Carbon Black Dispersion ASTM D5596	Category				**10 in Category 1**
Tensile Strength ASTM D6693 (2 inches / minute)	Average Strength @ Yield	MD	**24** N/mm	**134** ppi	**2240** psi
		TD	**26** N/mm	**151** ppi	**2517** psi
	Average Strength @ Break	MD	**36** N/mm	**207** ppi	**3442** psi
		TD	**32** N/mm	**185** ppi	**3090** psi
Tensile Elongation ASTM D6693 (2 inches / minute) Lo = 1.3" Yield Lo = 2.0" Break	Average Elongation @ Yield	MD		%	**20**
		TD		%	**14**
	Average Elongation @Break	MD		%	**449**
		TD		%	**594**
Dimensional Stability ASTM D1204 (Modified)	Average Dimensional Change			%	**-0.58**
Tear Resistance ASTM D1004 (Modified)	Average Tear Resistance	MD		**222.4** N	**50** lbs
		TD		**200.2** N	**45** lbs
Puncture Resistance FTMS 101 Method 2065 Modified					**CERTIFIED**
Puncture Resistance ASTM D4833 (Modified)	Average Peak Load			**560.4** N	**126** lbs
ESCR ASTM D1693	Minumum Hrs w/o Failures			1500 Hrs	**CERTIFIED**
Notched Constant Tensile Load ASTM D5397	Pass/Fail @ 30%			500 Hrs	**PASS**

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ROLL # G15F066061 **LOT #** HEN820700 **LINER TYPE** **60 HD MICROSPIKE**

		METRIC	ENGLISH		METRIC	ENGLISH
Thickness Measurement ASTM D5994 (Modified)	MIN	**1.39** mm	**55** mil	Thickness	**1.52** mm	**60** mil
	MAX	**1.56** mm	**61** mil	Length	**153.926** m	**505** feet
	AVE	**1.48** mm	**58** mil	Width	**7.01** m	**23** feet

OIT(Standard) ASTM D 3895				**185** minutes
Asperity ASTM D7466	Average	Top	**.66** mm	**26** mil
		Bottom	**.94** mm	**37** mil
Specific Gravity ASTM D792	Average Density		g/cc	**.946**
MFI ASTM D1238 COND. E Grade **K307**	Melt Flow Index 190C/2160 g - g/10 min			**.28**
Carbon Black Content ASTM D4218	Range		%	**2.3**
Carbon Black Dispersion ASTM D5596	Category			**10 in Category 1**
Tensile Strength ASTM D6693 (2 inches / minute)	Average Strength @ Yield	MD	**24** N/mm	**134** ppi	**2240** psi
		TD	**26** N/mm	**151** ppi	**2517** psi
	Average Strength @ Break	MD	**36** N/mm	**207** ppi	**3442** psi
		TD	**32** N/mm	**185** ppi	**3090** psi
Tensile Elongation ASTM D6693 (2 inches / minute) Lo = 1.3" Yield Lo = 2.0" Break	Average Elongation @ Yield	MD	%	**20**
		TD	%	**14**
	Average Elongation @Break	MD	%	**449**
		TD	%	**594**
Dimensional Stability ASTM D1204 (Modified)	Average Dimensional Change		%	**-0.58**
Tear Resistance ASTM D1004 (Modified)	Average Tear Resistance	MD	**222.4** N	**50** lbs
		TD	**200.2** N	**45** lbs
Puncture Resistance FTMS 101 Method 2065 Modified				**CERTIFIED**
Puncture Resistance ASTM D4833 (Modified)	Average Peak Load		**560.4** N	**126** lbs
ESCR ASTM D1693	Minumum Hrs w/o Failures		1500 Hrs	**CERTIFIED**
Notched Constant Tensile Load ASTM D5397	Pass/Fail @ 30%		500 Hrs	**PASS**

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ROLL # G15F066062 **LOT #** HEN820700 **LINER TYPE** **60 HD MICROSPIKE**

		METRIC	ENGLISH		METRIC	ENGLISH
Thickness Measurement ASTM D5994 (Modified)	MIN	**1.43** mm	**56** mil	Thickness	**1.52** mm	**60** mil
	MAX	**1.61** mm	**63** mil	Length	**153.926** m	**505** feet
	AVE	**1.50** mm	**59** mil	Width	**7.01** m	**23** feet

OIT(Standard) ASTM D 3895					**185** minutes
Asperity ASTM D7466	Average	Top		**.64** mm	**25** mil
		Bottom		**.91** mm	**36** mil
Specific Gravity ASTM D792	Average Density			g/cc	**.946**
MFI ASTM D1238 COND. E Grade **K307**	Melt Flow Index 190C/2160 g - g/10 min				**.28**
Carbon Black Content ASTM D4218	Range			%	**2.3**
Carbon Black Dispersion ASTM D5596	Category				**10 in Category 1**
Tensile Strength ASTM D6693 (2 inches / minute)	Average Strength @ Yield	MD	**24** N/mm	**134** ppi	**2240** psi
		TD	**26** N/mm	**151** ppi	**2517** psi
	Average Strength @ Break	MD	**36** N/mm	**207** ppi	**3442** psi
		TD	**32** N/mm	**185** ppi	**3090** psi
Tensile Elongation ASTM D6693 (2 inches / minute) Lo = 1.3" Yield Lo = 2.0" Break	Average Elongation @ Yield	MD		%	**20**
		TD		%	**14**
	Average Elongation @Break	MD		%	**449**
		TD		%	**594**
Dimensional Stability ASTM D1204 (Modified)	Average Dimensional Change			%	**-0.58**
Tear Resistance ASTM D1004 (Modified)	Average Tear Resistance	MD		**222.4** N	**50** lbs
		TD		**200.2** N	**45** lbs
Puncture Resistance FTMS 101 Method 2065 Modified					**CERTIFIED**
Puncture Resistance ASTM D4833 (Modified)	Average Peak Load			**560.4** N	**126** lbs
ESCR ASTM D1693	Minumum Hrs w/o Failures			1500 Hrs	**CERTIFIED**
Notched Constant Tensile Load ASTM D5397	Pass/Fail @ 30%			500 Hrs	**PASS**

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ROLL # G15F067063 **LOT #** HEN820700 **LINER TYPE** **60 HD MICROSPIKE**

		METRIC	ENGLISH		METRIC	ENGLISH
Thickness Measurement ASTM D5994 (Modified)	MIN	**1.38** mm	**54** mil	Thickness	**1.52** mm	**60** mil
	MAX	**1.55** mm	**61** mil	Length	**153.926** m	**505** feet
	AVE	**1.48** mm	**58** mil	Width	**7.01** m	**23** feet

OIT(Standard) ASTM D 3895					**185** minutes
Asperity ASTM D7466	Average	Top		**.64** mm	**25** mil
		Bottom		**.89** mm	**35** mil
Specific Gravity ASTM D792	Average Density			g/cc	**.946**
MFI ASTM D1238 COND. E Grade **K307**	Melt Flow Index 190C/2160 g - g/10 min				**.28**
Carbon Black Content ASTM D4218	Range			%	**2.2**
Carbon Black Dispersion ASTM D5596	Category				**10 in Category 1**
Tensile Strength ASTM D6693 (2 inches / minute)	Average Strength @ Yield	MD	**24** N/mm	**134** ppi	**2240** psi
		TD	**26** N/mm	**151** ppi	**2517** psi
	Average Strength @ Break	MD	**36** N/mm	**207** ppi	**3442** psi
		TD	**32** N/mm	**185** ppi	**3090** psi
Tensile Elongation ASTM D6693 (2 inches / minute) Lo = 1.3" Yield Lo = 2.0" Break	Average Elongation @ Yield	MD		%	**20**
		TD		%	**14**
	Average Elongation @Break	MD		%	**449**
		TD		%	**594**
Dimensional Stability ASTM D1204 (Modified)	Average Dimensional Change			%	**-0.58**
Tear Resistance ASTM D1004 (Modified)	Average Tear Resistance	MD		**222.4** N	**50** lbs
		TD		**200.2** N	**45** lbs
Puncture Resistance FTMS 101 Method 2065 Modified					**CERTIFIED**
Puncture Resistance ASTM D4833 (Modified)	Average Peak Load			**560.4** N	**126** lbs
ESCR ASTM D1693	Minumum Hrs w/o Failures			1500 Hrs	**CERTIFIED**
Notched Constant Tensile Load ASTM D5397	Pass/Fail @ 30%			500 Hrs	**PASS**

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ROLL # G15F067064 **LOT #** HEN820700 **LINER TYPE** **60 HD MICROSPIKE**

		METRIC	ENGLISH		METRIC	ENGLISH
Thickness Measurement ASTM D5994 (Modified)	MIN	**1.42** mm	**56** mil	Thickness	**1.52** mm	**60** mil
	MAX	**1.53** mm	**60** mil	Length	**153.926** m	**505** feet
	AVE	**1.47** mm	**58** mil	Width	**7.01** m	**23** feet

OIT(Standard) ASTM D 3895					**185** minutes
Asperity ASTM D7466	Average	Top		**.64** mm	**25** mil
		Bottom		**.94** mm	**37** mil
Specific Gravity ASTM D792	Average Density			g/cc	**.946**
MFI ASTM D1238 COND. E Grade **K307**	Melt Flow Index 190C/2160 g - g/10 min				**.28**
Carbon Black Content ASTM D4218	Range			%	**2.2**
Carbon Black Dispersion ASTM D5596	Category				**10 in Category 1**
Tensile Strength ASTM D6693 (2 inches / minute)	Average Strength @ Yield	MD	**24** N/mm	**134** ppi	**2240** psi
		TD	**26** N/mm	**151** ppi	**2517** psi
	Average Strength @ Break	MD	**36** N/mm	**207** ppi	**3442** psi
		TD	**32** N/mm	**185** ppi	**3090** psi
Tensile Elongation ASTM D6693 (2 inches / minute) Lo = 1.3" Yield Lo = 2.0" Break	Average Elongation @ Yield	MD		%	**20**
		TD		%	**14**
	Average Elongation @Break	MD		%	**449**
		TD		%	**594**
Dimensional Stability ASTM D1204 (Modified)	Average Dimensional Change			%	**-0.58**
Tear Resistance ASTM D1004 (Modified)	Average Tear Resistance	MD		**222.4** N	**50** lbs
		TD		**200.2** N	**45** lbs
Puncture Resistance FTMS 101 Method 2065 Modified					**CERTIFIED**
Puncture Resistance ASTM D4833 (Modified)	Average Peak Load			**560.4** N	**126** lbs
ESCR ASTM D1693	Minumum Hrs w/o Failures			1500 Hrs	**CERTIFIED**
Notched Constant Tensile Load ASTM D5397	Pass/Fail @ 30%			500 Hrs	**PASS**

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ROLL # G15F067065 **LOT #** HEN820700 **LINER TYPE** **60 HD MICROSPIKE**

		METRIC	ENGLISH		METRIC	ENGLISH
Thickness Measurement ASTM D5994 (Modified)	MIN	**1.39** mm	**55** mil	Thickness	**1.52** mm	**60** mil
	MAX	**1.53** mm	**60** mil	Length	**153.926** m	**505** feet
	AVE	**1.47** mm	**58** mil	Width	**7.01** m	**23** feet

OIT(Standard) ASTM D 3895					**185** minutes
Asperity ASTM D7466	Average	Top		**.64** mm	**25** mil
		Bottom		**.89** mm	**35** mil
Specific Gravity ASTM D792	Average Density			g/cc	**.946**
MFI ASTM D1238 COND. E Grade **K307**	Melt Flow Index 190C/2160 g - g/10 min				**.28**
Carbon Black Content ASTM D4218	Range			%	**2.3**
Carbon Black Dispersion ASTM D5596	Category				**10 in Category 1**
Tensile Strength ASTM D6693 (2 inches / minute)	Average Strength @ Yield	MD	**25** N/mm	**142** ppi	**2367** psi
		TD	**28** N/mm	**159** ppi	**2645** psi
	Average Strength @ Break	MD	**37** N/mm	**213** ppi	**3552** psi
		TD	**32** N/mm	**184** ppi	**3072** psi
Tensile Elongation ASTM D6693 (2 inches / minute) Lo = 1.3" Yield Lo = 2.0" Break	Average Elongation @ Yield	MD		%	**19**
		TD		%	**14**
	Average Elongation @Break	MD		%	**437**
		TD		%	**580**
Dimensional Stability ASTM D1204 (Modified)	Average Dimensional Change			%	**-0.58**
Tear Resistance ASTM D1004 (Modified)	Average Tear Resistance	MD		**226.8** N	**51** lbs
		TD		**200.2** N	**45** lbs
Puncture Resistance FTMS 101 Method 2065 Modified					**CERTIFIED**
Puncture Resistance ASTM D4833 (Modified)	Average Peak Load			**587.1** N	**132** lbs
ESCR ASTM D1693	Minumum Hrs w/o Failures			1500 Hrs	**CERTIFIED**
Notched Constant Tensile Load ASTM D5397	Pass/Fail @ 30%			500 Hrs	**PASS**

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ROLL # G15F067066 **LOT #** HEN820700 **LINER TYPE** **60 HD MICROSPIKE**

		METRIC	ENGLISH		METRIC	ENGLISH
Thickness Measurement ASTM D5994 (Modified)	MIN	**1.43** mm	**56** mil	Thickness	**1.52** mm	**60** mil
	MAX	**1.57** mm	**62** mil	Length	**153.926** m	**505** feet
	AVE	**1.49** mm	**59** mil	Width	**7.01** m	**23** feet

OIT(Standard) ASTM D 3895				**185** minutes
Asperity ASTM D7466	Average	Top	**.64** mm	**25** mil
		Bottom	**.89** mm	**35** mil
Specific Gravity ASTM D792	Average Density		g/cc	**.946**
MFI ASTM D1238 COND. E Grade **K307**	Melt Flow Index 190C/2160 g - g/10 min			**.28**
Carbon Black Content ASTM D4218	Range		%	**2.3**
Carbon Black Dispersion ASTM D5596	Category			**10 in Category 1**
Tensile Strength ASTM D6693 (2 inches / minute)	Average Strength @ Yield	MD	**25** N/mm **142** ppi	**2367** psi
		TD	**28** N/mm **159** ppi	**2645** psi
	Average Strength @ Break	MD	**37** N/mm **213** ppi	**3552** psi
		TD	**32** N/mm **184** ppi	**3072** psi
Tensile Elongation ASTM D6693 (2 inches / minute) Lo = 1.3" Yield Lo = 2.0" Break	Average Elongation @ Yield	MD	%	**19**
		TD	%	**14**
	Average Elongation @Break	MD	%	**437**
		TD	%	**580**
Dimensional Stability ASTM D1204 (Modified)	Average Dimensional Change		%	**-0.58**
Tear Resistance ASTM D1004 (Modified)	Average Tear Resistance	MD	**226.8** N	**51** lbs
		TD	**200.2** N	**45** lbs
Puncture Resistance FTMS 101 Method 2065 Modified				**CERTIFIED**
Puncture Resistance ASTM D4833 (Modified)	Average Peak Load		**587.1** N	**132** lbs
ESCR ASTM D1693	Minumum Hrs w/o Failures		1500 Hrs	**CERTIFIED**
Notched Constant Tensile Load ASTM D5397	Pass/Fail @ 30%		500 Hrs	**PASS**

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ROLL # G15F067067 **LOT #** HEN820700 **LINER TYPE** **60 HD MICROSPIKE**

		METRIC	ENGLISH		METRIC	ENGLISH
Thickness Measurement ASTM D5994 (Modified)	MIN	**1.39** mm	**55** mil	Thickness	**1.52** mm	**60** mil
	MAX	**1.54** mm	**61** mil	Length	**153.926** m	**505** feet
	AVE	**1.47** mm	**58** mil	Width	**7.01** m	**23** feet

OIT(Standard) ASTM D 3895					**185** minutes
Asperity ASTM D7466	Average	Top		**.76** mm	**30** mil
		Bottom		**.89** mm	**35** mil
Specific Gravity ASTM D792	Average Density			g/cc	**.946**
MFI ASTM D1238 COND. E Grade **K307**	Melt Flow Index 190C/2160 g - g/10 min				**.28**
Carbon Black Content ASTM D4218	Range			%	**2.3**
Carbon Black Dispersion ASTM D5596	Category				**10 in Category 1**
Tensile Strength ASTM D6693 (2 inches / minute)	Average Strength @ Yield	MD	**25** N/mm	**142** ppi	**2367** psi
		TD	**28** N/mm	**159** ppi	**2645** psi
	Average Strength @ Break	MD	**37** N/mm	**213** ppi	**3552** psi
		TD	**32** N/mm	**184** ppi	**3072** psi
Tensile Elongation ASTM D6693 (2 inches / minute) Lo = 1.3" Yield Lo = 2.0" Break	Average Elongation @ Yield	MD		%	**19**
		TD		%	**14**
	Average Elongation @Break	MD		%	**437**
		TD		%	**580**
Dimensional Stability ASTM D1204 (Modified)	Average Dimensional Change			%	**-0.58**
Tear Resistance ASTM D1004 (Modified)	Average Tear Resistance	MD		**226.8** N	**51** lbs
		TD		**200.2** N	**45** lbs
Puncture Resistance FTMS 101 Method 2065 Modified					**CERTIFIED**
Puncture Resistance ASTM D4833 (Modified)	Average Peak Load			**587.1** N	**132** lbs
ESCR ASTM D1693	Minumum Hrs w/o Failures			1500 Hrs	**CERTIFIED**
Notched Constant Tensile Load ASTM D5397	Pass/Fail @ 30%			500 Hrs	**PASS**

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ROLL # G15F067068 **LOT #** HEN820700 **LINER TYPE** **60 HD MICROSPIKE**

		METRIC	ENGLISH		METRIC	ENGLISH
Thickness Measurement ASTM D5994 (Modified)	MIN	**1.37** mm	**54** mil	Thickness	**1.52** mm	**60** mil
	MAX	**1.48** mm	**58** mil	Length	**153.926** m	**505** feet
	AVE	**1.44** mm	**57** mil	Width	**7.01** m	**23** feet

OIT(Standard) ASTM D 3895					**185** minutes
Asperity ASTM D7466	Average	Top		**.79** mm	**31** mil
		Bottom		**.84** mm	**33** mil
Specific Gravity ASTM D792	Average Density			g/cc	**.946**
MFI ASTM D1238 COND. E Grade **K307**	Melt Flow Index 190C/2160 g - g/10 min				**.28**
Carbon Black Content ASTM D4218	Range			%	**2.3**
Carbon Black Dispersion ASTM D5596	Category				**10 in Category 1**
Tensile Strength ASTM D6693 (2 inches / minute)	Average Strength @ Yield	MD	**25** N/mm	**142** ppi	**2367** psi
		TD	**28** N/mm	**159** ppi	**2645** psi
	Average Strength @ Break	MD	**37** N/mm	**213** ppi	**3552** psi
		TD	**32** N/mm	**184** ppi	**3072** psi
Tensile Elongation ASTM D6693 (2 inches / minute) Lo = 1.3" Yield Lo = 2.0" Break	Average Elongation @ Yield	MD		%	**19**
		TD		%	**14**
	Average Elongation @Break	MD		%	**437**
		TD		%	**580**
Dimensional Stability ASTM D1204 (Modified)	Average Dimensional Change			%	**-0.58**
Tear Resistance ASTM D1004 (Modified)	Average Tear Resistance	MD		**226.8** N	**51** lbs
		TD		**200.2** N	**45** lbs
Puncture Resistance FTMS 101 Method 2065 Modified					**CERTIFIED**
Puncture Resistance ASTM D4833 (Modified)	Average Peak Load			**587.1** N	**132** lbs
ESCR ASTM D1693	Minumum Hrs w/o Failures			1500 Hrs	**CERTIFIED**
Notched Constant Tensile Load ASTM D5397	Pass/Fail @ 30%			500 Hrs	**PASS**

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ROLL # G15F067069 **LOT #** HEN820700 **LINER TYPE** **60 HD MICROSPIKE**

		METRIC	ENGLISH		METRIC	ENGLISH
Thickness Measurement ASTM D5994 (Modified)	MIN	**1.39** mm	**55** mil	Thickness	**1.52** mm	**60** mil
	MAX	**1.52** mm	**60** mil	Length	**153.926** m	**505** feet
	AVE	**1.44** mm	**57** mil	Width	**7.01** m	**23** feet

OIT(Standard) ASTM D 3895					**185** minutes
Asperity ASTM D7466	Average	Top		**.71** mm	**28** mil
		Bottom		**.84** mm	**33** mil
Specific Gravity ASTM D792	Average Density			g/cc	**.946**
MFI ASTM D1238 COND. E Grade **K307**	Melt Flow Index 190C/2160 g - g/10 min				**.28**
Carbon Black Content ASTM D4218	Range			%	**2.3**
Carbon Black Dispersion ASTM D5596	Category				**10 in Category 1**
Tensile Strength ASTM D6693 (2 inches / minute)	Average Strength @ Yield	MD	**25** N/mm	**142** ppi	**2367** psi
		TD	**28** N/mm	**159** ppi	**2645** psi
	Average Strength @ Break	MD	**37** N/mm	**213** ppi	**3552** psi
		TD	**32** N/mm	**184** ppi	**3072** psi
Tensile Elongation ASTM D6693 (2 inches / minute) Lo = 1.3" Yield Lo = 2.0" Break	Average Elongation @ Yield	MD		%	**19**
		TD		%	**14**
	Average Elongation @Break	MD		%	**437**
		TD		%	**580**
Dimensional Stability ASTM D1204 (Modified)	Average Dimensional Change			%	**-0.58**
Tear Resistance ASTM D1004 (Modified)	Average Tear Resistance	MD		**226.8** N	**51** lbs
		TD		**200.2** N	**45** lbs
Puncture Resistance FTMS 101 Method 2065 Modified					**CERTIFIED**
Puncture Resistance ASTM D4833 (Modified)	Average Peak Load			**587.1** N	**132** lbs
ESCR ASTM D1693	Minumum Hrs w/o Failures			1500 Hrs	**CERTIFIED**
Notched Constant Tensile Load ASTM D5397	Pass/Fail @ 30%			500 Hrs	**PASS**

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ROLL # G15F067070 **LOT #** HEN820700 **LINER TYPE** **60 HD MICROSPIKE**

		METRIC	ENGLISH		METRIC	ENGLISH
Thickness Measurement ASTM D5994 (Modified)	MIN	**1.39** mm	**55** mil	Thickness	**1.52** mm	**60** mil
	MAX	**1.57** mm	**62** mil	Length	**153.926** m	**505** feet
	AVE	**1.49** mm	**59** mil	Width	**7.01** m	**23** feet

OIT(Standard) ASTM D 3895					**185** minutes
Asperity ASTM D7466	Average	Top		**.69** mm	**27** mil
		Bottom		**.86** mm	**34** mil
Specific Gravity ASTM D792	Average Density			g/cc	**.946**
MFI ASTM D1238 COND. E Grade **K307**	Melt Flow Index 190C/2160 g - g/10 min				**.28**
Carbon Black Content ASTM D4218	Range			%	**2.3**
Carbon Black Dispersion ASTM D5596	Category				**10 in Category 1**
Tensile Strength ASTM D6693 (2 inches / minute)	Average Strength @ Yield	MD	**27** N/mm	**154** ppi	**2568** psi
		TD	**29** N/mm	**166** ppi	**2759** psi
	Average Strength @ Break	MD	**39** N/mm	**224** ppi	**3737** psi
		TD	**31** N/mm	**179** ppi	**2986** psi
Tensile Elongation ASTM D6693 (2 inches / minute) Lo = 1.3" Yield Lo = 2.0" Break	Average Elongation @ Yield	MD		%	**20**
		TD		%	**15**
	Average Elongation @Break	MD		%	**489**
		TD		%	**564**
Dimensional Stability ASTM D1204 (Modified)	Average Dimensional Change			%	**-0.58**
Tear Resistance ASTM D1004 (Modified)	Average Tear Resistance	MD		**226.8** N	**51** lbs
		TD		**209.1** N	**47** lbs
Puncture Resistance FTMS 101 Method 2065 Modified					**CERTIFIED**
Puncture Resistance ASTM D4833 (Modified)	Average Peak Load			**582.7** N	**131** lbs
ESCR ASTM D1693	Minumum Hrs w/o Failures			1500 Hrs	**CERTIFIED**
Notched Constant Tensile Load ASTM D5397	Pass/Fail @ 30%			500 Hrs	**PASS**

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ROLL # G15F067071 **LOT #** HEN820700 **LINER TYPE** **60 HD MICROSPIKE**

		METRIC	ENGLISH		METRIC	ENGLISH
Thickness Measurement ASTM D5994 (Modified)	MIN	**1.39** mm	**55** mil	Thickness	**1.52** mm	**60** mil
	MAX	**1.58** mm	**62** mil	Length	**153.926** m	**505** feet
	AVE	**1.46** mm	**57** mil	Width	**7.01** m	**23** feet

OIT(Standard) ASTM D 3895					**185** minutes
Asperity ASTM D7466	Average	Top		**.61** mm	**24** mil
		Bottom		**.84** mm	**33** mil
Specific Gravity ASTM D792	Average Density			g/cc	**.946**
MFI ASTM D1238 COND. E Grade **K307**	Melt Flow Index 190C/2160 g - g/10 min				**.28**
Carbon Black Content ASTM D4218	Range			%	**2.3**
Carbon Black Dispersion ASTM D5596	Category				**10 in Category 1**
Tensile Strength ASTM D6693 (2 inches / minute)	Average Strength @ Yield	MD	**27** N/mm	**154** ppi	**2568** psi
		TD	**29** N/mm	**166** ppi	**2759** psi
	Average Strength @ Break	MD	**39** N/mm	**224** ppi	**3737** psi
		TD	**31** N/mm	**179** ppi	**2986** psi
Tensile Elongation ASTM D6693 (2 inches / minute) Lo = 1.3" Yield Lo = 2.0" Break	Average Elongation @ Yield	MD		%	**20**
		TD		%	**15**
	Average Elongation @Break	MD		%	**489**
		TD		%	**564**
Dimensional Stability ASTM D1204 (Modified)	Average Dimensional Change			%	**-0.58**
Tear Resistance ASTM D1004 (Modified)	Average Tear Resistance	MD		**226.8** N	**51** lbs
		TD		**209.1** N	**47** lbs
Puncture Resistance FTMS 101 Method 2065 Modified					**CERTIFIED**
Puncture Resistance ASTM D4833 (Modified)	Average Peak Load			**582.7** N	**131** lbs
ESCR ASTM D1693	Minumum Hrs w/o Failures			1500 Hrs	**CERTIFIED**
Notched Constant Tensile Load ASTM D5397	Pass/Fail @ 30%			500 Hrs	**PASS**

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ROLL # G15F067072 **LOT #** HEN820700 **LINER TYPE** **60 HD MICROSPIKE**

		METRIC	ENGLISH		METRIC	ENGLISH
Thickness Measurement ASTM D5994 (Modified)	MIN	**1.39** mm	**55** mil	Thickness	**1.52** mm	**60** mil
	MAX	**1.56** mm	**61** mil	Length	**153.926** m	**505** feet
	AVE	**1.48** mm	**58** mil	Width	**7.01** m	**23** feet

OIT(Standard) ASTM D 3895					**185** minutes
Asperity ASTM D7466	Average	Top		**.66** mm	**26** mil
		Bottom		**.89** mm	**35** mil
Specific Gravity ASTM D792	Average Density			g/cc	**.946**
MFI ASTM D1238 COND. E Grade **K307**	Melt Flow Index 190C/2160 g - g/10 min				**.28**
Carbon Black Content ASTM D4218	Range			%	**2.3**
Carbon Black Dispersion ASTM D5596	Category				**10 in Category 1**
Tensile Strength ASTM D6693 (2 inches / minute)	Average Strength @ Yield	MD	**27** N/mm	**154** ppi	**2568** psi
		TD	**29** N/mm	**166** ppi	**2759** psi
	Average Strength @ Break	MD	**39** N/mm	**224** ppi	**3737** psi
		TD	**31** N/mm	**179** ppi	**2986** psi
Tensile Elongation ASTM D6693 (2 inches / minute) Lo = 1.3" Yield Lo = 2.0" Break	Average Elongation @ Yield	MD		%	**20**
		TD		%	**15**
	Average Elongation @Break	MD		%	**489**
		TD		%	**564**
Dimensional Stability ASTM D1204 (Modified)	Average Dimensional Change			%	**-0.58**
Tear Resistance ASTM D1004 (Modified)	Average Tear Resistance	MD		**226.8** N	**51** lbs
		TD		**209.1** N	**47** lbs
Puncture Resistance FTMS 101 Method 2065 Modified					**CERTIFIED**
Puncture Resistance ASTM D4833 (Modified)	Average Peak Load			**582.7** N	**131** lbs
ESCR ASTM D1693	Minumum Hrs w/o Failures			1500 Hrs	**CERTIFIED**
Notched Constant Tensile Load ASTM D5397	Pass/Fail @ 30%			500 Hrs	**PASS**

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ROLL # G15F067073 **LOT #** HEN820700 **LINER TYPE** **60 HD MICROSPIKE**

		METRIC	ENGLISH		METRIC	ENGLISH
Thickness Measurement ASTM D5994 (Modified)	MIN	**1.44** mm	**57** mil	Thickness	**1.52** mm	**60** mil
	MAX	**1.55** mm	**61** mil	Length	**153.926** m	**505** feet
	AVE	**1.48** mm	**58** mil	Width	**7.01** m	**23** feet

OIT(Standard) ASTM D 3895					**185** minutes
Asperity ASTM D7466	Average	Top		**.64** mm	**25** mil
		Bottom		**.86** mm	**34** mil
Specific Gravity ASTM D792	Average Density			g/cc	**.946**
MFI ASTM D1238 COND. E Grade **K307**	Melt Flow Index 190C/2160 g - g/10 min				**.28**
Carbon Black Content ASTM D4218	Range			%	**2.2**
Carbon Black Dispersion ASTM D5596	Category				**10 in Category 1**
Tensile Strength ASTM D6693 (2 inches / minute)	Average Strength @ Yield	MD	**27** N/mm	**154** ppi	**2568** psi
		TD	**29** N/mm	**166** ppi	**2759** psi
	Average Strength @ Break	MD	**39** N/mm	**224** ppi	**3737** psi
		TD	**31** N/mm	**179** ppi	**2986** psi
Tensile Elongation ASTM D6693 (2 inches / minute) Lo = 1.3" Yield Lo = 2.0" Break	Average Elongation @ Yield	MD		%	**20**
		TD		%	**15**
	Average Elongation @Break	MD		%	**489**
		TD		%	**564**
Dimensional Stability ASTM D1204 (Modified)	Average Dimensional Change			%	**-0.58**
Tear Resistance ASTM D1004 (Modified)	Average Tear Resistance	MD		**226.8** N	**51** lbs
		TD		**209.1** N	**47** lbs
Puncture Resistance FTMS 101 Method 2065 Modified					**CERTIFIED**
Puncture Resistance ASTM D4833 (Modified)	Average Peak Load			**582.7** N	**131** lbs
ESCR ASTM D1693	Minumum Hrs w/o Failures			1500 Hrs	**CERTIFIED**
Notched Constant Tensile Load ASTM D5397	Pass/Fail @ 30%			500 Hrs	**PASS**

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ROLL # G15F067074 **LOT #** HEN820700 **LINER TYPE** **60 HD MICROSPIKE**

		METRIC	ENGLISH		METRIC	ENGLISH
Thickness Measurement ASTM D5994 (Modified)	MIN	**1.38** mm	**54** mil	Thickness	**1.52** mm	**60** mil
	MAX	**1.55** mm	**61** mil	Length	**153.926** m	**505** feet
	AVE	**1.48** mm	**58** mil	Width	**7.01** m	**23** feet

OIT(Standard) ASTM D 3895					**185** minutes
Asperity ASTM D7466	Average	Top		**.61** mm	**24** mil
		Bottom		**.94** mm	**37** mil
Specific Gravity ASTM D792	Average Density			g/cc	**.946**
MFI ASTM D1238 COND. E Grade **K307**	Melt Flow Index 190C/2160 g - g/10 min				**.28**
Carbon Black Content ASTM D4218	Range			%	**2.2**
Carbon Black Dispersion ASTM D5596	Category				**10 in Category 1**
Tensile Strength ASTM D6693 (2 inches / minute)	Average Strength @ Yield	MD	**27** N/mm	**154** ppi	**2568** psi
		TD	**29** N/mm	**166** ppi	**2759** psi
	Average Strength @ Break	MD	**39** N/mm	**224** ppi	**3737** psi
		TD	**31** N/mm	**179** ppi	**2986** psi
Tensile Elongation ASTM D6693 (2 inches / minute) Lo = 1.3" Yield Lo = 2.0" Break	Average Elongation @ Yield	MD		%	**20**
		TD		%	**15**
	Average Elongation @Break	MD		%	**489**
		TD		%	**564**
Dimensional Stability ASTM D1204 (Modified)	Average Dimensional Change			%	**-0.58**
Tear Resistance ASTM D1004 (Modified)	Average Tear Resistance	MD		**226.8** N	**51** lbs
		TD		**209.1** N	**47** lbs
Puncture Resistance FTMS 101 Method 2065 Modified					**CERTIFIED**
Puncture Resistance ASTM D4833 (Modified)	Average Peak Load			**582.7** N	**131** lbs
ESCR ASTM D1693	Minumum Hrs w/o Failures			1500 Hrs	**CERTIFIED**
Notched Constant Tensile Load ASTM D5397	Pass/Fail @ 30%			500 Hrs	**PASS**

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ROLL # G15F067075 **LOT #** HEN820700 **LINER TYPE** **60 HD MICROSPIKE**

		METRIC	ENGLISH		METRIC	ENGLISH
Thickness Measurement ASTM D5994 (Modified)	MIN	**1.43** mm	**56** mil	Thickness	**1.52** mm	**60** mil
	MAX	**1.56** mm	**61** mil	Length	**153.926** m	**505** feet
	AVE	**1.48** mm	**58** mil	Width	**7.01** m	**23** feet

OIT(Standard) ASTM D 3895					**185** minutes
Asperity ASTM D7466	Average	Top		**.66** mm	**26** mil
		Bottom		**.91** mm	**36** mil
Specific Gravity ASTM D792	Average Density			g/cc	**.945**
MFI ASTM D1238 COND. E Grade **K307**	Melt Flow Index 190C/2160 g - g/10 min				**.28**
Carbon Black Content ASTM D4218	Range			%	**2.3**
Carbon Black Dispersion ASTM D5596	Category				**10 in Category 1**
Tensile Strength ASTM D6693 (2 inches / minute)	Average Strength @ Yield	MD	**27** N/mm	**152** ppi	**2541** psi
		TD	**29** N/mm	**168** ppi	**2796** psi
	Average Strength @ Break	MD	**38** N/mm	**214** ppi	**3571** psi
		TD	**34** N/mm	**195** ppi	**3258** psi
Tensile Elongation ASTM D6693 (2 inches / minute) Lo = 1.3" Yield Lo = 2.0" Break	Average Elongation @ Yield	MD		%	**19**
		TD		%	**14**
	Average Elongation @Break	MD		%	**429**
		TD		%	**576**
Dimensional Stability ASTM D1204 (Modified)	Average Dimensional Change			%	**-0.58**
Tear Resistance ASTM D1004 (Modified)	Average Tear Resistance	MD		**244.6** N	**55** lbs
		TD		**222.4** N	**50** lbs
Puncture Resistance FTMS 101 Method 2065 Modified					**CERTIFIED**
Puncture Resistance ASTM D4833 (Modified)	Average Peak Load			**551.6** N	**124** lbs
ESCR ASTM D1693	Minumum Hrs w/o Failures			1500 Hrs	**CERTIFIED**
Notched Constant Tensile Load ASTM D5397	Pass/Fail @ 30%			500 Hrs	**PASS**

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ROLL # G15F067076 **LOT #** HEN820700 **LINER TYPE** **60 HD MICROSPIKE**

		METRIC	ENGLISH		METRIC	ENGLISH
Thickness Measurement ASTM D5994 (Modified)	MIN	**1.43** mm	**56** mil	Thickness	**1.52** mm	**60** mil
	MAX	**1.54** mm	**61** mil	Length	**153.926** m	**505** feet
	AVE	**1.47** mm	**58** mil	Width	**7.01** m	**23** feet

OIT(Standard) ASTM D 3895					**185** minutes
Asperity ASTM D7466	Average	Top		**.66** mm	**26** mil
		Bottom		**.91** mm	**36** mil
Specific Gravity ASTM D792	Average Density			g/cc	**.945**
MFI ASTM D1238 COND. E Grade **K307**	Melt Flow Index 190C/2160 g - g/10 min				**.28**
Carbon Black Content ASTM D4218	Range			%	**2.3**
Carbon Black Dispersion ASTM D5596	Category				**10 in Category 1**
Tensile Strength ASTM D6693 (2 inches / minute)	Average Strength @ Yield	MD	**27** N/mm	**152** ppi	**2541** psi
		TD	**29** N/mm	**168** ppi	**2796** psi
	Average Strength @ Break	MD	**38** N/mm	**214** ppi	**3571** psi
		TD	**34** N/mm	**195** ppi	**3258** psi
Tensile Elongation ASTM D6693 (2 inches / minute) Lo = 1.3" Yield Lo = 2.0" Break	Average Elongation @ Yield	MD		%	**19**
		TD		%	**14**
	Average Elongation @Break	MD		%	**429**
		TD		%	**576**
Dimensional Stability ASTM D1204 (Modified)	Average Dimensional Change			%	**-0.58**
Tear Resistance ASTM D1004 (Modified)	Average Tear Resistance	MD		**244.6** N	**55** lbs
		TD		**222.4** N	**50** lbs
Puncture Resistance FTMS 101 Method 2065 Modified					**CERTIFIED**
Puncture Resistance ASTM D4833 (Modified)	Average Peak Load			**551.6** N	**124** lbs
ESCR ASTM D1693	Minumum Hrs w/o Failures			1500 Hrs	**CERTIFIED**
Notched Constant Tensile Load ASTM D5397	Pass/Fail @ 30%			500 Hrs	**PASS**

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ROLL # G15F071001 **LOT #** HEN820700 **LINER TYPE** **60 HD MICROSPIKE**

		METRIC	ENGLISH		METRIC	ENGLISH
Thickness Measurement ASTM D5994 (Modified)	MIN	**1.41** mm	**56** mil	Thickness	**1.52** mm	**60** mil
	MAX	**1.54** mm	**61** mil	Length	**153.926** m	**505** feet
	AVE	**1.47** mm	**58** mil	Width	**7.01** m	**23** feet

OIT(Standard) ASTM D 3895					**185** minutes
Asperity ASTM D7466	Average	Top		**.61** mm	**24** mil
		Bottom		**.86** mm	**34** mil
Specific Gravity ASTM D792	Average Density			g/cc	**.945**
MFI ASTM D1238 COND. E Grade **K307**	Melt Flow Index 190C/2160 g - g/10 min				**.28**
Carbon Black Content ASTM D4218	Range			%	**2.3**
Carbon Black Dispersion ASTM D5596	Category				**10 in Category 1**
Tensile Strength ASTM D6693 (2 inches / minute)	Average Strength @ Yield	MD	**27** N/mm	**152** ppi	**2541** psi
		TD	**29** N/mm	**168** ppi	**2796** psi
	Average Strength @ Break	MD	**38** N/mm	**214** ppi	**3571** psi
		TD	**34** N/mm	**195** ppi	**3258** psi
Tensile Elongation ASTM D6693 (2 inches / minute) Lo = 1.3" Yield Lo = 2.0" Break	Average Elongation @ Yield	MD		%	**19**
		TD		%	**14**
	Average Elongation @Break	MD		%	**429**
		TD		%	**576**
Dimensional Stability ASTM D1204 (Modified)	Average Dimensional Change			%	**-0.58**
Tear Resistance ASTM D1004 (Modified)	Average Tear Resistance	MD		**244.6** N	**55** lbs
		TD		**222.4** N	**50** lbs
Puncture Resistance FTMS 101 Method 2065 Modified					**CERTIFIED**
Puncture Resistance ASTM D4833 (Modified)	Average Peak Load			**551.6** N	**124** lbs
ESCR ASTM D1693	Minumum Hrs w/o Failures			1500 Hrs	**CERTIFIED**
Notched Constant Tensile Load ASTM D5397	Pass/Fail @ 30%			500 Hrs	**PASS**

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ROLL # G15F071002 **LOT #** HEN820700 **LINER TYPE** **60 HD MICROSPIKE**

		METRIC	ENGLISH		METRIC	ENGLISH
Thickness Measurement ASTM D5994 (Modified)	MIN	**1.44** mm	**57** mil	Thickness	**1.52** mm	**60** mil
	MAX	**1.57** mm	**62** mil	Length	**153.926** m	**505** feet
	AVE	**1.49** mm	**59** mil	Width	**7.01** m	**23** feet

OIT(Standard) ASTM D 3895				**185** minutes
Asperity ASTM D7466	Average	Top	**.61** mm	**24** mil
		Bottom	**.89** mm	**35** mil
Specific Gravity ASTM D792	Average Density		g/cc	**.945**
MFI ASTM D1238 COND. E Grade **K307**	Melt Flow Index 190C/2160 g - g/10 min			**.28**
Carbon Black Content ASTM D4218	Range		%	**2.2**
Carbon Black Dispersion ASTM D5596	Category			**10 in Category 1**
Tensile Strength ASTM D6693 (2 inches / minute)	Average Strength @ Yield	MD	**27** N/mm	**152** ppi	**2541** psi
		TD	**29** N/mm	**168** ppi	**2796** psi
	Average Strength @ Break	MD	**38** N/mm	**214** ppi	**3571** psi
		TD	**34** N/mm	**195** ppi	**3258** psi
Tensile Elongation ASTM D6693 (2 inches / minute) Lo = 1.3" Yield Lo = 2.0" Break	Average Elongation @ Yield	MD	%	**19**
		TD	%	**14**
	Average Elongation @Break	MD	%	**429**
		TD	%	**576**
Dimensional Stability ASTM D1204 (Modified)	Average Dimensional Change		%	**-0.58**
Tear Resistance ASTM D1004 (Modified)	Average Tear Resistance	MD	**244.6** N	**55** lbs
		TD	**222.4** N	**50** lbs
Puncture Resistance FTMS 101 Method 2065 Modified				**CERTIFIED**
Puncture Resistance ASTM D4833 (Modified)	Average Peak Load		**551.6** N	**124** lbs
ESCR ASTM D1693	Minumum Hrs w/o Failures		1500 Hrs	**CERTIFIED**
Notched Constant Tensile Load ASTM D5397	Pass/Fail @ 30%		500 Hrs	**PASS**

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ROLL # G15F071003 **LOT #** HEN820700 **LINER TYPE** **60 HD MICROSPIKE**

		METRIC	ENGLISH		METRIC	ENGLISH
Thickness Measurement ASTM D5994 (Modified)	MIN	**1.41** mm	**56** mil	Thickness	**1.52** mm	**60** mil
	MAX	**1.52** mm	**60** mil	Length	**153.926** m	**505** feet
	AVE	**1.47** mm	**58** mil	Width	**7.01** m	**23** feet

OIT(Standard) ASTM D 3895					**185** minutes
Asperity ASTM D7466	Average	Top		**.64** mm	**25** mil
		Bottom		**.94** mm	**37** mil
Specific Gravity ASTM D792	Average Density			g/cc	**.945**
MFI ASTM D1238 COND. E Grade **K307**	Melt Flow Index 190C/2160 g - g/10 min				**.28**
Carbon Black Content ASTM D4218	Range			%	**2.2**
Carbon Black Dispersion ASTM D5596	Category				**10 in Category 1**
Tensile Strength ASTM D6693 (2 inches / minute)	Average Strength @ Yield	MD	**27** N/mm	**152** ppi	**2541** psi
		TD	**29** N/mm	**168** ppi	**2796** psi
	Average Strength @ Break	MD	**38** N/mm	**214** ppi	**3571** psi
		TD	**34** N/mm	**195** ppi	**3258** psi
Tensile Elongation ASTM D6693 (2 inches / minute) Lo = 1.3" Yield Lo = 2.0" Break	Average Elongation @ Yield	MD		%	**19**
		TD		%	**14**
	Average Elongation @Break	MD		%	**429**
		TD		%	**576**
Dimensional Stability ASTM D1204 (Modified)	Average Dimensional Change			%	**-0.58**
Tear Resistance ASTM D1004 (Modified)	Average Tear Resistance	MD		**244.6** N	**55** lbs
		TD		**222.4** N	**50** lbs
Puncture Resistance FTMS 101 Method 2065 Modified					**CERTIFIED**
Puncture Resistance ASTM D4833 (Modified)	Average Peak Load			**551.6** N	**124** lbs
ESCR ASTM D1693	Minumum Hrs w/o Failures			1500 Hrs	**CERTIFIED**
Notched Constant Tensile Load ASTM D5397	Pass/Fail @ 30%			500 Hrs	**PASS**

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ROLL # G15F071004 **LOT #** HEN820700 **LINER TYPE** **60 HD MICROSPIKE**

		METRIC	ENGLISH		METRIC	ENGLISH
Thickness Measurement ASTM D5994 (Modified)	MIN	**1.41** mm	**56** mil	Thickness	**1.52** mm	**60** mil
	MAX	**1.50** mm	**59** mil	Length	**153.926** m	**505** feet
	AVE	**1.46** mm	**57** mil	Width	**7.01** m	**23** feet

OIT(Standard) ASTM D 3895					**185** minutes
Asperity ASTM D7466	Average	Top		**.66** mm	**26** mil
		Bottom		**.89** mm	**35** mil
Specific Gravity ASTM D792	Average Density			g/cc	**.946**
MFI ASTM D1238 COND. E Grade **K307**	Melt Flow Index 190C/2160 g - g/10 min				**.28**
Carbon Black Content ASTM D4218	Range			%	**2.4**
Carbon Black Dispersion ASTM D5596	Category				**10 in Category 1**
Tensile Strength ASTM D6693 (2 inches / minute)	Average Strength @ Yield	MD	**26** N/mm	**147** ppi	**2449** psi
		TD	**26** N/mm	**149** ppi	**2482** psi
	Average Strength @ Break	MD	**37** N/mm	**214** ppi	**3560** psi
		TD	**31** N/mm	**176** ppi	**2932** psi
Tensile Elongation ASTM D6693 (2 inches / minute) Lo = 1.3" Yield Lo = 2.0" Break	Average Elongation @ Yield	MD		%	**18**
		TD		%	**14**
	Average Elongation @Break	MD		%	**469**
		TD		%	**554**
Dimensional Stability ASTM D1204 (Modified)	Average Dimensional Change			%	**-0.58**
Tear Resistance ASTM D1004 (Modified)	Average Tear Resistance	MD		**231.3** N	**52** lbs
		TD		**213.5** N	**48** lbs
Puncture Resistance FTMS 101 Method 2065 Modified					**CERTIFIED**
Puncture Resistance ASTM D4833 (Modified)	Average Peak Load			**551.6** N	**124** lbs
ESCR ASTM D1693	Minumum Hrs w/o Failures			1500 Hrs	**CERTIFIED**
Notched Constant Tensile Load ASTM D5397	Pass/Fail @ 30%			500 Hrs	**PASS**

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ROLL # G15F071005 **LOT #** HEN820700 **LINER TYPE** **60 HD MICROSPIKE**

		METRIC	ENGLISH		METRIC	ENGLISH
Thickness Measurement ASTM D5994 (Modified)	MIN	**1.41** mm	**56** mil	Thickness	**1.52** mm	**60** mil
	MAX	**1.48** mm	**58** mil	Length	**153.926** m	**505** feet
	AVE	**1.46** mm	**57** mil	Width	**7.01** m	**23** feet

OIT(Standard) ASTM D 3895					**185** minutes
Asperity ASTM D7466	Average	Top		**.66** mm	**26** mil
		Bottom		**.91** mm	**36** mil
Specific Gravity ASTM D792	Average Density			g/cc	**.946**
MFI ASTM D1238 COND. E Grade **K307**	Melt Flow Index 190C/2160 g - g/10 min				**.28**
Carbon Black Content ASTM D4218	Range			%	**2.4**
Carbon Black Dispersion ASTM D5596	Category				**10 in Category 1**
Tensile Strength ASTM D6693 (2 inches / minute)	Average Strength @ Yield	MD	**26** N/mm	**147** ppi	**2449** psi
		TD	**26** N/mm	**149** ppi	**2482** psi
	Average Strength @ Break	MD	**37** N/mm	**214** ppi	**3560** psi
		TD	**31** N/mm	**176** ppi	**2932** psi
Tensile Elongation ASTM D6693 (2 inches / minute) Lo = 1.3" Yield Lo = 2.0" Break	Average Elongation @ Yield	MD		%	**18**
		TD		%	**14**
	Average Elongation @Break	MD		%	**469**
		TD		%	**554**
Dimensional Stability ASTM D1204 (Modified)	Average Dimensional Change			%	**-0.58**
Tear Resistance ASTM D1004 (Modified)	Average Tear Resistance	MD		**231.3** N	**52** lbs
		TD		**213.5** N	**48** lbs
Puncture Resistance FTMS 101 Method 2065 Modified					**CERTIFIED**
Puncture Resistance ASTM D4833 (Modified)	Average Peak Load			**551.6** N	**124** lbs
ESCR ASTM D1693	Minumum Hrs w/o Failures			1500 Hrs	**CERTIFIED**
Notched Constant Tensile Load ASTM D5397	Pass/Fail @ 30%			500 Hrs	**PASS**

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ROLL # G15F071006 **LOT #** HEN820700 **LINER TYPE** **60 HD MICROSPIKE**

		METRIC	ENGLISH		METRIC	ENGLISH
Thickness Measurement ASTM D5994 (Modified)	MIN	**1.41** mm	**56** mil	Thickness	**1.52** mm	**60** mil
	MAX	**1.57** mm	**62** mil	Length	**153.926** m	**505** feet
	AVE	**1.46** mm	**57** mil	Width	**7.01** m	**23** feet

OIT(Standard) ASTM D 3895				**185** minutes
Asperity ASTM D7466	Average	Top	**.64** mm	**25** mil
		Bottom	**.94** mm	**37** mil
Specific Gravity ASTM D792	Average Density		g/cc	**.946**
MFI ASTM D1238 COND. E Grade **K307**	Melt Flow Index 190C/2160 g - g/10 min			**.28**
Carbon Black Content ASTM D4218	Range		%	**2.4**
Carbon Black Dispersion ASTM D5596	Category			**10 in Category 1**

Tensile Strength ASTM D6693 (2 inches / minute)	Average Strength @ Yield	MD	**26** N/mm	**147** ppi	**2449** psi
		TD	**26** N/mm	**149** ppi	**2482** psi
	Average Strength @ Break	MD	**37** N/mm	**214** ppi	**3560** psi
		TD	**31** N/mm	**176** ppi	**2932** psi
Tensile Elongation ASTM D6693 (2 inches / minute) Lo = 1.3" Yield Lo = 2.0" Break	Average Elongation @ Yield	MD		%	**18**
		TD		%	**14**
	Average Elongation @Break	MD		%	**469**
		TD		%	**554**
Dimensional Stability ASTM D1204 (Modified)	Average Dimensional Change			%	**-0.58**
Tear Resistance ASTM D1004 (Modified)	Average Tear Resistance	MD	**231.3** N		**52** lbs
		TD	**213.5** N		**48** lbs
Puncture Resistance FTMS 101 Method 2065 Modified					**CERTIFIED**
Puncture Resistance ASTM D4833 (Modified)	Average Peak Load		**551.6** N		**124** lbs
ESCR ASTM D1693	Minumum Hrs w/o Failures		1500 Hrs		**CERTIFIED**
Notched Constant Tensile Load ASTM D5397	Pass/Fail @ 30%		500 Hrs		**PASS**

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ROLL # G15F071007 **LOT #** HEN820700 **LINER TYPE** **60 HD MICROSPIKE**

		METRIC	ENGLISH		METRIC	ENGLISH
Thickness Measurement ASTM D5994 (Modified)	MIN	**1.42** mm	**56** mil	Thickness	**1.52** mm	**60** mil
	MAX	**1.53** mm	**60** mil	Length	**153.926** m	**505** feet
	AVE	**1.47** mm	**58** mil	Width	**7.01** m	**23** feet

OIT(Standard) ASTM D 3895					**185** minutes
Asperity ASTM D7466	Average	Top		**.64** mm	**25** mil
		Bottom		**.86** mm	**34** mil
Specific Gravity ASTM D792	Average Density			g/cc	**.946**
MFI ASTM D1238 COND. E Grade **K307**	Melt Flow Index 190C/2160 g - g/10 min				**.28**
Carbon Black Content ASTM D4218	Range			%	**2.2**
Carbon Black Dispersion ASTM D5596	Category				**10 in Category 1**
Tensile Strength ASTM D6693 (2 inches / minute)	Average Strength @ Yield	MD	**26** N/mm	**147** ppi	**2449** psi
		TD	**26** N/mm	**149** ppi	**2482** psi
	Average Strength @ Break	MD	**37** N/mm	**214** ppi	**3560** psi
		TD	**31** N/mm	**176** ppi	**2932** psi
Tensile Elongation ASTM D6693 (2 inches / minute) Lo = 1.3" Yield Lo = 2.0" Break	Average Elongation @ Yield	MD		%	**18**
		TD		%	**14**
	Average Elongation @Break	MD		%	**469**
		TD		%	**554**
Dimensional Stability ASTM D1204 (Modified)	Average Dimensional Change			%	**-0.58**
Tear Resistance ASTM D1004 (Modified)	Average Tear Resistance	MD		**231.3** N	**52** lbs
		TD		**213.5** N	**48** lbs
Puncture Resistance FTMS 101 Method 2065 Modified					**CERTIFIED**
Puncture Resistance ASTM D4833 (Modified)	Average Peak Load			**551.6** N	**124** lbs
ESCR ASTM D1693	Minumum Hrs w/o Failures			1500 Hrs	**CERTIFIED**
Notched Constant Tensile Load ASTM D5397	Pass/Fail @ 30%			500 Hrs	**PASS**

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ROLL # G15F071008 **LOT #** HEN820700 **LINER TYPE** **60 HD MICROSPIKE**

		METRIC	ENGLISH		METRIC	ENGLISH
Thickness Measurement ASTM D5994 (Modified)	MIN	**1.41** mm	**56** mil	Thickness	**1.52** mm	**60** mil
	MAX	**1.51** mm	**60** mil	Length	**153.926** m	**505** feet
	AVE	**1.46** mm	**58** mil	Width	**7.01** m	**23** feet

OIT(Standard) ASTM D 3895					**185** minutes
Asperity ASTM D7466	Average	Top		**.66** mm	**26** mil
		Bottom		**.89** mm	**35** mil
Specific Gravity ASTM D792	Average Density			g/cc	**.946**
MFI ASTM D1238 COND. E Grade **K307**	Melt Flow Index 190C/2160 g - g/10 min				**.28**
Carbon Black Content ASTM D4218	Range			%	**2.2**
Carbon Black Dispersion ASTM D5596	Category				**10 in Category 1**
Tensile Strength ASTM D6693 (2 inches / minute)	Average Strength @ Yield	MD	**26** N/mm	**147** ppi	**2449** psi
		TD	**26** N/mm	**149** ppi	**2482** psi
	Average Strength @ Break	MD	**37** N/mm	**214** ppi	**3560** psi
		TD	**31** N/mm	**176** ppi	**2932** psi
Tensile Elongation ASTM D6693 (2 inches / minute) Lo = 1.3" Yield Lo = 2.0" Break	Average Elongation @ Yield	MD		%	**18**
		TD		%	**14**
	Average Elongation @Break	MD		%	**469**
		TD		%	**554**
Dimensional Stability ASTM D1204 (Modified)	Average Dimensional Change			%	**-0.58**
Tear Resistance ASTM D1004 (Modified)	Average Tear Resistance	MD		**231.3** N	**52** lbs
		TD		**213.5** N	**48** lbs
Puncture Resistance FTMS 101 Method 2065 Modified					**CERTIFIED**
Puncture Resistance ASTM D4833 (Modified)	Average Peak Load			**551.6** N	**124** lbs
ESCR ASTM D1693	Minumum Hrs w/o Failures			1500 Hrs	**CERTIFIED**
Notched Constant Tensile Load ASTM D5397	Pass/Fail @ 30%			500 Hrs	**PASS**

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ROLL # G15F071009 **LOT #** HEN820700 **LINER TYPE** **60 HD MICROSPIKE**

		METRIC	ENGLISH		METRIC	ENGLISH
Thickness Measurement ASTM D5994 (Modified)	MIN	**1.38** mm	**54** mil	Thickness	**1.52** mm	**60** mil
	MAX	**1.51** mm	**59** mil	Length	**153.926** m	**505** feet
	AVE	**1.45** mm	**57** mil	Width	**7.01** m	**23** feet

OIT(Standard) ASTM D 3895					**185** minutes
Asperity ASTM D7466	Average	Top		**.66** mm	**26** mil
		Bottom		**.91** mm	**36** mil
Specific Gravity ASTM D792	Average Density			g/cc	**.946**
MFI ASTM D1238 COND. E Grade **K307**	Melt Flow Index 190C/2160 g - g/10 min				**.28**
Carbon Black Content ASTM D4218	Range			%	**2.5**
Carbon Black Dispersion ASTM D5596	Category				**10 in Category 1**
Tensile Strength ASTM D6693 (2 inches / minute)	Average Strength @ Yield	MD	**25** N/mm	**140** ppi	**2332** psi
		TD	**28** N/mm	**159** ppi	**2652** psi
	Average Strength @ Break	MD	**40** N/mm	**227** ppi	**3781** psi
		TD	**34** N/mm	**196** ppi	**3264** psi
Tensile Elongation ASTM D6693 (2 inches / minute) Lo = 1.3" Yield Lo = 2.0" Break	Average Elongation @ Yield	MD		%	**19**
		TD		%	**13**
	Average Elongation @Break	MD		%	**480**
		TD		%	**618**
Dimensional Stability ASTM D1204 (Modified)	Average Dimensional Change			%	**-0.58**
Tear Resistance ASTM D1004 (Modified)	Average Tear Resistance	MD		**226.8** N	**51** lbs
		TD		**209.1** N	**47** lbs
Puncture Resistance FTMS 101 Method 2065 Modified					**CERTIFIED**
Puncture Resistance ASTM D4833 (Modified)	Average Peak Load			**587.1** N	**132** lbs
ESCR ASTM D1693	Minumum Hrs w/o Failures			1500 Hrs	**CERTIFIED**
Notched Constant Tensile Load ASTM D5397	Pass/Fail @ 30%			500 Hrs	**PASS**

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ROLL # G15F071010 **LOT #** HEN820700 **LINER TYPE** **60 HD MICROSPIKE**

		METRIC	ENGLISH		METRIC	ENGLISH
Thickness Measurement ASTM D5994 (Modified)	MIN	**1.38** mm	**54** mil	Thickness	**1.52** mm	**60** mil
	MAX	**1.49** mm	**59** mil	Length	**153.926** m	**505** feet
	AVE	**1.44** mm	**57** mil	Width	**7.01** m	**23** feet

OIT(Standard) ASTM D 3895				**185** minutes
Asperity ASTM D7466	Average	Top	**.66** mm	**26** mil
		Bottom	**.91** mm	**36** mil
Specific Gravity ASTM D792	Average Density		g/cc	**.946**
MFI ASTM D1238 COND. E Grade **K307**	Melt Flow Index 190C/2160 g - g/10 min			**.28**
Carbon Black Content ASTM D4218	Range		%	**2.5**
Carbon Black Dispersion ASTM D5596	Category			**10 in Category 1**

Tensile Strength ASTM D6693 (2 inches / minute)	Average Strength @ Yield	MD	**25** N/mm	**140** ppi	**2332** psi
		TD	**28** N/mm	**159** ppi	**2652** psi
	Average Strength @ Break	MD	**40** N/mm	**227** ppi	**3781** psi
		TD	**34** N/mm	**196** ppi	**3264** psi
Tensile Elongation ASTM D6693 (2 inches / minute) Lo = 1.3" Yield Lo = 2.0" Break	Average Elongation @ Yield	MD	%	**19**	
		TD	%	**13**	
	Average Elongation @Break	MD	%	**480**	
		TD	%	**618**	
Dimensional Stability ASTM D1204 (Modified)	Average Dimensional Change		%	**-0.58**	
Tear Resistance ASTM D1004 (Modified)	Average Tear Resistance	MD	**226.8** N	**51** lbs	
		TD	**209.1** N	**47** lbs	
Puncture Resistance FTMS 101 Method 2065 Modified				**CERTIFIED**	
Puncture Resistance ASTM D4833 (Modified)	Average Peak Load		**587.1** N	**132** lbs	
ESCR ASTM D1693	Minumum Hrs w/o Failures		1500 Hrs	**CERTIFIED**	
Notched Constant Tensile Load ASTM D5397	Pass/Fail @ 30%		500 Hrs	**PASS**	

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ROLL # G15F071011 **LOT #** HEN820700 **LINER TYPE** **60 HD MICROSPIKE**

		METRIC	ENGLISH		METRIC	ENGLISH
Thickness Measurement ASTM D5994 (Modified)	MIN	**1.43** mm	**56** mil	Thickness	**1.52** mm	**60** mil
	MAX	**1.54** mm	**61** mil	Length	**153.926** m	**505** feet
	AVE	**1.49** mm	**59** mil	Width	**7.01** m	**23** feet

OIT(Standard) ASTM D 3895				**185** minutes
Asperity ASTM D7466	Average	Top	**.64** mm	**25** mil
		Bottom	**.89** mm	**35** mil
Specific Gravity ASTM D792	Average Density		g/cc	**.946**
MFI ASTM D1238 COND. E Grade **K307**	Melt Flow Index 190C/2160 g - g/10 min			**.28**
Carbon Black Content ASTM D4218	Range		%	**2.5**
Carbon Black Dispersion ASTM D5596	Category			**10 in Category 1**
Tensile Strength ASTM D6693 (2 inches / minute)	Average Strength @ Yield	MD	**25** N/mm **140** ppi	**2332** psi
		TD	**28** N/mm **159** ppi	**2652** psi
	Average Strength @ Break	MD	**40** N/mm **227** ppi	**3781** psi
		TD	**34** N/mm **196** ppi	**3264** psi
Tensile Elongation ASTM D6693 (2 inches / minute) Lo = 1.3" Yield Lo = 2.0" Break	Average Elongation @ Yield	MD	%	**19**
		TD	%	**13**
	Average Elongation @Break	MD	%	**480**
		TD	%	**618**
Dimensional Stability ASTM D1204 (Modified)	Average Dimensional Change		%	**-0.58**
Tear Resistance ASTM D1004 (Modified)	Average Tear Resistance	MD	**226.8** N	**51** lbs
		TD	**209.1** N	**47** lbs
Puncture Resistance FTMS 101 Method 2065 Modified				**CERTIFIED**
Puncture Resistance ASTM D4833 (Modified)	Average Peak Load		**587.1** N	**132** lbs
ESCR ASTM D1693	Minumum Hrs w/o Failures		1500 Hrs	**CERTIFIED**
Notched Constant Tensile Load ASTM D5397	Pass/Fail @ 30%		500 Hrs	**PASS**

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ROLL # G15F071012 **LOT #** HEN820700 **LINER TYPE** **60 HD MICROSPIKE**

		METRIC	ENGLISH		METRIC	ENGLISH
Thickness Measurement ASTM D5994 (Modified)	MIN	**1.40** mm	**55** mil	Thickness	**1.52** mm	**60** mil
	MAX	**1.52** mm	**60** mil	Length	**153.926** m	**505** feet
	AVE	**1.46** mm	**58** mil	Width	**7.01** m	**23** feet

OIT(Standard) ASTM D 3895					**185** minutes
Asperity ASTM D7466	Average	Top		**.64** mm	**25** mil
		Bottom		**.91** mm	**36** mil
Specific Gravity ASTM D792	Average Density			g/cc	**.946**
MFI ASTM D1238 COND. E Grade **K307**	Melt Flow Index 190C/2160 g - g/10 min				**.28**
Carbon Black Content ASTM D4218	Range			%	**2.2**
Carbon Black Dispersion ASTM D5596	Category				**10 in Category 1**
Tensile Strength ASTM D6693 (2 inches / minute)	Average Strength @ Yield	MD	**25** N/mm	**140** ppi	**2332** psi
		TD	**28** N/mm	**159** ppi	**2652** psi
	Average Strength @ Break	MD	**40** N/mm	**227** ppi	**3781** psi
		TD	**34** N/mm	**196** ppi	**3264** psi
Tensile Elongation ASTM D6693 (2 inches / minute) Lo = 1.3" Yield Lo = 2.0" Break	Average Elongation @ Yield	MD		%	**19**
		TD		%	**13**
	Average Elongation @Break	MD		%	**480**
		TD		%	**618**
Dimensional Stability ASTM D1204 (Modified)	Average Dimensional Change			%	**-0.58**
Tear Resistance ASTM D1004 (Modified)	Average Tear Resistance	MD		**226.8** N	**51** lbs
		TD		**209.1** N	**47** lbs
Puncture Resistance FTMS 101 Method 2065 Modified					**CERTIFIED**
Puncture Resistance ASTM D4833 (Modified)	Average Peak Load			**587.1** N	**132** lbs
ESCR ASTM D1693	Minumum Hrs w/o Failures			1500 Hrs	**CERTIFIED**
Notched Constant Tensile Load ASTM D5397	Pass/Fail @ 30%			500 Hrs	**PASS**

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ROLL # G15F071013 **LOT #** HEN820700 **LINER TYPE** **60 HD MICROSPIKE**

		METRIC	ENGLISH		METRIC	ENGLISH
Thickness Measurement ASTM D5994 (Modified)	MIN	**1.42** mm	**56** mil	Thickness	**1.52** mm	**60** mil
	MAX	**1.55** mm	**61** mil	Length	**153.926** m	**505** feet
	AVE	**1.48** mm	**58** mil	Width	**7.01** m	**23** feet

OIT(Standard) ASTM D 3895					**185** minutes
Asperity ASTM D7466	Average	Top		**.64** mm	**25** mil
		Bottom		**.91** mm	**36** mil
Specific Gravity ASTM D792	Average Density			g/cc	**.946**
MFI ASTM D1238 COND. E Grade **K307**	Melt Flow Index 190C/2160 g - g/10 min				**.28**
Carbon Black Content ASTM D4218	Range			%	**2.2**
Carbon Black Dispersion ASTM D5596	Category				**10 in Category 1**
Tensile Strength ASTM D6693 (2 inches / minute)	Average Strength @ Yield	MD	**25** N/mm	**140** ppi	**2332** psi
		TD	**28** N/mm	**159** ppi	**2652** psi
	Average Strength @ Break	MD	**40** N/mm	**227** ppi	**3781** psi
		TD	**34** N/mm	**196** ppi	**3264** psi
Tensile Elongation ASTM D6693 (2 inches / minute) Lo = 1.3" Yield Lo = 2.0" Break	Average Elongation @ Yield	MD		%	**19**
		TD		%	**13**
	Average Elongation @Break	MD		%	**480**
		TD		%	**618**
Dimensional Stability ASTM D1204 (Modified)	Average Dimensional Change			%	**-0.58**
Tear Resistance ASTM D1004 (Modified)	Average Tear Resistance	MD		**226.8** N	**51** lbs
		TD		**209.1** N	**47** lbs
Puncture Resistance FTMS 101 Method 2065 Modified					**CERTIFIED**
Puncture Resistance ASTM D4833 (Modified)	Average Peak Load			**587.1** N	**132** lbs
ESCR ASTM D1693	Minumum Hrs w/o Failures			1500 Hrs	**CERTIFIED**
Notched Constant Tensile Load ASTM D5397	Pass/Fail @ 30%			500 Hrs	**PASS**

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ROLL # G15F072014 **LOT #** HEN820700 **LINER TYPE** **60 HD MICROSPIKE**

		METRIC	ENGLISH		METRIC	ENGLISH
Thickness Measurement ASTM D5994 (Modified)	MIN	**1.40** mm	**55** mil	Thickness	**1.52** mm	**60** mil
	MAX	**1.54** mm	**61** mil	Length	**153.926** m	**505** feet
	AVE	**1.48** mm	**58** mil	Width	**7.01** m	**23** feet

OIT(Standard) ASTM D 3895					**185** minutes
Asperity ASTM D7466	Average	Top		**.64** mm	**25** mil
		Bottom		**.91** mm	**36** mil
Specific Gravity ASTM D792	Average Density			g/cc	**.945**
MFI ASTM D1238 COND. E Grade **K307**	Melt Flow Index 190C/2160 g - g/10 min				**.28**
Carbon Black Content ASTM D4218	Range			%	**2.2**
Carbon Black Dispersion ASTM D5596	Category				**10 in Category 1**
Tensile Strength ASTM D6693 (2 inches / minute)	Average Strength @ Yield	MD	**24** N/mm	**139** ppi	**2313** psi
		TD	**27** N/mm	**154** ppi	**2560** psi
	Average Strength @ Break	MD	**37** N/mm	**211** ppi	**3514** psi
		TD	**33** N/mm	**189** ppi	**3144** psi
Tensile Elongation ASTM D6693 (2 inches / minute) Lo = 1.3" Yield Lo = 2.0" Break	Average Elongation @ Yield	MD		%	**20**
		TD		%	**14**
	Average Elongation @Break	MD		%	**463**
		TD		%	**596**
Dimensional Stability ASTM D1204 (Modified)	Average Dimensional Change			%	**-0.58**
Tear Resistance ASTM D1004 (Modified)	Average Tear Resistance	MD	**222.4** N		**50** lbs
		TD	**200.2** N		**45** lbs
Puncture Resistance FTMS 101 Method 2065 Modified					**CERTIFIED**
Puncture Resistance ASTM D4833 (Modified)	Average Peak Load		**551.6** N		**124** lbs
ESCR ASTM D1693	Minumum Hrs w/o Failures		1500 Hrs		**CERTIFIED**
Notched Constant Tensile Load ASTM D5397	Pass/Fail @ 30%		500 Hrs		**PASS**

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ROLL # G15F072015 **LOT #** HEN820700 **LINER TYPE** **60 HD MICROSPIKE**

		METRIC	ENGLISH		METRIC	ENGLISH
Thickness Measurement ASTM D5994 (Modified)	MIN	**1.43** mm	**56** mil	Thickness	**1.52** mm	**60** mil
	MAX	**1.53** mm	**60** mil	Length	**153.926** m	**505** feet
	AVE	**1.49** mm	**59** mil	Width	**7.01** m	**23** feet

OIT(Standard) ASTM D 3895					**185** minutes
Asperity ASTM D7466	Average	Top		**.66** mm	**26** mil
		Bottom		**.91** mm	**36** mil
Specific Gravity ASTM D792	Average Density			g/cc	**.945**
MFI ASTM D1238 COND. E Grade **K307**	Melt Flow Index 190C/2160 g - g/10 min				**.28**
Carbon Black Content ASTM D4218	Range			%	**2.2**
Carbon Black Dispersion ASTM D5596	Category				**10 in Category 1**
Tensile Strength ASTM D6693 (2 inches / minute)	Average Strength @ Yield	MD	**24** N/mm	**139** ppi	**2313** psi
		TD	**27** N/mm	**154** ppi	**2560** psi
	Average Strength @ Break	MD	**37** N/mm	**211** ppi	**3514** psi
		TD	**33** N/mm	**189** ppi	**3144** psi
Tensile Elongation ASTM D6693 (2 inches / minute) Lo = 1.3" Yield Lo = 2.0" Break	Average Elongation @ Yield	MD		%	**20**
		TD		%	**14**
	Average Elongation @Break	MD		%	**463**
		TD		%	**596**
Dimensional Stability ASTM D1204 (Modified)	Average Dimensional Change			%	**-0.58**
Tear Resistance ASTM D1004 (Modified)	Average Tear Resistance	MD		**222.4** N	**50** lbs
		TD		**200.2** N	**45** lbs
Puncture Resistance FTMS 101 Method 2065 Modified					**CERTIFIED**
Puncture Resistance ASTM D4833 (Modified)	Average Peak Load			**551.6** N	**124** lbs
ESCR ASTM D1693	Minumum Hrs w/o Failures			1500 Hrs	**CERTIFIED**
Notched Constant Tensile Load ASTM D5397	Pass/Fail @ 30%			500 Hrs	**PASS**

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ROLL # G15F072016 **LOT #** HEN820700 **LINER TYPE** **60 HD MICROSPIKE**

		METRIC	ENGLISH		METRIC	ENGLISH
Thickness Measurement ASTM D5994 (Modified)	MIN	**1.41** mm	**55** mil	Thickness	**1.52** mm	**60** mil
	MAX	**1.55** mm	**61** mil	Length	**153.926** m	**505** feet
	AVE	**1.48** mm	**58** mil	Width	**7.01** m	**23** feet

OIT(Standard) ASTM D 3895					**185** minutes
Asperity ASTM D7466	Average	Top		**.61** mm	**24** mil
		Bottom		**.89** mm	**35** mil
Specific Gravity ASTM D792	Average Density			g/cc	**.945**
MFI ASTM D1238 COND. E Grade **K307**	Melt Flow Index 190C/2160 g - g/10 min				**.28**
Carbon Black Content ASTM D4218	Range			%	**2.2**
Carbon Black Dispersion ASTM D5596	Category				**10 in Category 1**
Tensile Strength ASTM D6693 (2 inches / minute)	Average Strength @ Yield	MD	**24** N/mm	**139** ppi	**2313** psi
		TD	**27** N/mm	**154** ppi	**2560** psi
	Average Strength @ Break	MD	**37** N/mm	**211** ppi	**3514** psi
		TD	**33** N/mm	**189** ppi	**3144** psi
Tensile Elongation ASTM D6693 (2 inches / minute) Lo = 1.3" Yield Lo = 2.0" Break	Average Elongation @ Yield	MD		%	**20**
		TD		%	**14**
	Average Elongation @Break	MD		%	**463**
		TD		%	**596**
Dimensional Stability ASTM D1204 (Modified)	Average Dimensional Change			%	**-0.58**
Tear Resistance ASTM D1004 (Modified)	Average Tear Resistance	MD		**222.4** N	**50** lbs
		TD		**200.2** N	**45** lbs
Puncture Resistance FTMS 101 Method 2065 Modified					**CERTIFIED**
Puncture Resistance ASTM D4833 (Modified)	Average Peak Load			**551.6** N	**124** lbs
ESCR ASTM D1693	Minumum Hrs w/o Failures			1500 Hrs	**CERTIFIED**
Notched Constant Tensile Load ASTM D5397	Pass/Fail @ 30%			500 Hrs	**PASS**

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ROLL # G15F072017 **LOT #** HEN820700 **LINER TYPE** **60 HD MICROSPIKE**

		METRIC	ENGLISH		METRIC	ENGLISH
Thickness Measurement ASTM D5994 (Modified)	MIN	**1.42** mm	**56** mil	Thickness	**1.52** mm	**60** mil
	MAX	**1.55** mm	**61** mil	Length	**153.926** m	**505** feet
	AVE	**1.48** mm	**58** mil	Width	**7.01** m	**23** feet

OIT(Standard) ASTM D 3895					**185** minutes
Asperity ASTM D7466	Average	Top		**.61** mm	**24** mil
		Bottom		**.89** mm	**35** mil
Specific Gravity ASTM D792	Average Density			g/cc	**.945**
MFI ASTM D1238 COND. E Grade **K307**	Melt Flow Index 190C/2160 g - g/10 min				**.28**
Carbon Black Content ASTM D4218	Range			%	**2.3**
Carbon Black Dispersion ASTM D5596	Category				**10 in Category 1**
Tensile Strength ASTM D6693 (2 inches / minute)	Average Strength @ Yield	MD	**24** N/mm	**139** ppi	**2313** psi
		TD	**27** N/mm	**154** ppi	**2560** psi
	Average Strength @ Break	MD	**37** N/mm	**211** ppi	**3514** psi
		TD	**33** N/mm	**189** ppi	**3144** psi
Tensile Elongation ASTM D6693 (2 inches / minute) Lo = 1.3" Yield Lo = 2.0" Break	Average Elongation @ Yield	MD		%	**20**
		TD		%	**14**
	Average Elongation @Break	MD		%	**463**
		TD		%	**596**
Dimensional Stability ASTM D1204 (Modified)	Average Dimensional Change			%	**-0.58**
Tear Resistance ASTM D1004 (Modified)	Average Tear Resistance	MD		**222.4** N	**50** lbs
		TD		**200.2** N	**45** lbs
Puncture Resistance FTMS 101 Method 2065 Modified					**CERTIFIED**
Puncture Resistance ASTM D4833 (Modified)	Average Peak Load			**551.6** N	**124** lbs
ESCR ASTM D1693	Minumum Hrs w/o Failures			1500 Hrs	**CERTIFIED**
Notched Constant Tensile Load ASTM D5397	Pass/Fail @ 30%			500 Hrs	**PASS**

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ROLL # G15F072018 **LOT #** HEN820700 **LINER TYPE** **60 HD MICROSPIKE**

		METRIC	ENGLISH		METRIC	ENGLISH
Thickness Measurement ASTM D5994 (Modified)	MIN	**1.44** mm	**57** mil	Thickness	**1.52** mm	**60** mil
	MAX	**1.57** mm	**62** mil	Length	**153.926** m	**505** feet
	AVE	**1.50** mm	**59** mil	Width	**7.01** m	**23** feet

OIT(Standard) ASTM D 3895				**185** minutes
Asperity ASTM D7466	Average	Top	**.64** mm	**25** mil
		Bottom	**.89** mm	**35** mil
Specific Gravity ASTM D792	Average Density		g/cc	**.945**
MFI ASTM D1238 COND. E Grade **K307**	Melt Flow Index 190C/2160 g - g/10 min			**.28**
Carbon Black Content ASTM D4218	Range		%	**2.3**
Carbon Black Dispersion ASTM D5596	Category			**10 in Category 1**
Tensile Strength ASTM D6693 (2 inches / minute)	Average Strength @ Yield	MD	**24** N/mm	**139** ppi	**2313** psi
		TD	**27** N/mm	**154** ppi	**2560** psi
	Average Strength @ Break	MD	**37** N/mm	**211** ppi	**3514** psi
		TD	**33** N/mm	**189** ppi	**3144** psi
Tensile Elongation ASTM D6693 (2 inches / minute) Lo = 1.3" Yield Lo = 2.0" Break	Average Elongation @ Yield	MD	%	**20**
		TD	%	**14**
	Average Elongation @Break	MD	%	**463**
		TD	%	**596**
Dimensional Stability ASTM D1204 (Modified)	Average Dimensional Change		%	**-0.58**
Tear Resistance ASTM D1004 (Modified)	Average Tear Resistance	MD	**222.4** N	**50** lbs
		TD	**200.2** N	**45** lbs
Puncture Resistance FTMS 101 Method 2065 Modified				**CERTIFIED**
Puncture Resistance ASTM D4833 (Modified)	Average Peak Load		**551.6** N	**124** lbs
ESCR ASTM D1693	Minumum Hrs w/o Failures		1500 Hrs	**CERTIFIED**
Notched Constant Tensile Load ASTM D5397	Pass/Fail @ 30%		500 Hrs	**PASS**

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ROLL # G15F072019 **LOT #** HEN820700 **LINER TYPE** **60 HD MICROSPIKE**

		METRIC	ENGLISH		METRIC	ENGLISH
Thickness Measurement ASTM D5994 (Modified)	MIN	**1.44** mm	**57** mil	Thickness	**1.52** mm	**60** mil
	MAX	**1.54** mm	**61** mil	Length	**153.926** m	**505** feet
	AVE	**1.50** mm	**59** mil	Width	**7.01** m	**23** feet

OIT(Standard) ASTM D 3895					**185** minutes
Asperity ASTM D7466	Average	Top		**.66** mm	**26** mil
		Bottom		**.94** mm	**37** mil
Specific Gravity ASTM D792	Average Density			g/cc	**.944**
MFI ASTM D1238 COND. E Grade **K307**	Melt Flow Index 190C/2160 g - g/10 min				**.28**
Carbon Black Content ASTM D4218	Range			%	**2.3**
Carbon Black Dispersion ASTM D5596	Category				**10 in Category 1**
Tensile Strength ASTM D6693 (2 inches / minute)	Average Strength @ Yield	MD	**24** N/mm	**138** ppi	**2304** psi
		TD	**27** N/mm	**152** ppi	**2531** psi
	Average Strength @ Break	MD	**39** N/mm	**221** ppi	**3684** psi
		TD	**33** N/mm	**189** ppi	**3157** psi
Tensile Elongation ASTM D6693 (2 inches / minute) Lo = 1.3" Yield Lo = 2.0" Break	Average Elongation @ Yield	MD		%	**19**
		TD		%	**14**
	Average Elongation @Break	MD		%	**496**
		TD		%	**594**
Dimensional Stability ASTM D1204 (Modified)	Average Dimensional Change			%	**-0.58**
Tear Resistance ASTM D1004 (Modified)	Average Tear Resistance	MD	**231.3** N		**52** lbs
		TD	**222.4** N		**50** lbs
Puncture Resistance FTMS 101 Method 2065 Modified					**CERTIFIED**
Puncture Resistance ASTM D4833 (Modified)	Average Peak Load		**556.0** N		**125** lbs
ESCR ASTM D1693	Minumum Hrs w/o Failures		1500 Hrs		**CERTIFIED**
Notched Constant Tensile Load ASTM D5397	Pass/Fail @ 30%		500 Hrs		**PASS**

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ROLL # G15F072020 **LOT #** HEN820700 **LINER TYPE** **60 HD MICROSPIKE**

		METRIC	ENGLISH		METRIC	ENGLISH
Thickness Measurement ASTM D5994 (Modified)	MIN	**1.41** mm	**56** mil	Thickness	**1.52** mm	**60** mil
	MAX	**1.57** mm	**62** mil	Length	**153.926** m	**505** feet
	AVE	**1.48** mm	**58** mil	Width	**7.01** m	**23** feet

OIT(Standard) ASTM D 3895					**185** minutes
Asperity ASTM D7466	Average	Top		**.66** mm	**26** mil
		Bottom		**.94** mm	**37** mil
Specific Gravity ASTM D792	Average Density			g/cc	**.944**
MFI ASTM D1238 COND. E Grade **K307**	Melt Flow Index 190C/2160 g - g/10 min				**.28**
Carbon Black Content ASTM D4218	Range			%	**2.3**
Carbon Black Dispersion ASTM D5596	Category				**10 in Category 1**
Tensile Strength ASTM D6693 (2 inches / minute)	Average Strength @ Yield	MD	**24** N/mm	**138** ppi	**2304** psi
		TD	**27** N/mm	**152** ppi	**2531** psi
	Average Strength @ Break	MD	**39** N/mm	**221** ppi	**3684** psi
		TD	**33** N/mm	**189** ppi	**3157** psi
Tensile Elongation ASTM D6693 (2 inches / minute) Lo = 1.3" Yield Lo = 2.0" Break	Average Elongation @ Yield	MD		%	**19**
		TD		%	**14**
	Average Elongation @Break	MD		%	**496**
		TD		%	**594**
Dimensional Stability ASTM D1204 (Modified)	Average Dimensional Change			%	**-0.58**
Tear Resistance ASTM D1004 (Modified)	Average Tear Resistance	MD		**231.3** N	**52** lbs
		TD		**222.4** N	**50** lbs
Puncture Resistance FTMS 101 Method 2065 Modified					**CERTIFIED**
Puncture Resistance ASTM D4833 (Modified)	Average Peak Load			**556.0** N	**125** lbs
ESCR ASTM D1693	Minumum Hrs w/o Failures			1500 Hrs	**CERTIFIED**
Notched Constant Tensile Load ASTM D5397	Pass/Fail @ 30%			500 Hrs	**PASS**

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ROLL # G15F072021 **LOT #** HEN820700 **LINER TYPE** **60 HD MICROSPIKE**

		METRIC	ENGLISH		METRIC	ENGLISH
Thickness Measurement ASTM D5994 (Modified)	MIN	**1.41** mm	**55** mil	Thickness	**1.52** mm	**60** mil
	MAX	**1.52** mm	**60** mil	Length	**153.926** m	**505** feet
	AVE	**1.47** mm	**58** mil	Width	**7.01** m	**23** feet

OIT(Standard) ASTM D 3895				**185** minutes
Asperity ASTM D7466	Average	Top	**.66** mm	**26** mil
		Bottom	**.91** mm	**36** mil
Specific Gravity ASTM D792	Average Density		g/cc	**.944**
MFI ASTM D1238 COND. E Grade **K307**	Melt Flow Index 190C/2160 g - g/10 min			**.28**
Carbon Black Content ASTM D4218	Range		%	**2.3**
Carbon Black Dispersion ASTM D5596	Category			**10 in Category 1**

Tensile Strength ASTM D6693 (2 inches / minute)	Average Strength @ Yield	MD	**24** N/mm	**138** ppi	**2304** psi
		TD	**27** N/mm	**152** ppi	**2531** psi
	Average Strength @ Break	MD	**39** N/mm	**221** ppi	**3684** psi
		TD	**33** N/mm	**189** ppi	**3157** psi
Tensile Elongation ASTM D6693 (2 inches / minute) Lo = 1.3" Yield Lo = 2.0" Break	Average Elongation @ Yield	MD	%	**19**	
		TD	%	**14**	
	Average Elongation @Break	MD	%	**496**	
		TD	%	**594**	
Dimensional Stability ASTM D1204 (Modified)	Average Dimensional Change		%	**-0.58**	
Tear Resistance ASTM D1004 (Modified)	Average Tear Resistance	MD	**231.3** N	**52** lbs	
		TD	**222.4** N	**50** lbs	
Puncture Resistance FTMS 101 Method 2065 Modified				**CERTIFIED**	
Puncture Resistance ASTM D4833 (Modified)	Average Peak Load		**556.0** N	**125** lbs	
ESCR ASTM D1693	Minumum Hrs w/o Failures		1500 Hrs	**CERTIFIED**	
Notched Constant Tensile Load ASTM D5397	Pass/Fail @ 30%		500 Hrs	**PASS**	

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ROLL # G15F072022 **LOT #** HEN820700 **LINER TYPE** **60 HD MICROSPIKE**

		METRIC	ENGLISH		METRIC	ENGLISH
Thickness Measurement ASTM D5994 (Modified)	MIN	**1.48** mm	**58** mil	Thickness	**1.52** mm	**60** mil
	MAX	**1.57** mm	**62** mil	Length	**153.926** m	**505** feet
	AVE	**1.51** mm	**60** mil	Width	**7.01** m	**23** feet

OIT(Standard) ASTM D 3895				**185** minutes
Asperity ASTM D7466	Average	Top	**.69** mm	**27** mil
		Bottom	**.94** mm	**37** mil
Specific Gravity ASTM D792	Average Density		g/cc	**.944**
MFI ASTM D1238 COND. E Grade **K307**	Melt Flow Index 190C/2160 g - g/10 min			**.28**
Carbon Black Content ASTM D4218	Range		%	**2.1**
Carbon Black Dispersion ASTM D5596	Category			**10 in Category 1**

Tensile Strength ASTM D6693 (2 inches / minute)	Average Strength @ Yield	MD	**24** N/mm	**138** ppi	**2304** psi
		TD	**27** N/mm	**152** ppi	**2531** psi
	Average Strength @ Break	MD	**39** N/mm	**221** ppi	**3684** psi
		TD	**33** N/mm	**189** ppi	**3157** psi
Tensile Elongation ASTM D6693 (2 inches / minute) Lo = 1.3" Yield Lo = 2.0" Break	Average Elongation @ Yield	MD	%	**19**	
		TD	%	**14**	
	Average Elongation @Break	MD	%	**496**	
		TD	%	**594**	
Dimensional Stability ASTM D1204 (Modified)	Average Dimensional Change		%	**-0.58**	
Tear Resistance ASTM D1004 (Modified)	Average Tear Resistance	MD	**231.3** N	**52** lbs	
		TD	**222.4** N	**50** lbs	
Puncture Resistance FTMS 101 Method 2065 Modified				**CERTIFIED**	
Puncture Resistance ASTM D4833 (Modified)	Average Peak Load		**556.0** N	**125** lbs	
ESCR ASTM D1693	Minumum Hrs w/o Failures		1500 Hrs	**CERTIFIED**	
Notched Constant Tensile Load ASTM D5397	Pass/Fail @ 30%		500 Hrs	**PASS**	

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ROLL # G15F072023 **LOT #** HEN820700 **LINER TYPE** **60 HD MICROSPIKE**

		METRIC	ENGLISH		METRIC	ENGLISH
Thickness Measurement ASTM D5994 (Modified)	MIN	**1.43** mm	**56** mil	Thickness	**1.52** mm	**60** mil
	MAX	**1.55** mm	**61** mil	Length	**153.926** m	**505** feet
	AVE	**1.50** mm	**59** mil	Width	**7.01** m	**23** feet

OIT(Standard) ASTM D 3895				**185** minutes
Asperity ASTM D7466	Average	Top	**.64** mm	**25** mil
		Bottom	**.89** mm	**35** mil
Specific Gravity ASTM D792	Average Density		g/cc	**.944**
MFI ASTM D1238 COND. E Grade **K307**	Melt Flow Index 190C/2160 g - g/10 min			**.28**
Carbon Black Content ASTM D4218	Range		%	**2.1**
Carbon Black Dispersion ASTM D5596	Category			**10 in Category 1**

Tensile Strength ASTM D6693 (2 inches / minute)	Average Strength @ Yield	MD	**24** N/mm	**138** ppi	**2304** psi
		TD	**27** N/mm	**152** ppi	**2531** psi
	Average Strength @ Break	MD	**39** N/mm	**221** ppi	**3684** psi
		TD	**33** N/mm	**189** ppi	**3157** psi
Tensile Elongation ASTM D6693 (2 inches / minute) Lo = 1.3" Yield Lo = 2.0" Break	Average Elongation @ Yield	MD	%	**19**	
		TD	%	**14**	
	Average Elongation @Break	MD	%	**496**	
		TD	%	**594**	
Dimensional Stability ASTM D1204 (Modified)	Average Dimensional Change		%	**-0.58**	
Tear Resistance ASTM D1004 (Modified)	Average Tear Resistance	MD	**231.3** N	**52** lbs	
		TD	**222.4** N	**50** lbs	
Puncture Resistance FTMS 101 Method 2065 Modified				**CERTIFIED**	
Puncture Resistance ASTM D4833 (Modified)	Average Peak Load		**556.0** N	**125** lbs	
ESCR ASTM D1693	Minumum Hrs w/o Failures		1500 Hrs	**CERTIFIED**	
Notched Constant Tensile Load ASTM D5397	Pass/Fail @ 30%		500 Hrs	**PASS**	

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ROLL # G15F072024 **LOT #** HEN820700 **LINER TYPE** **60 HD MICROSPIKE**

		METRIC	ENGLISH		METRIC	ENGLISH
Thickness Measurement ASTM D5994 (Modified)	MIN	**1.40** mm	**55** mil	Thickness	**1.52** mm	**60** mil
	MAX	**1.55** mm	**61** mil	Length	**153.926** m	**505** feet
	AVE	**1.49** mm	**58** mil	Width	**7.01** m	**23** feet

OIT(Standard) ASTM D 3895					**185** minutes
Asperity ASTM D7466	Average	Top		**.64** mm	**25** mil
		Bottom		**.91** mm	**36** mil
Specific Gravity ASTM D792	Average Density			g/cc	**.945**
MFI ASTM D1238 COND. E Grade **K307**	Melt Flow Index 190C/2160 g - g/10 min				**.28**
Carbon Black Content ASTM D4218	Range			%	**2.3**
Carbon Black Dispersion ASTM D5596	Category				**10 in Category 1**
Tensile Strength ASTM D6693 (2 inches / minute)	Average Strength @ Yield	MD	**25** N/mm	**144** ppi	**2400** psi
		TD	**26** N/mm	**149** ppi	**2476** psi
	Average Strength @ Break	MD	**37** N/mm	**213** ppi	**3543** psi
		TD	**31** N/mm	**179** ppi	**2981** psi
Tensile Elongation ASTM D6693 (2 inches / minute) Lo = 1.3" Yield Lo = 2.0" Break	Average Elongation @ Yield	MD		%	**18**
		TD		%	**15**
	Average Elongation @Break	MD		%	**470**
		TD		%	**570**
Dimensional Stability ASTM D1204 (Modified)	Average Dimensional Change			%	**-0.58**
Tear Resistance ASTM D1004 (Modified)	Average Tear Resistance	MD		**235.7** N	**53** lbs
		TD		**222.4** N	**50** lbs
Puncture Resistance FTMS 101 Method 2065 Modified					**CERTIFIED**
Puncture Resistance ASTM D4833 (Modified)	Average Peak Load			**564.9** N	**127** lbs
ESCR ASTM D1693	Minumum Hrs w/o Failures			1500 Hrs	**CERTIFIED**
Notched Constant Tensile Load ASTM D5397	Pass/Fail @ 30%			500 Hrs	**PASS**

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ROLL # G15D072021 **LOT #** HFA610170 **LINER TYPE** **60 HD MICROSPIKE**

		METRIC	ENGLISH		METRIC	ENGLISH
Thickness Measurement ASTM D5994 (Modified)	MIN	**1.50** mm	**59** mil	Thickness	**1.52** mm	**60** mil
	MAX	**1.67** mm	**66** mil	Length	**153.926** m	**505** feet
	AVE	**1.58** mm	**62** mil	Width	**7.01** m	**23** feet

OIT(Standard) ASTM D 3895					**194** minutes
Asperity ASTM D7466	Average	Top		**.64** mm	**25** mil
		Bottom		**.91** mm	**36** mil
Specific Gravity ASTM D792	Average Density			g/cc	**.944**
MFI ASTM D1238 COND. E Grade **K307**	Melt Flow Index 190C/2160 g - g/10 min				**.21**
Carbon Black Content ASTM D4218	Range			%	**2.3**
Carbon Black Dispersion ASTM D5596	Category				**10 in Category 1**
Tensile Strength ASTM D6693 (2 inches / minute)	Average Strength @ Yield	MD	**24** N/mm	**137** ppi	**2282** psi
		TD	**25** N/mm	**141** ppi	**2358** psi
	Average Strength @ Break	MD	**34** N/mm	**197** ppi	**3283** psi
		TD	**33** N/mm	**190** ppi	**3174** psi
Tensile Elongation ASTM D6693 (2 inches / minute) Lo = 1.3" Yield Lo = 2.0" Break	Average Elongation @ Yield	MD		%	**20**
		TD		%	**15**
	Average Elongation @Break	MD		%	**479**
		TD		%	**632**
Dimensional Stability ASTM D1204 (Modified)	Average Dimensional Change			%	**-0.58**
Tear Resistance ASTM D1004 (Modified)	Average Tear Resistance	MD	**231.3** N		**52** lbs
		TD	**209.1** N		**47** lbs
Puncture Resistance FTMS 101 Method 2065 Modified					**CERTIFIED**
Puncture Resistance ASTM D4833 (Modified)	Average Peak Load		**587.1** N		**132** lbs
ESCR ASTM D1693	Minumum Hrs w/o Failures		1500 Hrs		**CERTIFIED**
Notched Constant Tensile Load ASTM D5397	Pass/Fail @ 30%		500 Hrs		**PASS**

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ROLL # G15D072022 **LOT #** HFA610170 **LINER TYPE** **60 HD MICROSPIKE**

		METRIC	ENGLISH		METRIC	ENGLISH
Thickness Measurement ASTM D5994 (Modified)	MIN	**1.45** mm	**57** mil	Thickness	**1.52** mm	**60** mil
	MAX	**1.66** mm	**65** mil	Length	**153.926** m	**505** feet
	AVE	**1.55** mm	**61** mil	Width	**7.01** m	**23** feet

OIT(Standard) ASTM D 3895					**194** minutes
Asperity ASTM D7466	Average	Top		**.66** mm	**26** mil
		Bottom		**.97** mm	**38** mil
Specific Gravity ASTM D792	Average Density			g/cc	**.943**
MFI ASTM D1238 COND. E Grade **K307**	Melt Flow Index 190C/2160 g - g/10 min				**.21**
Carbon Black Content ASTM D4218	Range			%	**2.2**
Carbon Black Dispersion ASTM D5596	Category				**10 in Category 1**
Tensile Strength ASTM D6693 (2 inches / minute)	Average Strength @ Yield	MD	**26** N/mm	**147** ppi	**2446** psi
		TD	**26** N/mm	**147** ppi	**2450** psi
	Average Strength @ Break	MD	**38** N/mm	**218** ppi	**3635** psi
		TD	**37** N/mm	**211** ppi	**3513** psi
Tensile Elongation ASTM D6693 (2 inches / minute) Lo = 1.3" Yield Lo = 2.0" Break	Average Elongation @ Yield	MD		%	**20**
		TD		%	**16**
	Average Elongation @Break	MD		%	**476**
		TD		%	**634**
Dimensional Stability ASTM D1204 (Modified)	Average Dimensional Change			%	**-0.58**
Tear Resistance ASTM D1004 (Modified)	Average Tear Resistance	MD		**249.1** N	**56** lbs
		TD		**226.8** N	**51** lbs
Puncture Resistance FTMS 101 Method 2065 Modified					**CERTIFIED**
Puncture Resistance ASTM D4833 (Modified)	Average Peak Load			**609.4** N	**137** lbs
ESCR ASTM D1693	Minumum Hrs w/o Failures			1500 Hrs	**CERTIFIED**
Notched Constant Tensile Load ASTM D5397	Pass/Fail @ 30%			500 Hrs	**PASS**

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ROLL # G15D072023 **LOT #** HFA610170 **LINER TYPE** **60 HD MICROSPIKE**

		METRIC	ENGLISH		METRIC	ENGLISH
Thickness Measurement ASTM D5994 (Modified)	MIN	**1.43** mm	**56** mil	Thickness	**1.52** mm	**60** mil
	MAX	**1.66** mm	**65** mil	Length	**153.926** m	**505** feet
	AVE	**1.52** mm	**60** mil	Width	**7.01** m	**23** feet

OIT(Standard) ASTM D 3895					**194** minutes
Asperity ASTM D7466	Average	Top		**.64** mm	**25** mil
		Bottom		**.94** mm	**37** mil
Specific Gravity ASTM D792	Average Density			g/cc	**.943**
MFI ASTM D1238 COND. E Grade **K307**	Melt Flow Index 190C/2160 g - g/10 min				**.21**
Carbon Black Content ASTM D4218	Range			%	**2.2**
Carbon Black Dispersion ASTM D5596	Category				**10 in Category 1**
Tensile Strength ASTM D6693 (2 inches / minute)	Average Strength @ Yield	MD	**26** N/mm	**147** ppi	**2446** psi
		TD	**26** N/mm	**147** ppi	**2450** psi
	Average Strength @ Break	MD	**38** N/mm	**218** ppi	**3635** psi
		TD	**37** N/mm	**211** ppi	**3513** psi
Tensile Elongation ASTM D6693 (2 inches / minute) Lo = 1.3" Yield Lo = 2.0" Break	Average Elongation @ Yield	MD		%	**20**
		TD		%	**16**
	Average Elongation @Break	MD		%	**476**
		TD		%	**634**
Dimensional Stability ASTM D1204 (Modified)	Average Dimensional Change			%	**-0.58**
Tear Resistance ASTM D1004 (Modified)	Average Tear Resistance	MD		**249.1** N	**56** lbs
		TD		**226.8** N	**51** lbs
Puncture Resistance FTMS 101 Method 2065 Modified					**CERTIFIED**
Puncture Resistance ASTM D4833 (Modified)	Average Peak Load			**609.4** N	**137** lbs
ESCR ASTM D1693	Minumum Hrs w/o Failures			1500 Hrs	**CERTIFIED**
Notched Constant Tensile Load ASTM D5397	Pass/Fail @ 30%			500 Hrs	**PASS**

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ROLL # G15D072024 **LOT #** HFA610170 **LINER TYPE** **60 HD MICROSPIKE**

		METRIC	ENGLISH		METRIC	ENGLISH
Thickness Measurement ASTM D5994 (Modified)	MIN	**1.39** mm	**55** mil	Thickness	**1.52** mm	**60** mil
	MAX	**1.67** mm	**66** mil	Length	**153.926** m	**505** feet
	AVE	**1.54** mm	**61** mil	Width	**7.01** m	**23** feet

OIT(Standard) ASTM D 3895					**194** minutes
Asperity ASTM D7466	Average	Top		**.64** mm	**25** mil
		Bottom		**.97** mm	**38** mil
Specific Gravity ASTM D792	Average Density			g/cc	**.943**
MFI ASTM D1238 COND. E Grade **K307**	Melt Flow Index 190C/2160 g - g/10 min				**.21**
Carbon Black Content ASTM D4218	Range			%	**2.2**
Carbon Black Dispersion ASTM D5596	Category				**10 in Category 1**
Tensile Strength ASTM D6693 (2 inches / minute)	Average Strength @ Yield	MD	**26** N/mm	**147** ppi	**2446** psi
		TD	**26** N/mm	**147** ppi	**2450** psi
	Average Strength @ Break	MD	**38** N/mm	**218** ppi	**3635** psi
		TD	**37** N/mm	**211** ppi	**3513** psi
Tensile Elongation ASTM D6693 (2 inches / minute) Lo = 1.3" Yield Lo = 2.0" Break	Average Elongation @ Yield	MD		%	**20**
		TD		%	**16**
	Average Elongation @Break	MD		%	**476**
		TD		%	**634**
Dimensional Stability ASTM D1204 (Modified)	Average Dimensional Change			%	**-0.58**
Tear Resistance ASTM D1004 (Modified)	Average Tear Resistance	MD		**249.1** N	**56** lbs
		TD		**226.8** N	**51** lbs
Puncture Resistance FTMS 101 Method 2065 Modified					**CERTIFIED**
Puncture Resistance ASTM D4833 (Modified)	Average Peak Load			**609.4** N	**137** lbs
ESCR ASTM D1693	Minumum Hrs w/o Failures			1500 Hrs	**CERTIFIED**
Notched Constant Tensile Load ASTM D5397	Pass/Fail @ 30%			500 Hrs	**PASS**

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ROLL # G15D072025 **LOT #** HFA610170 **LINER TYPE** **60 HD MICROSPIKE**

		METRIC	ENGLISH		METRIC	ENGLISH
Thickness Measurement ASTM D5994 (Modified)	MIN	**1.38** mm	**54** mil	Thickness	**1.52** mm	**60** mil
	MAX	**1.66** mm	**65** mil	Length	**153.926** m	**505** feet
	AVE	**1.50** mm	**59** mil	Width	**7.01** m	**23** feet

OIT(Standard) ASTM D 3895					**194** minutes
Asperity ASTM D7466	Average	Top		**.66** mm	**26** mil
		Bottom		**.97** mm	**38** mil
Specific Gravity ASTM D792	Average Density			g/cc	**.943**
MFI ASTM D1238 COND. E Grade **K307**	Melt Flow Index 190C/2160 g - g/10 min				**.21**
Carbon Black Content ASTM D4218	Range			%	**2.3**
Carbon Black Dispersion ASTM D5596	Category				**10 in Category 1**
Tensile Strength ASTM D6693 (2 inches / minute)	Average Strength @ Yield	MD	**26** N/mm	**147** ppi	**2446** psi
		TD	**26** N/mm	**147** ppi	**2450** psi
	Average Strength @ Break	MD	**38** N/mm	**218** ppi	**3635** psi
		TD	**37** N/mm	**211** ppi	**3513** psi
Tensile Elongation ASTM D6693 (2 inches / minute) Lo = 1.3" Yield Lo = 2.0" Break	Average Elongation @ Yield	MD		%	**20**
		TD		%	**16**
	Average Elongation @Break	MD		%	**476**
		TD		%	**634**
Dimensional Stability ASTM D1204 (Modified)	Average Dimensional Change			%	**-0.58**
Tear Resistance ASTM D1004 (Modified)	Average Tear Resistance	MD		**249.1** N	**56** lbs
		TD		**226.8** N	**51** lbs
Puncture Resistance FTMS 101 Method 2065 Modified					**CERTIFIED**
Puncture Resistance ASTM D4833 (Modified)	Average Peak Load			**609.4** N	**137** lbs
ESCR ASTM D1693	Minumum Hrs w/o Failures			1500 Hrs	**CERTIFIED**
Notched Constant Tensile Load ASTM D5397	Pass/Fail @ 30%			500 Hrs	**PASS**

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ROLL # G15D072026 **LOT #** HFA610170 **LINER TYPE** **60 HD MICROSPIKE**

		METRIC	ENGLISH		METRIC	ENGLISH
Thickness Measurement ASTM D5994 (Modified)	MIN	**1.39** mm	**55** mil	Thickness	**1.52** mm	**60** mil
	MAX	**1.60** mm	**63** mil	Length	**153.926** m	**505** feet
	AVE	**1.50** mm	**59** mil	Width	**7.01** m	**23** feet

OIT(Standard) ASTM D 3895					**194** minutes
Asperity ASTM D7466	Average	Top		**.66** mm	**26** mil
		Bottom		**.97** mm	**38** mil
Specific Gravity ASTM D792	Average Density			g/cc	**.943**
MFI ASTM D1238 COND. E Grade **K307**	Melt Flow Index 190C/2160 g - g/10 min				**.21**
Carbon Black Content ASTM D4218	Range			%	**2.3**
Carbon Black Dispersion ASTM D5596	Category				**10 in Category 1**
Tensile Strength ASTM D6693 (2 inches / minute)	Average Strength @ Yield	MD	**26** N/mm	**147** ppi	**2446** psi
		TD	**26** N/mm	**147** ppi	**2450** psi
	Average Strength @ Break	MD	**38** N/mm	**218** ppi	**3635** psi
		TD	**37** N/mm	**211** ppi	**3513** psi
Tensile Elongation ASTM D6693 (2 inches / minute) Lo = 1.3" Yield Lo = 2.0" Break	Average Elongation @ Yield	MD		%	**20**
		TD		%	**16**
	Average Elongation @Break	MD		%	**476**
		TD		%	**634**
Dimensional Stability ASTM D1204 (Modified)	Average Dimensional Change			%	**-0.58**
Tear Resistance ASTM D1004 (Modified)	Average Tear Resistance	MD		**249.1** N	**56** lbs
		TD		**226.8** N	**51** lbs
Puncture Resistance FTMS 101 Method 2065 Modified					**CERTIFIED**
Puncture Resistance ASTM D4833 (Modified)	Average Peak Load			**609.4** N	**137** lbs
ESCR ASTM D1693	Minumum Hrs w/o Failures			1500 Hrs	**CERTIFIED**
Notched Constant Tensile Load ASTM D5397	Pass/Fail @ 30%			500 Hrs	**PASS**

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ROLL # G15D072027 **LOT #** HFA610170 **LINER TYPE** **60 HD MICROSPIKE**

		METRIC	ENGLISH		METRIC	ENGLISH
Thickness Measurement ASTM D5994 (Modified)	MIN	**1.39** mm	**55** mil	Thickness	**1.52** mm	**60** mil
	MAX	**1.58** mm	**62** mil	Length	**153.926** m	**505** feet
	AVE	**1.49** mm	**59** mil	Width	**7.01** m	**23** feet

OIT(Standard) ASTM D 3895					**194** minutes
Asperity ASTM D7466	Average	Top		**.74** mm	**29** mil
		Bottom		**.89** mm	**35** mil
Specific Gravity ASTM D792	Average Density			g/cc	**.945**
MFI ASTM D1238 COND. E Grade **K307**	Melt Flow Index 190C/2160 g - g/10 min				**.21**
Carbon Black Content ASTM D4218	Range			%	**2.2**
Carbon Black Dispersion ASTM D5596	Category				**10 in Category 1**
Tensile Strength ASTM D6693 (2 inches / minute)	Average Strength @ Yield	MD	**24** N/mm	**138** ppi	**2293** psi
		TD	**26** N/mm	**149** ppi	**2486** psi
	Average Strength @ Break	MD	**38** N/mm	**216** ppi	**3595** psi
		TD	**38** N/mm	**216** ppi	**3597** psi
Tensile Elongation ASTM D6693 (2 inches / minute) Lo = 1.3" Yield Lo = 2.0" Break	Average Elongation @ Yield	MD		%	**17**
		TD		%	**16**
	Average Elongation @Break	MD		%	**464**
		TD		%	**655**
Dimensional Stability ASTM D1204 (Modified)	Average Dimensional Change			%	**-0.58**
Tear Resistance ASTM D1004 (Modified)	Average Tear Resistance	MD		**244.6** N	**55** lbs
		TD		**222.4** N	**50** lbs
Puncture Resistance FTMS 101 Method 2065 Modified					**CERTIFIED**
Puncture Resistance ASTM D4833 (Modified)	Average Peak Load			**613.8** N	**138** lbs
ESCR ASTM D1693	Minumum Hrs w/o Failures			1500 Hrs	**CERTIFIED**
Notched Constant Tensile Load ASTM D5397	Pass/Fail @ 30%			500 Hrs	**PASS**

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ROLL # G15D072028 **LOT #** HFA610170 **LINER TYPE** **60 HD MICROSPIKE**

		METRIC	ENGLISH		METRIC	ENGLISH
Thickness Measurement ASTM D5994 (Modified)	MIN	**1.41** mm	**56** mil	Thickness	**1.52** mm	**60** mil
	MAX	**1.67** mm	**66** mil	Length	**153.926** m	**505** feet
	AVE	**1.52** mm	**60** mil	Width	**7.01** m	**23** feet

OIT(Standard) ASTM D 3895					**194** minutes
Asperity ASTM D7466	Average	Top		**.76** mm	**30** mil
		Bottom		**.86** mm	**34** mil
Specific Gravity ASTM D792	Average Density			g/cc	**.945**
MFI ASTM D1238 COND. E Grade **K307**	Melt Flow Index 190C/2160 g - g/10 min				**.21**
Carbon Black Content ASTM D4218	Range			%	**2.2**
Carbon Black Dispersion ASTM D5596	Category				**10 in Category 1**
Tensile Strength ASTM D6693 (2 inches / minute)	Average Strength @ Yield	MD	**24** N/mm	**138** ppi	**2293** psi
		TD	**26** N/mm	**149** ppi	**2486** psi
	Average Strength @ Break	MD	**38** N/mm	**216** ppi	**3595** psi
		TD	**38** N/mm	**216** ppi	**3597** psi
Tensile Elongation ASTM D6693 (2 inches / minute) Lo = 1.3" Yield Lo = 2.0" Break	Average Elongation @ Yield	MD		%	**17**
		TD		%	**16**
	Average Elongation @Break	MD		%	**464**
		TD		%	**655**
Dimensional Stability ASTM D1204 (Modified)	Average Dimensional Change			%	**-0.58**
Tear Resistance ASTM D1004 (Modified)	Average Tear Resistance	MD		**244.6** N	**55** lbs
		TD		**222.4** N	**50** lbs
Puncture Resistance FTMS 101 Method 2065 Modified					**CERTIFIED**
Puncture Resistance ASTM D4833 (Modified)	Average Peak Load			**613.8** N	**138** lbs
ESCR ASTM D1693	Minumum Hrs w/o Failures			1500 Hrs	**CERTIFIED**
Notched Constant Tensile Load ASTM D5397	Pass/Fail @ 30%			500 Hrs	**PASS**

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ROLL # G15D072029 **LOT #** HFA610170 **LINER TYPE** **60 HD MICROSPIKE**

		METRIC	ENGLISH		METRIC	ENGLISH
Thickness Measurement ASTM D5994 (Modified)	MIN	**1.39** mm	**55** mil	Thickness	**1.52** mm	**60** mil
	MAX	**1.56** mm	**61** mil	Length	**153.926** m	**505** feet
	AVE	**1.48** mm	**58** mil	Width	**7.01** m	**23** feet

OIT(Standard) ASTM D 3895				**194** minutes
Asperity ASTM D7466	Average	Top	**.71** mm	**28** mil
		Bottom	**.86** mm	**34** mil
Specific Gravity ASTM D792	Average Density		g/cc	**.945**
MFI ASTM D1238 COND. E Grade **K307**	Melt Flow Index 190C/2160 g - g/10 min			**.21**
Carbon Black Content ASTM D4218	Range		%	**2.2**
Carbon Black Dispersion ASTM D5596	Category			**10 in Category 1**
Tensile Strength ASTM D6693 (2 inches / minute)	Average Strength @ Yield	MD	**24** N/mm **138** ppi	**2293** psi
		TD	**26** N/mm **149** ppi	**2486** psi
	Average Strength @ Break	MD	**38** N/mm **216** ppi	**3595** psi
		TD	**38** N/mm **216** ppi	**3597** psi
Tensile Elongation ASTM D6693 (2 inches / minute) Lo = 1.3" Yield Lo = 2.0" Break	Average Elongation @ Yield	MD	%	**17**
		TD	%	**16**
	Average Elongation @Break	MD	%	**464**
		TD	%	**655**
Dimensional Stability ASTM D1204 (Modified)	Average Dimensional Change		%	**-0.58**
Tear Resistance ASTM D1004 (Modified)	Average Tear Resistance	MD	**244.6** N	**55** lbs
		TD	**222.4** N	**50** lbs
Puncture Resistance FTMS 101 Method 2065 Modified				**CERTIFIED**
Puncture Resistance ASTM D4833 (Modified)	Average Peak Load		**613.8** N	**138** lbs
ESCR ASTM D1693	Minumum Hrs w/o Failures		1500 Hrs	**CERTIFIED**
Notched Constant Tensile Load ASTM D5397	Pass/Fail @ 30%		500 Hrs	**PASS**

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ROLL # G15D073030 **LOT #** HFA610170 **LINER TYPE** **60 HD MICROSPIKE**

		METRIC	ENGLISH		METRIC	ENGLISH
Thickness Measurement ASTM D5994 (Modified)	MIN	**1.41** mm	**56** mil	Thickness	**1.52** mm	**60** mil
	MAX	**1.66** mm	**65** mil	Length	**153.926** m	**505** feet
	AVE	**1.51** mm	**59** mil	Width	**7.01** m	**23** feet

OIT(Standard) ASTM D 3895					**194** minutes
Asperity ASTM D7466	Average	Top		**.69** mm	**27** mil
		Bottom		**.89** mm	**35** mil
Specific Gravity ASTM D792	Average Density			g/cc	**.945**
MFI ASTM D1238 COND. E Grade **K307**	Melt Flow Index 190C/2160 g - g/10 min				**.21**
Carbon Black Content ASTM D4218	Range			%	**2.2**
Carbon Black Dispersion ASTM D5596	Category				**10 in Category 1**
Tensile Strength ASTM D6693 (2 inches / minute)	Average Strength @ Yield	MD	**24** N/mm	**138** ppi	**2293** psi
		TD	**26** N/mm	**149** ppi	**2486** psi
	Average Strength @ Break	MD	**38** N/mm	**216** ppi	**3595** psi
		TD	**38** N/mm	**216** ppi	**3597** psi
Tensile Elongation ASTM D6693 (2 inches / minute) Lo = 1.3" Yield Lo = 2.0" Break	Average Elongation @ Yield	MD		%	**17**
		TD		%	**16**
	Average Elongation @Break	MD		%	**464**
		TD		%	**655**
Dimensional Stability ASTM D1204 (Modified)	Average Dimensional Change			%	**-0.58**
Tear Resistance ASTM D1004 (Modified)	Average Tear Resistance	MD		**244.6** N	**55** lbs
		TD		**222.4** N	**50** lbs
Puncture Resistance FTMS 101 Method 2065 Modified					**CERTIFIED**
Puncture Resistance ASTM D4833 (Modified)	Average Peak Load			**613.8** N	**138** lbs
ESCR ASTM D1693	Minumum Hrs w/o Failures			1500 Hrs	**CERTIFIED**
Notched Constant Tensile Load ASTM D5397	Pass/Fail @ 30%			500 Hrs	**PASS**

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ROLL # G15D073031 **LOT #** HFA610170 **LINER TYPE** **60 HD MICROSPIKE**

		METRIC	ENGLISH		METRIC	ENGLISH
Thickness Measurement ASTM D5994 (Modified)	MIN	**1.39** mm	**55** mil	Thickness	**1.52** mm	**60** mil
	MAX	**1.62** mm	**64** mil	Length	**153.926** m	**505** feet
	AVE	**1.51** mm	**59** mil	Width	**7.01** m	**23** feet

OIT(Standard) ASTM D 3895					**194** minutes
Asperity ASTM D7466	Average	Top		**.64** mm	**25** mil
		Bottom		**.89** mm	**35** mil
Specific Gravity ASTM D792	Average Density			g/cc	**.945**
MFI ASTM D1238 COND. E Grade **K307**	Melt Flow Index 190C/2160 g - g/10 min				**.21**
Carbon Black Content ASTM D4218	Range			%	**2.2**
Carbon Black Dispersion ASTM D5596	Category				**10 in Category 1**
Tensile Strength ASTM D6693 (2 inches / minute)	Average Strength @ Yield	MD	**24** N/mm	**138** ppi	**2293** psi
		TD	**26** N/mm	**149** ppi	**2486** psi
	Average Strength @ Break	MD	**38** N/mm	**216** ppi	**3595** psi
		TD	**38** N/mm	**216** ppi	**3597** psi
Tensile Elongation ASTM D6693 (2 inches / minute) Lo = 1.3" Yield Lo = 2.0" Break	Average Elongation @ Yield	MD		%	**17**
		TD		%	**16**
	Average Elongation @Break	MD		%	**464**
		TD		%	**655**
Dimensional Stability ASTM D1204 (Modified)	Average Dimensional Change			%	**-0.58**
Tear Resistance ASTM D1004 (Modified)	Average Tear Resistance	MD		**244.6** N	**55** lbs
		TD		**222.4** N	**50** lbs
Puncture Resistance FTMS 101 Method 2065 Modified					**CERTIFIED**
Puncture Resistance ASTM D4833 (Modified)	Average Peak Load			**613.8** N	**138** lbs
ESCR ASTM D1693	Minumum Hrs w/o Failures			1500 Hrs	**CERTIFIED**
Notched Constant Tensile Load ASTM D5397	Pass/Fail @ 30%			500 Hrs	**PASS**

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ROLL # G15D073032 **LOT #** HFA610170 **LINER TYPE** **60 HD MICROSPIKE**

		METRIC	ENGLISH		METRIC	ENGLISH
Thickness Measurement ASTM D5994 (Modified)	MIN	**1.39** mm	**55** mil	Thickness	**1.52** mm	**60** mil
	MAX	**1.62** mm	**64** mil	Length	**153.926** m	**505** feet
	AVE	**1.49** mm	**58** mil	Width	**7.01** m	**23** feet

OIT(Standard) ASTM D 3895					**194** minutes
Asperity ASTM D7466	Average	Top		**.64** mm	**25** mil
		Bottom		**.89** mm	**35** mil
Specific Gravity ASTM D792	Average Density			g/cc	**.943**
MFI ASTM D1238 COND. E Grade **K307**	Melt Flow Index 190C/2160 g - g/10 min				**.21**
Carbon Black Content ASTM D4218	Range			%	**2.1**
Carbon Black Dispersion ASTM D5596	Category				**10 in Category 1**
Tensile Strength ASTM D6693 (2 inches / minute)	Average Strength @ Yield	MD	**29** N/mm	**166** ppi	**2774** psi
		TD	**30** N/mm	**174** ppi	**2893** psi
	Average Strength @ Break	MD	**40** N/mm	**229** ppi	**3815** psi
		TD	**38** N/mm	**217** ppi	**3624** psi
Tensile Elongation ASTM D6693 (2 inches / minute) Lo = 1.3" Yield Lo = 2.0" Break	Average Elongation @ Yield	MD		%	**20**
		TD		%	**15**
	Average Elongation @Break	MD		%	**481**
		TD		%	**594**
Dimensional Stability ASTM D1204 (Modified)	Average Dimensional Change			%	**-0.58**
Tear Resistance ASTM D1004 (Modified)	Average Tear Resistance	MD		**235.7** N	**53** lbs
		TD		**226.8** N	**51** lbs
Puncture Resistance FTMS 101 Method 2065 Modified					**CERTIFIED**
Puncture Resistance ASTM D4833 (Modified)	Average Peak Load			**587.1** N	**132** lbs
ESCR ASTM D1693	Minumum Hrs w/o Failures			1500 Hrs	**CERTIFIED**
Notched Constant Tensile Load ASTM D5397	Pass/Fail @ 30%			500 Hrs	**PASS**

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ROLL # G15D073033 **LOT #** HFA610170 **LINER TYPE** **60 HD MICROSPIKE**

		METRIC	ENGLISH		METRIC	ENGLISH
Thickness Measurement ASTM D5994 (Modified)	MIN	**1.38** mm	**54** mil	Thickness	**1.52** mm	**60** mil
	MAX	**1.61** mm	**63** mil	Length	**153.926** m	**505** feet
	AVE	**1.45** mm	**57** mil	Width	**7.01** m	**23** feet

OIT(Standard) ASTM D 3895					**194** minutes
Asperity ASTM D7466	Average	Top		**.66** mm	**26** mil
		Bottom		**.89** mm	**35** mil
Specific Gravity ASTM D792	Average Density			g/cc	**.943**
MFI ASTM D1238 COND. E Grade **K307**	Melt Flow Index 190C/2160 g - g/10 min				**.21**
Carbon Black Content ASTM D4218	Range			%	**2.1**
Carbon Black Dispersion ASTM D5596	Category				**10 in Category 1**
Tensile Strength ASTM D6693 (2 inches / minute)	Average Strength @ Yield	MD	**29** N/mm	**166** ppi	**2774** psi
		TD	**30** N/mm	**174** ppi	**2893** psi
	Average Strength @ Break	MD	**40** N/mm	**229** ppi	**3815** psi
		TD	**38** N/mm	**217** ppi	**3624** psi
Tensile Elongation ASTM D6693 (2 inches / minute) Lo = 1.3" Yield Lo = 2.0" Break	Average Elongation @ Yield	MD		%	**20**
		TD		%	**15**
	Average Elongation @Break	MD		%	**481**
		TD		%	**594**
Dimensional Stability ASTM D1204 (Modified)	Average Dimensional Change			%	**-0.58**
Tear Resistance ASTM D1004 (Modified)	Average Tear Resistance	MD		**235.7** N	**53** lbs
		TD		**226.8** N	**51** lbs
Puncture Resistance FTMS 101 Method 2065 Modified					**CERTIFIED**
Puncture Resistance ASTM D4833 (Modified)	Average Peak Load			**587.1** N	**132** lbs
ESCR ASTM D1693	Minumum Hrs w/o Failures			1500 Hrs	**CERTIFIED**
Notched Constant Tensile Load ASTM D5397	Pass/Fail @ 30%			500 Hrs	**PASS**

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ROLL # G15D073034 **LOT #** HFA610170 **LINER TYPE** **60 HD MICROSPIKE**

		METRIC	ENGLISH		METRIC	ENGLISH
Thickness Measurement ASTM D5994 (Modified)	MIN	**1.41** mm	**55** mil	Thickness	**1.52** mm	**60** mil
	MAX	**1.63** mm	**64** mil	Length	**153.926** m	**505** feet
	AVE	**1.51** mm	**59** mil	Width	**7.01** m	**23** feet

OIT(Standard) ASTM D 3895					**194** minutes
Asperity ASTM D7466	Average	Top		**.66** mm	**26** mil
		Bottom		**.94** mm	**37** mil
Specific Gravity ASTM D792	Average Density			g/cc	**.943**
MFI ASTM D1238 COND. E Grade **K307**	Melt Flow Index 190C/2160 g - g/10 min				**.21**
Carbon Black Content ASTM D4218	Range			%	**2.1**
Carbon Black Dispersion ASTM D5596	Category				**10 in Category 1**
Tensile Strength ASTM D6693 (2 inches / minute)	Average Strength @ Yield	MD	**29** N/mm	**166** ppi	**2774** psi
		TD	**30** N/mm	**174** ppi	**2893** psi
	Average Strength @ Break	MD	**40** N/mm	**229** ppi	**3815** psi
		TD	**38** N/mm	**217** ppi	**3624** psi
Tensile Elongation ASTM D6693 (2 inches / minute) Lo = 1.3" Yield Lo = 2.0" Break	Average Elongation @ Yield	MD		%	**20**
		TD		%	**15**
	Average Elongation @Break	MD		%	**481**
		TD		%	**594**
Dimensional Stability ASTM D1204 (Modified)	Average Dimensional Change			%	**-0.58**
Tear Resistance ASTM D1004 (Modified)	Average Tear Resistance	MD		**235.7** N	**53** lbs
		TD		**226.8** N	**51** lbs
Puncture Resistance FTMS 101 Method 2065 Modified					**CERTIFIED**
Puncture Resistance ASTM D4833 (Modified)	Average Peak Load			**587.1** N	**132** lbs
ESCR ASTM D1693	Minumum Hrs w/o Failures			1500 Hrs	**CERTIFIED**
Notched Constant Tensile Load ASTM D5397	Pass/Fail @ 30%			500 Hrs	**PASS**

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ROLL # G15D073035 **LOT #** HFA610170 **LINER TYPE** **60 HD MICROSPIKE**

		METRIC	ENGLISH		METRIC	ENGLISH
Thickness Measurement ASTM D5994 (Modified)	MIN	**1.42** mm	**56** mil	Thickness	**1.52** mm	**60** mil
	MAX	**1.65** mm	**65** mil	Length	**153.926** m	**505** feet
	AVE	**1.51** mm	**59** mil	Width	**7.01** m	**23** feet

OIT(Standard) ASTM D 3895					**194** minutes
Asperity ASTM D7466	Average	Top		**.66** mm	**26** mil
		Bottom		**.97** mm	**38** mil
Specific Gravity ASTM D792	Average Density			g/cc	**.943**
MFI ASTM D1238 COND. E Grade **K307**	Melt Flow Index 190C/2160 g - g/10 min				**.21**
Carbon Black Content ASTM D4218	Range			%	**2.2**
Carbon Black Dispersion ASTM D5596	Category				**10 in Category 1**
Tensile Strength ASTM D6693 (2 inches / minute)	Average Strength @ Yield	MD	**29** N/mm	**166** ppi	**2774** psi
		TD	**30** N/mm	**174** ppi	**2893** psi
	Average Strength @ Break	MD	**40** N/mm	**229** ppi	**3815** psi
		TD	**38** N/mm	**217** ppi	**3624** psi
Tensile Elongation ASTM D6693 (2 inches / minute) Lo = 1.3" Yield Lo = 2.0" Break	Average Elongation @ Yield	MD		%	**20**
		TD		%	**15**
	Average Elongation @Break	MD		%	**481**
		TD		%	**594**
Dimensional Stability ASTM D1204 (Modified)	Average Dimensional Change			%	**-0.58**
Tear Resistance ASTM D1004 (Modified)	Average Tear Resistance	MD		**235.7** N	**53** lbs
		TD		**226.8** N	**51** lbs
Puncture Resistance FTMS 101 Method 2065 Modified					**CERTIFIED**
Puncture Resistance ASTM D4833 (Modified)	Average Peak Load			**587.1** N	**132** lbs
ESCR ASTM D1693	Minumum Hrs w/o Failures			1500 Hrs	**CERTIFIED**
Notched Constant Tensile Load ASTM D5397	Pass/Fail @ 30%			500 Hrs	**PASS**

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ROLL # G15D073036 **LOT #** HFA610170 **LINER TYPE** **60 HD MICROSPIKE**

		METRIC	ENGLISH		METRIC	ENGLISH
Thickness Measurement ASTM D5994 (Modified)	MIN	**1.42** mm	**56** mil	Thickness	**1.52** mm	**60** mil
	MAX	**1.58** mm	**62** mil	Length	**153.926** m	**505** feet
	AVE	**1.50** mm	**59** mil	Width	**7.01** m	**23** feet

OIT(Standard) ASTM D 3895					**194** minutes
Asperity ASTM D7466	Average	Top		**.66** mm	**26** mil
		Bottom		**.94** mm	**37** mil
Specific Gravity ASTM D792	Average Density			g/cc	**.943**
MFI ASTM D1238 COND. E Grade **K307**	Melt Flow Index 190C/2160 g - g/10 min				**.21**
Carbon Black Content ASTM D4218	Range			%	**2.2**
Carbon Black Dispersion ASTM D5596	Category				**10 in Category 1**
Tensile Strength ASTM D6693 (2 inches / minute)	Average Strength @ Yield	MD	**29** N/mm	**166** ppi	**2774** psi
		TD	**30** N/mm	**174** ppi	**2893** psi
	Average Strength @ Break	MD	**40** N/mm	**229** ppi	**3815** psi
		TD	**38** N/mm	**217** ppi	**3624** psi
Tensile Elongation ASTM D6693 (2 inches / minute) Lo = 1.3" Yield Lo = 2.0" Break	Average Elongation @ Yield	MD		%	**20**
		TD		%	**15**
	Average Elongation @Break	MD		%	**481**
		TD		%	**594**
Dimensional Stability ASTM D1204 (Modified)	Average Dimensional Change			%	**-0.58**
Tear Resistance ASTM D1004 (Modified)	Average Tear Resistance	MD		**235.7** N	**53** lbs
		TD		**226.8** N	**51** lbs
Puncture Resistance FTMS 101 Method 2065 Modified					**CERTIFIED**
Puncture Resistance ASTM D4833 (Modified)	Average Peak Load			**587.1** N	**132** lbs
ESCR ASTM D1693	Minumum Hrs w/o Failures			1500 Hrs	**CERTIFIED**
Notched Constant Tensile Load ASTM D5397	Pass/Fail @ 30%			500 Hrs	**PASS**

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ROLL # G15D073037 **LOT #** HFA610170 **LINER TYPE** **60 HD MICROSPIKE**

		METRIC	ENGLISH		METRIC	ENGLISH
Thickness Measurement ASTM D5994 (Modified)	MIN	**1.41** mm	**56** mil	Thickness	**1.52** mm	**60** mil
	MAX	**1.65** mm	**65** mil	Length	**153.926** m	**505** feet
	AVE	**1.51** mm	**60** mil	Width	**7.01** m	**23** feet

OIT(Standard) ASTM D 3895					**194** minutes
Asperity ASTM D7466	Average	Top		**.64** mm	**25** mil
		Bottom		**.94** mm	**37** mil
Specific Gravity ASTM D792	Average Density			g/cc	**.942**
MFI ASTM D1238 COND. E Grade **K307**	Melt Flow Index 190C/2160 g - g/10 min				**.21**
Carbon Black Content ASTM D4218	Range			%	**2.3**
Carbon Black Dispersion ASTM D5596	Category				**10 in Category 1**
Tensile Strength ASTM D6693 (2 inches / minute)	Average Strength @ Yield	MD	**24** N/mm	**136** ppi	**2260** psi
		TD	**26** N/mm	**146** ppi	**2440** psi
	Average Strength @ Break	MD	**37** N/mm	**211** ppi	**3520** psi
		TD	**37** N/mm	**209** ppi	**3483** psi
Tensile Elongation ASTM D6693 (2 inches / minute) Lo = 1.3" Yield Lo = 2.0" Break	Average Elongation @ Yield	MD		%	**20**
		TD		%	**16**
	Average Elongation @Break	MD		%	**479**
		TD		%	**611**
Dimensional Stability ASTM D1204 (Modified)	Average Dimensional Change			%	**-0.58**
Tear Resistance ASTM D1004 (Modified)	Average Tear Resistance	MD		**244.6** N	**55** lbs
		TD		**218.0** N	**49** lbs
Puncture Resistance FTMS 101 Method 2065 Modified					**CERTIFIED**
Puncture Resistance ASTM D4833 (Modified)	Average Peak Load			**618.3** N	**139** lbs
ESCR ASTM D1693	Minumum Hrs w/o Failures			1500 Hrs	**CERTIFIED**
Notched Constant Tensile Load ASTM D5397	Pass/Fail @ 30%			500 Hrs	**PASS**

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ROLL # G15D073038 **LOT #** HFA610170 **LINER TYPE** **60 HD MICROSPIKE**

		METRIC	ENGLISH		METRIC	ENGLISH
Thickness Measurement ASTM D5994 (Modified)	MIN	**1.38** mm	**54** mil	Thickness	**1.52** mm	**60** mil
	MAX	**1.64** mm	**65** mil	Length	**153.926** m	**505** feet
	AVE	**1.50** mm	**59** mil	Width	**7.01** m	**23** feet

OIT(Standard) ASTM D 3895					**194** minutes
Asperity ASTM D7466	Average	Top		**.66** mm	**26** mil
		Bottom		**.94** mm	**37** mil
Specific Gravity ASTM D792	Average Density			g/cc	**.942**
MFI ASTM D1238 COND. E Grade **K307**	Melt Flow Index 190C/2160 g - g/10 min				**.21**
Carbon Black Content ASTM D4218	Range			%	**2.3**
Carbon Black Dispersion ASTM D5596	Category				**10 in Category 1**
Tensile Strength ASTM D6693 (2 inches / minute)	Average Strength @ Yield	MD	**24** N/mm	**136** ppi	**2260** psi
		TD	**26** N/mm	**146** ppi	**2440** psi
	Average Strength @ Break	MD	**37** N/mm	**211** ppi	**3520** psi
		TD	**37** N/mm	**209** ppi	**3483** psi
Tensile Elongation ASTM D6693 (2 inches / minute) Lo = 1.3" Yield Lo = 2.0" Break	Average Elongation @ Yield	MD		%	**20**
		TD		%	**16**
	Average Elongation @Break	MD		%	**479**
		TD		%	**611**
Dimensional Stability ASTM D1204 (Modified)	Average Dimensional Change			%	**-0.58**
Tear Resistance ASTM D1004 (Modified)	Average Tear Resistance	MD		**244.6** N	**55** lbs
		TD		**218.0** N	**49** lbs
Puncture Resistance FTMS 101 Method 2065 Modified					**CERTIFIED**
Puncture Resistance ASTM D4833 (Modified)	Average Peak Load			**618.3** N	**139** lbs
ESCR ASTM D1693	Minumum Hrs w/o Failures			1500 Hrs	**CERTIFIED**
Notched Constant Tensile Load ASTM D5397	Pass/Fail @ 30%			500 Hrs	**PASS**

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ROLL # G15D073039 **LOT #** HFA610170 **LINER TYPE** **60 HD MICROSPIKE**

		METRIC	ENGLISH		METRIC	ENGLISH
Thickness Measurement ASTM D5994 (Modified)	MIN	**1.39** mm	**55** mil	Thickness	**1.52** mm	**60** mil
	MAX	**1.68** mm	**66** mil	Length	**153.926** m	**505** feet
	AVE	**1.52** mm	**60** mil	Width	**7.01** m	**23** feet

OIT(Standard) ASTM D 3895					**194** minutes
Asperity ASTM D7466	Average	Top		**.66** mm	**26** mil
		Bottom		**.97** mm	**38** mil
Specific Gravity ASTM D792	Average Density			g/cc	**.942**
MFI ASTM D1238 COND. E Grade **K307**	Melt Flow Index 190C/2160 g - g/10 min				**.21**
Carbon Black Content ASTM D4218	Range			%	**2.3**
Carbon Black Dispersion ASTM D5596	Category				**10 in Category 1**
Tensile Strength ASTM D6693 (2 inches / minute)	Average Strength @ Yield	MD	**24** N/mm	**136** ppi	**2260** psi
		TD	**26** N/mm	**146** ppi	**2440** psi
	Average Strength @ Break	MD	**37** N/mm	**211** ppi	**3520** psi
		TD	**37** N/mm	**209** ppi	**3483** psi
Tensile Elongation ASTM D6693 (2 inches / minute) Lo = 1.3" Yield Lo = 2.0" Break	Average Elongation @ Yield	MD		%	**20**
		TD		%	**16**
	Average Elongation @Break	MD		%	**479**
		TD		%	**611**
Dimensional Stability ASTM D1204 (Modified)	Average Dimensional Change			%	**-0.58**
Tear Resistance ASTM D1004 (Modified)	Average Tear Resistance	MD		**244.6** N	**55** lbs
		TD		**218.0** N	**49** lbs
Puncture Resistance FTMS 101 Method 2065 Modified					**CERTIFIED**
Puncture Resistance ASTM D4833 (Modified)	Average Peak Load			**618.3** N	**139** lbs
ESCR ASTM D1693	Minumum Hrs w/o Failures			1500 Hrs	**CERTIFIED**
Notched Constant Tensile Load ASTM D5397	Pass/Fail @ 30%			500 Hrs	**PASS**

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ROLL # G15D073040 **LOT #** HFA610170 **LINER TYPE** **60 HD MICROSPIKE**

		METRIC	ENGLISH		METRIC	ENGLISH
Thickness Measurement ASTM D5994 (Modified)	MIN	**1.41** mm	**56** mil	Thickness	**1.52** mm	**60** mil
	MAX	**1.60** mm	**63** mil	Length	**153.926** m	**505** feet
	AVE	**1.52** mm	**60** mil	Width	**7.01** m	**23** feet

OIT(Standard) ASTM D 3895					**194** minutes
Asperity ASTM D7466	Average	Top		**.64** mm	**25** mil
		Bottom		**.94** mm	**37** mil
Specific Gravity ASTM D792	Average Density			g/cc	**.942**
MFI ASTM D1238 COND. E Grade **K307**	Melt Flow Index 190C/2160 g - g/10 min				**.21**
Carbon Black Content ASTM D4218	Range			%	**2.2**
Carbon Black Dispersion ASTM D5596	Category				**10 in Category 1**
Tensile Strength ASTM D6693 (2 inches / minute)	Average Strength @ Yield	MD	**24** N/mm	**136** ppi	**2260** psi
		TD	**26** N/mm	**146** ppi	**2440** psi
	Average Strength @ Break	MD	**37** N/mm	**211** ppi	**3520** psi
		TD	**37** N/mm	**209** ppi	**3483** psi
Tensile Elongation ASTM D6693 (2 inches / minute) Lo = 1.3" Yield Lo = 2.0" Break	Average Elongation @ Yield	MD		%	**20**
		TD		%	**16**
	Average Elongation @Break	MD		%	**479**
		TD		%	**611**
Dimensional Stability ASTM D1204 (Modified)	Average Dimensional Change			%	**-0.58**
Tear Resistance ASTM D1004 (Modified)	Average Tear Resistance	MD		**244.6** N	**55** lbs
		TD		**218.0** N	**49** lbs
Puncture Resistance FTMS 101 Method 2065 Modified					**CERTIFIED**
Puncture Resistance ASTM D4833 (Modified)	Average Peak Load			**618.3** N	**139** lbs
ESCR ASTM D1693	Minumum Hrs w/o Failures			1500 Hrs	**CERTIFIED**
Notched Constant Tensile Load ASTM D5397	Pass/Fail @ 30%			500 Hrs	**PASS**

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ROLL # G15D073041 **LOT #** HFA610170 **LINER TYPE** **60 HD MICROSPIKE**

		METRIC	ENGLISH		METRIC	ENGLISH
Thickness Measurement ASTM D5994 (Modified)	MIN	**1.44** mm	**57** mil	Thickness	**1.52** mm	**60** mil
	MAX	**1.59** mm	**62** mil	Length	**153.926** m	**505** feet
	AVE	**1.51** mm	**59** mil	Width	**7.01** m	**23** feet

OIT(Standard) ASTM D 3895					**194** minutes
Asperity ASTM D7466	Average	Top		**.66** mm	**26** mil
		Bottom		**.91** mm	**36** mil
Specific Gravity ASTM D792	Average Density			g/cc	**.942**
MFI ASTM D1238 COND. E Grade **K307**	Melt Flow Index 190C/2160 g - g/10 min				**.21**
Carbon Black Content ASTM D4218	Range			%	**2.2**
Carbon Black Dispersion ASTM D5596	Category				**10 in Category 1**
Tensile Strength ASTM D6693 (2 inches / minute)	Average Strength @ Yield	MD	**24** N/mm	**136** ppi	**2260** psi
		TD	**26** N/mm	**146** ppi	**2440** psi
	Average Strength @ Break	MD	**37** N/mm	**211** ppi	**3520** psi
		TD	**37** N/mm	**209** ppi	**3483** psi
Tensile Elongation ASTM D6693 (2 inches / minute) Lo = 1.3" Yield Lo = 2.0" Break	Average Elongation @ Yield	MD		%	**20**
		TD		%	**16**
	Average Elongation @Break	MD		%	**479**
		TD		%	**611**
Dimensional Stability ASTM D1204 (Modified)	Average Dimensional Change			%	**-0.58**
Tear Resistance ASTM D1004 (Modified)	Average Tear Resistance	MD		**244.6** N	**55** lbs
		TD		**218.0** N	**49** lbs
Puncture Resistance FTMS 101 Method 2065 Modified					**CERTIFIED**
Puncture Resistance ASTM D4833 (Modified)	Average Peak Load			**618.3** N	**139** lbs
ESCR ASTM D1693	Minumum Hrs w/o Failures			1500 Hrs	**CERTIFIED**
Notched Constant Tensile Load ASTM D5397	Pass/Fail @ 30%			500 Hrs	**PASS**

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ROLL # G15D073042 **LOT #** HFA610170 **LINER TYPE** **60 HD MICROSPIKE**

		METRIC	ENGLISH		METRIC	ENGLISH
Thickness Measurement ASTM D5994 (Modified)	MIN	**1.44** mm	**57** mil	Thickness	**1.52** mm	**60** mil
	MAX	**1.63** mm	**64** mil	Length	**153.926** m	**505** feet
	AVE	**1.51** mm	**60** mil	Width	**7.01** m	**23** feet

OIT(Standard) ASTM D 3895				**194** minutes
Asperity ASTM D7466	Average	Top	**.71** mm	**28** mil
		Bottom	**.86** mm	**34** mil
Specific Gravity ASTM D792	Average Density		g/cc	**.945**
MFI ASTM D1238 COND. E Grade **K307**	Melt Flow Index 190C/2160 g - g/10 min			**.21**
Carbon Black Content ASTM D4218	Range		%	**2.2**
Carbon Black Dispersion ASTM D5596	Category			**10 in Category 1**
Tensile Strength ASTM D6693 (2 inches / minute)	Average Strength @ Yield	MD	**24** N/mm **138** ppi	**2293** psi
		TD	**24** N/mm **140** ppi	**2329** psi
	Average Strength @ Break	MD	**35** N/mm **199** ppi	**3311** psi
		TD	**37** N/mm **210** ppi	**3502** psi
Tensile Elongation ASTM D6693 (2 inches / minute) Lo = 1.3" Yield Lo = 2.0" Break	Average Elongation @ Yield	MD	%	**19**
		TD	%	**16**
	Average Elongation @Break	MD	%	**466**
		TD	%	**645**
Dimensional Stability ASTM D1204 (Modified)	Average Dimensional Change		%	**-0.58**
Tear Resistance ASTM D1004 (Modified)	Average Tear Resistance	MD	**235.7** N	**53** lbs
		TD	**231.3** N	**52** lbs
Puncture Resistance FTMS 101 Method 2065 Modified				**CERTIFIED**
Puncture Resistance ASTM D4833 (Modified)	Average Peak Load		**591.6** N	**133** lbs
ESCR ASTM D1693	Minumum Hrs w/o Failures		1500 Hrs	**CERTIFIED**
Notched Constant Tensile Load ASTM D5397	Pass/Fail @ 30%		500 Hrs	**PASS**

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ROLL # G15D073043 **LOT #** HFA610170 **LINER TYPE** **60 HD MICROSPIKE**

		METRIC	ENGLISH		METRIC	ENGLISH
Thickness Measurement ASTM D5994 (Modified)	MIN	**1.44** mm	**57** mil	Thickness	**1.52** mm	**60** mil
	MAX	**1.64** mm	**65** mil	Length	**153.926** m	**505** feet
	AVE	**1.52** mm	**60** mil	Width	**7.01** m	**23** feet

OIT(Standard) ASTM D 3895				**194** minutes
Asperity ASTM D7466	Average	Top	**.66** mm	**26** mil
		Bottom	**.89** mm	**35** mil
Specific Gravity ASTM D792	Average Density		g/cc	**.945**
MFI ASTM D1238 COND. E Grade **K307**	Melt Flow Index 190C/2160 g - g/10 min			**.21**
Carbon Black Content ASTM D4218	Range		%	**2.2**
Carbon Black Dispersion ASTM D5596	Category			**10 in Category 1**
Tensile Strength ASTM D6693 (2 inches / minute)	Average Strength @ Yield	MD	**24** N/mm **138** ppi	**2293** psi
		TD	**24** N/mm **140** ppi	**2329** psi
	Average Strength @ Break	MD	**35** N/mm **199** ppi	**3311** psi
		TD	**37** N/mm **210** ppi	**3502** psi
Tensile Elongation ASTM D6693 (2 inches / minute) Lo = 1.3" Yield Lo = 2.0" Break	Average Elongation @ Yield	MD	%	**19**
		TD	%	**16**
	Average Elongation @Break	MD	%	**466**
		TD	%	**645**
Dimensional Stability ASTM D1204 (Modified)	Average Dimensional Change		%	**-0.58**
Tear Resistance ASTM D1004 (Modified)	Average Tear Resistance	MD	**235.7** N	**53** lbs
		TD	**231.3** N	**52** lbs
Puncture Resistance FTMS 101 Method 2065 Modified				**CERTIFIED**
Puncture Resistance ASTM D4833 (Modified)	Average Peak Load		**591.6** N	**133** lbs
ESCR ASTM D1693	Minumum Hrs w/o Failures		1500 Hrs	**CERTIFIED**
Notched Constant Tensile Load ASTM D5397	Pass/Fail @ 30%		500 Hrs	**PASS**

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ROLL # G15D226084 **LOT #** HFE710440 **LINER TYPE** **60 HD MICROSPIKE**

		METRIC	ENGLISH		METRIC	ENGLISH
Thickness Measurement ASTM D5994 (Modified)	MIN	**1.52** mm	**60** mil	Thickness	**1.52** mm	**60** mil
	MAX	**1.71** mm	**67** mil	Length	**153.926** m	**505** feet
	AVE	**1.58** mm	**62** mil	Width	**7.01** m	**23** feet

OIT(Standard) ASTM D 3895					**207** minutes
Asperity ASTM D7466	Average	Top		**.64** mm	**25** mil
		Bottom		**.91** mm	**36** mil
Specific Gravity ASTM D792	Average Density			g/cc	**.946**
MFI ASTM D1238 COND. E Grade **K307**	Melt Flow Index 190C/2160 g - g/10 min				**.21**
Carbon Black Content ASTM D4218	Range			%	**2.0**
Carbon Black Dispersion ASTM D5596	Category				**10 in Category 1**
Tensile Strength ASTM D6693 (2 inches / minute)	Average Strength @ Yield	MD	**24** N/mm	**140** ppi	**2327** psi
		TD	**27** N/mm	**152** ppi	**2529** psi
	Average Strength @ Break	MD	**34** N/mm	**195** ppi	**3248** psi
		TD	**36** N/mm	**205** ppi	**3413** psi
Tensile Elongation ASTM D6693 (2 inches / minute) Lo = 1.3" Yield Lo = 2.0" Break	Average Elongation @ Yield	MD		%	**18**
		TD		%	**15**
	Average Elongation @Break	MD		%	**464**
		TD		%	**613**
Dimensional Stability ASTM D1204 (Modified)	Average Dimensional Change			%	**-0.56**
Tear Resistance ASTM D1004 (Modified)	Average Tear Resistance	MD		**253.5** N	**57** lbs
		TD		**253.5** N	**57** lbs
Puncture Resistance FTMS 101 Method 2065 Modified					**CERTIFIED**
Puncture Resistance ASTM D4833 (Modified)	Average Peak Load			**618.3** N	**139** lbs
ESCR ASTM D1693	Minumum Hrs w/o Failures			1500 Hrs	**CERTIFIED**
Notched Constant Tensile Load ASTM D5397	Pass/Fail @ 30%			500 Hrs	**ONGOING**

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ROLL # G15D226085 **LOT #** HFE710440 **LINER TYPE** **60 HD MICROSPIKE**

		METRIC	ENGLISH		METRIC	ENGLISH
Thickness Measurement ASTM D5994 (Modified)	MIN	**1.50** mm	**59** mil	Thickness	**1.52** mm	**60** mil
	MAX	**1.66** mm	**65** mil	Length	**153.926** m	**505** feet
	AVE	**1.56** mm	**61** mil	Width	**7.01** m	**23** feet

OIT(Standard) ASTM D 3895					**207** minutes
Asperity ASTM D7466	Average	Top		**.71** mm	**28** mil
		Bottom		**.74** mm	**29** mil
Specific Gravity ASTM D792	Average Density			g/cc	**.946**
MFI ASTM D1238 COND. E Grade **K307**	Melt Flow Index 190C/2160 g - g/10 min				**.21**
Carbon Black Content ASTM D4218	Range			%	**2.0**
Carbon Black Dispersion ASTM D5596	Category				**10 in Category 1**
Tensile Strength ASTM D6693 (2 inches / minute)	Average Strength @ Yield	MD	**24** N/mm	**140** ppi	**2327** psi
		TD	**27** N/mm	**152** ppi	**2529** psi
	Average Strength @ Break	MD	**34** N/mm	**195** ppi	**3248** psi
		TD	**36** N/mm	**205** ppi	**3413** psi
Tensile Elongation ASTM D6693 (2 inches / minute) Lo = 1.3" Yield Lo = 2.0" Break	Average Elongation @ Yield	MD		%	**18**
		TD		%	**15**
	Average Elongation @Break	MD		%	**464**
		TD		%	**613**
Dimensional Stability ASTM D1204 (Modified)	Average Dimensional Change			%	**-0.56**
Tear Resistance ASTM D1004 (Modified)	Average Tear Resistance	MD		**253.5** N	**57** lbs
		TD		**253.5** N	**57** lbs
Puncture Resistance FTMS 101 Method 2065 Modified					**CERTIFIED**
Puncture Resistance ASTM D4833 (Modified)	Average Peak Load			**618.3** N	**139** lbs
ESCR ASTM D1693	Minumum Hrs w/o Failures			1500 Hrs	**CERTIFIED**
Notched Constant Tensile Load ASTM D5397	Pass/Fail @ 30%			500 Hrs	**ONGOING**

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ROLL # G15D226086 **LOT #** HFE710440 **LINER TYPE** **60 HD MICROSPIKE**

		METRIC	ENGLISH		METRIC	ENGLISH
Thickness Measurement ASTM D5994 (Modified)	MIN	**1.41** mm	**55** mil	Thickness	**1.52** mm	**60** mil
	MAX	**1.73** mm	**68** mil	Length	**153.926** m	**505** feet
	AVE	**1.57** mm	**62** mil	Width	**7.01** m	**23** feet

OIT(Standard) ASTM D 3895					**207** minutes
Asperity ASTM D7466	Average	Top		**.76** mm	**30** mil
		Bottom		**.79** mm	**31** mil
Specific Gravity ASTM D792	Average Density			g/cc	**.946**
MFI ASTM D1238 COND. E Grade **K307**	Melt Flow Index 190C/2160 g - g/10 min				**.21**
Carbon Black Content ASTM D4218	Range			%	**2.0**
Carbon Black Dispersion ASTM D5596	Category				**10 in Category 1**
Tensile Strength ASTM D6693 (2 inches / minute)	Average Strength @ Yield	MD	**24** N/mm	**140** ppi	**2327** psi
		TD	**27** N/mm	**152** ppi	**2529** psi
	Average Strength @ Break	MD	**34** N/mm	**195** ppi	**3248** psi
		TD	**36** N/mm	**205** ppi	**3413** psi
Tensile Elongation ASTM D6693 (2 inches / minute) Lo = 1.3" Yield Lo = 2.0" Break	Average Elongation @ Yield	MD		%	**18**
		TD		%	**15**
	Average Elongation @Break	MD		%	**464**
		TD		%	**613**
Dimensional Stability ASTM D1204 (Modified)	Average Dimensional Change			%	**-0.56**
Tear Resistance ASTM D1004 (Modified)	Average Tear Resistance	MD		**253.5** N	**57** lbs
		TD		**253.5** N	**57** lbs
Puncture Resistance FTMS 101 Method 2065 Modified					**CERTIFIED**
Puncture Resistance ASTM D4833 (Modified)	Average Peak Load			**618.3** N	**139** lbs
ESCR ASTM D1693	Minumum Hrs w/o Failures			1500 Hrs	**CERTIFIED**
Notched Constant Tensile Load ASTM D5397	Pass/Fail @ 30%			500 Hrs	**ONGOING**

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ROLL # G15D226087 **LOT #** HFE710440 **LINER TYPE** **60 HD MICROSPIKE**

		METRIC	ENGLISH		METRIC	ENGLISH
Thickness Measurement ASTM D5994 (Modified)	MIN	**1.42** mm	**56** mil	Thickness	**1.52** mm	**60** mil
	MAX	**1.71** mm	**67** mil	Length	**153.926** m	**505** feet
	AVE	**1.55** mm	**61** mil	Width	**7.01** m	**23** feet

OIT(Standard) ASTM D 3895					**207** minutes
Asperity ASTM D7466	Average	Top		**.76** mm	**30** mil
		Bottom		**.76** mm	**30** mil
Specific Gravity ASTM D792	Average Density			g/cc	**.946**
MFI ASTM D1238 COND. E Grade **K307**	Melt Flow Index 190C/2160 g - g/10 min				**.21**
Carbon Black Content ASTM D4218	Range			%	**2.0**
Carbon Black Dispersion ASTM D5596	Category				**10 in Category 1**
Tensile Strength ASTM D6693 (2 inches / minute)	Average Strength @ Yield	MD	**24** N/mm	**140** ppi	**2327** psi
		TD	**27** N/mm	**152** ppi	**2529** psi
	Average Strength @ Break	MD	**34** N/mm	**195** ppi	**3248** psi
		TD	**36** N/mm	**205** ppi	**3413** psi
Tensile Elongation ASTM D6693 (2 inches / minute) Lo = 1.3" Yield Lo = 2.0" Break	Average Elongation @ Yield	MD		%	**18**
		TD		%	**15**
	Average Elongation @Break	MD		%	**464**
		TD		%	**613**
Dimensional Stability ASTM D1204 (Modified)	Average Dimensional Change			%	**-0.56**
Tear Resistance ASTM D1004 (Modified)	Average Tear Resistance	MD		**253.5** N	**57** lbs
		TD		**253.5** N	**57** lbs
Puncture Resistance FTMS 101 Method 2065 Modified					**CERTIFIED**
Puncture Resistance ASTM D4833 (Modified)	Average Peak Load			**618.3** N	**139** lbs
ESCR ASTM D1693	Minumum Hrs w/o Failures			1500 Hrs	**CERTIFIED**
Notched Constant Tensile Load ASTM D5397	Pass/Fail @ 30%			500 Hrs	**ONGOING**

Customer Chesapeake Containment
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ROLL # G15D227088 **LOT #** HFE710440 **LINER TYPE** **60 HD MICROSPIKE**

		METRIC	ENGLISH		METRIC	ENGLISH
Thickness Measurement ASTM D5994 (Modified)	MIN	**1.41** mm	**55** mil	Thickness	**1.52** mm	**60** mil
	MAX	**1.62** mm	**64** mil	Length	**153.926** m	**505** feet
	AVE	**1.54** mm	**61** mil	Width	**7.01** m	**23** feet

OIT(Standard) ASTM D 3895					**207** minutes
Asperity ASTM D7466	Average	Top		**.81** mm	**32** mil
		Bottom		**.79** mm	**31** mil
Specific Gravity ASTM D792	Average Density			g/cc	**.946**
MFI ASTM D1238 COND. E Grade **K307**	Melt Flow Index 190C/2160 g - g/10 min				**.21**
Carbon Black Content ASTM D4218	Range			%	**2.1**
Carbon Black Dispersion ASTM D5596	Category				**10 in Category 1**
Tensile Strength ASTM D6693 (2 inches / minute)	Average Strength @ Yield	MD	**27** N/mm	**152** ppi	**2539** psi
		TD	**28** N/mm	**159** ppi	**2657** psi
	Average Strength @ Break	MD	**31** N/mm	**176** ppi	**2941** psi
		TD	**37** N/mm	**209** ppi	**3476** psi
Tensile Elongation ASTM D6693 (2 inches / minute) Lo = 1.3" Yield Lo = 2.0" Break	Average Elongation @ Yield	MD		%	**19**
		TD		%	**15**
	Average Elongation @Break	MD		%	**425**
		TD		%	**602**
Dimensional Stability ASTM D1204 (Modified)	Average Dimensional Change			%	**-0.56**
Tear Resistance ASTM D1004 (Modified)	Average Tear Resistance	MD		**253.5** N	**57** lbs
		TD		**253.5** N	**57** lbs
Puncture Resistance FTMS 101 Method 2065 Modified					**CERTIFIED**
Puncture Resistance ASTM D4833 (Modified)	Average Peak Load			**618.3** N	**139** lbs
ESCR ASTM D1693	Minumum Hrs w/o Failures			1500 Hrs	**CERTIFIED**
Notched Constant Tensile Load ASTM D5397	Pass/Fail @ 30%			500 Hrs	**ONGOING**

Customer Chesapeake Containment
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ROLL # G15D227089 **LOT #** HFE710440 **LINER TYPE** **60 HD MICROSPIKE**

		METRIC	ENGLISH		METRIC	ENGLISH
Thickness Measurement ASTM D5994 (Modified)	MIN	**1.45** mm	**57** mil	Thickness	**1.52** mm	**60** mil
	MAX	**1.61** mm	**63** mil	Length	**153.926** m	**505** feet
	AVE	**1.53** mm	**60** mil	Width	**7.01** m	**23** feet

OIT(Standard) ASTM D 3895					**207** minutes
Asperity ASTM D7466	Average	Top		**.64** mm	**25** mil
		Bottom		**.81** mm	**32** mil
Specific Gravity ASTM D792	Average Density			g/cc	**.946**
MFI ASTM D1238 COND. E Grade **K307**	Melt Flow Index 190C/2160 g - g/10 min				**.21**
Carbon Black Content ASTM D4218	Range			%	**2.1**
Carbon Black Dispersion ASTM D5596	Category				**10 in Category 1**
Tensile Strength ASTM D6693 (2 inches / minute)	Average Strength @ Yield	MD	**27** N/mm	**152** ppi	**2539** psi
		TD	**28** N/mm	**159** ppi	**2657** psi
	Average Strength @ Break	MD	**31** N/mm	**176** ppi	**2941** psi
		TD	**37** N/mm	**209** ppi	**3476** psi
Tensile Elongation ASTM D6693 (2 inches / minute) Lo = 1.3" Yield Lo = 2.0" Break	Average Elongation @ Yield	MD		%	**19**
		TD		%	**15**
	Average Elongation @Break	MD		%	**425**
		TD		%	**602**
Dimensional Stability ASTM D1204 (Modified)	Average Dimensional Change			%	**-0.56**
Tear Resistance ASTM D1004 (Modified)	Average Tear Resistance	MD		**253.5** N	**57** lbs
		TD		**253.5** N	**57** lbs
Puncture Resistance FTMS 101 Method 2065 Modified					**CERTIFIED**
Puncture Resistance ASTM D4833 (Modified)	Average Peak Load			**618.3** N	**139** lbs
ESCR ASTM D1693	Minumum Hrs w/o Failures			1500 Hrs	**CERTIFIED**
Notched Constant Tensile Load ASTM D5397	Pass/Fail @ 30%			500 Hrs	**ONGOING**

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ROLL # G15D227090 **LOT #** HFE710440 **LINER TYPE** **60 HD MICROSPIKE**

		METRIC	ENGLISH		METRIC	ENGLISH
Thickness Measurement ASTM D5994 (Modified)	MIN	**1.48** mm	**58** mil	Thickness	**1.52** mm	**60** mil
	MAX	**1.68** mm	**66** mil	Length	**153.926** m	**505** feet
	AVE	**1.55** mm	**61** mil	Width	**7.01** m	**23** feet

OIT(Standard) ASTM D 3895					**207** minutes
Asperity ASTM D7466	Average	Top		**.64** mm	**25** mil
		Bottom		**.71** mm	**28** mil
Specific Gravity ASTM D792	Average Density			g/cc	**.946**
MFI ASTM D1238 COND. E Grade **K307**	Melt Flow Index 190C/2160 g - g/10 min				**.21**
Carbon Black Content ASTM D4218	Range			%	**2.1**
Carbon Black Dispersion ASTM D5596	Category				**10 in Category 1**
Tensile Strength ASTM D6693 (2 inches / minute)	Average Strength @ Yield	MD	**27** N/mm	**152** ppi	**2539** psi
		TD	**28** N/mm	**159** ppi	**2657** psi
	Average Strength @ Break	MD	**31** N/mm	**176** ppi	**2941** psi
		TD	**37** N/mm	**209** ppi	**3476** psi
Tensile Elongation ASTM D6693 (2 inches / minute) Lo = 1.3" Yield Lo = 2.0" Break	Average Elongation @ Yield	MD		%	**19**
		TD		%	**15**
	Average Elongation @Break	MD		%	**425**
		TD		%	**602**
Dimensional Stability ASTM D1204 (Modified)	Average Dimensional Change			%	**-0.56**
Tear Resistance ASTM D1004 (Modified)	Average Tear Resistance	MD		**253.5** N	**57** lbs
		TD		**253.5** N	**57** lbs
Puncture Resistance FTMS 101 Method 2065 Modified					**CERTIFIED**
Puncture Resistance ASTM D4833 (Modified)	Average Peak Load			**618.3** N	**139** lbs
ESCR ASTM D1693	Minumum Hrs w/o Failures			1500 Hrs	**CERTIFIED**
Notched Constant Tensile Load ASTM D5397	Pass/Fail @ 30%			500 Hrs	**ONGOING**

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ROLL # G15D227091 **LOT #** HFE710440 **LINER TYPE** **60 HD MICROSPIKE**

		METRIC	ENGLISH		METRIC	ENGLISH
Thickness Measurement ASTM D5994 (Modified)	MIN	**1.38** mm	**54** mil	Thickness	**1.52** mm	**60** mil
	MAX	**1.59** mm	**63** mil	Length	**153.926** m	**505** feet
	AVE	**1.51** mm	**59** mil	Width	**7.01** m	**23** feet

OIT(Standard) ASTM D 3895				**207** minutes
Asperity ASTM D7466	Average	Top	**.64** mm	**25** mil
		Bottom	**.86** mm	**34** mil
Specific Gravity ASTM D792	Average Density		g/cc	**.946**
MFI ASTM D1238 COND. E Grade **K307**	Melt Flow Index 190C/2160 g - g/10 min			**.21**
Carbon Black Content ASTM D4218	Range		%	**2.3**
Carbon Black Dispersion ASTM D5596	Category			**10 in Category 1**
Tensile Strength ASTM D6693 (2 inches / minute)	Average Strength @ Yield	MD	**27** N/mm **152** ppi	**2539** psi
		TD	**28** N/mm **159** ppi	**2657** psi
	Average Strength @ Break	MD	**31** N/mm **176** ppi	**2941** psi
		TD	**37** N/mm **209** ppi	**3476** psi
Tensile Elongation ASTM D6693 (2 inches / minute) Lo = 1.3" Yield Lo = 2.0" Break	Average Elongation @ Yield	MD	%	**19**
		TD	%	**15**
	Average Elongation @Break	MD	%	**425**
		TD	%	**602**
Dimensional Stability ASTM D1204 (Modified)	Average Dimensional Change		%	**-0.56**
Tear Resistance ASTM D1004 (Modified)	Average Tear Resistance	MD	**253.5** N	**57** lbs
		TD	**253.5** N	**57** lbs
Puncture Resistance FTMS 101 Method 2065 Modified				**CERTIFIED**
Puncture Resistance ASTM D4833 (Modified)	Average Peak Load		**618.3** N	**139** lbs
ESCR ASTM D1693	Minumum Hrs w/o Failures		1500 Hrs	**CERTIFIED**
Notched Constant Tensile Load ASTM D5397	Pass/Fail @ 30%		500 Hrs	**ONGOING**

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ROLL # G15D227092 **LOT #** HFE710340 **LINER TYPE** **60 HD MICROSPIKE**

		METRIC	ENGLISH		METRIC	ENGLISH
Thickness Measurement ASTM D5994 (Modified)	MIN	**1.41** mm	**55** mil	Thickness	**1.52** mm	**60** mil
	MAX	**1.90** mm	**75** mil	Length	**153.926** m	**505** feet
	AVE	**1.56** mm	**62** mil	Width	**7.01** m	**23** feet

OIT(Standard) ASTM D 3895					**203** minutes
Asperity ASTM D7466	Average	Top		**.64** mm	**25** mil
		Bottom		**.86** mm	**34** mil
Specific Gravity ASTM D792	Average Density			g/cc	**.947**
MFI ASTM D1238 COND. E Grade **K307**	Melt Flow Index 190C/2160 g - g/10 min				**.19**
Carbon Black Content ASTM D4218	Range			%	**2.3**
Carbon Black Dispersion ASTM D5596	Category				**10 in Category 1**
Tensile Strength ASTM D6693 (2 inches / minute)	Average Strength @ Yield	MD	**27** N/mm	**152** ppi	**2539** psi
		TD	**28** N/mm	**159** ppi	**2657** psi
	Average Strength @ Break	MD	**31** N/mm	**176** ppi	**2941** psi
		TD	**37** N/mm	**209** ppi	**3476** psi
Tensile Elongation ASTM D6693 (2 inches / minute) Lo = 1.3" Yield Lo = 2.0" Break	Average Elongation @ Yield	MD		%	**19**
		TD		%	**15**
	Average Elongation @Break	MD		%	**425**
		TD		%	**602**
Dimensional Stability ASTM D1204 (Modified)	Average Dimensional Change			%	**-0.68**
Tear Resistance ASTM D1004 (Modified)	Average Tear Resistance	MD		**253.5** N	**57** lbs
		TD		**253.5** N	**57** lbs
Puncture Resistance FTMS 101 Method 2065 Modified					**CERTIFIED**
Puncture Resistance ASTM D4833 (Modified)	Average Peak Load			**618.3** N	**139** lbs
ESCR ASTM D1693	Minumum Hrs w/o Failures			1500 Hrs	**CERTIFIED**
Notched Constant Tensile Load ASTM D5397	Pass/Fail @ 30%			500 Hrs	**ONGOING**

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ROLL # G15D227093 **LOT #** HFE710340 **LINER TYPE** **60 HD MICROSPIKE**

		METRIC	ENGLISH		METRIC	ENGLISH
Thickness Measurement ASTM D5994 (Modified)	MIN	**1.37** mm	**54** mil	Thickness	**1.52** mm	**60** mil
	MAX	**1.66** mm	**65** mil	Length	**153.926** m	**505** feet
	AVE	**1.52** mm	**60** mil	Width	**7.01** m	**23** feet

OIT(Standard) ASTM D 3895					**203** minutes
Asperity ASTM D7466	Average	Top		**.64** mm	**25** mil
		Bottom		**.89** mm	**35** mil
Specific Gravity ASTM D792	Average Density			g/cc	**.947**
MFI ASTM D1238 COND. E Grade **K307**	Melt Flow Index 190C/2160 g - g/10 min				**.19**
Carbon Black Content ASTM D4218	Range			%	**2.3**
Carbon Black Dispersion ASTM D5596	Category				**10 in Category 1**
Tensile Strength ASTM D6693 (2 inches / minute)	Average Strength @ Yield	MD	**24** N/mm	**138** ppi	**2295** psi
		TD	**26** N/mm	**146** ppi	**2433** psi
	Average Strength @ Break	MD	**35** N/mm	**199** ppi	**3323** psi
		TD	**36** N/mm	**207** ppi	**3444** psi
Tensile Elongation ASTM D6693 (2 inches / minute) Lo = 1.3" Yield Lo = 2.0" Break	Average Elongation @ Yield	MD		%	**18**
		TD		%	**16**
	Average Elongation @Break	MD		%	**466**
		TD		%	**628**
Dimensional Stability ASTM D1204 (Modified)	Average Dimensional Change			%	**-0.68**
Tear Resistance ASTM D1004 (Modified)	Average Tear Resistance	MD		**275.8** N	**62** lbs
		TD		**271.3** N	**61** lbs
Puncture Resistance FTMS 101 Method 2065 Modified					**CERTIFIED**
Puncture Resistance ASTM D4833 (Modified)	Average Peak Load			**604.9** N	**136** lbs
ESCR ASTM D1693	Minumum Hrs w/o Failures			1500 Hrs	**CERTIFIED**
Notched Constant Tensile Load ASTM D5397	Pass/Fail @ 30%			500 Hrs	**ONGOING**

Customer Chesapeake Containment
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ROLL # G15D227094 **LOT #** HFE710340 **LINER TYPE** **60 HD MICROSPIKE**

		METRIC	ENGLISH		METRIC	ENGLISH
Thickness Measurement ASTM D5994 (Modified)	MIN	**1.40** mm	**55** mil	Thickness	**1.52** mm	**60** mil
	MAX	**1.66** mm	**65** mil	Length	**153.926** m	**505** feet
	AVE	**1.52** mm	**60** mil	Width	**7.01** m	**23** feet

OIT(Standard) ASTM D 3895					**203** minutes
Asperity ASTM D7466	Average	Top		**.66** mm	**26** mil
		Bottom		**.84** mm	**33** mil
Specific Gravity ASTM D792	Average Density			g/cc	**.947**
MFI ASTM D1238 COND. E Grade **K307**	Melt Flow Index 190C/2160 g - g/10 min				**.19**
Carbon Black Content ASTM D4218	Range			%	**2.3**
Carbon Black Dispersion ASTM D5596	Category				**10 in Category 1**
Tensile Strength ASTM D6693 (2 inches / minute)	Average Strength @ Yield	MD	**24** N/mm	**138** ppi	**2295** psi
		TD	**26** N/mm	**146** ppi	**2433** psi
	Average Strength @ Break	MD	**35** N/mm	**199** ppi	**3323** psi
		TD	**36** N/mm	**207** ppi	**3444** psi
Tensile Elongation ASTM D6693 (2 inches / minute) Lo = 1.3" Yield Lo = 2.0" Break	Average Elongation @ Yield	MD		%	**18**
		TD		%	**16**
	Average Elongation @Break	MD		%	**466**
		TD		%	**628**
Dimensional Stability ASTM D1204 (Modified)	Average Dimensional Change			%	**-0.68**
Tear Resistance ASTM D1004 (Modified)	Average Tear Resistance	MD		**275.8** N	**62** lbs
		TD		**271.3** N	**61** lbs
Puncture Resistance FTMS 101 Method 2065 Modified					**CERTIFIED**
Puncture Resistance ASTM D4833 (Modified)	Average Peak Load			**604.9** N	**136** lbs
ESCR ASTM D1693	Minumum Hrs w/o Failures			1500 Hrs	**CERTIFIED**
Notched Constant Tensile Load ASTM D5397	Pass/Fail @ 30%			500 Hrs	**ONGOING**

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ROLL # G15D227095 **LOT #** HFE710340 **LINER TYPE** **60 HD MICROSPIKE**

		METRIC	ENGLISH		METRIC	ENGLISH
Thickness Measurement ASTM D5994 (Modified)	MIN	**1.43** mm	**56** mil	Thickness	**1.52** mm	**60** mil
	MAX	**1.66** mm	**65** mil	Length	**153.926** m	**505** feet
	AVE	**1.51** mm	**60** mil	Width	**7.01** m	**23** feet

OIT(Standard) ASTM D 3895					**203** minutes
Asperity ASTM D7466	Average	Top		**.61** mm	**24** mil
		Bottom		**.79** mm	**31** mil
Specific Gravity ASTM D792	Average Density			g/cc	**.947**
MFI ASTM D1238 COND. E Grade **K307**	Melt Flow Index 190C/2160 g - g/10 min				**.19**
Carbon Black Content ASTM D4218	Range			%	**2.3**
Carbon Black Dispersion ASTM D5596	Category				**10 in Category 1**
Tensile Strength ASTM D6693 (2 inches / minute)	Average Strength @ Yield	MD	**24** N/mm	**138** ppi	**2295** psi
		TD	**26** N/mm	**146** ppi	**2433** psi
	Average Strength @ Break	MD	**35** N/mm	**199** ppi	**3323** psi
		TD	**36** N/mm	**207** ppi	**3444** psi
Tensile Elongation ASTM D6693 (2 inches / minute) Lo = 1.3" Yield Lo = 2.0" Break	Average Elongation @ Yield	MD		%	**18**
		TD		%	**16**
	Average Elongation @Break	MD		%	**466**
		TD		%	**628**
Dimensional Stability ASTM D1204 (Modified)	Average Dimensional Change			%	**-0.68**
Tear Resistance ASTM D1004 (Modified)	Average Tear Resistance	MD		**275.8** N	**62** lbs
		TD		**271.3** N	**61** lbs
Puncture Resistance FTMS 101 Method 2065 Modified					**CERTIFIED**
Puncture Resistance ASTM D4833 (Modified)	Average Peak Load			**604.9** N	**136** lbs
ESCR ASTM D1693	Minumum Hrs w/o Failures			1500 Hrs	**CERTIFIED**
Notched Constant Tensile Load ASTM D5397	Pass/Fail @ 30%			500 Hrs	**ONGOING**

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ROLL # G15D227096 **LOT #** HFE710340 **LINER TYPE** **60 HD MICROSPIKE**

		METRIC	ENGLISH		METRIC	ENGLISH
Thickness Measurement ASTM D5994 (Modified)	MIN	**1.38** mm	**54** mil	Thickness	**1.52** mm	**60** mil
	MAX	**1.64** mm	**65** mil	Length	**153.926** m	**505** feet
	AVE	**1.50** mm	**59** mil	Width	**7.01** m	**23** feet

OIT(Standard) ASTM D 3895					**203** minutes
Asperity ASTM D7466	Average	Top		**.69** mm	**27** mil
		Bottom		**.89** mm	**35** mil
Specific Gravity ASTM D792	Average Density			g/cc	**.947**
MFI ASTM D1238 COND. E Grade **K307**	Melt Flow Index 190C/2160 g - g/10 min				**.19**
Carbon Black Content ASTM D4218	Range			%	**2.3**
Carbon Black Dispersion ASTM D5596	Category				**10 in Category 1**
Tensile Strength ASTM D6693 (2 inches / minute)	Average Strength @ Yield	MD	**24** N/mm	**138** ppi	**2295** psi
		TD	**26** N/mm	**146** ppi	**2433** psi
	Average Strength @ Break	MD	**35** N/mm	**199** ppi	**3323** psi
		TD	**36** N/mm	**207** ppi	**3444** psi
Tensile Elongation ASTM D6693 (2 inches / minute) Lo = 1.3" Yield Lo = 2.0" Break	Average Elongation @ Yield	MD		%	**18**
		TD		%	**16**
	Average Elongation @Break	MD		%	**466**
		TD		%	**628**
Dimensional Stability ASTM D1204 (Modified)	Average Dimensional Change			%	**-0.68**
Tear Resistance ASTM D1004 (Modified)	Average Tear Resistance	MD		**275.8** N	**62** lbs
		TD		**271.3** N	**61** lbs
Puncture Resistance FTMS 101 Method 2065 Modified					**CERTIFIED**
Puncture Resistance ASTM D4833 (Modified)	Average Peak Load			**604.9** N	**136** lbs
ESCR ASTM D1693	Minumum Hrs w/o Failures			1500 Hrs	**CERTIFIED**
Notched Constant Tensile Load ASTM D5397	Pass/Fail @ 30%			500 Hrs	**ONGOING**

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ROLL # G15D227097 **LOT #** HFE710340 **LINER TYPE** **60 HD MICROSPIKE**

		METRIC	ENGLISH		METRIC	ENGLISH
Thickness Measurement ASTM D5994 (Modified)	MIN	**1.38** mm	**54** mil	Thickness	**1.52** mm	**60** mil
	MAX	**1.61** mm	**63** mil	Length	**153.926** m	**505** feet
	AVE	**1.50** mm	**59** mil	Width	**7.01** m	**23** feet

OIT(Standard) ASTM D 3895					**203** minutes
Asperity ASTM D7466	Average	Top		**.64** mm	**25** mil
		Bottom		**.84** mm	**33** mil
Specific Gravity ASTM D792	Average Density			g/cc	**.947**
MFI ASTM D1238 COND. E Grade **K307**	Melt Flow Index 190C/2160 g - g/10 min				**.19**
Carbon Black Content ASTM D4218	Range			%	**2.3**
Carbon Black Dispersion ASTM D5596	Category				**10 in Category 1**
Tensile Strength ASTM D6693 (2 inches / minute)	Average Strength @ Yield	MD	**24** N/mm	**138** ppi	**2295** psi
		TD	**26** N/mm	**146** ppi	**2433** psi
	Average Strength @ Break	MD	**35** N/mm	**199** ppi	**3323** psi
		TD	**36** N/mm	**207** ppi	**3444** psi
Tensile Elongation ASTM D6693 (2 inches / minute) Lo = 1.3" Yield Lo = 2.0" Break	Average Elongation @ Yield	MD		%	**18**
		TD		%	**16**
	Average Elongation @Break	MD		%	**466**
		TD		%	**628**
Dimensional Stability ASTM D1204 (Modified)	Average Dimensional Change			%	**-0.68**
Tear Resistance ASTM D1004 (Modified)	Average Tear Resistance	MD		**275.8** N	**62** lbs
		TD		**271.3** N	**61** lbs
Puncture Resistance FTMS 101 Method 2065 Modified					**CERTIFIED**
Puncture Resistance ASTM D4833 (Modified)	Average Peak Load			**604.9** N	**136** lbs
ESCR ASTM D1693	Minumum Hrs w/o Failures			1500 Hrs	**CERTIFIED**
Notched Constant Tensile Load ASTM D5397	Pass/Fail @ 30%			500 Hrs	**ONGOING**

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ROLL # G15D227098 **LOT #** HFE710340 **LINER TYPE** **60 HD MICROSPIKE**

		METRIC	ENGLISH		METRIC	ENGLISH
Thickness Measurement ASTM D5994 (Modified)	MIN	**1.41** mm	**56** mil	Thickness	**1.52** mm	**60** mil
	MAX	**1.62** mm	**64** mil	Length	**153.926** m	**505** feet
	AVE	**1.49** mm	**59** mil	Width	**7.01** m	**23** feet

OIT(Standard) ASTM D 3895					**203** minutes
Asperity ASTM D7466	Average	Top		**.66** mm	**26** mil
		Bottom		**.91** mm	**36** mil
Specific Gravity ASTM D792	Average Density			g/cc	**.947**
MFI ASTM D1238 COND. E Grade **K307**	Melt Flow Index 190C/2160 g - g/10 min				**.19**
Carbon Black Content ASTM D4218	Range			%	**2.3**
Carbon Black Dispersion ASTM D5596	Category				**10 in Category 1**
Tensile Strength ASTM D6693 (2 inches / minute)	Average Strength @ Yield	MD	**25** N/mm	**143** ppi	**2387** psi
		TD	**27** N/mm	**156** ppi	**2604** psi
	Average Strength @ Break	MD	**35** N/mm	**200** ppi	**3340** psi
		TD	**34** N/mm	**195** ppi	**3247** psi
Tensile Elongation ASTM D6693 (2 inches / minute) Lo = 1.3" Yield Lo = 2.0" Break	Average Elongation @ Yield	MD		%	**20**
		TD		%	**15**
	Average Elongation @Break	MD		%	**471**
		TD		%	**582**
Dimensional Stability ASTM D1204 (Modified)	Average Dimensional Change			%	**-0.68**
Tear Resistance ASTM D1004 (Modified)	Average Tear Resistance	MD		**275.8** N	**62** lbs
		TD		**271.3** N	**61** lbs
Puncture Resistance FTMS 101 Method 2065 Modified					**CERTIFIED**
Puncture Resistance ASTM D4833 (Modified)	Average Peak Load			**604.9** N	**136** lbs
ESCR ASTM D1693	Minumum Hrs w/o Failures			1500 Hrs	**CERTIFIED**
Notched Constant Tensile Load ASTM D5397	Pass/Fail @ 30%			500 Hrs	**ONGOING**

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ROLL # G15D227099 **LOT #** HFE710340 **LINER TYPE** **60 HD MICROSPIKE**

		METRIC	ENGLISH		METRIC	ENGLISH
Thickness Measurement ASTM D5994 (Modified)	MIN	**1.38** mm	**54** mil	Thickness	**1.52** mm	**60** mil
	MAX	**1.62** mm	**64** mil	Length	**153.926** m	**505** feet
	AVE	**1.49** mm	**59** mil	Width	**7.01** m	**23** feet

OIT(Standard) ASTM D 3895					**203** minutes
Asperity ASTM D7466	Average	Top		**.66** mm	**26** mil
		Bottom		**.94** mm	**37** mil
Specific Gravity ASTM D792	Average Density			g/cc	**.947**
MFI ASTM D1238 COND. E Grade **K307**	Melt Flow Index 190C/2160 g - g/10 min				**.19**
Carbon Black Content ASTM D4218	Range			%	**2.3**
Carbon Black Dispersion ASTM D5596	Category				**10 in Category 1**
Tensile Strength ASTM D6693 (2 inches / minute)	Average Strength @ Yield	MD	**25** N/mm	**143** ppi	**2387** psi
		TD	**27** N/mm	**156** ppi	**2604** psi
	Average Strength @ Break	MD	**35** N/mm	**200** ppi	**3340** psi
		TD	**34** N/mm	**195** ppi	**3247** psi
Tensile Elongation ASTM D6693 (2 inches / minute) Lo = 1.3" Yield Lo = 2.0" Break	Average Elongation @ Yield	MD		%	**20**
		TD		%	**15**
	Average Elongation @Break	MD		%	**471**
		TD		%	**582**
Dimensional Stability ASTM D1204 (Modified)	Average Dimensional Change			%	**-0.68**
Tear Resistance ASTM D1004 (Modified)	Average Tear Resistance	MD		**275.8** N	**62** lbs
		TD		**271.3** N	**61** lbs
Puncture Resistance FTMS 101 Method 2065 Modified					**CERTIFIED**
Puncture Resistance ASTM D4833 (Modified)	Average Peak Load			**604.9** N	**136** lbs
ESCR ASTM D1693	Minumum Hrs w/o Failures			1500 Hrs	**CERTIFIED**
Notched Constant Tensile Load ASTM D5397	Pass/Fail @ 30%			500 Hrs	**ONGOING**

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ROLL # G15D227100 **LOT #** HFE710340 **LINER TYPE** **60 HD MICROSPIKE**

		METRIC	ENGLISH		METRIC	ENGLISH
Thickness Measurement ASTM D5994 (Modified)	MIN	**1.38** mm	**54** mil	Thickness	**1.52** mm	**60** mil
	MAX	**1.68** mm	**66** mil	Length	**153.926** m	**505** feet
	AVE	**1.51** mm	**59** mil	Width	**7.01** m	**23** feet

OIT(Standard) ASTM D 3895					**203** minutes
Asperity ASTM D7466	Average	Top		**.69** mm	**27** mil
		Bottom		**.81** mm	**32** mil
Specific Gravity ASTM D792	Average Density			g/cc	**.947**
MFI ASTM D1238 COND. E Grade **K307**	Melt Flow Index 190C/2160 g - g/10 min				**.19**
Carbon Black Content ASTM D4218	Range			%	**2.3**
Carbon Black Dispersion ASTM D5596	Category				**10 in Category 1**
Tensile Strength ASTM D6693 (2 inches / minute)	Average Strength @ Yield	MD	**25** N/mm	**143** ppi	**2387** psi
		TD	**27** N/mm	**156** ppi	**2604** psi
	Average Strength @ Break	MD	**35** N/mm	**200** ppi	**3340** psi
		TD	**34** N/mm	**195** ppi	**3247** psi
Tensile Elongation ASTM D6693 (2 inches / minute) Lo = 1.3" Yield Lo = 2.0" Break	Average Elongation @ Yield	MD		%	**20**
		TD		%	**15**
	Average Elongation @Break	MD		%	**471**
		TD		%	**582**
Dimensional Stability ASTM D1204 (Modified)	Average Dimensional Change			%	**-0.68**
Tear Resistance ASTM D1004 (Modified)	Average Tear Resistance	MD		**275.8** N	**62** lbs
		TD		**271.3** N	**61** lbs
Puncture Resistance FTMS 101 Method 2065 Modified					**CERTIFIED**
Puncture Resistance ASTM D4833 (Modified)	Average Peak Load			**604.9** N	**136** lbs
ESCR ASTM D1693	Minumum Hrs w/o Failures			1500 Hrs	**CERTIFIED**
Notched Constant Tensile Load ASTM D5397	Pass/Fail @ 30%			500 Hrs	**ONGOING**

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ROLL # G15D227101 **LOT #** HFE710340 **LINER TYPE** **60 HD MICROSPIKE**

		METRIC	ENGLISH		METRIC	ENGLISH
Thickness Measurement ASTM D5994 (Modified)	MIN	**1.38** mm	**54** mil	Thickness	**1.52** mm	**60** mil
	MAX	**1.61** mm	**63** mil	Length	**153.926** m	**505** feet
	AVE	**1.49** mm	**59** mil	Width	**7.01** m	**23** feet

OIT(Standard) ASTM D 3895				**203** minutes
Asperity ASTM D7466	Average	Top	**.64** mm	**25** mil
		Bottom	**.86** mm	**34** mil
Specific Gravity ASTM D792	Average Density		g/cc	**.947**
MFI ASTM D1238 COND. E Grade **K307**	Melt Flow Index 190C/2160 g - g/10 min			**.19**
Carbon Black Content ASTM D4218	Range		%	**2.2**
Carbon Black Dispersion ASTM D5596	Category			**10 in Category 1**
Tensile Strength ASTM D6693 (2 inches / minute)	Average Strength @ Yield	MD	**25** N/mm **143** ppi	**2387** psi
		TD	**27** N/mm **156** ppi	**2604** psi
	Average Strength @ Break	MD	**35** N/mm **200** ppi	**3340** psi
		TD	**34** N/mm **195** ppi	**3247** psi
Tensile Elongation ASTM D6693 (2 inches / minute) Lo = 1.3" Yield Lo = 2.0" Break	Average Elongation @ Yield	MD	%	**20**
		TD	%	**15**
	Average Elongation @Break	MD	%	**471**
		TD	%	**582**
Dimensional Stability ASTM D1204 (Modified)	Average Dimensional Change		%	**-0.68**
Tear Resistance ASTM D1004 (Modified)	Average Tear Resistance	MD	**275.8** N	**62** lbs
		TD	**271.3** N	**61** lbs
Puncture Resistance FTMS 101 Method 2065 Modified				**CERTIFIED**
Puncture Resistance ASTM D4833 (Modified)	Average Peak Load		**604.9** N	**136** lbs
ESCR ASTM D1693	Minumum Hrs w/o Failures		1500 Hrs	**CERTIFIED**
Notched Constant Tensile Load ASTM D5397	Pass/Fail @ 30%		500 Hrs	**ONGOING**

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ROLL # G15D227102 **LOT #** HFE710340 **LINER TYPE** **60 HD MICROSPIKE**

		METRIC	ENGLISH		METRIC	ENGLISH
Thickness Measurement ASTM D5994 (Modified)	MIN	**1.43** mm	**56** mil	Thickness	**1.52** mm	**60** mil
	MAX	**1.67** mm	**66** mil	Length	**153.926** m	**505** feet
	AVE	**1.54** mm	**61** mil	Width	**7.01** m	**23** feet

OIT(Standard) ASTM D 3895					**203** minutes
Asperity ASTM D7466	Average	Top		**.71** mm	**28** mil
		Bottom		**.76** mm	**30** mil
Specific Gravity ASTM D792	Average Density			g/cc	**.947**
MFI ASTM D1238 COND. E Grade **K307**	Melt Flow Index 190C/2160 g - g/10 min				**.19**
Carbon Black Content ASTM D4218	Range			%	**2.2**
Carbon Black Dispersion ASTM D5596	Category				**10 in Category 1**
Tensile Strength ASTM D6693 (2 inches / minute)	Average Strength @ Yield	MD	**25** N/mm	**143** ppi	**2387** psi
		TD	**27** N/mm	**156** ppi	**2604** psi
	Average Strength @ Break	MD	**35** N/mm	**200** ppi	**3340** psi
		TD	**34** N/mm	**195** ppi	**3247** psi
Tensile Elongation ASTM D6693 (2 inches / minute) Lo = 1.3" Yield Lo = 2.0" Break	Average Elongation @ Yield	MD		%	**20**
		TD		%	**15**
	Average Elongation @Break	MD		%	**471**
		TD		%	**582**
Dimensional Stability ASTM D1204 (Modified)	Average Dimensional Change			%	**-0.68**
Tear Resistance ASTM D1004 (Modified)	Average Tear Resistance	MD		**275.8** N	**62** lbs
		TD		**271.3** N	**61** lbs
Puncture Resistance FTMS 101 Method 2065 Modified					**CERTIFIED**
Puncture Resistance ASTM D4833 (Modified)	Average Peak Load			**604.9** N	**136** lbs
ESCR ASTM D1693	Minumum Hrs w/o Failures			1500 Hrs	**CERTIFIED**
Notched Constant Tensile Load ASTM D5397	Pass/Fail @ 30%			500 Hrs	**ONGOING**

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ROLL # G15D231001 **LOT #** HFE710340 **LINER TYPE** **60 HD MICROSPIKE**

		METRIC	ENGLISH		METRIC	ENGLISH
Thickness Measurement ASTM D5994 (Modified)	MIN	**1.45** mm	**57** mil	Thickness	**1.52** mm	**60** mil
	MAX	**1.64** mm	**65** mil	Length	**153.926** m	**505** feet
	AVE	**1.55** mm	**61** mil	Width	**7.01** m	**23** feet

OIT(Standard) ASTM D 3895				**203** minutes
Asperity ASTM D7466	Average	Top	**.71** mm	**28** mil
		Bottom	**.84** mm	**33** mil
Specific Gravity ASTM D792	Average Density		g/cc	**.947**
MFI ASTM D1238 COND. E Grade **K307**	Melt Flow Index 190C/2160 g - g/10 min			**.19**
Carbon Black Content ASTM D4218	Range		%	**2.2**
Carbon Black Dispersion ASTM D5596	Category			**10 in Category 1**
Tensile Strength ASTM D6693 (2 inches / minute)	Average Strength @ Yield	MD	**25** N/mm **144** ppi	**2403** psi
		TD	**28** N/mm **161** ppi	**2676** psi
	Average Strength @ Break	MD	**34** N/mm **196** ppi	**3266** psi
		TD	**39** N/mm **224** ppi	**3733** psi
Tensile Elongation ASTM D6693 (2 inches / minute) Lo = 1.3" Yield Lo = 2.0" Break	Average Elongation @ Yield	MD	%	**20**
		TD	%	**15**
	Average Elongation @Break	MD	%	**461**
		TD	%	**641**
Dimensional Stability ASTM D1204 (Modified)	Average Dimensional Change		%	**-0.68**
Tear Resistance ASTM D1004 (Modified)	Average Tear Resistance	MD	**262.4** N	**59** lbs
		TD	**262.4** N	**59** lbs
Puncture Resistance FTMS 101 Method 2065 Modified				**CERTIFIED**
Puncture Resistance ASTM D4833 (Modified)	Average Peak Load		**600.5** N	**135** lbs
ESCR ASTM D1693	Minumum Hrs w/o Failures		1500 Hrs	**CERTIFIED**
Notched Constant Tensile Load ASTM D5397	Pass/Fail @ 30%		500 Hrs	**ONGOING**

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ROLL # G15D231002 **LOT #** HFE710340 **LINER TYPE** **60 HD MICROSPIKE**

		METRIC	ENGLISH		METRIC	ENGLISH
Thickness Measurement ASTM D5994 (Modified)	MIN	**1.41** mm	**55** mil	Thickness	**1.52** mm	**60** mil
	MAX	**1.60** mm	**63** mil	Length	**153.926** m	**505** feet
	AVE	**1.50** mm	**59** mil	Width	**7.01** m	**23** feet

OIT(Standard) ASTM D 3895					**203** minutes
Asperity ASTM D7466	Average	Top		**.61** mm	**24** mil
		Bottom		**.94** mm	**37** mil
Specific Gravity ASTM D792	Average Density			g/cc	**.947**
MFI ASTM D1238 COND. E Grade **K307**	Melt Flow Index 190C/2160 g - g/10 min				**.19**
Carbon Black Content ASTM D4218	Range			%	**2.2**
Carbon Black Dispersion ASTM D5596	Category				**10 in Category 1**
Tensile Strength ASTM D6693 (2 inches / minute)	Average Strength @ Yield	MD	**25** N/mm	**144** ppi	**2403** psi
		TD	**28** N/mm	**161** ppi	**2676** psi
	Average Strength @ Break	MD	**34** N/mm	**196** ppi	**3266** psi
		TD	**39** N/mm	**224** ppi	**3733** psi
Tensile Elongation ASTM D6693 (2 inches / minute) Lo = 1.3" Yield Lo = 2.0" Break	Average Elongation @ Yield	MD		%	**20**
		TD		%	**15**
	Average Elongation @Break	MD		%	**461**
		TD		%	**641**
Dimensional Stability ASTM D1204 (Modified)	Average Dimensional Change			%	**-0.68**
Tear Resistance ASTM D1004 (Modified)	Average Tear Resistance	MD		**262.4** N	**59** lbs
		TD		**262.4** N	**59** lbs
Puncture Resistance FTMS 101 Method 2065 Modified					**CERTIFIED**
Puncture Resistance ASTM D4833 (Modified)	Average Peak Load			**600.5** N	**135** lbs
ESCR ASTM D1693	Minumum Hrs w/o Failures			1500 Hrs	**CERTIFIED**
Notched Constant Tensile Load ASTM D5397	Pass/Fail @ 30%			500 Hrs	**ONGOING**

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ROLL # G15D231003 **LOT #** HFE710340 **LINER TYPE** **60 HD MICROSPIKE**

		METRIC	ENGLISH		METRIC	ENGLISH
Thickness Measurement ASTM D5994 (Modified)	MIN	**1.43** mm	**56** mil	Thickness	**1.52** mm	**60** mil
	MAX	**1.57** mm	**62** mil	Length	**153.926** m	**505** feet
	AVE	**1.49** mm	**59** mil	Width	**7.01** m	**23** feet

OIT(Standard) ASTM D 3895					**203** minutes
Asperity ASTM D7466	Average	Top		**.64** mm	**25** mil
		Bottom		**.91** mm	**36** mil
Specific Gravity ASTM D792	Average Density			g/cc	**.947**
MFI ASTM D1238 COND. E Grade **K307**	Melt Flow Index 190C/2160 g - g/10 min				**.19**
Carbon Black Content ASTM D4218	Range			%	**2.2**
Carbon Black Dispersion ASTM D5596	Category				**10 in Category 1**
Tensile Strength ASTM D6693 (2 inches / minute)	Average Strength @ Yield	MD	**25** N/mm	**144** ppi	**2403** psi
		TD	**28** N/mm	**161** ppi	**2676** psi
	Average Strength @ Break	MD	**34** N/mm	**196** ppi	**3266** psi
		TD	**39** N/mm	**224** ppi	**3733** psi
Tensile Elongation ASTM D6693 (2 inches / minute) Lo = 1.3" Yield Lo = 2.0" Break	Average Elongation @ Yield	MD		%	**20**
		TD		%	**15**
	Average Elongation @Break	MD		%	**461**
		TD		%	**641**
Dimensional Stability ASTM D1204 (Modified)	Average Dimensional Change			%	**-0.68**
Tear Resistance ASTM D1004 (Modified)	Average Tear Resistance	MD		**262.4** N	**59** lbs
		TD		**262.4** N	**59** lbs
Puncture Resistance FTMS 101 Method 2065 Modified					**CERTIFIED**
Puncture Resistance ASTM D4833 (Modified)	Average Peak Load			**600.5** N	**135** lbs
ESCR ASTM D1693	Minumum Hrs w/o Failures			1500 Hrs	**CERTIFIED**
Notched Constant Tensile Load ASTM D5397	Pass/Fail @ 30%			500 Hrs	**ONGOING**

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ROLL # G15D231004 **LOT #** HFE710340 **LINER TYPE** **60 HD MICROSPIKE**

		METRIC	ENGLISH		METRIC	ENGLISH
Thickness Measurement ASTM D5994 (Modified)	MIN	**1.43** mm	**56** mil	Thickness	**1.52** mm	**60** mil
	MAX	**1.59** mm	**63** mil	Length	**153.926** m	**505** feet
	AVE	**1.50** mm	**59** mil	Width	**7.01** m	**23** feet

OIT(Standard) ASTM D 3895					**203** minutes
Asperity ASTM D7466	Average	Top		**.64** mm	**25** mil
		Bottom		**.91** mm	**36** mil
Specific Gravity ASTM D792	Average Density			g/cc	**.947**
MFI ASTM D1238 COND. E Grade **K307**	Melt Flow Index 190C/2160 g - g/10 min				**.19**
Carbon Black Content ASTM D4218	Range			%	**2.3**
Carbon Black Dispersion ASTM D5596	Category				**10 in Category 1**
Tensile Strength ASTM D6693 (2 inches / minute)	Average Strength @ Yield	MD	**25** N/mm	**144** ppi	**2403** psi
		TD	**28** N/mm	**161** ppi	**2676** psi
	Average Strength @ Break	MD	**34** N/mm	**196** ppi	**3266** psi
		TD	**39** N/mm	**224** ppi	**3733** psi
Tensile Elongation ASTM D6693 (2 inches / minute) Lo = 1.3" Yield Lo = 2.0" Break	Average Elongation @ Yield	MD		%	**20**
		TD		%	**15**
	Average Elongation @Break	MD		%	**461**
		TD		%	**641**
Dimensional Stability ASTM D1204 (Modified)	Average Dimensional Change			%	**-0.68**
Tear Resistance ASTM D1004 (Modified)	Average Tear Resistance	MD		**262.4** N	**59** lbs
		TD		**262.4** N	**59** lbs
Puncture Resistance FTMS 101 Method 2065 Modified					**CERTIFIED**
Puncture Resistance ASTM D4833 (Modified)	Average Peak Load			**600.5** N	**135** lbs
ESCR ASTM D1693	Minumum Hrs w/o Failures			1500 Hrs	**CERTIFIED**
Notched Constant Tensile Load ASTM D5397	Pass/Fail @ 30%			500 Hrs	**ONGOING**

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ROLL # G15D231005 **LOT #** HFE710340 **LINER TYPE** **60 HD MICROSPIKE**

		METRIC	ENGLISH		METRIC	ENGLISH
Thickness Measurement ASTM D5994 (Modified)	MIN	**1.38** mm	**54** mil	Thickness	**1.52** mm	**60** mil
	MAX	**1.62** mm	**64** mil	Length	**153.926** m	**505** feet
	AVE	**1.49** mm	**59** mil	Width	**7.01** m	**23** feet

OIT(Standard) ASTM D 3895					**203** minutes
Asperity ASTM D7466	Average	Top		**.64** mm	**25** mil
		Bottom		**.86** mm	**34** mil
Specific Gravity ASTM D792	Average Density			g/cc	**.947**
MFI ASTM D1238 COND. E Grade **K307**	Melt Flow Index 190C/2160 g - g/10 min				**.19**
Carbon Black Content ASTM D4218	Range			%	**2.3**
Carbon Black Dispersion ASTM D5596	Category				**10 in Category 1**
Tensile Strength ASTM D6693 (2 inches / minute)	Average Strength @ Yield	MD	**25** N/mm	**144** ppi	**2403** psi
		TD	**28** N/mm	**161** ppi	**2676** psi
	Average Strength @ Break	MD	**34** N/mm	**196** ppi	**3266** psi
		TD	**39** N/mm	**224** ppi	**3733** psi
Tensile Elongation ASTM D6693 (2 inches / minute) Lo = 1.3" Yield Lo = 2.0" Break	Average Elongation @ Yield	MD		%	**20**
		TD		%	**15**
	Average Elongation @Break	MD		%	**461**
		TD		%	**641**
Dimensional Stability ASTM D1204 (Modified)	Average Dimensional Change			%	**-0.68**
Tear Resistance ASTM D1004 (Modified)	Average Tear Resistance	MD		**262.4** N	**59** lbs
		TD		**262.4** N	**59** lbs
Puncture Resistance FTMS 101 Method 2065 Modified					**CERTIFIED**
Puncture Resistance ASTM D4833 (Modified)	Average Peak Load			**600.5** N	**135** lbs
ESCR ASTM D1693	Minumum Hrs w/o Failures			1500 Hrs	**CERTIFIED**
Notched Constant Tensile Load ASTM D5397	Pass/Fail @ 30%			500 Hrs	**ONGOING**

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ROLL # G15D231006 **LOT #** HFE710340 **LINER TYPE** **60 HD MICROSPIKE**

		METRIC	ENGLISH		METRIC	ENGLISH
Thickness Measurement ASTM D5994 (Modified)	MIN	**1.40** mm	**55** mil	Thickness	**1.52** mm	**60** mil
	MAX	**1.61** mm	**63** mil	Length	**153.926** m	**505** feet
	AVE	**1.50** mm	**59** mil	Width	**7.01** m	**23** feet

OIT(Standard) ASTM D 3895				**203** minutes
Asperity ASTM D7466	Average	Top	**.69** mm	**27** mil
		Bottom	**.84** mm	**33** mil
Specific Gravity ASTM D792	Average Density		g/cc	**.947**
MFI ASTM D1238 COND. E Grade **K307**	Melt Flow Index 190C/2160 g - g/10 min			**.19**
Carbon Black Content ASTM D4218	Range		%	**2.4**
Carbon Black Dispersion ASTM D5596	Category			**10 in Category 1**

Tensile Strength ASTM D6693 (2 inches / minute)	Average Strength @ Yield	MD	**24** N/mm	**136** ppi	**2270** psi
		TD	**29** N/mm	**163** ppi	**2717** psi
	Average Strength @ Break	MD	**33** N/mm	**188** ppi	**3141** psi
		TD	**40** N/mm	**231** ppi	**3851** psi
Tensile Elongation ASTM D6693 (2 inches / minute) Lo = 1.3" Yield Lo = 2.0" Break	Average Elongation @ Yield	MD	%	**17**	
		TD	%	**16**	
	Average Elongation @Break	MD	%	**493**	
		TD	%	**644**	
Dimensional Stability ASTM D1204 (Modified)	Average Dimensional Change		%	**-0.68**	
Tear Resistance ASTM D1004 (Modified)	Average Tear Resistance	MD	**262.4** N	**59** lbs	
		TD	**262.4** N	**59** lbs	
Puncture Resistance FTMS 101 Method 2065 Modified				**CERTIFIED**	
Puncture Resistance ASTM D4833 (Modified)	Average Peak Load		**600.5** N	**135** lbs	
ESCR ASTM D1693	Minumum Hrs w/o Failures		1500 Hrs	**CERTIFIED**	
Notched Constant Tensile Load ASTM D5397	Pass/Fail @ 30%		500 Hrs	**ONGOING**	

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ROLL # G15D231007 **LOT #** HFE710340 **LINER TYPE** **60 HD MICROSPIKE**

		METRIC	ENGLISH		METRIC	ENGLISH
Thickness Measurement ASTM D5994 (Modified)	MIN	**1.40** mm	**55** mil	Thickness	**1.52** mm	**60** mil
	MAX	**1.64** mm	**65** mil	Length	**153.926** m	**505** feet
	AVE	**1.50** mm	**59** mil	Width	**7.01** m	**23** feet

OIT(Standard) ASTM D 3895					**203** minutes
Asperity ASTM D7466	Average	Top		**.66** mm	**26** mil
		Bottom		**.84** mm	**33** mil
Specific Gravity ASTM D792	Average Density			g/cc	**.947**
MFI ASTM D1238 COND. E Grade **K307**	Melt Flow Index 190C/2160 g - g/10 min				**.19**
Carbon Black Content ASTM D4218	Range			%	**2.4**
Carbon Black Dispersion ASTM D5596	Category				**10 in Category 1**
Tensile Strength ASTM D6693 (2 inches / minute)	Average Strength @ Yield	MD	**24** N/mm	**136** ppi	**2270** psi
		TD	**29** N/mm	**163** ppi	**2717** psi
	Average Strength @ Break	MD	**33** N/mm	**188** ppi	**3141** psi
		TD	**40** N/mm	**231** ppi	**3851** psi
Tensile Elongation ASTM D6693 (2 inches / minute) Lo = 1.3" Yield Lo = 2.0" Break	Average Elongation @ Yield	MD		%	**17**
		TD		%	**16**
	Average Elongation @Break	MD		%	**493**
		TD		%	**644**
Dimensional Stability ASTM D1204 (Modified)	Average Dimensional Change			%	**-0.68**
Tear Resistance ASTM D1004 (Modified)	Average Tear Resistance	MD		**262.4** N	**59** lbs
		TD		**262.4** N	**59** lbs
Puncture Resistance FTMS 101 Method 2065 Modified					**CERTIFIED**
Puncture Resistance ASTM D4833 (Modified)	Average Peak Load			**600.5** N	**135** lbs
ESCR ASTM D1693	Minumum Hrs w/o Failures			1500 Hrs	**CERTIFIED**
Notched Constant Tensile Load ASTM D5397	Pass/Fail @ 30%			500 Hrs	**ONGOING**

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ROLL # G15D231008 **LOT #** HFE710340 **LINER TYPE** **60 HD MICROSPIKE**

		METRIC	ENGLISH		METRIC	ENGLISH
Thickness Measurement ASTM D5994 (Modified)	MIN	**1.38** mm	**54** mil	Thickness	**1.52** mm	**60** mil
	MAX	**1.64** mm	**65** mil	Length	**153.926** m	**505** feet
	AVE	**1.51** mm	**59** mil	Width	**7.01** m	**23** feet

OIT(Standard) ASTM D 3895					**203** minutes
Asperity ASTM D7466	Average	Top		**.66** mm	**26** mil
		Bottom		**.86** mm	**34** mil
Specific Gravity ASTM D792	Average Density			g/cc	**.947**
MFI ASTM D1238 COND. E Grade **K307**	Melt Flow Index 190C/2160 g - g/10 min				**.19**
Carbon Black Content ASTM D4218	Range			%	**2.4**
Carbon Black Dispersion ASTM D5596	Category				**10 in Category 1**
Tensile Strength ASTM D6693 (2 inches / minute)	Average Strength @ Yield	MD	**24** N/mm	**136** ppi	**2270** psi
		TD	**29** N/mm	**163** ppi	**2717** psi
	Average Strength @ Break	MD	**33** N/mm	**188** ppi	**3141** psi
		TD	**40** N/mm	**231** ppi	**3851** psi
Tensile Elongation ASTM D6693 (2 inches / minute) Lo = 1.3" Yield Lo = 2.0" Break	Average Elongation @ Yield	MD		%	**17**
		TD		%	**16**
	Average Elongation @Break	MD		%	**493**
		TD		%	**644**
Dimensional Stability ASTM D1204 (Modified)	Average Dimensional Change			%	**-0.68**
Tear Resistance ASTM D1004 (Modified)	Average Tear Resistance	MD		**262.4** N	**59** lbs
		TD		**262.4** N	**59** lbs
Puncture Resistance FTMS 101 Method 2065 Modified					**CERTIFIED**
Puncture Resistance ASTM D4833 (Modified)	Average Peak Load			**600.5** N	**135** lbs
ESCR ASTM D1693	Minumum Hrs w/o Failures			1500 Hrs	**CERTIFIED**
Notched Constant Tensile Load ASTM D5397	Pass/Fail @ 30%			500 Hrs	**ONGOING**

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ROLL # G15D231009 **LOT #** HFE710340 **LINER TYPE** **60 HD MICROSPIKE**

		METRIC	ENGLISH		METRIC	ENGLISH
Thickness Measurement ASTM D5994 (Modified)	MIN	**1.40** mm	**55** mil	Thickness	**1.52** mm	**60** mil
	MAX	**1.69** mm	**66** mil	Length	**153.926** m	**505** feet
	AVE	**1.52** mm	**60** mil	Width	**7.01** m	**23** feet

OIT(Standard) ASTM D 3895					**203** minutes
Asperity ASTM D7466	Average	Top		**.69** mm	**27** mil
		Bottom		**.84** mm	**33** mil
Specific Gravity ASTM D792	Average Density			g/cc	**.947**
MFI ASTM D1238 COND. E Grade **K307**	Melt Flow Index 190C/2160 g - g/10 min				**.19**
Carbon Black Content ASTM D4218	Range			%	**2.2**
Carbon Black Dispersion ASTM D5596	Category				**10 in Category 1**
Tensile Strength ASTM D6693 (2 inches / minute)	Average Strength @ Yield	MD	**24** N/mm	**136** ppi	**2270** psi
		TD	**29** N/mm	**163** ppi	**2717** psi
	Average Strength @ Break	MD	**33** N/mm	**188** ppi	**3141** psi
		TD	**40** N/mm	**231** ppi	**3851** psi
Tensile Elongation ASTM D6693 (2 inches / minute) Lo = 1.3" Yield Lo = 2.0" Break	Average Elongation @ Yield	MD		%	**17**
		TD		%	**16**
	Average Elongation @Break	MD		%	**493**
		TD		%	**644**
Dimensional Stability ASTM D1204 (Modified)	Average Dimensional Change			%	**-0.68**
Tear Resistance ASTM D1004 (Modified)	Average Tear Resistance	MD		**262.4** N	**59** lbs
		TD		**262.4** N	**59** lbs
Puncture Resistance FTMS 101 Method 2065 Modified					**CERTIFIED**
Puncture Resistance ASTM D4833 (Modified)	Average Peak Load			**600.5** N	**135** lbs
ESCR ASTM D1693	Minumum Hrs w/o Failures			1500 Hrs	**CERTIFIED**
Notched Constant Tensile Load ASTM D5397	Pass/Fail @ 30%			500 Hrs	**ONGOING**

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ROLL # G15D231010 **LOT #** HFE710340 **LINER TYPE** **60 HD MICROSPIKE**

		METRIC	ENGLISH		METRIC	ENGLISH
Thickness Measurement ASTM D5994 (Modified)	MIN	**1.37** mm	**54** mil	Thickness	**1.52** mm	**60** mil
	MAX	**1.66** mm	**66** mil	Length	**153.926** m	**505** feet
	AVE	**1.48** mm	**58** mil	Width	**7.01** m	**23** feet

OIT(Standard) ASTM D 3895					**203** minutes
Asperity ASTM D7466	Average	Top		**.69** mm	**27** mil
		Bottom		**.84** mm	**33** mil
Specific Gravity ASTM D792	Average Density			g/cc	**.947**
MFI ASTM D1238 COND. E Grade **K307**	Melt Flow Index 190C/2160 g - g/10 min				**.19**
Carbon Black Content ASTM D4218	Range			%	**2.2**
Carbon Black Dispersion ASTM D5596	Category				**10 in Category 1**
Tensile Strength ASTM D6693 (2 inches / minute)	Average Strength @ Yield	MD	**24** N/mm	**136** ppi	**2270** psi
		TD	**29** N/mm	**163** ppi	**2717** psi
	Average Strength @ Break	MD	**33** N/mm	**188** ppi	**3141** psi
		TD	**40** N/mm	**231** ppi	**3851** psi
Tensile Elongation ASTM D6693 (2 inches / minute) Lo = 1.3" Yield Lo = 2.0" Break	Average Elongation @ Yield	MD		%	**17**
		TD		%	**16**
	Average Elongation @Break	MD		%	**493**
		TD		%	**644**
Dimensional Stability ASTM D1204 (Modified)	Average Dimensional Change			%	**-0.68**
Tear Resistance ASTM D1004 (Modified)	Average Tear Resistance	MD		**262.4** N	**59** lbs
		TD		**262.4** N	**59** lbs
Puncture Resistance FTMS 101 Method 2065 Modified					**CERTIFIED**
Puncture Resistance ASTM D4833 (Modified)	Average Peak Load			**600.5** N	**135** lbs
ESCR ASTM D1693	Minumum Hrs w/o Failures			1500 Hrs	**CERTIFIED**
Notched Constant Tensile Load ASTM D5397	Pass/Fail @ 30%			500 Hrs	**ONGOING**

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ROLL # G15D231011 **LOT #** HFE710340 **LINER TYPE** **60 HD MICROSPIKE**

		METRIC	ENGLISH		METRIC	ENGLISH
Thickness Measurement ASTM D5994 (Modified)	MIN	**1.37** mm	**54** mil	Thickness	**1.52** mm	**60** mil
	MAX	**1.63** mm	**64** mil	Length	**153.926** m	**505** feet
	AVE	**1.49** mm	**59** mil	Width	**7.01** m	**23** feet

OIT(Standard) ASTM D 3895					**203** minutes
Asperity ASTM D7466	Average	Top		**.66** mm	**26** mil
		Bottom		**.79** mm	**31** mil
Specific Gravity ASTM D792	Average Density			g/cc	**.947**
MFI ASTM D1238 COND. E Grade **K307**	Melt Flow Index 190C/2160 g - g/10 min				**.19**
Carbon Black Content ASTM D4218	Range			%	**2.2**
Carbon Black Dispersion ASTM D5596	Category				**10 in Category 1**
Tensile Strength ASTM D6693 (2 inches / minute)	Average Strength @ Yield	MD	**25** N/mm	**140** ppi	**2334** psi
		TD	**27** N/mm	**156** ppi	**2602** psi
	Average Strength @ Break	MD	**37** N/mm	**209** ppi	**3490** psi
		TD	**37** N/mm	**212** ppi	**3525** psi
Tensile Elongation ASTM D6693 (2 inches / minute) Lo = 1.3" Yield Lo = 2.0" Break	Average Elongation @ Yield	MD		%	**18**
		TD		%	**15**
	Average Elongation @Break	MD		%	**480**
		TD		%	**664**
Dimensional Stability ASTM D1204 (Modified)	Average Dimensional Change			%	**-0.68**
Tear Resistance ASTM D1004 (Modified)	Average Tear Resistance	MD		**231.3** N	**52** lbs
		TD		**226.8** N	**51** lbs
Puncture Resistance FTMS 101 Method 2065 Modified					**CERTIFIED**
Puncture Resistance ASTM D4833 (Modified)	Average Peak Load			**587.1** N	**132** lbs
ESCR ASTM D1693	Minumum Hrs w/o Failures			1500 Hrs	**CERTIFIED**
Notched Constant Tensile Load ASTM D5397	Pass/Fail @ 30%			500 Hrs	**ONGOING**

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ROLL # G15D231012 **LOT #** HFE710340 **LINER TYPE** **60 HD MICROSPIKE**

		METRIC	ENGLISH		METRIC	ENGLISH
Thickness Measurement ASTM D5994 (Modified)	MIN	**1.36** mm	**54** mil	Thickness	**1.52** mm	**60** mil
	MAX	**1.57** mm	**62** mil	Length	**153.926** m	**505** feet
	AVE	**1.47** mm	**58** mil	Width	**7.01** m	**23** feet

OIT(Standard) ASTM D 3895				**203** minutes
Asperity ASTM D7466	Average	Top	**.64** mm	**25** mil
		Bottom	**.66** mm	**26** mil
Specific Gravity ASTM D792	Average Density		g/cc	**.947**
MFI ASTM D1238 COND. E Grade **K307**	Melt Flow Index 190C/2160 g - g/10 min			**.19**
Carbon Black Content ASTM D4218	Range		%	**2.2**
Carbon Black Dispersion ASTM D5596	Category			**10 in Category 1**
Tensile Strength ASTM D6693 (2 inches / minute)	Average Strength @ Yield	MD	**25** N/mm **140** ppi	**2334** psi
		TD	**27** N/mm **156** ppi	**2602** psi
	Average Strength @ Break	MD	**37** N/mm **209** ppi	**3490** psi
		TD	**37** N/mm **212** ppi	**3525** psi
Tensile Elongation ASTM D6693 (2 inches / minute) Lo = 1.3" Yield Lo = 2.0" Break	Average Elongation @ Yield	MD	%	**18**
		TD	%	**15**
	Average Elongation @Break	MD	%	**480**
		TD	%	**664**
Dimensional Stability ASTM D1204 (Modified)	Average Dimensional Change		%	**-0.68**
Tear Resistance ASTM D1004 (Modified)	Average Tear Resistance	MD	**231.3** N	**52** lbs
		TD	**226.8** N	**51** lbs
Puncture Resistance FTMS 101 Method 2065 Modified				**CERTIFIED**
Puncture Resistance ASTM D4833 (Modified)	Average Peak Load		**587.1** N	**132** lbs
ESCR ASTM D1693	Minumum Hrs w/o Failures		1500 Hrs	**CERTIFIED**
Notched Constant Tensile Load ASTM D5397	Pass/Fail @ 30%		500 Hrs	**ONGOING**

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ROLL # G15D231013 **LOT #** HFE710340 **LINER TYPE** **60 HD MICROSPIKE**

		METRIC	ENGLISH		METRIC	ENGLISH
Thickness Measurement ASTM D5994 (Modified)	MIN	**1.42** mm	**56** mil	Thickness	**1.52** mm	**60** mil
	MAX	**1.62** mm	**64** mil	Length	**153.926** m	**505** feet
	AVE	**1.49** mm	**59** mil	Width	**7.01** m	**23** feet

OIT(Standard) ASTM D 3895					**203** minutes
Asperity ASTM D7466	Average	Top		**.76** mm	**30** mil
		Bottom		**.76** mm	**30** mil
Specific Gravity ASTM D792	Average Density			g/cc	**.947**
MFI ASTM D1238 COND. E Grade **K307**	Melt Flow Index 190C/2160 g - g/10 min				**.19**
Carbon Black Content ASTM D4218	Range			%	**2.2**
Carbon Black Dispersion ASTM D5596	Category				**10 in Category 1**
Tensile Strength ASTM D6693 (2 inches / minute)	Average Strength @ Yield	MD	**25** N/mm	**140** ppi	**2334** psi
		TD	**27** N/mm	**156** ppi	**2602** psi
	Average Strength @ Break	MD	**37** N/mm	**209** ppi	**3490** psi
		TD	**37** N/mm	**212** ppi	**3525** psi
Tensile Elongation ASTM D6693 (2 inches / minute) Lo = 1.3" Yield Lo = 2.0" Break	Average Elongation @ Yield	MD		%	**18**
		TD		%	**15**
	Average Elongation @Break	MD		%	**480**
		TD		%	**664**
Dimensional Stability ASTM D1204 (Modified)	Average Dimensional Change			%	**-0.68**
Tear Resistance ASTM D1004 (Modified)	Average Tear Resistance	MD		**231.3** N	**52** lbs
		TD		**226.8** N	**51** lbs
Puncture Resistance FTMS 101 Method 2065 Modified					**CERTIFIED**
Puncture Resistance ASTM D4833 (Modified)	Average Peak Load			**587.1** N	**132** lbs
ESCR ASTM D1693	Minumum Hrs w/o Failures			1500 Hrs	**CERTIFIED**
Notched Constant Tensile Load ASTM D5397	Pass/Fail @ 30%			500 Hrs	**ONGOING**

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ROLL # G15D231014 **LOT #** HFE710340 **LINER TYPE** **60 HD MICROSPIKE**

		METRIC	ENGLISH		METRIC	ENGLISH
Thickness Measurement ASTM D5994 (Modified)	MIN	**1.38** mm	**54** mil	Thickness	**1.52** mm	**60** mil
	MAX	**1.61** mm	**63** mil	Length	**153.926** m	**505** feet
	AVE	**1.47** mm	**58** mil	Width	**7.01** m	**23** feet

OIT(Standard) ASTM D 3895					**203** minutes
Asperity ASTM D7466	Average	Top		**.71** mm	**28** mil
		Bottom		**.84** mm	**33** mil
Specific Gravity ASTM D792	Average Density			g/cc	**.947**
MFI ASTM D1238 COND. E Grade **K307**	Melt Flow Index 190C/2160 g - g/10 min				**.19**
Carbon Black Content ASTM D4218	Range			%	**2.2**
Carbon Black Dispersion ASTM D5596	Category				**10 in Category 1**
Tensile Strength ASTM D6693 (2 inches / minute)	Average Strength @ Yield	MD	**25** N/mm	**140** ppi	**2334** psi
		TD	**27** N/mm	**156** ppi	**2602** psi
	Average Strength @ Break	MD	**37** N/mm	**209** ppi	**3490** psi
		TD	**37** N/mm	**212** ppi	**3525** psi
Tensile Elongation ASTM D6693 (2 inches / minute) Lo = 1.3" Yield Lo = 2.0" Break	Average Elongation @ Yield	MD		%	**18**
		TD		%	**15**
	Average Elongation @Break	MD		%	**480**
		TD		%	**664**
Dimensional Stability ASTM D1204 (Modified)	Average Dimensional Change			%	**-0.68**
Tear Resistance ASTM D1004 (Modified)	Average Tear Resistance	MD		**231.3** N	**52** lbs
		TD		**226.8** N	**51** lbs
Puncture Resistance FTMS 101 Method 2065 Modified					**CERTIFIED**
Puncture Resistance ASTM D4833 (Modified)	Average Peak Load			**587.1** N	**132** lbs
ESCR ASTM D1693	Minumum Hrs w/o Failures			1500 Hrs	**CERTIFIED**
Notched Constant Tensile Load ASTM D5397	Pass/Fail @ 30%			500 Hrs	**ONGOING**

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ROLL # G15D231015 **LOT #** HFE710340 **LINER TYPE** **60 HD MICROSPIKE**

		METRIC	ENGLISH		METRIC	ENGLISH
Thickness Measurement ASTM D5994 (Modified)	MIN	**1.38** mm	**54** mil	Thickness	**1.52** mm	**60** mil
	MAX	**1.57** mm	**62** mil	Length	**153.926** m	**505** feet
	AVE	**1.48** mm	**58** mil	Width	**7.01** m	**23** feet

OIT(Standard) ASTM D 3895				**203** minutes
Asperity ASTM D7466	Average	Top	**.76** mm	**30** mil
		Bottom	**.69** mm	**27** mil
Specific Gravity ASTM D792	Average Density		g/cc	**.947**
MFI ASTM D1238 COND. E Grade **K307**	Melt Flow Index 190C/2160 g - g/10 min			**.19**
Carbon Black Content ASTM D4218	Range		%	**2.2**
Carbon Black Dispersion ASTM D5596	Category			**10 in Category 1**
Tensile Strength ASTM D6693 (2 inches / minute)	Average Strength @ Yield	MD	**25** N/mm **140** ppi	**2334** psi
		TD	**27** N/mm **156** ppi	**2602** psi
	Average Strength @ Break	MD	**37** N/mm **209** ppi	**3490** psi
		TD	**37** N/mm **212** ppi	**3525** psi
Tensile Elongation ASTM D6693 (2 inches / minute) Lo = 1.3" Yield Lo = 2.0" Break	Average Elongation @ Yield	MD	%	**18**
		TD	%	**15**
	Average Elongation @Break	MD	%	**480**
		TD	%	**664**
Dimensional Stability ASTM D1204 (Modified)	Average Dimensional Change		%	**-0.68**
Tear Resistance ASTM D1004 (Modified)	Average Tear Resistance	MD	**231.3** N	**52** lbs
		TD	**226.8** N	**51** lbs
Puncture Resistance FTMS 101 Method 2065 Modified				**CERTIFIED**
Puncture Resistance ASTM D4833 (Modified)	Average Peak Load		**587.1** N	**132** lbs
ESCR ASTM D1693	Minumum Hrs w/o Failures		1500 Hrs	**CERTIFIED**
Notched Constant Tensile Load ASTM D5397	Pass/Fail @ 30%		500 Hrs	**ONGOING**

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ROLL # G15D232016 **LOT #** HFE710340 **LINER TYPE** **60 HD MICROSPIKE**

		METRIC	ENGLISH		METRIC	ENGLISH
Thickness Measurement ASTM D5994 (Modified)	MIN	**1.39** mm	**55** mil	Thickness	**1.52** mm	**60** mil
	MAX	**1.54** mm	**61** mil	Length	**153.926** m	**505** feet
	AVE	**1.46** mm	**58** mil	Width	**7.01** m	**23** feet

OIT(Standard) ASTM D 3895				**203** minutes
Asperity ASTM D7466	Average	Top	**.69** mm	**27** mil
		Bottom	**.79** mm	**31** mil
Specific Gravity ASTM D792	Average Density		g/cc	**.947**
MFI ASTM D1238 COND. E Grade **K307**	Melt Flow Index 190C/2160 g - g/10 min			**.19**
Carbon Black Content ASTM D4218	Range		%	**2.2**
Carbon Black Dispersion ASTM D5596	Category			**10 in Category 1**

Tensile Strength ASTM D6693 (2 inches / minute)	Average Strength @ Yield	MD	**25** N/mm	**142** ppi	**2360** psi
		TD	**28** N/mm	**162** ppi	**2698** psi
	Average Strength @ Break	MD	**32** N/mm	**183** ppi	**3046** psi
		TD	**33** N/mm	**189** ppi	**3152** psi
Tensile Elongation ASTM D6693 (2 inches / minute) Lo = 1.3" Yield Lo = 2.0" Break	Average Elongation @ Yield	MD		%	**16**
		TD		%	**15**
	Average Elongation @Break	MD		%	**454**
		TD		%	**568**
Dimensional Stability ASTM D1204 (Modified)	Average Dimensional Change			%	**-0.68**
Tear Resistance ASTM D1004 (Modified)	Average Tear Resistance	MD	**231.3** N		**52** lbs
		TD	**226.8** N		**51** lbs
Puncture Resistance FTMS 101 Method 2065 Modified					**CERTIFIED**
Puncture Resistance ASTM D4833 (Modified)	Average Peak Load		**587.1** N		**132** lbs
ESCR ASTM D1693	Minumum Hrs w/o Failures		1500 Hrs		**CERTIFIED**
Notched Constant Tensile Load ASTM D5397	Pass/Fail @ 30%		500 Hrs		**ONGOING**

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ROLL # G15D232017 **LOT #** HFE710340 **LINER TYPE** **60 HD MICROSPIKE**

		METRIC	ENGLISH		METRIC	ENGLISH
Thickness Measurement ASTM D5994 (Modified)	MIN	**1.37** mm	**54** mil	Thickness	**1.52** mm	**60** mil
	MAX	**1.59** mm	**63** mil	Length	**153.926** m	**505** feet
	AVE	**1.46** mm	**57** mil	Width	**7.01** m	**23** feet

OIT(Standard) ASTM D 3895					**203** minutes
Asperity ASTM D7466	Average	Top		**.64** mm	**25** mil
		Bottom		**.91** mm	**36** mil
Specific Gravity ASTM D792	Average Density			g/cc	**.947**
MFI ASTM D1238 COND. E Grade **K307**	Melt Flow Index 190C/2160 g - g/10 min				**.19**
Carbon Black Content ASTM D4218	Range			%	**2.2**
Carbon Black Dispersion ASTM D5596	Category				**10 in Category 1**
Tensile Strength ASTM D6693 (2 inches / minute)	Average Strength @ Yield	MD	**25** N/mm	**142** ppi	**2360** psi
		TD	**28** N/mm	**162** ppi	**2698** psi
	Average Strength @ Break	MD	**32** N/mm	**183** ppi	**3046** psi
		TD	**33** N/mm	**189** ppi	**3152** psi
Tensile Elongation ASTM D6693 (2 inches / minute) Lo = 1.3" Yield Lo = 2.0" Break	Average Elongation @ Yield	MD		%	**16**
		TD		%	**15**
	Average Elongation @Break	MD		%	**454**
		TD		%	**568**
Dimensional Stability ASTM D1204 (Modified)	Average Dimensional Change			%	**-0.68**
Tear Resistance ASTM D1004 (Modified)	Average Tear Resistance	MD	**231.3** N		**52** lbs
		TD	**226.8** N		**51** lbs
Puncture Resistance FTMS 101 Method 2065 Modified					**CERTIFIED**
Puncture Resistance ASTM D4833 (Modified)	Average Peak Load		**587.1** N		**132** lbs
ESCR ASTM D1693	Minumum Hrs w/o Failures		1500 Hrs		**CERTIFIED**
Notched Constant Tensile Load ASTM D5397	Pass/Fail @ 30%		500 Hrs		**ONGOING**

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ROLL # G15D232018 **LOT #** HFE710340 **LINER TYPE** **60 HD MICROSPIKE**

		METRIC	ENGLISH		METRIC	ENGLISH
Thickness Measurement ASTM D5994 (Modified)	MIN	**1.38** mm	**54** mil	Thickness	**1.52** mm	**60** mil
	MAX	**1.58** mm	**62** mil	Length	**153.926** m	**505** feet
	AVE	**1.45** mm	**57** mil	Width	**7.01** m	**23** feet

OIT(Standard) ASTM D 3895					**203** minutes
Asperity ASTM D7466	Average	Top		**.61** mm	**24** mil
		Bottom		**.86** mm	**34** mil
Specific Gravity ASTM D792	Average Density			g/cc	**.947**
MFI ASTM D1238 COND. E Grade **K307**	Melt Flow Index 190C/2160 g - g/10 min				**.19**
Carbon Black Content ASTM D4218	Range			%	**2.2**
Carbon Black Dispersion ASTM D5596	Category				**10 in Category 1**
Tensile Strength ASTM D6693 (2 inches / minute)	Average Strength @ Yield	MD	**25** N/mm	**142** ppi	**2360** psi
		TD	**28** N/mm	**162** ppi	**2698** psi
	Average Strength @ Break	MD	**32** N/mm	**183** ppi	**3046** psi
		TD	**33** N/mm	**189** ppi	**3152** psi
Tensile Elongation ASTM D6693 (2 inches / minute) Lo = 1.3" Yield Lo = 2.0" Break	Average Elongation @ Yield	MD		%	**16**
		TD		%	**15**
	Average Elongation @Break	MD		%	**454**
		TD		%	**568**
Dimensional Stability ASTM D1204 (Modified)	Average Dimensional Change			%	**-0.68**
Tear Resistance ASTM D1004 (Modified)	Average Tear Resistance	MD	**231.3** N		**52** lbs
		TD	**226.8** N		**51** lbs
Puncture Resistance FTMS 101 Method 2065 Modified					**CERTIFIED**
Puncture Resistance ASTM D4833 (Modified)	Average Peak Load		**587.1** N		**132** lbs
ESCR ASTM D1693	Minumum Hrs w/o Failures		1500 Hrs		**CERTIFIED**
Notched Constant Tensile Load ASTM D5397	Pass/Fail @ 30%		500 Hrs		**ONGOING**

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ROLL # G15D232019 **LOT #** HFE710340 **LINER TYPE** **60 HD MICROSPIKE**

		METRIC	ENGLISH		METRIC	ENGLISH
Thickness Measurement ASTM D5994 (Modified)	MIN	**1.40** mm	**55** mil	Thickness	**1.52** mm	**60** mil
	MAX	**1.64** mm	**65** mil	Length	**153.926** m	**505** feet
	AVE	**1.50** mm	**59** mil	Width	**7.01** m	**23** feet

OIT(Standard) ASTM D 3895					**203** minutes
Asperity ASTM D7466	Average	Top		**.64** mm	**25** mil
		Bottom		**.86** mm	**34** mil
Specific Gravity ASTM D792	Average Density			g/cc	**.947**
MFI ASTM D1238 COND. E Grade **K307**	Melt Flow Index 190C/2160 g - g/10 min				**.19**
Carbon Black Content ASTM D4218	Range			%	**2.3**
Carbon Black Dispersion ASTM D5596	Category				**10 in Category 1**
Tensile Strength ASTM D6693 (2 inches / minute)	Average Strength @ Yield	MD	**25** N/mm	**142** ppi	**2360** psi
		TD	**28** N/mm	**162** ppi	**2698** psi
	Average Strength @ Break	MD	**32** N/mm	**183** ppi	**3046** psi
		TD	**33** N/mm	**189** ppi	**3152** psi
Tensile Elongation ASTM D6693 (2 inches / minute) Lo = 1.3" Yield Lo = 2.0" Break	Average Elongation @ Yield	MD		%	**16**
		TD		%	**15**
	Average Elongation @Break	MD		%	**454**
		TD		%	**568**
Dimensional Stability ASTM D1204 (Modified)	Average Dimensional Change			%	**-0.68**
Tear Resistance ASTM D1004 (Modified)	Average Tear Resistance	MD	**231.3** N		**52** lbs
		TD	**226.8** N		**51** lbs
Puncture Resistance FTMS 101 Method 2065 Modified					**CERTIFIED**
Puncture Resistance ASTM D4833 (Modified)	Average Peak Load		**587.1** N		**132** lbs
ESCR ASTM D1693	Minumum Hrs w/o Failures		1500 Hrs		**CERTIFIED**
Notched Constant Tensile Load ASTM D5397	Pass/Fail @ 30%		500 Hrs		**ONGOING**

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ROLL # G15D232020 **LOT #** HFE710340 **LINER TYPE** **60 HD MICROSPIKE**

		METRIC	ENGLISH		METRIC	ENGLISH
Thickness Measurement ASTM D5994 (Modified)	MIN	**1.32** mm	**52** mil	Thickness	**1.52** mm	**60** mil
	MAX	**1.59** mm	**63** mil	Length	**153.926** m	**505** feet
	AVE	**1.44** mm	**57** mil	Width	**7.01** m	**23** feet

OIT(Standard) ASTM D 3895					**203** minutes
Asperity ASTM D7466	Average	Top		**.66** mm	**26** mil
		Bottom		**.74** mm	**29** mil
Specific Gravity ASTM D792	Average Density			g/cc	**.947**
MFI ASTM D1238 COND. E Grade **K307**	Melt Flow Index 190C/2160 g - g/10 min				**.19**
Carbon Black Content ASTM D4218	Range			%	**2.3**
Carbon Black Dispersion ASTM D5596	Category				**10 in Category 1**
Tensile Strength ASTM D6693 (2 inches / minute)	Average Strength @ Yield	MD	**25** N/mm	**142** ppi	**2360** psi
		TD	**28** N/mm	**162** ppi	**2698** psi
	Average Strength @ Break	MD	**32** N/mm	**183** ppi	**3046** psi
		TD	**33** N/mm	**189** ppi	**3152** psi
Tensile Elongation ASTM D6693 (2 inches / minute) Lo = 1.3" Yield Lo = 2.0" Break	Average Elongation @ Yield	MD		%	**16**
		TD		%	**15**
	Average Elongation @Break	MD		%	**454**
		TD		%	**568**
Dimensional Stability ASTM D1204 (Modified)	Average Dimensional Change			%	**-0.68**
Tear Resistance ASTM D1004 (Modified)	Average Tear Resistance	MD	**231.3** N		**52** lbs
		TD	**226.8** N		**51** lbs
Puncture Resistance FTMS 101 Method 2065 Modified					**CERTIFIED**
Puncture Resistance ASTM D4833 (Modified)	Average Peak Load		**587.1** N		**132** lbs
ESCR ASTM D1693	Minumum Hrs w/o Failures		1500 Hrs		**CERTIFIED**
Notched Constant Tensile Load ASTM D5397	Pass/Fail @ 30%		500 Hrs		**ONGOING**

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ROLL # G15D232021 **LOT #** HFE710340 **LINER TYPE** **60 HD MICROSPIKE**

		METRIC	ENGLISH		METRIC	ENGLISH
Thickness Measurement ASTM D5994 (Modified)	MIN	**1.34** mm	**53** mil	Thickness	**1.52** mm	**60** mil
	MAX	**1.58** mm	**62** mil	Length	**153.926** m	**505** feet
	AVE	**1.45** mm	**57** mil	Width	**7.01** m	**23** feet

OIT(Standard) ASTM D 3895					**203** minutes
Asperity ASTM D7466	Average	Top		**.71** mm	**28** mil
		Bottom		**.79** mm	**31** mil
Specific Gravity ASTM D792	Average Density			g/cc	**.947**
MFI ASTM D1238 COND. E Grade **K307**	Melt Flow Index 190C/2160 g - g/10 min				**.19**
Carbon Black Content ASTM D4218	Range			%	**2.2**
Carbon Black Dispersion ASTM D5596	Category				**10 in Category 1**
Tensile Strength ASTM D6693 (2 inches / minute)	Average Strength @ Yield	MD	**26** N/mm	**146** ppi	**2429** psi
		TD	**27** N/mm	**153** ppi	**2558** psi
	Average Strength @ Break	MD	**36** N/mm	**208** ppi	**3469** psi
		TD	**33** N/mm	**190** ppi	**3167** psi
Tensile Elongation ASTM D6693 (2 inches / minute) Lo = 1.3" Yield Lo = 2.0" Break	Average Elongation @ Yield	MD		%	**18**
		TD		%	**14**
	Average Elongation @Break	MD		%	**457**
		TD		%	**602**
Dimensional Stability ASTM D1204 (Modified)	Average Dimensional Change			%	**-0.68**
Tear Resistance ASTM D1004 (Modified)	Average Tear Resistance	MD		**222.4** N	**50** lbs
		TD		**222.4** N	**50** lbs
Puncture Resistance FTMS 101 Method 2065 Modified					**CERTIFIED**
Puncture Resistance ASTM D4833 (Modified)	Average Peak Load			**582.7** N	**131** lbs
ESCR ASTM D1693	Minumum Hrs w/o Failures			1500 Hrs	**CERTIFIED**
Notched Constant Tensile Load ASTM D5397	Pass/Fail @ 30%			500 Hrs	**ONGOING**

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ROLL # G15D232022 **LOT #** HFE710340 **LINER TYPE** **60 HD MICROSPIKE**

		METRIC	ENGLISH		METRIC	ENGLISH
Thickness Measurement ASTM D5994 (Modified)	MIN	**1.39** mm	**55** mil	Thickness	**1.52** mm	**60** mil
	MAX	**1.58** mm	**62** mil	Length	**153.926** m	**505** feet
	AVE	**1.46** mm	**58** mil	Width	**7.01** m	**23** feet

OIT(Standard) ASTM D 3895					**203** minutes
Asperity ASTM D7466	Average	Top		**.74** mm	**29** mil
		Bottom		**.84** mm	**33** mil
Specific Gravity ASTM D792	Average Density			g/cc	**.947**
MFI ASTM D1238 COND. E Grade **K307**	Melt Flow Index 190C/2160 g - g/10 min				**.19**
Carbon Black Content ASTM D4218	Range			%	**2.2**
Carbon Black Dispersion ASTM D5596	Category				**10 in Category 1**
Tensile Strength ASTM D6693 (2 inches / minute)	Average Strength @ Yield	MD	**26** N/mm	**146** ppi	**2429** psi
		TD	**27** N/mm	**153** ppi	**2558** psi
	Average Strength @ Break	MD	**36** N/mm	**208** ppi	**3469** psi
		TD	**33** N/mm	**190** ppi	**3167** psi
Tensile Elongation ASTM D6693 (2 inches / minute) Lo = 1.3" Yield Lo = 2.0" Break	Average Elongation @ Yield	MD		%	**18**
		TD		%	**14**
	Average Elongation @Break	MD		%	**457**
		TD		%	**602**
Dimensional Stability ASTM D1204 (Modified)	Average Dimensional Change			%	**-0.68**
Tear Resistance ASTM D1004 (Modified)	Average Tear Resistance	MD		**222.4** N	**50** lbs
		TD		**222.4** N	**50** lbs
Puncture Resistance FTMS 101 Method 2065 Modified					**CERTIFIED**
Puncture Resistance ASTM D4833 (Modified)	Average Peak Load			**582.7** N	**131** lbs
ESCR ASTM D1693	Minumum Hrs w/o Failures			1500 Hrs	**CERTIFIED**
Notched Constant Tensile Load ASTM D5397	Pass/Fail @ 30%			500 Hrs	**ONGOING**

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ROLL # G15D232023 **LOT #** HFE710340 **LINER TYPE** **60 HD MICROSPIKE**

		METRIC	ENGLISH		METRIC	ENGLISH
Thickness Measurement ASTM D5994 (Modified)	MIN	**1.37** mm	**54** mil	Thickness	**1.52** mm	**60** mil
	MAX	**1.56** mm	**61** mil	Length	**153.926** m	**505** feet
	AVE	**1.45** mm	**57** mil	Width	**7.01** m	**23** feet

OIT(Standard) ASTM D 3895				**203** minutes
Asperity ASTM D7466	Average	Top	**.64** mm	**25** mil
		Bottom	**.81** mm	**32** mil
Specific Gravity ASTM D792	Average Density		g/cc	**.947**
MFI ASTM D1238 COND. E Grade **K307**	Melt Flow Index 190C/2160 g - g/10 min			**.19**
Carbon Black Content ASTM D4218	Range		%	**2.2**
Carbon Black Dispersion ASTM D5596	Category			**10 in Category 1**
Tensile Strength ASTM D6693 (2 inches / minute)	Average Strength @ Yield	MD	**26** N/mm **146** ppi	**2429** psi
		TD	**27** N/mm **153** ppi	**2558** psi
	Average Strength @ Break	MD	**36** N/mm **208** ppi	**3469** psi
		TD	**33** N/mm **190** ppi	**3167** psi
Tensile Elongation ASTM D6693 (2 inches / minute) Lo = 1.3" Yield Lo = 2.0" Break	Average Elongation @ Yield	MD	%	**18**
		TD	%	**14**
	Average Elongation @Break	MD	%	**457**
		TD	%	**602**
Dimensional Stability ASTM D1204 (Modified)	Average Dimensional Change		%	**-0.68**
Tear Resistance ASTM D1004 (Modified)	Average Tear Resistance	MD	**222.4** N	**50** lbs
		TD	**222.4** N	**50** lbs
Puncture Resistance FTMS 101 Method 2065 Modified				**CERTIFIED**
Puncture Resistance ASTM D4833 (Modified)	Average Peak Load		**582.7** N	**131** lbs
ESCR ASTM D1693	Minumum Hrs w/o Failures		1500 Hrs	**CERTIFIED**
Notched Constant Tensile Load ASTM D5397	Pass/Fail @ 30%		500 Hrs	**ONGOING**

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ROLL # G15D232024 **LOT #** HFE710340 **LINER TYPE** **60 HD MICROSPIKE**

		METRIC	ENGLISH		METRIC	ENGLISH
Thickness Measurement ASTM D5994 (Modified)	MIN	**1.36** mm	**54** mil	Thickness	**1.52** mm	**60** mil
	MAX	**1.55** mm	**61** mil	Length	**153.926** m	**505** feet
	AVE	**1.46** mm	**57** mil	Width	**7.01** m	**23** feet

OIT(Standard) ASTM D 3895					**203** minutes
Asperity ASTM D7466	Average	Top		**.61** mm	**24** mil
		Bottom		**.94** mm	**37** mil
Specific Gravity ASTM D792	Average Density			g/cc	**.947**
MFI ASTM D1238 COND. E Grade **K307**	Melt Flow Index 190C/2160 g - g/10 min				**.19**
Carbon Black Content ASTM D4218	Range			%	**2.2**
Carbon Black Dispersion ASTM D5596	Category				**10 in Category 1**
Tensile Strength ASTM D6693 (2 inches / minute)	Average Strength @ Yield	MD	**26** N/mm	**146** ppi	**2429** psi
		TD	**27** N/mm	**153** ppi	**2558** psi
	Average Strength @ Break	MD	**36** N/mm	**208** ppi	**3469** psi
		TD	**33** N/mm	**190** ppi	**3167** psi
Tensile Elongation ASTM D6693 (2 inches / minute) Lo = 1.3" Yield Lo = 2.0" Break	Average Elongation @ Yield	MD		%	**18**
		TD		%	**14**
	Average Elongation @Break	MD		%	**457**
		TD		%	**602**
Dimensional Stability ASTM D1204 (Modified)	Average Dimensional Change			%	**-0.68**
Tear Resistance ASTM D1004 (Modified)	Average Tear Resistance	MD		**222.4** N	**50** lbs
		TD		**222.4** N	**50** lbs
Puncture Resistance FTMS 101 Method 2065 Modified					**CERTIFIED**
Puncture Resistance ASTM D4833 (Modified)	Average Peak Load			**582.7** N	**131** lbs
ESCR ASTM D1693	Minumum Hrs w/o Failures			1500 Hrs	**CERTIFIED**
Notched Constant Tensile Load ASTM D5397	Pass/Fail @ 30%			500 Hrs	**ONGOING**

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ROLL # G15D232025 **LOT #** HFE710340 **LINER TYPE** **60 HD MICROSPIKE**

		METRIC	ENGLISH		METRIC	ENGLISH
Thickness Measurement ASTM D5994 (Modified)	MIN	**1.37** mm	**54** mil	Thickness	**1.52** mm	**60** mil
	MAX	**1.51** mm	**60** mil	Length	**153.926** m	**505** feet
	AVE	**1.44** mm	**57** mil	Width	**7.01** m	**23** feet

OIT(Standard) ASTM D 3895				**203** minutes
Asperity ASTM D7466	Average	Top	**.66** mm	**26** mil
		Bottom	**.74** mm	**29** mil
Specific Gravity ASTM D792	Average Density		g/cc	**.947**
MFI ASTM D1238 COND. E Grade **K307**	Melt Flow Index 190C/2160 g - g/10 min			**.19**
Carbon Black Content ASTM D4218	Range		%	**2.2**
Carbon Black Dispersion ASTM D5596	Category			**10 in Category 1**
Tensile Strength ASTM D6693 (2 inches / minute)	Average Strength @ Yield	MD	**26** N/mm **146** ppi	**2429** psi
		TD	**27** N/mm **153** ppi	**2558** psi
	Average Strength @ Break	MD	**36** N/mm **208** ppi	**3469** psi
		TD	**33** N/mm **190** ppi	**3167** psi
Tensile Elongation ASTM D6693 (2 inches / minute) Lo = 1.3" Yield Lo = 2.0" Break	Average Elongation @ Yield	MD	%	**18**
		TD	%	**14**
	Average Elongation @Break	MD	%	**457**
		TD	%	**602**
Dimensional Stability ASTM D1204 (Modified)	Average Dimensional Change		%	**-0.68**
Tear Resistance ASTM D1004 (Modified)	Average Tear Resistance	MD	**222.4** N	**50** lbs
		TD	**222.4** N	**50** lbs
Puncture Resistance FTMS 101 Method 2065 Modified				**CERTIFIED**
Puncture Resistance ASTM D4833 (Modified)	Average Peak Load		**582.7** N	**131** lbs
ESCR ASTM D1693	Minumum Hrs w/o Failures		1500 Hrs	**CERTIFIED**
Notched Constant Tensile Load ASTM D5397	Pass/Fail @ 30%		500 Hrs	**ONGOING**

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ROLL # G15D232026 **LOT #** HFE710340 **LINER TYPE** **60 HD MICROSPIKE**

		METRIC	ENGLISH		METRIC	ENGLISH
Thickness Measurement ASTM D5994 (Modified)	MIN	**1.34** mm	**53** mil	Thickness	**1.52** mm	**60** mil
	MAX	**1.53** mm	**60** mil	Length	**153.926** m	**505** feet
	AVE	**1.44** mm	**57** mil	Width	**7.01** m	**23** feet

OIT(Standard) ASTM D 3895					**203** minutes
Asperity ASTM D7466	Average	Top		**.66** mm	**26** mil
		Bottom		**.76** mm	**30** mil
Specific Gravity ASTM D792	Average Density			g/cc	**.947**
MFI ASTM D1238 COND. E Grade **K307**	Melt Flow Index 190C/2160 g - g/10 min				**.19**
Carbon Black Content ASTM D4218	Range			%	**2.2**
Carbon Black Dispersion ASTM D5596	Category				**10 in Category 1**
Tensile Strength ASTM D6693 (2 inches / minute)	Average Strength @ Yield	MD	**26** N/mm	**151** ppi	**2515** psi
		TD	**27** N/mm	**153** ppi	**2542** psi
	Average Strength @ Break	MD	**36** N/mm	**206** ppi	**3426** psi
		TD	**31** N/mm	**179** ppi	**2989** psi
Tensile Elongation ASTM D6693 (2 inches / minute) Lo = 1.3" Yield Lo = 2.0" Break	Average Elongation @ Yield	MD		%	**16**
		TD		%	**14**
	Average Elongation @Break	MD		%	**437**
		TD		%	**573**
Dimensional Stability ASTM D1204 (Modified)	Average Dimensional Change			%	**-0.68**
Tear Resistance ASTM D1004 (Modified)	Average Tear Resistance	MD		**222.4** N	**50** lbs
		TD		**222.4** N	**50** lbs
Puncture Resistance FTMS 101 Method 2065 Modified					**CERTIFIED**
Puncture Resistance ASTM D4833 (Modified)	Average Peak Load			**582.7** N	**131** lbs
ESCR ASTM D1693	Minumum Hrs w/o Failures			1500 Hrs	**CERTIFIED**
Notched Constant Tensile Load ASTM D5397	Pass/Fail @ 30%			500 Hrs	**ONGOING**

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ROLL # G15D232027 **LOT #** HFE710340 **LINER TYPE** **60 HD MICROSPIKE**

		METRIC	ENGLISH		METRIC	ENGLISH
Thickness Measurement ASTM D5994 (Modified)	MIN	**1.34** mm	**53** mil	Thickness	**1.52** mm	**60** mil
	MAX	**1.52** mm	**60** mil	Length	**153.926** m	**505** feet
	AVE	**1.46** mm	**57** mil	Width	**7.01** m	**23** feet

OIT(Standard) ASTM D 3895				**203** minutes
Asperity ASTM D7466	Average	Top	**.64** mm	**25** mil
		Bottom	**.76** mm	**30** mil
Specific Gravity ASTM D792	Average Density		g/cc	**.947**
MFI ASTM D1238 COND. E Grade **K307**	Melt Flow Index 190C/2160 g - g/10 min			**.19**
Carbon Black Content ASTM D4218	Range		%	**2.2**
Carbon Black Dispersion ASTM D5596	Category			**10 in Category 1**

Tensile Strength ASTM D6693 (2 inches / minute)	Average Strength @ Yield	MD	**26** N/mm	**151** ppi	**2515** psi
		TD	**27** N/mm	**153** ppi	**2542** psi
	Average Strength @ Break	MD	**36** N/mm	**206** ppi	**3426** psi
		TD	**31** N/mm	**179** ppi	**2989** psi
Tensile Elongation ASTM D6693 (2 inches / minute) Lo = 1.3" Yield Lo = 2.0" Break	Average Elongation @ Yield	MD	%	**16**	
		TD	%	**14**	
	Average Elongation @Break	MD	%	**437**	
		TD	%	**573**	
Dimensional Stability ASTM D1204 (Modified)	Average Dimensional Change		%	**-0.68**	
Tear Resistance ASTM D1004 (Modified)	Average Tear Resistance	MD	**222.4** N	**50** lbs	
		TD	**222.4** N	**50** lbs	
Puncture Resistance FTMS 101 Method 2065 Modified				**CERTIFIED**	
Puncture Resistance ASTM D4833 (Modified)	Average Peak Load		**582.7** N	**131** lbs	
ESCR ASTM D1693	Minumum Hrs w/o Failures		1500 Hrs	**CERTIFIED**	
Notched Constant Tensile Load ASTM D5397	Pass/Fail @ 30%		500 Hrs	**ONGOING**	

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ROLL # G15D232031 **LOT #** HFE710340 **LINER TYPE** **60 HD MICROSPIKE**

		METRIC	ENGLISH		METRIC	ENGLISH
Thickness Measurement ASTM D5994 (Modified)	MIN	**1.34** mm	**53** mil	Thickness	**1.52** mm	**60** mil
	MAX	**1.71** mm	**67** mil	Length	**153.926** m	**505** feet
	AVE	**1.50** mm	**59** mil	Width	**7.01** m	**23** feet

OIT(Standard) ASTM D 3895					**203** minutes
Asperity ASTM D7466	Average	Top		**.61** mm	**24** mil
		Bottom		**.79** mm	**31** mil
Specific Gravity ASTM D792	Average Density			g/cc	**.947**
MFI ASTM D1238 COND. E Grade **K307**	Melt Flow Index 190C/2160 g - g/10 min				**.19**
Carbon Black Content ASTM D4218	Range			%	**2.2**
Carbon Black Dispersion ASTM D5596	Category				**10 in Category 1**
Tensile Strength ASTM D6693 (2 inches / minute)	Average Strength @ Yield	MD	**26** N/mm	**148** ppi	**2472** psi
		TD	**29** N/mm	**165** ppi	**2752** psi
	Average Strength @ Break	MD	**36** N/mm	**207** ppi	**3458** psi
		TD	**34** N/mm	**197** ppi	**3282** psi
Tensile Elongation ASTM D6693 (2 inches / minute) Lo = 1.3" Yield Lo = 2.0" Break	Average Elongation @ Yield	MD		%	**17**
		TD		%	**15**
	Average Elongation @Break	MD		%	**465**
		TD		%	**573**
Dimensional Stability ASTM D1204 (Modified)	Average Dimensional Change			%	**-0.68**
Tear Resistance ASTM D1004 (Modified)	Average Tear Resistance	MD		**253.5** N	**57** lbs
		TD		**253.5** N	**57** lbs
Puncture Resistance FTMS 101 Method 2065 Modified					**CERTIFIED**
Puncture Resistance ASTM D4833 (Modified)	Average Peak Load			**604.9** N	**136** lbs
ESCR ASTM D1693	Minumum Hrs w/o Failures			1500 Hrs	**CERTIFIED**
Notched Constant Tensile Load ASTM D5397	Pass/Fail @ 30%			500 Hrs	**ONGOING**

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ROLL # G15D233032 **LOT #** HFE710340 **LINER TYPE** **60 HD MICROSPIKE**

		METRIC	ENGLISH		METRIC	ENGLISH
Thickness Measurement ASTM D5994 (Modified)	MIN	**1.34** mm	**53** mil	Thickness	**1.52** mm	**60** mil
	MAX	**1.64** mm	**65** mil	Length	**153.926** m	**505** feet
	AVE	**1.50** mm	**59** mil	Width	**7.01** m	**23** feet

OIT(Standard) ASTM D 3895					**203** minutes
Asperity ASTM D7466	Average	Top		**.64** mm	**25** mil
		Bottom		**.86** mm	**34** mil
Specific Gravity ASTM D792	Average Density			g/cc	**.947**
MFI ASTM D1238 COND. E Grade **K307**	Melt Flow Index 190C/2160 g - g/10 min				**.19**
Carbon Black Content ASTM D4218	Range			%	**2.2**
Carbon Black Dispersion ASTM D5596	Category				**10 in Category 1**
Tensile Strength ASTM D6693 (2 inches / minute)	Average Strength @ Yield	MD	**26** N/mm	**148** ppi	**2472** psi
		TD	**29** N/mm	**165** ppi	**2752** psi
	Average Strength @ Break	MD	**36** N/mm	**207** ppi	**3458** psi
		TD	**34** N/mm	**197** ppi	**3282** psi
Tensile Elongation ASTM D6693 (2 inches / minute) Lo = 1.3" Yield Lo = 2.0" Break	Average Elongation @ Yield	MD		%	**17**
		TD		%	**15**
	Average Elongation @Break	MD		%	**465**
		TD		%	**573**
Dimensional Stability ASTM D1204 (Modified)	Average Dimensional Change			%	**-0.68**
Tear Resistance ASTM D1004 (Modified)	Average Tear Resistance	MD		**253.5** N	**57** lbs
		TD		**253.5** N	**57** lbs
Puncture Resistance FTMS 101 Method 2065 Modified					**CERTIFIED**
Puncture Resistance ASTM D4833 (Modified)	Average Peak Load			**604.9** N	**136** lbs
ESCR ASTM D1693	Minumum Hrs w/o Failures			1500 Hrs	**CERTIFIED**
Notched Constant Tensile Load ASTM D5397	Pass/Fail @ 30%			500 Hrs	**ONGOING**

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ROLL # G15D233033 **LOT #** HFE710340 **LINER TYPE** **60 HD MICROSPIKE**

		METRIC	ENGLISH		METRIC	ENGLISH
Thickness Measurement ASTM D5994 (Modified)	MIN	**1.36** mm	**54** mil	Thickness	**1.52** mm	**60** mil
	MAX	**1.62** mm	**64** mil	Length	**153.926** m	**505** feet
	AVE	**1.50** mm	**59** mil	Width	**7.01** m	**23** feet

OIT(Standard) ASTM D 3895				**203** minutes
Asperity ASTM D7466	Average	Top	**.61** mm	**24** mil
		Bottom	**.86** mm	**34** mil
Specific Gravity ASTM D792	Average Density		g/cc	**.947**
MFI ASTM D1238 COND. E Grade **K307**	Melt Flow Index 190C/2160 g - g/10 min			**.19**
Carbon Black Content ASTM D4218	Range		%	**2.2**
Carbon Black Dispersion ASTM D5596	Category			**10 in Category 1**
Tensile Strength ASTM D6693 (2 inches / minute)	Average Strength @ Yield	MD	**26** N/mm **148** ppi	**2472** psi
		TD	**29** N/mm **165** ppi	**2752** psi
	Average Strength @ Break	MD	**36** N/mm **207** ppi	**3458** psi
		TD	**34** N/mm **197** ppi	**3282** psi
Tensile Elongation ASTM D6693 (2 inches / minute) Lo = 1.3" Yield Lo = 2.0" Break	Average Elongation @ Yield	MD	%	**17**
		TD	%	**15**
	Average Elongation @Break	MD	%	**465**
		TD	%	**573**
Dimensional Stability ASTM D1204 (Modified)	Average Dimensional Change		%	**-0.68**
Tear Resistance ASTM D1004 (Modified)	Average Tear Resistance	MD	**253.5** N	**57** lbs
		TD	**253.5** N	**57** lbs
Puncture Resistance FTMS 101 Method 2065 Modified				**CERTIFIED**
Puncture Resistance ASTM D4833 (Modified)	Average Peak Load		**604.9** N	**136** lbs
ESCR ASTM D1693	Minumum Hrs w/o Failures		1500 Hrs	**CERTIFIED**
Notched Constant Tensile Load ASTM D5397	Pass/Fail @ 30%		500 Hrs	**ONGOING**

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ROLL # G15D233034 **LOT #** HFE710340 **LINER TYPE** **60 HD MICROSPIKE**

		METRIC	ENGLISH		METRIC	ENGLISH
Thickness Measurement ASTM D5994 (Modified)	MIN	**1.41** mm	**56** mil	Thickness	**1.52** mm	**60** mil
	MAX	**1.66** mm	**66** mil	Length	**153.926** m	**505** feet
	AVE	**1.50** mm	**59** mil	Width	**7.01** m	**23** feet

OIT(Standard) ASTM D 3895					**203** minutes
Asperity ASTM D7466	Average	Top		**.64** mm	**25** mil
		Bottom		**.84** mm	**33** mil
Specific Gravity ASTM D792	Average Density			g/cc	**.947**
MFI ASTM D1238 COND. E Grade **K307**	Melt Flow Index 190C/2160 g - g/10 min				**.19**
Carbon Black Content ASTM D4218	Range			%	**2.2**
Carbon Black Dispersion ASTM D5596	Category				**10 in Category 1**
Tensile Strength ASTM D6693 (2 inches / minute)	Average Strength @ Yield	MD	**26** N/mm	**148** ppi	**2472** psi
		TD	**29** N/mm	**165** ppi	**2752** psi
	Average Strength @ Break	MD	**36** N/mm	**207** ppi	**3458** psi
		TD	**34** N/mm	**197** ppi	**3282** psi
Tensile Elongation ASTM D6693 (2 inches / minute) Lo = 1.3" Yield Lo = 2.0" Break	Average Elongation @ Yield	MD		%	**17**
		TD		%	**15**
	Average Elongation @Break	MD		%	**465**
		TD		%	**573**
Dimensional Stability ASTM D1204 (Modified)	Average Dimensional Change			%	**-0.68**
Tear Resistance ASTM D1004 (Modified)	Average Tear Resistance	MD		**253.5** N	**57** lbs
		TD		**253.5** N	**57** lbs
Puncture Resistance FTMS 101 Method 2065 Modified					**CERTIFIED**
Puncture Resistance ASTM D4833 (Modified)	Average Peak Load			**604.9** N	**136** lbs
ESCR ASTM D1693	Minumum Hrs w/o Failures			1500 Hrs	**CERTIFIED**
Notched Constant Tensile Load ASTM D5397	Pass/Fail @ 30%			500 Hrs	**ONGOING**

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ROLL # G15D233035 **LOT #** HFE710340 **LINER TYPE** **60 HD MICROSPIKE**

		METRIC	ENGLISH		METRIC	ENGLISH
Thickness Measurement ASTM D5994 (Modified)	MIN	**1.36** mm	**54** mil	Thickness	**1.52** mm	**60** mil
	MAX	**1.64** mm	**64** mil	Length	**153.926** m	**505** feet
	AVE	**1.48** mm	**58** mil	Width	**7.01** m	**23** feet

OIT(Standard) ASTM D 3895				**203** minutes
Asperity ASTM D7466	Average	Top	**.61** mm	**24** mil
		Bottom	**.81** mm	**32** mil
Specific Gravity ASTM D792	Average Density		g/cc	**.947**
MFI ASTM D1238 COND. E Grade **K307**	Melt Flow Index 190C/2160 g - g/10 min			**.19**
Carbon Black Content ASTM D4218	Range		%	**2.2**
Carbon Black Dispersion ASTM D5596	Category			**10 in Category 1**
Tensile Strength ASTM D6693 (2 inches / minute)	Average Strength @ Yield	MD	**26** N/mm **148** ppi	**2472** psi
		TD	**29** N/mm **165** ppi	**2752** psi
	Average Strength @ Break	MD	**36** N/mm **207** ppi	**3458** psi
		TD	**34** N/mm **197** ppi	**3282** psi
Tensile Elongation ASTM D6693 (2 inches / minute) Lo = 1.3" Yield Lo = 2.0" Break	Average Elongation @ Yield	MD	%	**17**
		TD	%	**15**
	Average Elongation @Break	MD	%	**465**
		TD	%	**573**
Dimensional Stability ASTM D1204 (Modified)	Average Dimensional Change		%	**-0.68**
Tear Resistance ASTM D1004 (Modified)	Average Tear Resistance	MD	**253.5** N	**57** lbs
		TD	**253.5** N	**57** lbs
Puncture Resistance FTMS 101 Method 2065 Modified				**CERTIFIED**
Puncture Resistance ASTM D4833 (Modified)	Average Peak Load		**604.9** N	**136** lbs
ESCR ASTM D1693	Minumum Hrs w/o Failures		1500 Hrs	**CERTIFIED**
Notched Constant Tensile Load ASTM D5397	Pass/Fail @ 30%		500 Hrs	**ONGOING**

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ROLL # G15D233036 **LOT #** HFE710340 **LINER TYPE** **60 HD MICROSPIKE**

		METRIC	ENGLISH		METRIC	ENGLISH
Thickness Measurement ASTM D5994 (Modified)	MIN	**1.37** mm	**54** mil	Thickness	**1.52** mm	**60** mil
	MAX	**1.53** mm	**60** mil	Length	**153.926** m	**505** feet
	AVE	**1.46** mm	**57** mil	Width	**7.01** m	**23** feet

OIT(Standard) ASTM D 3895					**203** minutes
Asperity ASTM D7466	Average	Top		**.64** mm	**25** mil
		Bottom		**.89** mm	**35** mil
Specific Gravity ASTM D792	Average Density			g/cc	**.947**
MFI ASTM D1238 COND. E Grade **K307**	Melt Flow Index 190C/2160 g - g/10 min				**.19**
Carbon Black Content ASTM D4218	Range			%	**2.2**
Carbon Black Dispersion ASTM D5596	Category				**10 in Category 1**
Tensile Strength ASTM D6693 (2 inches / minute)	Average Strength @ Yield	MD	**26** N/mm	**147** ppi	**2455** psi
		TD	**28** N/mm	**160** ppi	**2672** psi
	Average Strength @ Break	MD	**33** N/mm	**188** ppi	**3141** psi
		TD	**36** N/mm	**205** ppi	**3415** psi
Tensile Elongation ASTM D6693 (2 inches / minute) Lo = 1.3" Yield Lo = 2.0" Break	Average Elongation @ Yield	MD		%	**18**
		TD		%	**15**
	Average Elongation @Break	MD		%	**429**
		TD		%	**609**
Dimensional Stability ASTM D1204 (Modified)	Average Dimensional Change			%	**-0.68**
Tear Resistance ASTM D1004 (Modified)	Average Tear Resistance	MD		**253.5** N	**57** lbs
		TD		**253.5** N	**57** lbs
Puncture Resistance FTMS 101 Method 2065 Modified					**CERTIFIED**
Puncture Resistance ASTM D4833 (Modified)	Average Peak Load			**604.9** N	**136** lbs
ESCR ASTM D1693	Minumum Hrs w/o Failures			1500 Hrs	**CERTIFIED**
Notched Constant Tensile Load ASTM D5397	Pass/Fail @ 30%			500 Hrs	**ONGOING**

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ROLL # G15D233037 **LOT #** HFE710340 **LINER TYPE** **60 HD MICROSPIKE**

		METRIC	ENGLISH		METRIC	ENGLISH
Thickness Measurement ASTM D5994 (Modified)	MIN	**1.37** mm	**54** mil	Thickness	**1.52** mm	**60** mil
	MAX	**1.54** mm	**61** mil	Length	**153.926** m	**505** feet
	AVE	**1.47** mm	**58** mil	Width	**7.01** m	**23** feet

OIT(Standard) ASTM D 3895					**203** minutes
Asperity ASTM D7466	Average	Top		**.69** mm	**27** mil
		Bottom		**.89** mm	**35** mil
Specific Gravity ASTM D792	Average Density			g/cc	**.947**
MFI ASTM D1238 COND. E Grade **K307**	Melt Flow Index 190C/2160 g - g/10 min				**.19**
Carbon Black Content ASTM D4218	Range			%	**2.2**
Carbon Black Dispersion ASTM D5596	Category				**10 in Category 1**
Tensile Strength ASTM D6693 (2 inches / minute)	Average Strength @ Yield	MD	**26** N/mm	**147** ppi	**2455** psi
		TD	**28** N/mm	**160** ppi	**2672** psi
	Average Strength @ Break	MD	**33** N/mm	**188** ppi	**3141** psi
		TD	**36** N/mm	**205** ppi	**3415** psi
Tensile Elongation ASTM D6693 (2 inches / minute) Lo = 1.3" Yield Lo = 2.0" Break	Average Elongation @ Yield	MD		%	**18**
		TD		%	**15**
	Average Elongation @Break	MD		%	**429**
		TD		%	**609**
Dimensional Stability ASTM D1204 (Modified)	Average Dimensional Change			%	**-0.68**
Tear Resistance ASTM D1004 (Modified)	Average Tear Resistance	MD		**253.5** N	**57** lbs
		TD		**253.5** N	**57** lbs
Puncture Resistance FTMS 101 Method 2065 Modified					**CERTIFIED**
Puncture Resistance ASTM D4833 (Modified)	Average Peak Load			**604.9** N	**136** lbs
ESCR ASTM D1693	Minumum Hrs w/o Failures			1500 Hrs	**CERTIFIED**
Notched Constant Tensile Load ASTM D5397	Pass/Fail @ 30%			500 Hrs	**ONGOING**

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ROLL # G15D233038 **LOT #** HFE710340 **LINER TYPE** **60 HD MICROSPIKE**

		METRIC	ENGLISH		METRIC	ENGLISH
Thickness Measurement ASTM D5994 (Modified)	MIN	**1.38** mm	**54** mil	Thickness	**1.52** mm	**60** mil
	MAX	**1.54** mm	**60** mil	Length	**153.926** m	**505** feet
	AVE	**1.46** mm	**57** mil	Width	**7.01** m	**23** feet

OIT(Standard) ASTM D 3895				**203** minutes
Asperity ASTM D7466	Average	Top	**.64** mm	**25** mil
		Bottom	**.84** mm	**33** mil
Specific Gravity ASTM D792	Average Density		g/cc	**.947**
MFI ASTM D1238 COND. E Grade **K307**	Melt Flow Index 190C/2160 g - g/10 min			**.19**
Carbon Black Content ASTM D4218	Range		%	**2.2**
Carbon Black Dispersion ASTM D5596	Category			**10 in Category 1**
Tensile Strength ASTM D6693 (2 inches / minute)	Average Strength @ Yield	MD	**26** N/mm **147** ppi	**2455** psi
		TD	**28** N/mm **160** ppi	**2672** psi
	Average Strength @ Break	MD	**33** N/mm **188** ppi	**3141** psi
		TD	**36** N/mm **205** ppi	**3415** psi
Tensile Elongation ASTM D6693 (2 inches / minute) Lo = 1.3" Yield Lo = 2.0" Break	Average Elongation @ Yield	MD	%	**18**
		TD	%	**15**
	Average Elongation @Break	MD	%	**429**
		TD	%	**609**
Dimensional Stability ASTM D1204 (Modified)	Average Dimensional Change		%	**-0.68**
Tear Resistance ASTM D1004 (Modified)	Average Tear Resistance	MD	**253.5** N	**57** lbs
		TD	**253.5** N	**57** lbs
Puncture Resistance FTMS 101 Method 2065 Modified				**CERTIFIED**
Puncture Resistance ASTM D4833 (Modified)	Average Peak Load		**604.9** N	**136** lbs
ESCR ASTM D1693	Minumum Hrs w/o Failures		1500 Hrs	**CERTIFIED**
Notched Constant Tensile Load ASTM D5397	Pass/Fail @ 30%		500 Hrs	**ONGOING**

Customer Chesapeake Containment
PO 15065 Brickhaven Mine Site
Destination Brickhaven, NC

Date **6/3/2015** OA# **29035**

Signature

Quality Control Department

agru america
quality control dept.

quality certificate

ROLL # G15D233039 **LOT #** HFE710340 **LINER TYPE** **60 HD MICROSPIKE**

		METRIC	ENGLISH		METRIC	ENGLISH
Thickness Measurement ASTM D5994 (Modified)	MIN	**1.36** mm	**54** mil	Thickness	**1.52** mm	**60** mil
	MAX	**1.54** mm	**61** mil	Length	**153.926** m	**505** feet
	AVE	**1.44** mm	**57** mil	Width	**7.01** m	**23** feet

OIT(Standard) ASTM D 3895					**203** minutes
Asperity ASTM D7466	Average	Top		**.64** mm	**25** mil
		Bottom		**.84** mm	**33** mil
Specific Gravity ASTM D792	Average Density			g/cc	**.947**
MFI ASTM D1238 COND. E Grade **K307**	Melt Flow Index 190C/2160 g - g/10 min				**.19**
Carbon Black Content ASTM D4218	Range			%	**2.2**
Carbon Black Dispersion ASTM D5596	Category				**10 in Category 1**
Tensile Strength ASTM D6693 (2 inches / minute)	Average Strength @ Yield	MD	**26** N/mm	**147** ppi	**2455** psi
		TD	**28** N/mm	**160** ppi	**2672** psi
	Average Strength @ Break	MD	**33** N/mm	**188** ppi	**3141** psi
		TD	**36** N/mm	**205** ppi	**3415** psi
Tensile Elongation ASTM D6693 (2 inches / minute) Lo = 1.3" Yield Lo = 2.0" Break	Average Elongation @ Yield	MD		%	**18**
		TD		%	**15**
	Average Elongation @Break	MD		%	**429**
		TD		%	**609**
Dimensional Stability ASTM D1204 (Modified)	Average Dimensional Change			%	**-0.68**
Tear Resistance ASTM D1004 (Modified)	Average Tear Resistance	MD		**253.5** N	**57** lbs
		TD		**253.5** N	**57** lbs
Puncture Resistance FTMS 101 Method 2065 Modified					**CERTIFIED**
Puncture Resistance ASTM D4833 (Modified)	Average Peak Load			**604.9** N	**136** lbs
ESCR ASTM D1693	Minumum Hrs w/o Failures			1500 Hrs	**CERTIFIED**
Notched Constant Tensile Load ASTM D5397	Pass/Fail @ 30%			500 Hrs	**ONGOING**

Customer Chesapeake Containment
PO 15065 Brickhaven Mine Site
Destination Brickhaven, NC

Date **6/3/2015** OA# **29035**

Signature

Quality Control Department

agru america
quality control dept.

quality certificate

ROLL # G15D233040 **LOT #** HFE710340 **LINER TYPE** **60 HD MICROSPIKE**

		METRIC	ENGLISH		METRIC	ENGLISH
Thickness Measurement ASTM D5994 (Modified)	MIN	**1.29** mm	**51** mil	Thickness	**1.52** mm	**60** mil
	MAX	**1.55** mm	**61** mil	Length	**153.926** m	**505** feet
	AVE	**1.45** mm	**57** mil	Width	**7.01** m	**23** feet

OIT(Standard) ASTM D 3895				**203** minutes
Asperity ASTM D7466	Average	Top	**.69** mm	**27** mil
		Bottom	**.86** mm	**34** mil
Specific Gravity ASTM D792	Average Density		g/cc	**.947**
MFI ASTM D1238 COND. E Grade **K307**	Melt Flow Index 190C/2160 g - g/10 min			**.19**
Carbon Black Content ASTM D4218	Range		%	**2.2**
Carbon Black Dispersion ASTM D5596	Category			**10 in Category 1**
Tensile Strength ASTM D6693 (2 inches / minute)	Average Strength @ Yield	MD	**26** N/mm **147** ppi	**2455** psi
		TD	**28** N/mm **160** ppi	**2672** psi
	Average Strength @ Break	MD	**33** N/mm **188** ppi	**3141** psi
		TD	**36** N/mm **205** ppi	**3415** psi
Tensile Elongation ASTM D6693 (2 inches / minute) Lo = 1.3" Yield Lo = 2.0" Break	Average Elongation @ Yield	MD	%	**18**
		TD	%	**15**
	Average Elongation @Break	MD	%	**429**
		TD	%	**609**
Dimensional Stability ASTM D1204 (Modified)	Average Dimensional Change		%	**-0.68**
Tear Resistance ASTM D1004 (Modified)	Average Tear Resistance	MD	**253.5** N	**57** lbs
		TD	**253.5** N	**57** lbs
Puncture Resistance FTMS 101 Method 2065 Modified				**CERTIFIED**
Puncture Resistance ASTM D4833 (Modified)	Average Peak Load		**604.9** N	**136** lbs
ESCR ASTM D1693	Minumum Hrs w/o Failures		1500 Hrs	**CERTIFIED**
Notched Constant Tensile Load ASTM D5397	Pass/Fail @ 30%		500 Hrs	**ONGOING**

Customer Chesapeake Containment
PO 15065 Brickhaven Mine Site
Destination Brickhaven, NC

Date **6/3/2015** OA# **29035**

Signature

Quality Control Department

agru america
quality control dept.

quality certificate

ROLL # G15D233041 **LOT #** HFE710340 **LINER TYPE** **60 HD MICROSPIKE**

		METRIC	ENGLISH		METRIC	ENGLISH
Thickness Measurement ASTM D5994 (Modified)	MIN	**1.32** mm	**52** mil	Thickness	**1.52** mm	**60** mil
	MAX	**1.55** mm	**61** mil	Length	**153.926** m	**505** feet
	AVE	**1.47** mm	**58** mil	Width	**7.01** m	**23** feet

OIT(Standard) ASTM D 3895					**203** minutes
Asperity ASTM D7466	Average	Top		**.64** mm	**25** mil
		Bottom		**.86** mm	**34** mil
Specific Gravity ASTM D792	Average Density			g/cc	**.947**
MFI ASTM D1238 COND. E Grade **K307**	Melt Flow Index 190C/2160 g - g/10 min				**.19**
Carbon Black Content ASTM D4218	Range			%	**2.2**
Carbon Black Dispersion ASTM D5596	Category				**10 in Category 1**
Tensile Strength ASTM D6693 (2 inches / minute)	Average Strength @ Yield	MD	**28** N/mm	**161** ppi	**2682** psi
		TD	**31** N/mm	**178** ppi	**2965** psi
	Average Strength @ Break	MD	**38** N/mm	**214** ppi	**3571** psi
		TD	**38** N/mm	**218** ppi	**3626** psi
Tensile Elongation ASTM D6693 (2 inches / minute) Lo = 1.3" Yield Lo = 2.0" Break	Average Elongation @ Yield	MD		%	**15**
		TD		%	**14**
	Average Elongation @Break	MD		%	**450**
		TD		%	**609**
Dimensional Stability ASTM D1204 (Modified)	Average Dimensional Change			%	**-0.68**
Tear Resistance ASTM D1004 (Modified)	Average Tear Resistance	MD		**213.5** N	**48** lbs
		TD		**222.4** N	**50** lbs
Puncture Resistance FTMS 101 Method 2065 Modified					**CERTIFIED**
Puncture Resistance ASTM D4833 (Modified)	Average Peak Load			**578.2** N	**130** lbs
ESCR ASTM D1693	Minumum Hrs w/o Failures			1500 Hrs	**CERTIFIED**
Notched Constant Tensile Load ASTM D5397	Pass/Fail @ 30%			500 Hrs	**ONGOING**

Customer Chesapeake Containment
PO 15065 Brickhaven Mine Site
Destination Brickhaven, NC

Date **6/3/2015** OA# **29035**

Signature

Quality Control Department

CoA Date: 01/07/2015

Certificate of Analysis

Shipped To: AGRU AMERICA INC:GEORGETOWN
500 GARRISON RD
GEORGETOWN SC 29440
USA

Recipient: PALMER
Fax:

Delivery #: 88982636
PO #: 008968
Weight: 188000 LB
Ship Date: 01/07/2015
Package: BULK
Mode: Hopper Car
Car #: CHVX891130
Seal No: 10759

Product:
MARLEX POLYETHYLENE K307 BULK

Lot Number: HEN820690

Property	Test Method	Value	Unit
Melt Index	ASTM D1238	0.25	g/10mi
HLMI Flow Rate	ASTM D1238	22	g/10mi
Density	D1505 or D4883	0.938	g/cm3
Pellet Count	P02.08.03	26	pel/g
Production Date		12/15/2014	

The data set forth herein have been carefully compiled by Chevron Phillips Chemical Company LP (CPChem).
However, there is no warranty of any kind, either expressed or implied, applicable to its use, and the user assumes all risk and liability in connection therewith.

Troy Griffin
Quality Systems Coordinator

For CoA questions contact Customer Service Representative at +1-832-813-4806

CoA Date: 01/07/2015

Certificate of Analysis

Shipped To: AGRU AMERICA INC:GEORGETOWN
500 GARRISON RD
GEORGETOWN SC 29440
USA

Recipient: PALMER
Fax:

Delivery #: 88982637
PO #: 008968
Weight: 186900 LB
Ship Date: 01/07/2015
Package: BULK
Mode: Hopper Car
Car #: CEFX053719
Seal No: 10758

Product:
MARLEX POLYETHYLENE K307 BULK

Lot Number: HEN820700

Property	Test Method	Value	Unit
Melt Index	ASTM D1238	0.28	g/10mi
HLMI Flow Rate	ASTM D1238	23	g/10mi
Density	D1505 or D4883	0.938	g/cm3
Pellet Count	P02.08.03	27	pel/g
Production Date		12/15/2014	

The data set forth herein have been carefully compiled by Chevron Phillips Chemical Company LP (CPChem).
However, there is no warranty of any kind, either expressed or implied, applicable to its use, and the user assumes all risk and liability in connection therewith.

Troy Griffin
Quality Systems Coordinator

For CoA questions contact Customer Service Representative at +1-832-813-4806

CoA Date: 01/14/2015

Certificate of Analysis

Shipped To: AGRU AMERICA INC:GEORGETOWN
500 GARRISON RD
GEORGETOWN SC 29440
USA

Recipient: PALMER
Fax:

Delivery #: 88985006
PO #: 008968
Weight: 191700 LB
Ship Date: 01/12/2015
Package: BULK
Mode: Hopper Car
Car #: CEFX053745
Seal No: 15904

Product:
MARLEX POLYETHYLENE K307 BULK

Lot Number: HFA610170

Property	Test Method	Value	Unit
Melt Index	ASTM D1238	0.21	g/10mi
HLMI Flow Rate	ASTM D1238	19	g/10mi
Density	D1505 or D4883	0.938	g/cm3
Pellet Count	P02.08.03	28	pel/g
Production Date		01/04/2015	

The data set forth herein have been carefully compiled by Chevron Phillips Chemical Company LP (CPChem).
However, there is no warranty of any kind, either expressed or implied, applicable to its use, and the user assumes all risk and liability in connection therewith.

Troy Griffin
Quality Systems Coordinator

For CoA questions contact Customer Service Representative at +1-832-813-4806

CoA Date: 05/13/2015

Certificate of Analysis

Shipped To: AGRU AMERICA INC:GEORGETOWN
500 GARRISON RD
GEORGETOWN SC 29440
USA

Recipient: PALMER
Fax:

Delivery #: 89055301
PO #: 009357
Weight: 195800 LB
Ship Date: 05/13/2015
Package: BULK
Mode: Hopper Car
Car #: CHVX890185
Seal No: 22761

Product:
MARLEX POLYETHYLENE K307 BULK

Lot Number: HFE710440

Property	Test Method	Value	Unit
Melt Index	ASTM D1238	0.21	g/10mi
HLMI Flow Rate	ASTM D1238	19	g/10mi
Density	D1505 or D4883	0.936	g/cm3
Pellet Count	P02.08.03	29	pel/g
Production Date		05/10/2015	

The data set forth herein have been carefully compiled by Chevron Phillips Chemical Company LP (CPChem).
However, there is no warranty of any kind, either expressed or implied, applicable to its use, and the user assumes all risk and liability in connection therewith.

Troy Griffin
Quality Systems Coordinator

For CoA questions contact Customer Service Representative at +1-832-813-4806

CoA Date: 05/15/2015

Certificate of Analysis

Shipped To: AGRU AMERICA INC:GEORGETOWN
500 GARRISON RD
GEORGETOWN SC 29440
USA

Recipient: PALMER
Fax:

Delivery #: 89056913
PO #: 009357
Weight: 196300 LB
Ship Date: 05/15/2015
Package: BULK
Mode: Hopper Car
Car #: CHVX896826
Seal No: 22873

Product:
MARLEX POLYETHYLENE K307 BULK

Lot Number: HFE710340

Property	Test Method	Value	Unit
Melt Index	ASTM D1238	0.19	g/10mi
HLMI Flow Rate	ASTM D1238	19	g/10mi
Density	D1505 or D4883	0.937	g/cm3
Pellet Count	P02.08.03	24	pel/g
Production Date		05/08/2015	

The data set forth herein have been carefully compiled by Chevron Phillips Chemical Company LP (CPChem).
However, there is no warranty of any kind, either expressed or implied, applicable to its use, and the user assumes all risk and liability in connection therewith.

Troy Griffin
Quality Systems Coordinator

For CoA questions contact Customer Service Representative at +1-832-813-4806

Yingying Lu, Ph.D., Geomembrane Technical Service & Applications Development
Highways 60 & 123, Bartlesville Research and Technology Center, Room 149 PTC
Bartlesville, OK 74003
■ 918-977-6894 ■ luyy@cpchem.com ■ Fax: 918-977-7599 ■ www.cpchem.com

March 11, 2015

Grant Palmer
Agru America
500 Garrison Road
Georgetown, SC 29440

Dear Grant:

This letter is to report the final results of oven-aging and UV-aging tests (according to GRI-GM13 and GRI-GM17) on Agru America sheet samples that you provided to us in Aug, 2014. These tests were performed by CPChem's Materials Evaluation Laboratory in Bartlesville, OK. The tests were completed March 2015.

The GRI-GM13 (HDPE) and GRI-GM17 (LLDPE) durability tests were done according to the following procedures.

Test	Exposure	Method
HP-OIT	150 °C, 500 psi oxygen	D5885
Oven Aging	90 days, 85 °C	D5721
UV Aging	1600 UV hrs (Conditions were 20 hours UVA-340 at 75 °C followed by 4 hrs dark with condensation at 60 °C. Irradiance was 0.72 W/m^2 at 340 nm.)	D7238

Oven-Aging Results

Sample	Initial HP-OIT (min)	HP-OIT Value after Oven Aging 30 Days (min)	% HP-OIT Retained after Oven Aging 30 Days	HP-OIT Value after Oven Aging 60 Days (min)	% HP-OIT Retained after Oven Aging 60 Days	HP-OIT Value after Oven Aging 90 Days (min)	% HP-OIT Retained after Oven Aging 90 Days	GRI-GM13 or GRI-GM17 % Retained Requirement (Oven Aging 90 Days)
40 mil LLDPE Roll # G14C243027 from Marlex® 7104 Polyethylene Lot # CEC810320	512	445	87	418	82	422	**82**	60
60 mil HDPE Roll # G14A091005 from Marlex® K307 Polyethylene Lot # H82-3-2869	1227	1120	91	1079	88	1015	**83**	80

UV-Aging Results

Sample	Initial HP-OIT (min)	HP-OIT Value after UV Aging (min)	% HP-OIT Retained	GRI-GM13 or GRI-GM17 % Retained Requirement
40 mil LLDPE Roll # 346550-11 from Marlex® 7104 Polyethylene Lot # CBC810430	512	351	**69**	35
60 mil HDPE Roll # G14A091005 from Marlex® K307 Polyethylene Lot # H82-3-2869	1227	973	**79**	50

According to these test results, the durability requirements are met.

If you have any questions, please call me at 918-977-6894.

Sincerely,

Yingying Lu, Ph. D.

Polyethylene Tech Service and Applications Development

Any technical advice, recommendations, results, or analysis ("Information") contained herein, including, without limitation, Information as it may relate to the selection of a specific product ("Product") for your use and application, is given ***without warranty or guarantee*** *and is accepted at your sole risk. It is imperative that you test the Information (and Product, if applicable) to determine to your own satisfaction whether the Information (and Product, if applicable) are suitable for your intended use and application.* ***You expressly assume, and release Chevron Phillips Chemical Company, from all risk and liability, whether based in contract, tort or otherwise, in connection with the use of, or results obtained from, such Information (and Product, if applicable).***

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D3

D3 – Drainage Manufacturer Composite Certifications

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514 Barbara Sue Ln
Mt. Washington, KY 40047

[O] 502.209.0325
[TF] 800.435.2008

GSE ENVIRONMENTAL™

June 18, 2015

Ryan Clark
Chesapeake Containment Systems
352 Earls Road
Middle River, Maryland 21220

RE: CoalDrain TRx Geocomposite MQC Submittal
Brickhaven No. 2 Mine Tract "A" Structural Fill, Phase 1
Moncure, North Carolina

Dear Mr. Clark,

As requested, GSE Environmental, LLC has enclosed MQC testing and certification documentation for the CoalDrain TRx Geocomposite manufactured in association with Sales Order No. SO-076037 for the above referenced project.

As required by Specification Section 02777 Drainage Composite and Section 02778 Geotextiles, the documentation noted below has been enclosed with this letter:

1) Manufacturer Roll Allocation List.
2) Manufacturer Roll Test Data Reports.
3) Raw Material Supplier Certifications.
4) Manufacturer Quality Assurance Laboratory Test Results.

This MQC Submittal applies to 834,600 SF. Please note that per the specified transmissivity testing frequencies (every 200,000 SF), 2 additional MQC Transmissivity Tests (ASTM D 4716) are required for this quantity. At this time, these transmissivity tests are ongoing. GSE will submit these test results upon completion next week.

As requested by the Engineer of Record in follow up to the CoalDrain TRx Geocomposite product resubmittal dated June 11, 2015, GSE has also included a revised Certification of Compliance and Ply Adhesion Letter for documentation purposes. Should you wish to discuss or require additional information, please do not hesitate to contact me at (502) 209-0325. Thank you for your business.

Respectfully,

Steven Mayes, P.E.
Senior Technical Manager, North America

19103 Gundle Road
Houston, Texas 77073

281.443.8564
281.875.6010
800.435.2008

GSE ENVIRONMENTAL™

June 16, 2015

Michael Plummer, P.E.
HDR Engineering
440 South Church St.
Suite 1000
Charlotte, NC 28202

RE: GSE Sales Order SO-076037
CCS Brickhaven Mine Project
GSE CoalDrain Geocomposite Specifications

Dear Mr. Plummer,

As discussed in your meeting with Steve Mayes, GSE has submitted the data sheet for the GSE CoalDrain Geocomposite material. The Ply Adhesion value was adjusted as agreed to 0.5 lb/in per ASTM D 7005. As a result of this specification, you can expect to see Ply Adhesion values for individual rolls supplied on the project to range from 0.5 lb/in to 1.5 lb/in or more.

This change represents typical performance for the product. Site specific shear performance at the CoalDrain Geocomposite and fly ash interface will be dependent to some extent on the fly ash's shear strength characteristics. Based on past experience, CoalDrain Geocomposite with a 0.5 lb Ply Adhesion (ASTM D 7005) value will exceed the specified 26 degree peak interface friction strength.

Thank you for your assistance in this matter, and please let me know if any further clarification is required.

Respectfully,

Edward J. Zimmel
Vice President Engineering

19103 Gundle Road
Houston, TX 77073
800 435 2008 • 281 443 8564
281 230 8650 Fax
www.gseworld.com

June 16, 2015

RE: CoalDrain FabriNet TRxH Geocomposite

Certification of Compliance

GSE CoalDrain FabriNet TRxH geocomposite consists of a GSE HyperNet geonet heat laminated with a non-woven geotextile on the bottom side and an innovative composite fabric on the top side. The top geotextile serves as filter against fine materials like coal ash and FGD gypsum while the core serves the drainage function. The innovative geocomposite has been tested extensively in the laboratory and the field and has been proven to meet the performance requirements of an effective filter against coal combustion residuals.

GSE that 8.oz double-side FabriNet 300 Geocomposite will meet or exceed the following properties:

Project: Brickhaven No. 2 Mine Tract "A" Structural Fill

Property	Test Method	MARV(1)
Geocomposite		
Index Transmissivity, m^2/sec	ASTM D 4716	3.3×10^{-3} (2)
Ply Adhesion, lb/in	ASTM D 7005	0.5(5)
Geonet Core		
Melt Index, 10 g/10 minutes	ASTM D 1238	1.1 max
Carbon black content, %	ASTM D 4218	2.0
Density, g/cm^3	ASTM D 1505	0.930
Thickness, mil	ASTM D 5199	300
Compression, psf	ASTM D 6364	25,000
Tensile Strength (MD)(3), lb/in	ASTM D 7179	75
Top Composite Geotextile		
Structure	Hybrid monolithic woven-nonwoven needlepunched	
Mass per unit area, oz/yd^2	ASTM D 5261	14
Grab strength, lb	ASTM D 4632	200
Puncture resistance, lb	ASTM D 6241	775
Trapezoidal Tear Strength, lb	ASTM D 4533	85
AOS, US Sieve (mm)	ASTM D 4751	170 (0.088)
Permittivity, sec-1	ASTM D 4491	0.3
Water Flow Rate, gpm/ft^2	ASTM D 4491	20
UV Resistance, % retained	ASTM D 4355 (after 500 hours)	90
Field Basin Tests		See note 4
Bottom Composite Geotextile		
Mass per unit area, oz/yd^2	ASTM D 5261	8
Grab strength, lb	ASTM D 4632	210
Grab Elongation %	ASTM D 4632	50
Puncture resistance, lb	ASTM D 4833	95
AOS, sieve	ASTM D 4751	70
Permittivity, sec-1	ASTM D 4491	0.5

NOTES:
•(1) Minimum Average roll value, accept where noted.
•(2) Gradient of 0.02, normal load of 6,250 psf, Sand/Geocomposite/Geomembrane, 100 hour seat time.
•(3) MD = Transverse Direction
•(4) Filter compatibility with a minimum of three types of CCP materials (fly ash, stabilized FGD, and FGD gypsum) under simulated field conditions.
•(5) Ply Adhesion value per individual roll in accordance with ASTM D 7005.

Roll Allocation List

Sales Order SO-076037
Customer Name Chesapeake Containment Systems, Inc.
Project Name CCS Brickhaven Mine Site

Serial number	Item Number	Resin Lot	Top	Bottom	Manufacturing date	Length
131465563	CT2-350E-CW-08-E-00	CFD611201	2023950207	130484989	6/1/2015	150.00
131465564	CT2-350E-CW-08-E-00	CFD611201	2023950207	130484989	6/1/2015	150.00
131465565	CT2-350E-CW-08-E-00	CFD611201	2023950207	130484989	6/1/2015	150.00
131465570	CT2-350E-CW-08-E-00	CFD611201	2023950223	130484989	6/1/2015	150.00
131465571	CT2-350E-CW-08-E-00	CFD611201	2023950223	130484965	6/1/2015	150.00
131465572	CT2-350E-CW-08-E-00	CFD611201	2023950223	130484965	6/1/2015	150.00
131465573	CT2-350E-CW-08-E-00	CFD611201	2023950029	130484965	6/1/2015	150.00
131465574	CT2-350E-CW-08-E-00	CFD611201	2023950029	130484965	6/1/2015	150.00
131465575	CT2-350E-CW-08-E-00	CFD611201	2023950029	130484965	6/1/2015	150.00
131465577	CT2-350E-CW-08-E-00	CFD611201	2023950029	130484965	6/1/2015	150.00
131465578	CT2-350E-CW-08-E-00	CFD611201	2023950029	130484965	6/1/2015	150.00
131465579	CT2-350E-CW-08-E-00	CFD611201	2023950029	130484965	6/1/2015	110.00
131465966	CT2-350E-CW-08-E-00	CFD611201	2023950042	130484973	6/5/2015	150.00
131465967	CT2-350E-CW-08-E-00	CFD611201	2023950042	130484973	6/5/2015	150.00
131465968	CT2-350E-CW-08-E-00	CFD611201	2023950042	130484973	6/5/2015	150.00
131465969	CT2-350E-CW-08-E-00	CFD611201	2023950042	130484973	6/5/2015	150.00
131465970	CT2-350E-CW-08-E-00	CFD611201	2023950042	130484973	6/5/2015	145.00
131465974	CT2-350E-CW-08-E-00	HFD711110	2023950205	130484973	6/5/2015	150.00
131465975	CT2-350E-CW-08-E-00	HFD711110	2023950205	130484973	6/5/2015	150.00
131465976	CT2-350E-CW-08-E-00	HFD711110	2023950205	130484973	6/5/2015	150.00
131465981	CT2-350E-CW-08-E-00	HFD711110	2023950019	130484953	6/6/2015	150.00
131465982	CT2-350E-CW-08-E-00	HFD711110	2023950019	130484953	6/6/2015	150.00
131465983	CT2-350E-CW-08-E-00	HFD711110	2023950019	130484953	6/6/2015	150.00
131465984	CT2-350E-CW-08-E-00	HFD711110	2023950019	130484953	6/6/2015	150.00
131465985	CT2-350E-CW-08-E-00	HFD711110	2023950019	130484953	6/6/2015	150.00
131465986	CT2-350E-CW-08-E-00	HFD711110	2023950019	130484953	6/6/2015	150.00
131465987	CT2-350E-CW-08-E-00	HFD711110	2023950030	130484971	6/6/2015	150.00
131465988	CT2-350E-CW-08-E-00	HFD711110	2023950030	130484971	6/6/2015	150.00
131465989	CT2-350E-CW-08-E-00	HFD711110	2023950030	130484971	6/6/2015	150.00
131465990	CT2-350E-CW-08-E-00	HFD711110	2023950030	130484971	6/6/2015	150.00
131465991	CT2-350E-CW-08-E-00	HFD711110	2023950030	130484971	6/6/2015	150.00
131465992	CT2-350E-CW-08-E-00	HFD711110	2023950040	130484971	6/6/2015	150.00
131465993	CT2-350E-CW-08-E-00	HFD711110	2023950040	130484971	6/6/2015	150.00
131465994	CT2-350E-CW-08-E-00	HFD711110	2023950040	130484971	6/6/2015	150.00
131465995	CT2-350E-CW-08-E-00	HFD711110	2023950040	130484971	6/6/2015	150.00
131465996	CT2-350E-CW-08-E-00	HFD711110	2023950040	130484969	6/6/2015	150.00
131465997	CT2-350E-CW-08-E-00	HFD711110	2023950040	130484969	6/6/2015	150.00
131465998	CT2-350E-CW-08-E-00	HFD711110	2023950220	130484969	6/6/2015	150.00
131465999	CT2-350E-CW-08-E-00	HFD711110	2023950220	130484969	6/6/2015	150.00
131466000	CT2-350E-CW-08-E-00	HFD711110	2023950220	130484969	6/6/2015	150.00
131466001	CT2-350E-CW-08-E-00	HFD711110	2023950220	130484969	6/6/2015	150.00
131466002	CT2-350E-CW-08-E-00	HFD711110	2023950220	130484969	6/6/2015	150.00
131466003	CT2-350E-CW-08-E-00	HFD711110	2023950035	130484969	6/6/2015	150.00

Roll Allocation List

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Customer Name Chesapeake Containment Systems, Inc.
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Serial number	Item Number	Resin Lot	Top	Bottom	Manufacturing date	Length
131466004	CT2-350E-CW-08-E-00	HFD711110	2023950035	130484969	6/6/2015	150.00
131466005	CT2-350E-CW-08-E-00	HFD711110	2023950035	130484969	6/6/2015	150.00
131466006	CT2-350E-CW-08-E-00	HFD711110	2023950035	130484948	6/6/2015	150.00
131466007	CT2-350E-CW-08-E-00	HFD711110	2023950035	130484948	6/6/2015	150.00
131466008	CT2-350E-CW-08-E-00	HFD711110	2023950035	130484948	6/6/2015	150.00
131466009	CT2-350E-CW-08-E-00	HFD711110	2023950035	130484948	6/6/2015	150.00
131466010	CT2-350E-CW-08-E-00	HFD711110	2023950027	130484948	6/6/2015	150.00
131466011	CT2-350E-CW-08-E-00	HFD711110	2023950027	130484948	6/6/2015	150.00
131466012	CT2-350E-CW-08-E-00	HFD711110	2023950027	130484948	6/6/2015	150.00
131466013	CT2-350E-CW-08-E-00	HFD711110	2023950027	130484948	6/6/2015	150.00
131466014	CT2-350E-CW-08-E-00	HFD711110	2023950027	130484958	6/6/2015	150.00
131466015	CT2-350E-CW-08-E-00	HFD711110	2023950027	130484958	6/6/2015	150.00
131466017	CT2-350E-CW-08-E-00	HFD711110	2023950200	130484958	6/6/2015	150.00
131466018	CT2-350E-CW-08-E-00	HFD711110	2023950200	130484958	6/6/2015	150.00
131466019	CT2-350E-CW-08-E-00	HFD711110	2023950200	130484958	6/6/2015	150.00
131466020	CT2-350E-CW-08-E-00	HFD711110	2023950200	130484958	6/6/2015	150.00
131466021	CT2-350E-CW-08-E-00	HFD711110	2023950200	130484958	6/6/2015	150.00
131466022	CT2-350E-CW-08-E-00	HFD711110	2023950200	130484958	6/6/2015	150.00
131466023	CT2-350E-CW-08-E-00	HFD711110	2023950009	130484958	6/6/2015	150.00
131466024	CT2-350E-CW-08-E-00	HFD711110	2023950009	130484958	6/6/2015	150.00
131466025	CT2-350E-CW-08-E-00	HFD711110	2023950009	130484999	6/6/2015	150.00
131466026	CT2-350E-CW-08-E-00	HFD711110	2023950009	130484999	6/6/2015	150.00
131466027	CT2-350E-CW-08-E-00	HFD711110	2023950009	130484999	6/6/2015	150.00
131466028	CT2-350E-CW-08-E-00	HFD711110	2023950009	130484999	6/6/2015	150.00
131466029	CT2-350E-CW-08-E-00	HFD711110	2023950204	130484999	6/6/2015	150.00
131466030	CT2-350E-CW-08-E-00	HFD711110	2023950204	130484999	6/6/2015	150.00
131466031	CT2-350E-CW-08-E-00	HFD711110	2023950204	130484999	6/6/2015	150.00
131466032	CT2-350E-CW-08-E-00	HFD711110	2023950204	130484999	6/6/2015	150.00
131466033	CT2-350E-CW-08-E-00	HFD711110	2023950204	130484999	6/6/2015	150.00
131466034	CT2-350E-CW-08-E-00	HFD711110	2023950204	130484979	6/6/2015	150.00
131466035	CT2-350E-CW-08-E-00	HFD711110	2023950028	130484979	6/6/2015	150.00
131466036	CT2-350E-CW-08-E-00	HFD711110	2023950028	130484979	6/6/2015	150.00
131466037	CT2-350E-CW-08-E-00	HFD711110	2023950028	130484979	6/6/2015	150.00
131466038	CT2-350E-CW-08-E-00	HFD711110	2023950028	130484979	6/6/2015	150.00
131466039	CT2-350E-CW-08-E-00	HFD711110	2023950028	130484979	6/6/2015	150.00
131466040	CT2-350E-CW-08-E-00	HFD711110	2023950208	130484979	6/6/2015	150.00
131466041	CT2-350E-CW-08-E-00	HFD711110	2023950208	130484979	6/6/2015	150.00
131466042	CT2-350E-CW-08-E-00	HFD711110	2023950208	130484979	6/6/2015	150.00
131466043	CT2-350E-CW-08-E-00	HFD711110	2023950208	130484975	6/6/2015	150.00
131466044	CT2-350E-CW-08-E-00	HFD711110	2023950208	130484975	6/6/2015	150.00
131466045	CT2-350E-CW-08-E-00	HFD711110	2023950208	130484975	6/6/2015	150.00
131466046	CT2-350E-CW-08-E-00	HFD711110	2023950016	130484975	6/6/2015	150.00
131466047	CT2-350E-CW-08-E-00	HFD711110	2023950016	130484975	6/6/2015	150.00

Roll Allocation List

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Serial number	Item Number	Resin Lot	Top	Bottom	Manufacturing date	Length
131466048	CT2-350E-CW-08-E-00	HFD711110	2023950016	130484975	6/6/2015	150.00
131466049	CT2-350E-CW-08-E-00	HFD711110	2023950016	130484975	6/6/2015	150.00
131466050	CT2-350E-CW-08-E-00	HFD711110	2023950016	130484975	6/6/2015	150.00
131466051	CT2-350E-CW-08-E-00	HFD711110	2023950016	130484975	6/6/2015	150.00
131466052	CT2-350E-CW-08-E-00	HFD711110	2023950037	130484960	6/6/2015	150.00
131466053	CT2-350E-CW-08-E-00	HFD711110	2023950037	130484960	6/6/2015	150.00
131466054	CT2-350E-CW-08-E-00	HFD711110	2023950037	130484960	6/6/2015	150.00
131466055	CT2-350E-CW-08-E-00	HFD711110	2023950037	130484960	6/6/2015	150.00
131466056	CT2-350E-CW-08-E-00	HFD711110	2023950037	130484960	6/6/2015	150.00
131466057	CT2-350E-CW-08-E-00	HFD711110	2023950026	130484960	6/6/2015	150.00
131466058	CT2-350E-CW-08-E-00	HFD711110	2023950026	130484960	6/6/2015	150.00
131466059	CT2-350E-CW-08-E-00	HFD711110	2023950026	130484960	6/6/2015	150.00
131466060	CT2-350E-CW-08-E-00	HFD711110	2023950026	130484960	6/6/2015	150.00
131466061	CT2-350E-CW-08-E-00	HFD711110	2023950026	130484961	6/6/2015	150.00
131466062	CT2-350E-CW-08-E-00	HFD711110	2023950026	130484961	6/6/2015	150.00
131466063	CT2-350E-CW-08-E-00	HFD711110	2023950202	130484961	6/6/2015	150.00
131466064	CT2-350E-CW-08-E-00	HFD711110	2023950202	130484961	6/6/2015	150.00
131466065	CT2-350E-CW-08-E-00	HFD711110	2023950202	130484961	6/6/2015	150.00
131466066	CT2-350E-CW-08-E-00	HFD711110	2023950202	130484961	6/6/2015	150.00
131466067	CT2-350E-CW-08-E-00	HFD711110	2023950202	130484961	6/6/2015	150.00
131466068	CT2-350E-CW-08-E-00	HFD711110	2023950202	130484961	6/6/2015	150.00
131466069	CT2-350E-CW-08-E-00	HFD711110	2023950007	130484961	6/7/2015	150.00
131466072	CT2-350E-CW-08-E-00	HFD711110	2023950007	130484976	6/7/2015	150.00
131466073	CT2-350E-CW-08-E-00	HFD711110	2023950007	130484976	6/7/2015	150.00
131466074	CT2-350E-CW-08-E-00	HFD711110	2023950007	130484976	6/7/2015	150.00
131466075	CT2-350E-CW-08-E-00	HFD711110	2023950023	130484976	6/7/2015	150.00
131466076	CT2-350E-CW-08-E-00	HFD711110	2023950023	130484976	6/7/2015	150.00
131466077	CT2-350E-CW-08-E-00	HFD711110	2023950023	130484976	6/7/2015	150.00
131466078	CT2-350E-CW-08-E-00	HFD711110	2023950023	130484976	6/7/2015	150.00
131466079	CT2-350E-CW-08-E-00	HFD711110	2023950023	130484976	6/7/2015	150.00
131466080	CT2-350E-CW-08-E-00	HFD711110	2023950023	130484976	6/7/2015	150.00
131466081	CT2-350E-CW-08-E-00	HFD711110	2023950043	130484963	6/7/2015	150.00
131466082	CT2-350E-CW-08-E-00	HFD711110	2023950043	130484963	6/7/2015	150.00
131466083	CT2-350E-CW-08-E-00	HFD711110	2023950043	130484963	6/7/2015	150.00
131466084	CT2-350E-CW-08-E-00	HFD711110	2023950043	130484963	6/7/2015	150.00
131466085	CT2-350E-CW-08-E-00	HFD711110	2023950043	130484963	6/7/2015	150.00
131466086	CT2-350E-CW-08-E-00	HFD711110	2023950043	130484963	6/7/2015	150.00
131466087	CT2-350E-CW-08-E-00	HFD711110	2023950219	130484963	6/7/2015	150.00
131466088	CT2-350E-CW-08-E-00	HFD711110	2023950219	130484963	6/7/2015	150.00
131466089	CT2-350E-CW-08-E-00	HFD711110	2023950219	130484963	6/7/2015	150.00
131466090	CT2-350E-CW-08-E-00	HFD711110	2023950219	130484947	6/7/2015	150.00
131466091	CT2-350E-CW-08-E-00	HFD711110	2023950219	130484947	6/7/2015	150.00
131466092	CT2-350E-CW-08-E-00	HFD711110	2023950219	130484947	6/7/2015	150.00

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Serial number	Item Number	Resin Lot	Top	Bottom	Manufacturing date	Length
131466093	CT2-350E-CW-08-E-00	HFD711110	2023950217	130484947	6/7/2015	150.00
131466094	CT2-350E-CW-08-E-00	HFD711110	2023950217	130484947	6/7/2015	150.00
131466095	CT2-350E-CW-08-E-00	HFD711110	2023950217	130484947	6/7/2015	150.00
131466096	CT2-350E-CW-08-E-00	HFD711110	2023950217	130484947	6/7/2015	150.00
131466097	CT2-350E-CW-08-E-00	HFD711110	2023950217	130484947	6/7/2015	150.00
131466098	CT2-350E-CW-08-E-00	HFD711110	2023950212	130484947	6/7/2015	150.00
131466099	CT2-350E-CW-08-E-00	HFD711110	2023950212	130484943	6/7/2015	150.00
131466100	CT2-350E-CW-08-E-00	HFD711110	2023950212	130484943	6/7/2015	150.00
131466101	CT2-350E-CW-08-E-00	HFD711110	2023950212	130484943	6/7/2015	150.00
131466102	CT2-350E-CW-08-E-00	HFD711110	2023950212	130484943	6/7/2015	150.00
131466103	CT2-350E-CW-08-E-00	HFD711110	2023950212	130484943	6/7/2015	150.00
131466104	CT2-350E-CW-08-E-00	HFD711110	2023950018	130484943	6/7/2015	150.00
131466105	CT2-350E-CW-08-E-00	HFD711110	2023950018	130484943	6/7/2015	150.00
131466106	CT2-350E-CW-08-E-00	HFD711110	2023950018	130484943	6/7/2015	150.00
131466107	CT2-350E-CW-08-E-00	HFD711110	2023950018	130484943	6/7/2015	150.00
131466109	CT2-350E-CW-08-E-00	HFD711110	2023950018	130484943	6/7/2015	150.00
131466110	CT2-350E-CW-08-E-00	HFD711110	2023950018	130484949	6/7/2015	150.00
131466111	CT2-350E-CW-08-E-00	HFD711110	2023950216	130484949	6/7/2015	150.00
131466112	CT2-350E-CW-08-E-00	HFD711110	2023950216	130484949	6/7/2015	150.00
131466113	CT2-350E-CW-08-E-00	HFD711110	2023950216	130484949	6/7/2015	150.00
131466114	CT2-350E-CW-08-E-00	HFD711110	2023950216	130484949	6/7/2015	150.00
131466115	CT2-350E-CW-08-E-00	HFD711110	2023950216	130484949	6/7/2015	150.00
131466116	CT2-350E-CW-08-E-00	HFD711110	2023950216	130484949	6/7/2015	150.00
131466117	CT2-350E-CW-08-E-00	HFD711110	2023950020	130484949	6/7/2015	150.00
131466118	CT2-350E-CW-08-E-00	HFD711110	2023950020	130484949	6/7/2015	150.00
131466119	CT2-350E-CW-08-E-00	HFD711110	2023950020	130484950	6/7/2015	150.00
131466120	CT2-350E-CW-08-E-00	HFD711110	2023950020	130484950	6/7/2015	150.00
131466121	CT2-350E-CW-08-E-00	HFD711110	2023950020	130484950	6/7/2015	150.00
131466122	CT2-350E-CW-08-E-00	HFD711110	2023950048	130484950	6/7/2015	150.00
131466123	CT2-350E-CW-08-E-00	HFD711110	2023950048	130484950	6/7/2015	150.00
131466124	CT2-350E-CW-08-E-00	HFD711110	2023950048	130484950	6/7/2015	150.00
131466125	CT2-350E-CW-08-E-00	HFD711110	2023950048	130484950	6/7/2015	150.00
131466126	CT2-350E-CW-08-E-00	HFD711110	2023950048	130484950	6/7/2015	150.00
131466127	CT2-350E-CW-08-E-00	HFD711110	2023950048	130484950	6/7/2015	150.00
131466128	CT2-350E-CW-08-E-00	HFD711110	2023950025	130484955	6/7/2015	150.00
131466129	CT2-350E-CW-08-E-00	HFD711110	2023950025	130484955	6/7/2015	150.00
131466130	CT2-350E-CW-08-E-00	HFD711110	2023950025	130484955	6/7/2015	150.00
131466131	CT2-350E-CW-08-E-00	HFD711110	2023950025	130484955	6/7/2015	150.00
131466132	CT2-350E-CW-08-E-00	HFD711110	2023950025	130484955	6/7/2015	150.00
131466133	CT2-350E-CW-08-E-00	HFD711110	2023950025	130484955	6/7/2015	150.00
131466134	CT2-350E-CW-08-E-00	HFD711110	2023950210	130484955	6/7/2015	150.00
131466135	CT2-350E-CW-08-E-00	HFD711110	2023950210	130484955	6/7/2015	150.00
131466136	CT2-350E-CW-08-E-00	HFD711110	2023950210	130484955	6/7/2015	150.00

Roll Allocation List

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Serial number	Item Number	Resin Lot	Top	Bottom	Manufacturing date	Length
131466137	CT2-350E-CW-08-E-00	HFD711110	2023950210	130484962	6/7/2015	150.00
131466138	CT2-350E-CW-08-E-00	HFD711110	2023950210	130484962	6/7/2015	150.00
131466139	CT2-350E-CW-08-E-00	HFD711110	2023950210	130484962	6/7/2015	150.00
131466140	CT2-350E-CW-08-E-00	HFD711110	2023950225	130484962	6/7/2015	150.00
131466141	CT2-350E-CW-08-E-00	HFD711110	2023950225	130484962	6/7/2015	150.00
131466142	CT2-350E-CW-08-E-00	HFD711110	2023950225	130484962	6/7/2015	150.00
131466143	CT2-350E-CW-08-E-00	HFD711110	2023950225	130484962	6/7/2015	150.00
131466144	CT2-350E-CW-08-E-00	HFD711110	2023950225	130484962	6/7/2015	150.00
131466145	CT2-350E-CW-08-E-00	HFD711110	2023950225	130484962	6/7/2015	150.00
131466146	CT2-350E-CW-08-E-00	HFD711110	2023950038	130484962	6/7/2015	150.00
131466147	CT2-350E-CW-08-E-00	HFD711110	2023950038	130484968	6/7/2015	150.00
131466148	CT2-350E-CW-08-E-00	HFD711110	2023950038	130484968	6/7/2015	150.00
131466149	CT2-350E-CW-08-E-00	HFD711110	2023950038	130484968	6/7/2015	150.00
131466150	CT2-350E-CW-08-E-00	HFD711110	2023950038	130484968	6/7/2015	150.00
131466151	CT2-350E-CW-08-E-00	HFD711110	2023950014	130484968	6/7/2015	150.00
131466152	CT2-350E-CW-08-E-00	HFD711110	2023950014	130484968	6/7/2015	150.00
131466153	CT2-350E-CW-08-E-00	HFD711110	2023950014	130484968	6/7/2015	150.00
131466154	CT2-350E-CW-08-E-00	HFD711110	2023950014	130484968	6/7/2015	150.00
131466155	CT2-350E-CW-08-E-00	HFD711110	2023950014	130484968	6/7/2015	150.00
131466156	CT2-350E-CW-08-E-00	HFD711110	2023950014	130484951	6/7/2015	150.00
131466157	CT2-350E-CW-08-E-00	HFD711110	2023950032	130484951	6/8/2015	150.00
131466158	CT2-350E-CW-08-E-00	HFD711110	2023950032	130484951	6/8/2015	150.00
131466160	CT2-350E-CW-08-E-00	HFD711110	2023950032	130484951	6/8/2015	150.00
131466161	CT2-350E-CW-08-E-00	HFD711110	2023950032	130484951	6/8/2015	150.00
131466162	CT2-350E-CW-08-E-00	HFD711110	2023950032	130484951	6/8/2015	150.00
131466163	CT2-350E-CW-08-E-00	HFD711110	2023950032	130484951	6/8/2015	150.00
131466164	CT2-350E-CW-08-E-00	HFD711110	2023950033	130484951	6/8/2015	150.00
131466165	CT2-350E-CW-08-E-00	HFD711110	2023950033	130484951	6/8/2015	150.00
131466166	CT2-350E-CW-08-E-00	HFD711110	2023950033	130485842	6/8/2015	150.00
131466167	CT2-350E-CW-08-E-00	HFD711110	2023950033	130485842	6/8/2015	150.00
131466168	CT2-350E-CW-08-E-00	HFD711110	2023950033	130485842	6/8/2015	150.00
131466169	CT2-350E-CW-08-E-00	HFD711110	2023950036	130485842	6/8/2015	150.00
131466170	CT2-350E-CW-08-E-00	HFD711110	2023950036	130485842	6/8/2015	150.00
131466171	CT2-350E-CW-08-E-00	HFD711110	2023950036	130484970	6/8/2015	150.00
131466172	CT2-350E-CW-08-E-00	HFD711110	2023950036	130484970	6/8/2015	150.00
131466173	CT2-350E-CW-08-E-00	HFD711110	2023950036	130484970	6/8/2015	150.00
131466174	CT2-350E-CW-08-E-00	HFD711110	2023950036	130484970	6/8/2015	150.00
131466175	CT2-350E-CW-08-E-00	HFD711110	2023950044	130484970	6/8/2015	150.00
131466176	CT2-350E-CW-08-E-00	HFD711110	2023950044	130484970	6/8/2015	150.00
131466177	CT2-350E-CW-08-E-00	HFD711110	2023950044	130484970	6/8/2015	150.00
131466178	CT2-350E-CW-08-E-00	HFD711110	2023950044	130484970	6/8/2015	150.00
131466179	CT2-350E-CW-08-E-00	HFD711110	2023950044	130484970	6/8/2015	150.00
131466180	CT2-350E-CW-08-E-00	HFD711110	2023950044	130484970	6/8/2015	150.00

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Serial number	Item Number	Resin Lot	Top	Bottom	Manufacturing date	Length
131466181	CT2-350E-CW-08-E-00	HFD711110	2023950041	130484970	6/8/2015	150.00
131466182	CT2-350E-CW-08-E-00	HFD711110	2023950041	130484970	6/8/2015	150.00
131466183	CT2-350E-CW-08-E-00	HFD711100	2023950041	130484970	6/8/2015	150.00
131466184	CT2-350E-CW-08-E-00	HFD711100	2023950041	130484970	6/8/2015	150.00
131466185	CT2-350E-CW-08-E-00	HFD711100	2023950041	130484974	6/8/2015	150.00
131466186	CT2-350E-CW-08-E-00	HFD711100	2023950041	130484974	6/8/2015	150.00
131466187	CT2-350E-CW-08-E-00	HFD711100	2023950013	130484974	6/8/2015	150.00
131466188	CT2-350E-CW-08-E-00	HFD711100	2023950013	130484974	6/8/2015	150.00
131466189	CT2-350E-CW-08-E-00	HFD711100	2023950013	130484974	6/8/2015	150.00
131466190	CT2-350E-CW-08-E-00	HFD711100	2023950013	130484974	6/8/2015	150.00
131466191	CT2-350E-CW-08-E-00	HFD711100	2023950013	130484974	6/8/2015	150.00
131466192	CT2-350E-CW-08-E-00	HFD711100	2023950034	130484974	6/8/2015	150.00
131466193	CT2-350E-CW-08-E-00	HFD711100	2023950034	130484974	6/8/2015	150.00
131466195	CT2-350E-CW-08-E-00	HFD711100	2023950034	130485855	6/8/2015	150.00
131466196	CT2-350E-CW-08-E-00	HFD711100	2023950034	130485855	6/8/2015	150.00
131466197	CT2-350E-CW-08-E-00	HFD711100	2023950034	130485855	6/8/2015	150.00
131466198	CT2-350E-CW-08-E-00	HFD711100	2023950034	130485855	6/8/2015	150.00
131466199	CT2-350E-CW-08-E-00	HFD711100	2023950015	130485855	6/8/2015	150.00
131466200	CT2-350E-CW-08-E-00	HFD711100	2023950015	130485855	6/8/2015	150.00
131466201	CT2-350E-CW-08-E-00	HFD711100	2023950015	130485855	6/8/2015	150.00
131466202	CT2-350E-CW-08-E-00	HFD711100	2023950015	130485855	6/8/2015	150.00
131466203	CT2-350E-CW-08-E-00	HFD711100	2023950015	130485855	6/8/2015	150.00
131466204	CT2-350E-CW-08-E-00	HFD711100	2023950015	130485854	6/8/2015	150.00
131466205	CT2-350E-CW-08-E-00	HFD711100	2023950012	130485854	6/8/2015	150.00
131466206	CT2-350E-CW-08-E-00	HFD711100	2023950012	130485854	6/8/2015	150.00
131466207	CT2-350E-CW-08-E-00	HFD711100	2023950012	130485854	6/8/2015	150.00
131466208	CT2-350E-CW-08-E-00	HFD711100	2023950012	130485854	6/8/2015	150.00
131466209	CT2-350E-CW-08-E-00	HFD711100	2023950012	130485854	6/8/2015	150.00
131466210	CT2-350E-CW-08-E-00	HFD711100	2023950012	130485854	6/8/2015	150.00
131466211	CT2-350E-CW-08-E-00	HFD711100	2023950021	130485854	6/8/2015	150.00
131466212	CT2-350E-CW-08-E-00	HFD711100	2023950021	130485854	6/8/2015	150.00
131466213	CT2-350E-CW-08-E-00	HFD711100	2023950021	130485857	6/8/2015	150.00
131466214	CT2-350E-CW-08-E-00	HFD711100	2023950021	130485857	6/8/2015	150.00
131466215	CT2-350E-CW-08-E-00	HFD711100	2023950021	130485857	6/8/2015	150.00
131466216	CT2-350E-CW-08-E-00	HFD711100	2023950021	130485857	6/8/2015	150.00
131466217	CT2-350E-CW-08-E-00	HFD711100	2023950222	130485857	6/8/2015	150.00
131466218	CT2-350E-CW-08-E-00	HFD711100	2023950222	130485857	6/8/2015	150.00
131466219	CT2-350E-CW-08-E-00	HFD711100	2023950222	130485857	6/8/2015	150.00
131466220	CT2-350E-CW-08-E-00	HFD711100	2023950222	130485857	6/8/2015	150.00
131466221	CT2-350E-CW-08-E-00	HFD711100	2023950022	130485857	6/8/2015	150.00
131466222	CT2-350E-CW-08-E-00	HFD711100	2023950022	130485857	6/8/2015	150.00
131466223	CT2-350E-CW-08-E-00	HFD711100	2023950022	130485862	6/8/2015	150.00
131466224	CT2-350E-CW-08-E-00	HFD711100	2023950022	130485862	6/8/2015	150.00

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131466225	CT2-350E-CW-08-E-00	HFD711100	2023950022	130485862	6/8/2015	150.00
131466226	CT2-350E-CW-08-E-00	HFD711100	2023950022	130485862	6/8/2015	150.00
131466227	CT2-350E-CW-08-E-00	HFD711100	2023950218	130485862	6/8/2015	150.00
131466228	CT2-350E-CW-08-E-00	HFD711100	2023950218	130485862	6/8/2015	150.00
131466229	CT2-350E-CW-08-E-00	HFD711100	2023950218	130485862	6/8/2015	150.00
131466230	CT2-350E-CW-08-E-00	HFD711100	2023950218	130485862	6/8/2015	150.00
131466231	CT2-350E-CW-08-E-00	HFD711100	2023950218	130485862	6/8/2015	150.00
131466232	CT2-350E-CW-08-E-00	HFD711100	2023950218	130485874	6/8/2015	150.00
131466233	CT2-350E-CW-08-E-00	HFD711100	2023950005	130485874	6/8/2015	150.00
131466234	CT2-350E-CW-08-E-00	HFD711100	2023950005	130485874	6/8/2015	150.00
131466235	CT2-350E-CW-08-E-00	HFD711100	2023950005	130485874	6/8/2015	150.00
131466236	CT2-350E-CW-08-E-00	HFD711100	2023950005	130485874	6/8/2015	150.00
131466237	CT2-350E-CW-08-E-00	HFD711100	2023950005	130485874	6/8/2015	150.00
131466238	CT2-350E-CW-08-E-00	HFD711100	2023950221	130485874	6/8/2015	150.00
131466239	CT2-350E-CW-08-E-00	HFD711100	2023950221	130485874	6/8/2015	150.00
131466240	CT2-350E-CW-08-E-00	HFD711100	2023950221	130485874	6/8/2015	150.00
131466241	CT2-350E-CW-08-E-00	HFD711100	2023950221	130485859	6/8/2015	150.00
131466242	CT2-350E-CW-08-E-00	HFD711100	2023950221	130485859	6/8/2015	150.00
131466243	CT2-350E-CW-08-E-00	HFD711100	2023950215	130485859	6/8/2015	150.00
131466244	CT2-350E-CW-08-E-00	HFD711100	2023950215	130485859	6/8/2015	150.00
131466245	CT2-350E-CW-08-E-00	HFD711100	2023950215	130485859	6/9/2015	150.00
131466248	CT2-350E-CW-08-E-00	HFD711100	2023950215	130485859	6/9/2015	150.00
131466249	CT2-350E-CW-08-E-00	HFD711100	2023950215	130485859	6/9/2015	150.00
131466250	CT2-350E-CW-08-E-00	HFD711100	2023950227	130485859	6/9/2015	150.00
131466251	CT2-350E-CW-08-E-00	HFD711100	2023950227	130485859	6/9/2015	150.00
131466252	CT2-350E-CW-08-E-00	HFD711100	2023950227	130485864	6/9/2015	150.00
131466253	CT2-350E-CW-08-E-00	HFD711100	2023950227	130485864	6/9/2015	150.00
131466254	CT2-350E-CW-08-E-00	HFD711100	2023950227	130485864	6/9/2015	150.00
131466255	CT2-350E-CW-08-E-00	HFD711100	2023950227	130485864	6/9/2015	150.00
131466256	CT2-350E-CW-08-E-00	HFD711100	2023950011	130485864	6/9/2015	150.00
131466257	CT2-350E-CW-08-E-00	HFD711100	2023950011	130485864	6/9/2015	150.00
131466258	CT2-350E-CW-08-E-00	HFD711100	2023950011	130485864	6/9/2015	150.00
131466259	CT2-350E-CW-08-E-00	HFD711100	2023950011	130485864	6/9/2015	150.00
131466260	CT2-350E-CW-08-E-00	HFD711100	2023950011	130485864	6/9/2015	150.00
131466261	CT2-350E-CW-08-E-00	HFD711100	2023950011	130485869	6/9/2015	150.00
131466262	CT2-350E-CW-08-E-00	HFD711100	2023950010	130485869	6/9/2015	150.00
131466263	CT2-350E-CW-08-E-00	HFD711100	2023950010	130485869	6/9/2015	150.00
131466264	CT2-350E-CW-08-E-00	HFD711100	2023950010	130485869	6/9/2015	150.00
131466265	CT2-350E-CW-08-E-00	HFD711100	2023950010	130485869	6/9/2015	150.00
131466266	CT2-350E-CW-08-E-00	HFD711100	2023950010	130485869	6/9/2015	150.00
131466267	CT2-350E-CW-08-E-00	HFD711100	2023950010	130485869	6/9/2015	150.00
131466268	CT2-350E-CW-08-E-00	HFD711100	2023950008	130485869	6/9/2015	150.00
131466269	CT2-350E-CW-08-E-00	HFD711100	2023950008	130485869	6/9/2015	150.00

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131466270	CT2-350E-CW-08-E-00	HFD711100	2023950008	130485877	6/9/2015	150.00
131466271	CT2-350E-CW-08-E-00	HFD711100	2023950008	130485877	6/9/2015	150.00
131466272	CT2-350E-CW-08-E-00	HFD711100	2023950008	130485877	6/9/2015	150.00
131466273	CT2-350E-CW-08-E-00	HFD711100	2023950214	130485877	6/9/2015	150.00
131466274	CT2-350E-CW-08-E-00	HFD711100	2023950214	130485877	6/9/2015	150.00
131466275	CT2-350E-CW-08-E-00	HFD711100	2023950214	130485877	6/9/2015	150.00
131466276	CT2-350E-CW-08-E-00	HFD711100	2023950214	130485877	6/9/2015	140.00
131466277	CT2-350E-CW-08-E-00	HFD711100	2023950214	130485877	6/9/2015	150.00
131466278	CT2-350E-CW-08-E-00	HFD711100	2023950214	130485877	6/9/2015	150.00
131466279	CT2-350E-CW-08-E-00	HFD711100	2023950209	130485872	6/9/2015	150.00
131466280	CT2-350E-CW-08-E-00	HFD711100	2023950209	130485872	6/9/2015	150.00
131466281	CT2-350E-CW-08-E-00	HFD711100	2023950209	130485872	6/9/2015	150.00
131466282	CT2-350E-CW-08-E-00	HFD711100	2023950209	130485872	6/9/2015	150.00
131466283	CT2-350E-CW-08-E-00	HFD711100	2023950209	130485872	6/9/2015	150.00
131466284	CT2-350E-CW-08-E-00	HFD711100	2023950209	130485872	6/9/2015	150.00
131466285	CT2-350E-CW-08-E-00	HFD711100	2023950006	130485872	6/9/2015	150.00
131466286	CT2-350E-CW-08-E-00	HFD711100	2023950006	130485872	6/9/2015	150.00
131466287	CT2-350E-CW-08-E-00	HFD711100	2023950006	130485872	6/9/2015	150.00
131466288	CT2-350E-CW-08-E-00	HFD711100	2023950006	130485872	6/9/2015	150.00
131466289	CT2-350E-CW-08-E-00	HFD711100	2023950006	130485870	6/9/2015	150.00
131466290	CT2-350E-CW-08-E-00	HFD711100	2023950211	130485870	6/9/2015	150.00
131466291	CT2-350E-CW-08-E-00	HFD711100	2023950211	130485870	6/9/2015	150.00
131466292	CT2-350E-CW-08-E-00	HFD711100	2023950211	130485870	6/9/2015	150.00
131466294	CT2-350E-CW-08-E-00	HFD711100	2023950211	130485870	6/9/2015	150.00
131466295	CT2-350E-CW-08-E-00	HFD711100	2023950211	130485870	6/9/2015	150.00
131466296	CT2-350E-CW-08-E-00	HFD711100	2023950017	130485870	6/9/2015	150.00
131466297	CT2-350E-CW-08-E-00	HFD711100	2023950017	130485870	6/9/2015	150.00
131466298	CT2-350E-CW-08-E-00	HFD711100	2023950017	130485876	6/9/2015	150.00
131466299	CT2-350E-CW-08-E-00	HFD711100	2023950017	130485876	6/9/2015	150.00
131466300	CT2-350E-CW-08-E-00	HFD711100	2023950017	130485876	6/9/2015	150.00
131466301	CT2-350E-CW-08-E-00	HFD711100	2023950224	130485876	6/9/2015	150.00
131466302	CT2-350E-CW-08-E-00	HFD711100	2023950224	130485876	6/9/2015	150.00
131466303	CT2-350E-CW-08-E-00	HFD711100	2023950224	130485876	6/9/2015	150.00
131466304	CT2-350E-CW-08-E-00	HFD711100	2023950224	130485876	6/9/2015	150.00
131466305	CT2-350E-CW-08-E-00	HFD711100	2023950049	130485876	6/9/2015	150.00
131466306	CT2-350E-CW-08-E-00	HFD711100	2023950049	130485876	6/9/2015	150.00
131466307	CT2-350E-CW-08-E-00	HFD711100	2023950049	130485876	6/9/2015	150.00
131466308	CT2-350E-CW-08-E-00	HFD711100	2023950049	130485860	6/9/2015	150.00
131466309	CT2-350E-CW-08-E-00	HFD711100	2023950049	130485860	6/9/2015	150.00
131466310	CT2-350E-CW-08-E-00	HFD711100	2023950226	130485860	6/9/2015	150.00
131466311	CT2-350E-CW-08-E-00	HFD711100	2023950226	130485860	6/9/2015	150.00
131466312	CT2-350E-CW-08-E-00	HFD711100	2023950226	130485860	6/9/2015	150.00
131466313	CT2-350E-CW-08-E-00	HFD711100	2023950226	130485860	6/9/2015	150.00

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Serial number	Item Number	Resin Lot	Top	Bottom	Manufacturing date	Length
131466314	CT2-350E-CW-08-E-00	HFD711100	2023950031	130485860	6/9/2015	150.00
131466315	CT2-350E-CW-08-E-00	HFD711100	2023950031	130485860	6/9/2015	150.00
131466316	CT2-350E-CW-08-E-00	HFD711100	2023950031	130485860	6/9/2015	150.00
131466317	CT2-350E-CW-08-E-00	HFD711100	2023950031	130485860	6/9/2015	150.00
131466318	CT2-350E-CW-08-E-00	HFD711100	2023950031	130485873	6/9/2015	150.00
131466319	CT2-350E-CW-08-E-00	HFD711100	2023950045	130485873	6/9/2015	150.00
131466320	CT2-350E-CW-08-E-00	HFD711100	2023950045	130485873	6/9/2015	150.00
131466321	CT2-350E-CW-08-E-00	HFD711100	2023950045	130485873	6/9/2015	150.00
131466322	CT2-350E-CW-08-E-00	HFD711100	2023950045	130485873	6/9/2015	150.00
131466323	CT2-350E-CW-08-E-00	HFD711100	2023950045	130485873	6/9/2015	150.00
131466324	CT2-350E-CW-08-E-00	HFD711100	2023950045	130485873	6/9/2015	150.00
131466325	CT2-350E-CW-08-E-00	HFD711100	2023950024	130485873	6/9/2015	150.00
131466326	CT2-350E-CW-08-E-00	HFD711100	2023950024	130485873	6/9/2015	150.00
131466327	CT2-350E-CW-08-E-00	HFD711100	2023950024	130485843	6/9/2015	150.00
131466328	CT2-350E-CW-08-E-00	HFD711100	2023950024	130485843	6/9/2015	150.00
131466329	CT2-350E-CW-08-E-00	HFD711100	2023950024	130485843	6/9/2015	150.00
131466330	CT2-350E-CW-08-E-00	HFD711100	2023950213	130485843	6/9/2015	150.00
131466331	CT2-350E-CW-08-E-00	HFD711100	2023950213	130485843	6/9/2015	150.00
131466332	CT2-350E-CW-08-E-00	HFD711100	2023950213	130485843	6/9/2015	150.00
131466333	CT2-350E-CW-08-E-00	HFD711100	2023950213	130485843	6/10/2015	150.00
131466334	CT2-350E-CW-08-E-00	HFD711100	2023950213	130485843	6/10/2015	150.00
131466335	CT2-350E-CW-08-E-00	HFD711100	2023950201	130485843	6/10/2015	150.00
131466336	CT2-350E-CW-08-E-00	HFD711100	2023950201	130485858	6/10/2015	150.00
131466337	CT2-350E-CW-08-E-00	HFD711100	2023950201	130485858	6/10/2015	150.00
131466338	CT2-350E-CW-08-E-00	HFD711100	2023950201	130485858	6/10/2015	150.00
131466339	CT2-350E-CW-08-E-00	HFD711100	2023950201	130485858	6/10/2015	150.00
131466340	CT2-350E-CW-08-E-00	HFD711100	2023950201	130485858	6/10/2015	150.00

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Sales Order No.	Customer Name	Project Location	Product Name	BOL Number
SO−076037	Chesapeake Containment Systems, Inc.	Moncure NC US	CT2−350E−CW−08−E−00	

Roll Number	Geonet Thickness ASTM D5199 (mils)	Tensile Strength ASTM D7179 (ppi)	Density ASTM D1505 (g/cc)	Carbon Black Content ASTM D4218 (%)	Ply Adhesion Average ASTM D7005 (ppi) Side A	Ply Adhesion Average ASTM D7005 (ppi) Side B
131465563	355	117	0.961	2.5	1.8	1.3
131465564	354	87	0.967	2.3	0.8	2.3
131465565	354	87	0.967	2.3	1.2	2.6
131465570	354	87	0.967	2.3	1.0	1.9
131465571	354	87	0.967	2.3	3.7	1.1
131465572	354	87	0.967	2.3	1.3	3.7
131465573	354	87	0.967	2.3	1.1	3.8
131465574	354	87	0.967	2.3	1.3	3.7
131465575	354	87	0.967	2.3	1.0	3.7
131465577	354	87	0.967	2.3	1.2	3.9
131465578	354	87	0.967	2.3	1.5	4.4
131465579	363	100	0.959	2.6	1.3	2.8
131465966	347	131	0.967	2.6	1.2	3.5
131465967	348	125	0.962	2.5	1.5	3.7
131465968	348	125	0.962	2.5	1.5	3.7
131465969	348	125	0.962	2.5	1.5	3.7
131465970	348	125	0.962	2.5	1.5	3.7
131465974	351	116	0.956	2.6	2.0	2.8
131465975	350	128	0.965	2.6	1.5	1.5
131465976	350	128	0.965	2.6	1.5	1.5
131465981	350	128	0.965	2.6	1.5	1.5
131465982	350	128	0.965	2.6	1.5	1.5
131465983	350	128	0.965	2.6	1.5	1.5
131465984	350	128	0.965	2.6	1.5	1.5
131465985	350	128	0.965	2.6	1.5	1.5
131465986	350	128	0.965	2.6	1.5	1.5
131465987	350	128	0.965	2.6	1.5	1.5
131465988	350	128	0.965	2.6	1.5	1.5
131465989	350	128	0.965	2.6	1.5	1.5
131465990	350	128	0.965	2.6	1.5	1.5
131465991	350	128	0.965	2.6	1.5	1.5
131465992	350	128	0.965	2.6	1.5	1.5
131465993	350	128	0.965	2.6	1.5	1.5
131465994	350	128	0.965	2.6	1.5	1.5

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Sales Order No.	Customer Name	Project Location	Product Name	BOL Number
SO−076037	Chesapeake Containment Systems, Inc.	Moncure NC US	CT2−350E−CW−08−E−00	

Roll Number	Geonet Thickness ASTM D5199 (mils)	Tensile Strength ASTM D7179 (ppi)	Density ASTM D1505 (g/cc)	Carbon Black Content ASTM D4218 (%)	Ply Adhesion Average ASTM D7005 (ppi) Side A	Ply Adhesion Average ASTM D7005 (ppi) Side B
131465995	356	141	0.962	2.8	1.6	1.9
131465996	356	141	0.962	2.8	1.6	1.9
131465997	356	141	0.962	2.8	1.6	1.9
131465998	356	141	0.962	2.8	1.6	1.9
131465999	356	141	0.962	2.8	1.6	1.9
131466000	356	141	0.962	2.8	1.6	1.9
131466001	356	141	0.962	2.8	1.6	1.9
131466002	356	141	0.962	2.8	1.6	1.9
131466003	356	141	0.962	2.8	1.6	1.9
131466004	356	141	0.962	2.8	1.6	1.9
131466005	356	141	0.962	2.8	1.6	1.9
131466006	356	141	0.962	2.8	1.6	1.9
131466007	356	141	0.962	2.8	1.6	1.9
131466008	356	141	0.962	2.8	1.6	1.9
131466009	356	141	0.962	2.8	1.6	1.9
131466010	356	141	0.962	2.8	1.6	1.9
131466011	356	141	0.962	2.8	1.6	1.9
131466012	356	141	0.962	2.8	1.6	1.9
131466013	356	141	0.962	2.8	1.6	1.9
131466014	356	141	0.962	2.8	1.6	1.9
131466015	349	142	0.962	2.7	2.1	2.3
131466017	349	142	0.962	2.7	2.1	2.3
131466018	349	142	0.962	2.7	2.1	2.3
131466019	349	142	0.962	2.7	2.1	2.3
131466020	349	142	0.962	2.7	2.1	2.3
131466021	349	142	0.962	2.7	2.1	2.3
131466022	349	142	0.962	2.7	2.1	2.3
131466023	349	142	0.962	2.7	2.1	2.3
131466024	349	142	0.962	2.7	2.1	2.3
131466025	349	142	0.962	2.7	2.1	2.3
131466026	349	142	0.962	2.7	2.1	2.3
131466027	349	142	0.962	2.7	2.1	2.3
131466028	349	142	0.962	2.7	2.1	2.3
131466029	349	142	0.962	2.7	2.1	2.3

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Sales Order No.	Customer Name	Project Location	Product Name	BOL Number
SO−076037	Chesapeake Containment Systems, Inc.	Moncure NC US	CT2−350E−CW−08−E−00	

Roll Number	Geonet Thickness ASTM D5199 (mils)	Tensile Strength ASTM D7179 (ppi)	Density ASTM D1505 (g/cc)	Carbon Black Content ASTM D4218 (%)	Ply Adhesion Average ASTM D7005 (ppi) Side A	Ply Adhesion Average ASTM D7005 (ppi) Side B
131466030	349	142	0.962	2.7	2.1	2.3
131466031	349	142	0.962	2.7	2.1	2.3
131466032	349	142	0.962	2.7	2.1	2.3
131466033	349	142	0.962	2.7	2.1	2.3
131466034	349	142	0.962	2.7	2.1	2.3
131466035	349	142	0.962	2.7	2.1	2.3
131466036	349	142	0.962	2.7	2.1	2.3
131466037	349	154	0.962	2.6	1.4	1.5
131466038	349	154	0.962	2.6	1.4	1.5
131466039	349	154	0.962	2.6	1.4	1.5
131466040	349	154	0.962	2.6	1.4	1.5
131466041	349	154	0.962	2.6	1.4	1.5
131466042	349	154	0.962	2.6	1.4	1.5
131466043	349	154	0.962	2.6	1.4	1.5
131466044	349	154	0.962	2.6	1.4	1.5
131466045	349	154	0.962	2.6	1.4	1.5
131466046	349	154	0.962	2.6	1.4	1.5
131466047	349	154	0.962	2.6	1.4	1.5
131466048	349	154	0.962	2.6	1.4	1.5
131466049	349	154	0.962	2.6	1.4	1.5
131466050	349	154	0.962	2.6	1.4	1.5
131466051	349	154	0.962	2.6	1.4	1.5
131466052	349	154	0.962	2.6	1.4	1.5
131466053	349	154	0.962	2.6	1.4	1.5
131466054	349	154	0.962	2.6	1.4	1.5
131466055	349	154	0.962	2.6	1.4	1.5
131466056	349	154	0.962	2.6	1.4	1.5
131466057	349	154	0.962	2.6	1.4	1.5
131466058	349	154	0.962	2.6	1.4	1.5
131466059	360	146	0.951	2.6	2.0	3.2
131466060	360	146	0.951	2.6	2.0	3.2
131466061	360	146	0.951	2.6	2.0	3.2
131466062	360	146	0.951	2.6	2.0	3.2
131466063	360	146	0.951	2.6	2.0	3.2

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SO−076037	Chesapeake Containment Systems, Inc.	Moncure NC US	CT2−350E−CW−08−E−00	

Roll Number	Geonet Thickness ASTM D5199 (mils)	Tensile Strength ASTM D7179 (ppi)	Density ASTM D1505 (g/cc)	Carbon Black Content ASTM D4218 (%)	Ply Adhesion Average ASTM D7005 (ppi) Side A	Ply Adhesion Average ASTM D7005 (ppi) Side B
131466064	360	146	0.951	2.6	2.0	3.2
131466065	360	146	0.951	2.6	2.0	3.2
131466066	360	146	0.951	2.6	2.0	3.2
131466067	360	146	0.951	2.6	2.0	3.2
131466068	360	146	0.951	2.6	2.0	3.2
131466069	360	146	0.951	2.6	2.0	3.2
131466072	360	146	0.951	2.6	2.0	3.2
131466073	360	146	0.951	2.6	2.0	3.2
131466074	360	146	0.951	2.6	2.0	3.2
131466075	360	146	0.951	2.6	2.0	3.2
131466076	360	146	0.951	2.6	2.0	3.2
131466077	360	146	0.951	2.6	2.0	3.2
131466078	360	146	0.951	2.6	2.0	3.2
131466079	360	146	0.951	2.6	2.0	3.2
131466080	360	146	0.951	2.6	2.0	3.2
131466081	352	136	0.964	2.6	1.4	1.7
131466082	352	136	0.964	2.6	1.4	1.7
131466083	352	136	0.964	2.6	1.4	1.7
131466084	352	136	0.964	2.6	1.4	1.7
131466085	352	136	0.964	2.6	1.4	1.7
131466086	352	136	0.964	2.6	1.4	1.7
131466087	352	136	0.964	2.6	1.4	1.7
131466088	352	136	0.964	2.6	1.4	1.7
131466089	352	136	0.964	2.6	1.4	1.7
131466090	352	136	0.964	2.6	1.4	1.7
131466091	352	136	0.964	2.6	1.4	1.7
131466092	352	136	0.964	2.6	1.4	1.7
131466093	352	136	0.964	2.6	1.4	1.7
131466094	352	136	0.964	2.6	1.4	1.7
131466095	352	136	0.964	2.6	1.4	1.7
131466096	352	136	0.964	2.6	1.4	1.7
131466097	352	136	0.964	2.6	1.4	1.7
131466098	352	136	0.964	2.6	1.4	1.7
131466099	352	136	0.964	2.6	1.4	1.7

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Sales Order No.	Customer Name	Project Location	Product Name	BOL Number
SO−076037	Chesapeake Containment Systems, Inc.	Moncure NC US	CT2−350E−CW−08−E−00	

Roll Number	Geonet Thickness ASTM D5199 (mils)	Tensile Strength ASTM D7179 (ppi)	Density ASTM D1505 (g/cc)	Carbon Black Content ASTM D4218 (%)	Ply Adhesion Average ASTM D7005 (ppi) Side A	Ply Adhesion Average ASTM D7005 (ppi) Side B
131466100	352	136	0.964	2.6	1.4	1.7
131466101	352	136	0.964	2.6	1.4	1.7
131466102	352	136	0.964	2.6	1.4	1.7
131466103	350	140	0.957	2.7	1.2	2.5
131466104	350	140	0.957	2.7	1.2	2.5
131466105	350	140	0.957	2.7	1.2	2.5
131466106	350	140	0.957	2.7	1.2	2.5
131466107	350	140	0.957	2.7	1.2	2.5
131466109	350	140	0.957	2.7	1.2	2.5
131466110	350	140	0.957	2.7	1.2	2.5
131466111	350	140	0.957	2.7	1.2	2.5
131466112	350	140	0.957	2.7	1.2	2.5
131466113	350	140	0.957	2.7	1.2	2.5
131466114	350	140	0.957	2.7	1.2	2.5
131466115	350	140	0.957	2.7	1.2	2.5
131466116	350	140	0.957	2.7	1.2	2.5
131466117	350	140	0.957	2.7	1.2	2.5
131466118	350	140	0.957	2.7	1.2	2.5
131466119	350	140	0.957	2.7	1.2	2.5
131466120	350	140	0.957	2.7	1.2	2.5
131466121	350	140	0.957	2.7	1.2	2.5
131466122	350	140	0.957	2.7	1.2	2.5
131466123	350	140	0.957	2.7	1.2	2.5
131466124	350	140	0.957	2.7	1.2	2.5
131466125	349	123	0.956	2.8	1.2	1.8
131466126	349	123	0.956	2.8	1.2	1.8
131466127	349	123	0.956	2.8	1.2	1.8
131466128	349	123	0.956	2.8	1.2	1.8
131466129	349	123	0.956	2.8	1.2	1.8
131466130	349	123	0.956	2.8	1.2	1.8
131466131	349	123	0.956	2.8	1.2	1.8
131466132	349	123	0.956	2.8	1.2	1.8
131466133	349	123	0.956	2.8	1.2	1.8
131466134	349	123	0.956	2.8	1.2	1.8

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SO−076037	Chesapeake Containment Systems, Inc.	Moncure NC US	CT2−350E−CW−08−E−00	

Roll Number	Geonet Thickness ASTM D5199 (mils)	Tensile Strength ASTM D7179 (ppi)	Density ASTM D1505 (g/cc)	Carbon Black Content ASTM D4218 (%)	Ply Adhesion Average ASTM D7005 (ppi) Side A	Ply Adhesion Average ASTM D7005 (ppi) Side B
131466135	349	123	0.956	2.8	1.2	1.8
131466136	349	123	0.956	2.8	1.2	1.8
131466137	349	123	0.956	2.8	1.2	1.8
131466138	349	123	0.956	2.8	1.2	1.8
131466139	349	123	0.956	2.8	1.2	1.8
131466140	349	123	0.956	2.8	1.2	1.8
131466141	349	123	0.956	2.8	1.2	1.8
131466142	349	123	0.956	2.8	1.2	1.8
131466143	349	123	0.956	2.8	1.2	1.8
131466144	349	123	0.956	2.8	1.2	1.8
131466145	349	123	0.956	2.8	1.2	1.8
131466146	349	123	0.956	2.8	1.2	1.8
131466147	352	159	0.970	2.6	1.8	3.7
131466148	352	159	0.970	2.6	1.8	3.7
131466149	352	159	0.970	2.6	1.8	3.7
131466150	352	159	0.970	2.6	1.8	3.7
131466151	352	159	0.970	2.6	1.8	3.7
131466152	352	159	0.970	2.6	1.8	3.7
131466153	352	159	0.970	2.6	1.8	3.7
131466154	352	159	0.970	2.6	1.8	3.7
131466155	352	159	0.970	2.6	1.8	3.7
131466156	352	159	0.970	2.6	1.8	3.7
131466157	352	159	0.970	2.6	1.8	3.7
131466158	352	159	0.970	2.6	1.8	3.7
131466160	352	159	0.970	2.6	1.8	3.7
131466161	352	159	0.970	2.6	1.8	3.7
131466162	352	159	0.970	2.6	1.8	3.7
131466163	352	159	0.970	2.6	1.8	3.7
131466164	352	159	0.970	2.6	1.8	3.7
131466165	352	159	0.970	2.6	1.8	3.7
131466166	352	159	0.970	2.6	1.8	3.7
131466167	352	159	0.970	2.6	1.8	3.7
131466168	352	159	0.970	2.6	1.8	3.7
131466169	349	140	0.965	2.7	1.2	2.1

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Sales Order No.	Customer Name	Project Location	Product Name	BOL Number
SO−076037	Chesapeake Containment Systems, Inc.	Moncure NC US	CT2−350E−CW−08−E−00	

Roll Number	Geonet Thickness ASTM D5199 (mils)	Tensile Strength ASTM D7179 (ppi)	Density ASTM D1505 (g/cc)	Carbon Black Content ASTM D4218 (%)	Ply Adhesion Average ASTM D7005 (ppi) Side A	Ply Adhesion Average ASTM D7005 (ppi) Side B
131466170	349	140	0.965	2.7	1.2	2.1
131466171	349	140	0.965	2.7	1.2	2.1
131466172	349	140	0.965	2.7	1.2	2.1
131466173	349	140	0.965	2.7	1.2	2.1
131466174	349	140	0.965	2.7	1.2	2.1
131466175	349	140	0.965	2.7	1.2	2.1
131466176	349	140	0.965	2.7	1.2	2.1
131466177	349	140	0.965	2.7	1.2	2.1
131466178	349	140	0.965	2.7	1.2	2.1
131466179	349	140	0.965	2.7	1.2	2.1
131466180	349	140	0.965	2.7	1.2	2.1
131466181	349	140	0.965	2.7	1.2	2.1
131466182	349	140	0.965	2.7	1.2	2.1
131466183	349	140	0.965	2.7	1.2	2.1
131466184	349	140	0.965	2.7	1.2	2.1
131466185	349	140	0.965	2.7	1.2	2.1
131466186	349	140	0.965	2.7	1.2	2.1
131466187	349	140	0.965	2.7	1.2	2.1
131466188	349	140	0.965	2.7	1.2	2.1
131466189	349	140	0.965	2.7	1.2	2.1
131466190	349	140	0.965	2.7	1.2	2.1
131466191	349	136	0.961	2.8	1.8	2.4
131466192	349	136	0.961	2.8	1.8	2.4
131466193	349	136	0.961	2.8	1.8	2.4
131466195	349	136	0.961	2.8	1.8	2.4
131466196	349	136	0.961	2.8	1.8	2.4
131466197	349	136	0.961	2.8	1.8	2.4
131466198	349	136	0.961	2.8	1.8	2.4
131466199	349	136	0.961	2.8	1.8	2.4
131466200	349	136	0.961	2.8	1.8	2.4
131466201	349	136	0.961	2.8	1.8	2.4
131466202	349	136	0.961	2.8	1.8	2.4
131466203	349	136	0.961	2.8	1.8	2.4
131466204	349	136	0.961	2.8	1.8	2.4

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Sales Order No.	Customer Name	Project Location	Product Name	BOL Number
SO−076037	Chesapeake Containment Systems, Inc.	Moncure NC US	CT2−350E−CW−08−E−00	

Roll Number	Geonet Thickness ASTM D5199 (mils)	Tensile Strength ASTM D7179 (ppi)	Density ASTM D1505 (g/cc)	Carbon Black Content ASTM D4218 (%)	Ply Adhesion Average ASTM D7005 (ppi) Side A	Ply Adhesion Average ASTM D7005 (ppi) Side B
131466205	349	136	0.961	2.8	1.8	2.4
131466206	349	136	0.961	2.8	1.8	2.4
131466207	349	136	0.961	2.8	1.8	2.4
131466208	349	136	0.961	2.8	1.8	2.4
131466209	349	136	0.961	2.8	1.8	2.4
131466210	349	136	0.961	2.8	1.8	2.4
131466211	349	136	0.961	2.8	1.8	2.4
131466212	349	136	0.961	2.8	1.8	2.4
131466213	347	158	0.950	2.9	1.2	3.0
131466214	347	158	0.950	2.9	1.2	3.0
131466215	347	158	0.950	2.9	1.2	3.0
131466216	347	158	0.950	2.9	1.2	3.0
131466217	347	158	0.950	2.9	1.2	3.0
131466218	347	158	0.950	2.9	1.2	3.0
131466219	347	158	0.950	2.9	1.2	3.0
131466220	347	158	0.950	2.9	1.2	3.0
131466221	347	158	0.950	2.9	1.2	3.0
131466222	347	158	0.950	2.9	1.2	3.0
131466223	347	158	0.950	2.9	1.2	3.0
131466224	347	158	0.950	2.9	1.2	3.0
131466225	347	158	0.950	2.9	1.2	3.0
131466226	347	158	0.950	2.9	1.2	3.0
131466227	347	158	0.950	2.9	1.2	3.0
131466228	347	158	0.950	2.9	1.2	3.0
131466229	347	158	0.950	2.9	1.2	3.0
131466230	347	158	0.950	2.9	1.2	3.0
131466231	347	158	0.950	2.9	1.2	3.0
131466232	347	158	0.950	2.9	1.2	3.0
131466233	347	158	0.950	2.9	1.2	3.0
131466234	347	158	0.950	2.9	1.2	3.0
131466235	348	145	0.954	2.8	1.6	4.8
131466236	348	145	0.954	2.8	1.6	4.8
131466237	348	145	0.954	2.8	1.6	4.8
131466238	348	145	0.954	2.8	1.6	4.8

GSE Environmental, LLC

ROLL TEST DATA REPORT

GSE QC APPROVED

Report Date: Jun/15/2015

Sales Order No.	Customer Name	Project Location	Product Name	BOL Number
SO−076037	Chesapeake Containment Systems, Inc.	Moncure NC US	CT2−350E−CW−08−E−00	

Roll Number	Geonet Thickness ASTM D5199 (mils)	Tensile Strength ASTM D7179 (ppi)	Density ASTM D1505 (g/cc)	Carbon Black Content ASTM D4218 (%)	Ply Adhesion Average ASTM D7005 (ppi) Side A	Ply Adhesion Average ASTM D7005 (ppi) Side B
131466239	348	145	0.954	2.8	1.6	4.8
131466240	348	145	0.954	2.8	1.6	4.8
131466241	348	145	0.954	2.8	1.6	4.8
131466242	348	145	0.954	2.8	1.6	4.8
131466243	348	145	0.954	2.8	1.6	4.8
131466244	348	145	0.954	2.8	1.6	4.8
131466245	348	145	0.954	2.8	1.6	4.8
131466248	348	145	0.954	2.8	1.6	4.8
131466249	348	145	0.954	2.8	1.6	4.8
131466250	348	145	0.954	2.8	1.6	4.8
131466251	348	145	0.954	2.8	1.6	4.8
131466252	348	145	0.954	2.8	1.6	4.8
131466253	348	145	0.954	2.8	1.6	4.8
131466254	348	145	0.954	2.8	1.6	4.8
131466255	348	145	0.954	2.8	1.6	4.8
131466256	348	145	0.954	2.8	1.6	4.8
131466257	349	139	0.965	2.5	1.1	2.7
131466258	349	139	0.965	2.5	1.1	2.7
131466259	349	139	0.965	2.5	1.1	2.7
131466260	349	139	0.965	2.5	1.1	2.7
131466261	349	139	0.965	2.5	1.1	2.7
131466262	349	139	0.965	2.5	1.1	2.7
131466263	349	139	0.965	2.5	1.1	2.7
131466264	349	139	0.965	2.5	1.1	2.7
131466265	349	139	0.965	2.5	1.1	2.7
131466266	349	139	0.965	2.5	1.1	2.7
131466267	349	139	0.965	2.5	1.1	2.7
131466268	349	139	0.965	2.5	1.1	2.7
131466269	349	139	0.965	2.5	1.1	2.7
131466270	349	139	0.965	2.5	1.1	2.7
131466271	349	139	0.965	2.5	1.1	2.7
131466272	349	139	0.965	2.5	1.1	2.7
131466273	349	139	0.965	2.5	1.1	2.7
131466274	349	139	0.965	2.5	1.1	2.7

GSE Environmental, LLC

ROLL TEST DATA REPORT

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Sales Order No.	Customer Name	Project Location	Product Name	BOL Number
SO−076037	Chesapeake Containment Systems, Inc.	Moncure NC US	CT2−350E−CW−08−E−00	

Roll Number	Geonet Thickness ASTM D5199 (mils)	Tensile Strength ASTM D7179 (ppi)	Density ASTM D1505 (g/cc)	Carbon Black Content ASTM D4218 (%)	Ply Adhesion Average ASTM D7005 (ppi) Side A	Ply Adhesion Average ASTM D7005 (ppi) Side B
131466275	349	139	0.965	2.5	1.1	2.7
131466276	349	139	0.965	2.5	1.1	2.7
131466277	349	139	0.965	2.5	1.1	2.7
131466278	349	139	0.965	2.5	1.1	2.7
131466279	353	117	0.966	2.7	2.6	4.0
131466280	353	117	0.966	2.7	2.6	4.0
131466281	353	117	0.966	2.7	2.6	4.0
131466282	353	117	0.966	2.7	2.6	4.0
131466283	353	117	0.966	2.7	2.6	4.0
131466284	353	117	0.966	2.7	2.6	4.0
131466285	353	117	0.966	2.7	2.6	4.0
131466286	353	117	0.966	2.7	2.6	4.0
131466287	353	117	0.966	2.7	2.6	4.0
131466288	353	117	0.966	2.7	2.6	4.0
131466289	353	117	0.966	2.7	2.6	4.0
131466290	353	117	0.966	2.7	2.6	4.0
131466291	353	117	0.966	2.7	2.6	4.0
131466292	353	117	0.966	2.7	2.6	4.0
131466294	353	117	0.966	2.7	2.6	4.0
131466295	353	117	0.966	2.7	2.6	4.0
131466296	353	117	0.966	2.7	2.6	4.0
131466297	353	117	0.966	2.7	2.6	4.0
131466298	353	117	0.966	2.7	2.6	4.0
131466299	353	117	0.966	2.7	2.6	4.0
131466300	353	117	0.966	2.7	2.6	4.0
131466301	350	137	0.965	2.7	0.8	2.4
131466302	350	137	0.965	2.7	0.8	2.4
131466303	350	137	0.965	2.7	0.8	2.4
131466304	350	137	0.965	2.7	0.8	2.4
131466305	350	137	0.965	2.7	0.8	2.4
131466306	350	137	0.965	2.7	0.8	2.4
131466307	350	137	0.965	2.7	0.8	2.4
131466308	350	137	0.965	2.7	0.8	2.4
131466309	350	137	0.965	2.7	0.8	2.4

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Sales Order No.	Customer Name	Project Location	Product Name	BOL Number
SO−076037	Chesapeake Containment Systems, Inc.	Moncure NC US	CT2−350E−CW−08−E−00	

Roll Number	Geonet Thickness ASTM D5199 (mils)	Tensile Strength ASTM D7179 (ppi)	Density ASTM D1505 (g/cc)	Carbon Black Content ASTM D4218 (%)	Ply Adhesion Average ASTM D7005 (ppi) Side A	Ply Adhesion Average ASTM D7005 (ppi) Side B
131466310	350	137	0.965	2.7	0.8	2.4
131466311	350	137	0.965	2.7	0.8	2.4
131466312	350	137	0.965	2.7	0.8	2.4
131466313	350	137	0.965	2.7	0.8	2.4
131466314	350	137	0.965	2.7	0.8	2.4
131466315	350	137	0.965	2.7	0.8	2.4
131466316	350	137	0.965	2.7	0.8	2.4
131466317	350	137	0.965	2.7	0.8	2.4
131466318	350	137	0.965	2.7	0.8	2.4
131466319	350	137	0.965	2.7	0.8	2.4
131466320	350	137	0.965	2.7	0.8	2.4
131466321	350	137	0.965	2.7	0.8	2.4
131466322	350	137	0.965	2.7	0.8	2.4
131466323	358	120	0.961	2.5	2.9	1.0
131466324	358	120	0.961	2.5	2.9	1.0
131466325	358	120	0.961	2.5	2.9	1.0
131466326	358	120	0.961	2.5	2.9	1.0
131466327	358	120	0.961	2.5	2.9	1.0
131466328	358	120	0.961	2.5	2.9	1.0
131466329	358	120	0.961	2.5	2.9	1.0
131466330	358	120	0.961	2.5	2.9	1.0
131466331	358	120	0.961	2.5	2.9	1.0
131466332	358	120	0.961	2.5	2.9	1.0
131466333	358	120	0.961	2.5	2.9	1.0
131466334	358	120	0.961	2.5	2.9	1.0
131466335	358	120	0.961	2.5	2.9	1.0
131466336	358	120	0.961	2.5	2.9	1.0
131466337	358	120	0.961	2.5	2.9	1.0
131466338	358	120	0.961	2.5	2.9	1.0
131466339	358	120	0.961	2.5	2.9	1.0

GSE Environmental, LLC

ROLL TEST DATA REPORT

GSE QC APPROVED

Report Date: Jun/15/2015

Sales Order No.	Customer Name	Project Location	Product Name	BOL Number
SO−076037	Chesapeake Containment Systems, Inc.	Moncure NC US	CT2−350E−CW−08−E−00	

Roll Number	Geonet Thickness ASTM D5199 (mils)	Tensile Strength ASTM D7179 (ppi)	Density ASTM D1505 (g/cc)	Carbon Black Content ASTM D4218 (%)	Ply Adhesion Average ASTM D7005 (ppi) Side A	Ply Adhesion Average ASTM D7005 (ppi) Side B
131466340	358	120	0.961	2.5	2.9	1.0

Laboratory Manager _____

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ROLL TEST DATA REPORT

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Report Date: Jun/16/2015

Sales Order No.	Customer Name	Project Location	Product Name	BOL Number
SO−076037	Chesapeake Containment Systems, Inc.	Moncure , NC US	FBR−080E−EBC−E−00	

Roll Number	Mass per Unit Area ASTM D5261 (oz/yd²)	ASTM D4491 Water Flow Rate (gpm/ft²)	ASTM D4491 Permittivity (sec−1)	ASTM D4751 AOS (mm)	ASTM D4632 Grab Strength (lbs) MD	ASTM D4632 Grab Strength (lbs) TD	ASTM D4632 Grab Elongation (%) MD	ASTM D4632 Grab Elongation (%) TD	ASTM D4533 Trapezoidal Tear (lbs) MD	ASTM D4533 Trapezoidal Tear (lbs) TD	Puncture Resistance ASTM D4833 (lbs)
130484943	9.0	107	1.40	0.180	271	312	98	118	123	154	142
130484947	8.3	107	1.40	0.180	244	268	116	109	101	130	134
130484948	8.3	107	1.40	0.180	244	268	116	109	101	130	134
130484949	8.5	107	1.40	0.180	233	270	95	112	119	162	149
130484950	8.5	107	1.40	0.180	233	270	95	112	119	162	149
130484951	8.5	107	1.40	0.180	233	270	95	112	119	162	149
130484953	9.1	107	1.40	0.180	250	300	102	116	99	156	166
130484955	9.1	107	1.40	0.180	250	300	102	116	99	156	166
130484958	9.0	107	1.40	0.180	230	288	101	129	151	181	163
130484960	9.0	107	1.40	0.180	230	288	101	129	151	181	163
130484961	8.2	107	1.40	0.180	243	256	104	117	98	102	144
130484962	8.2	107	1.40	0.180	243	256	104	117	98	102	144
130484963	8.2	107	1.40	0.180	243	256	104	117	98	102	144
130484965	9.2	108	1.40	0.180	244	301	104	116	102	124	171
130484968	9.2	108	1.40	0.180	244	301	104	116	102	124	171
130484969	8.1	108	1.40	0.180	231	274	90	125	105	139	141
130484970	8.1	108	1.40	0.180	231	274	90	125	105	139	141
130484971	8.1	108	1.40	0.180	231	274	90	125	105	139	141
130484973	9.0	108	1.40	0.180	225	297	99	112	95	99	145
130484974	9.0	108	1.40	0.180	225	297	99	112	95	99	145
130484975	9.0	108	1.40	0.180	225	297	99	112	95	99	145
130484976	9.0	108	1.40	0.180	225	297	99	112	95	99	145
130484979	9.5	108	1.40	0.180	240	295	105	114	93	107	147
130484989	8.3	118	1.60	0.180	238	305	105	112	119	170	141
130484999	8.8	118	1.60	0.180	254	272	99	104	98	160	156
130485842	8.3	102	1.40	0.180	266	293	92	104	115	125	140
130485843	8.2	102	1.40	0.180	251	280	85	113	107	110	146
130485854	8.4	109	1.50	0.180	251	277	97	112	110	121	151
130485855	8.5	109	1.50	0.180	268	267	92	103	116	128	132
130485857	8.5	109	1.50	0.180	268	267	92	103	116	128	132
130485858	8.5	109	1.50	0.180	268	267	92	103	116	128	132
130485859	8.3	109	1.50	0.180	269	244	89	122	122	123	153
130485860	8.3	109	1.50	0.180	269	244	89	122	122	123	153
130485862	8.3	109	1.50	0.180	269	244	89	122	122	123	153

GSE Environmental, LLC

ROLL TEST DATA REPORT

GSE QC APPROVED

Report Date: Jun/16/2015

Sales Order No.	Customer Name	Project Location	Product Name	BOL Number
SO−076037	Chesapeake Containment Systems, Inc.	Moncure , NC US	FBR−080E−EBC−E−00	

Roll Number	Mass per Unit Area ASTM D5261 (oz/yd²)	ASTM D4491 Water Flow Rate (gpm/ft²)	ASTM D4491 Permittivity (sec−1)	ASTM D4751 AOS (mm)	ASTM D4632 Grab Strength (lbs) MD	ASTM D4632 Grab Strength (lbs) TD	ASTM D4632 Grab Elongation (%) MD	ASTM D4632 Grab Elongation (%) TD	ASTM D4533 Trapezoidal Tear (lbs) MD	ASTM D4533 Trapezoidal Tear (lbs) TD	Puncture Resistance ASTM D4833 (lbs)
130485864	8.7	109	1.50	0.180	275	289	74	106	127	166	139
130485869	8.8	109	1.50	0.180	280	271	92	110	102	136	161
130485870	8.8	109	1.50	0.180	280	271	92	110	102	136	161
130485872	9.3	109	1.50	0.180	306	293	91	106	143	164	170
130485873	9.3	109	1.50	0.180	306	293	91	106	143	164	170
130485874	9.3	109	1.50	0.180	306	293	91	106	143	164	170
130485876	9.8	95	1.30	0.180	321	332	87	109	139	160	177
130485877	9.8	95	1.30	0.180	321	332	87	109	139	160	177

Laboratory Manager _____

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Propex

Dena Bledsoe

BOL: 80532958

Certificate of Analysis

HU#/Rolls Shipped	Style	Production Order	Mass/Unit Area	Thickness	Tensile		Elongation		Puncture	Burst	Trap Tear		AOS	Permittivity	Water Flow	CBR
					MD	XMD	MD	XMD			MD	XMD				
		Units	oz/yd²	mils	lbs	lbs	%	%	lbs	psi	lbs	lbs	Sieve	1/sec	gpm/ft²	lbs
		ASTM Test	D5261	D5199	D4632	D4632	D4632	D4632	D4833	D3786	D4533	D4533	D4751	D4491	D4491	D6241
2023950007	111CD	2286615	16.6	177	307	326	16	35	242	744	116	235	200.00	0.61	44.8	1127.94
2023950008	111CD	2286615	16.6	177	307	326	16	35	242	744	116	235	200.00	0.61	44.8	1127.94
2023950020	111CD	2286615	15.6	166	298	336	15	49	237	620	126	192	170.00	0.60	44.6	1096.69
2023950024	111CD	2286615	14.8	150	275	555	16	88	233	684	107	204	200.00	0.58	43.0	1058.68
2023950026	111CD	2286615	15.1	158	293	421	16	60	233	684	111	220	200.00	0.58	43.0	1058.68
2023950027	111CD	2286615	15.1	158	293	421	16	60	233	684	111	220	200.00	0.58	43.0	1058.68
2023950029	111CD	2286615	15.8	156	281	536	15	76	245	673	104	223	200.00	0.58	42.6	1063.09
2023950030	111CD	2286615	15.8	156	281	536	15	76	245	673	104	223	200.00	0.58	42.6	1063.09
2023950032	111CD	2286615	15.8	164	293	354	15	43	245	673	109	214	200.00	0.58	42.6	1063.09
2023950034	111CD	2286615	15.7	177	274	442	13	62	218	681	107	225	170.00	0.64	47.1	1017.34
2023950035	111CD	2286615	15.7	177	274	442	13	62	218	681	107	225	170.00	0.64	47.1	1017.34
2023950036	111CD	2286615	15.7	177	274	442	13	62	218	681	107	225	170.00	0.64	47.1	1017.34
2023950037	111CD	2286615	16.2	158	272	334	14	42	218	681	105	228	170.00	0.64	47.1	1017.34
2023950040	111CD	2286615	16.3	167	307	555	16	80	235	651	111	230	170.00	0.58	42.8	1161.23
2023950042	111CD	2286615	16.3	167	307	555	16	80	235	651	111	230	170.00	0.58	42.8	1161.23
2023950049	111CD	2286615	17.9	199	317	589	19	80	262	771	139	272	170.00	0.80	58.8	1179.81
2023950201	111CD	2286615	17.9	199	317	589	19	80	262	771	139	272	170.00	0.80	58.8	1179.81
2023950220	111CD	2286615	17.5	168	308	455	17	49	264	721	121	211	170.00	0.47	35.0	1199.03

1. Data listed above was determined in accordance with standard test methods, frequencies and procedures defined internally by plant and product type.

2. Rolls tested on this shipment are identified with an asterisk(*).

3. HU# is handling unit and is terminology for roll number and "production order" equates to lot number. Our enterprise resource planning system generates sequential handling unit and production order designations independent of the manufacturing facility producing the product. Therefore, handling unit numbers may not be in sequential order within a production order.

Propex Inc., 6025 Lee Hwy, Suite 425, PO Box 22788, Chattanooga, TN 37422

Propex

Gene Bledsoe

BOL: 80532959

Certificate of Analysis

HU#/Rolls Shipped	Style	Production Order	Mass/Unit Area	Thickness	Tensile		Elongation		Puncture	Burst	Trap Tear		AOS	Permittivity	Water Flow	CBR
					MD	XMD	MD	XMD			MD	XMD				
		Units	oz/yd²	mils	lbs	lbs	%	%	lbs	psi	lbs	lbs	Sieve	1/sec	gpm/ft²	lbs
		ASTM Test	D5261	D5199	D4632	D4632	D4632	D4632	D4833	D3786	D4533	D4533	D4751	D4491	D4491	D6241
2023950006	111CD	2286615	16.3	167	289	247	15	21	242	744	109	217	200.00	0.61	44.8	1127.94
2023950010	111CD	2286615	16.2	166	298	480	15	65	235	705	104	214	170.00	0.61	45.3	1131.81
2023950011	111CD	2286615	16.2	166	298	480	15	65	235	705	104	214	170.00	0.61	45.3	1131.81
2023950012	111CD	2286615	16.2	166	298	480	15	65	235	705	104	214	170.00	0.61	45.3	1131.81
2023950013	111CD	2286615	16.0	172	299	447	16	62	235	705	113	214	170.00	0.61	45.3	1131.81
2023950014	111CD	2286615	16.0	172	299	447	16	62	235	705	113	214	170.00	0.61	45.3	1131.81
2023950015	111CD	2286615	16.0	172	299	447	16	62	235	705	113	214	170.00	0.61	45.3	1131.81
2023950016	111CD	2286615	15.6	156	298	352	15	41	237	620	110	205	170.00	0.60	44.6	1096.69
2023950021	111CD	2286615	15.6	166	298	336	15	49	237	620	126	192	170.00	0.60	44.6	1096.69
2023950022	111CD	2286615	14.8	150	275	555	16	88	233	684	107	204	200.00	0.58	43.0	1058.68
2023950031	111CD	2286615	15.8	164	293	354	15	43	245	673	109	214	200.00	0.58	42.6	1063.09
2023950033	111CD	2286615	15.8	164	293	354	15	43	245	673	109	214	200.00	0.58	42.6	1063.09
2023950041	111CD	2286615	16.3	167	307	555	16	80	235	651	111	230	170.00	0.58	42.8	1161.23
2023950044	111CD	2286615	16.0	156	273	588	15	80	235	651	105	216	170.00	0.58	42.8	1161.23
2023950045	111CD	2286615	16.0	156	273	588	15	80	235	651	105	216	170.00	0.58	42.8	1161.23
2023950202	111CD	2286615	18.4	198	314	353	16	38	284	871	128	286	170.00	0.58	43.0	1251.11
2023950226	111CD	2286615	16.6	171	282	479	16	67	256	761	101	256	200.00	0.70	51.9	1133.74
2023950227	111CD	2286615	16.6	171	282	479	16	67	256	761	101	256	200.00	0.70	51.9	1133.74

1. Data listed above was determined in accordance with standard test methods, frequencies and procedures defined internally by plant and product type.

2. Rolls tested on this shipment are identified with an asterisk(*).

3. HU# is handling unit and is terminology for roll number and "production order" equates to lot number. Our enterprise resource planning system generates sequential handling unit and production order designations independent of the manufacturing facility producing the product. Therefore, handling unit numbers may not be in sequential order within a production order.

Propex Inc., 6025 Lee Hwy, Suite 425, PO Box 22788, Chattanooga, TN 37422

Propex

Gene Bledsoe

BOL: 80532936

Certificate of Analysis

HU#/Rolls Shipped	Style	Production Order	Mass/Unit Area	Thickness	Tensile		Elongation		Puncture	Burst	Trap Tear		AOS	Permittivity	Water Flow	CBR
					MD	XMD	MD	XMD			MD	XMD				
		Units	oz/yd²	mils	lbs	lbs	%	%	lbs	psi	lbs	lbs	Sieve	1/sec	gpm/ft²	lbs
		ASTM Test	D5261	D5199	D4632	D4632	D4632	D4632	D4833	D3786	D4533	D4533	D4751	D4491	D4491	D6241
2023950005	111CD	2286615	16.3	167	289	247	15	21	242	744	109	217	200.00	0.61	44.8	1127.94
2023950206	111CD	2286615	17.4	171	317	483	16	62	284	871	121	274	170.00	0.58	43.0	1251.11
2023950209	111CD	2286615	16.7	171	296	470	17	58	252	850	114	257	200.00	0.62	45.7	1209.88
2023950210	111CD	2286615	16.7	171	296	470	17	58	252	850	114	257	200.00	0.62	45.7	1209.88
2023950211	111CD	2286615	18.4	199	299	417	16	45	252	850	123	269	200.00	0.62	45.7	1209.88
2023950212	111CD	2286615	18.4	199	299	417	16	45	252	850	123	269	200.00	0.62	45.7	1209.88
2023950213	111CD	2286615	18.4	199	299	417	16	45	252	850	123	269	200.00	0.62	45.7	1209.88
2023950214	111CD	2286615	16.8	173	287	358	16	38	267	780	111	226	200.00	0.61	44.8	1181.74
2023950215	111CD	2286615	16.8	173	287	358	16	38	267	780	111	226	200.00	0.61	44.8	1181.74
2023950216	111CD	2286615	16.8	173	287	358	16	38	267	780	111	226	200.00	0.61	44.8	1181.74
2023950217	111CD	2286615	15.9	168	283	526	15	73	267	780	108	201	200.00	0.61	44.8	1181.74
2023950218	111CD	2286615	15.9	168	283	526	15	73	267	780	108	201	200.00	0.61	44.8	1181.74
2023950219	111CD	2286615	15.9	168	283	526	15	73	267	780	108	201	200.00	0.61	44.8	1181.74
2023950221	111CD	2286615	17.5	168	308	455	17	49	264	721	121	211	170.00	0.47	35.0	1199.03
2023950222	111CD	2286615	17.5	168	308	455	17	49	264	721	121	211	170.00	0.47	35.0	1199.03
2023950223	111CD	2286615	16.7	167	280	526	15	63	264	721	117	242	170.00	0.47	35.0	1199.03
2023950224	111CD	2286615	16.7	167	280	526	15	63	264	721	117	242	170.00	0.47	35.0	1199.03
2023950225	111CD	2286615	16.7	167	280	526	15	63	264	721	117	242	170.00	0.47	35.0	1199.03

1. Data listed above was determined in accordance with standard test methods, frequencies and procedures defined internally by plant and product type.

2. Rolls tested on this shipment are identified with an asterisk(*).

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Propex Inc., 6025 Lee Hwy, Suite 425, PO Box 22788, Chattanooga, TN 37422

Propex

Gene Bledsoe

BOL: 80532937

Certificate of Analysis

HU#/Rolls Shipped	Style	Production Order	Mass/Unit Area	Thickness	Tensile		Elongation		Puncture	Burst	Trap Tear		AOS	Permittivity	Water Flow	CBR
					MD	XMD	MD	XMD			MD	XMD				
		Units	oz/yd²	mils	lbs	lbs	%	%	lbs	psi	lbs	lbs	Sieve	1/sec	gpm/ft²	lbs
		ASTM Test	D5261	D5199	D4632	D4632	D4632	D4632	D4833	D3786	D4533	D4533	D4751	D4491	D4491	D6241
2023950038	111CD	2286615	16.2	158	272	334	14	42	218	681	105	228	170.00	0.64	47.1	1017.34
2023950039	111CD	2286615	16.2	158	272	334	14	42	218	681	105	228	170.00	0.64	47.1	1017.34
2023950043	111CD	2286615	16.0	156	273	588	15	80	235	651	105	216	170.00	0.58	42.8	1161.23
2023950046	111CD	2286615	18.3	188	295	646	16	84	262	771	115	254	170.00	0.80	58.8	1179.81
2023950047	111CD	2286615	18.3	188	295	646	16	84	262	771	115	254	170.00	0.80	58.8	1179.81
2023950048	111CD	2286615	18.3	188	295	646	16	84	262	771	115	254	170.00	0.80	58.8	1179.81
2023950200	111CD	2286615	17.9	199	317	589	19	80	262	771	139	272	170.00	0.80	58.8	1179.81
2023950203	111CD	2286615	18.4	198	314	353	16	38	284	871	128	286	170.00	0.58	43.0	1251.11
2023950204	111CD	2286615	18.4	198	314	353	16	38	284	871	128	286	170.00	0.58	43.0	1251.11
2023950205	111CD	2286615	17.4	171	317	483	16	62	284	871	121	274	170.00	0.58	43.0	1251.11
2023950207	111CD	2286615	17.4	171	317	483	16	62	284	871	121	274	170.00	0.58	43.0	1251.11
2023950208	111CD	2286615	16.7	171	296	470	17	58	252	850	114	257	200.00	0.62	45.7	1209.88

1. Data listed above was determined in accordance with standard test methods, frequencies and procedures defined internally by plant and product type.

2. Rolls tested on this shipment are identified with an asterisk(*).

3. HU# is handling unit and is terminology for roll number and "production order" equates to lot number. Our enterprise resource planning system generates sequential handling unit and production order designations independent of the manufacturing facility producing the product. Therefore, handling unit numbers may not be in sequential order within a production order.

Propex Inc., 6025 Lee Hwy, Suite 425, PO Box 22788, Chattanooga, TN 37422

Propex

Dena Bledsoe

BOL: 80533114

Certificate of Analysis

HU#/Rolls Shipped	Style	Production Order	Mass/Unit Area	Thickness	Tensile		Elongation		Puncture	Burst	Trap Tear		AOS	Permittivity	Water Flow	CBR
					MD	XMD	MD	XMD			MD	XMD				
		Units	oz/yd²	mils	lbs	lbs	%	%	lbs	psi	lbs	lbs	Sieve	1/sec	gpm/ft²	lbs
		ASTM Test	D5261	D5199	D4632	D4632	D4632	D4632	D4833	D3786	D4533	D4533	D4751	D4491	D4491	D6241
2023950009	111CD	2286615	16.6	177	307	326	16	35	242	744	116	235	200.00	0.61	44.8	1127.94
2023950017	111CD	2286615	15.6	156	298	352	15	41	237	620	110	205	170.00	0.60	44.6	1096.69
2023950018	111CD	2286615	15.6	156	298	352	15	41	237	620	110	205	170.00	0.60	44.6	1096.69
2023950019	111CD	2286615	15.6	166	298	336	15	49	237	620	126	192	170.00	0.60	44.6	1096.69
2023950023	111CD	2286615	14.8	150	275	555	16	88	233	684	107	204	200.00	0.58	43.0	1058.68
2023950025	111CD	2286615	15.1	158	293	421	16	60	233	684	111	220	200.00	0.58	43.0	1058.68
2023950028	111CD	2286615	15.8	156	281	536	15	76	245	673	104	223	200.00	0.58	42.6	1063.09

1. Data listed above was determined in accordance with standard test methods, frequencies and procedures defined internally by plant and product type.

2. Rolls tested on this shipment are identified with an asterisk(*).

3. HU# is handling unit and is terminology for roll number and "production order" equates to lot number. Our enterprise resource planning system generates sequential handling unit and production order designations independent of the manufacturing facility producing the product. Therefore, handling unit numbers may not be in sequential order within a production order.

Propex Inc., 6025 Lee Hwy, Suite 425, PO Box 22788, Chattanooga, TN 37422

CoA Date: 04/28/2015

Certificate of Analysis

Shipped To: GSE ENVIRONMENTAL, LLC
1245 EASTLAND AVE
KINGSTREE SC 29556
USA

Recipient: HARRELSON
Fax:

Delivery #: 89046901
PO #: 03-502630
Weight: 201850 LB
Ship Date: 04/28/2015
Package: BULK
Mode: Hopper Car
Car #: HCBX001406
Seal No: 20166

Product:
Marlex HHM 5502BN High Density Polyethylene Bulk

Lot Number: CFD611201

Property	Test Method	Value	Unit
Melt Index	ASTM D1238	0.35	g/10mi
Density	D1505 or D4883	0.9536	g/cm3

The data set forth herein have been carefully compiled by Chevron Phillips Chemical Company LP (CPChem). **However, there is no warranty of any kind, either expressed or implied, applicable to its use, and the user assumes all risk and liability in connection therewith.**

Kevin Ayres
Quality Control Supervisor

For CoA questions contact Customer Service Representative at +1-832-813-4806

CoA Date: 05/01/2015

Certificate of Analysis

Shipped To: GSE ENVIRONMENTAL, LLC
1245 EASTLAND AVE
KINGSTREE SC 29556
USA

Recipient: HARRELSON
Fax:

Delivery #: 89048374
PO #: 03-502904
Weight: 201700 LB
Ship Date: 05/01/2015
Package: BULK
Mode: Hopper Car
Car #: NAHX610207
Seal No: 25912

Product:
Marlex® HHM 5502BN High Density Polyethylene Bulk

Lot Number: HFD711100

Property	Test Method	Value	Unit
Melt Index	ASTM D1238	0.347	g/10mi
Density	D1505 or D4883	0.9558	g/cm3

The data set forth herein have been carefully compiled by Chevron Phillips Chemical Company LP (CPChem). **However, there is no warranty of any kind, either expressed or implied, applicable to its use, and the user assumes all risk and liability in connection therewith.**

Troy Griffin
Quality Systems Coordinator

For CoA questions contact Customer Service Representative at +1-832-813-4806

CoA Date: 05/01/2015

Certificate of Analysis

Shipped To: GSE ENVIRONMENTAL, LLC
1245 EASTLAND AVE
KINGSTREE SC 29556
USA

Recipient: HARRELSON
Fax:

Delivery #: 89048373
PO #: 03-502904
Weight: 204000 LB
Ship Date: 05/01/2015
Package: BULK
Mode: Hopper Car
Car #: CHVX896067
Seal No: 26206

Product:
Marlex® HHM 5502BN High Density Polyethylene Bulk

Lot Number: HFD711110

Property	Test Method	Value	Unit
Melt Index	ASTM D1238	0.353	g/10mi
Density	D1505 or D4883	0.9558	g/cm3

The data set forth herein have been carefully compiled by Chevron Phillips Chemical Company LP (CPChem). **However, there is no warranty of any kind, either expressed or implied, applicable to its use, and the user assumes all risk and liability in connection therewith.**

Troy Griffin
Quality Systems Coordinator

For CoA questions contact Customer Service Representative at +1-832-813-4806

Report Date
6/15/2015

Quality Assurance Laboratory Test Results

Job Name: CCS Brickhaven Mine Site
Sales Order: 76037

Required Testing: ASTM D 1238, 190 / 2.16 -- Standard Test Method for Melt Flow Rates of Thermoplastics by Extrusion Plastometer

Specification: ≤ 1.1 g/10 minutes

Product Code	Roll Number	Result
CT2-350E-CW-08-E-00	131465563	0.37
CT2-350E-CW-08-E-00	131465966	0.37
CT2-350E-CW-08-E-00	131465974	0.36
CT2-350E-CW-08-E-00	131465994	0.40
CT2-350E-CW-08-E-00	131466014	0.42
CT2-350E-CW-08-E-00	131466036	0.39
CT2-350E-CW-08-E-00	131466058	0.42
CT2-350E-CW-08-E-00	131466080	0.41
CT2-350E-CW-08-E-00	131466102	0.33
CT2-350E-CW-08-E-00	131466124	0.40
CT2-350E-CW-08-E-00	131466146	0.43
CT2-350E-CW-08-E-00	131466168	0.37
CT2-350E-CW-08-E-00	131466190	0.38
CT2-350E-CW-08-E-00	131466212	0.37
CT2-350E-CW-08-E-00	131466234	0.44
CT2-350E-CW-08-E-00	131466256	0.41
CT2-350E-CW-08-E-00	131466278	0.54
CT2-350E-CW-08-E-00	131466300	0.43
CT2-350E-CW-08-E-00	131466322	0.70

Approved by: Crystal Gore
Date: June 14, 2015

The above stated data shall not be reproduced except in full, without the written approval of the laboratory.

Quality Assurance Laboratory Test Results

Job Name: CCS Brickhaven Mine Site
SO Number: 76037

Test: ASTM D 6364, Short-Term Compressive Behavior of Geosynthetics

Specification: 25,000 psf

CT2-350E-CW-08-E-00

Roll Number	Compressive Strength (psf)
131465563	42,624
131465966	38,621
131465974	44,784
131465994	46,454
131466014	41,443
131466036	45,619
131466058	46,627
131466080	48,125
131466102	53,654
131466124	52,474
131466146	39,295
131466168	46,368
131466190	43,475
131466212	45,187
131466234	45,504
131466256	43,258
131466278	46,483
131466300	42,106
131466322	37,613

Approved By: Crystal Gore
Date Approved: 6/15/2015

GSE ENVIRONMENTAL™ GSE Environmental, LLC.

Transmissivity Report

ASTM D4716

Roll No. 131465578

ROLL IDENTIFICATION

Roll Number	131465578
Product Name	CT2-350E-CW-08-E-00
Production Date	6/1/2015

CUSTOMER INFORMATION

Order Number	76037
Customer Name	Chesapeake
Project Name	CCS Brickhaven Mine Site
Location	Moncure, NC

Pressure (psf)	Gradient	Net/Composite	Transmissivity Results (m^2/sec)	(gal/min/ft)	Seat Time (min)	Boundary
6,250	0.02	Composite	6.80E-03	32.85	6000	Ash/Geocomposite/Geomembrane

GSE ENVIRONMENTAL™ GSE Environmental, LLC.

Transmissivity Report

ASTM D4716

Roll No. 131466176

ROLL IDENTIFICATION

Roll Number	131466176
Product Name	CT2-350E-CW-08-E-00
Production Date	6/8/2015

CUSTOMER INFORMATION

Order Number	76037
Customer Name	Chesapeake
Project Name	CCS Brickhaven Mine Site
Location	Moncure, NC

Pressure (psf)	Gradient	Net/Composite	Transmissivity Results (m^2/sec)	(gal/min/ft)	Seat Time (min)	Boundary
6,250	0.02	Composite	6.85E-03	33.09	6000	Ash/Geocomposite/Geomembrane

GSE ENVIRONMENTAL™ GSE Environmental, LLC.

Transmissivity Report

ASTM D4716

Roll No. 131466040

ROLL IDENTIFICATION

Roll Number	131466040
Product Name	CT2-350E-CW-08-E-00
Production Date	6/6/2015

CUSTOMER INFORMATION

Order Number	76037
Customer Name	Chesapeake
Project Name	CCS Brickhaven Mine Site
Location	Moncure, NC

Pressure (psf)	Gradient	Net/Composite	Transmissivity Results (m^2/sec)	(gal/min/ft)	Seat Time (min)	Boundary
6,250	0.02	Composite	1.02E-02	49.28	6000	Ash/Geocomposite/Geomembrane

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GSE Lining Technology, Inc.

19103 Gundle Road
Houston, Texas 77073
800-435-2008
281-443-8564
Fax: 281-230-8650

June 4, 2007

Chesapeake Containment Systems, Inc.
4622 Wilmslow Road
Baltimore, MD 21210

CERTIFICATION

This letter is to certify that **Chesapeake Containment Systems, Inc.** has been provided with a copy of GSE's proprietary product manual containing the data sheets of all GSE's products for this project, and the GSE Field Installation Quality Assurance Manual.

With the information provided by GSE referenced herein, and the use of qualified technical field personnel, **Chesapeake Containment Systems, Inc.** can undertake this installation of GSE's products. GSE's Technical Department representatives are available to respond to questions on specifications and installation techniques.

Regards,

David Leggett
V.P. NA Sales Product Division

DL:kd

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D4

D4 – Geotextile Manufacturer Certifications

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Crown Resources

2694 Hayes Wilbank Road
Toccoa, GA 30577
(864)968-0592

Geotextile Product Description Sheet

Style E080

E080 is a nonwoven geotextile produced by needlepunching synthetic staple fibers in a random network to form a high strength dimensionally stable fabric. The polypropylene fibers are specially formulated to resist ultraviolet light deterioration, and are inert to commonly encountered soil chemicals. The fabric will not rot or mildew, is non-biodegradable, and is resistant to damage from insects and rodents. Polypropylene is stable within a ph range of 2 to 13. E080 conforms to the physical property values listed below:

Fabric Property	Test Method	Units	Minimum Average Roll Value
Weight	ASTM D 5261	oz/sq.yd.	8.0(271 g/sm)
Thickness*	ASTM D 5199	mils	100(2.5 mm)
Grab Tensile	ASTM D 4632	lbs.	225(1.0 kN)
Grab Elongation	ASTM D 4632	%	50
Trap Tear	ASTM D 4533	lbs.	90(.40 kN)
CBR Puncture	ASTM D 6241	lbs	575(2.56 kN)
Permittivity*	ASTM D 4491	1/sec	1.26
AOS	ASTM D 4751	U.S. Sieve	80 (.18 mm)
Water Flow*	ASTM D 4491	gal/min/sqft	100(4074 l/min/sm)
Permeability*	ASTM D 4491	cm/sec	0.3
UV Resistance	ASTM D 4355	%	70
Packaging			
Roll Dimensions-Feet			15 x 690
Square Yards Per Roll			1150
Estimated Roll Weight-Lbs.			620

* At time of manufacturing, handling may change these properties.

To the best of our knowledge, the information contained herein is accurate. However, Crown Resources cannot anticipate all conditions under which the product information and our products, or the products of other manufacturers in combination with our products, may be used. We accept no responsibility for results obtained by the application of this information or the safety or suitability of our products either alone or in combination with other products. Final determination of the suitability of any information or material for the use contemplated, of its manner of use, and whether the suggested use infringes any patents is the sole responsibility of the user.

CONFORMANCE TEST RESULTS

geotechnics
INTEGRITY IN TESTING

CLIENT: ACF ENVIRONMENTAL
CLIENT PROJECT: BRICKHAVEN
PROJECT NO.: L150102-01
LAB ID NO.: L150102-01-01
MATERIAL: CROWN RESOURCES E080 NW GEOTEXTILE

TEST	ASTM METHOD	UNITS	SPECIMEN NO. 1	2	3	4	5	6	7	8	9	10	AVG	STD
PUNCTURE	D 4833	lbs	147.1	128.6	121.7	145.8	158.1	170.6	210.7	145.2	145.1	155.3		
		lbs	172.9	141.6	174.7	189.1	158.6						**157.7**	**22.30**
CBR PUNCTURE	D 6241	lbs	701.2	770.6	836.2	826.9	858.1	822.2	749.2	920.1	862.9	975.2	**832.3**	**76.01**

CHECKED BY: J.O DATE: 8-12-15

\\geoserver\Data Drive\Synthetics\2015 SYNTHETICS\102 - ACF ENVIRONMENTAL - BRICKHAVEN\[L150102-01-01 TEXT BRICKHAVEN.xls]TEXT L150102-01-01 8/12/15

Crown Resources
2694 Hayes Wilbank Road
Toccoa, GA 30577

(864) 968-0592 Tel
(864) 879-4639 Fax

TECH NOTE - #201101

This tech note addresses a testing change in the geosynthetic industry regarding test methods, Mullen Burst – ASTM D3786 and Puncture – ASTM D4833.

Based on standard industry practice and following ASTM testing procedures, Crown Resources has substituted CBR Puncture ASTM D6241 in place of Mullen Burst ASTM D3786 and Puncture ASTM D4833. ASTM committee D35 on Geosynthetics does not recognize Mullen Burst ASTM D3786 as a Geotextile Test Method. Puncture ASTM D4833 is restricted by the title of the test method, 'Index Puncture Resistance of Geomembranes and Related Products'. Crown Resources no longer tests Mullen Burst and Pin Puncture for routine quality control testing.

CBR Puncture ASTM D6241 is representative of field conditions that a geosynthetic material will be exposed in comparison to the replaced test methods.

AASHTO has adopted the CBR Puncture in place of the Mullen Burst and Pin Puncture test methods in the M288 Geotextile Specification for Highway Applications.

GFR Specifier's guide Product Listings, lists CBR Puncture replacing the Mullen Burst and Pin Puncture.

Crown Resources tests CBR Puncture ASTM D6241 routinely as part of manufacturing quality control testing.

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D5

D5 – Interface Friction Tests

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INTERFACE FRICTION TEST RESULTS
ASTM D 5321

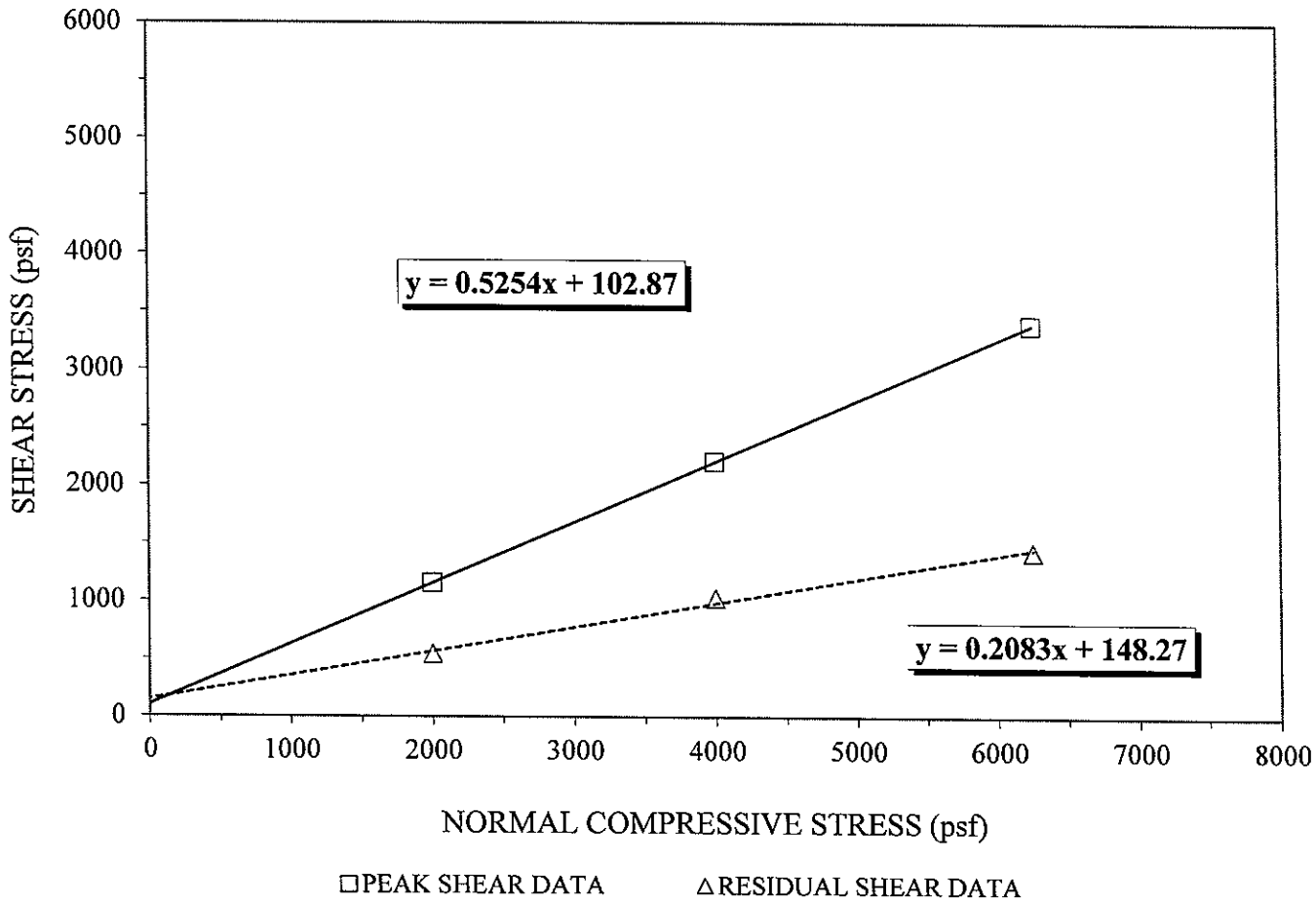
geotechnics
INTEGRITY IN TESTING

CLIENT : Chesapeake Containment Systems, Inc.
CLIENT PROJECT : Brickhaven No. 2 Mine Tract "A"
PROJECT NO. : L15058-01
LAB I. D. NO.: GSE CoalDrain Fabrinet Geocomposite, Roll # 131464070 (L15058-01-01)
Agru 60 mil HDPE Microspike (L15058-01-03)

INTERFACE : **Geocomposite (Non-Woven Side)**
vs. Agru 60 mil HDPE Microspike (Top Side)

	PEAK SHEAR		RESIDUAL SHEAR	
FRICTION ANGLE (deg) :	Φ =	**27.7**	Φ =	**11.8**
COEFFICIENT OF FRICTION :	=	**0.525**	=	**0.208**
ADHESION [Calculated] (psf):	a =	**103**	a =	**148**

NOTES:
1.) The interface was loaded, inundated with water & seated for 1 hour prior to shearing.
2.) The peak friction angle was calculated using linear regression on the three data points.
3.) The residual friction angle was calculated using linear regression on the end of test values.



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INTERFACE FRICTION TEST RESULTS
ASTM D 5321

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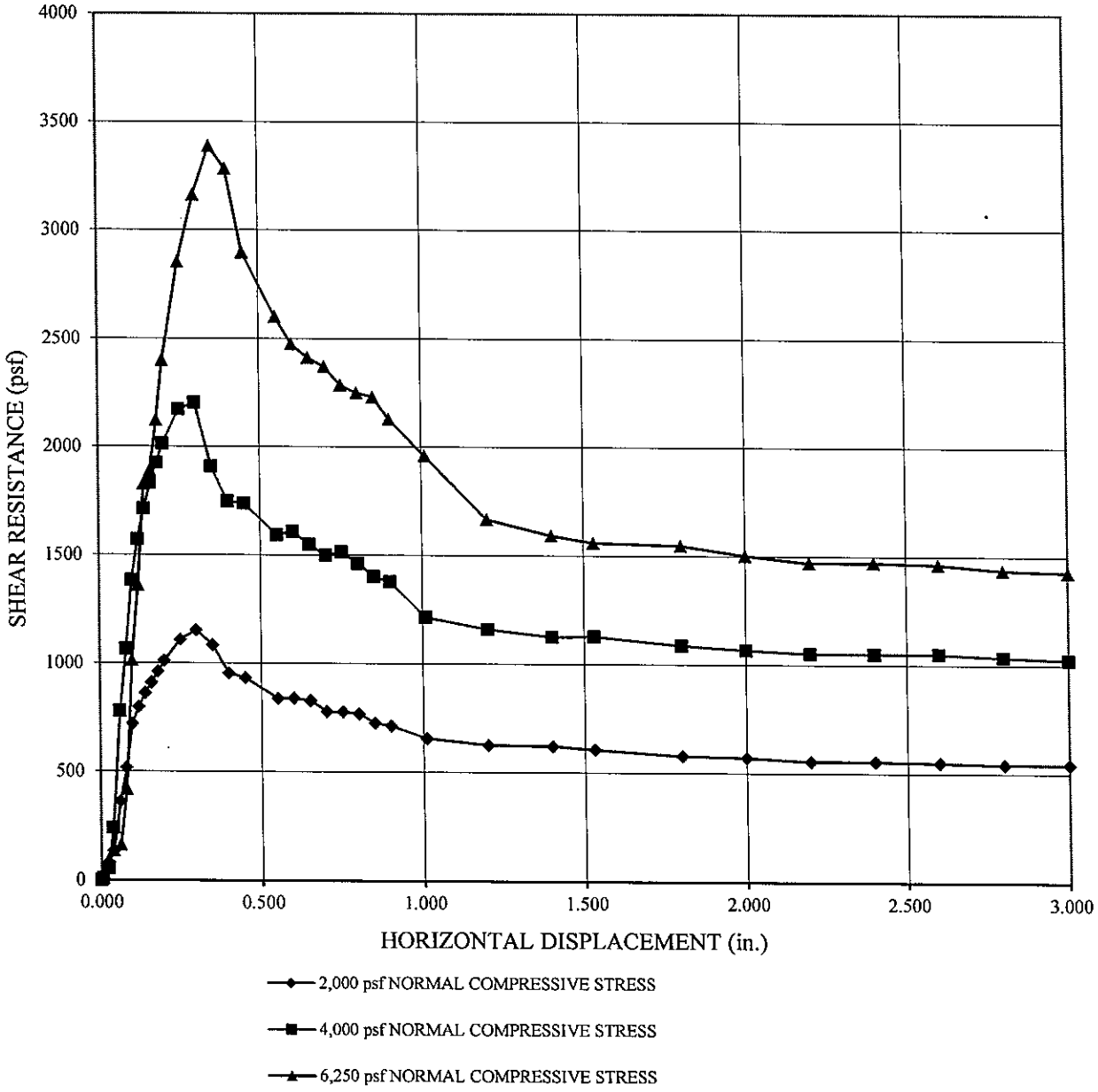
INTEGRITY IN TESTING

CLIENT : Chesapeake Containment Systems, Inc.
CLIENT PROJECT : Brickhaven No. 2 Mine Tract "A"
PROJECT NO. : L15058-01
LAB I. D. NO.: GSE CoalDrain Fabrinet Geocomposite, Roll # 131464070 (L15058-01-01)
Agru 60 mil HDPE Microspike (L15058-01-03)

INTERFACE : **Geocomposite (Non-Woven Side)**
vs. Agru 60 mil HDPE Microspike (Top Side)

SHEAR RESISTANCE VS HORIZONTAL DISPLACEMENT



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INTERFACE FRICTION TEST RESULTS
ASTM D 5321

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INTEGRITY IN TESTING

CLIENT : Chesapeake Containment Systems, Inc.
CLIENT PROJECT : Brickhaven No. 2 Mine Tract "A"
PROJECT NO. : L15058-01
LAB I. D. NO.S: GSE CoalDrain Fabrinet Geocomposite, Roll # 131464070 (L15058-01-01)
Agru 60 mil HDPE Microspike (L15058-01-03)

INTERFACE : **Geocomposite (Non-Woven Side)**
vs. Agru 60 mil HDPE Microspike (Top Side)

STRAIN RATE (in / min) : 0.20 DIRECT SHEAR UNIT: Durham Geo
PLACEMENT CONDITION: Inundated NORMAL LOAD: Bladder System

NORMAL LOAD (psf)		2000	NORMAL LOAD (psf)		4000	NORMAL LOAD (psf)		6250
NORMAL LOAD (psi)		13.9	NORMAL LOAD (psi)		27.8	NORMAL LOAD (psi)		43.4
PEAK SHEAR STRESS (psf)		1154	PEAK SHEAR STRESS (psf)		2204	PEAK SHEAR STRESS (psf)		3387
PEAK SECANT ANGLE (deg)		30.0	PEAK SECANT ANGLE (deg)		28.9	PEAK SECANT ANGLE (deg)		28.5
RESIDUAL SHEAR (psf)		542	RESIDUAL SHEAR (psf)		1025	RESIDUAL SHEAR (psf)		1430
RESID. SECANT ANGLE (deg)		15.2	RESID. SECANT ANGLE (deg)		14.4	RESID. SECANT ANGLE (deg)		12.9
ASPERITY		28	ASPERITY		27	ASPERITY		28
HORIZONTAL			HORIZONTAL			HORIZONTAL		
DISPLACE. (in.)	SHEAR FORCE (lbs)	STRESS (psf)	DISPLACE. (in.)	SHEAR FORCE (lbs)	STRESS (psf)	DISPLACE. (in.)	SHEAR FORCE (lbs)	STRESS (psf)
0.000	0	0	0.000	0	0	0.000	0	0
0.005	12	12	0.005	9	9	0.005	11	11
0.023	80	80	0.023	55	55	0.023	93	93
0.038	135	135	0.038	241	241	0.038	136	136
0.060	362	362	0.060	779	779	0.060	163	163
0.080	517	517	0.080	1066	1066	0.080	419	419
0.100	721	721	0.100	1384	1384	0.100	1013	1013
0.120	798	798	0.120	1572	1572	0.120	1361	1361
0.140	863	863	0.140	1713	1713	0.140	1827	1827
0.160	911	911	0.160	1832	1832	0.160	1891	1891
0.180	963	963	0.180	1926	1926	0.180	2122	2122
0.200	1012	1012	0.200	2014	2014	0.200	2400	2400
0.250	1109	1109	0.250	2173	2173	0.250	2853	2853
0.300	1154	1154	0.300	2204	2204	0.300	3162	3162
0.350	1084	1084	0.350	1909	1909	0.350	3387	3387
0.400	955	955	0.400	1748	1748	0.400	3283	3283
0.450	934	934	0.450	1738	1738	0.450	2897	2897
0.550	839	839	0.550	1594	1594	0.550	2602	2602
0.600	841	841	0.600	1610	1610	0.600	2476	2476
0.650	828	828	0.650	1549	1549	0.650	2413	2413
0.700	779	779	0.700	1500	1500	0.700	2372	2372
0.750	777	777	0.750	1515	1515	0.750	2286	2286
0.800	768	768	0.800	1463	1463	0.800	2250	2250
0.850	726	726	0.850	1402	1402	0.850	2230	2230
0.900	713	713	0.900	1378	1378	0.900	2129	2129
1.010	657	657	1.010	1216	1216	1.010	1960	1960
1.200	627	627	1.200	1161	1161	1.200	1667	1667
1.400	623	623	1.400	1127	1127	1.400	1594	1594
1.530	607	607	1.530	1129	1129	1.530	1561	1561
1.800	579	579	1.800	1088	1088	1.800	1549	1549
2.000	572	572	2.000	1069	1069	2.000	1504	1504
2.200	556	556	2.200	1053	1053	2.200	1472	1472
2.400	555	555	2.400	1052	1052	2.400	1473	1473
2.600	550	550	2.600	1052	1052	2.600	1465	1465
2.800	543	543	2.800	1037	1037	2.800	1439	1439
3.000	542	542	3.000	1025	1025	3.000	1430	1430

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INTERFACE FRICTION TEST RESULTS
ASTM D 6243

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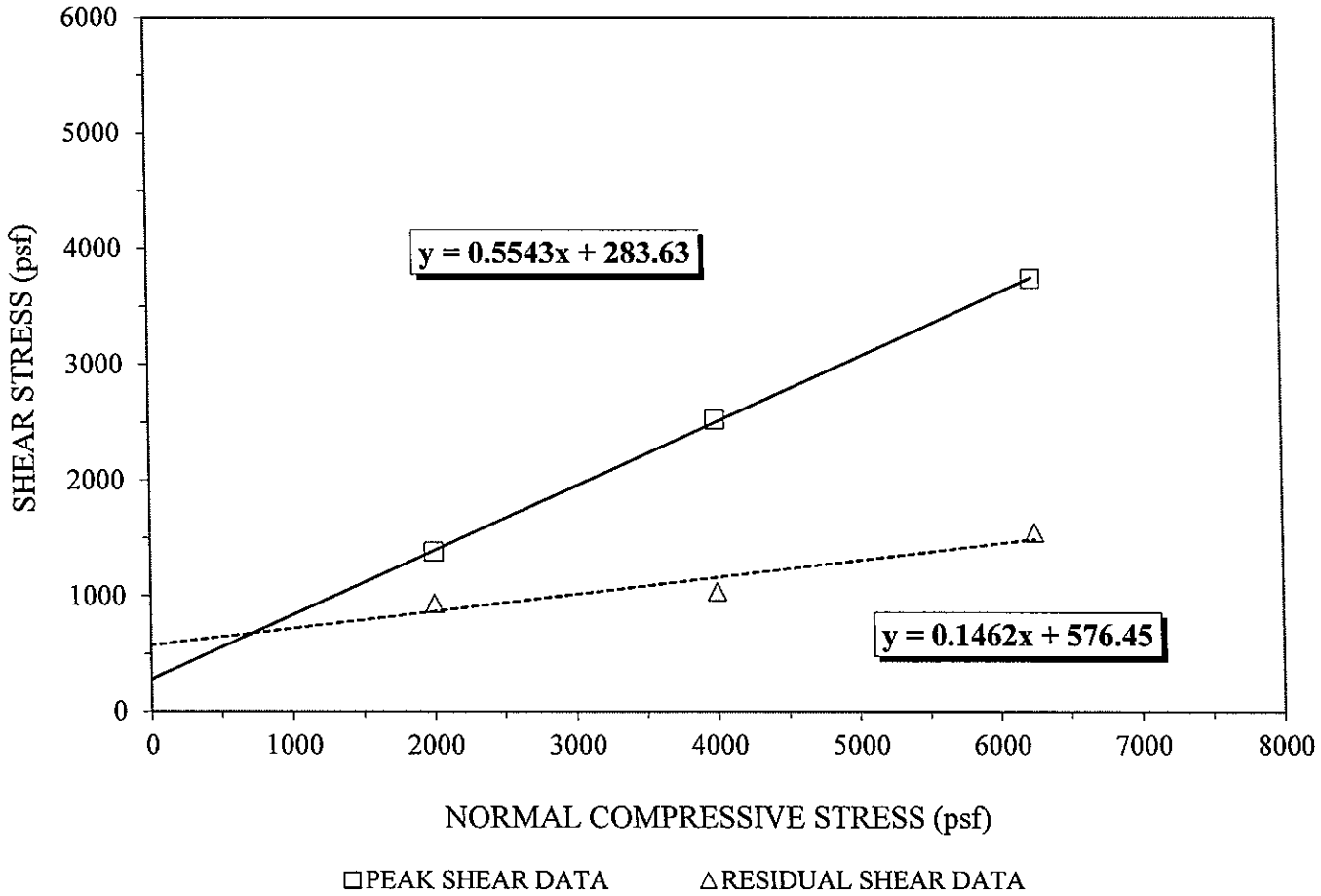
INTEGRITY IN TESTING

CLIENT : Chesapeake Containment Systems, Inc.
CLIENT PROJECT : Brickhaven No. 2 Mine Tract "A"
PROJECT NO. : L15058-01
LAB I. D. NO.: GSE BentoLiner CAR CNSL, Roll # 135032036 (L15058-01-02)
Agru 60 mil HDPE Microspike (L15058-01-03)

INTERFACE : **GCL (Non-Woven Side)**
vs. 60 mil HDPE Microspike (Bottom Side)

	PEAK SHEAR		RESIDUAL SHEAR	
FRICTION ANGLE (deg) :	Φ =	**29.0**	Φ =	**8.3**
COEFFICIENT OF FRICTION :	=	**0.554**	=	**0.146**
ADHESION [Calculated] (psf):	a =	**284**	a =	**576**

NOTES:
1.) GCL specimens were spray wetted prior to placement in shear box.
2.) The interface was loaded & seated for 1 hour prior to shearing.
3.) The peak friction angle was calculated using linear regression on the three data points.
4.) The residual friction angle was calculated using linear regression on the end of test values.



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INTERFACE FRICTION TEST RESULTS
ASTM D 6243

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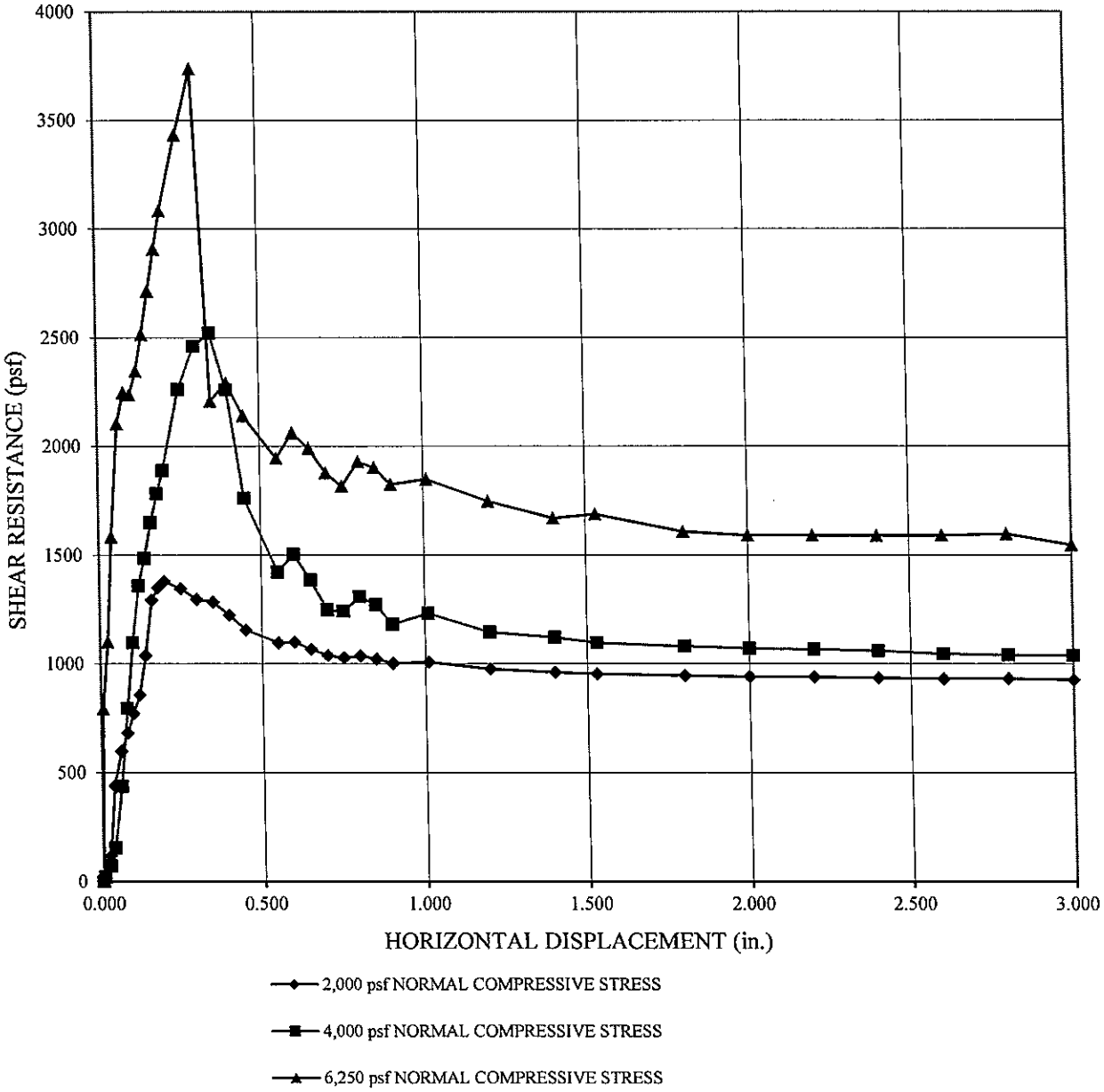
INTEGRITY IN TESTING

CLIENT : Chesapeake Containment Systems, Inc.
CLIENT PROJECT : Brickhaven No. 2 Mine Tract "A"
PROJECT NO. : L15058-01
LAB I. D. NO.: GSE BentoLiner CAR CNSL, Roll # 135032036 (L15058-01-02)
Agru 60 mil HDPE Microspike (L15058-01-03)

INTERFACE : **GCL (Non-Woven Side)**
vs. 60 mil HDPE Microspike (Bottom Side)

SHEAR RESISTANCE VS HORIZONTAL DISPLACEMENT



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INTERFACE FRICTION TEST RESULTS
ASTM D 6243

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INTEGRITY IN TESTING

CLIENT : Chesapeake Containment Systems, Inc.
CLIENT PROJECT : Brickhaven No. 2 Mine Tract "A"
PROJECT NO. : L15058-01
LAB I. D. NO.S: GSE BentoLiner CAR CNSL, Roll # 135032036 (L15058-01-02)
Agru 60 mil HDPE Microspike (L15058-01-03)

INTERFACE : **GCL (Non-Woven Side)**
vs. 60 mil HDPE Microspike (Bottom Side)

STRAIN RATE (in / min) : 0.04 DIRECT SHEAR UNIT: Durham Geo
PLACEMENT CONDITION: Dry NORMAL LOAD: Bladder System

NORMAL LOAD (psf)		2000	NORMAL LOAD (psf)		4000	NORMAL LOAD (psf)		6250
PEAK SHEAR STRESS (psf)		1381	PEAK SHEAR STRESS (psf)		2522	PEAK SHEAR STRESS (psf)		3738
PEAK SECANT ANGLE (deg)		34.6	PEAK SECANT ANGLE (deg)		32.2	PEAK SECANT ANGLE (deg)		30.9
RESIDUAL SHEAR (psf)		934	RESIDUAL SHEAR (psf)		1038	RESIDUAL SHEAR (psf)		1548
RESID. SECANT ANGLE (deg)		25.0	RESID. SECANT ANGLE (deg)		14.5	RESID. SECANT ANGLE (deg)		13.9
ASPERITY		32	ASPERITY		32	ASPERITY		32
HORIZONTAL			HORIZONTAL			HORIZONTAL		
DISPLACE. (in.)	SHEAR FORCE (lbs)	STRESS (psf)	DISPLACE. (in.)	SHEAR FORCE (lbs)	STRESS (psf)	DISPLACE. (in.)	SHEAR FORCE (lbs)	STRESS (psf)
0.000	0	0	0.000	0	0	0.000	0	0
0.005	17	17	0.005	21	21	0.005	793	793
0.023	120	120	0.023	72	72	0.023	1101	1101
0.038	440	440	0.038	156	156	0.038	1585	1585
0.060	599	599	0.060	438	438	0.060	2103	2103
0.080	683	683	0.080	796	796	0.080	2247	2247
0.100	773	773	0.100	1098	1098	0.100	2237	2237
0.120	857	857	0.120	1360	1360	0.120	2347	2347
0.140	1039	1039	0.140	1487	1487	0.140	2515	2515
0.160	1294	1294	0.160	1650	1650	0.160	2714	2714
0.180	1353	1353	0.180	1782	1782	0.180	2908	2908
0.200	1381	1381	0.200	1890	1890	0.200	3084	3084
0.250	1347	1347	0.250	2262	2262	0.250	3432	3432
0.300	1299	1299	0.300	2462	2462	0.300	3738	3738
0.350	1286	1286	0.350	2522	2522	0.350	2208	2208
0.400	1224	1224	0.400	2261	2261	0.400	2292	2292
0.450	1157	1157	0.450	1761	1761	0.450	2141	2141
0.550	1097	1097	0.550	1424	1424	0.550	1945	1945
0.600	1100	1100	0.600	1506	1506	0.600	2062	2062
0.650	1067	1067	0.650	1386	1386	0.650	1992	1992
0.700	1039	1039	0.700	1250	1250	0.700	1878	1878
0.750	1029	1029	0.750	1243	1243	0.750	1818	1818
0.800	1037	1037	0.800	1311	1311	0.800	1930	1930
0.850	1023	1023	0.850	1272	1272	0.850	1903	1903
0.900	1003	1003	0.900	1183	1183	0.900	1826	1826
1.010	1009	1009	1.010	1233	1233	1.010	1849	1849
1.200	977	977	1.200	1147	1147	1.200	1749	1749
1.400	961	961	1.400	1122	1122	1.400	1671	1671
1.530	954	954	1.530	1097	1097	1.530	1690	1690
1.800	947	947	1.800	1082	1082	1.800	1610	1610
2.000	941	941	2.000	1071	1071	2.000	1592	1592
2.200	940	940	2.200	1067	1067	2.200	1592	1592
2.400	936	936	2.400	1061	1061	2.400	1591	1591
2.600	933	933	2.600	1046	1046	2.600	1592	1592
2.800	933	933	2.800	1041	1041	2.800	1599	1599
3.000	927	927	3.000	1038	1038	3.000	1548	1548

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INTERFACE FRICTION TEST RESULTS
ASTM D 6243

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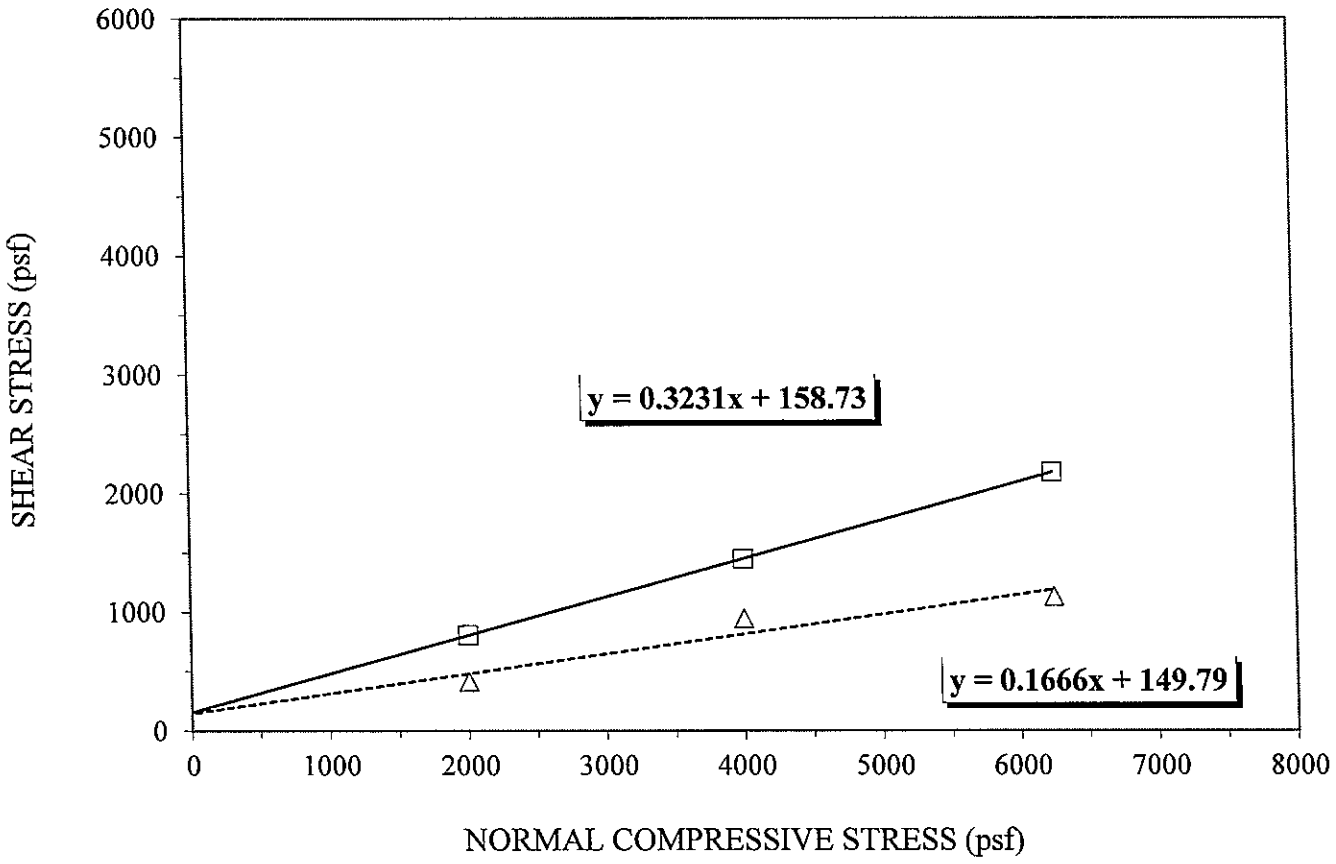
INTEGRITY IN TESTING

CLIENT : Chesapeake Containment Systems, Inc.
CLIENT PROJECT : Brickhaven No. 2 Mine Tract "A"
PROJECT NO. : L15058-02
LAB I. D. NO.: CSL-01 (2015-664-04-01)
GSE BentoLiner CAR CNSL, Roll # 135032036 (L15058-01-02)

INTERFACE : **Soil @ 100.7 pcf & 20.9 % M.C.**
vs. GCL (Coated Side)

	PEAK SHEAR		RESIDUAL SHEAR	
FRICTION ANGLE (deg) :	Φ =	**17.9**	Φ =	**9.5**
COEFFICIENT OF FRICTION :	=	**0.323**	=	**0.167**
ADHESION [Calculated] (psf):	a =	**159**	a =	**150**

NOTES:
1.) Soil placement was based on 95% maximum dry density and a moisture content +2% of optimum.
2.) The interface was loaded, inundated with water and consolidated for 24 hours prior to shearing.
3.) The peak friction angle was calculated using linear regression on the three data points.
4.) The residual friction angle was calculated using linear regression on the end of test values.



□PEAK SHEAR DATA △RESIDUAL SHEAR DATA

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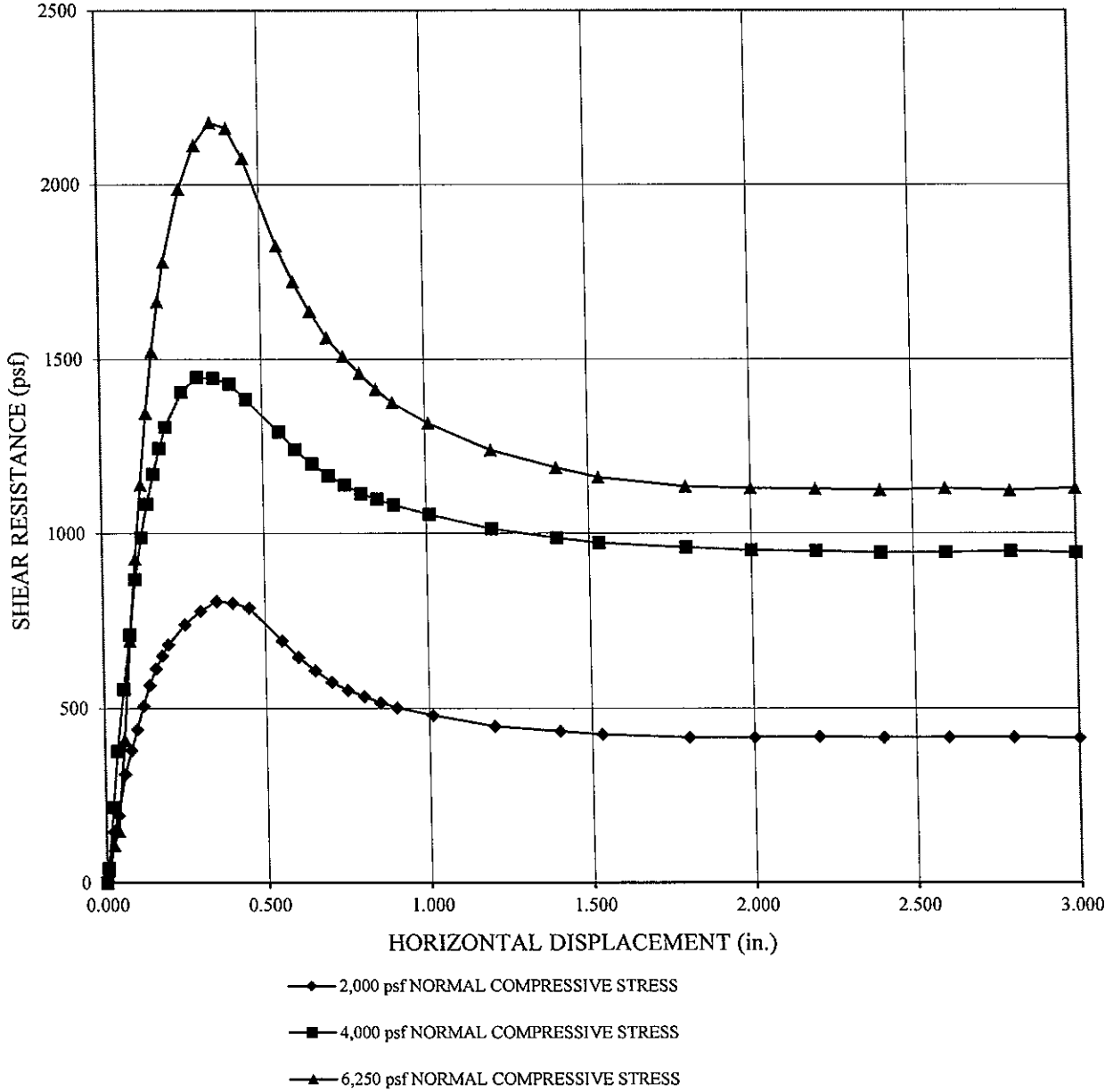
INTERFACE FRICTION TEST RESULTS
ASTM D 6243

geotechnics
INTEGRITY IN TESTING

CLIENT : Chesapeake Containment Systems, Inc.
CLIENT PROJECT : Brickhaven No. 2 Mine Tract "A"
PROJECT NO. : L15058-02
LAB I. D. NO.: CSL-01 (2015-664-04-01)
GSE BentoLiner CAR CNSL, Roll # 135032036 (L15058-01-02)

INTERFACE : **Soil @ 100.7 pcf & 20.9 % M.C.**
vs. GCL (Coated Side)

SHEAR RESISTANCE VS HORIZONTAL DISPLACEMENT



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INTERFACE FRICTION TEST RESULTS
ASTM D 6243

geotechnics
INTEGRITY IN TESTING

CLIENT : Chesapeake Containment Systems, Inc.
CLIENT PROJECT : Brickhaven No. 2 Mine Tract "A"
PROJECT NO. : L15058-02
LAB I. D. NO.S: CSL-01 (2015-664-04-01)
GSE BentoLiner CAR CNSL, Roll # 135032036 (L15058-01-02)

INTERFACE : **Soil @ 100.7 pcf & 20.9 % M.C.**
vs. GCL (Coated Side)

STRAIN RATE (in / min) : 0.04 DIRECT SHEAR UNIT: Durham Geo
PLACEMENT CONDITION: Inundated NORMAL LOAD: Bladder System

NORMAL LOAD (psf)	2000	NORMAL LOAD (psf)	4000	NORMAL LOAD (psf)	6250
PEAK SHEAR STRESS (psf)	806	PEAK SHEAR STRESS (psf)	1449	PEAK SHEAR STRESS (psf)	2179
PEAK SECANT ANGLE (deg)	21.9	PEAK SECANT ANGLE (deg)	19.9	PEAK SECANT ANGLE (deg)	19.2
RESIDUAL SHEAR (psf)	415	RESIDUAL SHEAR (psf)	945	RESIDUAL SHEAR (psf)	1131
RESID. SECANT ANGLE (deg)	11.7	RESID. SECANT ANGLE (deg)	13.3	RESID. SECANT ANGLE (deg)	10.3

HORIZONTAL			HORIZONTAL			HORIZONTAL		
DISPLACE. (in.)	SHEAR FORCE (lbs)	STRESS (psf)	DISPLACE. (in.)	SHEAR FORCE (lbs)	STRESS (psf)	DISPLACE. (in.)	SHEAR FORCE (lbs)	STRESS (psf)
0.000	0	0	0.000	0	0	0.000	0	0
0.005	21	21	0.005	41	41	0.005	18	18
0.023	146	146	0.023	216	216	0.023	108	108
0.038	193	193	0.038	377	377	0.038	149	149
0.060	311	311	0.060	555	555	0.060	410	410
0.080	380	380	0.080	710	710	0.080	694	694
0.100	440	440	0.100	868	868	0.100	928	928
0.120	507	507	0.120	989	989	0.120	1140	1140
0.140	567	567	0.140	1085	1085	0.140	1346	1346
0.160	614	614	0.160	1171	1171	0.160	1522	1522
0.180	651	651	0.180	1245	1245	0.180	1666	1666
0.200	683	683	0.200	1305	1305	0.200	1778	1778
0.250	739	739	0.250	1406	1406	0.250	1988	1988
0.300	778	778	0.300	1449	1449	0.300	2114	2114
0.350	806	806	0.350	1446	1446	0.350	2179	2179
0.400	801	801	0.400	1430	1430	0.400	2163	2163
0.450	787	787	0.450	1385	1385	0.450	2076	2076
0.550	693	693	0.550	1292	1292	0.550	1825	1825
0.600	647	647	0.600	1241	1241	0.600	1723	1723
0.650	608	608	0.650	1200	1200	0.650	1637	1637
0.700	575	575	0.700	1166	1166	0.700	1562	1562
0.750	552	552	0.750	1140	1140	0.750	1509	1509
0.800	534	534	0.800	1114	1114	0.800	1461	1461
0.850	516	516	0.850	1099	1099	0.850	1415	1415
0.900	502	502	0.900	1082	1082	0.900	1376	1376
1.010	480	480	1.010	1054	1054	1.010	1317	1317
1.200	448	448	1.200	1013	1013	1.200	1240	1240
1.400	434	434	1.400	987	987	1.400	1190	1190
1.530	425	425	1.530	973	973	1.530	1162	1162
1.800	416	416	1.800	960	960	1.800	1136	1136
2.000	417	417	2.000	952	952	2.000	1131	1131
2.200	419	419	2.200	949	949	2.200	1128	1128
2.400	416	416	2.400	945	945	2.400	1125	1125
2.600	417	417	2.600	946	946	2.600	1130	1130
2.800	417	417	2.800	949	949	2.800	1124	1124
3.000	415	415	3.000	945	945	3.000	1131	1131

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INTERFACE FRICTION TEST RESULTS
ASTM D 6243

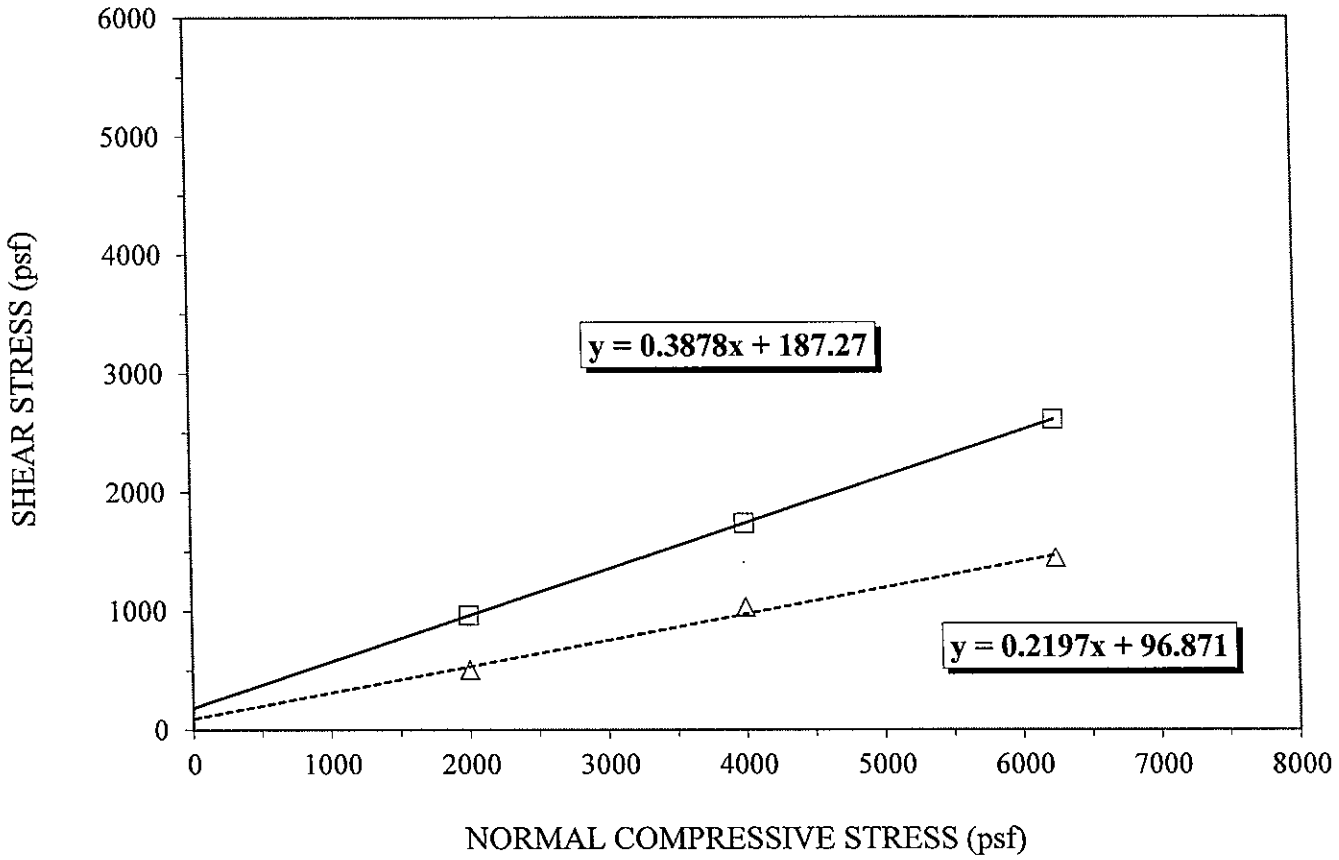
geotechnics
INTEGRITY IN TESTING

CLIENT : Chesapeake Containment Systems, Inc.
CLIENT PROJECT : Brickhaven No. 2 Mine Tract "A"
PROJECT NO. : L15058-02
LAB I. D. NO.: CSL-02 (2015-664-04-02)
GSE BentoLiner CAR CNSL, Roll # 135032036 (L15058-01-02)

INTERFACE : **Soil @ 111.1 pcf & 14.9 % M.C.**
vs. GCL (Coated Side)

	PEAK SHEAR		RESIDUAL SHEAR	
FRICTION ANGLE (deg) :	Φ =	**21.2**	Φ =	**12.4**
COEFFICIENT OF FRICTION :	=	**0.388**	=	**0.220**
ADHESION [Calculated] (psf):	a =	**187**	a =	**97**

NOTES:
1.) Soil placement was based on 95% maximum dry density and a moisture content +2% of optimum.
2.) The interface was loaded, inundated with water and consolidated for 24 hours prior to shearing.
3.) The peak friction angle was calculated using linear regression on the three data points.
4.) The residual friction angle was calculated using linear regression on the end of test values.



□PEAK SHEAR DATA △RESIDUAL SHEAR DATA

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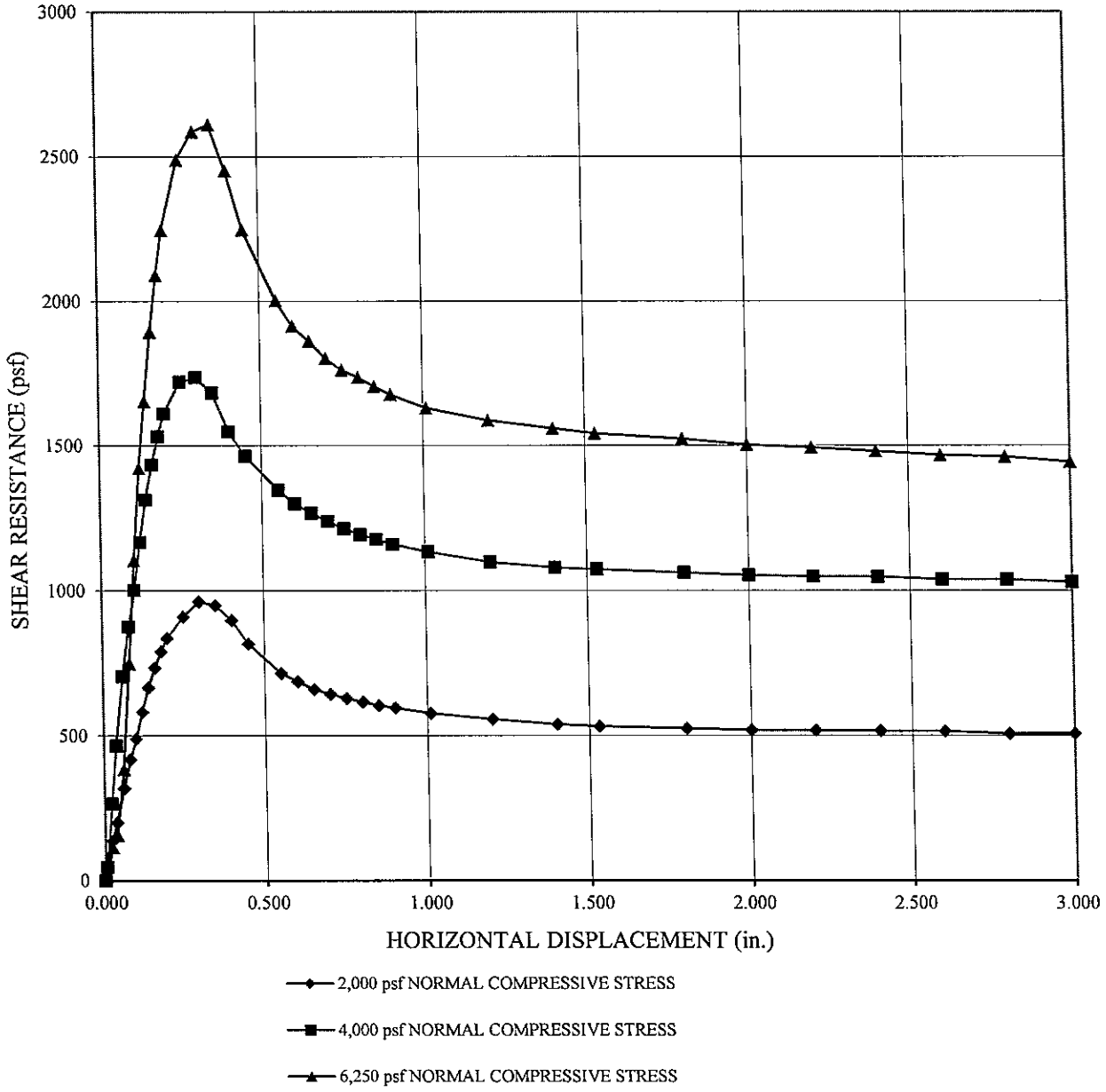
INTERFACE FRICTION TEST RESULTS
ASTM D 6243

geotechnics
INTEGRITY IN TESTING

CLIENT : Chesapeake Containment Systems, Inc.
CLIENT PROJECT : Brickhaven No. 2 Mine Tract "A"
PROJECT NO. : L15058-02
LAB I. D. NO.: CSL-02 (2015-664-04-02)
GSE BentoLiner CAR CNSL, Roll # 135032036 (L15058-01-02)

INTERFACE : **Soil @ 111.1 pcf & 14.9 % M.C.**
vs. GCL (Coated Side)

SHEAR RESISTANCE VS HORIZONTAL DISPLACEMENT



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INTERFACE FRICTION TEST RESULTS
ASTM D 6243

geotechnics
INTEGRITY IN TESTING

CLIENT : Chesapeake Containment Systems, Inc.
CLIENT PROJECT : Brickhaven No. 2 Mine Tract "A"
PROJECT NO. : L15058-02
LAB I. D. NO.S: CSL-02 (2015-664-04-02)
GSE BentoLiner CAR CNSL, Roll # 135032036 (L15058-01-02)

INTERFACE : **Soil @ 111.1 pcf & 14.9 % M.C.**
vs. GCL (Coated Side)

STRAIN RATE (in / min) : 0.04 DIRECT SHEAR UNIT: Durham Geo
PLACEMENT CONDITION: Inundated NORMAL LOAD: Bladder System

NORMAL LOAD (psf)	2000	NORMAL LOAD (psf)	4000	NORMAL LOAD (psf)	6250
PEAK SHEAR STRESS (psf)	963	PEAK SHEAR STRESS (psf)	1738	PEAK SHEAR STRESS (psf)	2611
PEAK SECANT ANGLE (deg)	25.7	PEAK SECANT ANGLE (deg)	23.5	PEAK SECANT ANGLE (deg)	22.7
RESIDUAL SHEAR (psf)	507	RESIDUAL SHEAR (psf)	1031	RESIDUAL SHEAR (psf)	1444
RESID. SECANT ANGLE (deg)	14.2	RESID. SECANT ANGLE (deg)	14.5	RESID. SECANT ANGLE (deg)	13.0

HORIZONTAL			HORIZONTAL			HORIZONTAL		
DISPLACE. (in.)	SHEAR FORCE (lbs)	STRESS (psf)	DISPLACE. (in.)	SHEAR FORCE (lbs)	STRESS (psf)	DISPLACE. (in.)	SHEAR FORCE (lbs)	STRESS (psf)
0.000	0	0	0.000	0	0	0.000	0	0
0.005	35	35	0.005	47	47	0.005	16	16
0.023	138	138	0.023	265	265	0.023	114	114
0.038	200	200	0.038	466	466	0.038	156	156
0.060	318	318	0.060	705	705	0.060	384	384
0.080	419	419	0.080	876	876	0.080	749	749
0.100	490	490	0.100	1002	1002	0.100	1105	1105
0.120	582	582	0.120	1167	1167	0.120	1423	1423
0.140	667	667	0.140	1313	1313	0.140	1653	1653
0.160	735	735	0.160	1434	1434	0.160	1894	1894
0.180	791	791	0.180	1532	1532	0.180	2091	2091
0.200	837	837	0.200	1611	1611	0.200	2246	2246
0.250	911	911	0.250	1722	1722	0.250	2489	2489
0.300	963	963	0.300	1738	1738	0.300	2586	2586
0.350	950	950	0.350	1684	1684	0.350	2611	2611
0.400	899	899	0.400	1549	1549	0.400	2451	2451
0.450	817	817	0.450	1464	1464	0.450	2248	2248
0.550	716	716	0.550	1347	1347	0.550	2003	2003
0.600	687	687	0.600	1301	1301	0.600	1915	1915
0.650	661	661	0.650	1268	1268	0.650	1863	1863
0.700	644	644	0.700	1240	1240	0.700	1804	1804
0.750	629	629	0.750	1214	1214	0.750	1763	1763
0.800	617	617	0.800	1193	1193	0.800	1738	1738
0.850	605	605	0.850	1178	1178	0.850	1706	1706
0.900	597	597	0.900	1160	1160	0.900	1678	1678
1.010	578	578	1.010	1134	1134	1.010	1631	1631
1.200	557	557	1.200	1099	1099	1.200	1588	1588
1.400	540	540	1.400	1080	1080	1.400	1560	1560
1.530	533	533	1.530	1074	1074	1.530	1543	1543
1.800	526	526	1.800	1062	1062	1.800	1524	1524
2.000	520	520	2.000	1054	1054	2.000	1503	1503
2.200	519	519	2.200	1050	1050	2.200	1494	1494
2.400	517	517	2.400	1049	1049	2.400	1481	1481
2.600	516	516	2.600	1040	1040	2.600	1468	1468
2.800	507	507	2.800	1039	1039	2.800	1462	1462
3.000	507	507	3.000	1031	1031	3.000	1444	1444

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INTERFACE FRICTION TEST RESULTS
ASTM D 6243

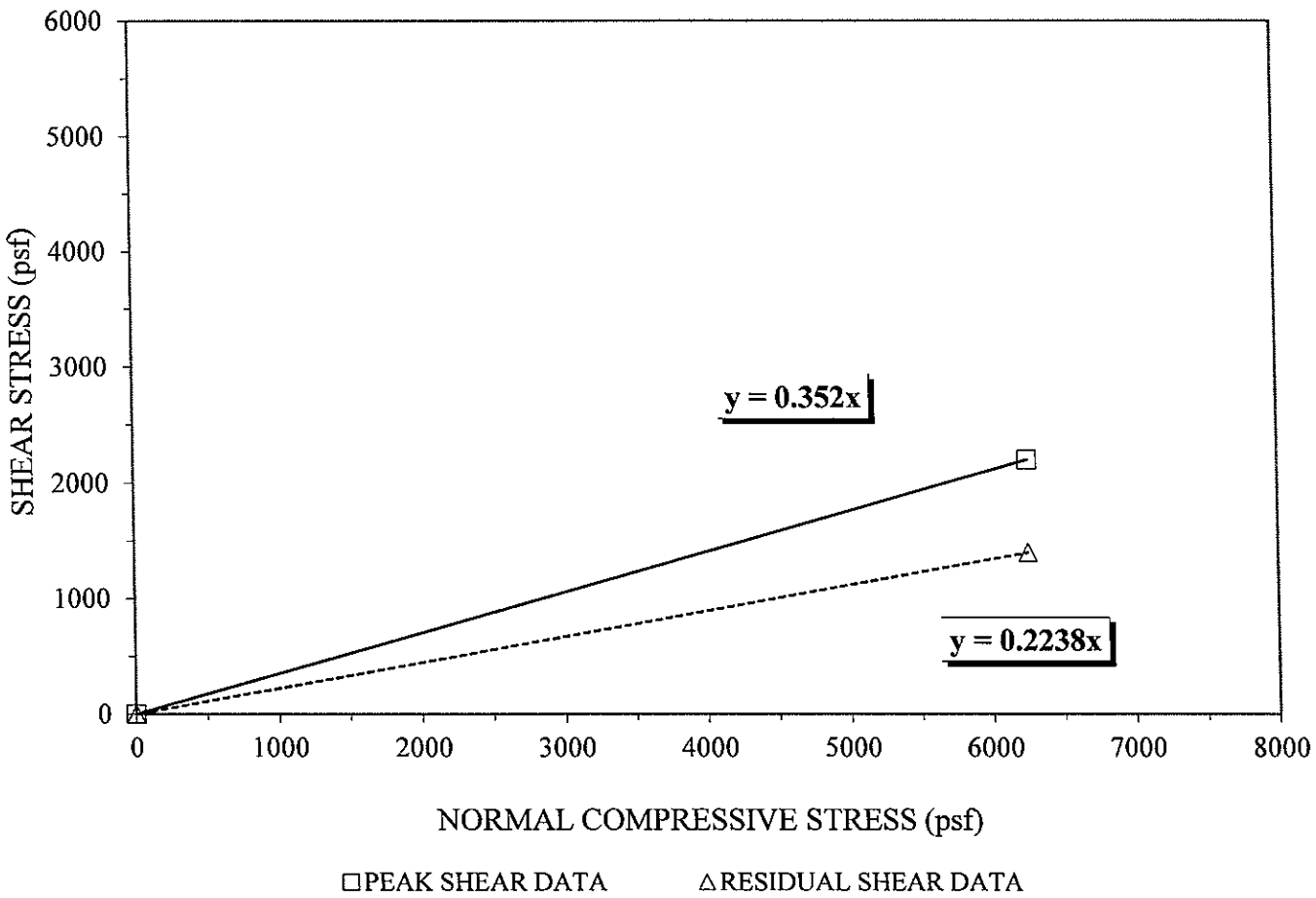
geotechnics
INTEGRITY IN TESTING

CLIENT : Chesapeake Containment Systems, Inc.
CLIENT PROJECT : Brickhaven No. 2 Mine Tract "A"
PROJECT NO. : L15058-02
LAB I. D. NO.: CSL-01 (2015-664-04-01)
GSE BentoLiner CAR CNSL, Roll # 135032036 (L15058-01-02)

INTERFACE : **Soil @ 100.7 pcf & 20.9 % M.C.**
vs. GCL (Coated Side)

	PEAK SHEAR		RESIDUAL SHEAR	
FRICTION ANGLE (deg) :	Φ =	**19.4**	Φ =	**12.6**
COEFFICIENT OF FRICTION :	=	**0.352**	=	**0.224**
ADHESION [Calculated] (psf):	a =	**0**	a =	**0**

NOTES:
1.) Soil placement was based on 95% maximum dry density and a moisture content +2% of optimum.
2.) The interface was loaded, inundated with water and consolidated for 24 hours prior to shearing.
3.) The peak friction angle was calculated using linear regression of the data point through the axis.
4.) The residual friction angle was calculated using linear regression on the end of test value through the axis.



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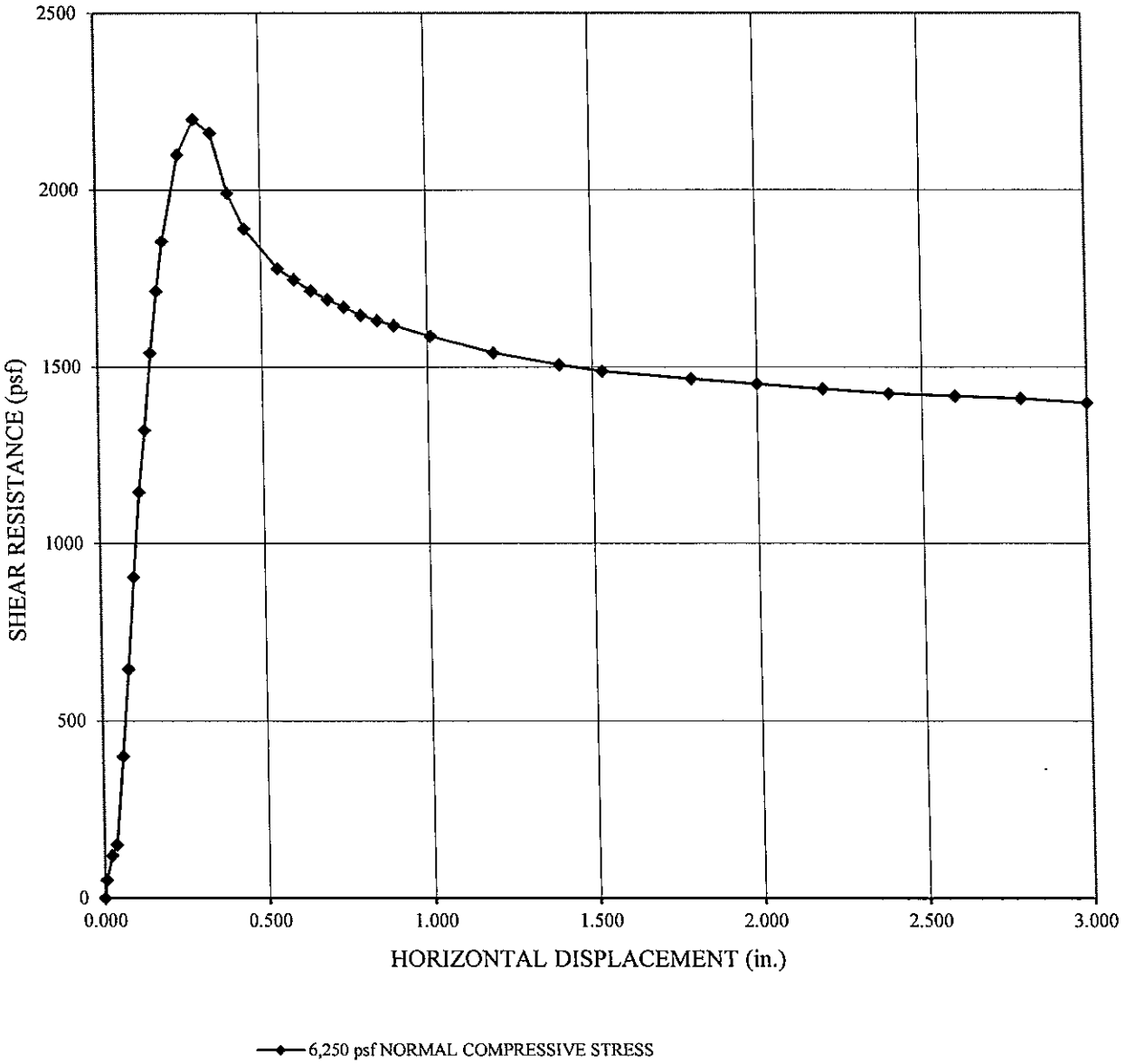
SHEAR RESISTANCE VS HORIZONTAL DISPLACEMENT



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GSE BentoLiner CAR CNSL, Roll # 135032036 (L15058-01-02)

INTERFACE : **Soil @ 100.7 pcf & 20.9 % M.C.**
vs. GCL (Coated Side)

STRAIN RATE (in / min) : 0.004 DIRECT SHEAR UNIT: Durham Geo
PLACEMENT CONDITION: Inundated NORMAL LOAD: Bladder System

NORMAL LOAD (psf)		6250	NORMAL LOAD (psf)		0	NORMAL LOAD (psf)		0
PEAK SHEAR STRESS (psf)		2200	PEAK SHEAR STRESS (psf)		0	PEAK SHEAR STRESS (psf)		0
PEAK SECANT ANGLE (deg)		19.4	PEAK SECANT ANGLE (deg)		0.0	PEAK SECANT ANGLE (deg)		0.0
RESIDUAL SHEAR (psf)		1399	RESIDUAL SHEAR (psf)		0	RESIDUAL SHEAR (psf)		0
RESID. SECANT ANGLE (deg)		12.6	RESID. SECANT ANGLE (deg)		0.0	RESID. SECANT ANGLE (deg)		0.0
HORIZONTAL			HORIZONTAL			HORIZONTAL		
DISPLACE. (in.)	SHEAR FORCE (lbs)	STRESS (psf)	DISPLACE. (in.)	SHEAR FORCE (lbs)	STRESS (psf)	DISPLACE. (in.)	SHEAR FORCE (lbs)	STRESS (psf)
0.000	0	0	0.000	0	0	0.000	0	0
0.005	51	51	0.005	0	0	0.005	0	0
0.023	120	120	0.023	0	0	0.023	0	0
0.038	150	150	0.038	0	0	0.038	0	0
0.060	400	400	0.060	0	0	0.060	0	0
0.080	646	646	0.080	0	0	0.080	0	0
0.100	905	905	0.100	0	0	0.100	0	0
0.120	1145	1145	0.120	0	0	0.120	0	0
0.140	1321	1321	0.140	0	0	0.140	0	0
0.160	1540	1540	0.160	0	0	0.160	0	0
0.180	1713	1713	0.180	0	0	0.180	0	0
0.200	1854	1854	0.200	0	0	0.200	0	0
0.250	2100	2100	0.250	0	0	0.250	0	0
0.300	2200	2200	0.300	0	0	0.300	0	0
0.350	2162	2162	0.350	0	0	0.350	0	0
0.400	1991	1991	0.400	0	0	0.400	0	0
0.450	1890	1890	0.450	0	0	0.450	0	0
0.550	1777	1777	0.550	0	0	0.550	0	0
0.600	1746	1746	0.600	0	0	0.600	0	0
0.650	1715	1715	0.650	0	0	0.650	0	0
0.700	1690	1690	0.700	0	0	0.700	0	0
0.750	1669	1669	0.750	0	0	0.750	0	0
0.800	1646	1646	0.800	0	0	0.800	0	0
0.850	1631	1631	0.850	0	0	0.850	0	0
0.900	1616	1616	0.900	0	0	0.900	0	0
1.010	1587	1587	1.010	0	0	1.010	0	0
1.200	1540	1540	1.200	0	0	1.200	0	0
1.400	1506	1506	1.400	0	0	1.400	0	0
1.530	1488	1488	1.530	0	0	1.530	0	0
1.800	1467	1467	1.800	0	0	1.800	0	0
2.000	1452	1452	2.000	0	0	2.000	0	0
2.200	1438	1438	2.200	0	0	2.200	0	0
2.400	1425	1425	2.400	0	0	2.400	0	0
2.600	1418	1418	2.600	0	0	2.600	0	0
2.800	1411	1411	2.800	0	0	2.800	0	0
3.000	1399	1399	3.000	0	0	3.000	0	0

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INTERFACE FRICTION TEST RESULTS
ASTM D 5321

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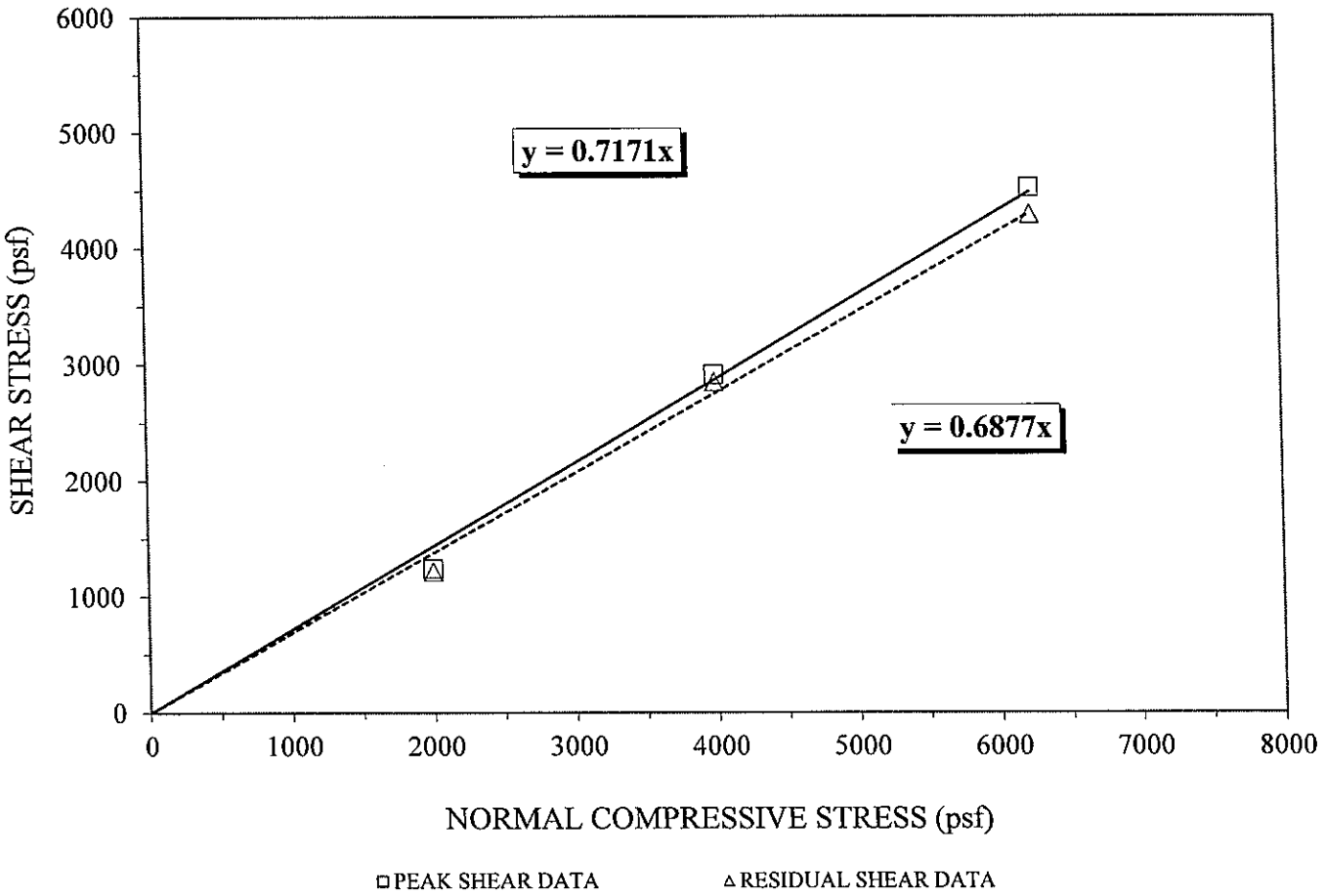
INTEGRITY IN TESTING

CLIENT : Chesapeake Containment Systems, Inc.
CLIENT PROJECT : Brickhaven No. 2 Mine Tract "A"
PROJECT NO. : L15058-02
LAB I. D. NO.: LV Sutton Fly Ash Sample (L15061-03-02)
GSE CoalDrain Fabrinet, Roll # 131464070 (L15058-02-01)

INTERFACE : **Fly Ash @ 74.9 pcf & 21.1 % M.C.**
vs. Geocomposite (composite woven-nonwoven fabric side)

	PEAK SHEAR		RESIDUAL SHEAR	
FRICTION ANGLE (deg) :	Φ =	**35.6**	Φ =	**34.5**
COEFFICIENT OF FRICTION :	=	**0.717**	=	**0.688**
ADHESION [Calculated] (psf):	a =	**0**	a =	**0**

NOTES:
1.) The ash was lightly compacted at a moisture content near optimum.
2.) The interface was loaded, inundated with water & seated for 24 hours prior to shearing.
3.) The peak friction angle was calculated using linear regression on the three data points.
4.) The residual friction angle was calculated using linear regression on the end of test values.



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ASTM D 5321

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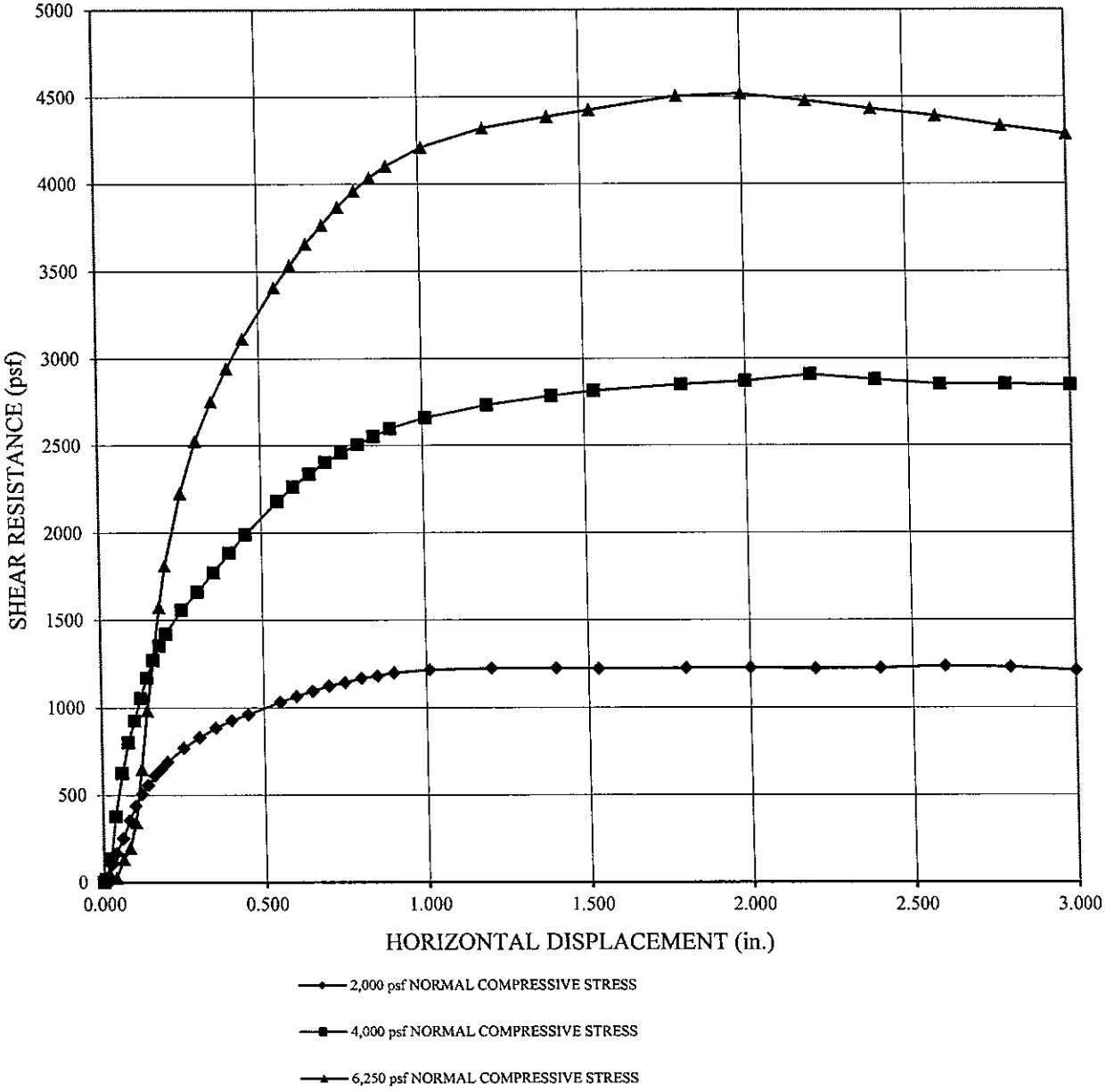
GSE CoalDrain Fabrinet, Roll # 131464070 (L15058-02-01)

INTERFACE : **Fly Ash @ 74.9 pcf & 21.1 % M.C.**
vs. Geocomposite (composite woven-nonwoven fabric side)

SHEAR RESISTANCE VS HORIZONTAL DISPLACEMENT



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INTERFACE FRICTION TEST RESULTS
ASTM D 5321

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GSE CoalDrain Fabrinet, Roll # 131464070 (L15058-02-01)

INTERFACE : **Fly Ash @ 74.9 pcf & 21.1 % M.C.**
vs. Geocomposite (composite woven-nonwoven fabric side)

STRAIN RATE (in / min) : 0.04 DIRECT SHEAR UNIT: Durham Geo
PLACEMENT CONDITION: Inundated NORMAL LOAD: Bladder System

NORMAL LOAD (psf)	2000	NORMAL LOAD (psf)	4000	NORMAL LOAD (psf)	6250
PEAK SHEAR STRESS (psf)	1238	PEAK SHEAR STRESS (psf)	2909	PEAK SHEAR STRESS (psf)	4519
PEAK SECANT ANGLE (deg)	31.8	PEAK SECANT ANGLE (deg)	36.0	PEAK SECANT ANGLE (deg)	35.9
RESIDUAL SHEAR (psf)	1213	RESIDUAL SHEAR (psf)	2849	RESIDUAL SHEAR (psf)	4287
RESID. SECANT ANGLE (deg)	31.2	RESID. SECANT ANGLE (deg)	35.5	RESID. SECANT ANGLE (deg)	34.4

HORIZONTAL			HORIZONTAL			HORIZONTAL		
DISPLACE. (in.)	SHEAR FORCE (lbs)	STRESS (psf)	DISPLACE. (in.)	SHEAR FORCE (lbs)	STRESS (psf)	DISPLACE. (in.)	SHEAR FORCE (lbs)	STRESS (psf)
0.000	0	0	0.000	0	0	0.000	0	0
0.005	15	15	0.005	16	16	0.005	25	25
0.023	101	101	0.023	136	136	0.023	28	28
0.038	168	168	0.038	376	376	0.038	26	26
0.060	252	252	0.060	626	626	0.060	132	132
0.080	355	355	0.080	801	801	0.080	196	196
0.100	439	439	0.100	926	926	0.100	343	343
0.120	506	506	0.120	1053	1053	0.120	649	649
0.140	559	559	0.140	1171	1171	0.140	984	984
0.160	611	611	0.160	1272	1272	0.160	1282	1282
0.180	648	648	0.180	1354	1354	0.180	1576	1576
0.200	690	690	0.200	1422	1422	0.200	1811	1811
0.250	770	770	0.250	1558	1558	0.250	2227	2227
0.300	831	831	0.300	1663	1663	0.300	2526	2526
0.350	884	884	0.350	1772	1772	0.350	2754	2754
0.400	927	927	0.400	1885	1885	0.400	2944	2944
0.450	962	962	0.450	1990	1990	0.450	3114	3114
0.550	1032	1032	0.550	2180	2180	0.550	3408	3408
0.600	1066	1066	0.600	2263	2263	0.600	3533	3533
0.650	1095	1095	0.650	2339	2339	0.650	3658	3658
0.700	1124	1124	0.700	2404	2404	0.700	3765	3765
0.750	1144	1144	0.750	2458	2458	0.750	3867	3867
0.800	1168	1168	0.800	2506	2506	0.800	3959	3959
0.850	1181	1181	0.850	2551	2551	0.850	4036	4036
0.900	1200	1200	0.900	2597	2597	0.900	4104	4104
1.010	1216	1216	1.010	2660	2660	1.010	4212	4212
1.200	1225	1225	1.200	2733	2733	1.200	4321	4321
1.400	1226	1226	1.400	2786	2786	1.400	4387	4387
1.530	1223	1223	1.530	2816	2816	1.530	4427	4427
1.800	1226	1226	1.800	2851	2851	1.800	4506	4506
2.000	1228	1228	2.000	2871	2871	2.000	4519	4519
2.200	1224	1224	2.200	2909	2909	2.200	4479	4479
2.400	1226	1226	2.400	2880	2880	2.400	4434	4434
2.600	1238	1238	2.600	2854	2854	2.600	4393	4393
2.800	1231	1231	2.800	2853	2853	2.800	4335	4335
3.000	1213	1213	3.000	2849	2849	3.000	4287	4287

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D6

D6 – Welding Rod

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17 September 2015

Ryan Clark
Chesapeake Containment Systems, Inc.
352 Earls Rd.
Middle River, MD 21220

RE: BRICKHAVEN MINE SITE

Dear Mr. Clark,

The extrusion rod supplied by Agru America, Inc. for the above referenced project was manufactured from the same type of resin as the geomembrane and is compatible with the geomembrane. The test reports for weld rod will be forwarded separately and will include density, melt index, carbon black content and dispersion at a frequency of once per resin lot.

Sincerely,

Nathan Ivy
Corporate Quality Control/Technical Manager
Agru America

Executive Offices: 500 Garrison Road, Georgetown, SC 29440 • 843 546-0600 • 800 321-1379 •
Sales Office: 700 Rockmead, Suite 150, Kingwood, TX 77339 • 281 358-4741 • 800 373-2478 •
Email: salesmkg@agruamerica.com

agru america
quality control dept.

WELDING ROD CERTIFICATE OF CONFORMITY

Weld Rod Thickness: **5 mm**

Lot Number: **HFG710030**

Material: **K307**

		Test Results
Carbon Black Content: ASTM D4218		**2.1** %
Melt Flow Index: Cond. E ASTM D1238	190C/2160 g	**.24** g/10 min
Specific Gravity: ASTM D792 /D1505	Average Density	**.938** g/cc
Carbon Dispersion:		**10 in Category 1**

CUSTOMER: **Chesapeake Containment**
P.O. #: **15065 Brickhaven Mine Site**
DESTINATION: **Brickhaven. NC**

OA #: **29035**

Signature:

Manager, Quality Control Department

Production Date: **7/28/2015**

CoA Date: 07/13/2015

Certificate of Analysis

Shipped To: AGRU AMERICA INC:GEORGETOWN
500 GARRISON RD
GEORGETOWN SC 29440
USA

Recipient: PALMER
Fax:

Delivery #: 89088781
PO #: 009581
Weight: 194800 LB
Ship Date: 07/13/2015
Package: BULK
Mode: Hopper Car
Car #: PSPX007044
Seal No: 31291

Product:
MARLEX POLYETHYLENE K307 BULK

Lot Number: HFG710030

Property	Test Method	Value	Unit
Melt Index	ASTM D1238	0.24	g/10mi
HLMI Flow Rate	ASTM D1238	22	g/10mi
Density	D1505 or D4883	0.937	g/cm3
Pellet Count	P02.08.03	25	pel/g
Production Date		07/01/2015	

The data set forth herein have been carefully compiled by Chevron Phillips Chemical Company LP (CPChem).
However, there is no warranty of any kind, either expressed or implied, applicable to its use, and the user assumes all risk and liability in connection therewith.

Troy Griffin
Quality Systems Coordinator

For CoA questions contact Customer Service Representative at +1-832-813-4806

WELDING ROD CERTIFICATE OF CONFORMITY

Weld Rod Thickness: **5 mm**

Lot Number: **HFF820520**

Material: **K307**

		Test Results
Carbon Black Content: ASTM D4218		**2.4** %
Melt Flow Index: Cond. E ASTM D1238	190C/2160 g	**.31** g/10 min
Specific Gravity: ASTM D792 /D1505	Average Density	**.940** g/cc
Carbon Dispersion:		**10 in Category 1**

CUSTOMER: **Chesapeake Containment**
P.O. #: **15065 Brickhaven Mine Site**
DESTINATION: **Brickhaven. NC**

OA #: **29035**

Signature:

Manager, Quality Control Department

Production Date: **7/12/2015**

CoA Date: 06/25/2015

Certificate of Analysis

Shipped To: AGRU AMERICA INC:GEORGETOWN
500 GARRISON RD
GEORGETOWN SC 29440
USA

Recipient: PALMER
Fax:

Delivery #: 89078798
PO #: 009477
Weight: 186100 LB
Ship Date: 06/25/2015
Package: BULK
Mode: Hopper Car
Car #: TILX620482
Seal No: 30988

Product:
MARLEX POLYETHYLENE K307 BULK

Lot Number: HFF820520

Property	Test Method	Value	Unit
Melt Index	ASTM D1238	0.31	g/10mi
HLMI Flow Rate	ASTM D1238	26	g/10mi
Density	D1505 or D4883	0.938	g/cm3
Pellet Count	P02.08.03	26	pel/g
Production Date		06/11/2015	

WAIVED BY NEIDERMOSER

The data set forth herein have been carefully compiled by Chevron Phillips Chemical Company LP (CPChem).
However, there is no warranty of any kind, either expressed or implied, applicable to its use, and the user assumes all risk and liability in connection therewith.

Troy Griffin
Quality Systems Coordinator

For CoA questions contact Customer Service Representative at +1-832-813-4806

agru america
quality control dept.

WELDING ROD CERTIFICATE OF CONFORMITY

Weld Rod Thickness: **5 mm**

Lot Number: **HFG710070**

Material: **K307**

		Test Results
Carbon Black Content: ASTM D4218		**2.2** %
Melt Flow Index: Cond. E ASTM D1238	190C/2160 g	**.20** g/10 min
Specific Gravity: ASTM D792 /D1505	Average Density	**.939** g/cc
Carbon Dispersion:		**10 in Category 1**

CUSTOMER: **Chesapeake Containment**
P.O. #: **15065 Brickhaven Mine Site**
DESTINATION: **Brickhaven. NC**

OA #: **29035**

Signature:

Manager, Quality Control Department

Production Date: **7/24/2015**

CoA Date: 07/08/2015

Certificate of Analysis

Shipped To: AGRU AMERICA INC:GEORGETOWN
500 GARRISON RD
GEORGETOWN SC 29440
USA

Recipient: PALMER
Fax:

Delivery #: 89085894
PO #: 009581
Weight: 195900 LB
Ship Date: 07/08/2015
Package: BULK
Mode: Hopper Car
Car #: CHVX890021
Seal No: 31294

Product:
MARLEX POLYETHYLENE K307 BULK

Lot Number: HFG710070

Property	Test Method	Value	Unit
Melt Index	ASTM D1238	0.20	g/10mi
HLMI Flow Rate	ASTM D1238	22	g/10mi
Density	D1505 or D4883	0.937	g/cm3
Pellet Count	P02.08.03	25	pel/g
Production Date		07/02/2015	

The data set forth herein have been carefully compiled by Chevron Phillips Chemical Company LP (CPChem).
However, there is no warranty of any kind, either expressed or implied, applicable to its use, and the user assumes all risk and liability in connection therewith.

Troy Griffin
Quality Systems Coordinator

For CoA questions contact Customer Service Representative at +1-832-813-4806

WELDING ROD CERTIFICATE OF CONFORMITY

Weld Rod Thickness: **5 mm**

Lot Number: **HEN820690**

Material: **K307**

		Test Results
Carbon Black Content: ASTM D4218		**2.2** %
Melt Flow Index: Cond. E ASTM D1238	190C/2160 g	**.25** g/10 min
Specific Gravity: ASTM D792 /D1505	Average Density	**.939** g/cc
Carbon Dispersion:		**10 in Category 1**

CUSTOMER: **Chesapeake Containment**
P.O. #: **15065 Brickhaven Mine Site**
DESTINATION: **Brickhaven. NC**

OA #: **29035**

Signature:

Manager, Quality Control Department

Production Date: **2/6/2015**

CoA Date: 01/07/2015

Certificate of Analysis

Shipped To: AGRU AMERICA INC:GEORGETOWN
500 GARRISON RD
GEORGETOWN SC 29440
USA

Recipient: PALMER
Fax:

Delivery #: 88982636
PO #: 008968
Weight: 188000 LB
Ship Date: 01/07/2015
Package: BULK
Mode: Hopper Car
Car #: CHVX891130
Seal No: 10759

Product:
MARLEX POLYETHYLENE K307 BULK

Lot Number: HEN820690

Property	Test Method	Value	Unit
Melt Index	ASTM D1238	0.25	g/10mi
HLMI Flow Rate	ASTM D1238	22	g/10mi
Density	D1505 or D4883	0.938	g/cm3
Pellet Count	P02.08.03	26	pel/g
Production Date		12/15/2014	

The data set forth herein have been carefully compiled by Chevron Phillips Chemical Company LP (CPChem).
However, there is no warranty of any kind, either expressed or implied, applicable to its use, and the user assumes all risk and liability in connection therewith.

Troy Griffin
Quality Systems Coordinator

For CoA questions contact Customer Service Representative at +1-832-813-4806

agru america
quality control dept.

WELDING ROD CERTIFICATE OF CONFORMITY

Weld Rod Thickness: **5 mm**

Lot Number: **HFG710090**

Material: **K307**

		Test Results
Carbon Black Content: ASTM D4218		**2.3** %
Melt Flow Index: Cond. E ASTM D1238	190C/2160 g	**.23** g/10 min
Specific Gravity: ASTM D792 /D1505	Average Density	**.937** g/cc
Carbon Dispersion:		**10 in Category 1**

CUSTOMER: **Chesapeake Containment**
P.O. #: **15065 Brickhaven Mine Site**
DESTINATION: **Brickhaven. NC**

OA #: **29035**

Signature:

Manager, Quality Control Department

Production Date: **7/24/2015**

CoA Date: 07/08/2015

Certificate of Analysis

Shipped To: AGRU AMERICA INC:GEORGETOWN
500 GARRISON RD
GEORGETOWN SC 29440
USA

Recipient: PALMER
Fax:

Delivery #: 89085892
PO #: 009581
Weight: 198600 LB
Ship Date: 07/08/2015
Package: BULK
Mode: Hopper Car
Car #: GACX001500
Seal No: 33290

Product:
MARLEX POLYETHYLENE K307 BULK

Lot Number: HFG710090

Property	Test Method	Value	Unit
Melt Index	ASTM D1238	0.23	g/10mi
HLMI Flow Rate	ASTM D1238	21	g/10mi
Density	D1505 or D4883	0.937	g/cm3
Pellet Count	P02.08.03	26	pel/g
Production Date		07/03/2015	

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Troy Griffin
Quality Systems Coordinator

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E

Appendix E – Geosynthetic Installation Data

E1 – Subgrade Acceptance Forms
E2 – Geosynthetic Clay Liner
E3 – Geomembrane
E4 – Warranty

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E1

E1 – Subgrade Acceptance Forms

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CHESAPEAKE
CONTAINMENT SYSTEMS, INC.

SUBGRADE SURFACE ACCEPTANCE

Project Name: Brick Haven

Customer: Charah

Project Number: 15-054

Date: 4/6/16

Location: Moncure, NC

Partial: ✓

Final: _____

This document only applies to the acceptability of surface conditions for installation of geosynthetic products. Chesapeake Containment Systems, Inc. does not accept responsibility for weather damage, compaction, elevation or moisture content, subsurface conditions, nor for the surface condition maintenance during deployment. Structural integrity of the subgrade and maintenance of these conditions are the responsibility of the Owner or Earthwork Contractor.

For Chesapeake Containment Systems, Inc.

Emiliano Salaz

For Contractor/Owner/Inspector:

Sean Mitchell 4/6/16 HDR

Acceptance Number: (1) Cell 1C

Area Accepted: Liner Installed on 4/6/16
GCL Installed on 4/6/16

CHESAPEAKE
CONTAINMENT SYSTEMS, INC.

SUBGRADE SURFACE ACCEPTANCE

Project Name: Brick Haven

Customer: Charah

Project Number: 15-054

Date: 4/7/16

Location: Moncure, NC

Partial: ✓

Final: _____

This document only applies to the acceptability of surface conditions for installation of geosynthetic products. Chesapeake Containment Systems, Inc. does not accept responsibility for weather damage, compaction, elevation or moisture content, subsurface conditions, nor for the surface condition maintenance during deployment. Structural integrity of the subgrade and maintenance of these conditions are the responsibility of the Owner or Earthwork Contractor.

For Chesapeake Containment Systems, Inc.

Jorge Lopez

For Contractor/Owner/Inspector:

[signature] 4/7/16 HDR

Acceptance Number: (2) Cell 1C

Area Accepted: Liner Installed On 4/7/16
GCL Installed On 4/7/16

CHESAPEAKE
CONTAINMENT SYSTEMS, INC.

SUBGRADE SURFACE ACCEPTANCE

Project Name: Brick Haven

Customer: Charah

Project Number: 15-054

Date: 4/8/16

Location: Moncure, NC

Partial: ✓

Final: _____

This document only applies to the acceptability of surface conditions for installation of geosynthetic products. Chesapeake Containment Systems, Inc. does not accept responsibility for weather damage, compaction, elevation or moisture content, subsurface conditions, nor for the surface condition maintenance during deployment. Structural integrity of the subgrade and maintenance of these conditions are the responsibility of the Owner or Earthwork Contractor.

For Chesapeake Containment Systems, Inc.

Jorge Lopez

For Contractor/Owner/Inspector:

[illegible] 4/8/16 HDR

Acceptance Number: (3) Cell 1C

Area Accepted: Liner Installed On 4/8/16
GCL Installed On 4/8/16

CHESAPEAKE
CONTAINMENT SYSTEMS, INC.

SUBGRADE SURFACE ACCEPTANCE

Project Name: Brick Haven

Customer: Charah

Project Number: 15-054

Date: 4/9/16

Location: Moncure, NC

Partial: .

Final: ✓

This document only applies to the acceptability of surface conditions for installation of geosynthetic products. Chesapeake Containment Systems, Inc. does not accept responsibility for weather damage, compaction, elevation or moisture content, subsurface conditions, nor for the surface condition maintenance during deployment. Structural integrity of the subgrade and maintenance of these conditions are the responsibility of the Owner or Earthwork Contractor.

For Chesapeake Containment Systems, Inc.

Jorge Lopez

For Contractor/Owner/Inspector:

[signature] 4/9/16 HDR

Liner Installed On 4/9/16

Acceptance Number: (4) Cell 1C Area Accepted: GCL Installed On 4/9/16

E2

E2 – Geosynthetic Clay Liner

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CHESAPEAKE CONTAINMENT SYSTEMS, INC.

Panel Placement Log

Project No.: I15-054

Material: GCL

Project Name: Brickhaven Mine Site - Subcell 1C

Project Start Date: 4/6/16

Project Location: Moncure, NC

Date Deployed	Panel No.	Time Deployed	Panel Location	Roll No.	Width (FT)	Length (FT)	Area (SQ FT)
4/6/16	1	10:20	North Slope & Floor	34003	14.5	150	2175
4/6/16	2	10:30	Floor	34033	14.5	150	2175
4/6/16	3	10:35	Floor	34456	14.5	150	2175
4/6/16	4	10:45	Floor	34460	14.5	55	797.5
4/6/16	5	10:55	Floor	34460	14.5	95	1377.5
4/6/16	6	11:00	Floor	34582	14.5	150	2175
4/6/16	7	11:10	Floor	34577	14.5	150	2175
4/6/16	8	11:15	Floor	34576	14.5	110	1595
4/6/16	9	11:20	Slope	34576	14.5	40	580
4/6/16	10	11:25	North Slope & Floor	34468	14.5	150	2175
4/6/16	11	11:30	Floor	34473	14.5	150	2175
4/6/16	12	11:40	Floor	34449	14.5	150	2175
4/6/16	13	14:15	Floor	33871	14.5	150	2175
4/6/16	14	14:20	Floor	34579	14.5	150	2175
4/6/16	15	14:30	Floor	33819	14.5	150	2175
4/6/16	16	14:35	Floor	34211	14.5	25	362.5
4/6/16	17	14:40	Floor	34211	14.5	60	870
4/6/16	18	14:45	Floor	34211	14.5	65	942.5
4/6/16	19	14:50	Floor	34047	14.5	150	2175
4/6/16	20	14:55	Floor	34203	14.5	150	2175
4/6/16	21	15:00	North Slope & Floor	34207	14.5	150	2175
4/6/16	22	15:05	North Slope & Floor	33875	14.5	150	2175
4/6/16	23	15:10	Floor	34035	14.5	150	2175
4/6/16	24	15:15	Floor	34046	14.5	150	2175
4/6/16	25	15:20	Floor	34044	14.5	60	870
4/6/16	26	18:00	North Slope & Floor	34044	14.5	90	1305
4/6/16	27	18:10	Floor	34045	14.5	150	2175
4/6/16	28	18:15	Floor	34039	14.5	150	2175
4/6/16	29	18:20	Floor	33870	14.5	120	1740
4/6/16	30	18:25	Floor	33870	14.5	30	435

CHESAPEAKE CONTAINMENT SYSTEMS, INC.

Panel Placement Log

Project No.: I15-054

Material: GCL

Project Name: Brickhaven Mine Site - Subcell 1C

Project Start Date: 4/6/16

Project Location: Moncure, NC

Date Deployed	Panel No.	Time Deployed	Panel Location	Roll No.	Width (FT)	Length (FT)	Area (SQ FT)
4/6/16	31	18:30	Floor	34036	14.5	150	2175
4/6/16	32	18:35	Floor	34037	14.5	150	2175
4/6/16	33	18:40	North Slope & Floor	34583	14.5	150	2175
4/6/16	34	18:45	Floor	34058	14.5	30	435
4/6/16	35	18:50	North Slope & Floor	34058	14.5	120	1740
4/6/16	36	18:55	Floor	34061	14.5	150	2175
4/6/16	37	19:00	Floor	34066	14.5	150	2175
4/6/16	38	19:05	Floor	34073	14.5	90	1305
4/7/16	39	9:15	North Slope	34073	14.5	60	870
4/7/16	40	9:25	Floor	34078	14.5	150	2175
4/7/16	41	9:35	Floor	34063	14.5	150	2175
4/7/16	42	9:40	Floor	34079	14.5	150	2175
4/7/16	43	9:50	North Slope & Floor	34066	14.5	150	2175
4/7/16	44	10:15	Floor	34054	14.5	150	2175
4/7/16	45	10:25	Floor	34073	14.5	150	2175
4/7/16	46	10:30	Floor	34072	14.5	50	725
4/7/16	47	10:35	Floor	34072	14.5	100	1450
4/7/16	48	10:40	Floor	34034	14.5	150	2175
4/7/16	49	10:45	Floor	34069	14.5	150	2175
4/7/16	50	10:50	North Slope & Floor	34040	14.5	95	1377.5
4/7/16	51	10:55	North Slope	34040	14.5	55	797.5
4/7/16	52	11:00	Floor	34067	14.5	150	2175
4/7/16	53	11:05	Floor	34051	14.5	150	2175
4/7/16	54	11:15	Floor	33966	14.5	150	2175
4/7/16	55	13:25	North Slope & Floor	34053	14.5	150	2175
4/7/16	56	13:30	Floor	34060	14.5	150	2175
4/7/16	57	13:35	Floor	34055	14.5	150	2175
4/7/16	58	13:40	Floor	34038	14.5	50	725
4/7/16	59	13:45	Floor	34028	14.5	150	2175
4/7/16	60	13:50	Floor	34076	14.5	150	2175

CHESAPEAKE CONTAINMENT SYSTEMS, INC.

Panel Placement Log

Project No.: I15-054

Material: GCL

Project Name: Brickhaven Mine Site - Subcell 1C

Project Start Date: 4/6/16

Project Location: Moncure, NC

Date Deployed	Panel No.	Time Deployed	Panel Location	Roll No.	Width (FT)	Length (FT)	Area (SQ FT)
4/7/16	61	14:35	Floor	34052	14.5	150	2175
4/7/16	62	14:40	Floor	34038	14.5	50	725
4/7/16	63	15:15	North Slope & Floor	34548	14.5	150	2175
4/7/16	64	15:20	Floor	34550	14.5	150	2175
4/7/16	65	15:25	Floor	34542	14.5	150	2175
4/7/16	66	15:30	Floor	34260	14.5	50	725
4/7/16	67	15:35	Floor	34260	14.5	100	1450
4/7/16	68	16:25	Floor	34268	14.5	150	2175
4/7/16	69	16:30	Floor	34273	14.5	150	2175
4/7/16	70	16:35	North Slope & Floor	34250	14.5	100	1450
4/7/16	71	16:40	North Slope	34250	14.5	50	725
4/7/16	72	16:50	North Slope & Floor	34275	14.5	150	2175
4/7/16	73	16:55	Floor	34038	14.5	50	725
4/7/16	74	17:00	Floor	34274	14.5	150	2175
4/7/16	75	17:05	Floor	34249	14.5	110	1595
4/7/16	76	17:30	Floor	34249	14.5	40	580
4/7/16	77	17:40	Floor	34265	14.5	150	2175
4/8/16	78	7:30	Floor	34278	14.5	150	2175
4/8/16	79	7:35	Floor	34258	14.5	150	2175
4/8/16	80	7:45	North Slope & Floor	34254	14.5	150	2175
4/8/16	81	8:00	Floor	34267	14.5	150	2175
4/8/16	82	8:05	Floor	34264	14.5	150	2175
4/8/16	83	8:10	Floor	34547	14.5	25	362.5
4/8/16	84	8:15	Floor	34547	14.5	125	1812.5
4/8/16	85	8:20	Floor	34253	14.5	150	2175
4/8/16	86	8:25	North Slope & Floor	34556	14.5	150	2175
4/8/16	87	8:30	Floor	34555	14.5	40	580
4/8/16	88	8:35	North Slope & Floor	34555	14.5	110	1595
4/8/16	89	8:40	Floor	34257	14.5	150	2175
4/8/16	90	8:45	Floor	34489	14.5	150	2175

CHESAPEAKE CONTAINMENT SYSTEMS, INC.

Panel Placement Log

Project No.: I15-054

Material: GCL

Project Name: Brickhaven Mine Site - Subcell 1C

Project Start Date: 4/6/16

Project Location: Moncure, NC

Date Deployed	Panel No.	Time Deployed	Panel Location	Roll No.	Width (FT)	Length (FT)	Area (SQ FT)
4/8/16	91	8:50	Floor	34536	14.5	110	1595
4/8/16	92	8:55	Floor	34536	14.5	40	580
4/8/16	93	9:00	Floor	34261	14.5	150	2175
4/8/16	94	9:05	North Slope & Floor	34251	14.5	110	1595
4/8/16	95	9:10	North Slope	34251	14.5	40	580
4/8/16	96	9:15	North Slope & Floor	34255	14.5	150	2175
4/8/16	97	9:20	Floor	34256	14.5	110	1595
4/8/16	98	9:22	Floor	34256	14.5	20	290
4/8/16	99	9:25	Floor	34256	14.5	20	290
4/8/16	100	9:30	Floor	34546	14.5	150	2175
4/8/16	101	9:35	North Slope & Floor	34269	14.5	120	1740
4/8/16	102	9:38	Floor	34269	14.5	30	435
4/8/16	103	9:40	North Slope & Floor	34280	14.5	150	2175
4/8/16	104	9:45	Floor	34276	14.5	60	870
4/8/16	105	9:48	Floor	34276	14.5	90	1305
4/8/16	106	9:50	North Slope & Floor	34266	14.5	90	1305
4/8/16	107	9:52	North Slope	34266	14.5	60	870
4/8/16	108	9:55	North Slope & Floor	34481	14.5	70	1015
4/8/16	109	9:57	Floor	34481	14.5	20	290
4/8/16	110	10:00	North Slope	34481	14.5	65	942.5
4/8/16	111	10:05	Floor	34504	14.5	40	580
4/8/16	112	10:15	North Slope	34504	14.5	60	870
4/8/16	113	15:50	Floor	34504	14.5	50	725
4/8/16	114	16:00	Floor	34512	14.5	75	1087.5
4/8/16	115	16:03	Floor	34512	14.5	75	1087.5
4/8/16	116	16:05	South Slope & Floor	34595	14.5	75	1087.5
4/8/16	117	16:10	South Slope & Floor	34595	14.5	75	1087.5
4/8/16	118	16:13	Floor	34520	14.5	115	1667.5
4/8/16	119	16:15	Floor	34520	14.5	35	507.5
4/8/16	120	16:25	South Slope & Floor	34271	14.5	150	2175

CHESAPEAKE CONTAINMENT SYSTEMS, INC.

Panel Placement Log

Project No.: I15-054

Material: GCL

Project Name: Brickhaven Mine Site - Subcell 1C

Project Start Date: 4/6/16

Project Location: Moncure, NC

Date Deployed	Panel No.	Time Deployed	Panel Location	Roll No.	Width (FT)	Length (FT)	Area (SQ FT)
4/8/16	121	16:30	South Slope & Floor	34578	14.5	150	2175
4/8/16	122	16:33	Floor	34532	14.5	40	580
4/8/16	123	16:37	Floor	34532	14.5	110	1595
4/8/16	124	16:40	South Slope & Floor	34475	14.5	80	1160
4/8/16	125	16:45	South Slope & Floor	34475	14.5	70	1015
4/8/16	126	16:48	Floor	34272	14.5	120	1740
4/9/16	127	7:50	Floor	34272	14.5	30	435
4/9/16	128	7:55	South Slope & Floor	34279	14.5	150	2175
4/9/16	129	8:00	Floor	34068	14.5	20	290
4/9/16	130	8:05	Floor	34068	14.5	130	1885
4/9/16	131	8:07	South Slope & Floor	33979	14.5	70	1015
4/9/16	132	8:10	South Slope & Floor	33979	14.5	80	1160
4/9/16	133	8:13	Floor	34064	14.5	130	1885
4/9/16	134	8:15	Floor	34064	14.5	20	290
4/9/16	135	8:20	South Slope & Floor	34484	14.5	150	2175
4/9/16	136	8:22	Floor	34479	14.5	40	580
4/9/16	137	8:25	Floor	34479	14.5	110	1595
4/9/16	138	8:28	South Slope & Floor	34490	14.5	110	1595
4/9/16	139	8:30	Floor	34490	14.5	40	580
4/9/16	140	8:33	South Slope & Floor	34431	14.5	150	2175
4/9/16	141	8:35	Floor	34480	14.5	30	435
4/9/16	142	8:45	Floor	34480	14.5	120	1740
4/9/16	143	8:50	South Slope & Floor	34446	14.5	90	1305
4/9/16	144	8:55	Floor	34446	14.5	60	870
4/9/16	145	9:00	South Slope & Floor	34402	14.5	150	2175
4/9/16	146	9:05	Floor	34477	14.5	30	435
4/9/16	147	9:10	Floor	34477	14.5	120	1740
4/9/16	148	9:15	South Slope & Floor	34575	14.5	95	1377.5
4/9/16	149	9:17	Floor	34575	14.5	55	797.5
4/9/16	150	9:20	Floor	34471	14.5	150	2175

CHESAPEAKE CONTAINMENT SYSTEMS, INC.

Panel Placement Log

Project No.: I15-054

Material: GCL

Project Name: Brickhaven Mine Site - Subcell 1C

Project Start Date: 4/6/16

Project Location: Moncure, NC

Date Deployed	Panel No.	Time Deployed	Panel Location	Roll No.	Width (FT)	Length (FT)	Area (SQ FT)
4/9/16	151	9:25	Floor	34476	14.5	30	435
4/9/16	152	9:28	Floor	34476	14.5	120	1740
4/9/16	153	9:30	South Slope & Floor	34483	14.5	100	1450
4/9/16	154	9:33	Floor	34483	14.5	50	725
4/9/16	155	9:35	Floor	34467	14.5	150	2175
4/9/16	156	9:40	South Slope & Floor	34482	14.5	60	870
4/9/16	157	9:43	Floor	34482	14.5	90	1305
4/9/16	158	9:45	Floor	34418	14.5	65	942.5
4/9/16	159	9:50	Floor	34418	14.5	85	1232.5
4/9/16	160	9:55	Floor	34578	14.5	50	725
4/9/16	161	10:00	Floor	34578	14.5	70	1015
4/9/16	162	10:05	North Slope	34578	14.5	30	435

Legends

DEFECT CODE			
BO-	Burn Out	SI-	Soil Surface
CR-	Crease	DD-	Deployment Damage
DS-	Destructive Test Number	MD-	Material Damage
EE-	Earthwork Equipment Damage	WR-	Wrinkle
FM-	Fishmouth	WS-	Welder Restart
FT-	Pressure Test Cut	FD-	Factory Defect
T-	Joint	AT-	Air Test

REPAIR TYPE	
C-	Cap Strip
P-	Patches
B-	Extrudate Bead
GB-	Grind & Bead
BT-	Boot

NOTATIONS	
SOS or 0'	Beginning of Seam
EOS	End of Seam
--	To an Area
>	From an Area
NOAT	No AT

TEST RESULTS	
P-	Pass
F-	Fail

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E3

E3 – Geomembrane

E3.1 – Panel Log
E3.2 – Trial Seam Log
E3.3 – Seam and Nondestructive Log
E3.4 – Destructive Test Log
E3.5 – Destructive Test Results
E3.6 – Repair Log
E3.7 – Tensiometer Calibration Certificates

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CHESAPEAKE CONTAINMENT SYSTEMS, INC.

Panel Placement Log

Project No.: I15-054

Project Name: Brickhaven Mine Site - Subcell 1C

Project Start Date: 4/6/16

Project Location: Moncure, NC

Material: HDPE

60 mil

Date Deployed	Panel No.	Time Deployed	Panel Location	Roll No.	Width (FT)	Length (FT)	Area (SQ FT)
4/6/16	1	13:15	North Slope & Floor	4061	22	500	11000
4/6/16	2	13:30	North Slope & Floor	5067	22	500	11000
4/6/16	3	15:35	North Slope & Floor	7101	22	500	11000
4/6/16	4	15:55	North Slope & Floor	4056	22	500	11000
4/6/16	5	19:00	North Slope & Floor	6083	22	500	11000
4/6/16	6	19:35	North Slope & Floor	7098	22	500	11000
4/7/16	7	11:30	North Slope & Floor	5071	22	500	11000
4/7/16	8	12:00	North Slope & Floor	4057	22	500	11000
4/7/16	9	14:20	North Slope & Floor	6092	22	500	11000
4/7/16	10	15:45	North Slope & Floor	6089	22	500	11000
4/7/16	11	17:20	North Slope & Floor	6087	22	500	11000
4/7/16	12	18:00	North Slope & Floor	7097	22	500	11000
4/8/16	13	11:00	North Slope & Floor	7100	22	475	10450
4/8/16	14	11:20	North Slope & Floor	6093	22	475	10450
4/8/16	15	13:00	North Slope & Floor	6086	22	435	9570
4/8/16	16	13:35	Floor	6086	22	75	1650
4/8/16	17	13:55	North Slope & Floor	6088	22	285	6270
4/8/16	18	14:10	North Slope & Floor	6088	22	200	4400
4/8/16	19	14:30	North Slope & Floor	5073	22	195	4290
4/8/16	20	14:45	Floor	5073	22	85	1870
4/8/16	21	15:00	North Slope & Floor	5073	22	140	3080
4/8/16	22	15:10	North Slope	5073	22	50	1100
4/8/16	23	16:55	South Slope & Floor	6082	22	190	4180
4/8/16	24	17:05	South Slope & Floor	6082	22	190	4180
4/8/16	25	17:15	South Slope & Floor	6082	22	100	2200
4/8/16	26	17:30	Floor	7103	22	100	2200
4/8/16	27	17:35	South Slope & Floor	7103	22	230	5060
4/9/16	28	10:20	South Slope & Floor	7103	22	160	3520
4/9/16	29	10:30	Floor	6080	22	70	1540
4/9/16	30	10:40	South Slope & Floor	6080	22	230	5060

CHESAPEAKE CONTAINMENT SYSTEMS, INC.

Panel Placement Log

Project No.: I15-054

Project Name: Brickhaven Mine Site - Subcell 1C

Project Start Date: 4/6/16

Project Location: Moncure, NC

Material: HDPE

60 mil

Date Deployed	Panel No.	Time Deployed	Panel Location	Roll No.	Width (FT)	Length (FT)	Area (SQ FT)
4/9/16	31	10:50	South Slope & Floor	6080	22	200	4400
4/9/16	32	10:55	Floor	7100	22	30	660
4/9/16	33	14:05	South Slope & Floor	4048	22	230	5060
4/9/16	34	14:15	South Slope & Floor	4048	22	230	5060
4/9/16	35	14:40	South Slope & Floor	5065	22	230	5060
4/9/16	36	15:15	South Slope & Floor	5065	22	230	5060
4/9/16	37	15:50	South Slope & Floor	4055	22	215	4730
4/9/16	38	16:15	Floor	4055	22	90	1980
4/9/16	39	16:20	Floor	4055	22	35	770
4/9/16	40	16:30	Floor	4048	22	42	924

CHESAPEAKE CONTAINMENT SYSTEMS, INC.

Geomembrane Field Trial Seam Log

Project No.: I15-054
Project Name: Brickhaven Mine Site - Subcell 1C
Start Date: 4/6/16
Project Location: Moncure, NC

Material: HDPE

60 mil Thickness

Project Seam Requirements

	Fusion:		Extrusion:
Peel:	91	Peel:	78
Shear:	120	Shear:	120

Sample #	Date	Time	Ambient Temp.	Welder ID		Wedge	Extruder	Seam Strength										Pass Fail	Tech ID	Remarks
				Machine	Operator	Temp/ Speed ºF/fpm (or %max)	Barrel/ Preheat ºF/ºF	Peel (ppi) IN/OUT					Shear (ppi)							
								1	2	3	4	5	1	2	3	4	5			
1	4/6/16	13:25	56	M36	CF	860/650		104	100	101	93		140	160	155	147		P	FL	S/S
								92	99	91	98									
2	4/6/16	13:30	56	M36	CF	860/650		137	97	125	91		121	125	131	128		P	FL	T/T
								124	132	127	121									
3	4/6/16	14:54	58	M28	ED	860/600		108	115	125	126		157	153	162	159		P	FL	S/S
								106	104	103	100									
4	4/6/16	15:00	58	M28	ED	860/600		132	151	105	148		159	128	148	139		P	FL	T/T
								120	130	140	137									
5	4/6/16	19:35	54	M19	ED	860/600		105	121	112	108		145	153	159	164		P	FL	S/S
								110	118	105	122									
6	4/7/16	11:42	60	M36	CF	860/750		105	94	97	99		143	140	138	146		P	FL	S/S
								92	91	91	97									
7	4/7/16	12:12	62	M19	ED	860/650		104	103	92	91		133	140	145	152		P	FL	S/S
								99	91	106	98									
8	4/7/16	17:26	60	M36	CF	860/750		115	98	99	91		146	135	139	148		P	FL	S/S
								95	107	105	104									
9	4/7/16	18:15	58	M19	ED	860/650		91	113	108	108		134	140	148	154		P	FL	S/S
								96	109	98	102									
10	4/8/16	11:35	58	M19	ED	860/700		91	110	106	104		120	125	134	129		P	FL	S/S
								92	104	99	91									
11	4/8/16	13:00	60	M36	CF	860/750		92	91	109	99		120	125	129	131		P	FL	S/S
								91	99	92	98									

Geomembrane Field Trial Seam Log

Project No.: I15-054
Project Name: Brickhaven Mine Site - Subcell 1C
Start Date: 4/6/16
Project Location: Moncure, NC

Material: HDPE

60 mil Thickness

Project Seam Requirements

	Fusion:		Extrusion:
Peel:	91	Peel:	78
Shear:	120	Shear:	120

Sample #	Date	Time	Ambient Temp.	Welder ID		Wedge	Extruder	Seam Strength										Pass Fail	Tech ID	Remarks
				Machine	Operator	Temp/ Speed ºF/fpm (or %max)	Barrel/ Preheat ºF/ºF	Peel (ppi) IN/OUT					Shear (ppi)							
								1	2	3	4	5	1	2	3	4	5			
12	4/8/16	13:05	60	M36	CF	860/750		99	125	113	117		129	123	131	133		P	FL	T/T
								111	107	97	114									
13	4/8/16	13:31	60	M19	ED	860/650		111	112	115	111		120	128	138	143		P	FL	S/T
								115	112	114	112									
14	4/8/16	13:25	60	M19	ED	860/650		91	126	128	110		121	128	134	132		P	FL	T/T
								96	111	126	115									
15	4/9/16	10:25	48	M36	CF	860/750		91	108	100	98		123	129	134	138		P	FL	S/S
								92	104	93	98									
16	4/9/16	10:30	48	M36	CF	860/750		91	103	107	110		142	135	129	137		P	FL	T/T
								92	93	100	106									
17	4/9/16	10:40	48	M19	ED	860/650		94	105	99	111		121	122	131	143		P	FL	S/S
								93	100	93	93									
18	4/9/16	10:45	48	M19	ED	860/650		112	112	123	119		126	133	147	158		P	FL	T/T
								115	109	116	108									
19	4/9/16	15:11	50	M19	ED	860/650		115	114	123	115		124	129	132	138		P	FL	S/S
								107	112	100	106									
20	4/9/16	17:13	50	M19	ED	860/650		116	99	145	96		125	147	151	139		P	FL	T/T
								101	108	116	120									
21	4/9/16	14:55	50	M36	CF	860/750		105	112	119	114		147	156	158	164		P	FL	S/S
								122	102	121	110									
22	4/9/16	15:00	50	M36	CF	860/750		107	92	128	115		134	152	144	159		P	FL	S/T
								115	110	126	99									

Geomembrane Field Trial Seam Log

Project No.: I15-054
Project Name: Brickhaven Mine Site - Subcell 1C
Start Date: 4/6/16
Project Location: Moncure, NC

Material: HDPE

60 mil Thickness

Project Seam Requirements

	Fusion:		Extrusion:
Peel:	91	Peel:	78
Shear:	120	Shear:	120

Sample #	Date	Time	Ambient Temp.	Welder ID		Wedge	Extruder	Seam Strength										Pass Fail	Tech ID	Remarks
				Machine	Operator	Temp/ Speed ºF/fpm (or %max)	Barrel/ Preheat ºF/ºF	Peel (ppi) IN/OUT					Shear (ppi)							
								1	2	3	4	5	1	2	3	4	5			
23	4/9/16	18:25	50	X2	CF		550/550	133	120	148	139		99	119	110	121		P	FL	EXT
24	4/10/16	7:30	30	X2	CF		550/550	137	130	130	120		146	131	157	161		P	FL	EXT
25	4/10/16	12:00	53	X10	ED		500/500	120	122	125	131		134	145	156	144		P	FL	EXT
26	4/10/16	13:10	54	X2	CF		550/550	100	94	91	97		111	124	129	137		P	FL	EXT

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CHESAPEAKE CONTAINMENT SYSTEMS, INC.

Seaming and Non Destructive Test Log

Project No.: I15-054
Project Name: Brickhaven Mine Site - Subcell 1C
Start Date: 4/6/16
Project Location: Moncure, NC

Material: HDPE

Thickness : 60 mil

WELD DATE	SEAM # (P#/P#)	WELD TIME	TECH ID	Machine ID	Machine Temp	Machine Speed or Preheat	Start Point	End Point	Seam Length (Feet)	Air Pressure Test					
										PSI		Time		Tech	Date
										Start	Finish	Start	Finish		
4/6/16	1/2	13:53	CF	M36	860	650	0+00	5+00	5+00	30	30	7:30	7:35	ED	4/10/16
4/6/16	2/3	15:42	CF	M36	860	650	0+00	5+00	5+00	30	30	7:30	7:35	ED	4/10/16
4/6/16	3/4	16:10	ED	M28	860	650	0+00	0+55	0+55	30	30	7:30	7:35	ED	4/10/16
4/6/16	3/4	16:10	ED	M28	860	650	0+55	5+00	4+45	30	30	7:35	7:40	ED	4/10/16
4/6/16	1/EL	17:14	CF	M36	860	650	0+00	0+55	0+55	30	30	7:35	7:40	ED	4/10/16
4/6/16	1/EL	17:14	CF	M36	860	650	0+55	0+60	0+05	30	30	7:40	7:45	ED	4/10/16
4/6/16	1/EL	17:14	CF	M36	860	650	0+60	2+90	2+30	30	30	7:40	7:45	ED	4/10/16
4/6/16	1/EL	17:14	CF	M36	860	650	2+90	3+05	0+15	30	30	7:40	7:45	ED	4/10/16
4/6/16	1/EL	17:14	CF	M36	860	650	3+05	5+00	1+95	30	30	7:45	7:50	ED	4/10/16
4/6/16	1/EL	17:14	CF	M36	860	650	0+55	5+00	4+45	30	30	7:35	7:40	ED	4/10/16
4/6/16	4/5	19:23	CF	M36	860	750	0+00	0+08	0+08	30	30	7:40	7:45	ED	4/10/16
4/6/16	4/5	19:23	CF	M36	860	750	0+08	5+00	4+92	30	30	7:40	7:45	ED	4/10/16
4/6/16	5/6	19:45	ED	M19	860	650	0+00	5+00	5+00	30	30	7:40	7:45	ED	4/10/16
4/7/16	6/7	11:45	CF	M36	860	750	0+00	5+00	5+00	30	30	7:45	7:50	ED	4/10/16
4/7/16	7/8	12:16	ED	M19	860	650	0+00	5+00	5+00	30	30	7:45	7:50	ED	4/10/16
4/7/16	8/9	14:24	CF	M36	860	750	0+00	5+00	5+00	30	30	7:45	7:50	ED	4/10/16
4/7/16	9/10	15:53	CF	M36	860	750	0+00	5+00	5+00	30	30	7:50	7:55	ED	4/10/16
4/7/16	10/11	17:35	CF	M36	860	750	0+00	5+00	5+00	30	30	7:50	7:55	ED	4/10/16
4/7/16	11/12	18:15	ED	M19	860	700	0+00	5+00	5+00	30	30	7:50	7:55	ED	4/10/16
4/8/16	13/14	11:37	ED	M19	860	700	0+00	4+75	4+75	30	30	7:55	8:00	ED	4/10/16

CHESAPEAKE CONTAINMENT SYSTEMS, INC.

Seaming and Non Destructive Test Log

Project No.: I15-054
Project Name: Brickhaven Mine Site - Subcell 1C
Start Date: 4/6/16
Project Location: Moncure, NC

Material: HDPE

Thickness : 60 mil

WELD DATE	SEAM # (P#/P#)	WELD TIME	TECH ID	Machine ID	Machine Temp	Machine Speed or Preheat	Start Point	End Point	Seam Length (Feet)	Air Pressure Test					
										PSI		Time		Tech	Date
										Start	Finish	Start	Finish		
4/8/16	14/15	13:32	CF	M36	860	750	0+00	4+35	4+35	30	30	7:55	8:00	ED	4/10/16
4/8/16	15/17	14:00	ED	M19	860	700	0+00	2+85	2+85	30	30	7:55	8:00	ED	4/10/16
4/8/16	15/16	14:45	ED	M19	860	700	2+85	3+60	0+75	30	30	7:55	8:00	ED	4/10/16
4/8/16	16/17	14:20	CF	M36	860	750	0+00	0+22	0+22	30	30	8:10	8:15	ED	4/10/16
4/8/16	17/18	14:25	CF	M36	860	750	0+00	2+00	2+00	30	30	8:10	8:15	ED	4/10/16
4/8/16	17/20	15:00	CF	M36	860	750	2+00	2+85	0+85	30	30	8:10	8:15	ED	4/10/16
4/8/16	18/20	14:35	ED	M19	860	700	0+00	0+22	0+22	30	30	8:10	8:15	ED	4/10/16
4/8/16	18/19	14:45	ED	M19	860	700	0+00	1+95	1+95	30	30	8:20	8:25	ED	4/10/16
4/8/16	19/21	15:15	ED	M19	860	700	0+00	0+70	0+70	30	30	8:20	8:25	ED	4/10/16
4/8/16	19/21	15:15	ED	M19	860	700	0+70	0+90	0+20	30	30	8:20	8:25	ED	4/10/16
4/8/16	19/21	15:15	ED	M19	860	700	0+90	1+40	0+50	30	30	8:20	8:25	ED	4/10/16
4/8/16	21/22	15:12	CF	M36	860	750	0+00	0+70	0+70	30	30	8:20	8:25	ED	4/10/16
4/8/16	12/22	18:52	ED	M19	860	700	0+00	0+70	0+70	30	30	8:20	8:25	ED	4/10/16
4/8/16	12/21	19:00	ED	M19	860	700	0+70	1+40	0+70	30	30	8:30	8:35	ED	4/10/16
4/8/16	12/19	19:10	ED	M19	860	700	1+40	2+15	0+75	30	30	8:30	8:35	ED	4/10/16
4/8/16	12/20	19:20	ED	M19	860	700	2+15	2+95	0+80	30	30	8:30	8:35	ED	4/10/16
4/8/16	12/17	19:30	ED	M19	860	700	2+95	3+02	0+07	30	30	8:45	8:50	ED	4/10/16
4/8/16	12/16	19:40	ED	M19	860	700	3+02	3+70	0+68	30	30	8:45	8:50	ED	4/10/16
4/8/16	12/15	19:50	ED	M19	860	700	3+70	4+50	0+80	30	30	8:45	8:50	ED	4/10/16
4/8/16	12/14	20:00	ED	M19	860	700	4+50	4+95	0+45	30	30	8:45	8:50	ED	4/10/16

CHESAPEAKE CONTAINMENT SYSTEMS, INC.

Seaming and Non Destructive Test Log

Project No.: I15-054
Project Name: Brickhaven Mine Site - Subcell 1C
Start Date: 4/6/16
Project Location: Moncure, NC

Material: HDPE

Thickness : 60 mil

WELD DATE	SEAM # (P#/P#)	WELD TIME	TECH ID	Machine ID	Machine Temp	Machine Speed or Preheat	Start Point	End Point	Seam Length (Feet)	Air Pressure Test					
										PSI		Time		Tech	Date
										Start	Finish	Start	Finish		
4/8/16	23/24	17:17	CF	M36	860	750	0+00	1+90	1+90	30	30	18:45	18:50	ED	4/9/16
4/8/16	24/26	17:40	ED	M19	860	650	0+00	0+50	0+50	30	30	18:45	18:50	ED	4/9/16
4/8/16	24/26	17:40	ED	M19	860	650	0+50	0+75	0+25	30	30	18:45	18:50	ED	4/9/16
4/8/16	24/26	17:40	ED	M19	860	650	0+75	1+05	0+30	30	30	18:45	18:50	ED	4/9/16
4/8/16	24/25	17:45	ED	M19	860	650	1+05	1+90	0+85	30	30	19:02	19:07	ED	4/9/16
4/8/16	25/26	17:35	ED	M19	860	650	0+00	0+22	0+22	30	30	19:00	19:05	ED	4/9/16
4/8/16	26/27	17:45	CF	M36	860	750	0+00	1+05	1+05	30	30	18:45	18:50	ED	4/9/16
4/8/16	25/27	18:00	CF	M36	860	750	1+05	1+90	0+85	30	30	19:04	19:09	ED	4/9/16
4/8/16	23/EL	18:32	CF	M36	860	750	0+00	0+30	0+30	30	30	18:22	18:27	ED	4/9/16
4/8/16	23/EL	18:32	CF	M36	860	750	0+30	0+75	0+45	30	30	18:22	18:27	ED	4/9/16
4/8/16	23/EL	18:32	CF	M36	860	750	0+75	1+35	0+60	30	30	18:22	18:27	ED	4/9/16
4/8/16	23/EL	18:32	CF	M36	860	750	1+35	1+90	0+55	30	30	18:22	18:27	ED	4/9/16
4/9/16	27/29	10:55	CF	M36	860	750	0+00	0+50	0+50	30	30	19:10	19:15	ED	4/9/16
4/9/16	27/28	11:00	CF	M36	860	750	0+50	1+90	1+40	30	30	19:15	19:20	ED	4/9/16
4/9/16	28/29	10:45	CF	M36	860	750	0+00	0+22	0+22	30	30	19:10	19:15	ED	4/9/16
4/9/16	29/30	11:10	ED	M19	860	650	0+00	0+50	0+50	30	30	19:10	19:15	ED	4/9/16
4/9/16	28/30	11:15	ED	M19	860	650	0+50	1+90	1+40	30	30	19:15	19:20	ED	4/9/16
4/9/16	30/32	11:25	CF	M36	860	750	0+00	0+15	0+15	30	30	19:25	19:30	ED	4/9/16
4/9/16	30/31	11:28	CF	M36	860	750	0+15	1+90	1+75	30	30	19:30	19:35	ED	4/9/16
4/9/16	31/32	11:20	ED	M19	860	650	0+00	0+22	0+22	30	30	19:25	19:30	ED	4/9/16

CHESAPEAKE CONTAINMENT SYSTEMS, INC.

Seaming and Non Destructive Test Log

Project No.: I15-054
Project Name: Brickhaven Mine Site - Subcell 1C
Start Date: 4/6/16
Project Location: Moncure, NC

Material: HDPE

Thickness : 60 mil

WELD DATE	SEAM # (P#/P#)	WELD TIME	TECH ID	Machine ID	Machine Temp	Machine Speed or Preheat	Start Point	End Point	Seam Length (Feet)	Air Pressure Test					
										PSI		Time		Tech	Date
										Start	Finish	Start	Finish		
4/9/16	32/33	14:15	CF	M36	860	750	0+00	0+15	0+15	30	30	19:25	19:30	ED	4/9/16
4/9/16	31/33	14:18	CF	M36	860	750	0+15	1+90	1+75	30	30	19:30	19:35	ED	4/9/16
4/9/16	33/34	14:45	CF	M36	860	750	0+00	1+90	1+90	30	30	19:30	19:35	ED	4/9/16
4/9/16	34/35	15:18	ED	M19	860	650	0+00	1+90	1+90	30	30	19:37	19:42	ED	4/9/16
4/9/16	35/36	15:27	CF	M36	860	750	0+00	1+90	1+90	30	30	19:37	19:42	ED	4/9/16
4/9/16	37/39	16:27	ED	M19	860	650	0+00	0+35	0+35	30	30	19:45	19:50	ED	4/9/16
4/9/16	37/38	16:35	ED	M19	860	650	0+35	1+25	0+90	30	30	19:45	19:50	ED	4/9/16
4/9/16	38/39	16:30	CF	M36	860	750	0+00	0+22	0+22	30	30	19:45	19:50	ED	4/9/16
4/9/16	39/40	16:35	CF	M36	860	750	0+00	0+35	0+35	30	30	19:45	19:50	ED	4/9/16
4/9/16	38/40	16:40	CF	M36	860	750	0+35	0+42	0+07	30	30	19:47	19:52	ED	4/9/16
4/9/16	36/40	16:48	CF	M36	860	750	0+00	0+45	0+45	30	30	19:37	19:42	ED	4/9/16
4/9/16	36/38	16:55	CF	M36	860	750	0+45	1+25	0+80	30	30	19:50	19:55	ED	4/9/16
4/9/16	36/37	17:03	CF	M36	860	750	1+25	2+15	0+90	30	30	19:54	19:59	ED	4/9/16
4/9/16	1/23	17:45	ED	M19	860	650	0+00	0+22	0+22	30	30	9:20	9:25	ED	4/10/16
4/9/16	2/24	17:50	ED	M19	860	650	0+22	0+44	0+22	30	30	9:20	9:25	ED	4/10/16
4/9/16	3/26	17:55	ED	M19	860	650	0+44	0+66	0+22	30	30	9:30	9:35	ED	4/10/16
4/9/16	4/27	18:00	ED	M19	860	650	0+66	0+88	0+22	30	30	9:30	9:35	ED	4/10/16
4/9/16	5/29	18:05	ED	M19	860	650	0+88	1+10	0+22	30	30	9:40	9:45	ED	4/10/16
4/9/16	6/30	18:10	ED	M19	860	650	1+10	1+32	0+22	30	30	9:40	9:45	ED	4/10/16
4/9/16	7/32	18:15	ED	M19	860	650	1+32	1+54	0+22	30	30	9:50	9:55	ED	4/10/16

CHESAPEAKE CONTAINMENT SYSTEMS, INC.

Seaming and Non Destructive Test Log

Project No.: I15-054
Project Name: Brickhaven Mine Site - Subcell 1C
Start Date: 4/6/16
Project Location: Moncure, NC

Material: HDPE

Thickness : 60 mil

WELD DATE	SEAM # (P#/P#)	WELD TIME	TECH ID	Machine ID	Machine Temp	Machine Speed or Preheat	Start Point	End Point	Seam Length (Feet)	Air Pressure Test					
										PSI		Time		Tech	Date
										Start	Finish	Start	Finish		
4/9/16	8/33	18:20	ED	M19	860	650	1+54	1+76	0+22	30	30	9:50	9:55	ED	4/10/16
4/9/16	9/34	18:25	ED	M19	860	650	1+76	1+98	0+22	30	30	10:00	10:05	ED	4/10/16
4/9/16	10/35	18:30	ED	M19	860	650	1+98	2+20	0+22	30	30	10:00	10:05	ED	4/10/16
4/9/16	11/36	18:35	ED	M19	860	650	2+20	2+42	0+22	30	30	10:10	10:15	ED	4/10/16
4/9/16	12/40	18:40	ED	M19	860	650	2+42	2+53	0+11	30	30	10:10	10:15	ED	4/10/16
4/9/16	12/39	18:45	ED	M19	860	650	2+53	2+64	0+11	30	30	10:20	10:25	ED	4/10/16
4/9/16	14/39	18:50	ED	M19	860	650	2+64	2+76	0+12	30	30	10:20	10:25	ED	4/10/16
4/9/16	13/37	18:55	ED	M19	860	650	2+76	2+98	0+22	30	30	10:30	10:35	ED	4/10/16

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CHESAPEAKE CONTAINMENT SYSTEMS, INC.

Geomembrane Seam Destructive Test Log

Project No.: I15-054
Project Name: Brickhaven Mine Site - Subcell 1C
Start Date: 4/6/16
Project Location: Moncure, NC

Material: HDPE

60 Mil Thickness

Project Seam Requirements

	Fusion:		Extrusion:
Peel:	91	Peel:	78
Shear:	120	Shear:	120

DT#	Location	Date Removed	Welder ID		Wedge	Extruder	Seam Strength										Pass Fail	Tech ID	Remarks
			Machine	Operator	Temp/ Speed °F/fpm (or %max)	Barrel/ Preheat °F/°F	Peel (ppi) IN/OUT					Shear (ppi)							
							1	2	3	4	5	1	2	3	4	5			
1	1/EL	4/10/16	M36	CF	860/750		105	140	120	125		185	188	174	179		P	FL	S/T
							111	91	99	128									
2	2/3	4/10/16	M36	CF	860/750		94	91	100	101		127	134	122	120		P	FL	S/S
							97	95	94	100									
3	2/3	4/10/16	M36	CF	860/750		120	106	99	119		147	141	152	158		P	FL	S/S
							91	114	93	105									
4	3/4	4/10/16	M19	ED	860/700		97	98	92	97		133	141	155	139		P	FL	S/S
							98	97	100	114									
5	4/5	4/10/16	M36	CF	860/750		100	110	91	104		143	143	152	161		P	FL	S/S
							92	91	101	92									
6	5/6	4/10/16	M19	ED	860/700		92	107	97	109		140	135	139	148		P	FL	S/S
							93	108	91	103									
7	6/7	4/10/16	M36	CF	860/750		123	110	109	110		138	179	165	154		P	FL	S/S
							118	100	107	100									
8	7/8	4/10/16	M19	ED	860/700		116	129	125	107		189	188	177	183		P	FL	S/S
							111	137	111	112									
9	8/9	4/10/16	M36	CF	860/750		114	100	130	95		179	186	177	169		P	FL	S/S
							120	105	123	99									
10	9/10	4/10/16	M36	CF	860/750		123	112	119	99		179	179	168	173		P	FL	S/S
							126	107	120	118									
11	10/11	4/10/16	M36	CF	860/750		120	124	116	140		179	187	173	181		P	FL	S/S
							124	91	123	105									

Geomembrane Seam Destructive Test Log

Project No.: I15-054
Project Name: Brickhaven Mine Site - Subcell 1C
Start Date: 4/6/16
Project Location: Moncure, NC

Material: HDPE

60 Mil Thickness

Project Seam Requirements

	Fusion:		Extrusion:
Peel:	91	Peel:	78
Shear:	120	Shear:	120

DT#	Location	Date Removed	Welder ID		Wedge	Extruder	Seam Strength										Pass Fail	Tech ID	Remarks
			Machine	Operator	Temp/ Speed °F/fpm (or %max)	Barrel/ Preheat °F/°F	Peel (ppi) IN/OUT					Shear (ppi)							
							1	2	3	4	5	1	2	3	4	5			
12	11/12	4/10/16	M19	ED	860/700		101	132	102	137		177	178	168	185		P	FL	S/S
							105	121	110	91									
13	18/19	4/10/16	M19	ED	860/700		110	114	133	92		121	163	134	145		P	FL	S/S
							99	110	104	106									
14	15/17	4/10/16	M19	ED	860/700		116	100	108	126		130	156	148	166		P	FL	S/S
							93	120	122	129									
15	14/15	4/10/16	M36	CF	860/750		104	95	121	91		166	162	171	174		P	FL	S/S
							98	91	101	102									
16	13/14	4/10/16	M19	ED	860/700		94	110	100	94		143	152	149	163		P	FL	S/S
							119	113	115	103									
17	23/24	4/10/16	M36	CF	860/750		125	104	112	125		169	153	158	168		P	FL	S/S
							92	93	103	125									
18	27/29	4/10/16	M36	CF	860/750		115	105	96	93		120	138	142	153		P	FL	S/S
							105	114	100	101									
19	30/31	4/10/16	M36	CF	860/750		97	107	103	91		140	120	157	148		P	FL	S/S
							105	100	98	99									
20	33/34	4/10/16	M36	CF	860/750		94	92	107	95		136	133	147	125		P	FL	S/S
							91	104	91	96									
21	35/36	4/10/16	M36	CF	860/750		94	97	114	105		148	137	139	154		P	FL	S/S
							93	99	96	110									
22	37/39	4/10/16	M19	ED	860/700		94	105	102	95		130	143	156	163		P	FL	S/S
							91	99	92	99									

Geomembrane Seam Destructive Test Log

Project No.: I15-054
Project Name: Brickhaven Mine Site - Subcell 1C
Start Date: 4/6/16
Project Location: Moncure, NC

Material: HDPE

60 Mil Thickness

Project Seam Requirements

	Fusion:		Extrusion:
Peel:	91	Peel:	78
Shear:	120	Shear:	120

DT#	Location	Date Removed	Welder ID		Wedge	Extruder	Seam Strength										Pass Fail	Tech ID	Remarks
			Machine	Operator	Temp/ Speed °F/fpm (or %max)	Barrel/ Preheat °F/°F	Peel (ppi) IN/OUT					Shear (ppi)							
							1	2	3	4	5	1	2	3	4	5			
23	12/16	4/10/16	M19	ED	860/700		91	98	97	95		139	130	148	157		P	FL	S/T
							91	103	93	116									
24	12/22	4/10/16	M19	ED	860/700		106	111	100	132		159	162	169	178		P	FL	T/T
							102	91	102	132									
25	9/34	4/10/16	M19	ED	860/700		153	125	137	128		155	157	164	177		P	FL	T/T
							150	116	123	123									

Legends

DEFECT CODE			
BO-	Burn Out	SI-	Soil Surface
CR-	Crease	DD-	Deployment Damage
DS-	Destructive Test Number	MD-	Material Damage
EE-	Earthwork Equipment Damage	WR-	Wrinkle
FM-	Fishmouth	WS-	Welder Restart
FT-	Pressure Test Cut	FD-	Factory Defect
T-	Joint	AT-	Air Test

REPAIR TYPE	
C-	Cap Strip
P-	Patches
B-	Extrudate Bead
GB-	Grind & Bead
BT-	Boot
GV-	Gas Vent

NOTATIONS	
SOS or 0'	Beginning of Seam
EOS	End of Seam
-	To an Area
NOAT	No AT
VT	Vacuum Test
EL	Existing Liner
AT	Anchor Trench

TEST RESULTS	
P-	Pass
F-	Fail

PEEL AND SHEAR TEST RESULTS
DESTRUCTIVE SEAM TESTING
ASTM D 6392 & 4437 w/NSF 54

geotechnics
geotechnical & geosynthetic testing

CLIENT: HDR ENGINEERING, INC.
CLIENT PROJECT: BRICKHAVEN NO.2 MINE

CLIENT PROJ. NO.: NA
PROJECT NO.: 2016-600-016
LAB ID NO.: 2016-600-016-001
MATERIAL: 60-MIL HDPE
SEAM TYPE: DOUBLE FUSION

SAMPLE I.D.: DS-1 (P-1/EL)

PEEL ADHESION

REPLICATE No.	PEAK LOAD (lbs/in)	EPA BREAK CLASSIFICATION CODE	PEEL INCURSION (%)
OUTSIDE TRACK (WELD "A")			
1	116.4	SE1	<10
2	111.1	SE1	<10
3	107.2	SE1	<10
4	114.9	SE1	<10
5	118.1	SE1	<10
AVERAGE	**113.5**		
STD. DEV.	4.39		
INSIDE TRACK (WELD "B")			
1	122.4	SE1	<10
2	116.3	SE1	<10
3	126.4	SE1	<10
4	121.3	SE1	<10
5	123.4	SE1	<10
AVERAGE	**122.0**		
STD. DEV.	3.69		

BONDED SEAM (SHEAR) STRENGTH

REPLICATE No.	PEAK LOAD (lbs/in)	EPA BREAK CLASSIFICATION CODE
1	158.1	SE1
2	156.4	SE1
3	157.9	SE1
4	163.1	SE1
5	159.8	SE1
AVERAGE	**159.1**	
STD. DEV.	2.56	

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PEEL AND SHEAR TEST RESULTS
DESTRUCTIVE SEAM TESTING
ASTM D 6392 & 4437 w/NSF 54

CLIENT: HDR ENGINEERING, INC.
CLIENT PROJECT: BRICKHAVEN NO.2 MINE

CLIENT PROJ. NO.: NA
PROJECT NO.: 2016-600-015
LAB ID NO.: 2016-600-015-001
MATERIAL: 60-MIL HDPE
SEAM TYPE: DOUBLE FUSION

SAMPLE I.D.: DS-2 (P-2/P-3)

PEEL ADHESION

REPLICATE No.	PEAK LOAD (lbs/in)	EPA BREAK CLASSIFICATION CODE	PEEL INCURSION (%)
OUTSIDE TRACK (WELD "A")			
1	104.5	SE1	<10
2	111.2	SE1	<10
3	109.9	SE1	<10
4	108.0	SE1	<10
5	116.8	SE1	<10
AVERAGE	**110.1**		
STD. DEV.	4.53		
INSIDE TRACK (WELD "B")			
1	116.0	SE1	<10
2	120.9	SE1	<10
3	117.2	SE1	<10
4	115.8	SE1	<10
5	117.5	SE1	<10
AVERAGE	**117.5**		
STD. DEV.	2.05		

BONDED SEAM (SHEAR) STRENGTH

REPLICATE No.	PEAK LOAD (lbs/in)	EPA BREAK CLASSIFICATION CODE
1	174.9	SE1
2	171.3	SE1
3	175.3	SE1
4	174.4	SE1
5	174.8	SE1
AVERAGE	**174.1**	
STD. DEV.	1.62	

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PEEL AND SHEAR TEST RESULTS
DESTRUCTIVE SEAM TESTING
ASTM D 6392 & 4437 w/NSF 54

geotechnics
geotechnical & geosynthetic testing

CLIENT: HDR ENGINEERING, INC.
CLIENT PROJECT: BRICKHAVEN NO.2 MINE

CLIENT PROJ. NO.: NA
PROJECT NO.: 2016-600-015
LAB ID NO.: 2016-600-015-002
MATERIAL: 60-MIL HDPE
SEAM TYPE: DOUBLE FUSION

SAMPLE I.D.: DS-3 (P-2/P-3)

PEEL ADHESION

REPLICATE No.	PEAK LOAD (lbs/in)	EPA BREAK CLASSIFICATION CODE	PEEL INCURSION (%)
OUTSIDE TRACK (WELD "A")			
1	119.5	SE1	<10
2	123.1	SE1	<10
3	116.8	SE1	<10
4	126.1	SE1	<10
5	118.4	SE1	<10
AVERAGE	**120.8**		
STD. DEV.	3.77		
INSIDE TRACK (WELD "B")			
1	105.0	SE1	<10
2	109.2	SE1	<10
3	108.1	SE1	<10
4	106.1	SE1	<10
5	103.9	SE1	<10
AVERAGE	**106.5**		
STD. DEV.	2.18		

BONDED SEAM (SHEAR) STRENGTH

REPLICATE No.	PEAK LOAD (lbs/in)	EPA BREAK CLASSIFICATION CODE
1	172.1	SE1
2	171.4	SE1
3	173.1	SE1
4	172.7	SE1
5	170.7	SE1
AVERAGE	**172.0**	
STD. DEV.	0.97	

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PEEL AND SHEAR TEST RESULTS
DESTRUCTIVE SEAM TESTING
ASTM D 6392 & 4437 w/NSF 54

geotechnics
geotechnical & geosynthetic testing

CLIENT: HDR ENGINEERING, INC.
CLIENT PROJECT: BRICKHAVEN NO.2 MINE

CLIENT PROJ. NO.: NA
PROJECT NO.: 2016-600-015
LAB ID NO.: 2016-600-015-003
MATERIAL: 60-MIL HDPE
SEAM TYPE: DOUBLE FUSION

SAMPLE I.D.: DS-4 (P-3/P-4)

PEEL ADHESION

REPLICATE No.	PEAK LOAD (lbs/in)	EPA BREAK CLASSIFICATION CODE	PEEL INCURSION (%)
OUTSIDE TRACK (WELD "A")			
1	110.9	SE1	<10
2	109.3	SE1	<10
3	108.1	SE1	<10
4	111.4	SE1	<10
5	106.8	SE1	<10
AVERAGE	**109.3**		
STD. DEV.	1.91		
INSIDE TRACK (WELD "B")			
1	124.9	SE1	<10
2	131.3	SE1	<10
3	126.9	SE1	<10
4	124.6	SE1	<10
5	133.5	SE1	<10
AVERAGE	**128.2**		
STD. DEV.	3.98		

BONDED SEAM (SHEAR) STRENGTH

REPLICATE No.	PEAK LOAD (lbs/in)	EPA BREAK CLASSIFICATION CODE
1	165.6	SE1
2	170.5	SE1
3	170.2	SE1
4	169.8	SE1
5	172.7	SE1
AVERAGE	**169.8**	
STD. DEV.	2.58	

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PEEL AND SHEAR TEST RESULTS
DESTRUCTIVE SEAM TESTING
ASTM D 6392 & 4437 w/NSF 54

geotechnics
geotechnical & geosynthetic testing

CLIENT: HDR ENGINEERING, INC.
CLIENT PROJECT: BRICKHAVEN NO.2 MINE

CLIENT PROJ. NO.: NA
PROJECT NO.: 2016-600-015
LAB ID NO.: 2016-600-015-004
MATERIAL: 60-MIL HDPE
SEAM TYPE: DOUBLE FUSION

SAMPLE I.D.: DS-5 (P-4/P-5)

PEEL ADHESION

REPLICATE No.	PEAK LOAD (lbs/in)	EPA BREAK CLASSIFICATION CODE	PEEL INCURSION (%)
OUTSIDE TRACK (WELD "A")			
1	109.8	SE1	<10
2	108.7	SE1	<10
3	105.3	SE1	<10
4	106.1	SE1	<10
5	107.3	SE1	<10
AVERAGE	**107.4**		
STD. DEV.	1.84		
INSIDE TRACK (WELD "B")			
1	126.8	SE1	<10
2	115.3	SE1	<10
3	109.7	SE1	<10
4	116.8	SE1	<10
5	127.2	SE1	<10
AVERAGE	**119.2**		
STD. DEV.	7.63		

BONDED SEAM (SHEAR) STRENGTH

REPLICATE No.	PEAK LOAD (lbs/in)	EPA BREAK CLASSIFICATION CODE
1	173.4	SE1
2	170.9	SE1
3	169.8	SE1
4	173.9	SE1
5	171.3	SE1
AVERAGE	**171.9**	
STD. DEV.	1.73	

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PEEL AND SHEAR TEST RESULTS
DESTRUCTIVE SEAM TESTING
ASTM D 6392 & 4437 w/NSF 54

geotechnics
geotechnical & geosynthetic testing

CLIENT: HDR ENGINEERING, INC.
CLIENT PROJECT: BRICKHAVEN NO.2 MINE

CLIENT PROJ. NO.: NA
PROJECT NO.: 2016-600-015
LAB ID NO.: 2016-600-015-005
MATERIAL: 60-MIL HDPE
SEAM TYPE: DOUBLE FUSION

SAMPLE I.D.: DS-6 (P-5/P-6)

PEEL ADHESION

REPLICATE No.	PEAK LOAD (lbs/in)	EPA BREAK CLASSIFICATION CODE	PEEL INCURSION (%)
OUTSIDE TRACK (WELD "A")			
1	114.2	SE1	<10
2	111.3	SE1	<10
3	107.4	SE1	<10
4	108.1	SE1	<10
5	115.7	SE1	<10
AVERAGE	**111.3**		
STD. DEV.	3.65		
INSIDE TRACK (WELD "B")			
1	113.2	SE1	<10
2	109.4	SE1	<10
3	129.7	SE1	<10
4	113.8	SE1	<10
5	116.4	SE1	<10
AVERAGE	**116.5**		
STD. DEV.	7.79		

BONDED SEAM (SHEAR) STRENGTH

REPLICATE No.	PEAK LOAD (lbs/in)	EPA BREAK CLASSIFICATION CODE
1	172.4	SE1
2	168.4	SE1
3	170.9	SE1
4	171.2	SE1
5	163.9	SE1
AVERAGE	**169.4**	
STD. DEV.	3.38	

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PEEL AND SHEAR TEST RESULTS
DESTRUCTIVE SEAM TESTING
ASTM D 6392 & 4437 w/NSF 54

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geotechnical & geosynthetic testing

CLIENT: HDR ENGINEERING, INC.
CLIENT PROJECT: BRICKHAVEN NO.2 MINE

CLIENT PROJ. NO.: NA
PROJECT NO.: 2016-600-015
LAB ID NO.: 2016-600-015-006
MATERIAL: 60-MIL HDPE
SEAM TYPE: DOUBLE FUSION

SAMPLE I.D.: DS-7 (P-6/P-7)

PEEL ADHESION

REPLICATE No.	PEAK LOAD (lbs/in)	EPA BREAK CLASSIFICATION CODE	PEEL INCURSION (%)
OUTSIDE TRACK (WELD "A")			
1	111.7	SE1	<10
2	109.4	SE1	<10
3	128.8	SE1	<10
4	116.9	SE1	<10
5	122.4	SE1	<10
AVERAGE	**117.8**		
STD. DEV.	7.92		
INSIDE TRACK (WELD "B")			
1	111.7	SE1	<10
2	121.3	SE1	<10
3	114.6	SE1	<10
4	113.4	SE1	<10
5	116.1	SE1	<10
AVERAGE	**115.4**		
STD. DEV.	3.66		

BONDED SEAM (SHEAR) STRENGTH

REPLICATE No.	PEAK LOAD (lbs/in)	EPA BREAK CLASSIFICATION CODE
1	167.7	SE1
2	173.1	SE1
3	168.6	SE1
4	171.4	SE1
5	166.8	SE1
AVERAGE	**169.5**	
STD. DEV.	2.64	

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PEEL AND SHEAR TEST RESULTS
DESTRUCTIVE SEAM TESTING
ASTM D 6392 & 4437 w/NSF 54

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CLIENT: HDR ENGINEERING, INC.
CLIENT PROJECT: BRICKHAVEN NO.2 MINE

CLIENT PROJ. NO.: NA
PROJECT NO.: 2016-600-016
LAB ID NO.: 2016-600-016-002
MATERIAL: 60-MIL HDPE
SEAM TYPE: DOUBLE FUSION

SAMPLE I.D.: DS-8 (P-7/P-8)

PEEL ADHESION

REPLICATE No.	PEAK LOAD (lbs/in)	EPA BREAK CLASSIFICATION CODE	PEEL INCURSION (%)
OUTSIDE TRACK (WELD "A")			
1	115.1	SE1	<10
2	107.5	SE1	<10
3	109.6	SE1	<10
4	110.2	SE1	<10
5	113.1	SE1	<10
AVERAGE	**111.1**		
STD. DEV.	3.00		
INSIDE TRACK (WELD "B")			
1	109.8	SE1	<10
2	114.8	SE1	<10
3	116.3	SE1	<10
4	115.3	SE1	<10
5	117.6	SE1	<10
AVERAGE	**114.8**		
STD. DEV.	2.97		

BONDED SEAM (SHEAR) STRENGTH

REPLICATE No.	PEAK LOAD (lbs/in)	EPA BREAK CLASSIFICATION CODE
1	176.4	SE1
2	171.3	SE1
3	176.8	SE1
4	171.8	SE1
5	172.3	SE1
AVERAGE	**173.7**	
STD. DEV.	2.66	

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PEEL AND SHEAR TEST RESULTS
DESTRUCTIVE SEAM TESTING
ASTM D 6392 & 4437 w/NSF 54

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CLIENT: HDR ENGINEERING, INC.
CLIENT PROJECT: BRICKHAVEN NO.2 MINE

CLIENT PROJ. NO.: NA
PROJECT NO.: 2016-600-016
LAB ID NO.: 2016-600-016-003
MATERIAL: 60-MIL HDPE
SEAM TYPE: DOUBLE FUSION

SAMPLE I.D.: DS-9 (P-8/P-9)

PEEL ADHESION

REPLICATE No.	PEAK LOAD (lbs/in)	EPA BREAK CLASSIFICATION CODE	PEEL INCURSION (%)
OUTSIDE TRACK (WELD "A")			
1	105.1	SE1	<10
2	109.6	SE1	<10
3	105.8	SE1	<10
4	113.4	SE1	<10
5	112.1	SE1	<10
AVERAGE	**109.2**		
STD. DEV.	3.69		
INSIDE TRACK (WELD "B")			
1	119.7	SE1	<10
2	117.3	SE1	<10
3	117.8	SE1	<10
4	126.1	SE1	<10
5	129.4	SE1	<10
AVERAGE	**122.1**		
STD. DEV.	5.40		

BONDED SEAM (SHEAR) STRENGTH

REPLICATE No.	PEAK LOAD (lbs/in)	EPA BREAK CLASSIFICATION CODE
1	171.4	SE1
2	173.7	SE1
3	170.9	SE1
4	169.6	SE1
5	170.7	SE1
AVERAGE	**171.3**	
STD. DEV.	1.51	

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PEEL AND SHEAR TEST RESULTS
DESTRUCTIVE SEAM TESTING
ASTM D 6392 & 4437 w/NSF 54

CLIENT: HDR ENGINEERING, INC.
CLIENT PROJECT: BRICKHAVEN NO.2 MINE

CLIENT PROJ. NO.: NA
PROJECT NO.: 2016-600-016
LAB ID NO.: 2016-600-016-004
MATERIAL: 60-MIL HDPE
SEAM TYPE: DOUBLE FUSION

SAMPLE I.D.: DS-10 (P-9/P-10)

PEEL ADHESION

REPLICATE No.	PEAK LOAD (lbs/in)	EPA BREAK CLASSIFICATION CODE	PEEL INCURSION (%)
OUTSIDE TRACK (WELD "A")			
1	123.1	SE1	<10
2	119.2	SE1	<10
3	115.1	SE1	<10
4	121.6	SE1	<10
5	116.7	SE1	<10
AVERAGE	**119.1**		
STD. DEV.	3.32		
INSIDE TRACK (WELD "B")			
1	133.8	SE1	<10
2	126.8	SE1	<10
3	121.7	SE1	<10
4	129.2	SE1	<10
5	123.4	SE1	<10
AVERAGE	**127.0**		
STD. DEV.	4.80		

BONDED SEAM (SHEAR) STRENGTH

REPLICATE No.	PEAK LOAD (lbs/in)	EPA BREAK CLASSIFICATION CODE
1	168.5	SE1
2	173.1	SE1
3	165.5	SE1
4	166.9	SE1
5	170.8	SE1
AVERAGE	**169.0**	
STD. DEV.	3.04	

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PEEL AND SHEAR TEST RESULTS
DESTRUCTIVE SEAM TESTING
ASTM D 6392 & 4437 w/NSF 54

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CLIENT: HDR ENGINEERING, INC.
CLIENT PROJECT: BRICKHAVEN NO.2 MINE

CLIENT PROJ. NO.: NA
PROJECT NO.: 2016-600-016
LAB ID NO.: 2016-600-016-005
MATERIAL: 60-MIL HDPE
SEAM TYPE: DOUBLE FUSION

SAMPLE I.D.: DS-11 (P-10/P-11)

PEEL ADHESION

REPLICATE No.	PEAK LOAD (lbs/in)	EPA BREAK CLASSIFICATION CODE	PEEL INCURSION (%)
OUTSIDE TRACK (WELD "A")			
1	108.0	SE1	<10
2	109.6	SE1	<10
3	105.3	SE1	<10
4	107.4	SE1	<10
5	109.3	SE1	<10
AVERAGE	**107.9**		
STD. DEV.	1.72		
INSIDE TRACK (WELD "B")			
1	108.1	SE1	<10
2	111.4	SE1	<10
3	123.0	SE1	<10
4	115.2	SE1	<10
5	112.1	SE1	<10
AVERAGE	**114.0**		
STD. DEV.	5.65		

BONDED SEAM (SHEAR) STRENGTH

REPLICATE No.	PEAK LOAD (lbs/in)	EPA BREAK CLASSIFICATION CODE
1	172.6	SE1
2	171.4	SE1
3	173.8	SE1
4	172.9	SE1
5	172.3	SE1
AVERAGE	**172.6**	
STD. DEV.	0.87	

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PEEL AND SHEAR TEST RESULTS
DESTRUCTIVE SEAM TESTING
ASTM D 6392 & 4437 w/NSF 54

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CLIENT: HDR ENGINEERING, INC.
CLIENT PROJECT: BRICKHAVEN NO.2 MINE

CLIENT PROJ. NO.: NA
PROJECT NO.: 2016-600-016
LAB ID NO.: 2016-600-016-006
MATERIAL: 60-MIL HDPE
SEAM TYPE: DOUBLE FUSION

SAMPLE I.D.: DS-12 (P-11/P-12)

PEEL ADHESION

REPLICATE No.	PEAK LOAD (lbs/in)	EPA BREAK CLASSIFICATION CODE	PEEL INCURSION (%)
OUTSIDE TRACK (WELD "A")			
1	105.4	SE1	<10
2	112.8	SE1	<10
3	113.6	SE1	<10
4	119.9	SE1	<10
5	116.3	SE1	<10
AVERAGE	**113.6**		
STD. DEV.	5.36		
INSIDE TRACK (WELD "B")			
1	134.7	SE1	<10
2	127.8	SE1	<10
3	128.7	SE1	<10
4	130.5	SE1	<10
5	132.3	SE1	<10
AVERAGE	**130.8**		
STD. DEV.	2.78		

BONDED SEAM (SHEAR) STRENGTH

REPLICATE No.	PEAK LOAD (lbs/in)	EPA BREAK CLASSIFICATION CODE
1	174.8	SE1
2	173.3	SE1
3	169.4	SE1
4	171.9	SE1
5	168.8	SE1
AVERAGE	**171.6**	
STD. DEV.	2.54	

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PEEL AND SHEAR TEST RESULTS
DESTRUCTIVE SEAM TESTING
ASTM D 6392 & 4437 w/NSF 54

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CLIENT: HDR ENGINEERING, INC.
CLIENT PROJECT: BRICKHAVEN NO.2 MINE

CLIENT PROJ. NO.: NA
PROJECT NO.: 2016-600-015
LAB ID NO.: 2016-600-015-007
MATERIAL: 60-MIL HDPE
SEAM TYPE: DOUBLE FUSION

SAMPLE I.D.: DS-13 (P-18/P-19)

PEEL ADHESION

REPLICATE No.	PEAK LOAD (lbs/in)	EPA BREAK CLASSIFICATION CODE	PEEL INCURSION (%)
OUTSIDE TRACK (WELD "A")			
1	106.4	SE1	<10
2	129.3	SE1	<10
3	112.1	SE1	<10
4	111.6	SE1	<10
5	109.1	SE1	<10
AVERAGE	**113.7**		
STD. DEV.	9.01		
INSIDE TRACK (WELD "B")			
1	103.1	SE1	<10
2	108.4	SE1	<10
3	112.4	SE1	<10
4	116.4	SE1	<10
5	112.6	SE1	<10
AVERAGE	**110.6**		
STD. DEV.	5.05		

BONDED SEAM (SHEAR) STRENGTH

REPLICATE No.	PEAK LOAD (lbs/in)	EPA BREAK CLASSIFICATION CODE
1	173.5	SE1
2	175.4	SE1
3	173.9	SE1
4	173.3	SE1
5	174.4	SE1
AVERAGE	**174.1**	
STD. DEV.	0.84	

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PEEL AND SHEAR TEST RESULTS
DESTRUCTIVE SEAM TESTING
ASTM D 6392 & 4437 w/NSF 54

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CLIENT: HDR ENGINEERING, INC.
CLIENT PROJECT: BRICKHAVEN NO.2 MINE

CLIENT PROJ. NO.: NA
PROJECT NO.: 2016-600-015
LAB ID NO.: 2016-600-015-008
MATERIAL: 60-MIL HDPE
SEAM TYPE: DOUBLE FUSION

SAMPLE I.D.: DS-14 (P-15/P-17)

PEEL ADHESION

REPLICATE No.	PEAK LOAD (lbs/in)	EPA BREAK CLASSIFICATION CODE	PEEL INCURSION (%)
OUTSIDE TRACK (WELD "A")			
1	110.1	SE1	<10
2	110.8	SE1	<10
3	134.8	SE1	<10
4	129.5	SE1	<10
5	131.8	SE1	<10
AVERAGE	**123.4**		
STD. DEV.	11.97		
INSIDE TRACK (WELD "B")			
1	112.6	SE1	<10
2	111.3	SE1	<10
3	111.9	SE1	<10
4	116.8	SE1	<10
5	112.8	SE1	<10
AVERAGE	**113.1**		
STD. DEV.	2.16		

BONDED SEAM (SHEAR) STRENGTH

REPLICATE No.	PEAK LOAD (lbs/in)	EPA BREAK CLASSIFICATION CODE
1	168.5	SE1
2	173.0	SE1
3	171.8	SE1
4	171.9	SE1
5	169.3	SE1
AVERAGE	**170.9**	
STD. DEV.	1.91	

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PEEL AND SHEAR TEST RESULTS
DESTRUCTIVE SEAM TESTING
ASTM D 6392 & 4437 w/NSF 54

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CLIENT: HDR ENGINEERING, INC.
CLIENT PROJECT: BRICKHAVEN NO.2 MINE

CLIENT PROJ. NO.: NA
PROJECT NO.: 2016-600-015
LAB ID NO.: 2016-600-015-009
MATERIAL: 60-MIL HDPE
SEAM TYPE: DOUBLE FUSION

SAMPLE I.D.: DS-15 (P-14/P-15)

PEEL ADHESION

REPLICATE No.	PEAK LOAD (lbs/in)	EPA BREAK CLASSIFICATION CODE	PEEL INCURSION (%)
OUTSIDE TRACK (WELD "A")			
1	104.9	SE1	<10
2	106.4	SE1	<10
3	116.8	SE1	<10
4	112.8	SE1	<10
5	110.3	SE1	<10
AVERAGE	**110.2**		
STD. DEV.	4.82		
INSIDE TRACK (WELD "B")			
1	119.3	SE1	<10
2	105.9	SE1	<10
3	113.6	SE1	<10
4	111.6	SE1	<10
5	130.3	SE1	<10
AVERAGE	**116.1**		
STD. DEV.	9.25		

BONDED SEAM (SHEAR) STRENGTH

REPLICATE No.	PEAK LOAD (lbs/in)	EPA BREAK CLASSIFICATION CODE
1	168.1	SE1
2	168.9	SE1
3	163.0	SE1
4	169.1	SE1
5	162.9	SE1
AVERAGE	**166.4**	
STD. DEV.	3.17	

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PEEL AND SHEAR TEST RESULTS
DESTRUCTIVE SEAM TESTING
ASTM D 6392 & 4437 w/NSF 54

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CLIENT: HDR ENGINEERING, INC.
CLIENT PROJECT: BRICKHAVEN NO.2 MINE

CLIENT PROJ. NO.: NA
PROJECT NO.: 2016-600-015
LAB ID NO.: 2016-600-015-010
MATERIAL: 60-MIL HDPE
SEAM TYPE: DOUBLE FUSION

SAMPLE I.D.: DS-16 (P-13/P-14)

PEEL ADHESION

REPLICATE No.	PEAK LOAD (lbs/in)	EPA BREAK CLASSIFICATION CODE	PEEL INCURSION (%)
OUTSIDE TRACK (WELD "A")			
1	124.5	SE1	<10
2	96.7	SE1	<10
3	105.7	SE1	<10
4	103.1	SE1	<10
5	102.7	SE1	<10
AVERAGE	**106.5**		
STD. DEV.	10.57		
INSIDE TRACK (WELD "B")			
1	116.1	SE1	<10
2	121.4	SE1	<10
3	124.5	SE1	<10
4	130.2	SE1	<10
5	129.4	SE1	<10
AVERAGE	**124.3**		
STD. DEV.	5.84		

BONDED SEAM (SHEAR) STRENGTH

REPLICATE No.	PEAK LOAD (lbs/in)	EPA BREAK CLASSIFICATION CODE
1	173.8	SE1
2	169.6	SE1
3	173.9	SE1
4	171.4	SE1
5	173.4	SE1
AVERAGE	**172.4**	
STD. DEV.	1.87	

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PEEL AND SHEAR TEST RESULTS
DESTRUCTIVE SEAM TESTING
ASTM D 6392 & 4437 w/NSF 54

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CLIENT: HDR ENGINEERING, INC.
CLIENT PROJECT: BRICKHAVEN NO.2 MINE

CLIENT PROJ. NO.: NA
PROJECT NO.: 2016-600-015
LAB ID NO.: 2016-600-015-011
MATERIAL: 60-MIL HDPE
SEAM TYPE: DOUBLE FUSION

SAMPLE I.D.: DS-17 (P-23/P-24)

PEEL ADHESION

REPLICATE No.	PEAK LOAD (lbs/in)	EPA BREAK CLASSIFICATION CODE	PEEL INCURSION (%)
OUTSIDE TRACK (WELD "A")			
1	114.9	SE1	<10
2	110.0	SE1	<10
3	113.1	SE1	<10
4	110.7	SE1	<10
5	107.4	SE1	<10
AVERAGE	**111.2**		
STD. DEV.	2.89		
INSIDE TRACK (WELD "B")			
1	122.9	SE1	<10
2	117.3	SE1	<10
3	116.2	SE1	<10
4	112.5	SE1	<10
5	112.8	SE1	<10
AVERAGE	**116.3**		
STD. DEV.	4.22		

BONDED SEAM (SHEAR) STRENGTH

REPLICATE No.	PEAK LOAD (lbs/in)	EPA BREAK CLASSIFICATION CODE
1	173.9	SE1
2	171.4	SE1
3	175.7	SE1
4	172.1	SE1
5	173.5	SE1
AVERAGE	**173.3**	
STD. DEV.	1.67	

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PEEL AND SHEAR TEST RESULTS
DESTRUCTIVE SEAM TESTING
ASTM D 6392 & 4437 w/NSF 54

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CLIENT: HDR ENGINEERING, INC.
CLIENT PROJECT: BRICKHAVEN NO.2 MINE

CLIENT PROJ. NO.: NA
PROJECT NO.: 2016-600-015
LAB ID NO.: 2016-600-015-012
MATERIAL: 60-MIL HDPE
SEAM TYPE: DOUBLE FUSION

SAMPLE I.D.: DS-18 (P-27/P-29)

PEEL ADHESION

REPLICATE No.	PEAK LOAD (lbs/in)	EPA BREAK CLASSIFICATION CODE	PEEL INCURSION (%)
OUTSIDE TRACK (WELD "A")			
1	106.0	SE1	<10
2	117.5	SE1	<10
3	107.9	SE1	<10
4	101.3	SE1	<10
5	108.8	SE1	<10
AVERAGE	**108.3**		
STD. DEV.	5.90		
INSIDE TRACK (WELD "B")			
1	103.5	SE1	<10
2	121.8	SE1	<10
3	112.7	SE1	<10
4	116.6	SE1	<10
5	119.6	SE1	<10
AVERAGE	**114.8**		
STD. DEV.	7.20		

BONDED SEAM (SHEAR) STRENGTH

REPLICATE No.	PEAK LOAD (lbs/in)	EPA BREAK CLASSIFICATION CODE
1	169.2	SE1
2	165.4	SE1
3	169.9	SE1
4	167.8	SE1
5	171.8	SE1
AVERAGE	**168.8**	
STD. DEV.	2.39	

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PEEL AND SHEAR TEST RESULTS
DESTRUCTIVE SEAM TESTING
ASTM D 6392 & 4437 w/NSF 54

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CLIENT: HDR ENGINEERING, INC.
CLIENT PROJECT: BRICKHAVEN NO.2 MINE

CLIENT PROJ. NO.: NA
PROJECT NO.: 2016-600-015
LAB ID NO.: 2016-600-015-013
MATERIAL: 60-MIL HDPE
SEAM TYPE: DOUBLE FUSION

SAMPLE I.D.: DS-19 (P-30/P-31)

PEEL ADHESION

REPLICATE No.	PEAK LOAD (lbs/in)	EPA BREAK CLASSIFICATION CODE	PEEL INCURSION (%)
OUTSIDE TRACK (WELD "A")			
1	117.5	SE1	<10
2	106.5	SE1	<10
3	121.6	SE1	<10
4	110.8	SE1	<10
5	119.9	SE1	<10
AVERAGE	**115.3**		
STD. DEV.	6.39		
INSIDE TRACK (WELD "B")			
1	116.8	SE1	<10
2	109.8	SE1	<10
3	112.7	SE1	<10
4	111.1	SE1	<10
5	123.7	SE1	<10
AVERAGE	**114.8**		
STD. DEV.	5.62		

BONDED SEAM (SHEAR) STRENGTH

REPLICATE No.	PEAK LOAD (lbs/in)	EPA BREAK CLASSIFICATION CODE
1	173.1	SE1
2	170.4	SE1
3	172.5	SE1
4	173.2	SE1
5	170.7	SE1
AVERAGE	**172.0**	
STD. DEV.	1.34	

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PEEL AND SHEAR TEST RESULTS
DESTRUCTIVE SEAM TESTING
ASTM D 6392 & 4437 w/NSF 54

geotechnics
geotechnical & geosynthetic testing

CLIENT: HDR ENGINEERING, INC.
CLIENT PROJECT: BRICKHAVEN NO.2 MINE

CLIENT PROJ. NO.: NA
PROJECT NO.: 2016-600-015
LAB ID NO.: 2016-600-015-014
MATERIAL: 60-MIL HDPE
SEAM TYPE: DOUBLE FUSION

SAMPLE I.D.: DS-20 (P-33/P-34)

PEEL ADHESION

REPLICATE No.	PEAK LOAD (lbs/in)	EPA BREAK CLASSIFICATION CODE	PEEL INCURSION (%)
OUTSIDE TRACK (WELD "A")			
1	112.8	SE1	<10
2	107.7	SE1	<10
3	112.4	SE1	<10
4	106.4	SE1	<10
5	110.1	SE1	<10
AVERAGE	**109.9**		
STD. DEV.	2.82		
INSIDE TRACK (WELD "B")			
1	120.3	SE1	<10
2	116.9	SE1	<10
3	119.9	SE1	<10
4	121.7	SE1	<10
5	124.2	SE1	<10
AVERAGE	**120.6**		
STD. DEV.	2.67		

BONDED SEAM (SHEAR) STRENGTH

REPLICATE No.	PEAK LOAD (lbs/in)	EPA BREAK CLASSIFICATION CODE
1	171.8	SE1
2	166.2	SE1
3	168.9	SE1
4	171.8	SE1
5	170.6	SE1
AVERAGE	**169.9**	
STD. DEV.	2.37	

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T:\2016 PROJECTS\2016-600 HDR - BRICKHAVEN NO.2 MINE\[2016-600-015-014 HDF 2016-600-015-014 4/11/16

PEEL AND SHEAR TEST RESULTS
DESTRUCTIVE SEAM TESTING
ASTM D 6392 & 4437 w/NSF 54

geotechnics
geotechnical & geosynthetic testing

CLIENT: HDR ENGINEERING, INC.
CLIENT PROJECT: BRICKHAVEN NO.2 MINE

CLIENT PROJ. NO.: NA
PROJECT NO.: 2016-600-015
LAB ID NO.: 2016-600-015-015
MATERIAL: 60-MIL HDPE
SEAM TYPE: DOUBLE FUSION

SAMPLE I.D.: DS-21 (P-35/P-36)

PEEL ADHESION

REPLICATE No.	PEAK LOAD (lbs/in)	EPA BREAK CLASSIFICATION CODE	PEEL INCURSION (%)
OUTSIDE TRACK (WELD "A")			
1	107.1	SE1	<10
2	112.1	SE1	<10
3	122.0	SE1	<10
4	103.1	SE1	<10
5	112.6	SE1	<10
AVERAGE	**111.4**		
STD. DEV.	7.10		
INSIDE TRACK (WELD "B")			
1	117.9	SE1	<10
2	116.2	SE1	<10
3	114.1	SE1	<10
4	116.6	SE1	<10
5	113.4	SE1	<10
AVERAGE	**115.6**		
STD. DEV.	1.85		

BONDED SEAM (SHEAR) STRENGTH

REPLICATE No.	PEAK LOAD (lbs/in)	EPA BREAK CLASSIFICATION CODE
1	169.2	SE1
2	171.0	SE1
3	167.9	SE1
4	163.5	SE1
5	168.5	SE1
AVERAGE	**168.0**	
STD. DEV.	2.78	

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PEEL AND SHEAR TEST RESULTS
DESTRUCTIVE SEAM TESTING
ASTM D 6392 & 4437 w/NSF 54

geotechnics
geotechnical & geosynthetic testing

CLIENT: HDR ENGINEERING, INC.
CLIENT PROJECT: BRICKHAVEN NO.2 MINE

CLIENT PROJ. NO.: NA
PROJECT NO.: 2016-600-015
LAB ID NO.: 2016-600-015-016
MATERIAL: 60-MIL HDPE
SEAM TYPE: DOUBLE FUSION

SAMPLE I.D.: DS-22 (P-37/P-39)

PEEL ADHESION

REPLICATE No.	PEAK LOAD (lbs/in)	EPA BREAK CLASSIFICATION CODE	PEEL INCURSION (%)
OUTSIDE TRACK (WELD "A")			
1	113.0	SE1	<10
2	109.8	SE1	<10
3	113.7	SE1	<10
4	107.1	SE1	<10
5	110.5	SE1	<10
AVERAGE	**110.8**		
STD. DEV.	2.65		
INSIDE TRACK (WELD "B")			
1	108.7	SE1	<10
2	113.6	SE1	<10
3	104.6	SE1	<10
4	116.5	SE1	<10
5	118.4	SE1	<10
AVERAGE	**112.4**		
STD. DEV.	5.67		

BONDED SEAM (SHEAR) STRENGTH

REPLICATE No.	PEAK LOAD (lbs/in)	EPA BREAK CLASSIFICATION CODE
1	172.2	SE1
2	170.8	SE1
3	175.9	SE1
4	172.4	SE1
5	171.3	SE1
AVERAGE	**172.5**	
STD. DEV.	2.00	

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PEEL AND SHEAR TEST RESULTS
DESTRUCTIVE SEAM TESTING
ASTM D 6392 & 4437 w/NSF 54

geotechnics
geotechnical & geosynthetic testing

CLIENT: HDR ENGINEERING, INC.
CLIENT PROJECT: BRICKHAVEN NO.2 MINE

CLIENT PROJ. NO.: NA
PROJECT NO.: 2016-600-015
LAB ID NO.: 2016-600-015-017
MATERIAL: 60-MIL HDPE
SEAM TYPE: DOUBLE FUSION

SAMPLE I.D.: DS-23 (P-12/P-16)

PEEL ADHESION

REPLICATE No.	PEAK LOAD (lbs/in)	EPA BREAK CLASSIFICATION CODE	PEEL INCURSION (%)
OUTSIDE TRACK (WELD "A")			
1	114.4	SE1	<10
2	113.8	SE1	<10
3	109.1	SE1	<10
4	100.9	SE1	<10
5	120.4	SE1	<10
AVERAGE	**111.7**		
STD. DEV.	7.26		
INSIDE TRACK (WELD "B")			
1	119.2	SE1	<10
2	118.3	SE1	<10
3	120.2	SE1	<10
4	115.6	SE1	<10
5	123.0	SE1	<10
AVERAGE	**119.3**		
STD. DEV.	2.70		

BONDED SEAM (SHEAR) STRENGTH

REPLICATE No.	PEAK LOAD (lbs/in)	EPA BREAK CLASSIFICATION CODE
1	164.4	SE1
2	158.6	SE1
3	160.7	SE1
4	155.7	SE1
5	158.0	SE1
AVERAGE	**159.5**	
STD. DEV.	3.28	

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PEEL AND SHEAR TEST RESULTS
DESTRUCTIVE SEAM TESTING
ASTM D 6392 & 4437 w/NSF 54

geotechnics
geotechnical & geosynthetic testing

CLIENT: HDR ENGINEERING, INC.
CLIENT PROJECT: BRICKHAVEN NO.2 MINE

CLIENT PROJ. NO.: NA
PROJECT NO.: 2016-600-016
LAB ID NO.: 2016-600-016-007
MATERIAL: 60-MIL HDPE
SEAM TYPE: DOUBLE FUSION

SAMPLE I.D.: DS-24 (P-12/P-22)

PEEL ADHESION

REPLICATE No.	PEAK LOAD (lbs/in)	EPA BREAK CLASSIFICATION CODE	PEEL INCURSION (%)
OUTSIDE TRACK (WELD "A")			
1	112.5	SE1	<10
2	111.6	SE1	<10
3	115.5	SE1	<10
4	116.3	SE1	<10
5	117.4	SE1	<10
AVERAGE	**114.7**		
STD. DEV.	2.50		
INSIDE TRACK (WELD "B")			
1	123.1	SE1	<10
2	126.5	SE1	<10
3	122.8	SE1	<10
4	124.4	SE1	<10
5	121.7	SE1	<10
AVERAGE	**123.7**		
STD. DEV.	1.84		

BONDED SEAM (SHEAR) STRENGTH

REPLICATE No.	PEAK LOAD (lbs/in)	EPA BREAK CLASSIFICATION CODE
1	164.6	SE1
2	168.4	SE1
3	163.3	SE1
4	166.1	SE1
5	164.5	SE1
AVERAGE	**165.4**	
STD. DEV.	1.96	

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PEEL AND SHEAR TEST RESULTS
DESTRUCTIVE SEAM TESTING
ASTM D 6392 & 4437 w/NSF 54

geotechnics
geotechnical & geosynthetic testing

CLIENT: HDR ENGINEERING, INC.
CLIENT PROJECT: BRICKHAVEN NO.2 MINE

CLIENT PROJ. NO.: NA
PROJECT NO.: 2016-600-016
LAB ID NO.: 2016-600-016-008
MATERIAL: 60-MIL HDPE
SEAM TYPE: DOUBLE FUSION

SAMPLE I.D.: DS-25 (P-9/P-34)

PEEL ADHESION

REPLICATE No.	PEAK LOAD (lbs/in)	EPA BREAK CLASSIFICATION CODE	PEEL INCURSION (%)
OUTSIDE TRACK (WELD "A")			
1	139.0	SE1	<10
2	127.1	SE1	<10
3	117.1	SE1	<10
4	134.4	SE1	<10
5	129.8	SE1	<10
AVERAGE	**129.5**		
STD. DEV.	8.27		
INSIDE TRACK (WELD "B")			
1	140.5	SE1	<10
2	136.1	SE1	<10
3	139.3	SE1	<10
4	137.6	SE1	<10
5	139.7	SE1	<10
AVERAGE	**138.6**		
STD. DEV.	1.77		

BONDED SEAM (SHEAR) STRENGTH

REPLICATE No.	PEAK LOAD (lbs/in)	EPA BREAK CLASSIFICATION CODE
1	159.2	SE1
2	164.8	SE1
3	161.3	SE1
4	156.7	SE1
5	158.4	SE1
AVERAGE	**160.1**	
STD. DEV.	3.11	

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CHESAPEAKE CONTAINMENT SYSTEMS, INC.

Repair Log

Project No.: I15-054

Project Name: Brickhaven Mine Site - Subcell 1C

Date: 4/6/16

Project Location: Moncure, NC

Material: HDPE

Thickness: 60 mil

Repair #	Defect Code	Defect Location	Repair Date	Repair Time	Repair Type	Approx Size	Machine ID	Repair Tech	Vacuum Test		
		Seam #							P/F	Date	Tech
1	C	23/EL 135' from P1	4/9/16	19:25	C	2x10	X2	CF	P	4/11/16	PV
2	C	23/EL 75' from P1	4/10/16	9:03	C	10x30	X2	CF	P	4/11/16	PV
3	BO	23/EL 30' from P1	4/10/16	9:08	P	2x2	X2	CF	P	4/11/16	PV
4	C	24/26 50' from P3	4/9/16	19:45	C	2x10	X2	CF	P	4/11/16	PV
5	BO	24/26 70' from P3	4/9/16	19:37	P	2x2	X2	CF	P	4/11/16	PV
6	T	24/25/26	4/9/16	19:29	P	2x2	X2	CF	P	4/11/16	PV
7	T	25/26/27	4/9/16	19:35	P	2x2	X2	CF	P	4/11/16	PV
8	T/DS-18	27/28/29	4/10/16	7:48	C	2x10	X2	CF	P	4/11/16	PV
9	T	28/29/30	4/10/16	7:35	P	2x2	X2	CF	P	4/11/16	PV
10	DS-19	30/31 70' from P32	4/10/16	7:58	P	2x6	X2	CF	P	4/11/16	PV
11	T	30/31/32	4/10/16	9:20	P	2x2	X2	CF	P	4/11/16	PV
12	T	31/32/33	4/10/16	9:23	P	2x2	X2	CF	P	4/11/16	PV
13	DS-20	33/34 80' from P9	4/10/16	8:05	P	2x6	X2	CF	P	4/11/16	PV
14	DS-21	35/36 110' from P11	4/10/16	8:12	P	2x6	X2	CF	P	4/11/16	PV
15	T	36/37/38	4/10/16	8:14	P	2x6	X2	CF	P	4/11/16	PV
16	T	36/38/39/40	4/10/16	8:30	P	2x10	X2	CF	P	4/11/16	PV
17	T	37/38/39	4/10/16	8:34	P	2x2	X2	CF	P	4/11/16	PV
18	DS-22	37/39 2' from P13	4/10/16	10:35	P	2x6	X2	CF	P	4/11/16	PV
19	C	12/13/14/37/39	4/10/16	10:38	C	2x14	X2	CF	P	4/11/16	PV
20	C	12/14/39	4/10/16	10:00	P	2x24	X2	CF	P	4/11/16	PV
21	T	12/39/40	4/10/16	10:05	P	2x2	X2	CF	P	4/11/16	PV
22	T	11/12/36/40	4/10/16	9:44	P	2x2	X2	CF	P	4/11/16	PV
23	T	10/11/35/36	4/10/16	10:10	P	2x6	X2	CF	P	4/11/16	PV
24	T	9/10/34/35	4/10/16	10:18	P	2x2	X2	CF	P	4/11/16	PV
25	DS-25	9/34 3' from P10	4/10/16	13:31	P	2x6	X2	CF	P	4/11/16	PV
26	T	8/9/33/34	4/10/16	10:40	P	2x2	X2	CF	P	4/11/16	PV
27	T	7/8/32/33	4/10/16	10:58	C	2x12	X2	CF	P	4/11/16	PV
28	T	6/7/30/32	4/10/16	10:46	P	2x6	X2	CF	P	4/11/16	PV
29	T	5/6/29/30	4/10/16	11:02	P	2x2	X2	CF	P	4/11/16	PV
30	T	4/5/27/29	4/10/16	11:08	P	2x2	X2	CF	P	4/11/16	PV

CHESAPEAKE CONTAINMENT SYSTEMS, INC.

Repair Log

Project No.: I15-054

Project Name: Brickhaven Mine Site - Subcell 1C

Date: 4/6/16

Project Location: Moncure, NC

Material: HDPE

Thickness: 60 mil

Repair #	Defect Code	Defect Location	Repair Date	Repair Time	Repair Type	Approx Size	Machine ID	Repair Tech	Vacuum Test		
		Seam #							P/F	Date	Tech
31	T	3/4/26/27	4/10/16	11:14	P	2x2	X2	CF	P	4/11/16	PV
32	T	2/3/24/26	4/10/16	11:20	P	2x2	X2	CF	P	4/11/16	PV
33	DS-17	1/2/23/24	4/10/16	11:28	P	2x8	X2	CF	P	4/11/16	PV
34	T	1/23/EL	4/10/16	11:54	C	6x10	X2	CF	P	4/11/16	PV
35	DS-1	1/EL 4' from P23	4/10/16	11:58	P	2x6	X2	CF	P	4/11/16	PV
36	DS-3	2/3 25' from P26	4/10/16	13:16	P	2x6	X2	CF	P	4/11/16	PV
37	BO	1/EL 305' from SOS	4/10/16	13:32	P	2x2	X2	CF	P	4/11/16	PV
38	BO	1/EL 290' from SOS	4/10/16	13:36	P	2x2	X2	CF	P	4/11/16	PV
39	BO	1/EL 55' from SOS	4/10/16	14:16	C	2x10	X2	CF	P	4/11/16	PV
40	BO	1/EL 60' from SOS	4/10/16	14:18	P	2x2	X2	CF	P	4/11/16	PV
41	DS-2	2/3 10' from SOS	4/10/16	14:47	P	2x6	X2	CF	P	4/11/16	PV
42	C	4/5 at SOS	4/10/16	15:10	C	2x15	X2	CF	P	4/11/16	PV
43	DS-4	3/4 40' from SOS	4/10/16	14:32	P	2x6	X2	CF	P	4/11/16	PV
44	BO	3/4 55' from SOS	4/10/16	14:26	P	2x2	X2	CF	P	4/11/16	PV
45	DS-6	5/6 75' from SOS	4/10/16	16:40	P	2x6	X2	CF	P	4/11/16	PV
46	DS-5	4/5 60' from P29	4/10/16	12:08	P	2x6	X10	ED	P	4/11/16	PV
47	DS-7	6/7 80' from P32	4/10/16	13:51	P	2x6	X10	ED	P	4/11/16	PV
48	DS-9	8/9 80' from P34	4/10/16	13:20	P	2x6	X10	ED	P	4/11/16	PV
49	DS-8	7/8 80' from SOS	4/10/16	16:40	P	2x6	X10	ED	P	4/11/16	PV
50	AT	5/6 at SOS	4/10/16	15:18	P	2x6	X2	CF	P	4/11/16	PV
51	AT	6/7 at SOS	4/10/16	15:26	P	2x6	X2	CF	P	4/11/16	PV
52	AT	7/8 at SOS	4/10/16	15:32	P	2x6	X2	CF	P	4/11/16	PV
53	AT	8/9 at SOS	4/10/16	15:41	P	2x6	X2	CF	P	4/11/16	PV
54	AT	9/10 at SOS	4/10/16	15:48	P	2x6	X2	CF	P	4/11/16	PV
55	AT	10/11 at SOS	4/10/16	16:01	P	2x6	X2	CF	P	4/11/16	PV
56	AT	11/12 at SOS	4/10/16	16:11	P	2x6	X2	CF	P	4/11/16	PV
57	DS-10	9/10 80' from SOS	4/10/16	16:28	P	2x6	X10	ED	P	4/11/16	PV
58	DS-12	11/12 100' from SOS	4/10/16	16:17	P	2x6	X10	ED	P	4/11/16	PV
59	DS-11	10/11 100' from P36	4/10/16	13:43	P	2x6	X10	ED	P	4/11/16	PV
60	T	12/14/15	4/10/16	9:32	P	2x8	X2	CF	P	4/11/16	PV

CHESAPEAKE CONTAINMENT SYSTEMS, INC.

Repair Log

Project No.: I15-054

Project Name: Brickhaven Mine Site - Subcell 1C

Date: 4/6/16

Project Location: Moncure, NC

Material: HDPE

Thickness: 60 mil

Repair #	Defect Code	Defect Location	Repair Date	Repair Time	Repair Type	Approx Size	Machine ID	Repair Tech	Vacuum Test		
		Seam #							P/F	Date	Tech
61	T	12/15/16	4/10/16	14:01	P	2x6	X10	ED	P	4/11/16	PV
62	T/DS-23	12/16/17/20	4/10/16	14:20	C	2x15	X10	ED	P	4/11/16	PV
63	T	12/18/19/20	4/10/16	14:28	P	2x8	X10	ED	P	4/11/16	PV
64	T	12/19/21	4/10/16	15:46	P	2x8	X10	ED	P	4/11/16	PV
65	T	12/21/22	4/10/16	15:50	P	2x6	X10	ED	P	4/11/16	PV
66	MD	P12 10' from P22, 65' from AT	4/10/16	16:00	P	2x2	X10	ED	P	4/11/16	PV
67	DS-24	12/22 10' from SOS	4/10/16	16:39	P	2x6	X2	CF	P	4/11/16	PV
68	MD	P12 6' from P22, 20' from AT	4/10/16	16:15	P	2x2	X2	CF	P	4/11/16	PV
69	MD	P12 6' from P22, 12' from AT	4/10/16	16:14	P	2x2	X2	CF	P	4/11/16	PV
70	MD	P12 6' from P22, 6' from AT	4/10/16	16:13	P	2x2	X2	CF	P	4/11/16	PV
71	AT	19/21 at SOS	4/10/16	16:43	P	2x2	X2	CF	P	4/11/16	PV
72	AT	18/19 at SOS	4/10/16	16:55	P	2x6	X2	CF	P	4/11/16	PV
73	BO	19/21 70' from SOS	4/10/16	16:10	P	2x2	X10	ED	P	4/11/16	PV
74	BO	19/21 90' from SOS	4/10/16	16:05	P	2x2	X10	ED	P	4/11/16	PV
75	DS-13	18/19 190' from SOS	4/10/16	14:48	P	2x6	X10	ED	P	4/11/16	PV
76	T	18/19/20	4/10/16	14:33	P	2x2	X10	ED	P	4/11/16	PV
77	T	17/18/20	4/10/16	14:41	P	2x6	X10	ED	P	4/11/16	PV
78	AT	17/18 at SOS	4/10/16	17:00	P	2x6	X2	CF	P	4/11/16	PV
79	AT	15/17 at SOS	4/10/16	17:05	P	2x6	X2	CF	P	4/11/16	PV
80	AT	14/15 at SOS	4/10/16	17:10	P	2x6	X2	CF	P	4/11/16	PV
81	AT	13/14 at SOS	4/10/16	17:11	P	2x6	X10	ED	P	4/11/16	PV
82	DS-15	14/15 150' from SOS	4/10/16	15:03	P	2x6	X10	ED	P	4/11/16	PV
83	DS-14	15/17 170' from SOS	4/10/16	14:54	P	2x6	X10	ED	P	4/11/16	PV
84	T	15/16/17	4/10/16	14:07	P	2x2	X10	ED	P	4/11/16	PV
85	DS-16	13/14 350' from SOS	4/10/16	9:39	P	2x6	X2	CF	P	4/11/16	PV
86	AT	1/EL at SOS	4/10/16	14:51	P	2x6	X2	CF	P	4/11/16	PV

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T8

CALIBRATION CERTIFICATE

Customer Name:	Chesapeake Containment	110 Volt	X
Unit Make & Model Number:	Accura-Lite	220 Volt	
Tensiometer Serial Number:	NAL-2606	Lbs.	X
		Kg.	

Device Calibrated: Transducer Load Cell
Range: 0 - 500 lbs. Tension
Model No: MLP-500
Serial No: 200198

Calibration Apparatus:
Dead Weight system w/
Fluke Model 187 Multimeter

Readout Model No: DPM-3
Readout Serial No: 317518

Indicator reading with no load: 0

Applied Force lbs.	Output (mv):	Display reading:	Deviation Error:
2	3.51	2	0.00
52	3.55	52	0.00
102	3.775	102	0.00
152	4.24	152	0.00
202	4.265	202	0.00
252	4.303	252	0.00
302	4.467	302	0.00

Total Deviation Error (%): 0.00%

Temperature at time of calibration: 73 degrees F
Exitation Voltage: NA V DC

Calibration Check # NA

This calibration conforms to the standards set by ASTM E4 and is traceable to NIST standards

Note: Readout and load cell above have been systems calibrated and are considered a matched pair. In general, calibrated readouts and load cells are not interchangeable.

Calibrated by: JW

Date: 09/15/15

T11

Demtech Services, Inc.

Placerville, California, USA

CALIBRATION CERTIFICATE

Tensiometer Model: Pro-Tester T-0100

Device Calibrated: S-Type load cell

Range: 0 - 750 lbs. Tension

Model No: M2405-750#

Serial No: **NA**

Calibration Apparatus:

Pro-Cal unit, model TC-0100/A

A/D Module Model No: T-029

A/D Module Serial No: **315022324**

Channel No: N/A

Dead Weight:		Reference Cell:	
W1	2	R1	2
W2	152	R2	152
W3	302	R3	302

Indicator reading with no load: 0

Offset: **4.305647** Scale: **3.331593**

Applied Force lbs.	Cell Response:	Deviation Error:
2	2	0.00
52	52	0.00
102	102	0.00
152	152	0.00
202	202	0.00
252	252	0.00
302	302	0.00

Total Deviation Error (%): 0.00%

Temperature at time of calibration: 73 degrees F

Exitation Voltage: 5 V DC

This calibration conforms to the standards set by ASTM E4 and is traceable to NIST standards

Note: A/D Module and load cell above have been systems calibrated and are considered a matched pair. In general, calibrated A/D Modules and load cells are not interchangeable.

Technician: JF Date: 05/18/15

Signature:

T11

Demtech Services, Inc.

Placerville, California, USA

CALIBRATION CERTIFICATE

Tensiometer Model: Pro-Tester T-0100

Device Calibrated: S-Type load cell

Range: 0 - 750 lbs. Tension

Model No: M2405-750#

Serial No: **NA**

Calibration Apparatus:

Pro-Cal unit, model TC-0100/A

A/D Module Model No: T-029

A/D Module Serial No: **315022375**

Channel No: N/A

Dead Weight:		Reference Cell:	
W1	2	R1	2
W2	152	R2	152
W3	302	R3	302

Indicator reading with no load: 0

Offset: **5.751014** Scale: **3.331893**

Applied Force lbs.	Cell Response:	Deviation Error:
2	2	0.00
52	52	0.00
102	102	0.00
152	152	0.00
202	202	0.00
252	252	0.00
302	302	0.00

Total Deviation Error (%): 0.00%

Temperature at time of calibration: 73 degrees F

Exitation Voltage: 5 V DC

This calibration conforms to the standards set by ASTM E4 and is traceable to NIST standards

Note: A/D Module and load cell above have been systems calibrated and are considered a matched pair. In general, calibrated A/D Modules and load cells are not interchangeable.

Technician MWH Matt Harrison Date: 05/18/15

Supervisor Signature:

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E4

E4 – Warranties

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CHESAPEAKE CONTAINMENT SYSTEMS, INC.
LIMITED WORKMANSHIP WARRANTY

Warranty No. 15-054-03
Project No: 15-054
Effective Date: April 18, 2016

PURCHASER:Charah,Inc

ADDRESS:

12601 Plantside Drive

Louisville Kentucky

PROJECT NAME: Brickhaven Mine Site Subcell 1C

DESCRIPTION: 60mil HDPE, GCL, Geocomposite

ADDRESS: 1149 Moncure Flatwood Road

CITY, STATE,ZIP Moncure, NC

CHESAPEAKE CONTAINMENT SYSTEMS, INC. (CCSI) warrants each CCSI LINER SYSTEM installed by CCSI to be free from defects in workmanship. This "Workmanship Warranty" shall be in effect from the date the installation of the Liner System is completed and accepted by the Owner for a period of TWO YEARS of normal use in approved applications.

This Limited Warranty does not include damages or defects in the CCSI Liner System resulting from acts of God, casualty or catastrophe including but not limited to: earthquakes, floods, piercing hail, tornadoes or force majeure. The term "normal use" as used herein does not include, among other things, the exposure of CCSI Liner System to chemicals causing damage to the liner, abuse of CCSI Liner System by machinery, equipment or people, excessive pressures or stress from any source, subsurface or overburdened soil conditions, and total or differential soil settlements outside of the limits of liner physical properties and the effect these may have on the liner system.

Should defects or premature loss of use within the scope of the above Limited Workmanship Warranty occur, CCSI will, at its option, repair or replace the CCSI Liner System on a pro-rata basis at the then current price in such manner as to charge the Purchaser/User only for that portion of the warranted life which has elapsed since purchase of the material. CCSI will have the right to inspect and determine the cause of any alleged defect in the CCSI Liner System and to take appropriate steps to repair or replace the CCSI Liner System if a defect exists and is within the term of this Limited Warranty.

Any claim for any alleged breach of this warranty must be made in writing, by certified mail, to the President of CCSI within thirty (30) days after the alleged defect is noticed. Should the required notice not be given, the defect and all warranties shall be deemed to have been waived by the Purchaser, and Purchaser shall have no right of recovery against CCSI. In the event repairs and/or replacements are to be effected, said repairs and/or replacements shall not become due until the area subject to repair and/or replacement of CCSI Liner System is available to CCSI in a clean, dry, unencumbered condition. This includes, but is not limited to, the area made available for repair and/or replacement of CCSI Liner System to be free from all water, dirt, sludge, residuals, and liquids of any kind.

CCSI's liability under this warranty shall in no event exceed the replacement cost of the material and installation sold to the Purchaser for the particular installation in which it failed. Further, under no circumstances shall CCSI be liable for any special, direct, indirect, or consequential damages arising from loss of production or any other losses including losses due to personal injuries and product liability owing to the failure of the material or installation and no allowance will be made for repairs, replacements, or alterations made by the Purchaser without the express written consent of CCSI.

CCSI neither assumes nor authorizes any person other than an officer of CCSI to assume for it any other or additional liability in connection with the CCSI Liner System made the basis of the Limited Warranty. The Limited Workmanship Warranty on the CCSI Liner System herein is given in lieu of all other possible material warranties, either express or implied, and by accepting delivery of the material Purchaser waives all other possible workmanship warranties, except those specifically given.

The parties expressly agree that the sale hereunder is for commercial or industrial use only.

CCSI's Limited Warranty is extended to the purchaser/owner and is non transferable and non-assignable.

Purchaser acknowledges by acceptance that the Limited Workmanship Warranty given herein is accepted in preference to any and all other possible workmanship warranties.

CCSI MAKES NO WARRANTY OF ANY KIND OTHER THAN THAT GIVEN ABOVE AND HEREBY DISCLAIMS ALL WARRANTIES, BOTH EXPRESS OR IMPLIED, OF MERCHANTABILITY AND FITNESS FOR A PARTICULAR PURPOSE

WARRANTY BECOMES EFFECTIVE UPON SUBSTANTIAL COMPLETION OF THE WORK
WARRANTY IS VALID AFTER RECEIPT OF FINAL PAYMENT

I hereby state I have read and understood the above and foregoing Limited Warranty and agree to such by signing hereunder.

PURCHASER NAME:_____

SIGNATURE:_____

TITLE:_____
DATE:_____

Chesapeake Containment Systems, Inc.

Vice President

Ryan P. Clark 04-18-16

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F

Appendix F – Pipe Video Documentation

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JETCLEAN AMERICA

HIGH PRESSURE WATER JETTING
EXPLOSION PROOF VIDEO INSPECTION
VACUUM TRUCK SERVICES
WWW.JETCLEANAMERICA.COM

7538 DUNBRIDGE DRIVE
ODESSA, FL 33556
T: 800-226-8013 / F: 813-926-4616
JETCLEANAMERICA@YAHOO.COM

Charah, Inc.
Duke Energy - Brickhaven
Cell 1C
LCS Pipe Jetcleaning & Inspection

Work Performed
April 2016

Conducted By:
Jetclean America
800-226-8013

JETCLEAN AMERICA

HIGH PRESSURE WATER JETTING
EXPLOSION PROOF VIDEO INSPECTION
VACUUM TRUCK SERVICES
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JETCLEANAMERICA@YAHOO.COM

REPORT

DATE : 4/19/2016
TO : John Henry Thompson – Charah, Inc.
FROM : Ralph Calistri (jetcleanamerica@yahoo.com)
SUBJECT : 2016 - Duke - Brickhaven - Cell 1C Pipe Jetting and Video-Inspection

Jetclean America completed the high-pressure water-jetting and explosion-proof video-inspection of the existing Cell 1C leachate collection piping at Duke Brickhaven on 4/15/2016. Please find the included jetting log, CCTV survey list, pipe graphic reports, and inspection videos for your further detailed reference.

High-pressure Water-jetting:
The below jetting log documents the pipe(s) that were jetcleaned, and the distances achieved in each pipe. The pipe was clean and blockage free upon completion.

CHARAH INC.
DUKE - BRICKHAVEN - CELL 1C
JETTING LOG
APRIL 2016

LOCATION	ACHIEVED DISTANCE (ft)	COMMENTS
Cell 1C to Donwstream	400'	Entire Pipe Length Jetcleaned

Explosion-proof Video-inspection:
After jetcleaning was completed, the above piping was video-inspected 350.4' utilizing certified explosion-proof video-inspection equipment (see included Video Footage and Pipe Graphic Report). All areas of the piping viewed through the inspection camera appear to be in good condition, with no specific defects noted.

Please call us with questions or concerns.

Regards,

Ralph Calistri

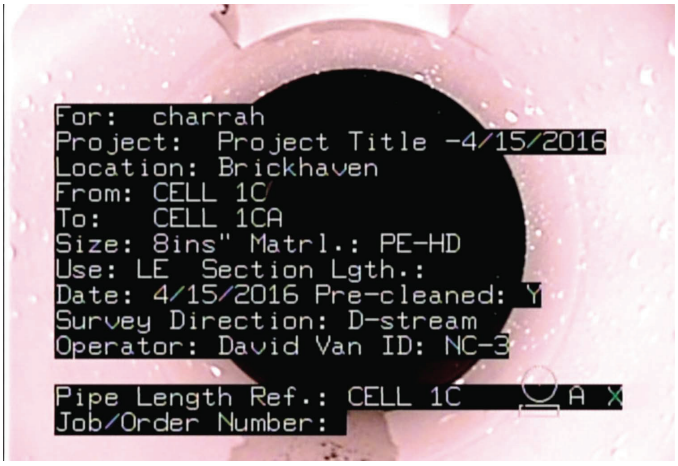
Ralph Calistri - Jetclean America - 800-226-8013

Pipe Video Documentation

Video inspection of the pipe was conducted and the resulting documentation reviewed to ensure that the pipes were installed and will function as intended. The inspection was perform on April 15, 2016 be Jet Clean America.

Representative photos from the leachate pipe video are provided below. A corresponding location map follows.

Cell 1 C to Cell 1 CA 4/15/2016



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PT #	NORTHING	EASTING	PROPOSED SUBGRADE ELEV.	AS-BUILT SUBGRADE ELEV.	DIFFERENCE PROPOSED SUBGRADE TO AS-BUILT SUBGRADE	PROPOSED LINER ELEV.	AS-BUILT LINER ELEV.	DIFFERENCE PROPOSED LINER TO AS-BUILT LINER	DIFFERENCE AS-BUILT SUBGRADE TO AS-BUILT LINER
2000	674253.65	1994239.05	243.63	243.45	-0.17	245.13	245.27	0.14	1.81
2001	674300.24	1994218.13	244.24	244.20	-0.03	245.74	245.83	0.09	1.63
2002	674346.76	1994197.24	245.03	244.87	-0.15	246.53	246.55	0.02	1.68
2003	674395.44	1994174.69	246.08	245.94	-0.14	247.58	247.62	0.04	1.68
2004	674444.90	1994145.74	247.45	247.29	-0.16	248.95	248.99	0.04	1.70
2005	674490.38	1994111.61	248.97	248.84	-0.13	250.47	250.61	0.14	1.77
2006	674532.85	1994071.30	250.54	250.40	-0.15	252.04	252.15	0.11	1.75
2007	674568.25	1994032.26	251.96	251.80	-0.16	253.46	253.51	0.05	1.71
2008	674604.71	1993991.92	253.41	253.31	-0.10	254.91	254.95	0.03	1.63
2009	674602.87	1993990.25	253.41	253.37	-0.04	254.91	254.93	0.02	1.55
2010	674566.37	1994030.56	251.96	251.85	-0.10	253.46	253.47	0.01	1.62
2011	674531.04	1994069.60	250.54	250.45	-0.10	252.04	252.14	0.10	1.69
2012	674488.78	1994109.70	248.97	248.86	-0.11	250.47	250.57	0.10	1.71
2013	674443.51	1994143.67	247.45	247.33	-0.12	248.95	249.01	0.06	1.68
2014	674394.31	1994172.47	246.08	246.00	-0.08	247.58	247.67	0.09	1.67
2015	674345.74	1994194.97	245.03	244.98	-0.05	246.53	246.59	0.07	1.61
2016	674299.22	1994215.85	244.24	244.22	-0.02	245.74	245.76	0.02	1.54
2017	674252.64	1994236.77	243.63	243.59	-0.03	245.13	245.29	0.16	1.69
2018	674251.62	1994234.49	243.63	243.57	-0.06	245.13	245.23	0.11	1.67
2019	674298.20	1994213.57	244.24	244.16	-0.08	245.74	245.76	0.02	1.60
2020	674344.72	1994192.69	245.03	245.02	0.00	246.53	246.56	0.03	1.53
2021	674393.18	1994170.24	246.08	246.06	-0.02	247.58	247.62	0.04	1.56
2022	674442.12	1994141.59	247.45	247.41	-0.04	248.95	249.04	0.09	1.64
2023	674487.16	1994107.79	248.97	248.83	-0.14	250.47	250.49	0.02	1.65
2024	674529.21	1994067.89	250.54	250.37	-0.17	252.04	252.15	0.11	1.78
2025	674564.55	1994028.91	251.96	251.93	-0.03	253.46	253.54	0.08	1.61
2026	674601.01	1993988.57	253.41	253.31	-0.10	254.91	254.98	0.06	1.66
2027	674576.46	1993966.38	242.38	242.27	-0.11	243.97	243.97	0.00	1.70
2028	674540.96	1994007.59	241.36	241.30	-0.06	242.94	242.95	0.01	1.65
2029	674506.90	1994047.06	240.38	240.34	-0.04	241.95	241.97	0.02	1.63
2030	674468.45	1994085.55	239.29	239.22	-0.07	240.88	240.92	0.05	1.70
2031	674426.57	1994118.34	238.14	238.08	-0.05	239.72	239.79	0.07	1.71
2032	674380.87	1994145.97	237.02	236.95	-0.07	238.60	238.70	0.09	1.75
2033	674333.72	1994168.18	236.08	236.00	-0.08	237.66	237.82	0.16	1.82
2034	674287.29	1994189.27	235.36	235.29	-0.07	236.94	237.00	0.06	1.72
2035	674241.09	1994210.86	235.00	234.87	-0.13	236.59	236.61	0.02	1.74
2036	674230.07	1994186.22	226.01	226.12	0.11	227.72	227.84	0.11	1.72
2037	674276.37	1994164.96	226.44	226.65	0.21	228.27	228.46	0.19	1.81
2038	674322.72	1994143.68	227.52	227.25	-0.27	229.02	229.10	0.08	1.85
2039	674368.55	1994121.71	228.06	228.14	0.08	229.77	229.92	0.15	1.78
2040	674411.02	1994095.09	228.80	229.03	0.23	230.46	230.60	0.14	1.57
2041	674449.73	1994063.30	229.59	229.65	0.06	231.10	231.22	0.12	1.57
2042	674484.59	1994026.22	230.22	230.18	-0.03	231.82	231.90	0.08	1.72
2043	674517.37	1993986.27	230.76	230.73	-0.03	232.36	232.53	0.17	1.80
2044	674551.90	1993944.19	231.35	231.31	-0.04	232.95	232.96	0.00	1.65
2045	674542.17	1993934.65	231.21	231.15	-0.06	232.71	232.77	0.06	1.62
2046	674501.39	1993964.28	230.54	230.53	-0.01	232.04	232.05	0.01	1.52
2047	674460.94	1993993.67	229.87	229.80	-0.07	231.37	231.44	0.08	1.65
2048	674420.49	1994023.06	229.20	229.14	-0.05	230.70	230.76	0.06	1.61
2049	674380.04	1994052.45	228.53	228.44	-0.09	230.03	230.08	0.05	1.64
2050	674339.59	1994081.84	227.86	227.76	-0.10	229.36	229.46	0.10	1.70
2051	674299.14	1994111.23	227.19	227.13	-0.06	228.69	228.78	0.09	1.65
2052	674258.69	1994140.62	226.52	226.36	-0.16	228.02	228.18	0.16	1.82
2053	674220.05	1994168.70	225.80	225.82	0.02	227.38	227.47	0.09	1.65
2054	674195.19	1994125.22	224.94	224.76	-0.19	226.44	226.54	0.10	1.79
2055	674229.43	1994100.35	225.52	225.50	-0.02	227.02	227.11	0.09	1.61
2056	674269.88	1994070.96	226.41	226.37	-0.04	227.91	228.05	0.14	1.68
2057	674310.33	1994041.57	227.31	227.21	-0.10	228.81	228.85	0.04	1.64
2058	674350.78	1994012.18	228.12	227.96	-0.16	229.62	229.62	0.00	1.66
2059	674391.23	1993982.79	228.79	228.65	-0.14	230.29	230.37	0.08	1.72
2060	674431.68	1993953.40	229.46	229.30	-0.16	230.96	230.98	0.02	1.68
2061	674472.13	1993924.01	230.13	229.97	-0.16	231.63	231.70	0.07	1.72
2062	674506.11	1993899.32	230.69	230.60	-0.09	232.19	232.21	0.02	1.61
2063	674470.05	1993863.98	229.56	229.50	-0.06	231.06	231.25	0.19	1.75
2064	674442.87	1993883.73	228.96	228.93	-0.03	230.46	230.58	0.12	1.65
2065	674402.42	1993913.12	228.07	228.06	-0.01	229.57	229.61	0.04	1.54
2066	674361.97	1993942.51	227.17	227.06	-0.11	228.68	228.70	0.02	1.63
2067	674321.51	1993971.90	226.28	226.24	-0.04	227.78	227.82	0.04	1.58
2068	674281.06	1994001.29	225.39	225.28	-0.11	226.89	226.98	0.09	1.70
2069	674240.54	1994030.73	224.49	224.38	-0.11	226.00	226.01	0.02	1.63
2070	674200.16	1994060.07	223.73	223.63	-0.10	225.23	225.24	0.01	1.62
2071	674170.33	1994081.75	223.51	223.35	-0.16	225.01	225.09	0.08	1.73
2072	674145.47	1994038.27	222.09	221.98	-0.10	223.59	223.60	0.02	1.62
2073	674170.90	1994019.80	222.27	222.17	-0.10	223.77	223.79	0.02	1.62
2074	674211.35	1993990.41	222.58	222.42	-0.15	224.08	224.12	0.04	1.69
2075	674251.80	1993961.02	223.47	223.42	-0.05	224.97	225.00	0.03	1.58
2076	674292.25	1993931.63	224.36	224.28	-0.08	225.86	225.92	0.06	1.64
2077	674332.70	1993902.24	225.26	225.13	-0.13	226.76	226.79	0.04	1.67
2078	674373.15	1993872.85	226.15	226.08	-0.07	227.65	227.67	0.02	1.59
2079	674413.60	1993843.46	227.04	226.90	-0.14	228.54	228.60	0.06	1.71
2080	674433.98	1993828.65	227.49	227.36	-0.13	228.99	229.00	0.00	1.64
2081	674397.92	1993793.31	225.42	225.35	-0.08	226.93	226.96	0.03	1.61
2082	674384.34	1993803.18	225.12	225.06	-0.06	226.63	226.65	0.02	1.59
2083	674343.89	1993832.57	224.23	224.10	-0.13	225.73	225.82	0.09	1.72
2084	674303.44	1993861.96	223.34	223.20	-0.14	224.84	224.90	0.06	1.71
2085	674262.99	1993891.35	222.45	222.39	-0.05	223.95	223.99	0.04	1.59
2086	674222.54	1993920.74	221.55	221.45	-0.10	223.05	223.07	0.01	1.62
2087	674182.09	1993950.13	221.10	220.96	-0.14	222.60	222.64	0.04	1.68
2088	674141.64	1993979.52	220.81	220.73	-0.08	222.31	222.36	0.05	1.63
2089	674120.61	1993994.80	220.66	220.60	-0.06	222.16	222.23	0.07	1.63
2090	674095.75	1993951.33	219.23	219.20	-0.03	220.73	220.79	0.05	1.59
2091	674112.38	1993939.24	219.35	219.26	-0.09	220.85	220.87	0.02	1.61
2092	674152.83	1993909.85	219.64	219.55	-0.09	221.14	221.20	0.06	1.65
2093	674193.28	1993880.46	219.93	219.88	-0.06	221.43	221.45	0.02	1.57
2094	674233.73	1993851.08	220.53	220.41	-0.12	222.03	222.07	0.05	1.67
2095	674274.18	1993821.69	221.42	221.28	-0.14	222.92	222.94	0.01	1.65
2096	674314.63	1993792.30	222.31	222.26	-0.05	223.82	223.88	0.06	1.61
2097	674361.86	1993757.98	223.36	223.28	-0.08	224.86	224.96	0.10	1.68
2098	674325.80	1993722.64	221.29	221.27	-0.02	222.79	222.81	0.02	1.54
2099	674285.37	1993752.02	220.40	220.35	-0.05	221.90	221.94	0.05	1.59
2100	674244.91	1993781.41	219.50	219.35	-0.16	221.00	221.09	0.08	1.74
2101	674204.46	1993810.80	218.76	218.69	-0.08	220.26	220.32	0.06	1.63
2102	674164.01	1993840.19	218.47	218.42	-0.05	219.97	219.99	0.02	1.57
2103	674123.56	1993869.58	218.18	218.12	-0.06	219.68	219.70	0.02	1.58
2104	674083.11	1993898.97	217.89	217.86	-0.03	219.39	219.42	0.03	1.56
2105	674070.89	1993907.85	217.80	217.62	-0.18	219.30	219.37	0.06	1.74
2106	674046.02	1993864.38	216.37	216.27	-0.10	217.87	218.02	0.14	1.75
2108	674094.30	1993829.30	216.72	216.67	-0.05	218.22	218.27	0.05	1.60
2109	674134.75	1993799.91	217.01	216.97	-0.04	218.51	218.53	0.02	1.56
2110	674175.20	1993770.52	217.30	217.23	-0.07	218.80	218.82	0.02	1.59
2111	674215.65	1993741.13	217.59	217.48	-0.11	219.09	219.15	0.06	1.67
2112	674256.10	1993711.74	218.48	218.34	-0.13	219.98	220.01	0.03	1.67
2113	674289.73	1993687.31	219.22	219.15	-0.08	220.72	220.74	0.01	1.59
2114	674253.67	1993651.97	217.15	217.01	-0.15	218.65	218.69	0.04	1.69
2115	674226.84	1993671.47	216.56	216.52	-0.04	218.06	218.09	0.03	1.58
2116	674186.39	1993700.86	216.13	216.12	-0.01	217.64	217.73	0.10	1.61
2117	674145.94	1993730.25	215.84	215.77	-0.08	217.34	217.36	0.02	1.59
2118	674105.49	1993759.64	215.55	215.53	-0.02	217.05	217.09	0.04	1.56
2119	674065.04	1993789.03	215.26	215.21	-0.05	216.76	216.78	0.02	1.57
2120	674021.16	1993820.91	214.95	214.83	-0.11	216.45	216.48	0.03	1.65
2121	673996.30	1993777.43	213.52	213.46	-0.06	215.02	215.07	0.05	1.61
2122	674035.78	1993748.75	213.80	213.74	-0.06	215.30	215.38	0.08	1.64
2123	674076.23	1993719.36	214.09	214.03	-0.07	215.59	215.60	0.01	1.58
2124	674116.68	1993689.97	214.38	214.35	-0.04	215.88	215.89	0.00	1.54
2125	674157.13	1993660.58	214.68	214.55	-0.12	216.18	216.30	0.12	1.74
2126	674197.58	1993631.19	214.97	214.80	-0.17	216.47	216.48	0.01	1.69
2127	674217.61	1993616.64	215.11	214.94	-0.17	216.61	216.69	0.08	1.75
2128	674197.43	1993596.88	214.27	214.36	0.09	215.77	215.87	0.10	1.51
2129	674181.21	1993608.66	214.15	214.13	-0.02	215.65	215.69	0.04	1.56
2130	674140.76	1993638.05	213.86	213.75	-0.11	215.36	215.50	0.14	1.75
2131	674100.31	1993667.44	213.57	213.48	-0.09	215.07	215.09	0.02	1.61
2132	674059.86	1993696.83	213.28	213.24	-0.04	214.78	214.79	0.02	1.56
2133	674019.41	1993726.22	212.99	212.96	-0.03	214.49	214.52	0.03	1.56
2134	673982.40	1993753.11	212.72	212.67	-0.05	214.22	214.32	0.10	1.65
2135	673971.44	1993733.96	213.19	213.16	-0.03	214.69	214.78	0.10	1.65

PT #	NORTHING	EASTING	PROPOSED SUBGRADE ELEV.	AS-BUILT SUBGRADE ELEV.	DIFFERENCE PROPOSED SUBGRADE TO AS-BUILT SUBGRADE	PROPOSED LINER ELEV.	AS-BUILT LINER ELEV.	DIFFERENCE PROPOSED LINER TO AS-BUILT LINER	DIFFERENCE AS-BUILT SUBGRADE TO AS-BUILT LINER
2136	674006.51	1993708.48	213.44	213.35	-0.09	214.94	214.99	0.05	1.63
2137	674046.96	1993679.09	213.73	213.63	-0.10	215.23	215.35	0.12	1.64
2138	674087.41	1993649.70	214.02	213.90	-0.12	215.52	215.60	0.08	1.72
2139	674127.86	1993620.31	214.31	214.29	-0.03	215.81	215.93	0.12	1.71
2140	674168.31	1993590.92	214.60	214.57	-0.03	216.10	216.22	0.12	1.64
2141	674181.55	1993581.30	215.02	214.89	-0.14	216.53	216.59	0.06	1.65
2142	674153.01	1993552.84	217.27	217.18	-0.09	218.78	218.83	0.05	1.65
2143	674145.14	1993559.02	217.18	217.18	0.00	218.78	218.83	0.05	1.65
2144	674105.07	1993588.93	215.69	215.82	0.13	217.37	217.47	0.10	1.65
2145	674064.68	1993618.41	215.48	215.36	-0.12	217.04	217.07	0.03	1.70
2146	674024.30	1993647.90	214.64	214.72	0.08	216.22	216.23	0.01	1.51
2147	673983.92	1993677.38	214.29	214.32	0.02	215.86	215.99	0.13	1.67
2148	673952.24	1993700.51	214.00	213.93	-0.07	215.58	215.60	0.02	1.66
2149	673938.71	1993681.37	221.82	221.72	-0.10	223.32	223.37	0.06	1.66
2150	673970.19	1993658.49	222.02	221.87	-0.15	223.56	223.70	0.14	1.83
2151	674010.63	1993629.08	222.19	222.32	0.13	223.87	223.96	0.09	1.64
2152	674051.07	1993599.67	222.86	222.71	-0.15	224.36	224.42	0.06	1.71
2153	674091.51	1993570.27	223.40	223.29	-0.11	224.90	225.08	0.17	1.79
2154	674131.94	1993540.86	224.65	224.49	-0.16	226.15	226.17	0.02	1.68
2155	674140.03	1993534.98	224.52	224.43	-0.10	226.02	226.13	0.10	1.70
2156	674137.34	1993531.27	224.47	224.38	-0.09	226.02	226.06	0.03	1.68
2157	674129.27	1993537.18	224.60	224.52	-0.08	226.15	226.18	0.03	1.66
2158	674088.84	1993566.60	223.37	223.25	-0.12	224.90	225.01	0.10	1.76
2159	674048.41	1993596.01	222.84	222.73	-0.11	224.36	224.38	0.01	1.64
2160	674007.97	1993625.42	222.18	222.28	0.10	223.91	223.96	0.05	1.68
2161	673967.54	1993654.83	222.02	221.89	-0.13	223.59	223.69	0.10	1.80
2162	673936.10	1993677.68	221.82	221.66	-0.16	223.33	223.44	0.11	1.78
2163	673924.28	1993661.01	215.00	215.23	0.22	216.90	217.03	0.13	1.80
2164	673955.50	1993638.27	215.65	215.63	-0.02	217.23	217.38	0.15	1.75
2165	673996.33	1993609.40	216.22	216.20	-0.02	217.80	217.93	0.12	1.73
2166	674039.07	1993583.16	217.53	217.54	0.02	219.09	219.23	0.14	1.69
2167	674081.12	1993555.98	219.06	219.04	-0.02	220.60	220.63	0.03	1.59
2168	674118.96	1993522.99	218.68	218.65	-0.04	220.34	220.44	0.09	1.79
2169	674126.53	1993516.39	218.24	218.21	-0.04	219.92	220.09	0.17	1.88
2170	674119.83	1993507.17	218.38	218.29	-0.09	219.94	220.12	0.18	1.83
2171	674111.74	1993513.05	218.52	218.41	-0.11	220.07	220.19	0.13	1.78
2172	674071.23	1993542.35	219.21	219.13	-0.08	220.71	220.79	0.08	1.66
2173	674030.72	1993571.66	218.57	218.46	-0.11	220.07	220.10	0.03	1.64
2174	673990.21	1993600.97	216.39	216.33	-0.06	218.13	218.15	0.02	1.83
2175	673949.69	1993630.28	215.35	215.33	-0.02	217.14	217.26	0.12	1.93
2176	673918.99	1993653.55	215.19	215.12	-0.07	216.69	216.83	0.14	1.71
2177	674647.18	1993937.49	255.26	255.14	-0.12	256.76	256.76	0.00	1.62
2178	674619.62	1993916.38	243.65	243.52	-0.13	245.24	245.31	0.07	1.80
2179	674592.05	1993895.27	232.04	232.03	-0.01	233.63	233.79	0.16	1.76
2180	674523.84	1993886.45	230.99	230.98	-0.01	232.49	232.54	0.06	1.56
2181	674494.57	1993846.17	230.10	230.10	0.00	231.60	231.62	0.02	1.53
2182	674465.31	1993805.89	228.18	228.13	-0.05	229.68	229.82	0.13	1.68
2183	674436.04	1993765.62	226.27	226.25	-0.02	227.77	227.83	0.07	1.59
2184	674406.78	1993725.34	224.35	224.29	-0.05	225.85	225.91	0.07	1.62
2186	674337.07	1993714.45	221.54	221.50	-0.04	223.04	223.07	0.03	1.57
2187	674307.80	1993674.18	219.62	219.50	-0.12	221.12	221.20	0.08	1.70
2189	674278.54	1993633.90	217.70	217.64	-0.06	219.20	219.29	0.09	1.65
2190	674249.28	1993593.63	215.78	215.66	-0.12	217.28	217.36	0.08	1.71
2191	674220.02	1993553.35	215.60	215.58	-0.03	217.10	217.25	0.15	1.68
2192	674177.95	1993535.66	216.50	216.44	-0.07	218.09	218.12	0.03	1.69
2193	674162.30	1993518.92	224.17	224.13	-0.04	225.67	225.73	0.06	1.60
2194	674160.65	1993514.54	224.16	224.13	-0.03	225.66	225.79	0.13	1.67
2195	674144.12	1993488.07	218.08	218.00	-0.08	219.58	219.64	0.06	1.64
2196	674649.17	1993939.01	255.27	255.18	-0.08	256.77	256.80	0.03	1.62
2197	674651.16	1993940.53	255.27	255.14	-0.13	256.77	256.80	0.03	1.67

STONE LIMITS OF LEACHATE

PT #	NORTHING	EASTING
7225	673984.58	1993753.76
7226	673981.21	1993749.46
7228	673995.97	1993746.13
7229	673991.87	1993738.59
7231	674009.20	1993735.56
7232	674005.47	1993728.97
7237	674042.18	1993713.46
7238	674037.77	1993706.24
7240	674069.91	1993682.74
7241	674074.64	1993690.91
7243	674107.13	1993666.97
7244	674104.04	1993658.52
7246	674140.30	1993643.38
7247	674137.35	1993635.16
7248	674163.69	1993616.69
7249	674170.61	1993616.05
7250	674171.45	1993616.83
7251	674169.60	1993621.83

LEACHATE PIPES

UPSTREAM POINT	DOWNSTREAM POINT	LENGTH	UPSTREAM INVERT	DOWNSTREAM INVERT	SLOPE
VALVE	B	53.20	216.53	215.97	1.05%
B	C	40.00	215.97	215.78	0.48%
C	D	40.20	215.78	215.51	0.67%
D	E	40.10	215.51	215.26	0.62%
E	F	40.10	215.26	215.10	0.40%
F	G	40.10	215.10	214.91	0.47%
G	H	16.00	214.91	214.80	0.69%
H	VALVE	15.90	214.80	214.69	0.69%

LEACHATE LOCATIONS

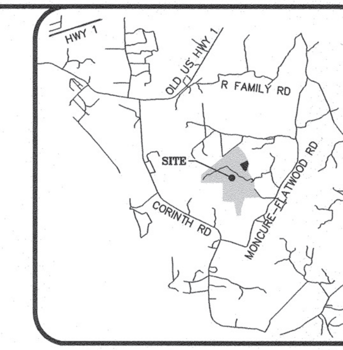
POINT	NORTHING	EASTING	ELEVATION
VALVE	674213.17	1993585.56	216.53
B	674170.20	1993616.95	215.97
C	674137.93	1993640.54	215.78
D	674105.09	1993663.58	215.51
E	674072.52	1993686.96	215.26
F	674040.04	1993710.44	215.10
G	674006.80	1993732.94	214.91
H	673994.11	1993742.71	214.80
VALVE	673983.02	1993752.08	214.69

TOP OF SUBCELL BERM

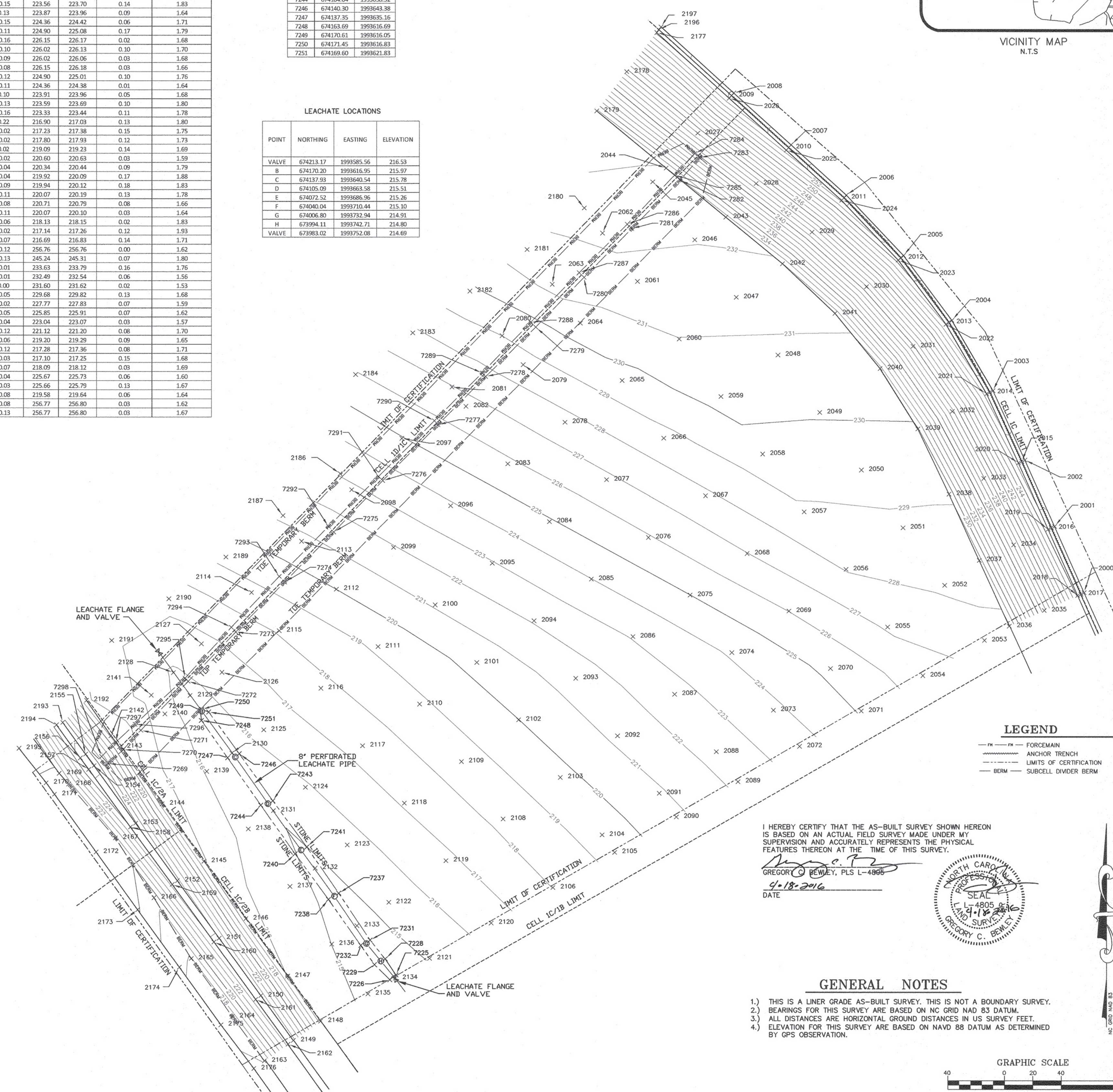
PT #	NORTHING	EASTING	ELEVATION
7269	674133.40	1993550.79	225.10
7270	674143.29	1993561.53	224.49
7271	674156.88	1993573.98	223.85
7272	674191.24	1993607.29	223.15
7273	674225.99	1993640.89	224.35
7274	674261.06	1993675.36	226.44
7275	674296.23	1993709.98	228.42
7276	674332.14	1993744.43	230.35
7277	674371.44	1993783.42	232.62
7278	674405.26	1993817.01	234.54
7279	674440.06	1993852.35	236.79
7280	674474.98	1993886.31	238.72
7281	674509.29	1993919.91	239.13
7282	674543.34	1993954.07	239.67
7283	674559.23	1993967.69	240.63
7284	674562.06	1993964.32	240.69
7285	674546.89	1993950.17	239.87
7286	674512.37	1993916.78	239.46
7287	674478.28	1993882.86	238.73
7288	674443.46	1993848.86	236.96
7289	674407.84	1993814.60	234.61
7290	674374.17	1993780.83	232.68
7291	674335.11	1993741.54	230.56
7292	674300.16	1993706.26	228.37
7293	674265.01	1993671.59	226.31
7294	674229.30	1993637.74	224.47
7295	674193.52	1993605.13	223.27
7296	674161.07	1993569.78	223.85
7297	674148.63	1993556.43	224.74
7298	674138.39	1993546.27	225.04

ANCHOR TRENCH

PT #	NORTHING	EASTING
2009	674602.87	1993990.25
2010	674566.37	1994030.56
2011	674531.04	1994069.60
2012	674488.78	1994109.70
2013	674443.51	1994143.67
2014	674394.31	1994172.47
2015	674345.74	1994194.97
2016	674299.22	1994215.85
2017	674252.64	1994236.77



VICINITY MAP
N.T.S



LEGEND

- FM —— FM — FORCEMAIN
- ANCHOR TRENCH
- LIMITS OF CERTIFICATION
- BERM — SUBCELL DIVIDER BERM

I HEREBY CERTIFY THAT THE AS-BUILT SURVEY SHOWN HEREON IS BASED ON AN ACTUAL FIELD SURVEY MADE UNDER MY SUPERVISION AND ACCURATELY REPRESENTS THE PHYSICAL FEATURES THEREON AT THE TIME OF THIS SURVEY.

GREGORY C. BEWLEY, PLS L-4805

4-18-2016
DATE

NORTH CAROLINA PROFESSIONAL SEAL L-4805 LAND SURVEYOR GREGORY C. BEWLEY 4-18-2016

GENERAL NOTES

1.) THIS IS A LINER GRADE AS-BUILT SURVEY. THIS IS NOT A BOUNDARY SURVEY.
2.) BEARINGS FOR THIS SURVEY ARE BASED ON NC GRID NAD 83 DATUM.
3.) ALL DISTANCES ARE HORIZONTAL GROUND DISTANCES IN US SURVEY FEET.
4.) ELEVATION FOR THIS SURVEY ARE BASED ON NAVD 88 DATUM AS DETERMINED BY GPS OBSERVATION.

GRAPHIC SCALE
40 0 20 40 80
1 inch = 40 ft.

THE JOHN R. McADAMS COMPANY, INC.
2905 Meridian Parkway
Durham, North Carolina 27713
License No.: C-0293
(800) 733-5646 ▪ McAdamsCo.com

McADAMS

REVISIONS:

OWNER:
CHARAH
12601 PLANTSIDE DRIVE
LOUISVILLE, KENTUCKY

BIRCKHAVEN MINE #2
CELL 1 C CLAY LINER
CHATHAM COUNTY, NORTH CAROLINA

TOPOGRAPHIC SURVEY

PROJECT NO.	CHR-15010
FILENAME:	CHR-15010-TL-CELL-1C-2016-04-12
CHECKED BY:	GCB
DRAWN BY:	WCR
SCALE:	1"=40'
DATE:	04/12/2016
SHEET NO.	1 OF 1

McADAMS

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G

Appendix G – As-Built Drawings

G1 Cell 1C Subgrade
G2 Cell 1C Clay Liner
G3 Record GCL Panel Layout
G4 Cell 1C Liner Panels
G5 Record Liner Layout

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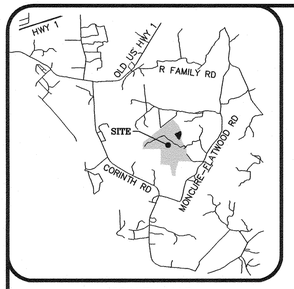
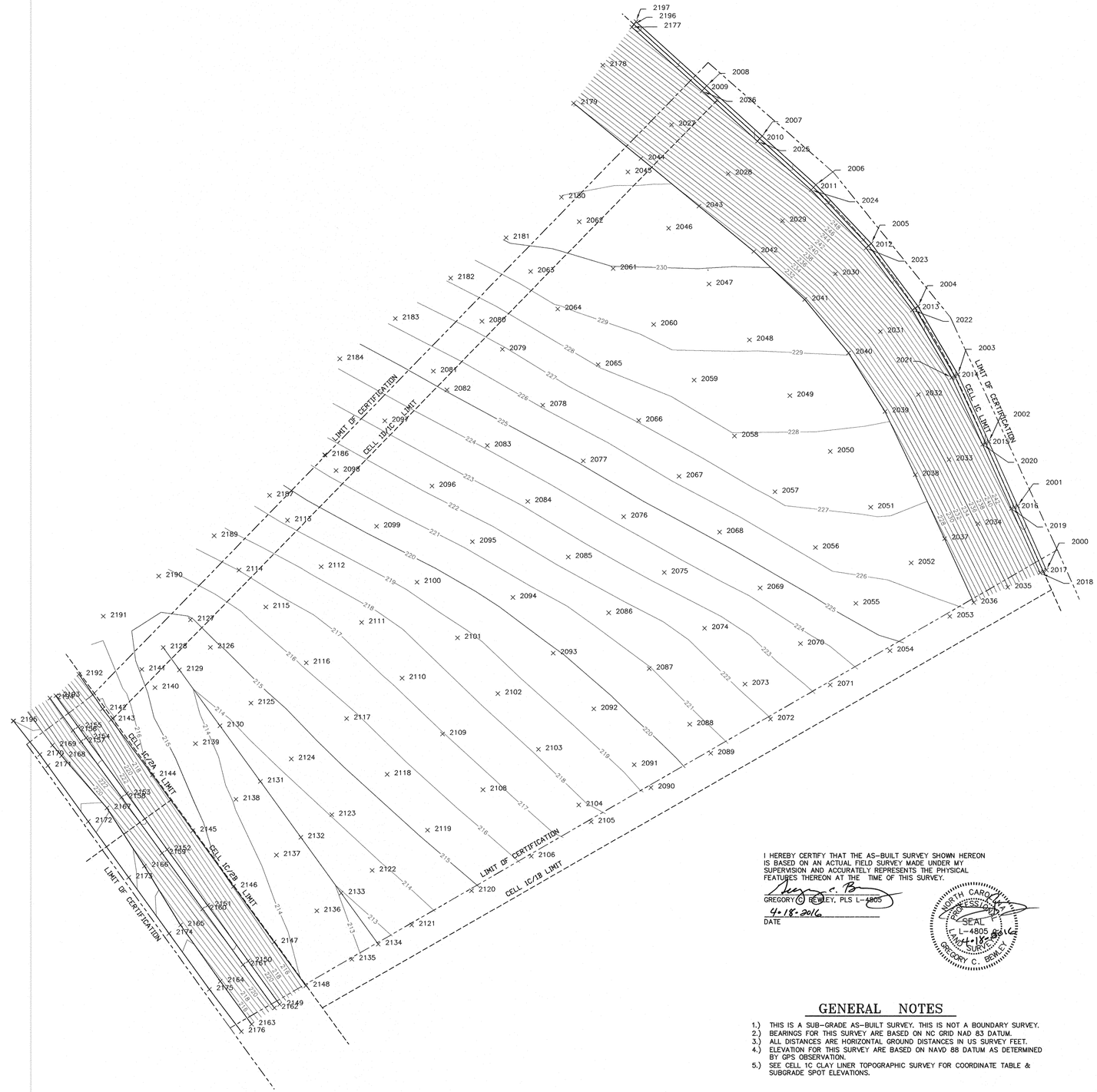


VICINITY MAP
N.T.S



I HEREBY CERTIFY THAT THE AS-BUILT SURVEY SHOWN HEREON IS BASED ON AN ACTUAL FIELD SURVEY MADE UNDER MY SUPERVISION AND ACCURATELY REPRESENTS THE PHYSICAL FEATURES THEREON AT THE TIME OF THIS SURVEY.

GREGORY C. BEWLEY, PLS L-4805

4-18-2016
DATE

NORTH CAROLINA PROFESSIONAL SEAL L-4805 LAND SURVEYOR GREGORY C. BEWLEY

GENERAL NOTES

1.) THIS IS A SUB-GRADE AS-BUILT SURVEY. THIS IS NOT A BOUNDARY SURVEY.
2.) BEARINGS FOR THIS SURVEY ARE BASED ON NC GRID NAD 83 DATUM.
3.) ALL DISTANCES ARE HORIZONTAL GROUND DISTANCES IN US SURVEY FEET.
4.) ELEVATION FOR THIS SURVEY ARE BASED ON NAVD 88 DATUM AS DETERMINED BY GPS OBSERVATION.
5.) SEE CELL 1C CLAY LINER TOPOGRAPHIC SURVEY FOR COORDINATE TABLE & SUBGRADE SPOT ELEVATIONS.

NC GRID NAD 83

LEGEND

— - - — LIMITS OF CERTIFICATION

GRAPHIC SCALE

40 0 20 40 80

1 inch = 40 ft.

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REVISIONS:

OWNER:
CHARAH
12601 PLANTSIDE DRIVE
LOUISVILLE, KENTUCKY

BIRCKHAVEN MINE #2

CELL 1 C SUBGRADE

CHATHAM COUNTY, NORTH CAROLINA

TOPOGRAPHIC SURVEY

PROJECT NO.	CHR-15010
FILENAME:	CHR-15010-BG-CELL-1C-2016-04-12
CHECKED BY:	GCB
DRAWN BY:	WCR
SCALE:	1"=40'
DATE:	4/12/2016
SHEET NO.	1 OF 1

McADAMS

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PT #	NORTHING	EASTING	PROPOSED SUBGRADE ELEV.	AS-BUILT SUBGRADE ELEV.	DIFFERENCE PROPOSED SUBGRADE TO AS-BUILT SUBGRADE	PROPOSED LINER ELEV.	AS-BUILT LINER ELEV.	DIFFERENCE PROPOSED LINER TO AS-BUILT LINER	DIFFERENCE AS-BUILT SUBGRADE TO AS-BUILT LINER
2000	674253.65	1994239.05	243.63	243.45	-0.17	245.13	245.27	0.14	1.81
2001	674300.24	1994218.13	244.24	244.20	-0.03	245.74	245.83	0.09	1.63
2002	674346.76	1994197.24	245.03	244.87	-0.15	246.53	246.55	0.02	1.68
2003	674395.44	1994174.69	246.08	245.94	-0.14	247.58	247.62	0.04	1.68
2004	674444.90	1994145.74	247.45	247.29	-0.16	248.95	248.99	0.04	1.70
2005	674490.38	1994111.61	248.97	248.84	-0.13	250.47	250.61	0.14	1.77
2006	674532.85	1994071.30	250.54	250.40	-0.15	252.04	252.15	0.11	1.75
2007	674568.25	1994032.26	251.96	251.80	-0.16	253.46	253.51	0.05	1.71
2008	674604.71	1993991.92	253.41	253.31	-0.10	254.91	254.95	0.03	1.63
2009	674602.87	1993990.25	253.41	253.37	-0.04	254.91	254.93	0.02	1.55
2010	674566.37	1994030.56	251.96	251.85	-0.10	253.46	253.47	0.01	1.62
2011	674531.04	1994069.60	250.54	250.45	-0.10	252.04	252.14	0.10	1.69
2012	674488.78	1994109.70	248.97	248.86	-0.11	250.47	250.57	0.10	1.71
2013	674443.51	1994143.67	247.45	247.33	-0.12	248.95	249.01	0.06	1.68
2014	674394.31	1994172.47	246.08	246.00	-0.08	247.58	247.67	0.09	1.67
2015	674345.74	1994194.97	245.03	244.98	-0.05	246.53	246.59	0.07	1.61
2016	674299.22	1994215.85	244.24	244.22	-0.02	245.74	245.76	0.02	1.54
2017	674252.64	1994236.77	243.63	243.59	-0.03	245.13	245.29	0.16	1.69
2018	674251.62	1994234.49	243.63	243.57	-0.06	245.13	245.23	0.11	1.67
2019	674298.20	1994213.57	244.24	244.16	-0.08	245.74	245.76	0.02	1.60
2020	674344.72	1994192.69	245.03	245.02	0.00	246.53	246.56	0.03	1.53
2021	674393.18	1994170.24	246.08	246.06	-0.02	247.58	247.62	0.04	1.56
2022	674442.12	1994141.59	247.45	247.41	-0.04	248.95	249.04	0.09	1.64
2023	674487.16	1994107.79	248.97	248.83	-0.14	250.47	250.49	0.02	1.65
2024	674529.21	1994067.89	250.54	250.37	-0.17	252.04	252.15	0.11	1.78
2025	674564.55	1994028.91	251.96	251.93	-0.03	253.46	253.54	0.08	1.61
2026	674601.01	1993988.57	253.41	253.31	-0.10	254.91	254.98	0.06	1.66
2027	674576.46	1993966.38	242.38	242.27	-0.11	243.97	243.97	0.00	1.70
2028	674540.96	1994007.59	241.36	241.30	-0.06	242.94	242.95	0.01	1.65
2029	674506.90	1994047.06	240.38	240.34	-0.04	241.95	241.97	0.02	1.63
2030	674468.45	1994085.55	239.29	239.22	-0.07	240.88	240.92	0.05	1.70
2031	674426.57	1994118.34	238.14	238.08	-0.05	239.72	239.79	0.07	1.71
2032	674380.87	1994145.97	237.02	236.95	-0.07	238.60	238.70	0.09	1.75
2033	674333.72	1994168.18	236.08	236.00	-0.08	237.66	237.82	0.16	1.82
2034	674287.29	1994189.27	235.36	235.29	-0.07	236.94	237.00	0.06	1.72
2035	674241.09	1994210.86	235.00	234.87	-0.13	236.59	236.61	0.02	1.74
2036	674230.07	1994186.22	226.01	226.12	0.11	227.72	227.84	0.11	1.72
2037	674276.37	1994164.96	226.44	226.65	0.21	228.27	228.46	0.19	1.81
2038	674322.72	1994143.68	227.52	227.25	-0.27	229.02	229.10	0.08	1.85
2039	674368.55	1994121.71	228.06	228.14	0.08	229.77	229.92	0.15	1.78
2040	674411.02	1994095.09	228.80	229.03	0.23	230.46	230.60	0.14	1.57
2041	674449.73	1994063.30	229.59	229.65	0.06	231.10	231.22	0.12	1.57
2042	674484.59	1994026.22	230.22	230.18	-0.03	231.82	231.90	0.08	1.72
2043	674517.37	1993986.27	230.76	230.73	-0.03	232.36	232.53	0.17	1.80
2044	674551.90	1993944.19	231.35	231.31	-0.04	232.95	232.96	0.00	1.65
2045	674542.17	1993934.65	231.21	231.15	-0.06	232.71	232.77	0.06	1.62
2046	674501.39	1993964.28	230.54	230.53	-0.01	232.04	232.05	0.01	1.52
2047	674460.94	1993993.67	229.87	229.80	-0.07	231.37	231.44	0.08	1.65
2048	674420.49	1994023.06	229.20	229.14	-0.05	230.70	230.76	0.06	1.61
2049	674380.04	1994052.45	228.53	228.44	-0.09	230.03	230.08	0.05	1.64
2050	674339.59	1994081.84	227.86	227.76	-0.10	229.36	229.46	0.10	1.70
2051	674299.14	1994111.23	227.19	227.13	-0.06	228.69	228.78	0.09	1.65
2052	674258.69	1994140.62	226.52	226.36	-0.16	228.02	228.18	0.16	1.82
2053	674220.05	1994168.70	225.80	225.82	0.02	227.38	227.47	0.09	1.65
2054	674195.19	1994125.22	224.94	224.76	-0.19	226.44	226.54	0.10	1.79
2055	674229.43	1994100.35	225.52	225.50	-0.02	227.02	227.11	0.09	1.61
2056	674269.88	1994070.96	226.41	226.37	-0.04	227.91	228.05	0.14	1.68
2057	674310.33	1994041.57	227.31	227.21	-0.10	228.81	228.85	0.04	1.64
2058	674350.78	1994012.18	228.12	227.96	-0.16	229.62	229.62	0.00	1.66
2059	674391.23	1993982.79	228.79	228.65	-0.14	230.29	230.37	0.08	1.72
2060	674431.68	1993953.40	229.46	229.30	-0.16	230.96	230.98	0.02	1.68
2061	674472.13	1993924.01	230.13	229.97	-0.16	231.63	231.70	0.07	1.72
2062	674506.11	1993899.32	230.69	230.60	-0.09	232.19	232.21	0.02	1.61
2063	674470.05	1993863.98	229.56	229.50	-0.06	231.06	231.25	0.19	1.75
2064	674442.87	1993883.73	228.96	228.93	-0.03	230.46	230.58	0.12	1.65
2065	674402.42	1993913.12	228.07	228.06	-0.01	229.57	229.61	0.04	1.54
2066	674361.97	1993942.51	227.17	227.06	-0.11	228.68	228.70	0.02	1.63
2067	674321.51	1993971.90	226.28	226.24	-0.04	227.78	227.82	0.04	1.58
2068	674281.06	1994001.29	225.39	225.28	-0.11	226.89	226.98	0.09	1.70
2069	674240.54	1994030.73	224.49	224.38	-0.11	226.00	226.01	0.02	1.63
2070	674200.16	1994060.07	223.73	223.63	-0.10	225.23	225.24	0.01	1.62
2071	674170.33	1994081.75	223.51	223.35	-0.16	225.01	225.09	0.08	1.73
2072	674145.47	1994038.27	222.09	221.98	-0.10	223.59	223.60	0.02	1.62
2073	674170.90	1994019.80	222.27	222.17	-0.10	223.77	223.79	0.02	1.62
2074	674211.35	1993990.41	222.58	222.42	-0.15	224.08	224.12	0.04	1.69
2075	674251.80	1993961.02	223.47	223.42	-0.05	224.97	225.00	0.03	1.58
2076	674292.25	1993931.63	224.36	224.28	-0.08	225.86	225.92	0.06	1.64
2077	674332.70	1993902.24	225.26	225.13	-0.13	226.76	226.79	0.04	1.67
2078	674373.15	1993872.85	226.15	226.08	-0.07	227.65	227.67	0.02	1.59
2079	674413.60	1993843.46	227.04	226.90	-0.14	228.54	228.60	0.06	1.71
2080	674433.98	1993828.65	227.49	227.36	-0.13	228.99	229.00	0.00	1.64
2081	674397.92	1993793.31	225.42	225.35	-0.08	226.93	226.96	0.03	1.61
2082	674384.34	1993803.18	225.12	225.06	-0.06	226.63	226.65	0.02	1.59
2083	674343.89	1993832.57	224.23	224.10	-0.13	225.73	225.82	0.09	1.72
2084	674303.44	1993861.96	223.34	223.20	-0.14	224.84	224.90	0.06	1.71
2085	674262.99	1993891.35	222.45	222.39	-0.05	223.95	223.99	0.04	1.59
2086	674222.54	1993920.74	221.55	221.45	-0.10	223.05	223.07	0.01	1.62
2087	674182.09	1993950.13	221.10	220.96	-0.14	222.60	222.64	0.04	1.68
2088	674141.64	1993979.52	220.81	220.73	-0.08	222.31	222.36	0.05	1.63
2089	674120.61	1993994.80	220.66	220.60	-0.06	222.16	222.23	0.07	1.63
2090	674095.75	1993951.33	219.23	219.20	-0.03	220.73	220.79	0.05	1.59
2091	674112.38	1993939.24	219.35	219.26	-0.09	220.85	220.87	0.02	1.61
2092	674152.83	1993909.85	219.64	219.55	-0.09	221.14	221.20	0.06	1.65
2093	674193.28	1993880.46	219.93	219.88	-0.06	221.43	221.45	0.02	1.57
2094	674233.73	1993851.08	220.53	220.41	-0.12	222.03	222.07	0.05	1.67
2095	674274.18	1993821.69	221.42	221.28	-0.14	222.92	222.94	0.01	1.65
2096	674314.63	1993792.30	222.31	222.26	-0.05	223.82	223.88	0.06	1.61
2097	674361.86	1993757.98	223.36	223.28	-0.08	224.86	224.96	0.10	1.68
2098	674325.80	1993722.64	221.29	221.27	-0.02	222.79	222.81	0.02	1.54
2099	674285.37	1993752.02	220.40	220.35	-0.05	221.90	221.94	0.05	1.59
2100	674244.91	1993781.41	219.50	219.35	-0.16	221.00	221.09	0.08	1.74
2101	674204.46	1993810.80	218.76	218.69	-0.08	220.26	220.32	0.06	1.63
2102	674164.01	1993840.19	218.47	218.42	-0.05	219.97	219.99	0.02	1.57
2103	674123.56	1993869.58	218.18	218.12	-0.06	219.68	219.70	0.02	1.58
2104	674083.11	1993898.97	217.89	217.86	-0.03	219.39	219.42	0.03	1.56
2105	674070.89	1993907.85	217.80	217.62	-0.18	219.30	219.37	0.06	1.74
2106	674046.02	1993864.38	216.37	216.27	-0.10	217.87	218.02	0.14	1.75
2108	674094.30	1993829.30	216.72	216.67	-0.05	218.22	218.27	0.05	1.60
2109	674134.75	1993799.91	217.01	216.97	-0.04	218.51	218.53	0.02	1.56
2110	674175.20	1993770.52	217.30	217.23	-0.07	218.80	218.82	0.02	1.59
2111	674215.65	1993741.13	217.59	217.48	-0.11	219.09	219.15	0.06	1.67
2112	674256.10	1993711.74	218.48	218.34	-0.13	219.98	220.01	0.03	1.67
2113	674289.73	1993687.31	219.22	219.15	-0.08	220.72	220.74	0.01	1.59
2114	674253.67	1993651.97	217.15	217.01	-0.15	218.65	218.69	0.04	1.69
2115	674226.84	1993671.47	216.56	216.52	-0.04	218.06	218.09	0.03	1.58
2116	674186.39	1993700.86	216.13	216.12	-0.01	217.64	217.73	0.10	1.61
2117	674145.94	1993730.25	215.84	215.77	-0.08	217.34	217.36	0.02	1.59
2118	674105.49	1993759.64	215.55	215.53	-0.02	217.05	217.09	0.04	1.56
2119	674065.04	1993789.03	215.26	215.21	-0.05	216.76	216.78	0.02	1.57
2120	674021.16	1993820.91	214.95	214.83	-0.11	216.45	216.48	0.03	1.65
2121	673996.30	1993777.43	213.52	213.46	-0.06	215.02	215.07	0.05	1.61
2122	674035.78	1993748.75	213.80	213.74	-0.06	215.30	215.38	0.08	1.64
2123	674076.23	1993719.36	214.09	214.03	-0.07	215.59	215.60	0.01	1.58
2124	674116.68	1993689.97	214.38	214.35	-0.04	215.88	215.89	0.00	1.54
2125	674157.13	1993660.58	214.68	214.55	-0.12	216.18	216.30	0.12	1.74
2126	674197.58	1993631.19	214.97	214.80	-0.17	216.47	216.48	0.01	1.69
2127	674217.61	1993616.64	215.11	214.94	-0.17	216.61	216.69	0.08	1.75
2128	674197.43	1993596.88	214.27	214.36	0.09	215.77	215.87	0.10	1.51
2129	674181.21	1993608.66	214.15	214.13	-0.02	215.65	215.69	0.04	1.56
2130	674140.76	1993638.05	213.86	213.75	-0.11	215.36	215.50	0.14	1.75
2131	674100.31	1993667.44	213.57	213.48	-0.09	215.07	215.09	0.02	1.61
2132	674059.86	1993696.83	213.28	213.24	-0.04	214.78	214.79	0.02	1.56
2133	674019.41	1993726.22	212.99	212.96	-0.03	214.49	214.52	0.03	1.56
2134	673982.40	1993753.11	212.72	212.67	-0.05	214.22	214.32	0.10	1.65
2135	673971.44	1993733.96	213.19	213.16	-0.03	214.69	214.78	0.10	1.65

PT #	NORTHING	EASTING	PROPOSED SUBGRADE ELEV.	AS-BUILT SUBGRADE ELEV.	DIFFERENCE PROPOSED SUBGRADE TO AS-BUILT SUBGRADE	PROPOSED LINER ELEV.	AS-BUILT LINER ELEV.	DIFFERENCE PROPOSED LINER TO AS-BUILT LINER	DIFFERENCE AS-BUILT SUBGRADE TO AS-BUILT LINER
2136	674006.51	1993708.48	213.44	213.35	-0.09	214.94	214.99	0.05	1.63
2137	674046.96	1993679.09	213.73	213.63	-0.10	215.23	215.35	0.12	1.64
2138	674087.41	1993649.70	214.02	213.90	-0.12	215.52	215.60	0.08	1.72
2139	674127.86	1993620.31	214.31	214.29	-0.03	215.81	215.93	0.12	1.71
2140	674168.31	1993590.92	214.60	214.57	-0.03	216.10	216.22	0.12	1.64
2141	674181.55	1993581.30	215.02	214.89	-0.14	216.53	216.59	0.06	1.65
2142	674153.01	1993552.84	217.27	217.18	-0.09	218.78	218.83	0.05	1.65
2143	674145.14	1993559.02	217.18	217.18	0.00	218.78	218.83	0.05	1.65
2144	674105.07	1993588.93	215.69	215.82	0.13	217.37	217.47	0.10	1.65
2145	674064.68	1993618.41	215.48	215.36	-0.12	217.04	217.07	0.03	1.70
2146	674024.30	1993647.90	214.64	214.72	0.08	216.22	216.23	0.01	1.51
2147	673983.92	1993677.38	214.29	214.32	0.02	215.86	215.99	0.13	1.67
2148	673952.24	1993700.51	214.00	213.93	-0.07	215.58	215.60	0.02	1.66
2149	673938.71	1993681.37	221.82	221.72	-0.10	223.32	223.37	0.06	1.66
2150	673970.19	1993658.49	222.02	221.87	-0.15	223.56	223.70	0.14	1.83
2151	674010.63	1993629.08	222.19	222.32	0.13	223.87	223.96	0.09	1.64
2152	674051.07	1993599.67	222.86	222.71	-0.15	224.36	224.42	0.06	1.71
2153	674091.51	1993570.27	223.40	223.29	-0.11	224.90	225.08	0.17	1.79
2154	674131.94	1993540.86	224.65	224.49	-0.16	226.15	226.17	0.02	1.68
2155	674140.03	1993534.98	224.52	224.43	-0.10	226.02	226.13	0.10	1.70
2156	674137.34	1993531.27	224.47	224.38	-0.09	226.02	226.06	0.03	1.68
2157	674129.27	1993537.18	224.60	224.52	-0.08	226.15	226.18	0.03	1.66
2158	674088.84	1993566.60	223.37	223.25	-0.12	224.90	225.01	0.10	1.76
2159	674048.41	1993596.01	222.84	222.73	-0.11	224.36	224.38	0.01	1.64
2160	674007.97	1993625.42	222.18	222.28	0.10	223.91	223.96	0.05	1.68
2161	673967.54	1993654.83	222.02	221.89	-0.13	223.59	223.69	0.10	1.80
2162	673936.10	1993677.68	221.82	221.66	-0.16	223.33	223.44	0.11	1.78
2163	673924.28	1993661.01	215.00	215.23	0.22	216.90	217.03	0.13	1.80
2164	673955.50	1993638.27	215.65	215.63	-0.02	217.23	217.38	0.15	1.75
2165	673996.33	1993609.40	216.22	216.20	-0.02	217.80	217.93	0.12	1.73
2166	674039.07	1993583.16	217.53	217.54	0.02	219.09	219.23	0.14	1.69
2167	674081.12	1993555.98	219.06	219.04	-0.02	220.60	220.63	0.03	1.59
2168	674118.96	1993522.99	218.68	218.65	-0.04	220.34	220.44	0.09	1.79
2169	674126.53	1993516.39	218.24	218.21	-0.04	219.92	220.09	0.17	1.88
2170	674119.83	1993507.17	218.38	218.29	-0.09	219.94	220.12	0.18	1.83
2171	674111.74	1993513.05	218.52	218.41	-0.11	220.07	220.19	0.13	1.78
2172	674071.23	1993542.35	219.21	219.13	-0.08	220.71	220.79	0.08	1.66
2173	674030.72	1993571.66	218.57	218.46	-0.11	220.07	220.10	0.03	1.64
2174	673990.21	1993600.97	216.39	216.33	-0.06	218.13	218.15	0.02	1.83
2175	673949.69	1993630.28	215.35	215.33	-0.02	217.14	217.26	0.12	1.93
2176	673918.99	1993653.55	215.19	215.12	-0.07	216.69	216.83	0.14	1.71
2177	674647.18	1993937.49	255.26	255.14	-0.12	256.76	256.76	0.00	1.62
2178	674619.62	1993916.38	243.65	243.52	-0.13	245.24	245.31	0.07	1.80
2179	674592.05	1993895.27	232.04	232.03	-0.01	233.63	233.79	0.16	1.76
2180	674523.84	1993886.45	230.99	230.98	-0.01	232.49	232.54	0.06	1.56
2181	674494.57	1993846.17	230.10	230.10	0.00	231.60	231.62	0.02	1.53
2182	674465.31	1993805.89	228.18	228.13	-0.05	229.68	229.82	0.13	1.68
2183	674436.04	1993765.62	226.27	226.25	-0.02	227.77	227.83	0.07	1.59
2184	674406.78	1993725.34	224.35	224.29	-0.05	225.85	225.91	0.07	1.62
2186	674337.07	1993714.45	221.54	221.50	-0.04	223.04	223.07	0.03	1.57
2187	674307.80	1993674.18	219.62	219.50	-0.12	221.12	221.20	0.08	1.70
2189	674278.54	1993633.90	217.70	217.64	-0.06	219.20	219.29	0.09	1.65
2190	674249.28	1993593.63	215.78	215.66	-0.12	217.28	217.36	0.08	1.71
2191	674220.02	1993553.35	215.60	215.58	-0.03	217.10	217.25	0.15	1.68
2192	674177.95	1993535.66	216.50	216.44	-0.07	218.09	218.12	0.03	1.69
2193	674162.30	1993518.92	224.17	224.13	-0.04	225.67	225.73	0.06	1.60
2194	674160.65	1993514.54	224.16	224.13	-0.03	225.66	225.79	0.13	1.67
2195	674144.12	1993488.07	218.08	218.00	-0.08	219.58	219.64	0.06	1.64
2196	674649.17	1993939.01	255.27	255.18	-0.08	256.77	256.80	0.03	1.62
2197	674651.16	1993940.53	255.27	255.14	-0.13	256.77	256.80	0.03	1.67

STONE LIMITS OF LEACHATE

PT #	NORTHING	EASTING
7225	673984.58	1993753.76
7226	673981.21	1993749.46
7228	673995.97	1993746.13
7229	673991.87	1993738.59
7231	674009.20	1993735.56
7232	674005.47	1993728.97
7237	674042.18	1993713.46
7238	674037.77	1993706.24
7240	674069.91	1993682.74
7241	674074.64	1993690.91
7243	674107.13	1993666.97
7244	674104.04	1993658.52
7246	674140.30	1993643.38
7247	674137.35	1993635.16
7248	674163.69	1993616.69
7249	674170.61	1993616.05
7250	674171.45	1993616.83
7251	674169.60	1993621.83

LEACHATE PIPES

UPSTREAM POINT	DOWNSTREAM POINT	LENGTH	UPSTREAM INVERT	DOWNSTREAM INVERT	SLOPE
VALVE	B	53.20	216.53	215.97	1.05%
B	C	40.00	215.97	215.78	0.48%
C	D	40.20	215.78	215.51	0.67%
D	E	40.10	215.51	215.26	0.62%
E	F	40.10	215.26	215.10	0.40%
F	G	40.10	215.10	214.91	0.47%
G	H	16.00	214.91	214.80	0.69%
H	VALVE	15.90	214.80	214.69	0.69%

LEACHATE LOCATIONS

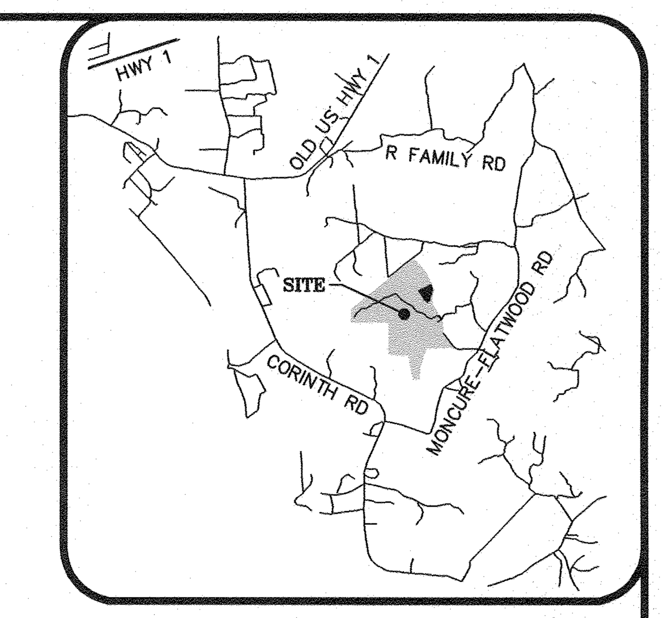
POINT	NORTHING	EASTING	ELEVATION
VALVE	674213.17	1993585.56	216.53
B	674170.20	1993616.95	215.97
C	674137.93	1993640.54	215.78
D	674105.09	1993663.58	215.51
E	674072.52	1993686.96	215.26
F	674040.04	1993710.44	215.10
G	674006.80	1993732.94	214.91
H	673994.11	1993742.71	214.80
VALVE	673983.02	1993752.08	214.69

TOP OF SUBCELL BERM

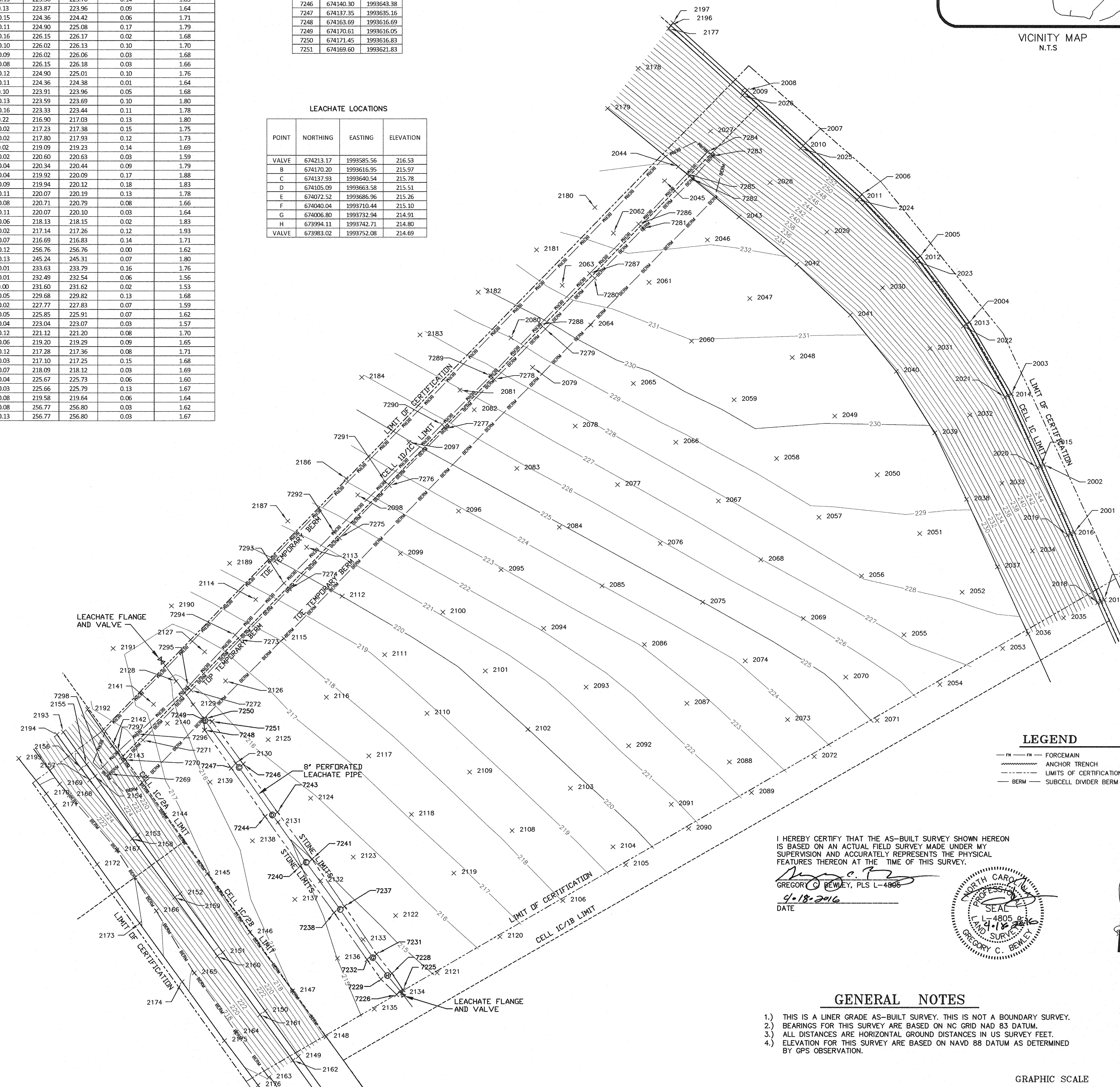
PT #	NORTHING	EASTING	ELEVATION
7269	674133.40	1993550.79	225.10
7270	674143.29	1993561.53	224.49
7271	674156.88	1993573.98	223.85
7272	674191.24	1993607.29	223.15
7273	674225.99	1993640.89	224.35
7274	674261.06	1993675.36	226.44
7275	674296.23	1993709.98	228.42
7276	674332.14	1993744.43	230.35
7277	674371.44	1993783.42	232.62
7278	674405.26	1993817.01	234.54
7279	674440.06	1993852.35	236.79
7280	674474.98	1993886.31	238.72
7281	674509.29	1993919.91	239.13
7282	674543.34	1993954.07	239.67
7283	674559.23	1993967.69	240.63
7284	674562.06	1993964.32	240.69
7285	674546.89	1993950.17	239.87
7286	674512.37	1993916.78	239.46
7287	674478.28	1993882.86	238.73
7288	674443.46	1993848.86	236.96
7289	674407.84	1993814.60	234.61
7290	674374.17	1993780.83	232.68
7291	674335.11	1993741.54	230.56
7292	674300.16	1993706.26	228.37
7293	674265.01	1993671.59	226.31
7294	674229.30	1993637.74	224.47
7295	674193.52	1993605.13	223.27
7296	674161.07	1993569.78	223.85
7297	674148.63	1993556.43	224.74
7298	674138.39	1993546.27	225.04

ANCHOR TRENCH

PT #	NORTHING	EASTING
2009	674602.87	1993990.25
2010	674566.37	1994030.56
2011	674531.04	1994069.60
2012	674488.78	1994109.70
2013	674443.51	1994143.67
2014	674394.31	1994172.47
2015	674345.74	1994194.97
2016	674299.22	1994215.85
2017	674252.64	1994236.77



VICINITY MAP
N.T.S



LEGEND

- FM —— FM — FORCEMAIN
- ANCHOR TRENCH
- LIMITS OF CERTIFICATION
- BERM — SUBCELL DIVIDER BERM

I HEREBY CERTIFY THAT THE AS-BUILT SURVEY SHOWN HEREON IS BASED ON AN ACTUAL FIELD SURVEY MADE UNDER MY SUPERVISION AND ACCURATELY REPRESENTS THE PHYSICAL FEATURES THEREON AT THE TIME OF THIS SURVEY.

GREGORY C. BEWLEY, PLS L-4805

4-18-2016
DATE

NORTH CAROLINA PROFESSIONAL SEAL L-4805 LAND SURVEYOR GREGORY C. BEWLEY 4-18-2016

GENERAL NOTES

1.) THIS IS A LINER GRADE AS-BUILT SURVEY. THIS IS NOT A BOUNDARY SURVEY.
2.) BEARINGS FOR THIS SURVEY ARE BASED ON NC GRID NAD 83 DATUM.
3.) ALL DISTANCES ARE HORIZONTAL GROUND DISTANCES IN US SURVEY FEET.
4.) ELEVATION FOR THIS SURVEY ARE BASED ON NAVD 88 DATUM AS DETERMINED BY GPS OBSERVATION.

GRAPHIC SCALE
40 0 20 40 80
1 inch = 40 ft.

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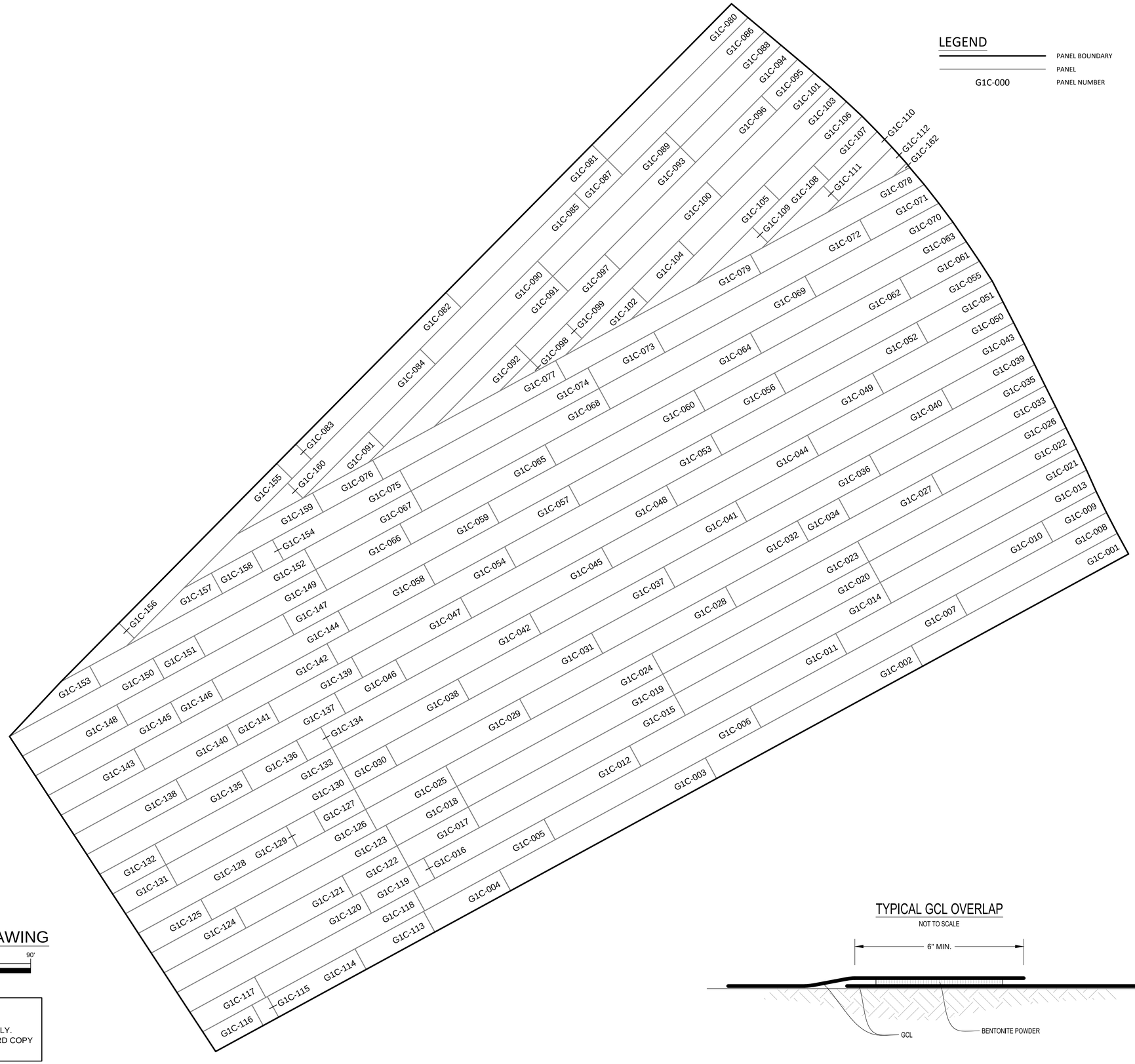
CHARAH
12601 PLANTSIDE DRIVE
LOUISVILLE, KENTUCKY

BIRCKHAVEN MINE #2
CELL 1 C CLAY LINER
CHATHAM COUNTY, NORTH CAROLINA
TOPOGRAPHIC SURVEY

PROJECT NO. CHR-15010
FILENAME: CHR-15010-TL-CELL-1C-2016-04-12
CHECKED BY: GCB
DRAWN BY: WCR
SCALE: 1"=40'
DATE: 04/12/2016
SHEET NO. 1 OF 1

McADAMS

X:\Projects\CHR\CHR-15010\Construction Administration\Cell Grading As-builts\Liner Grade\Cell 1C\CHR-15010-TL-CELL-1C-2016-04-12.dwg, 4/18/2016 4:27:33 PM, Davenport, Mike



LEGEND

———	PANEL BOUNDARY
———	PANEL
G1C-000	PANEL NUMBER

TYPICAL GCL OVERLAP

NOT TO SCALE

RECORD LAYOUT DRAWING

NORTH

30' 0 30' 60' 90'

SCALE : 1" = 30'

NOTE:

RECORD LAYOUT DRAWING IS FOR GENERAL ORIENTATION ONLY. INFORMATION DOCUMENTED AND SUBMITTED AS FINAL RECORD COPY OF INSTALLATION. THIS IS NOT A SURVEYED DRAWING.

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Middle River, MD 21220

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fax: 443.303.1682

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ENGINEER SEAL

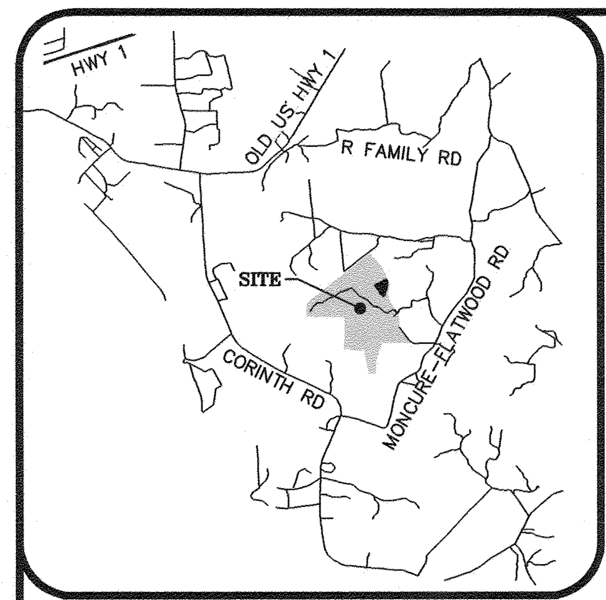
RECORD GCL LAYOUT DRAWING PLAN

BRICKHAVEN No. 2 MINE TRACT "A" MINE
SUBCELL 1C
MONCURE, NORTH CAROLINA

SCALE	DATE
1" = 30'	04/18/2016
CCS JOB NUMBER	SHEET NUMBER
I15-054	03 OF 05

DRAWING NUMBER

R-03



VICINITY MAP
N.T.S

FEATURE	NORTHING	EASTING
R = REPAIR		
DS = DESTRUCT		
R1	673954.73	1993689.31
R1	673955.88	1993688.46
R1	673959.84	1993695.38
R1	673952.60	1993699.83
R1	673951.30	1993697.91
R1	673957.01	1993694.22
R2	673989.01	1993745.86
R2	674002.58	1993772.83
R2	673994.44	1993776.85
R2	673984.23	1993757.33
R2	673984.64	1993752.83
R2	673982.79	1993749.13
R3	674009.23	1993785.49
R4	674036.72	1993745.70
R5	674026.82	1993727.87
R6	674010.35	1993698.77
R7	674029.85	1993687.56
R8/DS18	674082.90	1993736.07
R9	674100.21	1993721.18
R10/DS19	674108.99	1993690.56
R11	674141.07	1993747.71
R12	674160.45	1993736.82
R13/DS20	674133.90	1993643.77
R14/DS21	674152.81	1993586.38
R15	674183.95	1993595.74
R16	674222.56	1993664.56
R16	674223.70	1993663.52
R16	674230.53	1993670.37
R16	674227.74	1993672.67
R17	674244.85	1993654.81
R18/DS22	674267.29	1993674.88
R18/DS22	674265.86	1993676.38
R18/DS22	674268.79	1993679.61
R18/DS22	674270.69	1993678.30
R19	674268.79	1993679.61
R19	674270.69	1993678.30
R19	674271.86	1993679.70
R19	674263.09	1993688.60
R19	674261.73	1993686.88
R20	674263.09	1993688.60
R20	674261.73	1993686.88
R20	674270.00	1993706.06
R20	674271.76	1993705.08
R20	674260.03	1993687.74
R21	674252.54	1993693.42
R22	674242.96	1993699.18
R23	674223.57	1993710.70
R24	674203.67	1993722.63
R25	674199.90	1993725.06
R26	674184.63	1993734.64
R27	674163.67	1993744.48
R27	674165.97	1993743.37
R27	674171.73	1993754.28
R27	674169.46	1993755.65
R28	674145.53	1993756.19
R29	674125.82	1993766.81
R30	674104.99	1993775.75
R31	674084.40	1993784.68
R32	674063.45	1993793.82
R33/DS17	674044.76	1993803.90
R33/DS17	674042.68	1993804.98
R33/DS17	674038.54	1993797.57
R33/DS17	674040.48	1993796.44
R34	674022.69	1993809.23
R34	674020.32	1993810.46
R34	674019.33	1993812.61
R34	674016.32	1993814.40
R34	674016.08	1993816.39
R34	674017.68	1993818.58

FEATURE	NORTHING	EASTING
R = REPAIR		
DS = DESTRUCT		
R34	674024.18	1993815.44
R34	674025.61	1993814.24
R35	674024.18	1993815.44
R35	674025.61	1993814.24
R35	674026.69	1993816.41
R35	674025.37	1993816.93
R36/DS3	674074.67	1993814.48
R37	674111.26	1993971.91
R38	674115.52	1993982.09
R39	674230.16	1994193.74
R39	674227.72	1994193.18
R39	674228.89	1994185.62
R39	674230.53	1994185.52
R40	674226.50	1994186.00
R41/DS2	674289.79	1994210.47
R42	674334.27	1994200.56
R42	674336.38	1994199.37
R42	674331.58	1994191.14
R42	674329.95	1994192.09
R43/DS4	674295.95	1994174.30
R44	674291.30	1994165.68
R45/DS6	674322.15	1994128.03
R46/DS5	674129.51	1993820.61
R47/DS7	674182.88	1993824.35
R48/DS9	674223.28	1993805.31
R49/DS8	674361.15	1994106.40
R50	674355.45	1994190.96
R51	674375.61	1994181.47
R52	674396.06	1994171.84
R53	674416.06	1994161.64
R54	674435.06	1994149.82
R55	674453.52	1994137.07
R56	674471.97	1994123.73
R57/DS10	674400.51	1994084.89
R58/DS12	674428.21	1994042.10
R59/DS11	674266.34	1993790.24
R60	674278.00	1993716.17
R60	674281.91	1993722.42
R60	674280.02	1993723.70
R60	674276.43	1993717.35
R61	674316.89	1993788.43
R62/DS23	674357.30	1993859.21
R62/DS23	674354.66	1993861.00
R62/DS23	674347.73	1993848.71
R62/DS23	674350.38	1993847.17
R63	674391.06	1993924.58
R64	674424.31	1993987.61
R65	674458.65	1994053.48
R66	674452.39	1994064.56
R67/DS24	674483.80	1994103.03
R68	674475.43	1994098.73
R69	674478.61	1994105.13
R70	674481.72	1994111.30
R71	674519.12	1994079.94
R72	674535.34	1994064.79
R73	674476.78	1994039.91
R74	674465.26	1994028.78
R75/DS13	674408.48	1993941.72
R76	674399.62	1993933.06
R77	674414.98	1993916.92
R78	674550.88	1994048.21
R79	674565.74	1994031.58
R80	674580.38	1994015.15
R81	674595.70	1993998.97
R82	674475.02	1993913.05
R83	674451.49	1993921.58
R84	674368.07	1993839.19
R85	674352.33	1993760.50
R86	674253.74	1994236.08

PANEL #	NORTHING	EASTING
1	674253.74	1994236.08
1	674225.65	1994185.42
1	674273.36	1994227.24
1	674245.73	1994176.23
1	674042.70	1993802.58
1	674023.13	1993811.42
2	674273.36	1994227.24
2	674245.73	1994176.23
2	674042.70	1993802.58
2	674293.49	1994217.49
2	674265.97	1994166.02
2	674063.45	1993793.82
3	674293.49	1994217.49
3	674265.97	1994166.02
3	674063.45	1993793.82
3	674314.59	1994209.05
3	674286.93	1994157.86
3	674084.40	1993784.68
4	674314.59	1994209.05
4	674286.93	1994157.86
4	674084.40	1993784.68
4	674335.25	1994199.83
4	674307.55	1994148.53
4	674104.99	1993775.75
5	674335.25	1994199.83
5	674307.55	1994148.53
5	674104.99	1993775.75
5	674355.45	1994190.96
5	674327.67	1994138.95
5	674125.82	1993766.81
6	674355.45	1994190.96
6	674327.67	1994138.95
6	674125.82	1993766.81
6	674375.61	1994181.47
6	674347.03	1994127.79
6	674145.53	1993756.19
7	674375.61	1994181.47
7	674347.03	1994127.79
7	674145.53	1993756.19
7	674396.06	1994171.84
7	674367.60	1994118.52
7	674165.29	1993745.27
8	674396.06	1994171.84
8	674367.60	1994118.52
8	674165.29	1993745.27
8	674416.06	1994161.64
8	674387.52	1994108.14
8	674184.63	1993734.64
9	674416.06	1994161.64
9	674387.52	1994108.14
9	674184.63	1993734.64
9	674435.06	1994149.82
9	674406.77	1994096.78
9	674203.67	1993722.63
10	674453.52	1994137.07
10	674424.07	1994081.76
10	674222.75	1993711.47
10	674435.06	1994149.82
10	674406.77	1994096.78
10	674203.67	1993722.63
11	674453.52	1994137.07
11	674424.07	1994081.76
11	674222.75	1993711.47
11	674471.97	1994123.73
11	674441.47	1994066.59
11	674242.02	1993699.75
11	674223.57	1993710.70
12	674471.97	1994123.73
12	674441.47	1994066.59
12	674242.02	1993699.75
12	674261.56	1993688.16
12	674352.42	1993853.59
12	674391.06	1993924.58
12	674458.65	1994053.48
12	674488.17	1994110.63
12	674242.96	1993699.18
12	674252.54	1993693.42
12	674279.02	1993719.77
12	674316.96	1993788.42
12	674424.31	1993987.61
13	674610.89	1993981.77
13	674559.44	1993932.56
13	674454.81	1993829.39
13	674362.89	1993739.16
13	674595.70	1993998.97
13	674544.35	1993949.60
13	674438.60	1993845.25
13	674347.39	1993755.99
13	674269.66	1993679.99
13	674284.83	1993663.17
13	674270.30	1993679.05
14	674261.56	1993688.16
14	674595.70	1993998.97
14	674544.35	1993949.60
14	674438.60	1993845.25
14	674347.39	1993755.99
14	674269.66	1993679.99
14	674580.38	1994015.15
14	674529.88	1993966.78
14	674422.67	1993861.01
14	674331.66	1993771.77
14	674279.02	1993719.77
15	674565.74	1994031.58
15	674580.38	1994015.15
15	674529.88	1993966.78
15	674422.67	1993861.01
15	674331.66	1993771.77
15	674279.02	1993719.77
15	674316.96	1993788.42
15	674367.81	1993838.65
15	674515.38	1993983.73
15	674406.11	1993876.41
16	674352.42	1993853.59
16	674316.96	1993788.42
16	674367.81	1993838.65
17	674565.74	1994031.58
17	674352.42	1993853.59
17	674367.81	1993838.65
17	674515.38	1993983.73
17	674406.11	1993876.41
17	674550.88	1994048.21
17	674501.36	1994001.05
17	674414.98	1993916.92

PANEL #	NORTHING	EASTING
18	674550.88	1994048.21
18	674501.36	1994001.05
18	674414.98	1993916.92
18	674535.34	1994064.79
18	674487.03	1994018.47
18	674399.62	1993933.06
19	674391.06	1993924.58
19	674535.34	1994064.79
19	674487.03	1994018.47
19	674399.62	1993933.06
19	674519.95	1994080.84
19	674473.49	1994036.55
19	674424.31	1993987.61
20	674352.42	1993853.59
20	674391.06	1993924.58
20	674414.98	1993916.92
20	674399.62	1993933.06
21	674458.65	1994053.48
21	674519.95	1994080.84
21	674473.49	1994036.55
21	674503.92	1994096.52
21	674424.31	1993987.61
22	674458.65	1994053.48
22	674488.17	1994110.63
22	674503.92	1994096.52
23	674042.70	1993802.58
23	674023.13	1993811.42
23	673933.20	1993650.36
23	673948.45	1993635.55
24	674042.70	1993802.58
24	674063.45	1993793.82
24	673948.45	1993635.55
24	673966.52	1993622.24
24	674010.35	1993698.77
25	673966.52	1993622.24
25	674010.35	1993698.77
25	674029.85	1993687.56
25	673984.86	1993608.77
26	674063.45	1993793.82
26	674010.35	1993698.77
26	674029.85	1993687.56
26	673984.86	1993608.77
26	674084.40	1993784.68
27	674029.85	1993687.56
27	674003.97	1993597.62
27	674080.94	1993732.48
27	674084.40	1993784.68
27	674104.99	1993775.75
28	674003.97	1993597.62
28	674080.94	1993732.48
28	674100.21	1993721.18
28	674020.79	1993582.32
29	674080.94	1993732.48
29	674100.21	1993721.18
29	674104.99	1993775.75
29	674125.82	1993766.81
30	674100.21	1993721.18
30	674020.79	1993582.32
30	674039.53	1993570.00
30	674141.07	1993747.71
30	674125.82	1993766.81
30	674145.53	1993756.19
31	674039.53	1993570.00
31	674141.07	1993747.71
31	674160.45	1993736.82
31	674056.89	1993554.67
32	674141.07	1993747.71
32	674160.45	1993736.82
32	674145.53	1993756.19
32	674165.29	1993745.27
33	674160.45	1993736.82
33	674056.89	1993554.67
33	674076.26	1993543.32
33	674165.29	1993745.27
33	674184.63	1993734.64
34	674076.26	1993543.32
34	674094.87	1993530.84
34	674184.63	1993734.64
34	674203.67	1993722.63
35	674222.75	1993711.47
35	674223.57	1993710.70
35	674094.87	1993530.84
35	674113.17	1993517.66
35	674203.67	1993722.63
36	674242.02	1993699.75
36	674223.57	1993710.70
36	674242.96	1993699.18
36	674113.17	1993517.66
36	674129.66	1993500.46
36	674145.79	1993529.16
36	674139.15	1993517.12
36	674183.95	1993595.74
36	674222.94	1993664.10
37	674284.83	1993663.17
37	674270.30	1993679.05
37	674145.79	1993529.16
37	674139.15	1993517.12
37	674183.95	1993595.74
37	674222.94	1993664.10
37	674200.21	1993580.10
37	674148.25	1993527.29
37	674245.11	1993654.96
38	674183.95	1993595.74
38	674245.11	1993654.96
38	674229.40	1993670.28
39	674261.56	1993688.16
39	674252.54	1993693.42
39	674269.66	1993679.99
39	674270.30	1993679.05
39	674245.11	1993654.96
39	674229.40	1993670.28
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40	674252.54	1993693.42
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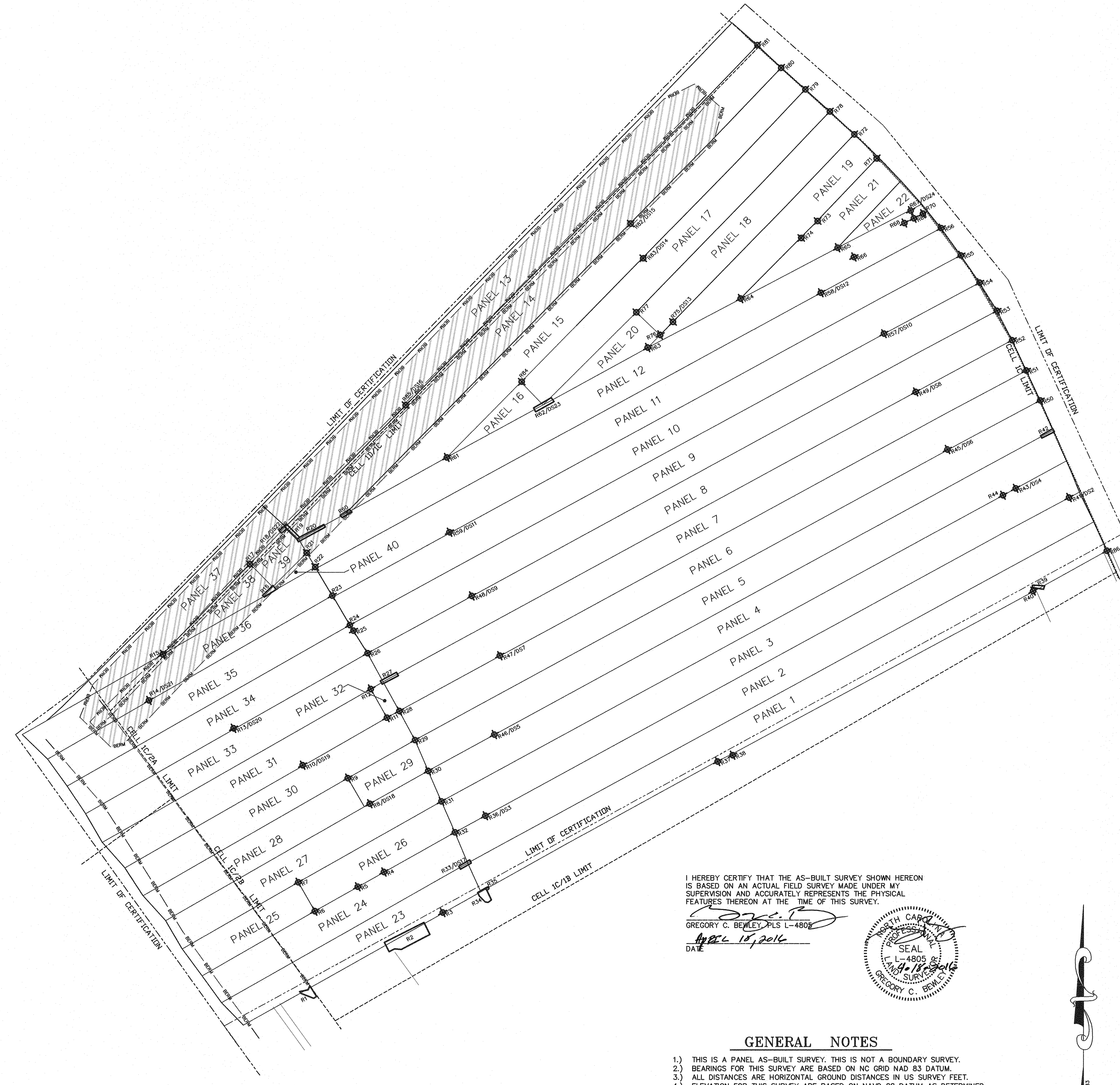
40	674229.40	1993670.28



I HEREBY CERTIFY THAT THE AS-BUILT SURVEY SHOWN HEREON IS BASED ON AN ACTUAL FIELD SURVEY MADE UNDER MY SUPERVISION AND ACCURATELY REPRESENTS THE PHYSICAL FEATURES THEREON AT THE TIME OF THIS SURVEY.

GREGORY C. BEWLEY, PLS L-4805

April 18, 2016
DATE

NORTH CAROLINA PROFESSIONAL LAND SURVEYOR SEAL L-4805 GREGORY C. BEWLEY 4-18-2016

GENERAL NOTES

1.) THIS IS A PANEL AS-BUILT SURVEY. THIS IS NOT A BOUNDARY SURVEY.
2.) BEARINGS FOR THIS SURVEY ARE BASED ON NC GRID NAD 83 DATUM.
3.) ALL DISTANCES ARE HORIZONTAL GROUND DISTANCES IN US SURVEY FEET.
4.) ELEVATION FOR THIS SURVEY ARE BASED ON NAVD 88 DATUM AS DETERMINED BY GPS OBSERVATION.

LEGEND

- ANCHOR TRENCH
- LIMITS OF CERTIFICATION
- BERM — DIVIDER BERM
- RAIN FLAP FOR TEMPORARY SUBCELL DIVIDER BERM

GRAPHIC SCALE
40 0 20 40 80
1 inch = 40 ft.

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McADAMS

REVISIONS:

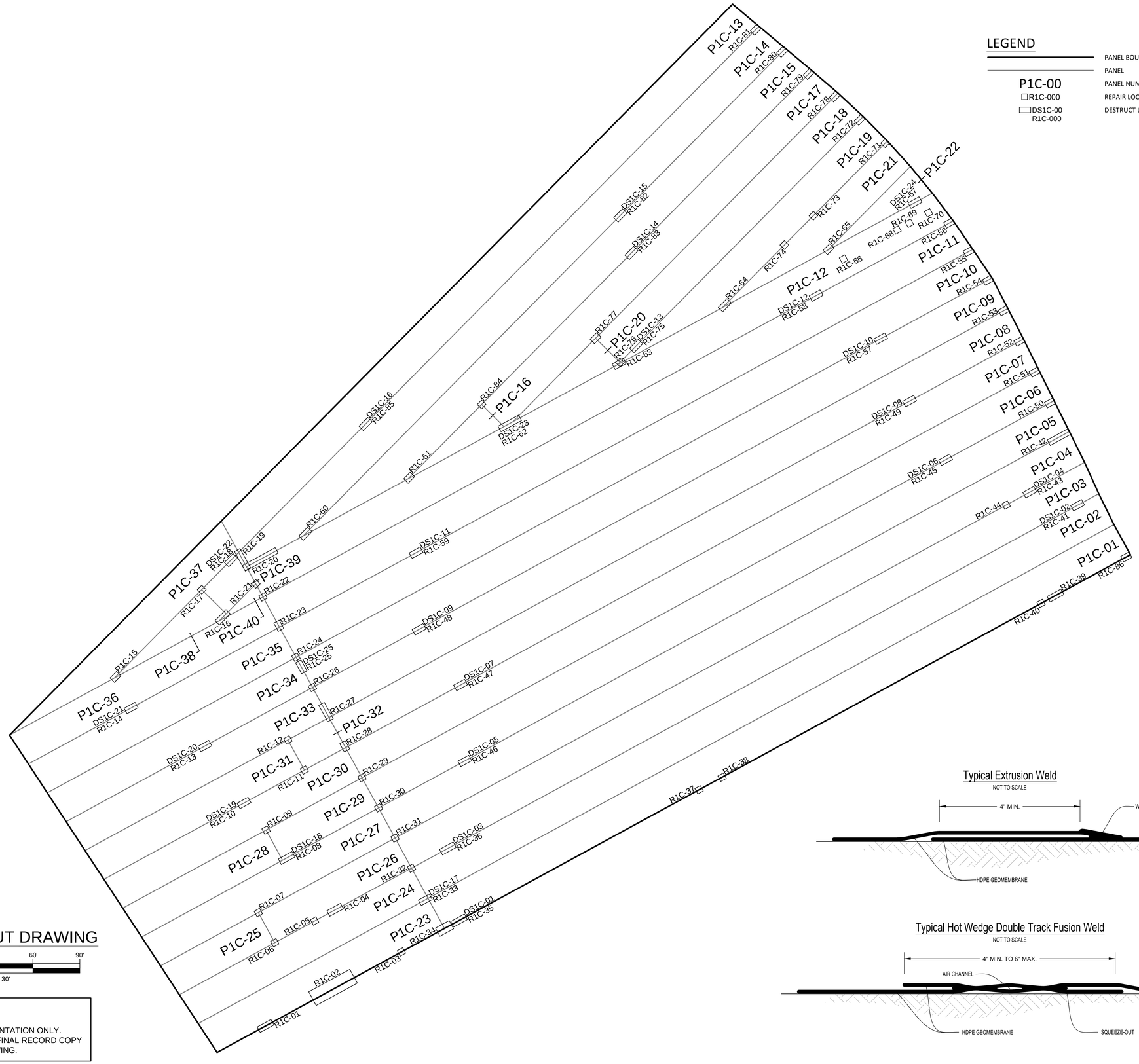
OWNER:
CHARAH
12601 PLANTSIDE DRIVE
LOUISVILLE, KENTUCKY 40299

BIRCKHAVEN MINE #2
CELL 1 C LINER PANELS
CHATHAM COUNTY, NORTH CAROLINA

AS-BUILT SURVEY

PROJECT NO. CHR-15010
FILENAME: CHR-15010-PANELS-CELL-1C-2016-04-12
CHECKED BY: GCB
DRAWN BY: WCR
SCALE: 1"=40'
DATE: 04/12/2016
SHEET NO. 1-1

McADAMS



LEGEND

	PANEL BOUNDARY
	PANEL
P1C-00	PANEL NUMBER
R1C-000	REPAIR LOCATION
DS1C-00 R1C-000	DESTRUCT LOCATION

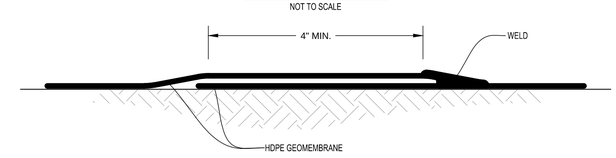
RECORD LAYOUT DRAWING

NOTE:

RECORD LAYOUT DRAWING IS FOR GENERAL ORIENTATION ONLY. INFORMATION DOCUMENTED AND SUBMITTED AS FINAL RECORD COPY OF INSTALLATION. THIS IS NOT A SURVEYED DRAWING.

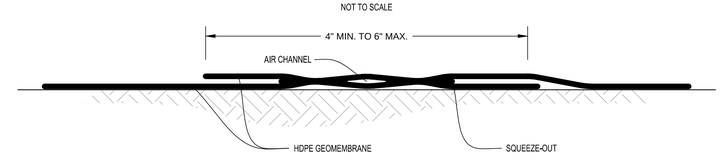
Typical Extrusion Weld

NOT TO SCALE



Typical Hot Wedge Double Track Fusion Weld

NOT TO SCALE



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office: 410.335.5886
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ENGINEER SEAL

RECORD LINER LAYOUT DRAWING PLAN

BRICKHAVEN No. 2 MINE TRACT "A" MINE
SUBCELL 1C
MONCURE, NORTH CAROLINA

SCALE	DATE
1" = 30'	04/18/2016
CCS JOB NUMBER	SHEET NUMBER
I15-054	03 OF 05

DRAWING NUMBER

R-03

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440 S Church Street, Suite 1000
Charlotte, NC 28202-2075
704.338.6700

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