

April 7, 2022

Ms. Wendy Karably  
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**Subject: Revision 02 - VDEQ Comment Resolution Support - Comments No. 14 through 16  
Green Ridge Recycling and Disposal Facility - Part A Permit Application,  
Cumberland County, Virginia (Schnabel Reference 21C43009.01)**

Dear Ms. Karably:

**SCHNABEL ENGINEERING, LLC** (Schnabel) is pleased to submit our engineering evaluations in response to VDEQ Comments No. 14, 15 and 16 on the Part A Permit Application (submitted by DAA on January 22, 2020) for the proposed Green Ridge Recycling and Disposal Facility (RDF) site in Cumberland County, Virginia. This study was performed in accordance with our proposal dated July 6, 2021 (Schnabel Reference 21P43039) and approved on July 30, 2021.

#### **PROJECT INFORMATION AND STUDY OBJECTIVE**

We understand the project involves a proposed new Municipal Solid Waste (MSW) landfill facility in Cumberland County, Virginia. The project site is a 1177.6 acres undeveloped piece of land. The 225 acres planned disposal unit will be on the southern portion of the property. Miller Lane is to the east of the site and undeveloped areas are on all other directions. The site is generally covered by planted trees, bushes, few wooded patches, and relatively open fields. Several streams and ephemeral channels are present within the project boundary. Significant topographic variations are present at this site with elevations varying from EL 380 on the southern areas to EL 240 near Muddy Creek on the north-west portion of the site.

On January 22, 2020, Draper Aden Associates (DAA) submitted the Part A Permit Application for this project. The site is generally underlain by residual silt, clay and sandy soils. These soils are underlain by Partially Weathered Rock (Saprolite) over auger refusal/bedrock. We understand DAA provided an evaluation of seismic hazards for this project as part of the Part A Permit Application package as Attachment PTA-XXIII. In their evaluation, DAA determined the proposed landfill site falls within the Central Virginia Seismic Zone but is not located within 200 ft of a known geologic fault that demonstrated movement within the Holocene epoch. The Peak Horizontal Ground Acceleration (PGA) at the ground surface was estimated to be up to 0.2g with a 2% probability of exceedance in 50 years. Design seismic coefficient for slope stability evaluations were estimated to be half of PGA, i.e., 0.1g. Considering seismicity of this region and the on-site soil conditions, DAA considered the site soils to be not susceptible to liquefaction.

In response to the permit application, DAA recently received the following technical comments from the Virginia Department of Environmental Quality (VDEQ) on the Attachment PTA-XXIII:

- 14.) *The proposed landfill is located within the Central Virginia Seismic Zone. 9 VAC 20-81-120.C.3.b.(1) restricts siting of a landfill within a seismic impact zone unless the owner or operator demonstrates that all containment structures are designed to resist the maximum horizontal acceleration in lithified earth material for the site. Attachment XXIII indicates that the peak ground acceleration may be as much as 20% gravity for the landfill site. However, according to the USGS Unified Hazard Tool, the peak ground acceleration to be used for design purposes at this site location is 22.5% gravity, or 0.225g. Please note that the USGS updated the U.S. Seismic Hazard Long-Term Model in 2018. The applicant should use the updated data as appropriate in the Part A Permit Application.*
- 15.) *The proposed base grades depicted in Attachment XV of the Part A Permit Application are shown constructed into the bedrock in some areas, and atop as much as 35 feet of silts and sands in other areas of the site. Attachment XXIII indicates that the proposed landfill will incorporate a design seismic coefficient of 0.10g, or one-half the peak ground acceleration. However, it is not appropriate to set the seismic coefficient as one-half the peak bedrock acceleration at this stage, since the seismic coefficient is related to the peak acceleration at the ground surface, which may be amplified by the overlying soils and be different than the peak acceleration in bedrock.*
- 16.) *An assessment of the Liquefaction Potential should be performed based upon the geotechnical and hydrogeological data gathered from the site investigations (in particular in those areas with more extensive silts and sands, e.g., DAA-4sb and DAA-36pz). In addition, a preliminary seismic stability analysis should be performed for both conditions that may be present (i.e., landfill constructed into bedrock, and landfill constructed atop 35 feet or more of silts and sands), in order to demonstrate that the landfill can be designed to resist the maximum horizontal acceleration in bedrock, as required by 9 VAC 20-81-120.C.3.b.(2). Guidance for performing these assessments can be found in document **EPA/600/R-95/051, RCRA Subtitle D (258) Seismic Design Guidance for Municipal Solid Waste Landfill Facilities**.*

Schnabel Engineering was tasked by DAA to perform seismic evaluation of the proposed facility in light of the above VDEQ comments. Per VDEQ's recommendation (i.e., Comment No. 16), we followed the general guidelines of the document *EPA/600/R-95/051, RCRA Subtitle D (258) Seismic Design Guidance for Municipal Solid Waste Landfill Facilities* in development of these responses. This document will be referred to as the 'EPA' document in this report.

In November 2021, DAA oversaw the installation of 11 Cone Penetration Test (CPT) soundings and two test borings at the site to supplement subsurface exploration activities conducted by DAA in 2019 (48 borings) and Koontz Bryant Johnson Williams in 2017 (20 borings). Figure A, at the end of this report, indicates the boring and CPT locations. These CPT soundings and the boring DAA-112pz were performed within/near specific areas of interest based on our preliminary liquefaction evaluation of the subsurface data that were previously collected. All the data from subsurface explorations and laboratory testing were provided to us by DAA and are presented as Attachment 3 at the end of this report for reference.

The following sections present our evaluations and responses to VDEQ Comments No. 14 through 16.

## **SCHNABEL'S RESPONSE TO VDEQ COMMENT NO. 14:**

### **VDEQ Comment No. 14:**

*The proposed landfill is located within the Central Virginia Seismic Zone. 9 VAC 20-81-120.C.3.b.(1) restricts siting of a landfill within a seismic impact zone unless the owner or operator demonstrates that all containment structures are designed to resist the maximum horizontal acceleration in lithified earth material for the site. Attachment XXIII indicates that the peak ground acceleration may be as much as 20% gravity for the landfill site. However, according to the USGS Unified Hazard Tool, the peak ground acceleration to be used for design purposes at this site location is 22.5% gravity, or 0.225g. Please note that the USGS updated the U.S. Seismic Hazard Long-Term Model in 2018. The applicant should use the updated data as appropriate in the Part A Permit Application.*

### **Schnabel's Response:**

The latest version of the USGS hazard map, the 2018 National Seismic Hazard Long-Term Model (2018 NSHM) for the Conterminous United States (Shumway et al., 2021; [https://www.usgs.gov/natural-hazards/earthquake-hazards/science/2018-united-states-lower-48-seismic-hazard-long-term?qt-science\\_center\\_objects=0#qt-science\\_center\\_objects](https://www.usgs.gov/natural-hazards/earthquake-hazards/science/2018-united-states-lower-48-seismic-hazard-long-term?qt-science_center_objects=0#qt-science_center_objects)), provides mapped acceleration parameters at the bed-rock level, i.e., Site Class B/C boundary, for the conterminous U.S. Accordingly, we determined the Peak Ground Acceleration (PGA) at the bed-rock level is 0.223g at this site for 2,500 year return period scenario (equivalent to 10% probability of exceedance in 250 years or 2% probability of exceedance in 50 years).

## **SCHNABEL'S RESPONSE TO VDEQ COMMENT NO. 15:**

### **VDEQ Comment No. 15:**

*The proposed base grades depicted in Attachment XV of the Part A Permit Application are shown constructed into the bedrock in some areas, and atop as much as 35 feet of silts and sands in other areas of the site. Attachment XXIII indicates that the proposed landfill will incorporate a design seismic coefficient of 0.10g, or one-half the peak ground acceleration. However, it is not appropriate to set the seismic coefficient as one-half the peak bedrock acceleration at this stage, since the seismic coefficient is related to the peak acceleration at the ground surface, which may be amplified by the overlying soils and be different than the peak acceleration in bedrock.*

### **Schnabel's Response:**

The following sections present the peak acceleration at the ground surface (i.e., approximately at the base grade level) and the design seismic coefficient parameters and the respective development processes.

***Estimation of Ground Surface Design Accelerations:***

Seismic waves as they travel through soil layers to ground surface can get amplified or de-amplified based on factors such as geologic stratification, soil stiffness/density, soil dynamic properties, and intensity of the motion. This phenomenon is commonly known as site-effect on ground motion. 2018 NSHM incorporated site-effect on ground motion by incorporating new soil amplification factors. These factors were based on recently performed linear and non-linear site response analyses considering conditions specific to the Central and Eastern United States (CEUS). In 2018 NSHM, hazards are provided for 22 spectral periods (from 0.001 to 10 s) and for 8 uniform  $V_{S30}$  values (average shear wave velocity within upper 30 m, i.e., about 100ft depth below ground surface) between 150 m/sec and 1,500 m/sec.

Using seismic CPT soundings, DAA collected shear wave velocity ( $V_s$ ) data at 5 locations at this site: DAA-105CP, DAA-107CP, DAA-109CP, DAA-110CP, and DAA-4CP. Based on these measured  $V_s$  data, the estimated  $V_{S30}$  values were determined and are presented in Table 1 below. Since all the seismic CPTs were refused shallower than 100 ft in probable very stiff soils and/or Disintegrated Rock (DR),  $V_s$  of 1,500 ft/sec was assumed for these materials below CPT refusal depths based on our experience with similar material in this geology. Bedrock depths were conservatively estimated based on nearby boring(s).  $V_s$  of 2,500 ft/sec was assumed for the anticipated bedrock (commonly accepted value for 'soft-bedrock' in the CEUS). This way the entire  $V_s$  column of 100 ft depth was generated to estimate  $V_{S30}$  values.

**Table 1: Estimated Average Shear Wave Velocities**

<b>Seismic CPT</b>	<b><math>V_{S30}</math> values, ft/sec (m/sec)</b>
DAA-105CP	1,550 (473)
DAA-107CP	1,800 (549)
DAA-109CP	1,620 (494)
DAA-110CP	1,480 (451)
DAA-4CP	1,155 (352)

Based on this evaluation, the proposed landfill site was divided into two general areas:

1. Zone-I: near boring DAA-4SB and CPT DAA-4CP and surrounding areas where estimated  $V_{S30}$  value is about 1155 ft/sec (352 m/sec), and
2. Zone-II: rest of the site. We assumed the minimum estimated  $V_{S30}$  value of 1,480 ft/sec (451 m/sec) for this zone.

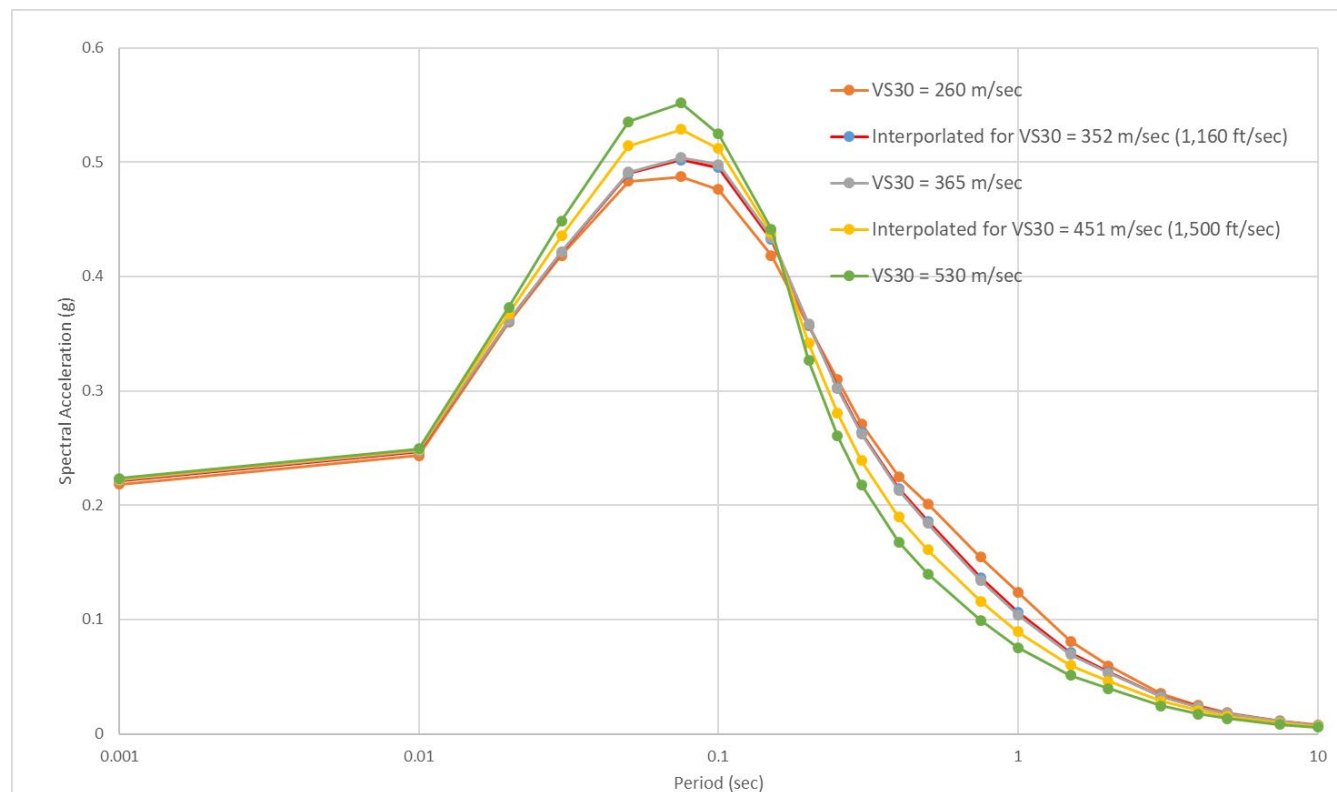
From 2018 NSHM, ground surface acceleration response spectra were generated for  $V_{S30}$  values of 260, 365 and 530 m/sec for this location. These spectra are presented in the below Figure 1. Based on these lines, ground surface acceleration response spectra were interpolated for  $V_{S30}$  values of 352 and 451 m/sec, corresponding to Zones-I & -II, respectively. These interpolated spectra are also presented in the Figure 1 below.

Ground surface (i.e., approximately at the base grade level) maximum considered earthquake (2,500 year return period scenario) compatible PGA, i.e.,  $PGA_M$ , is spectral acceleration corresponding to 0.001 sec spectral period. From Figure 1,  $PGA_M$  were determined as 0.22g for both  $V_{S30}$  values of 352 and 451 m/sec. Since PGA at the bed-rock level is 0.223g (from previous section), site amplification factor (ratio



of  $PGA_M$  and  $PGA$ ) is estimated as 1.0 for the entire site – hence site-effect on ground motion is insignificant at this site.

*Please Note: Up to 37% amplification was reported in our August 26, 2021 memorandum to DAA (Preliminary Response to VDEQ Comments No. 14 and 15 on Part A Permit Application). We used ASCE 7-16 to derive these amplification factors instead of 2018 NSHM. In the 2018 NSHM, site-amplification factors were a new addition and had not been adopted in any code at that time. However, the latest ASCE 7, i.e., ASCE 7-22 has just become available (released on December, 2021), which has revised the approach of determining amplification factors and adopted the amplification factors from the 2018 NSHM. Since ASCE 7 committee has performed a thorough review on this latest USGS model, we have opted to revise our approach accordingly and have used 2018 NSHM model to generate ground surface spectral accelerations for this project. The 2018 NSHM indicates no amplification of ground motion due to site-effect at this location.*



**Figure 1: 2018 NSHM – Acceleration Response Spectra at Approximate Base Grade Level (2,500 Year Return Period)**

#### **Seismic Coefficient, $K_s$ for Stability Evaluation:**

We evaluated the EPA guideline for determining the design seismic coefficient,  $K_s$  for seismic slope stability evaluation. Per Figure 4.8 of the EPA guidance document, also presented below as Figure 2, indicates that the peak average acceleration of the waste mass, i.e.,  $K_s$  can be less than 50% of  $PGA_M$  if the fundamental period of the waste mass is at least about 1.8 times greater than the fundamental period of the design earthquake.

Fundamental period of the waste mass:

Fundamental period of the waste mass,  $T_{MSW} = 4 \times \text{Landfill Height} / V_s \text{ of the Waste Mass}$

Considering a maximum overall landfill height of 330 ft for this project and overall  $V_s$  of 650 ft/sec (200 m/sec) for the Waste Mass,  $T_{MSW}$  was calculated as 2.03 seconds.  $V_s$  of the waste mass was conservatively selected per Figure 4.10 of the EPA guidance document.

Fundamental period of design ground motion:

Fundamental period of design ground motion can be selected using the Figure 1 above. The spectral period corresponding to the peak spectral accelerations is about 0.075 sec, which is considered as the fundamental period of the design ground motion at this site.

Accordingly, the fundamental period of the waste mass is at least about 1.8 times (specifically about 27 times) greater than the fundamental period of the design earthquake. Hence,  $K_s$  can be conservatively estimated as half of  $PGA_M$ , i.e., 0.11g for the entire site. This value was used in our preliminary seismic stability evaluation presented in a later section.

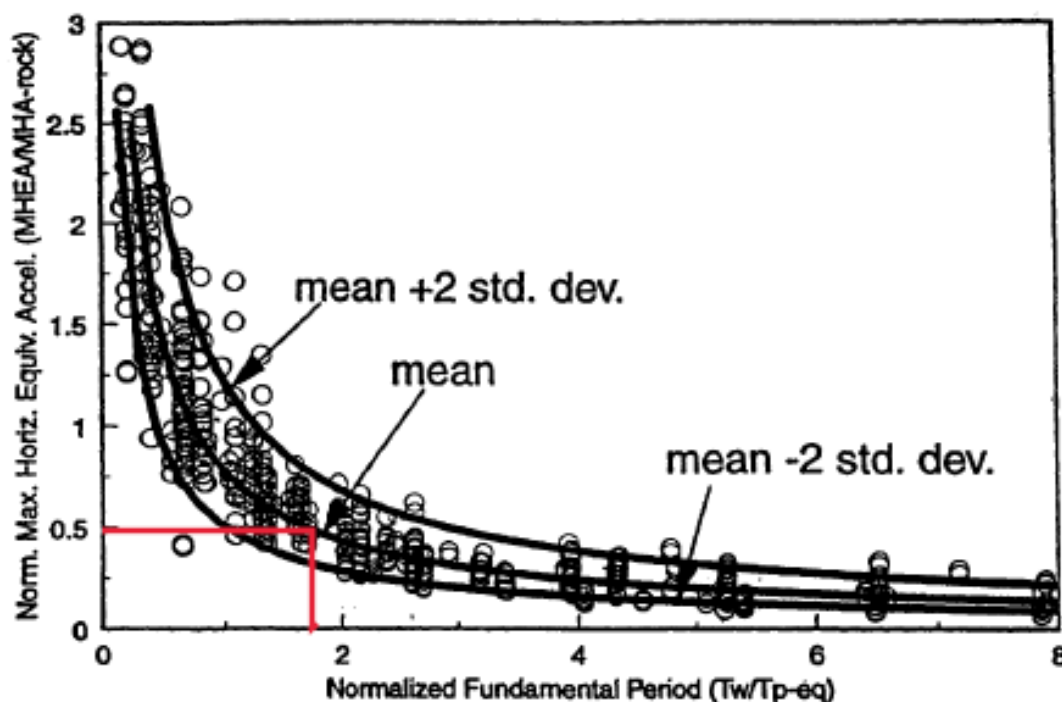


Figure 2: Screen-capture of Figure 4.8 of the EPA Guidance Document.

**SCHNABEL'S RESPONSE TO VDEQ COMMENT NO. 16:**

**VDEQ Comment No. 16:**

*An assessment of the Liquefaction Potential should be performed based upon the geotechnical and hydrogeological data gathered from the site investigations (in particular in those areas with more extensive silts and sands, e.g., DAA-4sb and DAA-36pz). In addition, a preliminary seismic stability*

*analysis should be performed for both conditions that may be present (i.e., landfill constructed into bedrock, and landfill constructed atop 35 feet or more of silts and sands), in order to demonstrate that the landfill can be designed to resist the maximum horizontal acceleration in bedrock, as required by 9 VAC 20-81-120.C.3.b.(2). Guidance for performing these assessments can be found in document EPA/600/R-95/051, RCRA Subtitle D (258) Seismic Design Guidance for Municipal Solid Waste Landfill Facilities.*

### **Schnabel's Response:**

Liquefaction assessment and preliminary seismic stability evaluations were performed and are presented in the below sections.

### ***Liquefaction Assessment***

When saturated, loose, cohesionless soils undergo cyclic loading, micro-structures of soil particles undergo re-arrangement and contraction, and hence generate excessive pore water pressure. Large magnitude earthquakes usually exert large acceleration and usually are longer events. A sustained ground motion that is large enough and acting over a long enough period of time can develop enough excess pore-water pressure which can reduce/negate soil's effective overburden stress, thereby significantly reducing or even no soil shear strength. This phenomena in saturated, loose, cohesionless soils is considered 'liquefaction'.

We initially performed a screening of the available data (boring logs, and laboratory test results) to evaluate possible susceptibility to liquefaction. Loose/soft and low plasticity (Plasticity Index  $\leq 7$ ) sand and silts that are below groundwater table, which will be left below the excavation level (i.e., to attain the proposed base grade), were identified during this screening step.

These layers were then further analyzed using simplified liquefaction triggering evaluation approach following Boulanger & Idriss (2014) for SPT based methods. These SPT based evaluations yielded results (presented in section below) that indicated further evaluation was necessary. Accordingly, DAA performed a supplemental exploration program in November, 2021 which included one boring (DAA-112pz) and 11 CPT soundings at locations that were selected based on the initial liquefaction evaluation efforts. We then evaluated these additional data for liquefaction susceptibility. CPT soundings were analyzed using simplified liquefaction triggering evaluation approach following Boulanger & Idriss (2014) for CPT based methods.

In liquefaction triggering evaluation, factor of safety (FS) against liquefaction triggering is computed by the ratio of cyclic stress ratio (CSR) induced by the design seismic event and cyclic resistance ratio (CRR) of soil. CSR is a function of  $PGA_M$  (0.22g), depth of soil strata, and moment magnitude ( $M_w$ ) of the design event. In SPT based method, CRR is a function of SPT blow counts with hammer energy and confining stress correction. In CPT based method, CRR is a function of corrected cone resistance and fines content (i.e., finer than No. 200 sieve). CRR is adjusted to a clean-sand equivalent CRR in both methods following equations provided in Boulanger & Idriss (2014). These evaluations were performed considering the excavation to attain the proposed base grade elevations for applicable borings and CPT soundings.

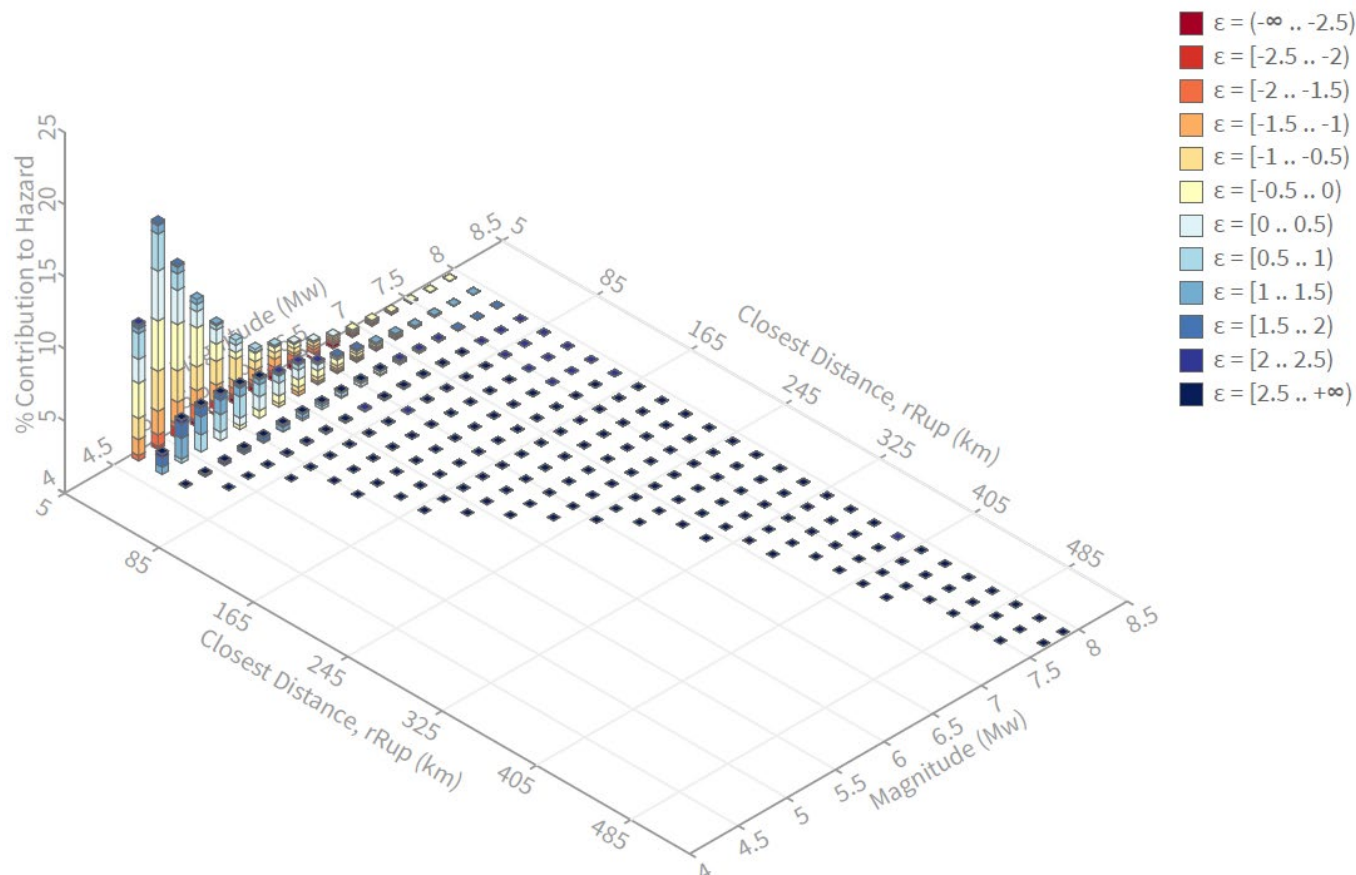
The susceptibility of sand-like soils to cyclic liquefaction has been found to be a function of geologic age and origin. Hayati and Andrus (2009) studied the effect of age of deposit on CRR. They proposed an equation for the age correction factor for CRR,  $K_{DR} = 0.13 \times \log(t) + 0.83$ . Here,  $t$  is the time since last deposition (for sedimentary-type soil) or last critical disturbance (i.e., last major seismic event that caused liquefaction in the strata). While this equation was developed based on a data set from coastal deposits, we made an attempt to estimate  $K_{DR}$  that is applicable to residual soils found at this site. The site is underlain by Porphyroblastic Biotite Gneiss which is from the Proterozoic period, i.e., about 541 million years old. Using the equation above,  $K_{DR}$  is estimated as 2.0. Considering the design seismic event under consideration has a return period of 2,500 year, we can very conservatively assume liquefaction was triggered at this site in that time-frame, hence  $K_{DR}$  can be estimated as 1.3. Since this equation was not specifically developed based on residual soils, a conservative estimation of  $K_{DR}$ , i.e., 1.3, was considered reasonable to be used in this study to increase CRR. In practicality,  $K_{DR}$  in residual soils is possibly much higher.

Liquefaction Potential Index (LPI), Iwasaki et al. (1978), is an index that provides a generic quantification of the severity of surface manifestation of liquefaction that is probable based on the depth and thickness of liquefiable layer(s). LPI is a function of thickness of the liquefied layer, thickness of non-liquefied crust over the liquefied layer, and FS against liquefaction of the liquefied layers (i.e., layers with FS less than 1.0). LPI can range from 0 for a site with no liquefaction potential to a maximum of 100 for a site where FS is zero. However, SPT data from 45 liquefaction sites in Japan, Iwasaki et al. (1978) found that 80% of the sites had  $LPI > 5$ , while 50% had  $LPI > 15$ . Based on this observation, they proposed that severe liquefaction damage should be expected for sites where  $LPI > 15$  but should not be expected for sites where LPI is less than 5. Although an old method, several research studies (Toprak & Holzer, 2003; Li, Juang & Andrus, 2006; Green, Maurer & van Ballegooy, 2018) have been performed based on the LPI framework, and LPI has largely remained as one of most reliable means to assess susceptibility of liquefaction hazard at the ground surface. Specifically, Li, Juang & Andrus (2006) evaluated the appropriateness of the formulation of the LPI in the light of the newer research efforts at that time. They concluded that the Iwasaki et al. (1978) LPI model provides acceptable results in estimating severity of surface manifestation of liquefaction. LPI model is especially conservative when used in conjunction with FS computed using Boulanger & Idriss (2014) model.

#### *M<sub>w</sub> of Design Earthquake:*

A seismic deaggregation plot provides a broad picture of the viable earthquake sources that contribute to the total seismic hazard at the subject site. Deaggregation plot presents the probable moment magnitudes, site-to-source distances, and contribution percentage of each viable source around a site. We used the 2014 USGS Seismic Hazard Tool (2018 based tool has not been available to public to this date) to generate deaggregation hazard plots at this site. The deaggregation plot for the 2,500 year return period (2% probability of exceedance in 50 years) for this site is presented in Figure 3 below. The relatively taller columns in a deaggregation plot corresponds to the most viable source(s) that have the largest probability to generate an event during the design life of the structure. The site-specific deaggregation plot indicates the Central Virginia Seismic Zone (CVSZ) controls the seismic hazard for PGA at this site. Based on this deaggregation run, the mean  $M_w$  and site-to-source distance for PGA

were determined as 5.44 and about 19 kilometers for this site. Accordingly,  $M_w$  of 5.44 was selected for liquefaction evaluation in this study.



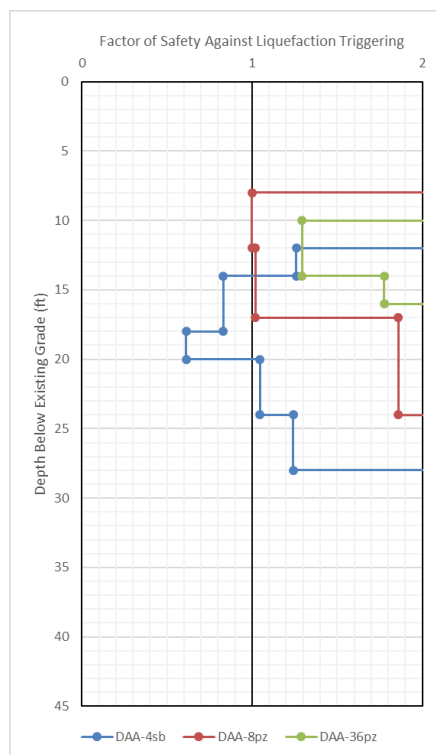
**Figure 3: Deaggregation of Seismic Hazards for PGA (2014 NSHM; 2,500 year Return Period).**

**SPT Based Triggering Evaluation Results:**

Liquefaction triggering evaluation were performed for Borings DAA-4sb, DAA-8pz and DAA-36pz. All other borings, including the recently performed Boring DAA-112pz, appeared to be underlain by non-liquefiable strata based on screening evaluation. Figure 4 presents the FS against Liquefaction calculated for Borings DAA-4sb, DAA-8pz and DAA-36pz.

Sandy soils between 14 and 20 ft depth (EL 333.5 and 327.5) in Boring DAA-4sb indicated FS below 1.0, which means this strata is potentially susceptible to liquefaction during the design seismic event. All other layers in Boring DAA-4sb and entire profiles in Borings DAA-8pz and DAA-36pz indicate a minimum FS of 1.0, i.e., not susceptible to liquefaction during the design seismic event.

LPI was estimated as less than 4.0 at Boring DAA-4sb.

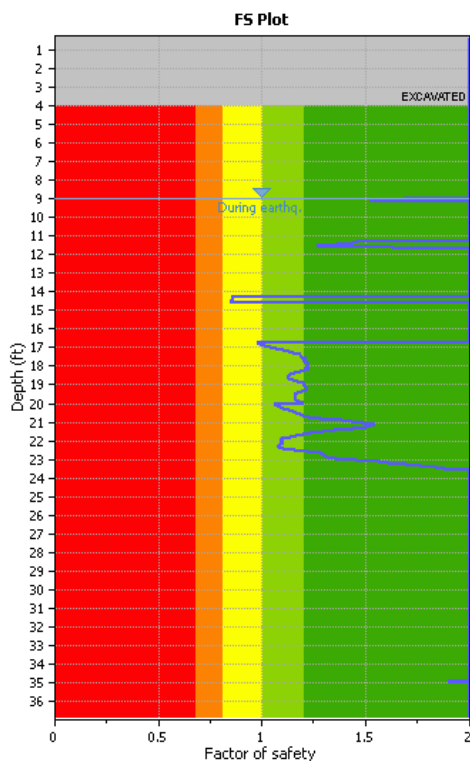


**Figure 4: SPT Based Liquefaction Triggering Evaluation Results.**

**CPT Based Triggering Evaluation Results:**

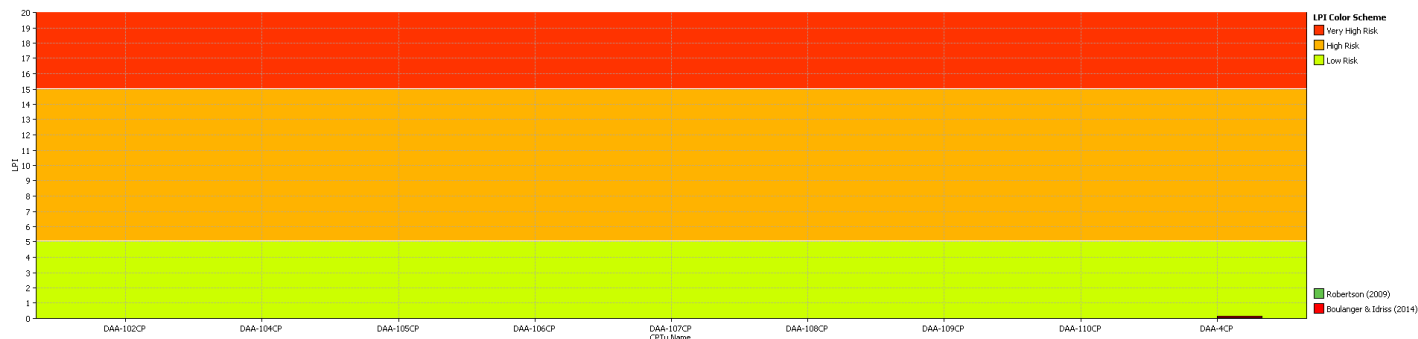
SPT based evaluation indicated that further evaluation was necessary, especially near Boring DAA-4sb. Accordingly, DAA performed a supplemental exploration program in November, 2021 which included one boring (DAA-112pz) and 11 CPT soundings in the areas of interest at this site. Liquefaction triggering evaluation were performed on all CPT soundings, except for DAA-111CP due to shallow refusal encountered at this location. CPT based evaluation results are included in Attachment 1. All the CPT soundings indicated FS against liquefaction triggering of at least 1.0.

CPT sounding DAA-4CP was performed within few feet of Boring DAA-4sb. FS profile for DAA-4CP is presented in Figure 5 and is also presented in Attachment 1. In DAA-4CP, few very thin lenses (less than 6 inches thick) between 14 and 17 ft depth indicated FS less than 1.0. After evaluating these layers, we suspect these to be due to a known issue of CPT sounding called 'thin layer effect'. This effect happens at the layer transitions where soil stiffness varies significantly. Liquefaction evaluations at these transitions are usually considered not representative of the actual condition.



**Figure 5: Estimated FS for DAA-4CP Sounding.**

Figure 6 presents overall summary of the estimated LPI of the CPT soundings. DAA-4CP sounding indicated LPI of less than 1.0. All other CPT soundings indicated LPI of 0.



**Figure 6: Estimated LPI from CPT Based Liquefaction Triggering Evaluation.**

Overall Commentary on Liquefaction Evaluation Results:

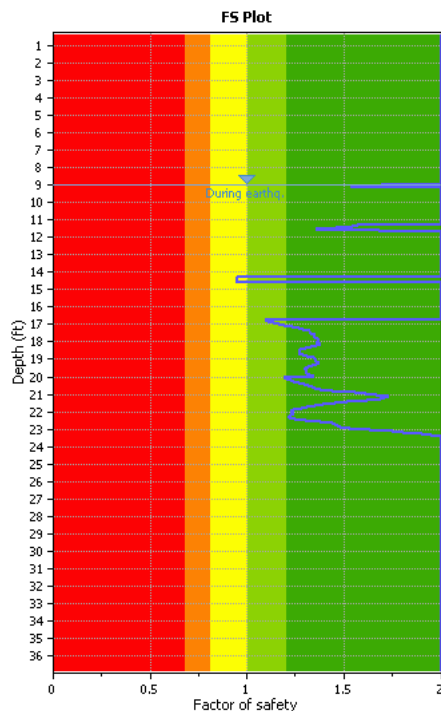
SPT based liquefaction triggering evaluation indicated FS against liquefaction triggering of less than 1.0 for sandy soil layers between 14 and 20 ft depth (EL 333.5 and 327.5) in Boring DAA-4sb. However, LPI was estimated less than 4.0. LPI below 5.0 was reported to be not likely to liquefy by Iwasake et al. (1978).

CPT based liquefaction triggering evaluation indicated FS against liquefaction triggering of at least 1.0 for all the CPT soundings performed at this site, including at the CPT location within a few feet of the Boring DAA-4sb. LPI was estimated less than 1.0.

CPT sounding based liquefaction triggering evaluation technique is generally more trusted and is preferred by the engineering community over SPT based evaluations. This is primarily because quality of data from CPT is superior to SPT, especially for saturated sandy soils below ground water table. Therefore, considering our liquefaction screening evaluation, estimated FS against liquefaction triggering, and LPI values for the borings and CPT soundings, we consider liquefaction is not likely at this site including areas near boring/CPT sounding DAA-4sb/ DAA-CP.

Additionally, our evaluation was based on the consideration of the proposed base grade level. As the liner is placed and consequent filling of the waste material, confining pressure of the underlying foundation strata will increase which will positively increase the CRR, and hence, FS against liquefaction triggering. Figure 7 presents FS against liquefaction with only 5 feet of waste mass (assumed unit weight of 60 pcf) at DAA-4CP location. We can observe about 12% increase of FS with this small filling of waste mass at this location. Similar improvement is also expected in the rest of the site. FS will continue to increase with additional filling of waste mass which will further reduce probability of liquefaction hazard at this site.

Based on supplemental subsurface data (CPT and borings) and our evaluations presented in this section, we believe cyclic liquefaction borne hazard is not likely at this site. Therefore, site conditions are not susceptible to liquefaction and does not need to be incorporated into site design.



**Figure 7: Estimated FS for DAA-4CP Considering 5 feet of Waste Mass Fill Overburden.**



### ***Preliminary Seismic Stability Evaluations***

Preliminary seismic slope stability analyses (pseudo-static stability) were performed at two selected locations across the proposed landfill footprint following the guidelines provided in the EPA document. Figure A shows the approximate locations of the selected north and south sections. The south section is underlain by a deeper soil profile associated with Boring DAA-4sb/ CPT sounding DAA-4cp and involves the tallest portion of the proposed landfill mass. The majority of the north section is underlain by relatively thin section of residual soils and Saprolite. The proposed gradient of the base grade is relatively steeper in the northern section area. We used *Slide2*, a 2-dimensional limit-equilibrium slope stability analysis software by Rocscience, in this study. Per our evaluations presented in a previous section,  $K_s$  of 0.11g was used in this preliminary seismic stability evaluation.

#### **Material Parameter Selection and Stability Model Setup:**

Appendix 3 at the end of this report includes stability models for both the north and south sections. Soil parameters (unit weight, cohesion and friction angle) were developed based on published correlations with the borings and CPT sounding data. We used drained and undrained parameters for the coarse and fine grained soils, respectively, which is customary for pseudo-static analysis. However, undrained shear strength was assigned for the loose sand layer in south section (i.e., Boring DAA-4sb/ CPT DAA-4cp), considering this layer could possibly have a few slightly contractive lenses.

Based on recommendations from the EPA document and some other published data (Stark & Huvaj-Sarihan, 2009, and Reddy et al., 2009), we estimated MSW unit weight, cohesion and friction angle to be 60 pcf, 500 psf and 20 degrees, respectively. Based on a communication with DAA on February 10, 2022, we understand the conceptual bottom liner section involves (top to bottom):

- 18 inches thick gravel leachate collection layer
- Geocomposite drainage net
- 60 mil textured High Density Polyethylene (HDPE) liner
- Geosynthetic Clay Liner (GCL), and
- 12 inches thick layer of compacted subgrade

Based on our experience with landfill design, the interface between GCL and subgrade soil usually has the lowest resistance against sliding along the contact plane among all interfaces within the liner structure. Accordingly, based on experience, we selected the peak and residual friction angles as low as 17 and 8 degrees, respectively, for this interface. The interface between GCL and subgrade soil was modeled using a feature available in SLIDE2 'Weak Layer', although we did not limit the failure surfaces only through the weak layer. Stark & Poeppel (1994) studied applicability of peak and residual shear strengths of GCL-Soil interface and concluded that due to settlement within waste mass, residual strength will possibly mobilize in this interface within the side slopes while peak strength should be applicable at the base. Accordingly, we have used residual friction angle ( $\phi = 8$  degrees) for the weak layer (i.e., GCL-Soil interface) in the side slopes while peak friction angle (i.e.,  $\phi = 17$  degrees) was assigned for the weak layer at the bottom liner location.

In SLIDE2, both the south and north sections were analyzed using Spencer's Method. The failure surface (i.e., slip surface) search engine in SLIDE2 evaluates the entire section for possible circular/ non-circular (i.e., block) slip surfaces and derive the surface with the minimum FS.

Overall Outcome of Stability Evaluations:

Appendix 3 at the end of this report includes stability analysis results for both the north and south sections. In the results pages in Appendix 3, FS for the slip surfaces and corresponding center points are presented using heat maps in addition to the Global Minimum Slip Surface (and corresponding FS).

Based on our stability analyses, both the north and south sections appear to have the minimum FS slightly above 1.0. Per the EPA document (see below screen capture from Section 6.2, Page 107), FS above 1.0 is acceptable for pseudo-static stability evaluation, provided up to about 1.0 ft of deformation is tolerable for this 2,500 year design event (return period).

**Step 3:** Perform the pseudo-static stability analysis. If the minimum factor of safety,  $FS_{min}$ , exceeds 1.0 and 0.3 m (1 ft) of deformation is acceptable, the seismic stability analysis is completed.

Based on these results, our assessment is: both the south and north sections are stable under seismic inertial loading conditions. Hence, based on this preliminary evaluation, we think the proposed facility can be designed to be stable under the design seismic event. At both the south and north sections, the minimum slip surfaces traversed through the weak layer (i.e., GCL-Soil interface). This highlights the fact that this interface controls the stability of the structure. During the design phase of this project, we recommend care should be given to assess the validity of the sets of assumptions that were made in this study, especially regarding the strength parameters of the GCL-Soil interface.

## LIMITATIONS

This report is intended for use concerning this specific project. We based the analyses and recommendations submitted in this report on the available information. Substantial changes in loads, locations, or grades should also be brought to our attention so we can modify our recommendations as needed.

We have endeavored to complete the services identified herein in a manner consistent with that level of care and skill ordinarily exercised by members of the profession currently practicing in the same locality and under similar conditions as this project. No other representation, express or implied, is included or intended, and no warranty or guarantee is included or intended in this report, or other instrument of service.

We appreciate the opportunity to be of service for this project. Please call us if you have any questions regarding this report.

Sincerely,

**SCHNABEL ENGINEERING, LLC**



Md. Ariful H. Bhuiyan, PhD, PE  
Project Engineer



Steven E. Conner, PE  
Principal Engineer

MHB:SEC:rm



## **ATTACHMENTS**

Figure A – Test Location Plan (Provided by DAA)

Attachment 1 – Liquefaction Triggering Evaluation – CPT Based Approach

Attachment 2 – Preliminary Seismic Stability Evaluation

- North Section
- South Section

Attachment 3 – Subsurface Exploration Data Provided by DAA

- CPT Sounding Report by Conetec
- Log of DAA 2021 Boring, DAA-112pz
- Logs of DAA Borings from 2019
- Laboratory Test Summary from DAA's 2019 Exploration
- Logs of KBJW Borings from 2017

## REFERENCES

Boulanger, R. W., and I. M. Idriss. CPT and SPT based liquefaction triggering procedures. *Report No. UCD/CGM.-14 1*, 2014.

Green, R.A., Maurer, B.W. and van Ballegooy, S. "The influence of the non-liquefied crust on the severity of surficial liquefaction manifestations: Case history from the 2016 Valentine's Day earthquake in New Zealand." In *Geotechnical Earthquake Engineering and Soil Dynamics V: Liquefaction Triggering, Consequences, and Mitigation*, pp. 21-32. Reston, VA: American Society of Civil Engineers, 2018.

Iwasaki, T., Tatsuoka, F., Tokida, K., & Yasuda, S. (1978). "A practical method for assessing soil liquefaction potential based on case studies at various sites in Japan." *Proc. 2nd Intern. Conf. Microzonation*, Vol. 2 (1978): 885-896.

Li, D.K., Juang, C.H., & Andrus, R.D. "Liquefaction potential index: a critical assessment using probability concept." *Journal of GeoEngineering* 1, no. 1 (2006): 11-24.

Reddy, Krishna R., Janardhanan Gangathulasi, Naveen S. Parakalla, Hiroshan Hettiarachchi, Jean E. Bogner, and Thomas Lagier. "Compressibility and shear strength of municipal solid waste under short-term leachate recirculation operations." *Waste Management & Research* 27, no. 6 (2009): 578-587.

Richardson, Gregory Neil, Edward Kavazanjian, and Neven Matasovi. "RCRA Subtitle D (258) Seismic design guidance for municipal solid waste landfill facilities." Risk Reduction Engineering Laboratory, Office of Research and Development, *US Environmental Protection Agency*, 1995.

Robertson, P.K. "Performance based earthquake design using the CPT", Keynote Lecture, International Conference on Performance-based Design in Earthquake Geotechnical Engineering - from case history to practice, IS -Tokyo (2009).

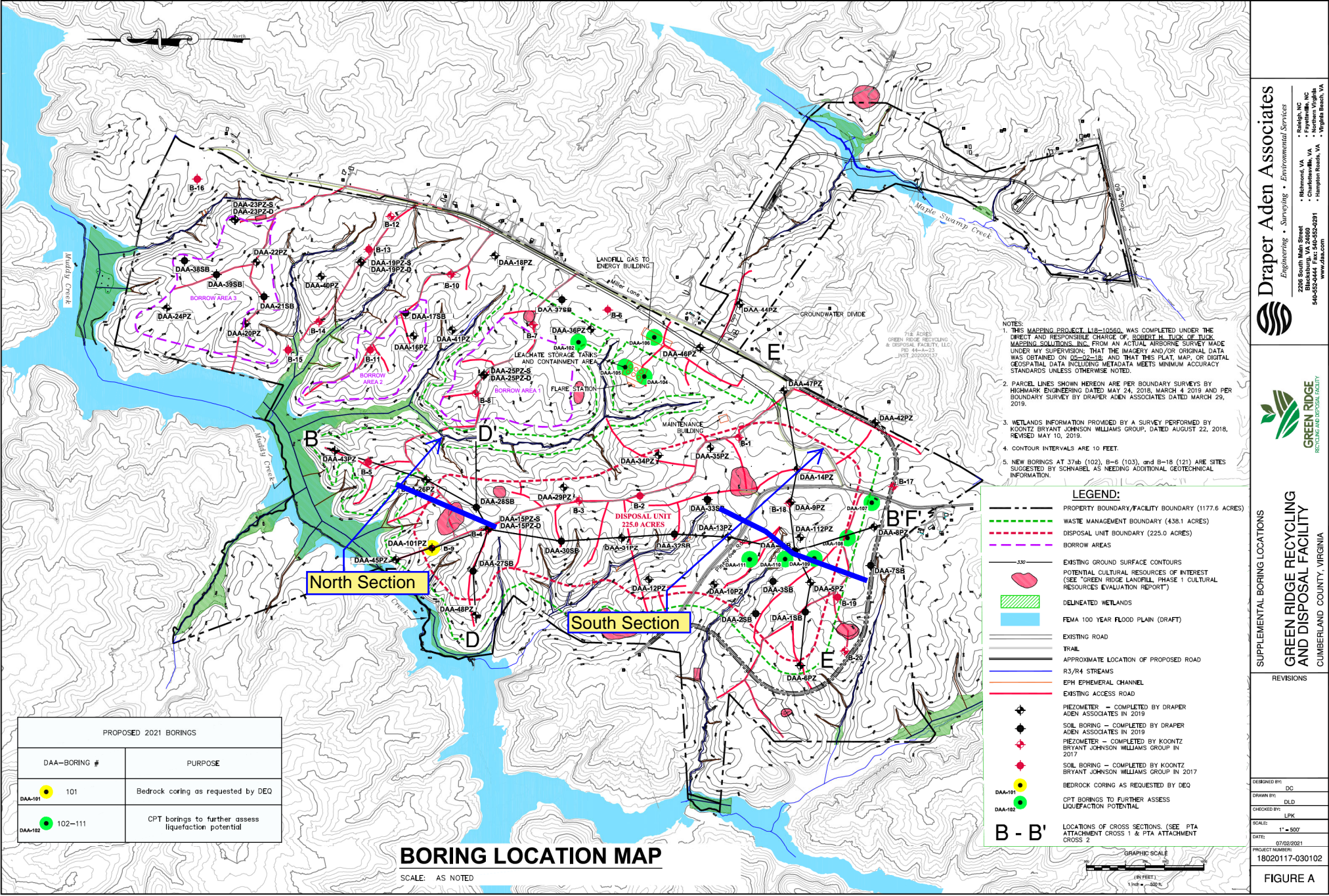
Stark, Timothy D., and Alan R. Poeppel. "Landfill liner interface strengths from torsional-ring-shear tests." *Journal of Geotechnical Engineering* 120, no. 3 (1994): 597-615.

Stark, Timothy D., Nejan Huvaj-Sarihan, and Guocheng Li. "Shear strength of municipal solid waste for stability analyses." *Environmental geology* 57, no. 8 (2009): 1911-1923.

Toprak, S., and Holzer, T.L. "Liquefaction potential index: Field assessment." *Journal of Geotechnical and Geoenvironmental Engineering* 129, no. 4 (2003): 315-322



FIGURE A - TEST LOCATION PLAN (PROVIDED BY DAA)



**Draper Aden Associates**  
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Blacksburg, VA 24060  
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CUMBERLAND COUNTY, VIRGINIA

**GREEN RIDGE RECYCLING AND DISPOSAL FACILITY**  
CUMBERLAND COUNTY, VIRGINIA

REVISIONS

# **ATTACHMENT 1 - LIQUEFACTION TRIGGERING EVALUATION – CPT BASED APPROACH**

# LIQUEFACTION TRIGGERING EVALUATION - CPT BASED APPROACH

## TABLE OF CONTENTS

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## LIQUEFACTION ANALYSIS REPORT

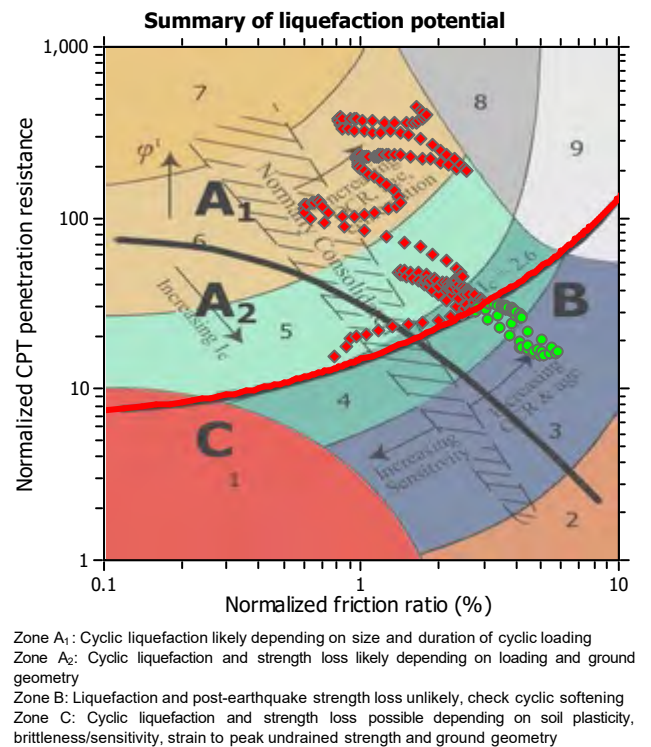
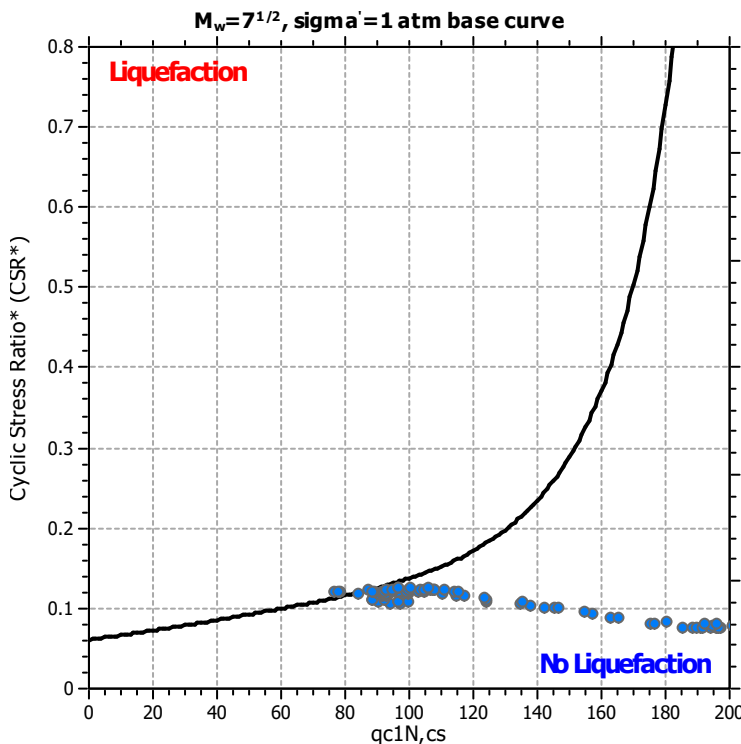
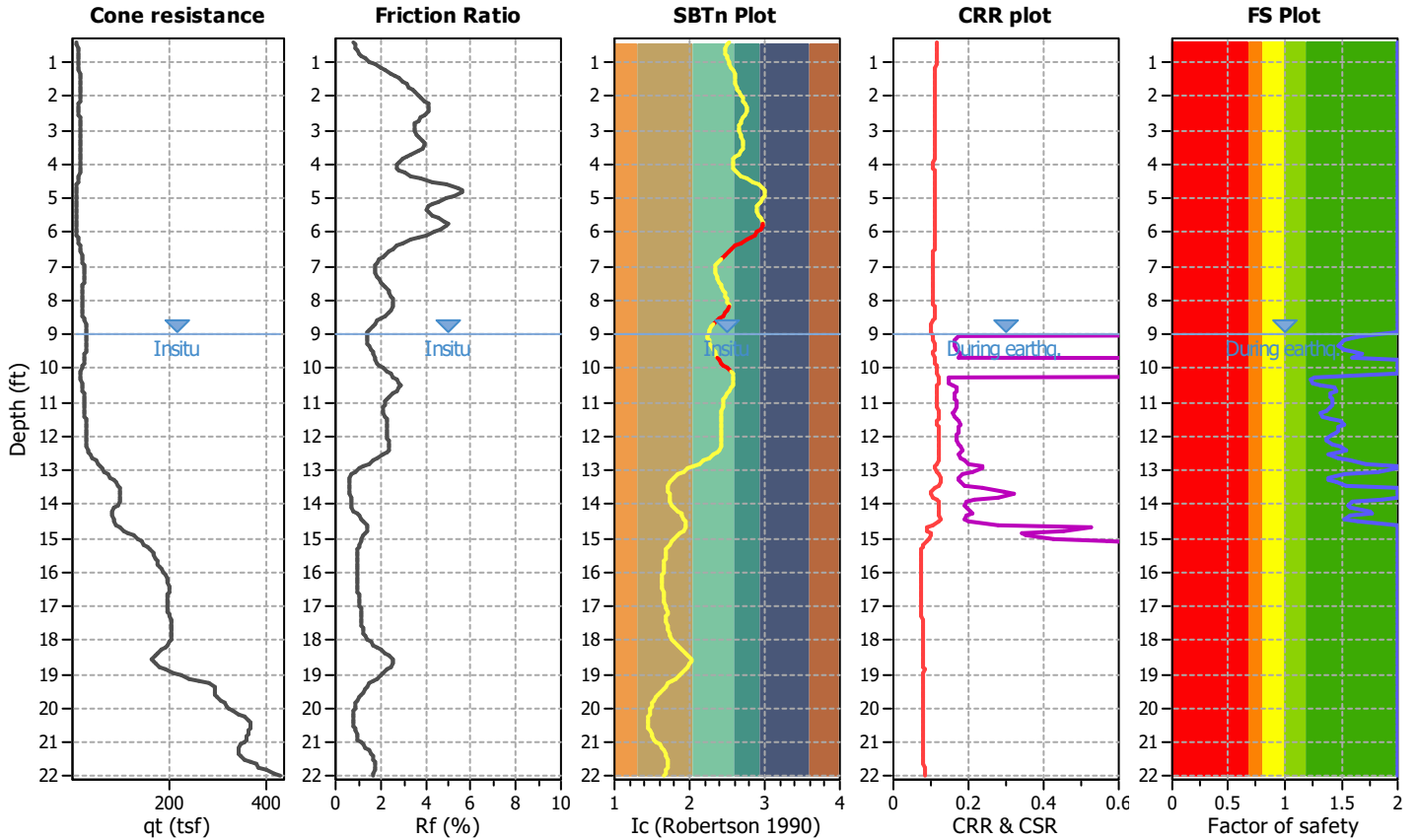
**Project title :** Green Ridge RDF - Part A Permit Application

**Location :** Cumberland County, Virginia

**CPT file :** DAA-102CP

### Input parameters and analysis data

Analysis method:	B&I (2014)	G.W.T. (in-situ):	9.00 ft	Use fill:	No	Clay like behavior applied:	Sand & Clay
Fines correction method:	B&I (2014)	G.W.T. (earthq.):	9.00 ft	Fill height:	N/A	Limit depth applied:	Yes
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Earthquake magnitude $M_w$ :	5.44	Ic cut-off value:	2.60	Trans. detect. applied:	Yes	MSF method:	Method based
Peak ground acceleration:	0.22	Unit weight calculation:	Based on SBT	$K_\sigma$ applied:	Yes		





## LIQUEFACTION ANALYSIS REPORT

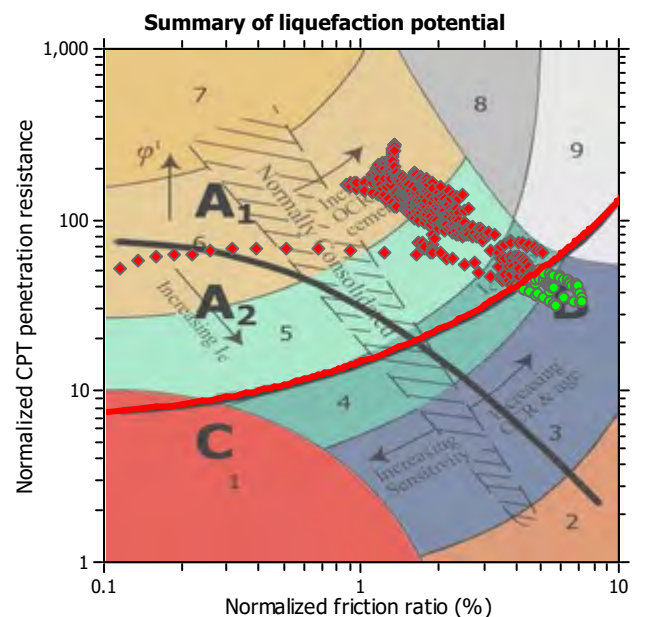
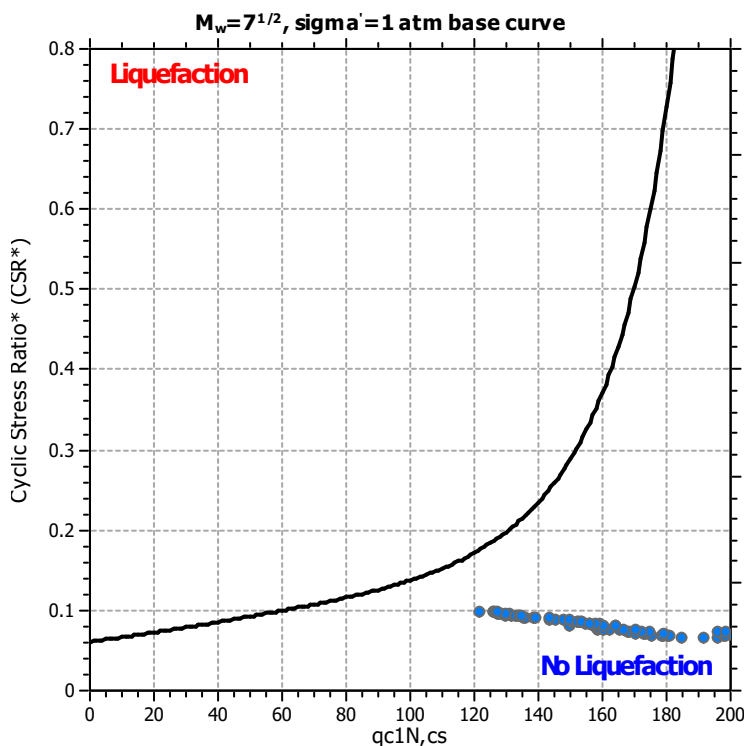
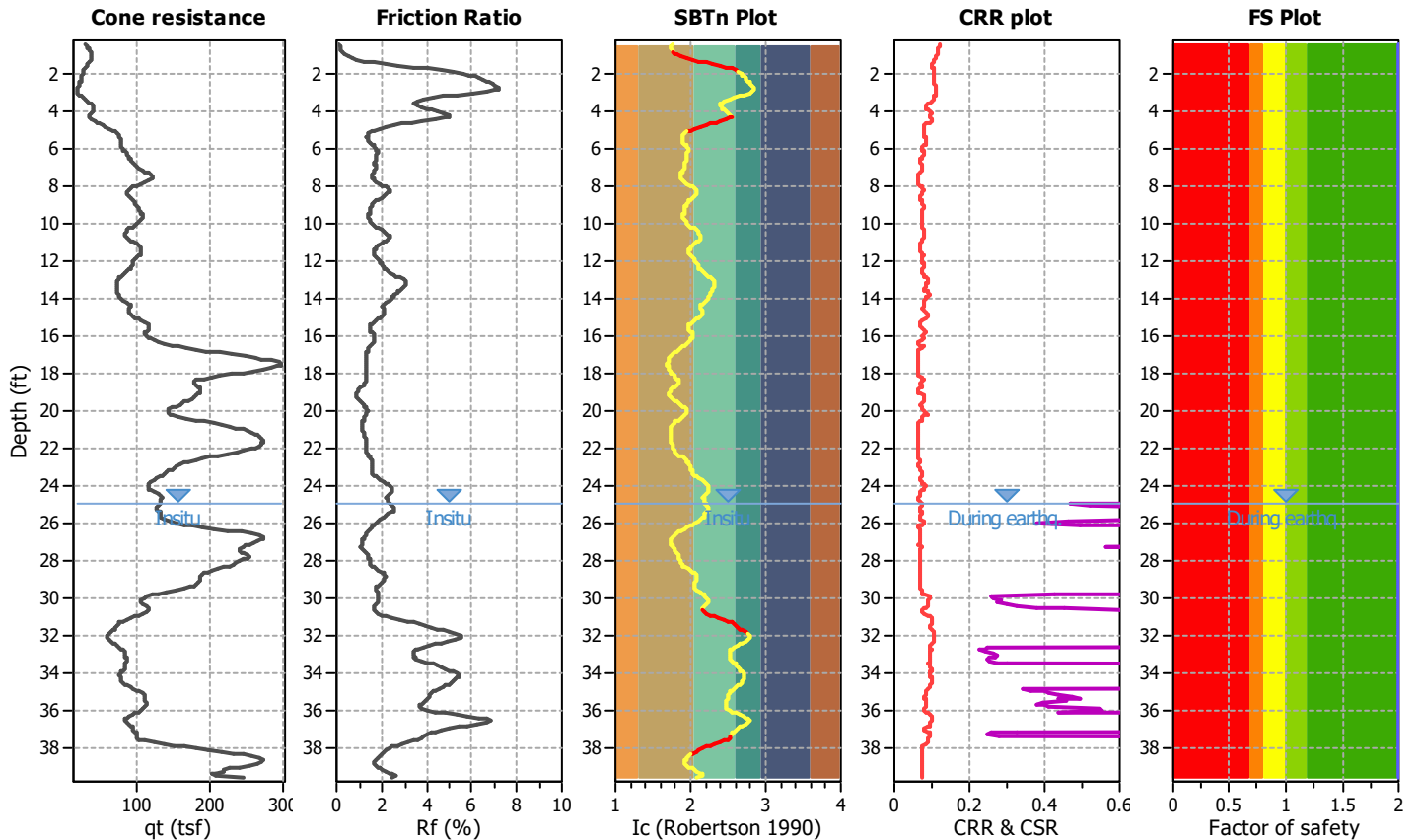
**Project title :** Green Ridge RDF - Part A Permit Application

**Location :** Cumberland County, Virginia

**CPT file :** DAA-104CP

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Points to test:	Based on Ic value	Average results interval:	.	Fill weight:	N/A	MSF method:	Method based
Earthquake magnitude $M_w$ :	5.44	Ic cut-off value:	2.60	Trans. detect. applied:	Yes	Limit depth:	60.00 ft
Peak ground acceleration:	0.22	Unit weight calculation:	Based on SBT	$K_\sigma$ applied:	Yes		



Zone A<sub>1</sub>: Cyclic liquefaction likely depending on size and duration of cyclic loading  
 Zone A<sub>2</sub>: Cyclic liquefaction and strength loss likely depending on loading and ground geometry  
 Zone B: Liquefaction and post-earthquake strength loss unlikely, check cyclic softening  
 Zone C: Cyclic liquefaction and strength loss possible depending on soil plasticity, brittleness/sensitivity, strain to peak undrained strength and ground geometry

## LIQUEFACTION ANALYSIS REPORT

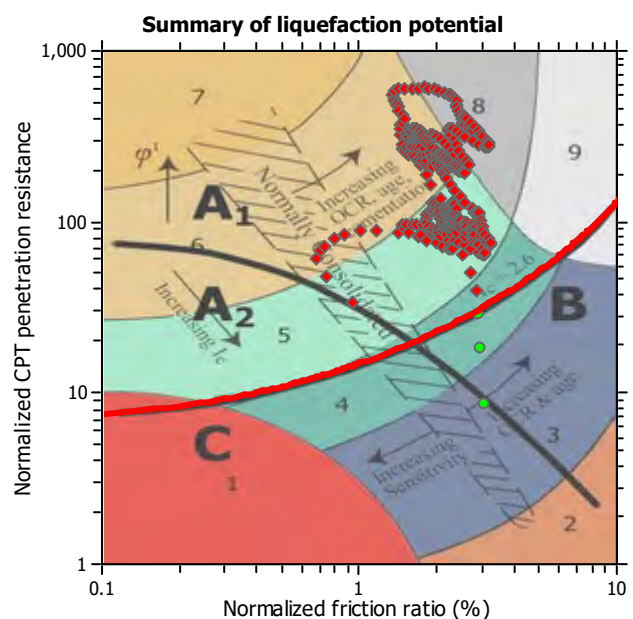
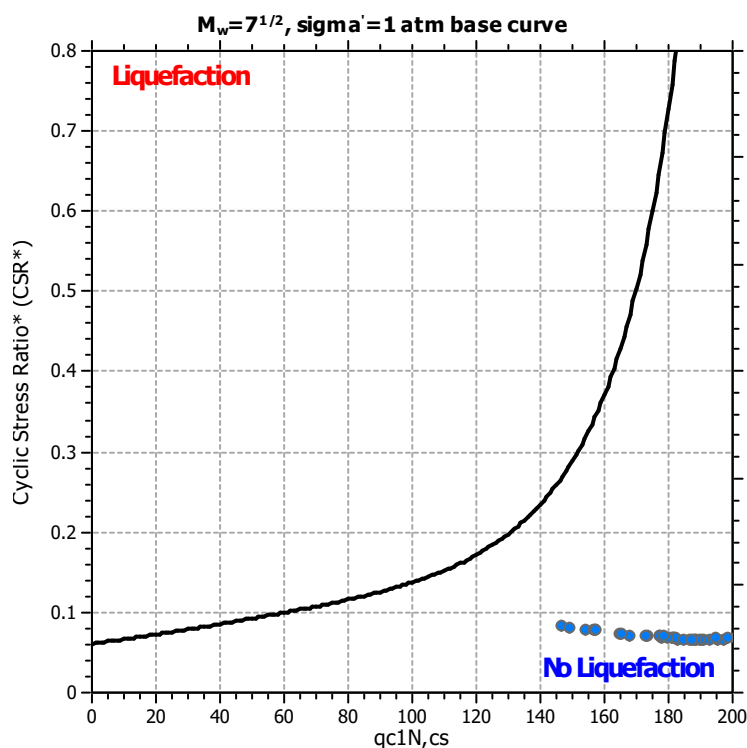
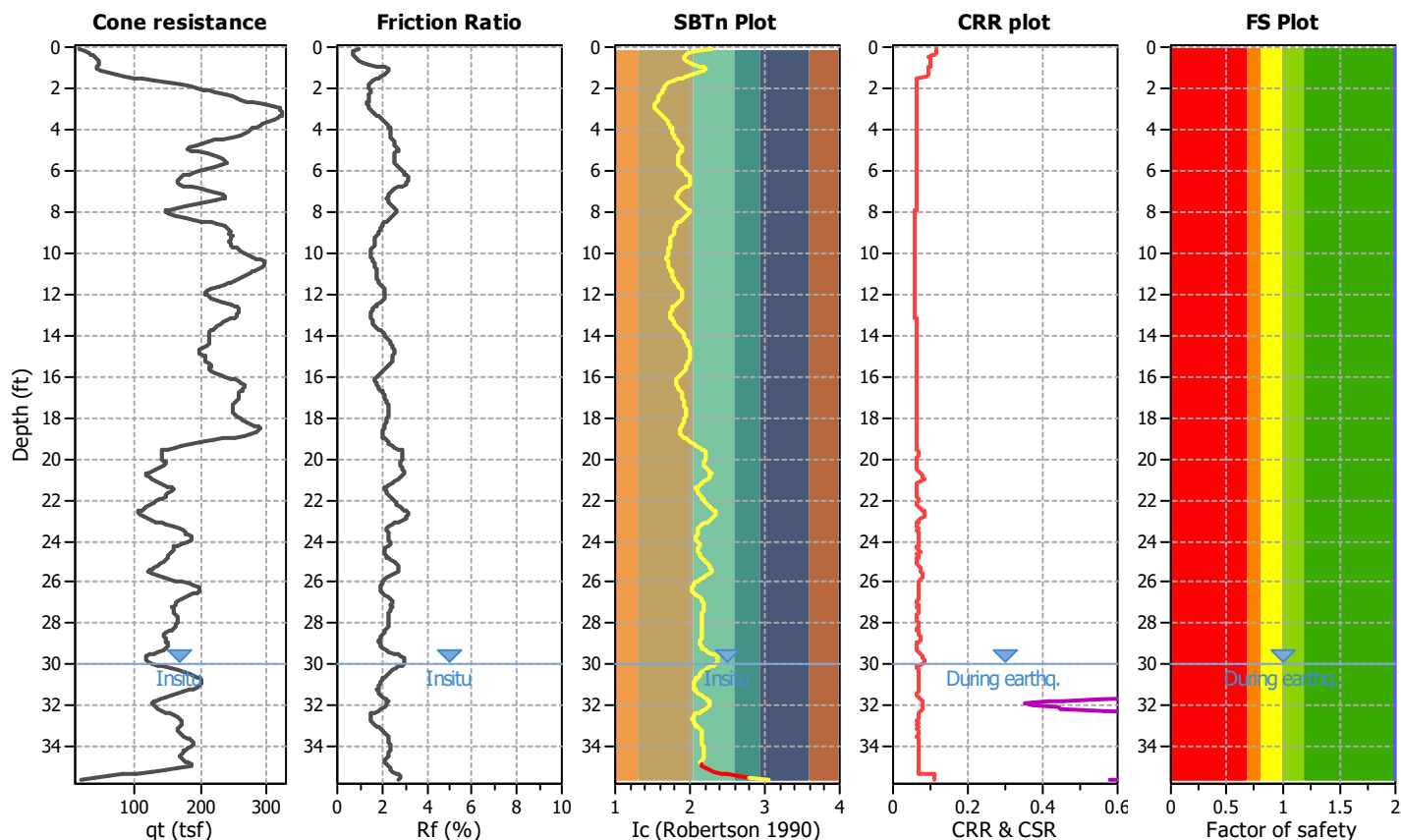
**Project title :** Green Ridge RDF - Part A Permit Application

**Location :** Cumberland County, Virginia

**CPT file :** DAA-105CP

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Earthquake magnitude $M_w$ :	5.44	Ic cut-off value:	2.60	Trans. detect. applied:	Yes	MSF method:	Method based
Peak ground acceleration:	0.22	Unit weight calculation:	Based on SBT	$K_\sigma$ applied:	Yes		



Zone A<sub>1</sub>: Cyclic liquefaction likely depending on size and duration of cyclic loading  
 Zone A<sub>2</sub>: Cyclic liquefaction and strength loss likely depending on loading and ground geometry  
 Zone B: Liquefaction and post-earthquake strength loss unlikely, check cyclic softening  
 Zone C: Cyclic liquefaction and strength loss possible depending on soil plasticity, brittleness/sensitivity, strain to peak undrained strength and ground geometry

## LIQUEFACTION ANALYSIS REPORT

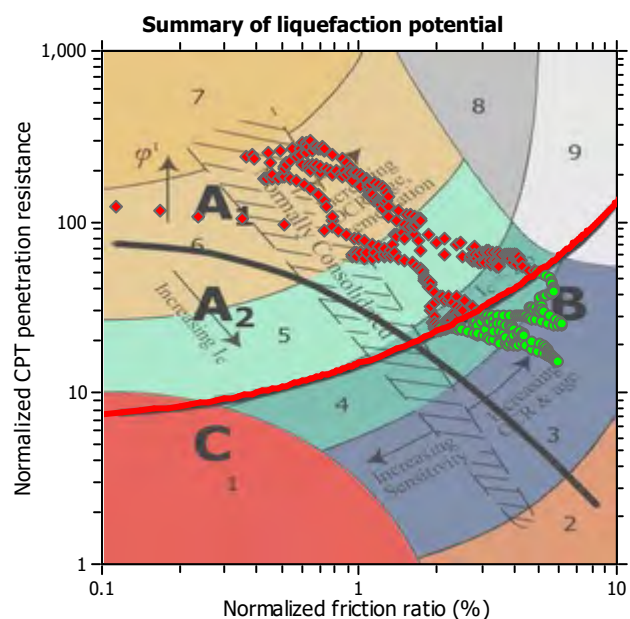
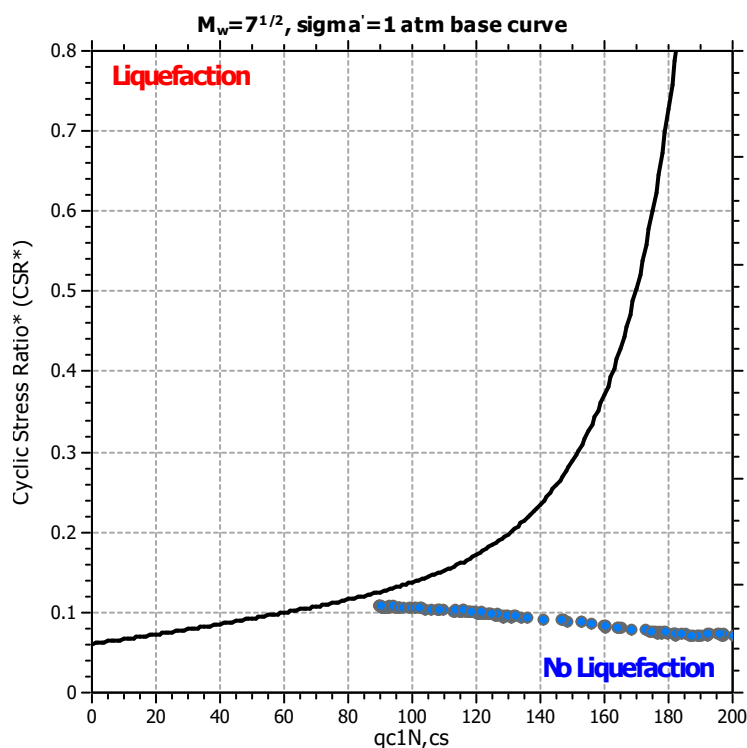
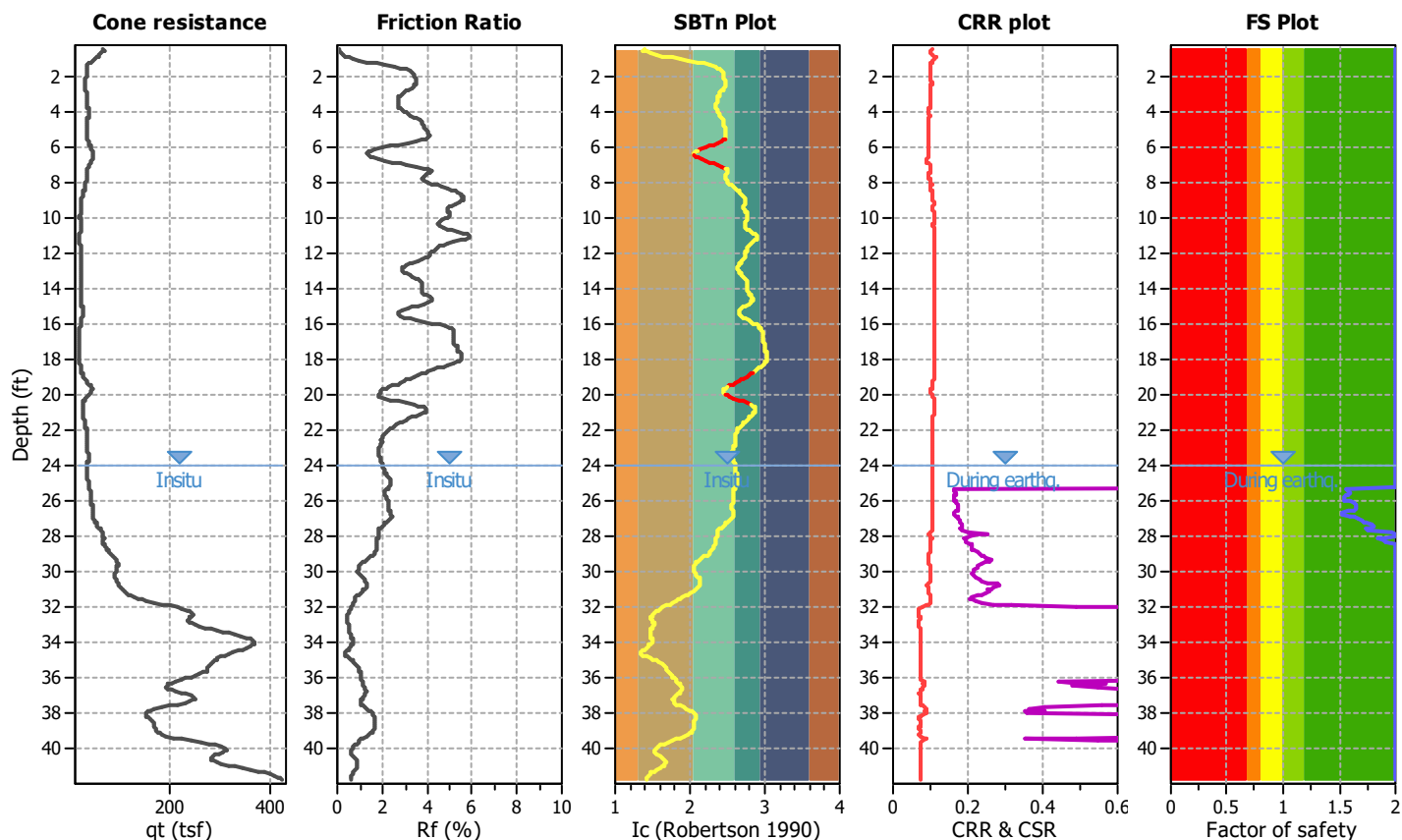
**Project title :** Green Ridge RDF - Part A Permit Application

**Location :** Cumberland County, Virginia

**CPT file :** DAA-106CP

### Input parameters and analysis data

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Points to test:	Based on Ic value	Average results interval:	.	Fill weight:	N/A	Limit depth:	60.00 ft
Earthquake magnitude $M_w$ :	5.44	Ic cut-off value:	2.60	Trans. detect. applied:	Yes	MSF method:	Method based
Peak ground acceleration:	0.22	Unit weight calculation:	Based on SBT	$K_\sigma$ applied:	Yes		



Zone A<sub>1</sub>: Cyclic liquefaction likely depending on size and duration of cyclic loading  
 Zone A<sub>2</sub>: Cyclic liquefaction and strength loss likely depending on loading and ground geometry  
 Zone B: Liquefaction and post-earthquake strength loss unlikely, check cyclic softening  
 Zone C: Cyclic liquefaction and strength loss possible depending on soil plasticity, brittleness/sensitivity, strain to peak undrained strength and ground geometry

## LIQUEFACTION ANALYSIS REPORT

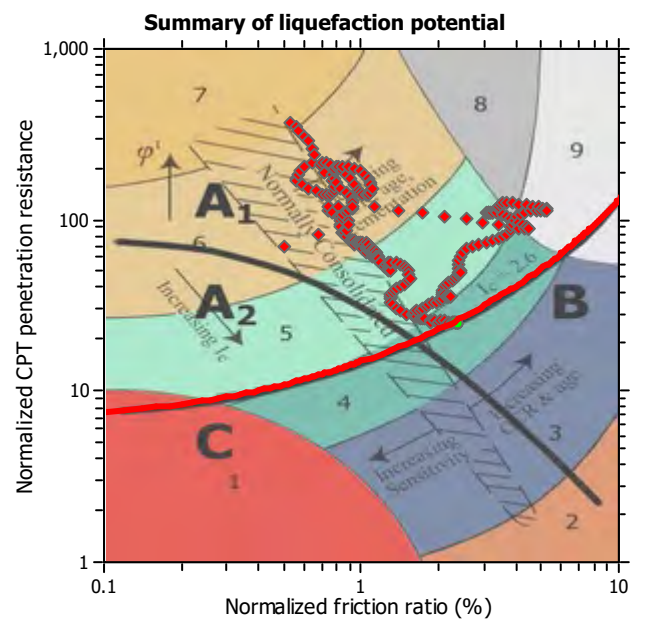
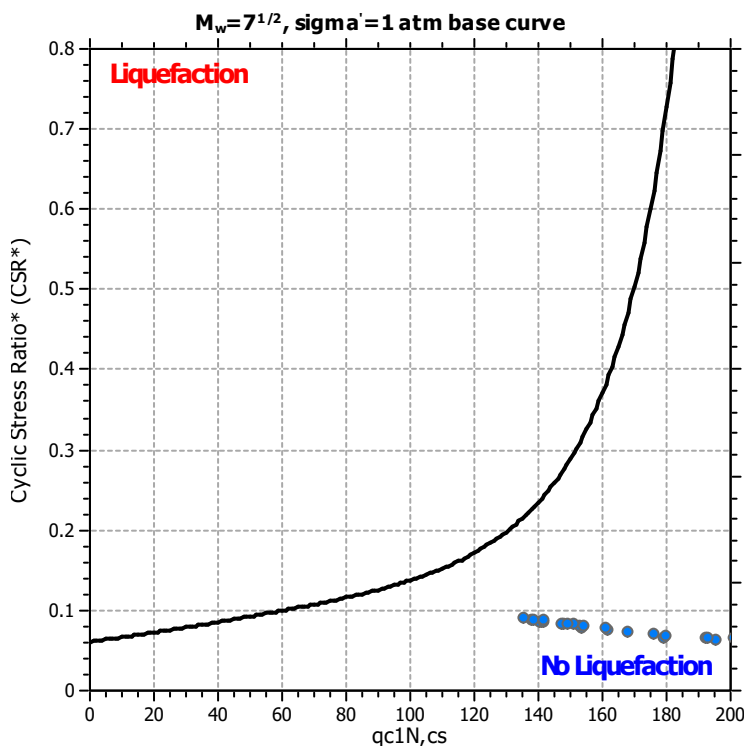
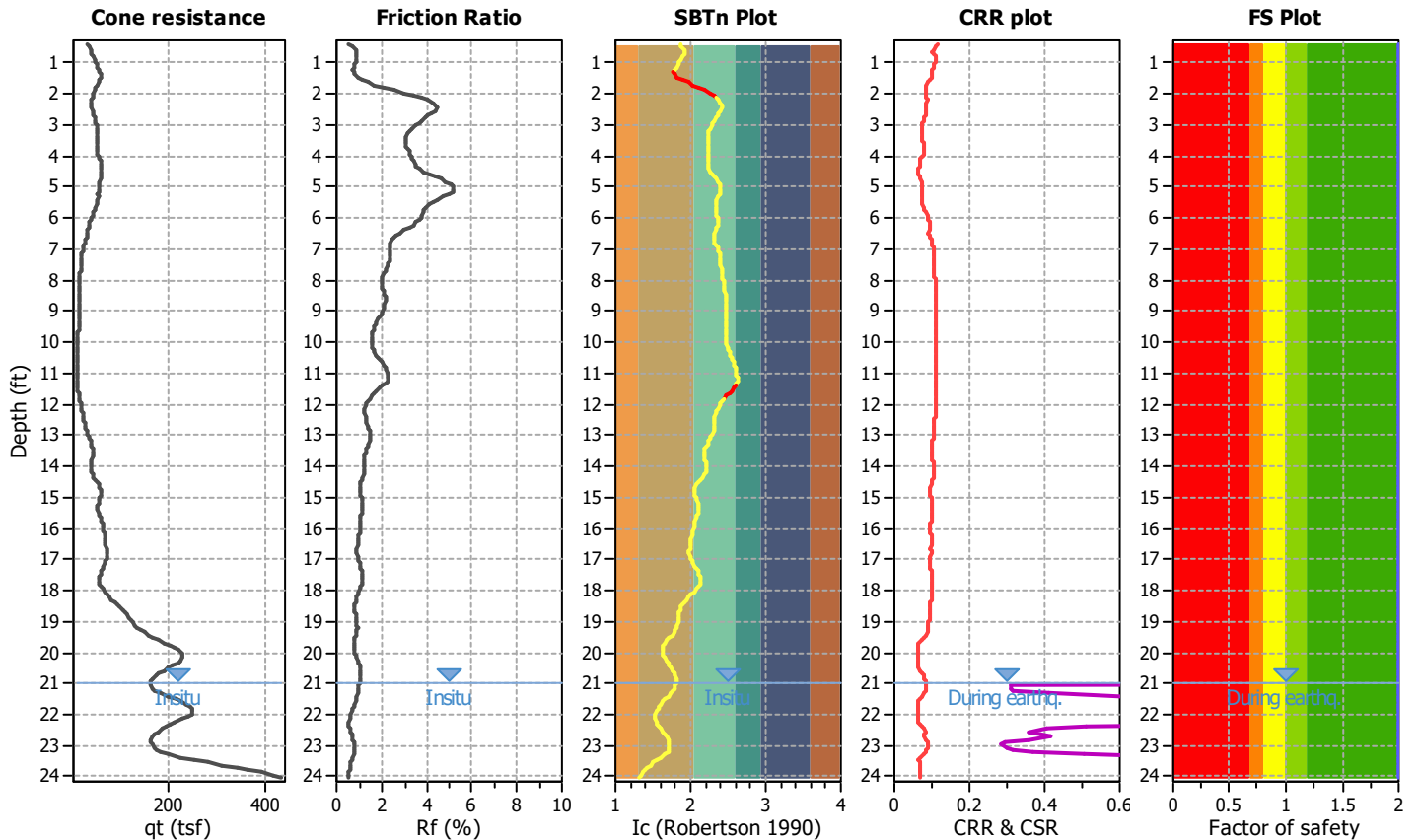
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**Location :** Cumberland County, Virginia

**CPT file :** DAA-107CP

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Points to test:	Based on Ic value	Average results interval:	.	Fill weight:	N/A	Limit depth:	60.00 ft
Earthquake magnitude $M_w$ :	5.44	Ic cut-off value:	2.60	Trans. detect. applied:	Yes	MSF method:	Method based
Peak ground acceleration:	0.22	Unit weight calculation:	Based on SBT	$K_\sigma$ applied:	Yes		



Zone A<sub>1</sub>: Cyclic liquefaction likely depending on size and duration of cyclic loading  
 Zone A<sub>2</sub>: Cyclic liquefaction and strength loss likely depending on loading and ground geometry  
 Zone B: Liquefaction and post-earthquake strength loss unlikely, check cyclic softening  
 Zone C: Cyclic liquefaction and strength loss possible depending on soil plasticity, brittleness/sensitivity, strain to peak undrained strength and ground geometry



## LIQUEFACTION ANALYSIS REPORT

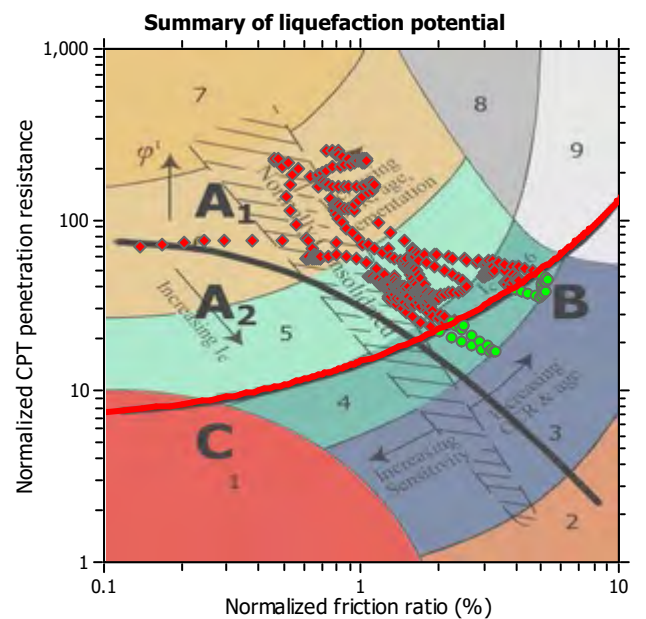
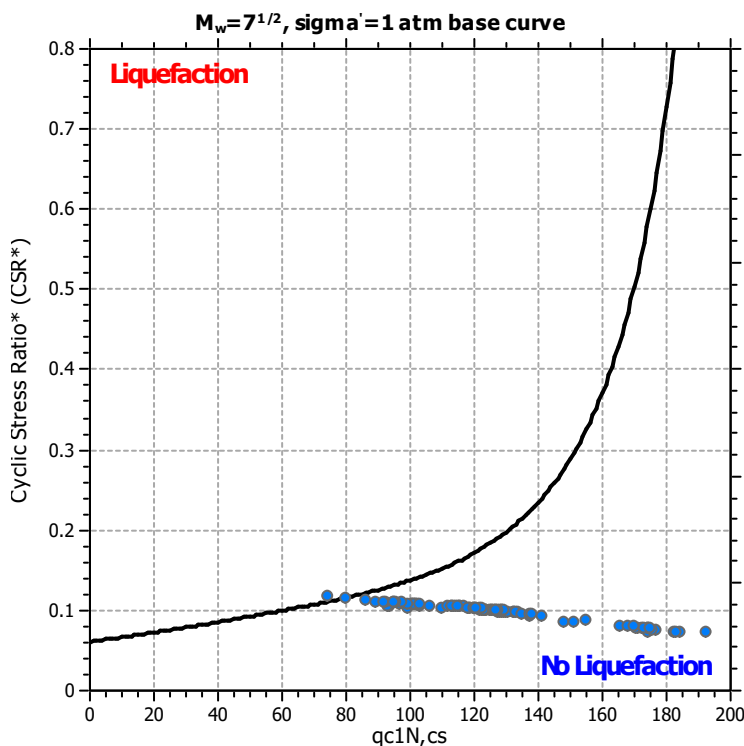
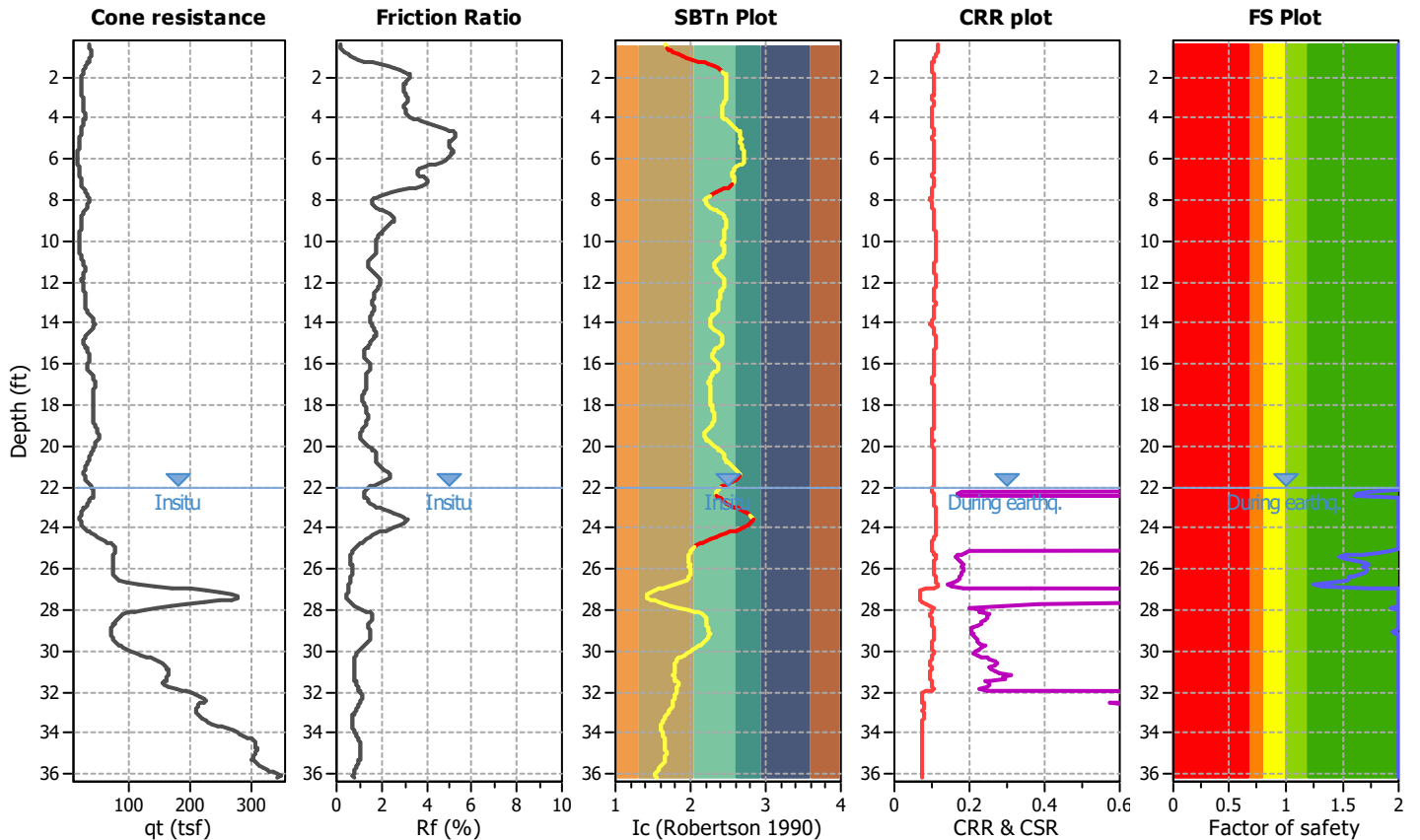
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**Location :** Cumberland County, Virginia

**CPT file :** DAA-108CP

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Earthquake magnitude $M_w$ :	5.44	Ic cut-off value:	2.60	Trans. detect. applied:	Yes	MSF method:	Method based
Peak ground acceleration:	0.22	Unit weight calculation:	Based on SBT	$K_\sigma$ applied:	Yes		



Zone A<sub>1</sub>: Cyclic liquefaction likely depending on size and duration of cyclic loading  
 Zone A<sub>2</sub>: Cyclic liquefaction and strength loss likely depending on loading and ground geometry  
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## LIQUEFACTION ANALYSIS REPORT

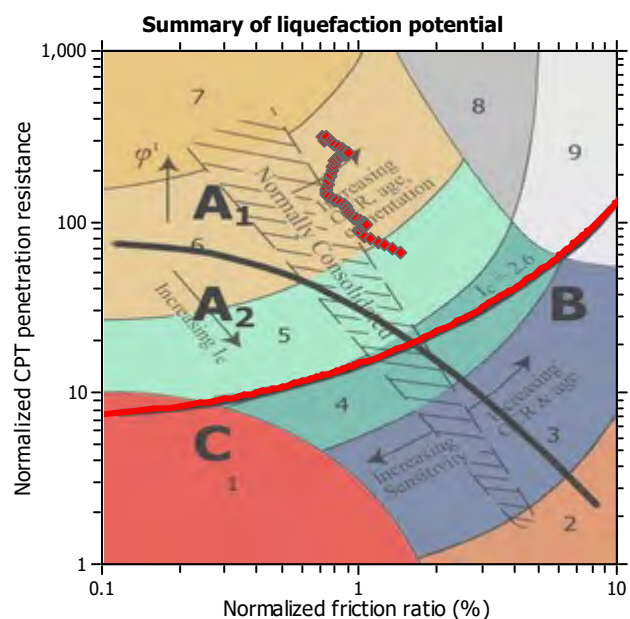
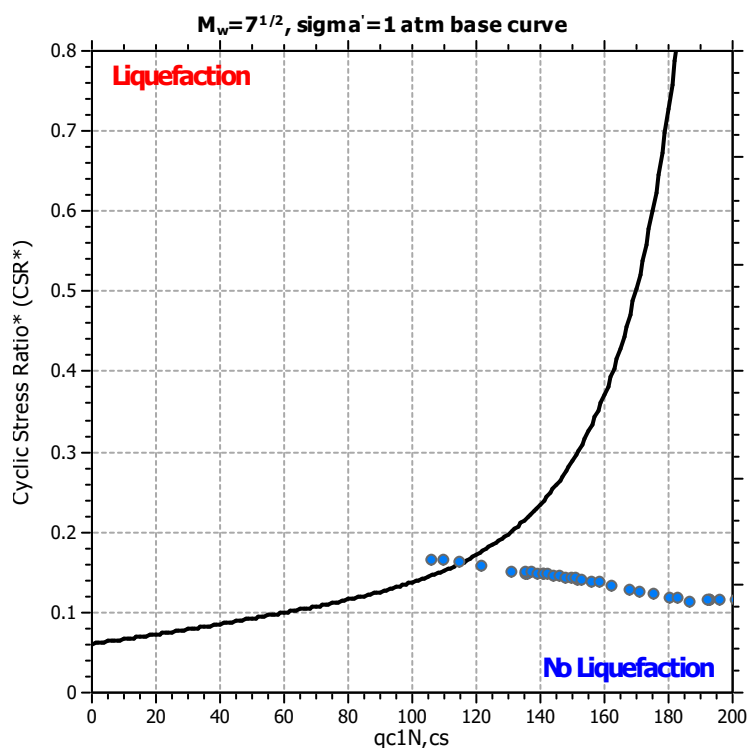
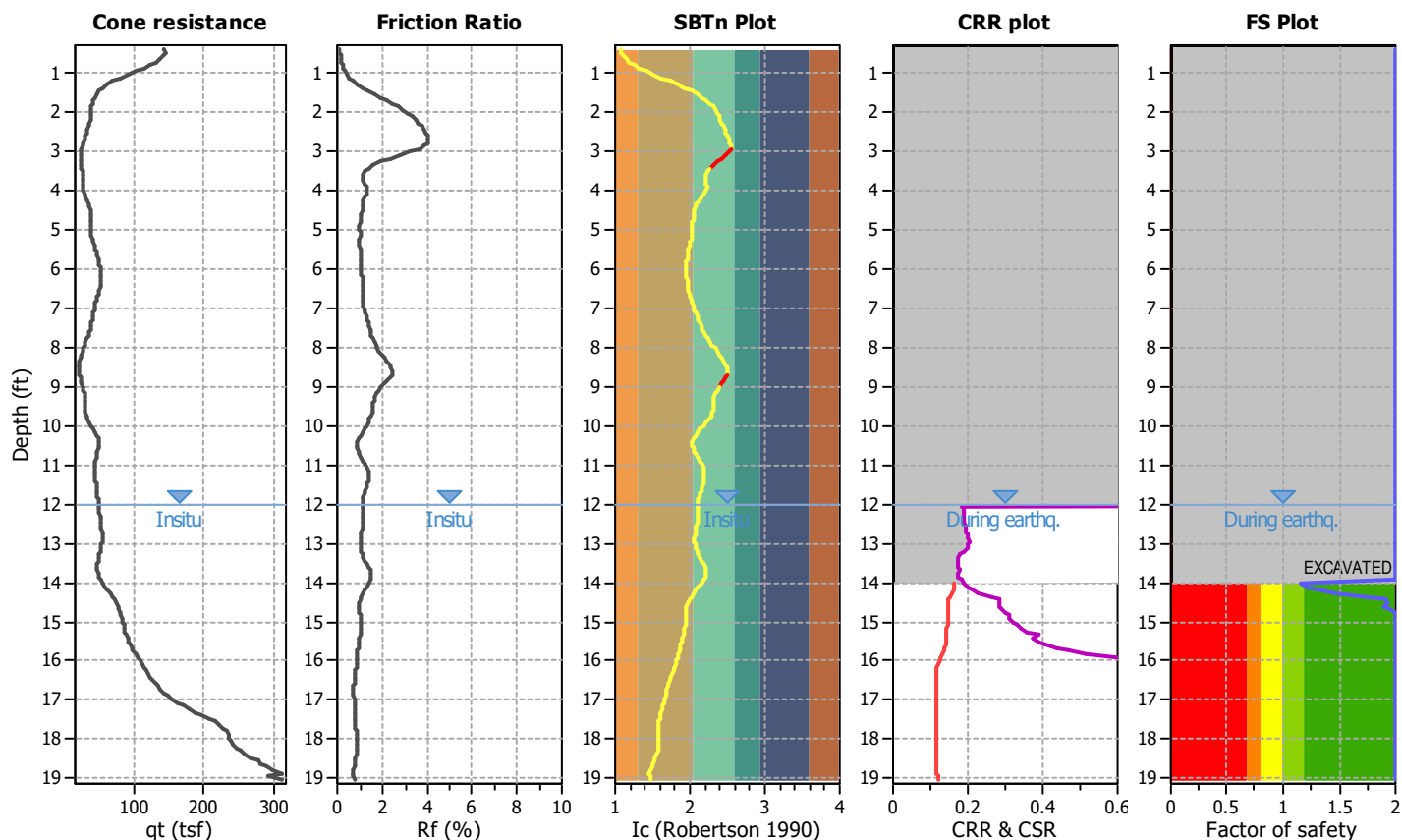
**Project title :** Green Ridge RDF - Part A Permit Application

**Location :** Cumberland County, Virginia

**CPT file :** DAA-109CP

### Input parameters and analysis data

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Earthquake magnitude $M_w$ :	5.44	Ic cut-off value:	2.60	Trans. detect. applied:	Yes	Limit depth:	60.00 ft
Peak ground acceleration:	0.22	Unit weight calculation:	Based on SBT	$K_\sigma$ applied:	Yes	MSF method:	Method based



Zone A<sub>1</sub>: Cyclic liquefaction likely depending on size and duration of cyclic loading  
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 Zone C: Cyclic liquefaction and strength loss possible depending on soil plasticity, brittleness/sensitivity, strain to peak undrained strength and ground geometry

## LIQUEFACTION ANALYSIS REPORT

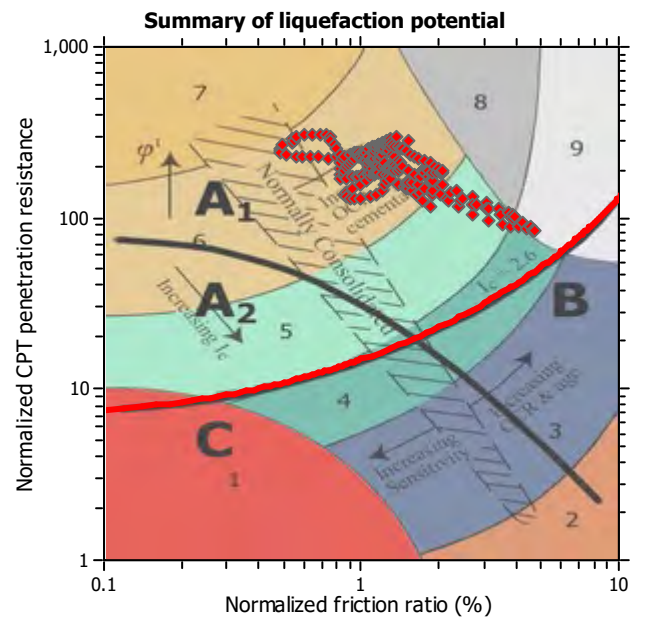
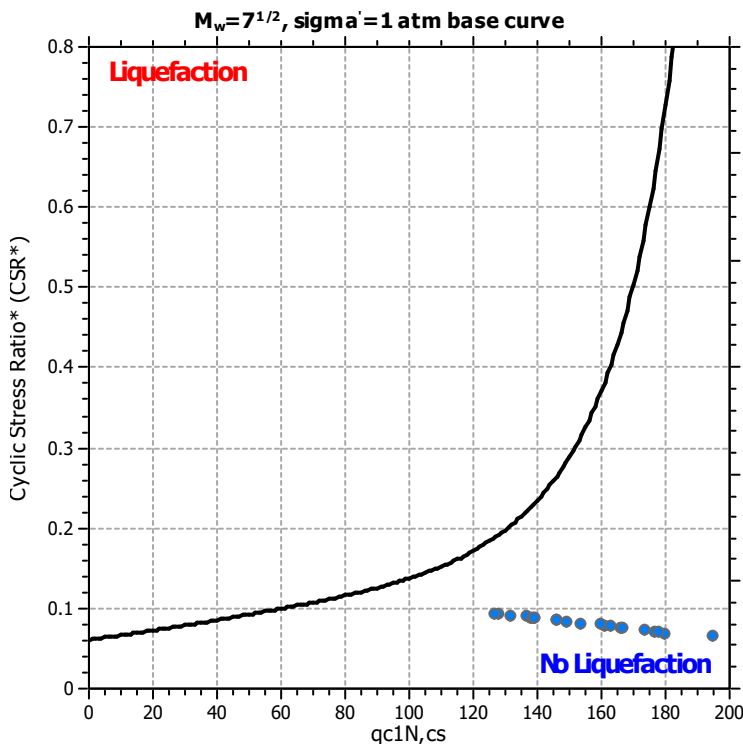
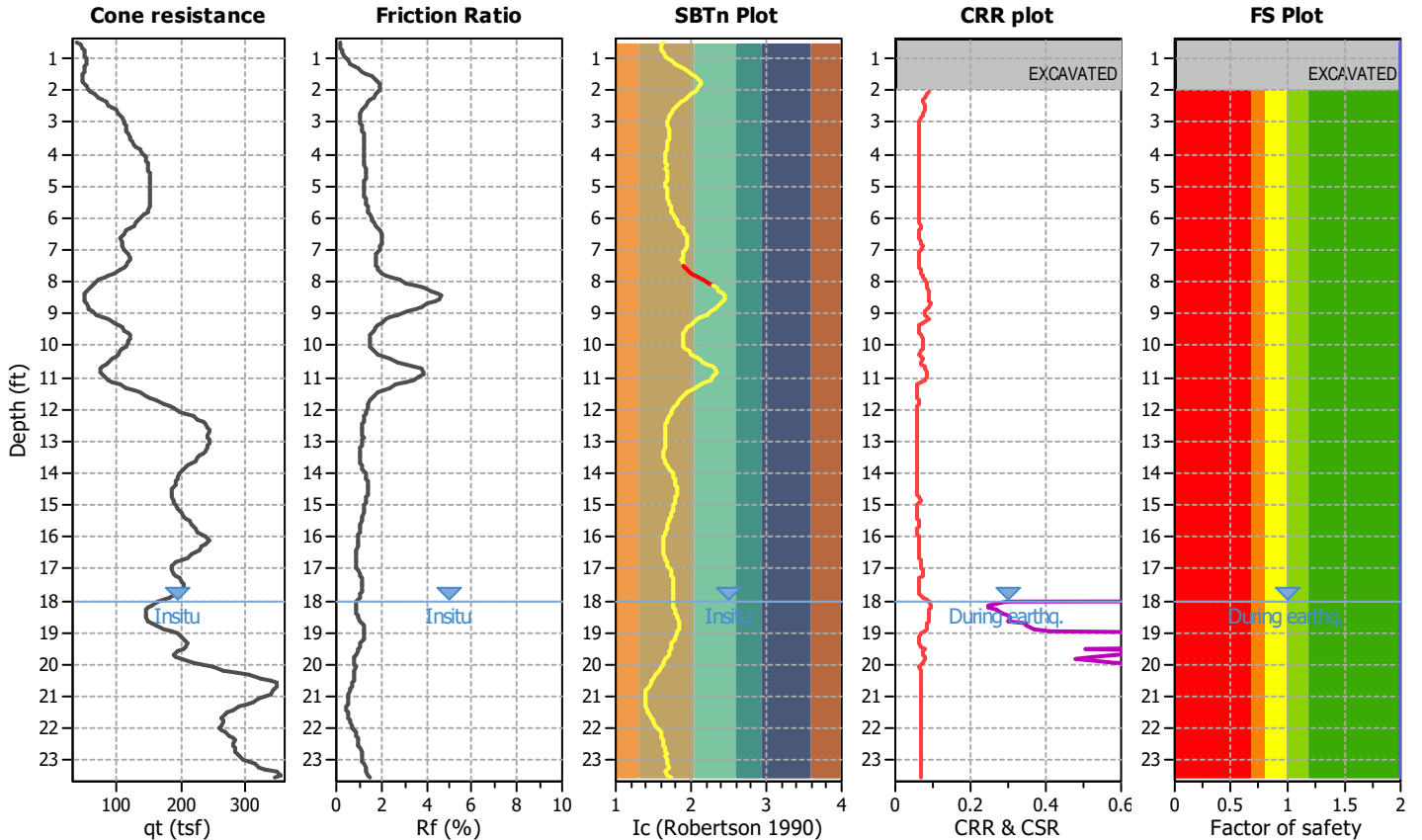
**Project title :** Green Ridge RDF - Part A Permit Application

**Location :** Cumberland County, Virginia

**CPT file :** DAA-110CP

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Points to test:	Based on Ic value	Average results interval:	.	Footing load:	0.00 tsf	Limit depth applied:	Yes
Earthquake magnitude $M_w$ :	5.44	Ic cut-off value:	2.60	Trans. detect. applied:	Yes	Limit depth:	60.00 ft
Peak ground acceleration:	0.22	Unit weight calculation:	Based on SBT	$K_\sigma$ applied:	Yes	MSF method:	Method based



Zone A<sub>1</sub>: Cyclic liquefaction likely depending on size and duration of cyclic loading  
 Zone A<sub>2</sub>: Cyclic liquefaction and strength loss likely depending on loading and ground geometry  
 Zone B: Liquefaction and post-earthquake strength loss unlikely, check cyclic softening  
 Zone C: Cyclic liquefaction and strength loss possible depending on soil plasticity, brittleness/sensitivity, strain to peak undrained strength and ground geometry

## LIQUEFACTION ANALYSIS REPORT

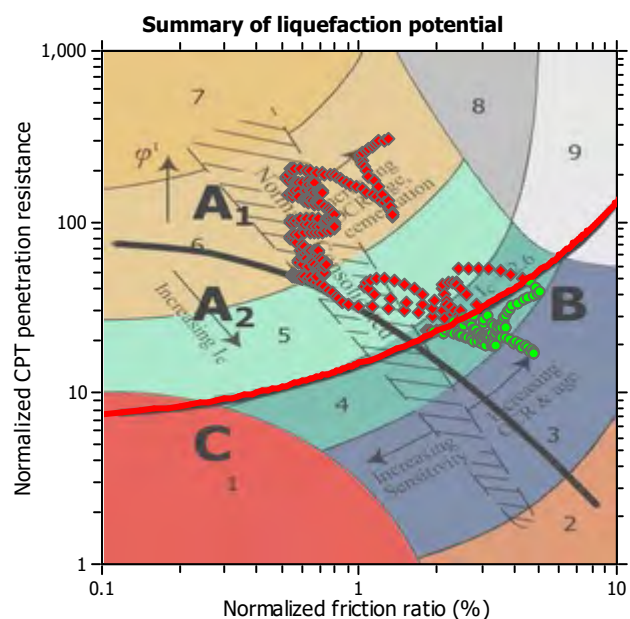
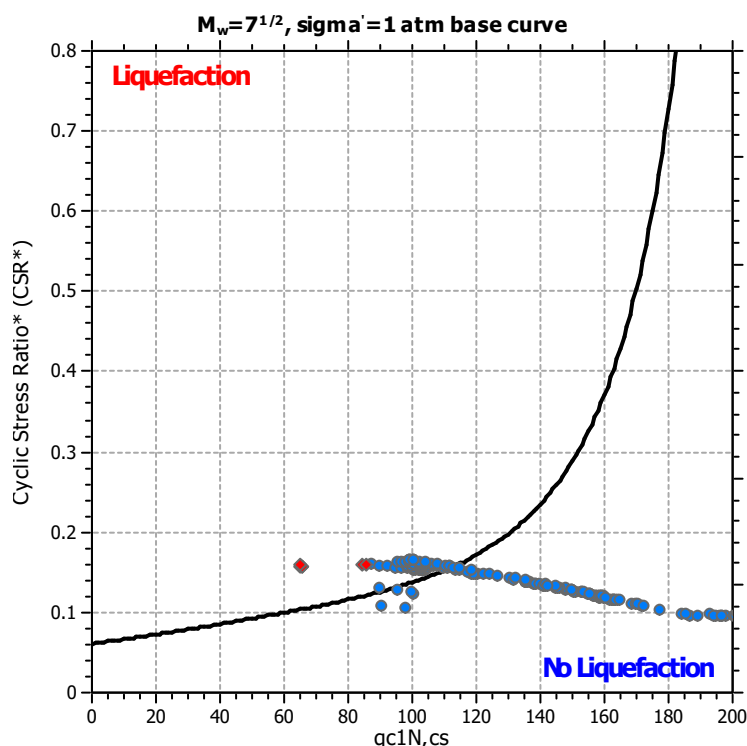
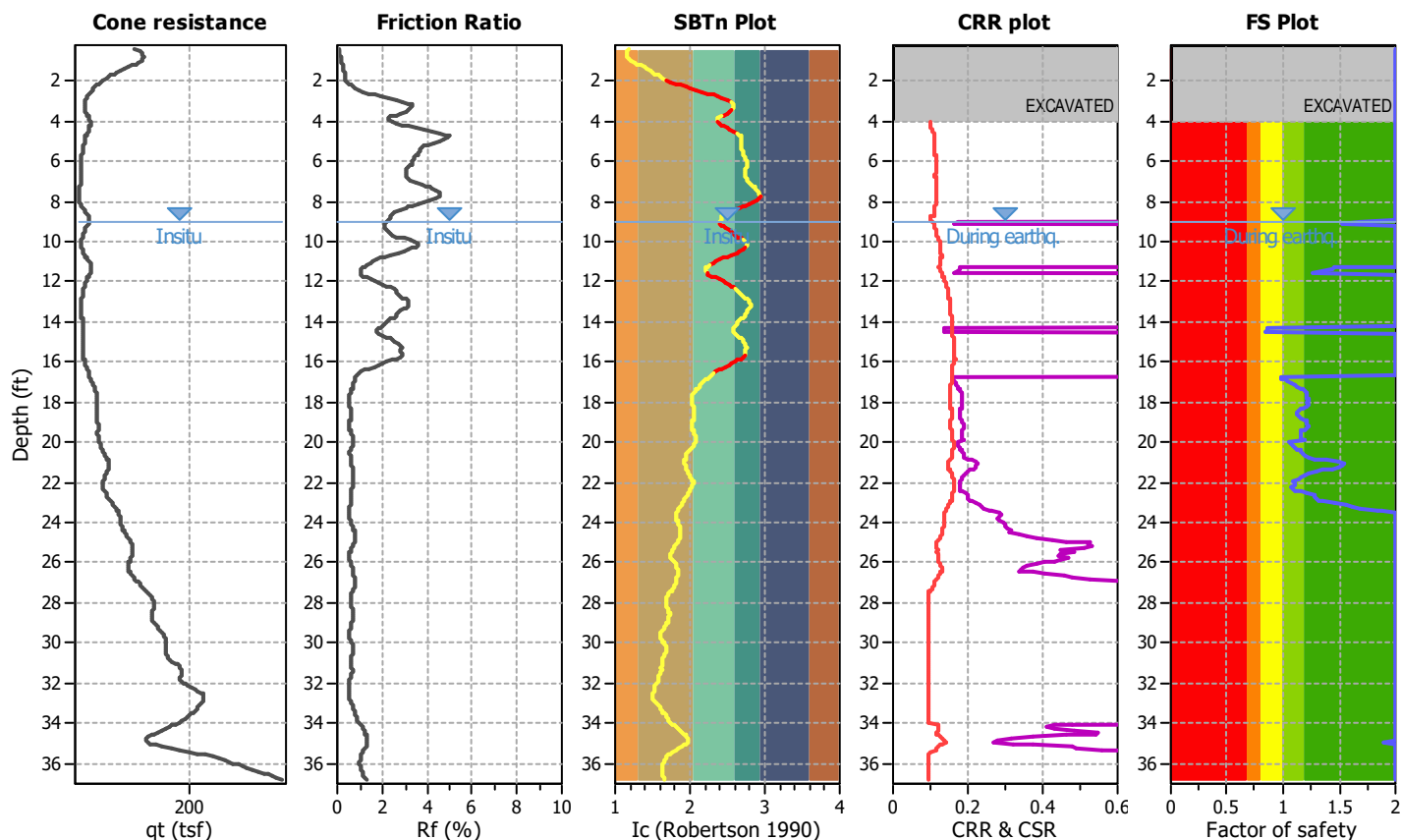
**Project title :** Green Ridge RDF - Part A Permit Application

**Location :** Cumberland County, Virginia

**CPT file :** DAA-4CP

### Input parameters and analysis data

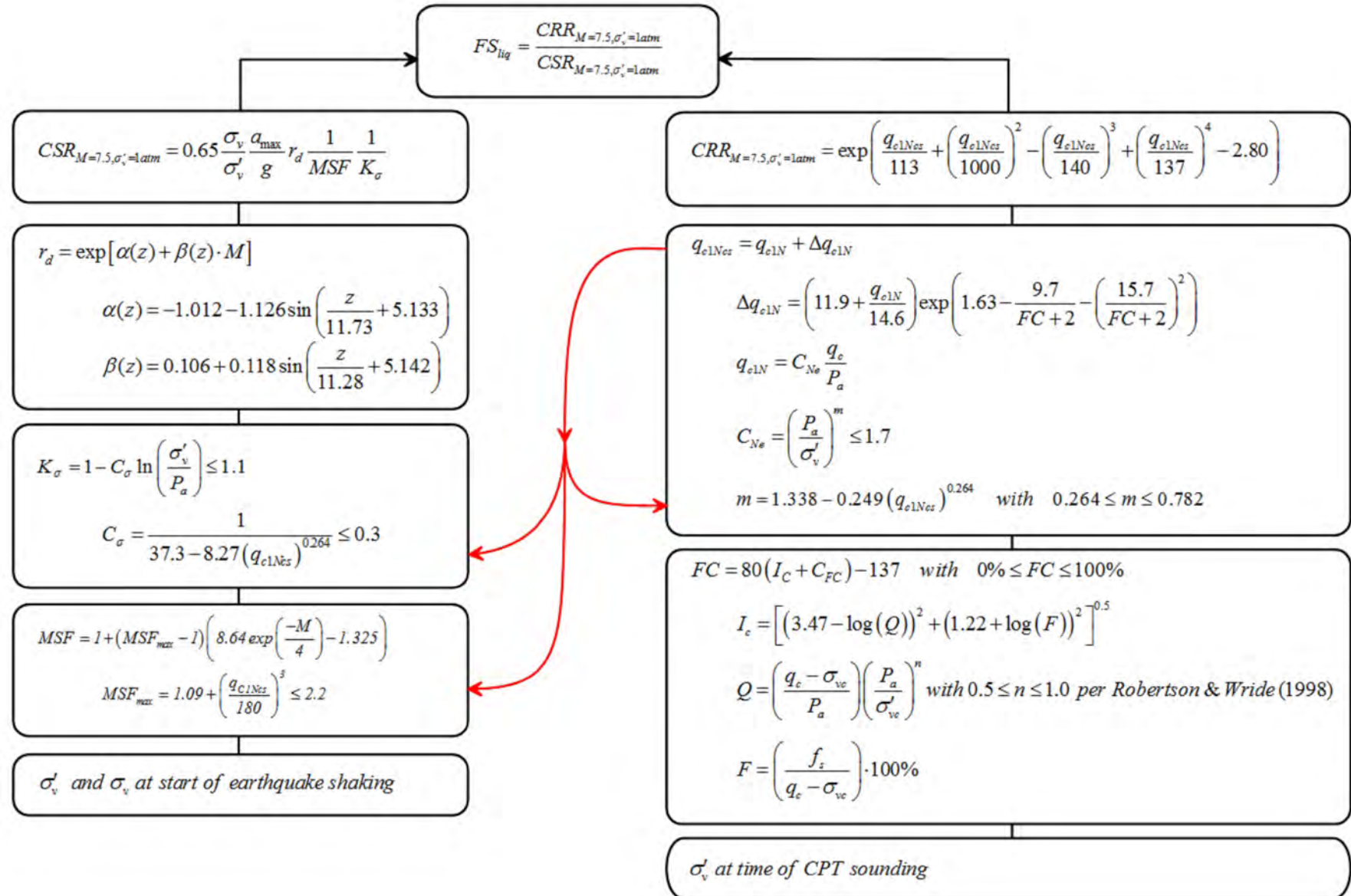
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Points to test:	Based on Ic value	Average results interval:	.	Footing load:	0.00 tsf	Limit depth:	60.00 ft
Earthquake magnitude $M_w$ :	5.44	Ic cut-off value:	2.60	Trans. detect. applied:	Yes	MSF method:	Method based
Peak ground acceleration:	0.22	Unit weight calculation:	Based on SBT	$K_\sigma$ applied:	Yes		



Zone A<sub>1</sub>: Cyclic liquefaction likely depending on size and duration of cyclic loading  
 Zone A<sub>2</sub>: Cyclic liquefaction and strength loss likely depending on loading and ground geometry  
 Zone B: Liquefaction and post-earthquake strength loss unlikely, check cyclic softening  
 Zone C: Cyclic liquefaction and strength loss possible depending on soil plasticity, brittleness/sensitivity, strain to peak undrained strength and ground geometry



**Procedure for the evaluation of soil liquefaction resistance, Boulanger & Idriss(2014)**



## Liquefaction Potential Index (LPI) calculation procedure

Calculation of the Liquefaction Potential Index (LPI) is used to interpret the liquefaction assessment calculations in terms of severity over depth. The calculation procedure is based on the methodology developed by Iwasaki (1982) and is adopted by AFPS.

To estimate the severity of liquefaction extent at a given site, LPI is calculated based on the following equation:

$$\mathbf{LPI} = \int_0^{20} (10 - 0,5z) \times F_L \times d_z$$

where:

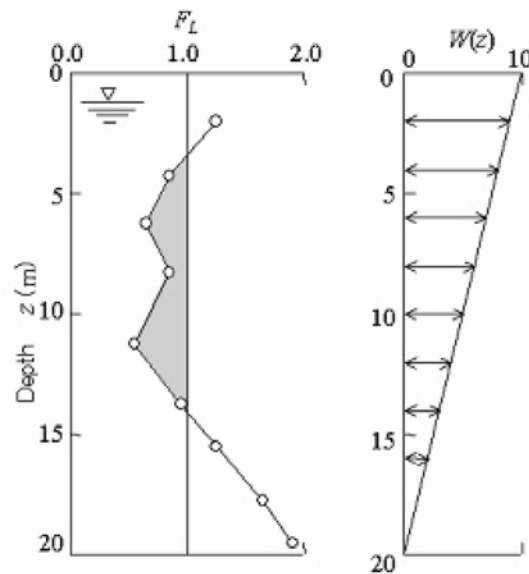
$F_L = 1 - F.S.$  when F.S. less than 1

$F_L = 0$  when F.S. greater than 1

$z$  depth of measurement in meters

Values of LPI range between zero (0) when no test point is characterized as liquefiable and 100 when all points are characterized as susceptible to liquefaction. Iwasaki proposed four (4) discrete categories based on the numeric value of LPI:

- LPI = 0 : Liquefaction risk is very low
- $0 < \text{LPI} \leq 5$  : Liquefaction risk is low
- $5 < \text{LPI} \leq 15$  : Liquefaction risk is high
- LPI > 15 : Liquefaction risk is very high

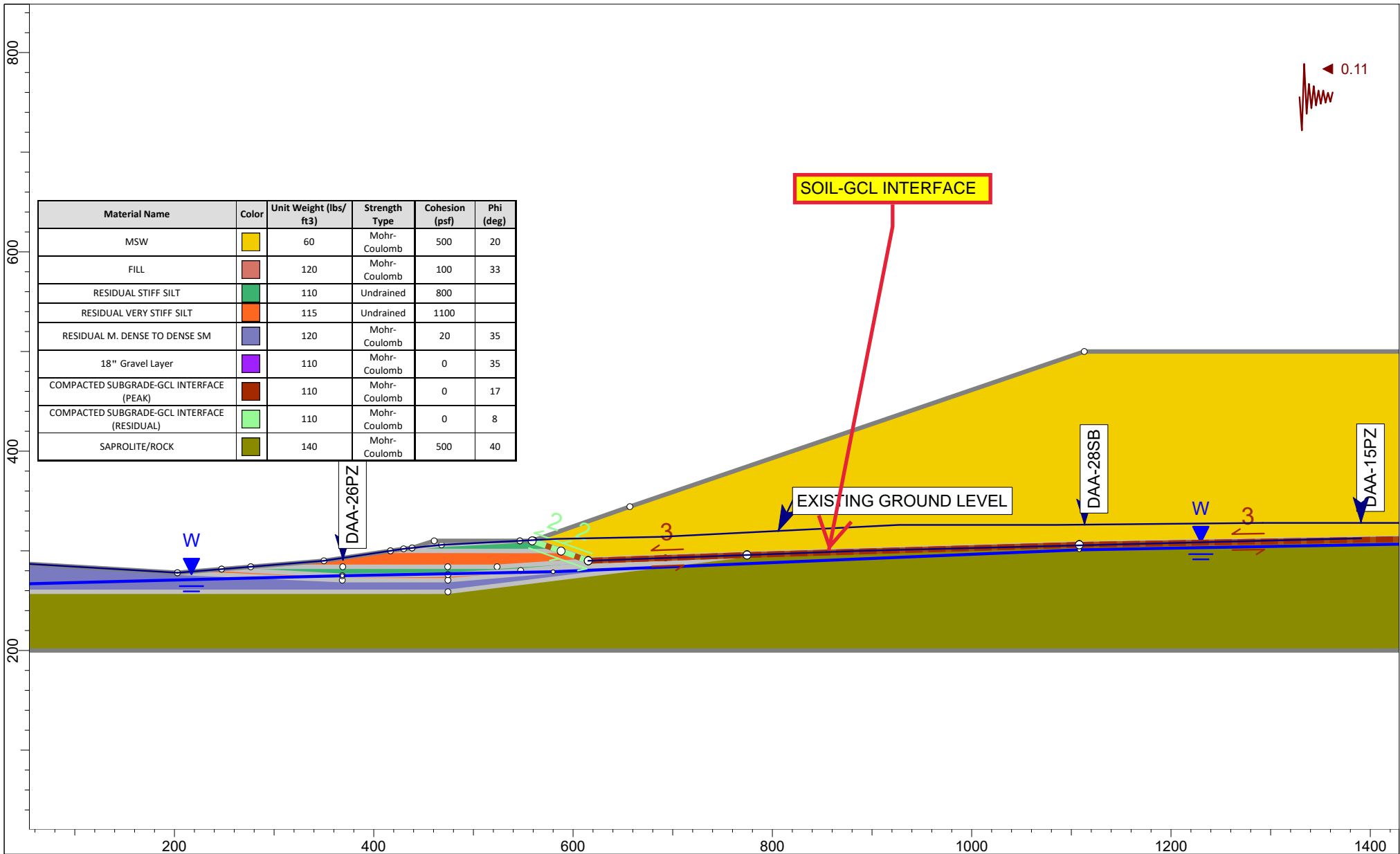



**Graphical presentation of the LPI calculation procedure**

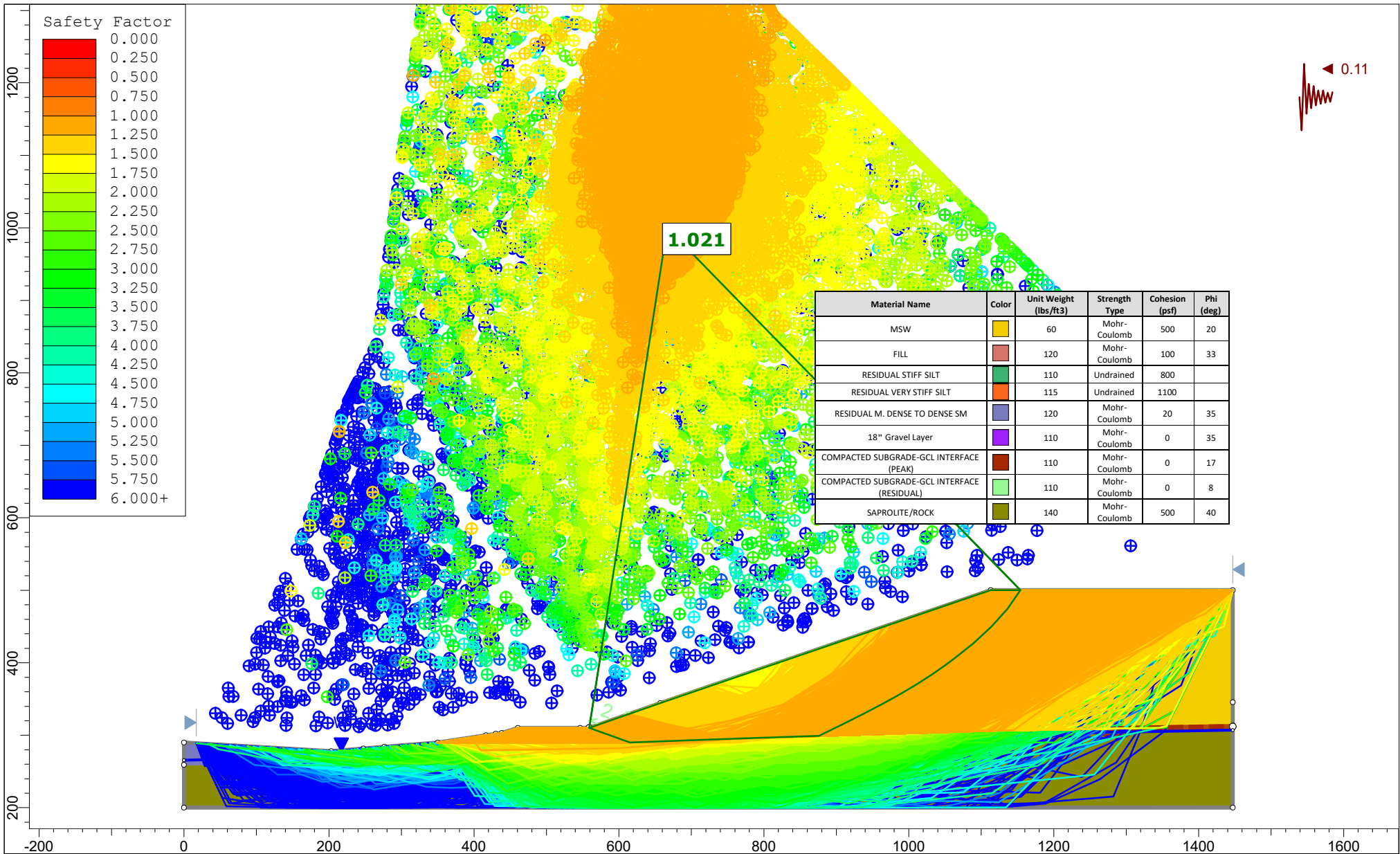
## References


- Lunne, T., Robertson, P.K., and Powell, J.J.M 1997. Cone penetration testing in geotechnical practice, E & FN Spon Routledge, 352 p, ISBN 0-7514-0393-8.
- Boulanger, R.W. and Idriss, I. M., 2007. Evaluation of Cyclic Softening in Silts and Clays. ASCE Journal of Geotechnical and Geoenvironmental Engineering June, Vol. 133, No. 6 pp 641 -652
- Boulanger, R.W. and Idriss, I. M., 2014. CPT AND SPT BASED LIQUEFACTION TRIGGERING PROCEDURES. DEPARTMENT OF CIVIL & ENVIRONMENTAL ENGINEERING COLLEGE OF ENGINEERING UNIVERSITY OF CALIFORNIA AT DAVIS
- Robertson, P.K. and Cabal, K.L., 2007, Guide to Cone Penetration Testing for Geotechnical Engineering. Available at no cost at <http://www.geologismiki.gr/>
- Robertson, P.K. 1990. Soil classification using the cone penetration test. Canadian Geotechnical Journal, 27 (1), 151 -8.
- Robertson, P.K. and Wride, C.E., 1998. Cyclic Liquefaction and its Evaluation based on the CPT Canadian Geotechnical Journal, 1998, Vol. 35, August.
- Youd, T.L., Idriss, I.M., Andrus, R.D., Arango, I., Castro, G., Christian, J.T., Dobry, R., Finn, W.D.L., Harder, L.F., Hynes, M.E., Ishihara, K., Koester, J., Liao, S., Marcuson III, W.F., Martin, G.R., Mitchell, J.K., Moriwaki, Y., Power, M.S., Robertson, P.K., Seed, R., and Stokoe, K.H., Liquefaction Resistance of Soils: Summary Report from the 1996 NCEER and 1998 NCEER/NSF Workshop on Evaluation of Liquefaction Resistance of Soils, ASCE, Journal of Geotechnical & Geoenvironmental Engineering, Vol. 127, October, pp 817-833
- Zhang, G., Robertson, P.K., Brachman, R., 2002, Estimating Liquefaction Induced Ground Settlements from the CPT, Canadian Geotechnical Journal, 39: pp 1168-1180
- Zhang, G., Robertson, P.K., Brachman, R., 2004, Estimating Liquefaction Induced Lateral Displacements using the SPT and CPT, ASCE, Journal of Geotechnical & Geoenvironmental Engineering, Vol. 130, No. 8, 861 -871
- Pradel, D., 1998, Procedure to Evaluate Earthquake -Induced Settlements in Dry Sandy Soils, ASCE, Journal of Geotechnical & Geoenvironmental Engineering, Vol. 124, No. 4, 364-368
- Iwasaki, T., 1986, Soil liquefaction studies in Japan: state -of-the-art, Soil Dynamics and Earthquake Engineering, Vol. 5, No. 1, 2-70
- Papathanassiou G., 2008, LPI-based approach for calibrating the severity of liquefaction -induced failures and for assessing the probability of liquefaction surface evidence, Eng. Geol. 96:94 –104
- P.K. Robertson, 2009, Interpretation of Cone Penetration Tests - a unified approach., Canadian Geotechnical Journal, Vol. 46, No. 11, pp 1337-1355
- P.K. Robertson, 2009. "Performance based earthquake design using the CPT", Keynote Lecture, International Conference on Performance-based Design in Earthquake Geotechnical Engineering - from case history to practice, IS-Tokyo, June 2009
- Robertson, P.K. and Lisheng, S., 2010, "Estimation of seismic compression in dry soils using the CPT" FIFTH INTERNATIONAL CONFERENCE ON RECENT ADVANCES IN GEOTECHNICAL EARTHQUAKE ENGINEERING AND SOIL DYNAMICS, *Symposium in honor of professor I. M. Idriss*, SAN diego, CA
- R. E. S. Moss, R. B. Seed, R. E. Kayen, J. P. Stewart, A. Der Kiureghian, K. O. Cetin, CPT -Based Probabilistic and Deterministic Assessment of In Situ Seismic Soil Liquefaction Potential, Journal of Geotechnical and Geoenvironmental Engineering, Vol. 132, No. 8, August 1, 2006
- I. M. Idriss and R. W. Boulanger, 2008. Soil liquefaction during earthquakes, Earthquake Engineering Research Institute MNO-12
- Jonathan D. Bray & Jorge Macedo, Department of Civil & Environmental Engineering, Univ. of California, Berkeley, CA, USA, Simplified procedure for estimating liquefaction -induced building settlement, *Proceedings of the 19th International Conference on Soil Mechanics and Geotechnical Engineering, Seoul 201*

# **ATTACHMENT 2 - PRELIMINARY SEISMIC STABILITY EVALUATION (NORTH AND SOUTH SECTIONS)**



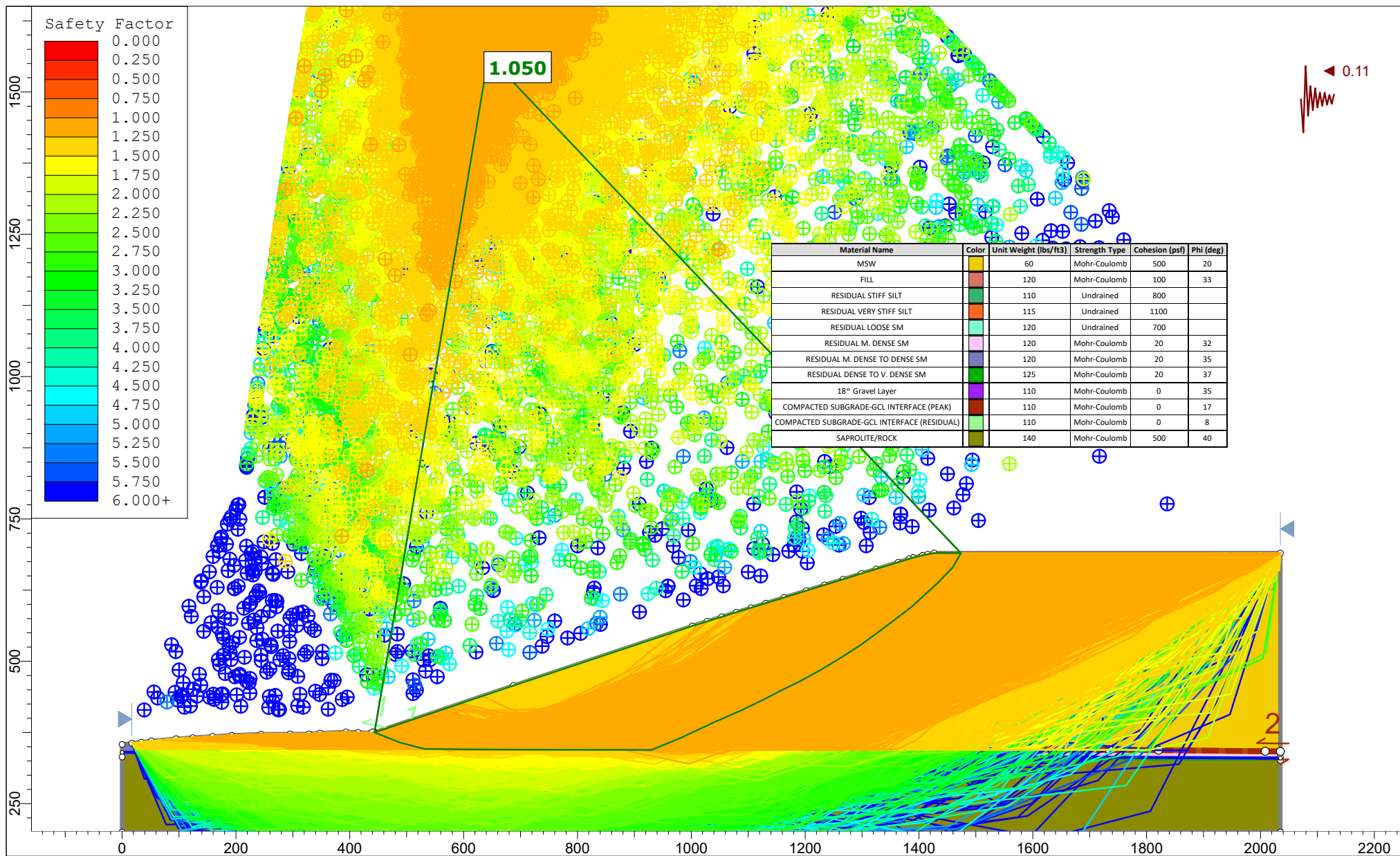
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	Group	North Section	Scenario	MODEL VIEW
	Drawn By	Arif Bhuiyan	Company	Schnabel Engineering
	Date	March 2022	File Name	Sections.slmd



 <b>Schnabel</b> ENGINEERING	Project		Green Ridge RDF - Preliminary Seismic Stability Evaluation	
	Group	North Section	Scenario	STABILITY RESULTS
	Drawn By	Arif Bhuiyan	Company	Schnabel Engineering
	Date	March 2022	File Name	Sections.slmd







Project				Green Ridge RDF - Preliminary Seismic Stability Evaluation	
Group		South Section		Scenario	
Drawn By		Arif Bhuiyan		Company	
Date		FEBRUARY 2022		File Name	
				STABILITY RESULTS	
				Schnabel Engineering	
				Sections.slmd	



# **ATTACHMENT 3 - SUBSURFACE EXPLORATION DATA PROVIDED BY DAA**

- CPT Sounding Report by Conetec
- Log of DAA 2021 Boring, DAA-112pz
- Logs of DAA Borings from 2019
- Laboratory Test Summary from DAA's 2019 Exploration
- Logs of KBJW Borings from 2017

# PRESENTATION OF SITE INVESTIGATION RESULTS

## Green Ridge Landfill

*Prepared for:*

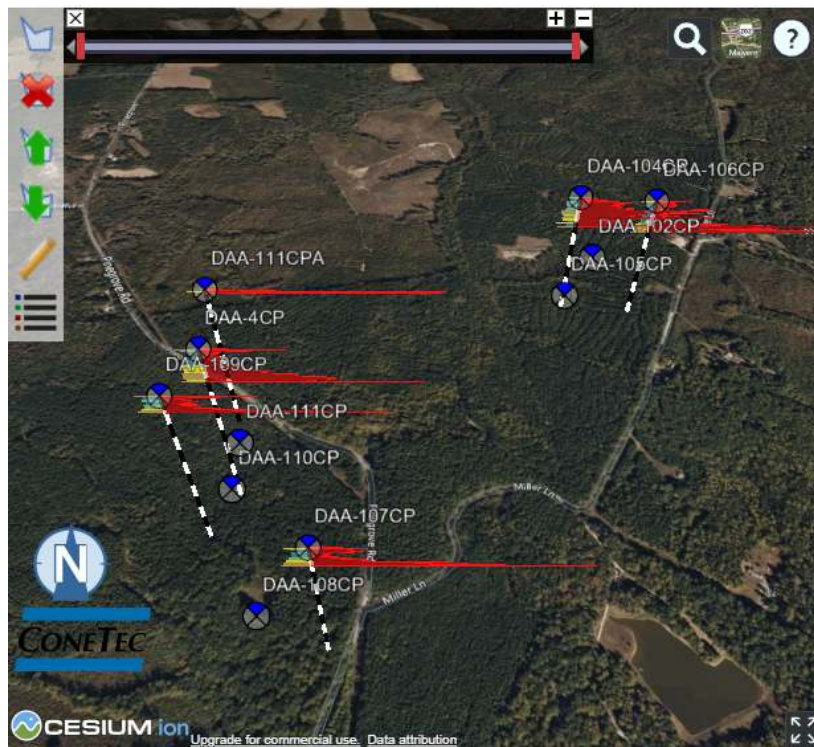
Draper Aden Associates

ConeTec Job No: 21-54-23203

Project Start Date: 25-Oct-2021

Project End Date: 26-Oct-2021

Report Date: 01-Nov-2021



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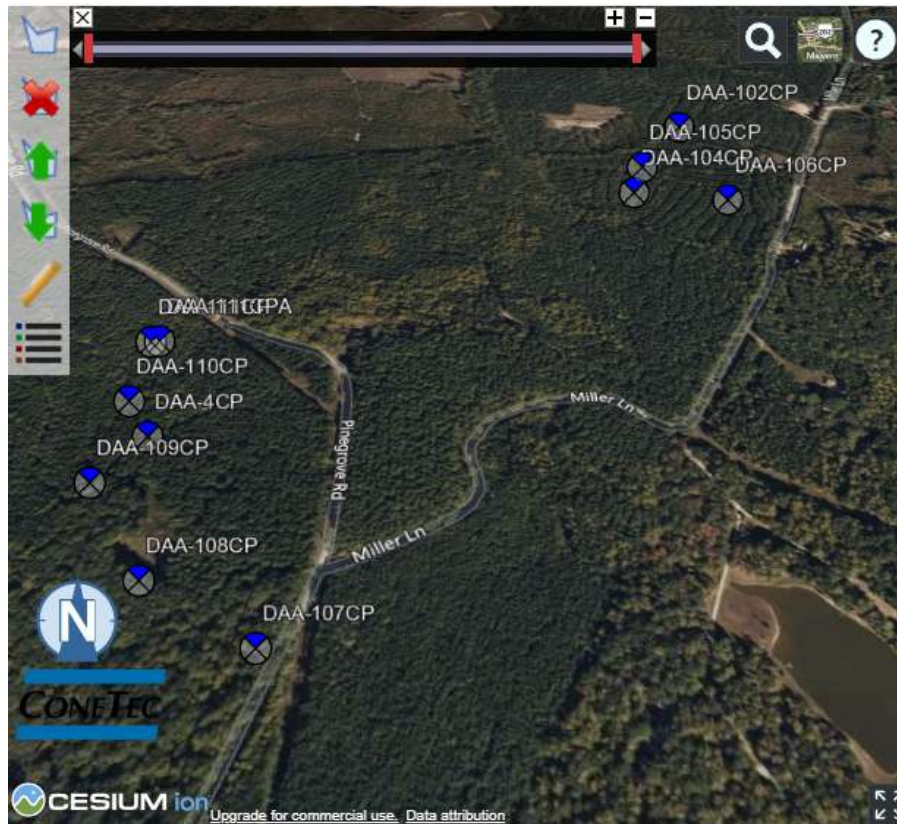
## Introduction

The enclosed report presents the results of the site investigation program conducted by ConeTec Inc. for Draper Aden Associates at Green Ridge Landfill in Cumberland, VA. The program consisted of six cone penetration tests (CPTu) and five seismic cone penetration tests (SCPTu) at locations selected and numbered under the direction of Draper Aden Associates personnel. The purpose of the program was to evaluate existing site conditions. Please note that this report, which also includes all accompanying data, are subject to the 3<sup>rd</sup> Party Disclaimer and Client Disclaimer that follow in the 'Limitations' section of this report.

## Project Information

Project	
Client	Draper Aden Associates
Project	Green Ridge Landfill
ConeTec project number	21-54-23203

An aerial overview from CESIUM including the CPTu and SCPTu test locations is presented below.



Rig Description	Deployment System	Test Type
15-ton Track Rig	Integrated Ramset	CPTu, SCPTu

Coordinates		
Test Type	Collection Method	EPSG Number
CPTu, SCPTu	Handheld GPS	4326

Cone Penetrometers Used for this Project						
Cone Description	Cone Number	Cross Sectional Area (cm <sup>2</sup> )	Sleeve Area (cm <sup>2</sup> )	Tip Capacity (bar)	Sleeve Capacity (bar)	Pore Pressure Capacity (bar)
556:T1500F15U35	EC556	15	225	1500	15	35
Cone EC556 was used for all CPT sounding.						

Cone Penetration Test (CPTu)	
Depth reference	Depths are referenced to the existing ground surface at the time of each test.
Tip and sleeve data offset	0.1 meter This has been accounted for in the CPT data files.
Additional plots	<ul style="list-style-type: none"> <li>Advanced plots with <math>I_c</math>, <math>S_u</math>, <math>\phi</math> and <math>N_1(60)</math></li> <li>Seismic Cone Penetration Test Plots, Tabular Results, and Wave Traces</li> <li>Soil Behavior Type (SBT) scatter plots</li> </ul>

Calculated Geotechnical Parameter Tables	
Additional information	<p>The Normalized Soil Behavior Type Chart based on <math>Q_{tn}</math> (SBT <math>Q_{tn}</math>) (Robertson, 2009) was used to classify the soil for this project. A detailed set of calculated CPTu parameters have been generated and are provided in Excel format files in the release folder. The CPTu parameter calculations are based on values of corrected tip resistance (<math>q_t</math>) sleeve friction (<math>f_s</math>) and pore pressure (<math>u_2</math>).</p> <p>Effective stresses are calculated based on unit weights that have been assigned to the individual soil behavior type zones and the assumed equilibrium pore pressure profile.</p> <p>For calculating undrained shear strength based on pore pressure (<math>S_u(N_{\Delta u})</math>) and undrained shear strength based on cone tip resistance (<math>S_u(N_{kt})</math>), an <math>N_{\Delta u}</math> value of 6 and an <math>N_{kt}</math> value of 15 were selected.</p>

## Limitations

### 3rd Party Disclaimer

This report titled “Green Ridge Landfill”, referred to as the (“Report”), was prepared by ConeTec for Draper Aden Associates. The Report is confidential and may not be distributed to or relied upon by any third parties without the express written consent of ConeTec. Any third parties gaining access to the Report do not acquire any rights as a result of such access. Any use which a third party makes of the Report, or any reliance on or decisions made based on it, are the responsibility of such third parties. ConeTec accepts no responsibility for loss, damage and/or expense, if any, suffered by any third parties as a result of decisions made, or actions taken or not taken, which are in any way based on, or related to, the Report or any portion(s) thereof.

### Client Disclaimer

ConeTec was retained by Draper Aden Associates to collect and provide the raw data (“Data”) which is included in this report titled “Green Ridge Landfill”, which is referred to as the (“Report”). ConeTec has collected and reported the Data in accordance with current industry standards. No other warranty, express or implied, with respect to the Data is made by ConeTec. In order to properly understand the Data included in the Report, reference must be made to the documents accompanying and other sources referenced in the Report in their entirety. Any analysis, interpretation, judgment, calculations and/or geotechnical parameters (collectively “Interpretations”) included in the Report, including those based on the Data, are outside the scope of ConeTec’s retainer and are included in the Report as a courtesy only. Other than the Data, the contents of the Report (including any Interpretations) should not be relied upon in any fashion without independent verification and ConeTec is in no way responsible for any loss, damage or expense resulting from the use of, and/or reliance on, such material by any party.

Cone penetration tests (CPTu) are conducted using an integrated electronic piezocone penetrometer and data acquisition system manufactured by Adara Systems Ltd., a subsidiary of ConeTec.

ConeTec's piezocone penetrometers are compression type designs in which the tip and friction sleeve load cells are independent and have separate load capacities. The piezocones use strain gauged load cells for tip and sleeve friction and a strain gauged diaphragm type transducer for recording pore pressure. The piezocones also have a platinum resistive temperature device (RTD) for monitoring the temperature of the sensors, an accelerometer type dual axis inclinometer and two geophone sensors for recording seismic signals. All signals are amplified and measured with minimum sixteen-bit resolution down hole within the cone body, and the signals are sent to the surface using a high bandwidth, error corrected digital interface through a shielded cable.

ConeTec penetrometers are manufactured with various tip, friction and pore pressure capacities in both 10 cm<sup>2</sup> and 15 cm<sup>2</sup> tip base area configurations in order to maximize signal resolution for various soil conditions. The specific piezocone used for each test is described in the CPT summary table presented in the first appendix. The 15 cm<sup>2</sup> penetrometers do not require friction reducers as they have a diameter larger than the deployment rods. The 10 cm<sup>2</sup> piezocones use a friction reducer consisting of a rod adapter extension behind the main cone body with an enlarged cross sectional area (typically 44 millimeters diameter over a length of 32 millimeters with tapered leading and trailing edges) located at a distance of 585 millimeters above the cone tip.

The penetrometers are designed with equal end area friction sleeves, a net end area ratio of 0.8 and cone tips with a 60 degree apex angle.

All ConeTec piezocones can record pore pressure at various locations. Unless otherwise noted, the pore pressure filter is located directly behind the cone tip in the "u<sub>2</sub>" position ([ASTM Type 2](#)). The filter is six millimeters thick, made of porous plastic (polyethylene) having an average pore size of 125 microns (90-160 microns). The function of the filter is to allow rapid movements of extremely small volumes of water needed to activate the pressure transducer while preventing soil ingress or blockage.

The piezocone penetrometers are manufactured with dimensions, tolerances and sensor characteristics that are in general accordance with the current [ASTM D5778](#) standard. ConeTec's calibration criteria also meets or exceeds those of the current [ASTM D5778](#) standard. An illustration of the piezocone penetrometer is presented in [Figure CPTu](#).

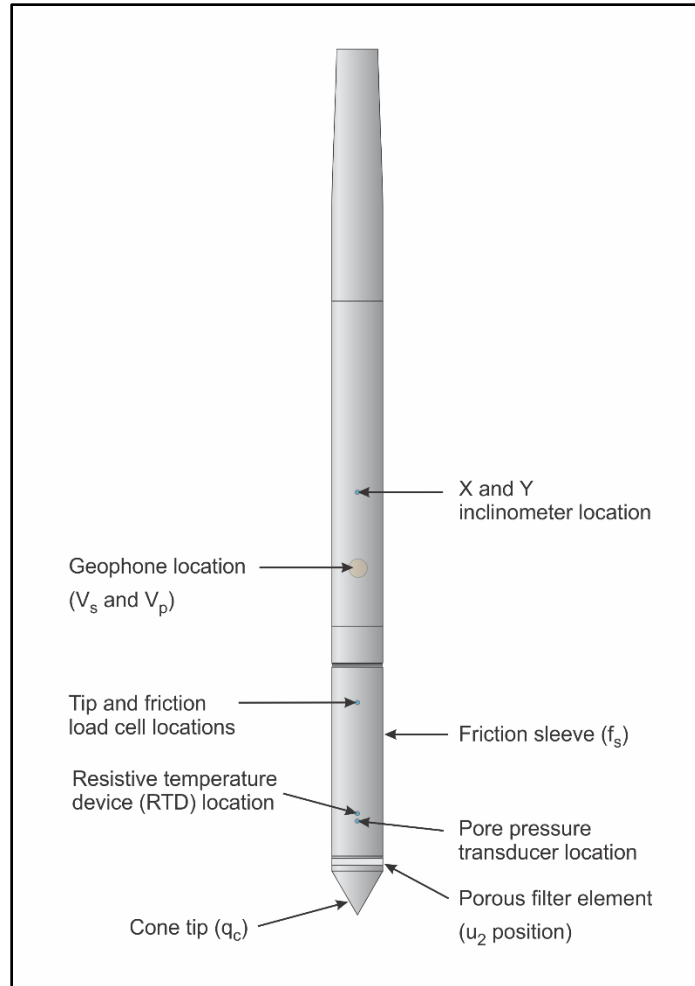


Figure CPTu. Piezocone Penetrometer (15 cm<sup>2</sup>)

The ConeTec data acquisition systems consist of a Windows based computer and a signal interface box and power supply. The signal interface combines depth increment signals, seismic trigger signals and the downhole digital data. This combined data is then sent to the Windows based computer for collection and presentation. The data is recorded at fixed depth increments using a depth wheel attached to the push cylinders or by using a spring loaded rubber depth wheel that is held against the cone rods. The typical recording interval is 2.5 centimeters; custom recording intervals are possible.

The system displays the CPTu data in real time and records the following parameters to a storage media during penetration:

- Depth
- Uncorrected tip resistance ( $q_c$ )
- Sleeve friction ( $f_s$ )
- Dynamic pore pressure ( $u$ )
- Additional sensors such as resistivity, passive gamma, ultra violet induced fluorescence, if applicable



All testing is performed in accordance to ConeTec's CPTu operating procedures which are in general accordance with the current [ASTM D5778](#) standard.

Prior to the start of a CPTu sounding a suitable cone is selected, the cone and data acquisition system are powered on, the pore pressure system is saturated with silicone oil and the baseline readings are recorded with the cone hanging freely in a vertical position.

The CPTu is conducted at a steady rate of two centimeters per second, within acceptable tolerances. Typically one meter length rods with an outer diameter of 1.5 inches (38.1 millimeters) are added to advance the cone to the sounding termination depth. After cone retraction final baselines are recorded.

Additional information pertaining to ConeTec's cone penetration testing procedures:

- Each filter is saturated in silicone oil under vacuum pressure prior to use
- Baseline readings are compared to previous readings
- Soundings are terminated at the client's target depth or at a depth where an obstruction is encountered, excessive rod flex occurs, excessive inclination occurs, equipment damage is likely to take place, or a dangerous working environment arises
- Differences between initial and final baselines are calculated to ensure zero load offsets have not occurred and to ensure compliance with [ASTM](#) standards

The interpretation of piezocone data for this report is based on the corrected tip resistance ( $q_t$ ), sleeve friction ( $f_s$ ) and pore water pressure ( $u$ ). The interpretation of soil type is based on the correlations developed by [Robertson et al. \(1986\)](#) and Robertson (1990, 2009). It should be noted that it is not always possible to accurately identify a soil behavior type based on these parameters. In these situations, experience, judgment and an assessment of other parameters may be used to infer soil behavior type.

The recorded tip resistance ( $q_c$ ) is the total force acting on the piezocone tip divided by its base area. The tip resistance is corrected for pore pressure effects and termed corrected tip resistance ( $q_t$ ) according to the following expression presented in [Robertson et al. \(1986\)](#):

$$q_t = q_c + (1-a) \cdot u_2$$

where:  $q_t$  is the corrected tip resistance

$q_c$  is the recorded tip resistance

$u_2$  is the recorded dynamic pore pressure behind the tip ( $u_2$  position)

$a$  is the Net Area Ratio for the piezocone (0.8 for ConeTec probes)

The sleeve friction ( $f_s$ ) is the frictional force on the sleeve divided by its surface area. As all ConeTec piezocones have equal end area friction sleeves, pore pressure corrections to the sleeve data are not required.

The dynamic pore pressure ( $u$ ) is a measure of the pore pressures generated during cone penetration. To record equilibrium pore pressure, the penetration must be stopped to allow the dynamic pore pressures to stabilize. The rate at which this occurs is predominantly a function of the permeability of the soil and the diameter of the cone.

The friction ratio ( $R_f$ ) is a calculated parameter. It is defined as the ratio of sleeve friction to the tip resistance expressed as a percentage. Generally, saturated cohesive soils have low tip resistance, high friction ratios and generate large excess pore water pressures. Cohesionless soils have higher tip resistances, lower friction ratios and do not generate significant excess pore water pressure.

A summary of the CPTu soundings along with test details and individual plots are provided in the appendices. A set of files with calculated geotechnical parameters were generated for each sounding based on published correlations and are provided in Excel format in the data release folder. Information regarding the methods used is also included in the data release folder.

For additional information on CPTu interpretations and calculated geotechnical parameters, refer to [Robertson et al. \(1986\)](#), [Lunne et al. \(1997\)](#), [Robertson \(2009\)](#), [Mayne \(2013, 2014\)](#) and [Mayne and Peuchen \(2012\)](#).

Shear wave velocity ( $V_s$ ) testing is performed in conjunction with the piezocone penetration test (SCPTu) in order to collect interval velocities. For some projects seismic compression wave velocity ( $V_p$ ) testing is also performed.

ConeTec's piezocone penetrometers are manufactured with one horizontally active geophone (28 hertz) and one vertically active geophone (28 hertz). Both geophones are rigidly mounted in the body of the cone penetrometer, 0.2 meters behind the cone tip. The vertically mounted geophone is more sensitive to compression waves.

Shear waves are typically generated by using an impact hammer horizontally striking a beam that is held in place by a normal load. In some instances, an auger source or an imbedded impulsive source may be used for both shear waves and compression waves. The hammer and beam act as a contact trigger that initiates the recording of the seismic wave traces. For impulsive devices an accelerometer trigger may be used. The traces are recorded in the memory of the cone using a fast analog to digital converter. The seismic trace is then transmitted digitally uphole to a Windows based computer through a signal interface box for recording and analysis. An illustration of the shear wave testing configuration is presented in [Figure SCPTu-1](#).

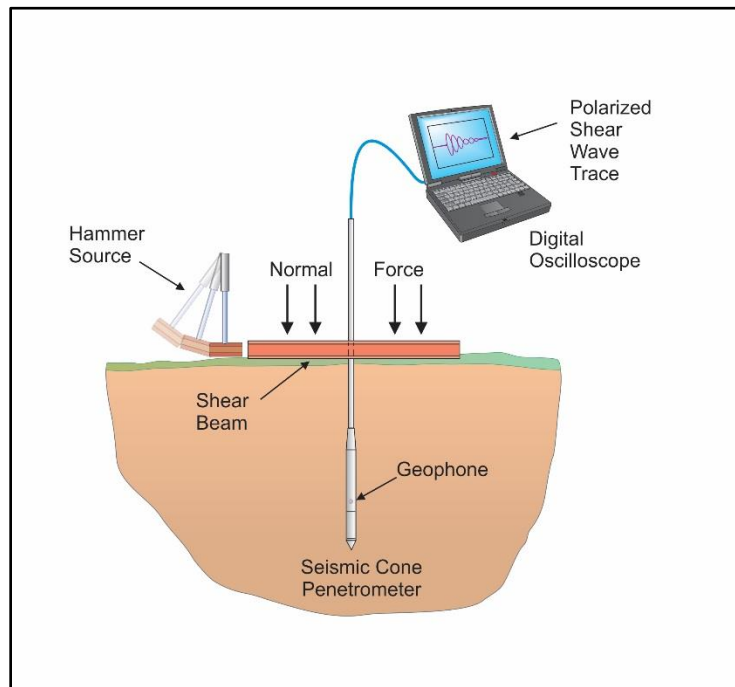


Figure SCPTu-1. Illustration of the SCPTu system

All testing is performed in accordance to ConeTec's SCPTu operating procedures which are in general accordance with the current [ASTM D5778](#) and [ASTM D7400](#) standards.

Prior to the start of a SCPTu sounding, the procedures described in the Cone Penetration Test section are followed. In addition, the active axis of the geophone is aligned parallel to the beam (or source) and the horizontal offset between the cone and the source is measured and recorded.

Prior to recording seismic waves at each test depth, cone penetration is stopped and the rods are decoupled from the rig to avoid transmission of rig energy down the rods. Typically, five wave traces for

each orientation are recorded for quality control and uncertainty analysis purposes. After reviewing wave traces for consistency the cone is pushed to the next test depth (typically one meter intervals or as requested by the client). [Figure SCPTu-2](#) presents an illustration of a SCPTu test.

For additional information on seismic cone penetration testing refer to [Robertson et al. \(1986\)](#).

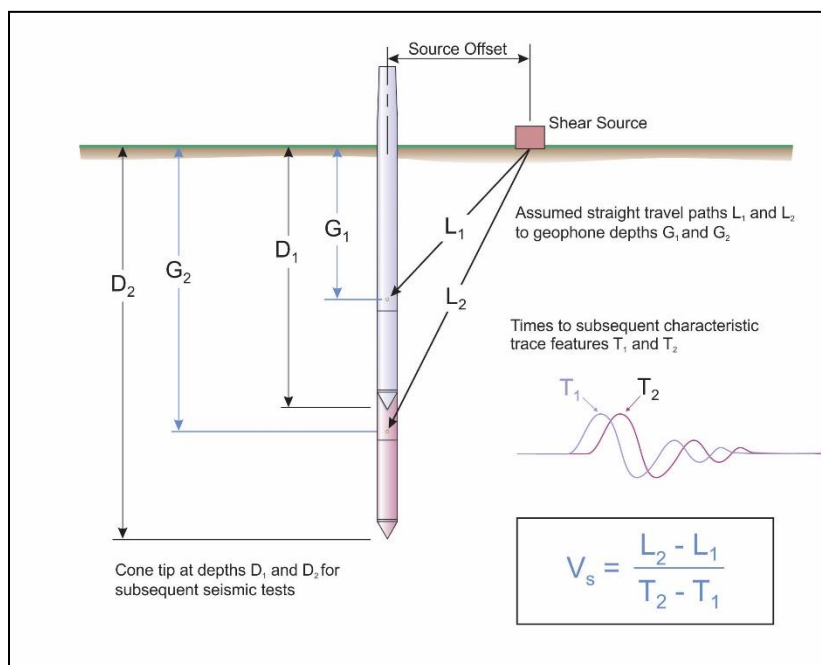


Figure SCPTu-2. Illustration of a seismic cone penetration test

Calculation of the interval velocities are performed by visually picking a common feature (e.g. the first characteristic peak, trough, or crossover) on all of the recorded wave sets and taking the difference in ray path divided by the time difference between subsequent features. Ray path is defined as the straight line distance from the seismic source to the geophone, accounting for beam offset, source depth and geophone offset from the cone tip.

For all SCPTu soundings that have achieved a depth of at least 100 feet (30 meters), the average shear wave velocity to a depth of 100 feet ( $\bar{v}_s$ ) has been calculated and provided for all applicable soundings using the following equation presented in [ASCE \(2010\)](#).

$$\bar{v}_s = \frac{\sum_{i=1}^n d_i}{\sum_{i=1}^n \frac{d_i}{v_{si}}}$$

where:

- $\bar{v}_s$  = average shear wave velocity ft/s (m/s)
- $d_i$  = the thickness of any layer between 0 and 100 ft (30 m)
- $v_{si}$  = the shear wave velocity in ft/s (m/s)
- $\sum_{i=1}^n d_i$  = the total thickness of all layers between 0 and 100 ft (30 m)

Average shear wave velocity,  $\bar{v}_s$  is also referenced to  $V_{s100}$  or  $V_{s30}$ .

The layer travel times refers to the travel times propagating in the vertical direction, not the measured travel times from an offset source.

Tabular results and SCPTu plots are presented in the relevant appendix.

The cone penetration test is halted at specific depths to carry out pore pressure dissipation (PPD) tests, shown in [Figure PPD-1](#). For each dissipation test the cone and rods are decoupled from the rig and the data acquisition system measures and records the variation of the pore pressure ( $u$ ) with time ( $t$ ).

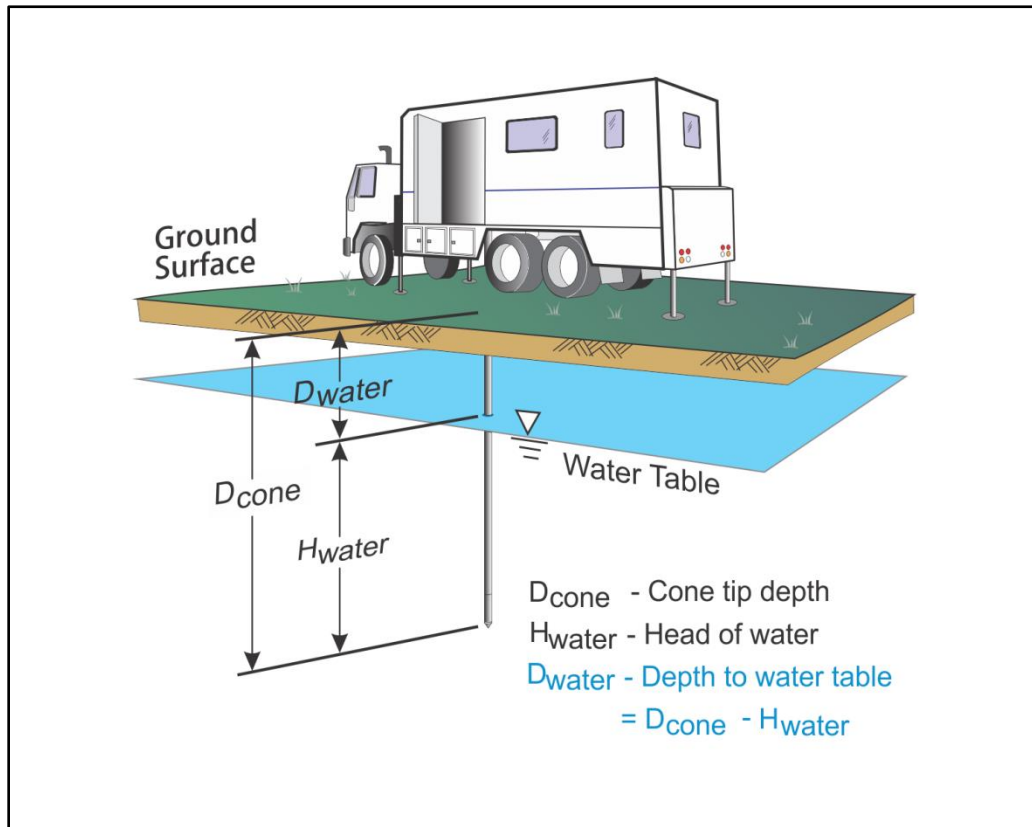


Figure PPD-1. Pore pressure dissipation test setup

Pore pressure dissipation data can be interpreted to provide estimates of ground water conditions, permeability, consolidation characteristics and soil behavior.

The typical shapes of dissipation curves shown in [Figure PPD-2](#) are very useful in assessing soil type, drainage, in situ pore pressure and soil properties. A flat curve that stabilizes quickly is typical of a freely draining sand. Undrained soils such as clays will typically show positive excess pore pressure and have long dissipation times. Dilative soils will often exhibit dynamic pore pressures below equilibrium that then rise over time. Overconsolidated fine-grained soils will often exhibit an initial dilatory response where there is an initial rise in pore pressure before reaching a peak and dissipating.

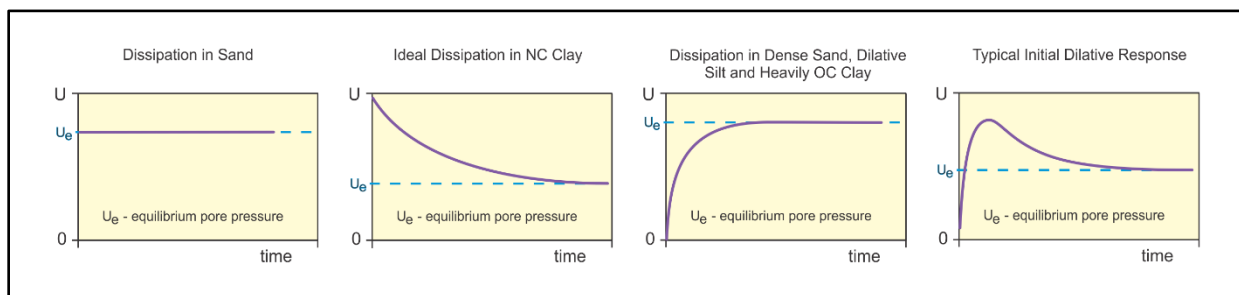


Figure PPD-2. Pore pressure dissipation curve examples



In order to interpret the equilibrium pore pressure ( $u_{eq}$ ) and the apparent phreatic surface, the pore pressure should be monitored until such time as there is no variation in pore pressure with time as shown for each curve in [Figure PPD-2](#).

In fine grained deposits the point at which 100% of the excess pore pressure has dissipated is known as  $t_{100}$ . In some cases this can take an excessive amount of time and it may be impractical to take the dissipation to  $t_{100}$ . A theoretical analysis of pore pressure dissipations by [Teh and Houlsby \(1991\)](#) showed that a single curve relating degree of dissipation versus theoretical time factor ( $T^*$ ) may be used to calculate the coefficient of consolidation ( $c_h$ ) at various degrees of dissipation resulting in the expression for  $c_h$  shown below.

$$c_h = \frac{T^* \cdot a^2 \cdot \sqrt{I_r}}{t}$$

Where:

$T^*$  is the dimensionless time factor ([Table Time Factor](#))

$a$  is the radius of the cone

$I_r$  is the rigidity index

$t$  is the time at the degree of consolidation

Table Time Factor.  $T^*$  versus degree of dissipation ([Teh and Houlsby \(1991\)](#))

Degree of Dissipation (%)	20	30	40	50	60	70	80
$T^* (u_2)$	0.038	0.078	0.142	0.245	0.439	0.804	1.60

The coefficient of consolidation is typically analyzed using the time ( $t_{50}$ ) corresponding to a degree of dissipation of 50% ( $u_{50}$ ). In order to determine  $t_{50}$ , dissipation tests must be taken to a pressure less than  $u_{50}$ . The  $u_{50}$  value is half way between the initial maximum pore pressure and the equilibrium pore pressure value, known as  $u_{100}$ . To estimate  $u_{50}$ , both the initial maximum pore pressure and  $u_{100}$  must be known or estimated. Other degrees of dissipations may be considered, particularly for extremely long dissipations.

At any specific degree of dissipation the equilibrium pore pressure ( $u$  at  $t_{100}$ ) must be estimated at the depth of interest. The equilibrium value may be determined from one or more sources such as measuring the value directly ( $u_{100}$ ), estimating it from other dissipations in the same profile, estimating the phreatic surface and assuming hydrostatic conditions, from nearby soundings, from client provided information, from site observations and/or past experience, or from other site instrumentation.

For calculations of  $c_h$  ([Teh and Houlsby \(1991\)](#)),  $t_{50}$  values are estimated from the corresponding pore pressure dissipation curve and a rigidity index ( $I_r$ ) is assumed. For curves having an initial dilatory response in which an initial rise in pore pressure occurs before reaching a peak, the relative time from the peak value is used in determining  $t_{50}$ . In cases where the time to peak is excessive,  $t_{50}$  values are not calculated.

Due to possible inherent uncertainties in estimating  $I_r$ , the equilibrium pore pressure and the effect of an initial dilatory response on calculating  $t_{50}$ , other methods should be applied to confirm the results for  $c_h$ .

Additional published methods for estimating the coefficient of consolidation from a piezocone test are described in Burns and Mayne ([1998, 2002](#)), [Jones and Van Zyl \(1981\)](#), [Robertson et al. \(1992\)](#) and [Sully et al. \(1999\)](#).

A summary of the pore pressure dissipation tests and dissipation plots are presented in the relevant appendix.

## REFERENCES

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- American Society of Civil Engineers (ASCE), 2010, "Minimum Design Loads for Buildings and Other Structures", Standard ASCE/SEI 7-10, American Society of Civil Engineers, ISBN 978-0-7844-1085-1, Reston, Virginia. DOI: [10.1061/9780784412916](https://doi.org/10.1061/9780784412916).
- ASTM D5778-12, 2012, "Standard Test Method for Performing Electronic Friction Cone and Piezocone Penetration Testing of Soils", ASTM International, West Conshohocken, PA. DOI: [10.1520/D5778-12](https://doi.org/10.1520/D5778-12).
- ASTM D7400/D7400M-19, 2019, "Standard Test Methods for Downhole Seismic Testing", ASTM International, West Conshohocken, PA. DOI: [10.1520/D7400\\_D7400M-19](https://doi.org/10.1520/D7400_D7400M-19).
- Burns, S.E. and Mayne, P.W., 1998, "Monotonic and dilatory pore pressure decay during piezocone tests", Canadian Geotechnical Journal 26 (4): 1063-1073. DOI: [1063-1073/T98-062](https://doi.org/10.1063-1073/T98-062).
- Burns, S.E. and Mayne, P.W., 2002, "Analytical cavity expansion-critical state model cone dissipation in fine-grained soils", Soils & Foundations, Vol. 42(2): 131-137.
- Jones, G.A. and Van Zyl, D.J.A., 1981, "The piezometer probe: a useful investigation tool", Proceedings, 10<sup>th</sup> International Conference on Soil Mechanics and Foundation Engineering, Vol. 3, Stockholm: 489-495.
- Lunne, T., Robertson, P.K. and Powell, J. J. M., 1997, "Cone Penetration Testing in Geotechnical Practice", Blackie Academic and Professional.
- Mayne, P.W., 2013, "Evaluating yield stress of soils from laboratory consolidation and in-situ cone penetration tests", Sound Geotechnical Research to Practice (Holtz Volume) GSP 230, ASCE, Reston/VA: 406-420. DOI: [10.1061/9780784412770.027](https://doi.org/10.1061/9780784412770.027).
- Mayne, P.W. and Peuchen, J., 2012, "Unit weight trends with cone resistance in soft to firm clays", Geotechnical and Geophysical Site Characterization 4, Vol. 1 (Proc. ISC-4, Pernambuco), CRC Press, London: 903-910.
- Mayne, P.W., 2014, "Interpretation of geotechnical parameters from seismic piezocone tests", CPT'14 Keynote Address, Las Vegas, NV, May 2014.
- Robertson, P.K., Campanella, R.G., Gillespie, D. and Greig, J., 1986, "Use of Piezometer Cone Data", Proceedings of InSitu 86, ASCE Specialty Conference, Blacksburg, Virginia.
- Robertson, P.K., Campanella, R.G., Gillespie D and Rice, A., 1986, "Seismic CPT to Measure In-Situ Shear Wave Velocity", Journal of Geotechnical Engineering ASCE, Vol. 112, No. 8: 791-803. DOI: [10.1061/\(ASCE\)0733-9410\(1986\)112:8\(791\)](https://doi.org/10.1061/(ASCE)0733-9410(1986)112:8(791)).
- Robertson, P.K., 1990, "Soil Classification Using the Cone Penetration Test", Canadian Geotechnical Journal, Volume 27: 151-158. DOI: [10.1139/T90-014](https://doi.org/10.1139/T90-014).
- Robertson, P.K., Sully, J.P., Woeller, D.J., Lunne, T., Powell, J.J.M. and Gillespie, D.G., 1992, "Estimating coefficient of consolidation from piezocone tests", Canadian Geotechnical Journal, 29(4): 539-550. DOI: [10.1139/T92-061](https://doi.org/10.1139/T92-061).

## REFERENCES

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Robertson, P.K., 2009, "Interpretation of cone penetration tests – a unified approach", Canadian Geotechnical Journal, Volume 46: 1337-1355. DOI: [10.1139/T09-065](https://doi.org/10.1139/T09-065).

Sully, J.P., Robertson, P.K., Campanella, R.G. and Woeller, D.J., 1999, "An approach to evaluation of field CPTU dissipation data in overconsolidated fine-grained soils", Canadian Geotechnical Journal, 36(2): 369-381. DOI: [10.1139/T98-105](https://doi.org/10.1139/T98-105).

Teh, C.I., and Houlsby, G.T., 1991, "An analytical study of the cone penetration test in clay", Geotechnique, 41(1): 17-34. DOI: [10.1680/geot.1991.41.1.17](https://doi.org/10.1680/geot.1991.41.1.17).

The appendices listed below are included in the report:

- Cone Penetration Test Summary and Standard Cone Penetration Test Plots
- Advanced Cone Penetration Test Plots with  $S_u(N_{kt})$ ,  $\Phi$  and  $N(60)_{lc}$
- Soil Behavior Type (SBT) Scatter Plots
- Seismic Cone Penetration Test Plots
- Seismic Cone Penetration Test Tabular Results
- Seismic Cone Penetration Test Wave Traces
- Pore Pressure Dissipation Summary and Pore Pressure Dissipation Plots

# Cone Penetration Test Summary and Standard Cone Penetration Test Plots





Job No: 21-54-23203  
Client: Draper Aden  
Project: Green Ridge Landfill  
Start Date: 25-Oct-2021  
End Date: 26-Oct-2021

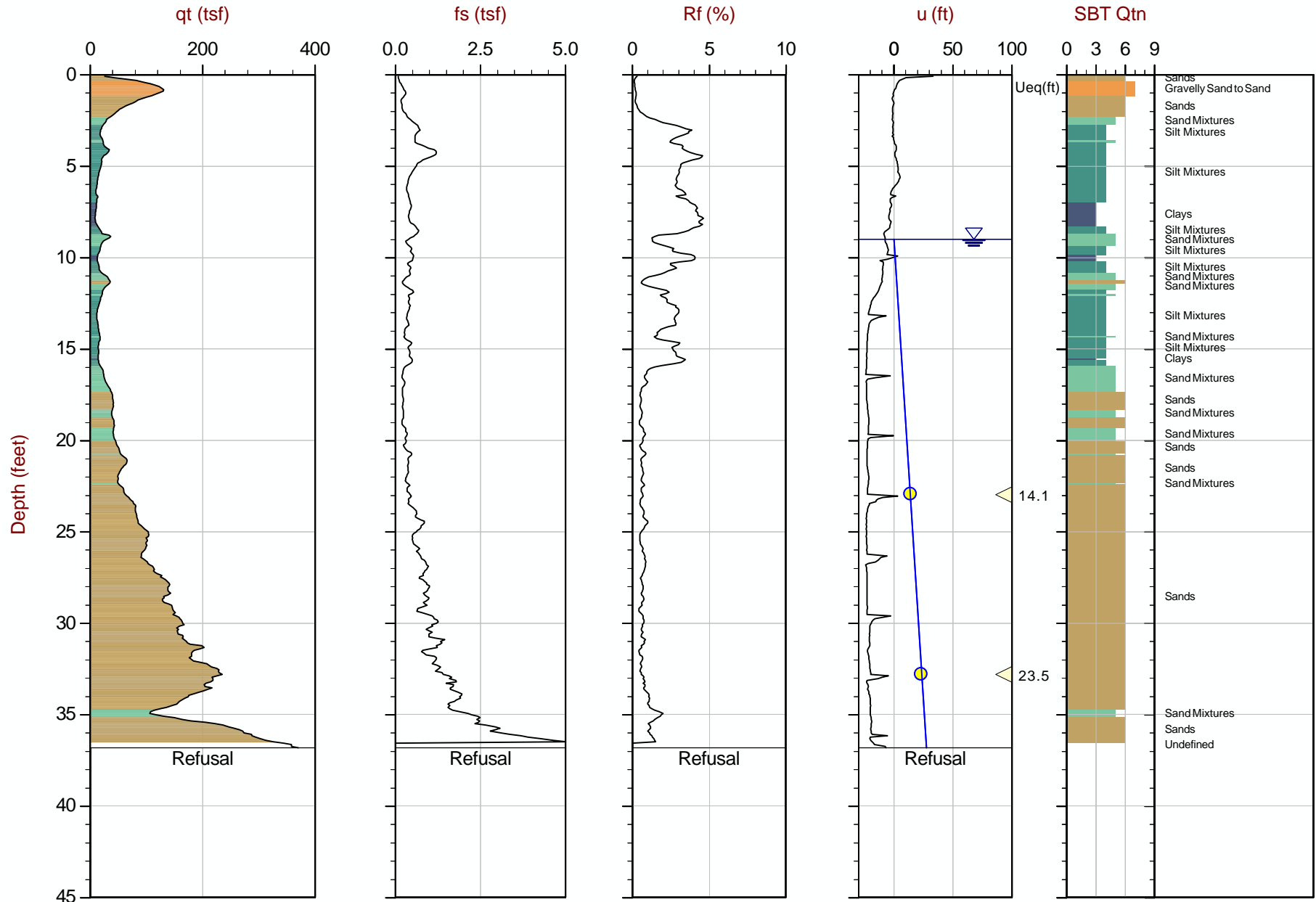
### CONE PENETRATION TEST SUMMARY

Sounding ID	File Name	Date	Cone	Assumed Phreatic Surface <sup>2</sup> (ft)	Final Depth (ft)	Shear Wave Velocity Tests	Latitude <sup>1</sup> (degrees)	Longitude <sup>1</sup> (degrees)	Note
DAA-4CP	21-54-23203_CP_DAA-4CP.COR	2021-10-25	556:T1500F15U35	9	36.8	12	37.55674	-78.12770	
DAA-102CP	21-54-23203_CP_DAA-102CP.COR	2021-10-26	556:T1500F15U35	9	22.0		37.56434	-78.11861	
DAA-104CP	21-54-23203_CP_DAA-104CP.COR	2021-10-26	556:T1500F15U35	25	39.6		37.56197	-78.12009	
DAA-105CP	21-54-23203_SP_DAA-105CP.COR	2021-10-26	556:T1500F15U35	30	36.1	11	37.56276	-78.11977	
DAA-106CP	21-54-23203_CP_DAA-106CP.COR	2021-10-26	556:T1500F15U35	24	41.7		37.56169	-78.11837	
DAA-107CP	21-54-23203_SP_DAA-107CP.COR	2021-10-25	556:T1500F15U35	21	24.0	7	37.55422	-78.12564	
DAA-108CP	21-54-23203_CP_DAA-108CP.COR	2021-10-25	556:T1500F15U35	22	36.2		37.55489	-78.12712	
DAA-109CP	21-54-23203_SP_DAA-109CP.COR	2021-10-25	556:T1500F15U35	12	19.0	6	37.55608	-78.12819	
DAA-110CP	21-54-23203_SP_DAA-110CP.COR	2021-10-25	556:T1500F15U35	18	23.5	7	37.55731	-78.12816	
DAA-111CP	21-54-23203_SP_DAA-111CP.COR	2021-10-26	556:T1500F15U35		3.9		37.55835	-78.12821	3
DAA-111CPA	21-54-23203_SP_DAA-111CPA.COR	2021-10-26	556:T1500F15U35		2.9		37.55835	-78.12808	3
Totals	11 Soundings				285.8	43			

1. WGS 84 Lat/Long. Coordinates were taken with a handheld GPS and should be considered approximate.

2. The assumed phreatic surface was estimated using representative pore pressure dissipation tests. Hydrostatically increasing pore water pressures with depth were used for interpretation tables.

3. The phreatic surface was deeper then explored.



Max Depth: 11.225 m / 36.83 ft  
Depth Inc: 0.025 m / 0.082 ft  
Avg Int: Every Point

File: 21-54-23203\_CP\_DAA-4CP.COR  
Unit Wt: SBTQtn (PKR2009)

SBT: Robertson, 2009 and 2010  
Coords: Lat: 37.55674 Long: -78.12770

— Hydrostatic Line    ● Ueq    ● Assumed Ueq    ◀ PPD, Ueq achieved    ◀ PPD, Ueq not achieved

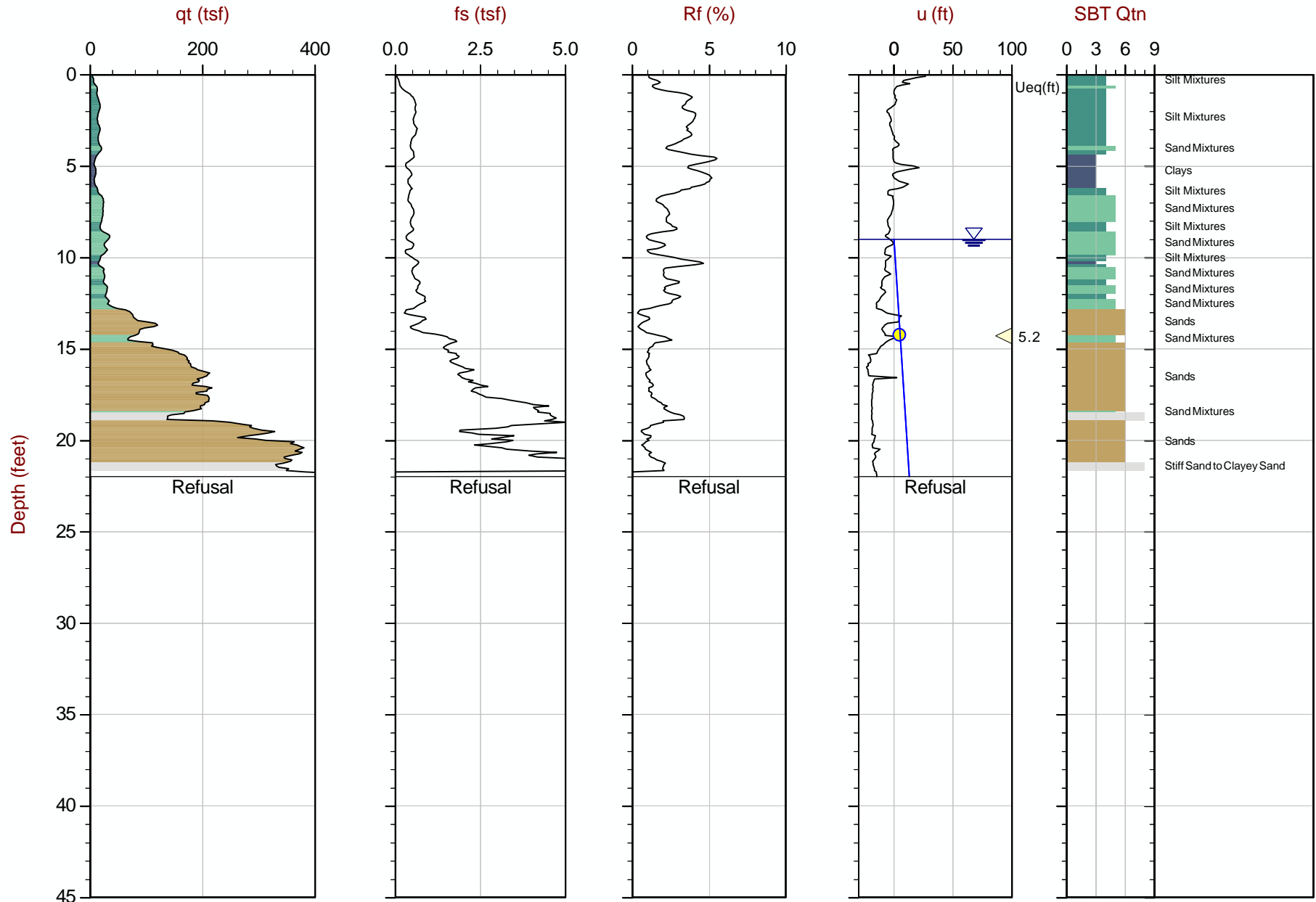
The reported coordinates were acquired from consumer-grade GPS equipment and are only approximate locations. The coordinates should not be used for design purposes.



# Draper Aden

Job No: 21-54-23203  
Date: 2021-10-26 21:27  
Site: Green Ridge Landfill

Sounding: DAA-102CP  
Cone: 556:T1500F15U35



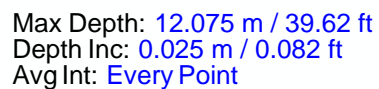
Max Depth: 6.700 m / 21.98 ft  
Depth Inc: 0.025 m / 0.082 ft  
Avg Int: Every Point

File: 21-54-23203\_CP\_DAA-102CP.COR  
Unit Wt: SBTQtn(PKR2009)

SBT: Robertson, 2009 and 2010  
Coords: Lat: 37.56434 Long: -78.11861

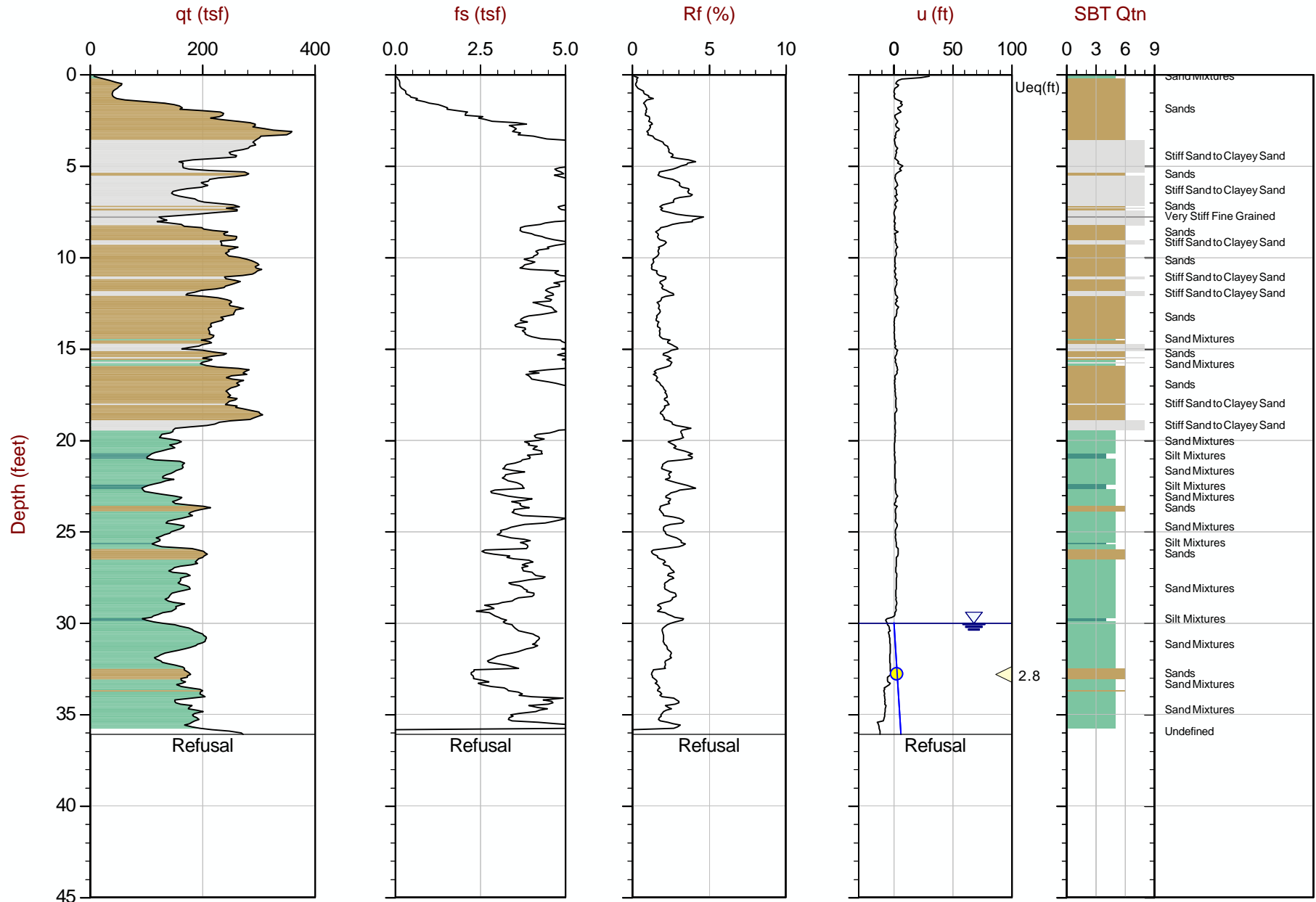
— Hydrostatic Line    ● Ueq    ● Assumed Ueq    ◀ PPD, Ueq achieved    ▶ PPD, Ueq not achieved

The reported coordinates were acquired from consumer-grade GPS equipment and are only approximate locations. The coordinates should not be used for design purposes.



SBT: Robertson, 2009 and 2010  
Coords: Lat: 37.56197 Long: -78.12009

The reported coordinates were acquired from consumer-grade GPS equipment and are only approximate locations. The coordinates should not be used for design purposes.



Max Depth: 11.000 m / 36.09 ft  
Depth Inc: 0.025 m / 0.082 ft  
Avg Int: Every Point

File: 21-54-23203\_SP\_DAA-105CP.COR  
Unit Wt: SBTQtn(PKR2009)

SBT: Robertson, 2009 and 2010  
Coords: Lat: 37.56276 Long: -78.11977

— Hydrostatic Line    ● Ueq    ● Assumed Ueq    ◀ PPD, Ueq achieved    ◀ PPD, Ueq not achieved

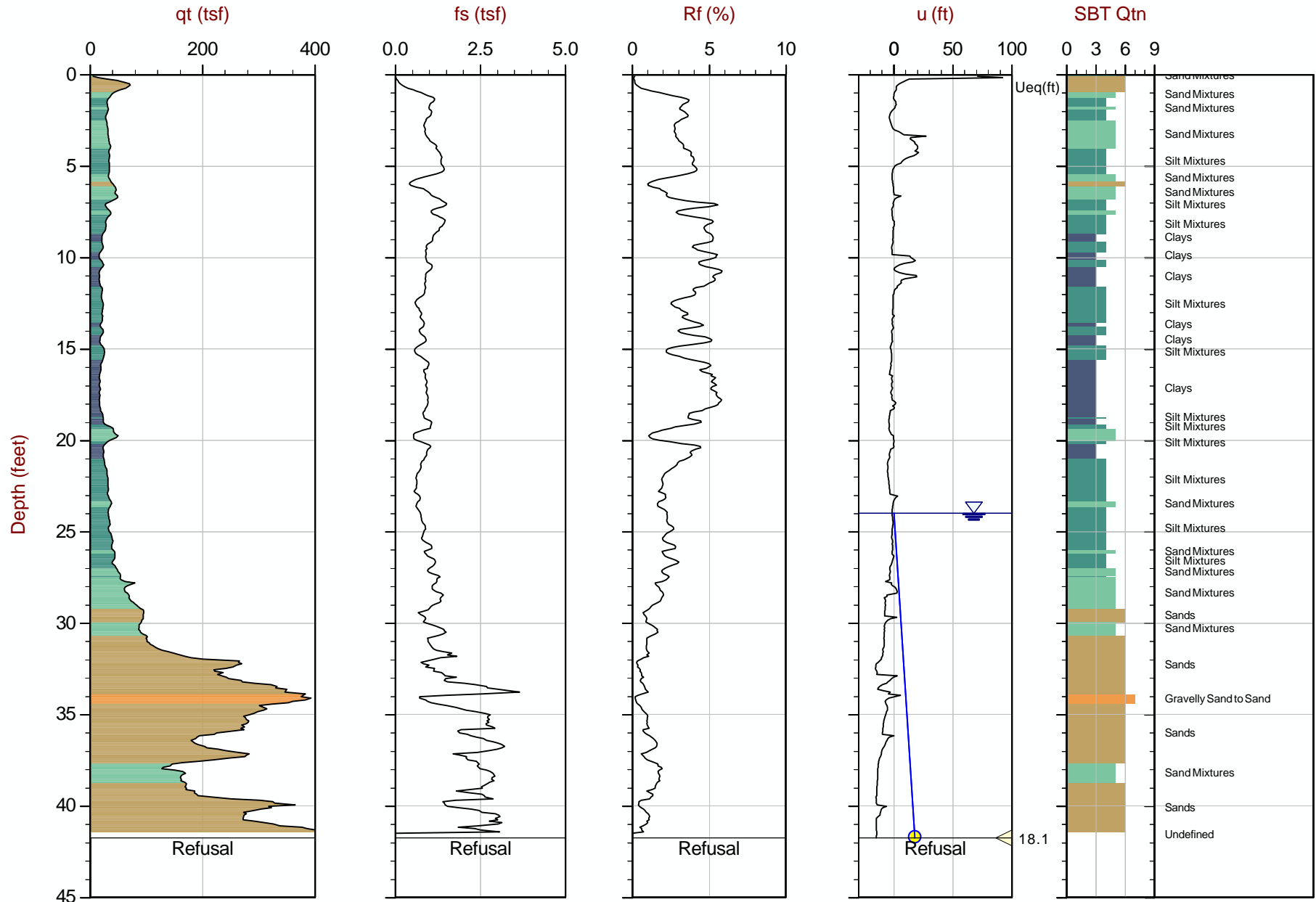
The reported coordinates were acquired from consumer-grade GPS equipment and are only approximate locations. The coordinates should not be used for design purposes.



# Draper Aden

Job No: 21-54-23203  
Date: 2021-10-26 20:02  
Site: Green Ridge Landfill

Sounding: DAA-106CP  
Cone: 556:T1500F15U35



Max Depth: 12.725 m / 41.75 ft  
Depth Inc: 0.025 m / 0.082 ft  
Avg Int: Every Point

File: 21-54-23203\_CP\_DAA-106CP.COR  
Unit Wt: SBTQtn(PKR2009)

SBT: Robertson, 2009 and 2010  
Coords: Lat: 37.56169 Long: -78.11837

— Hydrostatic Line    ● Ueq    ● Assumed Ueq    ◀ PPD, Ueq achieved    ◀ PPD, Ueq not achieved

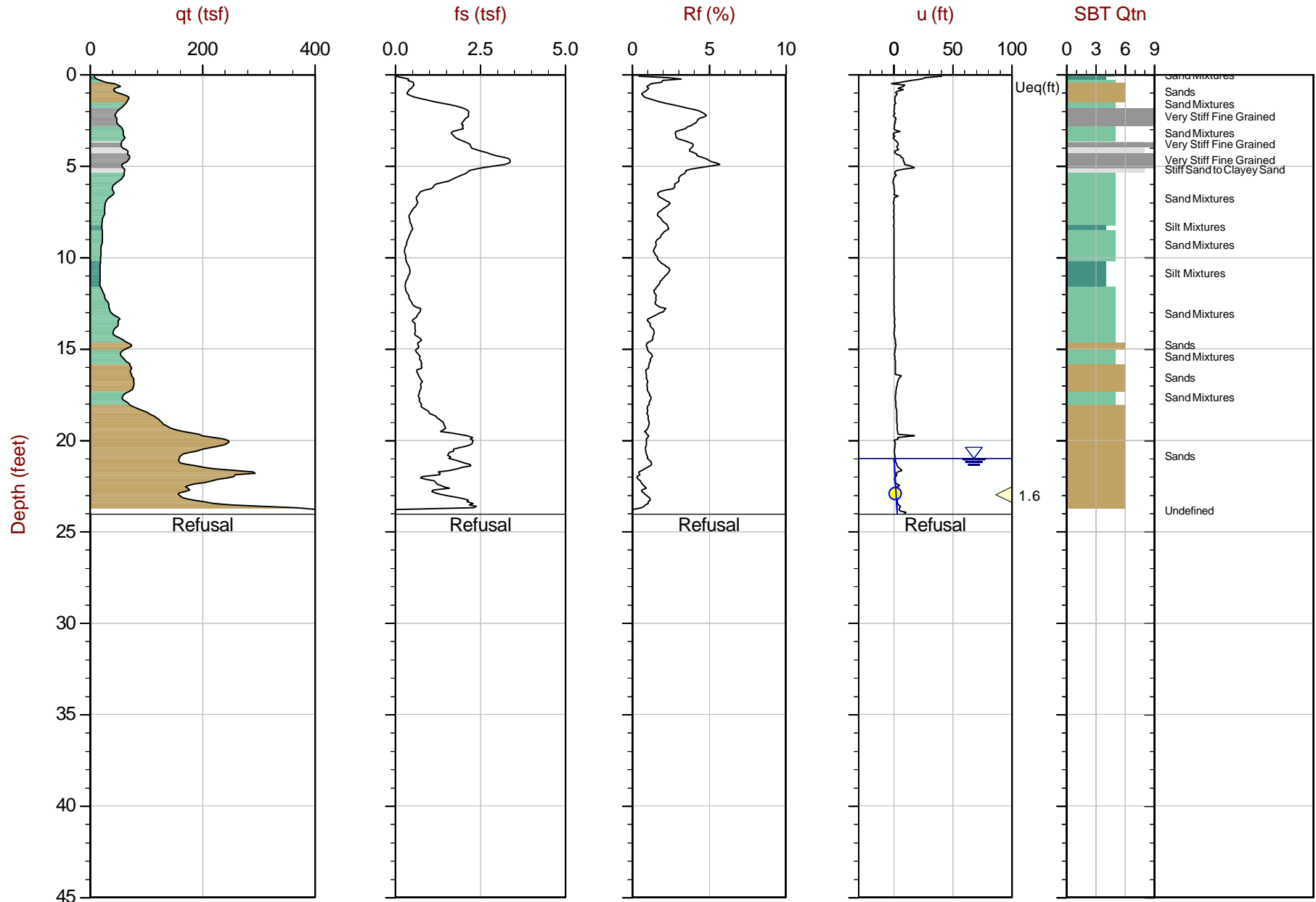
The reported coordinates were acquired from consumer-grade GPS equipment and are only approximate locations. The coordinates should not be used for design purposes.



# Draper Aden

Job No: 21-54-23203  
Date: 2021-10-25 19:54  
Site: Green Ridge Landfill

Sounding: DAA-107CP  
Cone: 556:T1500F15U35



Max Depth: 7.325 m / 24.03 ft  
Depth Inc: 0.025 m / 0.082 ft  
Avg Int: Every Point

File: 21-54-23203\_SP\_DAA-107CP.COR  
Unit Wt: SBTQtn(PKR2009)

SBT: Robertson, 2009 and 2010  
Coords: Lat: 37.55422 Long: -78.12564

— Hydrostatic Line    ● Ueq    ● Assumed Ueq    ▲ PPD, Ueq achieved    ▲ PPD, Ueq not achieved

The reported coordinates were acquired from consumer-grade GPS equipment and are only approximate locations. The coordinates should not be used for design purposes.

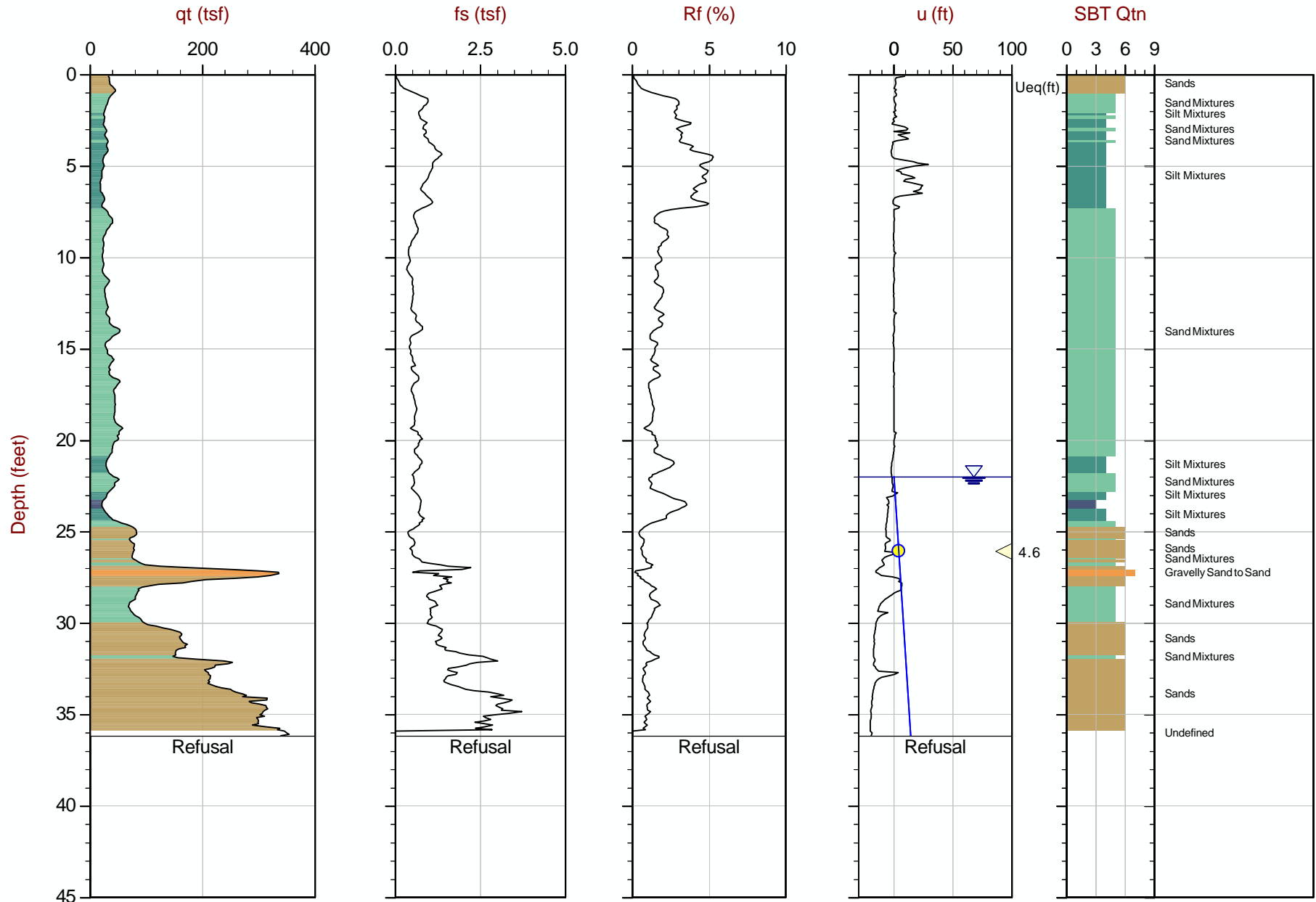




# Draper Aden

Job No: 21-54-23203  
Date: 2021-10-25 18:27  
Site: Green Ridge Landfill

Sounding: DAA-108CP  
Cone: 556:T1500F15U35



Max Depth: 11.025 m / 36.17 ft  
Depth Inc: 0.025 m / 0.082 ft  
Avg Int: Every Point

File: 21-54-23203\_CP\_DAA-108CP.COR  
Unit Wt: SBTQtn(PKR2009)

SBT: Robertson, 2009 and 2010  
Coords: Lat: 37.55489 Long: -78.12712

— Hydrostatic Line ● Ueq ● Assumed Ueq ▲ PPD, Ueq achieved ▼ PPD, Ueq not achieved

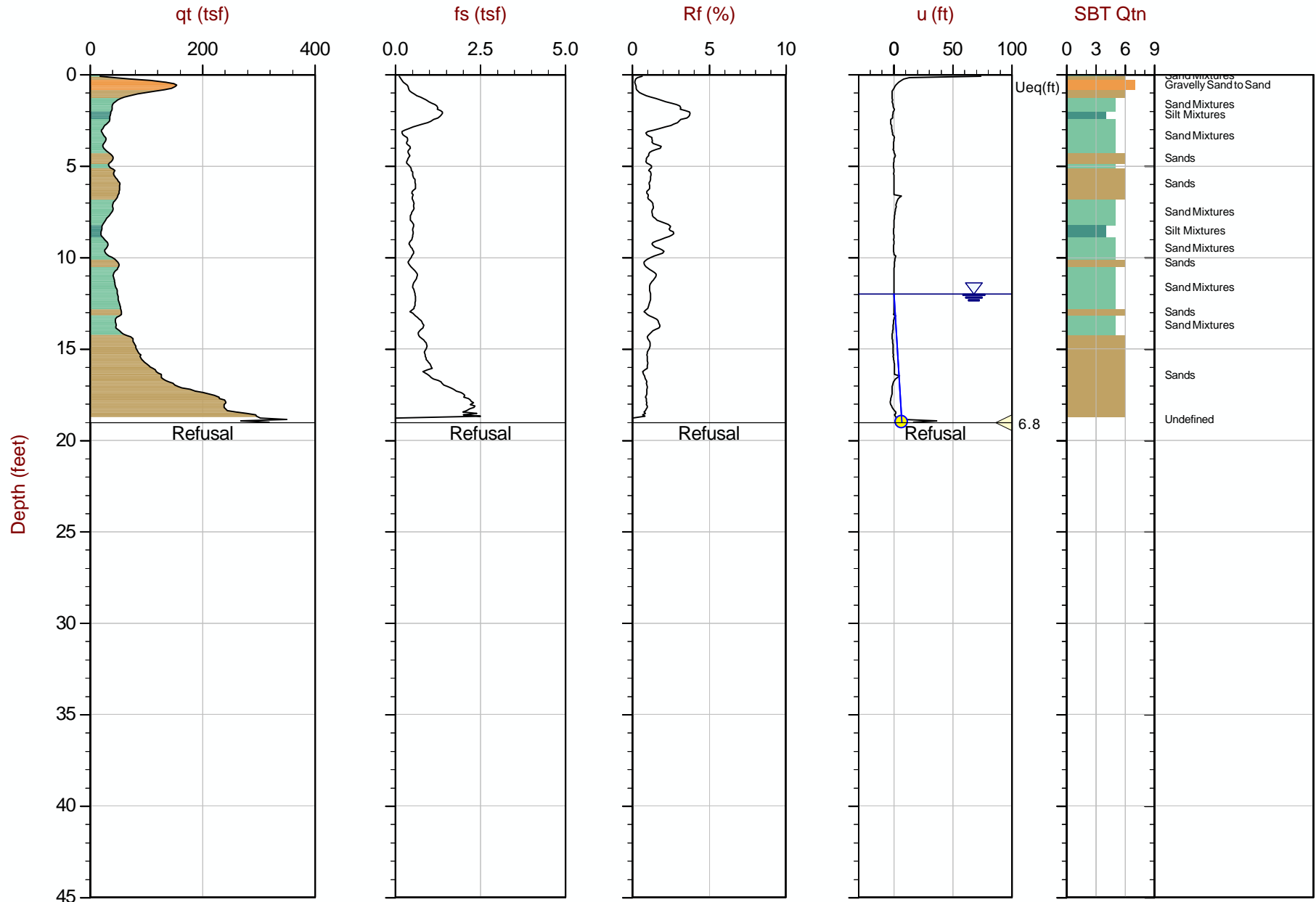
The reported coordinates were acquired from consumer-grade GPS equipment and are only approximate locations. The coordinates should not be used for design purposes.



# Draper Aden

Job No: 21-54-23203  
Date: 2021-10-25 16:56  
Site: Green Ridge Landfill

Sounding: DAA-109CP  
Cone: 556:T1500F15U35



Max Depth: 5.800 m / 19.03 ft  
Depth Inc: 0.025 m / 0.082 ft  
Avg Int: Every Point

File: 21-54-23203\_SP\_DAA-109CP.COR  
Unit Wt: SBTQtn(PKR2009)

SBT: Robertson, 2009 and 2010  
Coords: Lat: 37.55608 Long: -78.12819

— Hydrostatic Line ● Ueq ● Assumed Ueq ◀ PPD, Ueq achieved ▶ PPD, Ueq not achieved

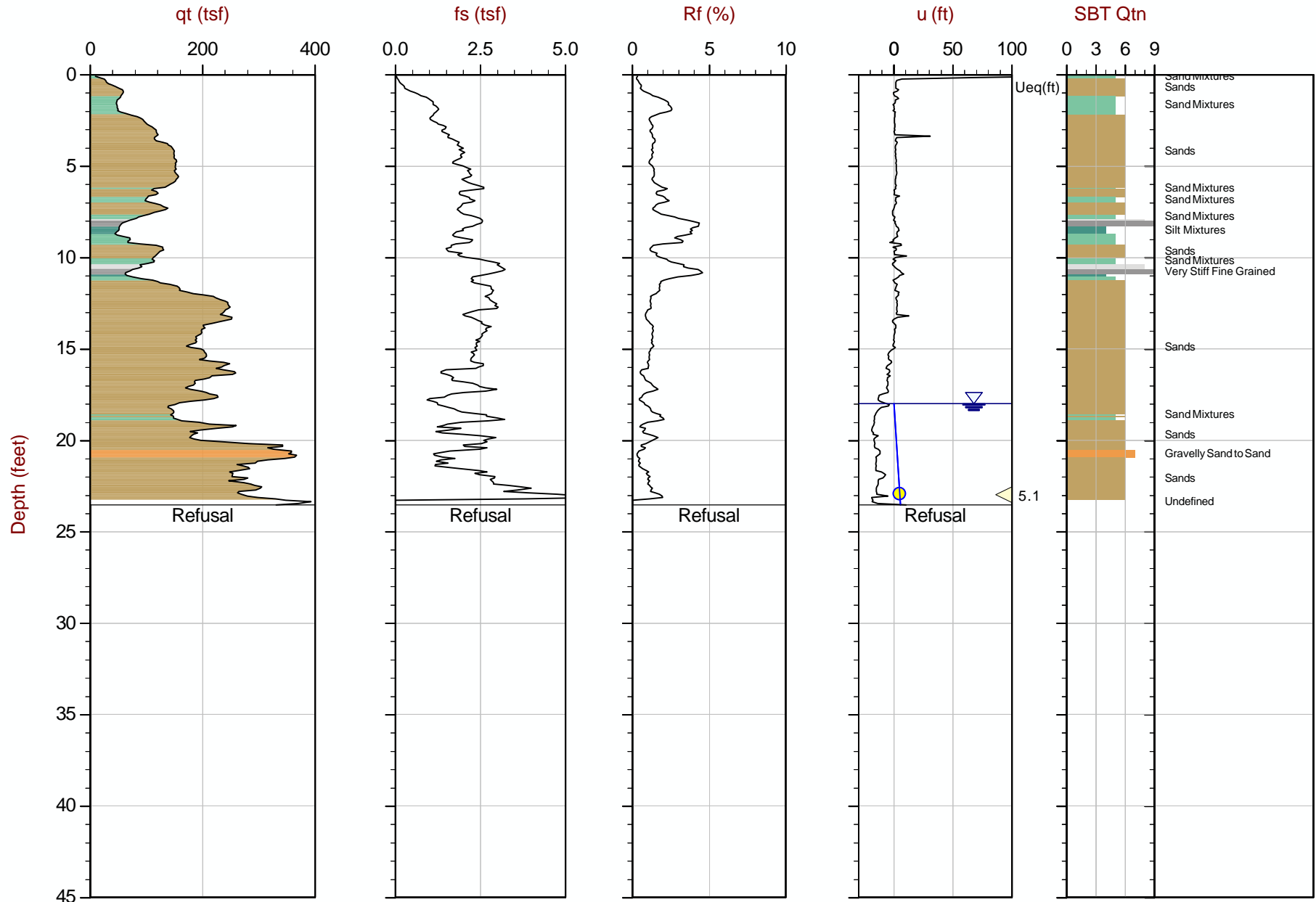
The reported coordinates were acquired from consumer-grade GPS equipment and are only approximate locations. The coordinates should not be used for design purposes.



# Draper Aden

Job No: 21-54-23203  
Date: 2021-10-25 13:56  
Site: Green Ridge Landfill

Sounding: DAA-110CP  
Cone: 556:T1500F15U35



Max Depth: 7.175 m / 23.54 ft  
Depth Inc: 0.025 m / 0.082 ft  
Avg Int: Every Point

File: 21-54-23203\_SP\_DAA-110CP.COR  
Unit Wt: SBTQtn(PKR2009)

SBT: Robertson, 2009 and 2010  
Coords: Lat: 37.55731 Long: -78.12816

— Hydrostatic Line ● Ueq ● Assumed Ueq ▲ PPD, Ueq achieved ▲ PPD, Ueq not achieved

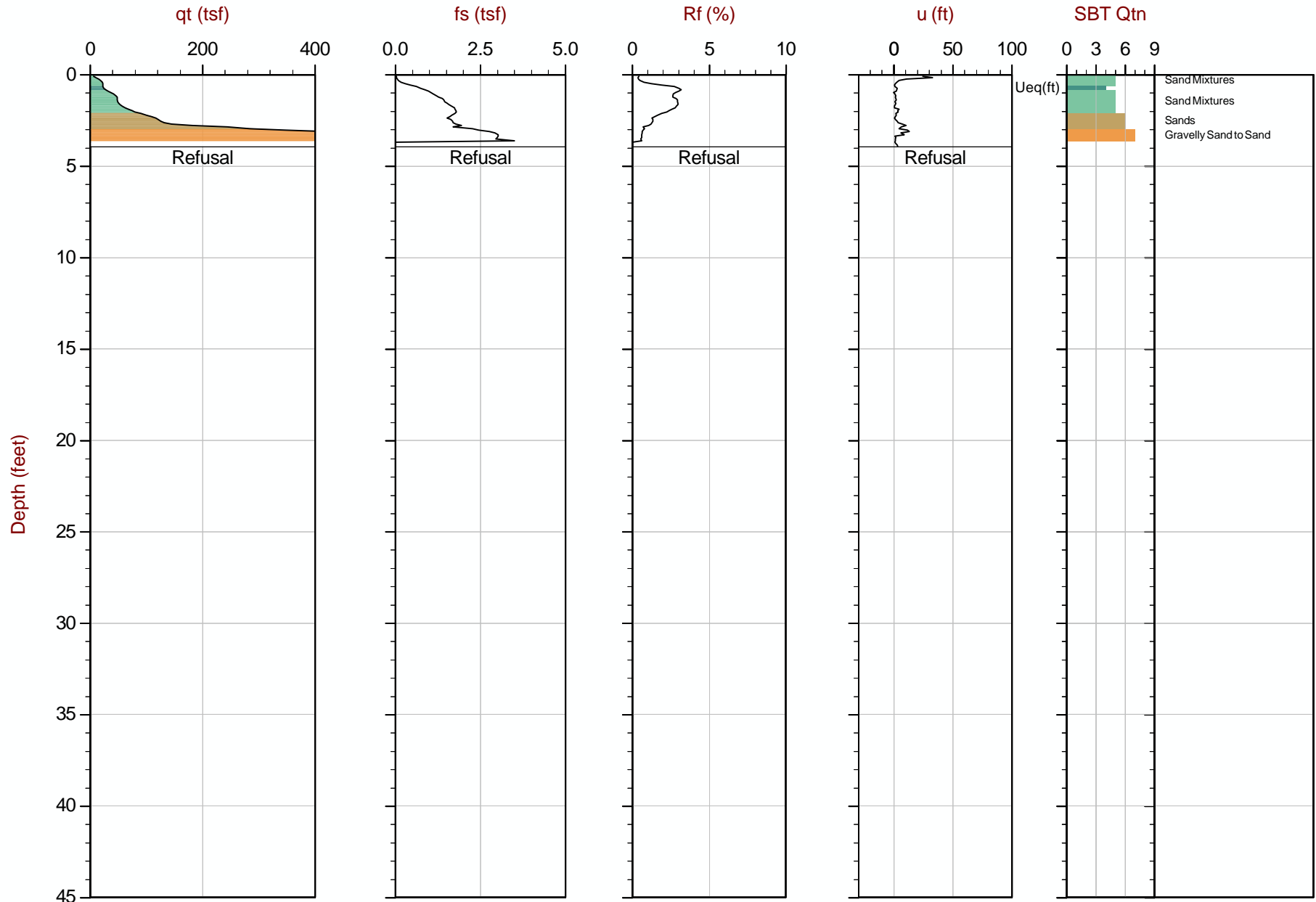
The reported coordinates were acquired from consumer-grade GPS equipment and are only approximate locations. The coordinates should not be used for design purposes.



# Draper Aden

Job No: 21-54-23203  
Date: 2021-10-26 13:56  
Site: Green Ridge Landfill

Sounding: DAA-111CP  
Cone: 556:T1500F15U35



Max Depth: 1.200 m / 3.94 ft  
Depth Inc: 0.025 m / 0.082 ft  
Avg Int: Every Point

File: 21-54-23203\_SP\_DAA-111CP.COR  
Unit Wt: SBTQtn(PKR2009)

SBT: Robertson, 2009 and 2010  
Coords: Lat: 37.55835 Long: -78.12821

— Hydrostatic Line ● Ueq ● Assumed Ueq ◀ PPD, Ueq achieved ▶ PPD, Ueq not achieved

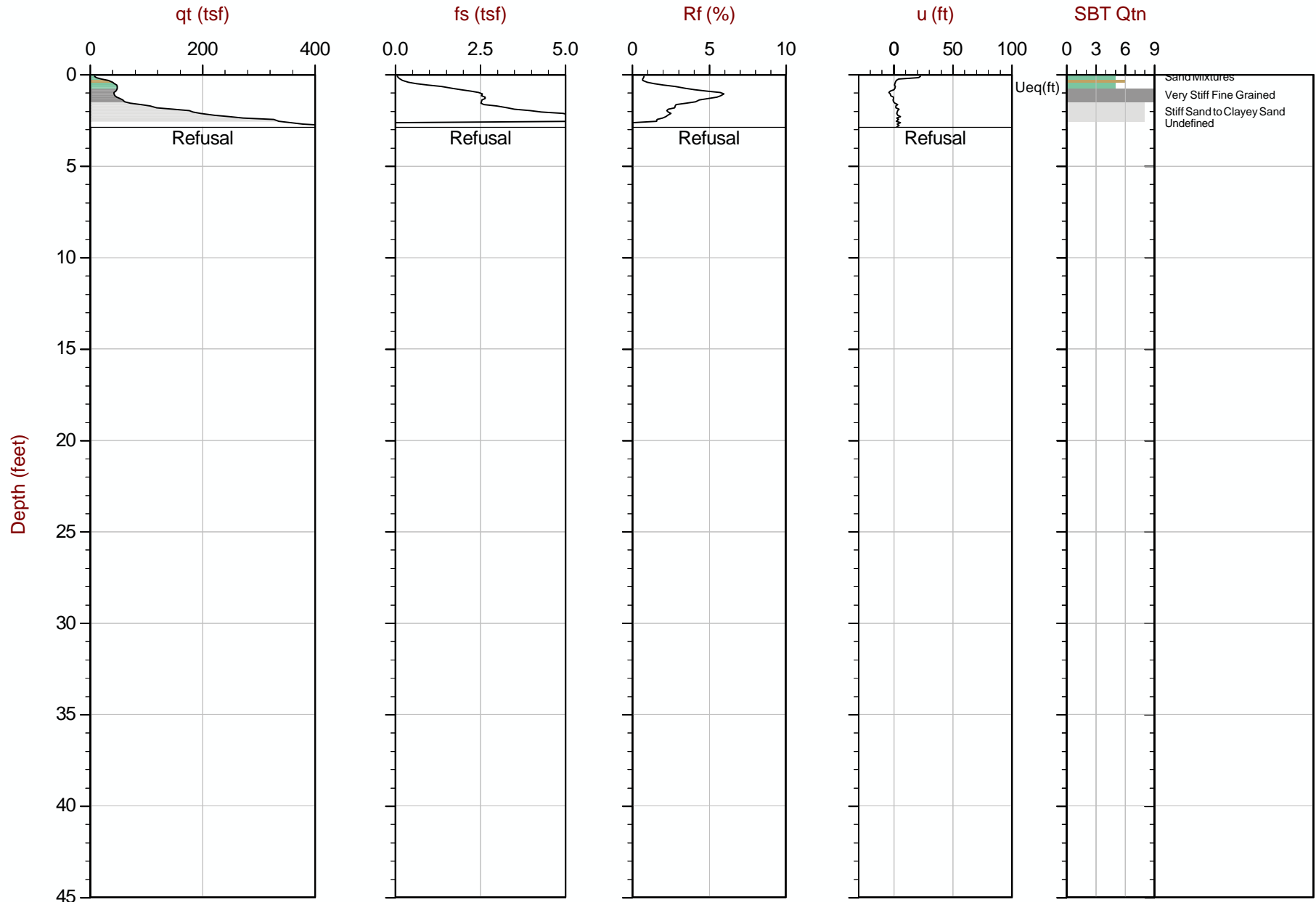
The reported coordinates were acquired from consumer-grade GPS equipment and are only approximate locations. The coordinates should not be used for design purposes.



# Draper Aden

Job No: 21-54-23203  
Date: 2021-10-26 14:25  
Site: Green Ridge Landfill

Sounding: DAA-111CPA  
Cone: 556:T1500F15U35



Max Depth: 0.875 m / 2.87 ft  
Depth Inc: 0.025 m / 0.082 ft  
Avg Int: Every Point

File: 21-54-23203\_SP\_DAA-111CPA.COR  
Unit Wt: SBTQtn(PKR2009)

SBT: Robertson, 2009 and 2010  
Coords: Lat: 37.55835 Long: -78.12808

— Hydrostatic Line ● Ueq ● Assumed Ueq ◀ PPD, Ueq achieved ▶ PPD, Ueq not achieved

The reported coordinates were acquired from consumer-grade GPS equipment and are only approximate locations. The coordinates should not be used for design purposes.

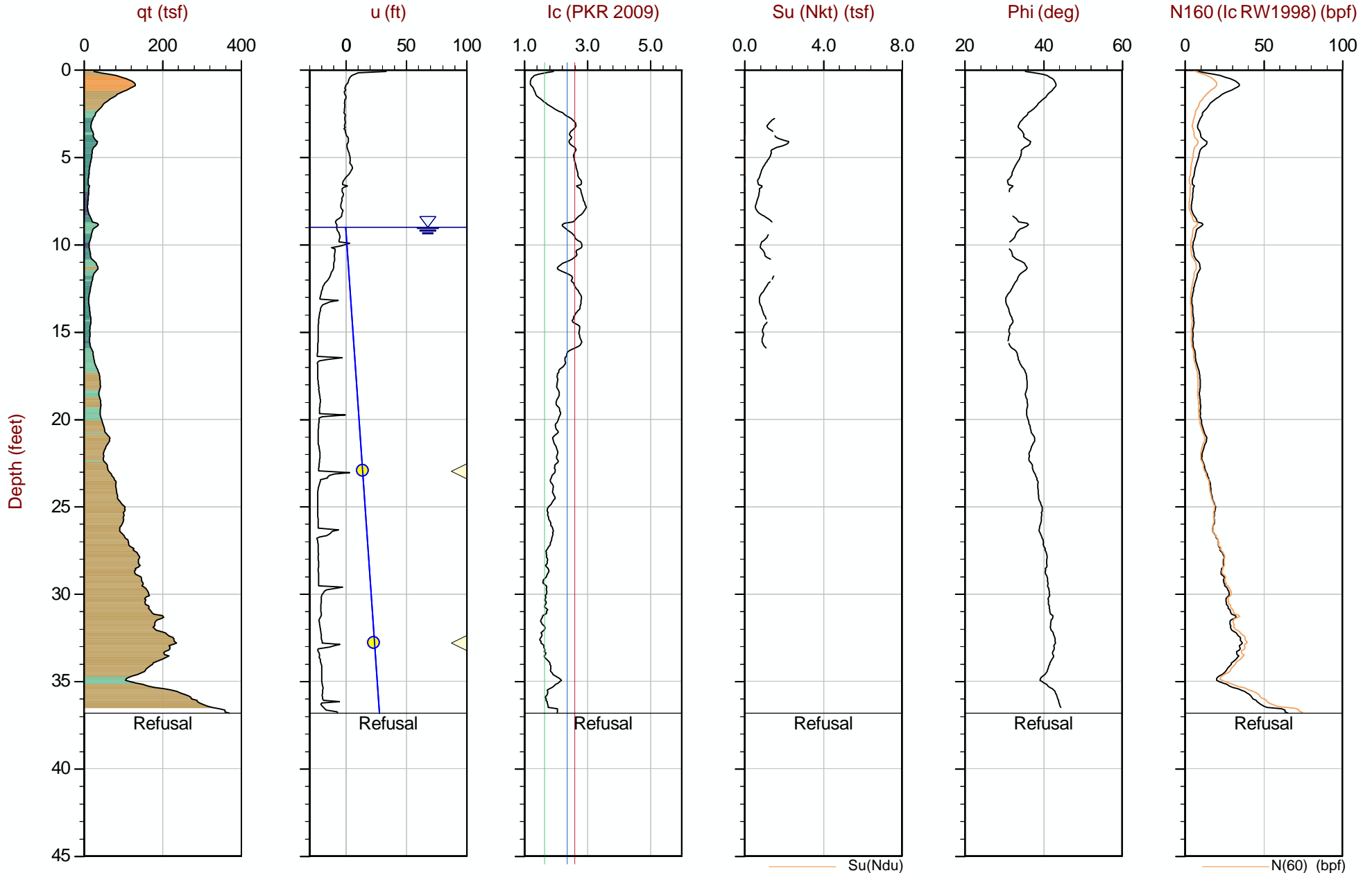
## Advanced Cone Penetration Test Plots with N60, Su(Nkt) and Phi



# Draper Aden

Job No: 21-54-23203  
Date: 2021-10-25 15:34  
Site: Green Ridge Landfill

Sounding: DAA-4CP  
Cone: 556:T1500F15U35



Max Depth: 11.225 m / 36.83 ft  
Depth Inc: 0.025 m / 0.082 ft  
Avg Int: Every Point

File: 21-54-23203\_CP\_DAA-4CP.COR  
Unit Wt: SBTQtn(PKR2009)  
Su Nkt/Ndu: 15.0 / 6.0

SBT: Robertson, 2009 and 2010  
Coords: Lat: 37.55674 Long: -78.12770

— Hydrostatic Line ● Ueq ● Assumed Ueq ◀ PPD, Ueq achieved ▶ PPD, Ueq not achieved

The reported coordinates were acquired from consumer-grade GPS equipment and are only approximate locations. The coordinates should not be used for design purposes.

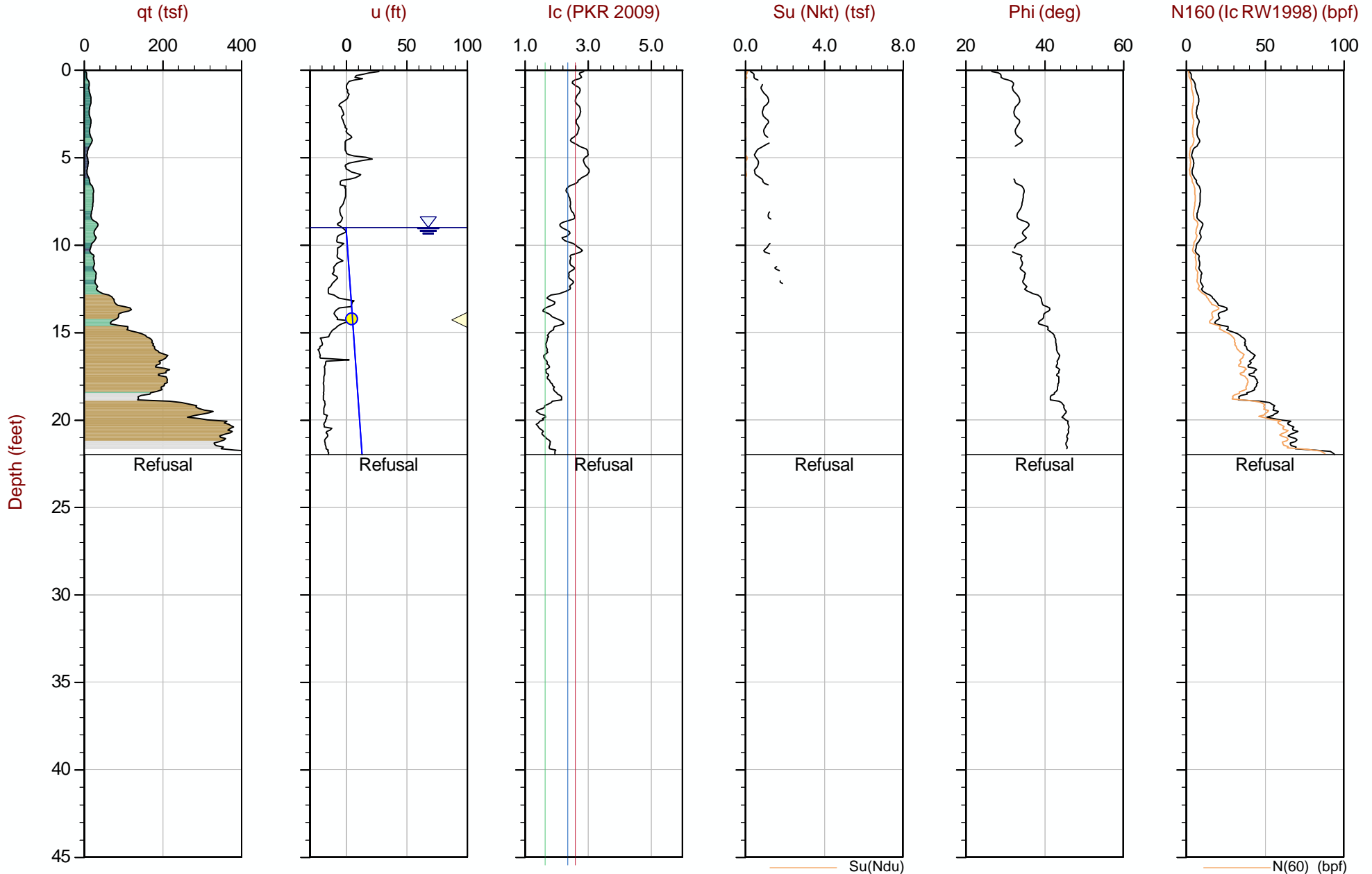




# Draper Aden

Job No: 21-54-23203  
Date: 2021-10-26 21:27  
Site: Green Ridge Landfill

Sounding: DAA-102CP  
Cone: 556:T1500F15U35



Max Depth: 6.700 m / 21.98 ft  
Depth Inc: 0.025 m / 0.082 ft  
Avg Int: Every Point

File: 21-54-23203\_CP\_DAA-102CP.COR  
Unit Wt: SBTQtn(PKR2009)  
Su Nkt/Ndu: 15.0 / 6.0

SBT: Robertson, 2009 and 2010  
Coords: Lat: 37.56434 Long: -78.11861

— Hydrostatic Line ● Ueq ● Assumed Ueq ◀ PPD, Ueq achieved ▶ PPD, Ueq not achieved

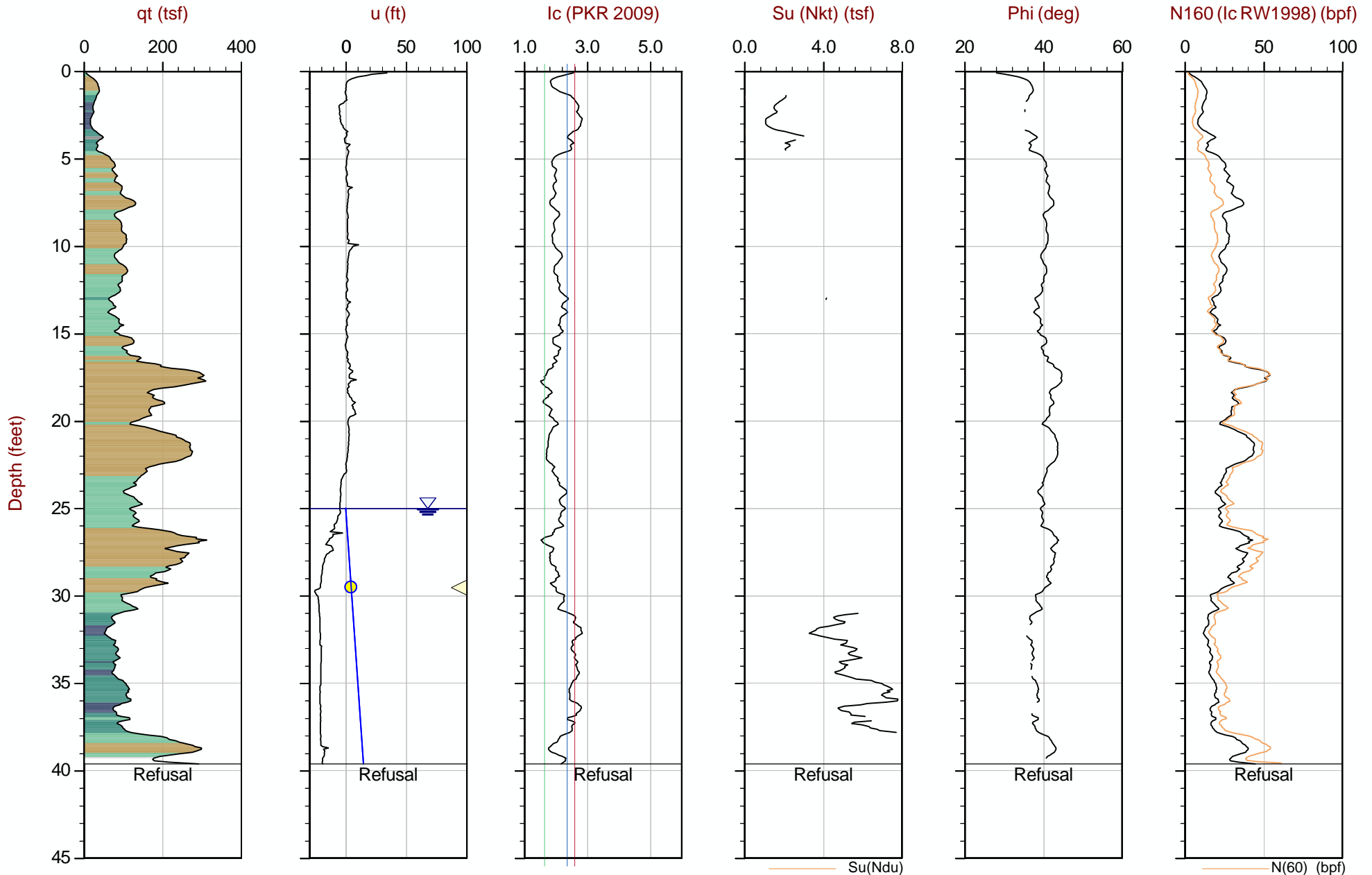
The reported coordinates were acquired from consumer-grade GPS equipment and are only approximate locations. The coordinates should not be used for design purposes.



# Draper Aden

Job No: 21-54-23203  
Date: 2021-10-26 16:35  
Site: Green Ridge Landfill

Sounding: DAA-104CP  
Cone: 556:T1500F15U35



Max Depth: 12.075 m / 39.62 ft  
Depth Inc: 0.025 m / 0.082 ft  
Avg Int: Every Point

File: 21-54-23203\_CP\_DAA-104CP.COR  
Unit Wt: SBTQtn(PKR2009)  
Su Nkt/Ndu: 15.0 / 6.0

SBT: Robertson, 2009 and 2010  
Coords: Lat: 37.56197 Long: -78.12009

— Hydrostatic Line ● Ueq ● Assumed Ueq ◀ PPD, Ueq achieved ▶ PPD, Ueq not achieved

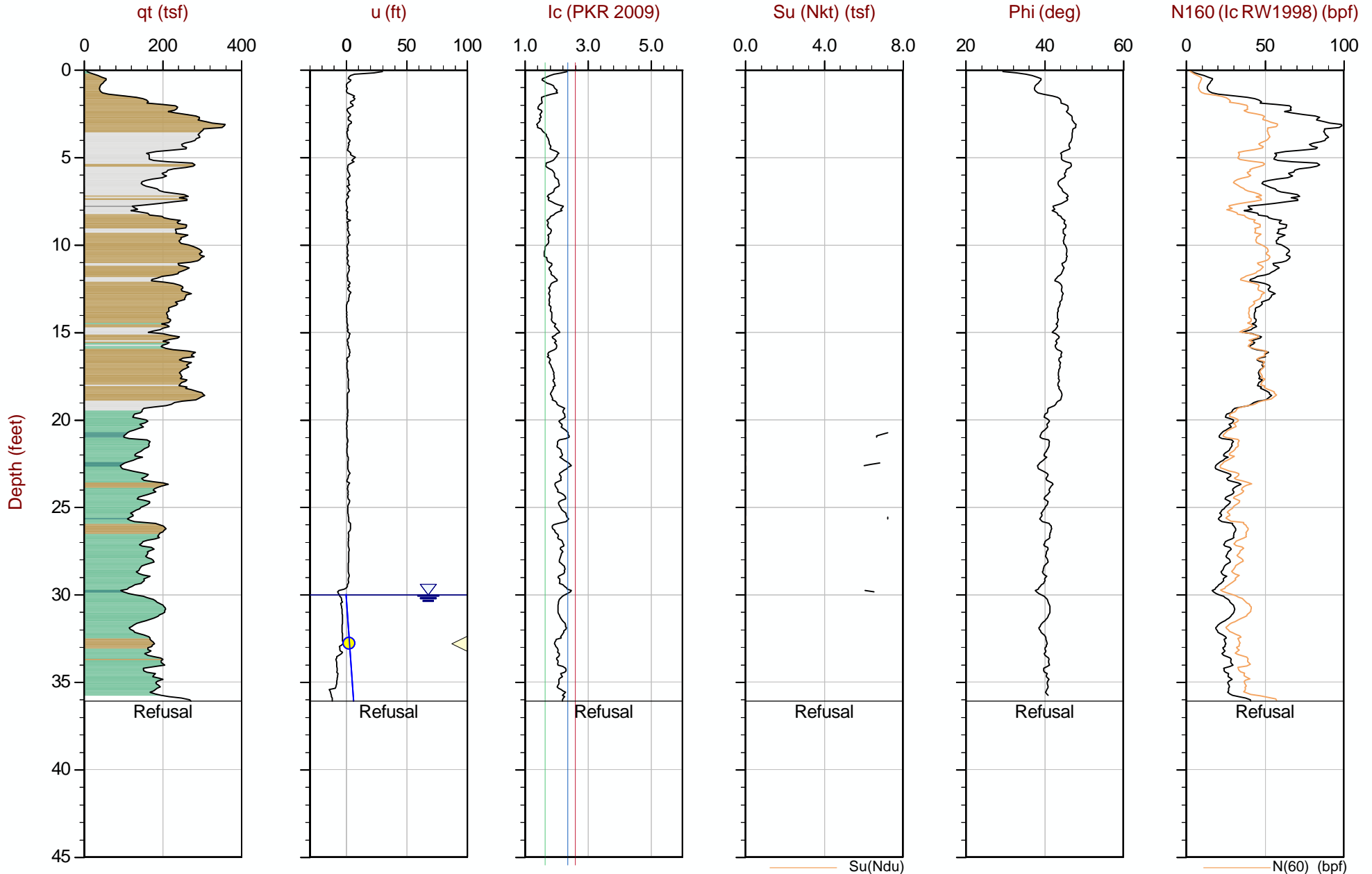
The reported coordinates were acquired from consumer-grade GPS equipment and are only approximate locations. The coordinates should not be used for design purposes.



# Draper Aden

Job No: 21-54-23203  
Date: 2021-10-26 17:53  
Site: Green Ridge Landfill

Sounding: DAA-105CP  
Cone: 556:T1500F15U35



Max Depth: 11.000 m / 36.09 ft  
Depth Inc: 0.025 m / 0.082 ft  
Avg Int: Every Point

File: 21-54-23203\_SP\_DAA-105CP.COR  
Unit Wt: SBTQtn(PKR2009)  
Su Nkt/Ndu: 15.0 / 6.0

SBT: Robertson, 2009 and 2010  
Coords: Lat: 37.56276 Long: -78.11977

Hydrostatic Line Ueq Assumed Ueq PPD, Ueq achieved PPD, Ueq not achieved

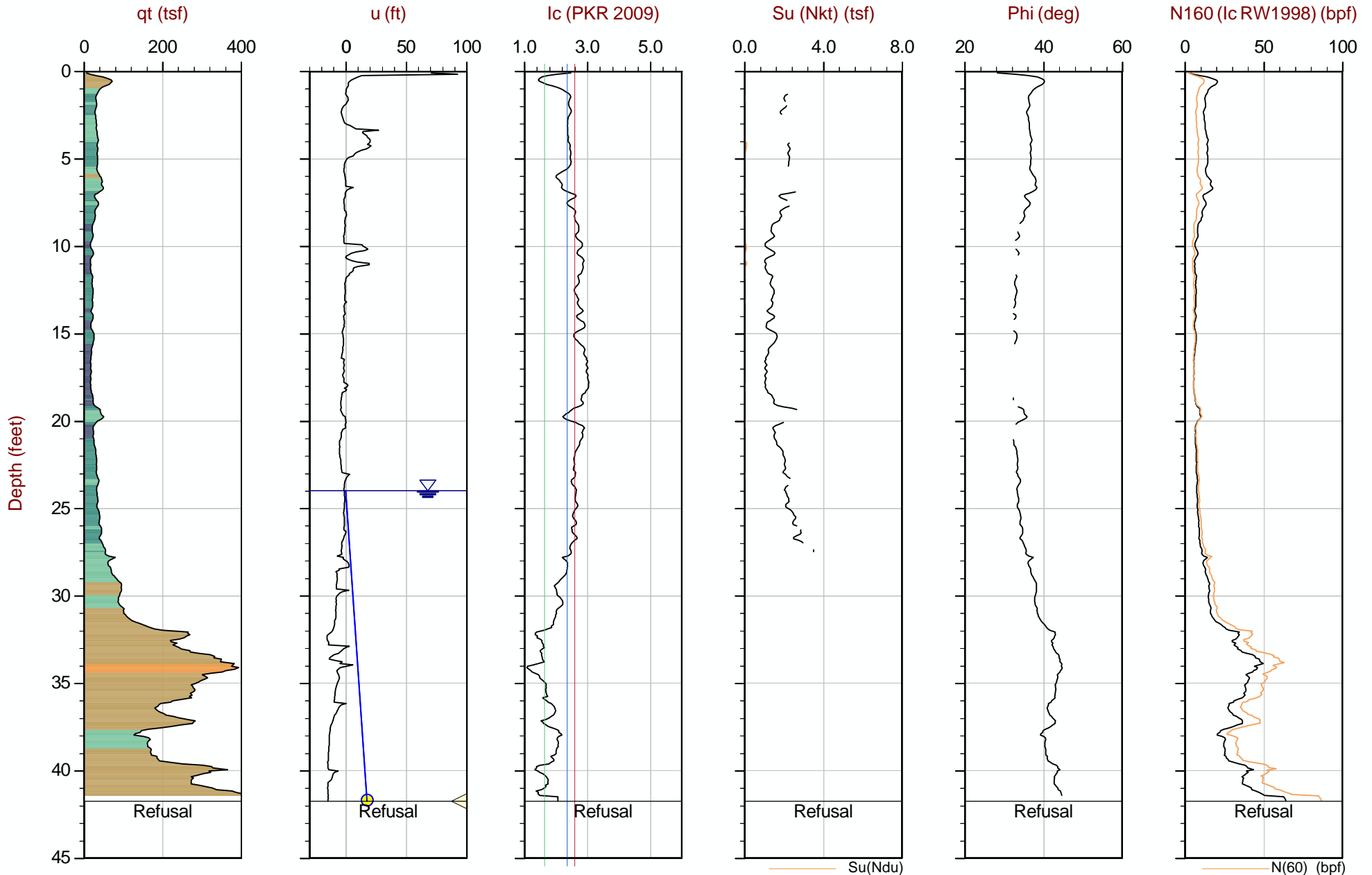
The reported coordinates were acquired from consumer-grade GPS equipment and are only approximate locations. The coordinates should not be used for design purposes.



# Draper Aden

Job No: 21-54-23203  
Date: 2021-10-26 20:02  
Site: Green Ridge Landfill

Sounding: DAA-106CP  
Cone: 556:T1500F15U35



Max Depth: 12.725 m / 41.75 ft  
Depth Inc: 0.025 m / 0.082 ft  
Avg Int: Every Point

File: 21-54-23203\_CP\_DAA-106CP.COR  
Unit Wt: SBTQtn(PKR2009)  
Su Nkt/Ndu: 15.0 / 6.0

SBT: Robertson, 2009 and 2010  
Coords: Lat: 37.56169 Long: -78.11837

— Hydrostatic Line    ● Ueq    ● Assumed Ueq    ▲ PPD, Ueq achieved    ▲ PPD, Ueq not achieved

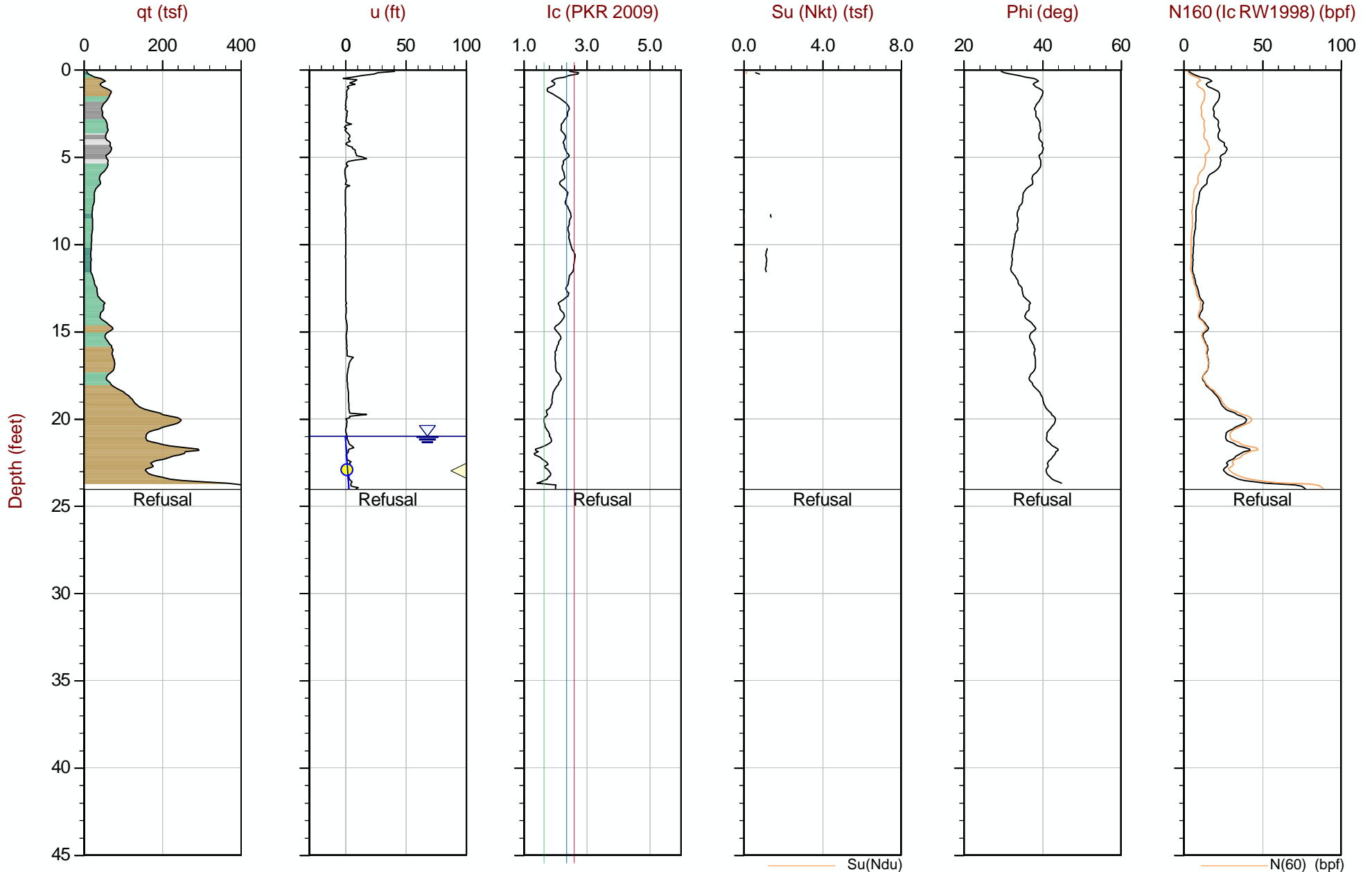
The reported coordinates were acquired from consumer-grade GPS equipment and are only approximate locations. The coordinates should not be used for design purposes.



# Draper Aden

Job No: 21-54-23203  
Date: 2021-10-25 19:54  
Site: Green Ridge Landfill

Sounding: DAA-107CP  
Cone: 556:T1500F15U35



Max Depth: 7.325 m / 24.03 ft  
Depth Inc: 0.025 m / 0.082 ft  
Avg Int: Every Point

File: 21-54-23203\_SP\_DAA-107CP.COR  
Unit Wt: SBTQtn(PKR2009)  
Su Nkt/Ndu: 15.0 / 6.0

SBT: Robertson, 2009 and 2010  
Coords: Lat: 37.55422 Long: -78.12564

— Hydrostatic Line      ● Ueq      ● Assumed Ueq      ◀ PPD, Ueq achieved      ▶ PPD, Ueq not achieved

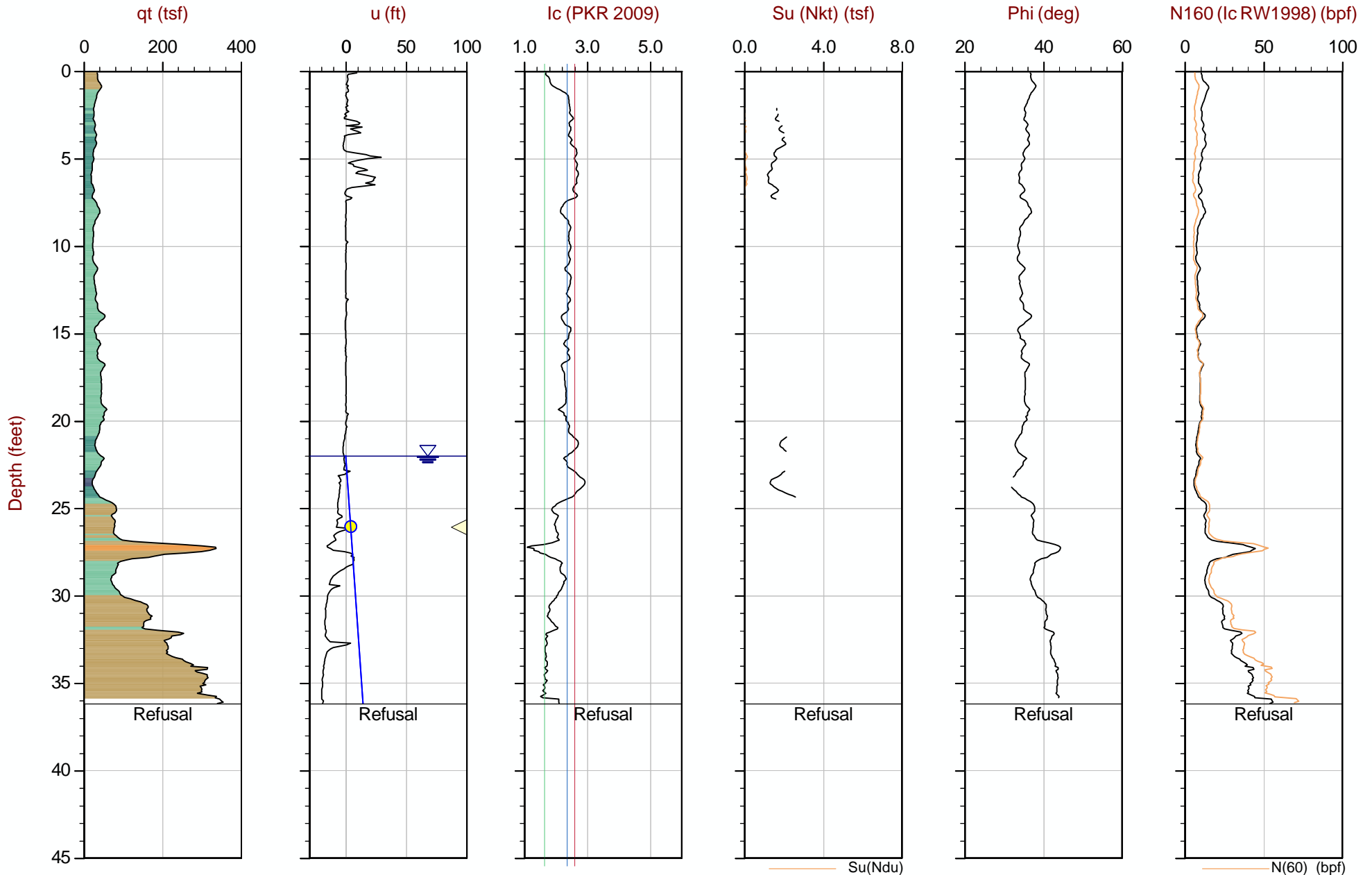
The reported coordinates were acquired from consumer-grade GPS equipment and are only approximate locations. The coordinates should not be used for design purposes.



# Draper Aden

Job No: 21-54-23203  
Date: 2021-10-25 18:27  
Site: Green Ridge Landfill

Sounding: DAA-108CP  
Cone: 556:T1500F15U35



Max Depth: 11.025 m / 36.17 ft  
Depth Inc: 0.025 m / 0.082 ft  
Avg Int: Every Point

File: 21-54-23203\_CP\_DAA-108CP.COR  
Unit Wt: SBTQtn(PKR2009)  
Su Nkt/Ndu: 15.0 / 6.0

SBT: Robertson, 2009 and 2010  
Coords: Lat: 37.55489 Long: -78.12712

— Hydrostatic Line ● Ueq ● Assumed Ueq ◀ PPD, Ueq achieved ▶ PPD, Ueq not achieved

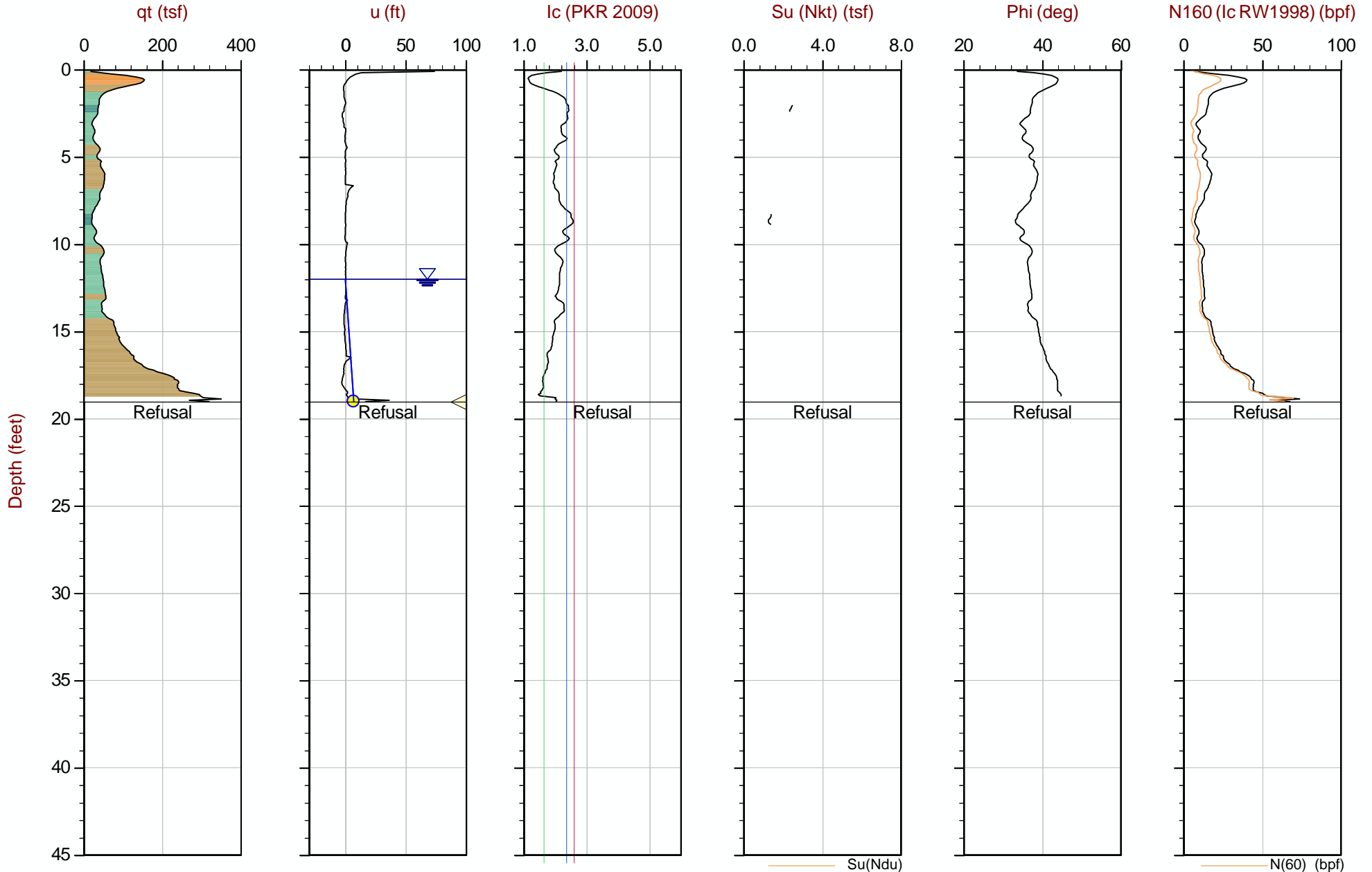
The reported coordinates were acquired from consumer-grade GPS equipment and are only approximate locations. The coordinates should not be used for design purposes.



# Draper Aden

Job No: 21-54-23203  
Date: 2021-10-25 16:56  
Site: Green Ridge Landfill

Sounding: DAA-109CP  
Cone: 556:T1500F15U35



Max Depth: 5.800 m / 19.03 ft  
Depth Inc: 0.025 m / 0.082 ft  
Avg Int: Every Point

File: 21-54-23203\_SP\_DAA-109CP.COR  
Unit Wt: SBTQtn(PKR2009)  
Su Nkt/Ndu: 15.0 / 6.0

SBT: Robertson, 2009 and 2010  
Coords: Lat: 37.55608 Long: -78.12819

— Hydrostatic Line ● Ueq ● Assumed Ueq ◀ PPD, Ueq achieved ◀ PPD, Ueq not achieved

The reported coordinates were acquired from consumer-grade GPS equipment and are only approximate locations. The coordinates should not be used for design purposes.

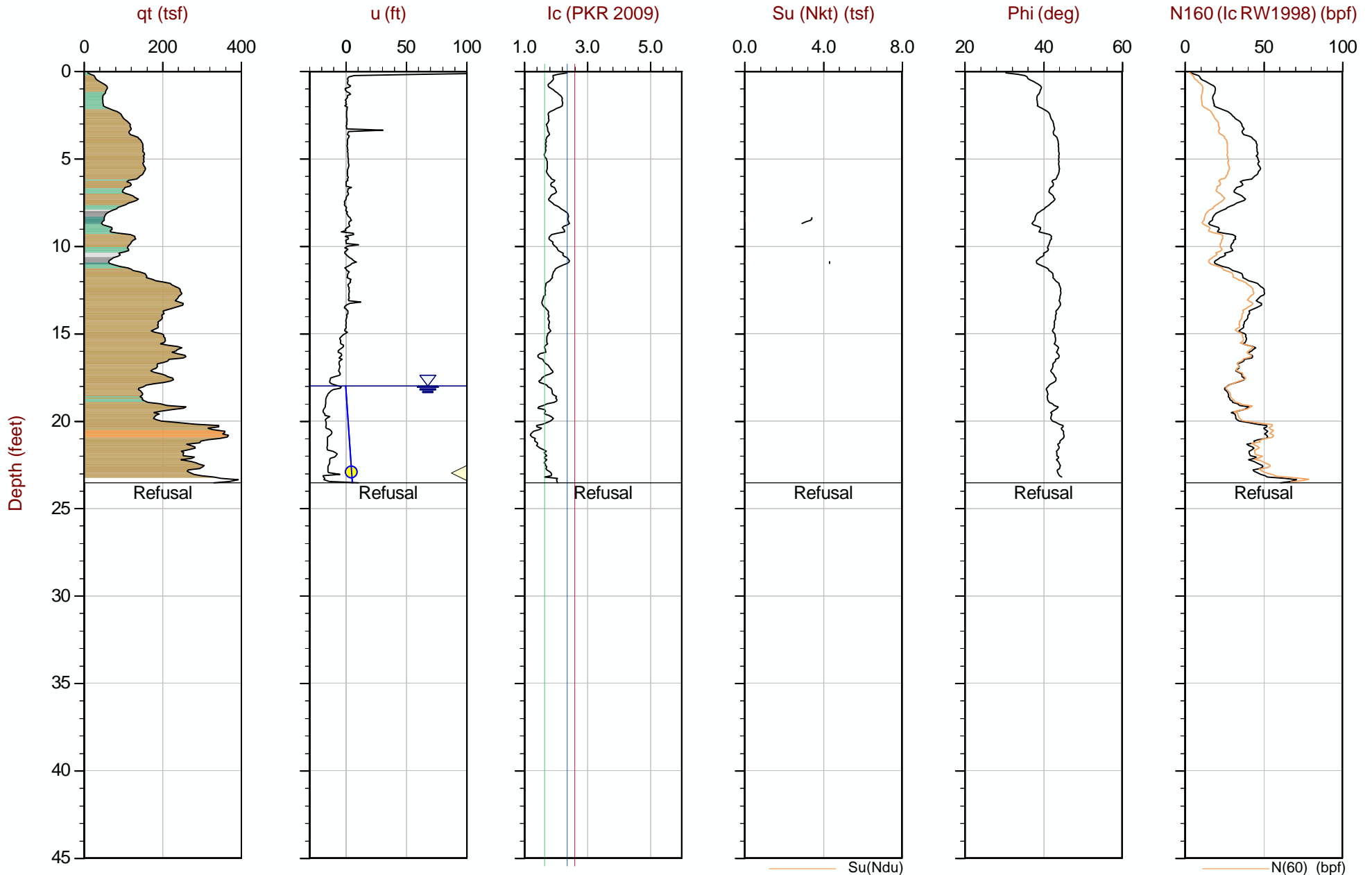




# Draper Aden

Job No: 21-54-23203  
Date: 2021-10-25 13:56  
Site: Green Ridge Landfill

Sounding: DAA-110CP  
Cone: 556:T1500F15U35



Max Depth: 7.175 m / 23.54 ft  
Depth Inc: 0.025 m / 0.082 ft  
Avg Int: Every Point

File: 21-54-23203\_SP\_DAA-110CP.COR  
Unit Wt: SBTQtn(PKR2009)  
Su Nkt/Ndu: 15.0 / 6.0

SBT: Robertson, 2009 and 2010  
Coords: Lat: 37.55731 Long: -78.12816

— Hydrostatic Line ● Ueq ● Assumed Ueq ◀ PPD, Ueq achieved ▶ PPD, Ueq not achieved

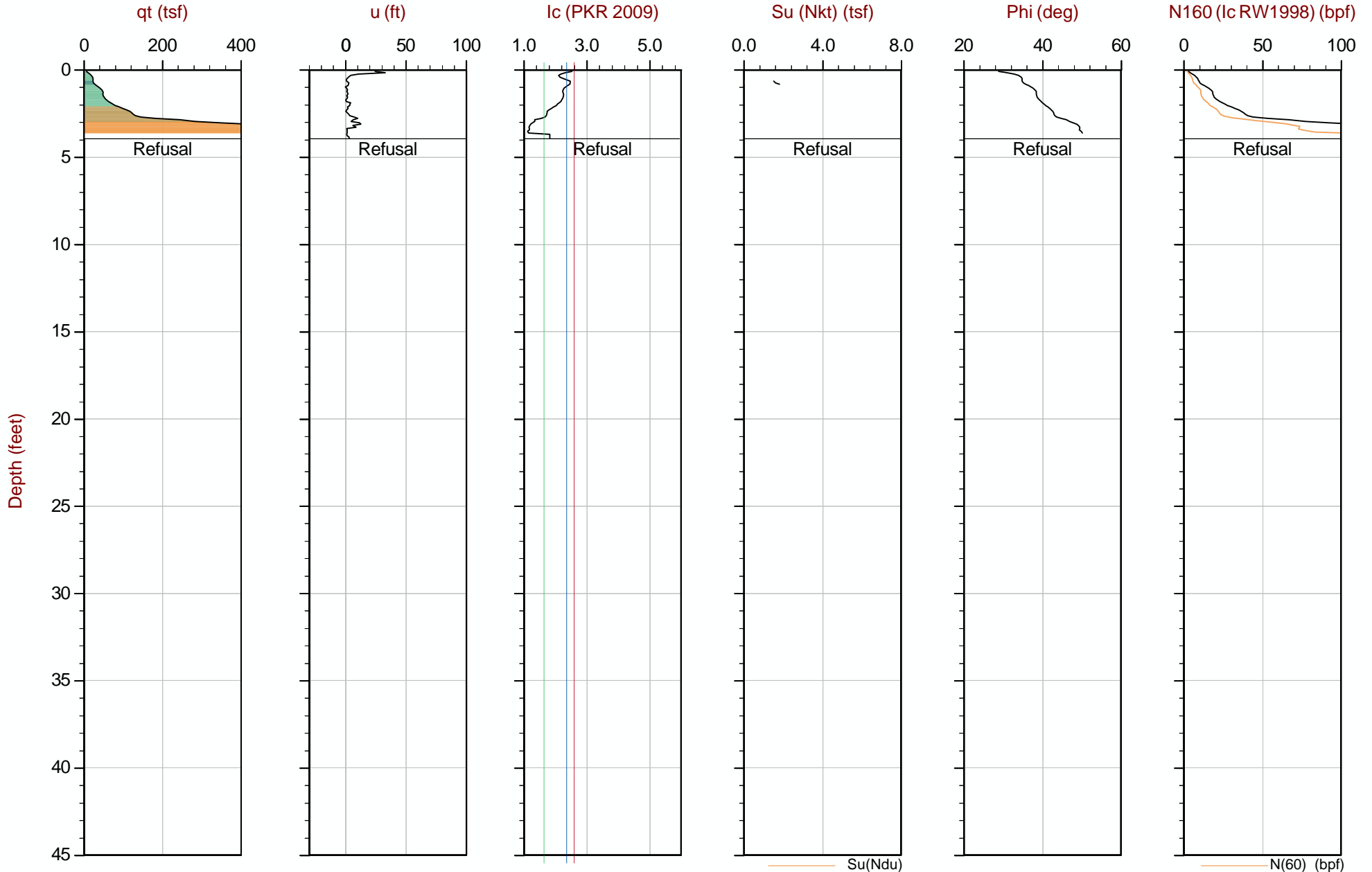
The reported coordinates were acquired from consumer-grade GPS equipment and are only approximate locations. The coordinates should not be used for design purposes.



# Draper Aden

Job No: 21-54-23203  
Date: 2021-10-26 13:56  
Site: Green Ridge Landfill

Sounding: DAA-111CP  
Cone: 556:T1500F15U35



Max Depth: 1.200 m / 3.94 ft  
Depth Inc: 0.025 m / 0.082 ft  
Avg Int: Every Point

File: 21-54-23203\_SP\_DAA-111CP.COR  
Unit Wt: SBTQtn(PKR2009)  
Su Nkt/Ndu: 15.0 / 6.0

SBT: Robertson, 2009 and 2010  
Coords: Lat: 37.55835 Long: -78.12821

— Hydrostatic Line ● Ueq ● Assumed Ueq ◀ PPD, Ueq achieved ▶ PPD, Ueq not achieved

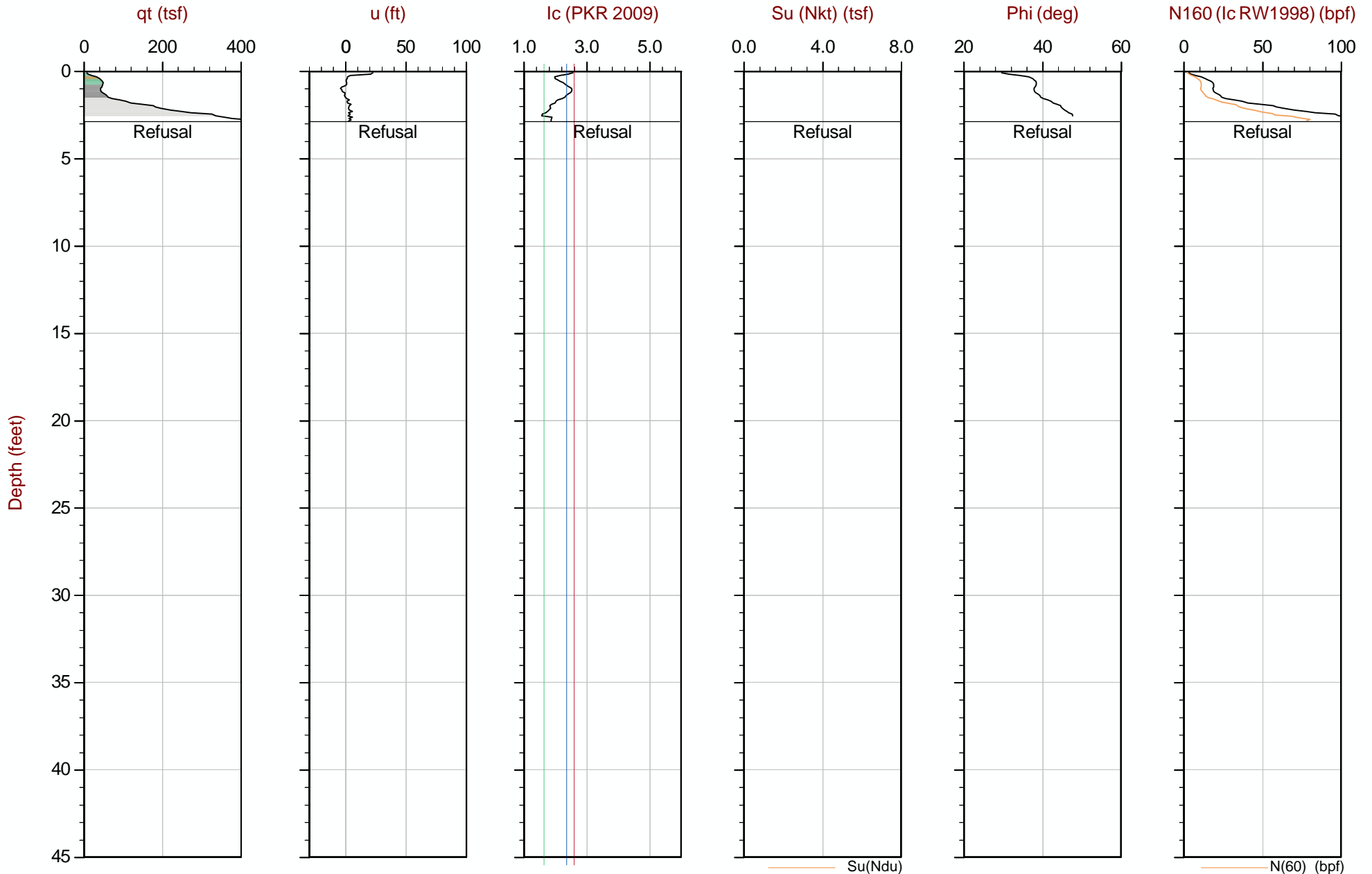
The reported coordinates were acquired from consumer-grade GPS equipment and are only approximate locations. The coordinates should not be used for design purposes.



# Draper Aden

Job No: 21-54-23203  
Date: 2021-10-26 14:25  
Site: Green Ridge Landfill

Sounding: DAA-111CPA  
Cone: 556:T1500F15U35



Max Depth: 0.875 m / 2.87 ft  
Depth Inc: 0.025 m / 0.082 ft  
Avg Int: Every Point

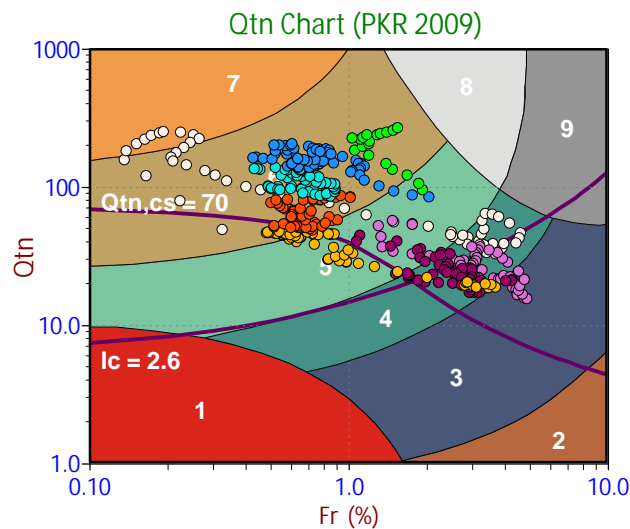
File: 21-54-23203\_SP\_DAA-111CPA.COR  
Unit Wt: SBTQtn(PKR2009)  
Su Nkt/Ndu: 15.0 / 6.0

SBT: Robertson, 2009 and 2010  
Coords: Lat: 37.55835 Long: -78.12808

Hydrostatic Line Ueq Assumed Ueq PPD, Ueq achieved PPD, Ueq not achieved

The reported coordinates were acquired from consumer-grade GPS equipment and are only approximate locations. The coordinates should not be used for design purposes.

## SBT Scatter Plots

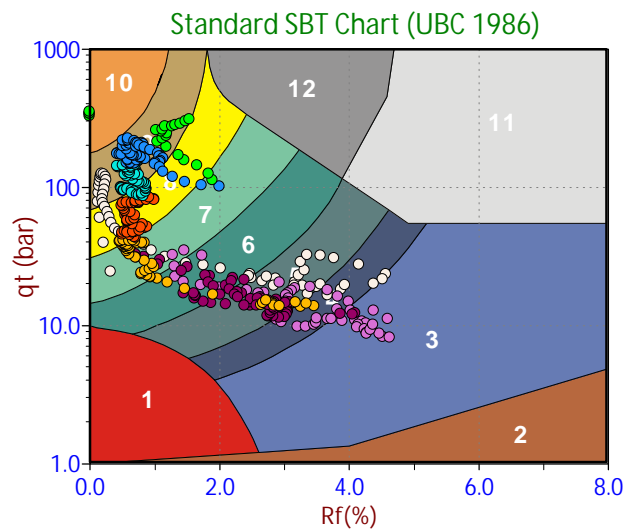


### Depth Ranges

- >0.0 to 5.0 ft
- >5.0 to 10.0 ft
- >10.0 to 15.0 ft
- >15.0 to 20.0 ft
- >20.0 to 25.0 ft
- >25.0 to 30.0 ft
- >30.0 to 35.0 ft
- >35.0 to 40.0 ft
- >40.0 to 45.0 ft
- >45.0 to 50.0 ft
- >50.0 ft

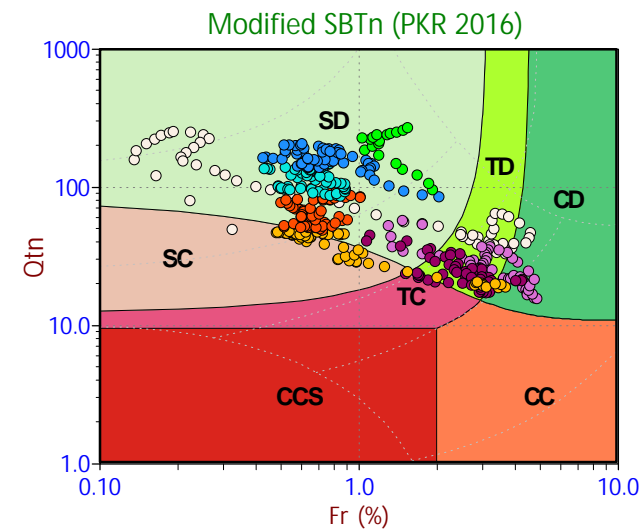
### Legend

- Sensitive, Fine Grained
- Organic Soils
- Clays
- Silt Mixtures
- Sand Mixtures
- Sands
- Gravelly Sand to Sand
- Stiff Sand to Clayey Sand
- Very Stiff Fine Grained



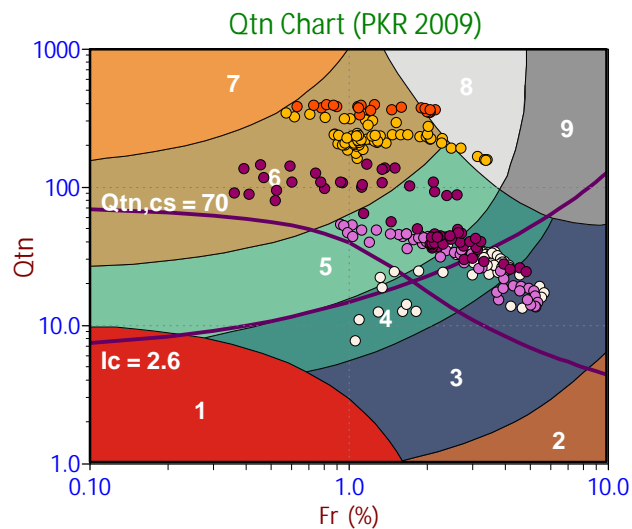
### Legend

- Sensitive Fines
- Organic Soil
- Clay
- Silty Clay
- Clayey Silt
- Silt
- Sandy Silt
- Silty Sand/Sand
- Sand
- Gravelly Sand
- Stiff Fine Grained
- Cemented Sand



### Legend

- CCS (Cont. sensitive clay like)
- CC (Cont. clay like)
- TC (Cont. transitional)
- SC (Cont. sand like)
- CD (Dil. clay like)
- TD (Dil. transitional)
- SD (Dil. sand like)

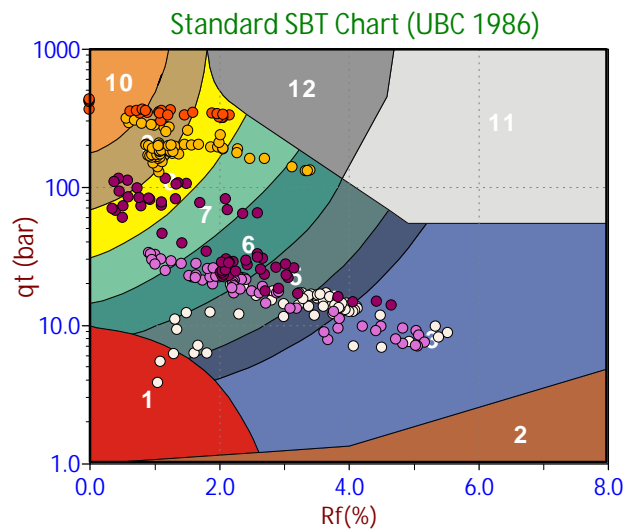


### Depth Ranges

- >0.0 to 5.0 ft
- >5.0 to 10.0 ft
- >10.0 to 15.0 ft
- >15.0 to 20.0 ft
- >20.0 to 25.0 ft
- >25.0 to 30.0 ft
- >30.0 to 35.0 ft
- >35.0 to 40.0 ft
- >40.0 to 45.0 ft
- >45.0 to 50.0 ft
- >50.0 ft

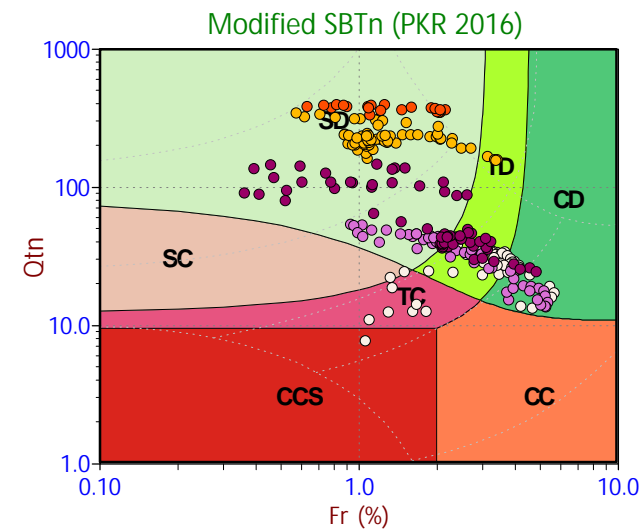
### Legend

- Sensitive, Fine Grained
- Organic Soils
- Clays
- Silt Mixtures
- Sand Mixtures
- Sands
- Gravelly Sand to Sand
- Stiff Sand to Clayey Sand
- Very Stiff Fine Grained



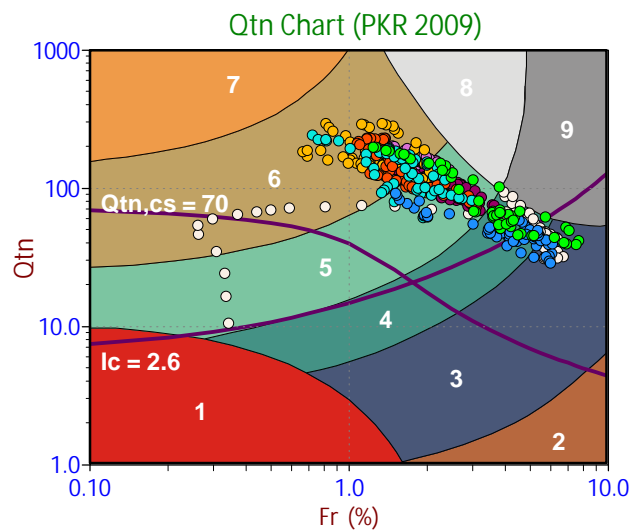
### Legend

- Sensitive Fines
- Organic Soil
- Clay
- Silty Clay
- Clayey Silt
- Silt
- Sandy Silt
- Silty Sand/Sand
- Sand
- Gravelly Sand
- Stiff Fine Grained
- Cemented Sand



### Legend

- CCS (Cont. sensitive clay like)
- CC (Cont. clay like)
- TC (Cont. transitional)
- SC (Cont. sand like)
- CD (Dil. clay like)
- TD (Dil. transitional)
- SD (Dil. sand like)

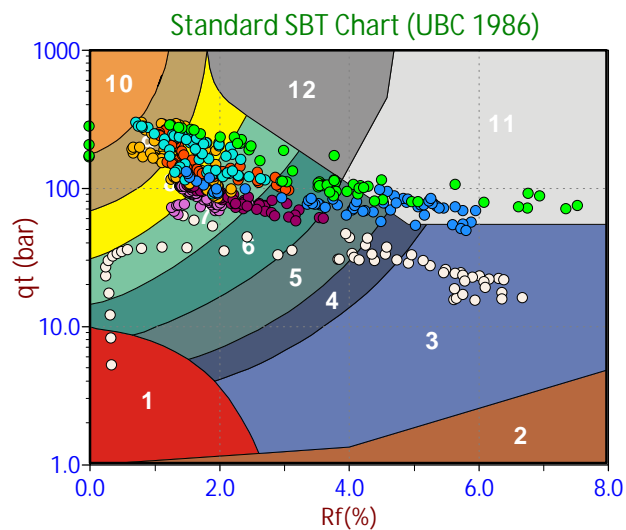


### Depth Ranges

- >0.0 to 5.0 ft
- >5.0 to 10.0 ft
- >10.0 to 15.0 ft
- >15.0 to 20.0 ft
- >20.0 to 25.0 ft
- >25.0 to 30.0 ft
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- >40.0 to 45.0 ft
- >45.0 to 50.0 ft
- >50.0 ft

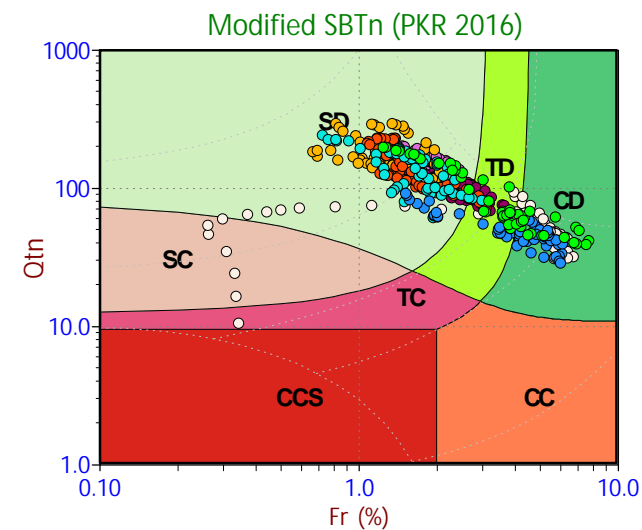
### Legend

- Sensitive, Fine Grained
- Organic Soils
- Clays
- Silt Mixtures
- Sand Mixtures
- Sands
- Gravelly Sand to Sand
- Stiff Sand to Clayey Sand
- Very Stiff Fine Grained



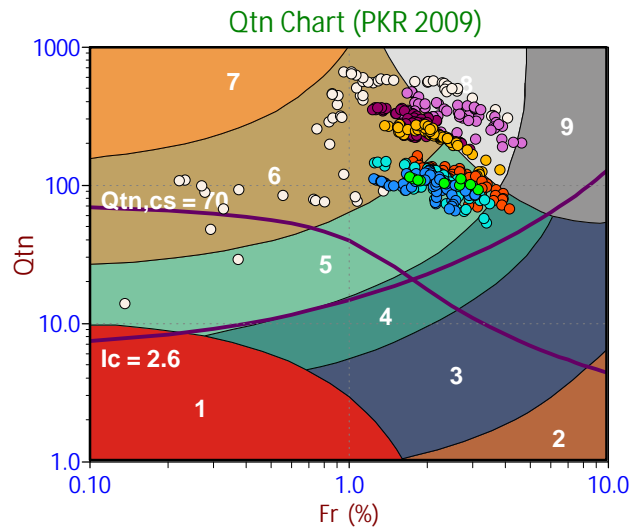
### Legend

- Sensitive Fines
- Organic Soil
- Clay
- Silty Clay
- Clayey Silt
- Silt
- Sandy Silt
- Silty Sand/Sand
- Sand
- Gravelly Sand
- Stiff Fine Grained
- Cemented Sand



### Legend

- CCS (Cont. sensitive clay like)
- CC (Cont. clay like)
- TC (Cont. transitional)
- SC (Cont. sand like)
- CD (Dil. clay like)
- TD (Dil. transitional)
- SD (Dil. sand like)

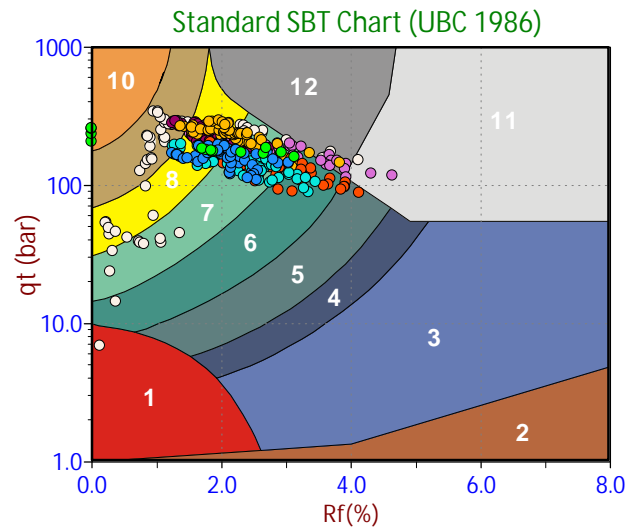


### Depth Ranges

- >0.0 to 5.0 ft
- >5.0 to 10.0 ft
- >10.0 to 15.0 ft
- >15.0 to 20.0 ft
- >20.0 to 25.0 ft
- >25.0 to 30.0 ft
- >30.0 to 35.0 ft
- >35.0 to 40.0 ft
- >40.0 to 45.0 ft
- >45.0 to 50.0 ft
- >50.0 ft

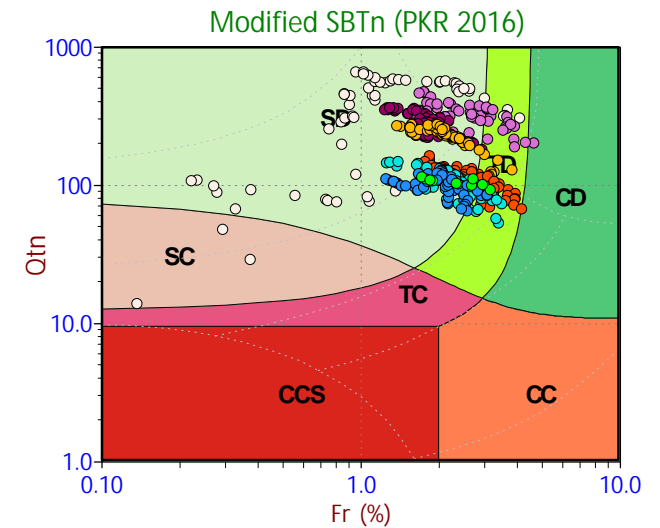
### Legend

- Sensitive, Fine Grained
- Organic Soils
- Clays
- Silt Mixtures
- Sand Mixtures
- Sands
- Gravelly Sand to Sand
- Stiff Sand to Clayey Sand
- Very Stiff Fine Grained



### Legend

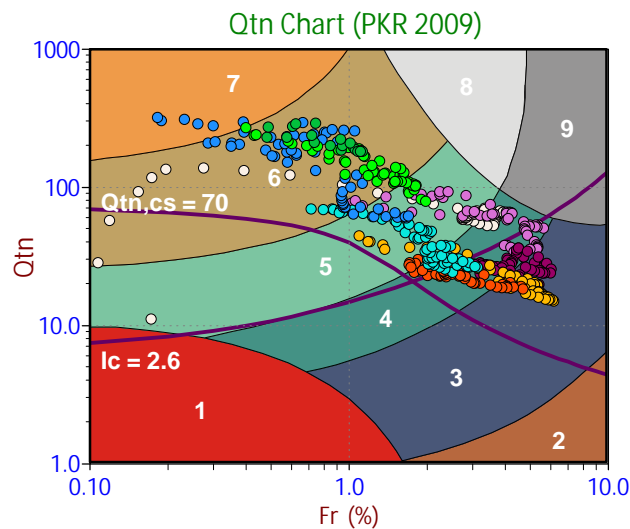
- Sensitive Fines
- Organic Soil
- Clay
- Silty Clay
- Clayey Silt
- Silt
- Sandy Silt
- Silty Sand/Sand
- Sand
- Gravelly Sand
- Stiff Fine Grained
- Cemented Sand



### Legend

- CCS (Cont. sensitive clay like)
- CC (Cont. clay like)
- TC (Cont. transitional)
- SC (Cont. sand like)
- CD (Dil. clay like)
- TD (Dil. transitional)
- SD (Dil. sand like)



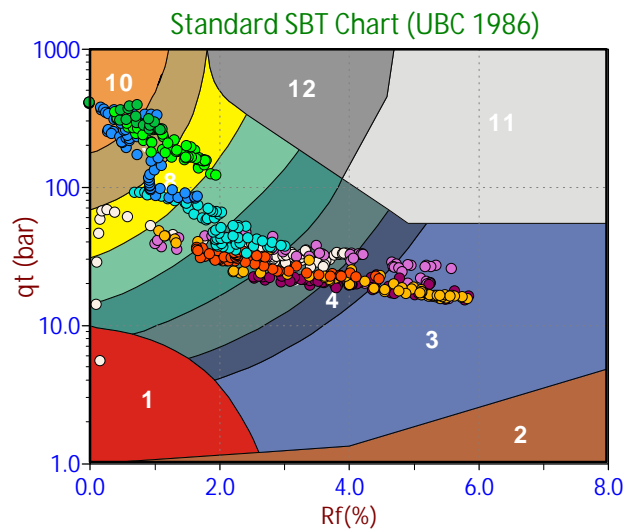


### Depth Ranges

- >0.0 to 5.0 ft
- >5.0 to 10.0 ft
- >10.0 to 15.0 ft
- >15.0 to 20.0 ft
- >20.0 to 25.0 ft
- >25.0 to 30.0 ft
- >30.0 to 35.0 ft
- >35.0 to 40.0 ft
- >40.0 to 45.0 ft
- >45.0 to 50.0 ft
- >50.0 ft

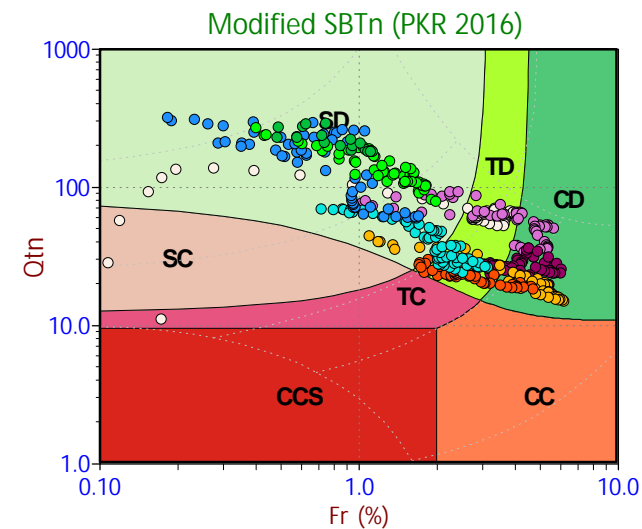
### Legend

- Sensitive, Fine Grained
- Organic Soils
- Clays
- Silt Mixtures
- Sand Mixtures
- Sands
- Gravelly Sand to Sand
- Stiff Sand to Clayey Sand
- Very Stiff Fine Grained



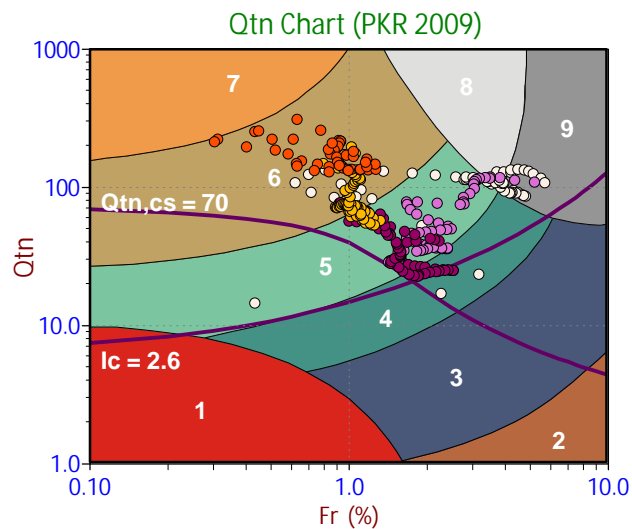
### Legend

- Sensitive Fines
- Organic Soil
- Clay
- Silty Clay
- Clayey Silt
- Silt
- Sandy Silt
- Silty Sand/Sand
- Sand
- Gravelly Sand
- Stiff Fine Grained
- Cemented Sand



### Legend

- CCS (Cont. sensitive clay like)
- CC (Cont. clay like)
- TC (Cont. transitional)
- SC (Cont. sand like)
- CD (Dil. clay like)
- TD (Dil. transitional)
- SD (Dil. sand like)

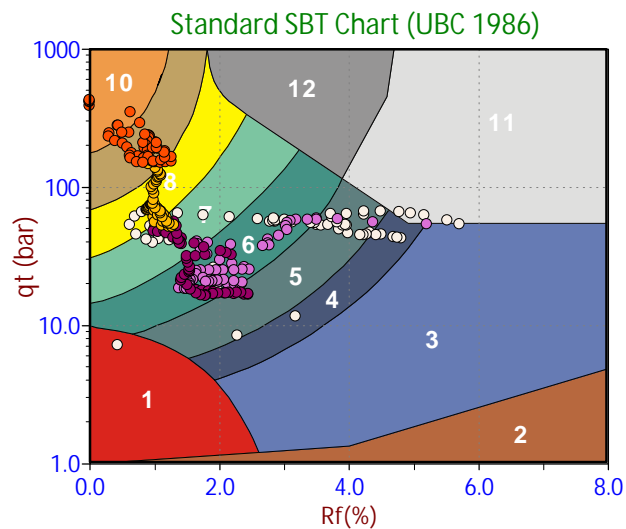


### Depth Ranges

- >0.0 to 5.0 ft
- >5.0 to 10.0 ft
- >10.0 to 15.0 ft
- >15.0 to 20.0 ft
- >20.0 to 25.0 ft
- >25.0 to 30.0 ft
- >30.0 to 35.0 ft
- >35.0 to 40.0 ft
- >40.0 to 45.0 ft
- >45.0 to 50.0 ft
- >50.0 ft

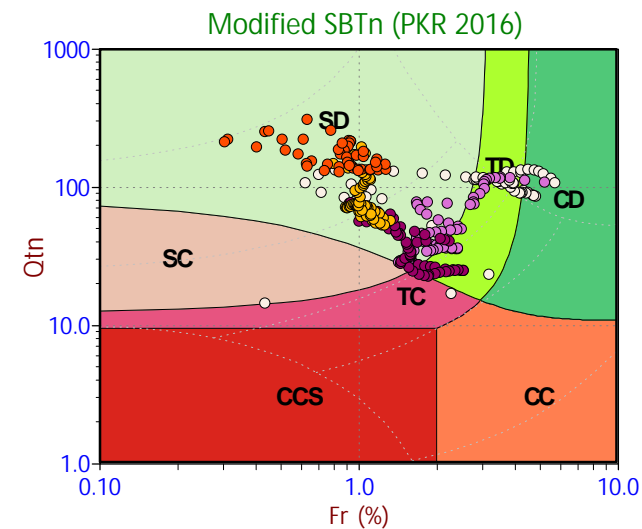
### Legend

- Sensitive, Fine Grained
- Organic Soils
- Clays
- Silt Mixtures
- Sand Mixtures
- Sands
- Gravelly Sand to Sand
- Stiff Sand to Clayey Sand
- Very Stiff Fine Grained



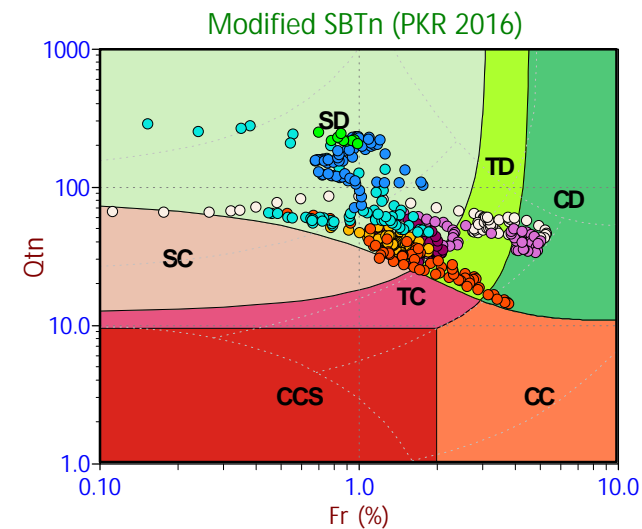
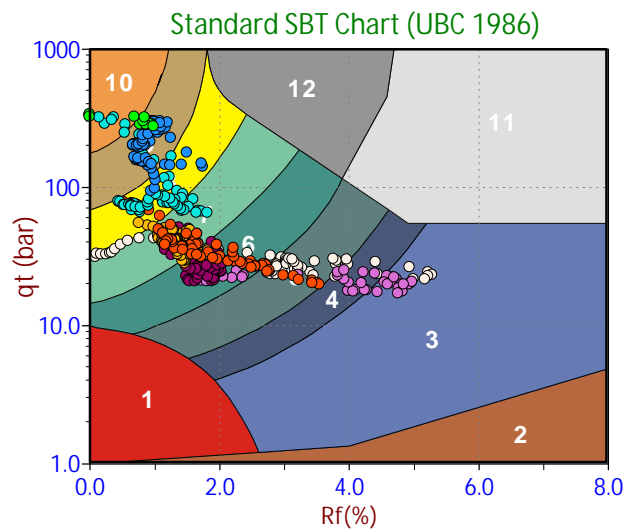
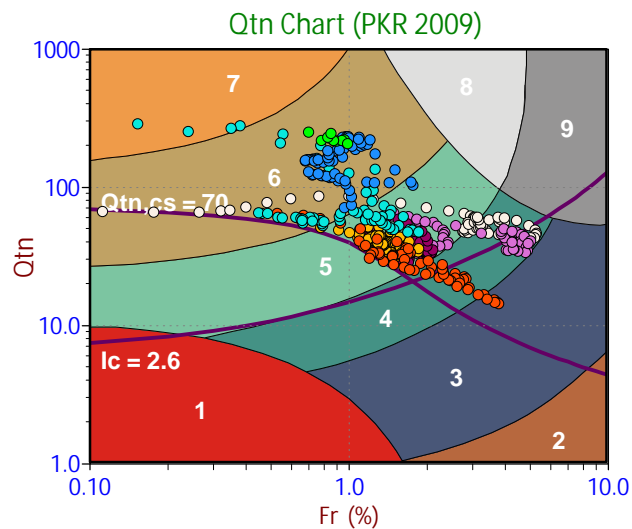
### Legend

- Sensitive Fines
- Organic Soil
- Clay
- Silty Clay
- Clayey Silt
- Silt
- Sandy Silt
- Silty Sand/Sand
- Sand
- Gravelly Sand
- Stiff Fine Grained
- Cemented Sand



### Legend

- CCS (Cont. sensitive clay like)
- CC (Cont. clay like)
- TC (Cont. transitional)
- SC (Cont. sand like)
- CD (Dil. clay like)
- TD (Dil. transitional)
- SD (Dil. sand like)



## Depth Ranges

- >0.0 to 5.0 ft
- >5.0 to 10.0 ft
- >10.0 to 15.0 ft
- >15.0 to 20.0 ft
- >20.0 to 25.0 ft
- >25.0 to 30.0 ft
- >30.0 to 35.0 ft
- >35.0 to 40.0 ft
- >40.0 to 45.0 ft
- >45.0 to 50.0 ft
- >50.0 ft

## Legend

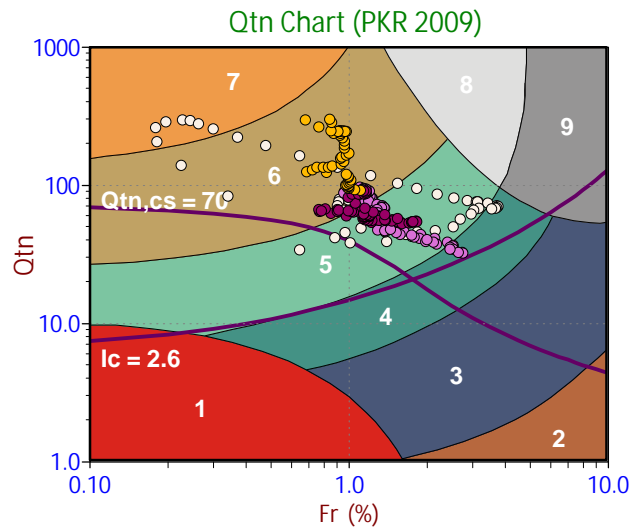
- Sensitive, Fine Grained
- Organic Soils
- Clays
- Silt Mixtures
- Sand Mixtures
- Sands
- Gravelly Sand to Sand
- Stiff Sand to Clayey Sand
- Very Stiff Fine Grained

## Legend

- Sensitive Fines
- Organic Soil
- Clay
- Silty Clay
- Clayey Silt
- Silt
- Sandy Silt
- Silty Sand/Sand
- Sand
- Gravelly Sand
- Stiff Fine Grained
- Cemented Sand

## Legend

- CCS (Cont. sensitive clay like)
- CC (Cont. clay like)
- TC (Cont. transitional)
- SC (Cont. sand like)
- CD (Dil. clay like)
- TD (Dil. transitional)
- SD (Dil. sand like)

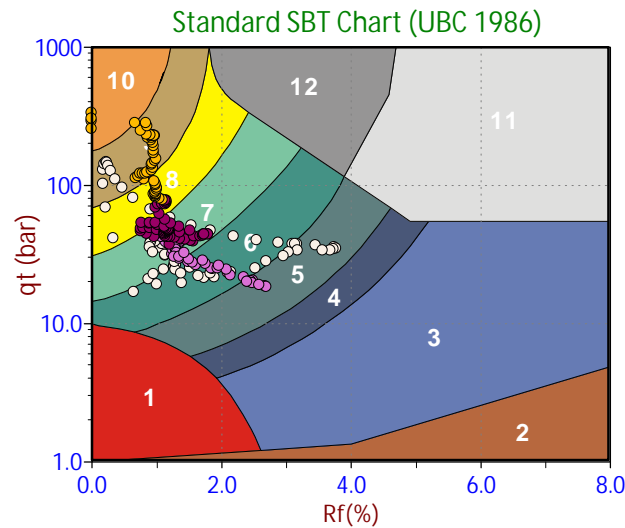


### Depth Ranges

- >0.0 to 5.0 ft
- >5.0 to 10.0 ft
- >10.0 to 15.0 ft
- >15.0 to 20.0 ft
- >20.0 to 25.0 ft
- >25.0 to 30.0 ft
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- >35.0 to 40.0 ft
- >40.0 to 45.0 ft
- >45.0 to 50.0 ft
- >50.0 ft

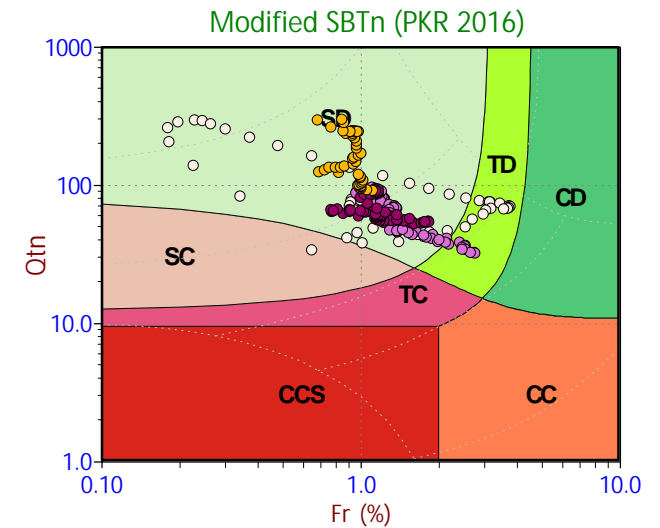
### Legend

- Sensitive, Fine Grained
- Organic Soils
- Clays
- Silt Mixtures
- Sand Mixtures
- Sands
- Gravelly Sand to Sand
- Stiff Sand to Clayey Sand
- Very Stiff Fine Grained



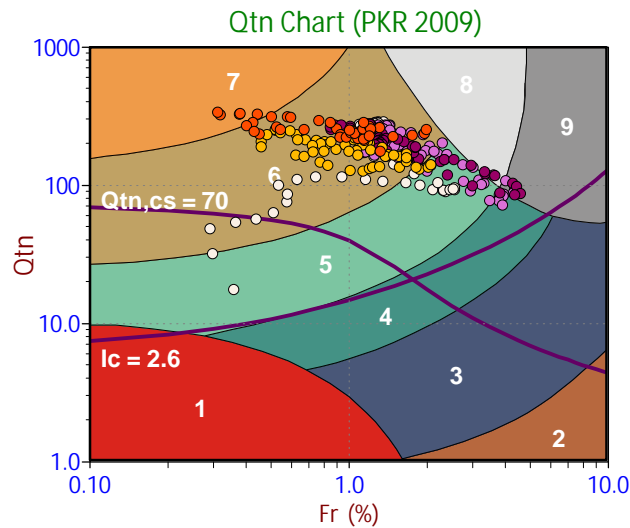
### Legend

- Sensitive Fines
- Organic Soil
- Clay
- Silty Clay
- Clayey Silt
- Silt
- Sandy Silt
- Silty Sand/Sand
- Sand
- Gravelly Sand
- Stiff Fine Grained
- Cemented Sand



### Legend

- CCS (Cont. sensitive clay like)
- CC (Cont. clay like)
- TC (Cont. transitional)
- SC (Cont. sand like)
- CD (Dil. clay like)
- TD (Dil. transitional)
- SD (Dil. sand like)

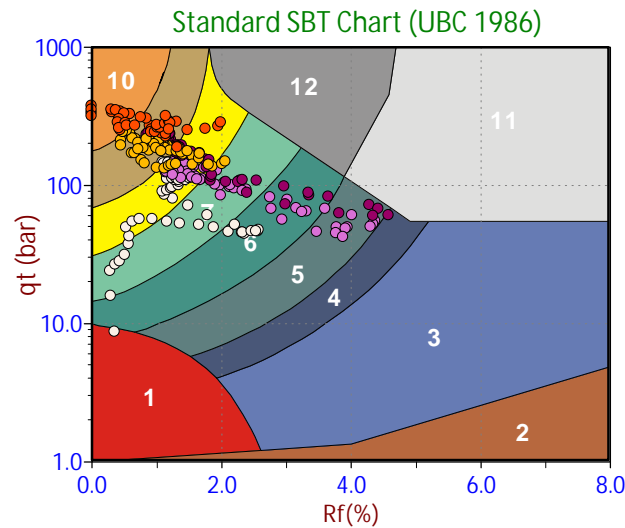


### Depth Ranges

- >0.0 to 5.0 ft
- >5.0 to 10.0 ft
- >10.0 to 15.0 ft
- >15.0 to 20.0 ft
- >20.0 to 25.0 ft
- >25.0 to 30.0 ft
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- >35.0 to 40.0 ft
- >40.0 to 45.0 ft
- >45.0 to 50.0 ft
- >50.0 ft

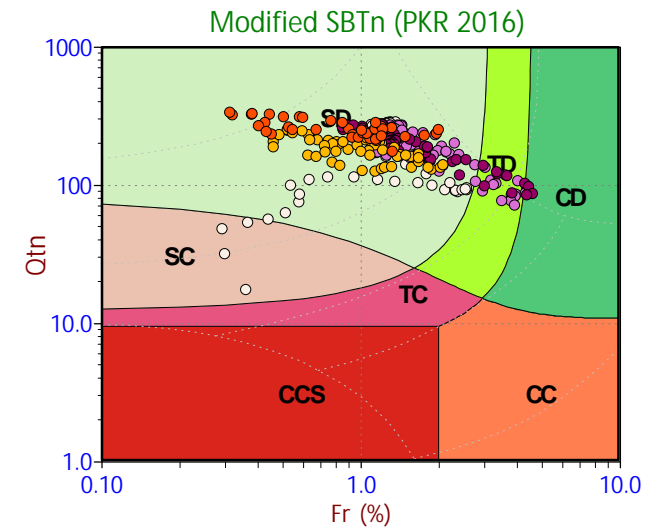
### Legend

- Sensitive, Fine Grained
- Organic Soils
- Clays
- Silt Mixtures
- Sand Mixtures
- Sands
- Gravelly Sand to Sand
- Stiff Sand to Clayey Sand
- Very Stiff Fine Grained



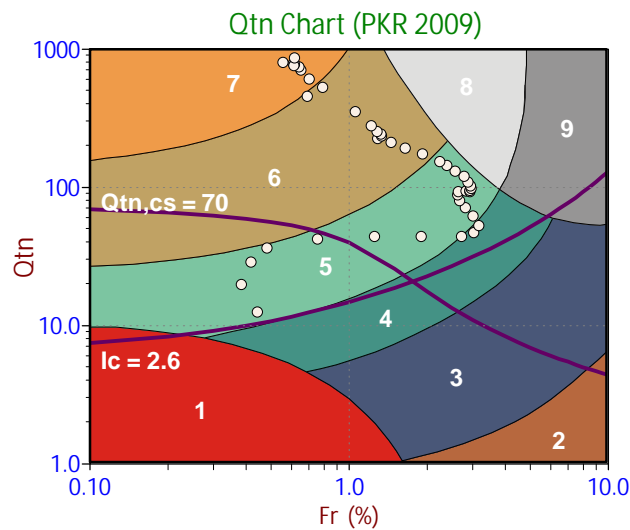
### Legend

- Sensitive Fines
- Organic Soil
- Clay
- Silty Clay
- Clayey Silt
- Silt
- Sandy Silt
- Silty Sand/Sand
- Sand
- Gravelly Sand
- Stiff Fine Grained
- Cemented Sand



### Legend

- CCS (Cont. sensitive clay like)
- CC (Cont. clay like)
- TC (Cont. transitional)
- SC (Cont. sand like)
- CD (Dil. clay like)
- TD (Dil. transitional)
- SD (Dil. sand like)

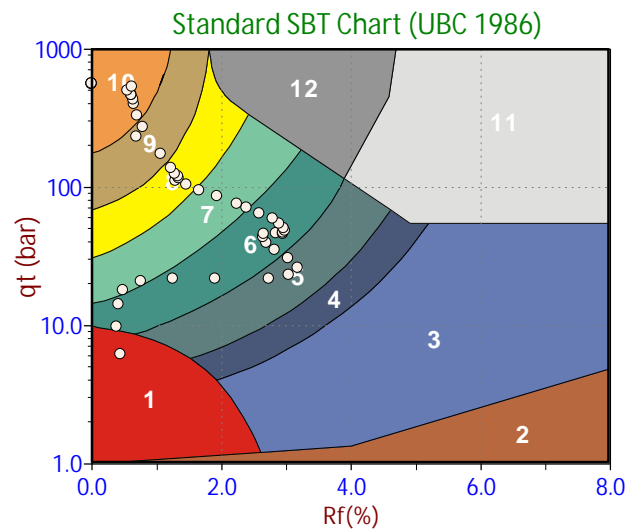


### Depth Ranges

- >0.0 to 5.0 ft
- >5.0 to 10.0 ft
- >10.0 to 15.0 ft
- >15.0 to 20.0 ft
- >20.0 to 25.0 ft
- >25.0 to 30.0 ft
- >30.0 to 35.0 ft
- >35.0 to 40.0 ft
- >40.0 to 45.0 ft
- >45.0 to 50.0 ft
- >50.0 ft

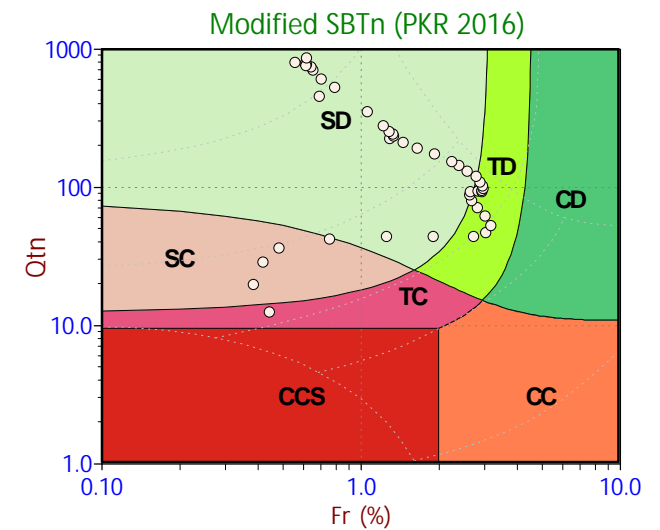
### Legend

- Sensitive, Fine Grained
- Organic Soils
- Clays
- Silt Mixtures
- Sand Mixtures
- Sands
- Gravelly Sand to Sand
- Stiff Sand to Clayey Sand
- Very Stiff Fine Grained



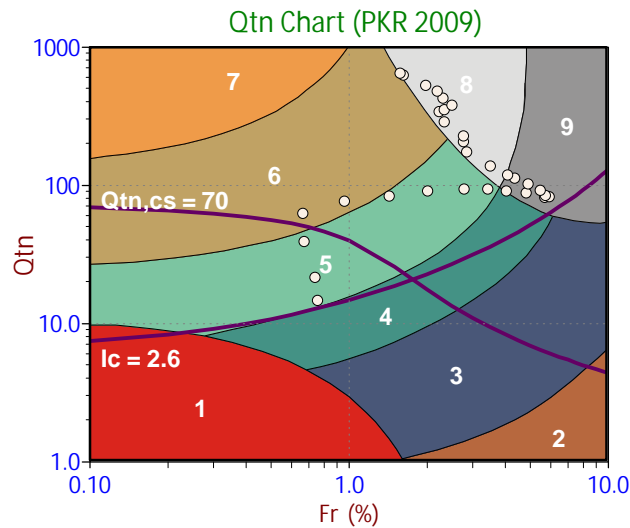
### Legend

- Sensitive Fines
- Organic Soil
- Clay
- Silty Clay
- Clayey Silt
- Silt
- Sandy Silt
- Silty Sand/Sand
- Sand
- Gravelly Sand
- Stiff Fine Grained
- Cemented Sand



### Legend

- CCS (Cont. sensitive clay like)
- CC (Cont. clay like)
- TC (Cont. transitional)
- SC (Cont. sand like)
- CD (Dil. clay like)
- TD (Dil. transitional)
- SD (Dil. sand like)

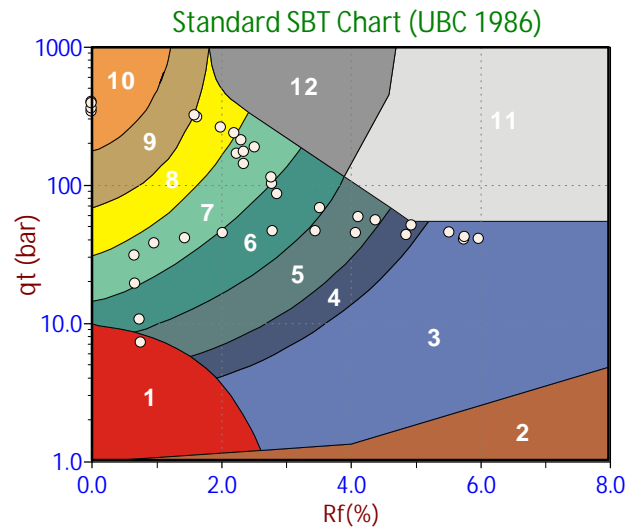


### Depth Ranges

- >0.0 to 5.0 ft
- >5.0 to 10.0 ft
- >10.0 to 15.0 ft
- >15.0 to 20.0 ft
- >20.0 to 25.0 ft
- >25.0 to 30.0 ft
- >30.0 to 35.0 ft
- >35.0 to 40.0 ft
- >40.0 to 45.0 ft
- >45.0 to 50.0 ft
- >50.0 ft

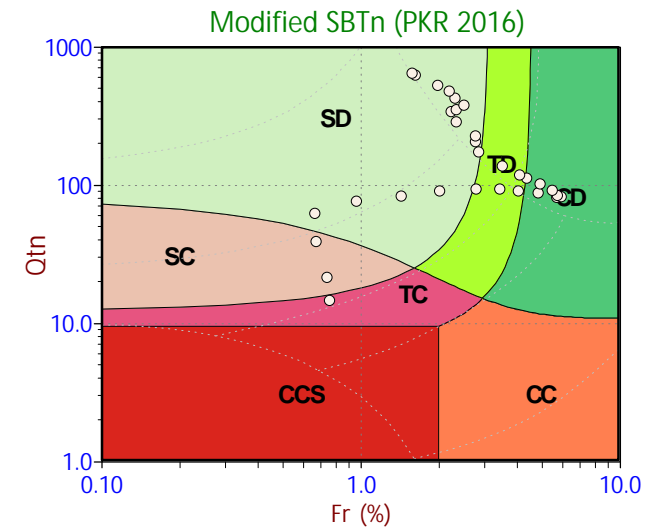
### Legend

- Sensitive, Fine Grained
- Organic Soils
- Clays
- Silt Mixtures
- Sand Mixtures
- Sands
- Gravelly Sand to Sand
- Stiff Sand to Clayey Sand
- Very Stiff Fine Grained



### Legend

- Sensitive Fines
- Organic Soil
- Clay
- Silty Clay
- Clayey Silt
- Silt
- Sandy Silt
- Silty Sand/Sand
- Sand
- Gravelly Sand
- Stiff Fine Grained
- Cemented Sand



### Legend

- CCS (Cont. sensitive clay like)
- CC (Cont. clay like)
- TC (Cont. transitional)
- SC (Cont. sand like)
- CD (Dil. clay like)
- TD (Dil. transitional)
- SD (Dil. sand like)

## Seismic Cone Penetration Test Plots

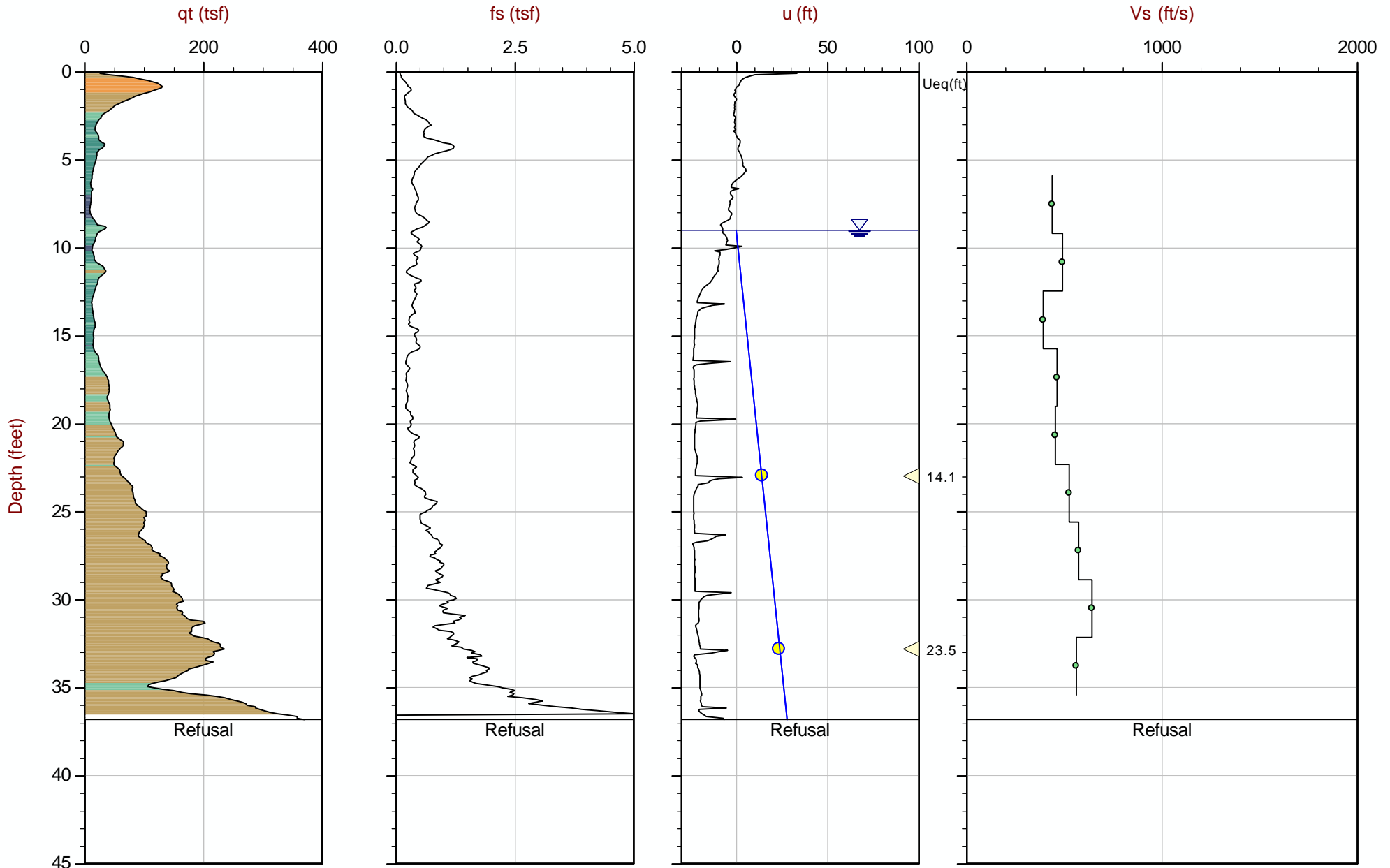




# Draper Aden

Job No: 21-54-23203  
Date: 2021-10-25 15:34  
Site: Green Ridge Landfill

Sounding: DAA-4CP  
Cone: 556:T1500F15U35



Max Depth: 11.225 m / 36.83 ft  
Depth Inc: 0.025 m / 0.082 ft  
Avg Int: Every Point

File: 21-54-23203\_CP\_DAA-4CP.COR  
Unit Wt: SBTQtn(PKR2009)

SBT: Robertson, 2009 and 2010  
Coords: Lat: 37.55674 Long: -78.12770

— Hydrostatic Line    ● Ueq    ● Assumed Ueq    ◀ PPD, Ueq achieved    ▶ PPD, Ueq not achieved

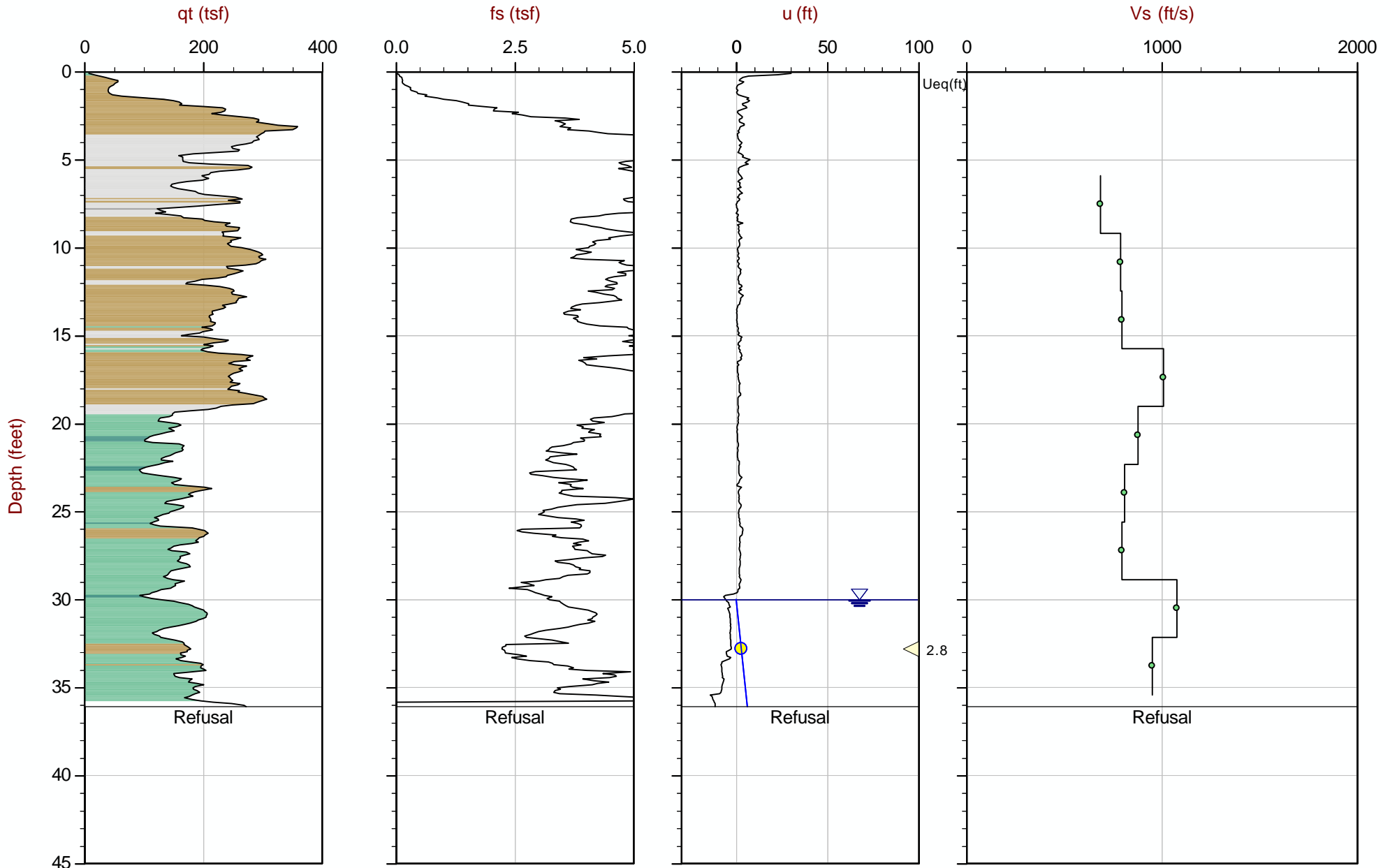
The reported coordinates were acquired from consumer-grade GPS equipment and are only approximate locations. The coordinates should not be used for design purposes.



# Draper Aden

Job No: 21-54-23203  
Date: 2021-10-26 17:53  
Site: Green Ridge Landfill

Sounding: DAA-105CP  
Cone: 556:T1500F15U35



Max Depth: 11.000 m / 36.09 ft  
Depth Inc: 0.025 m / 0.082 ft  
Avg Int: Every Point

File: 21-54-23203\_SP\_DAA-105CP.COR  
Unit Wt: SBTQtn(PKR2009)

SBT: Robertson, 2009 and 2010  
Coords: Lat: 37.56276 Long: -78.11977

— Hydrostatic Line    ● Ueq    ● Assumed Ueq    ◀ PPD, Ueq achieved    ▶ PPD, Ueq not achieved

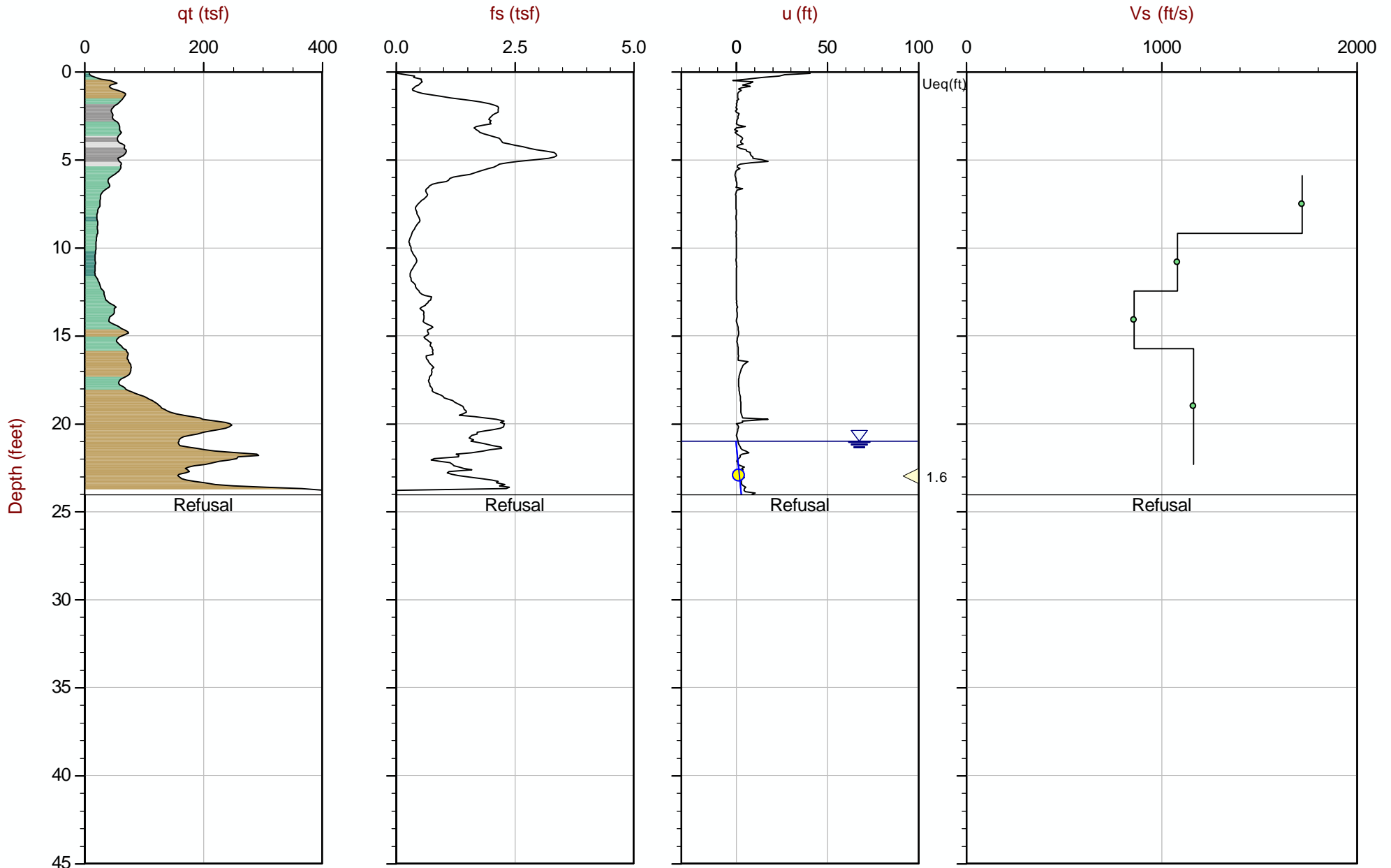
The reported coordinates were acquired from consumer-grade GPS equipment and are only approximate locations. The coordinates should not be used for design purposes.



# Draper Aden

Job No: 21-54-23203  
Date: 2021-10-25 19:54  
Site: Green Ridge Landfill

Sounding: DAA-107CP  
Cone: 556:T1500F15U35



Max Depth: 7.325 m / 24.03 ft  
Depth Inc: 0.025 m / 0.082 ft  
Avg Int: Every Point

File: 21-54-23203\_SP\_DAA-107CP.COR  
Unit Wt: SBTQtn(PKR2009)

SBT: Robertson, 2009 and 2010  
Coords: Lat: 37.55422 Long: -78.12564

— Hydrostatic Line    ● Ueq    ● Assumed Ueq    ▲ PPD, Ueq achieved    ▼ PPD, Ueq not achieved

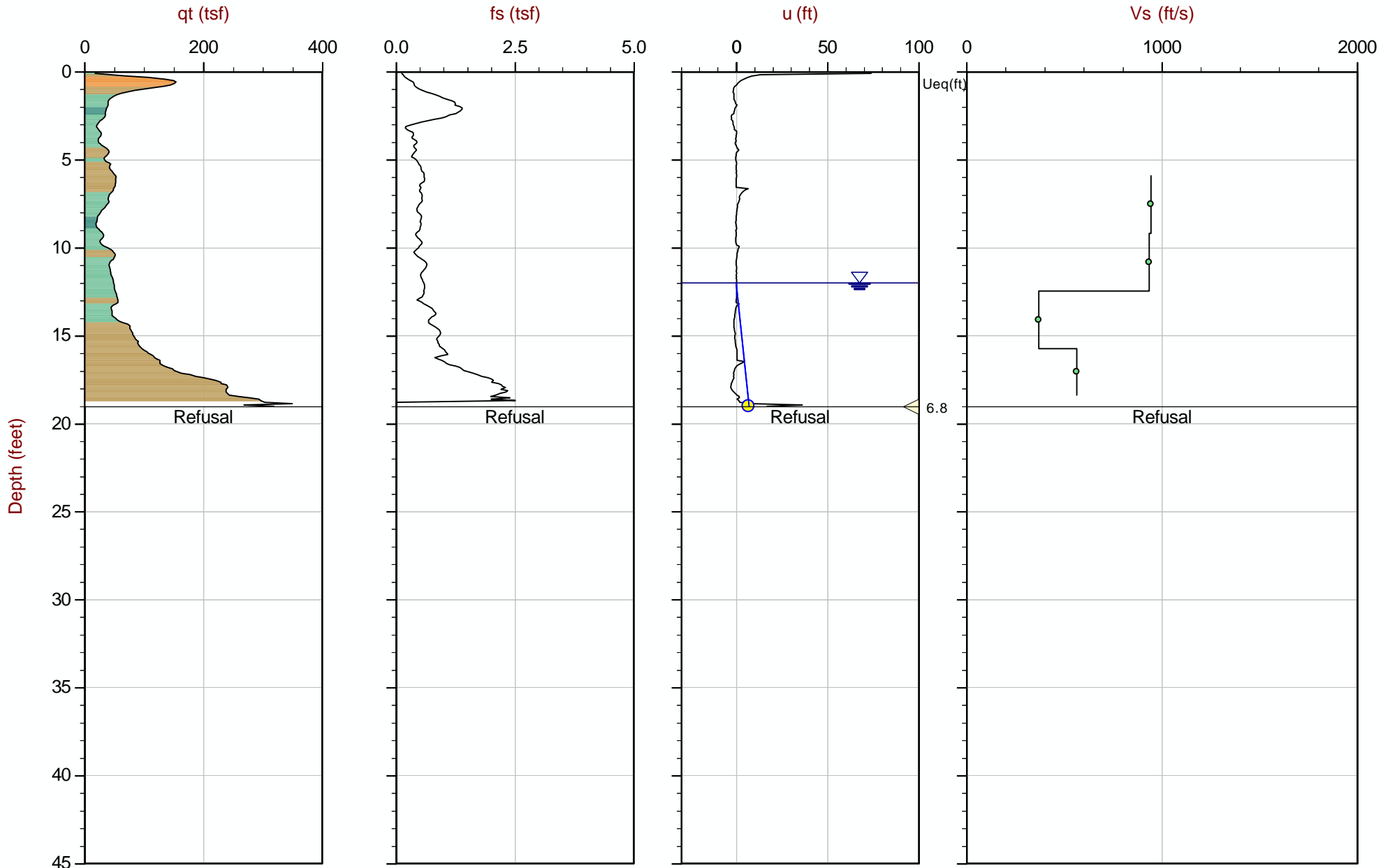
The reported coordinates were acquired from consumer-grade GPS equipment and are only approximate locations. The coordinates should not be used for design purposes.



# Draper Aden

Job No: 21-54-23203  
Date: 2021-10-25 16:56  
Site: Green Ridge Landfill

Sounding: DAA-109CP  
Cone: 556:T1500F15U35



Max Depth: 5.800 m / 19.03 ft  
Depth Inc: 0.025 m / 0.082 ft  
Avg Int: Every Point

File: 21-54-23203\_SP\_DAA-109CP.COR  
Unit Wt: SBTQtn(PKR2009)

SBT: Robertson, 2009 and 2010  
Coords: Lat: 37.55608 Long: -78.12819

— Hydrostatic Line    ● Ueq    ● Assumed Ueq    ◀ PPD, Ueq achieved    ▶ PPD, Ueq not achieved

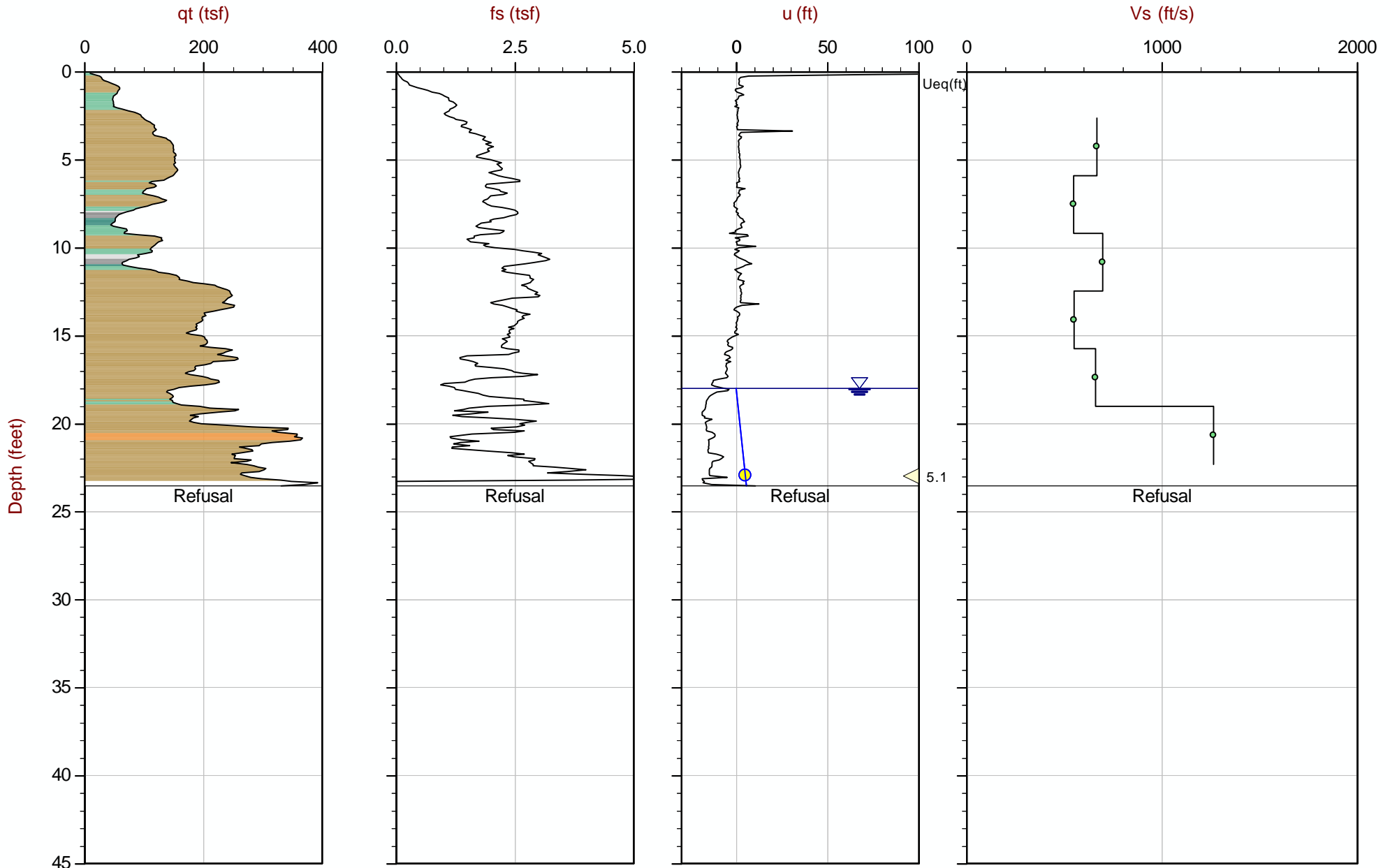
The reported coordinates were acquired from consumer-grade GPS equipment and are only approximate locations. The coordinates should not be used for design purposes.



# Draper Aden

Job No: 21-54-23203  
Date: 2021-10-25 13:56  
Site: Green Ridge Landfill

Sounding: DAA-110CP  
Cone: 556:T1500F15U35



Max Depth: 7.175 m / 23.54 ft  
Depth Inc: 0.025 m / 0.082 ft  
Avg Int: Every Point

File: 21-54-23203\_SP\_DAA-110CP.COR  
Unit Wt: SBTQn(PKR2009)

SBT: Robertson, 2009 and 2010  
Coords: Lat: 37.55731 Long: -78.12816

— Hydrostatic Line    ● Ueq    ● Assumed Ueq    ◀ PPD, Ueq achieved    ▶ PPD, Ueq not achieved

The reported coordinates were acquired from consumer-grade GPS equipment and are only approximate locations. The coordinates should not be used for design purposes.

## Seismic Cone Penetration Test Tabular Results



Job No: 21-54-23203  
Client: Draper Aden  
Project: Green Ridge Landfill  
Sounding ID: DAA-4CP  
Date: 25-Oct-2021

Seismic Source: Beam  
Source Offset (ft): 7.05  
Source Depth (ft): 0.00  
Geophone Offset (ft): 0.66

### ***SCPT<sub>u</sub> SHEAR WAVE VELOCITY TEST RESULTS - V<sub>s</sub>***

Tip Depth (ft)	Geophone Depth (ft)	Ray Path (ft)	Ray Path Difference (ft)	Travel Time Interval (ms)	Interval Velocity (ft/s)
6.56	5.91	9.20			
9.84	9.19	11.58	2.38	5.44	438
13.12	12.47	14.32	2.74	5.59	491
16.40	15.75	17.25	2.93	7.47	393
19.69	19.03	20.29	3.04	6.56	464
22.97	22.31	23.40	3.10	6.85	453
26.25	25.59	26.54	3.15	6.00	524
29.53	28.87	29.72	3.18	5.54	574
32.81	32.15	32.92	3.20	4.97	643
36.09	35.43	36.13	3.21	5.72	561



Job No: 21-54-23203  
Client: Draper Aden  
Project: Green Ridge Landfill  
Sounding ID: DAA-105CP  
Date: 26-Oct-2021

Seismic Source: Beam  
Source Offset (ft): 7.05  
Source Depth (ft): 0.00  
Geophone Offset (ft): 0.66

### ***SCPT<sub>u</sub> SHEAR WAVE VELOCITY TEST RESULTS - V<sub>s</sub>***

Tip Depth (ft)	Geophone Depth (ft)	Ray Path (ft)	Ray Path Difference (ft)	Travel Time Interval (ms)	Interval Velocity (ft/s)
6.56	5.91	9.20			
9.84	9.19	11.58	2.38	3.48	685
13.12	12.47	14.32	2.74	3.48	788
16.40	15.75	17.25	2.93	3.69	795
19.69	19.03	20.29	3.04	3.02	1007
22.97	22.31	23.40	3.10	3.53	878
26.25	25.59	26.54	3.15	3.89	809
29.53	28.87	29.72	3.18	4.00	795
32.81	32.15	32.92	3.20	2.97	1076
36.09	35.43	36.13	3.21	3.38	950





Job No: 21-54-23203  
Client: Draper Aden  
Project: Green Ridge Landfill  
Sounding ID: DAA-107CP  
Date: 25-Oct-2021

Seismic Source: Beam  
Source Offset (ft): 7.05  
Source Depth (ft): 0.00  
Geophone Offset (ft): 0.66

### ***SCPT<sub>u</sub> SHEAR WAVE VELOCITY TEST RESULTS - V<sub>s</sub>***

Tip Depth (ft)	Geophone Depth (ft)	Ray Path (ft)	Ray Path Difference (ft)	Travel Time Interval (ms)	Interval Velocity (ft/s)
6.56	5.91	9.20			
9.84	9.19	11.58	2.38	1.39	1720
13.12	12.47	14.32	2.74	2.54	1080
16.40	15.75	17.25	2.93	3.41	859
22.97	22.31	23.40	6.14	5.28	1164



Job No: 21-54-23203  
Client: Draper Aden  
Project: Green Ridge Landfill  
Sounding ID: DAA-109CP  
Date: 25-Oct-2021

Seismic Source: Beam  
Source Offset (ft): 7.05  
Source Depth (ft): 0.00  
Geophone Offset (ft): 0.66

### ***SCPT<sub>u</sub> SHEAR WAVE VELOCITY TEST RESULTS - V<sub>s</sub>***

Tip Depth (ft)	Geophone Depth (ft)	Ray Path (ft)	Ray Path Difference (ft)	Travel Time Interval (ms)	Interval Velocity (ft/s)
6.56	5.91	9.20			
9.84	9.19	11.58	2.38	2.52	944
13.12	12.47	14.32	2.74	2.94	934
16.40	15.75	17.25	2.93	7.95	369
19.03	18.37	19.68	2.42	4.30	564



Job No: 21-54-23203  
Client: Draper Aden  
Project: Green Ridge Landfill  
Sounding ID: DAA-110CP  
Date: 25-Oct-2021

Seismic Source: Beam  
Source Offset (ft): 7.05  
Source Depth (ft): 0.00  
Geophone Offset (ft): 0.66

### ***SCPT<sub>u</sub> SHEAR WAVE VELOCITY TEST RESULTS - $V_s$***

Tip Depth (ft)	Geophone Depth (ft)	Ray Path (ft)	Ray Path Difference (ft)	Travel Time Interval (ms)	Interval Velocity (ft/s)
3.28	2.62	7.52			
6.56	5.91	9.20	1.67	2.51	668
9.84	9.19	11.58	2.38	4.35	548
13.12	12.47	14.32	2.74	3.94	696
16.40	15.75	17.25	2.93	5.32	551
19.69	19.03	20.29	3.04	4.61	660
22.97	22.31	23.40	3.10	2.46	1263

## Seismic Cone Penetration Test Wave Traces

Job No: 21-54-23203  
Date: 10:25:21 15:34

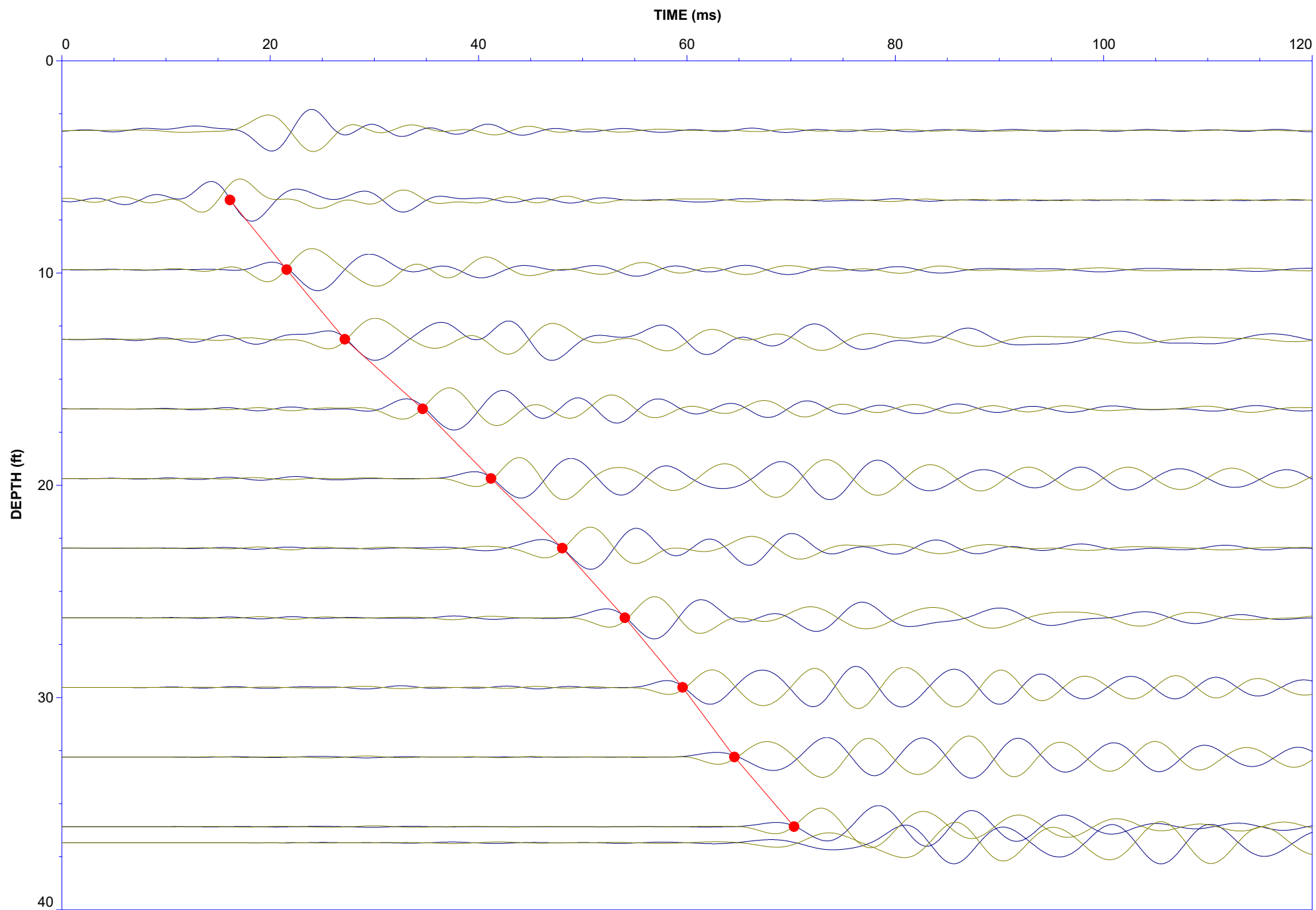
Client: Draper Aden  
Cone: 556:T1500F15U35

Project: Green Ridge Landfill

Operator: ECH / JH

Sounding: DAA-4CP

Filter: 0 Hz to 200 Hz



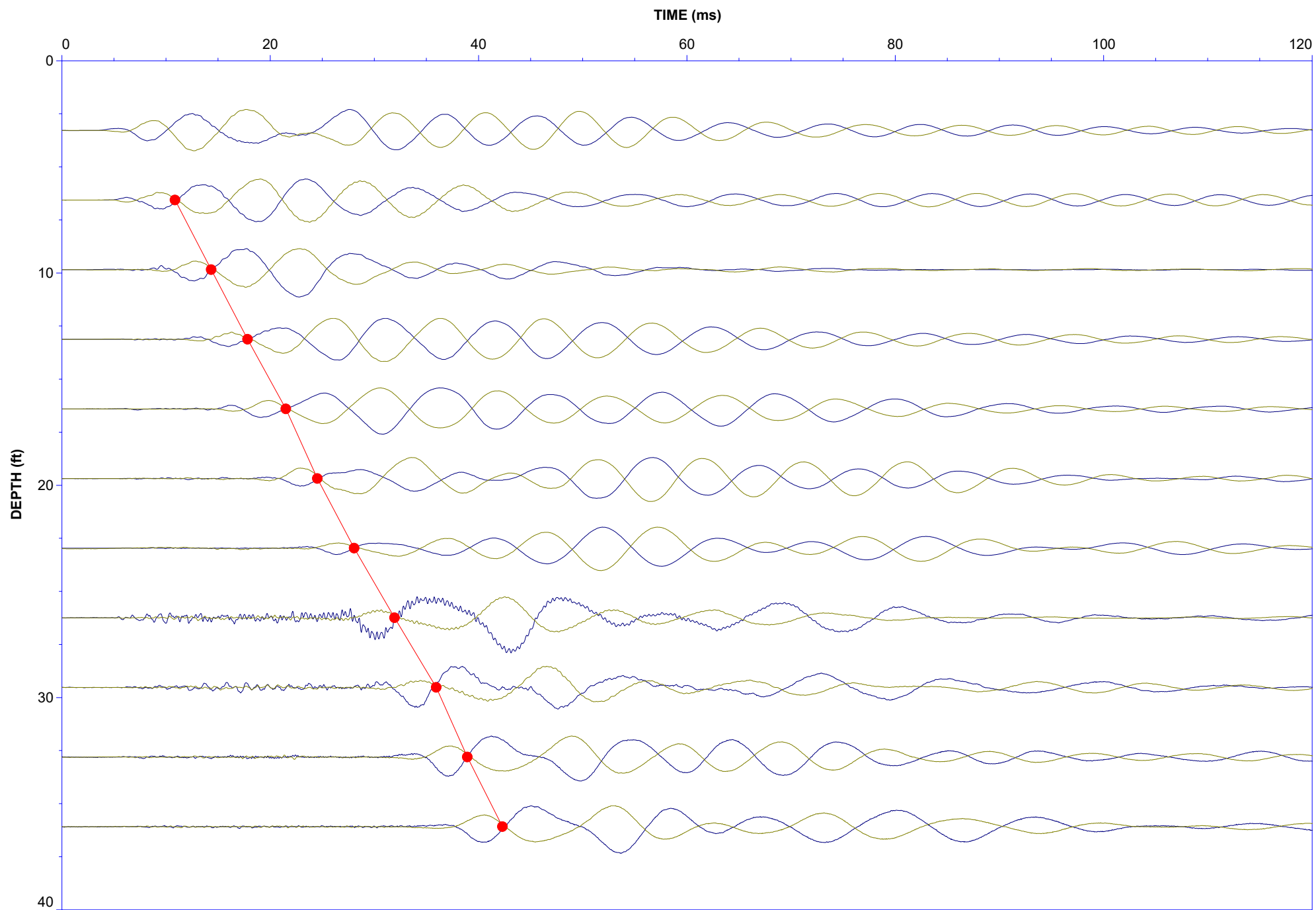
Job No: 21-54-23203  
Site: Cumberland, VA.

Client: Draper Aden  
Date: 10:26:21 17:53

Project: Green Ridge Landfill  
Cone: 556:T1500F15U35

Operator: ECH / JH

Sounding: DAA-105CP



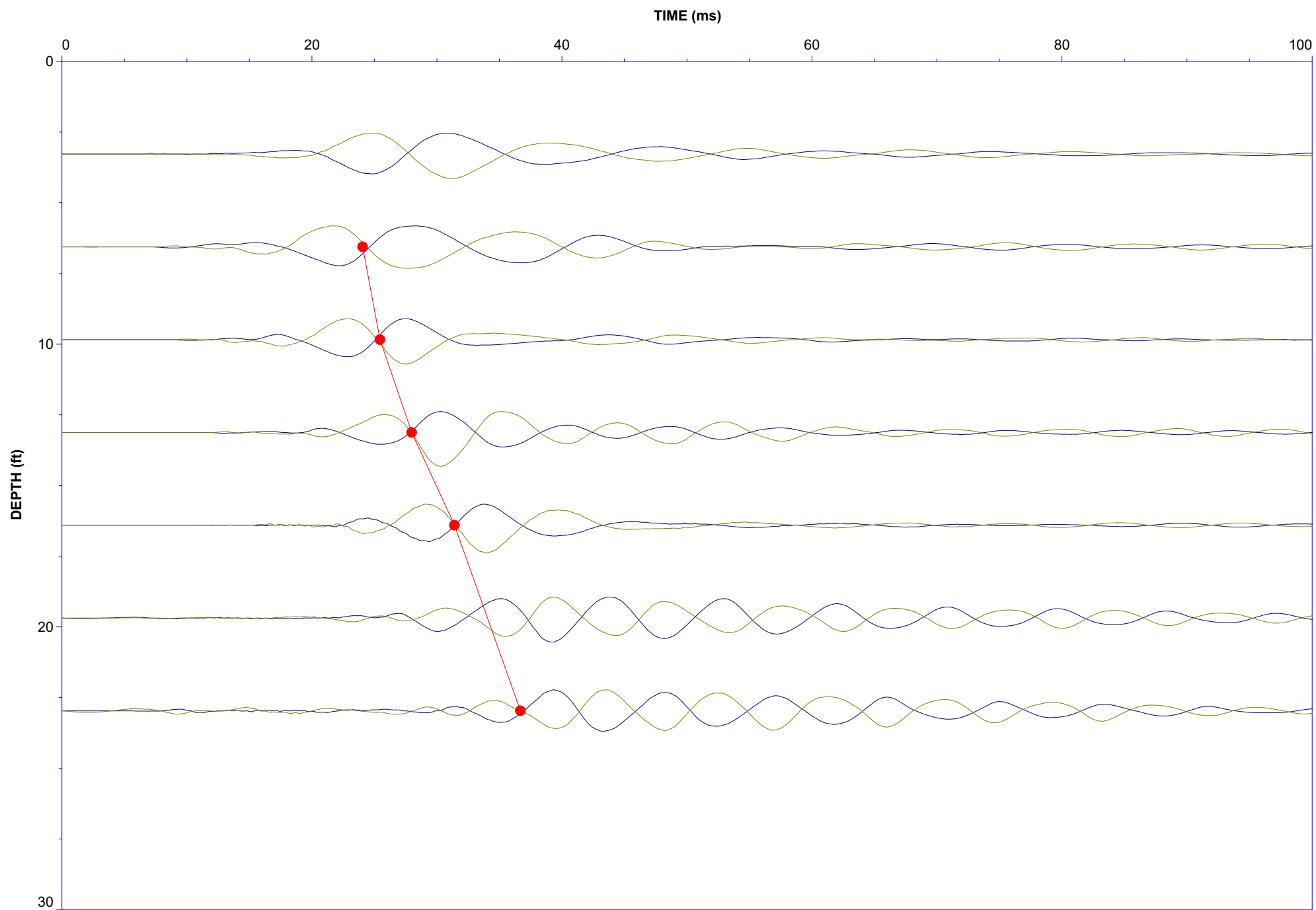
Job No: 21-54-23203  
Site: Cumberland, VA.

Client: Draper Aden  
Date: 10:25:21 19:54

Project: Green Ridge Landfill  
Cone: 556:T1500F15U35

Operator: ECH / JH

Sounding: DAA-107CP



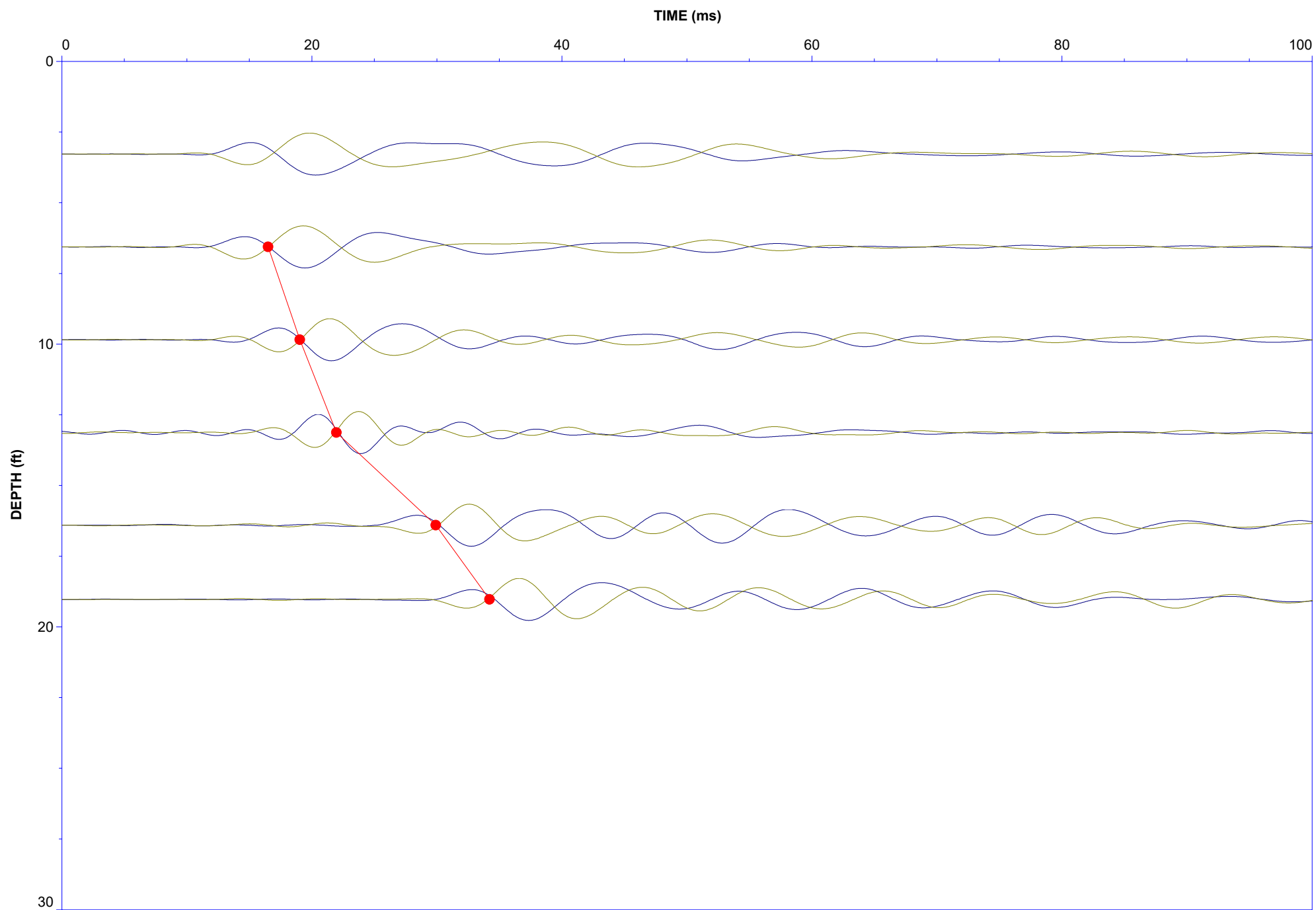
Job No: 21-54-23203  
Filter: 0 Hz to 200 Hz

Client: Draper Aden  
Date: 10:25:21 16:56

Project: Green Ridge Landfill  
Cone: 556:T1500F15U35

Operator: ECH / JH

Sounding: DAA-109CP





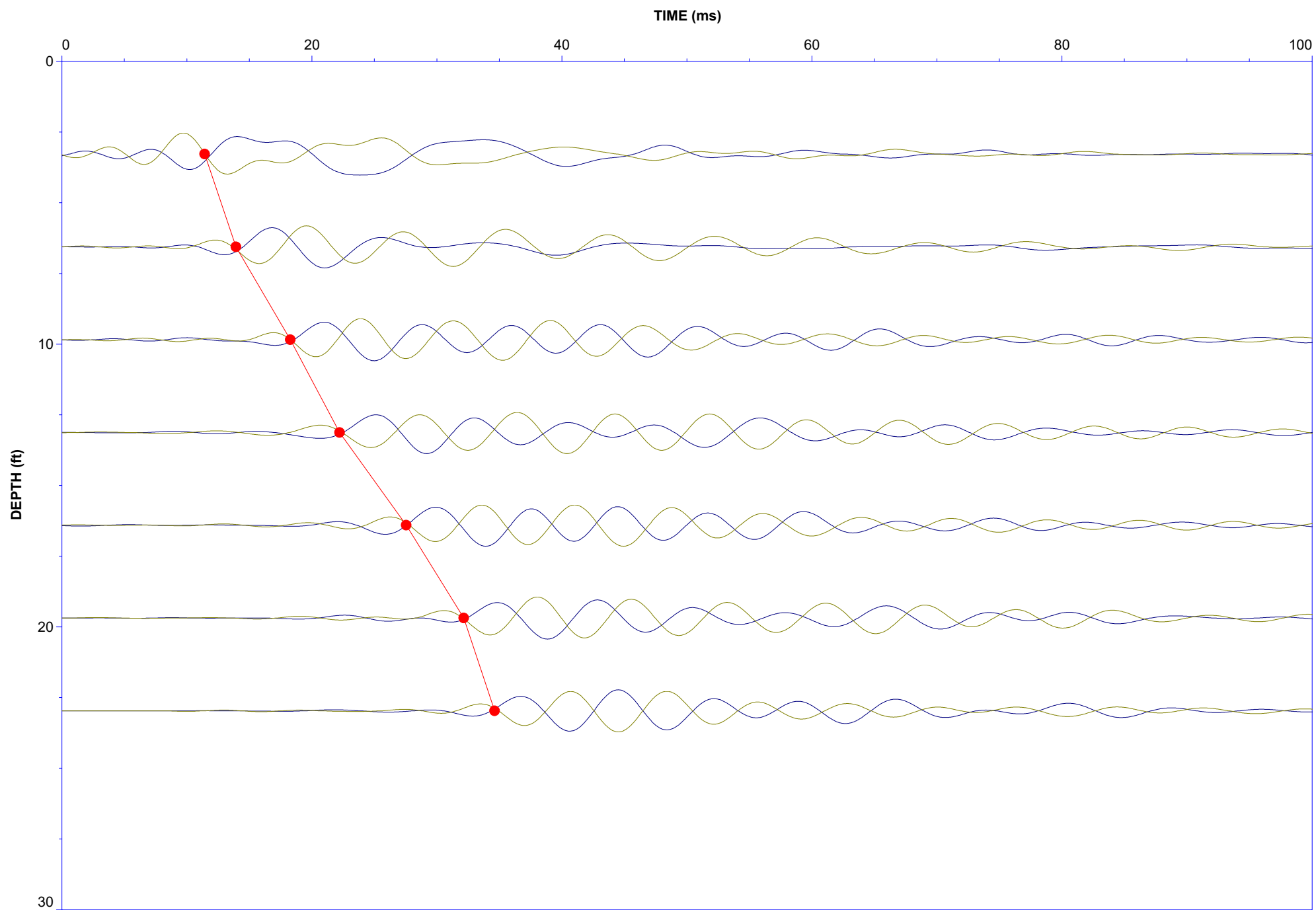
Job No: 21-54-23203  
Filter: 0 Hz to 200 Hz

Client: Draper Aden  
Date: 10:25:21 13:56

Project: Green Ridge Landfill  
Cone: 556:T1500F15U35

Operator: ECH / JH

Sounding: DAA -110CP



Pore Pressure Dissipation Summary and  
Pore Pressure Dissipation Plots



Job No: 21-54-23203  
Client: Draper Aden  
Project: Green Ridge Landfill  
Start Date: 25-Oct-2021  
End Date: 26-Oct-2021

### ***CPTu PORE PRESSURE DISSIPATION SUMMARY***

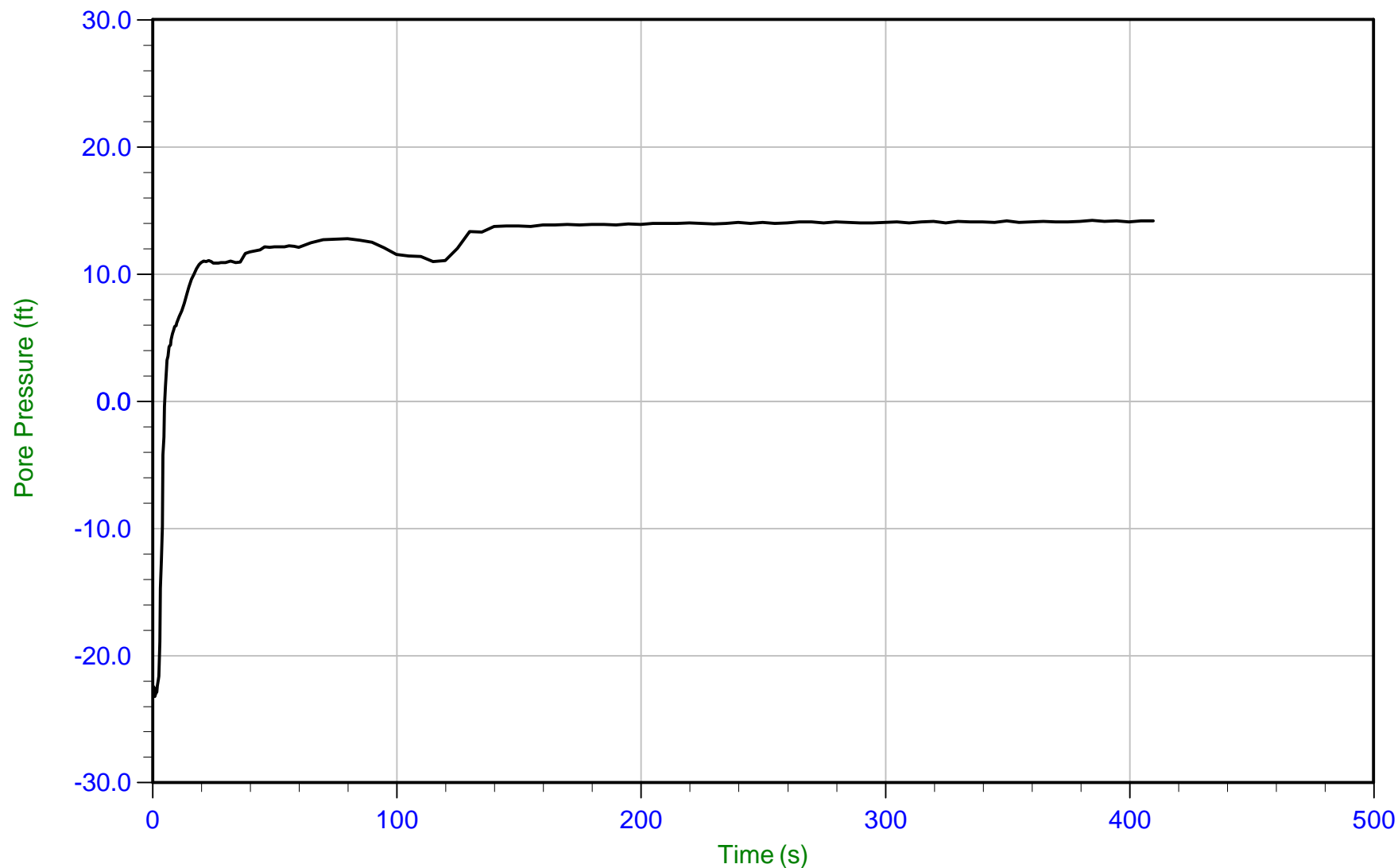
Sounding ID	File Name	Cone Area (cm <sup>2</sup> )	Duration (s)	Test Depth (ft)	Estimated Equilibrium Pore Pressure $U_{eq}$ (ft)	Calculated Phreatic Surface (ft)
DAA-4CP	21-54-23203_CP_DAA-4CP	15	410	23.0	14.1	8.8
DAA-4CP	21-54-23203_CP_DAA-4CP	15	365	32.8	23.5	9.3
DAA-102CP	21-54-23203_CP_DAA-102CP	15	180	14.3	5.2	9.1
DAA-104CP	21-54-23203_CP_DAA-104CP	15	535	29.5	4.6	24.9
DAA-105CP	21-54-23203_SP_DAA-105CP	15	840	32.8	2.8	30.0
DAA-106CP	21-54-23203_CP_DAA-106CP	15	1160	41.7	18.2	23.6
DAA-107CP	21-54-23203_SP_DAA-107CP	15	620	23.0	1.6	21.4
DAA-108CP	21-54-23203_CP_DAA-108CP	15	525	26.1	4.6	21.5
DAA-109CP	21-54-23203_SP_DAA-109CP	15	555	19.0	6.8	12.2
DAA-110CP	21-54-23203_SP_DAA-110CP	15	720	23.0	5.1	17.9
Totals			1.6 hrs			



# Draper Aden

Job No: 21-54-23203  
Date: 10/25/2021 15:34  
Site: Green Ridge Landfill

Sounding: DAA-4CP  
Cone: 556:T1500F15U35 Area=15 cm<sup>2</sup>



## Trace Summary:

Filename: 21-54-23203\_CP\_DAA-4CP.ppd2  
Depth: 7.000 m / 22.966 ft  
Duration: 410.0 s

u Min: -23.2 ft  
u Max: 14.2 ft  
u Final: 14.2 ft

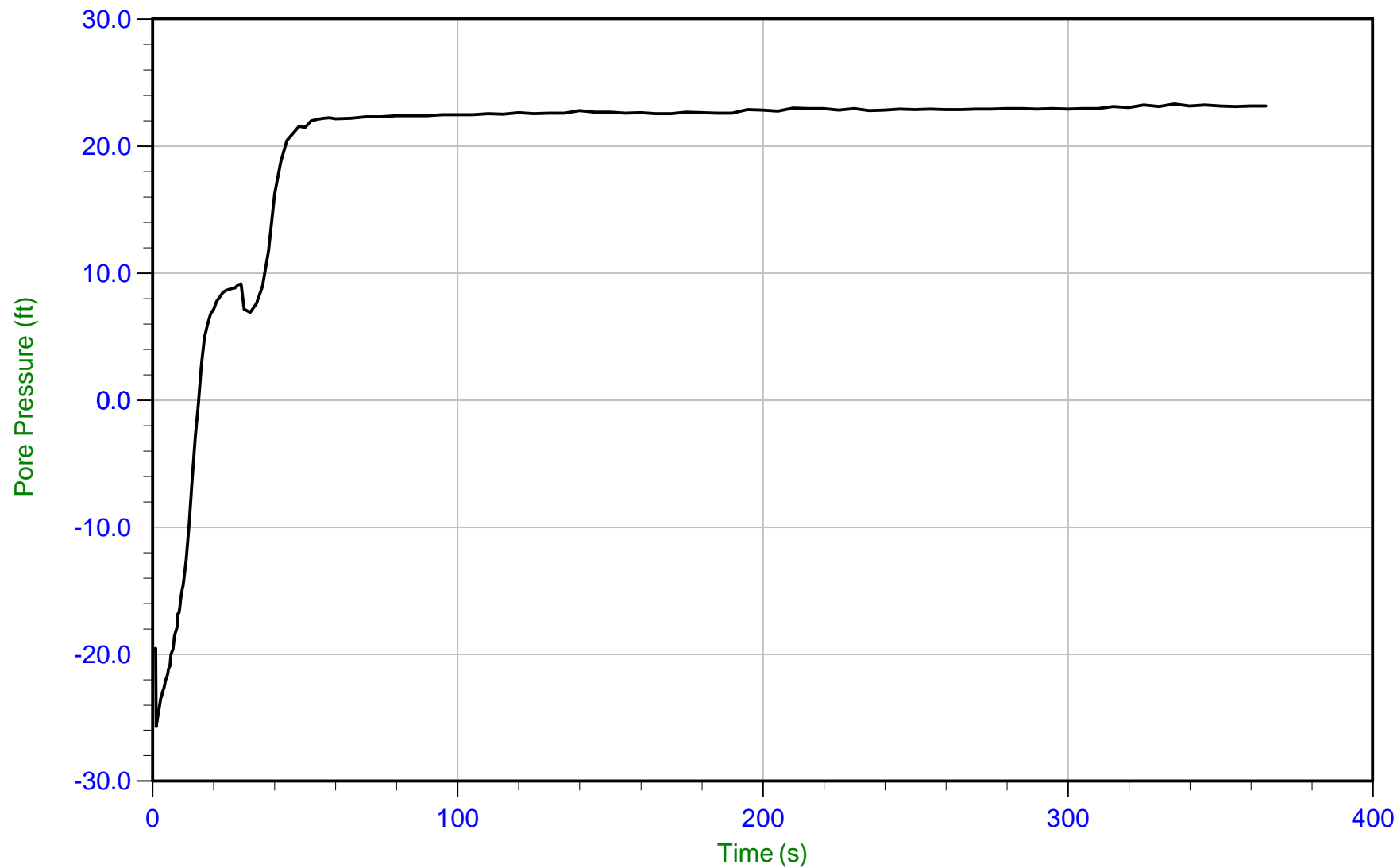
WT: 2.690 m / 8.825 ft  
Ueq: 14.1 ft



# Draper Aden

Job No: 21-54-23203  
Date: 10/25/2021 15:34  
Site: Green Ridge Landfill

Sounding: DAA-4CP  
Cone: 556:T1500F15U35 Area=15 cm<sup>2</sup>



## Trace Summary:

Filename: 21-54-23203\_CP\_DAA-4CP.ppd2  
Depth: 10.000 m / 32.808 ft  
Duration: 365.0 s

u Min: -25.7 ft  
u Max: 23.3 ft  
u Final: 23.1 ft

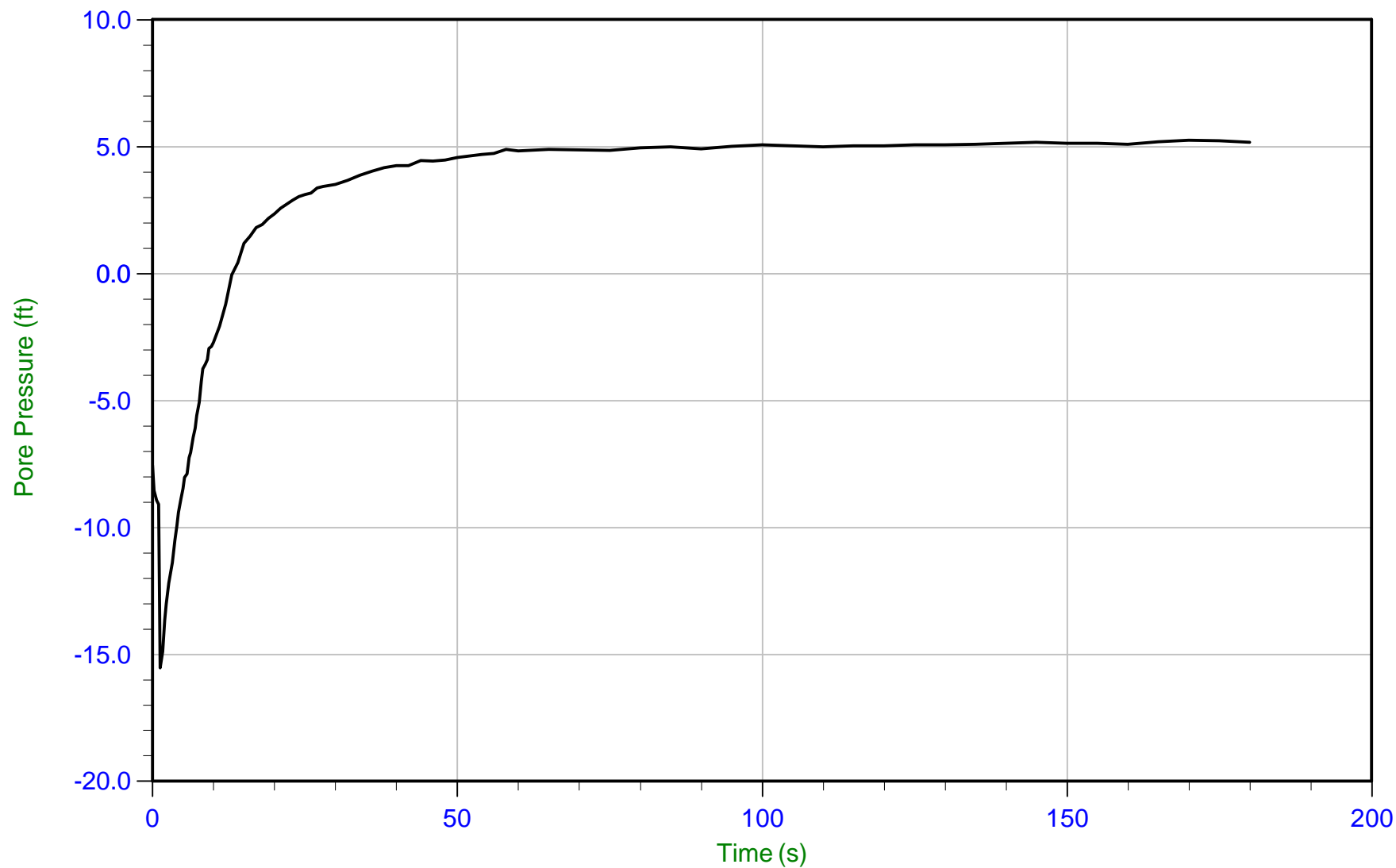
WT: 2.836 m / 9.304 ft  
Ueq: 23.5 ft



## Draper Aden

Job No: 21-54-23203  
Date: 10/26/2021 21:27  
Site: Green Ridge Landfill

Sounding: DAA-102CP  
Cone: 556:T1500F15U35 Area=15 cm<sup>2</sup>



### Trace Summary:

Filename: 21-54-23203\_CP\_DAA-102CP.ppd2  
Depth: 4.350 m / 14.271 ft  
Duration: 180.0 s

u Min: -15.5 ft  
u Max: 5.2 ft  
u Final: 5.2 ft

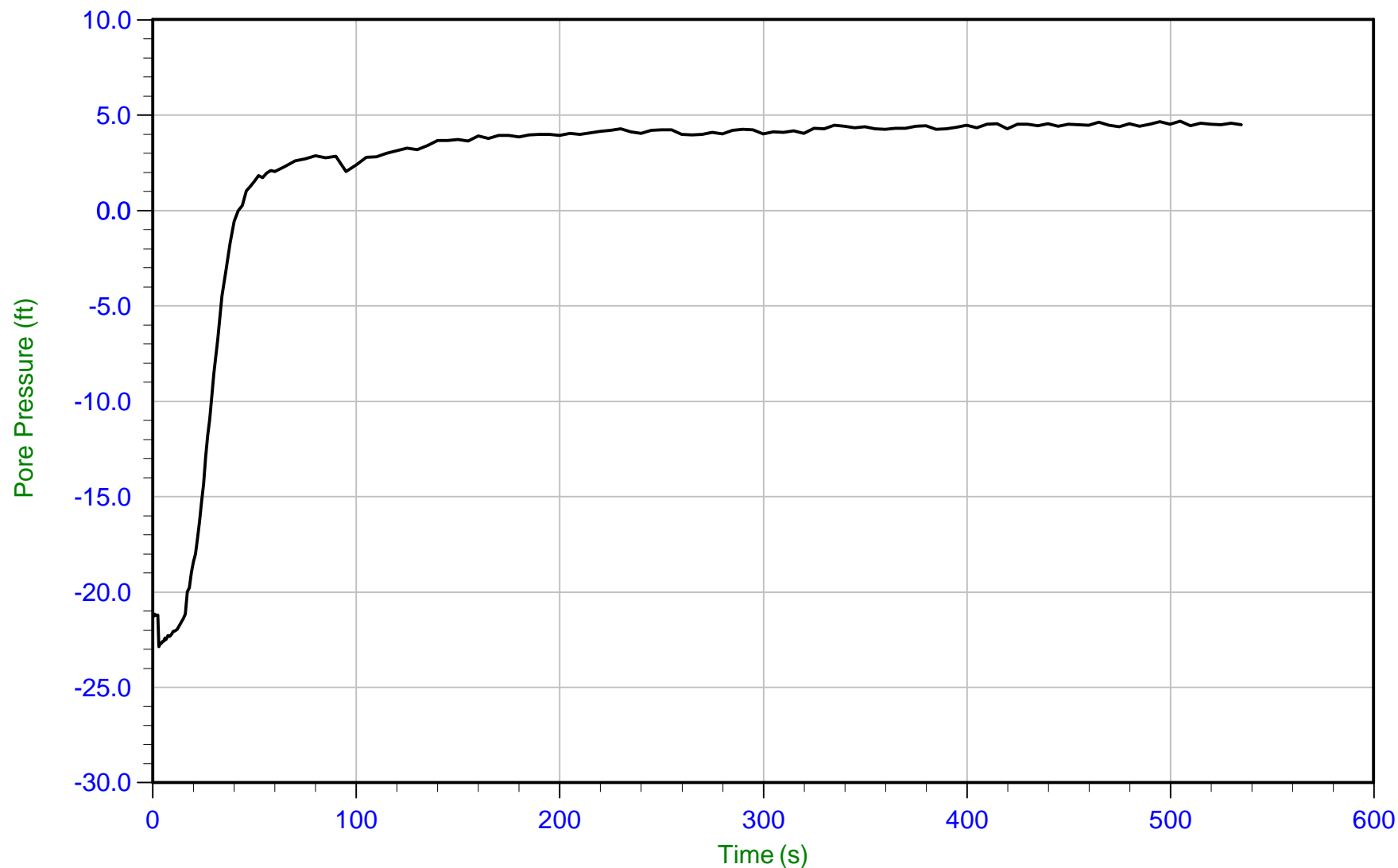
WT: 2.770 m / 9.087 ft  
Ueq: 5.2 ft



# Draper Aden

Job No: 21-54-23203  
Date: 10/26/2021 16:35  
Site: Green Ridge Landfill

Sounding: DAA-104CP  
Cone: 556:T1500F15U35 Area=15 cm<sup>2</sup>



## Trace Summary:

Filename: 21-54-23203\_CP\_DAA-104CP.ppd2  
Depth: 9.000 m / 29.527 ft  
Duration: 535.0 s

u Min: -22.9 ft  
u Max: 4.7 ft  
u Final: 4.5 ft

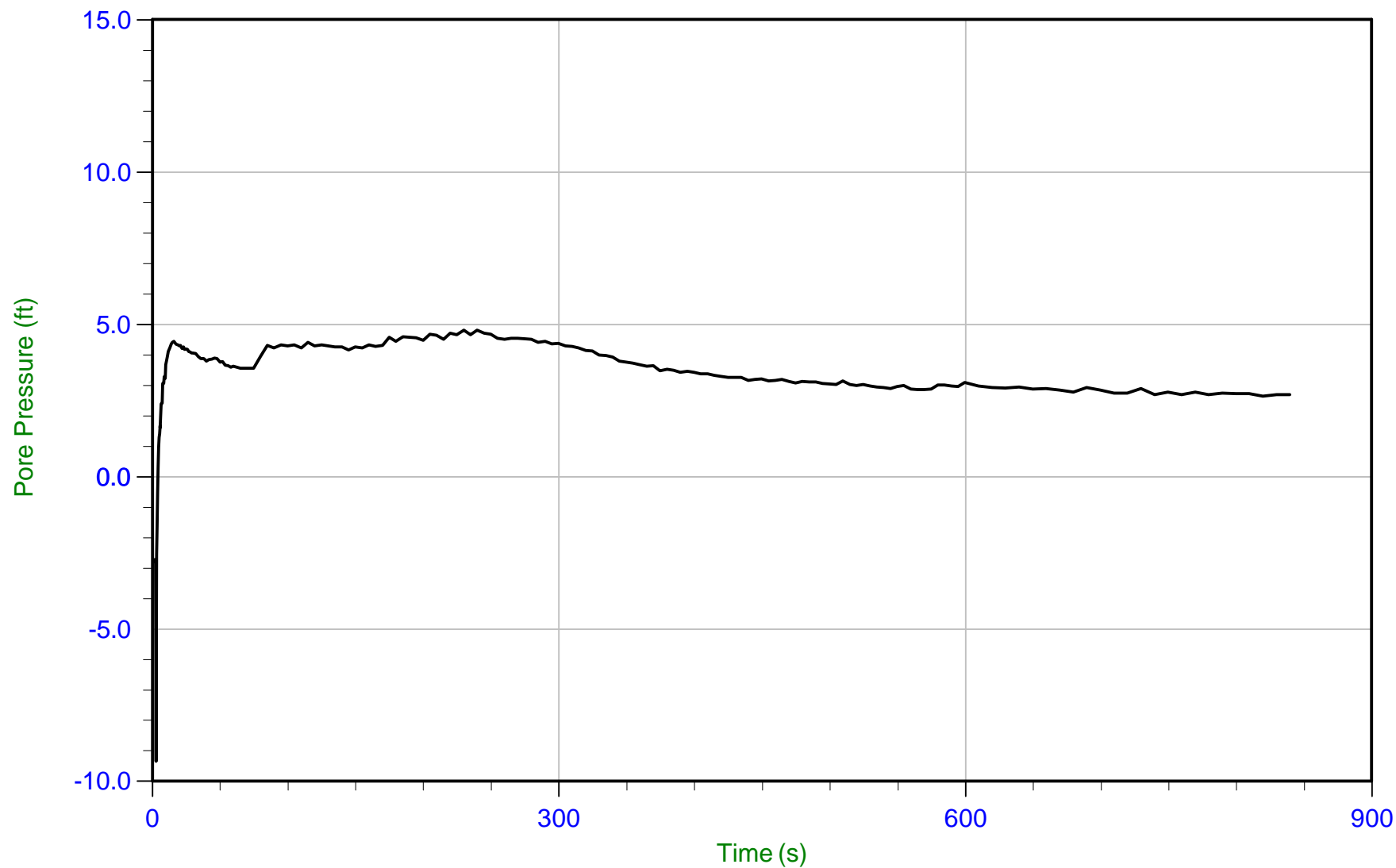
WT: 7.588 m / 24.896 ft  
Ueq: 4.6 ft



# Draper Aden

Job No: 21-54-23203  
Date: 10/26/2021 17:53  
Site: Green Ridge Landfill

Sounding: DAA-105CP  
Cone: 556:T1500F15U35 Area=15 cm<sup>2</sup>



## Trace Summary:

Filename: 21-54-23203\_SP\_DAA-105CP.ppd2  
Depth: 10.000 m / 32.808 ft  
Duration: 840.0 s

u Min: -9.3 ft  
u Max: 4.8 ft  
u Final: 2.7 ft

WT: 9.138 m / 29.979 ft  
Ueq: 2.8 ft

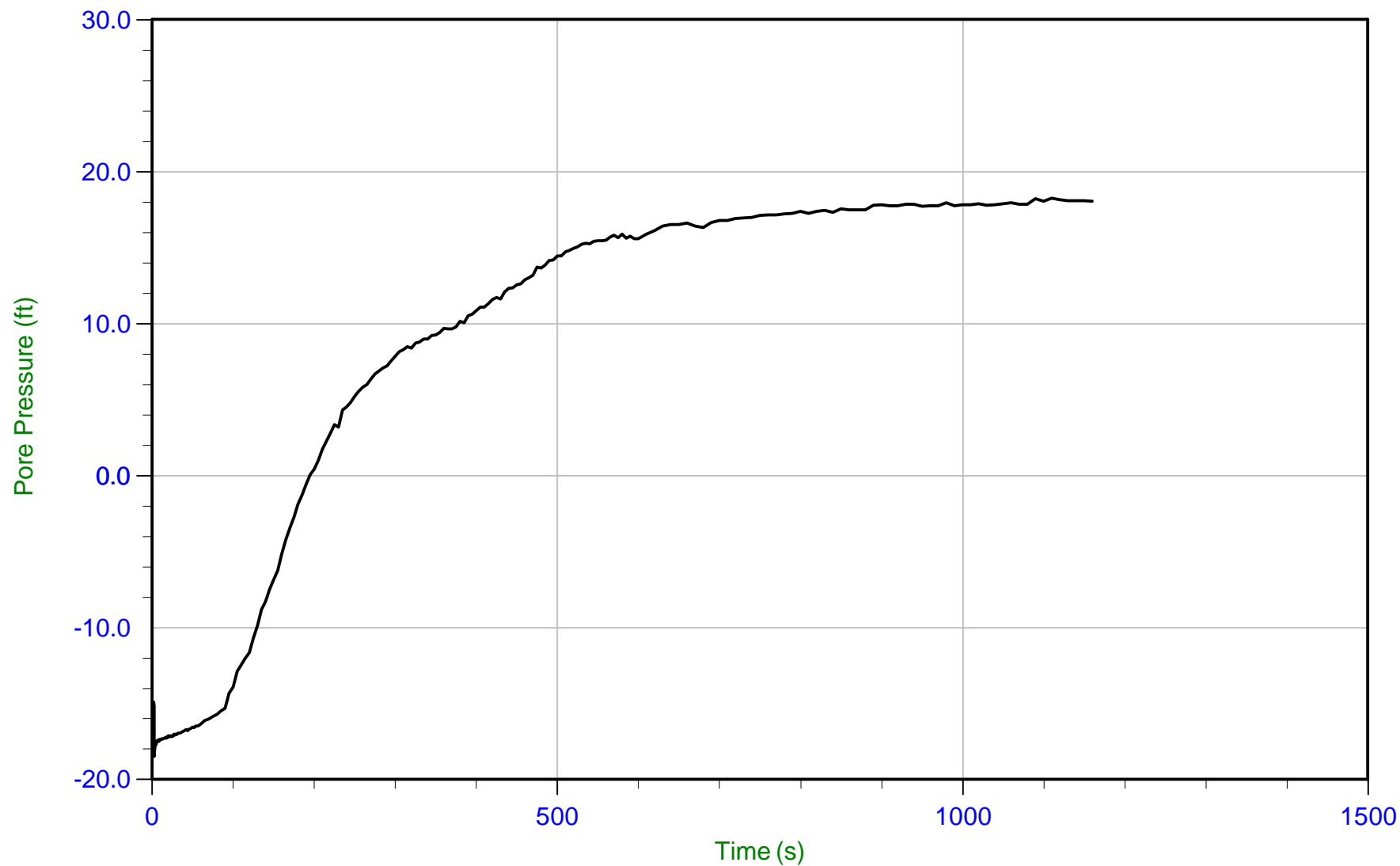




# Draper Aden

Job No: 21-54-23203  
Date: 10/26/2021 20:02  
Site: Green Ridge Landfill

Sounding: DAA-106CP  
Cone: 556:T1500F15U35 Area=15 cm<sup>2</sup>



## Trace Summary:

Filename: 21-54-23203\_CP\_DAA-106CP.ppd2  
Depth: 12.725 m / 41.748 ft  
Duration: 1160.0 s

u Min: -18.5 ft  
u Max: 18.2 ft  
u Final: 18.0 ft

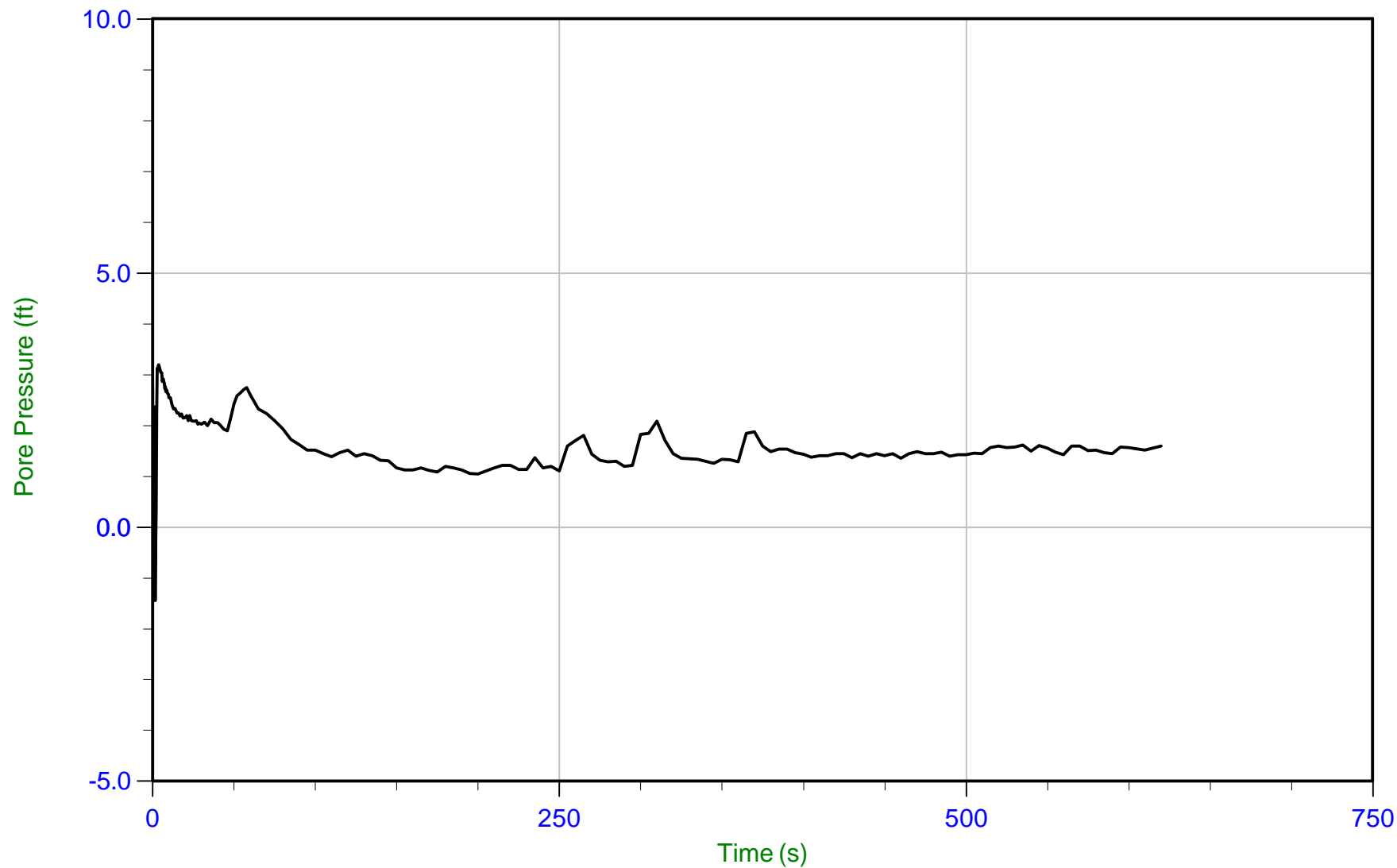
WT: 7.190 m / 23.591 ft  
Ueq: 18.2 ft



# Draper Aden

Job No: 21-54-23203  
Date: 10/25/2021 19:54  
Site: Green Ridge Landfill

Sounding: DAA-107CP  
Cone: 556:T1500F15U35 Area=15 cm<sup>2</sup>



## Trace Summary:

Filename: 21-54-23203\_SP\_DAA-107CP.ppd2  
Depth: 7.000 m / 22.966 ft  
Duration: 620.0 s

u Min: -1.4 ft  
u Max: 3.2 ft  
u Final: 1.6 ft

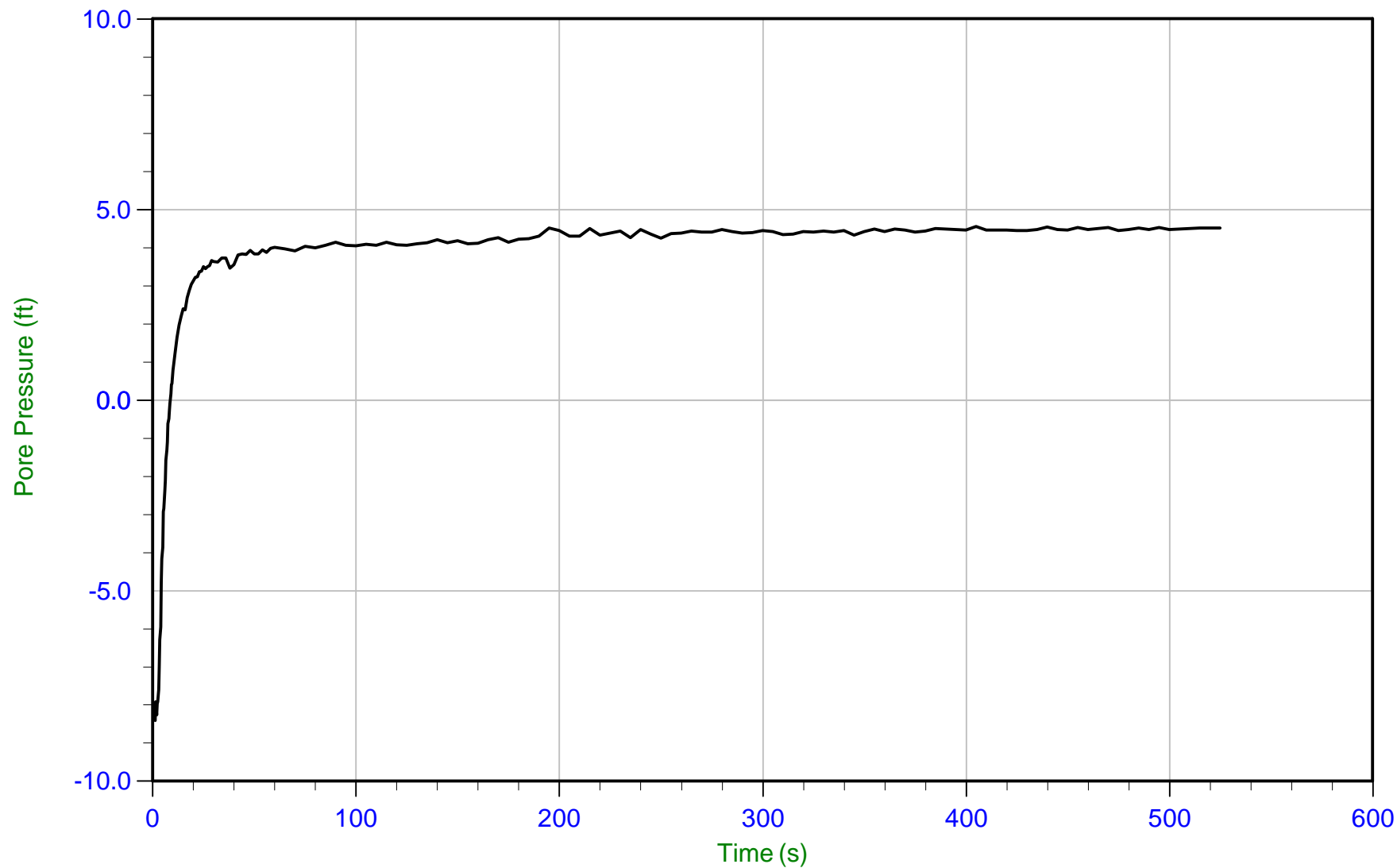
WT: 6.515 m / 21.374 ft  
Ueq: 1.6 ft



# Draper Aden

Job No: 21-54-23203  
Date: 10/25/2021 18:27  
Site: Green Ridge Landfill

Sounding: DAA-108CP  
Cone: 556:T1500F15U35 Area=15 cm<sup>2</sup>



## Trace Summary:

Filename: 21-54-23203\_CP\_DAA-108CP.ppd2  
Depth: 7.950 m / 26.082 ft  
Duration: 525.0 s

u Min: -8.4 ft  
u Max: 4.6 ft  
u Final: 4.5 ft

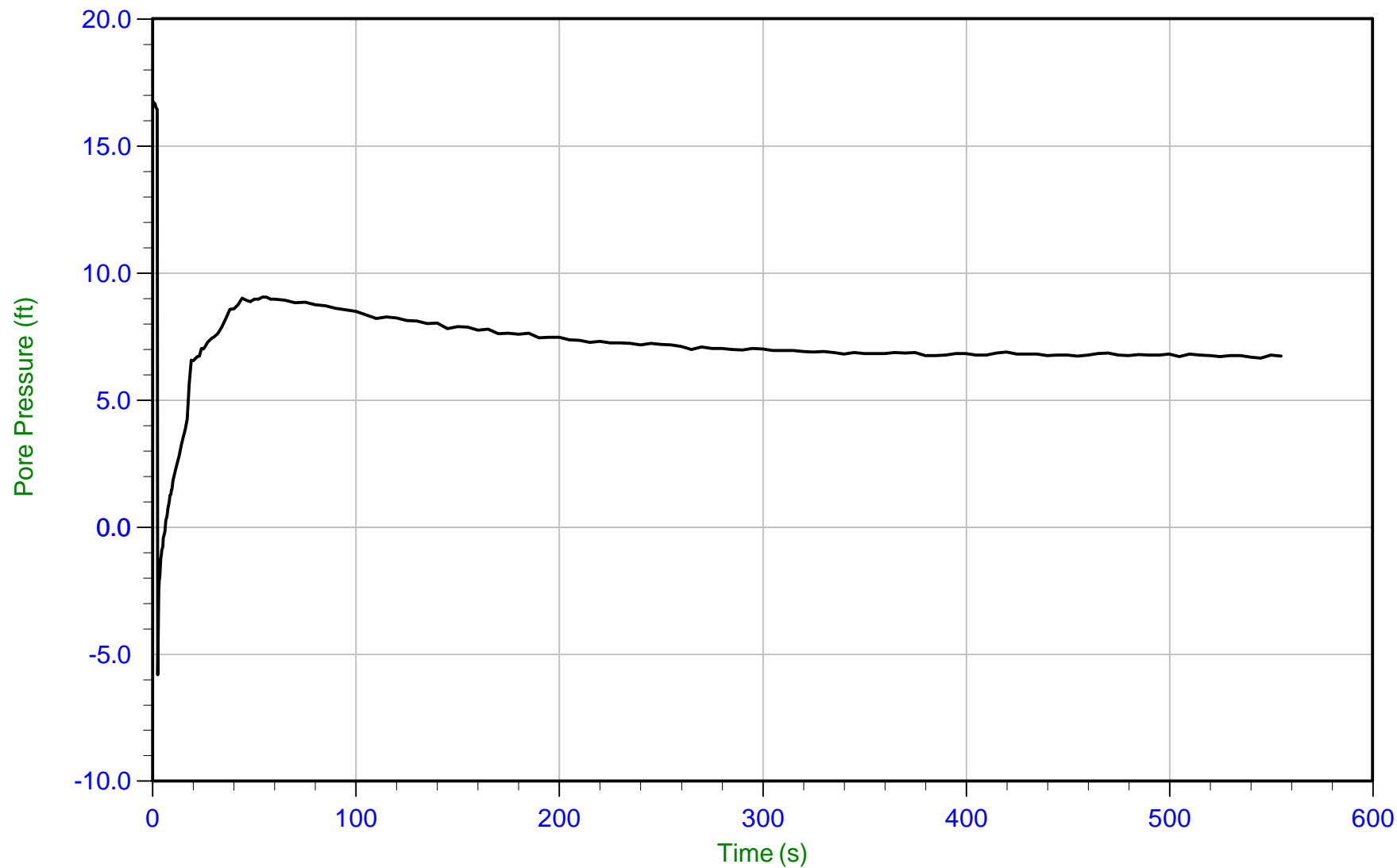
WT: 6.552 m / 21.496 ft  
Ueq: 4.6 ft



## Draper Aden

Job No: 21-54-23203  
Date: 10/25/2021 16:56  
Site: Green Ridge Landfill

Sounding: DAA-109CP  
Cone: 556:T1500F15U35 Area=15 cm<sup>2</sup>



### Trace Summary:

Filename: 21-54-23203\_SP\_DAA-109CP.ppd2  
Depth: 5.800 m / 19.029 ft  
Duration: 555.0 s

u Min: -5.8 ft  
u Max: 16.8 ft  
u Final: 6.7 ft

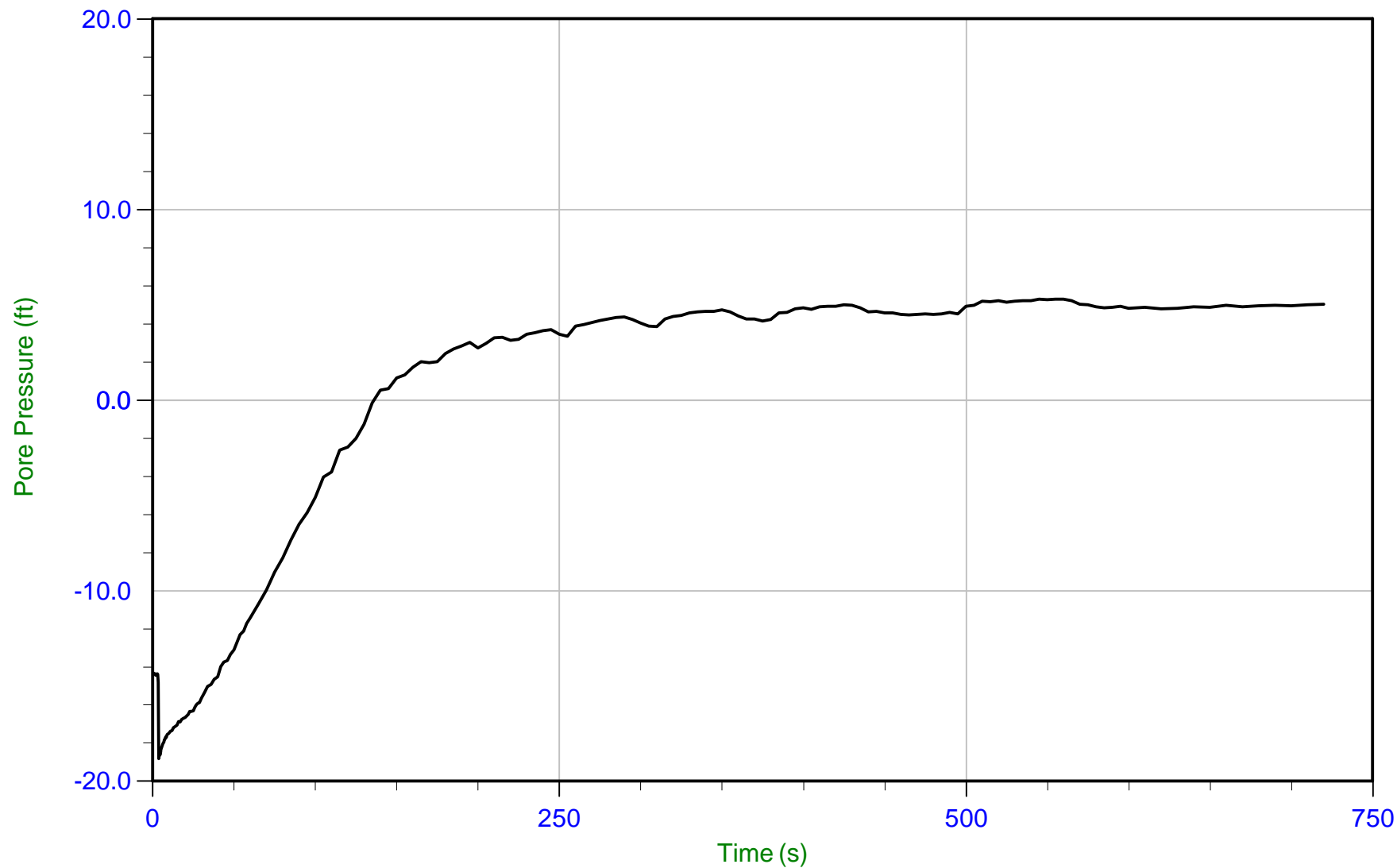
WT: 3.723 m / 12.214 ft  
Ueq: 6.8 ft



# Draper Aden

Job No: 21-54-23203  
Date: 10/25/2021 13:56  
Site: Green Ridge Landfill

Sounding: DAA-110CP  
Cone: 556:T1500F15U35 Area=15 cm<sup>2</sup>



## Trace Summary:

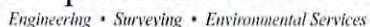
Filename: 21-54-23203\_SP\_DAA-110CP.ppd2  
Depth: 7.000 m / 22.966 ft  
Duration: 720.0 s

u Min: -18.8 ft  
u Max: 5.3 ft  
u Final: 5.0 ft

WT: 5.447 m / 17.871 ft  
Ueq: 5.1 ft

Project:	<b>Green Ridge Recycling</b>	Boring/Well Area:	<b>South Area of Cell</b>	Drilling Rig Type:	<b>Track Rig CME 45</b>
Project #:	<b>2101370</b>	Logged By:	<b>D. Coakley</b>	Drilling Method:	<b>4.25" Hollow Stem Auger</b>
Location:	<b>Cumberland County, VA</b>	Northing:	<b>3726429.45</b>	Sampling Method:	<b>Split Spoon</b>
Start Date:	<b>11/29/21</b>	Easting:	<b>11590969.56</b>	Well Material:	<b>2" Schedule 40 PVC</b>
Completion Date:	<b>11/29/21</b>	Ground Elevation:	<b>351.20</b>	Screen Size:	<b>0.10 Slot</b>
Contractor:	<b>Blue Ridge Drilling</b>	Total Depth:	<b>18'</b>	Filter Pack:	<b>#2 Sand</b>
Driller:	<b>James Jones</b>	TOC Elevation:	<b>353.49</b>	Seal:	<b>Bentonite Pellets/Hydrated</b>

N Value	Blow Counts	Depth	Description (USCS)	Geol	Well Log	ELEV.	Remarks
6	2 3 3 5 3 3		Light Tan Silty CLAY, trace fine Sand <b>(ML)</b>				Loose
7	3 4 3 2 3		Gray Silty CLAY, little fine Sand <b>(ML)</b>				
7	4 4 3 4 5 3 4	5	Gray SILT, some fine Sand, trace Clay <b>(SM)</b>			346.20	
9	4 5 3 4 4		Drk Gray fine SAND, brown Silt bands, micaceous <b>(SM)</b>				Approx. Depth to GW during drilling
12	8 4 22 3 10 15 16 11		Grayish Tan Fine SAND, some Silt, micaceous <b>(SM)</b>				Medium Dense
25	28 23 15 7	10				341.20	
51	50/5"	15	Light Brown fine SAND, some Silt, white sand lenses, horizontal structure, SAPROLITE <b>(SM)</b>			336.20	Very Dense
>50	50/5"		<b>Auger Refusal at 18'</b>				
>50							
		20				331.20	
		25				326.20	
		30				321.20	



## Page 1 of 1

N Value	Blow Counts	Depth	Description (USCS)	Geol	Well Log	ELEV.	Remarks
			Red SILT, some Clay, trace fine Sand (MH)				Logged Cuttings from 0-6'
7	3 4 3 3	5	Red fine SAND, some Silt, trace Clay (SM)			343.25	Loose
8	4 4 4 5	10	Light Brown fine SAND, little Silt, trace white quartzite gravel (SM)			338.25	Loose
13	7 4 9 11 7	15	Gray fine to medium SAND, some Silt, coarse white quartzite sand lenses (SM)			333.25	Medium Dense
26	12 14 16 11 9	20	Brown to gray medium SAND, some Silt, SAPROLITE (SM)			328.25	Dense
>50	50/2"		Auger Refusal at 21.5'				Very Dense
>50	50/6"						
		25	Biotite Gneiss Rock Core Run 1: 21.5 to 26.5 feet Recovery: 34.5/60 inches = 57% RQD: 19/34.5 inches = 55%			323.25	
		30	Biotite Gneiss Rock Core Run 1: 26.5 to 31.5 feet Recovery: 47/60 inches = 78% RQD: 10.5/41 inches = 25%			318.25	



# BORING/WELL LOG

Boring/Well ID: **DAA-2sb**

Page 1 of 2

Project:	<b>Green Ridge Recycling</b>	Boring/Well Area:	<b>West Area</b>	Drilling Rig Type:	<b>Track Rig CME 45</b>
Project #:	<b>18020117-030201</b>	Logged By:	<b>D. Coakley</b>	Drilling Method:	<b>3.25" Hollow Stem Auger</b>
Location:	<b>Cumberland County, VA</b>	Northing:	<b>3726996.95</b>	Sampling Method:	<b>Split Spoon</b>
Start Date:	<b>02/25/19</b>	Easting:	<b>11589988.63</b>	Well Material:	<b>NA</b>
Completion Date:	<b>02/25/19</b>	Ground Elevation:	<b>355.61</b>	Screen Size:	<b>NA</b>
Contractor:	<b>Blue Ridge Drilling</b>	Total Depth:	<b>51.5'</b>	Filter Pack:	<b>NA</b>
Driller:	<b>James Jones</b>	TOC Elevation:	<b>NA</b>	Seal:	<b>Bentonite Pellets/Hydrated</b>

N Value	Blow Counts	Depth	Description (USCS)	Geol	Well Log	ELEV.	Remarks
			Red SILT, some fine SAND, little Clay (MH)				Logged Cuttings from 0-6'
		5				350.61	
5	2						Loose
	3						
	2						
	2						
5	3		Brown fine SAND, some Silt, micaceous, Dry (SM)				
	3						
	4						
	3	10				345.61	
6	3						Loose
	3						
	5						
7	3						
	4						
	3						
	3						
9	4	15				340.61	Loose
	5						
	6		Red to brown fine SAND, little Silt, trace Clay, micaceous (SM)				
6	3						
	3						
	6						
	5						
12	5						Medium Dense
	7						
	11	20				335.61	
20	7						
	9						
	11						
	13						
21	8						Medium Dense
	11						
	10						
	10						
24	8	25				330.61	
	9						
	15						
	12						
	7						
23	11		Light Tan to gray very fine SAND, some Silt, bands of biotite, micaceous, dry (SM)				Medium Dense
	12						
	8						
	6						
21	10						
	11						
	11						
	12	30				325.61	
21	10						Medium Dense
	11						
	21						
	8						
24	9						
	15						
	28						
	13						
	14						



# BORING/WELL LOG

Boring/Well ID: **DAA-2sb**

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Project:	Green Ridge Recycling	Boring/Well Area:	West Area	Drilling Rig Type:	Track Rig CME 45
Project #:	18020117-030201	Logged By:	D. Coakley	Drilling Method:	3.25" Hollow Stem Auger
Location:	Cumberland County, VA	Northing:	3726996.95	Sampling Method:	Split Spoon
Start Date:	02/25/19	Easting:	11589988.63	Well Material:	NA
Completion Date:	02/25/19	Ground Elevation:	355.61	Screen Size:	NA
Contractor:	Blue Ridge Drilling	Total Depth:	51.5'	Filter Pack:	NA
Driller:	James Jones	TOC Elevation:	NA	Seal:	Bentonite Pellets/Hydrated

N Value	Blow Counts	Depth	Description (USCS)	Geol	Well Log	ELEV.	Remarks
36	16 28 6 13 23 50/6"		Light Tan very fine SAND, some Silt, bands of biotite, micaceous, dry (SM)				Dense
>50	35 50/4"	40	Light Tan to white fine SAND, little Silt, SAPROLITE (SM)			315.61	
>50	21 33 50/6"	45				310.61	Very Dense
>50	28 50/3"	50	Brown to gray fine SAND, some Silt, trace white quartzite gravel, SAPROLITE (SM)			305.61	Very Dense
			Auger Refusal at 51.5'				
		55				300.61	
		60				295.61	
		65				290.61	



Boring/Well ID: **DAA-3sb**

Page 1 of 2

N Value	Blow Counts	Depth	Description (USCS)	Geol	Well Log	ELEV.	Remarks
							Logged Cuttings from 0-6'
		5				343.39	
15	369912						Stiff
2	333333						
	889933	10				338.39	
3	333333						Medium Stiff
4	333333						
5	333333	15				333.39	Medium Stiff
6	222222		Reddish brown SILT, some Clay, little fine Sand, iron bands, damp, (MH)				
	446333						
7	333333						Medium Stiff
	5wh	20				328.39	
8	334443						
9	333333						Medium Stiff
	4wh						
10	333333	25				323.39	
	wh						
11	333333						Medium Stiff
	wh						
12	1234						
	wh	30				318.39	
13	145						Soft



# BORING/WELL LOG

 Boring/Well ID: **DAA-3sb**

Page 2 of 2

Project:	Green Ridge Recycling	Boring/Well Area:	West Area	Drilling Rig Type:	Track Rig CME 45
Project #:	18020117-030201	Logged By:	D. Coakley	Drilling Method:	3.25" Hollow Stem Auger
Location:	Cumberland County, VA	Northing:	3726777.44	Sampling Method:	Split Spoon
Start Date:	02/25/19	Easting:	11590399.87	Well Material:	NA
Completion Date:	02/25/19	Ground Elevation:	348.39	Screen Size:	NA
Contractor:	Blue Ridge Drilling	Total Depth:	60'	Filter Pack:	NA
Driller:	James Jones	TOC Elevation:	NA	Seal:	Bentonite Pellets/Hydrated

N Value	Blow Counts	Depth	Description (USCS)	Geol	Well Log	ELEV.	Remarks
14	3 3 8 10						Stiff
15	wh 3 4 5	40				308.39	Medium Stiff
16	4 7 9 8	45				303.39	Stiff
17	3 3 4 7	50	Brown SILT, some Clay, little very fine Sand, wet (MH)			298.39	Medium Stiff
18	5 6 8 10	55				293.39	Medium Stiff
19	4 7 9 13	60	No Auger Refusal, Drilling depth terminated at 60'			288.39	Medium Stiff
		65				283.39	





Project:	Green Ridge Recycling	Boring/Well Area:	West Area	Drilling Rig Type:	Track Rig CME 45
Project #:	18020117-030201	Logged By:	D. Coakley	Drilling Method:	3.25" Hollow Stem Auger
Location:	Cumberland County, VA	Northing:	3726498.37	Sampling Method:	Split Spoon
Start Date:	02/26/19	Easting:	11590790.11	Well Material:	NA
Completion Date:	02/26/19	Ground Elevation:	347.44	Screen Size:	NA
Contractor:	Blue Ridge Drilling	Total Depth:	39'	Filter Pack:	NA
Driller:	James Jones	TOC Elevation:	NA	Seal:	Bentonite Pellets/Hydrated

N Value	Blow Counts	Depth	Description (USCS)	Geol	Well Log	ELEV.	Remarks
>50	22 50/6"		Brown fine SAND, little Silt, little Clay, biotite bands, white quartzite coarse Sand lenses, <i>SAPROLITE</i> (SM)				Very Dense
>50	50/4"		Auger Refusal at 39'				Very Dense
		40				307.44	
		45				302.44	
		50				297.44	
		55				292.44	
		60				287.44	
		65				282.44	

Project:	Green Ridge Recycling	Boring/Well Area:	West Area	Drilling Rig Type:	Track Rig CME 45
Project #:	18020117-030201	Logged By:	D. Coakley	Drilling Method:	4.25" Hollow Stem Auger
Location:	Cumberland County, VA	Northing:	3726297.92	Sampling Method:	Split Spoon
Start Date:	02/26/19	Easting:	11590385.49	Well Material:	2" Schedule 40 PVC
Completion Date:	02/26/19	Ground Elevation:	356.49	Screen Size:	0.10 Slot
Contractor:	Blue Ridge Drilling	Total Depth:	35.5	Filter Pack:	#2 Sand
Driller:	James Jones	TOC Elevation:	356.50	Seal:	Bentonite Pellets/Hydrated

N Value	Blow Counts	Depth	Description (USCS)	Geol	Well Log	ELEV.	Remarks
			Red fine SAND and Silt, some Clay ( <b>ML</b> )				Logged Cuttings from 0-7'
31	6 12 19 50/6"	5				351.49	
			Light Tan to Red fine SAND, little Silt, trace gravel, Micaceous ( <b>SM</b> )				Dense
	Shelby Tube	10				346.49	
>50	65/4"						Very Dense
		15				341.49	
>50	25 50/6"						Very Dense
		20				336.49	
>50	65/4"						
		25	Light Tan fine to med SAND, little Silt, Micaceous, Damp, <b>SAPROLITE (SM)</b>			331.49	Very Dense
>50	50/2"						
		30				326.49	
>50	50/1"						Very Dense
			Auger Refusal at 35.5'				



# BORING/WELL LOG

Boring/Well ID: **DAA-6pz**

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Project:	<b>Green Ridge Recycling</b>	Boring/Well Area:	<b>West Area</b>	Drilling Rig Type:	<b>Track Rig CME 45</b>
Project #:	<b>18020117-030201</b>	Logged By:	<b>D. Coakley</b>	Drilling Method:	<b>4.25" Hollow Stem Auger</b>
Location:	<b>Cumberland County, VA</b>	Northing:	<b>3726430.01</b>	Sampling Method:	<b>Split Spoon</b>
Start Date:	<b>02/26/19</b>	Easting:	<b>11589325.34</b>	Well Material:	<b>2" Schedule 40 PVC</b>
Completion Date:	<b>02/26/19</b>	Ground Elevation:	<b>332.92</b>	Screen Size:	<b>0.10 Slot</b>
Contractor:	<b>Blue Ridge Drilling</b>	Total Depth:	<b>23.5'</b>	Filter Pack:	<b>#2 Sand</b>
Driller:	<b>James Jones</b>	TOC Elevation:	<b>335.19</b>	Seal:	<b>Bentonite Pellets/Hydrated</b>

N Value	Blow Counts	Depth	Description (USCS)	Geol	Well Log	ELEV.	Remarks
			Red SAND, some Silt, some Clay (ML)				Logged Cuttings from 0-6'
		5	Light brown fine SAND, some Silt, trace Clay, Micaceous (SM)			327.92	Loose
7	2						Loose
	3						
	4						
	6						
8	4						
	4						
	4						
	5	10	Light brown fine SAND, some Silt, trace Clay, biotite bands, Micaceous (SM)			322.92	Medium Dense
15	5						Very Dense
	10						
	20						
>50	31		Very light tan fine SAND, little Silt, Micaceous (SM)				
	50/6"						
		15				317.92	Dense
30	10						Very Dense
	14						
	16						
	26						
	10						
>50	24		Light brown fine SAND, some Silt, trace Clay, iron and biotite bands, Micaceous, SAPROLITE (SM)				
	50/6"	20				312.92	Very Dense
>50	50/6"						
			Auger Refusal at 23.5'				
		25				307.92	
		30				302.92	

# BORING/WELL LOG

Boring/Well ID: **DAA-7sb**

Page 1 of 2

Project:	Green Ridge Recycling	Boring/Well Area:	West Area	Drilling Rig Type:	Track Rig CME 45
Project #:	18020117-030201	Logged By:	D. Coakley	Drilling Method:	3.25" Hollow Stem Auger
Location:	Cumberland County, VA	Northing:	3725536.82	Sampling Method:	Split Spoon
Start Date:	02/27/19	Easting:	11590630.30	Well Material:	NA
Completion Date:	02/27/19	Ground Elevation:	352.90	Screen Size:	NA
Contractor:	Blue Ridge Drilling	Total Depth:	63.5'	Filter Pack:	NA
Driller:	James Jones	TOC Elevation:	NA	Seal:	Bentonite Pellets/Hydrated

N Value	Blow Counts	Depth	Description (USCS)	Geol	Well Log	ELEV.	Remarks
15	4 6 9 7	5	Brown SILT, some Clay, trace Sand (SM)			347.90	Logged Cuttings from 0-5'
19	9 11 8 9 7	10	Green to gray fine SAND, little Silt, trace Clay, mottling (SM)			342.90	Medium Dense
21	11 10 12 8	15				337.90	Medium Dense
19	9 10 14 5	20				332.90	Very Dense
24	9 15 27 17	25				327.90	
66	36 30 31 6	30				322.90	
28	13 15 32		Light tan to brown SAND, some Silt, biotite mica bands, mottled (SM)				
>50	50/4"						
>50	50/2"						
>50	17 50/6"		Tan fine SAND, some Silt, white quartzite gravel and biotite mica lenses, mottled (SM)				



# BORING/WELL LOG

Boring/Well ID: **DAA-7sb**

Page 2 of 2

Project:	Green Ridge Recycling	Boring/Well Area:	West Area	Drilling Rig Type:	Track Rig CME 45
Project #:	18020117-030201	Logged By:	D. Coakley	Drilling Method:	3.25" Hollow Stem Auger
Location:	Cumberland County, VA	Northing:	3725536.82	Sampling Method:	Split Spoon
Start Date:	02/27/19	Easting:	11590630.30	Well Material:	NA
Completion Date:	02/27/19	Ground Elevation:	352.90	Screen Size:	NA
Contractor:	Blue Ridge Drilling	Total Depth:	63.5'	Filter Pack:	NA
Driller:	James Jones	TOC Elevation:	NA	Seal:	Bentonite Pellets/Hydrated

N Value	Blow Counts	Depth	Description (USCS)	Geol	Well Log	ELEV.	Remarks
>50	26 38 50/5+		Tan fine SAND, some Silt, white quartzite gravel and biotite mica lenses, mottled (SM)				Very Dense
>50	33 50/3"	40				312.90	Very Dense
16	4 7 9 13	45				307.90	Medium Dense
23	6 9 14 24	50	Red brown SILT, some fine Sand, little Clay, mottled (SM)			302.90	Medium Dense
26	5 11 14 19	55				297.90	Medium Dense
18	8 9 9 23	60	Red SILT, some Clay, little Sand (SM)			292.90	Medium Dense
			Auger Refusal at 63.5'				
		65				287.90	

Project:	Green Ridge Recycling	Boring/Well Area:	West Area	Drilling Rig Type:	Track Rig CME 45
Project #:	18020117-030201	Logged By:	D. Coakley	Drilling Method:	4.25" Hollow Stem Auger
Location:	Cumberland County, VA	Northing:	3726549.74	Sampling Method:	Split Spoon
Start Date:	02/27/19	Easting:	11591416.33	Well Material:	2" Schedule 40 PVC
Completion Date:	02/27/19	Ground Elevation:	364.19	Screen Size:	0.10 Slot
Contractor:	Blue Ridge Drilling	Total Depth:	36.0	Filter Pack:	#2 Sand
Driller:	James Jones	TOC Elevation:	365.46	Seal:	Bentonite Pellets/Hydrated

N Value	Blow Counts	Depth	Description (USCS)	Geol	Well Log	ELEV.	Remarks
							Logged Cuttings from 0-6'
		5	Red SILT, some Clay, trace fine Sand (ML)			359.19	
4	2 2 3 wh		Red/Brown fine to med SAND and Silt, trace Clay, micaceous, Damp (SM)				Medium Stiff
2	2 2 3	10				354.19	
	Shelby Tube						Medium Stiff
4	wh 2 2 4		Brown to gray fine to med SAND, little Silt, micaceous, iron and biotite bands, Wet (SM)				
	Shelby Tube	15				349.19	
							Stiff
10	2 4 6 8	20				344.19	Medium Dense
12	4 6 6 11						
	Shelby Tube						
32	13 14 18 20	25				339.19	Dense
							Very Dense
>50	11 37 50/4"	30	Light Gray to dark brown fine SAND, some Silt, white quartz gravel lenses SAPROLITE (SM)			334.19	Very Dense
>50	23 32 50/5"						





# BORING/WELL LOG

Boring/Well ID: **DAA-8pz**

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Project:	<b>Green Ridge Recycling</b>	Boring/Well Area:	<b>West Area</b>	Drilling Rig Type:	<b>Track Rig CME 45</b>
Project #:	<b>18020117-030201</b>	Logged By:	<b>D. Coakley</b>	Drilling Method:	<b>4.25" Hollow Stem Auger</b>
Location:	<b>Cumberland County, VA</b>	Northing:	<b>3726549.74</b>	Sampling Method:	<b>Split Spoon</b>
Start Date:	<b>02/27/19</b>	Easting:	<b>11591416.33</b>	Well Material:	<b>2" Schedule 40 PVC</b>
Completion Date:	<b>02/27/19</b>	Ground Elevation:	<b>364.19</b>	Screen Size:	<b>0.10 Slot</b>
Contractor:	<b>Blue Ridge Drilling</b>	Total Depth:	<b>36.0</b>	Filter Pack:	<b>#2 Sand</b>
Driller:	<b>James Jones</b>	TOC Elevation:	<b>365.46</b>	Seal:	<b>Bentonite Pellets/Hydrated</b>

N Value	Blow Counts	Depth	Description (USCS)	Geol	Well Log	ELEV.	Remarks
>50	50/4"		Auger Refusal at 36'				Very Dense
		40				324.19	
		45				319.19	
		50				314.19	
		55				309.19	
		60				304.19	
		65				299.19	

# BORING/WELL LOG

Boring/Well ID: **DAA-9pz**

Page 1 of 1

Project:	<b>Green Ridge Recycling</b>	Boring/Well Area:	<b>West Area</b>	Drilling Rig Type:	<b>Track Rig CME 45</b>
Project #:	<b>18020117-030201</b>	Logged By:	<b>D. Coakley</b>	Drilling Method:	<b>4.25" Hollow Stem Auger</b>
Location:	<b>Cumberland County, VA</b>	Northing:	<b>3725486.86</b>	Sampling Method:	<b>Split Spoon</b>
Start Date:	<b>02/28/19</b>	Easting:	<b>11591101.07</b>	Well Material:	<b>2" Schedule 40 PVC</b>
Completion Date:	<b>02/28/19</b>	Ground Elevation:	<b>365.25</b>	Screen Size:	<b>0.10 Slot</b>
Contractor:	<b>Blue Ridge Drilling</b>	Total Depth:	<b>25'</b>	Filter Pack:	<b>#2 Sand</b>
Driller:	<b>James Jones</b>	TOC Elevation:	<b>365.68</b>	Seal:	<b>Bentonite Pellets/Hydrated</b>

N Value	Blow Counts	Depth	Description (USCS)	Geol	Well Log	ELEV.	Remarks
			Red SILT, some Clay, trace fine Sand (ML)				Logged Cuttings from 0-6'
8	23542233	5	Red/brown fine SAND and Silt, trace Clay, micaceous (SM)			360.25	Loose
5	2242233	10				355.25	Loose
5	2233333		Red/Brown fine SAND, little Silt, micaceous, white quartz lenses (SM)				Loose
5	2223333						Loose
5	2223333	15				350.25	Medium Dense
9	4345455						Medium Dense
12	6667666	20				345.25	Medium Dense
17	8889888		Brown fine SAND, some Silt, white quartz sand lenses, SAPROLITE (SM)				Very Dense
>50	50/4"	25	Auger Refusal at 25'			340.25	
		30				335.25	



# BORING/WELL LOG

Boring/Well ID: **DAA-10pz**

Page 1 of 1

Project:	<b>Green Ridge Recycling</b>	Boring/Well Area:	<b>West Area</b>	Drilling Rig Type:	<b>Track Rig CME 45</b>
Project #:	<b>18020117-030201</b>	Logged By:	<b>D. Coakley</b>	Drilling Method:	<b>4.25" Hollow Stem Auger</b>
Location:	<b>Cumberland County, VA</b>	Northing:	<b>3726549.74</b>	Sampling Method:	<b>Split Spoon</b>
Start Date:	<b>02/28/19</b>	Easting:	<b>11591416.33</b>	Well Material:	<b>2" Schedule 40 PVC</b>
Completion Date:	<b>02/28/19</b>	Ground Elevation:	<b>339.45</b>	Screen Size:	<b>0.10 Slot</b>
Contractor:	<b>Blue Ridge Drilling</b>	Total Depth:	<b>31'</b>	Filter Pack:	<b>#2 Sand</b>
Driller:	<b>James Jones</b>	TOC Elevation:	<b>341.55</b>	Seal:	<b>Bentonite Pellets/Hydrated</b>

N Value	Blow Counts	Depth	Description (USCS)	Geol	Well Log	ELEV.	Remarks
			Gray/Green SILT, little fine Sand, little Clay (MH)				Logged Cuttings from 0-6'
		5	Red/Brown SILT, little fine Sand, little Clay (MH)			334.45	
49	18 16 33 49 12						Very Dense
49	18 31 50/5"	10	Light Brown fine SAND, some Silt, gray/white quartz sand lenses (SM)			329.45	Very Dense
>50	25 40 50/5"	15				324.45	Very Dense
>50	33 50/5"	20	Light brown SILT and fine Sand, dry, SAPROLITE (SM)			319.45	Very Dense
24	13 13 11 18 29 50/2"	25	Dark brown fine SAND, little Silt, gray quartz sand lenses; SAPROLITE (SM)			314.45	
>50	50/5"	30				309.45	
>50			Auger Refusal at 31'				

# BORING/WELL LOG

Boring/Well ID: **DAA-11pz**

Page 1 of 1

Project:	<b>Green Ridge Recycling</b>	Boring/Well Area:	<b>West Area</b>	Drilling Rig Type:	<b>Track Rig CME 45</b>
Project #:	<b>18020117-030201</b>	Logged By:	<b>D. Coakley</b>	Drilling Method:	<b>4.25" Hollow Stem Auger</b>
Location:	<b>Cumberland County, VA</b>	Northing:	<b>3728437.13</b>	Sampling Method:	<b>Split Spoon</b>
Start Date:	<b>02/28/19</b>	Easting:	<b>11589977.41</b>	Well Material:	<b>2" Schedule 40 PVC</b>
Completion Date:	<b>02/28/19</b>	Ground Elevation:	<b>335.07</b>	Screen Size:	<b>0.10 Slot</b>
Contractor:	<b>Blue Ridge Drilling</b>	Total Depth:	<b>23'</b>	Filter Pack:	<b>#2 Sand</b>
Driller:	<b>James Jones</b>	TOC Elevation:	<b>336.30</b>	Seal:	<b>Bentonite Pellets/Hydrated</b>

N Value	Blow Counts	Depth	Description (USCS)	Geol	Well Log	ELEV.	Remarks
			Red SILT, some Clay, trace fine Sand (ML)				Logged Cuttings from 0-6'
		5	Red SILT, little fine Sand, dry, weathered, SAPROLITE (SM)			330.07	
>50	24 50/3"						Medium Dense
>50	50/3"						Medium Dense
		10				325.07	
		15				320.07	Dense
>50	50/3"						
		20	Light brown fine SAND, trace Silt, white quartz sand lenses, SAPROLITE, (SM)			315.07	Very Dense
>50	50/5"						
			Auger Refusal at 23'				
		25				310.07	
		30				305.07	



Project:	<b>Green Ridge Recycling</b>	Boring/Well Area:	<b>West Area</b>	Drilling Rig Type:	<b>Track Rig CME 45</b>
Project #:	<b>18020117-030201</b>	Logged By:	<b>D. Coakley</b>	Drilling Method:	<b>4.25" Hollow Stem Auger</b>
Location:	<b>Cumberland County, VA</b>	Northing:	<b>3728364.31</b>	Sampling Method:	<b>Split Spoon</b>
Start Date:	<b>03/04/19</b>	Easting:	<b>11590423.89</b>	Well Material:	<b>2" Schedule 40 PVC</b>
Completion Date:	<b>03/04/19</b>	Ground Elevation:	<b>330.07</b>	Screen Size:	<b>0.10 Slot</b>
Contractor:	<b>Blue Ridge Drilling</b>	Total Depth:	<b>25.5'</b>	Filter Pack:	<b>#2 Sand</b>
Driller:	<b>James Jones</b>	TOC Elevation:	<b>331.20</b>	Seal:	<b>Bentonite Pellets/Hydrated</b>

N Value	Blow Counts	Depth	Description (USCS)	Geol	Well Log	ELEV.	Remarks
			Red/Brown fine SAND, some Silt ( <b>SM</b> )				Logged Cuttings from 0-6'
		5				325.07	
12	4 5 7		Red/Brown fine to med SAND, some Silt, trace gravel ( <b>SM</b> )				
15	5 7 8		Light Tan fine SAND, some Silt, micaceous, ( <b>SM</b> )				
		10				320.07	
16	4 7 9 8 6		Light Tan fine SAND, some Silt, micaceous, white quartz sand lenses ( <b>SM</b> )				
21	8 13 14 9						
25	10 15 14 9	15				315.07	
24	12 12 15 7						
24	8 16 43 14						
>50	50/3"	20	Gray fine SAND, little Silt, white quartz sand lenses, iron and biotite bands, <b>SAPROLITE (SM)</b>			310.07	Very Dense
		25	Auger Refusal at 25.5'			305.07	
>50	50/4"						
		30				300.07	

# BORING/WELL LOG

Boring/Well ID: **DAA-13pz**

Page 1 of 1

Project:	<b>Green Ridge Recycling</b>	Boring/Well Area:	<b>West Area</b>	Drilling Rig Type:	<b>Track Rig CME 45</b>
Project #:	<b>18020117-030201</b>	Logged By:	<b>D. Coakley</b>	Drilling Method:	<b>4.25" Hollow Stem Auger</b>
Location:	<b>Cumberland County, VA</b>	Northing:	<b>3727352.27</b>	Sampling Method:	<b>Split Spoon</b>
Start Date:	<b>03/04/19</b>	Easting:	<b>11590973.86</b>	Well Material:	<b>2" Schedule 40 PVC</b>
Completion Date:	<b>03/04/19</b>	Ground Elevation:	<b>357.96</b>	Screen Size:	<b>0.10 Slot</b>
Contractor:	<b>Blue Ridge Drilling</b>	Total Depth:	<b>34'</b>	Filter Pack:	<b>#2 Sand</b>
Driller:	<b>James Jones</b>	TOC Elevation:	<b>359.36</b>	Seal:	<b>Bentonite Pellets/Hydrated</b>

N Value	Blow Counts	Depth	Description (USCS)	Geol	Well Log	ELEV.	Remarks
			Red SILT, some Clay (MH)				Logged Cuttings from 0-6'
		5				352.96	
12	4		Red SILT, little Clay, trace fine Sand, micaceous, (MH)				Medium Dense
	5						
	7						
	6						
	3						
10	4		Red fine SAND, little Silt, trace Clay, micaceous, (SM)				Medium Dense
	6						
	8						
	3	10				347.96	
	4						Medium Dense
9	5						Medium Dense
	6						
	4						
12	5						Medium Dense
	7						
	6						
	3						
9	3	15				342.96	
	6						Medium Dense
	6						
	4		Tan to Brown fine SAND, little Silt, trace Clay, micaceous, (SM)				Medium Dense
10	5						
	6						
	3						
14	6						Medium Dense
	8						
	8						
	6	20				337.96	
16	7						Medium Dense
	9						
	9						
19	5						
	10						
	9						
	8						
	4						
17	4	25				332.96	
	7						Medium Dense
	10						
	13						
22	8						
	10						Very Dense
	12						
	8						
	9						
39	17		Red/Brown fine SAND, some Silt, iron and biotite bands, micaceous (SM)				Very Dense
	22						
	16	30				327.96	
	14						Very Dense
41	22						
	19						
	29						
	8						
>50	50/4"		Gray fine SAND and Silt; SAPROLITE, (SM)				Very Dense
			Auger Refusal at 34'				



# BORING/WELL LOG


























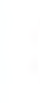




Boring/Well ID: **DAA-14pz**

Page 1 of 2

Project:	Green Ridge Recycling	Boring/Well Area:	West Area	Drilling Rig Type:	Track Rig CME 45
Project #:	18020117-030201	Logged By:	D. Coakley	Drilling Method:	4.25" Hollow Stem Auger
Location:	Cumberland County, VA	Northing:	3726467.15	Sampling Method:	Split Spoon
Start Date:	03/05/19	Easting:	11591831.94	Well Material:	2" Schedule 40 PVC
Completion Date:	03/05/19	Ground Elevation:	380.13	Screen Size:	0.10 Slot
Contractor:	Blue Ridge Drilling	Total Depth:	42'	Filter Pack:	#2 Sand
Driller:	James Jones	TOC Elevation:	381.44	Seal:	Bentonite Pellets/Hydrated

Samp ID	Blow Counts	Depth	Description (USCS)	Geol	Well Log	ELEV.	Remarks
							Logged Cuttings from 0-6'
15	3	5	Red SILT, some Clay, trace fine Sand (ML)			375.13	Stiff
	6						
	9						
	12						
14	4						Stiff
	5						
	9						
	10	10				370.13	
15	3						Stiff
	6						
	9						
	10						
8	3		Red SILT and fine Sand, trace Clay, white quartzite gravel lenses, (SM)				Medium Stiff
	4						
	4						
	6						
	3						
8	3	15				365.13	Medium Stiff
	5						
	6						
	3						
7	3						Loose
	4						
	3						
8	4		Red SILT and fine Sand, trace Clay, white quartzite gravel lenses, (SM)				Loose
	4						
	6						
	3	20				360.13	
9	4						Loose
	5						
	5						
	2						
9	4						Loose
	5						
	5						
	4						
11	5	25	Lite tan fine SAND, little Silt, biotite bands, white quartzite sand lenses, micaceous (SM)			355.13	Medium Dense
	6						
	8						
	3						
7	3						Loose
	4						
	7						
	4						
10	4						Loose
	6						
	12	30				350.13	
	5						
18	7		Lite tan fine SAND, little Silt, biotite bands, white quartzite sand lenses, micaceous (SM)				Medium Dense
	11						
	11						
	4						
13	6						Medium Dense
	7						
	8						
	5						
	7						

Project:		Green Ridge Recycling		Boring/Well Area:		West Area		Drilling Rig Type:		Track Rig CME 45	
Project #:		18020117-030201		Logged By:		D. Coakley		Drilling Method:		4.25" Hollow Stem Auger	
Location:		Cumberland County, VA		Northing:		3726467.15		Sampling Method:		Split Spoon	
Start Date:		03/05/19		Easting:		11591831.94		Well Material:		2" Schedule 40 PVC	
Completion Date:		03/05/19		Ground Elevation:		380.13		Screen Size:		0.10 Slot	
Contractor:		Blue Ridge Drilling		Total Depth:		42'		Filter Pack:		#2 Sand	
Driller:		James Jones		TOC Elevation:		381.44		Seal:		Bentonite Pellets/Hydrated	

Samp ID	Blow Counts	Depth	Description (USCS)	Geol	Well Log	ELEV.	Remarks			
28	10		Lite tan fine SAND, little Silt, biotite bands, white quartzite sand lenses, micaceous (SM)				Medium Dense			
14	12						Medium Dense			
>50	6		Lite tan fine SAND, little Silt, biotite bands, white quartzite sand lenses, micaceous, SAPROLITE, (SM)			340.13	Medium Dense			
	11									Very Dense
	12									
	8		Auger Refusal at 42'							
	6									
	16		Auger Refusal at 42'							
	32									
	50/6"	40	Auger Refusal at 42'							
	23									
	45		Auger Refusal at 42'							
	50/4"									
			Auger Refusal at 42'							
			Auger Refusal at 42'							
			Auger Refusal at 42'							
			Auger Refusal at 42'							
			Auger Refusal at 42'							
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			Auger Refusal at 42'							
			Auger Refusal at 42'							
			Auger Refusal at 42'							



# BORING/WELL LOG

Boring/Well ID: **DAA-15pz-s**

Page 1 of 1

Project:	<b>Green Ridge Recycling</b>	Boring/Well Area:	<b>West Area</b>	Drilling Rig Type:	<b>Track Rig CME 45</b>
Project #:	<b>18020117-030201</b>	Logged By:	<b>D. Coakley</b>	Drilling Method:	<b>4.25" Hollow Stem Auger</b>
Location:	<b>Cumberland County, VA</b>	Northing:	<b>3730413.59</b>	Sampling Method:	<b>Split Spoon</b>
Start Date:	<b>03/05/19</b>	Easting:	<b>11591080.07</b>	Well Material:	<b>2" Schedule 40 PVC</b>
Completion Date:	<b>03/05/19</b>	Ground Elevation:	<b>329.98</b>	Screen Size:	<b>0.10 Slot</b>
Contractor:	<b>Blue Ridge Drilling</b>	Total Depth:	<b>34'</b>	Filter Pack:	<b>#2 Sand</b>
Driller:	<b>James Jones</b>	TOC Elevation:	<b>331.15</b>	Seal:	<b>Bentonite Pellets/Hydrated</b>

N Value	Blow Counts	Depth	Description (USCS)	Geol	Well Log	ELEV.	Remarks
		5				324.98	
	Shelby Tube						
		10				319.98	
		15				314.98	
	Shelby Tube						
		20				309.98	
		25				304.98	
		30				299.98	
			Soil sampling and classification data available on well log for paired Deep well DAA-15pz-d				
			Auger Refusal at 34'				

Project:	<b>Green Ridge Recycling</b>	Boring/Well Area:	<b>West Area</b>	Drilling Rig Type:	<b>Track Rig CME 45</b>
Project #:	<b>18020117-030201</b>	Logged By:	<b>D. Coakley</b>	Drilling Method:	<b>4.25" Hollow Stem Auger</b>
Location:	<b>Cumberland County, VA</b>	Northing:	<b>3730411.63</b>	Sampling Method:	<b>Split Spoon</b>
Start Date:	<b>03/05/19</b>	Easting:	<b>11591070.98</b>	Well Material:	<b>2" Schedule 40 PVC</b>
Completion Date:	<b>03/05/19</b>	Ground Elevation:	<b>329.71</b>	Screen Size:	<b>0.10 Slot</b>
Contractor:	<b>Blue Ridge Drilling</b>	Total Depth:	<b>39'</b>	Filter Pack:	<b>#2 Sand</b>
Driller:	<b>James Jones</b>	TOC Elevation:	<b>331.34</b>	Seal:	<b>Bentonite Pellets/Hydrated</b>

N Value	Blow Counts	Depth	Description (USCS)	Geol	Well Log	ELEV.	Remarks
							Logged Cuttings from 0-6'
66	22 28 38 50/5"	5	Brown fine SAND, some Silt ( <b>SM</b> )			324.71	
							Very Dense
>50	28 47 50/5"	10	Very light Tan fine SAND, trace Silt, iron bands, <b>SAPROLITE (SM)</b>			319.71	
							Very Dense
64	12 18 46 50/5"	15				314.71	
							Very Dense
>50	40 50/5"	20	Very light Tan fine SAND, trace Silt, white quartz gravel lenses, <b>SAPROLITE (SM)</b>			309.71	
							Very Dense
>50	50/3"	25				304.71	
							Very Dense
			<b>Auger Refusal at 29'</b>				
		30	Biotite Gneiss Rock Core Run 1: 29 to 34 feet Recovery: 59/60 inches = 98% RQD: 12/59 inches = 25%			299.71	

Rock Core





## BORING/WELL LOG

Boring/Well ID: **DAA-15pz-d**

Page 2 of 2

Project:	<b>Green Ridge Recycling</b>	Boring/Well Area:	<b>West Area</b>	Drilling Rig Type:	<b>Track Rig CME 45</b>
Project #:	<b>18020117-030201</b>	Logged By:	<b>D. Coakley</b>	Drilling Method:	<b>4.25" Hollow Stem Auger</b>
Location:	<b>Cumberland County, VA</b>	Northing:	<b>3730411.63</b>	Sampling Method:	<b>Split Spoon</b>
Start Date:	<b>03/05/19</b>	Easting:	<b>11591070.98</b>	Well Material:	<b>2" Schedule 40 PVC</b>
Completion Date:	<b>03/05/19</b>	Ground Elevation:	<b>329.71</b>	Screen Size:	<b>0.10 Slot</b>
Contractor:	<b>Blue Ridge Drilling</b>	Total Depth:	<b>39'</b>	Filter Pack:	<b>#2 Sand</b>
Driller:	<b>James Jones</b>	TOC Elevation:	<b>331.34</b>	Seal:	<b>Bentonite Pellets/Hydrated</b>

N Value	Blow Counts	Depth	Description (USCS)	Geol	Well Log	ELEV.	Remarks
Rock Core			Biotite Gneiss Rock Core Run 2: 34 to 39 feet Recovery: 56.5/60 inches = 94% RDQ: 14/56.5 inches = 25%				
		40				289.71	
		45				284.71	
		50				279.71	
		55				274.71	
		60				269.71	
		65				264.71	

# BORING/WELL LOG

Boring/Well ID: **DAA-16pz**

Page 1 of 1

Project:	<b>Green Ridge Recycling</b>	Boring/Well Area:	<b>East Area</b>	Drilling Rig Type:	<b>Track Rig CME 45</b>
Project #:	<b>18020117-030201</b>	Logged By:	<b>D. Coakley</b>	Drilling Method:	<b>4.25" Hollow Stem Auger</b>
Location:	<b>Cumberland County, VA</b>	Northing:	<b>3731369.62</b>	Sampling Method:	<b>Split Spoon</b>
Start Date:	<b>03/06/19</b>	Easting:	<b>11593538.41</b>	Well Material:	<b>2" Schedule 40 PVC</b>
Completion Date:	<b>03/06/19</b>	Ground Elevation:	<b>323.02</b>	Screen Size:	<b>0.10 Slot</b>
Contractor:	<b>Blue Ridge Drilling</b>	Total Depth:	<b>26'</b>	Filter Pack:	<b>#2 Sand</b>
Driller:	<b>James Jones</b>	TOC Elevation:	<b>324.60</b>	Seal:	<b>Bentonite Pellets/Hydrated</b>

N Value	Blow Counts	Depth	Description (USCS)	Geol	Well Log	ELEV.	Remarks
			Dark brown SILT, some Clay, trace fine Sand (MH)				Logged Cuttings from 0-6'
61	13	5				318.02	
	26		Brown fine SAND, some Silt, trace Clay (SM)				Very Dense
	35						Very Dense
>50	50/5"						
	21	10				313.02	Very Dense
	37						
>50	50/3"						Very Dense
	41						
>50	50/3"						Very Dense
		15				308.02	
	50/6"						Very Dense
			Light Tan fine SAND with lenses of Gray/Green Silt, mottling, SAPROLITE (SM)				
		20				303.02	
	50/4"						Very Dense
>50							
		25				298.02	
>50	50/3"		Auger Refusal at 26'				
		30				293.02	



# BORING/WELL LOG

Boring/Well ID: **DAA-17sb**

Page 1 of 1

Project:	<b>Green Ridge Recycling</b>	Boring/Well Area:	<b>East Area</b>	Drilling Rig Type:	<b>Track Rig CME 45</b>
Project #:	<b>18020117-030201</b>	Logged By:	<b>D. Coakley</b>	Drilling Method:	<b>3.25" Hollow Stem Auger</b>
Location:	<b>Cumberland County, VA</b>	Northing:	<b>3731469.53</b>	Sampling Method:	<b>Split Spoon</b>
Start Date:	<b>03/06/19</b>	Easting:	<b>11593827.25</b>	Well Material:	<b>NA</b>
Completion Date:	<b>03/06/19</b>	Ground Elevation:	<b>332.69</b>	Screen Size:	<b>NA</b>
Contractor:	<b>Blue Ridge Drilling</b>	Total Depth:	<b>22.5'</b>	Filter Pack:	<b>NA</b>
Driller:	<b>James Jones</b>	TOC Elevation:	<b>NA</b>	Seal:	<b>Bentonite Pellets/Hydrated</b>

N Value	Blow Counts	Depth	Description (USCS)	Geol	Well Log	ELEV.	Remarks
							Logged Cuttings from 0-6'
		5	Red to brown SILT and Clay (MH)			327.69	
24	7 8 16						Medium Dense
	15		Light Tan very fine SAND, some Silt, dry (SM)				
23	9 11 12						Medium Dense
	16	10				322.69	
28	8 12 16		Green to gray fine SAND, little Silt, dry (SM)				Medium Dense
	19						
40	11 16 24						Medium Dense
	24		Light Tan very fine SAND, some Silt, dry, SAPROLITE (SM)				
59	12 22 37	15				317.69	Very Dense
	50/5"						
			Red to brown fine SAND, some SILT, biotite bands, SAPROLITE (SM)				
		20				312.69	
76	19 39 37 41						Very Dense
			Auger Refusal at 22.5'				
		25				307.69	
		30				302.69	

# BORING/WELL LOG

Boring/Well ID: **DAA-18pz**

Page 1 of 1

Project:	<b>Green Ridge Recycling</b>	Boring/Well Area:	<b>East Area</b>	Drilling Rig Type:	<b>Track Rig CME 45</b>
Project #:	<b>18020117-030201</b>	Logged By:	<b>D. Coakley</b>	Drilling Method:	<b>4.25" Hollow Stem Auger</b>
Location:	<b>Cumberland County, VA</b>	Northing:	<b>3730329.89</b>	Sampling Method:	<b>Split Spoon</b>
Start Date:	<b>03/07/19</b>	Easting:	<b>11594565.79</b>	Well Material:	<b>2" Schedule 40 PVC</b>
Completion Date:	<b>03/07/19</b>	Ground Elevation:	<b>342.12</b>	Screen Size:	<b>0.10 Slot</b>
Contractor:	<b>Blue Ridge Drilling</b>	Total Depth:	<b>27'</b>	Filter Pack:	<b>#2 Sand</b>
Driller:	<b>James Jones</b>	TOC Elevation:	<b>343.46</b>	Seal:	<b>Bentonite Pellets/Hydrated</b>

N Value	Blow Counts	Depth	Description (USCS)	Geol	Well Log	ELEV.	Remarks
			Red SILT and Clay, trace fine Sand (MH)				Logged Cuttings from 0-6'
		5	Brown fine SAND, some Silt, trace Clay, white quartz gravel lenses (SM)			337.12	
4	3						Loose
	2						
	2						
4	2						Loose
	2						
	2	10				332.12	
6	3		Red/Brown fine SAND, little Silt, biotite and iron bands, micaceous (SM)				Loose
	3						
	4						
9	3						Medium Dense
	4						
	5						
	4						
	Shelby Tube	15				327.12	Medium Dense
23	17		Brown fine SAND, some Silt, trace Clay, white quartz gravel lenses (SM)				
	11						
	12						
	16						
	7						
25	11						Dense
	14						
	17	20				322.12	
	8						
53	18						Very Dense
	35						
	50						
		25	Brown/Gray very fine SAND and Silt, white quartz sand lenses, SAPROLITE (SM)			317.12	
>50	18						Very Dense
	50/2"						
			Auger Refusal at 27'				
		30				312.12	



# BORING/WELL LOG

Boring/Well ID: **DAA-19pz-s**

Page 1 of 1

Project:	<b>Green Ridge Recycling</b>	Boring/Well Area:	<b>East Area</b>	Drilling Rig Type:	<b>Track Rig CME 45</b>
Project #:	<b>18020117-030201</b>	Logged By:	<b>D. Coakley</b>	Drilling Method:	<b>4.25" Hollow Stem Auger</b>
Location:	<b>Cumberland County, VA</b>	Northing:	<b>3732042.79</b>	Sampling Method:	<b>Split Spoon</b>
Start Date:	<b>03/07/19</b>	Easting:	<b>11594480.40</b>	Well Material:	<b>2" Schedule 40 PVC</b>
Completion Date:	<b>03/07/19</b>	Ground Elevation:	<b>325.34</b>	Screen Size:	<b>0.10 Slot</b>
Contractor:	<b>Blue Ridge Drilling</b>	Total Depth:	<b>21.5'</b>	Filter Pack:	<b>#2 Sand</b>
Driller:	<b>James Jones</b>	TOC Elevation:	<b>325.94</b>	Seal:	<b>Bentonite Pellets/Hydrated</b>

N Value	Blow Counts	Depth	Description (USCS)	Geol	Well Log	ELEV.	Remarks
			Red SILT, some Clay, trace fine Sand (MH)				Logged Cuttings from 0-6'
		5				320.34	
14	7		Brown/Gray/Green fine SAND, little Silt, trace Clay, Mottled (SM)				Medium Dense
	6						
	8						Dense
	12						
34	8						
	10						
	24						
	42						
	16	10				315.34	Very Dense
>50	45						
	50/4"		Light Tan very fine SAND, little Silt, loose, dry, SAPROLITE (SM)				
		15				310.34	Very Dense
>50	50/4"						
		20				305.34	Very Dense
>50	50/2"						
			Auger Refusal at 21.5'				
		25				300.34	Very Dense
		30				295.34	

# BORING/WELL LOG

Boring/Well ID: **DAA-19pz-d**

Page 1 of 1

Project:	<b>Green Ridge Recycling</b>	Boring/Well Area:	<b>East Area</b>	Drilling Rig Type:	<b>Track Rig CME 45</b>
Project #:	<b>18020117-030201</b>	Logged By:	<b>D. Coakley</b>	Drilling Method:	<b>4.25" Hollow Stem Auger</b>
Location:	<b>Cumberland County, VA</b>	Northing:	<b>3732039.94</b>	Sampling Method:	<b>Split Spoon</b>
Start Date:	<b>03/11/19</b>	Easting:	<b>11594488.33</b>	Well Material:	<b>2" Schedule 40 PVC</b>
Completion Date:	<b>03/11/19</b>	Ground Elevation:	<b>325.18</b>	Screen Size:	<b>0.10 Slot</b>
Contractor:	<b>Blue Ridge Drilling</b>	Total Depth:	<b>33'</b>	Filter Pack:	<b>#2 Sand</b>
Driller:	<b>James Jones</b>	TOC Elevation:	<b>327.09</b>	Seal:	<b>Bentonite Pellets/Hydrated</b>

N Value	Blow Counts	Depth	Description (USCS)	Geol	Well Log	ELEV.	Remarks
		5				320.18	
		10	Soil sampling and classification data available on well log for paired Shallow well DAA-19pz-s			315.18	
		15				310.18	
		20				305.18	
		23	Auger Refusal at 23'				
		25	Biotite Gneiss Rock Core Run 1: 23 to 28 feet Recovery: 58.5/60 inches = 97% RQD: 23/58 inches = 39%			300.18	
		30	Biotite Gneiss Rock Core Run 2: 28 to 33 feet Recovery: 57.5/60 inches = 96% RDQ: 37/57.5 inches = 65%			295.18	
							Sand caved into core hole from 29 to 33'

Rock Core



# BORING/WELL LOG

Boring/Well ID: **DAA-20pz**

Page 1 of 1

Project:	<b>Green Ridge Recycling</b>	Boring/Well Area:	<b>East Area</b>	Drilling Rig Type:	<b>Track Rig CME 45</b>
Project #:	<b>18020117-030201</b>	Logged By:	<b>D. Coakley</b>	Drilling Method:	<b>4.25" Hollow Stem Auger</b>
Location:	<b>Cumberland County, VA</b>	Northing:	<b>3732042.79</b>	Sampling Method:	<b>Split Spoon</b>
Start Date:	<b>03/11/19</b>	Easting:	<b>11594480.40</b>	Well Material:	<b>2" Schedule 40 PVC</b>
Completion Date:	<b>03/11/19</b>	Ground Elevation:	<b>312.39</b>	Screen Size:	<b>0.10 Slot</b>
Contractor:	<b>Blue Ridge Drilling</b>	Total Depth:	<b>34'</b>	Filter Pack:	<b>#2 Sand</b>
Driller:	<b>James Jones</b>	TOC Elevation:	<b>313.62</b>	Seal:	<b>Bentonite Pellets/Hydrated</b>

N Value	Blow Counts	Depth	Description (USCS)	Geol	Well Log	ELEV.	Remarks
			Red SILT, some Clay, trace fine Sand (MH)				Logged Cuttings from 0-6'
		5				307.39	
30	7 13 17 18 10		Red very fine SAND, some Silt, trace Clay (SM)				Dense
35	18 17 26 14	10				302.39	Dense
47	19 28 23 9		Gray/Green very fine SAND, little Silt, white quartz course sand lenses (SM)				Vey Dense
52	20 32 42 16						Very Dense
39	18 21 26 18 40	15				297.39	Very Dense
>50	50/5"						Very Dense
>50	37 50/6"		Light Tan very fine SAND, little Silt, white quartz course sand lenses, loose, dry SAPROLITE (SM)				Very Dense
>50	50/6"	20				292.39	Very Dense
>50	20 34 50/4"	25	Red/Brown fine SAND, some Silt, loose, dry, SAPROLITE (SM)			287.39	Very Dense
>50	50/1"	30				282.39	
			Auger Refusal at 34				

Project:	<b>Green Ridge Recycling</b>	Boring/Well Area:	<b>East Area</b>	Drilling Rig Type:	<b>Track Rig CME 45</b>
Project #:	<b>18020117-030201</b>	Logged By:	<b>D. Coakley</b>	Drilling Method:	<b>3.25" Hollow Stem Auger</b>
Location:	<b>Cumberland County, VA</b>	Northing:	<b>3733279.40</b>	Sampling Method:	<b>Split Spoon</b>
Start Date:	<b>03/12/19</b>	Easting:	<b>11594045.62</b>	Well Material:	<b>NA</b>
Completion Date:	<b>03/12/19</b>	Ground Elevation:	<b>315.47</b>	Screen Size:	<b>NA</b>
Contractor:	<b>Blue Ridge Drilling</b>	Total Depth:	<b>47'</b>	Filter Pack:	<b>NA</b>
Driller:	<b>James Jones</b>	TOC Elevation:	<b>NA</b>	Seal:	<b>Bentonite Pellets/Hydrated</b>

N Value	Blow Counts	Depth	Description (USCS)	Geol	Well Log	ELEV.	Remarks
			Red Brown SILT and Clay (MH)				
							Logged Cuttings from 0-6'
		5	Red fine SAND, some Silt, little Clay with gray medium sand lenses (SM)			310.47	
22	6 9 13 18 13						Medium Dense
29	17 12 16						Medium Dense
	6	10	Brown fine SAND, some Silt, trace Clay (SM)			305.47	
23	11 12 19						Medium Dense
28	7 12 16						Medium Dense
	25 13		Gray to white fine SAND, little Silt (SM)				
57	22 35	15				300.47	Very Dense
>50	50/6" 41 50/4"						Very Dense
		20				295.47	
>50	32 50/2"						Very Dense
		25	Light brown fine SAND and Silt, SAPROLITE (SM)			290.47	
		30				285.47	
>50	25 50/5"						Very Dense



# BORING/WELL LOG

Boring/Well ID: **DAA-21sb**

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Project:	<b>Green Ridge Recycling</b>	Boring/Well Area:	<b>East Area</b>	Drilling Rig Type:	<b>Track Rig CME 45</b>
Project #:	<b>18020117-030201</b>	Logged By:	<b>D. Coakley</b>	Drilling Method:	<b>3.25" Hollow Stem Auger</b>
Location:	<b>Cumberland County, VA</b>	Northing:	<b>3733279.40</b>	Sampling Method:	<b>Split Spoon</b>
Start Date:	<b>03/12/19</b>	Easting:	<b>11594045.62</b>	Well Material:	<b>NA</b>
Completion Date:	<b>03/12/19</b>	Ground Elevation:	<b>315.47</b>	Screen Size:	<b>NA</b>
Contractor:	<b>Blue Ridge Drilling</b>	Total Depth:	<b>47'</b>	Filter Pack:	<b>NA</b>
Driller:	<b>James Jones</b>	TOC Elevation:	<b>NA</b>	Seal:	<b>Bentonite Pellets/Hydrated</b>

N Value	Blow Counts	Depth	Description (USCS)	Geol	Well Log	ELEV.	Remarks
>50	45 50/4"		Light brown fine SAND and Silt, trace white quartzite gravel, <b>SAPROLITE (SM)</b>				Very Dense
>50	50/5"	40	Gray fine SAND, little Silt, dry, <b>SAPROLITE (SM)</b>			275.47	Very Dense
>50	50/2"	45	Gray fine SAND, little Silt, dry, <b>SAPROLITE (SM)</b>			270.47	Very Dense
			<b>Auger Refusal at 47'</b>				
		50				265.47	
		55				260.47	
		60				255.47	
		65				250.47	

Project:	<b>Green Ridge Recycling</b>	Boring/Well Area:	<b>East Area</b>	Drilling Rig Type:	<b>Track Rig CME 45</b>
Project #:	<b>18020117-030201</b>	Logged By:	<b>D. Coakley</b>	Drilling Method:	<b>4.25" Hollow Stem Auger</b>
Location:	<b>Cumberland County, VA</b>	Northing:	<b>3733377.87</b>	Sampling Method:	<b>Split Spoon</b>
Start Date:	<b>03/12/19</b>	Easting:	<b>11594485.30</b>	Well Material:	<b>2" Schedule 40 PVC</b>
Completion Date:	<b>03/12/19</b>	Ground Elevation:	<b>323.33</b>	Screen Size:	<b>0.10 Slot</b>
Contractor:	<b>Blue Ridge Drilling</b>	Total Depth:	<b>55'</b>	Filter Pack:	<b>#2 Sand</b>
Driller:	<b>James Jones</b>	TOC Elevation:	<b>324.70</b>	Seal:	<b>Bentonite Pellets/Hydrated</b>

N Value	Blow Counts	Depth	Description (USCS)	Geol	Well Log	ELEV.	Remarks
			Red SILT, some Clay, trace fine Sand, elastic (MH)				Logged Cuttings from 0-6'
6	23334	5	Tan SILT, some fine Sand, trace Clay, moist (SM)			318.33	Medium Stiff
5	22233						Loose
5	22233	10	Reddish brown fine SAND, little Silt, micaceous, loose (SM)			313.33	Loose
7	33344						Loose
6	33333	15				308.33	Loose
6	33333						Loose
11	55555	20	Gray/Green fine SAND, some Silt, micaceous, white quartz sand lenses, loose (SM)			303.33	Medium Dense
12	66668						Medium Dense
>50	3050/5"						Very Dense
>50	50/6"	25				298.33	Very Dense
>50	183950/4"	30	Brown fine SAND, some Silt, trace white quartz gravel, micaceous, SAPROLITE (SM)			293.33	Very Dense



# BORING/WELL LOG

Boring/Well ID: **DAA-22pz**

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Project:	<b>Green Ridge Recycling</b>	Boring/Well Area:	<b>East Area</b>	Drilling Rig Type:	<b>Track Rig CME 45</b>
Project #:	<b>18020117-030201</b>	Logged By:	<b>D. Coakley</b>	Drilling Method:	<b>4.25" Hollow Stem Auger</b>
Location:	<b>Cumberland County, VA</b>	Northing:	<b>3733377.87</b>	Sampling Method:	<b>Split Spoon</b>
Start Date:	<b>03/12/19</b>	Easting:	<b>11594485.30</b>	Well Material:	<b>2" Schedule 40 PVC</b>
Completion Date:	<b>03/12/19</b>	Ground Elevation:	<b>323.33</b>	Screen Size:	<b>0.10 Slot</b>
Contractor:	<b>Blue Ridge Drilling</b>	Total Depth:	<b>55'</b>	Filter Pack:	<b>#2 Sand</b>
Driller:	<b>James Jones</b>	TOC Elevation:	<b>324.70</b>	Seal:	<b>Bentonite Pellets/Hydrated</b>

N Value	Blow Counts	Depth	Description (USCS)	Geol	Well Log	ELEV.	Remarks
>50	39 50/6"						Very Dense
>50	50/3"	40				283.33	
		45	Brown fine SAND, little Silt, trace white quartz gravel, micaceous, <i>SAPROLITE (SM)</i>			278.33	
>50	50/1"	50				273.33	No Sample Recovery
		55	No Auger Refusal, boring depth terminated at 55'			268.33	
		60				263.33	
		65				258.33	



Boring/Well ID: **DAA-23pz-s**

Page 1 of 1

N Value	Blow Counts	Depth	Description (USCS)	Geol	Well Log	ELEV.	Remarks
							Logged Cuttings from 0-6'
6	23	5	Red SILT and Clay, little fine Sand ( <b>ML</b> )			313.63	
5	22		Red fine SAND, some Silt, trace Clay, white Quartz sand lenses, black biotite bands ( <b>SM</b> )				Loose
	22						Loose
	23						
	22	10				308.63	
	Shelby Tube						
5	32		Reddish brown fine SAND, some Silt, trace Clay, micaceous ( <b>SM</b> )				Loose
	33						
	33						
5	22	15	Dark gray fine SAND, little Silt ( <b>SM</b> )			303.63	Loose
	33						
	5						
	Shelby Tube						
20	35		Red fine SAND, some Silt, trace Clay ( <b>SM</b> )				Medium Dense
	15						
	18	20				298.63	
	12						
47	20		White fine SAND, trace Silt ( <b>SM</b> )				Dense
	27						
	35						
	Shelby Tube						
30	8	25	White fine SAND, trace Silt ( <b>SM</b> )			293.63	Medium Dense
	10						
	20						
	31						
	24						
>50	29						Very Dense
	50/6"						
23	15	30	Gray fine SAND, little Silt, trace Clay, micaceous, <i>SAPROLITE</i> ( <b>SM</b> )			288.63	Medium Dense
	12						
	11						
	15						
	Shelby Tube						
>50	41		Auger Refusal at 33'				
	50/3"						



# BORING/WELL LOG

Boring/Well ID: **DAA-23pz-d**

Page 1 of 2

Project:	<b>Green Ridge Recycling</b>	Boring/Well Area:	<b>East Area</b>	Drilling Rig Type:	<b>Track Rig CME 45</b>
Project #:	<b>18020117-030201</b>	Logged By:	<b>D. Coakley</b>	Drilling Method:	<b>4.25" Hollow Stem Auger</b>
Location:	<b>Cumberland County, VA</b>	Northing:	<b>3733658.36</b>	Sampling Method:	<b>Split Spoon</b>
Start Date:	<b>03/12/19</b>	Easting:	<b>11595026.15</b>	Well Material:	<b>2" Schedule 40 PVC</b>
Completion Date:	<b>03/13/19</b>	Ground Elevation:	<b>317.94</b>	Screen Size:	<b>0.10 Slot</b>
Contractor:	<b>Blue Ridge Drilling</b>	Total Depth:	<b>47'</b>	Filter Pack:	<b>#2 Sand</b>
Driller:	<b>James Jones</b>	TOC Elevation:	<b>318.67</b>	Seal:	<b>Bentonite Pellets/Hydrated</b>

N Value	Blow Counts	Depth	Description (USCS)	Geol	Well Log	ELEV.	Remarks
		5				312.94	
		10				307.94	
		15				302.94	
		20				297.94	
		25				292.94	
		30				287.94	
			Soil sampling and classification data available on well log for paired Shallow well DAA-23pz-s				

# BORING/WELL LOG

Boring/Well ID: **DAA-23pz-d**

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Project:	<b>Green Ridge Recycling</b>	Boring/Well Area:	<b>East Area</b>	Drilling Rig Type:	<b>Track Rig CME 45</b>
Project #:	<b>18020117-030201</b>	Logged By:	<b>D. Coakley</b>	Drilling Method:	<b>4.25" Hollow Stem Auger</b>
Location:	<b>Cumberland County, VA</b>	Northing:	<b>3733658.36</b>	Sampling Method:	<b>Split Spoon</b>
Start Date:	<b>03/12/19</b>	Easting:	<b>11595026.15</b>	Well Material:	<b>2" Schedule 40 PVC</b>
Completion Date:	<b>03/13/19</b>	Ground Elevation:	<b>317.94</b>	Screen Size:	<b>0.10 Slot</b>
Contractor:	<b>Blue Ridge Drilling</b>	Total Depth:	<b>47'</b>	Filter Pack:	<b>#2 Sand</b>
Driller:	<b>James Jones</b>	TOC Elevation:	<b>318.67</b>	Seal:	<b>Bentonite Pellets/Hydrated</b>

N Value	Blow Counts	Depth	Description (USCS)	Geol	Well Log	ELEV.	Remarks
			<b>Auger Refusal at 37"</b>				
		40	Bitotite Gneiss Rock Core Run 1: 37 to 42 feet Recovery: 54.5/60 inches = 90% RQD: 32.5/60 inches = 54%			277.94	
		45	Biotite Gneiss Rock Core Run 1: 42 to 47 feet Recovery: 58/60 inches = 96% RQD: 50.5/58 inches = 87%			272.94	
		50				267.94	
		55				262.94	
		60				257.94	
		65				252.94	



# BORING/WELL LOG

Boring/Well ID: **DAA-24pz**

Page 1 of 1

Project:	<b>Green Ridge Recycling</b>	Boring/Well Area:	<b>East Area</b>	Drilling Rig Type:	<b>Track Rig CME 45</b>
Project #:	<b>18020117-030201</b>	Logged By:	<b>D. Coakley</b>	Drilling Method:	<b>4.25" Hollow Stem Auger</b>
Location:	<b>Cumberland County, VA</b>	Northing:	<b>3734520.89</b>	Sampling Method:	<b>Split Spoon</b>
Start Date:	<b>03/13/19</b>	Easting:	<b>11593898.96</b>	Well Material:	<b>2" Schedule 40 PVC</b>
Completion Date:	<b>03/13/19</b>	Ground Elevation:	<b>289.87</b>	Screen Size:	<b>0.10 Slot</b>
Contractor:	<b>Blue Ridge Drilling</b>	Total Depth:	<b>23'</b>	Filter Pack:	<b>#2 Sand</b>
Driller:	<b>James Jones</b>	TOC Elevation:	<b>291.19</b>	Seal:	<b>Bentonite Pellets/Hydrated</b>

N Value	Blow Counts	Depth	Description (USCS)	Geol	Well Log	ELEV.	Remarks
			Red SILT, some Clay, trace fine Sand (ML)				Logged Cuttings from 0-6'
		5				284.87	
5	2		Red fine SAND, some Silt, trace Clay, white quartz sand lenses, micaceous (SM)				Loose
	2						
	3						
	3						
8	3						Loose
	5						
	6						
	5	10	Tan fine SAND, some Silt (SM)			279.87	
10	5						Loose
	5						
	4						
	4		Red fine SAND, some Silt, trace Clay, white quartz sand lenses, micaceous (SM)				Loose
8	4						
	4						
	6						
	7						
11	6	15	Tan fine SAND, some Silt (SM)			274.87	Medium Dense
	5						
	8						
25	8		Red fine SAND, some Silt, trace Clay, white quartz sand lenses, micaceous (SM)				Medium Dense
	17						
	50/3"						Dense
	50/3"						
>50			Tan fine SAND, some Silt, micaceous, SAPROLITE (SM)				
		20				269.87	
			Auger Refusal at 23'				
		25				264.87	
		30				259.87	







Boring/Well ID: **DAA-25pz-s**

Page 1 of 2

N Value	Blow Counts	Depth	Description (USCS)	Geol	Well Log	ELEV.	Remarks
		5				321.38	
		10				316.38	
		15	Soil sampling and classification data available on well log for paired Deep well DAA-25pz-d			311.38	
	Shelby Tube	20				306.38	
	Shelby Tube	25				301.38	
		30				296.38	

Project:	<b>Green Ridge Recycling</b>	Boring/Well Area:	<b>East Area</b>	Drilling Rig Type:	<b>Track Rig CME 45</b>
Project #:	<b>18020117-030201</b>	Logged By:	<b>D. Coakley</b>	Drilling Method:	<b>4.25" Hollow Stem Auger</b>
Location:	<b>Cumberland County, VA</b>	Northing:	<b>3733647.76</b>	Sampling Method:	<b>Split Spoon</b>
Start Date:	<b>03/14/19</b>	Easting:	<b>11595024.84</b>	Well Material:	<b>2" Schedule 40 PVC</b>
Completion Date:	<b>03/14/19</b>	Ground Elevation:	<b>326.38</b>	Screen Size:	<b>0.10 Slot</b>
Contractor:	<b>Blue Ridge Drilling</b>	Total Depth:	<b>37'</b>	Filter Pack:	<b>#2 Sand</b>
Driller:	<b>James Jones</b>	TOC Elevation:	<b>328.45</b>	Seal:	<b>Bentonite Pellets/Hydrated</b>

N Value	Blow Counts	Depth	Description (USCS)	Geol	Well Log	ELEV.	Remarks
			<b>Auger Refusal at 37"</b>				
		40				286.38	
		45				281.38	
		50				276.38	
		55				271.38	
		60				266.38	
		65				261.38	





Boring/Well ID: **DAA-25pz-d**

Project:	Green Ridge Recycling	Boring/Well Area:	East Area	Drilling Rig Type:	Track Rig CME 45
Project #:	18020117-030201	Logged By:	D. Coakley	Drilling Method:	4.25" Hollow Stem Auger
Location:	Cumberland County, VA	Northing:	3730467.21	Sampling Method:	Split Spoon
Start Date:	03/14/19	Easting:	11593049.11	Well Material:	2" Schedule 40 PVC
Completion Date:	03/14/19	Ground Elevation:	326.58	Screen Size:	0.10 Slot
Contractor:	Blue Ridge Drilling	Total Depth:	47'	Filter Pack:	#2 Sand
Driller:	James Jones	TOC Elevation:	327.70	Seal:	Bentonite Pellets/Hydrated

[illegible]

Project:	<b>Green Ridge Recycling</b>	Boring/Well Area:	<b>East Area</b>	Drilling Rig Type:	<b>Track Rig CME 45</b>
Project #:	<b>18020117-030201</b>	Logged By:	<b>D. Coakley</b>	Drilling Method:	<b>4.25" Hollow Stem Auger</b>
Location:	<b>Cumberland County, VA</b>	Northing:	<b>3730467.21</b>	Sampling Method:	<b>Split Spoon</b>
Start Date:	<b>03/14/19</b>	Easting:	<b>11593049.11</b>	Well Material:	<b>2" Schedule 40 PVC</b>
Completion Date:	<b>03/14/19</b>	Ground Elevation:	<b>326.58</b>	Screen Size:	<b>0.10 Slot</b>
Contractor:	<b>Blue Ridge Drilling</b>	Total Depth:	<b>47'</b>	Filter Pack:	<b>#2 Sand</b>
Driller:	<b>James Jones</b>	TOC Elevation:	<b>327.70</b>	Seal:	<b>Bentonite Pellets/Hydrated</b>

N Value	Blow Counts	Depth	Description (USCS)	Geol	Well Log	ELEV.	Remarks
>50	50/5"						
			<b>Auger Refusal at 37"</b>				
		40	Biotite Gneiss Rock Core Run 1: 37 to 42 feet Recovery: 58/60 inches = 96% RQD: 41/58 inches = 70%			286.58	
		45	Biotite Gneiss Rock Core Run 1: 42 to 47 feet Recovery: 58.5/60 inches = 97% RQD: 33.5/58.5 inches = 57%			281.58	
		50				276.58	
		55				271.58	
		60				266.58	
		65				261.58	



# BORING/WELL LOG

Boring/Well ID: **DAA-26pz**

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Project:	<b>Green Ridge Recycling</b>	Boring/Well Area:	<b>West Area</b>	Drilling Rig Type:	<b>Track Rig CME 45</b>
Project #:	<b>18020117-030201</b>	Logged By:	<b>D. Coakley</b>	Drilling Method:	<b>4.25" Hollow Stem Auger</b>
Location:	<b>Cumberland County, VA</b>	Northing:	<b>3731202.27</b>	Sampling Method:	<b>Split Spoon</b>
Start Date:	<b>03/27/19</b>	Easting:	<b>11591698.15</b>	Well Material:	<b>2" Schedule 40 PVC</b>
Completion Date:	<b>03/27/19</b>	Ground Elevation:	<b>304.20</b>	Screen Size:	<b>0.10 Slot</b>
Contractor:	<b>Blue Ridge Drilling</b>	Total Depth:	<b>48'</b>	Filter Pack:	<b>#2 Sand</b>
Driller:	<b>James Jones</b>	TOC Elevation:	<b>305.08</b>	Seal:	<b>Bentonite Pellets/Hydrated</b>

N Value	Blow Counts	Depth	Description (USCS)	Geol	Well Log	ELEV.	Remarks
5	3		Red SILT, some Clay (MH)				Soft
	2						
	3		Reddish brown SILT, some Clay, elastic (MH)				
7	4						Medium Stiff
	3						
	4						
	5						
11	3	5				299.20	Medium Stiff
	4						
	7						
12	5		Light brown SILT and Clay, elastic (MH)				Stiff
	7						
	10						
	4						
16	6						Stiff
	10						
	12	10	Light brown SILT, some Clay, little fine Sand mottling, elastic (MH)			294.20	
18	4						Very Stiff
	8						
	10						
	12						
	5						
17	7						Very Stiff
	10						
	9						
	4						
20	7	15				289.20	Very Stiff
	13						
	10						
11	4						Stiff
	5						
	6						
	9						
9	3						Medium Stiff
	4						
	5						
	8	20				284.20	
6	wh						Medium Stiff
	3						
	3						
	4						Soft
4	wh						
	2						
	2						
	4						
4	wh	25	Light brown SILT, some Clay, trace fine Sand, mottling, elastic (MH)			279.20	Soft
	2						
	3						
	wh						
9	6						Medium Stiff
	3						
	13						
13	wh						Stiff
	7						
	6	30				274.20	
	8						
6	wh						Medium Stiff
	2						
	4						
	6						
	3						
17	7						Stiff
	10						
	23		Light brown fine SAND, some Silt, trace Clay, (SM)				
	3						
	8						



Project:	<b>Green Ridge Recycling</b>	Boring/Well Area:	<b>West Area</b>	Drilling Rig Type:	<b>Track Rig CME 45</b>
Project #:	<b>18020117-030201</b>	Logged By:	<b>D. Coakley</b>	Drilling Method:	<b>4.25" Hollow Stem Auger</b>
Location:	<b>Cumberland County, VA</b>	Northing:	<b>3731202.27</b>	Sampling Method:	<b>Split Spoon</b>
Start Date:	<b>03/27/19</b>	Easting:	<b>11591698.15</b>	Well Material:	<b>2" Schedule 40 PVC</b>
Completion Date:	<b>03/27/19</b>	Ground Elevation:	<b>304.20</b>	Screen Size:	<b>0.10 Slot</b>
Contractor:	<b>Blue Ridge Drilling</b>	Total Depth:	<b>48'</b>	Filter Pack:	<b>#2 Sand</b>
Driller:	<b>James Jones</b>	TOC Elevation:	<b>305.08</b>	Seal:	<b>Bentonite Pellets/Hydrated</b>

N Value	Blow Counts	Depth	Description (USCS)	Geol	Well Log	ELEV.	Remarks
15	14 15 6 6 9 15 4 7						Medium Dense
17	10 16 5 8 10 15 7	40	Light brown fine SAND, some Silt, little Sand, trace Clay, (SM)			264.20	Medium Dense
18	12 18 25 12 25 32 42 50/2	45	Light brown fine fine SAND, little Silt, SAPROLITE (SM)			259.20	Medium Dense
>50			Auger Refusal at 48'				Dense
		50				254.20	Very Dense
		55				249.20	
		60				244.20	
		65				239.20	



Boring/Well ID: **DAA-27sb**

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N Value	Blow Counts	Depth	Description (USCS)	Geol	Well Log	ELEV.	Remarks
			Brown SILT, some Clay, trace fine Sand ( <b>MH</b> )				
32	6 12 20 60/4" 50/6"		Brown to dark gray fine SAND, some Silt, trace Clay ( <b>SM</b> )				Medium Dense
>50		5				326.70	
>50	24 50/3"						Very Dense
48	24 25 23 39 18	10				321.70	Very Dense
59	22 37 50/4" 50/3"		Light Tan very fine SAND, little Silt, trace white quartzite gravel, dry, <b>SAPROLITE (SM)</b>				Very Dense
30	14 12 8	15				316.70	Medium Dense
>50	14 11 50/4"						Very Dense
>50	50/5"						
>50	50/3"	20				311.70	
			Auger Refusal at 21.5'				
		25				306.70	
		30				301.70	



# BORING/WELL LOG

Boring/Well ID: **DAA-28sb**

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Project:	Green Ridge Recycling	Boring/Well Area:	West Area	Drilling Rig Type:	Track Rig CME 45
Project #:	18020117-030201	Logged By:	D. Coakley	Drilling Method:	3.25" Hollow Stem Auger
Location:	Cumberland County, VA	Northing:	3730566.92	Sampling Method:	Split Spoon
Start Date:	03/28/19	Easting:	11591349.73	Well Material:	NA
Completion Date:	03/28/19	Ground Elevation:	320.28	Screen Size:	NA
Contractor:	Blue Ridge Drilling	Total Depth:	44'	Filter Pack:	NA
Driller:	James Jones	TOC Elevation:	NA	Seal:	Bentonite Pellets/Hydrated

N Value	Blow Counts	Depth	Description (USCS)	Geol	Well Log	ELEV.	Remarks
6	2 2 4 7 3		Red to brown SAND, some Silt, little Clay (SM)				Medium Stiff
12	6 6 10 6	5				315.28	Stiff
13	6 7 10 5						Stiff
44	14 30 23	10				310.28	Dense
23	7 12 11 28		Light Tan very fine SAND and Silt, (SM)				Medium Dense
>50	42 50/6"						Very Dense
79	27 42 37 28 11	15				305.28	Very Dense
55	24 31 21 18						Very Dense
>50	50/0"						Very Dense
65	20 24 41 38 36	20	Brown to red fine SAND, some Silt, trace Clay, white quartzite sand lenses, micaceous, SAPROLITE, (SM)			300.28	Very Dense
>50	50/5"						Very Dense
>50	29 50/4"	25				295.28	Very Dense
>50	28 50/6"						Very Dense
>50	50/6"						
61	28 25 36 50/6" 50/5"	30	Red fine SAND, some Silt, iron and biotite bands, SAPROLITE, (SM)			290.28	Very Dense
>50	50/6"						

# BORING/WELL LOG

Boring/Well ID: **DAA-28sb**

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Project:	<b>Green Ridge Recycling</b>	Boring/Well Area:	<b>West Area</b>	Drilling Rig Type:	<b>Track Rig CME 45</b>
Project #:	<b>18020117-030201</b>	Logged By:	<b>D. Coakley</b>	Drilling Method:	<b>3.25" Hollow Stem Auger</b>
Location:	<b>Cumberland County, VA</b>	Northing:	<b>3730566.92</b>	Sampling Method:	<b>Split Spoon</b>
Start Date:	<b>03/28/19</b>	Easting:	<b>11591349.73</b>	Well Material:	<b>NA</b>
Completion Date:	<b>03/28/19</b>	Ground Elevation:	<b>320.28</b>	Screen Size:	<b>NA</b>
Contractor:	<b>Blue Ridge Drilling</b>	Total Depth:	<b>44'</b>	Filter Pack:	<b>NA</b>
Driller:	<b>James Jones</b>	TOC Elevation:	<b>NA</b>	Seal:	<b>Bentonite Pellets/Hydrated</b>

N Value	Blow Counts	Depth	Description (USCS)	Geol	Well Log	ELEV.	Remarks
>50	26 50/3"	40	Red fine SAND, some Silt, iron and biotite bands, white quartzite gravel lenses, <i>SAPROLITE</i> , Wet (SM)			280.28	Very Dense
		45	Auger Refusal at 44'			275.28	
		50				270.28	
		55				265.28	
		60				260.28	
		65				255.28	



# BORING/WELL LOG

Boring/Well ID: **DAA-29pz**

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Project:	<b>Green Ridge Recycling</b>	Boring/Well Area:	<b>West Area</b>	Drilling Rig Type:	<b>Track Rig CME 45</b>
Project #:	<b>18020117-030201</b>	Logged By:	<b>D. Coakley</b>	Drilling Method:	<b>4.25" Hollow Stem Auger</b>
Location:	<b>Cumberland County, VA</b>	Northing:	<b>3729450.80</b>	Sampling Method:	<b>Split Spoon</b>
Start Date:	<b>03/28/19</b>	Easting:	<b>11591602.94</b>	Well Material:	<b>2" Schedule 40 PVC</b>
Completion Date:	<b>03/28/19</b>	Ground Elevation:	<b>347.84</b>	Screen Size:	<b>0.10 Slot</b>
Contractor:	<b>Blue Ridge Drilling</b>	Total Depth:	<b>34.5'</b>	Filter Pack:	<b>#2 Sand</b>
Driller:	<b>James Jones</b>	TOC Elevation:	<b>349.41</b>	Seal:	<b>Bentonite Pellets/Hydrated</b>

N Value	Blow Counts	Depth	Description (USCS)	Geol	Well Log	ELEV.	Remarks
7	2 3 4 7 2		Brown fine SAND, some Clay, little Silt (SC)				Medium Stiff
10	4 6 9 4 6	5				342.84	Loose
17	11 18 6						Medium Dense
30	12 18 25	10				337.84	Medium Dense
31	4 12 19 23 11		Brown fine SAND, some Silt, little Clay, trace gravel (SM)				Dense
41	11 23 18 27 7						Dense
45	14 31 28 19	15				332.84	Dense
59	32 27 31 10						Very Dense
>50	22 50/6"						Very Dense
>50	15 32 50/4"	20				327.84	Very Dense
>50	13 31 50/5"		Light Tan very fine SAND, some Silt, trace gravel, SAPROLITE (SM)				Very Dense
67	15 27 40 50/6"	25				322.84	Very Dense
>50	26 36 50/4"		Red/Brown fine SAND, some Silt, little Clay SAPROLITE (SM)				Very Dense
>50	20 29 50/4"						Very Dense
>50	50/5"	30				317.84	
			Dark Gray fine SAND, little Silt, SAPROLITE (SM)				
			Auger Refusal at 34.5'				



# BORING/WELL LOG

Boring/Well ID: **DAA-30sb**

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Project:	<b>Green Ridge Recycling</b>	Boring/Well Area:	<b>West Area</b>	Drilling Rig Type:	<b>Track Rig CME 45</b>
Project #:	<b>18020117-030201</b>	Logged By:	<b>D. Coakley</b>	Drilling Method:	<b>3.25" Hollow Stem Auger</b>
Location:	<b>Cumberland County, VA</b>	Northing:	<b>3729480.24</b>	Sampling Method:	<b>Split Spoon</b>
Start Date:	<b>03/28/19</b>	Easting:	<b>11590921.73</b>	Well Material:	<b>NA</b>
Completion Date:	<b>03/28/19</b>	Ground Elevation:	<b>339.93</b>	Screen Size:	<b>NA</b>
Contractor:	<b>Blue Ridge Drilling</b>	Total Depth:	<b>31'</b>	Filter Pack:	<b>NA</b>
Driller:	<b>James Jones</b>	TOC Elevation:	<b>NA</b>	Seal:	<b>Bentonite Pellets/Hydrated</b>

N Value	Blow Counts	Depth	Description (USCS)	Geol	Well Log	ELEV.	Remarks
			Red SILT, little Clay, trace fine Sand (ML)				
>50	50/5"						Very Dense
>50	50/2"	5				334.93	Very Dense
>50	50/3"						Very Dense
>50	15 30 50/3"	10				329.93	Very Dense
>50	50/6"		Light Tan fine SAND and Silt, trace white quartzite gravel, SAPROLITE (SM)				Very Dense
>50	50/3"						Very Dense
>50	41 50/4"	15				324.93	Very Dense
>50	50/5"	20				319.93	Very Dense
>50	44 50/4"	25	Dark gray fine SAND and Silt, SAPROLITE (SM)			314.93	Very Dense
>50	50/3"	30				309.93	Very Dense
			Auger Refusal at 31'				

# BORING/WELL LOG

Boring/Well ID: **DAA-31pz**

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Project:	<b>Green Ridge Recycling</b>	Boring/Well Area:	<b>West Area</b>	Drilling Rig Type:	<b>Track Rig CME 45</b>
Project #:	<b>18020117-030201</b>	Logged By:	<b>D. Coakley</b>	Drilling Method:	<b>4.25" Hollow Stem Auger</b>
Location:	<b>Cumberland County, VA</b>	Northing:	<b>3729450.80</b>	Sampling Method:	<b>Split Spoon</b>
Start Date:	<b>03/29/19</b>	Easting:	<b>11591602.94</b>	Well Material:	<b>2" Schedule 40 PVC</b>
Completion Date:	<b>03/29/19</b>	Ground Elevation:	<b>348.57</b>	Screen Size:	<b>0.10 Slot</b>
Contractor:	<b>Blue Ridge Drilling</b>	Total Depth:	<b>33.5'</b>	Filter Pack:	<b>#2 Sand</b>
Driller:	<b>James Jones</b>	TOC Elevation:	<b>349.92</b>	Seal:	<b>Bentonite Pellets/Hydrated</b>

N Value	Blow Counts	Depth	Description (USCS)	Geol	Well Log	ELEV.	Remarks
>50	25 32 50/6"		Red SILT, some Sand, trace fine Sand (SM)				Very Dense
59	15 27 32 50/6"	5				343.57	Very Dense
54	14 19 35 25 9		Light Tan fine SAND, some Silt (SM)				Very Dense
37	17 20 34 19	10				338.57	Dense
>50	29 50/6"						Very Dense
57	20 31 26 21 8						Very Dense
22	9 13 12 12 15	15	Tan fine SAND, some Silt, trace Clay, biotite and iron bands, white quartz sand lenses (SM)			333.57	Medium Dense
42	27 36 10						Dense
34	18 16 20 18	20				328.57	Dense
49	31 18 27 50/6"						Very Dense
>50							Very Dense
>50	50/1"	25				323.57	Very Dense
>50	50/2"						Very Dense
>50			Brown Silt, some SAND, micaceous, SAPROLITE, (SM)				
		30				318.57	
Auger Refusal at 33.5'							



# BORING/WELL LOG

Boring/Well ID: **DAA-32sb**

Page 1 of 1

Project:	<b>Green Ridge Recycling</b>	Boring/Well Area:	<b>West Area</b>	Drilling Rig Type:	<b>Track Rig CME 45</b>
Project #:	<b>18020117-030201</b>	Logged By:	<b>D. Coakley</b>	Drilling Method:	<b>3.25" Hollow Stem Auger</b>
Location:	<b>Cumberland County, VA</b>	Northing:	<b>3728036.55</b>	Sampling Method:	<b>Split Spoon</b>
Start Date:	<b>03/29/19</b>	Easting:	<b>11591011.48</b>	Well Material:	<b>NA</b>
Completion Date:	<b>03/29/19</b>	Ground Elevation:	<b>349.82</b>	Screen Size:	<b>NA</b>
Contractor:	<b>Blue Ridge Drilling</b>	Total Depth:	<b>31'</b>	Filter Pack:	<b>NA</b>
Driller:	<b>James Jones</b>	TOC Elevation:	<b>NA</b>	Seal:	<b>Bentonite Pellets/Hydrated</b>

N Value	Blow Counts	Depth	Description (USCS)	Geol	Well Log	ELEV.	Remarks
22	6 7 15 29 14		Red SILT and Clay, trace fine Sand ( <b>ML</b> )				Very Stiff
>50	22 50/5"	5				344.82	Very Dense
>50	50/4"						Very Dense
>50	50/3"		Tan very fine SAND and Silt, dry, <i>SAPROLITE</i> , ( <b>SM</b> )				Very Dense
>50	50/4"	10				339.82	Very Dense
>50	50/3"						Very Dense
>50	50/4"	15				334.82	Very Dense
>50	50/3"		Gray SILT, some fine Sand, <i>SAPROLITE</i> ( <b>SM</b> )				Very Dense
>50	50/2"						Very Dense
>50	50/2"	20				329.82	Very Dense
>50	50/4"	25	Light Tan SILT, some fine Sand, <i>SAPROLITE</i> , ( <b>SM</b> )			324.82	Very Dense
>50	50/1"	30				319.82	Very Dense
			<b>Auger Refusal at 31'</b>				



Boring/Well ID: **DAA-33sb**

Project:		Green Ridge Recycling		Boring/Well Area:		West Area		Drilling Rig Type:		Track Rig CME 45	
Project #:		18020117-030201		Logged By:		D. Coakley		Drilling Method:		3.25" Hollow Stem Auger	
Location:		Cumberland County, VA		Northing:		3727617.39		Sampling Method:		Split Spoon	
Start Date:		04/02/19		Easting:		11591448.65		Well Material:		NA	
Completion Date:		04/02/19		Ground Elevation:		348.20		Screen Size:		NA	
Contractor:		Blue Ridge Drilling		Total Depth:		17'		Filter Pack:		NA	
Driller:		James Jones		TOC Elevation:		NA		Seal:		Bentonite Pellets/Hydrated	

N Value	Blow Counts	Depth	Description (USCS)	Geol	Well Log	ELEV.	Remarks	
7	4		Red fine SAND, little Silt, little Clay, micaceous (SM)				Medium Stiff	
6	3							
6	4	5				343.20		Medium Stiff
	2							
	3							
9	3		Gray fine SAND, some Clay, little Silt (SM)				Loose	
	5							
	3							
	4							
	5							
30	12		Brown fine SAND, some Silt, dry, SAPROLITE, (SM)				Medium Dense	
	18							
	50/5"							
>50	50/6"	15				333.20		Very Dense
>50	50/0"							
			Auger Refusal at 17'					
		20				328.20		
		25				323.20		
		30				318.20		



# BORING/WELL LOG

Boring/Well ID: **DAA-34pz**

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Project:	<b>Green Ridge Recycling</b>	Boring/Well Area:	<b>West Area</b>	Drilling Rig Type:	<b>Track Rig CME 45</b>
Project #:	<b>18020117-030201</b>	Logged By:	<b>D. Coakley</b>	Drilling Method:	<b>4.25" Hollow Stem Auger</b>
Location:	<b>Cumberland County, VA</b>	Northing:	<b>3728241.05</b>	Sampling Method:	<b>Split Spoon</b>
Start Date:	<b>04/02/19</b>	Easting:	<b>11592007.95</b>	Well Material:	<b>2" Schedule 40 PVC</b>
Completion Date:	<b>04/02/19</b>	Ground Elevation:	<b>354.70</b>	Screen Size:	<b>0.10 Slot</b>
Contractor:	<b>Blue Ridge Drilling</b>	Total Depth:	<b>39.5'</b>	Filter Pack:	<b>#2 Sand</b>
Driller:	<b>James Jones</b>	TOC Elevation:	<b>355.38</b>	Seal:	<b>Bentonite Pellets/Hydrated</b>

N Value	Blow Counts	Depth	Description (USCS)	Geol	Well Log	ELEV.	Remarks
8	33		Red SILT, some Clay, trace fine Sand (ML)				Loose
7	34	5	Red SILT, some Clay, little Sand, micaceous (ML)			349.70	Loose
9	33						Loose
9	33	10				344.70	Loose
7	33						Loose
8	33						Loose
7	33	15				339.70	Loose
9	34		Brown to Red SILT, some fine Sand, trace Clay, micaceous, white quartz sand lenses (SM)				Loose
10	35						Loose
13	35	20				334.70	Medium Dense
14	37						Medium Dense
	37						
	10	25				329.70	
>50	22						Very Dense
>50	34						Very Dense
>50	50/5"						Very Dense
>50	32						Very Dense
>50	50/6"						Very Dense
>50	50/5"	30				324.70	
>50			Brown very fine SAND, some Silt, micaceous, SAPROLITE (SM)				Very Dense
>50	50/2"						Very Dense



## BORING/WELL LOG

Boring/Well ID: **DAA-34pz**

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Project:	Green Ridge Recycling	Boring/Well Area:	West Area	Drilling Rig Type:	Track Rig CME 45
Project #:	18020117-030201	Logged By:	D. Coakley	Drilling Method:	4.25" Hollow Stem Auger
Location:	Cumberland County, VA	Northing:	3728241.05	Sampling Method:	Split Spoon
Start Date:	04/02/19	Easting:	11592007.95	Well Material:	2" Schedule 40 PVC
Completion Date:	04/02/19	Ground Elevation:	354.70	Screen Size:	0.10 Slot
Contractor:	Blue Ridge Drilling	Total Depth:	39.5'	Filter Pack:	#2 Sand
Driller:	James Jones	TOC Elevation:	355.38	Seal:	Bentonite Pellets/Hydrated

N Value	Blow Counts	Depth	Description (USCS)	Geol	Well Log	ELEV.	Remarks
	50/5"		Brown very fine SAND, some Silt, micaceous, SAPROLITE (SM)				
			Auger Refusal at 39.5'				
		40				314.70	
		45				309.70	
		50				304.70	
		55				299.70	
		60				294.70	
		65				289.70	

# BORING/WELL LOG

Boring/Well ID: **DAA-35pz**

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Project:	Green Ridge Recycling	Boring/Well Area:	West Area	Drilling Rig Type:	Track Rig CME 45
Project #:	18020117-030201	Logged By:	D. Coakley	Drilling Method:	4.25" Hollow Stem Auger
Location:	Cumberland County, VA	Northing:	3727576.32	Sampling Method:	Split Spoon
Start Date:	04/03/19	Easting:	11592108.08	Well Material:	2" Schedule 40 PVC
Completion Date:	04/03/19	Ground Elevation:	365.58	Screen Size:	0.10 Slot
Contractor:	Blue Ridge Drilling	Total Depth:	38'	Filter Pack:	#2 Sand
Driller:	James Jones	TOC Elevation:	367.36	Seal:	Bentonite Pellets/Hydrated

Samp ID	Blow Counts	Depth	Description (USCS)	Geol	Well Log	ELEV.	Remarks
7	13		Red CLAY, little Silt (ML)				Loose
7	34	5				360.58	Loose
5	22						Loose
4	22		Red SILT, some Clay, little fine Sand, micaceous (SM)			355.58	Loose
5	22	10					Loose
	Shelby Tube						
5	23	15				350.58	Loose
8	24						Loose
7	33						Loose
10	33	20	Light brown to tan fine SAND, some Silt, trace Clay, white quartz gravel lenses, micaceous (SM)			345.58	Loose
13	55						Medium Dense
	Shelby Tube	25				340.58	
47	819						Dense
43	2023	30				335.58	Dense
43	1825		Gray to Light brown fine SAND, some Silt, trace gravel, micaceous, (SM)				Dense



# BORING/WELL LOG

Boring/Well ID: **DAA-35pz**

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Project:	Green Ridge Recycling	Boring/Well Area:	West Area	Drilling Rig Type:	Track Rig CME 45
Project #:	18020117-030201	Logged By:	D. Coakley	Drilling Method:	4.25" Hollow Stem Auger
Location:	Cumberland County, VA	Northing:	3727576.32	Sampling Method:	Split Spoon
Start Date:	04/03/19	Easting:	11592108.08	Well Material:	2" Schedule 40 PVC
Completion Date:	04/03/19	Ground Elevation:	365.58	Screen Size:	0.10 Slot
Contractor:	Blue Ridge Drilling	Total Depth:	38'	Filter Pack:	#2 Sand
Driller:	James Jones	TOC Elevation:	367.36	Seal:	Bentonite Pellets/Hydrated

Samp ID	Blow Counts	Depth	Description (USCS)	Geol	Well Log	ELEV.	Remarks
>50	35 50/6"		Light Tan very fine SAND, little Silt, micaceous, SAPROLITE (SM)				Very Dense
			Auger Refusal at 38'				
		40				325.58	
		45				320.58	
		50				315.58	
		55				310.58	
		60				305.58	
		65				300.58	

Project:	<b>Green Ridge Recycling</b>	Boring/Well Area:	<b>East Area</b>	Drilling Rig Type:	<b>Track Rig CME 45</b>
Project #:	<b>18020117-030201</b>	Logged By:	<b>D. Coakley</b>	Drilling Method:	<b>4.25" Hollow Stem Auger</b>
Location:	<b>Cumberland County, VA</b>	Northing:	<b>3729104.75</b>	Sampling Method:	<b>Split Spoon</b>
Start Date:	<b>04/03/19</b>	Easting:	<b>11593620.95</b>	Well Material:	<b>2" Schedule 40 PVC</b>
Completion Date:	<b>04/03/19</b>	Ground Elevation:	<b>340.15</b>	Screen Size:	<b>0.10 Slot</b>
Contractor:	<b>Blue Ridge Drilling</b>	Total Depth:	<b>45'</b>	Filter Pack:	<b>#2 Sand</b>
Driller:	<b>James Jones</b>	TOC Elevation:	<b>340.83</b>	Seal:	<b>Bentonite Pellets/Hydrated</b>

N Value	Blow Counts	Depth	Description (USCS)	Geol	Well Log	ELEV.	Remarks
			Red/brown SILT, little Clay, trace fine Sand ( <b>ML</b> )				
7	4						Loose
	3						
	4						
	6						
	2		Red to Tan SILT, little Sand, trace Clay ( <b>SM</b> )				
5	2	5				335.15	Loose
	3						
	2						
5	2						Loose
	3						
	4		Tan SAND and Silt, trace Clay ( <b>SM</b> )				
	4						
7	3						Loose
	4						
	4		Tan/Red/Gray SAND, some Silt, little Clay, mottling; moist ( <b>SM</b> )			330.15	
	2	10					Loose
4	1						
	3						
	3						
6	2		Red SILT, little Clay, gray sand lenses; moist; ( <b>SM</b> )				Loose
	3						
	5						
	3						
9	3	15				325.15	Loose
	6						
	7						
	4						
15	6		Tan SILT, some fine Sand, little Clay ( <b>SM</b> )				Medium Dense
	9						
	9						
	6						
17	9						Medium Dense
	8						
	10						
	5	20				320.15	
18	7						Medium Dense
	11						
	14						
	7						
20	10						Medium Dense
	10						
	22						
	15						
32	15	25				315.15	Dense
	17						
	28						
	10						
23	11		Tan to brown fine SAND and Silt, trace Clay ( <b>SM</b> )				Medium Dense
	12						
	17						
		30				310.15	
21	8						Medium Dense
	10						
	11						
	16						



Project:	<b>Green Ridge Recycling</b>	Boring/Well Area:	<b>East Area</b>	Drilling Rig Type:	<b>Track Rig CME 45</b>
Project #:	<b>18020117-030201</b>	Logged By:	<b>D. Coakley</b>	Drilling Method:	<b>4.25" Hollow Stem Auger</b>
Location:	<b>Cumberland County, VA</b>	Northing:	<b>3729104.75</b>	Sampling Method:	<b>Split Spoon</b>
Start Date:	<b>04/03/19</b>	Easting:	<b>11593620.95</b>	Well Material:	<b>2" Schedule 40 PVC</b>
Completion Date:	<b>04/03/19</b>	Ground Elevation:	<b>340.15</b>	Screen Size:	<b>0.10 Slot</b>
Contractor:	<b>Blue Ridge Drilling</b>	Total Depth:	<b>45'</b>	Filter Pack:	<b>#2 Sand</b>
Driller:	<b>James Jones</b>	TOC Elevation:	<b>340.83</b>	Seal:	<b>Bentonite Pellets/Hydrated</b>

N Value	Blow Counts	Depth	Description (USCS)	Geol	Well Log	ELEV.	Remarks
30	7 13 17 24						Dense
57	22 28 29 50/6"	40	Brown fine SAND, little Silt, white/pink quartzite gravel lenses, <i>SAPROLITE (SM)</i>			300.15	Very Dense
		45	Auger Refusal at 45"			295.15	
		50				290.15	
		55				285.15	
		60				280.15	
		65				275.15	



# BORING/WELL LOG

Boring/Well ID: **DAA-37sb**

Page 1 of 2

Project:		Green Ridge Recycling		Boring/Well Area:		East Area		Drilling Rig Type:		Track Rig CME 45	
Project #:		18020117-030201		Logged By:		D. Coakley		Drilling Method:		3.25" Hollow Stem Auger	
Location:		Cumberland County, VA		Northing:		3729474.02		Sampling Method:		Split Spoon	
Start Date:		04/04/19		Easting:		11594007.15		Well Material:		NA	
Completion Date:		04/04/19		Ground Elevation:		357.48		Screen Size:		NA	
Contractor:		Blue Ridge Drilling		Total Depth:		47.5'		Filter Pack:		NA	
Driller:		James Jones		TOC Elevation:		NA		Seal:		Bentonite Pellets/Hydrated	
N Value	Blow Counts	Depth	Description (USCS)				Geol	Well Log	ELEV.	Remarks	
14	3 6 8 10		Red SILT and Clay (ML)								Medium Dense
10	3 5 5 7	5	Red SILT and fine Sand, trace Clay, micaceous, dry (SM)						352.48		Loose
8	3 3 5 5										Loose
		10							347.48		
10	5 5 3 3 2										Loose
6	3 3 3 3										Loose
6	2 4 4 3	15							342.48		Loose
7	4 3 6 5										Loose
13	5 8 9 4	20							337.48		Medium Dense
14	7 7 9		Light tan to brown SILT, some fine Sand, micaceous, white quartzite gravel lenses, (SM)								Medium Dense
	Shelby Tube										
17	7 8 9 12 10	25							332.48		Medium Dense
26	12 14 14 5										Medium Dense
35	13 22 42 20	30							327.48		Dense
>50	30 50/6"										Very Dense
64	20 25 39 50/5" 14 50/5"		Gray fine SAND, little Silt, dry, micaceous, SAPROLITE (SM)								Very Dense

# BORING/WELL LOG

Boring/Well ID: **DAA-37sb**

Page 2 of 2

Project:	Green Ridge Recycling	Boring/Well Area:	East Area	Drilling Rig Type:	Track Rig CME 45
Project #:	18020117-030201	Logged By:	D. Coakley	Drilling Method:	3.25" Hollow Stem Auger
Location:	Cumberland County, VA	Northing:	3729474.02	Sampling Method:	Split Spoon
Start Date:	04/04/19	Easting:	11594007.15	Well Material:	NA
Completion Date:	04/04/19	Ground Elevation:	357.48	Screen Size:	NA
Contractor:	Blue Ridge Drilling	Total Depth:	47.5'	Filter Pack:	NA
Driller:	James Jones	TOC Elevation:	NA	Seal:	Bentonite Pellets/Hydrated

N Value	Blow Counts	Depth	Description (USCS)	Geol	Well Log	ELEV.	Remarks
>50	40 60/4"						Very Dense
>50	40 50/3"	40	Gray fine SAND, little Silt, dry, micaceous, SAPROLITE (SM)			317.48	Very Dense
>50	45 50/2"	45				312.48	Very Dense
			Auger Refusal at 47.5'				
		50				307.48	
		55				302.48	
		60				297.48	
		65				292.48	



## BORING/WELL LOG

Boring/Well ID: **DAA-38sb**

Page 1 of 1

Project:	<b>Green Ridge Recycling</b>	Boring/Well Area:	<b>East Area</b>	Drilling Rig Type:	<b>Track Rig CME 45</b>
Project #:	<b>18020117-030201</b>	Logged By:	<b>D. Coakley</b>	Drilling Method:	<b>3.25" Hollow Stem Auger</b>
Location:	<b>Cumberland County, VA</b>	Northing:	<b>3734294.95</b>	Sampling Method:	<b>Split Spoon</b>
Start Date:	<b>04/04/19</b>	Easting:	<b>11594503.05</b>	Well Material:	<b>NA</b>
Completion Date:	<b>04/04/19</b>	Ground Elevation:	<b>307.43</b>	Screen Size:	<b>NA</b>
Contractor:	<b>Blue Ridge Drilling</b>	Total Depth:	<b>19.5'</b>	Filter Pack:	<b>NA</b>
Driller:	<b>James Jones</b>	TOC Elevation:	<b>NA</b>	Seal:	<b>Bentonite Pellets/Hydrated</b>

N Value	Blow Counts	Depth	Description (USCS)	Geol	Well Log	ELEV.	Remarks
			Red SILT and Clay (ML)				
9	3						Loose
	3						
	6						
	9						
	9						
	3						
8	4	5	Red SILT and fine Sand, micaceous (SM)			302.43	Loose
	4						
	6						Loose
	3						
6	3						Loose
	3						
	5						
	5						
15	10						Medium Dense
	11						
	5	10				297.43	
13	6						Medium Dense
	7						
	8						
	5						
18	7		Very light Tan fine SAND and Silt, micaceous, dry, (SM)				Medium Dense
	11						
	9						
	Shelby Tube	15				292.43	
	7						
12	5						Medium Dense
	7						
	10						
	6						
>50	50/6"		Auger Refusal at 19.5'				Very Dense
		20				287.43	
		25				282.43	
		30				277.43	

## BORING/WELL LOG

Boring/Well ID: **DAA-39sb**

Page 1 of 1

Project:	<b>Green Ridge Recycling</b>	Boring/Well Area:	<b>East Area</b>	Drilling Rig Type:	<b>Track Rig CME 45</b>
Project #:	<b>18020117-030201</b>	Logged By:	<b>D. Coakley</b>	Drilling Method:	<b>3.25" Hollow Stem Auger</b>
Location:	<b>Cumberland County, VA</b>	Northing:	<b>3733886.43</b>	Sampling Method:	<b>Split Spoon</b>
Start Date:	<b>04/04/19</b>	Easting:	<b>11594325.67</b>	Well Material:	<b>NA</b>
Completion Date:	<b>04/04/19</b>	Ground Elevation:	<b>315.21</b>	Screen Size:	<b>NA</b>
Contractor:	<b>Blue Ridge Drilling</b>	Total Depth:	<b>25.5'</b>	Filter Pack:	<b>NA</b>
Driller:	<b>James Jones</b>	TOC Elevation:	<b>NA</b>	Seal:	<b>Bentonite Pellets/Hydrated</b>

N Value	Blow Counts	Depth	Description (USCS)	Geol	Well Log	ELEV.	Remarks		
>50	50/4"		Tan very fine SAND and Silt, <i>SAPROLITE</i> (SM)				Very Dense		
>50	50/4"						Very Dense		
		5					310.21		
>50	50/3"							Very Dense	
>50	11 17 50/5"		Tan fine SAND, little Silt, white quartzite gravel lenses, <i>SAPROLITE</i> (SM)				Very Dense		
		10					305.21		
43	14 21 22 23 15							Dense	
69	35 34 30 10							Very Dense	
31	13 18 27 24	15						300.21	Dense
>50	31 50/5"								Very Dense
43	19 21 22 22 17	20	Brown to gray fine SAND, little Silt, dry, <i>SAPROLITE</i> , (SM)				Dense		
							295.21		
56	23 33 39 18							Very Dense	
69	31 38 50/5" 27 50/3"							Very Dense	
>50		25	Auger Refusal at 25.5'			290.21	Very Dense		
		30				285.21			



# BORING/WELL LOG

Boring/Well ID: **DAA-40pz**

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Project:	Green Ridge Recycling	Boring/Well Area:	East Area	Drilling Rig Type:	Track Rig CME 45
Project #:	18020117-030201	Logged By:	D. Coakley	Drilling Method:	4.25" Hollow Stem Auger
Location:	Cumberland County, VA	Northing:	3732549.57	Sampling Method:	Split Spoon
Start Date:	04/05/19	Easting:	11594305.23	Well Material:	2" Schedule 40 PVC
Completion Date:	04/05/19	Ground Elevation:	325.93	Screen Size:	0.10 Slot
Contractor:	Blue Ridge Drilling	Total Depth:	29'	Filter Pack:	#2 Sand
Driller:	James Jones	TOC Elevation:	327.50	Seal:	Bentonite Pellets/Hydrated

N Value	Blow Counts	Depth	Description (USCS)	Geol	Well Log	ELEV.	Remarks
		5	Red SILT and Clay (MH)			320.93	
		10	Red SILT, some fine Sand, little Clay (MH)			315.93	
		15	Brown fine SAND, some Silt (SM)			310.93	
		20				305.93	
		25	Brown fine SAND, some Silt, micaceous (SM)			300.93	
		30	Auger Refusal at 29'			295.93	

**NOTE:** Pouring rain, split spoons not collected due to safety concerns; Logged Cuttings and collected grab samples



Project:	<b>Green Ridge Recycling</b>	Boring/Well Area:	<b>East Area</b>	Drilling Rig Type:	<b>Track Rig CME 45</b>
Project #:	<b>18020117-030201</b>	Logged By:	<b>D. Coakley</b>	Drilling Method:	<b>4.25" Hollow Stem Auger</b>
Location:	<b>Cumberland County, VA</b>	Northing:	<b>3730877.23</b>	Sampling Method:	<b>Split Spoon</b>
Start Date:	<b>04/08/19</b>	Easting:	<b>11593612.69</b>	Well Material:	<b>2" Schedule 40 PVC</b>
Completion Date:	<b>04/08/19</b>	Ground Elevation:	<b>306.52</b>	Screen Size:	<b>0.10 Slot</b>
Contractor:	<b>Blue Ridge Drilling</b>	Total Depth:	<b>22.5'</b>	Filter Pack:	<b>#2 Sand</b>
Driller:	<b>James Jones</b>	TOC Elevation:	<b>307.99</b>	Seal:	<b>Bentonite Pellets/Hydrated</b>

N Value	Blow Counts	Depth	Description (USCS)	Geol	Well Log	ELEV.	Remarks
>50	18 38 50/6"		Brown fine SAND, some Silt ( <b>SM</b> )				Very Dense
>50	43 50/4"	5	Light Tan fine SAND, some Silt, trace white quartz gravel, <b>SAPROLITE (SM)</b>			301.52	Very Dense
>50	50/5"						
>50	50/3"						
>50	50/5"	10				296.52	
>50	50/4"	15	Dark Brown fine SAND, little Silt, trace white quartz gravel, <b>SAPROLITE (SM)</b>			291.52	
>50	50/2"	20				286.52	
			<b>Auger Refusal at 22.5'</b>				
		25				281.52	
		30				276.52	

Project:	Green Ridge Recycling	Boring/Well Area:	West Area	Drilling Rig Type:	Geoprobe 7822DT
Project #:	18020117-030201	Logged By:	D. Coakley	Drilling Method:	2.25" Hollow Stem Auger
Location:	Cumberland County, VA	Northing:	3729104.75	Sampling Method:	Logged Cuttings
Start Date:	05/20/19	Easting:	11593620.95	Well Material:	1" Schedule 40 PVC
Completion Date:	05/20/19	Ground Elevation:	363.99	Screen Size:	0.10 Slot
Contractor:	Jetco Inc.	Total Depth:	48'	Filter Pack:	#2 Sand
Driller:	Rory Ricks	TOC Elevation:	366.57	Seal:	Bentonite Pellets/Hydrated

N Value	Blow Counts	Depth	Description (USCS)	Geol	Well Log	ELEV.	Remarks
			Red SILT, some Clay, trace fine Sand (ML)				
		5				358.99	
		10				353.99	
		15	Red to brown SILT, little fine Sand, trace gravel (SM)			348.99	
		20				343.99	
		25				338.99	
		30	Light gray fine SAND, some Silt, trace white quartz gravel (SM)			333.99	

1" Piezometer installed for additional groundwater and bedrock (auger refusal) control data; drill cuttings logged; no samples collected



Project:	Green Ridge Recycling	Boring/Well Area:	West Area	Drilling Rig Type:	Geoprobe 7822DT
Project #:	18020117-030201	Logged By:	D. Coakley	Drilling Method:	2.25" Hollow Stem Auger
Location:	Cumberland County, VA	Northing:	3729104.75	Sampling Method:	Logged Cuttings
Start Date:	05/20/19	Easting:	11593620.95	Well Material:	1" Schedule 40 PVC
Completion Date:	05/20/19	Ground Elevation:	363.99	Screen Size:	0.10 Slot
Contractor:	Jetco Inc.	Total Depth:	48'	Filter Pack:	#2 Sand
Driller:	Rory Ricks	TOC Elevation:	366.57	Seal:	Bentonite Pellets/Hydrated

N Value	Blow Counts	Depth	Description (USCS)	Geol	Well Log	ELEV.	Remarks
			Light gray fine SAND, some Silt, trace white quartz gravel (SM)				
		40				323.99	Auger bit chattering noted, Increase in drilling down pressure required to advance depth;
			Dark Gray very fine SAND, some Silt, micaceous, wet SAPROLITE (SM)				
		45				318.99	
			Auger Refusal at 48"				
		50				313.99	
		55				308.99	
		60				303.99	
		65				298.99	

Project:	Green Ridge Recycling	Boring/Well Area:	West Area	Drilling Rig Type:	Geoprobe 7822DT
Project #:	18020117-030201	Logged By:	D. Coakley	Drilling Method:	2.25" Hollow Stem Auger
Location:	Cumberland County, VA	Northing:	3732375.27	Sampling Method:	Logged Cuttings
Start Date:	05/20/19	Easting:	11592068.47	Well Material:	1" Schedule 40 PVC
Completion Date:	05/20/19	Ground Elevation:	309.00	Screen Size:	0.10 Slot
Contractor:	Jetco Inc.	Total Depth:	15'	Filter Pack:	#2 Sand
Driller:	Rory Ricks	TOC Elevation:	309.32	Seal:	Bentonite Pellets/Hydrated

N Value	Blow Counts	Depth	Description (USCS)	Geol	Well Log	ELEV.	Remarks
		5	Light brown SILT, little fine Sand, dry (SM)			304.00	1" Piezometer installed for additional groundwater and bedrock (auger refusal) control data; drill cuttings logged; no samples collected
		10	Light Tan to gray fine SAND, some Silt, micaceous, dry (SM)			299.00	
		15	Brown to gray very fine SAND and Silt, micaceous, dry, SAPROLITE (SM)			294.00	Auger bit chattering noted, Increase in drilling down pressure required to advance depth;
			Auger Refusal at 15'				
		20				289.00	
		25				284.00	
		30				279.00	



Project:	Green Ridge Recycling	Boring/Well Area:	West Area	Drilling Rig Type:	Geoprobe 7822DT
Project #:	18020117-030201	Logged By:	D. Coakley	Drilling Method:	2.25" Hollow Stem Auger
Location:	Cumberland County, VA	Northing:	3727203.10	Sampling Method:	Logged Cuttings
Start Date:	05/20/19	Easting:	11593948.53	Well Material:	1" Schedule 40 PVC
Completion Date:	05/20/19	Ground Elevation:	379.96	Screen Size:	0.10 Slot
Contractor:	Jetco Inc.	Total Depth:	45'	Filter Pack:	#2 Sand
Driller:	Rory Ricks	TOC Elevation:	382.98	Seal:	Bentonite Pellets/Hydrated

N Value	Blow Counts	Depth	Description (USCS)	Geol	Well Log	ELEV.	Remarks
			Red to brown SILT and Clay, trace fine Sand, micaceous ( <b>ML</b> )				
		5	Red SILT, trace white quartz gravel, ( <b>SM</b> )			374.96	
			Dark brown SILT, trace fine Sand, micaceous, ( <b>SM</b> )				
		10				369.96	
			Light Gray SILT, trace quartz gravel, micaceous, ( <b>SM</b> )				
		15				364.96	
							1" Piezometer installed for additional groundwater and bedrock (auger refusal) control data; drill cuttings logged; no samples collected
		20				359.96	
		25				354.96	
							Auger bit chattering noted, Increase in drilling down pressure required to advance depth;
		30	Gray fine SAND, some Silt, trace white quartz gravel, micaceous, <b>SAPROLITE (SM)</b>			349.96	

# BORING/WELL LOG

Boring/Well ID: **DAA-44pz**

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Project:	Green Ridge Recycling	Boring/Well Area:	West Area	Drilling Rig Type:	Geoprobe 7822DT
Project #:	18020117-030201	Logged By:	D. Coakley	Drilling Method:	2.25" Hollow Stem Auger
Location:	Cumberland County, VA	Northing:	3727203.10	Sampling Method:	Logged Cuttings
Start Date:	05/20/19	Easting:	11593948.53	Well Material:	1" Schedule 40 PVC
Completion Date:	05/20/19	Ground Elevation:	379.96	Screen Size:	0.10 Slot
Contractor:	Jetco Inc.	Total Depth:	45'	Filter Pack:	#2 Sand
Driller:	Rory Ricks	TOC Elevation:	382.98	Seal:	Bentonite Pellets/Hydrated

N Value	Blow Counts	Depth	Description (USCS)	Geol	Well Log	ELEV.	Remarks
		40	Gray fine SAND, some Silt, trace white quartz gravel, micaceous, <i>SAPROLITE (SM)</i>			339.96	
		45	Auger Refusal at 45"			334.96	
		50				329.96	
		55				324.96	
		60				319.96	
		65				314.96	



# BORING/WELL LOG

Boring/Well ID: **DAA-45pz**

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Project:	<b>Green Ridge Recycling</b>	Boring/Well Area:	<b>West Area</b>	Drilling Rig Type:	<b>Geoprobe 7822DT</b>
Project #:	<b>18020117-030201</b>	Logged By:	<b>D. Coakley</b>	Drilling Method:	<b>2.25" Hollow Stem Auger</b>
Location:	<b>Cumberland County, VA</b>	Northing:	<b>3731594.25</b>	Sampling Method:	<b>Logged Cuttings</b>
Start Date:	<b>05/20/19</b>	Easting:	<b>11590676.39</b>	Well Material:	<b>1" Schedule 40 PVC</b>
Completion Date:	<b>05/20/19</b>	Ground Elevation:	<b>269.06</b>	Screen Size:	<b>0.10 Slot</b>
Contractor:	<b>Jetco Inc.</b>	Total Depth:	<b>8'</b>	Filter Pack:	<b>#2 Sand</b>
Driller:	<b>Rory Ricks</b>	TOC Elevation:	<b>271.24</b>	Seal:	<b>Bentonite Pellets/Hydrated</b>

N Value	Blow Counts	Depth	Description (USCS)	Geol	Well Log	ELEV.	Remarks
			Red SILT, some Clay, trace fine Sand (ML)				1" Piezometer installed for additional groundwater and bedrock (auger refusal) control data; drill cuttings logged; no samples collected
		5	Light Tan to gray fine SAND, some Silt, micaceous, dry (SM)			264.06	
			Auger Refusal at 8'				
		10				259.06	
		15				254.06	
		20				249.06	
		25				244.06	
		30				239.06	

Project:	Green Ridge Recycling	Boring/Well Area:	West Area	Drilling Rig Type:	Geoprobe 7822DT
Project #:	18020117-030201	Logged By:	D. Coakley	Drilling Method:	2.25" Hollow Stem Auger
Location:	Cumberland County, VA	Northing:	3727762.31	Sampling Method:	Logged Cuttings
Start Date:	05/20/19	Easting:	11593398.57	Well Material:	1" Schedule 40 PVC
Completion Date:	05/20/19	Ground Elevation:	360.77	Screen Size:	0.10 Slot
Contractor:	Jetco Inc.	Total Depth:	35'	Filter Pack:	#2 Sand
Driller:	Rory Ricks	TOC Elevation:	364.16	Seal:	Bentonite Pellets/Hydrated

N Value	Blow Counts	Depth	Description (USCS)	Geol	Well Log	ELEV.	Remarks
			Red SILT, some Clay, trace fine Sand (ML)				
		5	Red to brown SILT, some fine Sand, trace Clay, micaceous, (SM)			355.77	
		10				350.77	
		15	Brown fine SAND, some Silt, trace white quartz gravel, micaceous, (SM)			345.77	
		20				340.77	
		25	Light Gray SILT and fine Sand, micaceous, (SM)			335.77	
		30	Dark Gray very fine SAND, little Silt, micaceous, (SM)			330.77	
			Auger Refusal at 35'				

1" Piezometer installed for additional groundwater and bedrock (auger refusal) control data; drill cuttings logged; no samples collected





# BORING/WELL LOG

Boring/Well ID: **DAA-47pz**

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Project:	Green Ridge Recycling	Boring/Well Area:	West Area	Drilling Rig Type:	Geoprobe 7822DT
Project #:	18020117-030201	Logged By:	D. Coakley	Drilling Method:	2.25" Hollow Stem Auger
Location:	Cumberland County, VA	Northing:	3726637.56	Sampling Method:	Logged Cuttings
Start Date:	05/21/19	Easting:	11592845.76	Well Material:	1" Schedule 40 PVC
Completion Date:	05/21/19	Ground Elevation:	359.19	Screen Size:	0.10 Slot
Contractor:	Jetco Inc.	Total Depth:	54'	Filter Pack:	#2 Sand
Driller:	Rory Ricks	TOC Elevation:	360.91	Seal:	Bentonite Pellets/Hydrated

N Value	Blow Counts	Depth	Description (USCS)	Geol	Well Log	ELEV.	Remarks
			Red to brown SILT, some Clay, trace fine Sand (ML)				
		5	Red to brown SILT, little fine Sand, trace gravel (SM)			354.19	
		10	Very light Tan to white fine SAND, little Silt (SM)			349.19	
		15	Light brown very fine SAND, trace gravel, micaceous (SM)			344.19	
		20				339.19	
		25				334.19	
		30	Light gray fine SAND, trace Silt, trace white quartz gravel (SM)			329.19	
							1" Piezometer installed for additional groundwater and bedrock (auger refusal) control data; drill cuttings logged; no samples collected



# BORING/WELL LOG

Boring/Well ID: **DAA-47pz**

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Project:	Green Ridge Recycling	Boring/Well Area:	West Area	Drilling Rig Type:	Geoprobe 7822DT
Project #:	18020117-030201	Logged By:	D. Coakley	Drilling Method:	2.25" Hollow Stem Auger
Location:	Cumberland County, VA	Northing:	3726637.56	Sampling Method:	Logged Cuttings
Start Date:	05/21/19	Easting:	11592845.76	Well Material:	1" Schedule 40 PVC
Completion Date:	05/21/19	Ground Elevation:	359.19	Screen Size:	0.10 Slot
Contractor:	Jetco Inc.	Total Depth:	54'	Filter Pack:	#2 Sand
Driller:	Rory Ricks	TOC Elevation:	360.91	Seal:	Bentonite Pellets/Hydrated

N Value	Blow Counts	Depth	Description (USCS)	Geol	Well Log	ELEV.	Remarks
		40	Gray very fine SAND, little Silt, micaceous, wet <i>SAPROLITE (SM)</i>			319.19	
		45				314.19	
		50	Dark Gray very fine SAND, little Silt, micaceous, wet <i>SAPROLITE (SM)</i>			309.19	Auger bit chattering noted, Increase in drilling down pressure required to advance depth;
		55	Auger Refusal at 54"			304.19	
		60				299.19	
		65				294.19	



Project:	Green Ridge Recycling	Boring/Well Area:	West Area	Drilling Rig Type:	Geoprobe 7822DT
Project #:	18020117-030201	Logged By:	D. Coakley	Drilling Method:	2.25" Hollow Stem Auger
Location:	Cumberland County, VA	Northing:	3730575.48	Sampling Method:	Logged Cuttings from 0-6
Start Date:	05/21/19	Easting:	11589971.32	Well Material:	1" Schedule 40 PVC
Completion Date:	05/21/19	Ground Elevation:	315.50	Screen Size:	0.10 Slot
Contractor:	Jetco Inc.	Total Depth:	18'	Filter Pack:	#2 Sand
Driller:	Rory Ricks	TOC Elevation:	317.84	Seal:	Bentonite Pellets/Hydrated

N Value	Blow Counts	Depth	Description (USCS)	Geol	Well Log	ELEV.	Remarks
		5	Red SILT, some Clay, trace fine Sand (ML)			310.50	1" Piezometer installed for additional groundwater and bedrock (auger refusal) control data; drill cuttings logged; no samples collected
		10				305.50	
		15	Very light Tan fine SAND, trace Silt, white quartz gravel lenses, SAPROLITE (SM)			300.50	Auger bit chattering noted, Increase in drilling down pressure required to advance depth;
			Auger Refusal at 18'				
		20				295.50	
		25				290.50	
		30				285.50	

# Summary Of Laboratory Tests

**Green Ridge,  
Cumberland County Landfill**

**DAA# 18020117-030102**

**Prepared By: CBW Date: 6/11/2019**

## Sample Data

<u>Sample ID</u>	DAA-01	DAA-02	DAA-02	DAA-02	DAA-03	DAA-03	DAA-03	DAA-03
<u>Sample Depth</u>	6'-8'	16'-18'	24'-26'	38'-40'	6'-8'	10'-12'	20'-22'	28'-30'
<u>Sample Type</u>	Jar	Jar	Jar	Jar	Jar	Jar	Jar	Jar
<u>Visual Description</u>	Brown	Brownish-Gray	Gray	Light Yellowish-Brown	Light Brownish-Gray	Brown	Brownish-Gray	Light Brownish-Gray

## Classification Data

<u>Natural Moisture Content, %</u>	19.9%	21.4%	9.0%	7.3%	42.4%	45.7%	49.4%	53.3%
<u>Liquid Limit</u>	Np	53	Np	Np	63	65	69	73
<u>Plastic Limit</u>	Np	45	Np	Np	48	44	44	41
<u>Plastic Index</u>	Np	8	Np	Np	15	21	25	32
<u>Passing No. 200 Sieve, %</u>	23.7%	20.7%	18.8%	16.9%	77.3%	79.6%	85.6%	78.0%
<u>USCS Group Symbol</u>	SM	SM	SM	SM	MH	MH	MH	MH
<u>USCS Group Name</u>	Silty SAND	Silty SAND	Silty SAND	Silty SAND	Elastic SILT with Sand	Elastic SILT with Sand	Elastic SILT	Elastic SILT with Sand

## Standard Proctor Data

<u>Maximum Dry Density, pcf</u>	-	-	-	-	-	-	-	-
<u>Optimum Moisture Content, %</u>	-	-	-	-	-	-	-	-

## Permeability Data

<u>Compacted Dry Density, pcf</u>	-	-	-	-	-	-	-	-
<u>Percent Compaction, %</u>	-	-	-	-	-	-	-	-
<u>Compacted Moisture Content, %</u>	-	-	-	-	-	-	-	-
<u>Deviation from Optimum</u>	-	-	-	-	-	-	-	-
<u>Permeability, cm/sec</u>	-	-	-	-	-	-	-	-



# Summary Of Laboratory Tests

**Green Ridge,  
Cumberland County Landfill**

**DAA# 18020117-030102**

**Prepared By: CBW Date: 6/11/2019**

## **Sample Data**

<u>Sample ID</u>	DAA-03	DAA-03	DAA-04	DAA-04	DAA-04	DAA-04	DAA-04	DAA-04
<u>Sample Depth</u>	45'-47'	55'-57'	10'-12'	12'-14'	18'-20'	24'-26'	28'-30'	36'-38'
<u>Sample Type</u>	Jar	Jar	Jar	Jar	Jar	Jar	Jar	Jar
<u>Visual Description</u>	Brownish-Gray	Brown	Light Brownish-Gray	Light Red-Brown	Brown	Light Gray	Brown	Brown

## **Classification Data**

<u>Natural Moisture Content, %</u>	51.3%	43.3%	44.1%	32.8%	49.8%	36.3%	33.3%	26.2%
<u>Liquid Limit</u>	56	63	44	Np	52	Np	41	Np
<u>Plastic Limit</u>	34	35	33	Np	42	Np	34	Np
<u>Plastic Index</u>	22	28	11	Np	10	Np	7	Np
<u>Passing No. 200 Sieve, %</u>	74.4%	69.9%	42.6%	33.6%	45.3%	31.1%	37.6%	30.6%
<u>USCS Group Symbol</u>	MH	MH	SM	SM	SM	SM	SM	SM
<u>USCS Group Name</u>	Elastic SILT with Sand	Sandy Elastic SILT	Silty SAND	Silty SAND	Silty SAND	Silty SAND	Silty SAND	Silty SAND

## **Standard Proctor Data**

<u>Maximum Dry Density, pcf</u>	-	-	-	-	-	-	-	-
<u>Optimum Moisture Content, %</u>	-	-	-	-	-	-	-	-

## **Permeability Data**

<u>Compacted Dry Density, pcf</u>	-	-	-	-	-	-	-	-
<u>Percent Compaction, %</u>	-	-	-	-	-	-	-	-
<u>Compacted Moisture Content, %</u>	-	-	-	-	-	-	-	-
<u>Deviation from Optimum</u>	-	-	-	-	-	-	-	-
<u>Permeability, cm/sec</u>	-	-	-	-	-	-	-	-

# Summary Of Laboratory Tests

**Green Ridge,  
Cumberland County Landfill**

**DAA# 18020117-030102**

**Prepared By: CBW Date: 6/11/2019**

## **Sample Data**

<u>Sample ID</u>	DAA-05	DAA-05	DAA-06	DAA-07	DAA-07	DAA-07	DAA-08	DAA-08
<u>Sample Depth</u>	7'-9'	15'-17'	12'-14'	10'-12'	14'-16'	55'-57'	6'-8'	10'-11.5'
<u>Sample Type</u>	Jar	Jar	Jar	Jar	Jar	Jar	Jar	Shelby-Tube
<u>Visual Description</u>	Light Brownish-Gray	Light Red-Brown	Light Brown	Brownish-Gray	Brownish-Gray	Dark Red-brown	Reddish-Brown	Gray

## **Classification Data**

<u>Natural Moisture Content, %</u>	7.1%	7.4%	4.8%	29.1%	24.4%	52.3%	32.7%	41.6%
<u>Liquid Limit</u>	Np	Np	Np	56	40	59	53	Np
<u>Plastic Limit</u>	Np	Np	Np	34	28	44	48	Np
<u>Plastic Index</u>	Np	Np	Np	22	12	15	5	Np
<u>Passing No. 200 Sieve, %</u>	16.6%	18.4%	17.1%	31.1%	25.9%	54.7%	39.8%	27.9%
<u>USCS Group Symbol</u>	SM	SM	SM	SM	SM	SM	SM	SM
<u>USCS Group Name</u>	Silty SAND	Silty SAND	Silty SAND	Silty SAND	Silty SAND	Sandy Elastic SILT	Silty SAND	Silty SAND

## **Standard Proctor Data**

<u>Maximum Dry Density, pcf</u>	-	-	-	-	-	-	-	-
<u>Optimum Moisture Content, %</u>	-	-	-	-	-	-	-	-

## **Permeability Data**

<u>Compacted Dry Density, pcf</u>	-	-	-	-	-	-	-	-
<u>Percent Compaction, %</u>	-	-	-	-	-	-	-	-
<u>Compacted Moisture Content, %</u>	-	-	-	-	-	-	-	-
<u>Deviation from Optimum</u>	-	-	-	-	-	-	-	-
<u>Permeability, cm/sec</u>	-	-	-	-	-	-	-	-

# Summary Of Laboratory Tests

**Green Ridge,  
Cumberland County Landfill**

**DAA# 18020117-030102**

**Prepared By: CBW Date: 6/11/2019**

## Sample Data

<u>Sample ID</u>	DAA-08	DAA-08	DAA-09	DAA-09	DAA-10	DAA-10	DAA-12	DAA-13
<u>Sample Depth</u>	12'-14'	20'-22'	6'-8'	20'-22'	22'-24'	24'-26'	25'-27'	8'-10'
<u>Sample Type</u>	Jar	Jar	Jar	Jar	Jar	Jar	Jar	Jar
<u>Visual Description</u>	Brown	Brownish-Gray	Light Brown	Brownish-Gray	Brownish-Gray	Gray	Gray	Light Brown

## Classification Data

<u>Natural Moisture Content, %</u>	43.8%	28.0%	31.3%	12.4%	11.8%	11.6%	3.7%	21.1%
<u>Liquid Limit</u>	43	Np	57	Np	36	Np	Np	39
<u>Plastic Limit</u>	36	Np	44	Np	28	Np	Np	29
<u>Plastic Index</u>	7	Np	13	Np	8	Np	Np	10
<u>Passing No. 200 Sieve, %</u>	26.4%	22.9%	42.3%	16.4%	17.8%	29.5%	18.2%	30.6%
<u>USCS Group Symbol</u>	SM	SM	SM	SM	SM	SM	SM	SM
<u>USCS Group Name</u>	Silty SAND	Silty SAND	Silty SAND	Silty SAND	Silty SAND	Silty SAND	Silty SAND	Silty SAND

## Standard Proctor Data

<u>Maximum Dry Density, pcf</u>	-	-	-	-	-	-	-	-
<u>Optimum Moisture Content, %</u>	-	-	-	-	-	-	-	-

## Permeability Data

<u>Compacted Dry Density, pcf</u>	-	-	-	-	-	-	-	-
<u>Percent Compaction, %</u>	-	-	-	-	-	-	-	-
<u>Compacted Moisture Content, %</u>	-	-	-	-	-	-	-	-
<u>Deviation from Optimum</u>	-	-	-	-	-	-	-	-
<u>Permeability, cm/sec</u>	-	-	-	-	-	-	-	-

# Summary Of Laboratory Tests

**Green Ridge,  
Cumberland County Landfill**

**DAA# 18020117-030102**

**Prepared By: CBW Date: 6/11/2019**

<b>Sample Data</b>								
Sample ID	DAA-13	DAA-13	DAA-13	DAA-14	DAA-14	DAA-14	DAA-14	DAA-14
Sample Depth	14'-16'	26'-28'	28'-30'	6'-8'	10'-12'	14'-16'	24'-26'	26'-28'
Sample Type	Jar	Jar	Jar	Jar	Jar	Jar	Jar	Jar
Visual Description	Brown	Brownish-Gray	Light Brown	Reddish-Brown	Reddish-Brown	Reddish-Brown	Reddish-Brown	Light Brown
<b>Classification Data</b>								
Natural Moisture Content, %	12.6%	17.4%	15.1%	30.8%	36.7%	33.9%	38.4%	18.3%
Liquid Limit	34	Np	Np	66	72	66	55	Np
Plastic Limit	27	Np	Np	41	37	42	40	Np
Plastic Index	7	Np	Np	25	35	24	15	Np
Passing No. 200 Sieve, %	25.4%	17.5%	31.5%	54.4%	71.9%	51.5%	48.1%	26.4%
USCS Group Symbol	SM	SM	SM	MH	MH	MH	SM	SM
USCS Group Name	Silty SAND	Silty SAND	Silty SAND	Sandy Elastic SILT	Elastic SILT with Sand	Sandy Elastic SILT	Silty SAND	Silty SAND
<b>Standard Proctor Data</b>								
Maximum Dry Density, pcf	-	-	-	-	-	-	-	-
Optimum Moisture Content, %	-	-	-	-	-	-	-	-
<b>Permeability Data</b>								
Compacted Dry Density, pcf	-	-	-	-	-	-	-	-
Percent Compaction, %	-	-	-	-	-	-	-	-
Compacted Moisture Content, %	-	-	-	-	-	-	-	-
Deviation from Optimum	-	-	-	-	-	-	-	-
Permeability, cm/sec	-	-	-	-	-	-	-	-



# Summary Of Laboratory Tests

**Green Ridge,  
Cumberland County Landfill**

**DAA# 18020117-030102**

**Prepared By: CBW Date: 6/11/2019**

## **Sample Data**

<u>Sample ID</u>	DAA-14	DAA-17	DAA-17	DAA-18	DAA-19	DAA-20	DAA-21	DAA-22
<u>Sample Depth</u>	30'-32'	6'-8'	10'-12'	6'-8'	6'-8'	14'-16'	6'-8'	6'-8'
<u>Sample Type</u>	Jar	Jar	Jar	Jar	Jar	Jar	Jar	Jar
<u>Visual Description</u>	Light Red-Brown	Light Brown	Brownish-Gray	Light Brown	Brownish-Gray	Brownish-Gray	Light Brown	Light Brown

## **Classification Data**

<u>Natural Moisture Content, %</u>	13.8%	9.1%	8.6%	27.3%	17.6%	11.4%	14.8%	19.4%
<u>Liquid Limit</u>	Np	Np	41	Np	41	Np	38	Np
<u>Plastic Limit</u>	Np	Np	26	Np	26	Np	27	Np
<u>Plastic Index</u>	Np	Np	14	Np	15	Np	11	Np
<u>Passing No. 200 Sieve, %</u>	25.0%	27.8%	25.6%	23.1%	22.4%	26.7%	25.1%	29.8%
<u>USCS Group Symbol</u>	SM	SM	SM	SM	SM	SM	SM	SM
<u>USCS Group Name</u>	Silty SAND	Silty SAND	Silty SAND	Silty SAND	Silty SAND	Silty SAND	Silty SAND	Silty SAND

## **Standard Proctor Data**

<u>Maximum Dry Density, pcf</u>	-	-	-	-	-	-	-	-
<u>Optimum Moisture Content, %</u>	-	-	-	-	-	-	-	-

## **Permeability Data**

<u>Compacted Dry Density, pcf</u>	-	-	-	-	-	-	-	-
<u>Percent Compaction, %</u>	-	-	-	-	-	-	-	-
<u>Compacted Moisture Content, %</u>	-	-	-	-	-	-	-	-
<u>Deviation from Optimum</u>	-	-	-	-	-	-	-	-
<u>Permeability, cm/sec</u>	-	-	-	-	-	-	-	-

# Summary Of Laboratory Tests

**Green Ridge,  
Cumberland County Landfill**

**DAA# 18020117-030102**

**Prepared By: CBW Date: 6/11/2019**

<b>Sample Data</b>								
Sample ID	DAA-22	DAA-22	DAA-23	DAA-23	DAA-23	DAA-25	DAA-25	DAA-26
Sample Depth	10'-12	35'-37'	14'-16'	26'-28'	28'-29.5'	6'-8'	16'-18'	2'-4'
Sample Type	Jar	Jar	Jar	Jar	Shelby-Tube	Jar	Jar	Jar
Visual Description	Brown	Brownish-Gray	Reddish-Brown	Brownish-Gray	Gray	Light Brown	Light Brown	Light Red-Brown
<b>Classification Data</b>								
Natural Moisture Content, %	20.9%	8.1%	22.3%	16.7%	16.5%	39.4%	24.0%	41.5%
Liquid Limit	Np	Np	Np	Np	Np	61	62	79
Plastic Limit	Np	Np	Np	Np	Np	38	38	37
Plastic Index	Np	Np	Np	Np	Np	23	24	42
Passing No. 200 Sieve, %	13.5%	15.5%	30.0%	16.0%	18.9%	40.3%	31.9%	93.8%
USCS Group Symbol	SM	SM	SM	SM	SM	SM	SM	MH
USCS Group Name	Silty SAND	Silty SAND	Silty SAND	Silty SAND	Silty SAND	Silty SAND	Silty SAND	Elastic SILT
<b>Standard Proctor Data</b>								
Maximum Dry Density, pcf	-	-	-	-	-	-	-	-
Optimum Moisture Content, %	-	-	-	-	-	-	-	-
<b>Permeability Data</b>								
Compacted Dry Density, pcf	-	-	-	-	-	-	-	-
Percent Compaction, %	-	-	-	-	-	-	-	-
Compacted Moisture Content, %	-	-	-	-	-	-	-	-
Deviation from Optimum	-	-	-	-	-	-	-	-
Permeability, cm/sec	-	-	-	-	-	-	-	-

# Summary Of Laboratory Tests

**Green Ridge,  
Cumberland County Landfill**

**DAA# 18020117-030102**

**Prepared By: CBW Date: 6/11/2019**

<b>Sample Data</b>								
Sample ID	DAA-26	DAA-26	DAA-26	DAA-26	DAA-26	DAA-26	DAA-26	DAA-26
Sample Depth	4'-6'	8'-10'	18'-20'	20'-22'	22'-24'	24'-26'	28'-30'	34'-36'
Sample Type	Jar	Jar	Jar	Jar	Jar	Jar	Jar	Jar
Visual Description	Light Brown	Light Brown	Light Brown	Light Brown	Light Brown	Light Brown	Light Brown	Light Brown
<b>Classification Data</b>								
Natural Moisture Content, %	36.3%	36.1%	46.0%	58.8%	59.4%	60.2%	52.0%	26.3%
Liquid Limit	61	Np	64	67	62	69	51	54
Plastic Limit	38	Np	52	55	46	53	37	42
Plastic Index	23	Np	12	12	16	16	14	12
Passing No. 200 Sieve, %	86.8%	79.7%	70.3%	88.3%	80.9%	87.3%	61.8%	32.0%
USCS Group Symbol	MH	ML	MH	MH	MH	MH	MH	SM
USCS Group Name	Elastic SILT	SILT with Sand	Elastic SILT with Sand	Elastic SILT	Elastic SILT with Sand	Elastic SILT	Sandy Elastic SILT	Silty SAND
<b>Standard Proctor Data</b>								
Maximum Dry Density, pcf	-	-	-	-	-	-	-	-
Optimum Moisture Content, %	-	-	-	-	-	-	-	-
<b>Permeability Data</b>								
Compacted Dry Density, pcf	-	-	-	-	-	-	-	-
Percent Compaction, %	-	-	-	-	-	-	-	-
Compacted Moisture Content, %	-	-	-	-	-	-	-	-
Deviation from Optimum	-	-	-	-	-	-	-	-
Permeability, cm/sec	-	-	-	-	-	-	-	-

# Summary Of Laboratory Tests

**Green Ridge,  
Cumberland County Landfill**

**DAA# 18020117-030102**

**Prepared By: CBW Date: 6/11/2019**

<b>Sample Data</b>								
Sample ID	DAA-27	DAA-27	DAA-27	DAA-28	DAA-28	DAA-28	DAA-28	DAA-28
Sample Depth	2'-4'	14'-16'	16'-18'	2'-4'	4'-6'	10'-12'	28'-30'	34'-36'
Sample Type	Jar	Jar	Jar	Jar	Jar	Jar	Jar	Jar
Visual Description	Light Brown	Light Brownish-Gray	Light Gray	Dark Brown	Light Red-Brown	Light Brown	Brownish-Gray	Brown
<b>Classification Data</b>								
Natural Moisture Content, %	7.4%	12.2%	7.5%	24.7%	21.5%	16.1%	9.3%	18.5%
Liquid Limit	Np	Np	Np	38	52	39	Np	Np
Plastic Limit	Np	Np	Np	22	29	29	Np	Np
Plastic Index	Np	Np	Np	16	23	10	Np	Np
Passing No. 200 Sieve, %	23.2%	35.4%	25.9%	42.7%	33.4%	30.4%	19.1%	22.1%
USCS Group Symbol	SM	SM	SM	SC	SM	SM	SM	SM
USCS Group Name	Silty SAND	Silty SAND	Silty SAND	Clayey SAND	Silty SAND	Silty SAND	Silty SAND	Silty SAND
<b>Standard Proctor Data</b>								
Maximum Dry Density, pcf	-	-	-	-	-	-	-	-
Optimum Moisture Content, %	-	-	-	-	-	-	-	-
<b>Permeability Data</b>								
Compacted Dry Density, pcf	-	-	-	-	-	-	-	-
Percent Compaction, %	-	-	-	-	-	-	-	-
Compacted Moisture Content, %	-	-	-	-	-	-	-	-
Deviation from Optimum	-	-	-	-	-	-	-	-
Permeability, cm/sec	-	-	-	-	-	-	-	-



# Summary Of Laboratory Tests

**Green Ridge,  
Cumberland County Landfill**

**DAA# 18020117-030102**

**Prepared By: CBW Date: 6/11/2019**

<b>Sample Data</b>								
Sample ID	DAA-29	DAA-29	DAA-29	DAA-29	DAA-33	DAA-33	DAA-33	DAA-33
Sample Depth	2'-4'	6'-8'	12'-14'	24'-26'	2'-4'	4'-6'	6'-8'	8'-10'
Sample Type	Jar	Jar	Jar	Jar	Jar	Jar	Jar	Jar
Visual Description	Light Brown	Brown	Brown	Reddish-Brown	Red	Light Red-Brown	Light Brown	Light Gray
<b>Classification Data</b>								
Natural Moisture Content, %	19.4%	30.8%	36.6%	30.0%	27.7%	27.3%	21.9%	13.0%
Liquid Limit	48	63	53	51	64	60	Np	32
Plastic Limit	24	34	41	35	38	33	Np	21
Plastic Index	24	29	12	16	26	27	Np	11
Passing No. 200 Sieve, %	28.8%	23.0%	23.8%	37.4%	36.0%	29.2%	20.2%	40.9%
USCS Group Symbol	SC	SM	SM	SM	SM	SM	SM	SC
USCS Group Name	Clayey SAND	Silty SAND with Gravel	Silty SAND	Silty SAND	Silty SAND	Silty SAND	Silty SAND	Clayey SAND
<b>Standard Proctor Data</b>								
Maximum Dry Density, pcf	-	-	-	-	-	-	-	-
Optimum Moisture Content, %	-	-	-	-	-	-	-	-
<b>Permeability Data</b>								
Compacted Dry Density, pcf	-	-	-	-	-	-	-	-
Percent Compaction, %	-	-	-	-	-	-	-	-
Compacted Moisture Content, %	-	-	-	-	-	-	-	-
Deviation from Optimum	-	-	-	-	-	-	-	-
Permeability, cm/sec	-	-	-	-	-	-	-	-

# Summary Of Laboratory Tests

**Green Ridge,  
Cumberland County Landfill**

**DAA# 18020117-030102**

**Prepared By: CBW Date: 6/11/2019**

<b>Sample Data</b>								
Sample ID	DAA-33	DAA-33	DAA-34	DAA-34	DAA-34	DAA-35	DAA-35	DAA-35
Sample Depth	10'-12'	12'-14'	2'-4'	6'-8'	20'-22'	2'-4'	4'-6'	6'-8'
Sample Type	Jar	Jar	Jar	Jar	Jar	Jar	Jar	Jar
Visual Description	Light Gray	Light Red-Brown	Reddish-Brown	Light Brown	Light Brown	Red	Red	Reddish-Brown
<b>Classification Data</b>								
Natural Moisture Content, %	12.7%	8.5%	26.8%	10.1%	19.2%	20.9%	39.2%	30.1%
Liquid Limit	35	Np	65	35	Np	46	65	50
Plastic Limit	18	Np	20	19	Np	23	30	39
Plastic Index	17	Np	45	16	Np	23	35	11
Passing No. 200 Sieve, %	31.7%	20.5%	49.0%	17.4%	28.9%	57.7%	41.4%	39.4%
USCS Group Symbol	SC	SM	SC	SC	SM	CL	SC	SM
USCS Group Name	Clayey SAND	Silty SAND	Clayey SAND	Clayey SAND	Silty SAND	Sandy Lean CLAY	Clayey SAND	Silty SAND
<b>Standard Proctor Data</b>								
Maximum Dry Density, pcf	-	-	-	-	-	-	-	-
Optimum Moisture Content, %	-	-	-	-	-	-	-	-
<b>Permeability Data</b>								
Compacted Dry Density, pcf	-	-	-	-	-	-	-	-
Percent Compaction, %	-	-	-	-	-	-	-	-
Compacted Moisture Content, %	-	-	-	-	-	-	-	-
Deviation from Optimum	-	-	-	-	-	-	-	-
Permeability, cm/sec	-	-	-	-	-	-	-	-

# Summary Of Laboratory Tests

**Green Ridge,  
Cumberland County Landfill**

**DAA# 18020117-030102**

**Prepared By: CBW Date: 6/11/2019**

<b>Sample Data</b>								
Sample ID	DAA-36	DAA-36	DAA-36	DAA-36	DAA-37	DAA-40	DAA-40	DAA-40
Sample Depth	4'-6'	6'-8'	22'-24'	35'-37'	4'-6'	5'	10'	15'
Sample Type	Jar	Jar	Jar	Jar	Jar	Cuttings	Cuttings	Cuttings
Visual Description	Reddish-Brown	Light Brown	Light Brown	Light Red-Brown	Red	Reddish-Brown	Reddish-Brown	Brown
<b>Classification Data</b>								
Natural Moisture Content, %	35.4%	38.3%	31.9%	24.1%	25.8%	28.4%	19.9%	24.9%
Liquid Limit	69	54	43	41	52	54	42	63
Plastic Limit	52	34	29	30	33	35	32	34
Plastic Index	17	20	14	11	19	19	10	29
Passing No. 200 Sieve, %	40.7%	48.3%	27.2%	31.7%	46.0%	50.4%	40.9%	44.8%
USCS Group Symbol	SM	SM	SM	SM	SM	MH	SM	SM
USCS Group Name	Silty SAND	Silty SAND	Silty SAND	Silty SAND	Silty SAND	Sandy Elastic SILT	Silty SAND	Silty SAND
<b>Standard Proctor Data</b>								
Maximum Dry Density, pcf	-	-	-	-	-	-	-	-
Optimum Moisture Content, %	-	-	-	-	-	-	-	-
<b>Permeability Data</b>								
Compacted Dry Density, pcf	-	-	-	-	-	-	-	-
Percent Compaction, %	-	-	-	-	-	-	-	-
Compacted Moisture Content, %	-	-	-	-	-	-	-	-
Deviation from Optimum	-	-	-	-	-	-	-	-
Permeability, cm/sec	-	-	-	-	-	-	-	-

# Summary Of Laboratory Tests

**Green Ridge,  
Cumberland County Landfill**

**DAA# 18020117-030102**

**Prepared By: CBW Date: 6/11/2019**

<b>Sample Data</b>							
Sample ID	DAA-40	East	East	West	West		
Sample Depth	25'	0'-2.5'	2.5'-5.0'	0'-2.5'	2.5'-5.0'		
Sample Type	Cuttings	Bulk	Bulk	Bulk	Bulk		
Visual Description	Brown	Brown	Light Brown	Brown	Brown		
<b>Classification Data</b>							
Natural Moisture Content, %	11.9%	9.4%	5.9%	18.4%	17.0%		
Liquid Limit	Np	33	34	55	54		
Plastic Limit	Np	20	20	22	22		
Plastic Index	Np	13	14	33	32		
Passing No. 200 Sieve, %	35.9%	33.9%	30.1%	46.9%	58.4%		
USCS Group Symbol	SM	SC	SC	SC	CH		
USCS Group Name	Silty SAND	Clayey SAND	Clayey SAND	Clayey SAND	Sandy Fat CLAY		
<b>Standard Proctor Data</b>							
Maximum Dry Density, pcf	-	113.7	108.8	101.2	103.2		
Optimum Moisture Content, %	-	13.6%	16.7%	18.0%	20.1%		
<b>Permeability Data</b>							
Compacted Dry Density, pcf	-	110.6	105.8	98.1	99.5		
Percent Compaction, %	-	97.3%	97.2%	96.9%	96.4%		
Compacted Moisture Content, %	-	14.3%	17.5%	20.3%	21.3%		
Deviation from Optimum	-	0.7%	0.8%	2.3%	1.2%		
Permeability, cm/sec	-	1.10E-07	1.00E-07	7.60E-08	7.10E-08		



## Soil Classification Calculations

Green Ridge, Cumberland Landfill

DAA# 18020117-030102

Prepared By: CBW



1030 Wilmer Ave., Ste. 100

Richmond, VA 23227

Army Corps of Engineers Certified Laboratory

Sample ID DAA-01

Sample Depth 6'-8'

Visual Sample Description Brown Silty SAND

Sample Received: 3/19/2019

Date Tested: 3/19/2019

### Natural Moisture Content: ASTM D 2216

Pan ID	41
Pan Wt	194.41 grams
Pan + Soil (wet)	301.24 grams
Pan + Soil (dry)	283.50 grams
Natural Moisture Content	19.9%

### Coarse or Fine Grained: ASTM D 422

Pan + Soil retained on No. 200 sieve	
(dry)	262.40 grams
Percent Passing No. 200 Sieve	23.7%
Pan + Soil retained on No. 4 sieve	
(dry)	194.41 grams
Percent Passing No. 4 Sieve	100.0%

Soil Classifies as Coarse-Grained Soil

### Atterberg Limits: ASTM D 4318

Date Tested: 4/15/2019

#### Liquid Limit

No of Blows			
Pan ID		Non-plastic	
Pan Wt			
Pan + Soil (wet)			
Pan + Soil (dry)			
Moisture Content			

Liquid Limit

Liquid Limit

#### Plastic Limit

Pan ID		
Pan Weight	Non-plastic	
Pan + Soil (wet)		
Pan + Soil (dry)		
Moisture Content		

Plastic Limit

Plastic Index

### USCS Classification: ASTM D 2487

Group Symbol **SM**

Group Name **Silty SAND**

## Grain Size Distribution Calculations

Green Ridge, Cumberland Landfill

DAA# 18020117-030102

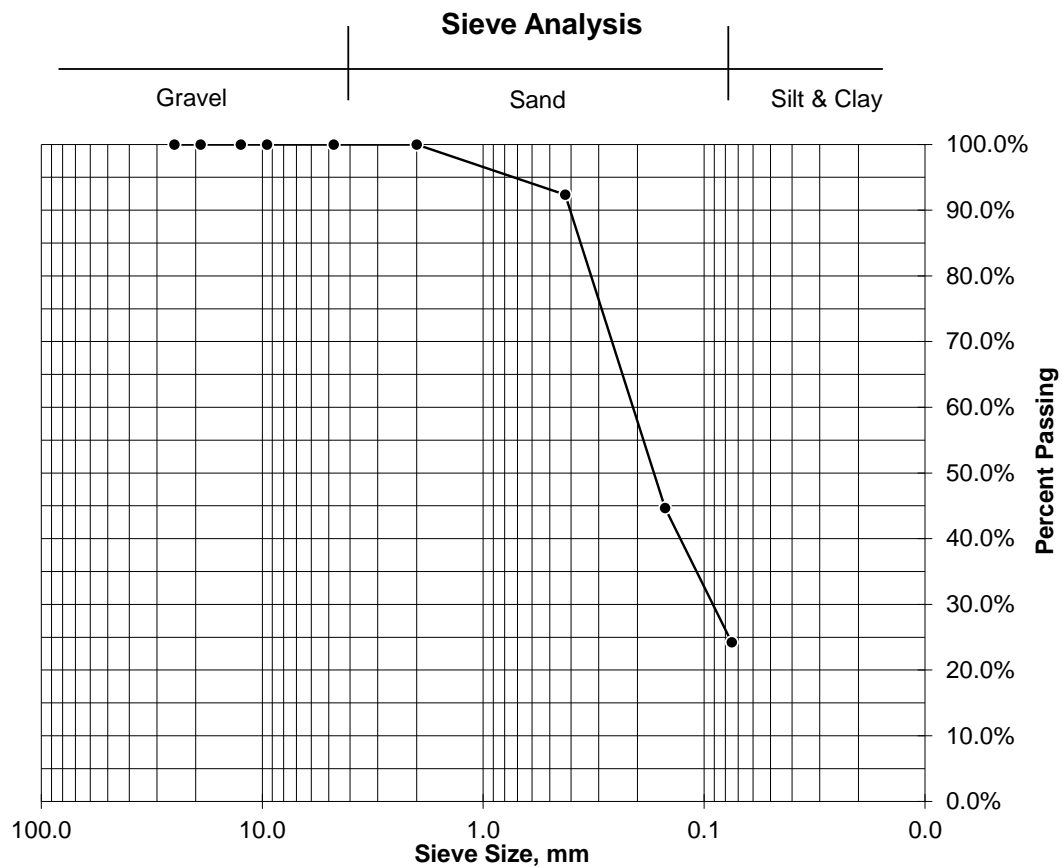
Prepared By: CBW

Sample ID DAA-01

Sample Depth 6'-8'

### Mechanical Sieve Analysis: ASTM D 422

Sieve Size	Weight Retained	Percent Retained	Sieve Size, mm	Percent Passing
1"	0.00	0.0%	25.0	100.0%
3/4"	0.00	0.0%	19.0	100.0%
1/2"	0.00	0.0%	12.5	100.0%
3/8"	0.00	0.0%	9.50	100.0%
No. 4	0.00	0.0%	4.75	100.0%
No. 10	0.00	0.0%	2.00	100.0%
No. 40	6.79	7.6%	0.425	92.4%
No. 100	42.51	47.7%	0.15	44.7%
No. 200	18.21	20.4%	0.075	24.2%
Pan	0.45	0.5%		
Total	67.96	76.3%		



## Soil Classification Calculations

Green Ridge, Cumberland Landfill

DAA# 18020117-030102

Prepared By: CBW



1030 Wilmer Ave., Ste. 100

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Army Corps of Engineers Certified Laboratory

Sample ID DAA-02

Sample Depth 16'-18'

Visual Sample Description Micaceous Brownish-Gray Silty SAND

Sample Received: 3/19/2019

Date Tested: 3/19/2019

### Natural Moisture Content: ASTM D 2216

Pan ID	21
Pan Wt	193.80 grams
Pan + Soil (wet)	296.90 grams
Pan + Soil (dry)	278.75 grams
Natural Moisture Content	21.4%

### Coarse or Fine Grained: ASTM D 422

Pan + Soil retained on No. 200 sieve

(dry) 261.20 grams

Percent Passing No. 200 Sieve 20.7%

Pan + Soil retained on No. 4 sieve

(dry) 193.80 grams

Percent Passing No. 4 Sieve 100.0%

Soil Classifies as Coarse-Grained Soil

### Atterberg Limits: ASTM D 4318

Date Tested: 3/22/2019

#### Liquid Limit

No of Blows	15	22	34
Pan ID	97	103	104
Pan Wt	26.10	27.43	26.26
Pan + Soil (wet)	44.31	45.25	40.90
Pan + Soil (dry)	37.59	39.04	36.08
Moisture Content	58.5%	53.5%	49.1%
Liquid Limit	55	53	51
Liquid Limit	53		

#### Plastic Limit

Pan ID	315	356
Pan Weight	9.14	9.09
Pan + Soil (wet)	21.79	23.44
Pan + Soil (dry)	17.89	19.00
Moisture Content	44.6%	44.8%
Plastic Limit	45	
Plastic Index	8	

### USCS Classification: ASTM D 2487

Group Symbol **SM**

Group Name **Silty SAND**

## Grain Size Distribution Calculations

Green Ridge, Cumberland Landfill

DAA# 18020117-030102

Prepared By: CBW

Sample ID DAA-02

Sample Depth 16'-18'

### Mechanical Sieve Analysis: ASTM D 422

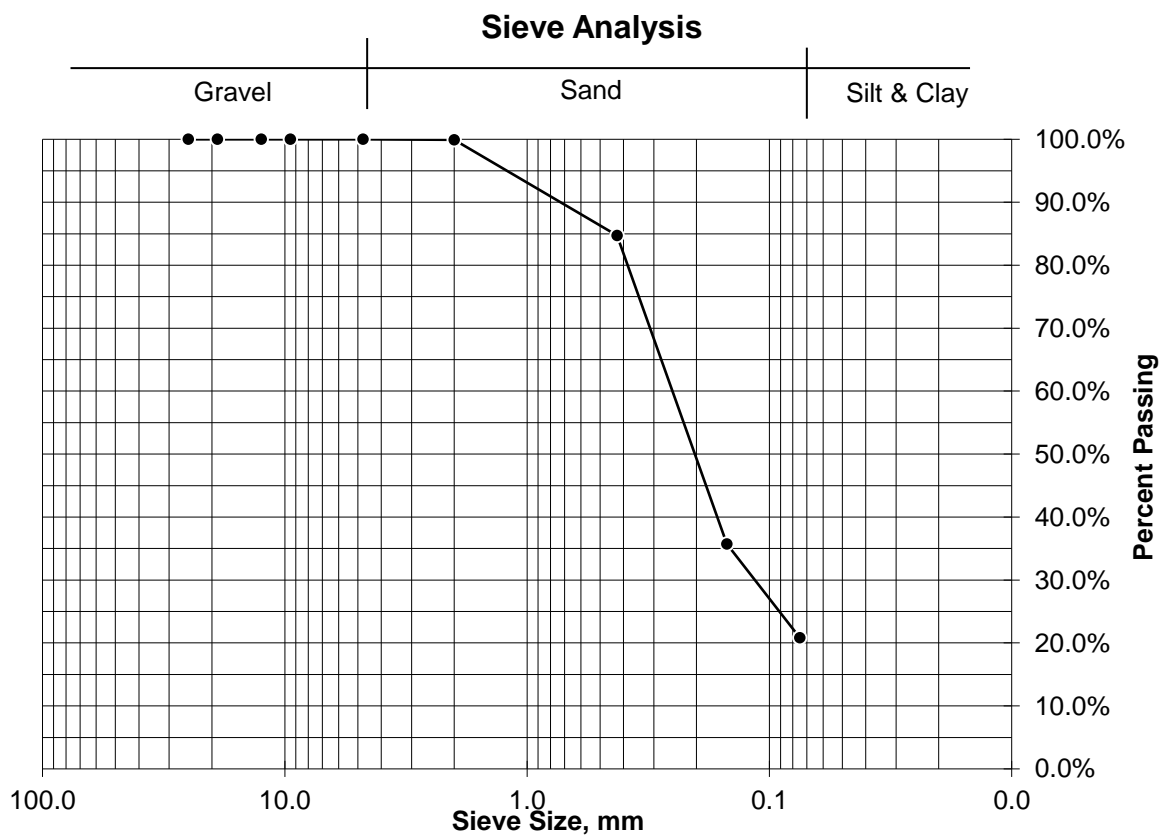


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Sieve Size	Weight Retained	Percent Retained	Sieve Size, mm	Percent Passing
1"	0.00	0.0%	25.0	100.0%
3/4"	0.00	0.0%	19.0	100.0%
1/2"	0.00	0.0%	12.5	100.0%
3/8"	0.00	0.0%	9.50	100.0%
No. 4	0.00	0.0%	4.75	100.0%
No. 10	0.07	0.1%	2.00	99.9%
No. 40	12.92	15.2%	0.425	84.7%
No. 100	41.59	49.0%	0.15	35.8%
No. 200	12.65	14.9%	0.075	20.9%
Pan	0.16	0.2%		
Total	67.39	79.3%		





## Soil Classification Calculations

Green Ridge, Cumberland Landfill

DAA# 18020117-030102

Prepared By: CBW



1030 Wilmer Ave., Ste. 100

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Sample ID DAA-02

Sample Depth 24'-26'

Visual Sample Description Gray Silty SAND

Sample Received: 3/19/2019

Date Tested: 3/22/2019

### Natural Moisture Content: ASTM D 2216

Pan ID	124
Pan Wt	124.38 grams
Pan + Soil (wet)	229.97 grams
Pan + Soil (dry)	221.28 grams
Natural Moisture Content	9.0%

### Coarse or Fine Grained: ASTM D 422

Pan + Soil retained on No. 200 sieve

(dry) 203.04 grams

Percent Passing No. 200 Sieve 18.8%

Pan + Soil retained on No. 4 sieve

(dry) 124.38 grams

Percent Passing No. 4 Sieve 100.0%

Soil Classifies as Coarse-Grained Soil

### Atterberg Limits: ASTM D 4318

Date Tested: 3/22/2019

#### Liquid Limit

No of Blows			
Pan ID		Non-plastic	
Pan Wt			
Pan + Soil (wet)			
Pan + Soil (dry)			
Moisture Content			
Liquid Limit			
Liquid Limit			

#### Plastic Limit

Pan ID		
Pan Weight	Non-plastic	
Pan + Soil (wet)		
Pan + Soil (dry)		
Moisture Content		
Plastic Limit		
Plastic Index		

### USCS Classification: ASTM D 2487

Group Symbol **SM**

Group Name **Silty SAND**

## Grain Size Distribution Calculations

Green Ridge, Cumberland Landfill

DAA# 18020117-030102

Prepared By: CBW

Sample ID DAA-02

Sample Depth 24'-26'

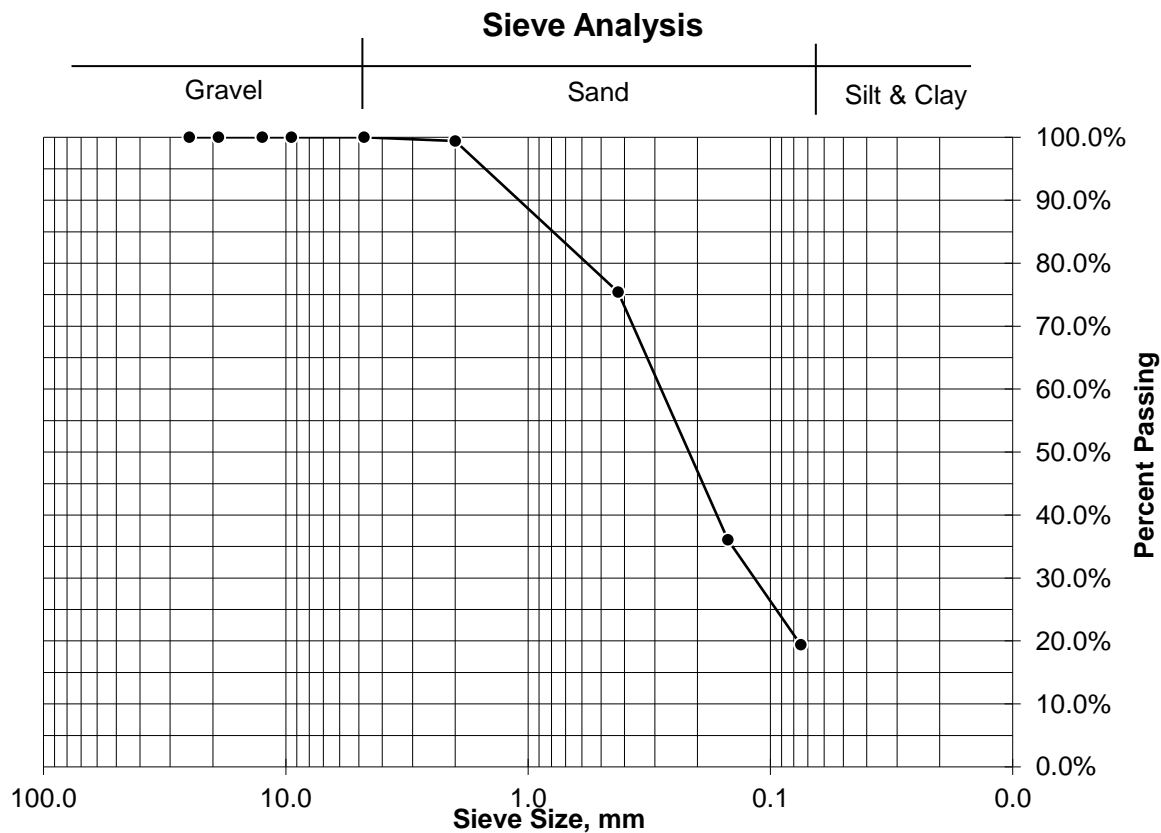
### Mechanical Sieve Analysis: ASTM D 422



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Sieve Size	Weight Retained	Percent Retained	Sieve Size, mm	Percent Passing
1"	0.00	0.0%	25.0	100.0%
3/4"	0.00	0.0%	19.0	100.0%
1/2"	0.00	0.0%	12.5	100.0%
3/8"	0.00	0.0%	9.50	100.0%
No. 4	0.00	0.0%	4.75	100.0%
No. 10	0.56	0.6%	2.00	99.4%
No. 40	23.25	24.0%	0.425	75.4%
No. 100	38.15	39.4%	0.15	36.1%
No. 200	16.14	16.7%	0.075	19.4%
Pan	0.54	0.6%		
Total	78.64	81.2%		



## Soil Classification Calculations

Green Ridge, Cumberland Landfill

DAA# 18020117-030102

Prepared By: CBW



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Sample ID DAA-02

Sample Depth 38'-40'

Visual Sample Description Light Yellowish-Brown Silty SAND

Sample Received: 3/19/2019

Date Tested: 3/19/2019

### Natural Moisture Content: ASTM D 2216

Pan ID	19
Pan Wt	188.60 grams
Pan + Soil (wet)	289.46 grams
Pan + Soil (dry)	282.64 grams
Natural Moisture Content	7.3%

### Coarse or Fine Grained: ASTM D 422

Pan + Soil retained on No. 200 sieve

(dry) 266.73 grams

Percent Passing No. 200 Sieve 16.9%

Pan + Soil retained on No. 4 sieve

(dry) 188.60 grams

Percent Passing No. 4 Sieve 100.0%

Soil Classifies as Coarse-Grained Soil

### Atterberg Limits: ASTM D 4318

Date Tested: 3/22/2019

#### Liquid Limit

No of Blows			
Pan ID		Non-plastic	
Pan Wt			
Pan + Soil (wet)			
Pan + Soil (dry)			
Moisture Content			
Liquid Limit			
Liquid Limit			

#### Plastic Limit

Pan ID		
Pan Weight	Non-plastic	
Pan + Soil (wet)		
Pan + Soil (dry)		
Moisture Content		
Plastic Limit		
Plastic Index		

### USCS Classification: ASTM D 2487

Group Symbol **SM**

Group Name **Silty SAND**

# Grain Size Distribution Calculations

Green Ridge, Cumberland Landfill

DAA# 18020117-030102

Prepared By: CBW

Sample ID DAA-02

Sample Depth 38'-40'

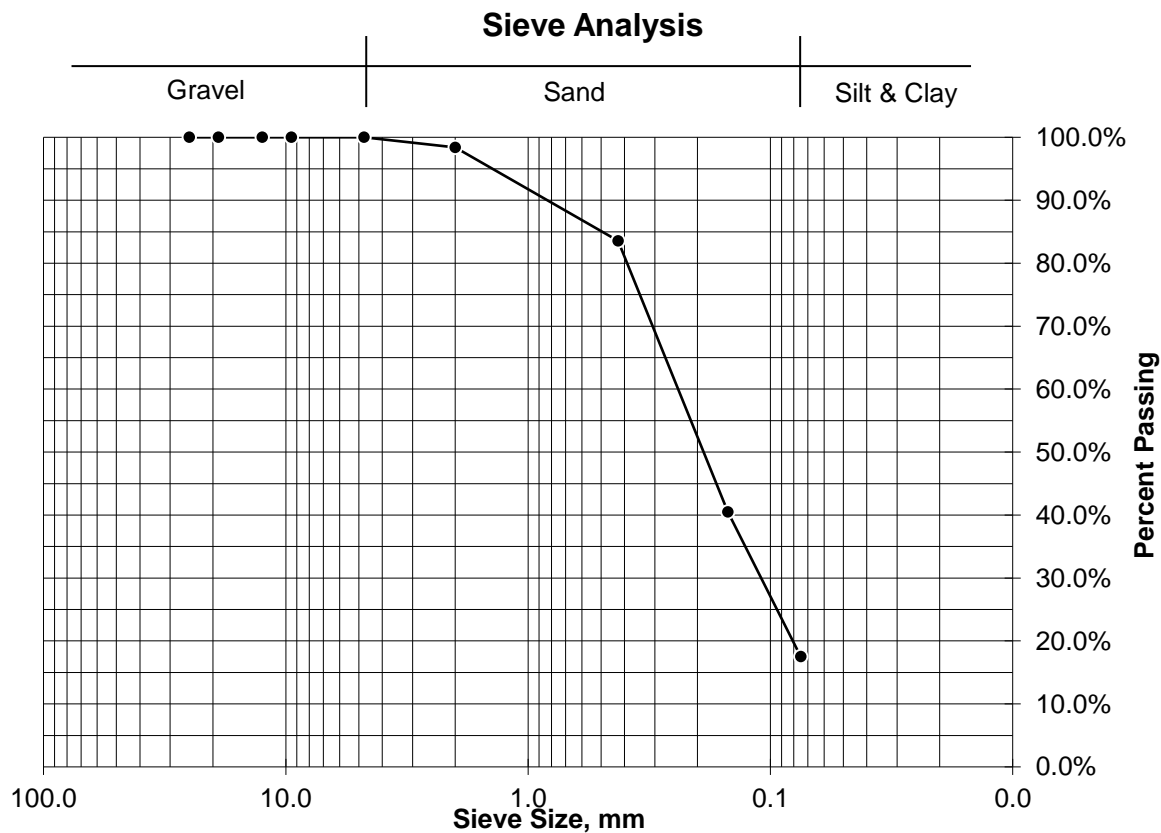
## Mechanical Sieve Analysis: ASTM D 422



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Sieve Size	Weight Retained	Percent Retained	Sieve Size, mm	Percent Passing
1"	0.00	0.0%	25.0	100.0%
3/4"	0.00	0.0%	19.0	100.0%
1/2"	0.00	0.0%	12.5	100.0%
3/8"	0.00	0.0%	9.50	100.0%
No. 4	0.00	0.0%	4.75	100.0%
No. 10	1.53	1.6%	2.00	98.4%
No. 40	13.93	14.8%	0.425	83.6%
No. 100	40.48	43.0%	0.15	40.5%
No. 200	21.61	23.0%	0.075	17.5%
Pan	0.58	0.6%		
Total	78.13	83.1%		





## Soil Classification Calculations

Green Ridge, Cumberland Landfill

DAA# 18020117-030102

Prepared By: CBW



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Sample ID DAA-03

Sample Received: 3/19/2019

Sample Depth 6'-8'

Date Tested: 3/19/2019

Visual Sample Description Light Brownish-Gray Elastic SILT with Sand

### Natural Moisture Content: ASTM D 2216

Pan ID 4  
Pan Wt 194.44 grams  
Pan + Soil (wet) 298.58 grams  
Pan + Soil (dry) 267.58 grams  
Natural Moisture Content 42.4%

### Coarse or Fine Grained: ASTM D 422

Pan + Soil retained on No. 200 sieve

(dry) 211.04 grams

Percent Passing No. 200 Sieve 77.3%

Pan + Soil retained on No. 4 sieve

(dry) 194.44 grams

Percent Passing No. 4 Sieve 100.0%

Soil Classifies as Fine-Grained Soil

### Atterberg Limits: ASTM D 4318

Date Tested: 3/21/2019

#### Liquid Limit

No of Blows	15	24	34
Pan ID	94	108	95
Pan Wt	23.78	33.07	24.41
Pan + Soil (wet)	37.72	50.20	42.96
Pan + Soil (dry)	32.02	43.53	36.08
Moisture Content	69.1%	63.8%	59.0%
Liquid Limit	65	63	61
Liquid Limit	63		

#### Plastic Limit

Pan ID	0	1138
Pan Weight	6.07	6.15
Pan + Soil (wet)	20.20	18.53
Pan + Soil (dry)	15.56	14.52
Moisture Content	48.9%	47.9%
Plastic Limit	48	
Plastic Index	15	

### USCS Classification: ASTM D 2487

Group Symbol MH

Group Name Elastic SILT with Sand

# Grain Size Distribution Calculations

Green Ridge, Cumberland Landfill

DAA# 18020117-030102

Prepared By: CBW

Sample ID DAA-03

Sample Depth 6'-8'

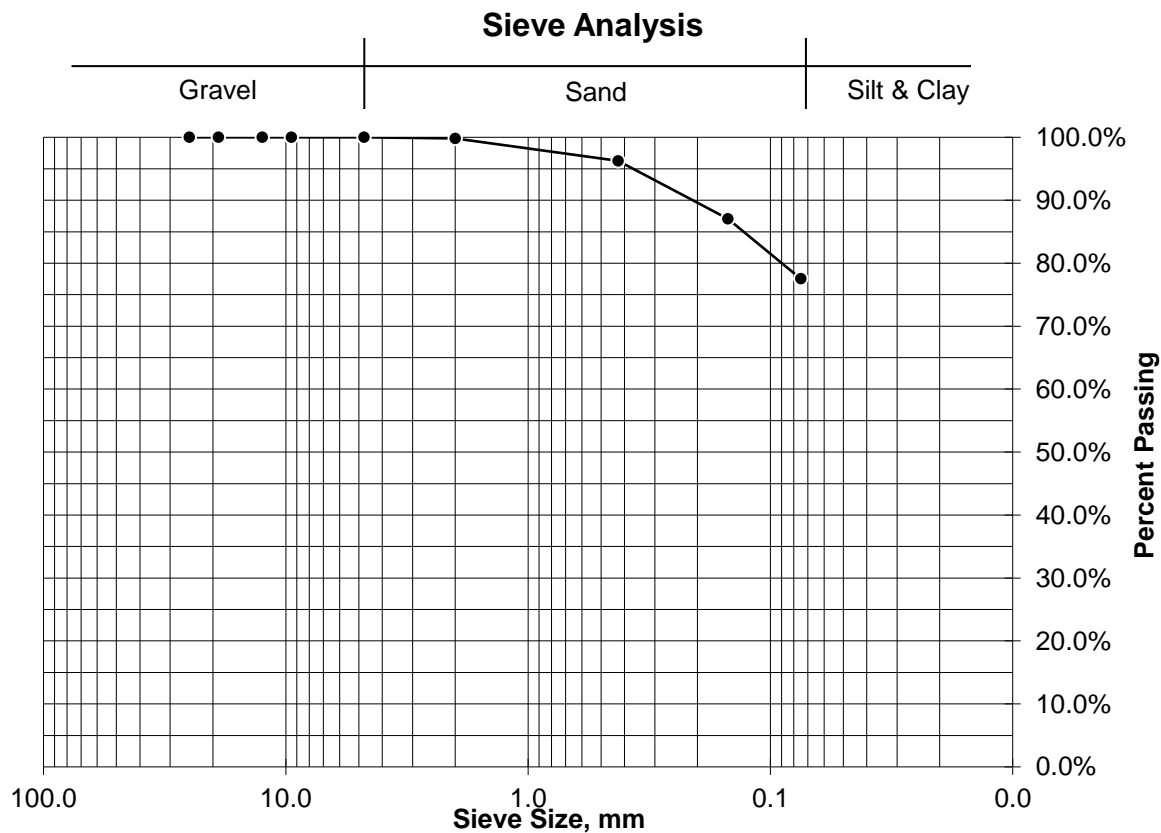
## Mechanical Sieve Analysis: ASTM D 422



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Sieve Size	Weight Retained	Percent Retained	Sieve Size, mm	Percent Passing
1"	0.00	0.0%	25.0	100.0%
3/4"	0.00	0.0%	19.0	100.0%
1/2"	0.00	0.0%	12.5	100.0%
3/8"	0.00	0.0%	9.50	100.0%
No. 4	0.00	0.0%	4.75	100.0%
No. 10	0.15	0.2%	2.00	99.8%
No. 40	2.57	3.5%	0.425	96.3%
No. 100	6.74	9.2%	0.15	87.1%
No. 200	6.97	9.5%	0.075	77.5%
Pan	0.15	0.2%		
Total	16.58	22.7%		



## Soil Classification Calculations

Green Ridge, Cumberland Landfill

DAA# 18020117-030102

Prepared By: CBW



1030 Wilmer Ave., Ste. 100

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Sample ID DAA-03

Sample Depth 10'-12'

Visual Sample Description Brown Elastic SILT with Sand

Sample Received: 3/19/2019

Date Tested: 3/19/2019

### Natural Moisture Content: ASTM D 2216

Pan ID	11
Pan Wt	187.42 grams
Pan + Soil (wet)	298.94 grams
Pan + Soil (dry)	263.95 grams
Natural Moisture Content	45.7%

### Coarse or Fine Grained: ASTM D 422

Pan + Soil retained on No. 200 sieve

(dry) 203.07 grams

Percent Passing No. 200 Sieve 79.6%

Pan + Soil retained on No. 4 sieve

(dry) 187.42 grams

Percent Passing No. 4 Sieve 100.0%

Soil Classifies as Fine-Grained Soil

### Atterberg Limits: ASTM D 4318

Date Tested: 3/21/2019

#### Liquid Limit

No of Blows	19	22	33
Pan ID	96	101	169
Pan Wt	24.80	23.95	27.10
Pan + Soil (wet)	43.27	42.52	46.41
Pan + Soil (dry)	35.71	35.12	39.08
Moisture Content	69.3%	66.2%	61.1%
Liquid Limit	67	65	63
Liquid Limit	65		

#### Plastic Limit

Pan ID	318	78
Pan Weight	6.17	4.22
Pan + Soil (wet)	18.93	14.41
Pan + Soil (dry)	15.02	11.29
Moisture Content	44.2%	44.1%
Plastic Limit	44	
Plastic Index	21	

### USCS Classification: ASTM D 2487

Group Symbol MH

Group Name Elastic SILT with Sand

# Grain Size Distribution Calculations

Green Ridge, Cumberland Landfill

DAA# 18020117-030102

Prepared By: CBW



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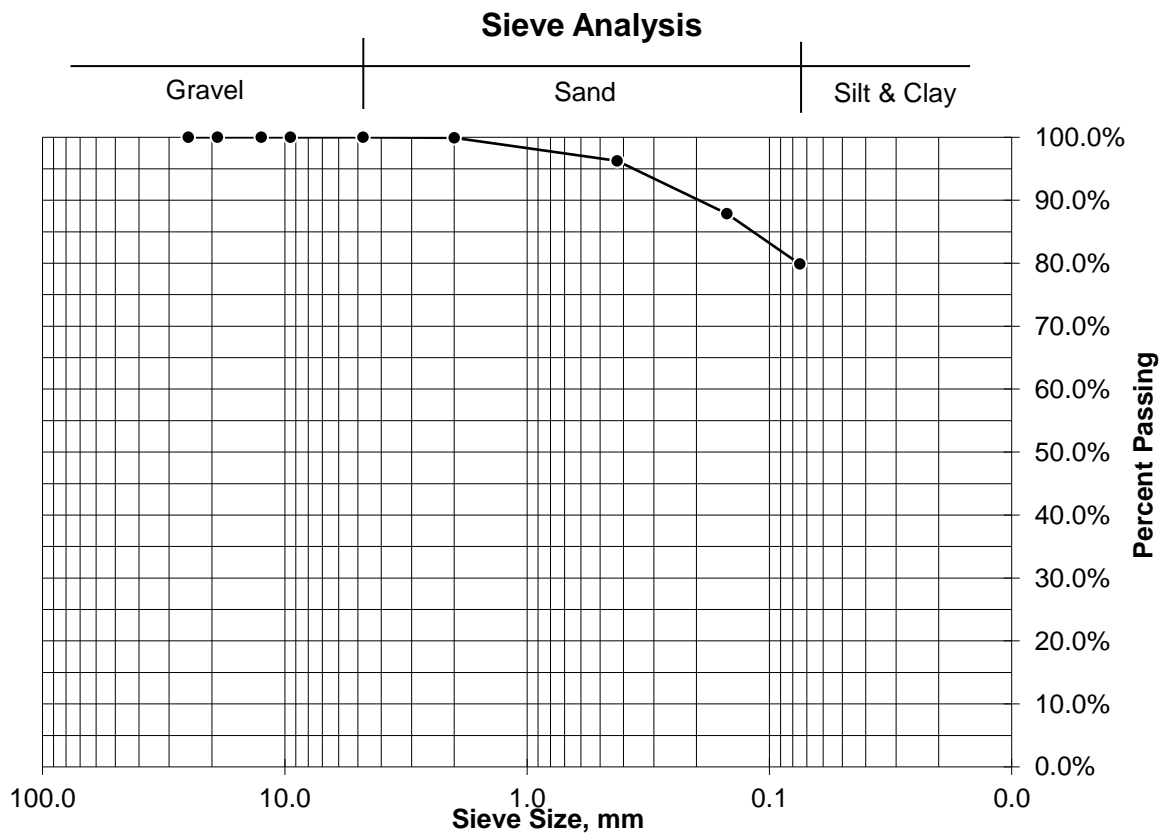
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Sample ID DAA-03

Sample Depth 10'-12'

## Mechanical Sieve Analysis: ASTM D 422

Sieve Size	Weight Retained	Percent Retained	Sieve Size, mm	Percent Passing
1"	0.00	0.0%	25.0	100.0%
3/4"	0.00	0.0%	19.0	100.0%
1/2"	0.00	0.0%	12.5	100.0%
3/8"	0.00	0.0%	9.50	100.0%
No. 4	0.00	0.0%	4.75	100.0%
No. 10	0.06	0.1%	2.00	99.9%
No. 40	2.79	3.6%	0.425	96.3%
No. 100	6.42	8.4%	0.15	87.9%
No. 200	6.13	8.0%	0.075	79.9%
Pan	0.25	0.3%		
Total	15.65	20.4%		





## Soil Classification Calculations

Green Ridge, Cumberland Landfill

DAA# 18020117-030102

Prepared By: CBW



1030 Wilmer Ave., Ste. 100

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Sample ID DAA-03

Sample Depth 20'-22'

Visual Sample Description Brownish-Gray Elastic SILT

Sample Received: 3/19/2019

Date Tested: 3/19/2019

### Natural Moisture Content: ASTM D 2216

Pan ID	32
Pan Wt	191.70 grams
Pan + Soil (wet)	312.15 grams
Pan + Soil (dry)	272.30 grams
Natural Moisture Content	49.4%

### Coarse or Fine Grained: ASTM D 422

Pan + Soil retained on No. 200 sieve

(dry) 203.34 grams

Percent Passing No. 200 Sieve 85.6%

Pan + Soil retained on No. 4 sieve

(dry) 191.70 grams

Percent Passing No. 4 Sieve 100.0%

Soil Classifies as Fine-Grained Soil

### Atterberg Limits: ASTM D 4318

Date Tested: 3/22/2019

#### Liquid Limit

No of Blows	15	26	34
Pan ID	5	6	7
Pan Wt	11.04	11.17	11.10
Pan + Soil (wet)	26.52	28.70	25.05
Pan + Soil (dry)	19.86	21.56	19.59
Moisture Content	75.5%	68.7%	64.3%
Liquid Limit	71	69	67
Liquid Limit	69		

#### Plastic Limit

Pan ID	81	82
Pan Weight	4.33	4.24
Pan + Soil (wet)	15.52	16.80
Pan + Soil (dry)	12.13	12.93
Moisture Content	43.5%	44.5%
Plastic Limit	44	
Plastic Index	25	

### USCS Classification: ASTM D 2487

Group Symbol **MH**

Group Name **Elastic SILT**

## Grain Size Distribution Calculations

Green Ridge, Cumberland Landfill

DAA# 18020117-030102

Prepared By: CBW

Sample ID DAA-03

Sample Depth 20'-22'

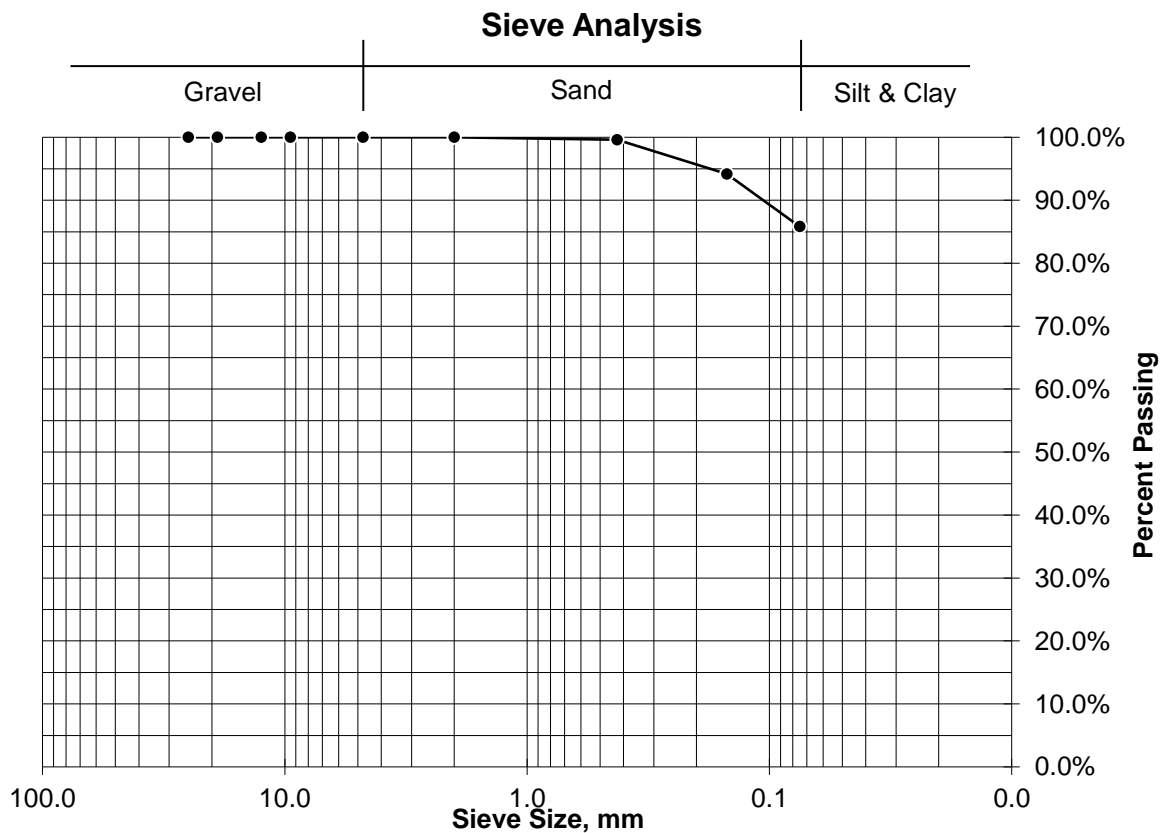
### Mechanical Sieve Analysis: ASTM D 422



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Sieve Size	Weight Retained	Percent Retained	Sieve Size, mm	Percent Passing
1"	0.00	0.0%	25.0	100.0%
3/4"	0.00	0.0%	19.0	100.0%
1/2"	0.00	0.0%	12.5	100.0%
3/8"	0.00	0.0%	9.50	100.0%
No. 4	0.00	0.0%	4.75	100.0%
No. 10	0.00	0.0%	2.00	100.0%
No. 40	0.32	0.4%	0.425	99.6%
No. 100	4.37	5.4%	0.15	94.2%
No. 200	6.74	8.4%	0.075	85.8%
Pan	0.21	0.3%		
Total	11.64	14.4%		



## Soil Classification Calculations

Green Ridge, Cumberland Landfill

DAA# 18020117-030102

Prepared By: CBW



1030 Wilmer Ave., Ste. 100

Richmond, VA 23227

Army Corps of Engineers Certified Laboratory

Sample ID DAA-03

Sample Received: 3/19/2019

Sample Depth 28'-30'

Date Tested: 3/19/2019

Visual Sample Description Light Brownish-Gray Elastic SILT with Sand

### Natural Moisture Content: ASTM D 2216

Pan ID 9  
Pan Wt 189.25 grams  
Pan + Soil (wet) 306.75 grams  
Pan + Soil (dry) 265.88 grams  
Natural Moisture Content 53.3%

### Coarse or Fine Grained: ASTM D 422

Pan + Soil retained on No. 200 sieve

(dry) 206.13 grams

Percent Passing No. 200 Sieve 78.0%

Pan + Soil retained on No. 4 sieve

(dry) 189.25 grams

Percent Passing No. 4 Sieve 100.0%

Soil Classifies as Fine-Grained Soil

### Atterberg Limits: ASTM D 4318

Date Tested: 3/21/2019

#### Liquid Limit

No of Blows	16	26	34
Pan ID	10	70	72
Pan Wt	11.20	10.97	11.03
Pan + Soil (wet)	26.48	25.54	28.67
Pan + Soil (dry)	19.73	19.43	21.49
Moisture Content	79.2%	72.2%	68.6%
Liquid Limit	75	73	71
Liquid Limit	73		

#### Plastic Limit

Pan ID	313	316
Pan Weight	9.14	9.06
Pan + Soil (wet)	21.79	21.72
Pan + Soil (dry)	18.12	18.00
Moisture Content	40.9%	41.6%
Plastic Limit	41	
Plastic Index	32	

### USCS Classification: ASTM D 2487

Group Symbol MH

Group Name Elastic SILT with Sand

# Grain Size Distribution Calculations

Green Ridge, Cumberland Landfill

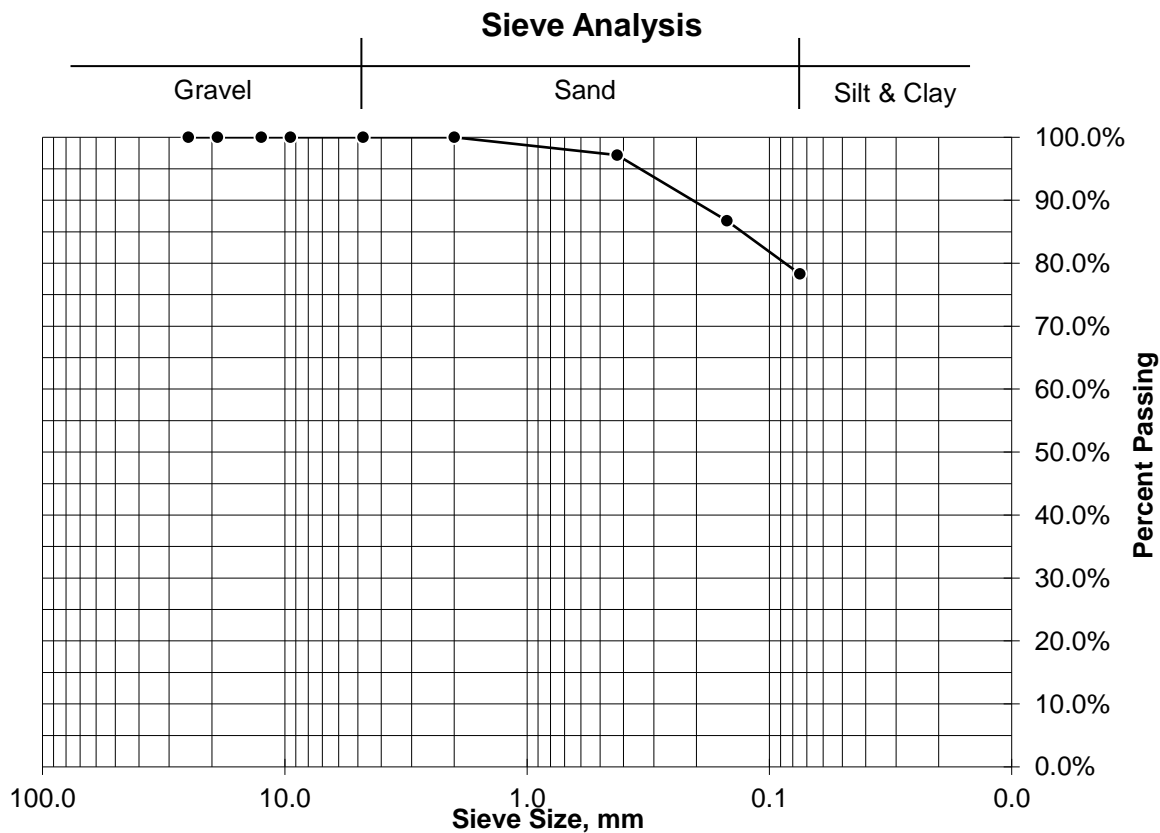
DAA# 18020117-030102

Prepared By: CBW

Sample ID DAA-03  
Sample Depth 28'-30'

## Mechanical Sieve Analysis: ASTM D 422

Sieve Size	Weight Retained	Percent Retained	Sieve Size, mm	Percent Passing
1"	0.00	0.0%	25.0	100.0%
3/4"	0.00	0.0%	19.0	100.0%
1/2"	0.00	0.0%	12.5	100.0%
3/8"	0.00	0.0%	9.50	100.0%
No. 4	0.00	0.0%	4.75	100.0%
No. 10	0.00	0.0%	2.00	100.0%
No. 40	2.16	2.8%	0.425	97.2%
No. 100	8.00	10.4%	0.15	86.7%
No. 200	6.47	8.4%	0.075	78.3%
Pan	0.25	0.3%		
Total	16.88	22.0%		





## Soil Classification Calculations

Green Ridge, Cumberland Landfill

DAA# 18020117-030102

Prepared By: CBW



1030 Wilmer Ave., Ste. 100

Richmond, VA 23227

Army Corps of Engineers Certified Laboratory

Sample ID DAA-03

Sample Depth 45'-47'

Visual Sample Description Brownish-gray Elastic SILT with Sand

Sample Received: 3/19/2019

Date Tested: 3/19/2019

### Natural Moisture Content: ASTM D 2216

Pan ID	101
Pan Wt	122.76 grams
Pan + Soil (wet)	246.78 grams
Pan + Soil (dry)	204.71 grams
Natural Moisture Content	51.3%

### Coarse or Fine Grained: ASTM D 422

Pan + Soil retained on No. 200 sieve

(dry) 143.75 grams

Percent Passing No. 200 Sieve 74.4%

Pan + Soil retained on No. 4 sieve

(dry) 122.76 grams

Percent Passing No. 4 Sieve 100.0%

Soil Classifies as Fine-Grained Soil

### Atterberg Limits: ASTM D 4318

Date Tested: 5/2/2019

#### Liquid Limit

No of Blows	18	21	33
Pan ID	101	105	107
Pan Wt	24.02	29.28	25.11
Pan + Soil (wet)	46.76	58.97	43.98
Pan + Soil (dry)	38.20	48.17	37.49
Moisture Content	60.4%	57.2%	52.4%
Liquid Limit	58	56	54
Liquid Limit	56		

#### Plastic Limit

Pan ID	75	78
Pan Weight	4.26	4.24
Pan + Soil (wet)	15.29	15.10
Pan + Soil (dry)	12.50	12.35
Moisture Content	33.8%	33.9%
Plastic Limit	34	
Plastic Index	22	

### USCS Classification: ASTM D 2487

Group Symbol MH

Group Name Elastic SILT with Sand

# Grain Size Distribution Calculations

Green Ridge, Cumberland Landfill

DAA# 18020117-030102

Prepared By: CBW

Sample ID DAA-03  
Sample Depth 45'-47'

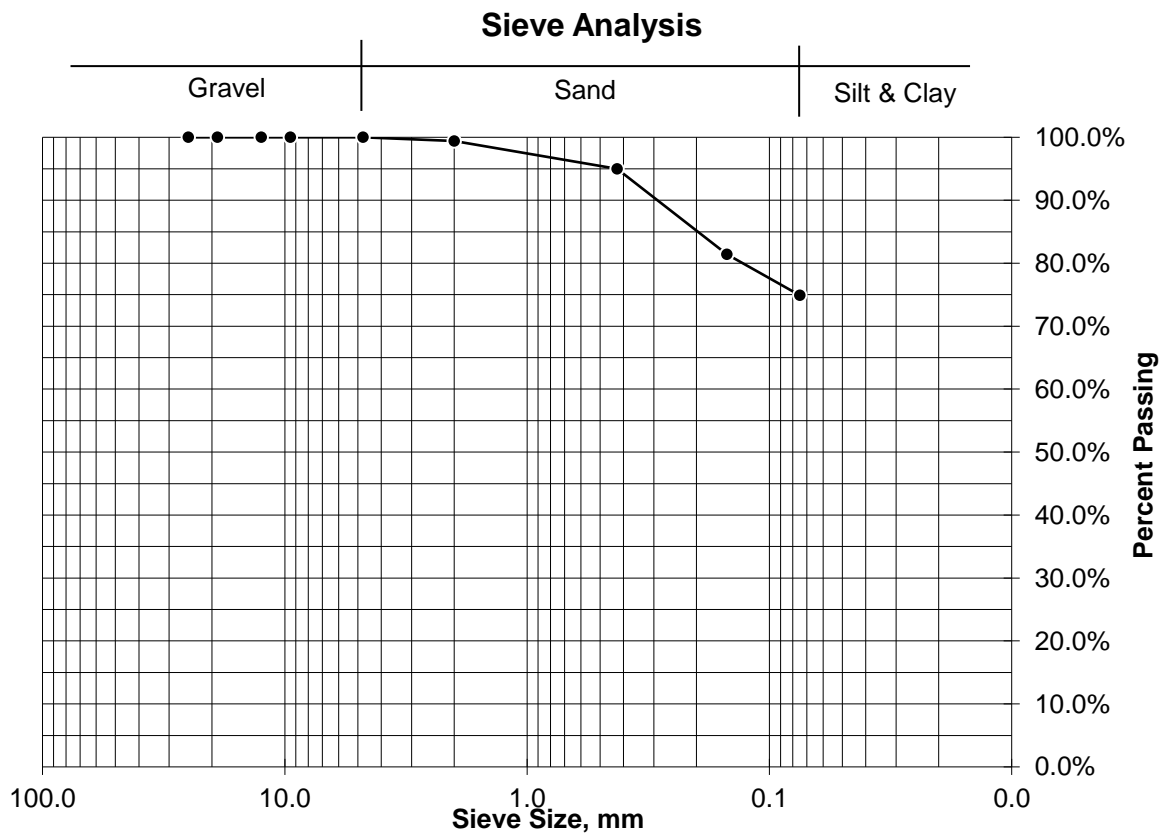


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Richmond, VA 23227

Army Corps of Engineers Certified Laboratory

## Mechanical Sieve Analysis: ASTM D 422

Sieve Size	Weight Retained	Percent Retained	Sieve Size, mm	Percent Passing
1"	0.00	0.0%	25.0	100.0%
3/4"	0.00	0.0%	19.0	100.0%
1/2"	0.00	0.0%	12.5	100.0%
3/8"	0.00	0.0%	9.50	100.0%
No. 4	0.00	0.0%	4.75	100.0%
No. 10	0.50	0.6%	2.00	99.4%
No. 40	3.62	4.4%	0.425	95.0%
No. 100	11.10	13.5%	0.15	81.4%
No. 200	5.34	6.5%	0.075	74.9%
Pan	0.42	0.5%		
Total	20.98	25.6%		



## Soil Classification Calculations

Green Ridge, Cumberland Landfill

DAA# 18020117-030102

Prepared By: CBW



1030 Wilmer Ave., Ste. 100

Richmond, VA 23227

Army Corps of Engineers Certified Laboratory

Sample ID DAA-03

Sample Depth 55'-57'

Visual Sample Description Brown Sandy Elastic SILT

Sample Received: 3/19/2019

Date Tested: 3/19/2019

### Natural Moisture Content: ASTM D 2216

Pan ID	25
Pan Wt	194.02 grams
Pan + Soil (wet)	294.69 grams
Pan + Soil (dry)	264.26 grams
Natural Moisture Content	43.3%

### Coarse or Fine Grained: ASTM D 422

Pan + Soil retained on No. 200 sieve

(dry) 215.15 grams

Percent Passing No. 200 Sieve 69.9%

Pan + Soil retained on No. 4 sieve

(dry) 194.02 grams

Percent Passing No. 4 Sieve 100.0%

Soil Classifies as Fine-Grained Soil

### Atterberg Limits: ASTM D 4318

Date Tested: 3/21/2019

#### Liquid Limit

No of Blows	15	24	35
Pan ID	102	92	2000
Pan Wt	23.99	25.64	25.72
Pan + Soil (wet)	44.19	43.75	44.08
Pan + Soil (dry)	35.93	36.76	37.31
Moisture Content	69.1%	62.9%	58.4%
Liquid Limit	65	63	61
Liquid Limit	63		

#### Plastic Limit

Pan ID	314	317
Pan Weight	9.13	8.07
Pan + Soil (wet)	21.53	22.12
Pan + Soil (dry)	18.30	18.56
Moisture Content	35.2%	33.9%
Plastic Limit	35	
Plastic Index	28	

### USCS Classification: ASTM D 2487

Group Symbol MH

Group Name Sandy Elastic SILT

# Grain Size Distribution Calculations

Green Ridge, Cumberland Landfill

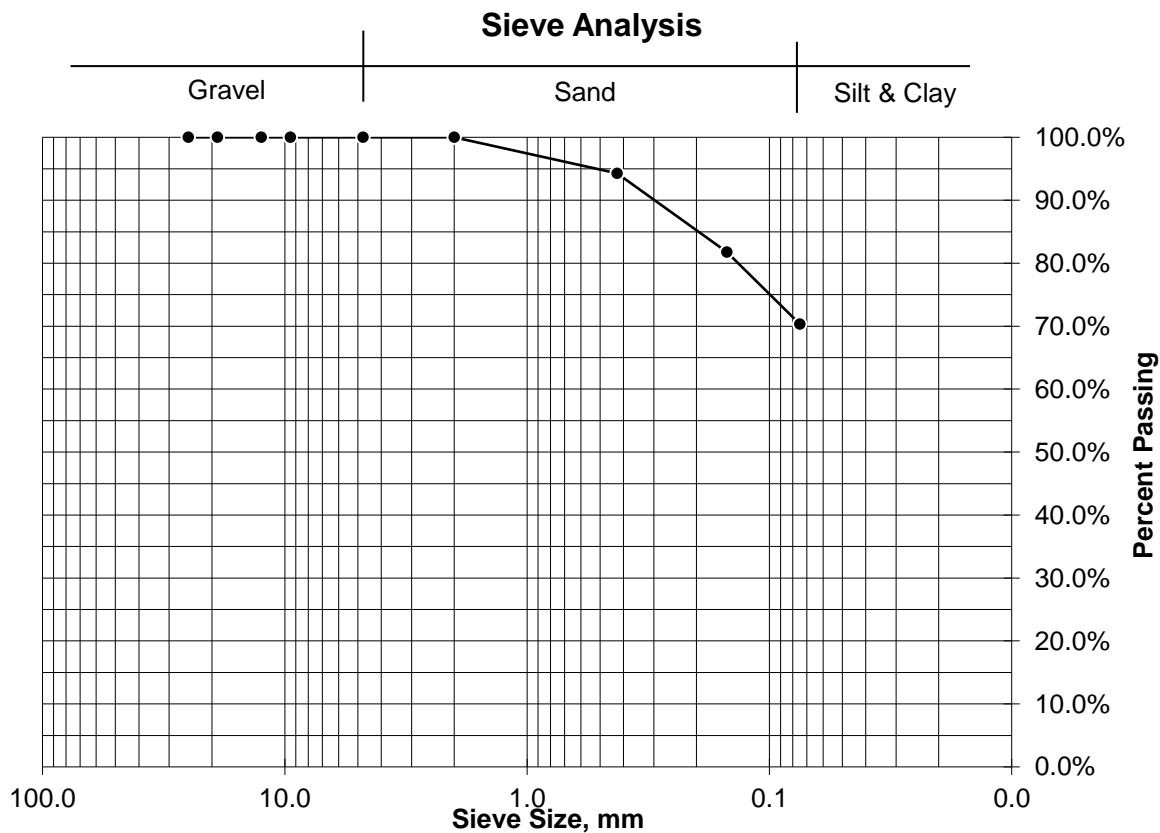
DAA# 18020117-030102

Prepared By: CBW

Sample ID DAA-03  
Sample Depth 55'-57'

## Mechanical Sieve Analysis: ASTM D 422

Sieve Size	Weight Retained	Percent Retained	Sieve Size, mm	Percent Passing
1"	0.00	0.0%	25.0	100.0%
3/4"	0.00	0.0%	19.0	100.0%
1/2"	0.00	0.0%	12.5	100.0%
3/8"	0.00	0.0%	9.50	100.0%
No. 4	0.00	0.0%	4.75	100.0%
No. 10	0.00	0.0%	2.00	100.0%
No. 40	4.01	5.7%	0.425	94.3%
No. 100	8.80	12.5%	0.15	81.8%
No. 200	8.01	11.4%	0.075	70.4%
Pan	0.29	0.4%		
Total	21.11	30.1%		





## Soil Classification Calculations

Green Ridge, Cumberland Landfill

DAA# 18020117-030102

Prepared By: CBW



1030 Wilmer Ave., Ste. 100

Richmond, VA 23227

Army Corps of Engineers Certified Laboratory

Sample ID DAA-04

Sample Received: 3/19/2019

Sample Depth 10'-12'

Date Tested: 3/19/2019

Visual Sample Description Miaceous Light Brownish-Gray Silty SAND

### Natural Moisture Content: ASTM D 2216

Pan ID 40  
Pan Wt 192.70 grams  
Pan + Soil (wet) 298.16 grams  
Pan + Soil (dry) 265.91 grams  
*Natural Moisture Content* 44.1%

### Coarse or Fine Grained: ASTM D 422

Pan + Soil retained on No. 200 sieve

(dry) 234.75 grams

Percent Passing No. 200 Sieve 42.6%

Pan + Soil retained on No. 4 sieve

(dry) 192.70 grams

Percent Passing No. 4 Sieve 100.0%

*Soil Classifies as Coarse-Grained Soil*

### Atterberg Limits: ASTM D 4318

Date Tested: 3/22/2019

#### Liquid Limit

No of Blows	18	25	33
Pan ID	61	71	1
Pan Wt	10.95	10.92	11.23
Pan + Soil (wet)	23.05	22.82	21.86
Pan + Soil (dry)	19.13	19.19	18.79
Moisture Content	47.9%	43.9%	40.6%
Liquid Limit	46	44	42
<i>Liquid Limit</i>	44		

#### Plastic Limit

Pan ID	0	1138
Pan Weight	6.07	6.14
Pan + Soil (wet)	16.17	16.93
Pan + Soil (dry)	13.71	14.26
Moisture Content	32.2%	32.9%
<i>Plastic Limit</i>	33	
<i>Plastic Index</i>	11	

### USCS Classification: ASTM D 2487

Group Symbol **SM**

Group Name **Silty SAND**

# Grain Size Distribution Calculations

Green Ridge, Cumberland Landfill

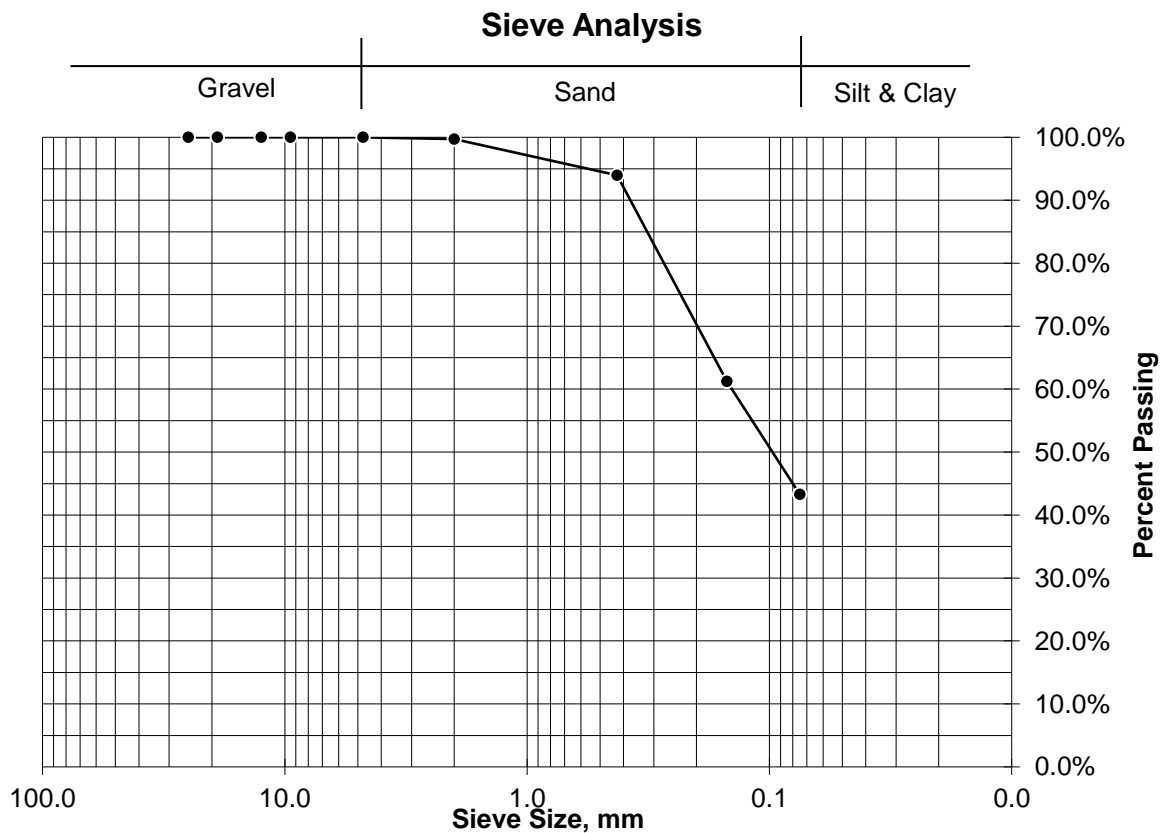
DAA# 18020117-030102

Prepared By: CBW

Sample ID DAA-04  
Sample Depth 10'-12'

## Mechanical Sieve Analysis: ASTM D 422

Sieve Size	Weight Retained	Percent Retained	Sieve Size, mm	Percent Passing
1"	0.00	0.0%	25.0	100.0%
3/4"	0.00	0.0%	19.0	100.0%
1/2"	0.00	0.0%	12.5	100.0%
3/8"	0.00	0.0%	9.50	100.0%
No. 4	0.00	0.0%	4.75	100.0%
No. 10	0.22	0.3%	2.00	99.7%
No. 40	4.21	5.8%	0.425	93.9%
No. 100	23.94	32.7%	0.15	61.2%
No. 200	13.13	17.9%	0.075	43.3%
Pan	0.53	0.7%		
Total	42.03	57.4%		



## Soil Classification Calculations

Green Ridge, Cumberland Landfill

DAA# 18020117-030102

Prepared By: CBW



1030 Wilmer Ave., Ste. 100

Richmond, VA 23227

Army Corps of Engineers Certified Laboratory

Sample ID DAA-04

Sample Depth 12'-14'

Visual Sample Description Light Reddish-Brown Silty SAND

Sample Received: 3/19/2019

Date Tested: 3/22/2019

### Natural Moisture Content: ASTM D 2216

Pan ID	23
Pan Wt	193.95 grams
Pan + Soil (wet)	330.26 grams
Pan + Soil (dry)	296.59 grams
Natural Moisture Content	32.8%

### Coarse or Fine Grained: ASTM D 422

Pan + Soil retained on No. 200 sieve

(dry) 262.13 grams

Percent Passing No. 200 Sieve 33.6%

Pan + Soil retained on No. 4 sieve

(dry) 193.95 grams

Percent Passing No. 4 Sieve 100.0%

Soil Classifies as Coarse-Grained Soil

### Atterberg Limits: ASTM D 4318

Date Tested: 3/22/2019

#### Liquid Limit

No of Blows			
Pan ID		Non-plastic	
Pan Wt			
Pan + Soil (wet)			
Pan + Soil (dry)			
Moisture Content			
Liquid Limit			
Liquid Limit			

#### Plastic Limit

Pan ID		
Pan Weight	Non-plastic	
Pan + Soil (wet)		
Pan + Soil (dry)		
Moisture Content		
Plastic Limit		
Plastic Index		

### USCS Classification: ASTM D 2487

Group Symbol **SM**

Group Name **Silty SAND**

# Grain Size Distribution Calculations

Green Ridge, Cumberland Landfill

DAA# 18020117-030102

Prepared By: CBW

Sample ID DAA-04

Sample Depth 12'-14'

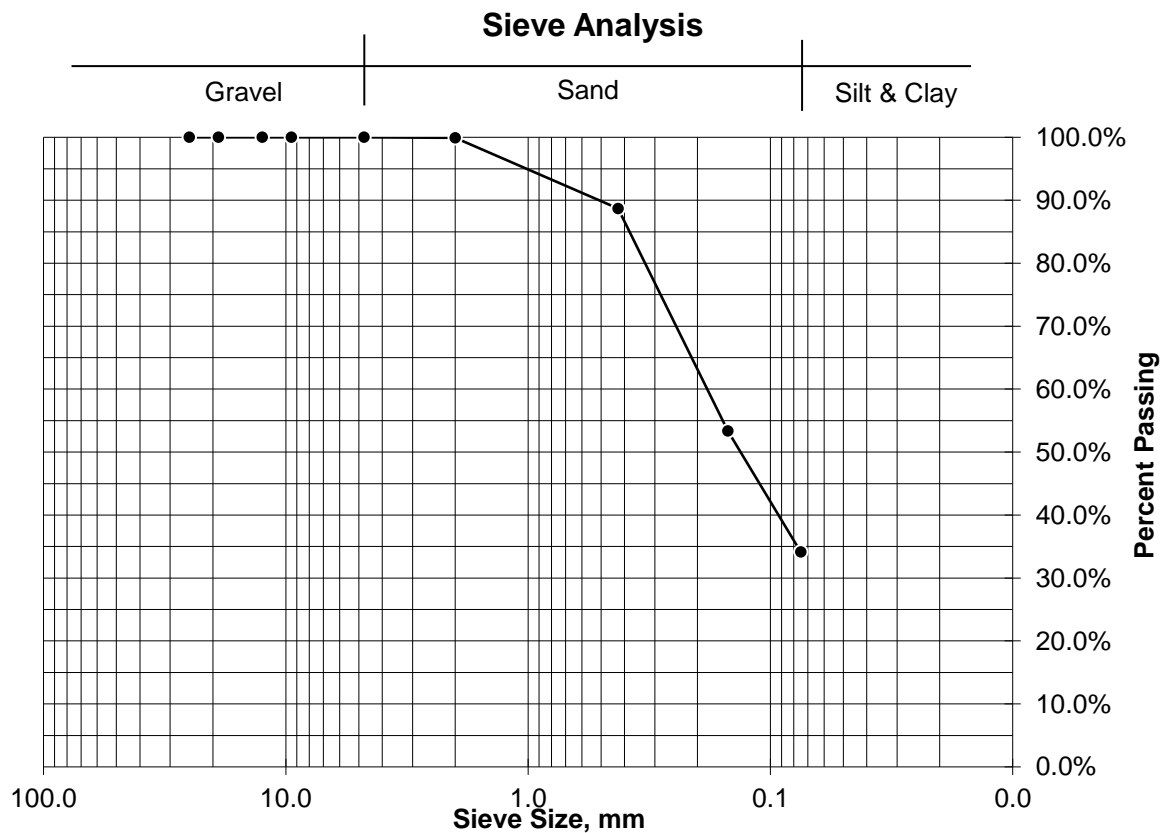
## Mechanical Sieve Analysis: ASTM D 422



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Sieve Size	Weight Retained	Percent Retained	Sieve Size, mm	Percent Passing
1"	0.00	0.0%	25.0	100.0%
3/4"	0.00	0.0%	19.0	100.0%
1/2"	0.00	0.0%	12.5	100.0%
3/8"	0.00	0.0%	9.50	100.0%
No. 4	0.00	0.0%	4.75	100.0%
No. 10	0.10	0.1%	2.00	99.9%
No. 40	11.51	11.2%	0.425	88.7%
No. 100	36.26	35.3%	0.15	53.4%
No. 200	19.72	19.2%	0.075	34.1%
Pan	0.58	0.6%		
Total	68.17	66.4%		



## Soil Classification Calculations

Green Ridge, Cumberland Landfill

DAA# 18020117-030102

Prepared By: CBW



1030 Wilmer Ave., Ste. 100

Richmond, VA 23227

Army Corps of Engineers Certified Laboratory

Sample ID DAA-04

Sample Depth 18'-20'

Visual Sample Description Brown Silty SAND

Sample Received: 3/19/2019

Date Tested: 3/19/2019

### Natural Moisture Content: ASTM D 2216

Pan ID	19
Pan Wt	188.56 grams
Pan + Soil (wet)	291.38 grams
Pan + Soil (dry)	257.20 grams
Natural Moisture Content	49.8%

### Coarse or Fine Grained: ASTM D 422

Pan + Soil retained on No. 200 sieve

(dry) 226.14 grams

Percent Passing No. 200 Sieve 45.3%

Pan + Soil retained on No. 4 sieve

(dry) 188.56 grams

Percent Passing No. 4 Sieve 100.0%

Soil Classifies as Coarse-Grained Soil

### Atterberg Limits: ASTM D 4318

Date Tested: 3/22/2019

#### Liquid Limit

No of Blows	18	23	31
Pan ID	705	710	711
Pan Wt	11.57	11.51	11.58
Pan + Soil (wet)	30.27	31.37	32.83
Pan + Soil (dry)	23.54	24.50	25.84
Moisture Content	56.2%	52.9%	49.0%
Liquid Limit	54	52	50
Liquid Limit	52		

#### Plastic Limit

Pan ID	314	317
Pan Weight	9.15	8.08
Pan + Soil (wet)	23.17	21.93
Pan + Soil (dry)	19.04	17.84
Moisture Content	41.8%	41.9%
Plastic Limit	42	
Plastic Index	10	

### USCS Classification: ASTM D 2487

Group Symbol **SM**

Group Name **Silty SAND**



## Grain Size Distribution Calculations

Green Ridge, Cumberland Landfill

DAA# 18020117-030102

Prepared By: CBW

Sample ID DAA-04

Sample Depth 18'-20'

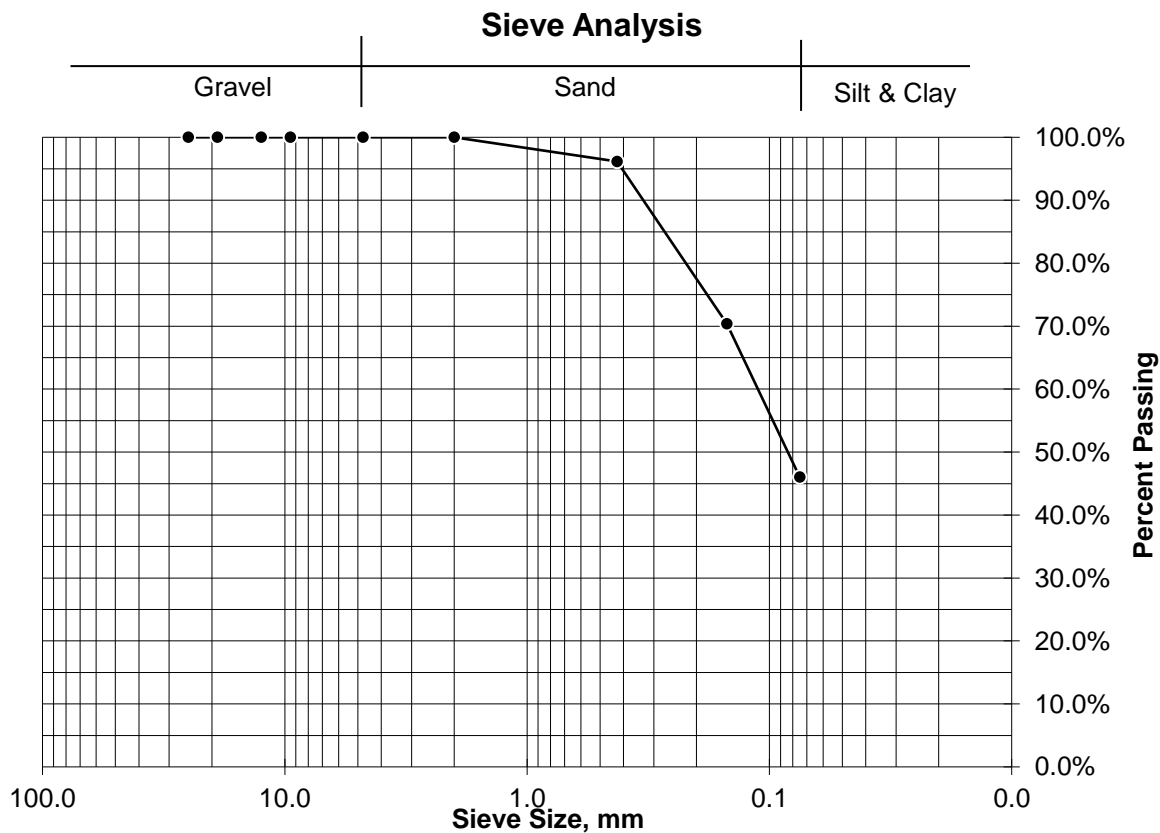
### Mechanical Sieve Analysis: ASTM D 422



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Army Corps of Engineers Certified Laboratory

Sieve Size	Weight Retained	Percent Retained	Sieve Size, mm	Percent Passing
1"	0.00	0.0%	25.0	100.0%
3/4"	0.00	0.0%	19.0	100.0%
1/2"	0.00	0.0%	12.5	100.0%
3/8"	0.00	0.0%	9.50	100.0%
No. 4	0.00	0.0%	4.75	100.0%
No. 10	0.00	0.0%	2.00	100.0%
No. 40	2.65	3.9%	0.425	96.1%
No. 100	17.67	25.7%	0.15	70.4%
No. 200	16.71	24.3%	0.075	46.1%
Pan	0.55	0.8%		
Total	37.58	54.8%		



## Soil Classification Calculations

Green Ridge, Cumberland Landfill

DAA# 18020117-030102

Prepared By: CBW



1030 Wilmer Ave., Ste. 100

Richmond, VA 23227

Army Corps of Engineers Certified Laboratory

Sample ID DAA-04

Sample Depth 24'-26'

Visual Sample Description Light Gray Silty SAND

Sample Received: 3/19/2019

Date Tested: 3/22/2019

### Natural Moisture Content: ASTM D 2216

Pan ID	5
Pan Wt	192.72 grams
Pan + Soil (wet)	295.14 grams
Pan + Soil (dry)	267.88 grams
Natural Moisture Content	36.3%

### Coarse or Fine Grained: ASTM D 422

Pan + Soil retained on No. 200 sieve

(dry) 244.49 grams

Percent Passing No. 200 Sieve 31.1%

Pan + Soil retained on No. 4 sieve

(dry) 192.89 grams

Percent Passing No. 4 Sieve 99.8%

Soil Classifies as Coarse-Grained Soil

### Atterberg Limits: ASTM D 4318

Date Tested: 3/22/2019

#### Liquid Limit

No of Blows			
Pan ID		Non-plastic	
Pan Wt			
Pan + Soil (wet)			
Pan + Soil (dry)			
Moisture Content			
Liquid Limit			
Liquid Limit			

#### Plastic Limit

Pan ID		
Pan Weight	Non-plastic	
Pan + Soil (wet)		
Pan + Soil (dry)		
Moisture Content		
Plastic Limit		
Plastic Index		

### USCS Classification: ASTM D 2487

Group Symbol **SM**

Group Name **Silty SAND**

## Grain Size Distribution Calculations

Green Ridge, Cumberland Landfill

DAA# 18020117-030102

Prepared By: CBW

Sample ID DAA-04

Sample Depth 24'-26'

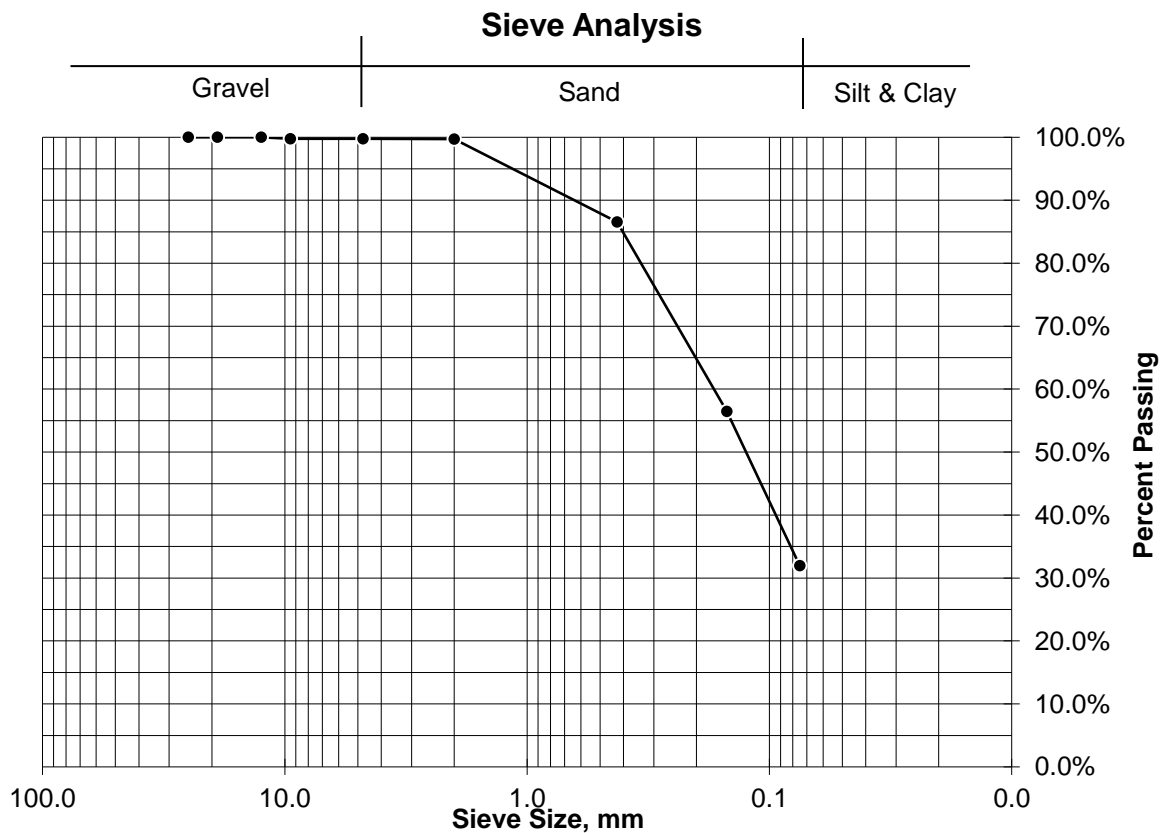
### Mechanical Sieve Analysis: ASTM D 422



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Richmond, VA 23227

Army Corps of Engineers Certified Laboratory

Sieve Size	Weight Retained	Percent Retained	Sieve Size, mm	Percent Passing
1"	0.00	0.0%	25.0	100.0%
3/4"	0.00	0.0%	19.0	100.0%
1/2"	0.00	0.0%	12.5	100.0%
3/8"	0.17	0.2%	9.50	99.8%
No. 4	0.00	0.0%	4.75	99.8%
No. 10	0.05	0.1%	2.00	99.7%
No. 40	9.90	13.2%	0.425	86.5%
No. 100	22.60	30.1%	0.15	56.5%
No. 200	18.40	24.5%	0.075	32.0%
Pan	0.61	0.8%		
Total	51.73	68.8%		



## Soil Classification Calculations

Green Ridge, Cumberland Landfill

DAA# 18020117-030102

Prepared By: CBW



1030 Wilmer Ave., Ste. 100

Richmond, VA 23227

Army Corps of Engineers Certified Laboratory

Sample ID DAA-04

Sample Depth 28'-30'

Visual Sample Description Brown Silty SAND

Sample Received: 3/19/2019

Date Tested: 3/19/2019

### Natural Moisture Content: ASTM D 2216

Pan ID	17
Pan Wt	188.64 grams
Pan + Soil (wet)	303.75 grams
Pan + Soil (dry)	275.02 grams
Natural Moisture Content	33.3%

### Coarse or Fine Grained: ASTM D 422

Pan + Soil retained on No. 200 sieve

(dry) 242.56 grams

Percent Passing No. 200 Sieve 37.6%

Pan + Soil retained on No. 4 sieve

(dry) 188.64 grams

Percent Passing No. 4 Sieve 100.0%

Soil Classifies as Coarse-Grained Soil

### Atterberg Limits: ASTM D 4318

Date Tested: 3/22/2019

#### Liquid Limit

No of Blows	17	26	34
Pan ID	92	102	2000
Pan Wt	25.65	24.02	25.71
Pan + Soil (wet)	48.43	42.15	44.60
Pan + Soil (dry)	41.33	36.89	39.45
Moisture Content	45.3%	40.9%	37.5%
Liquid Limit	43	41	39
Liquid Limit	41		

#### Plastic Limit

Pan ID	22	75
Pan Weight	4.33	4.27
Pan + Soil (wet)	20.34	17.45
Pan + Soil (dry)	16.30	14.05
Moisture Content	33.8%	34.8%
Plastic Limit	34	
Plastic Index	7	

### USCS Classification: ASTM D 2487

Group Symbol **SM**

Group Name **Silty SAND**

## Grain Size Distribution Calculations

Green Ridge, Cumberland Landfill

DAA# 18020117-030102

Prepared By: CBW

Sample ID DAA-04

Sample Depth 28'-30'

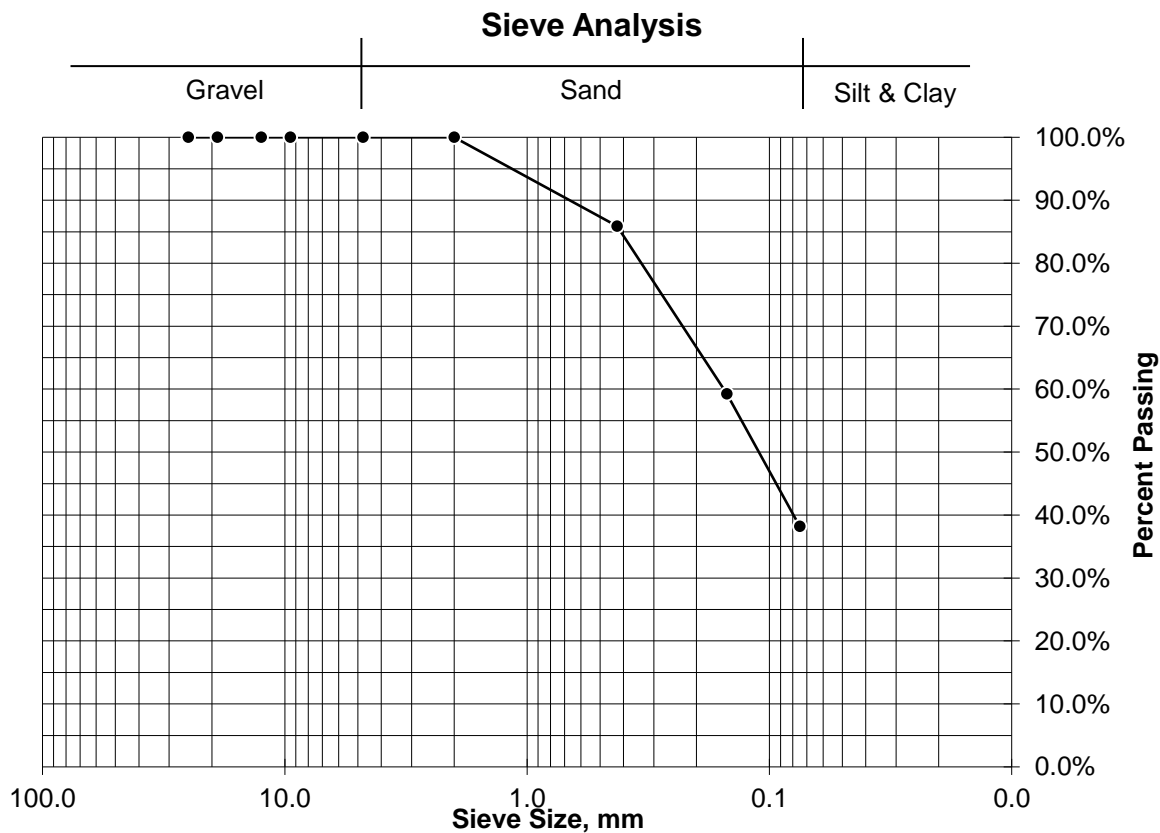
### Mechanical Sieve Analysis: ASTM D 422



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Army Corps of Engineers Certified Laboratory

Sieve Size	Weight Retained	Percent Retained	Sieve Size, mm	Percent Passing
1"	0.00	0.0%	25.0	100.0%
3/4"	0.00	0.0%	19.0	100.0%
1/2"	0.00	0.0%	12.5	100.0%
3/8"	0.00	0.0%	9.50	100.0%
No. 4	0.00	0.0%	4.75	100.0%
No. 10	0.00	0.0%	2.00	100.0%
No. 40	12.20	14.1%	0.425	85.9%
No. 100	22.98	26.6%	0.15	59.3%
No. 200	18.19	21.1%	0.075	38.2%
Pan	0.55	0.6%		
Total	53.92	62.4%		





## Soil Classification Calculations

Green Ridge, Cumberland Landfill

DAA# 18020117-030102

Prepared By: CBW



1030 Wilmer Ave., Ste. 100

Richmond, VA 23227

Army Corps of Engineers Certified Laboratory

Sample ID DAA-04

Sample Depth 36'-38'

Visual Sample Description Brown Silty SAND

Sample Received: 3/19/2019

Date Tested: 3/19/2019

### Natural Moisture Content: ASTM D 2216

Pan ID	42
Pan Wt	192.28 grams
Pan + Soil (wet)	296.27 grams
Pan + Soil (dry)	274.70 grams
Natural Moisture Content	26.2%

### Coarse or Fine Grained: ASTM D 422

Pan + Soil retained on No. 200 sieve

(dry) 249.52 grams

Percent Passing No. 200 Sieve 30.6%

Pan + Soil retained on No. 4 sieve

(dry) 192.28 grams

Percent Passing No. 4 Sieve 100.0%

Soil Classifies as Coarse-Grained Soil

### Atterberg Limits: ASTM D 4318

Date Tested: 3/22/2019

#### Liquid Limit

No of Blows			
Pan ID		Non-plastic	
Pan Wt			
Pan + Soil (wet)			
Pan + Soil (dry)			
Moisture Content			
Liquid Limit			
Liquid Limit			

#### Plastic Limit

Pan ID		
Pan Weight	Non-plastic	
Pan + Soil (wet)		
Pan + Soil (dry)		
Moisture Content		
Plastic Limit		
Plastic Index		

### USCS Classification: ASTM D 2487

Group Symbol **SM**

Group Name **Silty SAND**

# Grain Size Distribution Calculations

Green Ridge, Cumberland Landfill

DAA# 18020117-030102

Prepared By: CBW

Sample ID DAA-04

Sample Depth 36'-38'

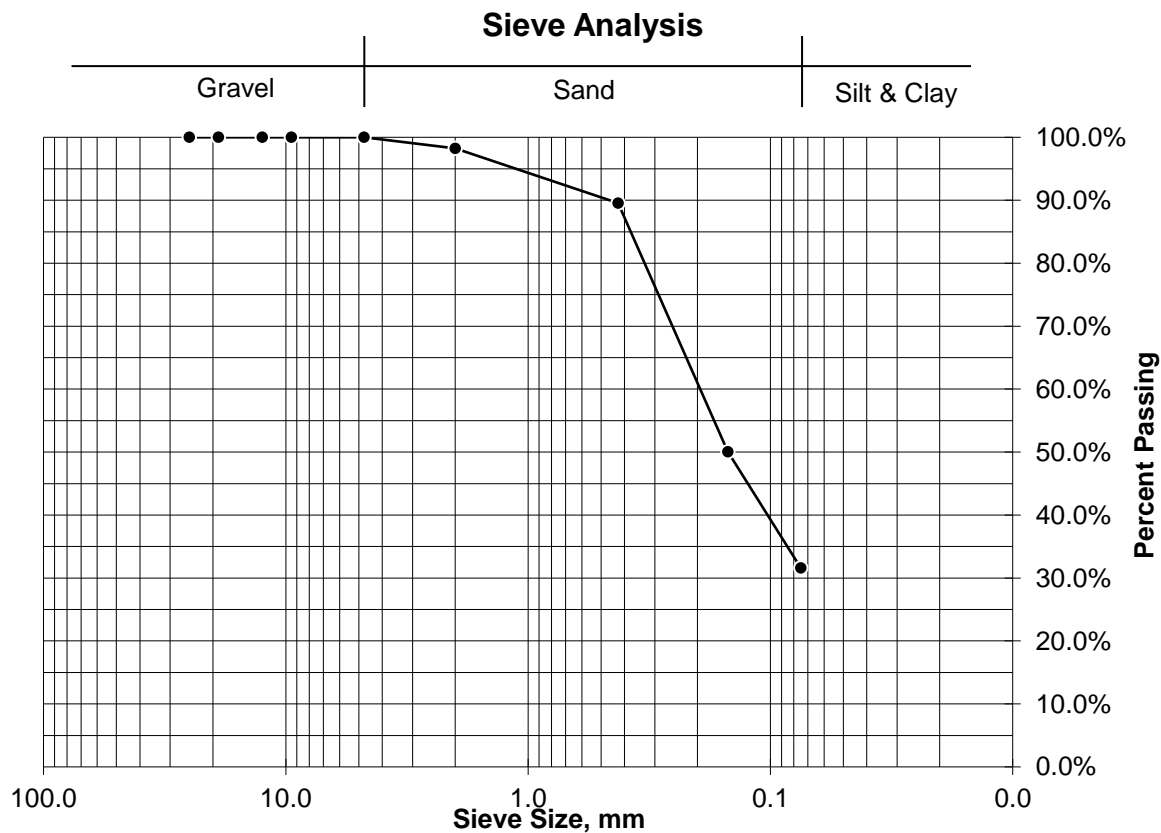
## Mechanical Sieve Analysis: ASTM D 422



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Sieve Size	Weight Retained	Percent Retained	Sieve Size, mm	Percent Passing
1"	0.00	0.0%	25.0	100.0%
3/4"	0.00	0.0%	19.0	100.0%
1/2"	0.00	0.0%	12.5	100.0%
3/8"	0.00	0.0%	9.50	100.0%
No. 4	0.00	0.0%	4.75	100.0%
No. 10	1.44	1.7%	2.00	98.3%
No. 40	7.17	8.7%	0.425	89.6%
No. 100	32.57	39.5%	0.15	50.0%
No. 200	15.17	18.4%	0.075	31.6%
Pan	0.87	1.1%		
Total	57.22	69.4%		



## Soil Classification Calculations

Green Ridge, Cumberland Landfill

DAA# 18020117-030102

Prepared By: CBW



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Sample ID DAA-05

Sample Depth 7'-9'

Visual Sample Description Light Brownish-Gray Silty SAND

Sample Received: 3/19/2019

Date Tested: 3/19/2019

### Natural Moisture Content: ASTM D 2216

Pan ID	24
Pan Wt	186.11 grams
Pan + Soil (wet)	314.11 grams
Pan + Soil (dry)	305.66 grams
Natural Moisture Content	7.1%

### Coarse or Fine Grained: ASTM D 422

Pan + Soil retained on No. 200 sieve

(dry) 285.82 grams

Percent Passing No. 200 Sieve 16.6%

Pan + Soil retained on No. 4 sieve

(dry) 186.11 grams

Percent Passing No. 4 Sieve 100.0%

Soil Classifies as Coarse-Grained Soil

### Atterberg Limits: ASTM D 4318

Date Tested: 3/19/2019

#### Liquid Limit

No of Blows			
Pan ID			
Pan Wt		Non-plastic	
Pan + Soil (wet)			
Pan + Soil (dry)			
Moisture Content			
Liquid Limit			
Liquid Limit			

#### Plastic Limit

Pan ID		
Pan Weight		
Pan + Soil (wet)	Non-plastic	
Pan + Soil (dry)		
Moisture Content		
Plastic Limit		
Plastic Index		

### USCS Classification: ASTM D 2487

Group Symbol **SM**

Group Name **Silty SAND**

# Grain Size Distribution Calculations

Green Ridge, Cumberland Landfill

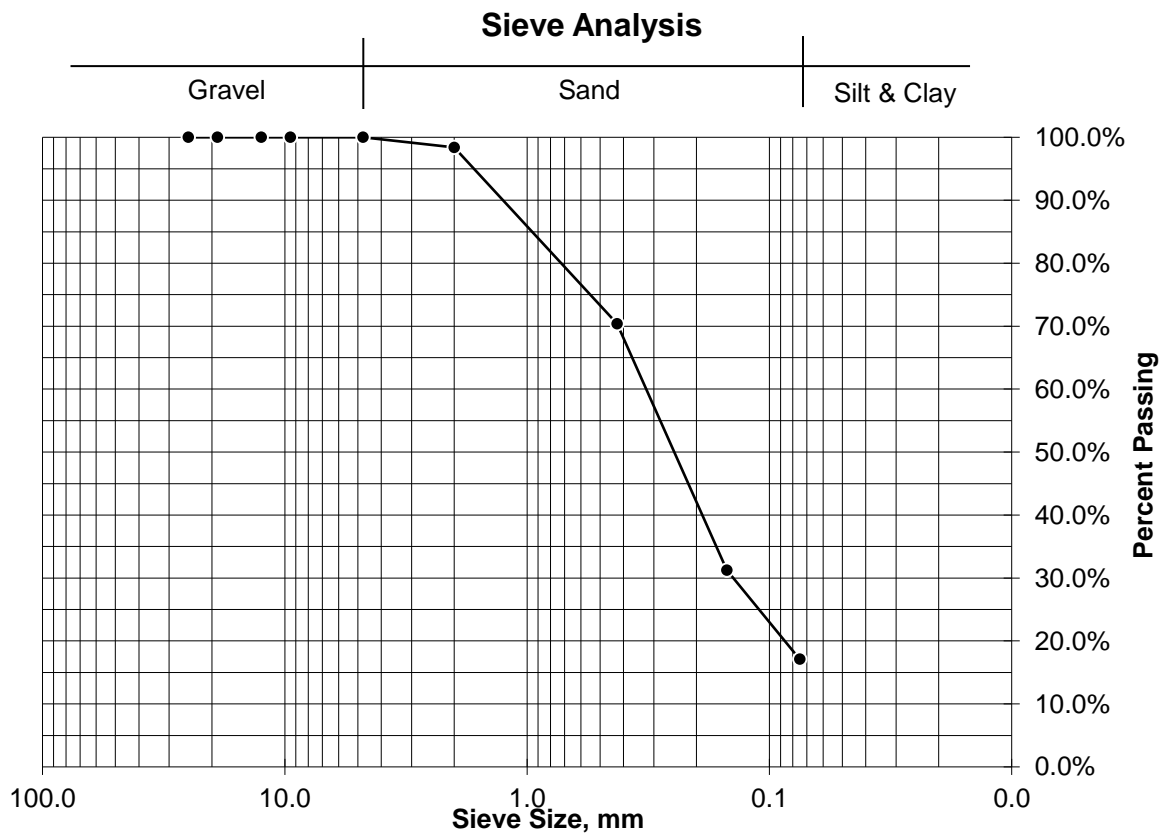
DAA# 18020117-030102

Prepared By: CBW

Sample ID DAA-05  
Sample Depth 7'-9'

## Mechanical Sieve Analysis: ASTM D 422

Sieve Size	Weight Retained	Percent Retained	Sieve Size, mm	Percent Passing
1"	0.00	0.0%	25.0	100.0%
3/4"	0.00	0.0%	19.0	100.0%
1/2"	0.00	0.0%	12.5	100.0%
3/8"	0.00	0.0%	9.50	100.0%
No. 4	0.00	0.0%	4.75	100.0%
No. 10	1.90	1.6%	2.00	98.4%
No. 40	33.50	28.0%	0.425	70.4%
No. 100	46.78	39.1%	0.15	31.3%
No. 200	16.92	14.2%	0.075	17.1%
Pan	0.60	0.5%		
Total	99.70	83.4%		



## Soil Classification Calculations

Green Ridge, Cumberland Landfill

DAA# 18020117-030102

Prepared By: CBW



1030 Wilmer Ave., Ste. 100

Richmond, VA 23227

Army Corps of Engineers Certified Laboratory

Sample ID DAA-05

Sample Depth 15'-17'

Visual Sample Description Light Brownish-Red Silty SAND

Sample Received: 3/19/2019

Date Tested: 3/19/2019

### Natural Moisture Content: ASTM D 2216

Pan ID	1
Pan Wt	195.45 grams
Pan + Soil (wet)	301.00 grams
Pan + Soil (dry)	293.74 grams
Natural Moisture Content	7.4%

### Coarse or Fine Grained: ASTM D 422

Pan + Soil retained on No. 200 sieve

(dry) 275.64 grams

Percent Passing No. 200 Sieve 18.4%

Pan + Soil retained on No. 4 sieve

(dry) 195.61 grams

Percent Passing No. 4 Sieve 99.8%

Soil Classifies as Coarse-Grained Soil

### Atterberg Limits: ASTM D 4318

Date Tested: 3/19/2019

#### Liquid Limit

No of Blows			
Pan ID			
Pan Wt		Non-plastic	
Pan + Soil (wet)			
Pan + Soil (dry)			
Moisture Content			
Liquid Limit			
Liquid Limit			

#### Plastic Limit

Pan ID		
Pan Weight		
Pan + Soil (wet)	Non-plastic	
Pan + Soil (dry)		
Moisture Content		
Plastic Limit		
Plastic Index		

### USCS Classification: ASTM D 2487

Group Symbol **SM**

Group Name **Silty SAND**



## Grain Size Distribution Calculations

Green Ridge, Cumberland Landfill

DAA# 18020117-030102

Prepared By: CBW

Sample ID DAA-05

Sample Depth 15'-17'

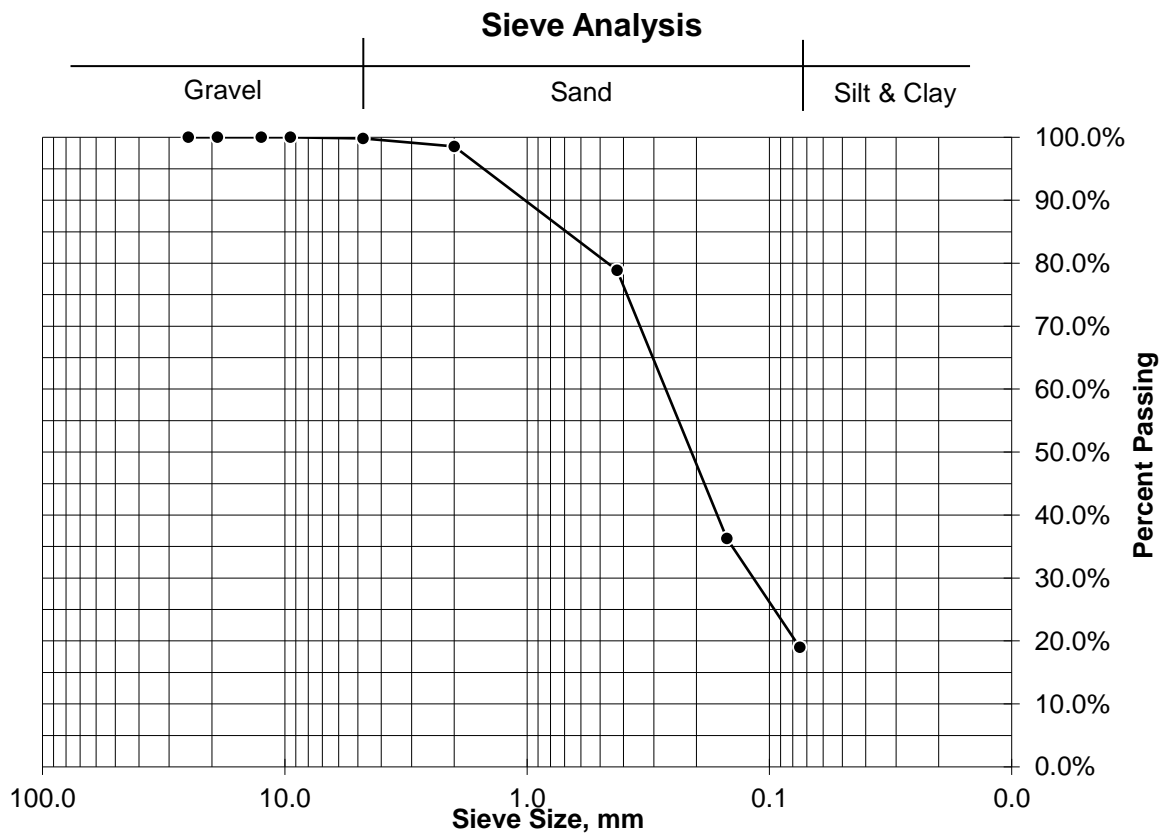
### Mechanical Sieve Analysis: ASTM D 422



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Sieve Size	Weight Retained	Percent Retained	Sieve Size, mm	Percent Passing
1"	0.00	0.0%	25.0	100.0%
3/4"	0.00	0.0%	19.0	100.0%
1/2"	0.00	0.0%	12.5	100.0%
3/8"	0.00	0.0%	9.50	100.0%
No. 4	0.16	0.2%	4.75	99.8%
No. 10	1.28	1.3%	2.00	98.5%
No. 40	19.31	19.6%	0.425	78.9%
No. 100	41.90	42.6%	0.15	36.3%
No. 200	16.96	17.3%	0.075	19.0%
Pan	0.57	0.6%		
Total	80.18	81.6%		



## Soil Classification Calculations

Green Ridge, Cumberland Landfill

DAA# 18020117-030102

Prepared By: CBW



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Richmond, VA 23227

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Sample ID DAA-06

Sample Depth 12'-14'

Visual Sample Description Light Brown Silty SAND

Sample Received: 3/19/2019

Date Tested: 3/19/2019

### Natural Moisture Content: ASTM D 2216

Pan ID	10
Pan Wt	184.04 grams
Pan + Soil (wet)	298.73 grams
Pan + Soil (dry)	293.47 grams
Natural Moisture Content	4.8%

### Coarse or Fine Grained: ASTM D 422

Pan + Soil retained on No. 200 sieve

(dry) 274.71 grams

Percent Passing No. 200 Sieve 17.1%

Pan + Soil retained on No. 4 sieve

(dry) 184.04 grams

Percent Passing No. 4 Sieve 100.0%

Soil Classifies as Coarse-Grained Soil

### Atterberg Limits: ASTM D 4318

Date Tested: 3/19/2019

#### Liquid Limit

No of Blows			
Pan ID			
Pan Wt		Non-plastic	
Pan + Soil (wet)			
Pan + Soil (dry)			
Moisture Content			
Liquid Limit			
Liquid Limit			

#### Plastic Limit

Pan ID		
Pan Weight		
Pan + Soil (wet)	Non-plastic	
Pan + Soil (dry)		
Moisture Content		
Plastic Limit		
Plastic Index		

### USCS Classification: ASTM D 2487

Group Symbol **SM**

Group Name **Silty SAND**

## Grain Size Distribution Calculations

Green Ridge, Cumberland Landfill

DAA# 18020117-030102

Prepared By: CBW

Sample ID DAA-06

Sample Depth 12'-14'

### Mechanical Sieve Analysis: ASTM D 422

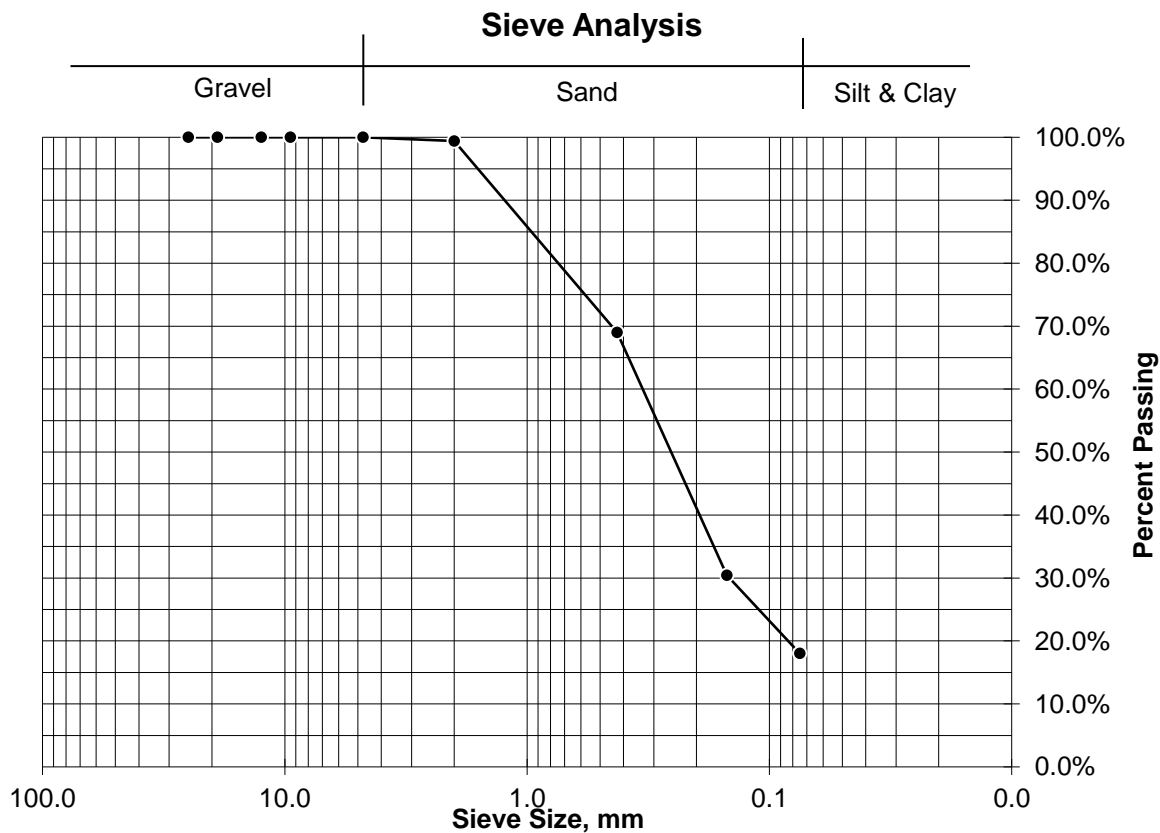


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Sieve Size	Weight Retained	Percent Retained	Sieve Size, mm	Percent Passing
1"	0.00	0.0%	25.0	100.0%
3/4"	0.00	0.0%	19.0	100.0%
1/2"	0.00	0.0%	12.5	100.0%
3/8"	0.00	0.0%	9.50	100.0%
No. 4	0.00	0.0%	4.75	100.0%
No. 10	0.67	0.6%	2.00	99.4%
No. 40	33.23	30.4%	0.425	69.0%
No. 100	42.24	38.6%	0.15	30.4%
No. 200	13.55	12.4%	0.075	18.0%
Pan	0.96	0.9%		
Total	90.65	82.8%		



## Soil Classification Calculations

Green Ridge, Cumberland Landfill

DAA# 18020117-030102

Prepared By: CBW



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Sample ID DAA-07

Sample Depth 10'-12'

Visual Sample Description Brownish-gray Silty SAND

Sample Received: 3/19/2019

Date Tested: 3/19/2019

### Natural Moisture Content: ASTM D 2216

Pan ID	30
Pan Wt	193.24 grams
Pan + Soil (wet)	300.01 grams
Pan + Soil (dry)	275.97 grams
Natural Moisture Content	29.1%

### Coarse or Fine Grained: ASTM D 422

Pan + Soil retained on No. 200 sieve

(dry) 250.28 grams

Percent Passing No. 200 Sieve 31.1%

Pan + Soil retained on No. 4 sieve

(dry) 193.24 grams

Percent Passing No. 4 Sieve 100.0%

Soil Classifies as Coarse-Grained Soil

### Atterberg Limits: ASTM D 4318

Date Tested: 3/21/2019

#### Liquid Limit

No of Blows	15	23	35
Pan ID	105	107	201
Pan Wt	29.29	25.13	27.70
Pan + Soil (wet)	49.71	42.20	50.08
Pan + Soil (dry)	41.92	36.00	42.44
Moisture Content	61.7%	57.0%	51.8%
Liquid Limit	58	56	54
Liquid Limit	56		

#### Plastic Limit

Pan ID	352	354
Pan Weight	9.13	9.19
Pan + Soil (wet)	20.33	20.54
Pan + Soil (dry)	17.50	17.67
Moisture Content	33.8%	33.9%
Plastic Limit	34	
Plastic Index	22	

### USCS Classification: ASTM D 2487

Group Symbol SM

Group Name Silty SAND

## Grain Size Distribution Calculations

Green Ridge, Cumberland Landfill

DAA# 18020117-030102

Prepared By: CBW

Sample ID DAA-07

Sample Depth 10'-12'

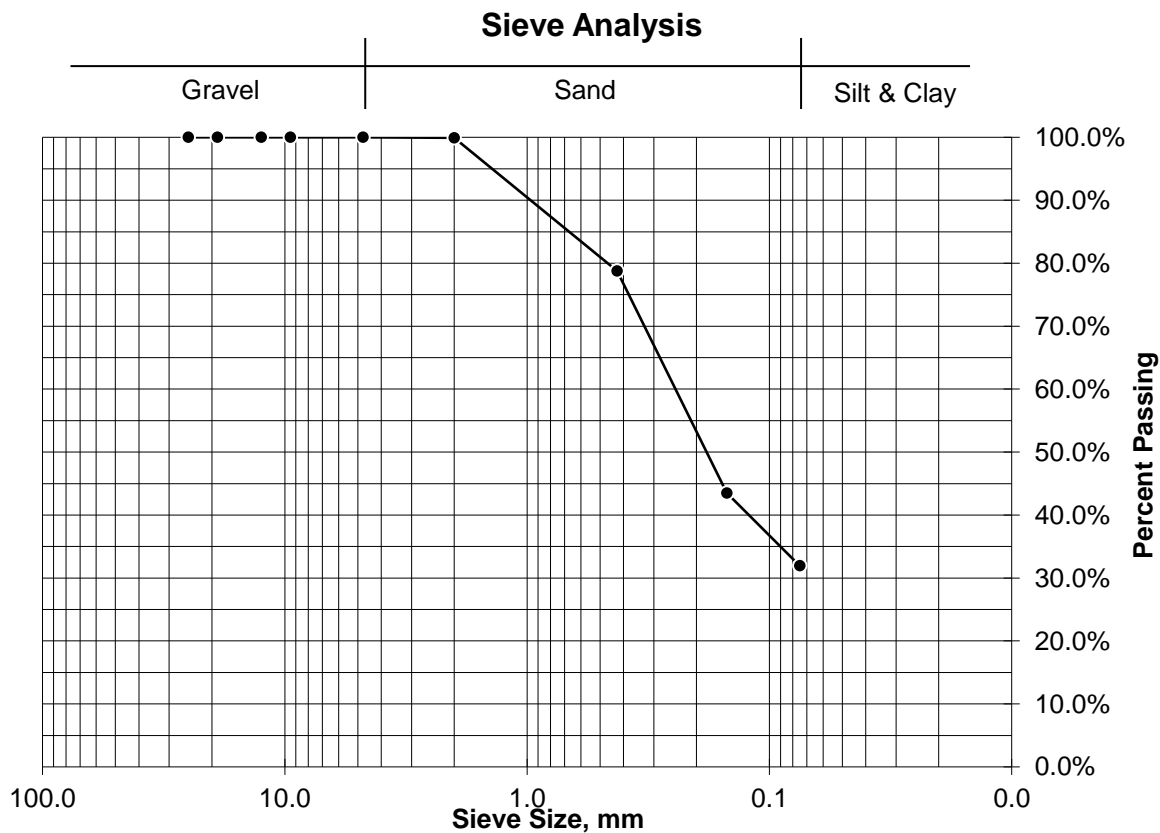
### Mechanical Sieve Analysis: ASTM D 422



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Sieve Size	Weight Retained	Percent Retained	Sieve Size, mm	Percent Passing
1"	0.00	0.0%	25.0	100.0%
3/4"	0.00	0.0%	19.0	100.0%
1/2"	0.00	0.0%	12.5	100.0%
3/8"	0.00	0.0%	9.50	100.0%
No. 4	0.00	0.0%	4.75	100.0%
No. 10	0.08	0.1%	2.00	99.9%
No. 40	17.50	21.2%	0.425	78.8%
No. 100	29.16	35.2%	0.15	43.5%
No. 200	9.56	11.6%	0.075	31.9%
Pan	0.73	0.9%		
Total	57.03	68.9%		





## Soil Classification Calculations

Green Ridge, Cumberland Landfill

DAA# 18020117-030102

Prepared By: CBW



1030 Wilmer Ave., Ste. 100

Richmond, VA 23227

Army Corps of Engineers Certified Laboratory

Sample ID DAA-07

Sample Depth 14'-16'

Visual Sample Description Micaceous Brownish-Gray Silty SAND

Sample Received: 3/19/2019

Date Tested: 3/19/2019

### Natural Moisture Content: ASTM D 2216

Pan ID	26
Pan Wt	194.56 grams
Pan + Soil (wet)	309.39 grams
Pan + Soil (dry)	286.88 grams
Natural Moisture Content	24.4%

### Coarse or Fine Grained: ASTM D 422

Pan + Soil retained on No. 200 sieve

(dry) 263.01 grams

Percent Passing No. 200 Sieve 25.9%

Pan + Soil retained on No. 4 sieve

(dry) 194.56 grams

Percent Passing No. 4 Sieve 100.0%

Soil Classifies as Coarse-Grained Soil

### Atterberg Limits: ASTM D 4318

Date Tested: 3/22/2019

#### Liquid Limit

No of Blows	17	28	35
Pan ID	70	9	65
Pan Wt	11.00	11.15	10.99
Pan + Soil (wet)	22.48	21.98	23.37
Pan + Soil (dry)	18.97	18.94	20.06
Moisture Content	44.0%	39.0%	36.5%
Liquid Limit	42	40	38
Liquid Limit	40		

#### Plastic Limit

Pan ID	84	83
Pan Weight	4.29	4.22
Pan + Soil (wet)	15.22	15.73
Pan + Soil (dry)	12.83	13.20
Moisture Content	28.0%	28.2%
Plastic Limit	28	
Plastic Index	12	

### USCS Classification: ASTM D 2487

Group Symbol **SM**

Group Name **Silty SAND**

## Grain Size Distribution Calculations

Green Ridge, Cumberland Landfill

DAA# 18020117-030102

Prepared By: CBW

Sample ID DAA-07

Sample Depth 14'-16'

### Mechanical Sieve Analysis: ASTM D 422

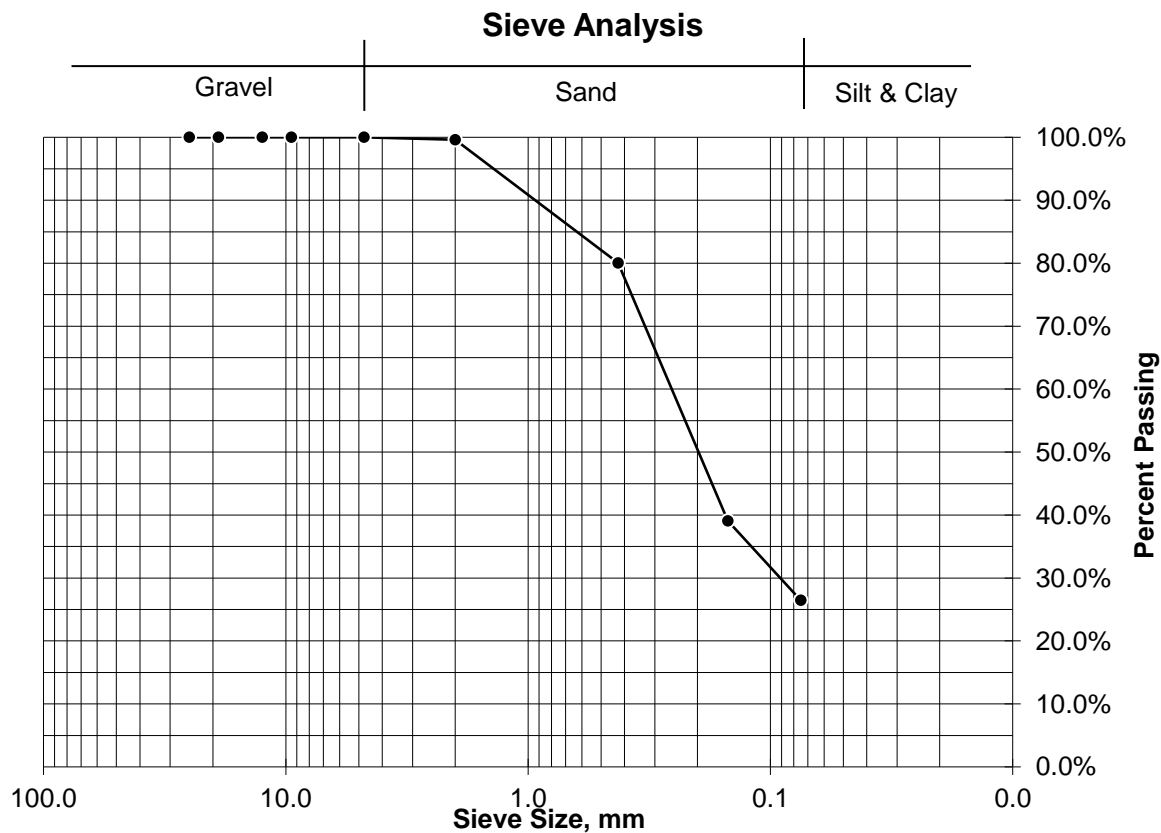


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Sieve Size	Weight Retained	Percent Retained	Sieve Size, mm	Percent Passing
1"	0.00	0.0%	25.0	100.0%
3/4"	0.00	0.0%	19.0	100.0%
1/2"	0.00	0.0%	12.5	100.0%
3/8"	0.00	0.0%	9.50	100.0%
No. 4	0.00	0.0%	4.75	100.0%
No. 10	0.35	0.4%	2.00	99.6%
No. 40	18.09	19.6%	0.425	80.0%
No. 100	37.80	40.9%	0.15	39.1%
No. 200	11.64	12.6%	0.075	26.5%
Pan	0.54	0.6%		
Total	68.42	74.1%		



## Soil Classification Calculations

Green Ridge, Cumberland Landfill

DAA# 18020117-030102

Prepared By: CBW



1030 Wilmer Ave., Ste. 100

Richmond, VA 23227

Army Corps of Engineers Certified Laboratory

Sample ID DAA-07

Sample Depth 55'-57'

Sample Received: 3/19/2019

Date Tested: 3/19/2019

Visual Sample Description Dark Reddish-Brown Sandy Elastic SILT

### Natural Moisture Content: ASTM D 2216

Pan ID	7
Pan Wt	192.36 grams
Pan + Soil (wet)	300.83 grams
Pan + Soil (dry)	263.58 grams
Natural Moisture Content	52.3%

### Coarse or Fine Grained: ASTM D 422

Pan + Soil retained on No. 200 sieve

(dry) 224.65 grams

Percent Passing No. 200 Sieve 54.7%

Pan + Soil retained on No. 4 sieve

(dry) 192.36 grams

Percent Passing No. 4 Sieve 100.0%

Soil Classifies as Fine-Grained Soil

### Atterberg Limits: ASTM D 4318

Date Tested: 3/21/2019

#### Liquid Limit

No of Blows	15	26	34
Pan ID	91	93	98
Pan Wt	24.48	30.02	30.33
Pan + Soil (wet)	39.70	51.63	45.57
Pan + Soil (dry)	33.71	43.60	40.18
Moisture Content	64.9%	59.1%	54.7%
Liquid Limit	61	59	57
Liquid Limit	59		

#### Plastic Limit

Pan ID	22	84
Pan Weight	4.26	4.27
Pan + Soil (wet)	15.82	15.11
Pan + Soil (dry)	12.33	11.81
Moisture Content	43.2%	43.8%
Plastic Limit	44	
Plastic Index	15	

### USCS Classification: ASTM D 2487

Group Symbol MH

Group Name Sandy Elastic SILT

# Grain Size Distribution Calculations

Green Ridge, Cumberland Landfill

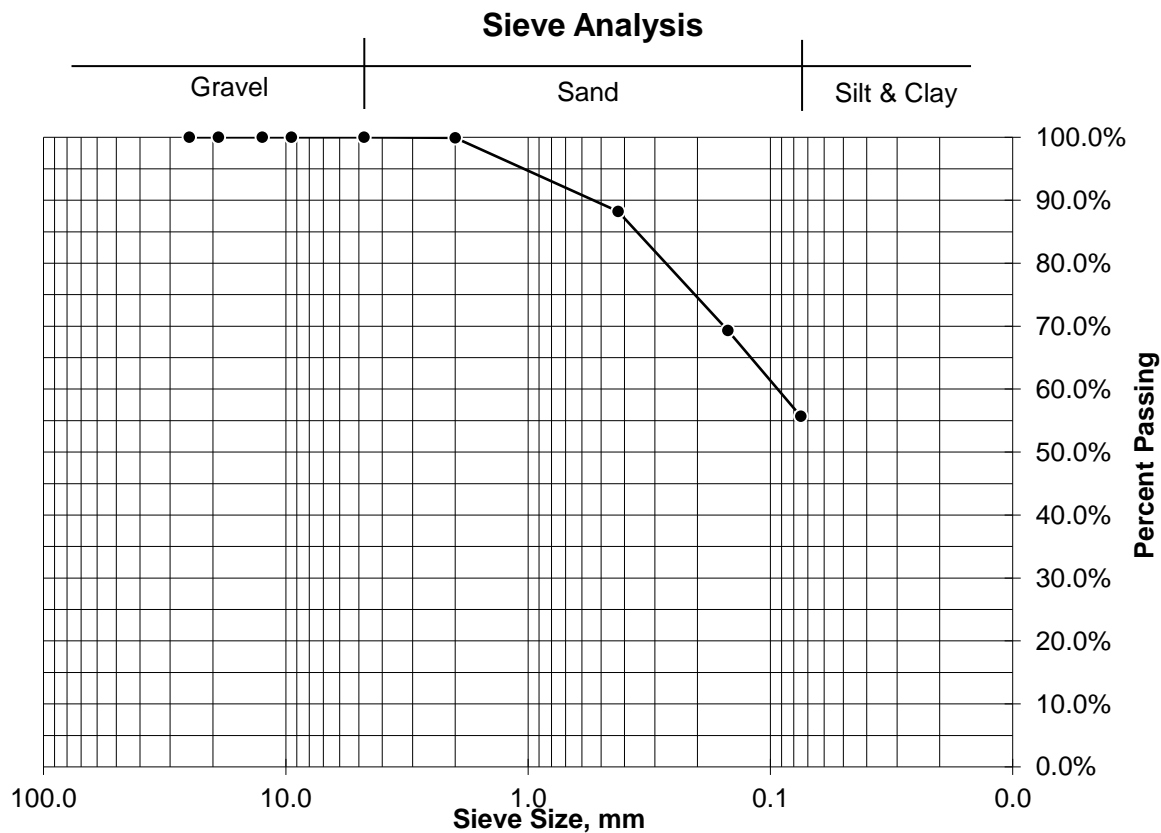
DAA# 18020117-030102

Prepared By: CBW

Sample ID DAA-07  
Sample Depth 55'-57'

## Mechanical Sieve Analysis: ASTM D 422

Sieve Size	Weight Retained	Percent Retained	Sieve Size, mm	Percent Passing
1"	0.00	0.0%	25.0	100.0%
3/4"	0.00	0.0%	19.0	100.0%
1/2"	0.00	0.0%	12.5	100.0%
3/8"	0.00	0.0%	9.50	100.0%
No. 4	0.00	0.0%	4.75	100.0%
No. 10	0.07	0.1%	2.00	99.9%
No. 40	8.33	11.7%	0.425	88.2%
No. 100	13.45	18.9%	0.15	69.3%
No. 200	9.70	13.6%	0.075	55.7%
Pan	0.74	1.0%		
Total	32.29	45.3%		



## Soil Classification Calculations

Green Ridge, Cumberland Landfill

DAA# 18020117-030102

Prepared By: CBW



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Sample ID DAA-08

Sample Depth 6'-8'

Visual Sample Description Reddish-Brown Silty SAND

Sample Received: 3/19/2019

Date Tested: 3/19/2019

### Natural Moisture Content: ASTM D 2216

Pan ID	6
Pan Wt	195.41 grams
Pan + Soil (wet)	306.06 grams
Pan + Soil (dry)	278.78 grams
Natural Moisture Content	32.7%

### Coarse or Fine Grained: ASTM D 422

Pan + Soil retained on No. 200 sieve

(dry) 245.61 grams

Percent Passing No. 200 Sieve 39.8%

Pan + Soil retained on No. 4 sieve

(dry) 195.41 grams

Percent Passing No. 4 Sieve 100.0%

Soil Classifies as Coarse-Grained Soil

### Atterberg Limits: ASTM D 4318

Date Tested: 3/22/2019

#### Liquid Limit

No of Blows	15	26	34
Pan ID	10	62	63
Pan Wt	11.20	10.85	10.81
Pan + Soil (wet)	28.75	27.80	27.63
Pan + Soil (dry)	22.27	21.93	22.09
Moisture Content	58.5%	53.0%	49.1%
Liquid Limit	55	53	51
Liquid Limit	53		

#### Plastic Limit

Pan ID	23	74
Pan Weight	4.34	4.26
Pan + Soil (wet)	15.71	15.31
Pan + Soil (dry)	12.03	11.73
Moisture Content	47.8%	47.9%
Plastic Limit	48	
Plastic Index	5	

### USCS Classification: ASTM D 2487

Group Symbol **SM**

Group Name **Silty SAND**



# Grain Size Distribution Calculations

Green Ridge, Cumberland Landfill

DAA# 18020117-030102

Prepared By: CBW

Sample ID DAA-08

Sample Depth 6'-8'

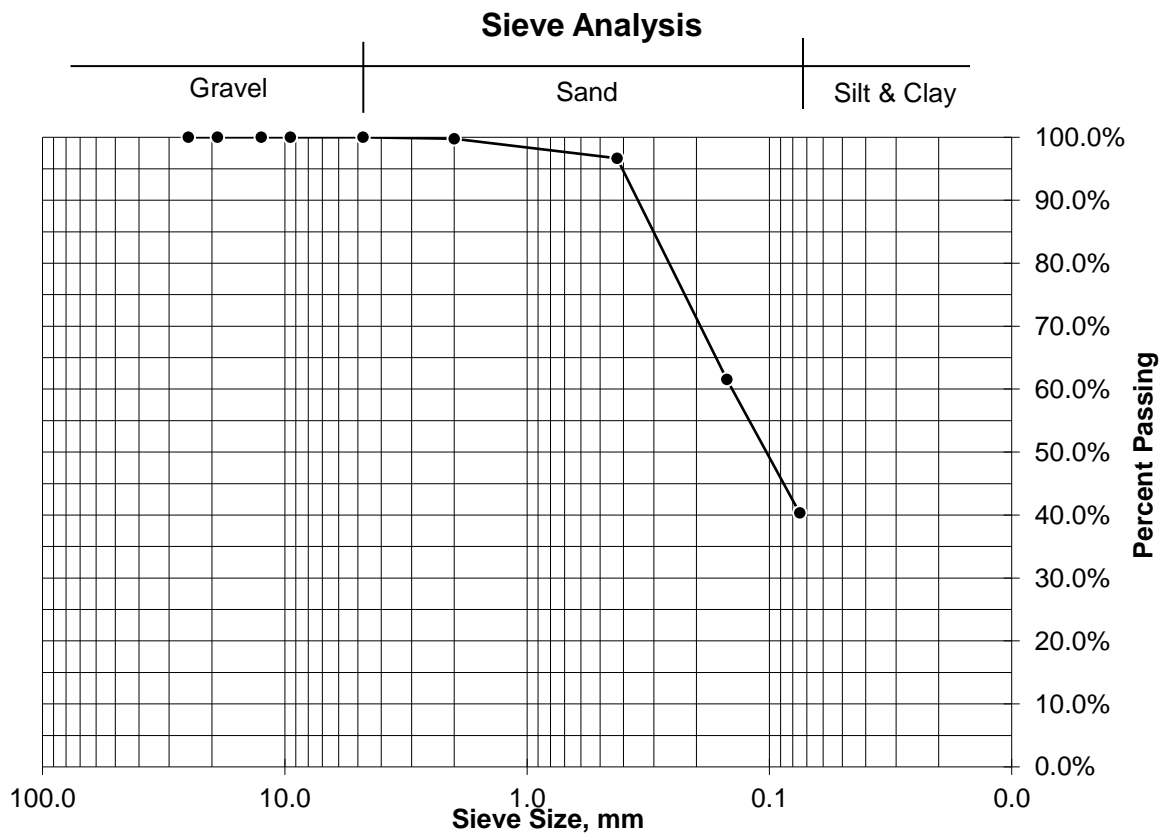
## Mechanical Sieve Analysis: ASTM D 422



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Sieve Size	Weight Retained	Percent Retained	Sieve Size, mm	Percent Passing
1"	0.00	0.0%	25.0	100.0%
3/4"	0.00	0.0%	19.0	100.0%
1/2"	0.00	0.0%	12.5	100.0%
3/8"	0.00	0.0%	9.50	100.0%
No. 4	0.00	0.0%	4.75	100.0%
No. 10	0.21	0.3%	2.00	99.7%
No. 40	2.57	3.1%	0.425	96.7%
No. 100	29.28	35.1%	0.15	61.5%
No. 200	17.69	21.2%	0.075	40.3%
Pan	0.45	0.5%		
Total	50.20	60.2%		



## **Soil Classification Calculations**

**Green Ridge, Cumberland Landfill**

**DAA# 18020117-030102**

**Prepared By: CBW**



1030 Wilmer Ave., Ste. 100  
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Sample ID DAA-08

Sample Depth 10'-11.5'

Visual Sample Description Gray Silty SAND

Sample Received: 4/26/2019

Date Tested: 4/26/2019

### **Natural Moisture Content: ASTM D 2216**

Pan ID	35
Pan Wt	192.71 grams
Pan + Soil (wet)	485.76 grams
Pan + Soil (dry)	399.72 grams
Natural Moisture Content	41.6%

### **Coarse or Fine Grained: ASTM D 422**

Pan + Soil retained on No. 200 sieve

(dry) 341.96 grams

Percent Passing No. 200 Sieve 27.9%

Pan + Soil retained on No. 4 sieve

(dry) 194.03 grams

Percent Passing No. 4 Sieve 99.4%

*Soil Classifies as Coarse-Grained Soil*

### **Atterberg Limits: ASTM D 4318**

Date Tested: 5/1/2019

#### **Liquid Limit**

No of Blows			
Pan ID		Non-plastic	
Pan Wt			
Pan + Soil (wet)			
Pan + Soil (dry)			
Moisture Content			
Liquid Limit			
<i>Liquid Limit</i>			

#### **Plastic Limit**

Pan ID		
Pan Weight	Non-plastic	
Pan + Soil (wet)		
Pan + Soil (dry)		
Moisture Content		
<i>Plastic Limit</i>		
<i>Plastic Index</i>		

### **USCS Classification: ASTM D 2487**

Group Symbol **SM**

Group Name **Silty SAND**

## Grain Size Distribution Calculations

Green Ridge, Cumberland Landfill

DAA# 18020117-030102

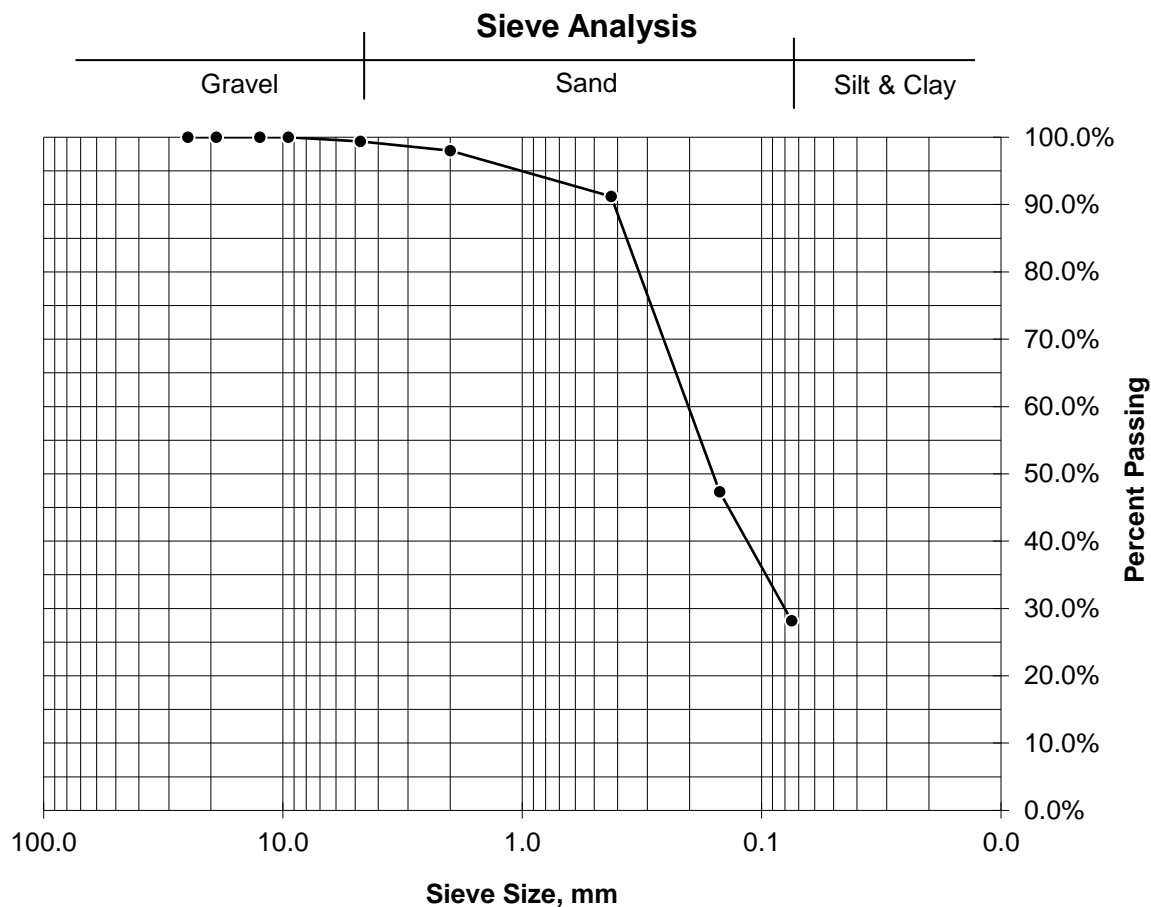
Prepared By: CBW

Sample ID DAA-08

Sample Depth 10'-11.5'

### Mechanical Sieve Analysis: ASTM D 422

Sieve Size	Weight Retained	Percent Retained	Sieve Size, mm	Date Tested: Passing
1"	0.00	0.0%	25.0	100.0%
3/4"	0.00	0.0%	19.0	100.0%
1/2"	0.00	0.0%	12.5	100.0%
3/8"	0.00	0.0%	9.5	100.0%
No. 4	1.32	0.6%	4.75	99.4%
No. 10	2.77	1.3%	2.0	98.0%
No. 40	14.15	6.8%	0.425	91.2%
No. 100	90.77	43.8%	0.15	47.3%
No. 200	39.67	19.2%	0.075	28.2%
Pan	0.54	0.3%		
Total	149.22	72.1%		



## Soil Classification Calculations

Green Ridge, Cumberland Landfill

DAA# 18020117-030102

Prepared By: CBW



1030 Wilmer Ave., Ste. 100

Richmond, VA 23227

Army Corps of Engineers Certified Laboratory

Sample ID DAA-08

Sample Depth 12'-14'

Visual Sample Description Micaceous Brown Silty SAND

Sample Received: 3/19/2019

Date Tested: 3/19/2019

### Natural Moisture Content: ASTM D 2216

Pan ID	37
Pan Wt	193.55 grams
Pan + Soil (wet)	302.87 grams
Pan + Soil (dry)	269.55 grams
Natural Moisture Content	43.8%

### Coarse or Fine Grained: ASTM D 422

Pan + Soil retained on No. 200 sieve

(dry) 249.49 grams

Percent Passing No. 200 Sieve 26.4%

Pan + Soil retained on No. 4 sieve

(dry) 193.55 grams

Percent Passing No. 4 Sieve 100.0%

Soil Classifies as Coarse-Grained Soil

### Atterberg Limits: ASTM D 4318

Date Tested: 3/22/2019

#### Liquid Limit

No of Blows	15	22	35
Pan ID	96	169	201
Pan Wt	24.82	27.15	27.65
Pan + Soil (wet)	41.90	45.82	47.45
Pan + Soil (dry)	36.35	40.19	41.86
Moisture Content	48.1%	43.2%	39.4%
Liquid Limit	45	43	41
Liquid Limit	43		

#### Plastic Limit

Pan ID	13	353
Pan Weight	4.28	9.12
Pan + Soil (wet)	17.45	22.46
Pan + Soil (dry)	13.97	18.94
Moisture Content	35.9%	35.8%
Plastic Limit	36	
Plastic Index	7	

### USCS Classification: ASTM D 2487

Group Symbol SM

Group Name Silty SAND

## Grain Size Distribution Calculations

Green Ridge, Cumberland Landfill

DAA# 18020117-030102

Prepared By: CBW

Sample ID DAA-08

Sample Depth 12'-14'

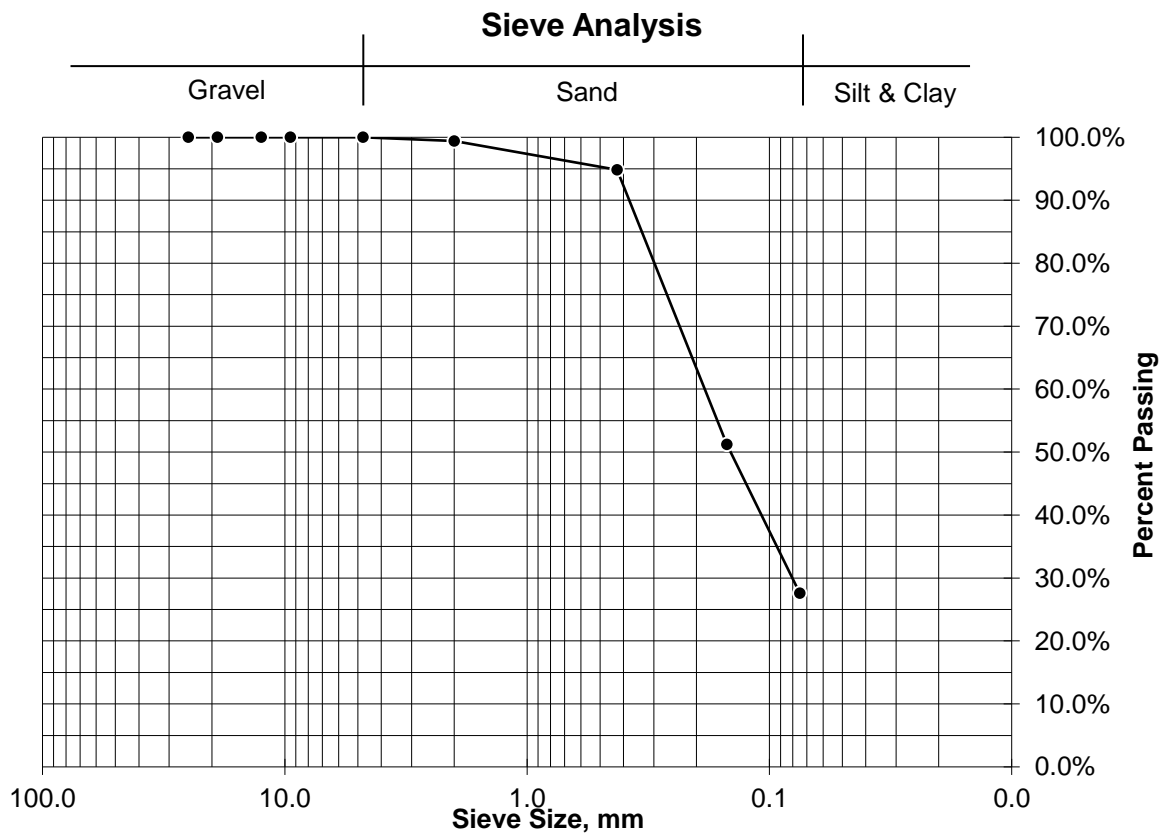
### Mechanical Sieve Analysis: ASTM D 422



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Sieve Size	Weight Retained	Percent Retained	Sieve Size, mm	Percent Passing
1"	0.00	0.0%	25.0	100.0%
3/4"	0.00	0.0%	19.0	100.0%
1/2"	0.00	0.0%	12.5	100.0%
3/8"	0.00	0.0%	9.50	100.0%
No. 4	0.00	0.0%	4.75	100.0%
No. 10	0.45	0.6%	2.00	99.4%
No. 40	3.48	4.6%	0.425	94.8%
No. 100	33.13	43.6%	0.15	51.2%
No. 200	17.95	23.6%	0.075	27.6%
Pan	0.92	1.2%		
Total	55.93	73.6%		





## Soil Classification Calculations

Green Ridge, Cumberland Landfill

DAA# 18020117-030102

Prepared By: CBW



1030 Wilmer Ave., Ste. 100

Richmond, VA 23227

Army Corps of Engineers Certified Laboratory

Sample ID DAA-08

Sample Depth 20'-22'

Sample Received: 3/19/2019

Date Tested: 3/19/2019

Visual Sample Description Micaceous Brownish-Gray Silty SAND

### Natural Moisture Content: ASTM D 2216

Pan ID	20
Pan Wt	189.94 grams
Pan + Soil (wet)	298.08 grams
Pan + Soil (dry)	274.42 grams
Natural Moisture Content	28.0%

### Coarse or Fine Grained: ASTM D 422

Pan + Soil retained on No. 200 sieve

(dry) 255.08 grams

Percent Passing No. 200 Sieve 22.9%

Pan + Soil retained on No. 4 sieve

(dry) 190.42 grams

Percent Passing No. 4 Sieve 99.4%

Soil Classifies as Coarse-Grained Soil

### Atterberg Limits: ASTM D 4318

Date Tested: 3/22/2019

#### Liquid Limit

No of Blows			
Pan ID		Non-plastic	
Pan Wt			
Pan + Soil (wet)			
Pan + Soil (dry)			
Moisture Content			
Liquid Limit			
Liquid Limit			

#### Plastic Limit

Pan ID		
Pan Weight	Non-plastic	
Pan + Soil (wet)		
Pan + Soil (dry)		
Moisture Content		
Plastic Limit		
Plastic Index		

### USCS Classification: ASTM D 2487

Group Symbol **SM**

Group Name **Silty SAND**

## Grain Size Distribution Calculations

Green Ridge, Cumberland Landfill

DAA# 18020117-030102

Prepared By: CBW

Sample ID DAA-08

Sample Depth 20'-22'

### Mechanical Sieve Analysis: ASTM D 422

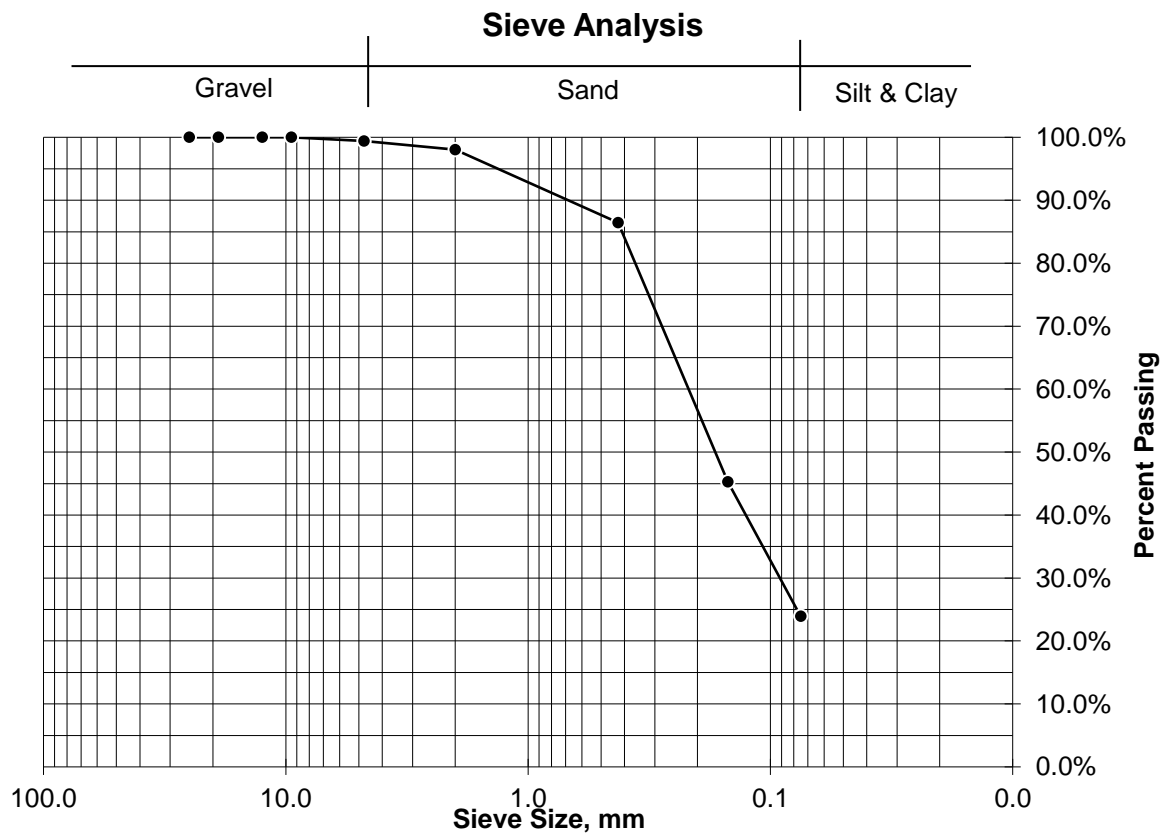


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Richmond, VA 23227

Army Corps of Engineers Certified Laboratory

Sieve Size	Weight Retained	Percent Retained	Sieve Size, mm	Percent Passing
1"	0.00	0.0%	25.0	100.0%
3/4"	0.00	0.0%	19.0	100.0%
1/2"	0.00	0.0%	12.5	100.0%
3/8"	0.00	0.0%	9.50	100.0%
No. 4	0.48	0.6%	4.75	99.4%
No. 10	1.16	1.4%	2.00	98.1%
No. 40	9.80	11.6%	0.425	86.5%
No. 100	34.77	41.2%	0.15	45.3%
No. 200	18.07	21.4%	0.075	23.9%
Pan	0.83	1.0%		
Total	65.11	77.1%		



## Soil Classification Calculations

Green Ridge, Cumberland Landfill

DAA# 18020117-030102

Prepared By: CBW



1030 Wilmer Ave., Ste. 100

Richmond, VA 23227

Army Corps of Engineers Certified Laboratory

Sample ID DAA-09

Sample Depth 6'-8'

Visual Sample Description Light Brown Silty SAND

Sample Received: 3/19/2019

Date Tested: 3/19/2019

### Natural Moisture Content: ASTM D 2216

Pan ID	38
Pan Wt	193.63 grams
Pan + Soil (wet)	296.08 grams
Pan + Soil (dry)	271.63 grams
Natural Moisture Content	31.3%

### Coarse or Fine Grained: ASTM D 422

Pan + Soil retained on No. 200 sieve

(dry) 238.65 grams

Percent Passing No. 200 Sieve 42.3%

Pan + Soil retained on No. 4 sieve

(dry) 193.63 grams

Percent Passing No. 4 Sieve 100.0%

Soil Classifies as Coarse-Grained Soil

### Atterberg Limits: ASTM D 4318

Date Tested: 4/2/2019

#### Liquid Limit

No of Blows	17	23	34
Pan ID	6	9	62
Pan Wt	11.18	11.14	10.87
Pan + Soil (wet)	20.78	31.60	21.61
Pan + Soil (dry)	17.11	24.10	17.87
Moisture Content	61.8%	57.9%	53.4%
Liquid Limit	59	57	55
Liquid Limit	57		

#### Plastic Limit

Pan ID	79	317
Pan Weight	4.24	8.09
Pan + Soil (wet)	14.44	18.73
Pan + Soil (dry)	11.31	15.46
Moisture Content	44.3%	44.4%
Plastic Limit	44	
Plastic Index	13	

### USCS Classification: ASTM D 2487

Group Symbol SM

Group Name Silty SAND

# Grain Size Distribution Calculations

Green Ridge, Cumberland Landfill

DAA# 18020117-030102

Prepared By: CBW



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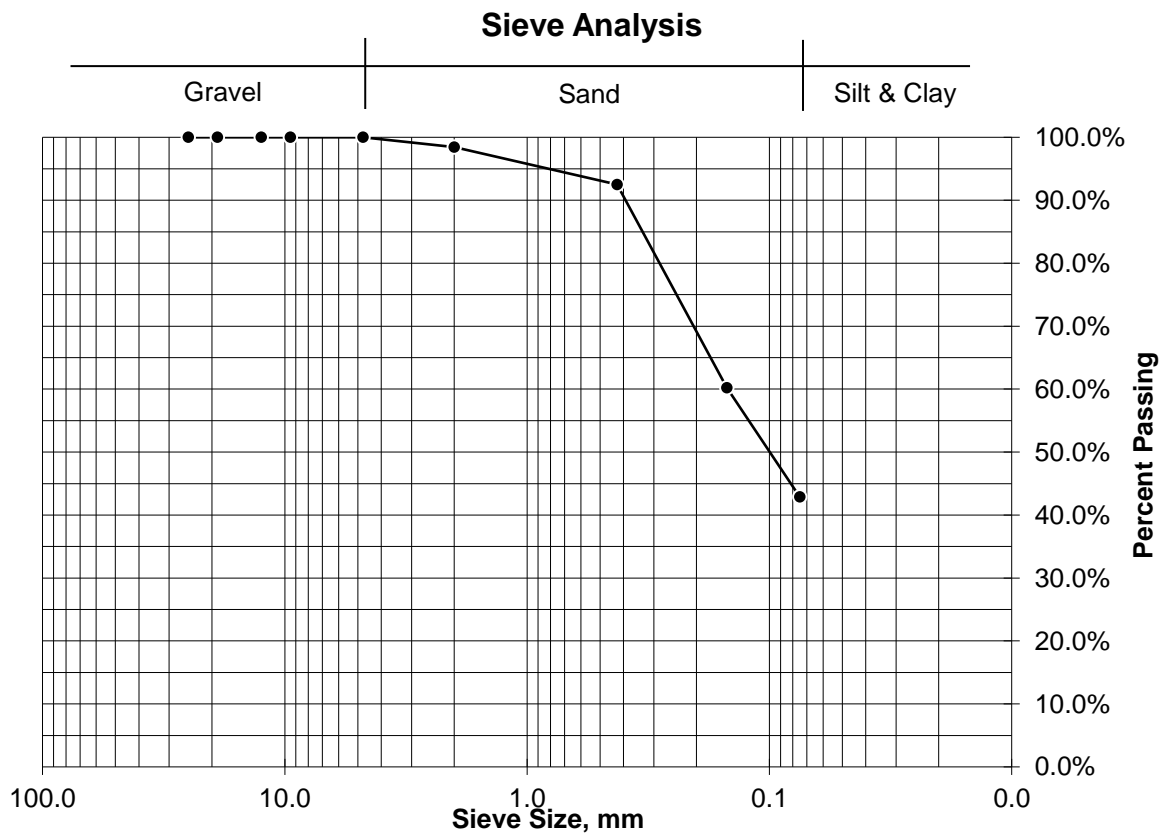
Army Corps of Engineers Certified Laboratory

Sample ID DAA-09

Sample Depth 6'-8'

## Mechanical Sieve Analysis: ASTM D 422

Sieve Size	Weight Retained	Percent Retained	Sieve Size, mm	Percent Passing
1"	0.00	0.0%	25.0	100.0%
3/4"	0.00	0.0%	19.0	100.0%
1/2"	0.00	0.0%	12.5	100.0%
3/8"	0.00	0.0%	9.50	100.0%
No. 4	0.00	0.0%	4.75	100.0%
No. 10	1.21	1.6%	2.00	98.4%
No. 40	4.63	5.9%	0.425	92.5%
No. 100	25.17	32.3%	0.15	60.2%
No. 200	13.53	17.3%	0.075	42.9%
Pan	0.48	0.6%		
Total	45.02	57.7%		



## Soil Classification Calculations

Green Ridge, Cumberland Landfill

DAA# 18020117-030102

Prepared By: CBW



1030 Wilmer Ave., Ste. 100

Richmond, VA 23227

Army Corps of Engineers Certified Laboratory

Sample ID DAA-09

Sample Depth 20'-22'

Sample Received: 3/19/2019

Date Tested: 3/19/2019

Visual Sample Description Micaceous Brownish-Gray Silty SAND

### Natural Moisture Content: ASTM D 2216

Pan ID	31
Pan Wt	193.03 grams
Pan + Soil (wet)	308.43 grams
Pan + Soil (dry)	295.67 grams
Natural Moisture Content	12.4%

### Coarse or Fine Grained: ASTM D 422

Pan + Soil retained on No. 200 sieve

(dry) 278.85 grams

Percent Passing No. 200 Sieve 16.4%

Pan + Soil retained on No. 4 sieve

(dry) 193.49 grams

Percent Passing No. 4 Sieve 99.6%

Soil Classifies as Coarse-Grained Soil

### Atterberg Limits: ASTM D 4318

Date Tested: 3/22/2019

#### Liquid Limit

No of Blows			
Pan ID		Non-plastic	
Pan Wt			
Pan + Soil (wet)			
Pan + Soil (dry)			
Moisture Content			
Liquid Limit			
Liquid Limit			

#### Plastic Limit

Pan ID		
Pan Weight	Non-plastic	
Pan + Soil (wet)		
Pan + Soil (dry)		
Moisture Content		
Plastic Limit		
Plastic Index		

### USCS Classification: ASTM D 2487

Group Symbol **SM**

Group Name **Silty SAND**



# Grain Size Distribution Calculations

Green Ridge, Cumberland Landfill

DAA# 18020117-030102

Prepared By: CBW



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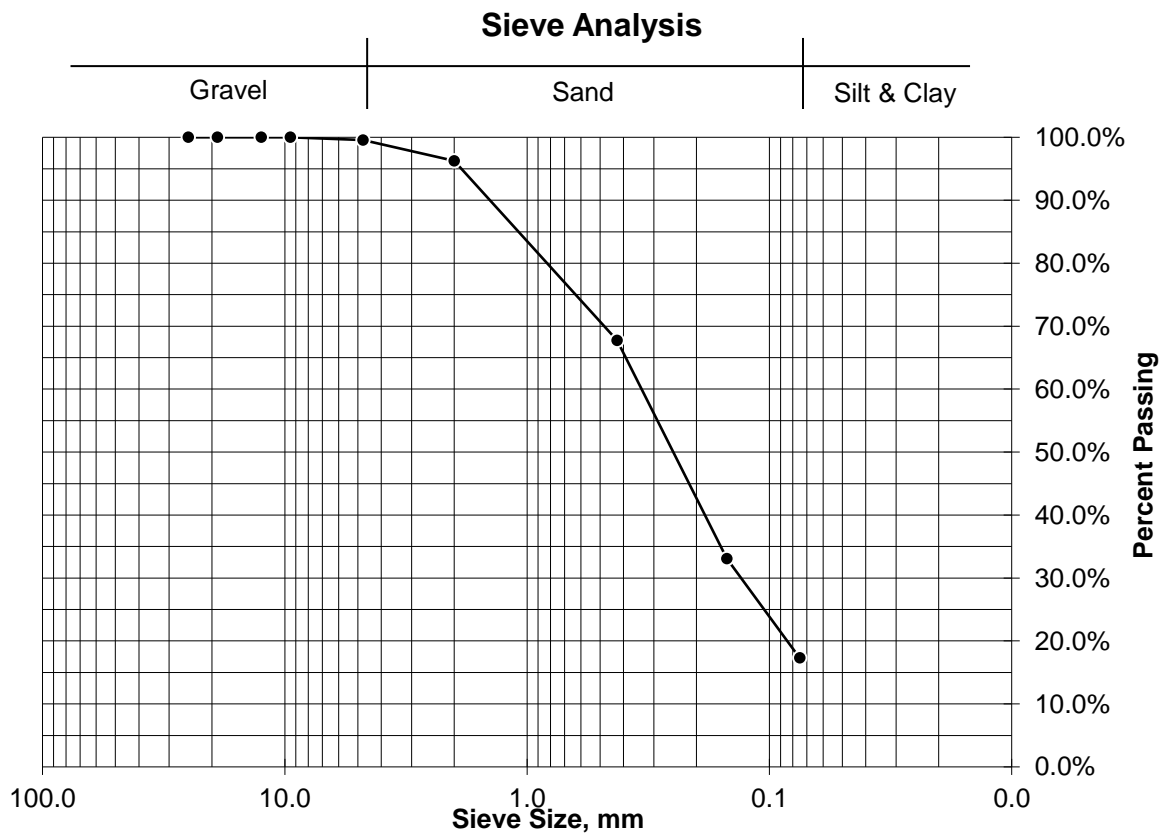
Army Corps of Engineers Certified Laboratory

Sample ID DAA-09

Sample Depth 20'-22'

## Mechanical Sieve Analysis: ASTM D 422

Sieve Size	Weight Retained	Percent Retained	Sieve Size, mm	Percent Passing
1"	0.00	0.0%	25.0	100.0%
3/4"	0.00	0.0%	19.0	100.0%
1/2"	0.00	0.0%	12.5	100.0%
3/8"	0.00	0.0%	9.50	100.0%
No. 4	0.46	0.4%	4.75	99.6%
No. 10	3.36	3.3%	2.00	96.3%
No. 40	29.30	28.5%	0.425	67.7%
No. 100	35.57	34.7%	0.15	33.1%
No. 200	16.19	15.8%	0.075	17.3%
Pan	0.93	0.9%		
Total	85.81	83.6%		



## Soil Classification Calculations

Green Ridge, Cumberland Landfill

DAA# 18020117-030102

Prepared By: CBW



1030 Wilmer Ave., Ste. 100

Richmond, VA 23227

Army Corps of Engineers Certified Laboratory

Sample ID DAA-10

Sample Depth 22'-24'

Visual Sample Description Brownish Gray Silty SAND

Sample Received: 3/19/2019

Date Tested: 3/22/2019

### Natural Moisture Content: ASTM D 2216

Pan ID	101
Pan Wt	122.79 grams
Pan + Soil (wet)	236.05 grams
Pan + Soil (dry)	224.08 grams
Natural Moisture Content	11.8%

### Coarse or Fine Grained: ASTM D 422

Pan + Soil retained on No. 200 sieve

(dry) 206.06 grams

Percent Passing No. 200 Sieve 17.8%

Pan + Soil retained on No. 4 sieve

(dry) 125.12 grams

Percent Passing No. 4 Sieve 97.7%

Soil Classifies as Coarse-Grained Soil

### Atterberg Limits: ASTM D 4318

Date Tested: 3/25/2019

#### Liquid Limit

No of Blows	18	24	34
Pan ID	2000	92	102
Pan Wt	25.70	25.63	24.01
Pan + Soil (wet)	37.17	36.23	37.46
Pan + Soil (dry)	33.92	33.39	34.14
Moisture Content	39.5%	36.6%	32.8%
Liquid Limit	38	36	34
Liquid Limit	36		

#### Plastic Limit

Pan ID	315	353
Pan Weight	9.14	9.12
Pan + Soil (wet)	22.89	22.11
Pan + Soil (dry)	19.88	19.28
Moisture Content	28.0%	27.9%
Plastic Limit	28	
Plastic Index	8	

### USCS Classification: ASTM D 2487

Group Symbol SM

Group Name Silty SAND

# Grain Size Distribution Calculations

Green Ridge, Cumberland Landfill

DAA# 18020117-030102

Prepared By: CBW



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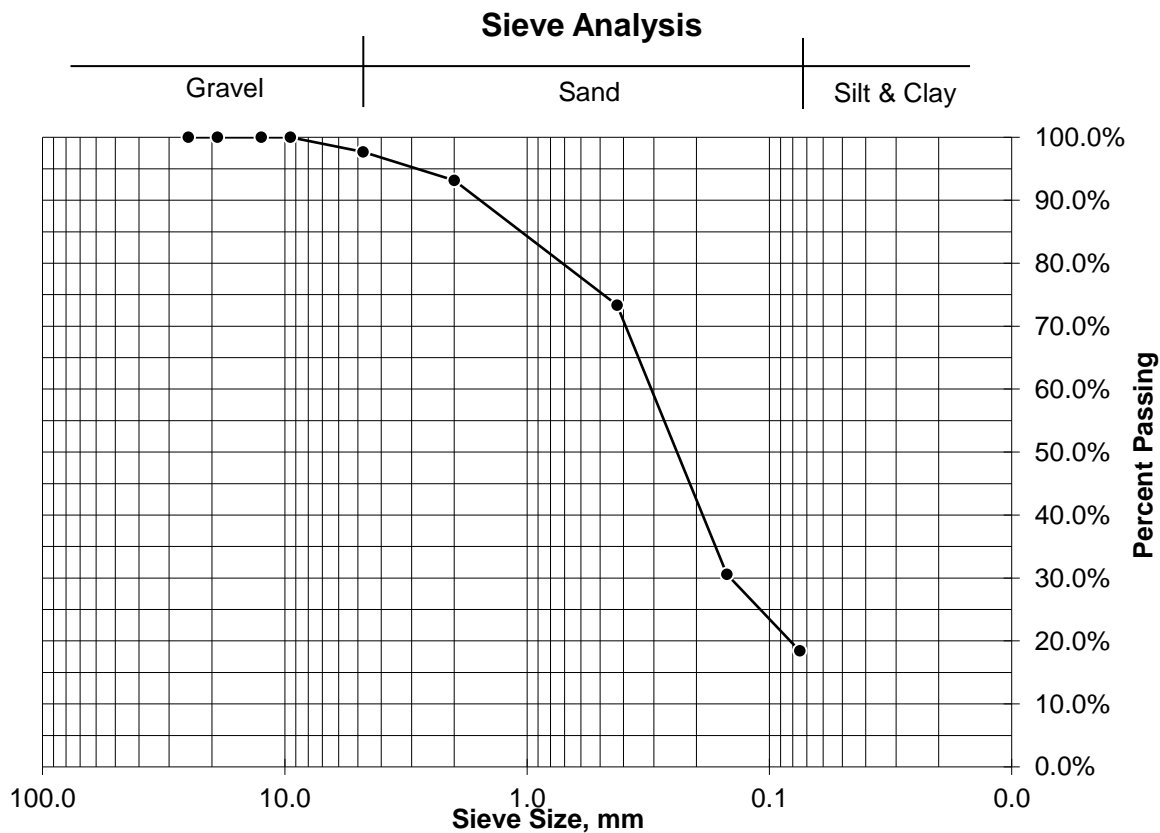
Army Corps of Engineers Certified Laboratory

Sample ID DAA-10

Sample Depth 22'-24'

## Mechanical Sieve Analysis: ASTM D 422

Sieve Size	Weight Retained	Percent Retained	Sieve Size, mm	Percent Passing
1"	0.00	0.0%	25.0	100.0%
3/4"	0.00	0.0%	19.0	100.0%
1/2"	0.00	0.0%	12.5	100.0%
3/8"	0.00	0.0%	9.50	100.0%
No. 4	2.33	2.3%	4.75	97.7%
No. 10	4.62	4.6%	2.00	93.1%
No. 40	20.05	19.8%	0.425	73.3%
No. 100	43.31	42.8%	0.15	30.6%
No. 200	12.32	12.2%	0.075	18.4%
Pan	0.64	0.6%		
Total	83.27	82.2%		



## Soil Classification Calculations

Green Ridge, Cumberland Landfill

DAA# 18020117-030102

Prepared By: CBW



1030 Wilmer Ave., Ste. 100

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Army Corps of Engineers Certified Laboratory

Sample ID DAA-10

Sample Depth 24'-26'

Visual Sample Description Gray Silty SAND

Sample Received: 3/19/2019

Date Tested: 3/19/2019

### Natural Moisture Content: ASTM D 2216

Pan ID	39
Pan Wt	192.99 grams
Pan + Soil (wet)	305.74 grams
Pan + Soil (dry)	294.04 grams
Natural Moisture Content	11.6%

### Coarse or Fine Grained: ASTM D 422

Pan + Soil retained on No. 200 sieve

(dry) 264.20 grams

Percent Passing No. 200 Sieve 29.5%

Pan + Soil retained on No. 4 sieve

(dry) 192.99 grams

Percent Passing No. 4 Sieve 100.0%

Soil Classifies as Coarse-Grained Soil

### Atterberg Limits: ASTM D 4318

Date Tested: 3/22/2019

#### Liquid Limit

No of Blows			
Pan ID		Non-plastic	
Pan Wt			
Pan + Soil (wet)			
Pan + Soil (dry)			
Moisture Content			
Liquid Limit			
Liquid Limit			

#### Plastic Limit

Pan ID		
Pan Weight	Non-plastic	
Pan + Soil (wet)		
Pan + Soil (dry)		
Moisture Content		
Plastic Limit		
Plastic Index		

### USCS Classification: ASTM D 2487

Group Symbol **SM**

Group Name **Silty SAND**

## Grain Size Distribution Calculations

Green Ridge, Cumberland Landfill

DAA# 18020117-030102

Prepared By: CBW

Sample ID DAA-10

Sample Depth 24'-26'

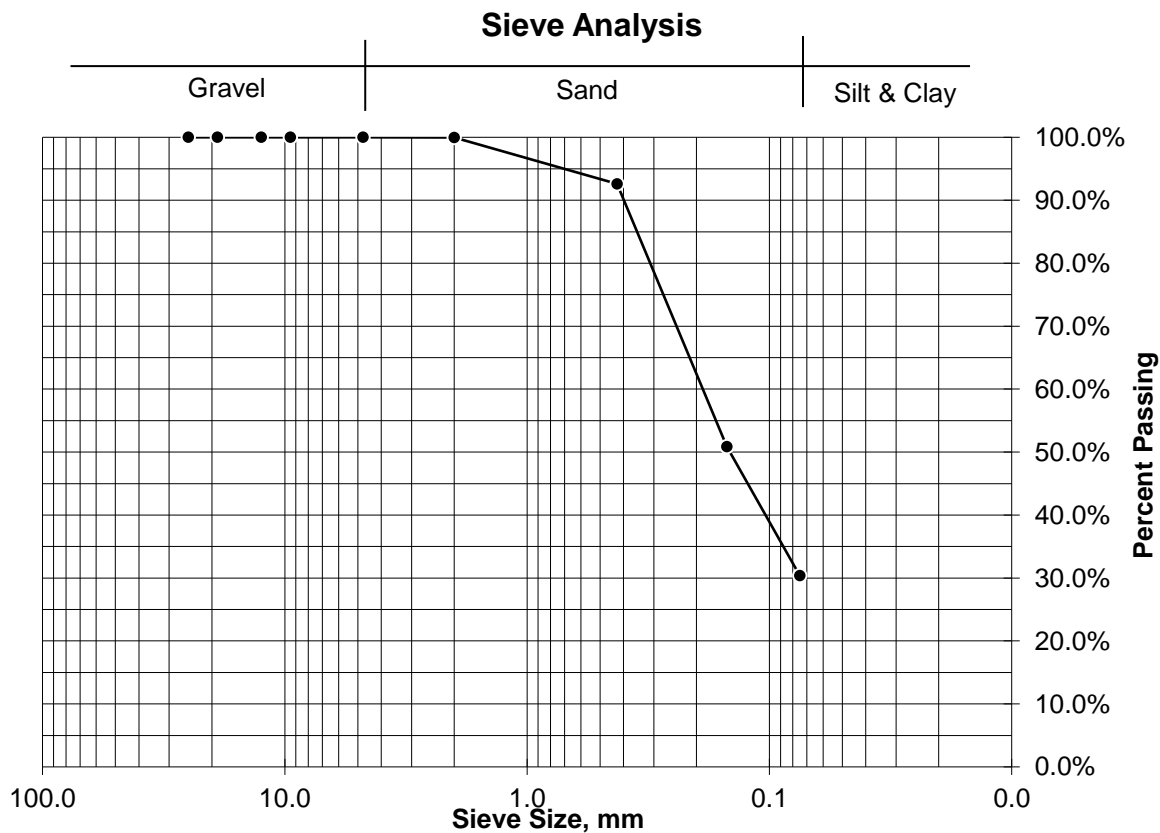
### Mechanical Sieve Analysis: ASTM D 422



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Army Corps of Engineers Certified Laboratory

Sieve Size	Weight Retained	Percent Retained	Sieve Size, mm	Percent Passing
1"	0.00	0.0%	25.0	100.0%
3/4"	0.00	0.0%	19.0	100.0%
1/2"	0.00	0.0%	12.5	100.0%
3/8"	0.00	0.0%	9.50	100.0%
No. 4	0.00	0.0%	4.75	100.0%
No. 10	0.03	0.0%	2.00	100.0%
No. 40	7.45	7.4%	0.425	92.6%
No. 100	42.14	41.7%	0.15	50.9%
No. 200	20.70	20.5%	0.075	30.4%
Pan	0.88	0.9%		
Total	71.20	70.5%		





## Soil Classification Calculations

Green Ridge, Cumberland Landfill

DAA# 18020117-030102

Prepared By: CBW



1030 Wilmer Ave., Ste. 100

Richmond, VA 23227

Army Corps of Engineers Certified Laboratory

Sample ID DAA-12

Sample Depth 25'-27'

Visual Sample Description Gray Silty SAND

Sample Received: 3/19/2019

Date Tested: 3/19/2019

### Natural Moisture Content: ASTM D 2216

Pan ID	33
Pan Wt	193.68 grams
Pan + Soil (wet)	312.10 grams
Pan + Soil (dry)	307.83 grams
Natural Moisture Content	3.7%

### Coarse or Fine Grained: ASTM D 422

Pan + Soil retained on No. 200 sieve

(dry) 287.06 grams

Percent Passing No. 200 Sieve 18.2%

Pan + Soil retained on No. 4 sieve

(dry) 194.40 grams

Percent Passing No. 4 Sieve 99.4%

Soil Classifies as Coarse-Grained Soil

### Atterberg Limits: ASTM D 4318

Date Tested: 3/22/2019

#### Liquid Limit

No of Blows			
Pan ID		Non-plastic	
Pan Wt			
Pan + Soil (wet)			
Pan + Soil (dry)			
Moisture Content			
Liquid Limit			
Liquid Limit			

#### Plastic Limit

Pan ID		
Pan Weight	Non-plastic	
Pan + Soil (wet)		
Pan + Soil (dry)		
Moisture Content		
Plastic Limit		
Plastic Index		

### USCS Classification: ASTM D 2487

Group Symbol **SM**

Group Name **Silty SAND**

## Grain Size Distribution Calculations

Green Ridge, Cumberland Landfill

DAA# 18020117-030102

Prepared By: CBW

Sample ID DAA-12

Sample Depth 25'-27'

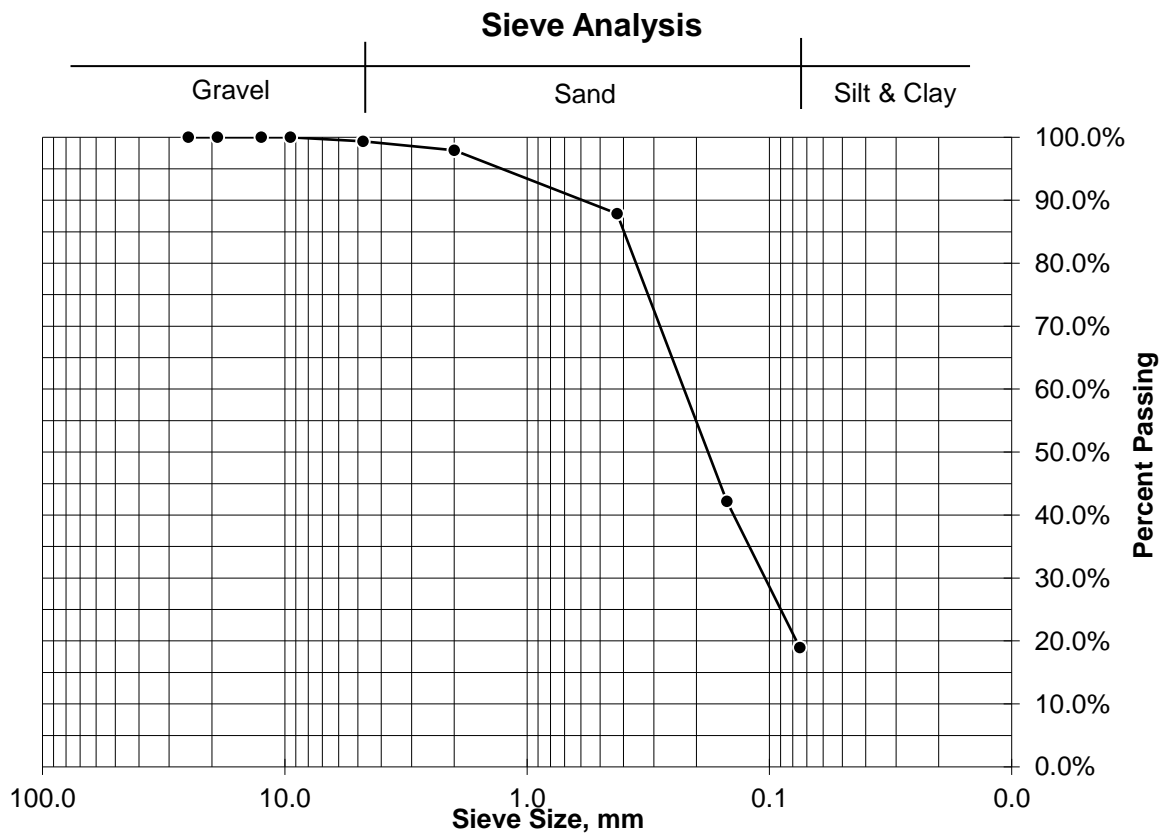
### Mechanical Sieve Analysis: ASTM D 422



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Sieve Size	Weight Retained	Percent Retained	Sieve Size, mm	Percent Passing
1"	0.00	0.0%	25.0	100.0%
3/4"	0.00	0.0%	19.0	100.0%
1/2"	0.00	0.0%	12.5	100.0%
3/8"	0.00	0.0%	9.50	100.0%
No. 4	0.72	0.6%	4.75	99.4%
No. 10	1.65	1.4%	2.00	97.9%
No. 40	11.45	10.0%	0.425	87.9%
No. 100	52.16	45.7%	0.15	42.2%
No. 200	26.51	23.2%	0.075	19.0%
Pan	0.87	0.8%		
Total	93.36	81.8%		



## Soil Classification Calculations

Green Ridge, Cumberland Landfill

DAA# 18020117-030102

Prepared By: CBW



1030 Wilmer Ave., Ste. 100

Richmond, VA 23227

Army Corps of Engineers Certified Laboratory

Sample ID DAA-13

Sample Depth 8'-10'

Visual Sample Description Light Brown Silty SAND

Sample Received: 3/19/2019

Date Tested: 3/19/2019

### Natural Moisture Content: ASTM D 2216

Pan ID	22
Pan Wt	189.00 grams
Pan + Soil (wet)	296.08 grams
Pan + Soil (dry)	277.42 grams
Natural Moisture Content	21.1%

### Coarse or Fine Grained: ASTM D 422

Pan + Soil retained on No. 200 sieve

(dry) 250.40 grams

Percent Passing No. 200 Sieve 30.6%

Pan + Soil retained on No. 4 sieve

(dry) 189.00 grams

Percent Passing No. 4 Sieve 100.0%

Soil Classifies as Coarse-Grained Soil

### Atterberg Limits: ASTM D 4318

Date Tested: 3/21/2019

#### Liquid Limit

No of Blows	18	24	35
Pan ID	94	108	109
Pan Wt	23.81	33.16	25.00
Pan + Soil (wet)	42.00	51.14	42.51
Pan + Soil (dry)	36.56	46.05	37.92
Moisture Content	42.7%	39.5%	35.5%
Liquid Limit	41	39	37
Liquid Limit	39		

#### Plastic Limit

Pan ID	313	316
Pan Weight	9.17	9.09
Pan + Soil (wet)	22.43	22.78
Pan + Soil (dry)	19.42	19.68
Moisture Content	29.4%	29.3%
Plastic Limit	29	
Plastic Index	10	

### USCS Classification: ASTM D 2487

Group Symbol **SM**

Group Name **Silty SAND**

# Grain Size Distribution Calculations

Green Ridge, Cumberland Landfill

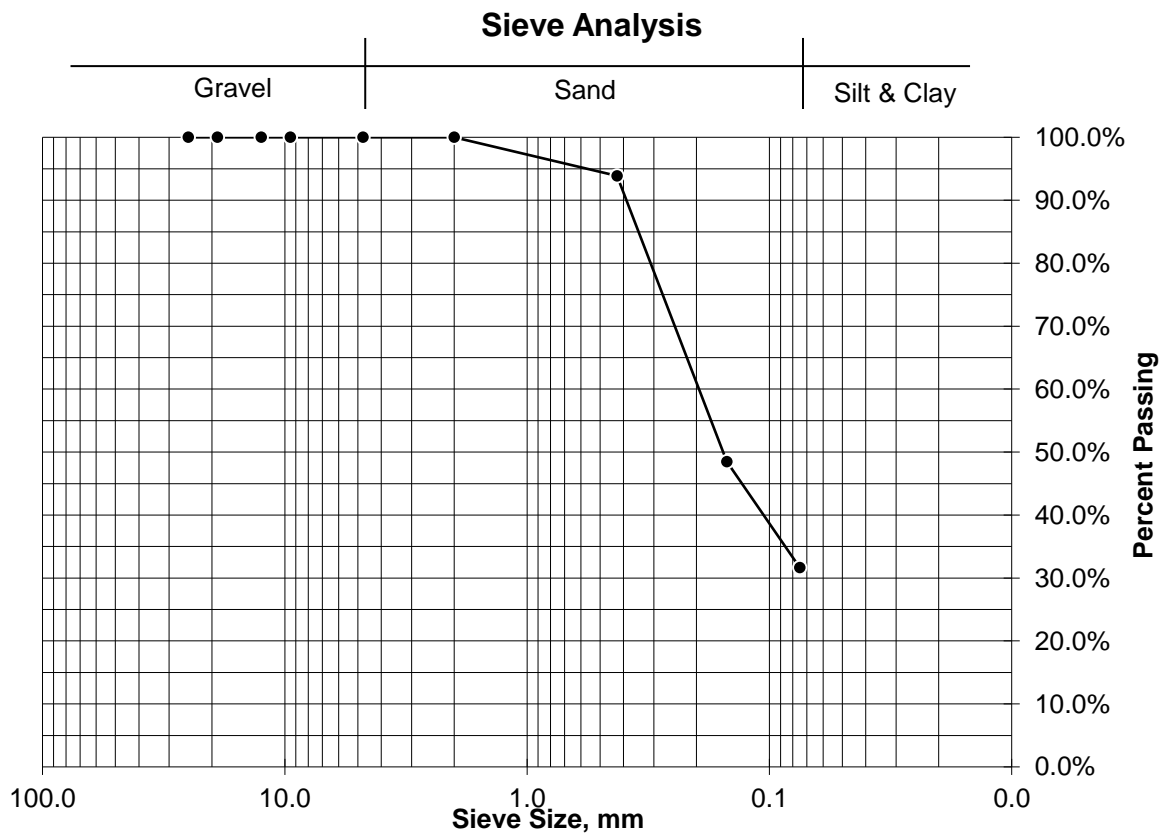
DAA# 18020117-030102

Prepared By: CBW

Sample ID DAA-13  
Sample Depth 8'-10'

## Mechanical Sieve Analysis: ASTM D 422

Sieve Size	Weight Retained	Percent Retained	Sieve Size, mm	Percent Passing
1"	0.00	0.0%	25.0	100.0%
3/4"	0.00	0.0%	19.0	100.0%
1/2"	0.00	0.0%	12.5	100.0%
3/8"	0.00	0.0%	9.50	100.0%
No. 4	0.00	0.0%	4.75	100.0%
No. 10	0.00	0.0%	2.00	100.0%
No. 40	5.40	6.1%	0.425	93.9%
No. 100	40.17	45.4%	0.15	48.5%
No. 200	14.84	16.8%	0.075	31.7%
Pan	0.98	1.1%		
Total	61.39	69.4%		



## Soil Classification Calculations

Green Ridge, Cumberland Landfill

DAA# 18020117-030102

Prepared By: CBW



1030 Wilmer Ave., Ste. 100

Richmond, VA 23227

Army Corps of Engineers Certified Laboratory

Sample ID DAA-13

Sample Depth 14'-16'

Visual Sample Description Micaceous Brown Silty SAND

Sample Received: 3/19/2019

Date Tested: 3/19/2019

### Natural Moisture Content: ASTM D 2216

Pan ID	36
Pan Wt	193.75 grams
Pan + Soil (wet)	296.27 grams
Pan + Soil (dry)	284.81 grams
Natural Moisture Content	12.6%

### Coarse or Fine Grained: ASTM D 422

Pan + Soil retained on No. 200 sieve

(dry) 261.66 grams

Percent Passing No. 200 Sieve 25.4%

Pan + Soil retained on No. 4 sieve

(dry) 194.29 grams

Percent Passing No. 4 Sieve 99.4%

Soil Classifies as Coarse-Grained Soil

### Atterberg Limits: ASTM D 4318

Date Tested: 3/22/2019

#### Liquid Limit

No of Blows	16	25	32
Pan ID	101	105	107
Pan Wt	24.02	29.28	25.11
Pan + Soil (wet)	41.09	50.43	44.11
Pan + Soil (dry)	36.36	45.01	39.58
Moisture Content	38.3%	34.5%	31.3%
Liquid Limit	36	34	32
Liquid Limit	34		

#### Plastic Limit

Pan ID	2	4
Pan Weight	9.03	9.02
Pan + Soil (wet)	26.00	24.05
Pan + Soil (dry)	22.37	20.83
Moisture Content	27.2%	27.3%
Plastic Limit	27	
Plastic Index	7	

### USCS Classification: ASTM D 2487

Group Symbol SM

Group Name Silty SAND



## Grain Size Distribution Calculations

Green Ridge, Cumberland Landfill

DAA# 18020117-030102

Prepared By: CBW

Sample ID DAA-13

Sample Depth 14'-16'

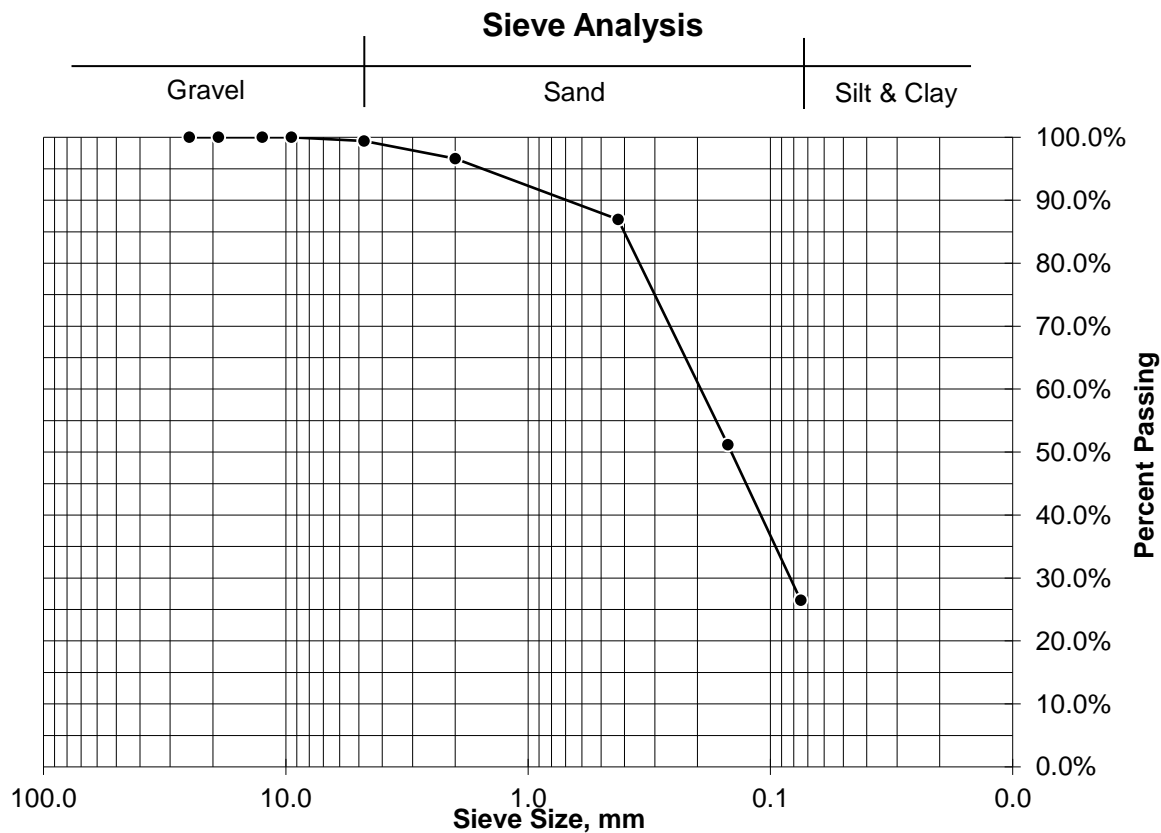
### Mechanical Sieve Analysis: ASTM D 422



1030 Wilmer Ave., Ste. 100  
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Army Corps of Engineers Certified Laboratory

Sieve Size	Weight Retained	Percent Retained	Sieve Size, mm	Percent Passing
1"	0.00	0.0%	25.0	100.0%
3/4"	0.00	0.0%	19.0	100.0%
1/2"	0.00	0.0%	12.5	100.0%
3/8"	0.00	0.0%	9.50	100.0%
No. 4	0.54	0.6%	4.75	99.4%
No. 10	2.55	2.8%	2.00	96.6%
No. 40	8.77	9.6%	0.425	87.0%
No. 100	32.59	35.8%	0.15	51.2%
No. 200	22.50	24.7%	0.075	26.5%
Pan	0.95	1.0%		
Total	67.90	74.6%		



## Soil Classification Calculations

Green Ridge, Cumberland Landfill

DAA# 18020117-030102

Prepared By: CBW



1030 Wilmer Ave., Ste. 100

Richmond, VA 23227

Army Corps of Engineers Certified Laboratory

Sample ID DAA-13

Sample Depth 26'-28'

Visual Sample Description Brownish-Gray Silty SAND

Sample Received: 3/19/2019

Date Tested: 3/22/2019

### Natural Moisture Content: ASTM D 2216

Pan ID	42
Pan Wt	192.26 grams
Pan + Soil (wet)	295.02 grams
Pan + Soil (dry)	279.80 grams
Natural Moisture Content	17.4%

### Coarse or Fine Grained: ASTM D 422

Pan + Soil retained on No. 200 sieve

(dry) 264.47 grams

Percent Passing No. 200 Sieve 17.5%

Pan + Soil retained on No. 4 sieve

(dry) 192.26 grams

Percent Passing No. 4 Sieve 100.0%

Soil Classifies as Coarse-Grained Soil

### Atterberg Limits: ASTM D 4318

Date Tested: 3/22/2019

#### Liquid Limit

No of Blows			
Pan ID			
Pan Wt		Non-plastic	
Pan + Soil (wet)			
Pan + Soil (dry)			
Moisture Content			
Liquid Limit			
Liquid Limit			

#### Plastic Limit

Pan ID		
Pan Weight	Non-plastic	
Pan + Soil (wet)		
Pan + Soil (dry)		
Moisture Content		
Plastic Limit		
Plastic Index		

### USCS Classification: ASTM D 2487

Group Symbol **SM**

Group Name **Silty SAND**

## Grain Size Distribution Calculations

Green Ridge, Cumberland Landfill

DAA# 18020117-030102

Prepared By: CBW

Sample ID DAA-13

Sample Depth 26'-28'

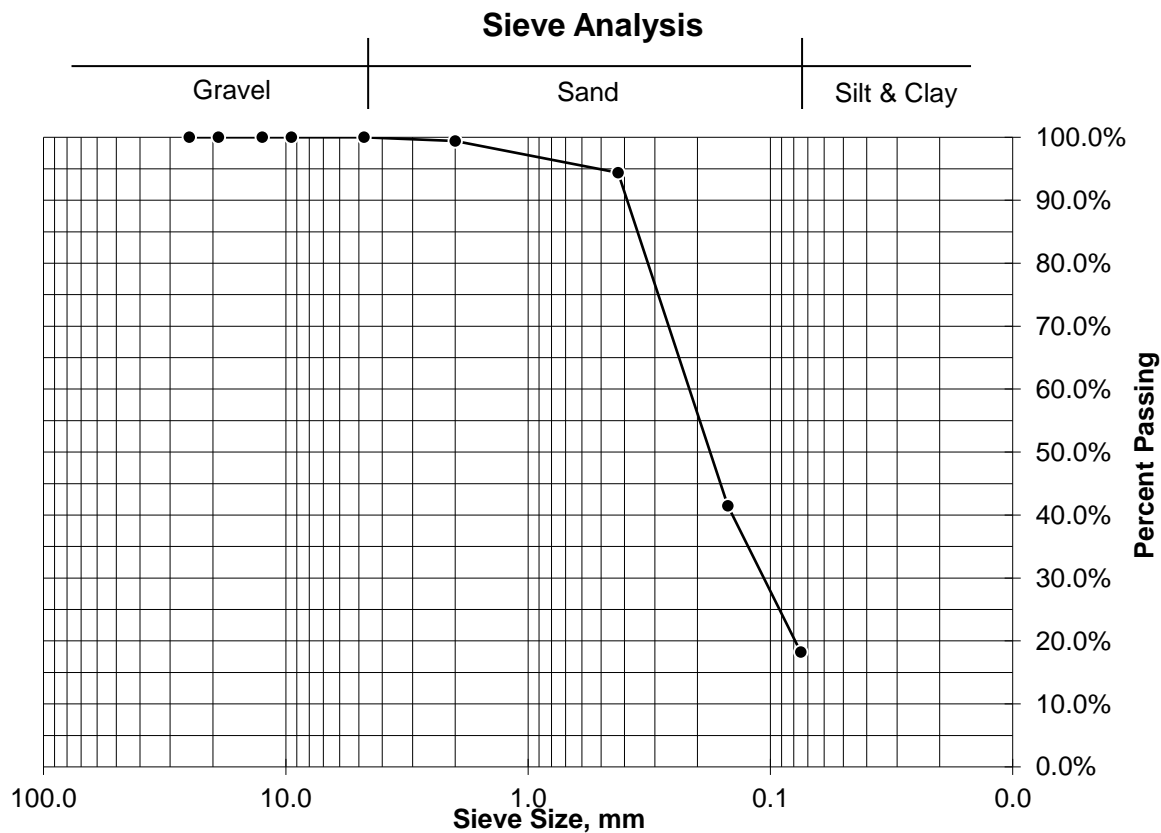
### Mechanical Sieve Analysis: ASTM D 422



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Sieve Size	Weight Retained	Percent Retained	Sieve Size, mm	Percent Passing
1"	0.00	0.0%	25.0	100.0%
3/4"	0.00	0.0%	19.0	100.0%
1/2"	0.00	0.0%	12.5	100.0%
3/8"	0.00	0.0%	9.50	100.0%
No. 4	0.00	0.0%	4.75	100.0%
No. 10	0.50	0.6%	2.00	99.4%
No. 40	4.43	5.1%	0.425	94.4%
No. 100	46.33	52.9%	0.15	41.4%
No. 200	20.30	23.2%	0.075	18.3%
Pan	0.65	0.7%		
Total	72.21	82.5%		



## Soil Classification Calculations

Green Ridge, Cumberland Landfill

DAA# 18020117-030102

Prepared By: CBW



1030 Wilmer Ave., Ste. 100

Richmond, VA 23227

Army Corps of Engineers Certified Laboratory

Sample ID DAA-13

Sample Depth 28'-30'

Visual Sample Description Light Brown Silty SAND

Sample Received: 3/19/2019

Date Tested: 3/19/2019

### Natural Moisture Content: ASTM D 2216

Pan ID	27
Pan Wt	193.73 grams
Pan + Soil (wet)	306.26 grams
Pan + Soil (dry)	291.52 grams
Natural Moisture Content	15.1%

### Coarse or Fine Grained: ASTM D 422

Pan + Soil retained on No. 200 sieve

(dry) 260.69 grams

Percent Passing No. 200 Sieve 31.5%

Pan + Soil retained on No. 4 sieve

(dry) 193.73 grams

Percent Passing No. 4 Sieve 100.0%

Soil Classifies as Coarse-Grained Soil

### Atterberg Limits: ASTM D 4318

Date Tested: 3/21/2019

#### Liquid Limit

No of Blows			
Pan ID			
Pan Wt		Non-plastic	
Pan + Soil (wet)			
Pan + Soil (dry)			
Moisture Content			
Liquid Limit			
Liquid Limit			

#### Plastic Limit

Pan ID		
Pan Weight	Non-plastic	
Pan + Soil (wet)		
Pan + Soil (dry)		
Moisture Content		
Plastic Limit		
Plastic Index		

### USCS Classification: ASTM D 2487

Group Symbol **SM**

Group Name **Silty SAND**

# Grain Size Distribution Calculations

Green Ridge, Cumberland Landfill

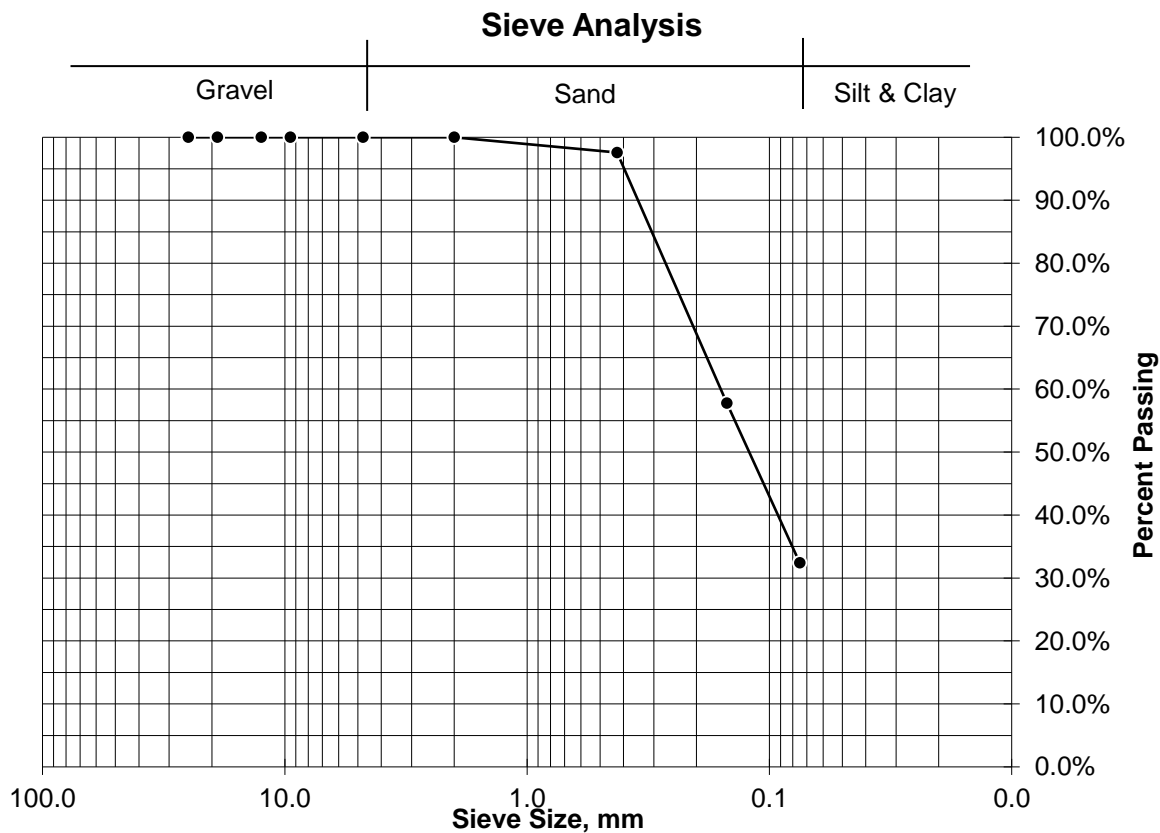
DAA# 18020117-030102

Prepared By: CBW

Sample ID DAA-13  
Sample Depth 28'-30'

## Mechanical Sieve Analysis: ASTM D 422

Sieve Size	Weight Retained	Percent Retained	Sieve Size, mm	Percent Passing
1"	0.00	0.0%	25.0	100.0%
3/4"	0.00	0.0%	19.0	100.0%
1/2"	0.00	0.0%	12.5	100.0%
3/8"	0.00	0.0%	9.50	100.0%
No. 4	0.00	0.0%	4.75	100.0%
No. 10	0.00	0.0%	2.00	100.0%
No. 40	2.36	2.4%	0.425	97.6%
No. 100	38.90	39.8%	0.15	57.8%
No. 200	24.81	25.4%	0.075	32.4%
Pan	0.86	0.9%		
Total	66.93	68.4%		





## Soil Classification Calculations

Green Ridge, Cumberland Landfill

DAA# 18020117-030102

Prepared By: CBW



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Richmond, VA 23227

Army Corps of Engineers Certified Laboratory

Sample ID DAA-14

Sample Depth 6'-8'

Visual Sample Description Reddish-Brown Sandy Elastic SILT

Sample Received: 3/19/2019

Date Tested: 3/22/2019

### Natural Moisture Content: ASTM D 2216

Pan ID	1
Pan Wt	195.48 grams
Pan + Soil (wet)	297.07 grams
Pan + Soil (dry)	273.14 grams
Natural Moisture Content	30.8%

### Coarse or Fine Grained: ASTM D 422

Pan + Soil retained on No. 200 sieve

(dry) 230.92 grams

Percent Passing No. 200 Sieve 54.4%

Pan + Soil retained on No. 4 sieve

(dry) 195.48 grams

Percent Passing No. 4 Sieve 100.0%

Soil Classifies as Fine-Grained Soil

### Atterberg Limits: ASTM D 4318

Date Tested: 3/26/2019

#### Liquid Limit

No of Blows	16	27	33
Pan ID	2000	102	92
Pan Wt	25.73	24.03	25.68
Pan + Soil (wet)	36.84	35.62	36.77
Pan + Soil (dry)	32.18	31.05	32.53
Moisture Content	72.2%	65.1%	61.9%
Liquid Limit	68	66	64
Liquid Limit	66		

#### Plastic Limit

Pan ID	19	18
Pan Weight	4.36	4.27
Pan + Soil (wet)	15.87	14.96
Pan + Soil (dry)	12.53	11.89
Moisture Content	40.9%	40.3%
Plastic Limit	41	
Plastic Index	25	

### USCS Classification: ASTM D 2487

Group Symbol MH

Group Name Sandy Elastic SILT

## Grain Size Distribution Calculations

Green Ridge, Cumberland Landfill

DAA# 18020117-030102

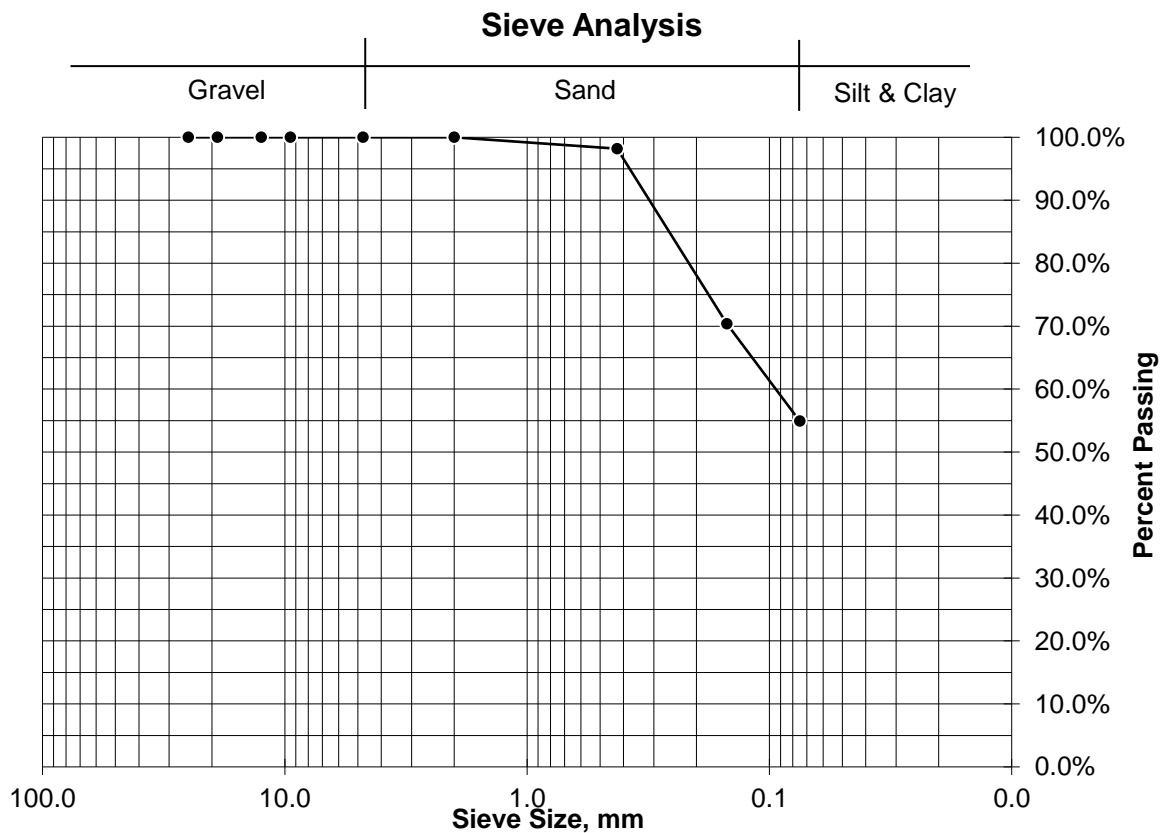
Prepared By: CBW

Sample ID DAA-14

Sample Depth 6'-8'

### Mechanical Sieve Analysis: ASTM D 422

Sieve Size	Weight Retained	Percent Retained	Sieve Size, mm	Percent Passing
1"	0.00	0.0%	25.0	100.0%
3/4"	0.00	0.0%	19.0	100.0%
1/2"	0.00	0.0%	12.5	100.0%
3/8"	0.00	0.0%	9.50	100.0%
No. 4	0.00	0.0%	4.75	100.0%
No. 10	0.00	0.0%	2.00	100.0%
No. 40	1.40	1.8%	0.425	98.2%
No. 100	21.59	27.8%	0.15	70.4%
No. 200	12.01	15.5%	0.075	54.9%
Pan	0.44	0.6%		
Total	35.44	45.6%		



## Soil Classification Calculations

Green Ridge, Cumberland Landfill

DAA# 18020117-030102

Prepared By: CBW



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Richmond, VA 23227

Army Corps of Engineers Certified Laboratory

Sample ID DAA-14

Sample Depth 10'-12'

Sample Received: 3/19/2019

Date Tested: 3/22/2019

Visual Sample Description Reddish-Brown Elastic SILT with Sand

### Natural Moisture Content: ASTM D 2216

Pan ID	33
Pan Wt	193.65 grams
Pan + Soil (wet)	299.18 grams
Pan + Soil (dry)	270.84 grams
Natural Moisture Content	36.7%

### Coarse or Fine Grained: ASTM D 422

Pan + Soil retained on No. 200 sieve

(dry) 215.35 grams

Percent Passing No. 200 Sieve 71.9%

Pan + Soil retained on No. 4 sieve

(dry) 193.65 grams

Percent Passing No. 4 Sieve 100.0%

Soil Classifies as Fine-Grained Soil

### Atterberg Limits: ASTM D 4318

Date Tested: 3/26/2019

#### Liquid Limit

No of Blows	19	28	33
Pan ID	107	101	105
Pan Wt	25.12	24.01	29.31
Pan + Soil (wet)	35.16	35.82	40.30
Pan + Soil (dry)	30.82	30.92	35.88
Moisture Content	76.1%	70.9%	67.2%
Liquid Limit	74	72	70
Liquid Limit	72		

#### Plastic Limit

Pan ID	76	79
Pan Weight	4.21	4.24
Pan + Soil (wet)	14.55	15.55
Pan + Soil (dry)	11.80	12.47
Moisture Content	36.2%	37.4%
Plastic Limit	37	
Plastic Index	35	

### USCS Classification: ASTM D 2487

Group Symbol MH

Group Name Elastic SILT with Sand

## Grain Size Distribution Calculations

Green Ridge, Cumberland Landfill

DAA# 18020117-030102

Prepared By: CBW

Sample ID DAA-14

Sample Depth 10'-12'

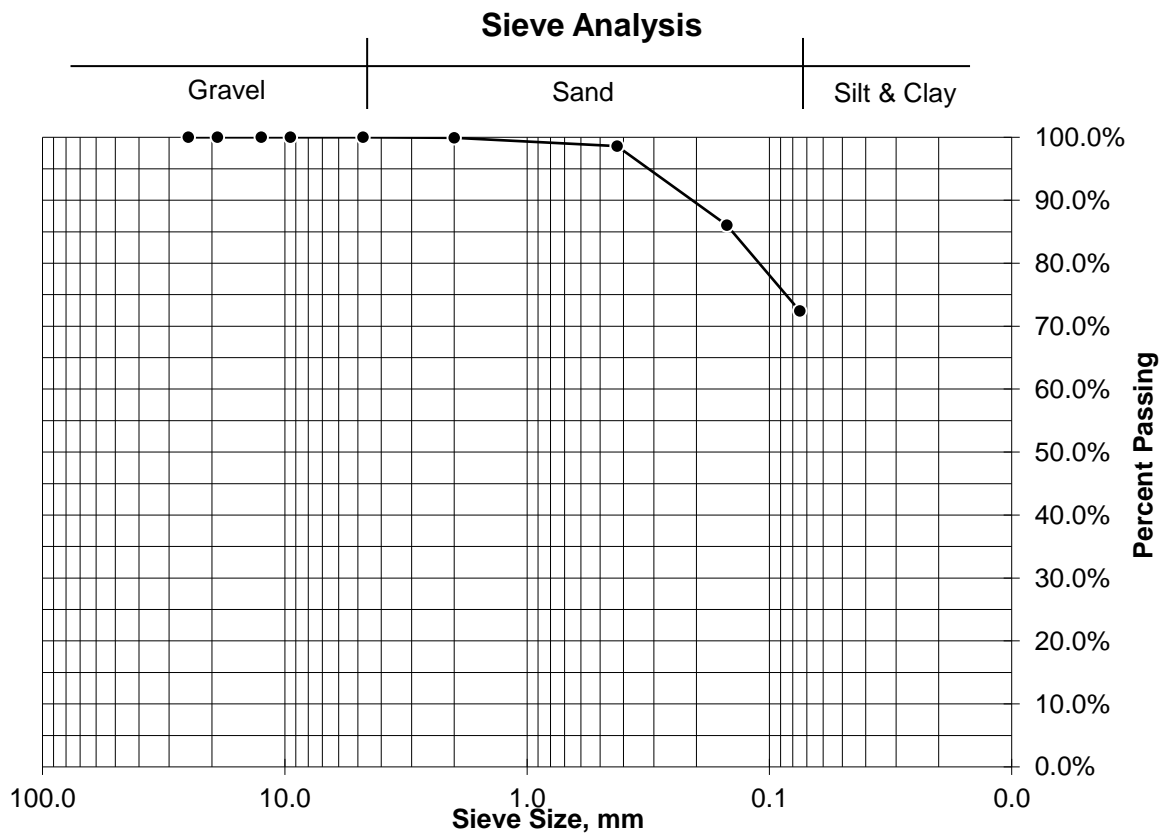
### Mechanical Sieve Analysis: ASTM D 422



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Sieve Size	Weight Retained	Percent Retained	Sieve Size, mm	Percent Passing
1"	0.00	0.0%	25.0	100.0%
3/4"	0.00	0.0%	19.0	100.0%
1/2"	0.00	0.0%	12.5	100.0%
3/8"	0.00	0.0%	9.50	100.0%
No. 4	0.00	0.0%	4.75	100.0%
No. 10	0.08	0.1%	2.00	99.9%
No. 40	1.01	1.3%	0.425	98.6%
No. 100	9.67	12.5%	0.15	86.1%
No. 200	10.52	13.6%	0.075	72.4%
Pan	0.42	0.5%		
Total	21.70	28.1%		



## Soil Classification Calculations

Green Ridge, Cumberland Landfill

DAA# 18020117-030102

Prepared By: CBW



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Richmond, VA 23227

Army Corps of Engineers Certified Laboratory

Sample ID DAA-14

Sample Depth 14'-16'

Visual Sample Description Reddish-Brown Sandy Elastic SILT

Sample Received: 3/19/2019

Date Tested: 3/22/2019

### Natural Moisture Content: ASTM D 2216

Pan ID	15
Pan Wt	188.25 grams
Pan + Soil (wet)	288.54 grams
Pan + Soil (dry)	263.15 grams
Natural Moisture Content	33.9%

### Coarse or Fine Grained: ASTM D 422

Pan + Soil retained on No. 200 sieve

(dry) 224.55 grams

Percent Passing No. 200 Sieve 51.5%

Pan + Soil retained on No. 4 sieve

(dry) 189.26 grams

Percent Passing No. 4 Sieve 98.7%

Soil Classifies as Fine-Grained Soil

### Atterberg Limits: ASTM D 4318

Date Tested: 3/26/2019

#### Liquid Limit

No of Blows	15	27	33
Pan ID	91	98	93
Pan Wt	24.52	30.34	30.11
Pan + Soil (wet)	36.76	43.64	46.23
Pan + Soil (dry)	31.62	38.37	40.07
Moisture Content	72.3%	65.6%	61.9%
Liquid Limit	68	66	64
Liquid Limit	66		

#### Plastic Limit

Pan ID	316	2
Pan Weight	9.08	9.03
Pan + Soil (wet)	19.78	19.28
Pan + Soil (dry)	16.62	16.21
Moisture Content	41.9%	42.8%
Plastic Limit	42	
Plastic Index	24	

### USCS Classification: ASTM D 2487

Group Symbol MH

Group Name Sandy Elastic SILT



# Grain Size Distribution Calculations

Green Ridge, Cumberland Landfill

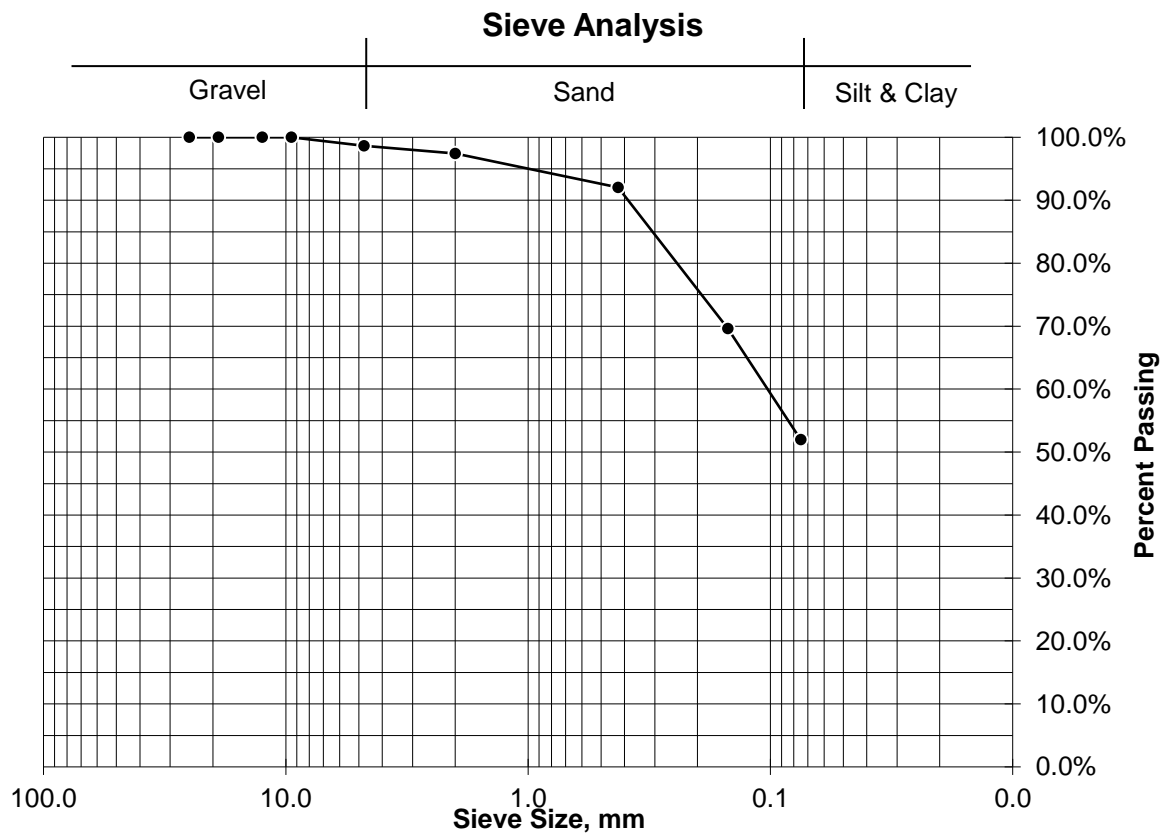
DAA# 18020117-030102

Prepared By: CBW

Sample ID DAA-14  
Sample Depth 14'-16'

## Mechanical Sieve Analysis: ASTM D 422

Sieve Size	Weight Retained	Percent Retained	Sieve Size, mm	Percent Passing
1"	0.00	0.0%	25.0	100.0%
3/4"	0.00	0.0%	19.0	100.0%
1/2"	0.00	0.0%	12.5	100.0%
3/8"	0.00	0.0%	9.50	100.0%
No. 4	1.01	1.3%	4.75	98.7%
No. 10	0.90	1.2%	2.00	97.4%
No. 40	4.07	5.4%	0.425	92.0%
No. 100	16.76	22.4%	0.15	69.6%
No. 200	13.22	17.7%	0.075	52.0%
Pan	0.31	0.4%		
Total	36.27	48.4%		



## Soil Classification Calculations

Green Ridge, Cumberland Landfill

DAA# 18020117-030102

Prepared By: CBW



1030 Wilmer Ave., Ste. 100

Richmond, VA 23227

Army Corps of Engineers Certified Laboratory

Sample ID DAA-14

Sample Depth 24'-26'

Visual Sample Description Reddish-Brown Silty SAND

Sample Received: 3/19/2019

Date Tested: 3/19/2019

### Natural Moisture Content: ASTM D 2216

Pan ID 27  
Pan Wt 193.72 grams  
Pan + Soil (wet) 300.75 grams  
Pan + Soil (dry) 271.07 grams  
Natural Moisture Content 38.4%

### Coarse or Fine Grained: ASTM D 422

Pan + Soil retained on No. 200 sieve

(dry) 233.89 grams

Percent Passing No. 200 Sieve 48.1%

Pan + Soil retained on No. 4 sieve

(dry) 193.88 grams

Percent Passing No. 4 Sieve 99.8%

Soil Classifies as Coarse-Grained Soil

### Atterberg Limits: ASTM D 4318

Date Tested: 3/25/2019

#### Liquid Limit

No of Blows	18	27	33
Pan ID	103	104	97
Pan Wt	27.43	26.24	26.09
Pan + Soil (wet)	37.76	36.38	36.36
Pan + Soil (dry)	33.93	32.79	32.88
Moisture Content	58.9%	54.8%	51.2%
Liquid Limit	57	55	53
Liquid Limit	55		

#### Plastic Limit

Pan ID	83	4
Pan Weight	4.23	9.02
Pan + Soil (wet)	14.83	19.32
Pan + Soil (dry)	11.81	16.39
Moisture Content	39.8%	39.8%
Plastic Limit	40	
Plastic Index	15	

### USCS Classification: ASTM D 2487

Group Symbol SM

Group Name Silty SAND

# Grain Size Distribution Calculations

Green Ridge, Cumberland Landfill

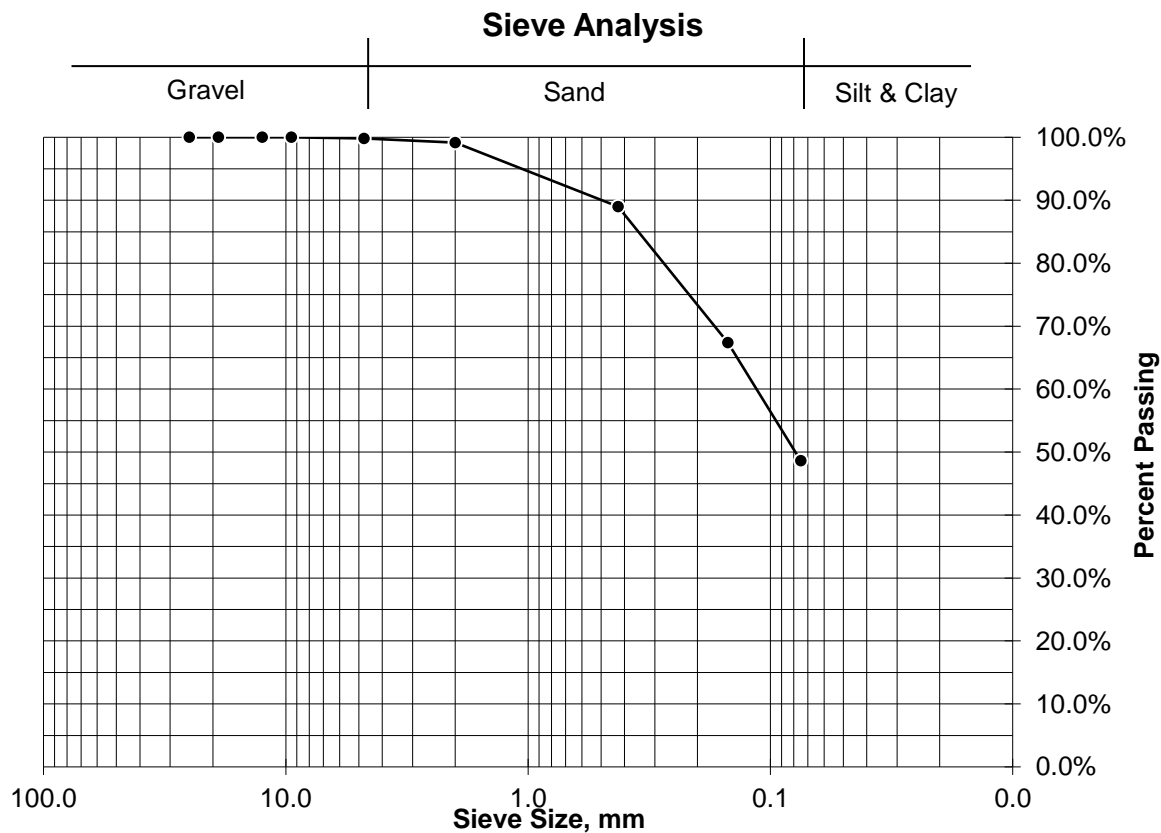
DAA# 18020117-030102

Prepared By: CBW

Sample ID DAA-14  
Sample Depth 24'-26'

## Mechanical Sieve Analysis: ASTM D 422

Sieve Size	Weight Retained	Percent Retained	Sieve Size, mm	Percent Passing
1"	0.00	0.0%	25.0	100.0%
3/4"	0.00	0.0%	19.0	100.0%
1/2"	0.00	0.0%	12.5	100.0%
3/8"	0.00	0.0%	9.50	100.0%
No. 4	0.16	0.2%	4.75	99.8%
No. 10	0.50	0.6%	2.00	99.1%
No. 40	7.87	10.2%	0.425	89.0%
No. 100	16.71	21.6%	0.15	67.4%
No. 200	14.49	18.7%	0.075	48.6%
Pan	0.44	0.6%		
Total	40.17	51.9%		



## Soil Classification Calculations

Green Ridge, Cumberland Landfill

DAA# 18020117-030102

Prepared By: CBW



1030 Wilmer Ave., Ste. 100

Richmond, VA 23227

Army Corps of Engineers Certified Laboratory

Sample ID DAA-14

Sample Depth 26'-28'

Visual Sample Description Light Brown Silty SAND

Sample Received: 3/19/2019

Date Tested: 3/22/2019

### Natural Moisture Content: ASTM D 2216

Pan ID	8
Pan Wt	187.14 grams
Pan + Soil (wet)	289.88 grams
Pan + Soil (dry)	273.99 grams
Natural Moisture Content	18.3%

### Coarse or Fine Grained: ASTM D 422

Pan + Soil retained on No. 200 sieve

(dry) 251.07 grams

Percent Passing No. 200 Sieve 26.4%

Pan + Soil retained on No. 4 sieve

(dry) 189.22 grams

Percent Passing No. 4 Sieve 97.6%

Soil Classifies as Coarse-Grained Soil

### Atterberg Limits: ASTM D 4318

Date Tested: 3/25/2019

#### Liquid Limit

No of Blows			
Pan ID		Non-plastic	
Pan Wt			
Pan + Soil (wet)			
Pan + Soil (dry)			
Moisture Content			
Liquid Limit			
Liquid Limit			

#### Plastic Limit

Pan ID		
Pan Weight	Non-plastic	
Pan + Soil (wet)		
Pan + Soil (dry)		
Moisture Content		
Plastic Limit		
Plastic Index		

### USCS Classification: ASTM D 2487

Group Symbol **SM**

Group Name **Silty SAND**

# Grain Size Distribution Calculations

Green Ridge, Cumberland Landfill

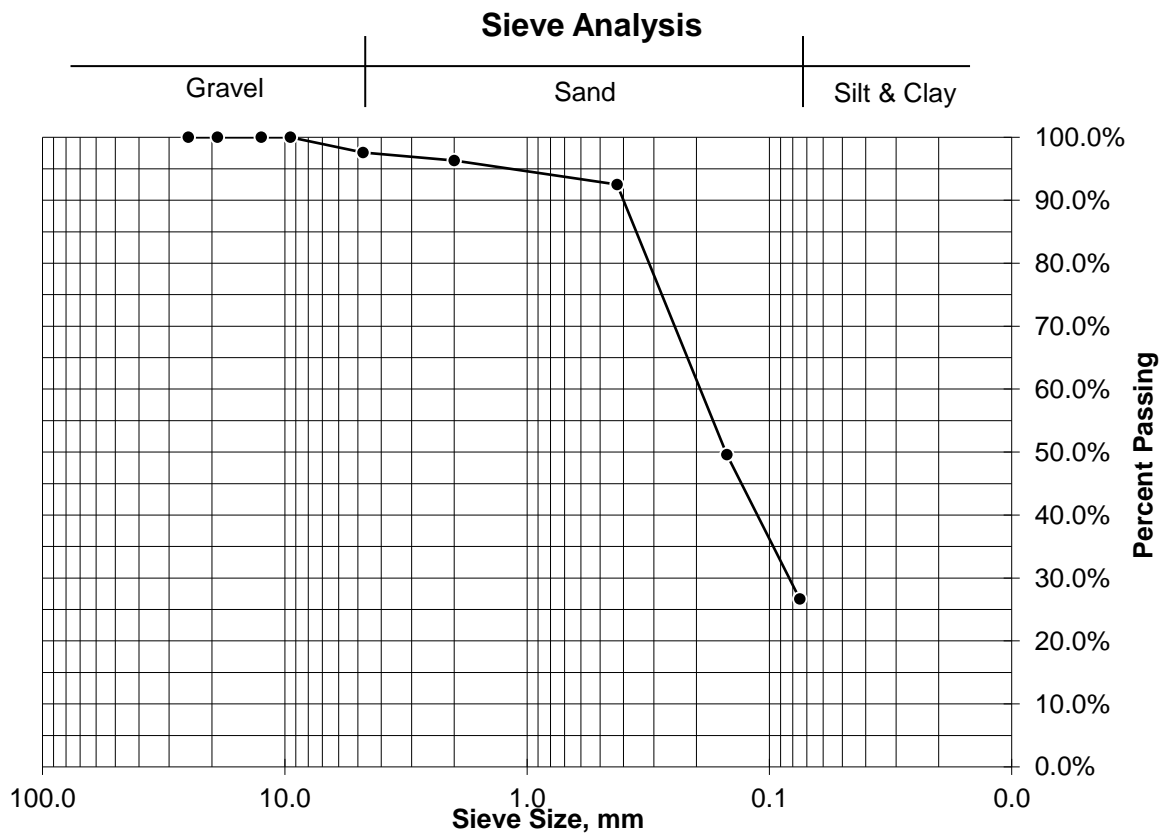
DAA# 18020117-030102

Prepared By: CBW

Sample ID DAA-14  
Sample Depth 26'-28'

## Mechanical Sieve Analysis: ASTM D 422

Sieve Size	Weight Retained	Percent Retained	Sieve Size, mm	Percent Passing
1"	0.00	0.0%	25.0	100.0%
3/4"	0.00	0.0%	19.0	100.0%
1/2"	0.00	0.0%	12.5	100.0%
3/8"	0.00	0.0%	9.50	100.0%
No. 4	2.08	2.4%	4.75	97.6%
No. 10	1.14	1.3%	2.00	96.3%
No. 40	3.30	3.8%	0.425	92.5%
No. 100	37.27	42.9%	0.15	49.6%
No. 200	19.87	22.9%	0.075	26.7%
Pan	0.27	0.3%		
Total	63.93	73.6%		





## Soil Classification Calculations

Green Ridge, Cumberland Landfill

DAA# 18020117-030102

Prepared By: CBW



1030 Wilmer Ave., Ste. 100

Richmond, VA 23227

Army Corps of Engineers Certified Laboratory

Sample ID DAA-14

Sample Depth 30'-32'

Visual Sample Description Light Reddish-Brown Silty SAND

Sample Received: 3/19/2019

Date Tested: 3/22/2019

### Natural Moisture Content: ASTM D 2216

Pan ID	17
Pan Wt	188.67 grams
Pan + Soil (wet)	296.57 grams
Pan + Soil (dry)	283.45 grams
Natural Moisture Content	13.8%

### Coarse or Fine Grained: ASTM D 422

Pan + Soil retained on No. 200 sieve

(dry) 259.80 grams

Percent Passing No. 200 Sieve 25.0%

Pan + Soil retained on No. 4 sieve

(dry) 195.36 grams

Percent Passing No. 4 Sieve 92.9%

Soil Classifies as Coarse-Grained Soil

### Atterberg Limits: ASTM D 4318

Date Tested: 3/22/2019

#### Liquid Limit

No of Blows			
Pan ID			
Pan Wt		Non-plastic	
Pan + Soil (wet)			
Pan + Soil (dry)			
Moisture Content			
Liquid Limit			
Liquid Limit			

#### Plastic Limit

Pan ID		
Pan Weight	Non-plastic	
Pan + Soil (wet)		
Pan + Soil (dry)		
Moisture Content		
Plastic Limit		
Plastic Index		

### USCS Classification: ASTM D 2487

Group Symbol **SM**

Group Name **Silty SAND**

## Grain Size Distribution Calculations

Green Ridge, Cumberland Landfill

DAA# 18020117-030102

Prepared By: CBW

Sample ID DAA-14

Sample Depth 30'-32'

### Mechanical Sieve Analysis: ASTM D 422

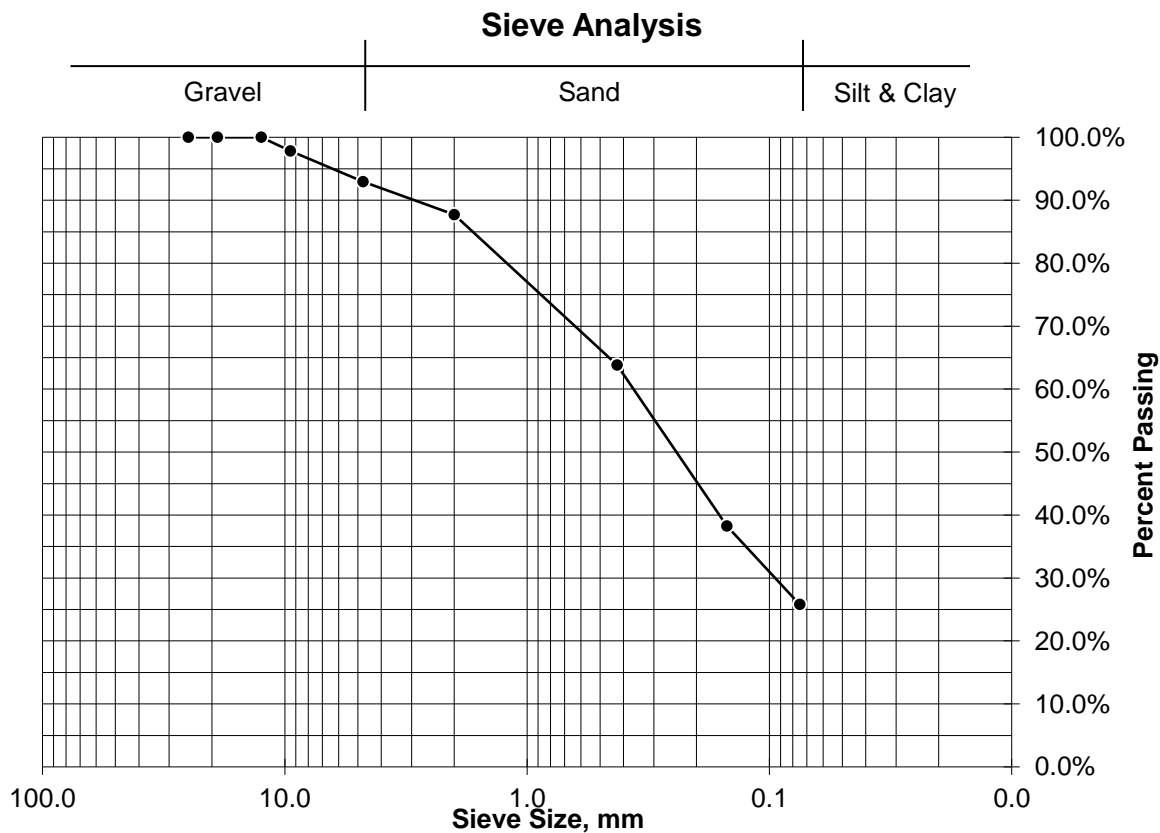


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Richmond, VA 23227

Army Corps of Engineers Certified Laboratory

Sieve Size	Weight Retained	Percent Retained	Sieve Size, mm	Percent Passing
1"	0.00	0.0%	25.0	100.0%
3/4"	0.00	0.0%	19.0	100.0%
1/2"	0.00	0.0%	12.5	100.0%
3/8"	2.07	2.2%	9.50	97.8%
No. 4	4.62	4.9%	4.75	92.9%
No. 10	4.96	5.2%	2.00	87.7%
No. 40	22.61	23.9%	0.425	63.9%
No. 100	24.27	25.6%	0.15	38.2%
No. 200	11.80	12.4%	0.075	25.8%
Pan	0.79	0.8%		
Total	71.12	75.0%		



## Soil Classification Calculations

Green Ridge, Cumberland Landfill

DAA# 18020117-030102

Prepared By: CBW



1030 Wilmer Ave., Ste. 100

Richmond, VA 23227

Army Corps of Engineers Certified Laboratory

Sample ID DAA-17

Sample Depth 6'-8'

Visual Sample Description Light Brown Silty SAND

Sample Received: 3/19/2019

Date Tested: 3/22/2019

### Natural Moisture Content: ASTM D 2216

Pan ID	4
Pan Wt	194.50 grams
Pan + Soil (wet)	301.33 grams
Pan + Soil (dry)	292.45 grams
Natural Moisture Content	9.1%

### Coarse or Fine Grained: ASTM D 422

Pan + Soil retained on No. 200 sieve

(dry) 265.18 grams

Percent Passing No. 200 Sieve 27.8%

Pan + Soil retained on No. 4 sieve

(dry) 194.76 grams

Percent Passing No. 4 Sieve 99.7%

Soil Classifies as Coarse-Grained Soil

### Atterberg Limits: ASTM D 4318

Date Tested: 3/22/2019

#### Liquid Limit

No of Blows			
Pan ID			
Pan Wt		Non-plastic	
Pan + Soil (wet)			
Pan + Soil (dry)			
Moisture Content			
Liquid Limit			
Liquid Limit			

#### Plastic Limit

Pan ID		
Pan Weight	Non-plastic	
Pan + Soil (wet)		
Pan + Soil (dry)		
Moisture Content		
Plastic Limit		
Plastic Index		

### USCS Classification: ASTM D 2487

Group Symbol **SM**

Group Name **Silty SAND**

## Grain Size Distribution Calculations

Green Ridge, Cumberland Landfill

DAA# 18020117-030102

Prepared By: CBW

Sample ID DAA-17

Sample Depth 6'-8'

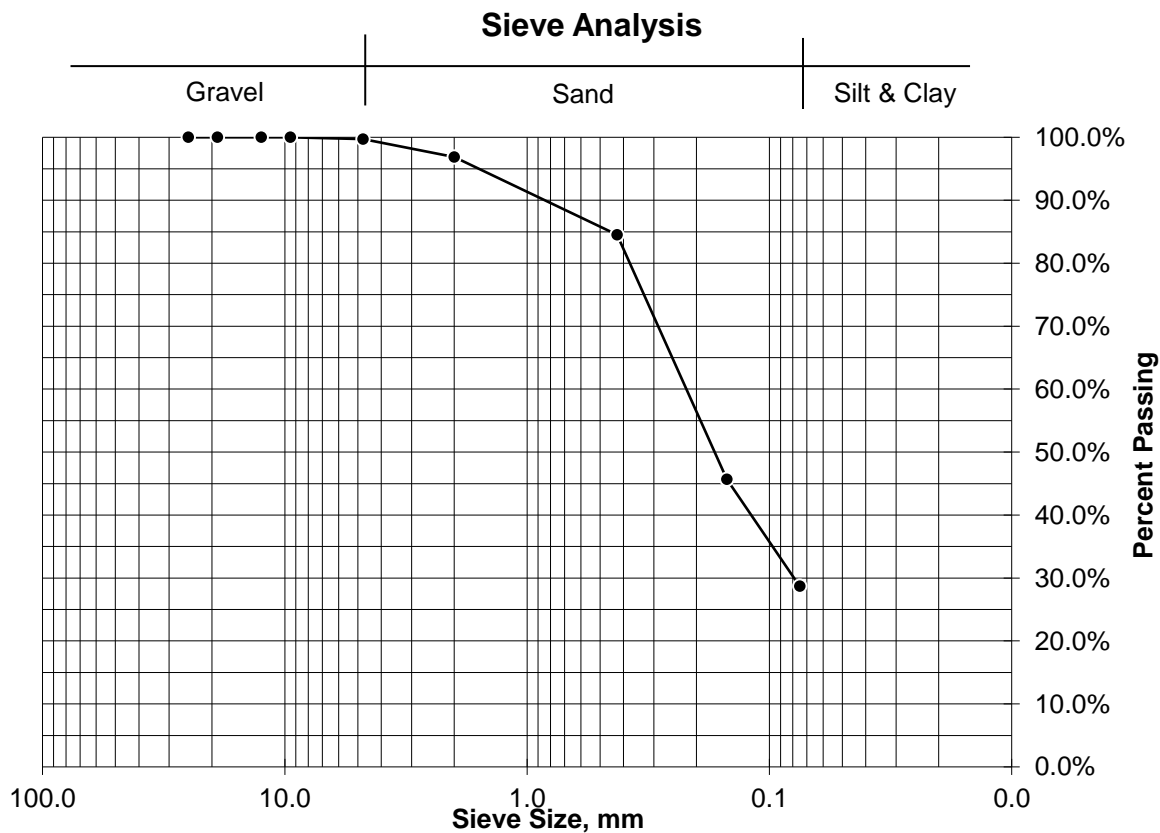
### Mechanical Sieve Analysis: ASTM D 422



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Sieve Size	Weight Retained	Percent Retained	Sieve Size, mm	Percent Passing
1"	0.00	0.0%	25.0	100.0%
3/4"	0.00	0.0%	19.0	100.0%
1/2"	0.00	0.0%	12.5	100.0%
3/8"	0.00	0.0%	9.50	100.0%
No. 4	0.26	0.3%	4.75	99.7%
No. 10	2.81	2.9%	2.00	96.9%
No. 40	12.08	12.3%	0.425	84.5%
No. 100	38.03	38.8%	0.15	45.7%
No. 200	16.67	17.0%	0.075	28.7%
Pan	0.82	0.8%		
Total	70.67	72.1%		



## Soil Classification Calculations

Green Ridge, Cumberland Landfill

DAA# 18020117-030102

Prepared By: CBW



1030 Wilmer Ave., Ste. 100

Richmond, VA 23227

Army Corps of Engineers Certified Laboratory

Sample ID DAA-17

Sample Depth 10'-12'

Visual Sample Description Brownish-Gray Silty SAND

Sample Received: 3/19/2019

Date Tested: 3/22/2019

### Natural Moisture Content: ASTM D 2216

Pan ID	30
Pan Wt	193.25 grams
Pan + Soil (wet)	298.76 grams
Pan + Soil (dry)	290.37 grams
Natural Moisture Content	8.6%

### Coarse or Fine Grained: ASTM D 422

Pan + Soil retained on No. 200 sieve

(dry) 265.51 grams

Percent Passing No. 200 Sieve 25.6%

Pan + Soil retained on No. 4 sieve

(dry) 195.30 grams

Percent Passing No. 4 Sieve 97.9%

Soil Classifies as Coarse-Grained Soil

### Atterberg Limits: ASTM D 4318

Date Tested: 3/25/2019

#### Liquid Limit

No of Blows	18	23	32
Pan ID	169	201	96
Pan Wt	27.16	27.65	24.85
Pan + Soil (wet)	38.29	38.22	35.06
Pan + Soil (dry)	34.85	35.10	32.26
Moisture Content	44.7%	41.9%	37.9%
Liquid Limit	43	41	39
Liquid Limit	41		

#### Plastic Limit

Pan ID	82	13
Pan Weight	4.23	4.27
Pan + Soil (wet)	14.55	15.29
Pan + Soil (dry)	12.39	12.99
Moisture Content	26.5%	26.4%
Plastic Limit	26	
Plastic Index	14	

### USCS Classification: ASTM D 2487

Group Symbol **SM**

Group Name **Silty SAND**

## Grain Size Distribution Calculations

Green Ridge, Cumberland Landfill

DAA# 18020117-030102

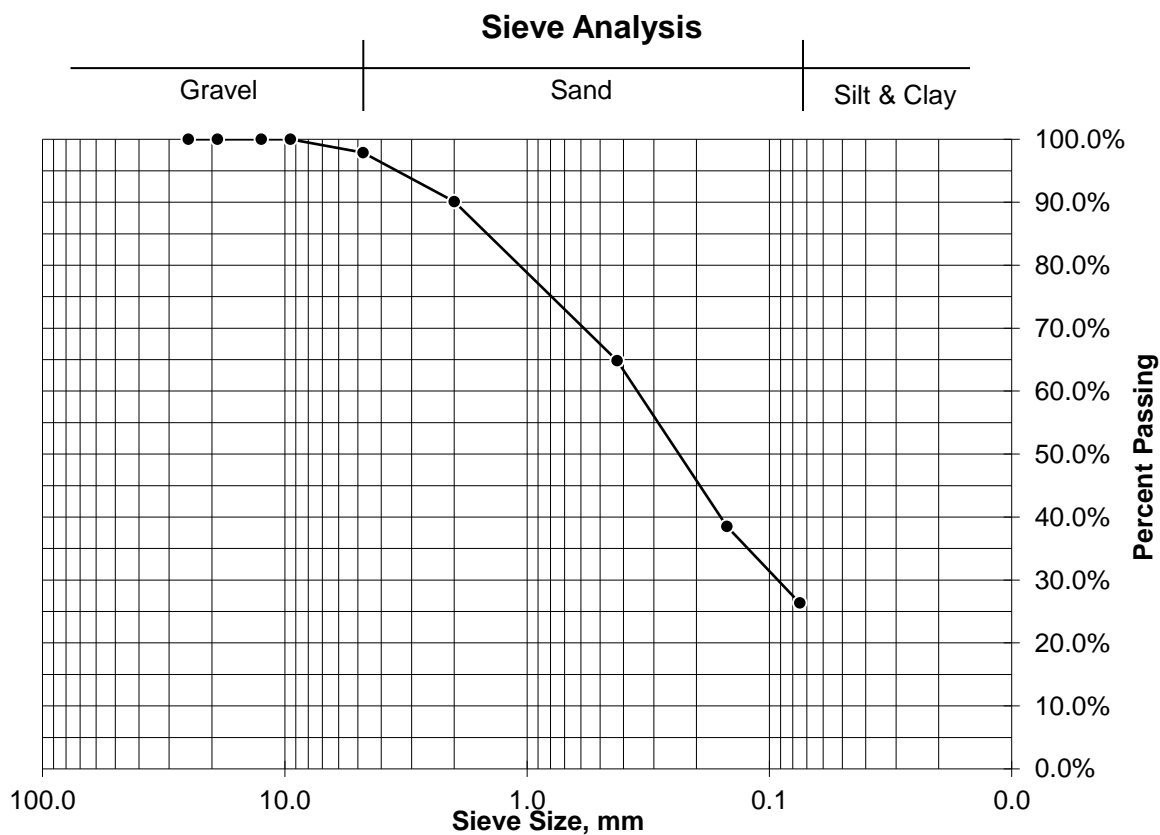
Prepared By: CBW

Sample ID DAA-17

Sample Depth 10'-12'

### Mechanical Sieve Analysis: ASTM D 422

Sieve Size	Weight Retained	Percent Retained	Sieve Size, mm	Percent Passing
1"	0.00	0.0%	25.0	100.0%
3/4"	0.00	0.0%	19.0	100.0%
1/2"	0.00	0.0%	12.5	100.0%
3/8"	0.00	0.0%	9.50	100.0%
No. 4	2.05	2.1%	4.75	97.9%
No. 10	7.56	7.8%	2.00	90.1%
No. 40	24.55	25.3%	0.425	64.8%
No. 100	25.55	26.3%	0.15	38.5%
No. 200	11.82	12.2%	0.075	26.3%
Pan	0.73	0.8%		
Total	72.26	74.4%		





## Soil Classification Calculations

Green Ridge, Cumberland Landfill

DAA# 18020117-030102

Prepared By: CBW



1030 Wilmer Ave., Ste. 100

Richmond, VA 23227

Army Corps of Engineers Certified Laboratory

Sample ID DAA-18

Sample Depth 6'-8'

Visual Sample Description Light Brown Silty SAND

Sample Received: 3/19/2019

Date Tested: 3/22/2019

### Natural Moisture Content: ASTM D 2216

Pan ID	34
Pan Wt	192.79 grams
Pan + Soil (wet)	310.43 grams
Pan + Soil (dry)	285.19 grams
Natural Moisture Content	27.3%

### Coarse or Fine Grained: ASTM D 422

Pan + Soil retained on No. 200 sieve

(dry) 263.85 grams

Percent Passing No. 200 Sieve 23.1%

Pan + Soil retained on No. 4 sieve

(dry) 194.87 grams

Percent Passing No. 4 Sieve 97.7%

Soil Classifies as Coarse-Grained Soil

### Atterberg Limits: ASTM D 4318

Date Tested: 3/22/2019

#### Liquid Limit

No of Blows			
Pan ID		Non-plastic	
Pan Wt			
Pan + Soil (wet)			
Pan + Soil (dry)			
Moisture Content			
Liquid Limit			
Liquid Limit			

#### Plastic Limit

Pan ID		
Pan Weight	Non-plastic	
Pan + Soil (wet)		
Pan + Soil (dry)		
Moisture Content		
Plastic Limit		
Plastic Index		

### USCS Classification: ASTM D 2487

Group Symbol **SM**

Group Name **Silty SAND**

## Grain Size Distribution Calculations

Green Ridge, Cumberland Landfill

DAA# 18020117-030102

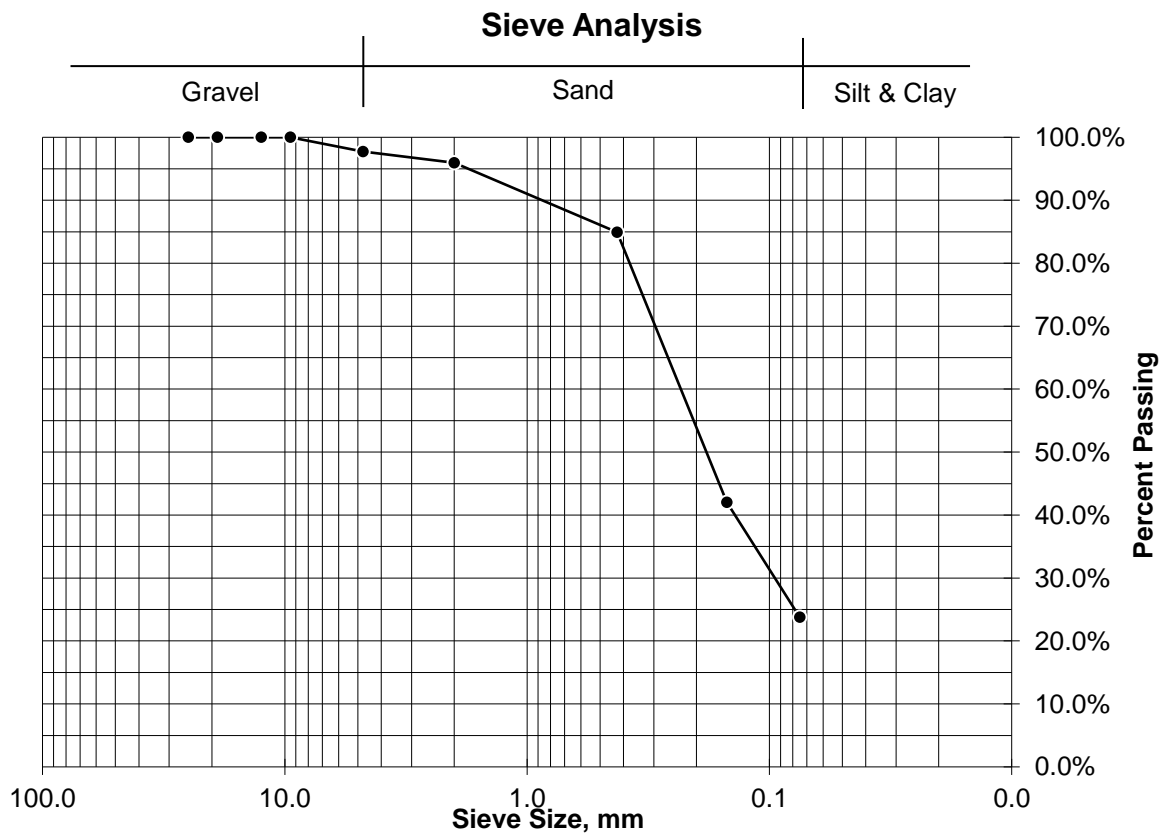
Prepared By: CBW

Sample ID DAA-18

Sample Depth 6'-8'

### Mechanical Sieve Analysis: ASTM D 422

Sieve Size	Weight Retained	Percent Retained	Sieve Size, mm	Percent Passing
1"	0.00	0.0%	25.0	100.0%
3/4"	0.00	0.0%	19.0	100.0%
1/2"	0.00	0.0%	12.5	100.0%
3/8"	0.00	0.0%	9.50	100.0%
No. 4	2.08	2.3%	4.75	97.7%
No. 10	1.64	1.8%	2.00	96.0%
No. 40	10.19	11.0%	0.425	84.9%
No. 100	39.64	42.9%	0.15	42.0%
No. 200	16.87	18.3%	0.075	23.8%
Pan	0.63	0.7%		
Total	71.05	76.9%		



## Soil Classification Calculations

Green Ridge, Cumberland Landfill

DAA# 18020117-030102

Prepared By: CBW



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Richmond, VA 23227

Army Corps of Engineers Certified Laboratory

Sample ID DAA-19

Sample Depth 6'-8'

Visual Sample Description Brownish-Gray Silty SAND

Sample Received: 3/19/2019

Date Tested: 3/22/2019

### Natural Moisture Content: ASTM D 2216

Pan ID	35
Pan Wt	192.73 grams
Pan + Soil (wet)	294.78 grams
Pan + Soil (dry)	279.51 grams
Natural Moisture Content	17.6%

### Coarse or Fine Grained: ASTM D 422

Pan + Soil retained on No. 200 sieve

(dry) 260.05 grams

Percent Passing No. 200 Sieve 22.4%

Pan + Soil retained on No. 4 sieve

(dry) 192.73 grams

Percent Passing No. 4 Sieve 100.0%

Soil Classifies as Coarse-Grained Soil

### Atterberg Limits: ASTM D 4318

Date Tested: 3/29/2019

#### Liquid Limit

No of Blows	19	26	33
Pan ID	10	7	72
Pan Wt	11.33	10.98	11.06
Pan + Soil (wet)	27.79	26.58	25.37
Pan + Soil (dry)	22.73	22.04	21.45
Moisture Content	44.4%	41.0%	37.7%
Liquid Limit	43	41	39
Liquid Limit	41		

#### Plastic Limit

Pan ID	82	13
Pan Weight	4.23	4.27
Pan + Soil (wet)	14.55	15.29
Pan + Soil (dry)	12.39	12.99
Moisture Content	26.5%	26.4%
Plastic Limit	26	
Plastic Index	15	

### USCS Classification: ASTM D 2487

Group Symbol **SM**

Group Name **Silty SAND**

# Grain Size Distribution Calculations

Green Ridge, Cumberland Landfill

DAA# 18020117-030102

Prepared By: CBW



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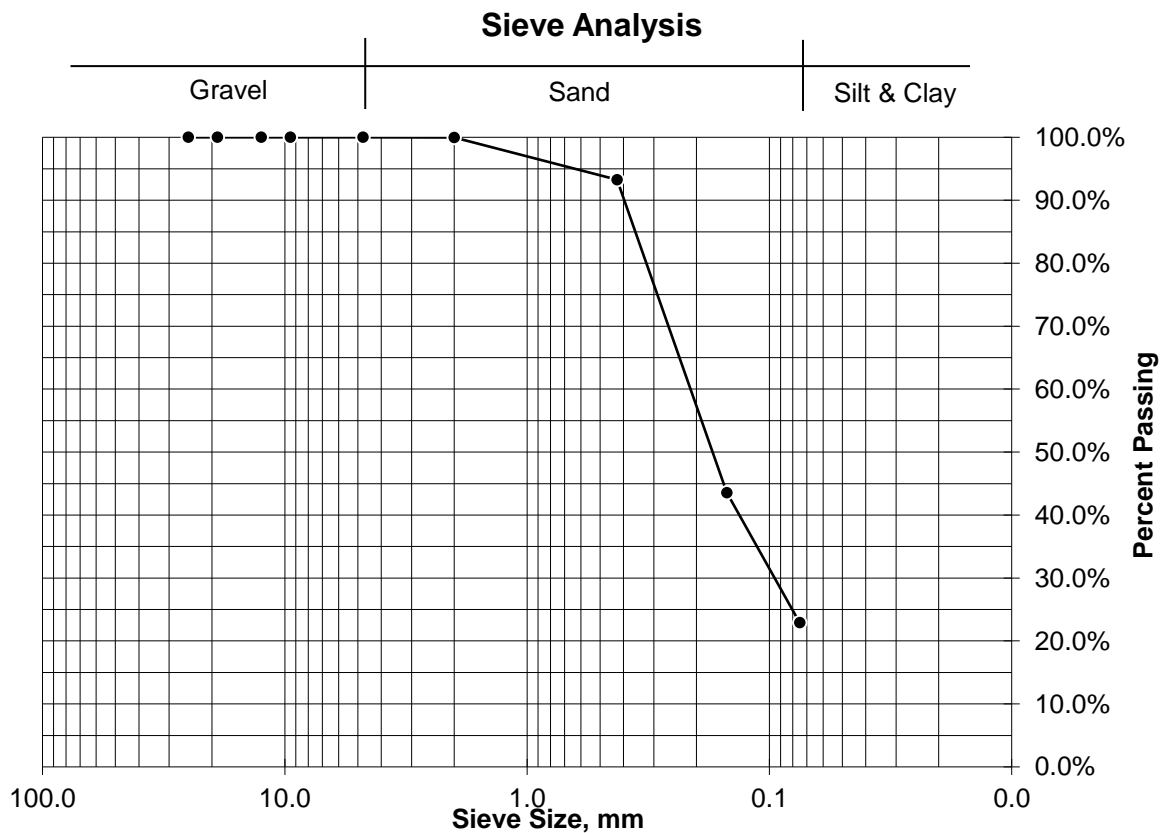
Army Corps of Engineers Certified Laboratory

Sample ID DAA-19

Sample Depth 6'-8'

## Mechanical Sieve Analysis: ASTM D 422

Sieve Size	Weight Retained	Percent Retained	Sieve Size, mm	Percent Passing
1"	0.00	0.0%	25.0	100.0%
3/4"	0.00	0.0%	19.0	100.0%
1/2"	0.00	0.0%	12.5	100.0%
3/8"	0.00	0.0%	9.50	100.0%
No. 4	0.00	0.0%	4.75	100.0%
No. 10	0.04	0.0%	2.00	100.0%
No. 40	5.79	6.7%	0.425	93.3%
No. 100	43.16	49.7%	0.15	43.5%
No. 200	17.92	20.6%	0.075	22.9%
Pan	0.41	0.5%		
Total	67.32	77.6%		



## Soil Classification Calculations

Green Ridge, Cumberland Landfill

DAA# 18020117-030102

Prepared By: CBW



1030 Wilmer Ave., Ste. 100

Richmond, VA 23227

Army Corps of Engineers Certified Laboratory

Sample ID DAA-20

Sample Depth 14'-16'

Visual Sample Description Brownish-gray Silty SAND

Sample Received: 3/19/2019

Date Tested: 3/22/2019

### Natural Moisture Content: ASTM D 2216

Pan ID	22
Pan Wt	189.03 grams
Pan + Soil (wet)	291.46 grams
Pan + Soil (dry)	280.94 grams
Natural Moisture Content	11.4%

### Coarse or Fine Grained: ASTM D 422

Pan + Soil retained on No. 200 sieve

(dry) 256.41 grams

Percent Passing No. 200 Sieve 26.7%

Pan + Soil retained on No. 4 sieve

(dry) 191.13 grams

Percent Passing No. 4 Sieve 97.7%

Soil Classifies as Coarse-Grained Soil

### Atterberg Limits: ASTM D 4318

Date Tested: 3/23/2019

#### Liquid Limit

No of Blows			
Pan ID		Non-plastic	
Pan Wt			
Pan + Soil (wet)			
Pan + Soil (dry)			
Moisture Content			
Liquid Limit			
Liquid Limit			

#### Plastic Limit

Pan ID		
Pan Weight	Non-plastic	
Pan + Soil (wet)		
Pan + Soil (dry)		
Moisture Content		
Plastic Limit		
Plastic Index		

### USCS Classification: ASTM D 2487

Group Symbol **SM**

Group Name **Silty SAND**

## Grain Size Distribution Calculations

Green Ridge, Cumberland Landfill

DAA# 18020117-030102

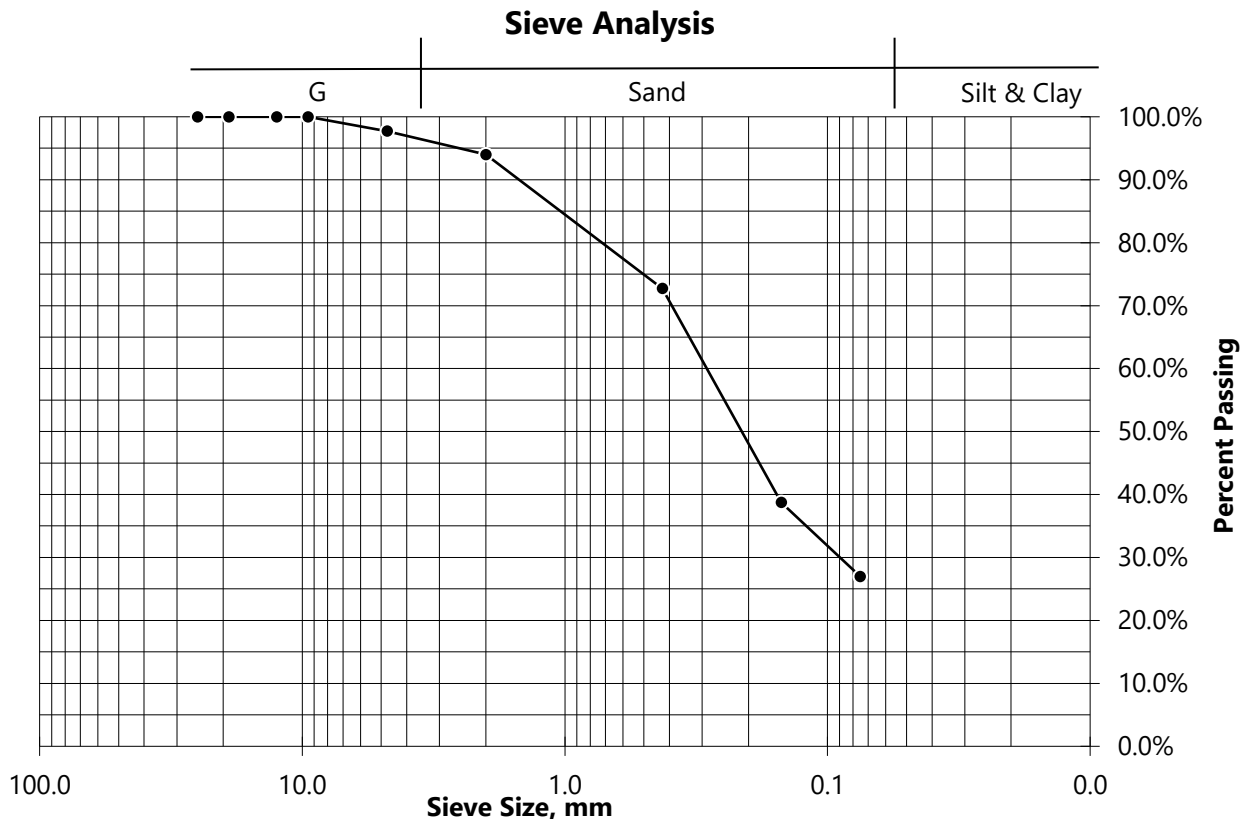
Prepared By: CBW

Sample ID DAA-20

Sample Depth 14'-16'

### Mechanical Sieve Analysis: ASTM D 422

Sieve Size	Weight Retained	Percent Retained	Sieve Size, mm	Percent Passing
1"	0.00	0.0%	25.0	100.0%
3/4"	0.00	0.0%	19.0	100.0%
1/2"	0.00	0.0%	12.5	100.0%
3/8"	0.00	0.0%	9.50	100.0%
No. 4	2.10	2.3%	4.75	97.7%
No. 10	3.41	3.7%	2.00	94.0%
No. 40	19.56	21.3%	0.425	72.7%
No. 100	31.24	34.0%	0.15	38.7%
No. 200	10.81	11.8%	0.075	27.0%
Pan	0.21	0.2%		
Total	67.33	73.3%		





## Soil Classification Calculations

Green Ridge, Cumberland Landfill

DAA# 18020117-030102

Prepared By: CBW



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Richmond, VA 23227

Army Corps of Engineers Certified Laboratory

Sample ID DAA-21

Sample Depth 6'-8'

Visual Sample Description Light Brown Silty SAND

Sample Received: 3/19/2019

Date Tested: 3/22/2019

### Natural Moisture Content: ASTM D 2216

Pan ID	20
Pan Wt	189.93 grams
Pan + Soil (wet)	298.07 grams
Pan + Soil (dry)	284.10 grams
Natural Moisture Content	14.8%

### Coarse or Fine Grained: ASTM D 422

Pan + Soil retained on No. 200 sieve

(dry) 260.46 grams

Percent Passing No. 200 Sieve 25.1%

Pan + Soil retained on No. 4 sieve

(dry) 189.93 grams

Percent Passing No. 4 Sieve 100.0%

Soil Classifies as Coarse-Grained Soil

### Atterberg Limits: ASTM D 4318

Date Tested: 3/25/2019

#### Liquid Limit

No of Blows	16	23	31
Pan ID	72	70	10
Pan Wt	11.06	10.97	11.27
Pan + Soil (wet)	21.29	21.05	21.31
Pan + Soil (dry)	18.25	18.25	18.70
Moisture Content	42.2%	38.5%	35.1%
Liquid Limit	40	38	36
Liquid Limit	38		

#### Plastic Limit

Pan ID	4	313
Pan Weight	8.98	9.14
Pan + Soil (wet)	19.49	21.27
Pan + Soil (dry)	17.28	18.71
Moisture Content	26.6%	26.7%
Plastic Limit	27	
Plastic Index	11	

### USCS Classification: ASTM D 2487

Group Symbol SM

Group Name Silty SAND

# Grain Size Distribution Calculations

Green Ridge, Cumberland Landfill

DAA# 18020117-030102

Prepared By: CBW



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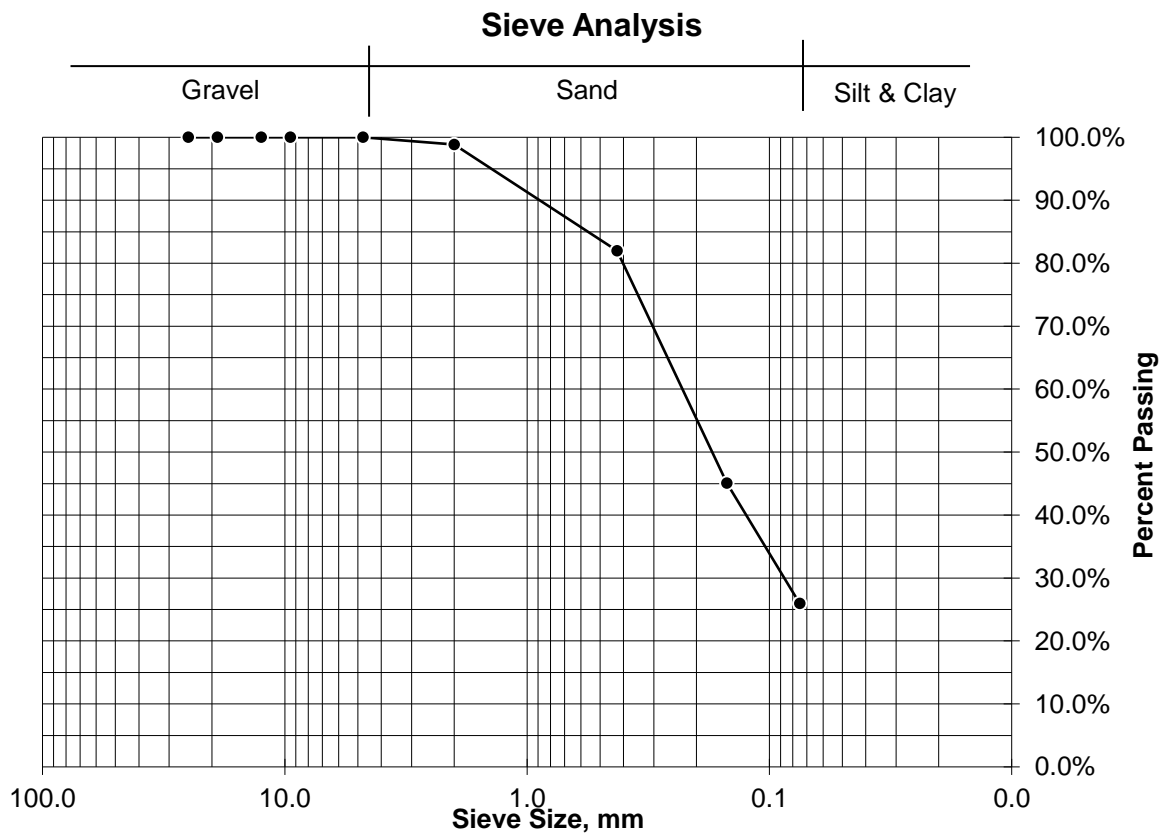
Army Corps of Engineers Certified Laboratory

Sample ID DAA-21

Sample Depth 6'-8'

## Mechanical Sieve Analysis: ASTM D 422

Sieve Size	Weight Retained	Percent Retained	Sieve Size, mm	Percent Passing
1"	0.00	0.0%	25.0	100.0%
3/4"	0.00	0.0%	19.0	100.0%
1/2"	0.00	0.0%	12.5	100.0%
3/8"	0.00	0.0%	9.50	100.0%
No. 4	0.00	0.0%	4.75	100.0%
No. 10	1.06	1.1%	2.00	98.9%
No. 40	15.90	16.9%	0.425	82.0%
No. 100	34.75	36.9%	0.15	45.1%
No. 200	18.02	19.1%	0.075	26.0%
Pan	0.78	0.8%		
Total	70.51	74.9%		



## Soil Classification Calculations

Green Ridge, Cumberland Landfill

DAA# 18020117-030102

Prepared By: CBW



1030 Wilmer Ave., Ste. 100

Richmond, VA 23227

Army Corps of Engineers Certified Laboratory

Sample ID DAA-22

Sample Depth 6'-8'

Visual Sample Description Light Brown Silty SAND

Sample Received: 3/19/2019

Date Tested: 3/22/2019

### Natural Moisture Content: ASTM D 2216

Pan ID	123
Pan Wt	124.43 grams
Pan + Soil (wet)	233.34 grams
Pan + Soil (dry)	215.67 grams
Natural Moisture Content	19.4%

### Coarse or Fine Grained: ASTM D 422

Pan + Soil retained on No. 200 sieve

(dry) 188.44 grams

Percent Passing No. 200 Sieve 29.8%

Pan + Soil retained on No. 4 sieve

(dry) 124.97 grams

Percent Passing No. 4 Sieve 99.4%

Soil Classifies as Coarse-Grained Soil

### Atterberg Limits: ASTM D 4318

Date Tested: 3/22/2019

#### Liquid Limit

No of Blows			
Pan ID		Non-plastic	
Pan Wt			
Pan + Soil (wet)			
Pan + Soil (dry)			
Moisture Content			
Liquid Limit			
Liquid Limit			

#### Plastic Limit

Pan ID		
Pan Weight	Non-plastic	
Pan + Soil (wet)		
Pan + Soil (dry)		
Moisture Content		
Plastic Limit		
Plastic Index		

### USCS Classification: ASTM D 2487

Group Symbol **SM**

Group Name **Silty SAND**

## Grain Size Distribution Calculations

Green Ridge, Cumberland Landfill

DAA# 18020117-030102

Prepared By: CBW

Sample ID DAA-22

Sample Depth 6'-8'

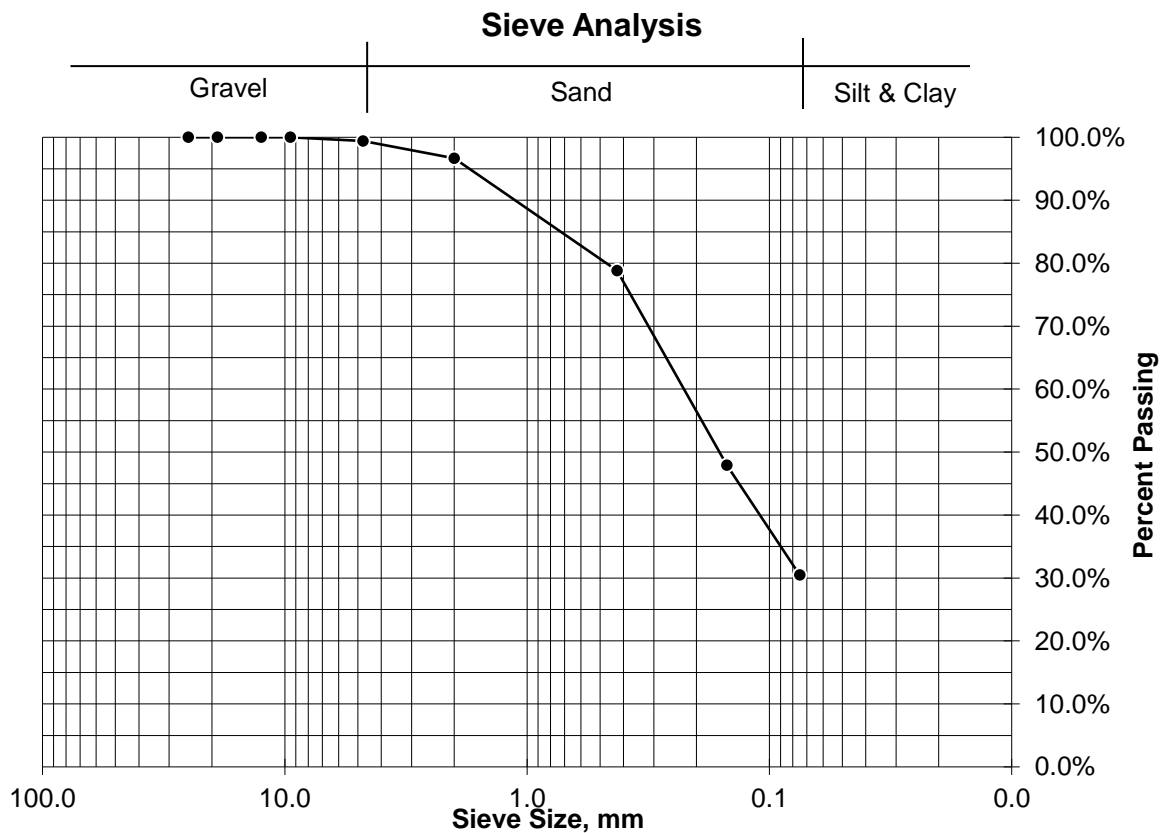
### Mechanical Sieve Analysis: ASTM D 422



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Sieve Size	Weight Retained	Percent Retained	Sieve Size, mm	Percent Passing
1"	0.00	0.0%	25.0	100.0%
3/4"	0.00	0.0%	19.0	100.0%
1/2"	0.00	0.0%	12.5	100.0%
3/8"	0.00	0.0%	9.50	100.0%
No. 4	0.54	0.6%	4.75	99.4%
No. 10	2.48	2.7%	2.00	96.7%
No. 40	16.28	17.8%	0.425	78.8%
No. 100	28.23	30.9%	0.15	47.9%
No. 200	15.90	17.4%	0.075	30.5%
Pan	0.57	0.6%		
Total	64.00	70.1%		



## Soil Classification Calculations

Green Ridge, Cumberland Landfill

DAA# 18020117-030102

Prepared By: CBW



1030 Wilmer Ave., Ste. 100

Richmond, VA 23227

Army Corps of Engineers Certified Laboratory

Sample ID DAA-22

Sample Depth 10'-12'

Visual Sample Description Brown Silty SAND

Sample Received: 3/19/2019

Date Tested: 3/22/2019

### Natural Moisture Content: ASTM D 2216

Pan ID	122
Pan Wt	123.30 grams
Pan + Soil (wet)	225.80 grams
Pan + Soil (dry)	208.05 grams
Natural Moisture Content	20.9%

### Coarse or Fine Grained: ASTM D 422

Pan + Soil retained on No. 200 sieve

(dry) 196.59 grams

Percent Passing No. 200 Sieve 13.5%

Pan + Soil retained on No. 4 sieve

(dry) 123.30 grams

Percent Passing No. 4 Sieve 100.0%

Soil Classifies as Coarse-Grained Soil

### Atterberg Limits: ASTM D 4318

Date Tested: 3/22/2019

#### Liquid Limit

No of Blows			
Pan ID		Non-plastic	
Pan Wt			
Pan + Soil (wet)			
Pan + Soil (dry)			
Moisture Content			
Liquid Limit			
Liquid Limit			

#### Plastic Limit

Pan ID		
Pan Weight	Non-plastic	
Pan + Soil (wet)		
Pan + Soil (dry)		
Moisture Content		
Plastic Limit		
Plastic Index		

### USCS Classification: ASTM D 2487

Group Symbol **SM**

Group Name **Silty SAND**

# Grain Size Distribution Calculations

Green Ridge, Cumberland Landfill

DAA# 18020117-030102

Prepared By: CBW

Sample ID DAA-22

Sample Depth 10'-12'

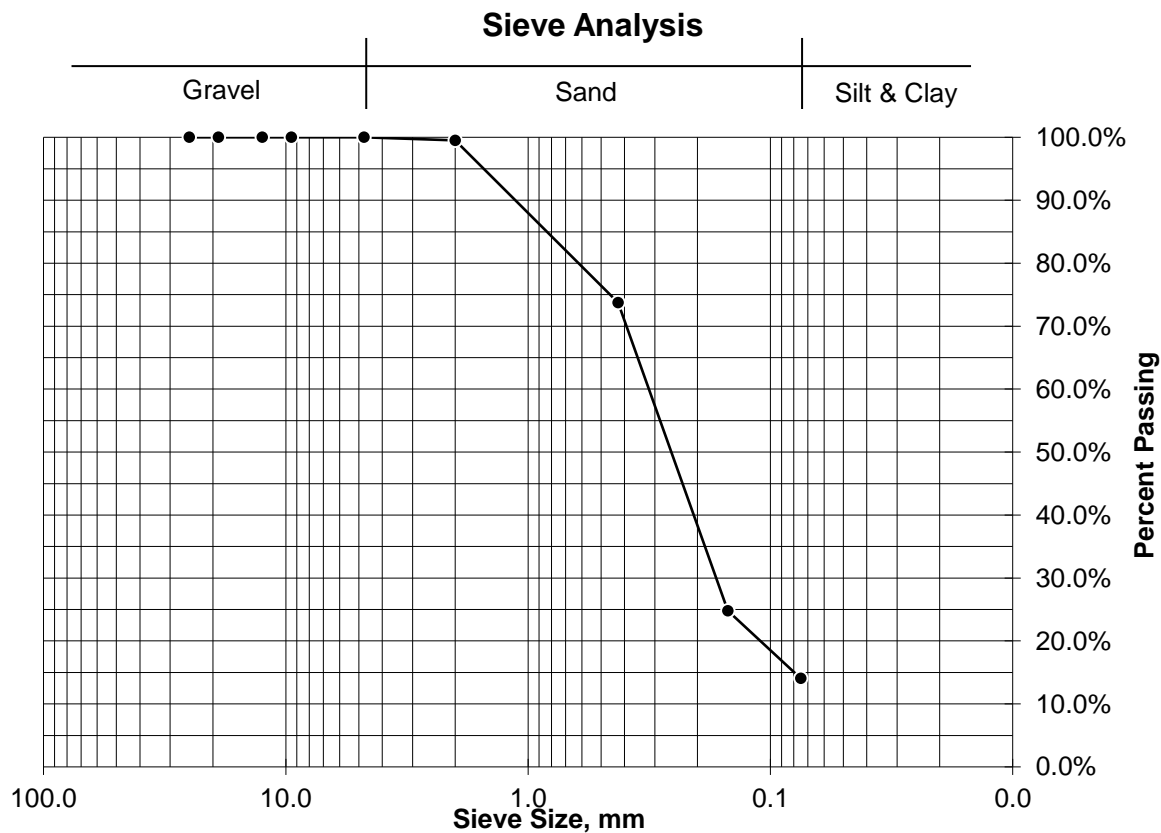
## Mechanical Sieve Analysis: ASTM D 422



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Sieve Size	Weight Retained	Percent Retained	Sieve Size, mm	Percent Passing
1"	0.00	0.0%	25.0	100.0%
3/4"	0.00	0.0%	19.0	100.0%
1/2"	0.00	0.0%	12.5	100.0%
3/8"	0.00	0.0%	9.50	100.0%
No. 4	0.00	0.0%	4.75	100.0%
No. 10	0.43	0.5%	2.00	99.5%
No. 40	21.84	25.8%	0.425	73.7%
No. 100	41.47	48.9%	0.15	24.8%
No. 200	9.09	10.7%	0.075	14.1%
Pan	0.46	0.5%		
Total	73.29	86.5%		





## Soil Classification Calculations

Green Ridge, Cumberland Landfill

DAA# 18020117-030102

Prepared By: CBW



1030 Wilmer Ave., Ste. 100

Richmond, VA 23227

Army Corps of Engineers Certified Laboratory

Sample ID DAA-22

Sample Depth 35'-37'

Visual Sample Description Brownish-Gray Silty SAND

Sample Received: 3/19/2019

Date Tested: 3/22/2019

### Natural Moisture Content: ASTM D 2216

Pan ID	36
Pan Wt	193.74 grams
Pan + Soil (wet)	296.82 grams
Pan + Soil (dry)	289.12 grams
Natural Moisture Content	8.1%

### Coarse or Fine Grained: ASTM D 422

Pan + Soil retained on No. 200 sieve

(dry) 274.32 grams

Percent Passing No. 200 Sieve 15.5%

Pan + Soil retained on No. 4 sieve

(dry) 193.97 grams

Percent Passing No. 4 Sieve 99.8%

Soil Classifies as Coarse-Grained Soil

### Atterberg Limits: ASTM D 4318

Date Tested: 3/22/2019

#### Liquid Limit

No of Blows			
Pan ID		Non-plastic	
Pan Wt			
Pan + Soil (wet)			
Pan + Soil (dry)			
Moisture Content			
Liquid Limit			
Liquid Limit			

#### Plastic Limit

Pan ID		
Pan Weight	Non-plastic	
Pan + Soil (wet)		
Pan + Soil (dry)		
Moisture Content		
Plastic Limit		
Plastic Index		

### USCS Classification: ASTM D 2487

Group Symbol **SM**

Group Name **Silty SAND**

## Grain Size Distribution Calculations

Green Ridge, Cumberland Landfill

DAA# 18020117-030102

Prepared By: CBW

Sample ID DAA-22

Sample Depth 35'-37'

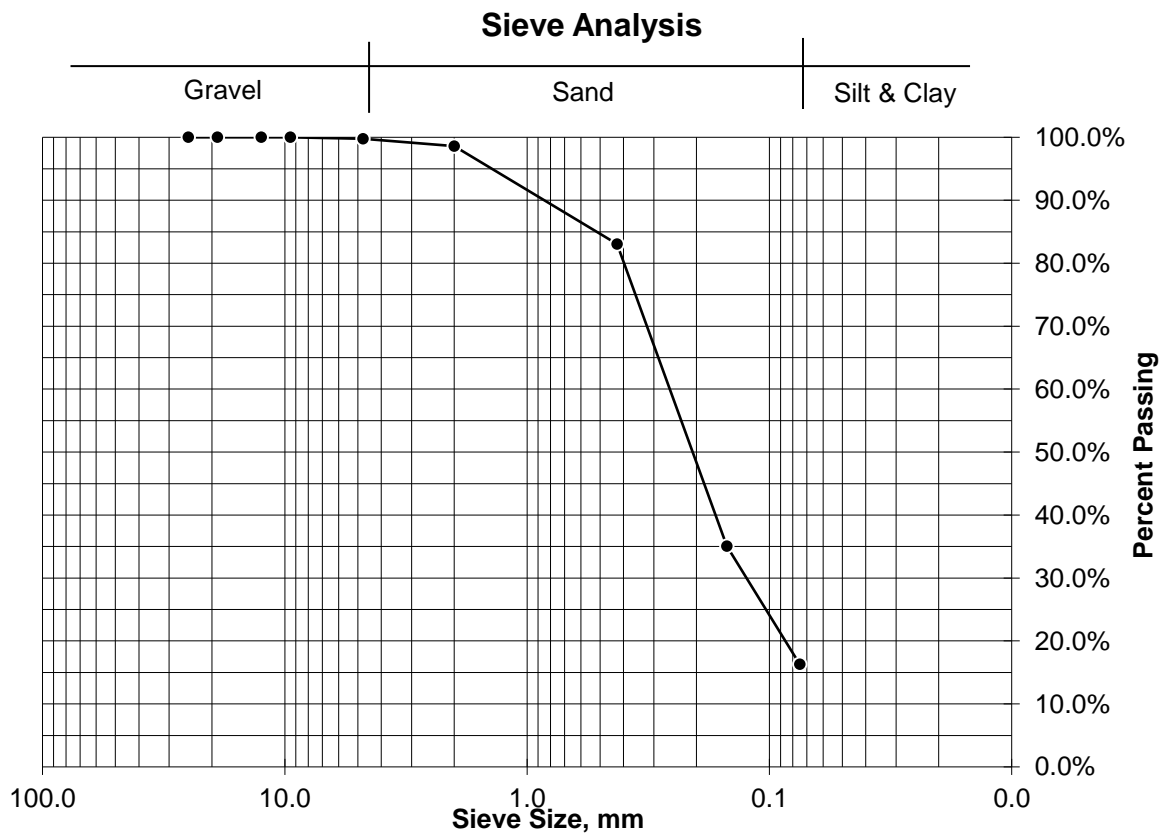
### Mechanical Sieve Analysis: ASTM D 422



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Sieve Size	Weight Retained	Percent Retained	Sieve Size, mm	Percent Passing
1"	0.00	0.0%	25.0	100.0%
3/4"	0.00	0.0%	19.0	100.0%
1/2"	0.00	0.0%	12.5	100.0%
3/8"	0.00	0.0%	9.50	100.0%
No. 4	0.23	0.2%	4.75	99.8%
No. 10	1.11	1.2%	2.00	98.6%
No. 40	14.82	15.5%	0.425	83.1%
No. 100	45.77	48.0%	0.15	35.1%
No. 200	17.89	18.8%	0.075	16.3%
Pan	0.76	0.8%		
Total	80.58	84.5%		



## Soil Classification Calculations

Green Ridge, Cumberland Landfill

DAA# 18020117-030102

Prepared By: CBW



1030 Wilmer Ave., Ste. 100

Richmond, VA 23227

Army Corps of Engineers Certified Laboratory

Sample ID DAA-23

Sample Depth 14'-16'

Visual Sample Description Reddish-brown Silty SAND

Sample Received: 3/19/2019

Date Tested: 3/22/2019

### Natural Moisture Content: ASTM D 2216

Pan ID	24
Pan Wt	186.13 grams
Pan + Soil (wet)	290.13 grams
Pan + Soil (dry)	271.17 grams
Natural Moisture Content	22.3%

### Coarse or Fine Grained: ASTM D 422

Pan + Soil retained on No. 200 sieve

(dry) 245.63 grams

Percent Passing No. 200 Sieve 30.0%

Pan + Soil retained on No. 4 sieve

(dry) 186.13 grams

Percent Passing No. 4 Sieve 100.0%

Soil Classifies as Coarse-Grained Soil

### Atterberg Limits: ASTM D 4318

Date Tested: 4/15/2019

#### Liquid Limit

No of Blows			
Pan ID		Non-plastic	
Pan Wt			
Pan + Soil (wet)			
Pan + Soil (dry)			
Moisture Content			
Liquid Limit			
Liquid Limit			

#### Plastic Limit

Pan ID		
Pan Weight	Non-plastic	
Pan + Soil (wet)		
Pan + Soil (dry)		
Moisture Content		
Plastic Limit		
Plastic Index		

### USCS Classification: ASTM D 2487

Group Symbol **SM**

Group Name **Silty SAND**

# Grain Size Distribution Calculations

Green Ridge, Cumberland Landfill

DAA# 18020117-030102

Prepared By: CBW

Sample ID DAA-23

Sample Depth 14'-16'

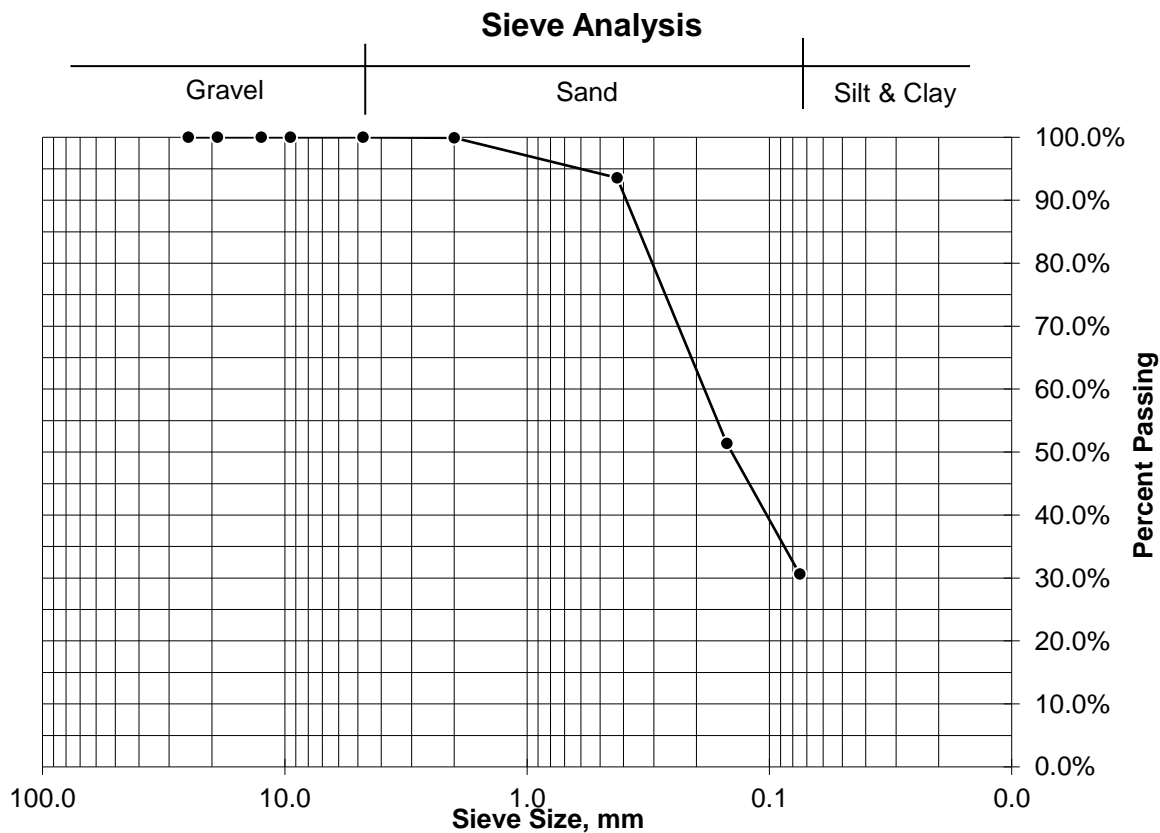
## Mechanical Sieve Analysis: ASTM D 422



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Sieve Size	Weight Retained	Percent Retained	Sieve Size, mm	Percent Passing
1"	0.00	0.0%	25.0	100.0%
3/4"	0.00	0.0%	19.0	100.0%
1/2"	0.00	0.0%	12.5	100.0%
3/8"	0.00	0.0%	9.50	100.0%
No. 4	0.00	0.0%	4.75	100.0%
No. 10	0.09	0.1%	2.00	99.9%
No. 40	5.37	6.3%	0.425	93.6%
No. 100	35.87	42.2%	0.15	51.4%
No. 200	17.67	20.8%	0.075	30.6%
Pan	0.50	0.6%		
Total	59.50	70.0%		



## Soil Classification Calculations

Green Ridge, Cumberland Landfill

DAA# 18020117-030102

Prepared By: CBW



1030 Wilmer Ave., Ste. 100

Richmond, VA 23227

Army Corps of Engineers Certified Laboratory

Sample ID DAA-23

Sample Depth 26'-28'

Visual Sample Description Brownish-Gray Silty SAND

Sample Received: 3/19/2019

Date Tested: 3/22/2019

### Natural Moisture Content: ASTM D 2216

Pan ID	11
Pan Wt	187.47 grams
Pan + Soil (wet)	305.65 grams
Pan + Soil (dry)	288.73 grams
Natural Moisture Content	16.7%

### Coarse or Fine Grained: ASTM D 422

Pan + Soil retained on No. 200 sieve

(dry) 272.53 grams

Percent Passing No. 200 Sieve 16.0%

Pan + Soil retained on No. 4 sieve

(dry) 187.47 grams

Percent Passing No. 4 Sieve 100.0%

Soil Classifies as Coarse-Grained Soil

### Atterberg Limits: ASTM D 4318

Date Tested: 3/22/2019

#### Liquid Limit

No of Blows			
Pan ID		Non-plastic	
Pan Wt			
Pan + Soil (wet)			
Pan + Soil (dry)			
Moisture Content			
Liquid Limit			
Liquid Limit			

#### Plastic Limit

Pan ID		
Pan Weight	Non-plastic	
Pan + Soil (wet)		
Pan + Soil (dry)		
Moisture Content		
Plastic Limit		
Plastic Index		

### USCS Classification: ASTM D 2487

Group Symbol **SM**

Group Name **Silty SAND**

## Grain Size Distribution Calculations

Green Ridge, Cumberland Landfill

DAA# 18020117-030102

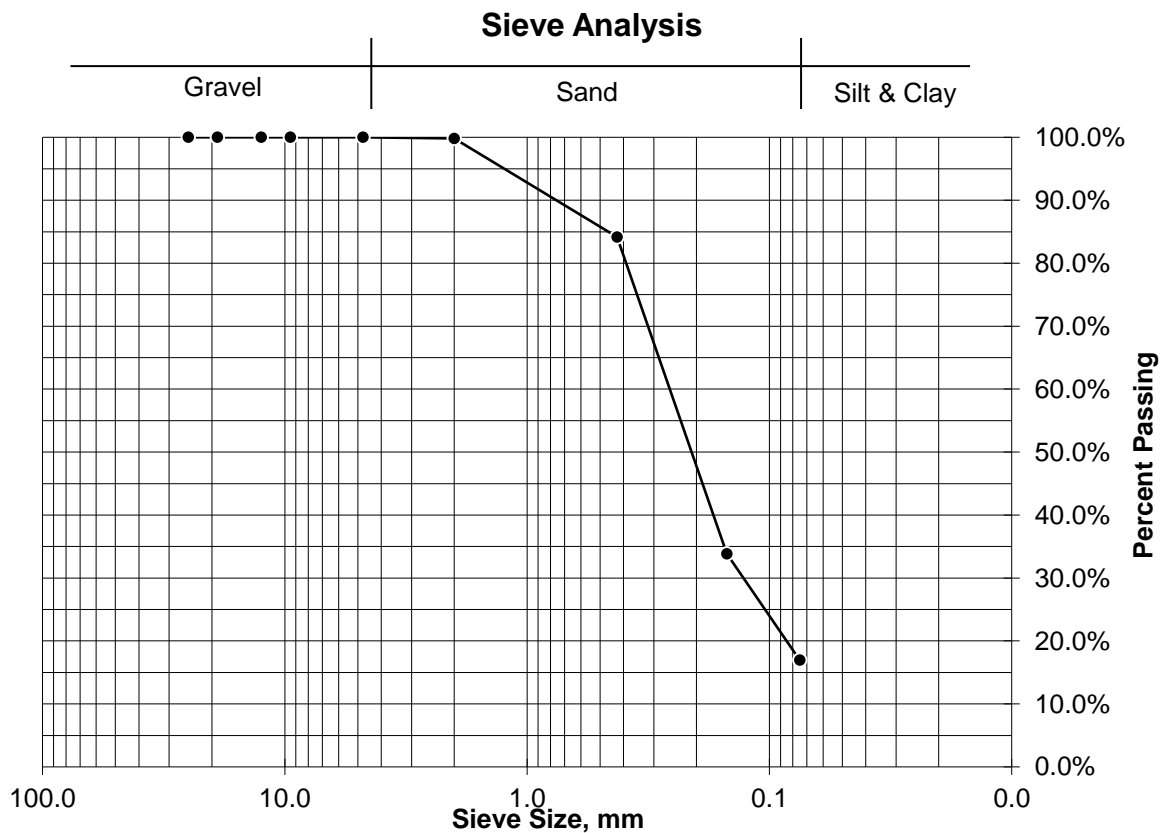
Prepared By: CBW

Sample ID DAA-23

Sample Depth 26'-28'

### Mechanical Sieve Analysis: ASTM D 422

Sieve Size	Weight Retained	Percent Retained	Sieve Size, mm	Percent Passing
1"	0.00	0.0%	25.0	100.0%
3/4"	0.00	0.0%	19.0	100.0%
1/2"	0.00	0.0%	12.5	100.0%
3/8"	0.00	0.0%	9.50	100.0%
No. 4	0.00	0.0%	4.75	100.0%
No. 10	0.20	0.2%	2.00	99.8%
No. 40	15.84	15.6%	0.425	84.2%
No. 100	50.95	50.3%	0.15	33.8%
No. 200	17.08	16.9%	0.075	17.0%
Pan	0.95	0.9%		
Total	85.02	84.0%		





## **Soil Classification Calculations**

**Green Ridge, Cumberland Landfill**

**DAA# 18020117-030102**

**Prepared By: CBW**



1030 Wilmer Ave., Ste. 100  
Richmond, VA 23227

*Army Corps of Engineers Certified Laboratory*

Sample ID DAA-23

Sample Depth 28'-29.5'

Visual Sample Description Gray Silty SAND

Sample Received: 4/26/2019

Date Tested: 4/26/2019

### **Natural Moisture Content: ASTM D 2216**

Pan ID	11
Pan Wt	187.50 grams
Pan + Soil (wet)	428.90 grams
Pan + Soil (dry)	394.65 grams
Natural Moisture Content	16.5%

### **Coarse or Fine Grained: ASTM D 422**

Pan + Soil retained on No. 200 sieve

(dry) 355.60 grams

Percent Passing No. 200 Sieve 18.9%

Pan + Soil retained on No. 4 sieve

(dry) 188.82 grams

Percent Passing No. 4 Sieve 99.4%

*Soil Classifies as Coarse-Grained Soil*

### **Atterberg Limits: ASTM D 4318**

Date Tested: 5/1/2019

#### **Liquid Limit**

No of Blows			
Pan ID		Non-plastic	
Pan Wt			
Pan + Soil (wet)			
Pan + Soil (dry)			
Moisture Content			
Liquid Limit			
<i>Liquid Limit</i>			

#### **Plastic Limit**

Pan ID		
Pan Weight	Non-plastic	
Pan + Soil (wet)		
Pan + Soil (dry)		
Moisture Content		
<i>Plastic Limit</i>		
<i>Plastic Index</i>		

### **USCS Classification: ASTM D 2487**

Group Symbol **SM**

Group Name **Silty SAND**

## Grain Size Distribution Calculations

Green Ridge, Cumberland Landfill

DAA# 18020117-030102

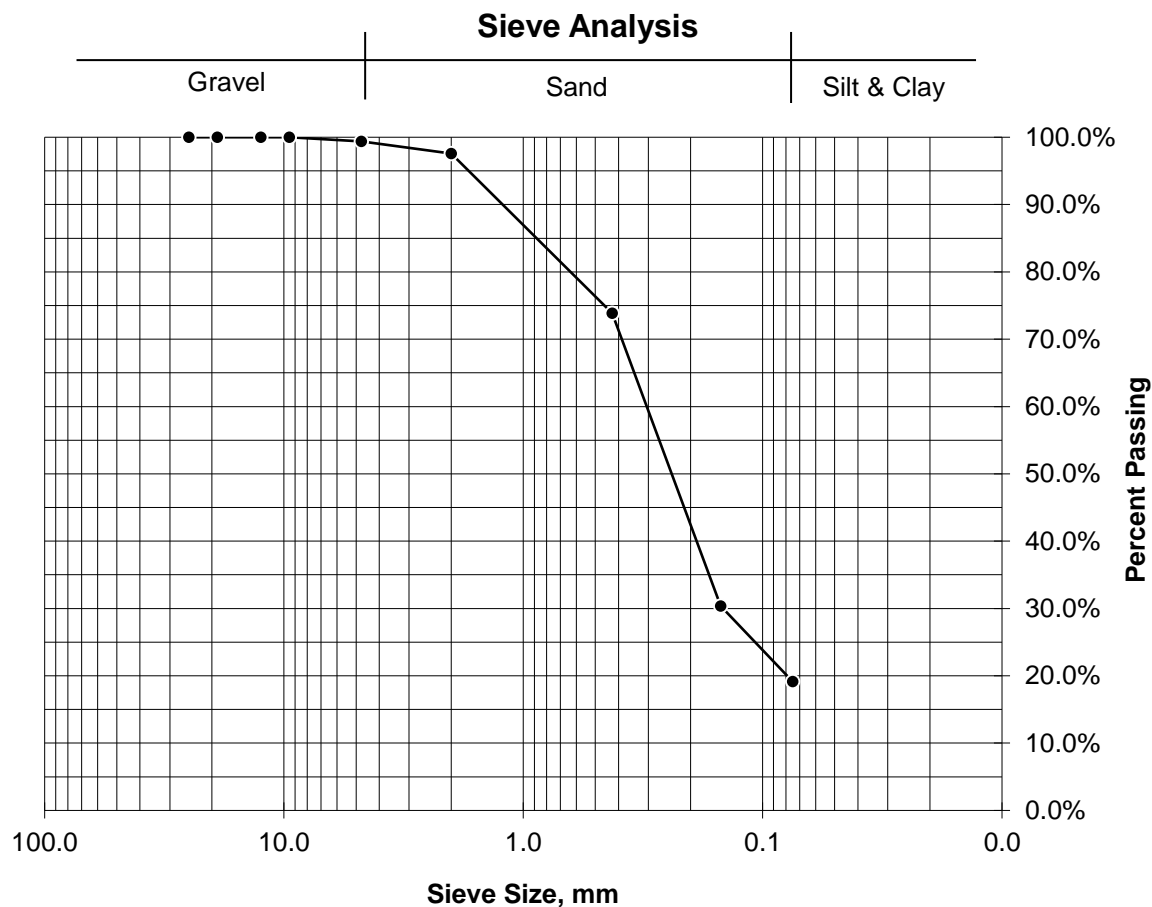
Prepared By: CBW

Sample ID DAA-23

Sample Depth 28'-29.5'

### Mechanical Sieve Analysis: ASTM D 422

Sieve Size	Weight Retained	Percent Retained	Sieve Size, mm	Date Tested: Passing
1"	0.00	0.0%	25.0	100.0%
3/4"	0.00	0.0%	19.0	100.0%
1/2"	0.00	0.0%	12.5	100.0%
3/8"	0.00	0.0%	9.5	100.0%
No. 4	1.32	0.6%	4.75	99.4%
No. 10	3.67	1.8%	2.0	97.6%
No. 40	49.17	23.7%	0.425	73.9%
No. 100	90.09	43.5%	0.15	30.4%
No. 200	23.21	11.2%	0.075	19.2%
Pan	0.60	0.3%		
Total	168.06	81.1%		



## **Permeability Calculations**

**Green Ridge, Cumberland Landfill**

**DAA# 18020117-030102**

**Prepared By: CBW**



1030 Wilmer Ave., Ste. 100  
Richmond, VA 23227

*Army Corps of Engineers Certified Laboratory*

Sample ID: DAA-23  
Sample Depth: 28'-29.5'  
Permeability Method: ASTM D5084  
Sample Length, in: 3.71  
Sample Diameter, in: 2.86  
Sample Condition: Undisturbed

Sample Received: 4/26/2019  
Date Tested: 4/26/2019

### **Moisture Content**

Pan Wt 187.50 grams  
Pan + Soil (wet) 428.90 grams  
Pan + Soil (dry) 394.65 grams  
Moisture Content 16.5%

### **Dry Density**

Soil (wet) 797.58 grams  
Wet Density 127.4 pcf  
Dry Density 109.4 pcf

### **Test Conditions**

Backpressure, psi 40.0  
Cell Pressure, psi 50.0  
Influent Buret Area, cm<sup>2</sup> 0.03142  
Effluent Buret Area, cm<sup>2</sup> 0.76712  
Effective Stress, psi 10.0  
Pearment Liquid Temp.(°C):

### **Initial Data**

Assumed Specific Gravity 2.65  
Percent Voids 33.9%  
Actual Volume of Voids 132.3 ml  
Porosity 33.9%  
Saturation 85.6%

Date Tested:

### **Permeability Trials**

					Flow		
Time	Influent	Influent	Effluent	Effluent	Deviation	Gradient	Permeability, k
min	Head, cm	Flow, cm <sup>3</sup>	Head, cm	Flow, cm <sup>3</sup>	Ratio	mm-Hg	cm/sec

# Failed, unable to get reading

**Average Permeability** #DIV/0! cm/sec Corrected for 20°C

### **Final Data**

Assumed Specific Gravity	2.65		
Final Weight of Sample	836.42 grams		
Final Moisture Content	22.2%	Final Sample Length, in:	3.67
Percent Voids	33.6%	Final Sample Diameter, in:	2.87
Actual Volume of Voids	130.7 ml	Wet Density	134.2 pcf
Porosity	33.6%	Dry Density	109.8 pcf
Saturation	100.0%		

## Soil Classification Calculations

Green Ridge, Cumberland Landfill

DAA# 18020117-030102

Prepared By: CBW



1030 Wilmer Ave., Ste. 100

Richmond, VA 23227

Army Corps of Engineers Certified Laboratory

Sample ID DAA-25

Sample Depth 6'-8'

Visual Sample Description Light Brown Silty SAND

Sample Received: 3/19/2019

Date Tested: 3/22/2019

### Natural Moisture Content: ASTM D 2216

Pan ID	25
Pan Wt	194.03 grams
Pan + Soil (wet)	296.42 grams
Pan + Soil (dry)	267.47 grams
Natural Moisture Content	39.4%

### Coarse or Fine Grained: ASTM D 422

Pan + Soil retained on No. 200 sieve

(dry) 237.91 grams

Percent Passing No. 200 Sieve 40.3%

Pan + Soil retained on No. 4 sieve

(dry) 194.52 grams

Percent Passing No. 4 Sieve 99.3%

Soil Classifies as Coarse-Grained Soil

### Atterberg Limits: ASTM D 4318

Date Tested: 3/26/2019

#### Liquid Limit

No of Blows	19	24	35
Pan ID	169	201	96
Pan Wt	27.18	27.71	24.87
Pan + Soil (wet)	39.50	38.36	35.41
Pan + Soil (dry)	34.64	34.32	31.60
Moisture Content	65.1%	61.1%	56.6%
Liquid Limit	63	61	59
Liquid Limit	61		

#### Plastic Limit

Pan ID	73	74
Pan Weight	4.26	4.28
Pan + Soil (wet)	14.40	16.68
Pan + Soil (dry)	11.59	13.24
Moisture Content	38.3%	38.4%
Plastic Limit	38	
Plastic Index	23	

### USCS Classification: ASTM D 2487

Group Symbol SM

Group Name Silty SAND

## Grain Size Distribution Calculations

Green Ridge, Cumberland Landfill

DAA# 18020117-030102

Prepared By: CBW

Sample ID DAA-25

Sample Depth 6'-8'

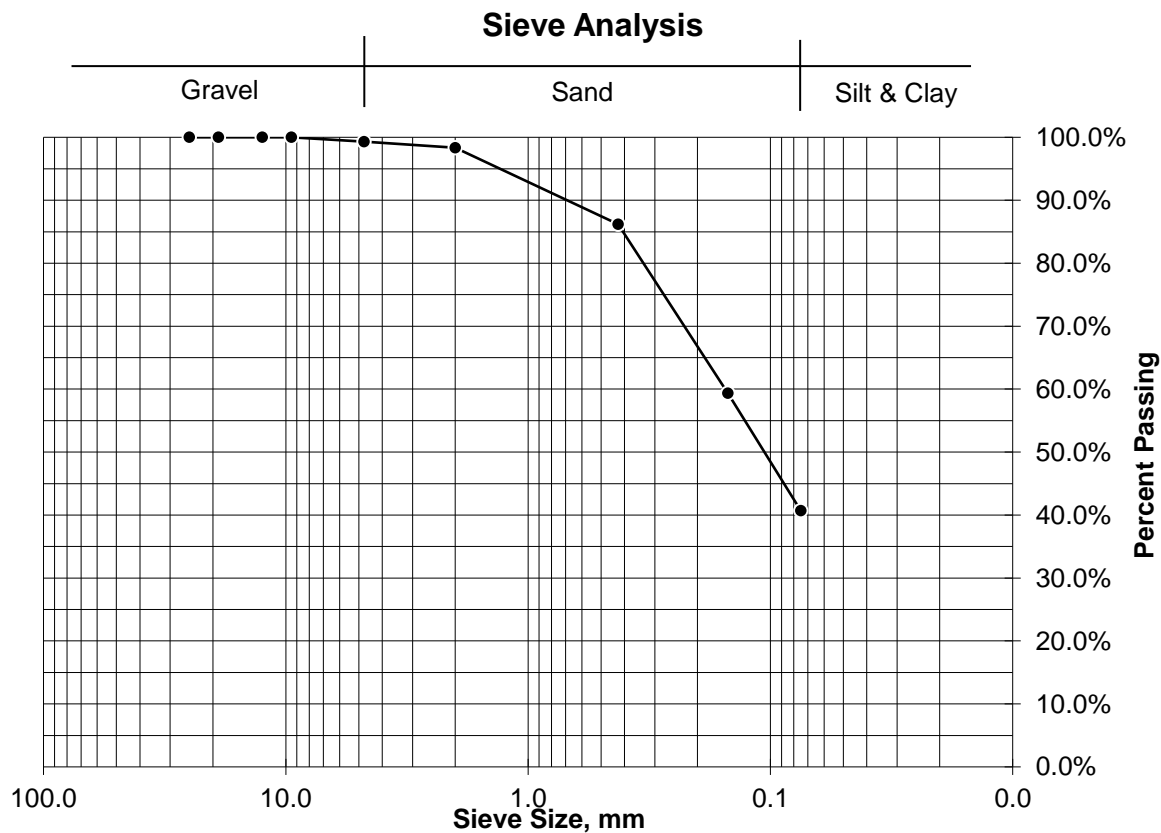
### Mechanical Sieve Analysis: ASTM D 422



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Sieve Size	Weight Retained	Percent Retained	Sieve Size, mm	Percent Passing
1"	0.00	0.0%	25.0	100.0%
3/4"	0.00	0.0%	19.0	100.0%
1/2"	0.00	0.0%	12.5	100.0%
3/8"	0.00	0.0%	9.50	100.0%
No. 4	0.49	0.7%	4.75	99.3%
No. 10	0.71	1.0%	2.00	98.4%
No. 40	8.92	12.1%	0.425	86.2%
No. 100	19.72	26.9%	0.15	59.4%
No. 200	13.69	18.6%	0.075	40.7%
Pan	0.35	0.5%		
Total	43.88	59.7%		



## Soil Classification Calculations

Green Ridge, Cumberland Landfill

DAA# 18020117-030102

Prepared By: CBW



1030 Wilmer Ave., Ste. 100

Richmond, VA 23227

Army Corps of Engineers Certified Laboratory

Sample ID DAA-25

Sample Depth 16'-18'

Visual Sample Description Light Brown Silty SAND

Sample Received: 3/19/2019

Date Tested: 3/22/2019

### Natural Moisture Content: ASTM D 2216

Pan ID 110  
Pan Wt 122.63 grams  
Pan + Soil (wet) 231.01 grams  
Pan + Soil (dry) 210.04 grams  
*Natural Moisture Content* 24.0%

### Coarse or Fine Grained: ASTM D 422

Pan + Soil retained on No. 200 sieve

(dry) 182.18 grams

Percent Passing No. 200 Sieve 31.9%

Pan + Soil retained on No. 4 sieve

(dry) 128.16 grams

Percent Passing No. 4 Sieve 93.7%

*Soil Classifies as Coarse-Grained Soil*

### Atterberg Limits: ASTM D 4318

Date Tested: 4/15/2019

#### Liquid Limit

No of Blows	16	26	32
Pan ID	1	64	96
Pan Wt	11.24	11.04	24.78
Pan + Soil (wet)	29.45	27.98	31.00
Pan + Soil (dry)	22.11	21.51	28.71
Moisture Content	67.6%	61.8%	58.2%
Liquid Limit	64	62	60
<i>Liquid Limit</i>	62		

#### Plastic Limit

Pan ID	78	81
Pan Weight	4.24	4.33
Pan + Soil (wet)	15.31	15.09
Pan + Soil (dry)	12.28	12.10
Moisture Content	37.7%	38.5%
<i>Plastic Limit</i>	38	
<i>Plastic Index</i>	24	

### USCS Classification: ASTM D 2487

Group Symbol **SM**

Group Name **Silty SAND**



# Grain Size Distribution Calculations

Green Ridge, Cumberland Landfill

DAA# 18020117-030102

Prepared By: CBW

Sample ID DAA-25

Sample Depth 16'-18'

## Mechanical Sieve Analysis: ASTM D 422

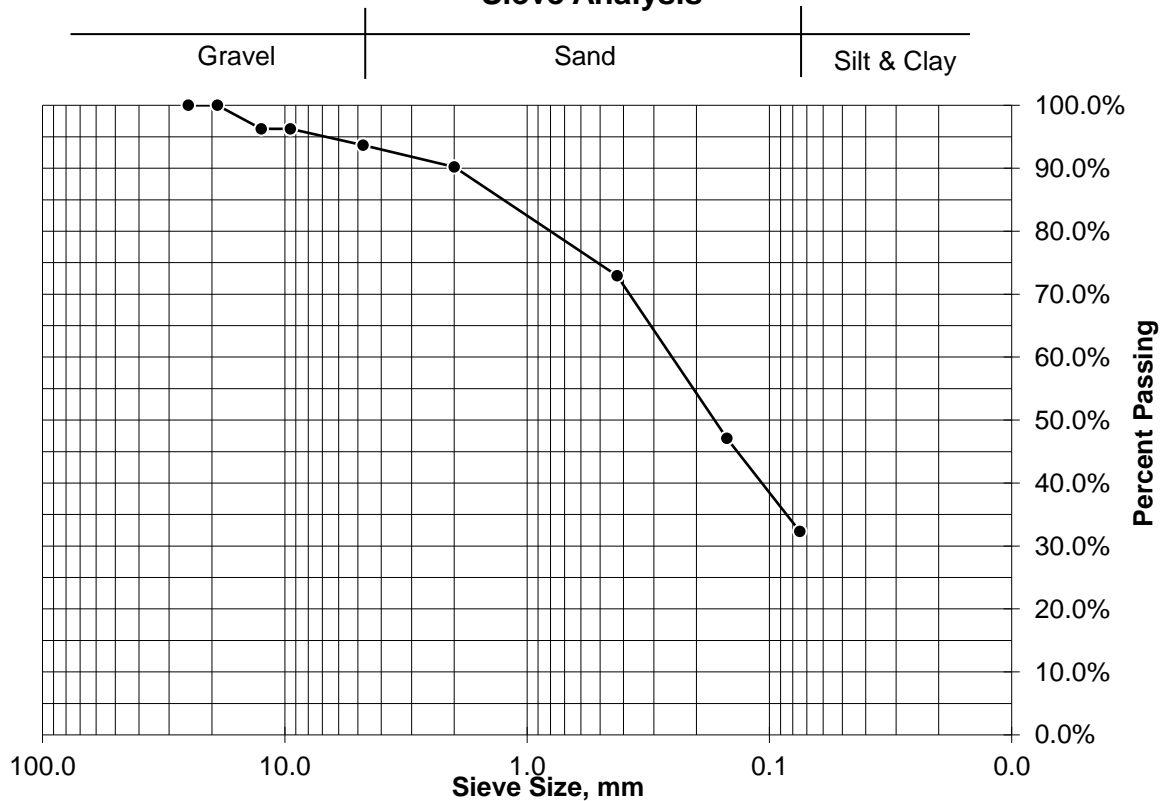


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Sieve Size	Weight Retained	Percent Retained	Sieve Size, mm	Percent Passing
1"	0.00	0.0%	25.0	100.0%
3/4"	0.00	0.0%	19.0	100.0%
1/2"	3.27	3.7%	12.5	96.3%
3/8"	0.00	0.0%	9.50	96.3%
No. 4	2.26	2.6%	4.75	93.7%
No. 10	3.03	3.5%	2.00	90.2%
No. 40	15.10	17.3%	0.425	72.9%
No. 100	22.59	25.8%	0.15	47.1%
No. 200	12.89	14.7%	0.075	32.3%
Pan	0.40	0.5%		
Total	59.54	68.1%		

### Sieve Analysis



## Soil Classification Calculations

Green Ridge, Cumberland Landfill

DAA# 18020117-030102

Prepared By: CBW



1030 Wilmer Ave., Ste. 100

Richmond, VA 23227

Army Corps of Engineers Certified Laboratory

Sample ID DAA-26

Sample Depth 2'-4'

Visual Sample Description Light Reddish-brown Elastic SILT

Sample Received: 4/17/2019

Date Tested: 4/22/2019

### Natural Moisture Content: ASTM D 2216

Pan ID	9
Pan Wt	189.24 grams
Pan + Soil (wet)	293.77 grams
Pan + Soil (dry)	263.10 grams
Natural Moisture Content	41.5%

### Coarse or Fine Grained: ASTM D 422

Pan + Soil retained on No. 200 sieve

(dry) 193.83 grams

Percent Passing No. 200 Sieve 93.8%

Pan + Soil retained on No. 4 sieve

(dry) 189.24 grams

Percent Passing No. 4 Sieve 100.0%

Soil Classifies as Fine-Grained Soil

### Atterberg Limits: ASTM D 4318

Date Tested: 5/29/2019

#### Liquid Limit

No of Blows	15	27	34
Pan ID	61	63	10
Pan Wt	10.96	10.86	11.26
Pan + Soil (wet)	17.72	20.86	19.33
Pan + Soil (dry)	14.59	16.48	15.90
Moisture Content	86.2%	77.9%	73.9%
Liquid Limit	81	79	77
Liquid Limit	79		

#### Plastic Limit

Pan ID	74	22
Pan Weight	4.29	4.31
Pan + Soil (wet)	14.49	14.34
Pan + Soil (dry)	11.73	11.62
Moisture Content	37.1%	37.2%
Plastic Limit	37	
Plastic Index	42	

### USCS Classification: ASTM D 2487

Group Symbol **MH**

Group Name **Elastic SILT**

# Grain Size Distribution Calculations

Green Ridge, Cumberland Landfill

DAA# 18020117-030102

Prepared By: CBW



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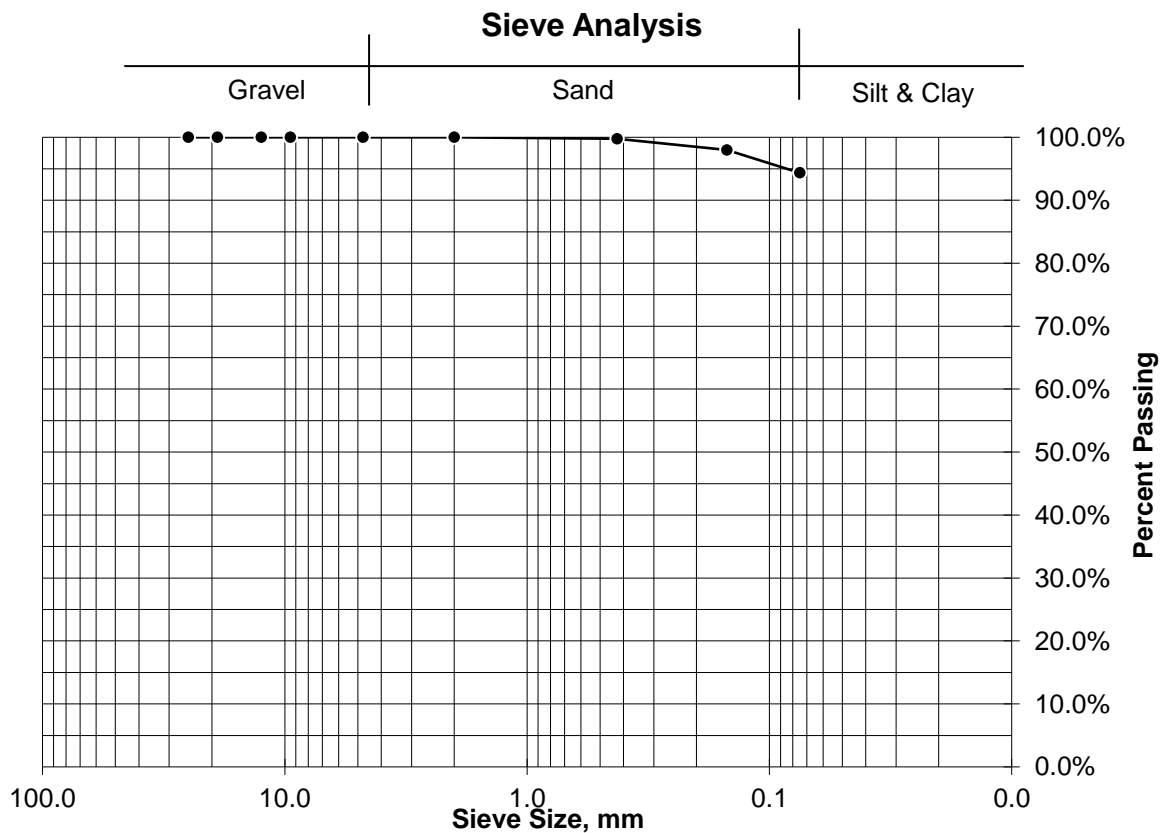
Army Corps of Engineers Certified Laboratory

Sample ID DAA-26

Sample Depth 2'-4'

## Mechanical Sieve Analysis: ASTM D 422

Sieve Size	Weight Retained	Percent Retained	Sieve Size, mm	Percent Passing
1"	0.00	0.0%	25.0	100.0%
3/4"	0.00	0.0%	19.0	100.0%
1/2"	0.00	0.0%	12.5	100.0%
3/8"	0.00	0.0%	9.50	100.0%
No. 4	0.00	0.0%	4.75	100.0%
No. 10	0.00	0.0%	2.00	100.0%
No. 40	0.18	0.2%	0.425	99.8%
No. 100	1.31	1.8%	0.15	98.0%
No. 200	2.68	3.6%	0.075	94.4%
Pan	0.41	0.6%		
Total	4.58	6.2%		



## Soil Classification Calculations

Green Ridge, Cumberland Landfill

DAA# 18020117-030102

Prepared By: CBW



1030 Wilmer Ave., Ste. 100

Richmond, VA 23227

Army Corps of Engineers Certified Laboratory

Sample ID DAA-26

Sample Depth 4'-6'

Visual Sample Description Light Brown Elastic SILT

Sample Received: 4/11/2019

Date Tested: 4/17/2019

### Natural Moisture Content: ASTM D 2216

Pan ID	118
Pan Wt	122.25 grams
Pan + Soil (wet)	224.18 grams
Pan + Soil (dry)	197.03 grams
Natural Moisture Content	36.3%

### Coarse or Fine Grained: ASTM D 422

Pan + Soil retained on No. 200 sieve

(dry) 132.14 grams

Percent Passing No. 200 Sieve 86.8%

Pan + Soil retained on No. 4 sieve

(dry) 122.25 grams

Percent Passing No. 4 Sieve 100.0%

Soil Classifies as Fine-Grained Soil

### Atterberg Limits: ASTM D 4318

Date Tested: 4/25/2019

#### Liquid Limit

No of Blows	19	28	30
Pan ID	1	96	64
Pan Wt	11.23	24.79	11.03
Pan + Soil (wet)	22.55	33.44	40.61
Pan + Soil (dry)	18.07	30.20	29.81
Moisture Content	65.5%	59.9%	57.5%
Liquid Limit	63	61	59
Liquid Limit	61		

#### Plastic Limit

Pan ID	352	353
Pan Weight	9.06	9.10
Pan + Soil (wet)	19.61	19.98
Pan + Soil (dry)	16.71	17.02
Moisture Content	37.9%	37.4%
Plastic Limit	38	
Plastic Index	23	

### USCS Classification: ASTM D 2487

Group Symbol MH

Group Name Elastic SILT

# Grain Size Distribution Calculations

Green Ridge, Cumberland Landfill

DAA# 18020117-030102

Prepared By: CBW



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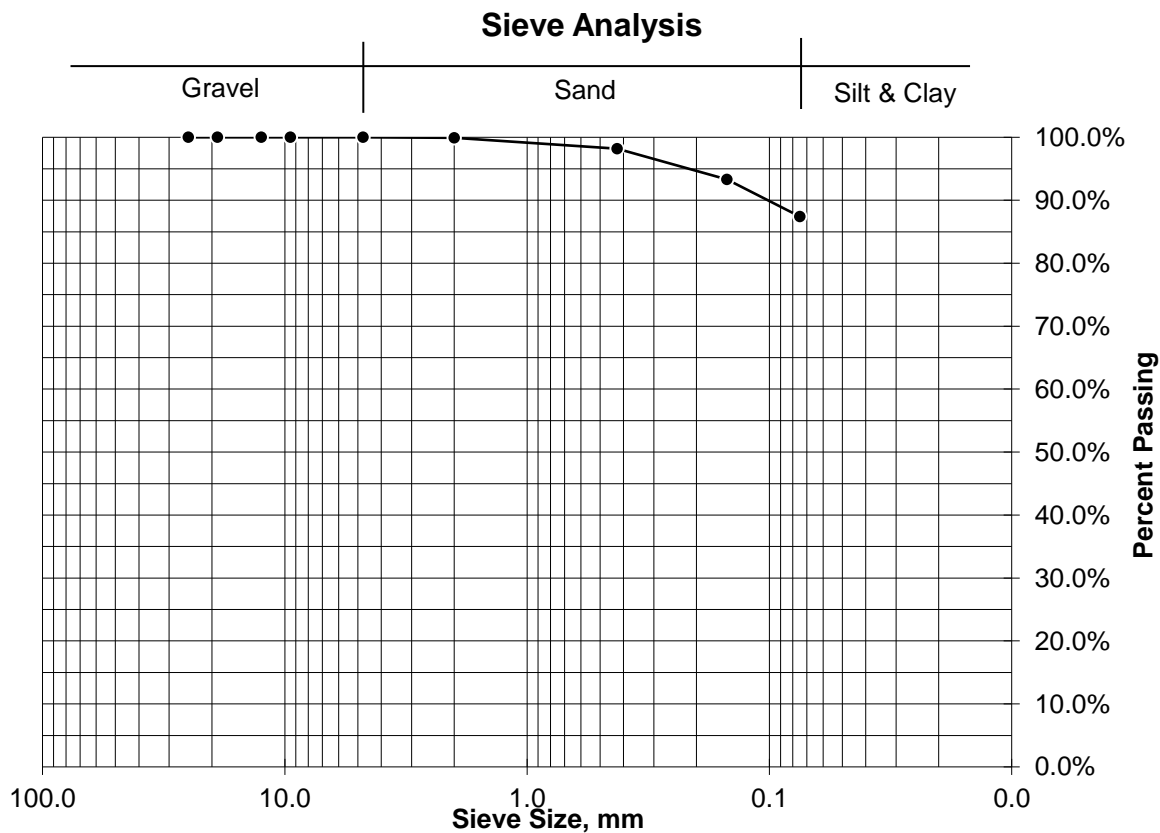
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Sample ID DAA-26

Sample Depth 4'-6'

## Mechanical Sieve Analysis: ASTM D 422

Sieve Size	Weight Retained	Percent Retained	Sieve Size, mm	Percent Passing
1"	0.00	0.0%	25.0	100.0%
3/4"	0.00	0.0%	19.0	100.0%
1/2"	0.00	0.0%	12.5	100.0%
3/8"	0.00	0.0%	9.50	100.0%
No. 4	0.00	0.0%	4.75	100.0%
No. 10	0.06	0.1%	2.00	99.9%
No. 40	1.30	1.7%	0.425	98.2%
No. 100	3.65	4.9%	0.15	93.3%
No. 200	4.39	5.9%	0.075	87.4%
Pan	0.45	0.6%		
Total	9.85	13.2%		



## Soil Classification Calculations

Green Ridge, Cumberland Landfill

DAA# 18020117-030102

Prepared By: CBW



1030 Wilmer Ave., Ste. 100

Richmond, VA 23227

Army Corps of Engineers Certified Laboratory

Sample ID DAA-26

Sample Depth 8'-10'

Visual Sample Description Light Brown SILT with Sand

Sample Received: 4/11/2019

Date Tested: 4/22/2019

### Natural Moisture Content: ASTM D 2216

Pan ID	6
Pan Wt	195.32 grams
Pan + Soil (wet)	307.70 grams
Pan + Soil (dry)	277.87 grams
Natural Moisture Content	36.1%

### Coarse or Fine Grained: ASTM D 422

Pan + Soil retained on No. 200 sieve

(dry) 212.08 grams

Percent Passing No. 200 Sieve 79.7%

Pan + Soil retained on No. 4 sieve

(dry) 195.32 grams

Percent Passing No. 4 Sieve 100.0%

Soil Classifies as Fine-Grained Soil

### Atterberg Limits: ASTM D 4318

Date Tested: 4/22/2019

#### Liquid Limit

No of Blows			
Pan ID		Non-plastic	
Pan Wt			
Pan + Soil (wet)			
Pan + Soil (dry)			
Moisture Content			
Liquid Limit			
Liquid Limit			

#### Plastic Limit

Pan ID		
Pan Weight	Non-plastic	
Pan + Soil (wet)		
Pan + Soil (dry)		
Moisture Content		
Plastic Limit		
Plastic Index		

### USCS Classification: ASTM D 2487

Group Symbol **ML**

Group Name **SILT with Sand**



# Grain Size Distribution Calculations

Green Ridge, Cumberland Landfill

DAA# 18020117-030102

Prepared By: CBW



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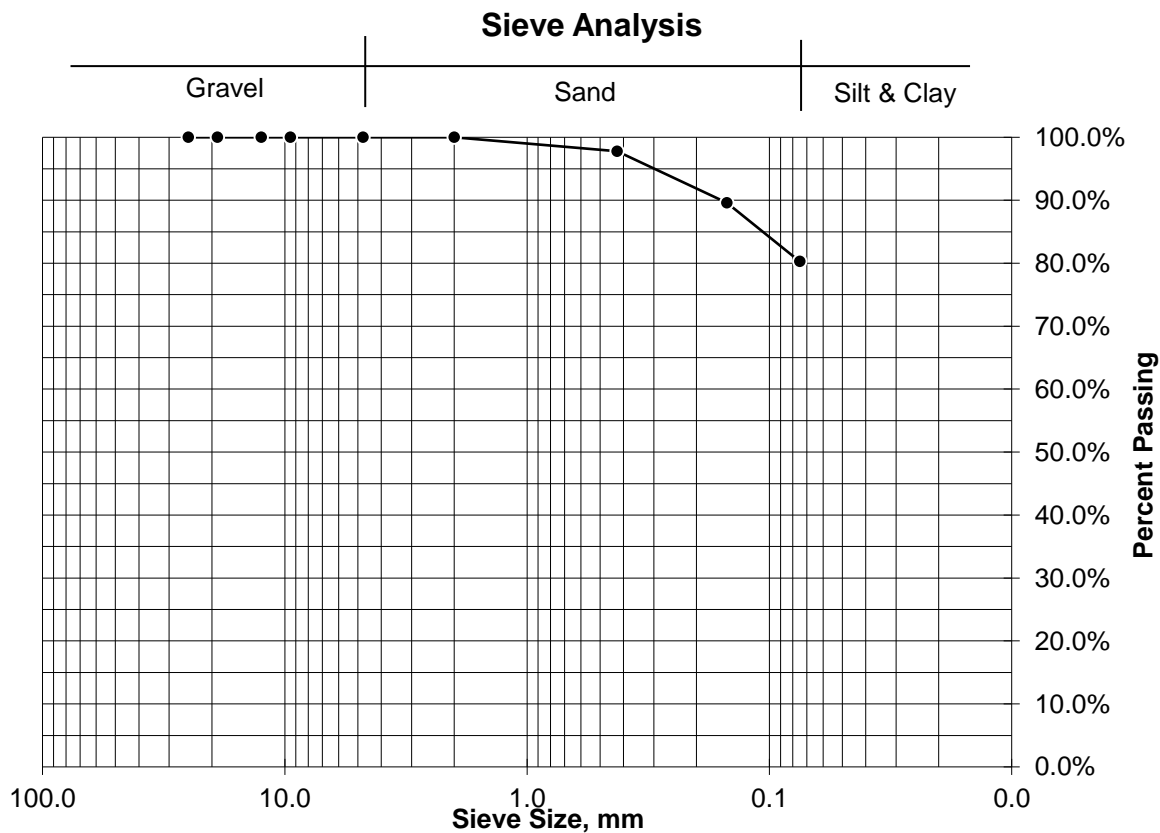
Army Corps of Engineers Certified Laboratory

Sample ID DAA-26

Sample Depth 8'-10'

## Mechanical Sieve Analysis: ASTM D 422

Sieve Size	Weight Retained	Percent Retained	Sieve Size, mm	Percent Passing
1"	0.00	0.0%	25.0	100.0%
3/4"	0.00	0.0%	19.0	100.0%
1/2"	0.00	0.0%	12.5	100.0%
3/8"	0.00	0.0%	9.50	100.0%
No. 4	0.00	0.0%	4.75	100.0%
No. 10	0.00	0.0%	2.00	100.0%
No. 40	1.82	2.2%	0.425	97.8%
No. 100	6.75	8.2%	0.15	89.6%
No. 200	7.71	9.3%	0.075	80.3%
Pan	0.48	0.6%		
Total	16.76	20.3%		



## Soil Classification Calculations

Green Ridge, Cumberland Landfill

DAA# 18020117-030102

Prepared By: CBW



1030 Wilmer Ave., Ste. 100

Richmond, VA 23227

Army Corps of Engineers Certified Laboratory

Sample ID DAA-26

Sample Depth 18'-20'

Visual Sample Description Light Brown Elastic SILT with Sand

Sample Received: 4/17/2019

Date Tested: 4/17/2019

### Natural Moisture Content: ASTM D 2216

Pan ID	26
Pan Wt	194.57 grams
Pan + Soil (wet)	323.67 grams
Pan + Soil (dry)	282.99 grams
Natural Moisture Content	46.0%

### Coarse or Fine Grained: ASTM D 422

Pan + Soil retained on No. 200 sieve

(dry) 220.82 grams

Percent Passing No. 200 Sieve 70.3%

Pan + Soil retained on No. 4 sieve

(dry) 194.75 grams

Percent Passing No. 4 Sieve 99.8%

Soil Classifies as Fine-Grained Soil

### Atterberg Limits: ASTM D 4318

Date Tested: 5/1/2019

#### Liquid Limit

No of Blows	16	23	31
Pan ID	107	64	70
Pan Wt	25.10	10.98	10.99
Pan + Soil (wet)	39.42	27.99	39.40
Pan + Soil (dry)	33.54	21.32	28.70
Moisture Content	69.7%	64.5%	60.4%
Liquid Limit	66	64	62
Liquid Limit	64		

#### Plastic Limit

Pan ID	354	4
Pan Weight	9.17	9.06
Pan + Soil (wet)	20.46	19.76
Pan + Soil (dry)	16.63	16.11
Moisture Content	51.3%	51.8%
Plastic Limit	52	
Plastic Index	12	

### USCS Classification: ASTM D 2487

Group Symbol MH

Group Name Elastic SILT with Sand

## Grain Size Distribution Calculations

Green Ridge, Cumberland Landfill

DAA# 18020117-030102

Prepared By: CBW

Sample ID DAA-26

Sample Depth 18'-20'

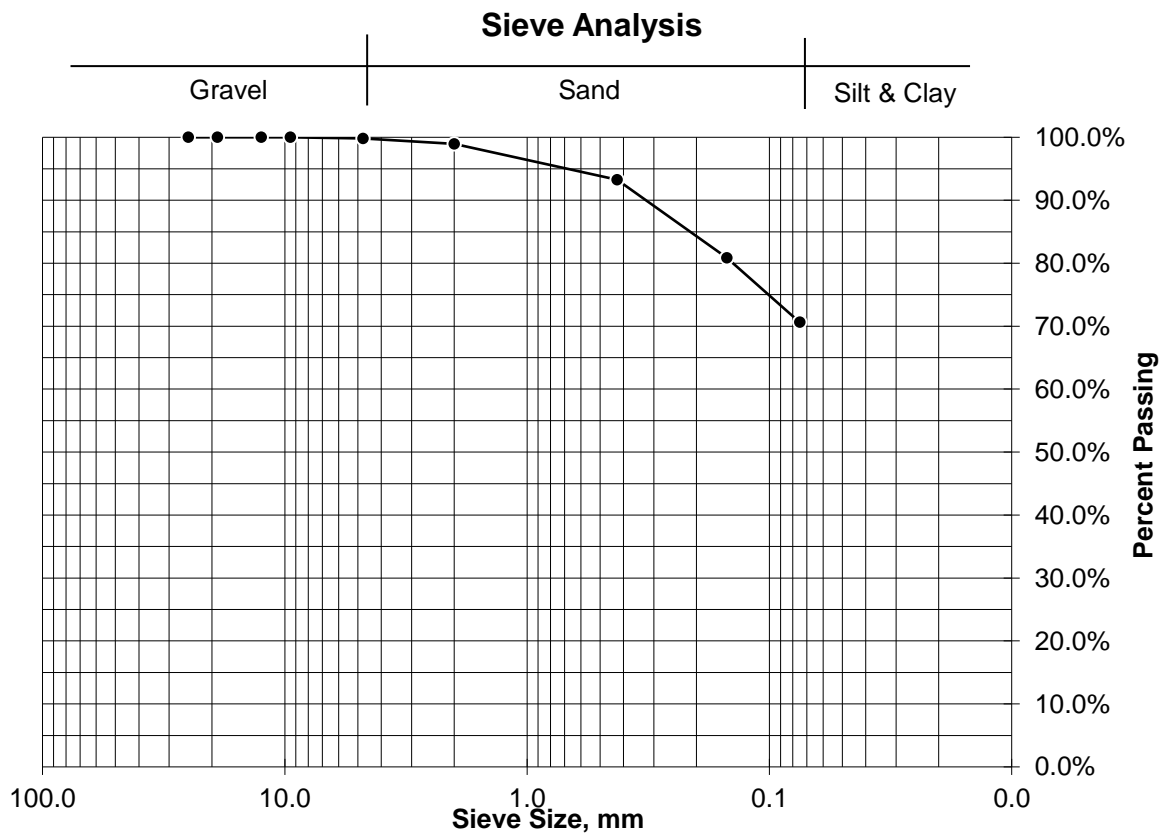
### Mechanical Sieve Analysis: ASTM D 422



1030 Wilmer Ave., Ste. 100  
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Army Corps of Engineers Certified Laboratory

Sieve Size	Weight Retained	Percent Retained	Sieve Size, mm	Percent Passing
1"	0.00	0.0%	25.0	100.0%
3/4"	0.00	0.0%	19.0	100.0%
1/2"	0.00	0.0%	12.5	100.0%
3/8"	0.00	0.0%	9.50	100.0%
No. 4	0.18	0.2%	4.75	99.8%
No. 10	0.74	0.8%	2.00	99.0%
No. 40	5.03	5.7%	0.425	93.3%
No. 100	10.99	12.4%	0.15	80.8%
No. 200	9.04	10.2%	0.075	70.6%
Pan	0.27	0.3%		
Total	26.25	29.7%		



## Soil Classification Calculations

Green Ridge, Cumberland Landfill

DAA# 18020117-030102

Prepared By: CBW



1030 Wilmer Ave., Ste. 100

Richmond, VA 23227

Army Corps of Engineers Certified Laboratory

Sample ID DAA-26

Sample Depth 20'-22'

Visual Sample Description Light Brown Elastic SILT

Sample Received: 4/17/2019

Date Tested: 4/17/2019

### Natural Moisture Content: ASTM D 2216

Pan ID	124
Pan Wt	124.38 grams
Pan + Soil (wet)	252.16 grams
Pan + Soil (dry)	204.84 grams
Natural Moisture Content	58.8%

### Coarse or Fine Grained: ASTM D 422

Pan + Soil retained on No. 200 sieve

(dry) 133.77 grams

Percent Passing No. 200 Sieve 88.3%

Pan + Soil retained on No. 4 sieve

(dry) 124.38 grams

Percent Passing No. 4 Sieve 100.0%

Soil Classifies as Fine-Grained Soil

### Atterberg Limits: ASTM D 4318

Date Tested: 4/26/2019

#### Liquid Limit

No of Blows	17	21	32
Pan ID	91	62	108
Pan Wt	24.52	10.87	33.14
Pan + Soil (wet)	36.06	27.36	41.26
Pan + Soil (dry)	31.22	20.68	38.11
Moisture Content	72.3%	68.1%	63.3%
Liquid Limit	69	67	65
Liquid Limit	67		

#### Plastic Limit

Pan ID	313	352
Pan Weight	9.14	9.05
Pan + Soil (wet)	23.99	19.79
Pan + Soil (dry)	18.74	15.99
Moisture Content	54.7%	54.8%
Plastic Limit	55	
Plastic Index	12	

### USCS Classification: ASTM D 2487

Group Symbol **MH**

Group Name **Elastic SILT**

# Grain Size Distribution Calculations

Green Ridge, Cumberland Landfill

DAA# 18020117-030102

Prepared By: CBW

Sample ID DAA-26

Sample Depth 20'-22'

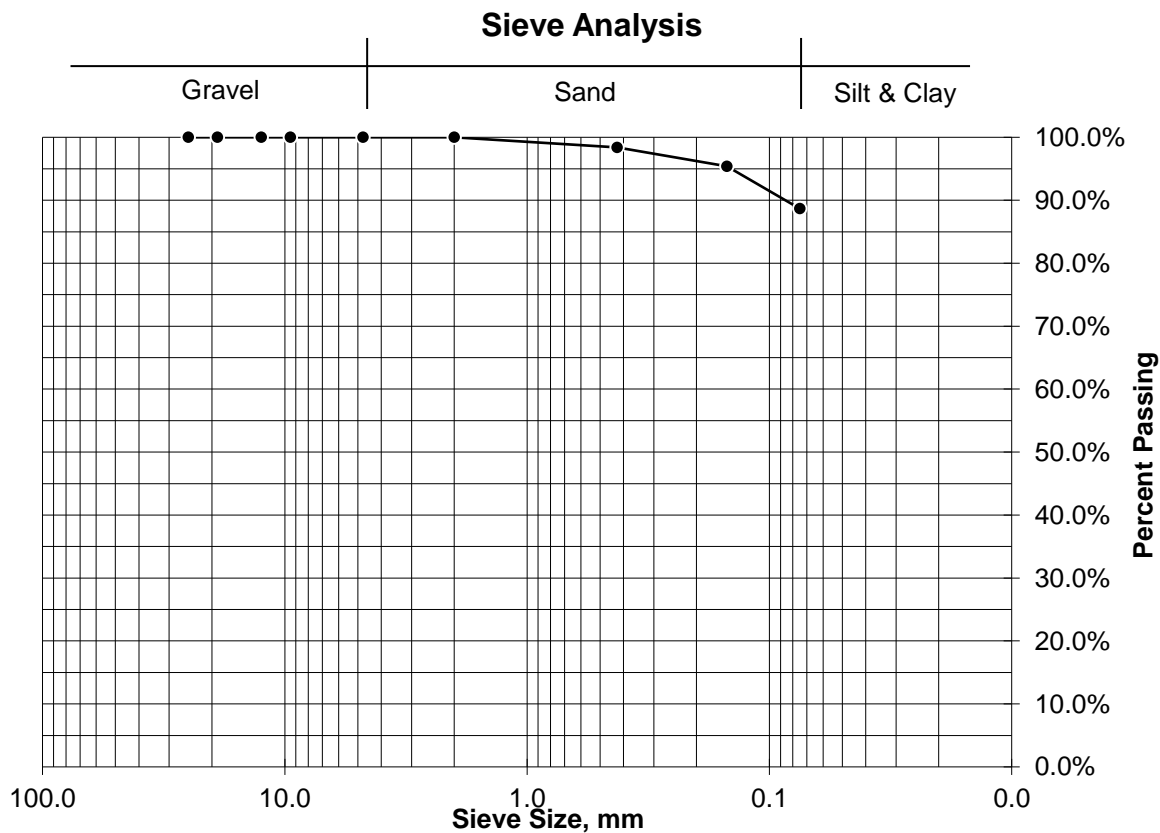
## Mechanical Sieve Analysis: ASTM D 422



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Richmond, VA 23227

Army Corps of Engineers Certified Laboratory

Sieve Size	Weight Retained	Percent Retained	Sieve Size, mm	Percent Passing
1"	0.00	0.0%	25.0	100.0%
3/4"	0.00	0.0%	19.0	100.0%
1/2"	0.00	0.0%	12.5	100.0%
3/8"	0.00	0.0%	9.50	100.0%
No. 4	0.00	0.0%	4.75	100.0%
No. 10	0.00	0.0%	2.00	100.0%
No. 40	1.31	1.6%	0.425	98.4%
No. 100	2.40	3.0%	0.15	95.4%
No. 200	5.40	6.7%	0.075	88.7%
Pan	0.28	0.3%		
Total	9.39	11.7%		



## Soil Classification Calculations

Green Ridge, Cumberland Landfill

DAA# 18020117-030102

Prepared By: CBW



1030 Wilmer Ave., Ste. 100

Richmond, VA 23227

Army Corps of Engineers Certified Laboratory

Sample ID DAA-26

Sample Depth 22'-24'

Visual Sample Description Light Brown Elastic SILT with Sand

Sample Received: 4/11/2019

Date Tested: 4/17/2019

### Natural Moisture Content: ASTM D 2216

Pan ID	100
Pan Wt	123.77 grams
Pan + Soil (wet)	224.48 grams
Pan + Soil (dry)	186.94 grams
Natural Moisture Content	59.4%

### Coarse or Fine Grained: ASTM D 422

Pan + Soil retained on No. 200 sieve

(dry) 135.86 grams

Percent Passing No. 200 Sieve 80.9%

Pan + Soil retained on No. 4 sieve

(dry) 123.77 grams

Percent Passing No. 4 Sieve 100.0%

Soil Classifies as Fine-Grained Soil

### Atterberg Limits: ASTM D 4318

Date Tested: 4/25/2019

#### Liquid Limit

No of Blows	17	26	33
Pan ID	98	109	6
Pan Wt	30.31	25.03	11.17
Pan + Soil (wet)	40.96	38.05	28.39
Pan + Soil (dry)	36.70	33.10	22.07
Moisture Content	66.7%	61.3%	58.0%
Liquid Limit	64	62	60
Liquid Limit	62		

#### Plastic Limit

Pan ID	2	4
Pan Weight	9.04	9.06
Pan + Soil (wet)	19.64	21.14
Pan + Soil (dry)	16.30	17.36
Moisture Content	46.0%	45.5%
Plastic Limit	46	
Plastic Index	16	

### USCS Classification: ASTM D 2487

Group Symbol MH

Group Name Elastic SILT with Sand



# Grain Size Distribution Calculations

Green Ridge, Cumberland Landfill

DAA# 18020117-030102

Prepared By: CBW

Sample ID DAA-26

Sample Depth 22'-24'

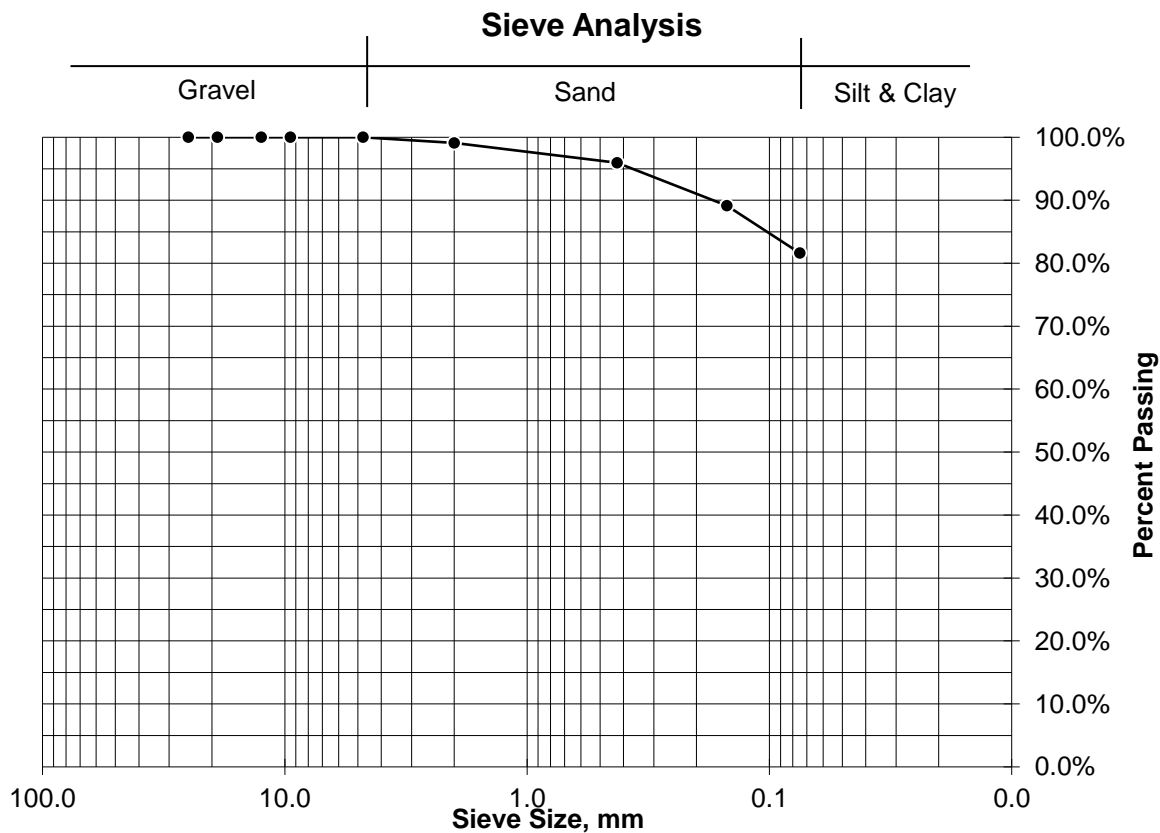
## Mechanical Sieve Analysis: ASTM D 422



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Richmond, VA 23227

Army Corps of Engineers Certified Laboratory

Sieve Size	Weight Retained	Percent Retained	Sieve Size, mm	Percent Passing
1"	0.00	0.0%	25.0	100.0%
3/4"	0.00	0.0%	19.0	100.0%
1/2"	0.00	0.0%	12.5	100.0%
3/8"	0.00	0.0%	9.50	100.0%
No. 4	0.00	0.0%	4.75	100.0%
No. 10	0.57	0.9%	2.00	99.1%
No. 40	1.99	3.2%	0.425	95.9%
No. 100	4.31	6.8%	0.15	89.1%
No. 200	4.74	7.5%	0.075	81.6%
Pan	0.47	0.7%		
Total	12.08	19.1%		



## Soil Classification Calculations

Green Ridge, Cumberland Landfill

DAA# 18020117-030102

Prepared By: CBW



1030 Wilmer Ave., Ste. 100

Richmond, VA 23227

Army Corps of Engineers Certified Laboratory

Sample ID DAA-26

Sample Depth 24'-26'

Visual Sample Description Light Brown Elastic SILT

Sample Received: 4/17/2019

Date Tested: 4/17/2019

### Natural Moisture Content: ASTM D 2216

Pan ID	37
Pan Wt	193.60 grams
Pan + Soil (wet)	302.92 grams
Pan + Soil (dry)	261.86 grams
Natural Moisture Content	60.2%

### Coarse or Fine Grained: ASTM D 422

Pan + Soil retained on No. 200 sieve

(dry) 202.27 grams

Percent Passing No. 200 Sieve 87.3%

Pan + Soil retained on No. 4 sieve

(dry) 193.60 grams

Percent Passing No. 4 Sieve 100.0%

Soil Classifies as Fine-Grained Soil

### Atterberg Limits: ASTM D 4318

Date Tested: 4/26/2019

#### Liquid Limit

No of Blows	16	21	31
Pan ID	6	9	93
Pan Wt	11.18	11.11	30.11
Pan + Soil (wet)	32.28	28.61	46.24
Pan + Soil (dry)	23.24	21.37	39.87
Moisture Content	74.9%	70.6%	65.3%
Liquid Limit	71	69	67
Liquid Limit	69		

#### Plastic Limit

Pan ID	317	353
Pan Weight	8.08	9.13
Pan + Soil (wet)	18.44	19.36
Pan + Soil (dry)	14.87	15.84
Moisture Content	52.6%	52.5%
Plastic Limit	53	
Plastic Index	16	

### USCS Classification: ASTM D 2487

Group Symbol **MH**

Group Name **Elastic SILT**

# Grain Size Distribution Calculations

Green Ridge, Cumberland Landfill

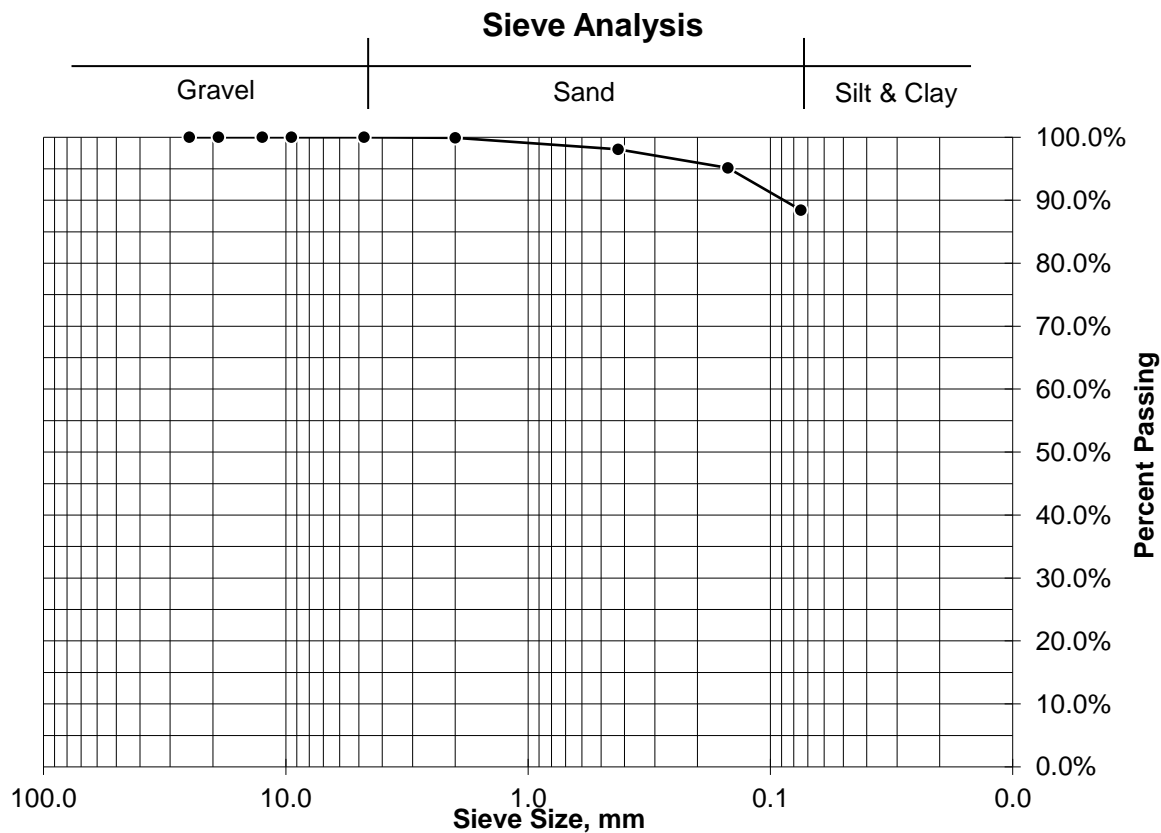
DAA# 18020117-030102

Prepared By: CBW

Sample ID DAA-26  
Sample Depth 24'-26'

## Mechanical Sieve Analysis: ASTM D 422

Sieve Size	Weight Retained	Percent Retained	Sieve Size, mm	Percent Passing
1"	0.00	0.0%	25.0	100.0%
3/4"	0.00	0.0%	19.0	100.0%
1/2"	0.00	0.0%	12.5	100.0%
3/8"	0.00	0.0%	9.50	100.0%
No. 4	0.00	0.0%	4.75	100.0%
No. 10	0.06	0.1%	2.00	99.9%
No. 40	1.26	1.8%	0.425	98.1%
No. 100	2.01	2.9%	0.15	95.1%
No. 200	4.55	6.7%	0.075	88.5%
Pan	0.72	1.1%		
Total	8.60	12.6%		



## Soil Classification Calculations

Green Ridge, Cumberland Landfill

DAA# 18020117-030102

Prepared By: CBW



1030 Wilmer Ave., Ste. 100

Richmond, VA 23227

Army Corps of Engineers Certified Laboratory

Sample ID DAA-26

Sample Depth 28'-30'

Visual Sample Description Light Brown Sandy Elastic SILT

Sample Received: 4/17/2019

Date Tested: 4/22/2019

### Natural Moisture Content: ASTM D 2216

Pan ID	11
Pan Wt	187.45 grams
Pan + Soil (wet)	294.74 grams
Pan + Soil (dry)	258.02 grams
Natural Moisture Content	52.0%

### Coarse or Fine Grained: ASTM D 422

Pan + Soil retained on No. 200 sieve

(dry) 214.44 grams

Percent Passing No. 200 Sieve 61.8%

Pan + Soil retained on No. 4 sieve

(dry) 187.45 grams

Percent Passing No. 4 Sieve 100.0%

Soil Classifies as Fine-Grained Soil

### Atterberg Limits: ASTM D 4318

Date Tested: 6/3/2019

#### Liquid Limit

No of Blows	20	24	32
Pan ID	6	63	69
Pan Wt	11.20	10.83	10.96
Pan + Soil (wet)	21.84	20.02	19.57
Pan + Soil (dry)	18.09	16.91	16.78
Moisture Content	54.5%	51.2%	47.9%
Liquid Limit	53	51	49
Liquid Limit	51		

#### Plastic Limit

Pan ID	33	52
Pan Weight	2.40	2.39
Pan + Soil (wet)	9.45	9.69
Pan + Soil (dry)	7.53	7.72
Moisture Content	37.4%	37.0%
Plastic Limit	37	
Plastic Index	14	

### USCS Classification: ASTM D 2487

Group Symbol MH

Group Name Sandy Elastic SILT

# Grain Size Distribution Calculations

Green Ridge, Cumberland Landfill

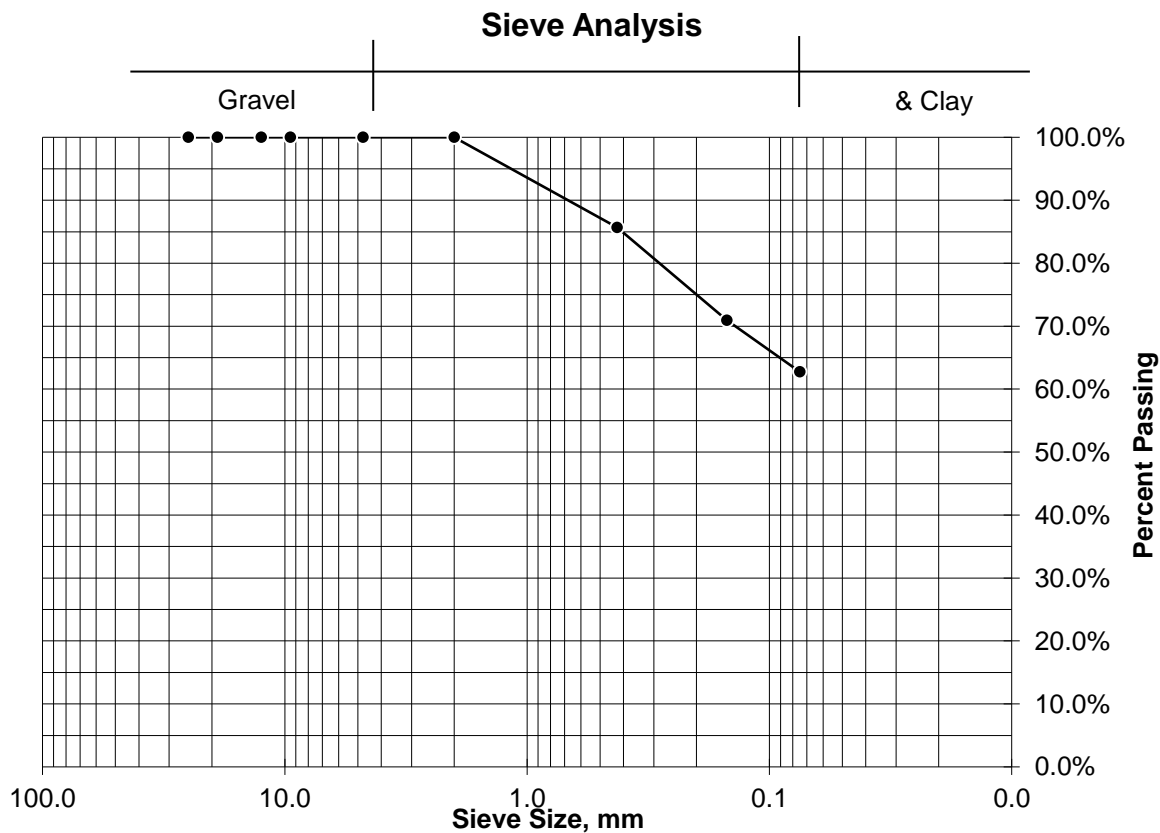
DAA# 18020117-030102

Prepared By: CBW

Sample ID DAA-26  
Sample Depth 28'-30'

## Mechanical Sieve Analysis: ASTM D 422

Sieve Size	Weight Retained	Percent Retained	Sieve Size, mm	Percent Passing
1"	0.00	0.0%	25.0	100.0%
3/4"	0.00	0.0%	19.0	100.0%
1/2"	0.00	0.0%	12.5	100.0%
3/8"	0.00	0.0%	9.50	100.0%
No. 4	0.00	0.0%	4.75	100.0%
No. 10	0.00	0.0%	2.00	100.0%
No. 40	10.11	14.3%	0.425	85.7%
No. 100	10.38	14.7%	0.15	71.0%
No. 200	5.79	8.2%	0.075	62.8%
Pan	0.68	1.0%		
Total	26.96	38.2%		



## Soil Classification Calculations

Green Ridge, Cumberland Landfill

DAA# 18020117-030102

Prepared By: CBW



1030 Wilmer Ave., Ste. 100

Richmond, VA 23227

Army Corps of Engineers Certified Laboratory

Sample ID DAA-26

Sample Depth 34'-36'

Visual Sample Description Light Brown Silty SAND

Sample Received: 4/17/2019

Date Tested: 4/22/2019

### Natural Moisture Content: ASTM D 2216

Pan ID	42
Pan Wt	192.29 grams
Pan + Soil (wet)	306.28 grams
Pan + Soil (dry)	282.57 grams
Natural Moisture Content	26.3%

### Coarse or Fine Grained: ASTM D 422

Pan + Soil retained on No. 200 sieve

(dry) 253.65 grams

Percent Passing No. 200 Sieve 32.0%

Pan + Soil retained on No. 4 sieve

(dry) 205.44 grams

Percent Passing No. 4 Sieve 85.4%

Soil Classifies as Coarse-Grained Soil

### Atterberg Limits: ASTM D 4318

Date Tested: 5/1/2019

#### Liquid Limit

No of Blows	17	21	33
Pan ID	91	65	98
Pan Wt	24.52	10.99	30.34
Pan + Soil (wet)	33.03	28.80	33.17
Pan + Soil (dry)	29.87	22.44	32.22
Moisture Content	59.1%	55.5%	50.5%
Liquid Limit	56	54	52
Liquid Limit	54		

#### Plastic Limit

Pan ID	2	313
Pan Weight	9.02	9.14
Pan + Soil (wet)	20.85	20.02
Pan + Soil (dry)	17.34	16.79
Moisture Content	42.2%	42.2%
Plastic Limit	42	
Plastic Index	12	

### USCS Classification: ASTM D 2487

Group Symbol **SM**

Group Name **Silty SAND**



# Grain Size Distribution Calculations

Green Ridge, Cumberland Landfill

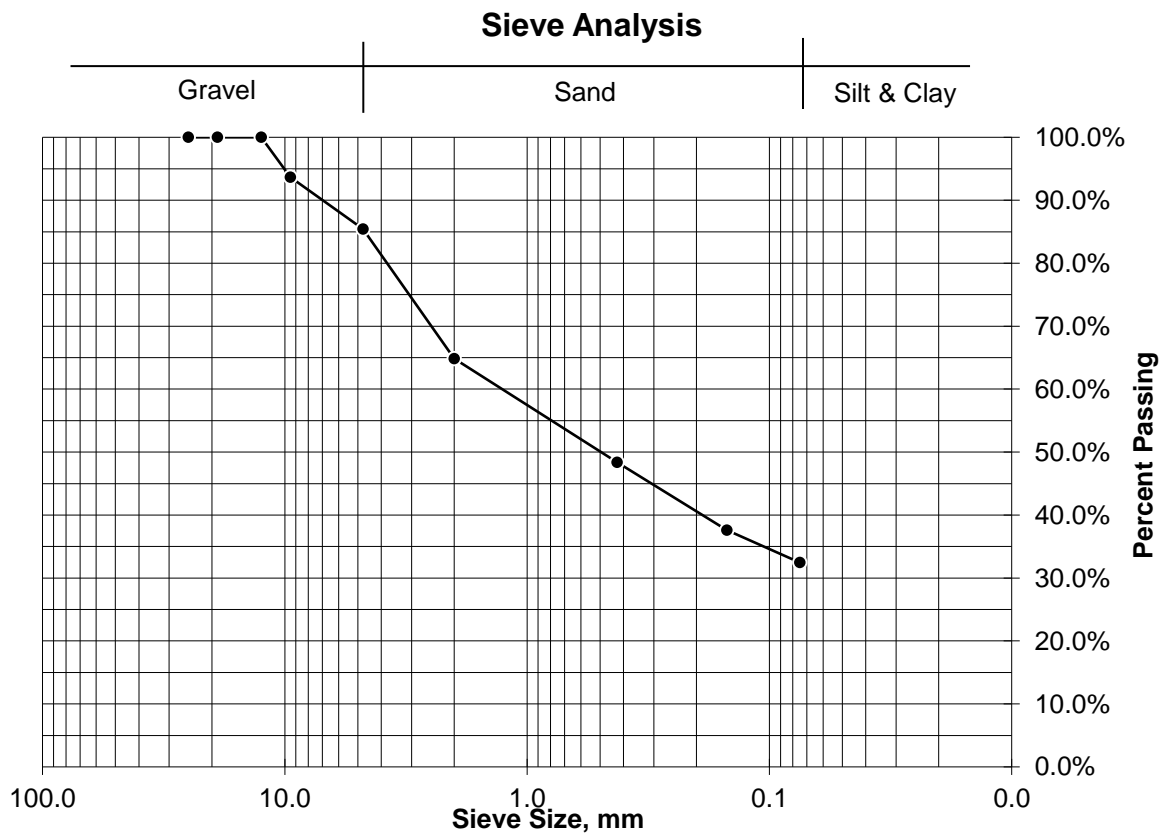
DAA# 18020117-030102

Prepared By: CBW

Sample ID DAA-26  
Sample Depth 34'-36'

## Mechanical Sieve Analysis: ASTM D 422

Sieve Size	Weight Retained	Percent Retained	Sieve Size, mm	Percent Passing
1"	0.00	0.0%	25.0	100.0%
3/4"	0.00	0.0%	19.0	100.0%
1/2"	0.00	0.0%	12.5	100.0%
3/8"	5.73	6.3%	9.50	93.7%
No. 4	7.42	8.2%	4.75	85.4%
No. 10	18.59	20.6%	2.00	64.8%
No. 40	14.88	16.5%	0.425	48.4%
No. 100	9.70	10.7%	0.15	37.6%
No. 200	4.65	5.2%	0.075	32.5%
Pan	0.38	0.4%		
Total	61.35	68.0%		



## Soil Classification Calculations

Green Ridge, Cumberland Landfill

DAA# 18020117-030102

Prepared By: CBW



1030 Wilmer Ave., Ste. 100

Richmond, VA 23227

Army Corps of Engineers Certified Laboratory

Sample ID DAA-27

Sample Depth 2'-4'

Visual Sample Description Light Brown Silty SAND

Sample Received: 4/11/2019

Date Tested: 4/22/2019

### Natural Moisture Content: ASTM D 2216

Pan ID	21
Pan Wt	193.79 grams
Pan + Soil (wet)	357.07 grams
Pan + Soil (dry)	345.85 grams
Natural Moisture Content	7.4%

### Coarse or Fine Grained: ASTM D 422

Pan + Soil retained on No. 200 sieve

(dry) 310.60 grams

Percent Passing No. 200 Sieve 23.2%

Pan + Soil retained on No. 4 sieve

(dry) 193.79 grams

Percent Passing No. 4 Sieve 100.0%

Soil Classifies as Coarse-Grained Soil

### Atterberg Limits: ASTM D 4318

Date Tested: 4/22/2019

#### Liquid Limit

No of Blows			
Pan ID		Non-plastic	
Pan Wt			
Pan + Soil (wet)			
Pan + Soil (dry)			
Moisture Content			
Liquid Limit			
Liquid Limit			

#### Plastic Limit

Pan ID		
Pan Weight	Non-plastic	
Pan + Soil (wet)		
Pan + Soil (dry)		
Moisture Content		
Plastic Limit		
Plastic Index		

### USCS Classification: ASTM D 2487

Group Symbol **SM**

Group Name **Silty SAND**

# Grain Size Distribution Calculations

Green Ridge, Cumberland Landfill

DAA# 18020117-030102

Prepared By: CBW



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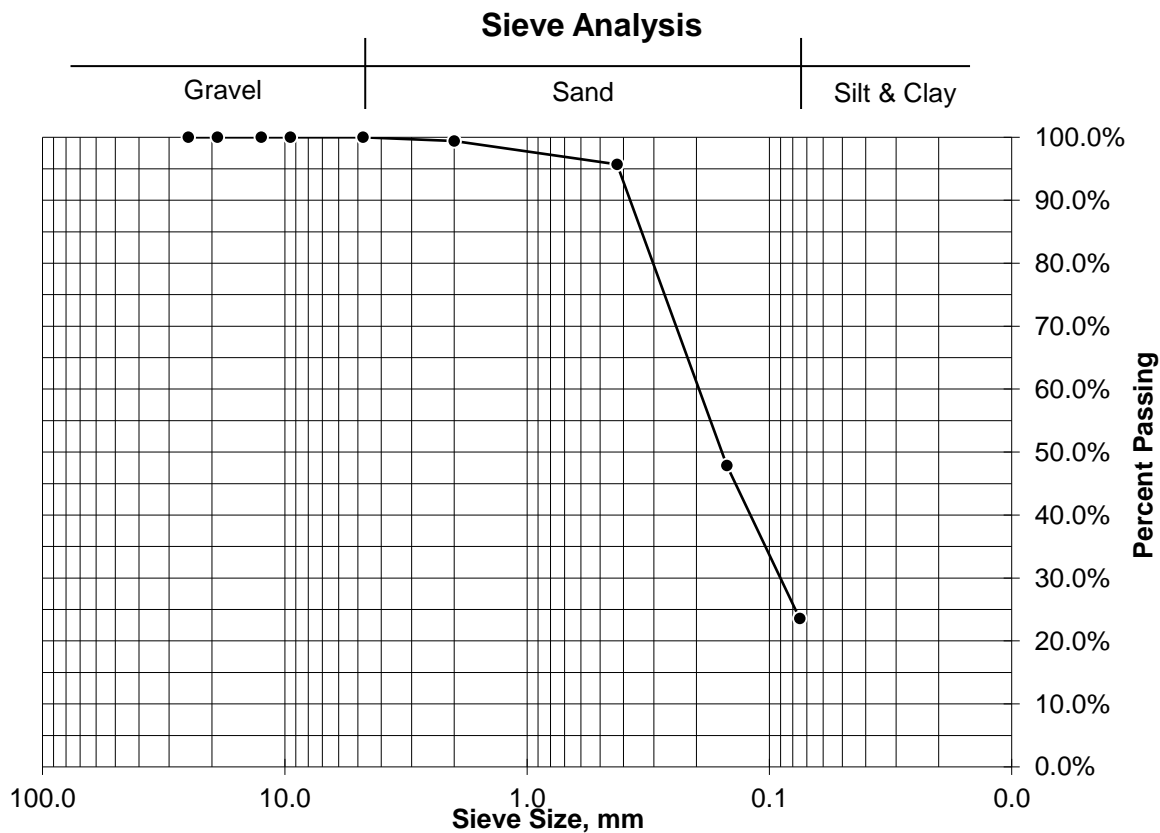
Army Corps of Engineers Certified Laboratory

Sample ID DAA-27

Sample Depth 2'-4'

## Mechanical Sieve Analysis: ASTM D 422

Sieve Size	Weight Retained	Percent Retained	Sieve Size, mm	Percent Passing
1"	0.00	0.0%	25.0	100.0%
3/4"	0.00	0.0%	19.0	100.0%
1/2"	0.00	0.0%	12.5	100.0%
3/8"	0.00	0.0%	9.50	100.0%
No. 4	0.00	0.0%	4.75	100.0%
No. 10	0.93	0.6%	2.00	99.4%
No. 40	5.61	3.7%	0.425	95.7%
No. 100	72.74	47.8%	0.15	47.9%
No. 200	36.94	24.3%	0.075	23.6%
Pan	0.59	0.4%		
Total	116.81	76.8%		



## Soil Classification Calculations

### Green Ridge, Cumberland Landfill

DAA# 18020117-030102

Prepared By: CBW

Sample ID DAA-27

Sample Depth 14'-16'

Visual Sample Description Light Brownish-gray Silty SAND

Sample Received: 4/15/2019

Date Tested: 4/22/2019

### Natural Moisture Content: ASTM D 2216

Pan ID	29
Pan Wt	191.85 grams
Pan + Soil (wet)	349.47 grams
Pan + Soil (dry)	332.37 grams
Natural Moisture Content	12.2%

### Coarse or Fine Grained: ASTM D 422

Pan + Soil retained on No. 200 sieve	
(dry)	282.63 grams
Percent Passing No. 200 Sieve	35.4%
Pan + Soil retained on No. 4 sieve	
(dry)	192.16 grams
Percent Passing No. 4 Sieve	99.8%

Soil Classifies as Coarse-Grained Soil

### Atterberg Limits: ASTM D 4318

Date Tested: 4/23/2019

#### Liquid Limit

No of Blows			
Pan ID		Non-plastic	
Pan Wt			
Pan + Soil (wet)			
Pan + Soil (dry)			
Moisture Content			

Liquid Limit

Liquid Limit

#### Plastic Limit

Pan ID		
Pan Weight	Non-plastic	
Pan + Soil (wet)		
Pan + Soil (dry)		
Moisture Content		

Plastic Limit

Plastic Index

### USCS Classification: ASTM D 2487

Group Symbol **SM**

Group Name **Silty SAND**

# Grain Size Distribution Calculations

Green Ridge, Cumberland Landfill

DAA# 18020117-030102

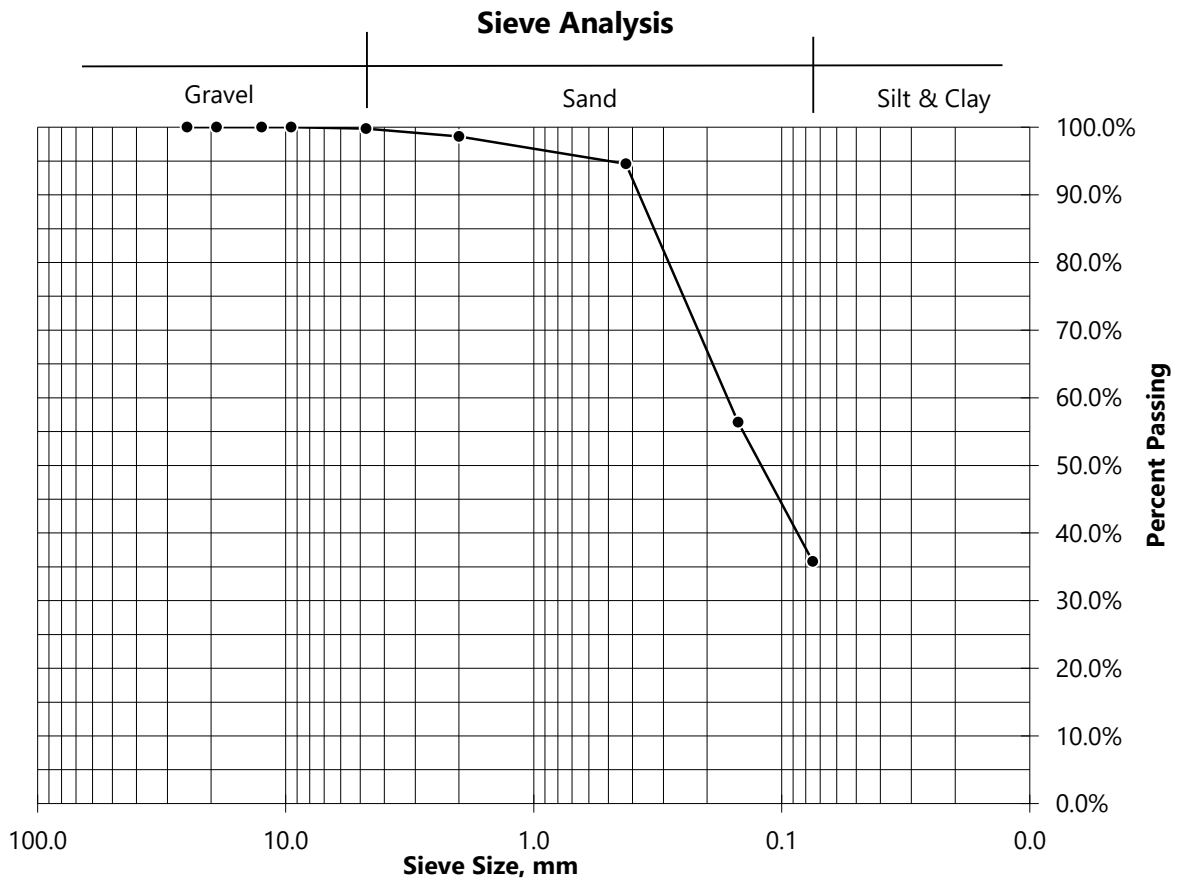
Prepared By: CBW

Sample ID DAA-27

Sample Depth 14'-16'

## Mechanical Sieve Analysis: ASTM D 422

Sieve Size	Weight Retained	Percent Retained	Sieve Size, mm	Percent Passing
1"	0.00	0.0%	25.0	100.0%
3/4"	0.00	0.0%	19.0	100.0%
1/2"	0.00	0.0%	12.5	100.0%
3/8"	0.00	0.0%	9.50	100.0%
No. 4	0.31	0.2%	4.75	99.8%
No. 10	1.64	1.2%	2.00	98.6%
No. 40	5.69	4.0%	0.425	94.6%
No. 100	53.68	38.2%	0.15	56.4%
No. 200	28.91	20.6%	0.075	35.8%
Pan	0.55	0.4%		
Total	90.78	64.6%		



## Soil Classification Calculations

Green Ridge, Cumberland Landfill

DAA# 18020117-030102

Prepared By: CBW



1030 Wilmer Ave., Ste. 100

Richmond, VA 23227

Army Corps of Engineers Certified Laboratory

Sample ID DAA-27

Sample Depth 16'-18'

Visual Sample Description Light Gray Silty SAND

Sample Received: 4/11/2019

Date Tested: 4/22/2019

### Natural Moisture Content: ASTM D 2216

Pan ID	20
Pan Wt	189.95 grams
Pan + Soil (wet)	373.46 grams
Pan + Soil (dry)	360.71 grams
Natural Moisture Content	7.5%

### Coarse or Fine Grained: ASTM D 422

Pan + Soil retained on No. 200 sieve

(dry) 316.54 grams

Percent Passing No. 200 Sieve 25.9%

Pan + Soil retained on No. 4 sieve

(dry) 191.06 grams

Percent Passing No. 4 Sieve 99.3%

Soil Classifies as Coarse-Grained Soil

### Atterberg Limits: ASTM D 4318

Date Tested: 4/22/2019

#### Liquid Limit

No of Blows			
Pan ID		Non-plastic	
Pan Wt			
Pan + Soil (wet)			
Pan + Soil (dry)			
Moisture Content			
Liquid Limit			
Liquid Limit			

#### Plastic Limit

Pan ID		
Pan Weight	Non-plastic	
Pan + Soil (wet)		
Pan + Soil (dry)		
Moisture Content		
Plastic Limit		
Plastic Index		

### USCS Classification: ASTM D 2487

Group Symbol **SM**

Group Name **Silty SAND**



# Grain Size Distribution Calculations

Green Ridge, Cumberland Landfill

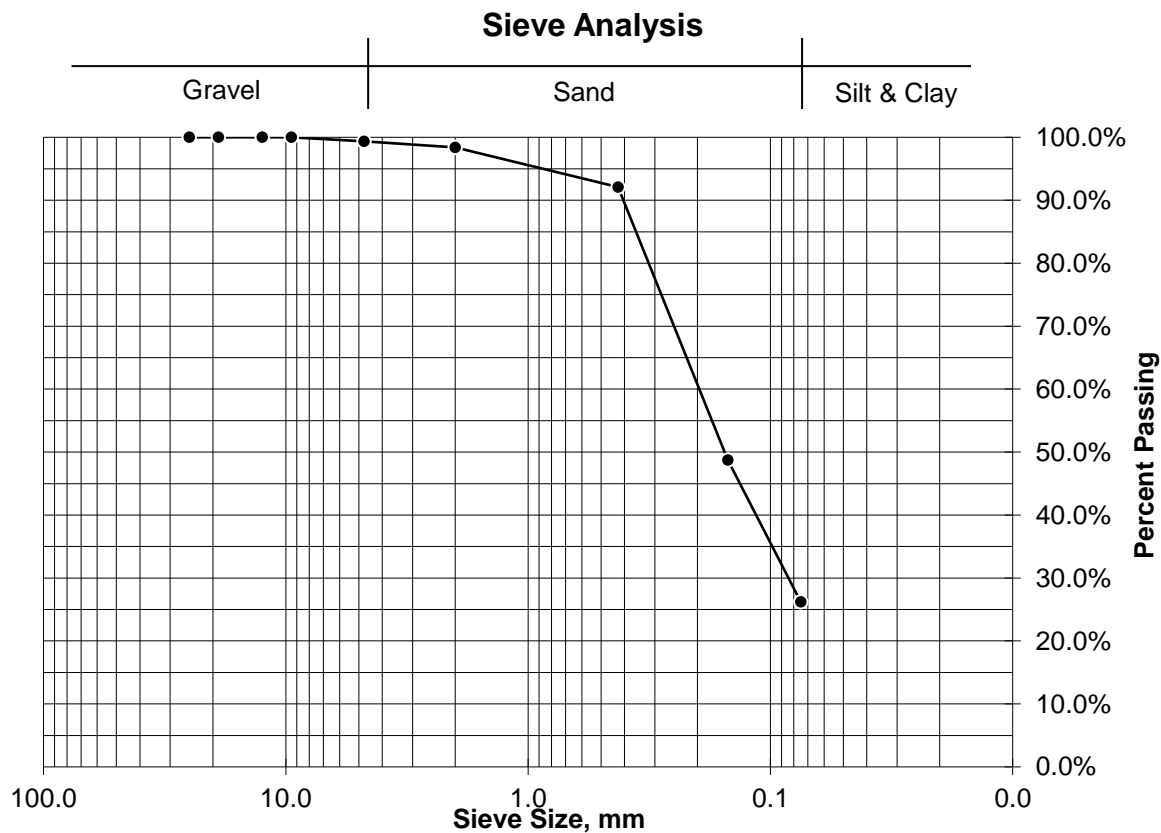
DAA# 18020117-030102

Prepared By: CBW

Sample ID DAA-27  
Sample Depth 16'-18'

## Mechanical Sieve Analysis: ASTM D 422

Sieve Size	Weight Retained	Percent Retained	Sieve Size, mm	Percent Passing
1"	0.00	0.0%	25.0	100.0%
3/4"	0.00	0.0%	19.0	100.0%
1/2"	0.00	0.0%	12.5	100.0%
3/8"	0.00	0.0%	9.50	100.0%
No. 4	1.11	0.7%	4.75	99.3%
No. 10	1.66	1.0%	2.00	98.4%
No. 40	10.74	6.3%	0.425	92.1%
No. 100	74.06	43.4%	0.15	48.7%
No. 200	38.39	22.5%	0.075	26.2%
Pan	0.58	0.3%		
Total	126.54	74.1%		



## Soil Classification Calculations

Green Ridge, Cumberland Landfill

DAA# 18020117-030102

Prepared By: CBW



1030 Wilmer Ave., Ste. 100

Richmond, VA 23227

Army Corps of Engineers Certified Laboratory

Sample ID DAA-28

Sample Depth 2'-4'

Visual Sample Description Dark Brown Clayey SAND

Sample Received: 4/11/2019

Date Tested: 4/17/2019

### Natural Moisture Content: ASTM D 2216

Pan ID	105
Pan Wt	124.05 grams
Pan + Soil (wet)	248.62 grams
Pan + Soil (dry)	223.97 grams
Natural Moisture Content	24.7%

### Coarse or Fine Grained: ASTM D 422

Pan + Soil retained on No. 200 sieve

(dry) 181.28 grams

Percent Passing No. 200 Sieve 42.7%

Pan + Soil retained on No. 4 sieve

(dry) 124.05 grams

Percent Passing No. 4 Sieve 100.0%

Soil Classifies as Coarse-Grained Soil

### Atterberg Limits: ASTM D 4318

Date Tested: 4/25/2019

#### Liquid Limit

No of Blows	17	27	31
Pan ID	103	201	2000
Pan Wt	27.42	27.63	25.69
Pan + Soil (wet)	44.21	43.99	36.60
Pan + Soil (dry)	39.25	39.51	33.77
Moisture Content	41.9%	37.7%	35.1%
Liquid Limit	40	38	36
Liquid Limit	38		

#### Plastic Limit

Pan ID	315	354
Pan Weight	9.16	9.14
Pan + Soil (wet)	19.68	20.18
Pan + Soil (dry)	17.81	18.20
Moisture Content	21.6%	21.9%
Plastic Limit	22	
Plastic Index	16	

### USCS Classification: ASTM D 2487

Group Symbol SC

Group Name Clayey SAND

# Grain Size Distribution Calculations

Green Ridge, Cumberland Landfill

DAA# 18020117-030102

Prepared By: CBW

Sample ID DAA-28

Sample Depth 2'-4'

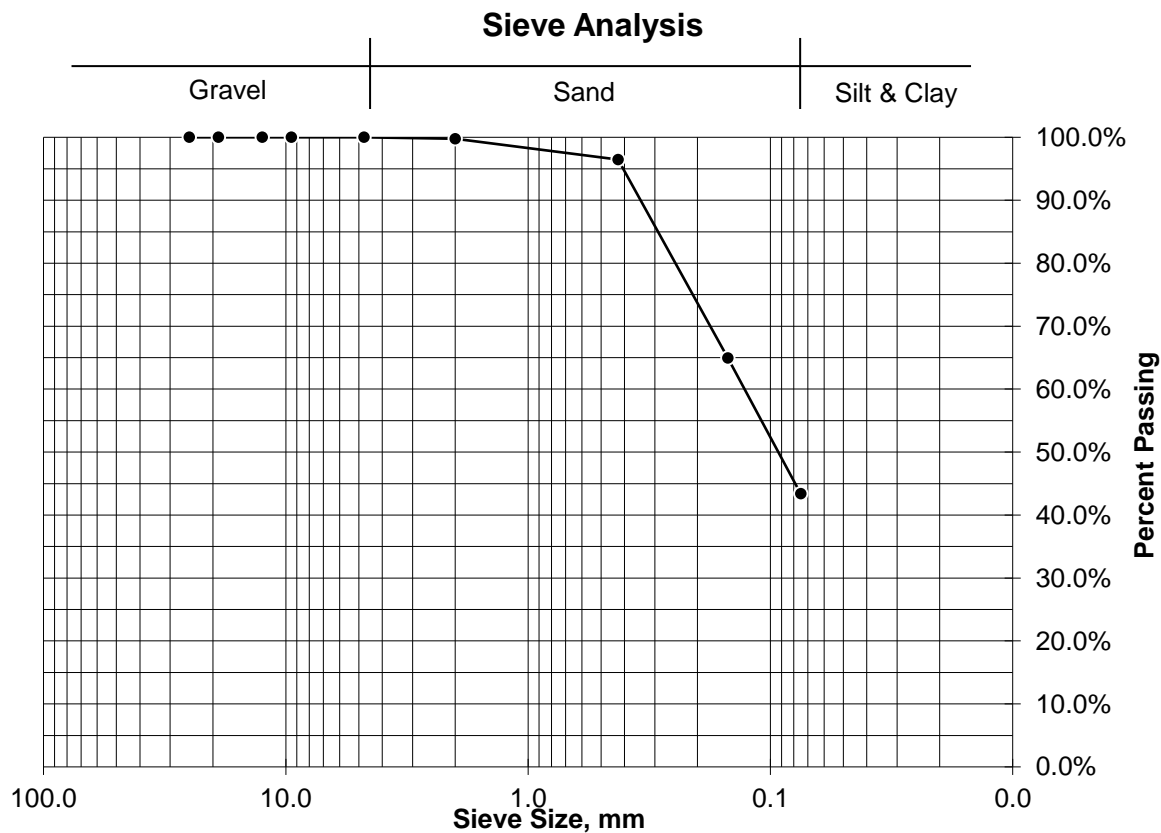
## Mechanical Sieve Analysis: ASTM D 422



1030 Wilmer Ave., Ste. 100  
Richmond, VA 23227

Army Corps of Engineers Certified Laboratory

Sieve Size	Weight Retained	Percent Retained	Sieve Size, mm	Percent Passing
1"	0.00	0.0%	25.0	100.0%
3/4"	0.00	0.0%	19.0	100.0%
1/2"	0.00	0.0%	12.5	100.0%
3/8"	0.00	0.0%	9.50	100.0%
No. 4	0.00	0.0%	4.75	100.0%
No. 10	0.25	0.3%	2.00	99.7%
No. 40	3.30	3.3%	0.425	96.4%
No. 100	31.45	31.5%	0.15	65.0%
No. 200	21.57	21.6%	0.075	43.4%
Pan	0.65	0.7%		
Total	57.22	57.3%		



## Soil Classification Calculations

Green Ridge, Cumberland Landfill

DAA# 18020117-030102

Prepared By: CBW



1030 Wilmer Ave., Ste. 100

Richmond, VA 23227

Army Corps of Engineers Certified Laboratory

Sample ID DAA-28

Sample Depth 4'-6'

Visual Sample Description Light Reddish-brown Silty SAND

Sample Received: 4/17/2019

Date Tested: 4/17/2019

### Natural Moisture Content: ASTM D 2216

Pan ID	110
Pan Wt	122.64 grams
Pan + Soil (wet)	248.23 grams
Pan + Soil (dry)	225.98 grams
Natural Moisture Content	21.5%

### Coarse or Fine Grained: ASTM D 422

Pan + Soil retained on No. 200 sieve

(dry) 191.50 grams

Percent Passing No. 200 Sieve 33.4%

Pan + Soil retained on No. 4 sieve

(dry) 122.64 grams

Percent Passing No. 4 Sieve 100.0%

Soil Classifies as Coarse-Grained Soil

### Atterberg Limits: ASTM D 4318

Date Tested: 6/4/2019

#### Liquid Limit

No of Blows	17	23	35
Pan ID	98	103	109
Pan Wt	30.34	27.36	25.00
Pan + Soil (wet)	44.45	41.12	36.79
Pan + Soil (dry)	39.35	36.38	32.95
Moisture Content	56.6%	52.5%	48.3%
Liquid Limit	54	52	50
Liquid Limit	52		

#### Plastic Limit

Pan ID	78	315
Pan Weight	4.24	9.16
Pan + Soil (wet)	19.06	25.26
Pan + Soil (dry)	15.70	21.60
Moisture Content	29.3%	29.4%
Plastic Limit	29	
Plastic Index	23	

### USCS Classification: ASTM D 2487

Group Symbol **SM**

Group Name **Silty SAND**

# Grain Size Distribution Calculations

Green Ridge, Cumberland Landfill

DAA# 18020117-030102

Prepared By: CBW

Sample ID DAA-28

Sample Depth 4'-6'

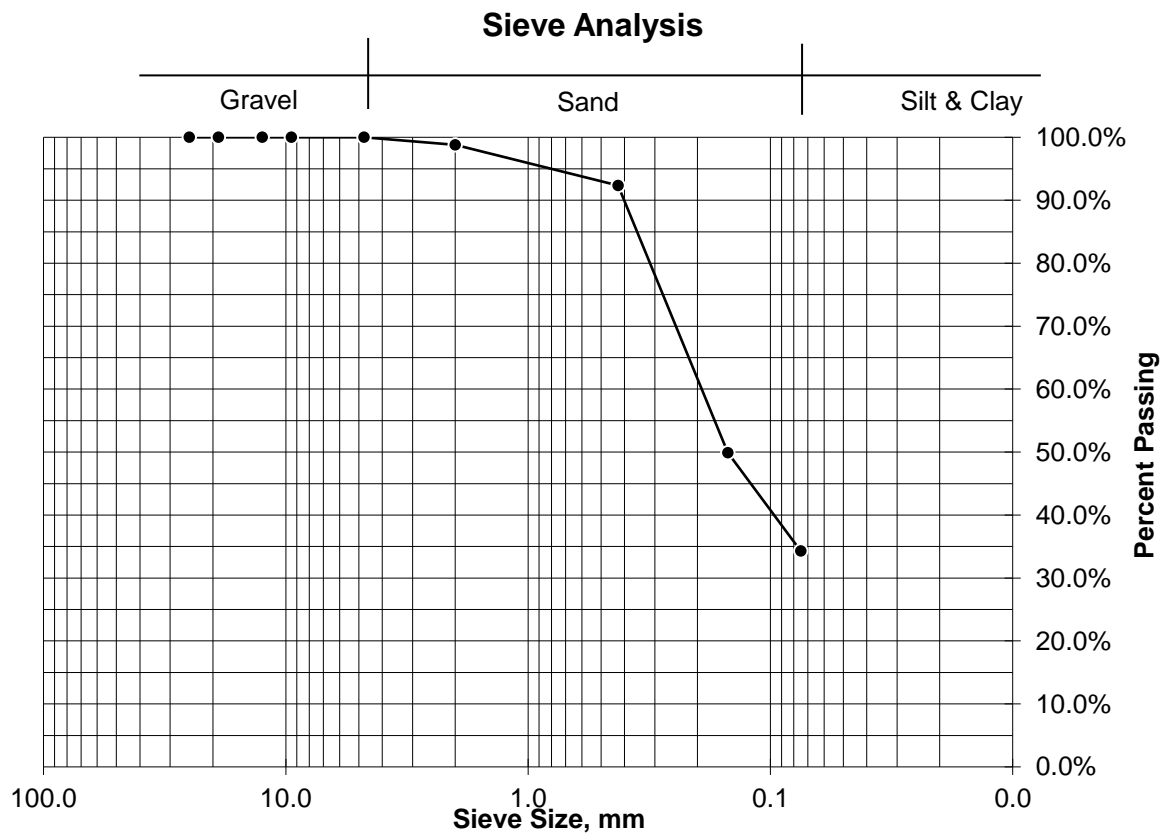
## Mechanical Sieve Analysis: ASTM D 422



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Sieve Size	Weight Retained	Percent Retained	Sieve Size, mm	Percent Passing
1"	0.00	0.0%	25.0	100.0%
3/4"	0.00	0.0%	19.0	100.0%
1/2"	0.00	0.0%	12.5	100.0%
3/8"	0.00	0.0%	9.50	100.0%
No. 4	0.00	0.0%	4.75	100.0%
No. 10	1.24	1.2%	2.00	98.8%
No. 40	6.69	6.5%	0.425	92.3%
No. 100	43.84	42.4%	0.15	49.9%
No. 200	16.12	15.6%	0.075	34.3%
Pan	0.93	0.9%		
Total	68.82	66.6%		



## Soil Classification Calculations

Green Ridge, Cumberland Landfill

DAA# 18020117-030102

Prepared By: CBW



1030 Wilmer Ave., Ste. 100

Richmond, VA 23227

Army Corps of Engineers Certified Laboratory

Sample ID DAA-28

Sample Depth 10'-12'

Visual Sample Description Light Brown Silty SAND

Sample Received: 4/17/2019

Date Tested: 4/22/2019

### Natural Moisture Content: ASTM D 2216

Pan ID	31
Pan Wt	192.97 grams
Pan + Soil (wet)	325.95 grams
Pan + Soil (dry)	307.47 grams
Natural Moisture Content	16.1%

### Coarse or Fine Grained: ASTM D 422

Pan + Soil retained on No. 200 sieve

(dry) 272.63 grams

Percent Passing No. 200 Sieve 30.4%

Pan + Soil retained on No. 4 sieve

(dry) 192.97 grams

Percent Passing No. 4 Sieve 100.0%

Soil Classifies as Coarse-Grained Soil

### Atterberg Limits: ASTM D 4318

Date Tested: 6/3/2019

#### Liquid Limit

No of Blows	20	25	34
Pan ID	92	103	109
Pan Wt	25.59	27.35	25.00
Pan + Soil (wet)	43.11	44.41	40.63
Pan + Soil (dry)	37.92	39.62	36.53
Moisture Content	42.1%	39.0%	35.5%
Liquid Limit	41	39	37
Liquid Limit	39		

#### Plastic Limit

Pan ID	352	356
Pan Weight	9.08	9.11
Pan + Soil (wet)	24.74	27.56
Pan + Soil (dry)	21.17	23.41
Moisture Content	29.5%	29.0%
Plastic Limit	29	
Plastic Index	10	

### USCS Classification: ASTM D 2487

Group Symbol **SM**

Group Name **Silty SAND**



## Grain Size Distribution Calculations

Green Ridge, Cumberland Landfill

DAA# 18020117-030102

Prepared By: CBW

Sample ID DAA-28

Sample Depth 10'-12'

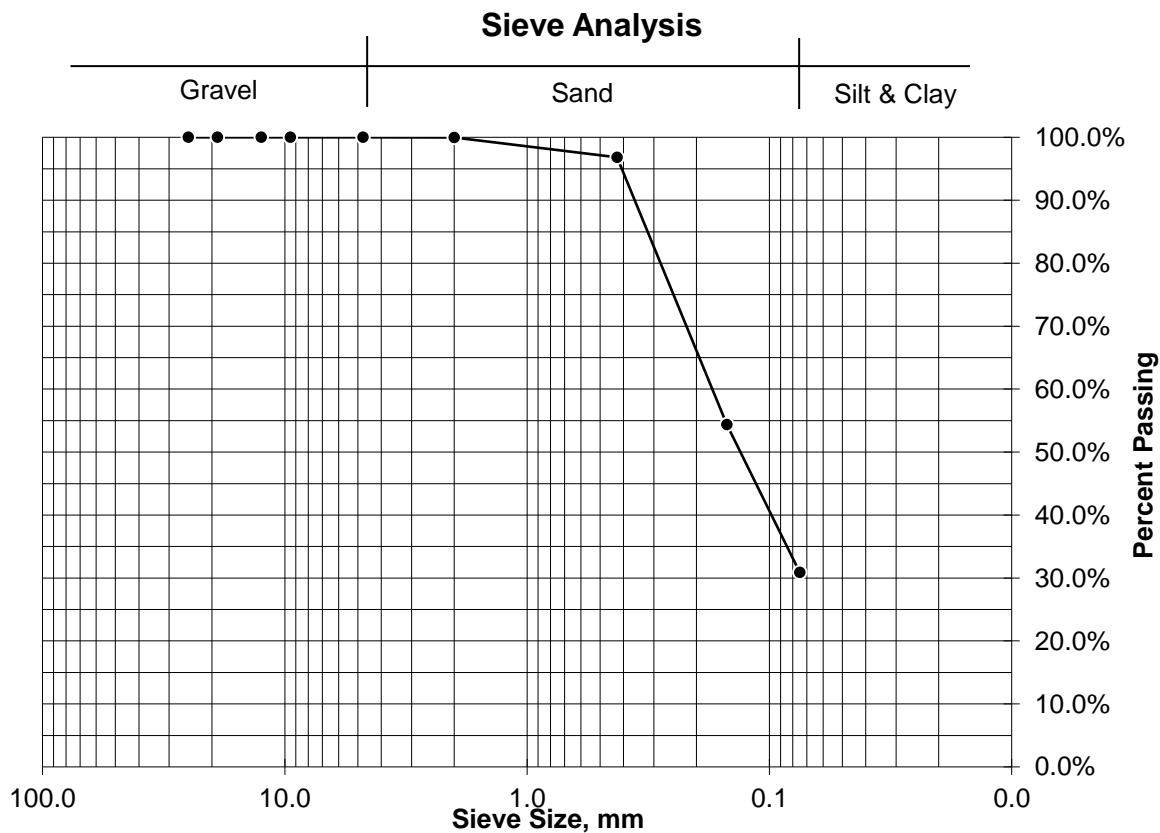
### Mechanical Sieve Analysis: ASTM D 422



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Sieve Size	Weight Retained	Percent Retained	Sieve Size, mm	Percent Passing
1"	0.00	0.0%	25.0	100.0%
3/4"	0.00	0.0%	19.0	100.0%
1/2"	0.00	0.0%	12.5	100.0%
3/8"	0.00	0.0%	9.50	100.0%
No. 4	0.00	0.0%	4.75	100.0%
No. 10	0.03	0.0%	2.00	100.0%
No. 40	3.62	3.2%	0.425	96.8%
No. 100	48.60	42.4%	0.15	54.4%
No. 200	26.85	23.4%	0.075	30.9%
Pan	0.52	0.5%		
Total	79.62	69.5%		



## Soil Classification Calculations

Green Ridge, Cumberland Landfill

DAA# 18020117-030102

Prepared By: CBW



1030 Wilmer Ave., Ste. 100

Richmond, VA 23227

Army Corps of Engineers Certified Laboratory

Sample ID DAA-28

Sample Depth 28'-30'

Visual Sample Description Brownish-gray Silty SAND

Sample Received: 4/11/2019

Date Tested: 4/22/2019

### Natural Moisture Content: ASTM D 2216

Pan ID	22
Pan Wt	188.96 grams
Pan + Soil (wet)	399.90 grams
Pan + Soil (dry)	382.04 grams
Natural Moisture Content	9.3%

### Coarse or Fine Grained: ASTM D 422

Pan + Soil retained on No. 200 sieve

(dry) 345.09 grams

Percent Passing No. 200 Sieve 19.1%

Pan + Soil retained on No. 4 sieve

(dry) 194.04 grams

Percent Passing No. 4 Sieve 97.4%

Soil Classifies as Coarse-Grained Soil

### Atterberg Limits: ASTM D 4318

Date Tested: 4/22/2019

#### Liquid Limit

No of Blows			
Pan ID		Non-plastic	
Pan Wt			
Pan + Soil (wet)			
Pan + Soil (dry)			
Moisture Content			
Liquid Limit			
Liquid Limit			

#### Plastic Limit

Pan ID		
Pan Weight	Non-plastic	
Pan + Soil (wet)		
Pan + Soil (dry)		
Moisture Content		
Plastic Limit		
Plastic Index		

### USCS Classification: ASTM D 2487

Group Symbol **SM**

Group Name **Silty SAND**

## Grain Size Distribution Calculations

Green Ridge, Cumberland Landfill

DAA# 18020117-030102

Prepared By: CBW

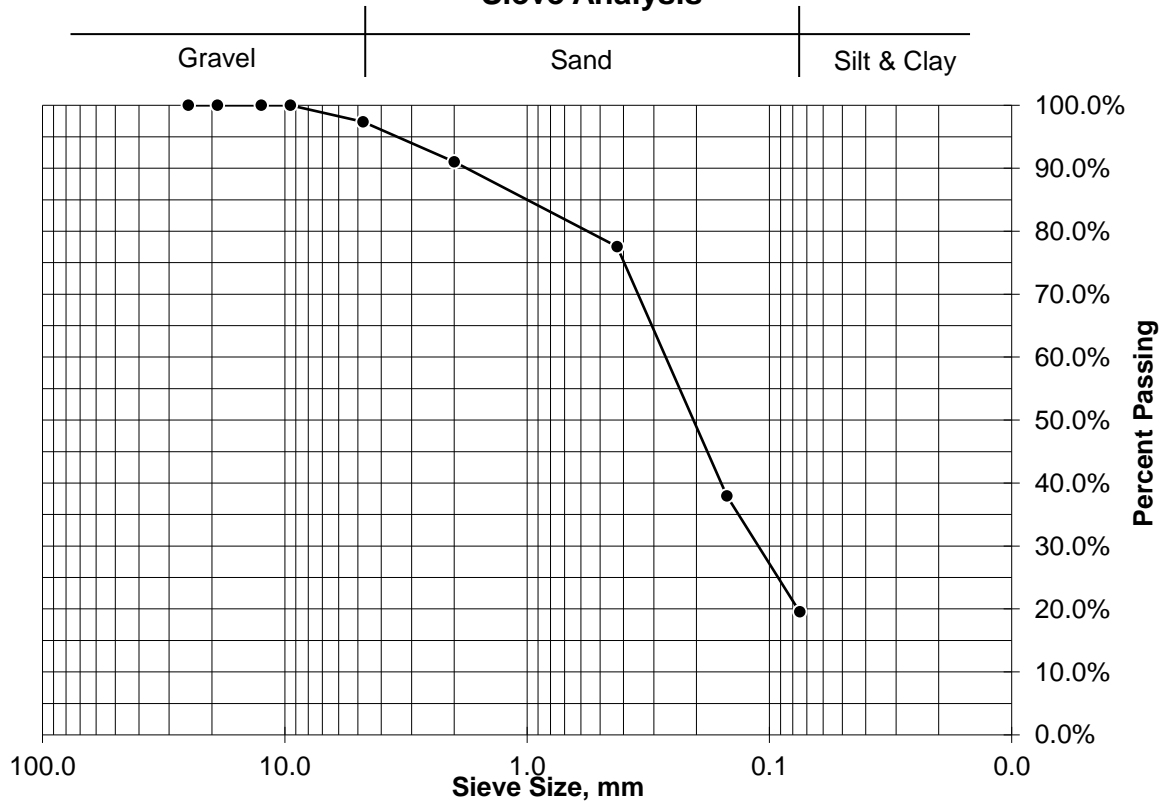
Sample ID DAA-28

Sample Depth 28'-30'

### Mechanical Sieve Analysis: ASTM D 422

Sieve Size	Weight Retained	Percent Retained	Sieve Size, mm	Percent Passing
1"	0.00	0.0%	25.0	100.0%
3/4"	0.00	0.0%	19.0	100.0%
1/2"	0.00	0.0%	12.5	100.0%
3/8"	0.00	0.0%	9.50	100.0%
No. 4	5.08	2.6%	4.75	97.4%
No. 10	12.25	6.3%	2.00	91.0%
No. 40	26.00	13.5%	0.425	77.6%
No. 100	76.44	39.6%	0.15	38.0%
No. 200	35.58	18.4%	0.075	19.5%
Pan	0.77	0.4%		
Total	156.12	80.9%		

### Sieve Analysis



## Soil Classification Calculations

Green Ridge, Cumberland Landfill

DAA# 18020117-030102

Prepared By: CBW



1030 Wilmer Ave., Ste. 100

Richmond, VA 23227

Army Corps of Engineers Certified Laboratory

Sample ID DAA-28

Sample Depth 34'-36'

Visual Sample Description Brown Silty SAND

Sample Received: 4/11/2019

Date Tested: 4/17/2019

### Natural Moisture Content: ASTM D 2216

Pan ID	24
Pan Wt	186.15 grams
Pan + Soil (wet)	314.37 grams
Pan + Soil (dry)	294.31 grams
Natural Moisture Content	18.5%

### Coarse or Fine Grained: ASTM D 422

Pan + Soil retained on No. 200 sieve

(dry) 270.42 grams

Percent Passing No. 200 Sieve 22.1%

Pan + Soil retained on No. 4 sieve

(dry) 186.15 grams

Percent Passing No. 4 Sieve 100.0%

Soil Classifies as Coarse-Grained Soil

### Atterberg Limits: ASTM D 4318

Date Tested: 4/24/2019

#### Liquid Limit

No of Blows			
Pan ID		Non-plastic	
Pan Wt			
Pan + Soil (wet)			
Pan + Soil (dry)			
Moisture Content			
Liquid Limit			
Liquid Limit			

#### Plastic Limit

Pan ID		
Pan Weight	Non-plastic	
Pan + Soil (wet)		
Pan + Soil (dry)		
Moisture Content		
Plastic Limit		
Plastic Index		

### USCS Classification: ASTM D 2487

Group Symbol **SM**

Group Name **Silty SAND**

## Grain Size Distribution Calculations

Green Ridge, Cumberland Landfill

DAA# 18020117-030102

Prepared By: CBW

Sample ID DAA-28

Sample Depth 34'-36'

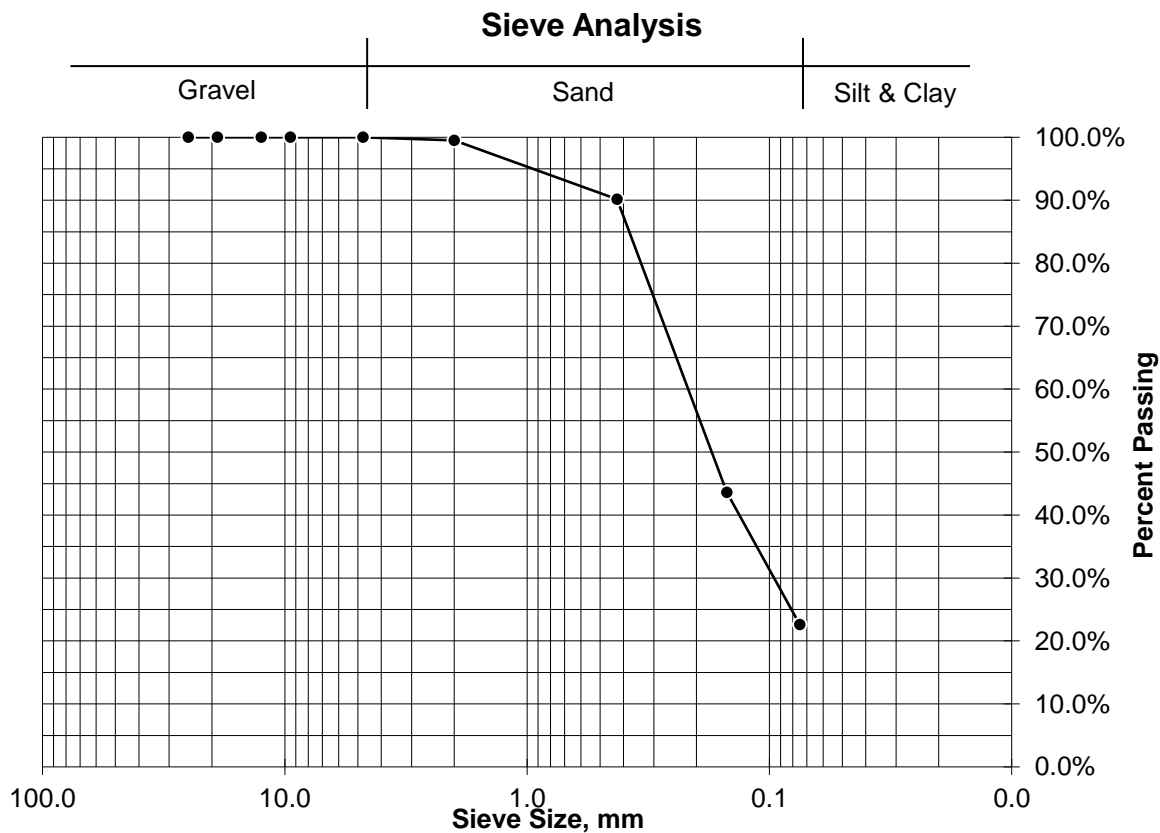
### Mechanical Sieve Analysis: ASTM D 422



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Sieve Size	Weight Retained	Percent Retained	Sieve Size, mm	Percent Passing
1"	0.00	0.0%	25.0	100.0%
3/4"	0.00	0.0%	19.0	100.0%
1/2"	0.00	0.0%	12.5	100.0%
3/8"	0.00	0.0%	9.50	100.0%
No. 4	0.00	0.0%	4.75	100.0%
No. 10	0.51	0.5%	2.00	99.5%
No. 40	10.16	9.4%	0.425	90.1%
No. 100	50.34	46.5%	0.15	43.6%
No. 200	22.68	21.0%	0.075	22.6%
Pan	0.56	0.5%		
Total	84.25	77.9%		



## Soil Classification Calculations

Green Ridge, Cumberland Landfill

DAA# 18020117-030102

Prepared By: CBW



1030 Wilmer Ave., Ste. 100

Richmond, VA 23227

Army Corps of Engineers Certified Laboratory

Sample ID DAA-29

Sample Depth 2'-4'

Visual Sample Description Light Brown Clayey SAND

Sample Received: 4/17/2019

Date Tested: 4/17/2019

### Natural Moisture Content: ASTM D 2216

Pan ID	21
Pan Wt	193.75 grams
Pan + Soil (wet)	328.60 grams
Pan + Soil (dry)	306.68 grams
Natural Moisture Content	19.4%

### Coarse or Fine Grained: ASTM D 422

Pan + Soil retained on No. 200 sieve

(dry) 274.10 grams

Percent Passing No. 200 Sieve 28.8%

Pan + Soil retained on No. 4 sieve

(dry) 194.04 grams

Percent Passing No. 4 Sieve 99.7%

Soil Classifies as Coarse-Grained Soil

### Atterberg Limits: ASTM D 4318

Date Tested: 5/1/2019

#### Liquid Limit

No of Blows	18	27	32
Pan ID	93	62	96
Pan Wt	30.11	10.87	24.80
Pan + Soil (wet)	43.28	33.01	34.09
Pan + Soil (dry)	38.77	25.91	31.22
Moisture Content	52.0%	47.2%	44.6%
Liquid Limit	50	48	46
Liquid Limit	48		

#### Plastic Limit

Pan ID	315	314
Pan Weight	9.15	9.13
Pan + Soil (wet)	19.24	19.81
Pan + Soil (dry)	17.26	17.80
Moisture Content	24.4%	23.2%
Plastic Limit	24	
Plastic Index	24	

### USCS Classification: ASTM D 2487

Group Symbol SC

Group Name Clayey SAND



## Grain Size Distribution Calculations

Green Ridge, Cumberland Landfill

DAA# 18020117-030102

Prepared By: CBW

Sample ID DAA-29

Sample Depth 2'-4'

### Mechanical Sieve Analysis: ASTM D 422

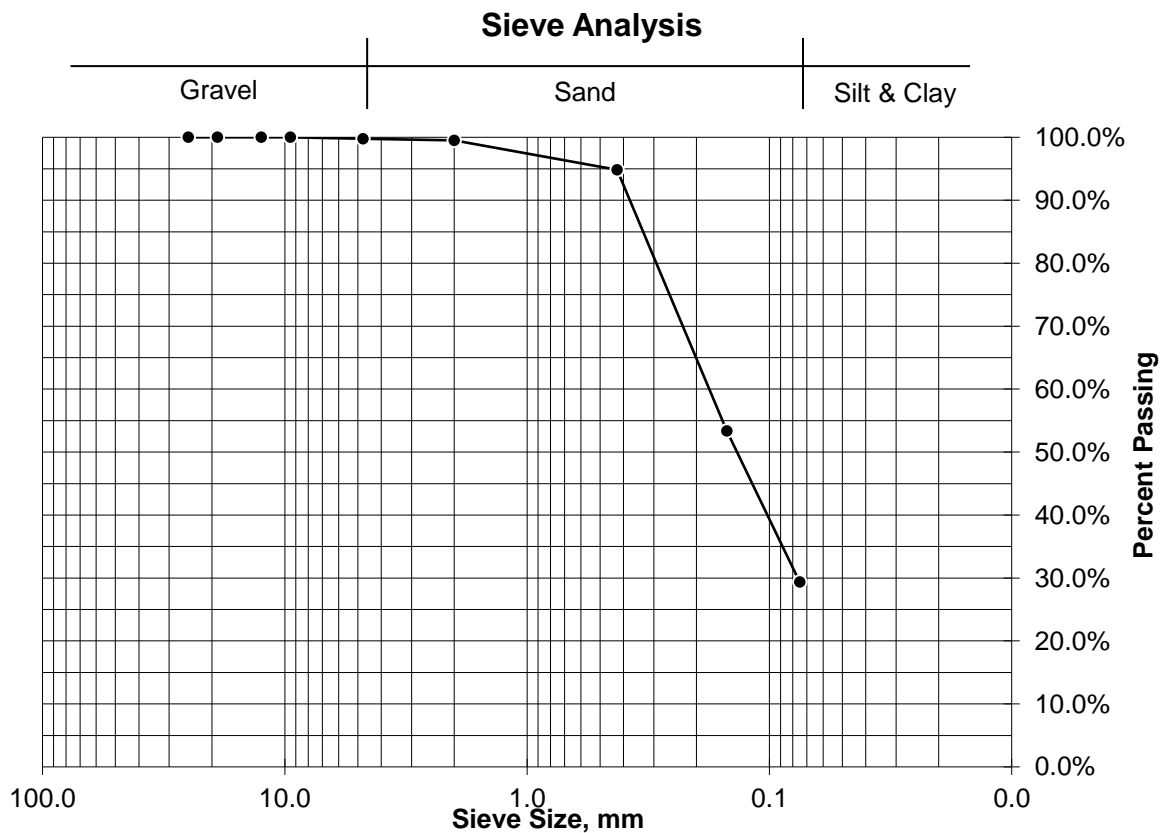


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Richmond, VA 23227

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Sieve Size	Weight Retained	Percent Retained	Sieve Size, mm	Percent Passing
1"	0.00	0.0%	25.0	100.0%
3/4"	0.00	0.0%	19.0	100.0%
1/2"	0.00	0.0%	12.5	100.0%
3/8"	0.00	0.0%	9.50	100.0%
No. 4	0.29	0.3%	4.75	99.7%
No. 10	0.25	0.2%	2.00	99.5%
No. 40	5.30	4.7%	0.425	94.8%
No. 100	46.80	41.4%	0.15	53.4%
No. 200	27.13	24.0%	0.075	29.4%
Pan	0.57	0.5%		
Total	80.34	71.1%		



## Soil Classification Calculations

Green Ridge, Cumberland Landfill

DAA# 18020117-030102

Prepared By: CBW



1030 Wilmer Ave., Ste. 100

Richmond, VA 23227

Army Corps of Engineers Certified Laboratory

Sample ID DAA-29

Sample Depth 6'-8'

Visual Sample Description Brown Silty SAND with Gravel

Sample Received: 4/17/2019

Date Tested: 4/17/2019

### Natural Moisture Content: ASTM D 2216

Pan ID	41
Pan Wt	194.44 grams
Pan + Soil (wet)	318.66 grams
Pan + Soil (dry)	289.38 grams
Natural Moisture Content	30.8%

### Coarse or Fine Grained: ASTM D 422

Pan + Soil retained on No. 200 sieve

(dry) 267.58 grams

Percent Passing No. 200 Sieve 23.0%

Pan + Soil retained on No. 4 sieve

(dry) 220.35 grams

Percent Passing No. 4 Sieve 72.7%

Soil Classifies as Coarse-Grained Soil

### Atterberg Limits: ASTM D 4318

Date Tested: 5/29/2019

#### Liquid Limit

No of Blows	18	26	32
Pan ID	701	704	708
Pan Wt	11.42	11.39	11.55
Pan + Soil (wet)	15.93	15.99	15.82
Pan + Soil (dry)	14.11	14.22	14.23
Moisture Content	67.6%	62.5%	59.2%
Liquid Limit	65	63	61
Liquid Limit	63		

#### Plastic Limit

Pan ID	58	359
Pan Weight	1.94	1.93
Pan + Soil (wet)	9.81	9.50
Pan + Soil (dry)	7.83	7.60
Moisture Content	33.6%	33.5%
Plastic Limit	34	
Plastic Index	29	

### USCS Classification: ASTM D 2487

Group Symbol **SM**

Group Name **Silty SAND with Gravel**

## Grain Size Distribution Calculations

Green Ridge, Cumberland Landfill

DAA# 18020117-030102

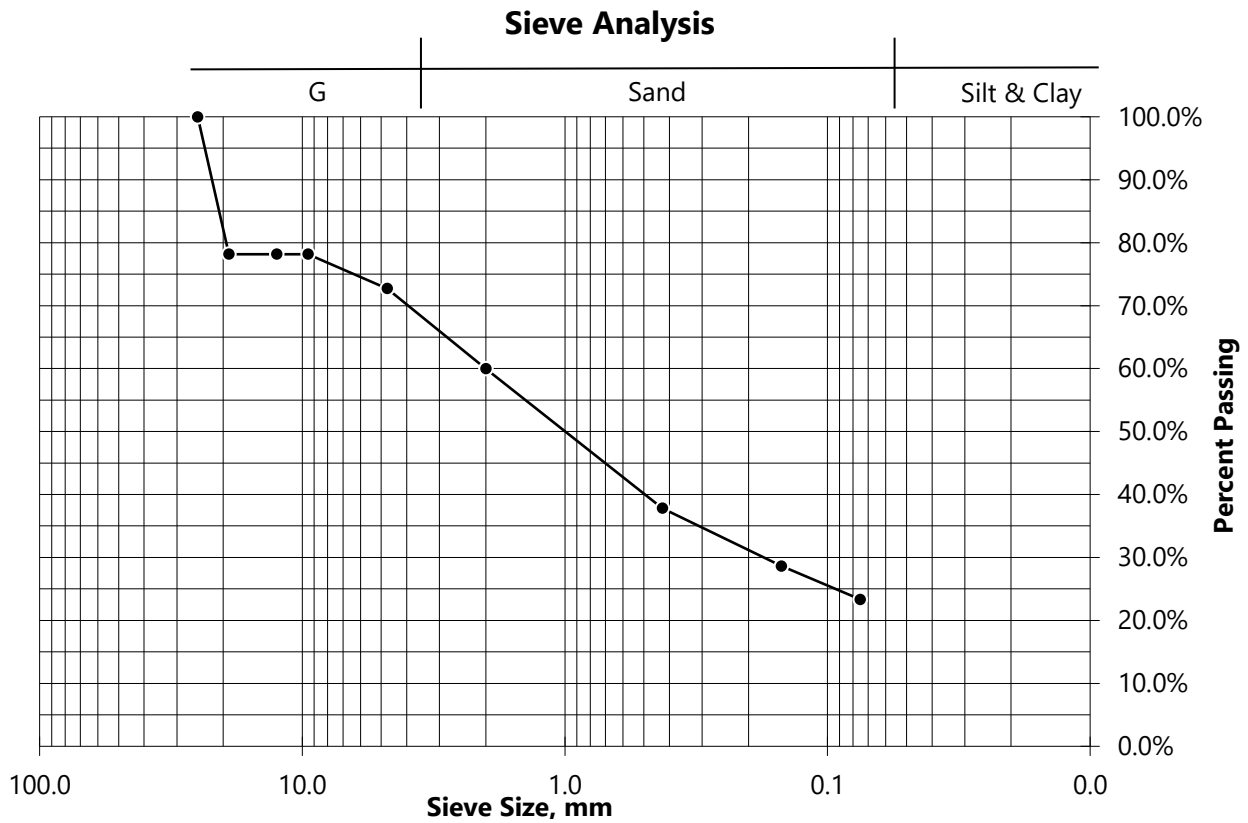
Prepared By: CBW

Sample ID DAA-29

Sample Depth 6'-8'

### Mechanical Sieve Analysis: ASTM D 422

Sieve Size	Weight Retained	Percent Retained	Sieve Size, mm	Percent Passing
1"	0.00	0.0%	25.0	100.0%
3/4"	20.71	21.8%	19.0	78.2%
1/2"	0.00	0.0%	12.5	78.2%
3/8"	0.00	0.0%	9.50	78.2%
No. 4	5.20	5.5%	4.75	72.7%
No. 10	12.08	12.7%	2.00	60.0%
No. 40	21.04	22.2%	0.425	37.8%
No. 100	8.71	9.2%	0.15	28.6%
No. 200	5.05	5.3%	0.075	23.3%
Pan	0.35	0.4%		
Total	73.14	77.0%		



## Soil Classification Calculations

Green Ridge, Cumberland Landfill

DAA# 18020117-030102

Prepared By: CBW



1030 Wilmer Ave., Ste. 100

Richmond, VA 23227

Army Corps of Engineers Certified Laboratory

Sample ID DAA-29

Sample Depth 12'-14'

Visual Sample Description Brown Silty SAND

Sample Received: 4/17/2019

Date Tested: 4/17/2019

### Natural Moisture Content: ASTM D 2216

Pan ID	23
Pan Wt	193.98 grams
Pan + Soil (wet)	300.48 grams
Pan + Soil (dry)	271.97 grams
Natural Moisture Content	36.6%

### Coarse or Fine Grained: ASTM D 422

Pan + Soil retained on No. 200 sieve

(dry) 253.44 grams

Percent Passing No. 200 Sieve 23.8%

Pan + Soil retained on No. 4 sieve

(dry) 202.00 grams

Percent Passing No. 4 Sieve 89.7%

Soil Classifies as Coarse-Grained Soil

### Atterberg Limits: ASTM D 4318

Date Tested: 6/4/2019

#### Liquid Limit

No of Blows	18	26	32
Pan ID	98	103	109
Pan Wt	30.33	27.37	24.99
Pan + Soil (wet)	40.82	36.76	32.63
Pan + Soil (dry)	37.00	33.53	30.10
Moisture Content	57.2%	52.4%	49.5%
Liquid Limit	55	53	51
Liquid Limit	53		

#### Plastic Limit

Pan ID	313	314
Pan Weight	9.14	9.13
Pan + Soil (wet)	26.19	24.82
Pan + Soil (dry)	21.25	20.28
Moisture Content	40.8%	40.7%
Plastic Limit	41	
Plastic Index	12	

### USCS Classification: ASTM D 2487

Group Symbol SM

Group Name Silty SAND

# Grain Size Distribution Calculations

Green Ridge, Cumberland Landfill

DAA# 18020117-030102

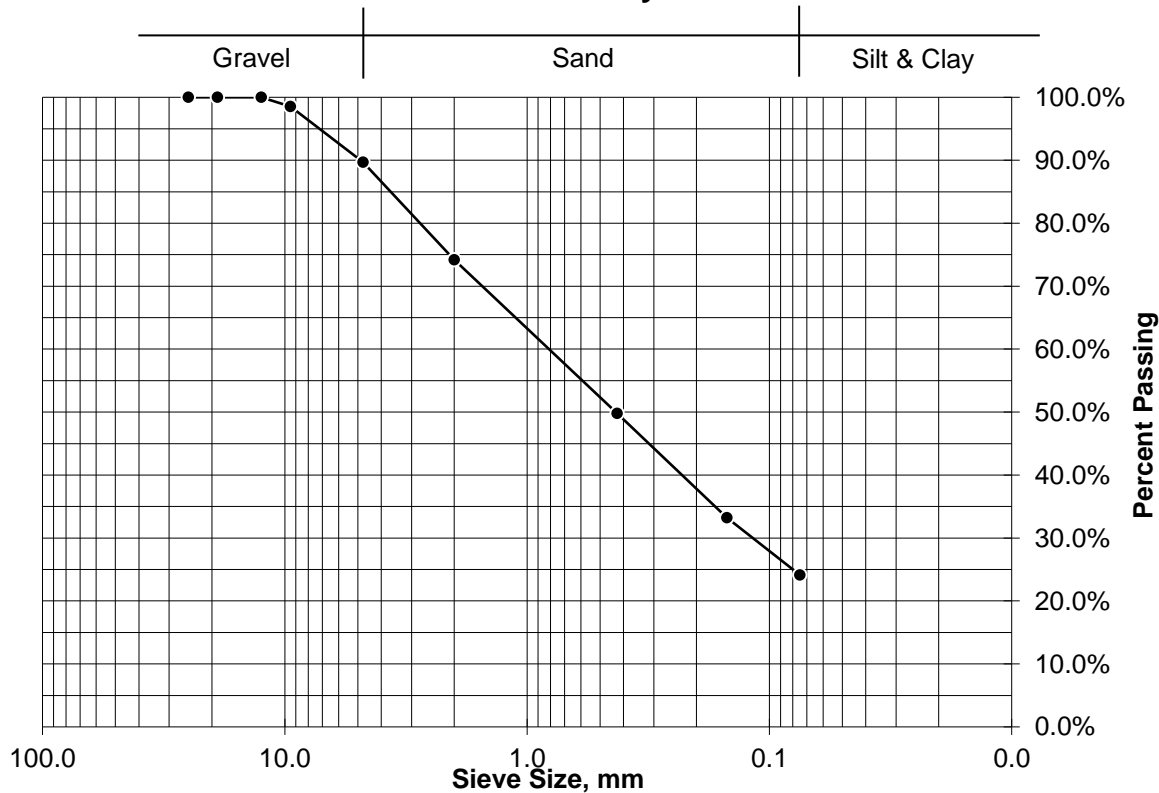
Prepared By: CBW

Sample ID DAA-29  
Sample Depth 12'-14'

## Mechanical Sieve Analysis: ASTM D 422

Sieve Size	Weight Retained	Percent Retained	Sieve Size, mm	Percent Passing
1"	0.00	0.0%	25.0	100.0%
3/4"	0.00	0.0%	19.0	100.0%
1/2"	0.00	0.0%	12.5	100.0%
3/8"	1.12	1.4%	9.50	98.6%
No. 4	6.90	8.8%	4.75	89.7%
No. 10	12.09	15.5%	2.00	74.2%
No. 40	19.04	24.4%	0.425	49.8%
No. 100	12.93	16.6%	0.15	33.2%
No. 200	7.07	9.1%	0.075	24.2%
Pan	0.31	0.4%		
Total	59.46	76.2%		

Sieve Analysis



## Soil Classification Calculations

Green Ridge, Cumberland Landfill

DAA# 18020117-030102

Prepared By: CBW



1030 Wilmer Ave., Ste. 100

Richmond, VA 23227

Army Corps of Engineers Certified Laboratory

Sample ID DAA-29

Sample Depth 24'-26'

Visual Sample Description Reddish-Brown Silty SAND

Sample Received: 4/17/2019

Date Tested: 4/17/2019

### Natural Moisture Content: ASTM D 2216

Pan ID	36
Pan Wt	193.75 grams
Pan + Soil (wet)	349.90 grams
Pan + Soil (dry)	313.89 grams
Natural Moisture Content	30.0%

### Coarse or Fine Grained: ASTM D 422

Pan + Soil retained on No. 200 sieve

(dry) 268.96 grams

Percent Passing No. 200 Sieve 37.4%

Pan + Soil retained on No. 4 sieve

(dry) 193.75 grams

Percent Passing No. 4 Sieve 100.0%

Soil Classifies as Coarse-Grained Soil

### Atterberg Limits: ASTM D 4318

Date Tested: 4/29/2019

#### Liquid Limit

No of Blows	17	26	32
Pan ID	70	72	65
Pan Wt	10.99	11.06	10.99
Pan + Soil (wet)	28.38	21.90	36.69
Pan + Soil (dry)	22.17	18.24	28.41
Moisture Content	55.5%	51.0%	47.6%
Liquid Limit	53	51	49
Liquid Limit	51		

#### Plastic Limit

Pan ID	18	73
Pan Weight	4.33	4.22
Pan + Soil (wet)	15.50	15.86
Pan + Soil (dry)	12.60	12.83
Moisture Content	35.1%	35.2%
Plastic Limit	35	
Plastic Index	16	

### USCS Classification: ASTM D 2487

Group Symbol **SM**

Group Name **Silty SAND**



## Grain Size Distribution Calculations

Green Ridge, Cumberland Landfill

DAA# 18020117-030102

Prepared By: CBW



1030 Wilmer Ave., Ste. 100  
Richmond, VA 23227

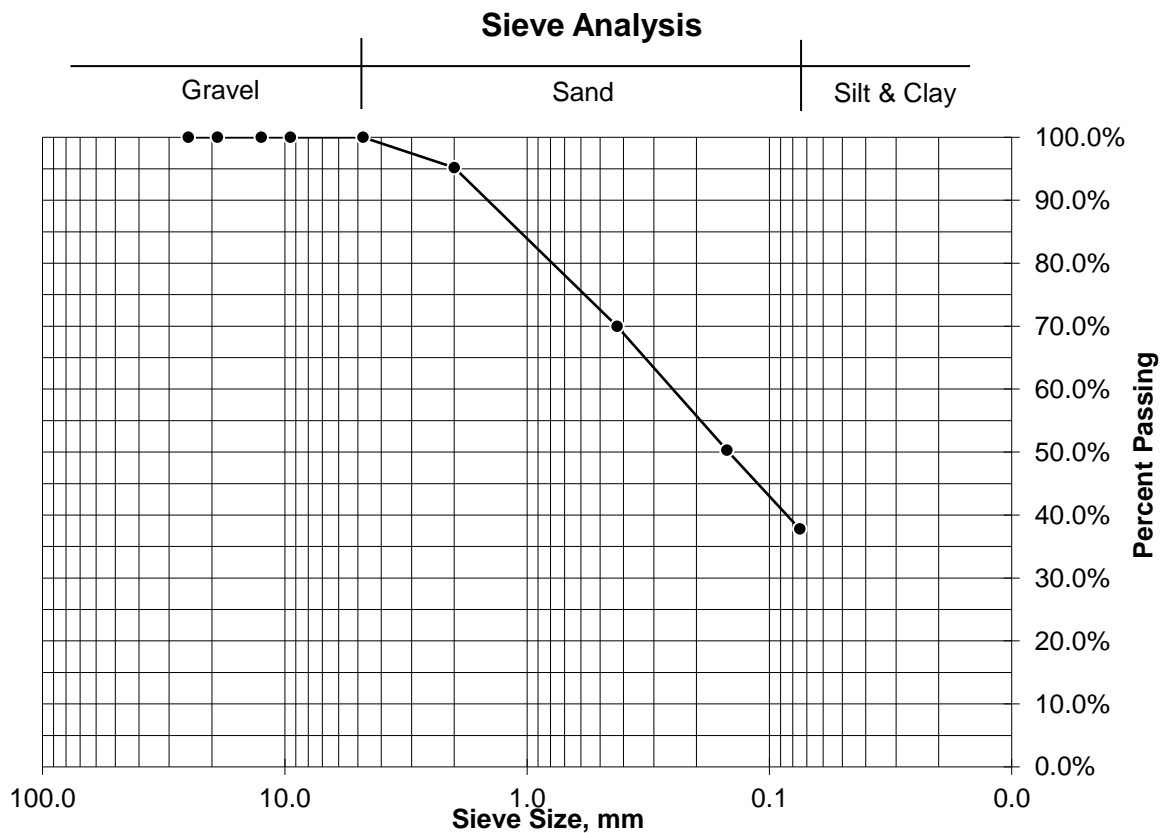
Army Corps of Engineers Certified Laboratory

Sample ID DAA-29

Sample Depth 24'-26'

### Mechanical Sieve Analysis: ASTM D 422

Sieve Size	Weight Retained	Percent Retained	Sieve Size, mm	Percent Passing
1"	0.00	0.0%	25.0	100.0%
3/4"	0.00	0.0%	19.0	100.0%
1/2"	0.00	0.0%	12.5	100.0%
3/8"	0.00	0.0%	9.50	100.0%
No. 4	0.00	0.0%	4.75	100.0%
No. 10	5.78	4.8%	2.00	95.2%
No. 40	30.30	25.2%	0.425	70.0%
No. 100	23.64	19.7%	0.15	50.3%
No. 200	15.02	12.5%	0.075	37.8%
Pan	0.47	0.4%		
Total	75.21	62.6%		



## Soil Classification Calculations

### Green Ridge, Cumberland Landfill

DAA# 18020117-030102

Prepared By: CBW

Sample ID DAA-33

Sample Depth 2'-4'

Visual Sample Description Red Silty SAND

Sample Received: 4/17/2019

Date Tested: 4/17/2019

### Natural Moisture Content: ASTM D 2216

Pan ID	8
Pan Wt	187.15 grams
Pan + Soil (wet)	335.23 grams
Pan + Soil (dry)	303.13 grams
Natural Moisture Content	27.7%

### Coarse or Fine Grained: ASTM D 422

Pan + Soil retained on No. 200 sieve	
(dry)	261.34 grams
Percent Passing No. 200 Sieve	36.0%
Pan + Soil retained on No. 4 sieve	
(dry)	187.15 grams
Percent Passing No. 4 Sieve	100.0%
Soil Classifies as	Coarse-Grained Soil

### Atterberg Limits: ASTM D 4318

Date Tested: 5/29/2019

#### Liquid Limit

No of Blows	17	26	32
Pan ID	2	314	703
Pan Wt	9.02	9.12	11.53
Pan + Soil (wet)	19.41	20.30	21.05
Pan + Soil (dry)	15.16	15.96	17.46
Moisture Content	69.2%	63.5%	60.5%
Liquid Limit	66	64	62
Liquid Limit	64		

#### Plastic Limit

Pan ID	23	73
Pan Weight	4.32	4.23
Pan + Soil (wet)	15.69	14.27
Pan + Soil (dry)	12.56	11.51
Moisture Content	38.0%	37.9%
Plastic Limit	38	
Plastic Index	26	

### USCS Classification: ASTM D 2487

Group Symbol **SM**  
 Group Name **Silty SAND**

# Grain Size Distribution Calculations

Green Ridge, Cumberland Landfill

DAA# 18020117-030102

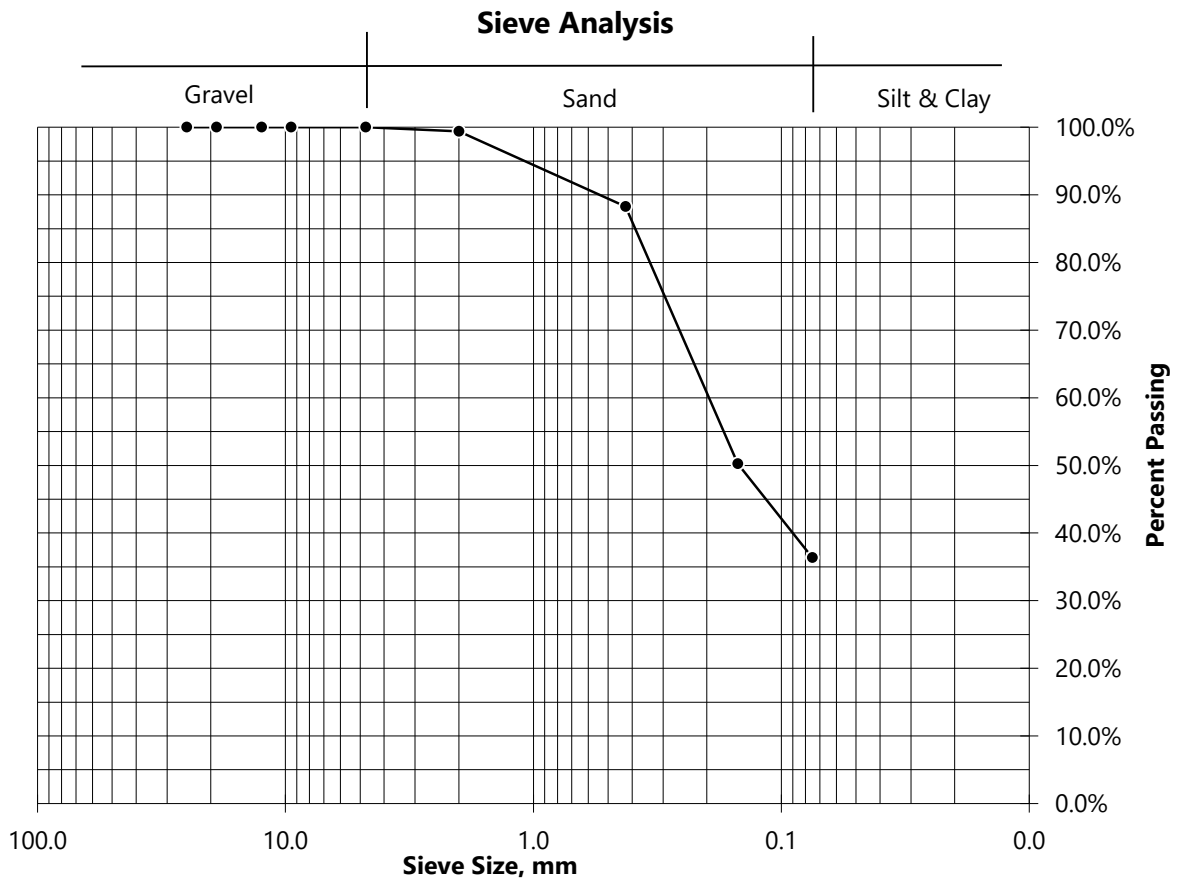
Prepared By: CBW

Sample ID DAA-33

Sample Depth 2'-4'

## Mechanical Sieve Analysis: ASTM D 422

Sieve Size	Weight Retained	Percent Retained	Sieve Size, mm	Percent Passing
1"	0.00	0.0%	25.0	100.0%
3/4"	0.00	0.0%	19.0	100.0%
1/2"	0.00	0.0%	12.5	100.0%
3/8"	0.00	0.0%	9.50	100.0%
No. 4	0.00	0.0%	4.75	100.0%
No. 10	0.73	0.6%	2.00	99.4%
No. 40	12.90	11.1%	0.425	88.2%
No. 100	44.08	38.0%	0.15	50.2%
No. 200	16.09	13.9%	0.075	36.4%
Pan	0.33	0.3%		
Total	74.13	63.9%		



## Soil Classification Calculations

### Green Ridge, Cumberland Landfill

DAA# 18020117-030102

Prepared By: CBW

Sample ID DAA-33

Sample Received: 4/17/2019

Sample Depth 4'-6'

Date Tested: 4/17/2019

Visual Sample Description Light Reddish-brown Silty SAND

### Natural Moisture Content: ASTM D 2216

Pan ID	38
Pan Wt	193.65 grams
Pan + Soil (wet)	300.60 grams
Pan + Soil (dry)	277.67 grams
Natural Moisture Content	27.3%

### Coarse or Fine Grained: ASTM D 422

Pan + Soil retained on No. 200 sieve	
(dry)	253.13 grams
Percent Passing No. 200 Sieve	29.2%
Pan + Soil retained on No. 4 sieve	
(dry)	193.65 grams
Percent Passing No. 4 Sieve	100.0%

Soil Classifies as Coarse-Grained Soil

### Atterberg Limits: ASTM D 4318

Date Tested: 5/29/2019

#### Liquid Limit

No of Blows	19	23	35
Pan ID	91	169	201
Pan Wt	24.49	27.13	27.63
Pan + Soil (wet)	34.09	36.18	36.99
Pan + Soil (dry)	30.35	32.78	33.64
Moisture Content	63.8%	60.2%	55.7%
Liquid Limit	62	60	58
Liquid Limit	60		

#### Plastic Limit

Pan ID	354	356
Pan Weight	9.13	9.08
Pan + Soil (wet)	24.29	24.75
Pan + Soil (dry)	20.53	20.85
Moisture Content	33.0%	33.1%
Plastic Limit	33	
Plastic Index	27	

### USCS Classification: ASTM D 2487

Group Symbol **SM**

Group Name **Silty SAND**

# Grain Size Distribution Calculations

Green Ridge, Cumberland Landfill

DAA# 18020117-030102

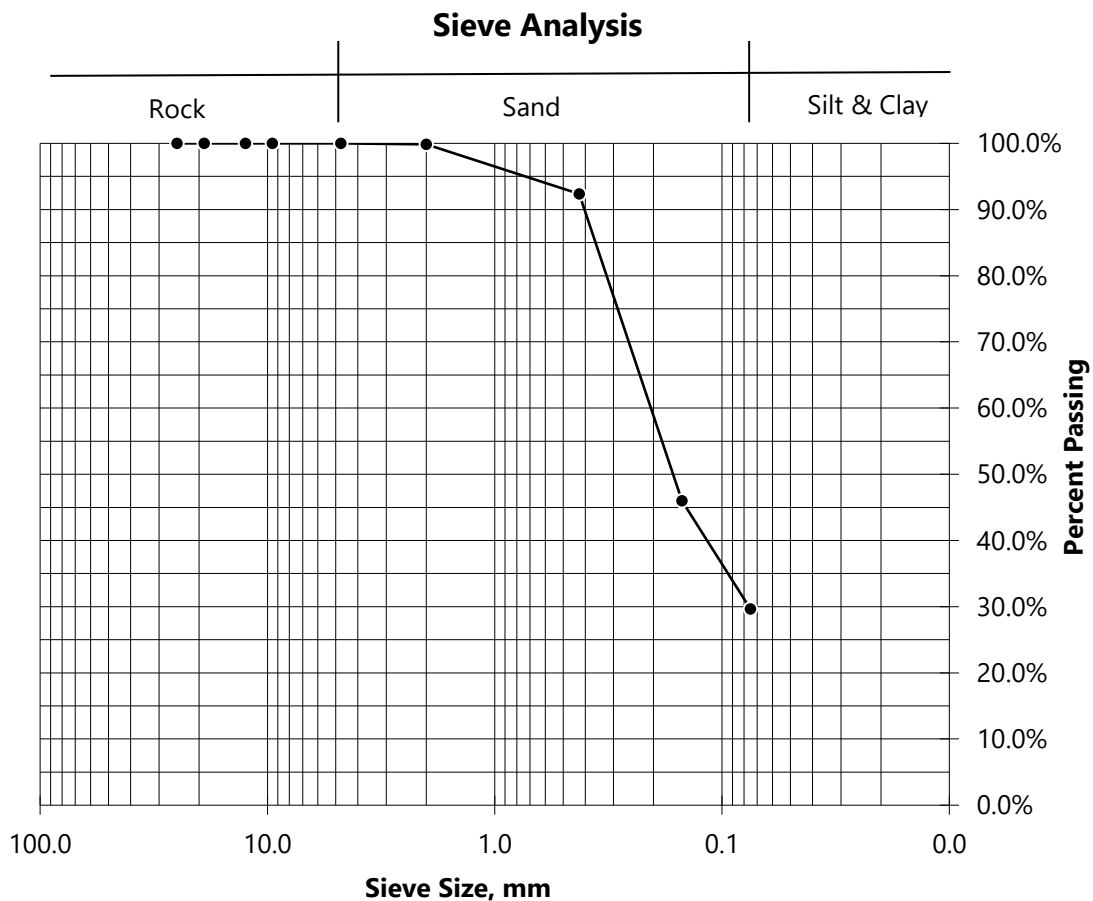
Prepared By: CBW

Sample ID DAA-33

Sample Depth 4'-6'

## Mechanical Sieve Analysis: ASTM D 422

Sieve Size	Weight Retained	Percent Retained	Sieve Size, mm	Percent Passing
1"	0.00	0.0%	25.0	100.0%
3/4"	0.00	0.0%	19.0	100.0%
1/2"	0.00	0.0%	12.5	100.0%
3/8"	0.00	0.0%	9.50	100.0%
No. 4	0.00	0.0%	4.75	100.0%
No. 10	0.14	0.2%	2.00	99.8%
No. 40	6.28	7.5%	0.425	92.4%
No. 100	38.97	46.4%	0.15	46.0%
No. 200	13.72	16.3%	0.075	29.6%
Pan	0.32	0.4%		
Total	59.43	70.7%		



## Soil Classification Calculations

### Green Ridge, Cumberland Landfill

DAA# 18020117-030102

Prepared By: CBW

Sample ID DAA-33

Sample Depth 6'-8'

Visual Sample Description Light Brown Silty SAND

Sample Received: 4/15/2019

Date Tested: 4/15/2019

### Natural Moisture Content: ASTM D 2216

Pan ID	19
Pan Wt	188.54 grams
Pan + Soil (wet)	363.97 grams
Pan + Soil (dry)	332.50 grams
Natural Moisture Content	21.9%

### Coarse or Fine Grained: ASTM D 422

Pan + Soil retained on No. 200 sieve	
(dry)	303.48 grams
Percent Passing No. 200 Sieve	20.2%
Pan + Soil retained on No. 4 sieve	
(dry)	190.18 grams
Percent Passing No. 4 Sieve	98.9%

Soil Classifies as Coarse-Grained Soil

### Atterberg Limits: ASTM D 4318

Date Tested: 4/23/2019

#### Liquid Limit

No of Blows			
Pan ID		Non-plastic	
Pan Wt			
Pan + Soil (wet)			
Pan + Soil (dry)			
Moisture Content			

Liquid Limit

Liquid Limit

#### Plastic Limit

Pan ID		
Pan Weight	Non-plastic	
Pan + Soil (wet)		
Pan + Soil (dry)		
Moisture Content		

Plastic Limit

Plastic Index

### USCS Classification: ASTM D 2487

Group Symbol **SM**

Group Name **Silty SAND**



# Grain Size Distribution Calculations

Green Ridge, Cumberland Landfill

DAA# 18020117-030102

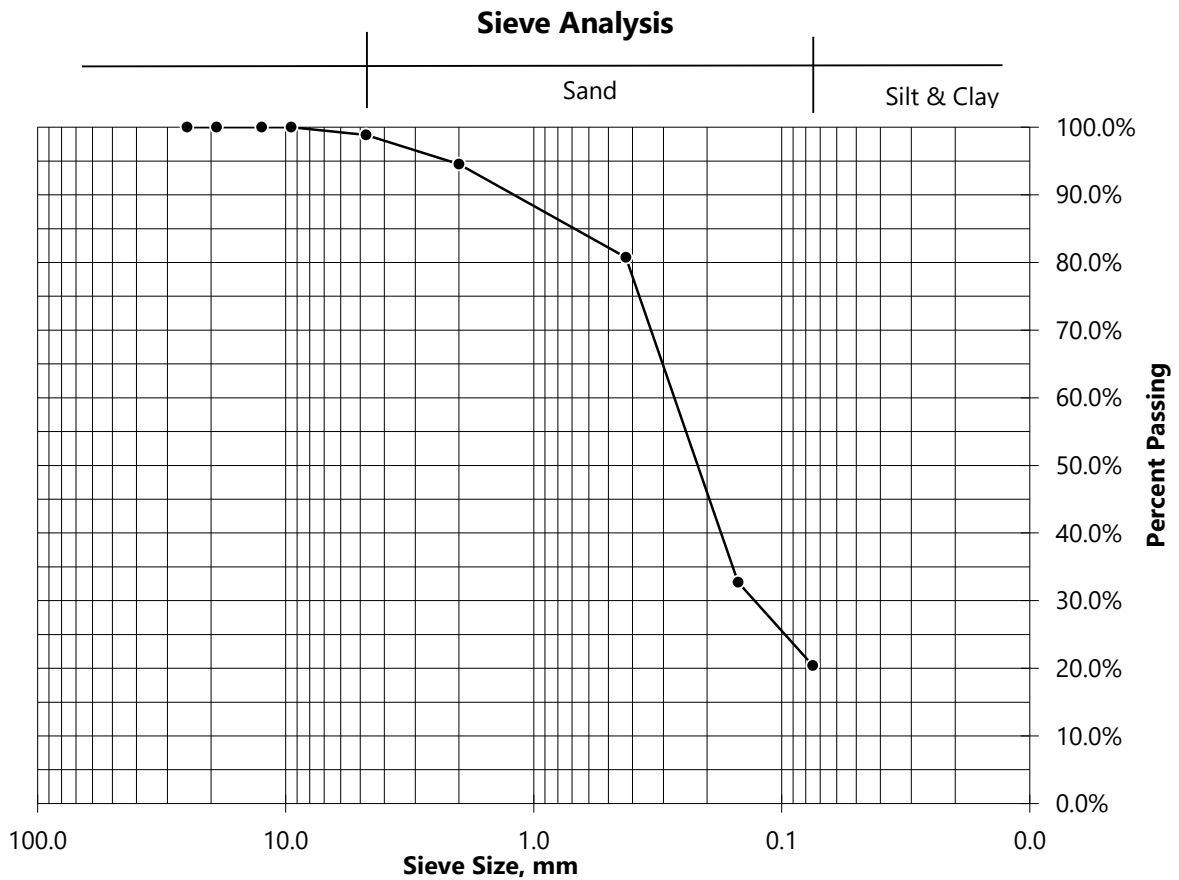
Prepared By: CBW

Sample ID DAA-33

Sample Depth 6'-8'

## Mechanical Sieve Analysis: ASTM D 422

Sieve Size	Weight Retained	Percent Retained	Sieve Size, mm	Percent Passing
1"	0.00	0.0%	25.0	100.0%
3/4"	0.00	0.0%	19.0	100.0%
1/2"	0.00	0.0%	12.5	100.0%
3/8"	0.00	0.0%	9.50	100.0%
No. 4	1.64	1.1%	4.75	98.9%
No. 10	6.24	4.3%	2.00	94.5%
No. 40	19.85	13.8%	0.425	80.7%
No. 100	69.12	48.0%	0.15	32.7%
No. 200	17.71	12.3%	0.075	20.4%
Pan	0.36	0.3%		
Total	114.92	79.8%		



## Soil Classification Calculations

Green Ridge, Cumberland Landfill

DAA# 18020117-030102

Prepared By: CBW



1030 Wilmer Ave., Ste. 100

Richmond, VA 23227

Army Corps of Engineers Certified Laboratory

Sample ID DAA-33

Sample Depth 8'-10'

Visual Sample Description Light Gray Clayey SAND

Sample Received: 4/17/2019

Date Tested: 4/17/2019

### Natural Moisture Content: ASTM D 2216

Pan ID	6
Pan Wt	195.34 grams
Pan + Soil (wet)	307.15 grams
Pan + Soil (dry)	294.30 grams
Natural Moisture Content	13.0%

### Coarse or Fine Grained: ASTM D 422

Pan + Soil retained on No. 200 sieve

(dry) 253.78 grams

Percent Passing No. 200 Sieve 40.9%

Pan + Soil retained on No. 4 sieve

(dry) 198.00 grams

Percent Passing No. 4 Sieve 97.3%

Soil Classifies as Coarse-Grained Soil

### Atterberg Limits: ASTM D 4318

Date Tested: 6/4/2019

#### Liquid Limit

No of Blows	15	23	35
Pan ID	101	107	108
Pan Wt	23.99	25.11	33.14
Pan + Soil (wet)	39.02	37.64	44.89
Pan + Soil (dry)	35.03	34.57	42.26
Moisture Content	36.2%	32.5%	28.8%
Liquid Limit	34	32	30
Liquid Limit	32		

#### Plastic Limit

Pan ID	315	352
Pan Weight	9.15	9.07
Pan + Soil (wet)	31.65	29.36
Pan + Soil (dry)	27.76	25.84
Moisture Content	20.9%	21.0%
Plastic Limit	21	
Plastic Index	11	

### USCS Classification: ASTM D 2487

Group Symbol SC

Group Name Clayey SAND

## Grain Size Distribution Calculations

Green Ridge, Cumberland Landfill

DAA# 18020117-030102

Prepared By: CBW

Sample ID DAA-33

Sample Depth 8'-10'

### Mechanical Sieve Analysis: ASTM D 422

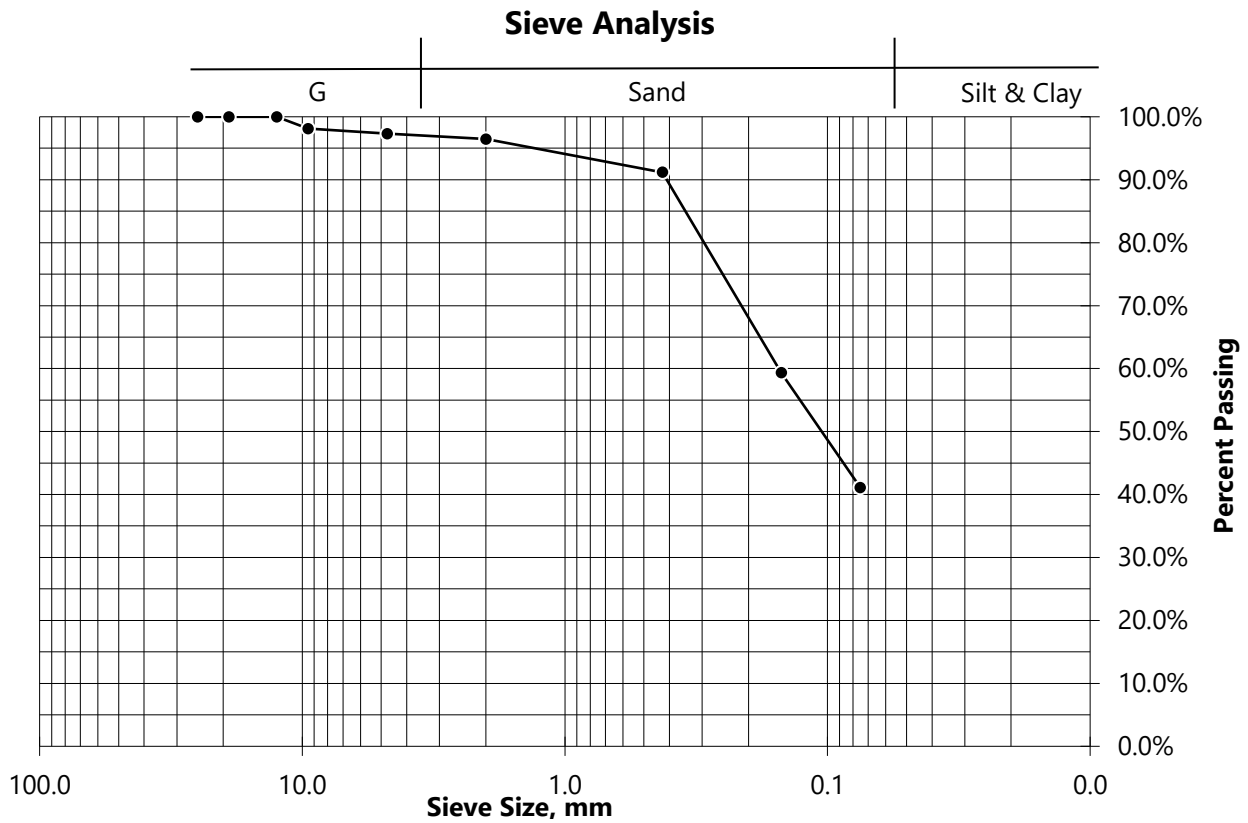


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Richmond, VA 23227

Army Corps of Engineers Certified Laboratory

Sieve Size	Weight Retained	Percent Retained	Sieve Size, mm	Percent Passing
1"	0.00	0.0%	25.0	100.0%
3/4"	0.00	0.0%	19.0	100.0%
1/2"	0.00	0.0%	12.5	100.0%
3/8"	1.85	1.9%	9.50	98.1%
No. 4	0.81	0.8%	4.75	97.3%
No. 10	0.85	0.9%	2.00	96.5%
No. 40	5.22	5.3%	0.425	91.2%
No. 100	31.50	31.8%	0.15	59.3%
No. 200	18.04	18.2%	0.075	41.1%
Pan	0.17	0.2%		
Total	58.44	59.1%		



## Soil Classification Calculations

Green Ridge, Cumberland Landfill

DAA# 18020117-030102

Prepared By: CBW



1030 Wilmer Ave., Ste. 100

Richmond, VA 23227

Army Corps of Engineers Certified Laboratory

Sample ID DAA-33

Sample Depth 10'-12'

Visual Sample Description Light Gray Clayey SAND

Sample Received: 4/17/2019

Date Tested: 4/17/2019

### Natural Moisture Content: ASTM D 2216

Pan ID	7
Pan Wt	192.34 grams
Pan + Soil (wet)	333.57 grams
Pan + Soil (dry)	317.63 grams
Natural Moisture Content	12.7%

### Coarse or Fine Grained: ASTM D 422

Pan + Soil retained on No. 200 sieve

(dry) 277.96 grams

Percent Passing No. 200 Sieve 31.7%

Pan + Soil retained on No. 4 sieve

(dry) 203.21 grams

Percent Passing No. 4 Sieve 91.3%

Soil Classifies as Coarse-Grained Soil

### Atterberg Limits: ASTM D 4318

Date Tested: 6/4/2019

#### Liquid Limit

No of Blows	16	26	31
Pan ID	91	96	102
Pan Wt	24.50	24.82	23.96
Pan + Soil (wet)	34.07	34.41	36.18
Pan + Soil (dry)	31.39	31.93	33.21
Moisture Content	38.9%	34.8%	32.2%
Liquid Limit	37	35	33
Liquid Limit	35		

#### Plastic Limit

Pan ID	19	74
Pan Weight	4.35	4.24
Pan + Soil (wet)	17.26	17.16
Pan + Soil (dry)	15.32	15.22
Moisture Content	17.7%	17.7%
Plastic Limit	18	
Plastic Index	17	

### USCS Classification: ASTM D 2487

Group Symbol SC

Group Name Clayey SAND

## Grain Size Distribution Calculations

Green Ridge, Cumberland Landfill

DAA# 18020117-030102

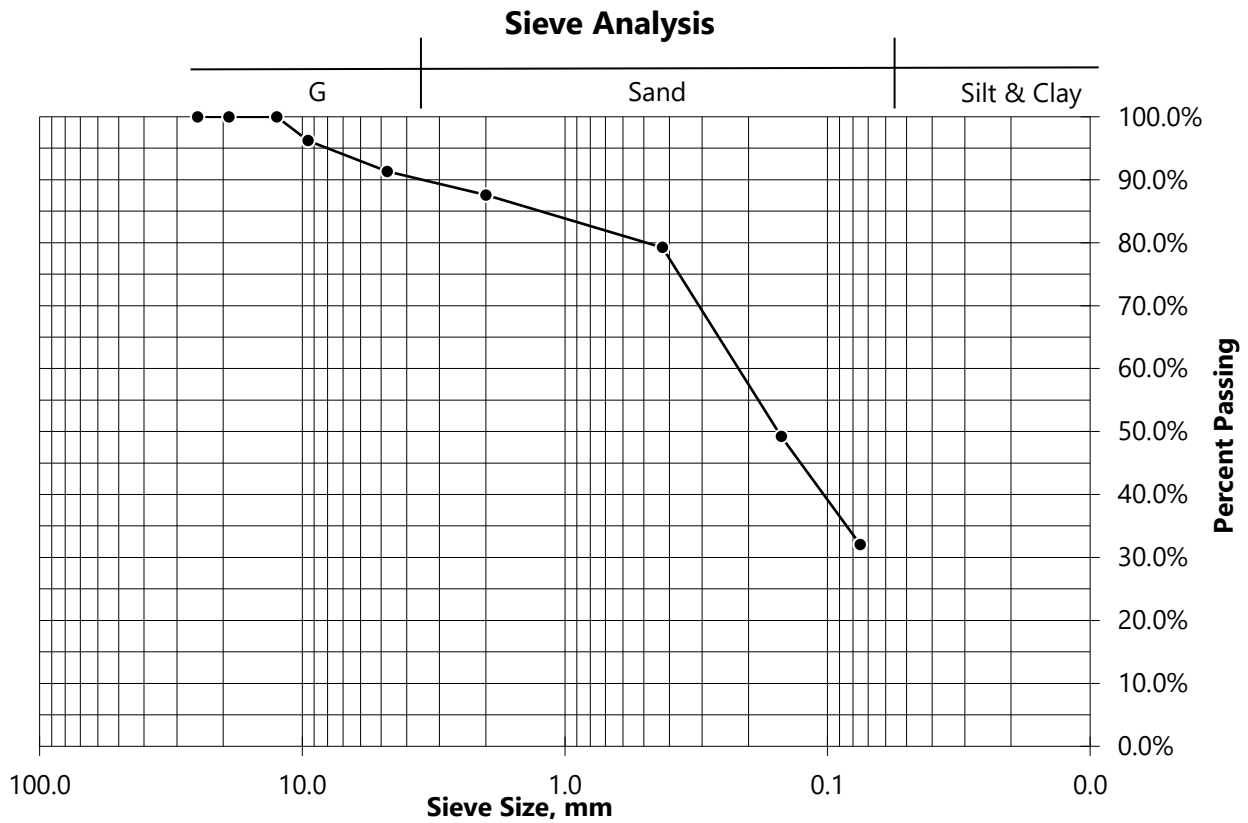
Prepared By: CBW

Sample ID DAA-33

Sample Depth 10'-12'

### Mechanical Sieve Analysis: ASTM D 422

Sieve Size	Weight Retained	Percent Retained	Sieve Size, mm	Percent Passing
1"	0.00	0.0%	25.0	100.0%
3/4"	0.00	0.0%	19.0	100.0%
1/2"	0.00	0.0%	12.5	100.0%
3/8"	4.75	3.8%	9.50	96.2%
No. 4	6.12	4.9%	4.75	91.3%
No. 10	4.69	3.7%	2.00	87.6%
No. 40	10.44	8.3%	0.425	79.2%
No. 100	37.63	30.0%	0.15	49.2%
No. 200	21.53	17.2%	0.075	32.0%
Pan	0.46	0.4%		
Total	85.62	68.3%		



## Soil Classification Calculations

Green Ridge, Cumberland Landfill

DAA# 18020117-030102

Prepared By: CBW



1030 Wilmer Ave., Ste. 100

Richmond, VA 23227

Army Corps of Engineers Certified Laboratory

Sample ID DAA-33

Sample Depth 12'-14'

Visual Sample Description Light Reddish-brown Silty SAND

Sample Received: 4/15/2019

Date Tested: 4/15/2019

### Natural Moisture Content: ASTM D 2216

Pan ID	22
Pan Wt	189.01 grams
Pan + Soil (wet)	336.96 grams
Pan + Soil (dry)	325.31 grams
Natural Moisture Content	8.5%

### Coarse or Fine Grained: ASTM D 422

Pan + Soil retained on No. 200 sieve

(dry) 297.36 grams

Percent Passing No. 200 Sieve 20.5%

Pan + Soil retained on No. 4 sieve

(dry) 189.22 grams

Percent Passing No. 4 Sieve 99.8%

Soil Classifies as Coarse-Grained Soil

### Atterberg Limits: ASTM D 4318

Date Tested: 4/17/2019

#### Liquid Limit

No of Blows			
Pan ID		Non-plastic	
Pan Wt			
Pan + Soil (wet)			
Pan + Soil (dry)			
Moisture Content			
Liquid Limit			
Liquid Limit			

#### Plastic Limit

Pan ID		
Pan Weight	Non-plastic	
Pan + Soil (wet)		
Pan + Soil (dry)		
Moisture Content		
Plastic Limit		
Plastic Index		

### USCS Classification: ASTM D 2487

Group Symbol **SM**

Group Name **Silty SAND**

## Grain Size Distribution Calculations

Green Ridge, Cumberland Landfill

DAA# 18020117-030102

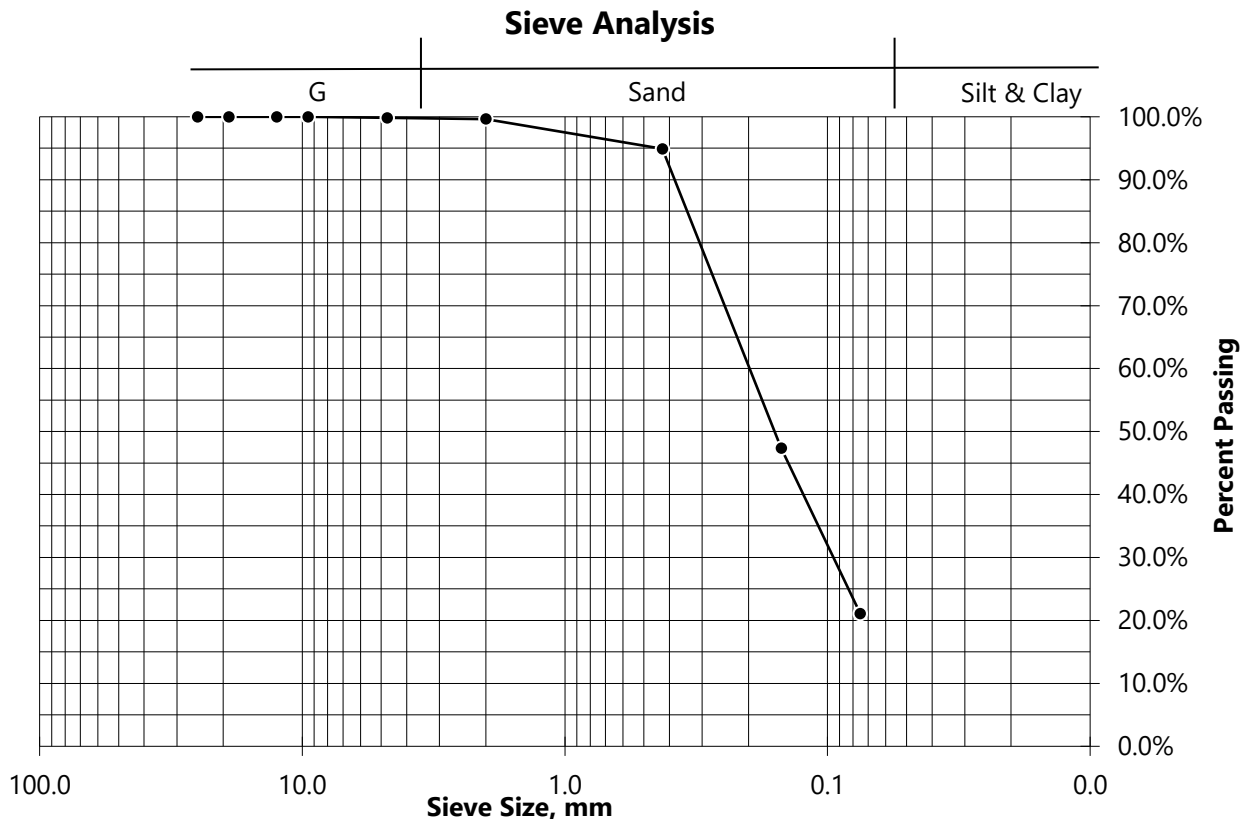
Prepared By: CBW

Sample ID DAA-33

Sample Depth 12'-14'

### Mechanical Sieve Analysis: ASTM D 422

Sieve Size	Weight Retained	Percent Retained	Sieve Size, mm	Percent Passing
1"	0.00	0.0%	25.0	100.0%
3/4"	0.00	0.0%	19.0	100.0%
1/2"	0.00	0.0%	12.5	100.0%
3/8"	0.00	0.0%	9.50	100.0%
No. 4	0.21	0.2%	4.75	99.8%
No. 10	0.29	0.2%	2.00	99.6%
No. 40	6.46	4.7%	0.425	94.9%
No. 100	64.82	47.6%	0.15	47.3%
No. 200	35.81	26.3%	0.075	21.1%
Pan	0.74	0.5%		
Total	108.33	79.5%		





## Soil Classification Calculations

Green Ridge, Cumberland Landfill

DAA# 18020117-030102

Prepared By: CBW



1030 Wilmer Ave., Ste. 100

Richmond, VA 23227

Army Corps of Engineers Certified Laboratory

Sample ID DAA-34

Sample Depth 2'-4'

Visual Sample Description Reddish-brown Clayey SAND

Sample Received: 4/15/2019

Date Tested: 4/15/2019

### Natural Moisture Content: ASTM D 2216

Pan ID	25
Pan Wt	194.03 grams
Pan + Soil (wet)	297.16 grams
Pan + Soil (dry)	275.38 grams
Natural Moisture Content	26.8%

### Coarse or Fine Grained: ASTM D 422

Pan + Soil retained on No. 200 sieve

(dry) 235.52 grams

Percent Passing No. 200 Sieve 49.0%

Pan + Soil retained on No. 4 sieve

(dry) 194.03 grams

Percent Passing No. 4 Sieve 100.0%

Soil Classifies as Coarse-Grained Soil

### Atterberg Limits: ASTM D 4318

Date Tested: 5/21/2019

#### Liquid Limit

No of Blows	19	25	33
Pan ID	61	65	6
Pan Wt	10.89	10.94	11.19
Pan + Soil (wet)	21.21	22.31	21.59
Pan + Soil (dry)	16.99	17.84	17.65
Moisture Content	69.3%	64.8%	60.9%
Liquid Limit	67	65	63
Liquid Limit	65		

#### Plastic Limit

Pan ID	82	74
Pan Weight	4.23	4.25
Pan + Soil (wet)	14.30	14.52
Pan + Soil (dry)	12.65	12.83
Moisture Content	19.6%	19.7%
Plastic Limit	20	
Plastic Index	45	

### USCS Classification: ASTM D 2487

Group Symbol SC

Group Name Clayey SAND

## Grain Size Distribution Calculations

Green Ridge, Cumberland Landfill

DAA# 18020117-030102

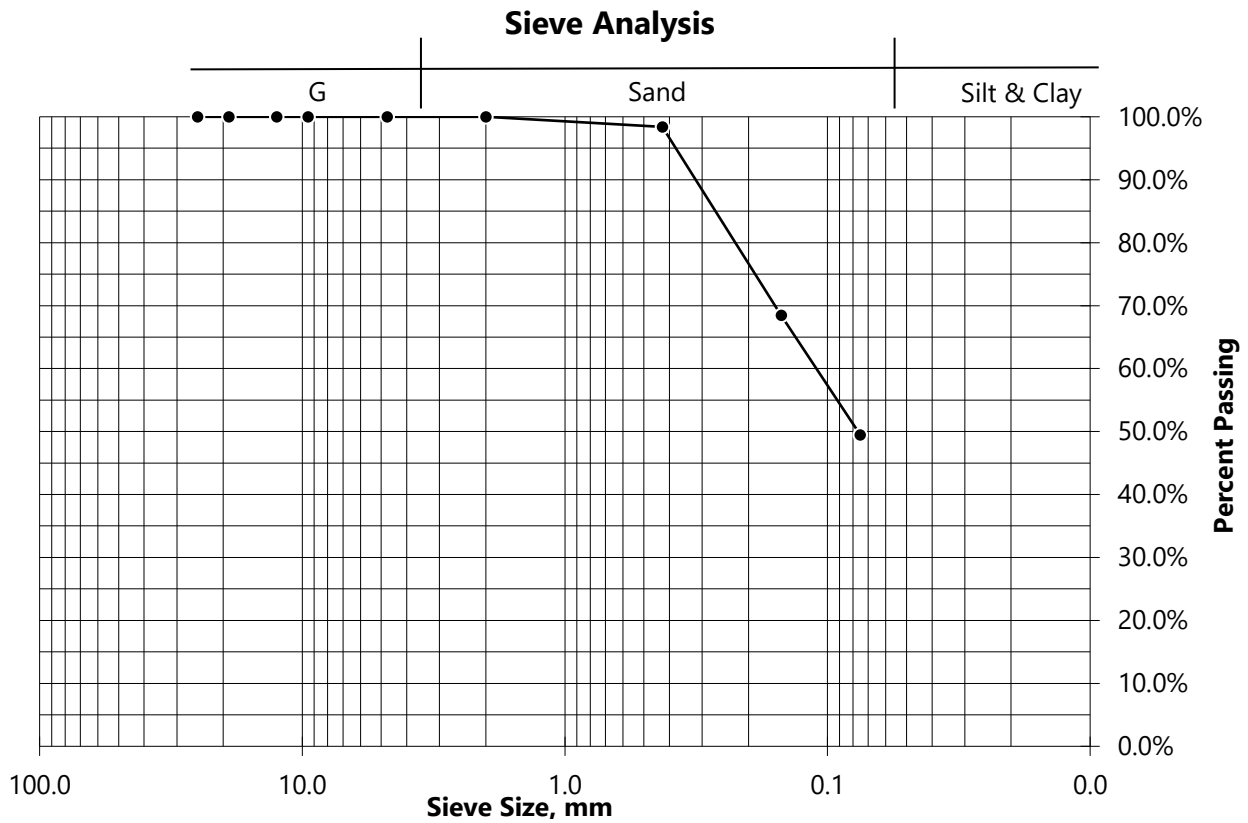
Prepared By: CBW

Sample ID DAA-34

Sample Depth 2'-4'

### Mechanical Sieve Analysis: ASTM D 422

Sieve Size	Weight Retained	Percent Retained	Sieve Size, mm	Percent Passing
1"	0.00	0.0%	25.0	100.0%
3/4"	0.00	0.0%	19.0	100.0%
1/2"	0.00	0.0%	12.5	100.0%
3/8"	0.00	0.0%	9.50	100.0%
No. 4	0.00	0.0%	4.75	100.0%
No. 10	0.00	0.0%	2.00	100.0%
No. 40	1.31	1.6%	0.425	98.4%
No. 100	24.37	30.0%	0.15	68.4%
No. 200	15.43	19.0%	0.075	49.5%
Pan	0.37	0.5%		
Total	41.48	51.0%		



## Soil Classification Calculations

Green Ridge, Cumberland Landfill

DAA# 18020117-030102

Prepared By: CBW



1030 Wilmer Ave., Ste. 100

Richmond, VA 23227

Army Corps of Engineers Certified Laboratory

Sample ID DAA-34

Sample Depth 6'-8'

Visual Sample Description Light Brown Clayey SAND

Sample Received: 4/15/2019

Date Tested: 4/15/2019

### Natural Moisture Content: ASTM D 2216

Pan ID	39
Pan Wt	193.09 grams
Pan + Soil (wet)	295.84 grams
Pan + Soil (dry)	286.39 grams
Natural Moisture Content	10.1%

### Coarse or Fine Grained: ASTM D 422

Pan + Soil retained on No. 200 sieve

(dry) 270.19 grams

Percent Passing No. 200 Sieve 17.4%

Pan + Soil retained on No. 4 sieve

(dry) 193.34 grams

Percent Passing No. 4 Sieve 99.7%

Soil Classifies as Coarse-Grained Soil

### Atterberg Limits: ASTM D 4318

Date Tested: 5/29/2019

#### Liquid Limit

No of Blows	19	24	34
Pan ID	705	710	711
Pan Wt	11.53	11.49	11.55
Pan + Soil (wet)	16.80	16.03	16.39
Pan + Soil (dry)	15.34	14.85	15.22
Moisture Content	38.2%	35.1%	31.8%
Liquid Limit	37	35	33
Liquid Limit	35		

#### Plastic Limit

Pan ID	26	122
Pan Weight	2.41	2.42
Pan + Soil (wet)	9.25	11.34
Pan + Soil (dry)	8.15	9.90
Moisture Content	19.2%	19.3%
Plastic Limit	19	
Plastic Index	16	

### USCS Classification: ASTM D 2487

Group Symbol SC

Group Name Clayey SAND

## Grain Size Distribution Calculations

Green Ridge, Cumberland Landfill

DAA# 18020117-030102

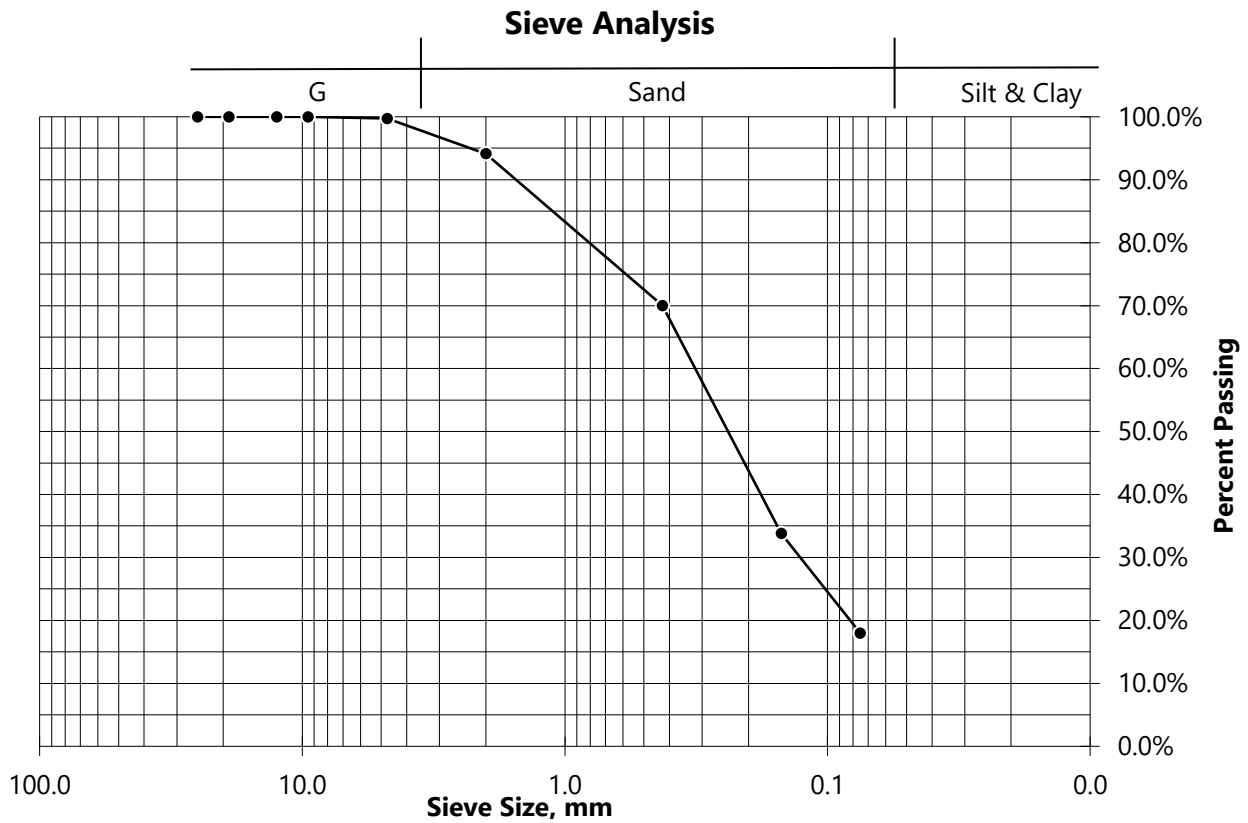
Prepared By: CBW

Sample ID DAA-34

Sample Depth 6'-8'

### Mechanical Sieve Analysis: ASTM D 422

Sieve Size	Weight Retained	Percent Retained	Sieve Size, mm	Percent Passing
1"	0.00	0.0%	25.0	100.0%
3/4"	0.00	0.0%	19.0	100.0%
1/2"	0.00	0.0%	12.5	100.0%
3/8"	0.00	0.0%	9.50	100.0%
No. 4	0.25	0.3%	4.75	99.7%
No. 10	5.23	5.6%	2.00	94.1%
No. 40	22.50	24.1%	0.425	70.0%
No. 100	33.77	36.2%	0.15	33.8%
No. 200	14.78	15.8%	0.075	18.0%
Pan	0.54	0.6%		
Total	77.07	82.6%		



## Soil Classification Calculations

Green Ridge, Cumberland Landfill

DAA# 18020117-030102

Prepared By: CBW



1030 Wilmer Ave., Ste. 100

Richmond, VA 23227

Army Corps of Engineers Certified Laboratory

Sample ID DAA-33

Sample Depth 20'-22'

Visual Sample Description Light Brown Silty SAND

Sample Received: 4/15/2019

Date Tested: 4/15/2019

### Natural Moisture Content: ASTM D 2216

Pan ID	4
Pan Wt	194.52 grams
Pan + Soil (wet)	307.70 grams
Pan + Soil (dry)	289.46 grams
Natural Moisture Content	19.2%

### Coarse or Fine Grained: ASTM D 422

Pan + Soil retained on No. 200 sieve

(dry) 262.04 grams

Percent Passing No. 200 Sieve 28.9%

Pan + Soil retained on No. 4 sieve

(dry) 194.52 grams

Percent Passing No. 4 Sieve 100.0%

Soil Classifies as Coarse-Grained Soil

### Atterberg Limits: ASTM D 4318

Date Tested: 5/29/2019

#### Liquid Limit

No of Blows			
Pan ID		Non-plastic	
Pan Wt			
Pan + Soil (wet)			
Pan + Soil (dry)			
Moisture Content			
Liquid Limit			
Liquid Limit			

#### Plastic Limit

Pan ID		
Pan Weight	Non-plastic	
Pan + Soil (wet)		
Pan + Soil (dry)		
Moisture Content		
Plastic Limit		
Plastic Index		

### USCS Classification: ASTM D 2487

Group Symbol **SM**

Group Name **Silty SAND**

## Grain Size Distribution Calculations

Green Ridge, Cumberland Landfill

DAA# 18020117-030102

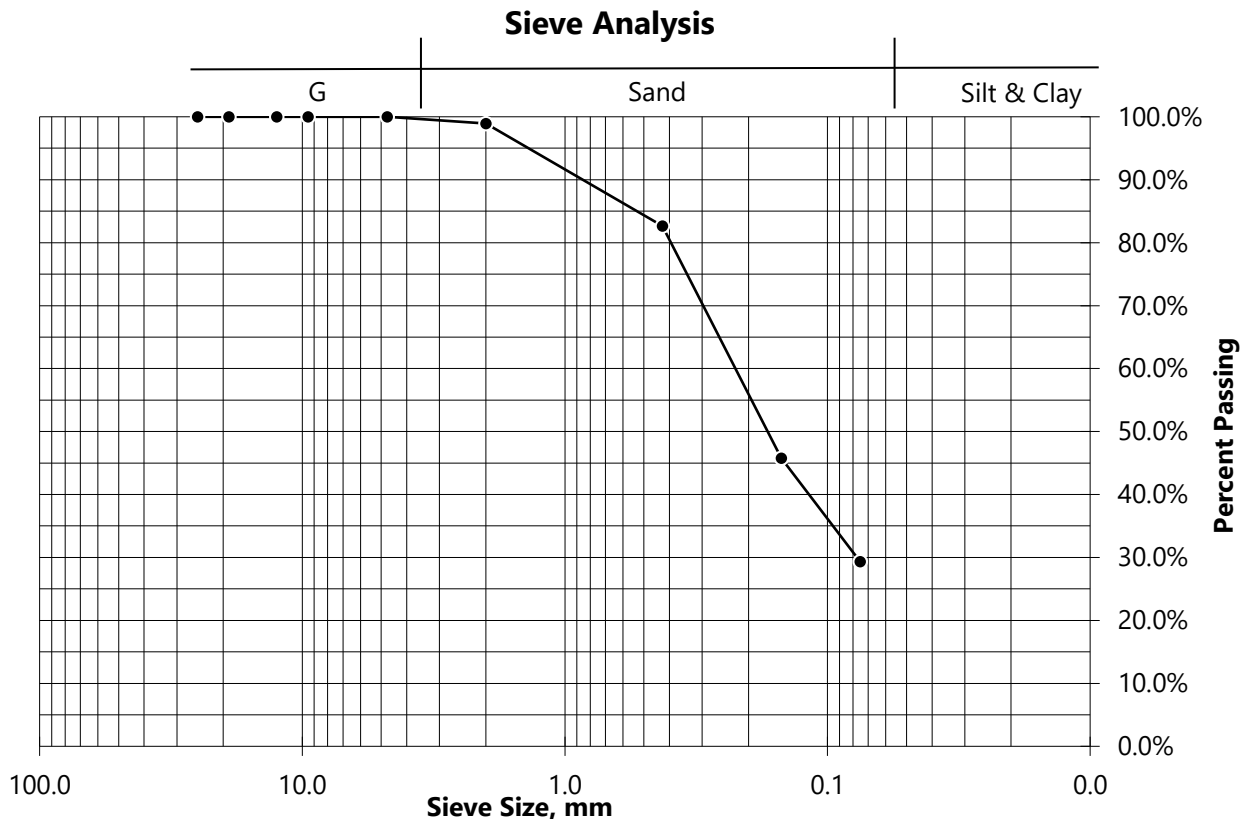
Prepared By: CBW

Sample ID DAA-33

Sample Depth 20'-22'

### Mechanical Sieve Analysis: ASTM D 422

Sieve Size	Weight Retained	Percent Retained	Sieve Size, mm	Percent Passing
1"	0.00	0.0%	25.0	100.0%
3/4"	0.00	0.0%	19.0	100.0%
1/2"	0.00	0.0%	12.5	100.0%
3/8"	0.00	0.0%	9.50	100.0%
No. 4	0.00	0.0%	4.75	100.0%
No. 10	1.01	1.1%	2.00	98.9%
No. 40	15.46	16.3%	0.425	82.7%
No. 100	35.01	36.9%	0.15	45.8%
No. 200	15.64	16.5%	0.075	29.3%
Pan	0.40	0.4%		
Total	67.52	71.1%		



## Soil Classification Calculations

Green Ridge, Cumberland Landfill

DAA# 18020117-030102

Prepared By: CBW



1030 Wilmer Ave., Ste. 100

Richmond, VA 23227

Army Corps of Engineers Certified Laboratory

Sample ID DAA-35

Sample Depth 2'-4'

Visual Sample Description Red Sandy Lean CLAY

Sample Received: 4/15/2019

Date Tested: 4/15/2019

### Natural Moisture Content: ASTM D 2216

Pan ID	10
Pan Wt	184.07 grams
Pan + Soil (wet)	299.66 grams
Pan + Soil (dry)	279.65 grams
Natural Moisture Content	20.9%

### Coarse or Fine Grained: ASTM D 422

Pan + Soil retained on No. 200 sieve

(dry) 224.48 grams

Percent Passing No. 200 Sieve 57.7%

Pan + Soil retained on No. 4 sieve

(dry) 184.07 grams

Percent Passing No. 4 Sieve 100.0%

Soil Classifies as Fine-Grained Soil

### Atterberg Limits: ASTM D 4318

Date Tested: 6/4/2019

#### Liquid Limit

No of Blows	16	27	35
Pan ID	108	169	201
Pan Wt	33.14	27.12	27.64
Pan + Soil (wet)	43.65	40.63	40.98
Pan + Soil (dry)	40.12	36.39	37.02
Moisture Content	50.6%	45.7%	42.2%
Liquid Limit	48	46	44
Liquid Limit	46		

#### Plastic Limit

Pan ID	313	352
Pan Weight	9.14	9.09
Pan + Soil (wet)	25.41	21.57
Pan + Soil (dry)	22.33	19.26
Moisture Content	23.4%	22.7%
Plastic Limit	23	
Plastic Index	23	

### USCS Classification: ASTM D 2487

Group Symbol **CL**

Group Name **Sandy Lean CLAY**



## Grain Size Distribution Calculations

Green Ridge, Cumberland Landfill

DAA# 18020117-030102

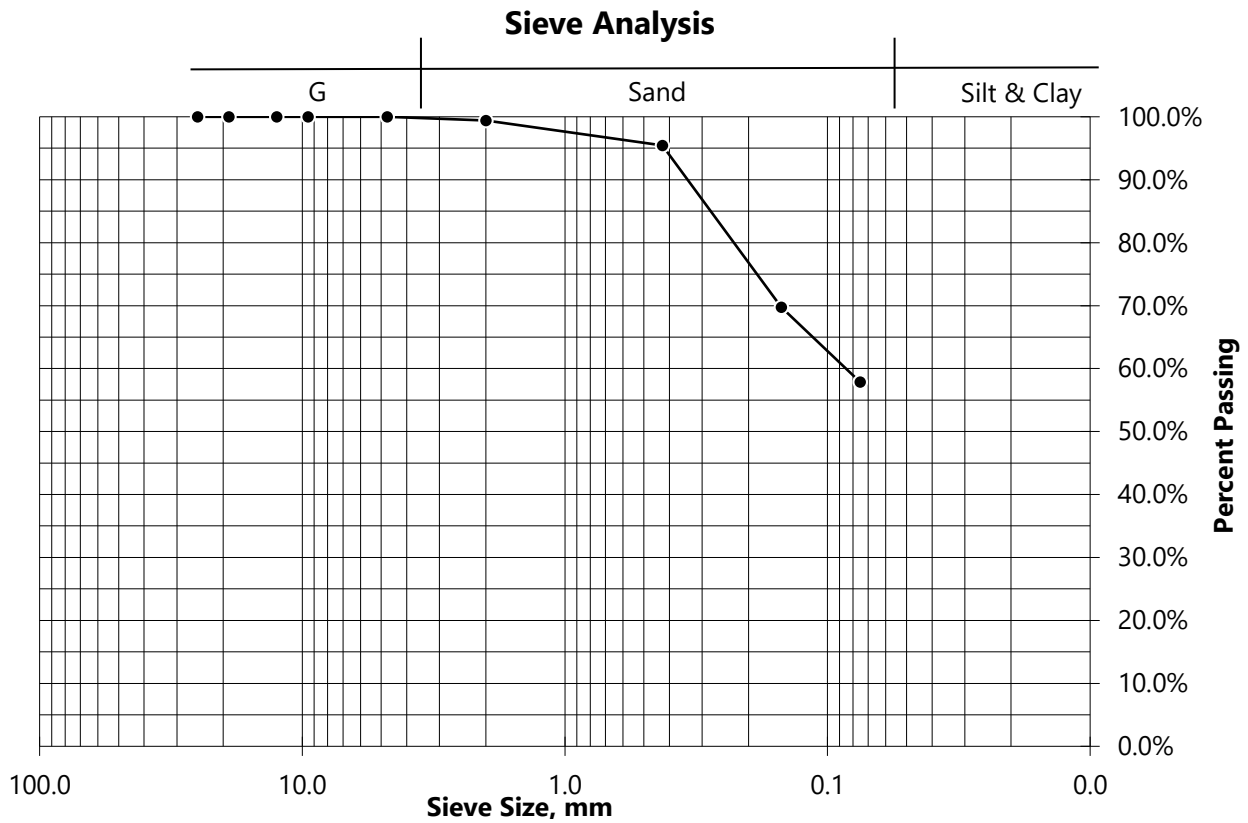
Prepared By: CBW

Sample ID DAA-35

Sample Depth 2'-4'

### Mechanical Sieve Analysis: ASTM D 422

Sieve Size	Weight Retained	Percent Retained	Sieve Size, mm	Percent Passing
1"	0.00	0.0%	25.0	100.0%
3/4"	0.00	0.0%	19.0	100.0%
1/2"	0.00	0.0%	12.5	100.0%
3/8"	0.00	0.0%	9.50	100.0%
No. 4	0.00	0.0%	4.75	100.0%
No. 10	0.58	0.6%	2.00	99.4%
No. 40	3.78	4.0%	0.425	95.4%
No. 100	24.54	25.7%	0.15	69.8%
No. 200	11.40	11.9%	0.075	57.8%
Pan	0.10	0.1%		
Total	40.40	42.3%		



## Soil Classification Calculations

Green Ridge, Cumberland Landfill

DAA# 18020117-030102

Prepared By: CBW



1030 Wilmer Ave., Ste. 100

Richmond, VA 23227

Army Corps of Engineers Certified Laboratory

Sample ID DAA-35

Sample Depth 4'-6'

Visual Sample Description Red Clayey SAND

Sample Received: 4/15/2019

Date Tested: 4/15/2019

### Natural Moisture Content: ASTM D 2216

Pan ID	17
Pan Wt	188.69 grams
Pan + Soil (wet)	313.98 grams
Pan + Soil (dry)	278.70 grams
Natural Moisture Content	39.2%

### Coarse or Fine Grained: ASTM D 422

Pan + Soil retained on No. 200 sieve

(dry) 241.47 grams

Percent Passing No. 200 Sieve 41.4%

Pan + Soil retained on No. 4 sieve

(dry) 189.64 grams

Percent Passing No. 4 Sieve 98.9%

Soil Classifies as Coarse-Grained Soil

### Atterberg Limits: ASTM D 4318

Date Tested: 5/20/2019

#### Liquid Limit

No of Blows	16	22	34
Pan ID	6	10	69
Pan Wt	11.21	11.24	10.96
Pan + Soil (wet)	22.60	22.30	22.56
Pan + Soil (dry)	17.88	17.91	18.18
Moisture Content	70.7%	65.8%	60.7%
Liquid Limit	67	65	63
Liquid Limit	65		

#### Plastic Limit

Pan ID	33	52
Pan Weight	2.44	2.42
Pan + Soil (wet)	12.28	13.01
Pan + Soil (dry)	10.03	10.60
Moisture Content	29.6%	29.5%
Plastic Limit	30	
Plastic Index	35	

### USCS Classification: ASTM D 2487

Group Symbol SC

Group Name Clayey SAND

## Grain Size Distribution Calculations

Green Ridge, Cumberland Landfill

DAA# 18020117-030102

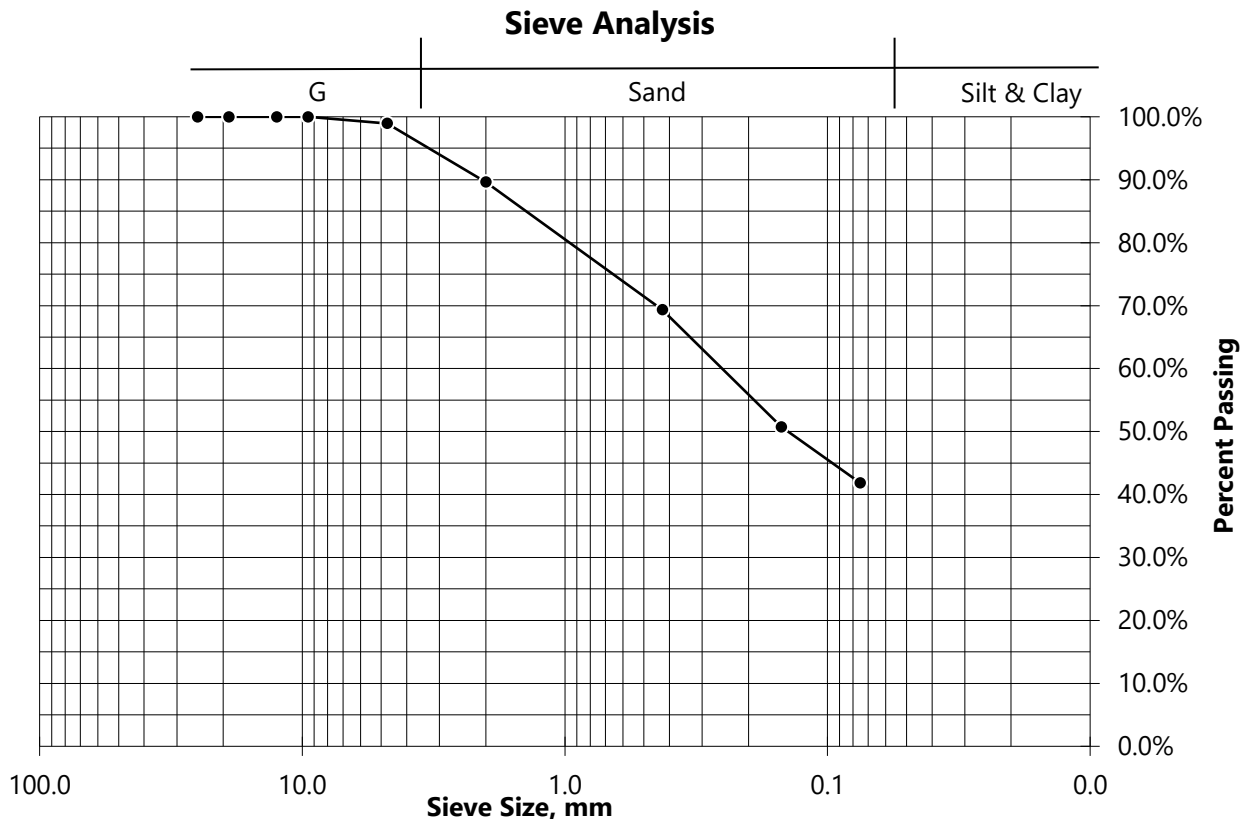
Prepared By: CBW

Sample ID DAA-35

Sample Depth 4'-6'

### Mechanical Sieve Analysis: ASTM D 422

Sieve Size	Weight Retained	Percent Retained	Sieve Size, mm	Percent Passing
1"	0.00	0.0%	25.0	100.0%
3/4"	0.00	0.0%	19.0	100.0%
1/2"	0.00	0.0%	12.5	100.0%
3/8"	0.00	0.0%	9.50	100.0%
No. 4	0.95	1.1%	4.75	98.9%
No. 10	8.39	9.3%	2.00	89.6%
No. 40	18.25	20.3%	0.425	69.3%
No. 100	16.74	18.6%	0.15	50.7%
No. 200	8.03	8.9%	0.075	41.8%
Pan	0.41	0.5%		
Total	52.77	58.6%		



## Soil Classification Calculations

Green Ridge, Cumberland Landfill

DAA# 18020117-030102

Prepared By: CBW



1030 Wilmer Ave., Ste. 100

Richmond, VA 23227

Army Corps of Engineers Certified Laboratory

Sample ID DAA-35

Sample Depth 6'-8'

Visual Sample Description Reddish-brown Silty SAND

Sample Received: 4/15/2019

Date Tested: 4/15/2019

### Natural Moisture Content: ASTM D 2216

Pan ID	30
Pan Wt	193.23 grams
Pan + Soil (wet)	330.76 grams
Pan + Soil (dry)	298.94 grams
Natural Moisture Content	30.1%

### Coarse or Fine Grained: ASTM D 422

Pan + Soil retained on No. 200 sieve

(dry) 257.27 grams

Percent Passing No. 200 Sieve 39.4%

Pan + Soil retained on No. 4 sieve

(dry) 193.23 grams

Percent Passing No. 4 Sieve 100.0%

Soil Classifies as Coarse-Grained Soil

### Atterberg Limits: ASTM D 4318

Date Tested: 5/9/2019

#### Liquid Limit

No of Blows	17	22	31
Pan ID	93	103	2000
Pan Wt	30.12	27.36	25.68
Pan + Soil (wet)	40.59	37.49	36.47
Pan + Soil (dry)	36.90	34.06	33.02
Moisture Content	54.5%	51.2%	47.0%
Liquid Limit	52	50	48
Liquid Limit	50		

#### Plastic Limit

Pan ID	19	22
Pan Weight	4.38	4.31
Pan + Soil (wet)	14.59	14.41
Pan + Soil (dry)	11.74	11.58
Moisture Content	38.7%	38.9%
Plastic Limit	39	
Plastic Index	11	

### USCS Classification: ASTM D 2487

Group Symbol **SM**

Group Name **Silty SAND**

## Grain Size Distribution Calculations

Green Ridge, Cumberland Landfill

DAA# 18020117-030102

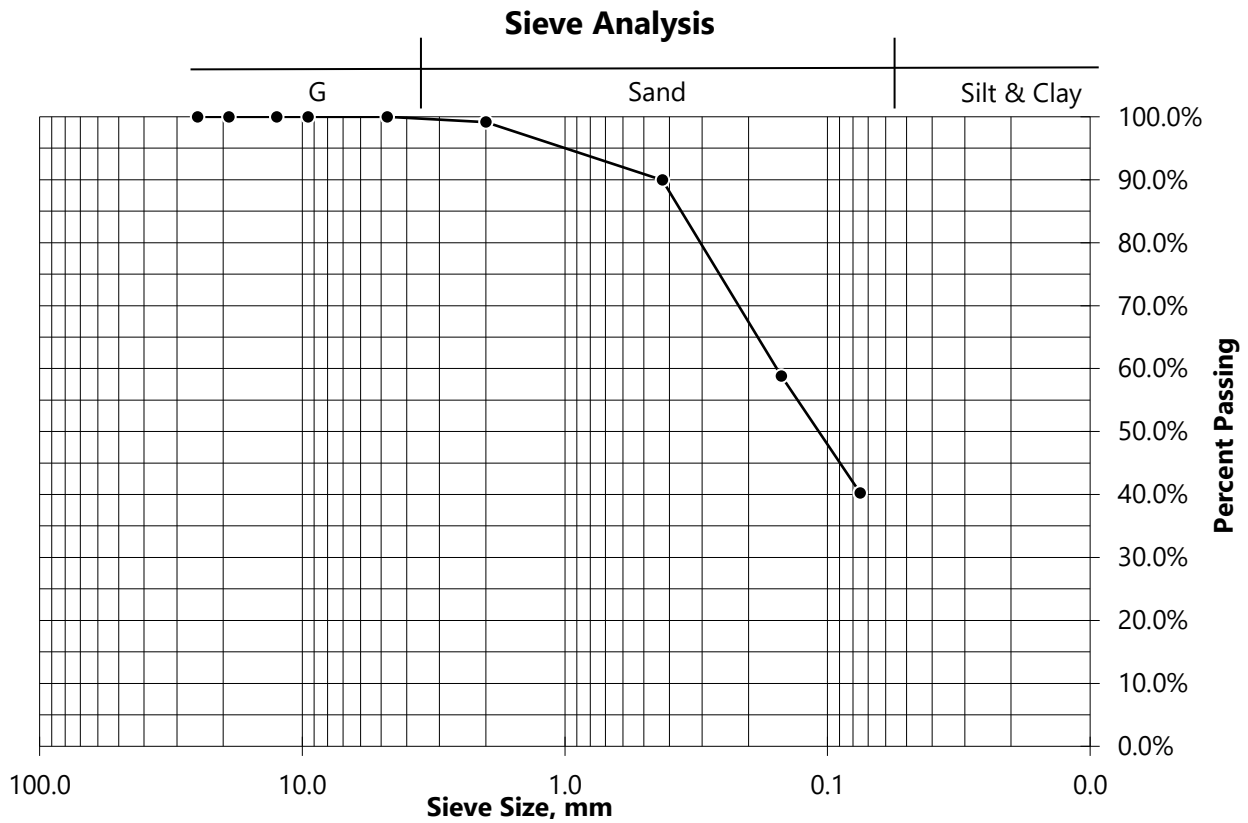
Prepared By: CBW

Sample ID DAA-35

Sample Depth 6'-8'

### Mechanical Sieve Analysis: ASTM D 422

Sieve Size	Weight Retained	Percent Retained	Sieve Size, mm	Percent Passing
1"	0.00	0.0%	25.0	100.0%
3/4"	0.00	0.0%	19.0	100.0%
1/2"	0.00	0.0%	12.5	100.0%
3/8"	0.00	0.0%	9.50	100.0%
No. 4	0.00	0.0%	4.75	100.0%
No. 10	0.88	0.8%	2.00	99.2%
No. 40	9.74	9.2%	0.425	90.0%
No. 100	32.89	31.1%	0.15	58.8%
No. 200	19.68	18.6%	0.075	40.2%
Pan	0.85	0.8%		
Total	64.04	60.6%		



## Soil Classification Calculations

Green Ridge, Cumberland Landfill

DAA# 18020117-030102

Prepared By: CBW



1030 Wilmer Ave., Ste. 100

Richmond, VA 23227

Army Corps of Engineers Certified Laboratory

Sample ID DAA-36

Sample Depth 4'-6'

Visual Sample Description Reddish-brown Silty SAND

Sample Received: 4/15/2019

Date Tested: 4/15/2019

### Natural Moisture Content: ASTM D 2216

Pan ID	20
Pan Wt	190.00 grams
Pan + Soil (wet)	295.89 grams
Pan + Soil (dry)	268.23 grams
Natural Moisture Content	35.4%

### Coarse or Fine Grained: ASTM D 422

Pan + Soil retained on No. 200 sieve

(dry) 236.40 grams

Percent Passing No. 200 Sieve 40.7%

Pan + Soil retained on No. 4 sieve

(dry) 190.00 grams

Percent Passing No. 4 Sieve 100.0%

Soil Classifies as Coarse-Grained Soil

### Atterberg Limits: ASTM D 4318

Date Tested: 5/31/2019

#### Liquid Limit

No of Blows	18	23	32
Pan ID	72	70	64
Pan Wt	11.01	10.95	10.97
Pan + Soil (wet)	22.28	22.70	20.56
Pan + Soil (dry)	17.49	17.87	16.78
Moisture Content	73.9%	69.8%	65.0%
Liquid Limit	71	69	67
Liquid Limit	69		

#### Plastic Limit

Pan ID	75	82
Pan Weight	4.24	4.23
Pan + Soil (wet)	15.88	14.90
Pan + Soil (dry)	11.91	11.27
Moisture Content	51.7%	51.6%
Plastic Limit	52	
Plastic Index	17	

### USCS Classification: ASTM D 2487

Group Symbol **SM**

Group Name **Silty SAND**

## Grain Size Distribution Calculations

Green Ridge, Cumberland Landfill

DAA# 18020117-030102

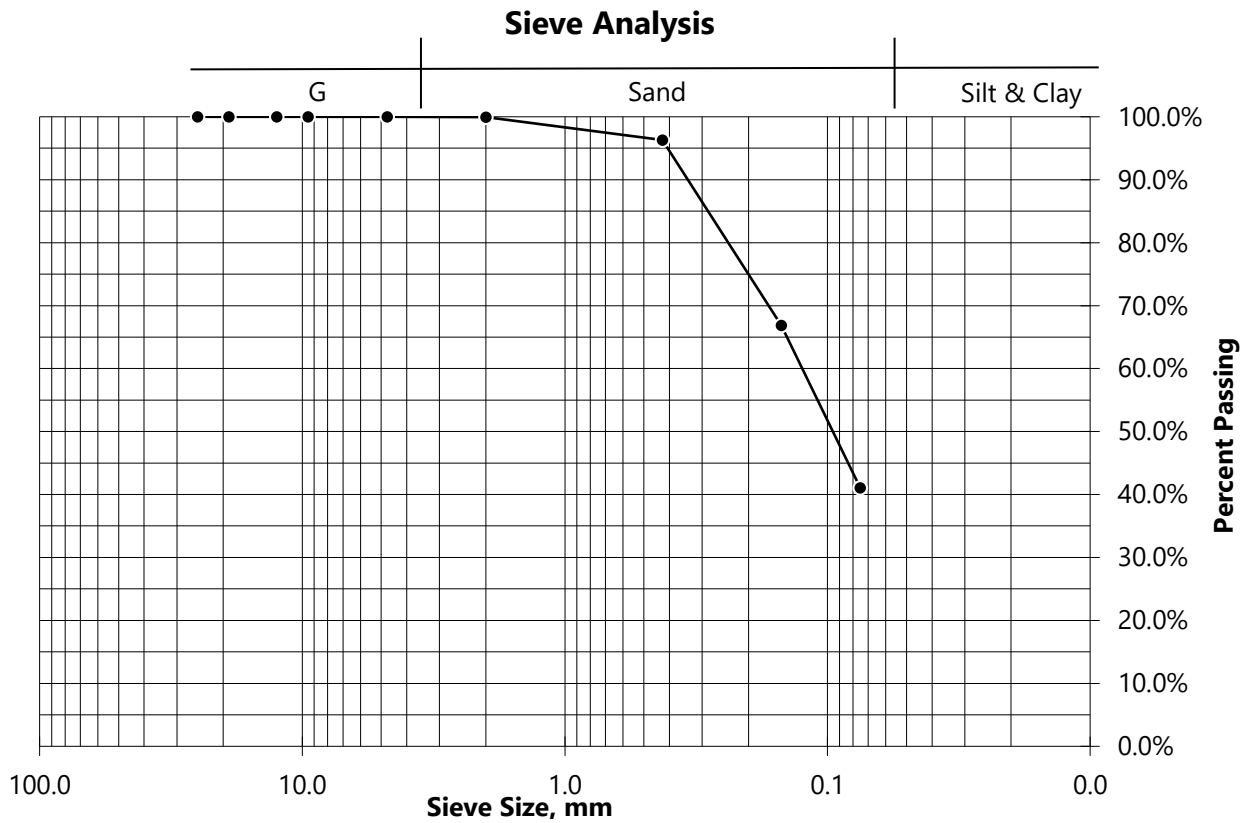
Prepared By: CBW

Sample ID DAA-36

Sample Depth 4'-6'

### Mechanical Sieve Analysis: ASTM D 422

Sieve Size	Weight Retained	Percent Retained	Sieve Size, mm	Percent Passing
1"	0.00	0.0%	25.0	100.0%
3/4"	0.00	0.0%	19.0	100.0%
1/2"	0.00	0.0%	12.5	100.0%
3/8"	0.00	0.0%	9.50	100.0%
No. 4	0.00	0.0%	4.75	100.0%
No. 10	0.06	0.1%	2.00	99.9%
No. 40	2.84	3.6%	0.425	96.3%
No. 100	23.02	29.4%	0.15	66.9%
No. 200	20.21	25.8%	0.075	41.0%
Pan	0.21	0.3%		
Total	46.34	59.2%		





## Soil Classification Calculations

Green Ridge, Cumberland Landfill

DAA# 18020117-030102

Prepared By: CBW



1030 Wilmer Ave., Ste. 100

Richmond, VA 23227

Army Corps of Engineers Certified Laboratory

Sample ID DAA-36

Sample Depth 6'-8'

Visual Sample Description Light Brown Silty SAND

Sample Received: 4/15/2019

Date Tested: 4/15/2019

### Natural Moisture Content: ASTM D 2216

Pan ID	122
Pan Wt	123.35 grams
Pan + Soil (wet)	240.36 grams
Pan + Soil (dry)	207.93 grams
Natural Moisture Content	38.3%

### Coarse or Fine Grained: ASTM D 422

Pan + Soil retained on No. 200 sieve

(dry) 167.12 grams

Percent Passing No. 200 Sieve 48.3%

Pan + Soil retained on No. 4 sieve

(dry) 123.35 grams

Percent Passing No. 4 Sieve 100.0%

Soil Classifies as Coarse-Grained Soil

### Atterberg Limits: ASTM D 4318

Date Tested: 6/3/2019

#### Liquid Limit

No of Blows	15	25	34
Pan ID	97	105	108
Pan Wt	26.03	29.25	33.13
Pan + Soil (wet)	35.05	45.44	49.58
Pan + Soil (dry)	31.68	39.77	44.09
Moisture Content	59.6%	53.9%	50.1%
Liquid Limit	56	54	52
Liquid Limit	54		

#### Plastic Limit

Pan ID	75	78
Pan Weight	4.25	4.22
Pan + Soil (wet)	13.42	13.09
Pan + Soil (dry)	11.10	10.83
Moisture Content	33.9%	34.2%
Plastic Limit	34	
Plastic Index	20	

### USCS Classification: ASTM D 2487

Group Symbol **SM**

Group Name **Silty SAND**

## Grain Size Distribution Calculations

Green Ridge, Cumberland Landfill

DAA# 18020117-030102

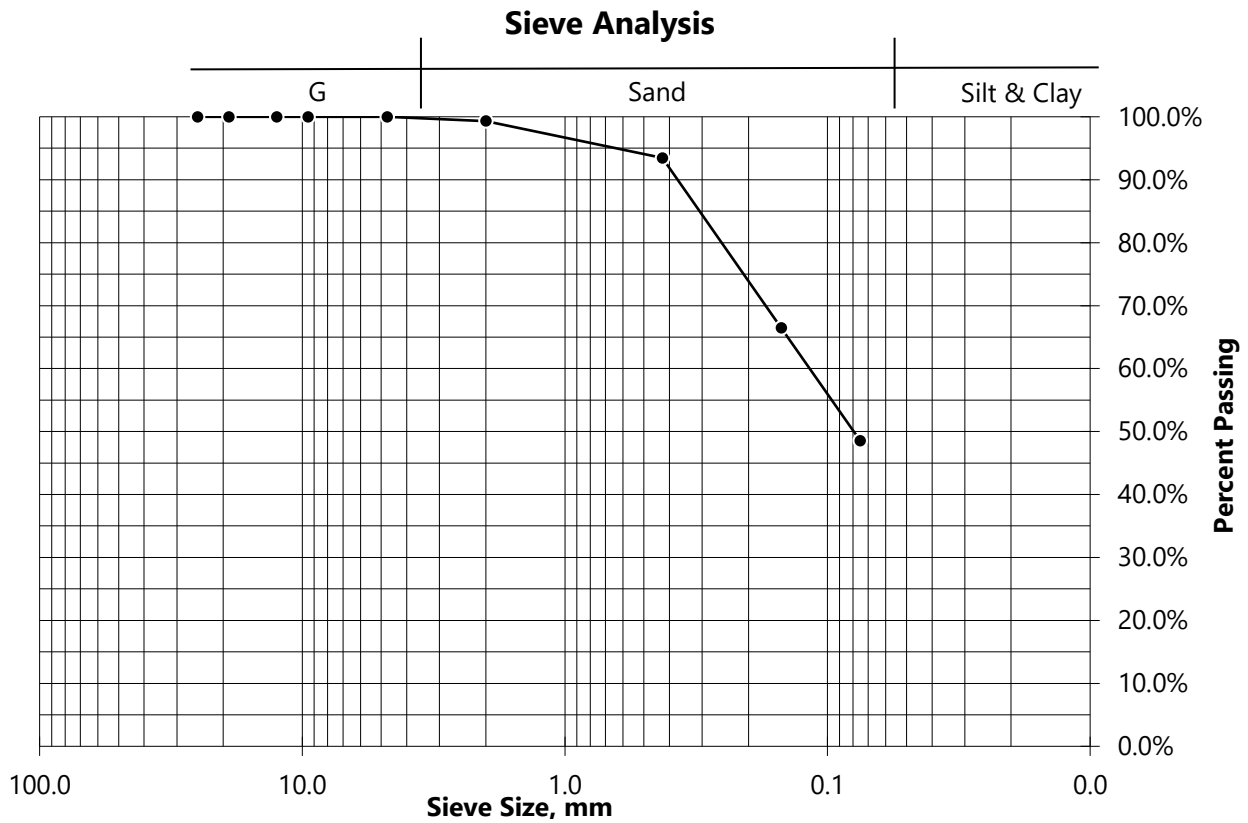
Prepared By: CBW

Sample ID DAA-36

Sample Depth 6'-8'

### Mechanical Sieve Analysis: ASTM D 422

Sieve Size	Weight Retained	Percent Retained	Sieve Size, mm	Percent Passing
1"	0.00	0.0%	25.0	100.0%
3/4"	0.00	0.0%	19.0	100.0%
1/2"	0.00	0.0%	12.5	100.0%
3/8"	0.00	0.0%	9.50	100.0%
No. 4	0.00	0.0%	4.75	100.0%
No. 10	0.58	0.7%	2.00	99.3%
No. 40	4.94	5.8%	0.425	93.5%
No. 100	22.85	27.0%	0.15	66.5%
No. 200	15.17	17.9%	0.075	48.5%
Pan	0.23	0.3%		
Total	43.77	51.7%		



## Soil Classification Calculations

Green Ridge, Cumberland Landfill

DAA# 18020117-030102

Prepared By: CBW



1030 Wilmer Ave., Ste. 100

Richmond, VA 23227

Army Corps of Engineers Certified Laboratory

Sample ID DAA-36

Sample Depth 22'-24'

Visual Sample Description Light Brown Silty SAND

Sample Received: 4/15/2019

Date Tested: 4/15/2019

### Natural Moisture Content: ASTM D 2216

Pan ID	27
Pan Wt	193.73 grams
Pan + Soil (wet)	364.00 grams
Pan + Soil (dry)	322.86 grams
Natural Moisture Content	31.9%

### Coarse or Fine Grained: ASTM D 422

Pan + Soil retained on No. 200 sieve

(dry) 287.74 grams

Percent Passing No. 200 Sieve 27.2%

Pan + Soil retained on No. 4 sieve

(dry) 194.53 grams

Percent Passing No. 4 Sieve 99.4%

Soil Classifies as Coarse-Grained Soil

### Atterberg Limits: ASTM D 4318

Date Tested: 5/31/2019

#### Liquid Limit

No of Blows	16	24	33
Pan ID	97	7	108
Pan Wt	26.03	11.18	33.13
Pan + Soil (wet)	31.71	23.16	44.41
Pan + Soil (dry)	29.88	19.54	41.21
Moisture Content	47.5%	43.3%	39.6%
Liquid Limit	45	43	41
Liquid Limit	43		

#### Plastic Limit

Pan ID	19	73
Pan Weight	4.37	4.24
Pan + Soil (wet)	16.38	16.92
Pan + Soil (dry)	13.68	14.08
Moisture Content	29.0%	28.9%
Plastic Limit	29	
Plastic Index	14	

### USCS Classification: ASTM D 2487

Group Symbol **SM**

Group Name **Silty SAND**

## Grain Size Distribution Calculations

Green Ridge, Cumberland Landfill

DAA# 18020117-030102

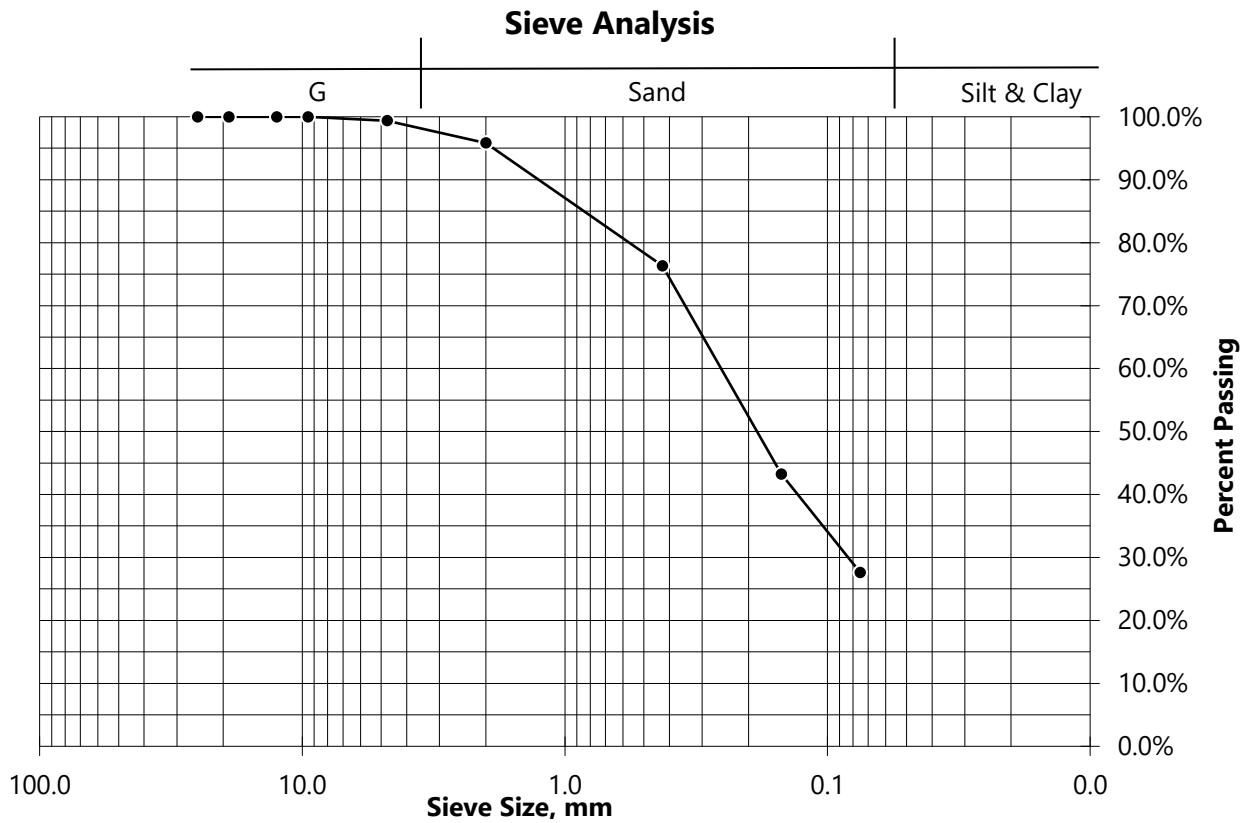
Prepared By: CBW

Sample ID DAA-36

Sample Depth 22'-24'

### Mechanical Sieve Analysis: ASTM D 422

Sieve Size	Weight Retained	Percent Retained	Sieve Size, mm	Percent Passing
1"	0.00	0.0%	25.0	100.0%
3/4"	0.00	0.0%	19.0	100.0%
1/2"	0.00	0.0%	12.5	100.0%
3/8"	0.00	0.0%	9.50	100.0%
No. 4	0.80	0.6%	4.75	99.4%
No. 10	4.57	3.5%	2.00	95.8%
No. 40	25.19	19.5%	0.425	76.3%
No. 100	42.70	33.1%	0.15	43.3%
No. 200	20.24	15.7%	0.075	27.6%
Pan	0.51	0.4%		
Total	94.01	72.8%		



## Soil Classification Calculations

Green Ridge, Cumberland Landfill

DAA# 18020117-030102

Prepared By: CBW



1030 Wilmer Ave., Ste. 100

Richmond, VA 23227

Army Corps of Engineers Certified Laboratory

Sample ID DAA-36

Sample Depth 35'-37'

Visual Sample Description Light Reddish-brown Silty SAND

Sample Received: 4/15/2019

Date Tested: 4/15/2019

### Natural Moisture Content: ASTM D 2216

Pan ID	34
Pan Wt	192.79 grams
Pan + Soil (wet)	314.64 grams
Pan + Soil (dry)	290.95 grams
Natural Moisture Content	24.1%

### Coarse or Fine Grained: ASTM D 422

Pan + Soil retained on No. 200 sieve

(dry) 259.87 grams

Percent Passing No. 200 Sieve 31.7%

Pan + Soil retained on No. 4 sieve

(dry) 192.79 grams

Percent Passing No. 4 Sieve 100.0%

Soil Classifies as Coarse-Grained Soil

### Atterberg Limits: ASTM D 4318

Date Tested: 6/3/2019

#### Liquid Limit

No of Blows	15	26	31
Pan ID	101	107	2000
Pan Wt	23.99	25.10	25.67
Pan + Soil (wet)	35.58	37.10	33.29
Pan + Soil (dry)	31.94	33.62	31.19
Moisture Content	45.7%	40.8%	38.0%
Liquid Limit	43	41	39
Liquid Limit	41		

#### Plastic Limit

Pan ID	354	356
Pan Weight	9.16	9.10
Pan + Soil (wet)	23.82	26.44
Pan + Soil (dry)	20.46	22.45
Moisture Content	29.7%	29.9%
Plastic Limit	30	
Plastic Index	11	

### USCS Classification: ASTM D 2487

Group Symbol **SM**

Group Name **Silty SAND**

## Grain Size Distribution Calculations

Green Ridge, Cumberland Landfill

DAA# 18020117-030102

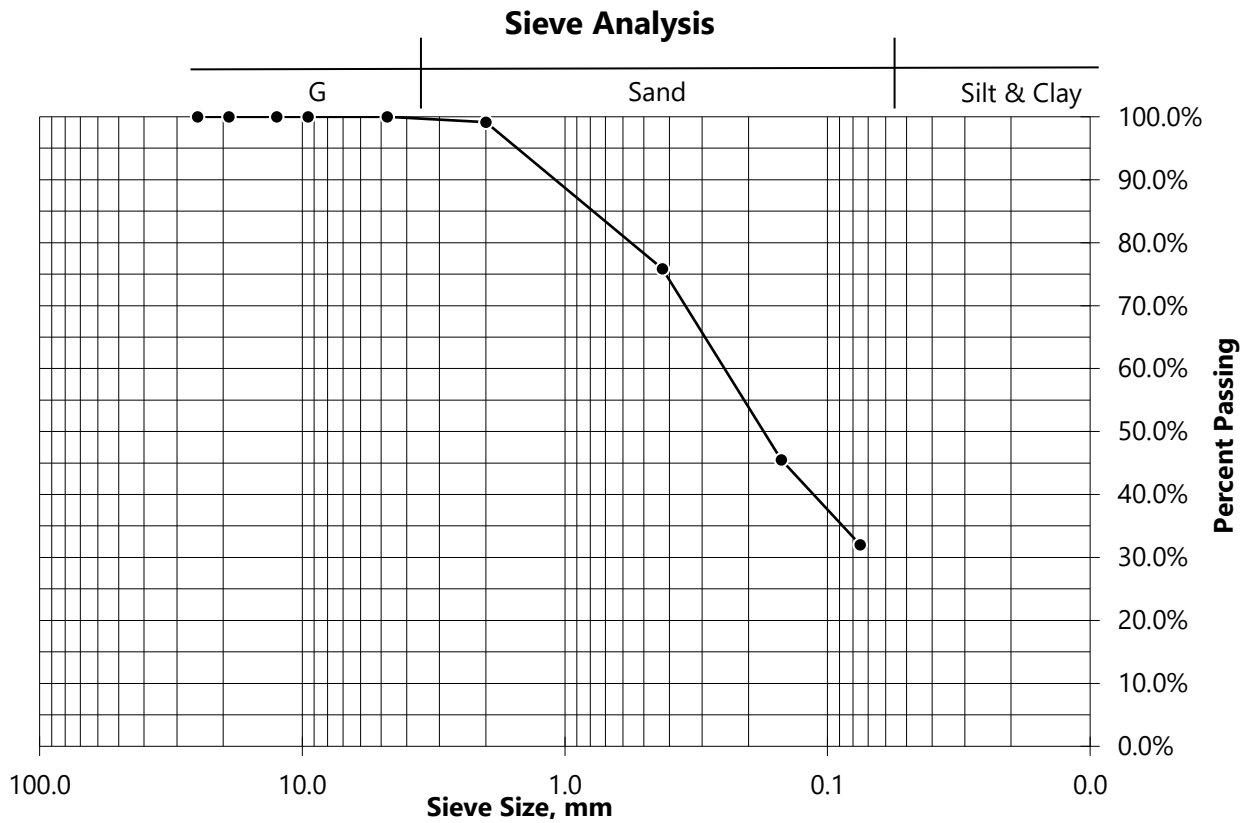
Prepared By: CBW

Sample ID DAA-36

Sample Depth 35'-37'

### Mechanical Sieve Analysis: ASTM D 422

Sieve Size	Weight Retained	Percent Retained	Sieve Size, mm	Percent Passing
1"	0.00	0.0%	25.0	100.0%
3/4"	0.00	0.0%	19.0	100.0%
1/2"	0.00	0.0%	12.5	100.0%
3/8"	0.00	0.0%	9.50	100.0%
No. 4	0.00	0.0%	4.75	100.0%
No. 10	0.85	0.9%	2.00	99.1%
No. 40	22.86	23.3%	0.425	75.8%
No. 100	29.78	30.3%	0.15	45.5%
No. 200	13.27	13.5%	0.075	32.0%
Pan	0.31	0.3%		
Total	67.07	68.3%		



## Soil Classification Calculations

Green Ridge, Cumberland Landfill

DAA# 18020117-030102

Prepared By: CBW



1030 Wilmer Ave., Ste. 100

Richmond, VA 23227

Army Corps of Engineers Certified Laboratory

Sample ID DAA-37

Sample Depth 4'-6'

Visual Sample Description Red Silty SAND

Sample Received: 4/15/2019

Date Tested: 4/17/2019

### Natural Moisture Content: ASTM D 2216

Pan ID	108
Pan Wt	125.54 grams
Pan + Soil (wet)	238.24 grams
Pan + Soil (dry)	215.11 grams
Natural Moisture Content	25.8%

### Coarse or Fine Grained: ASTM D 422

Pan + Soil retained on No. 200 sieve

(dry) 173.89 grams

Percent Passing No. 200 Sieve 46.0%

Pan + Soil retained on No. 4 sieve

(dry) 125.54 grams

Percent Passing No. 4 Sieve 100.0%

Soil Classifies as Coarse-Grained Soil

### Atterberg Limits: ASTM D 4318

Date Tested: 5/21/2019

#### Liquid Limit

No of Blows	16	26	34
Pan ID	10	71	69
Pan Wt	11.25	10.91	10.97
Pan + Soil (wet)	22.55	22.90	21.96
Pan + Soil (dry)	18.45	18.82	18.37
Moisture Content	57.0%	51.6%	48.5%
Liquid Limit	54	52	50
Liquid Limit	52		

#### Plastic Limit

Pan ID	353	315
Pan Weight	9.12	9.15
Pan + Soil (wet)	20.72	20.18
Pan + Soil (dry)	17.82	17.42
Moisture Content	33.3%	33.4%
Plastic Limit	33	
Plastic Index	19	

### USCS Classification: ASTM D 2487

Group Symbol **SM**

Group Name **Silty SAND**



## Grain Size Distribution Calculations

Green Ridge, Cumberland Landfill

DAA# 18020117-030102

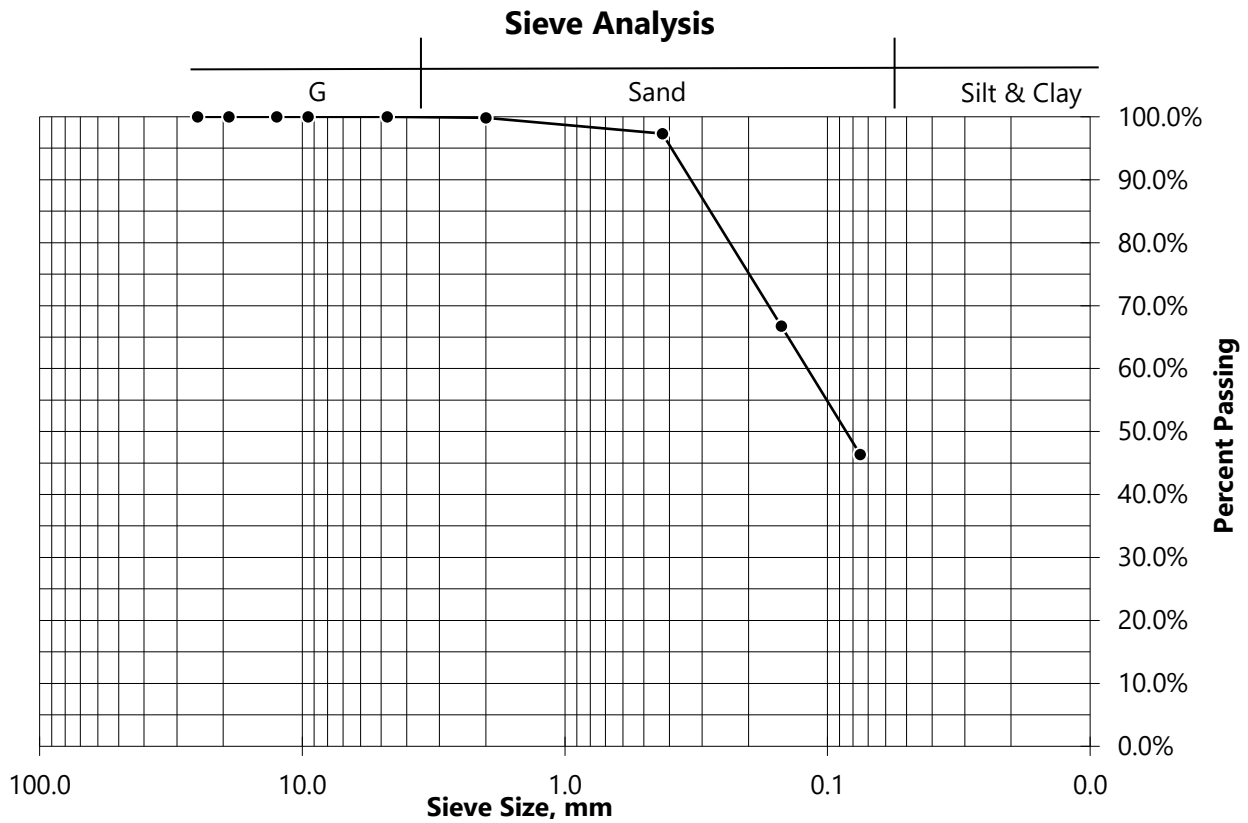
Prepared By: CBW

Sample ID DAA-37

Sample Depth 4'-6'

### Mechanical Sieve Analysis: ASTM D 422

Sieve Size	Weight Retained	Percent Retained	Sieve Size, mm	Percent Passing
1"	0.00	0.0%	25.0	100.0%
3/4"	0.00	0.0%	19.0	100.0%
1/2"	0.00	0.0%	12.5	100.0%
3/8"	0.00	0.0%	9.50	100.0%
No. 4	0.00	0.0%	4.75	100.0%
No. 10	0.16	0.2%	2.00	99.8%
No. 40	2.26	2.5%	0.425	97.3%
No. 100	27.35	30.5%	0.15	66.8%
No. 200	18.30	20.4%	0.075	46.3%
Pan	0.28	0.3%		
Total	48.35	54.0%		



## Soil Classification Calculations

### Cumberland Landfill

DAA# 18020117-030102

Prepared By: CBW



1030 Wilmer Ave., Ste. 100  
Richmond, VA 23227

Army Corps of Engineers Certified Laboratory

Sample ID DAA-40

Sample Depth 5'

Visual Sample Description Reddish-Brown Sandy Elastic SILT

Sample Received: 4/17/2019

Date Tested: 4/17/2019

### Natural Moisture Content: ASTM D 2216

Pan ID	24
Pan Wt	186.14 grams
Pan + Soil (wet)	295.88 grams
Pan + Soil (dry)	271.59 grams
Natural Moisture Content	28.4%

### Coarse or Fine Grained: ASTM D 422

Pan + Soil retained on No. 200 sieve

(dry) 228.52 grams

Percent Passing No. 200 Sieve 50.4%

Pan + Soil retained on No. 4 sieve

(dry) 186.94 grams

Percent Passing No. 4 Sieve 99.1%

Soil Classifies as Fine-Grained Soil

### Atterberg Limits: ASTM D 4318

Date Tested: 4/29/2019

#### Liquid Limit

No of Blows	19	26	31
Pan ID	6	72	9
Pan Wt	11.18	11.08	11.11
Pan + Soil (wet)	31.14	28.22	33.35
Pan + Soil (dry)	23.82	22.20	25.87
Moisture Content	57.9%	54.1%	50.7%
Liquid Limit	56	54	52
Liquid Limit	54		

#### Plastic Limit

Pan ID	18	73
Pan Weight	4.33	4.24
Pan + Soil (wet)	14.66	15.30
Pan + Soil (dry)	11.98	12.47
Moisture Content	35.0%	34.4%
Plastic Limit	35	
Plastic Index	19	

### USCS Classification: ASTM D 2487

Group Symbol MH

Group Name Sandy Elastic SILT

# Grain Size Distribution Calculations

Cumberland Landfill

DAA# 18020117-030102

Prepared By: CBW

Sample ID DAA-40

Sample Depth 5'

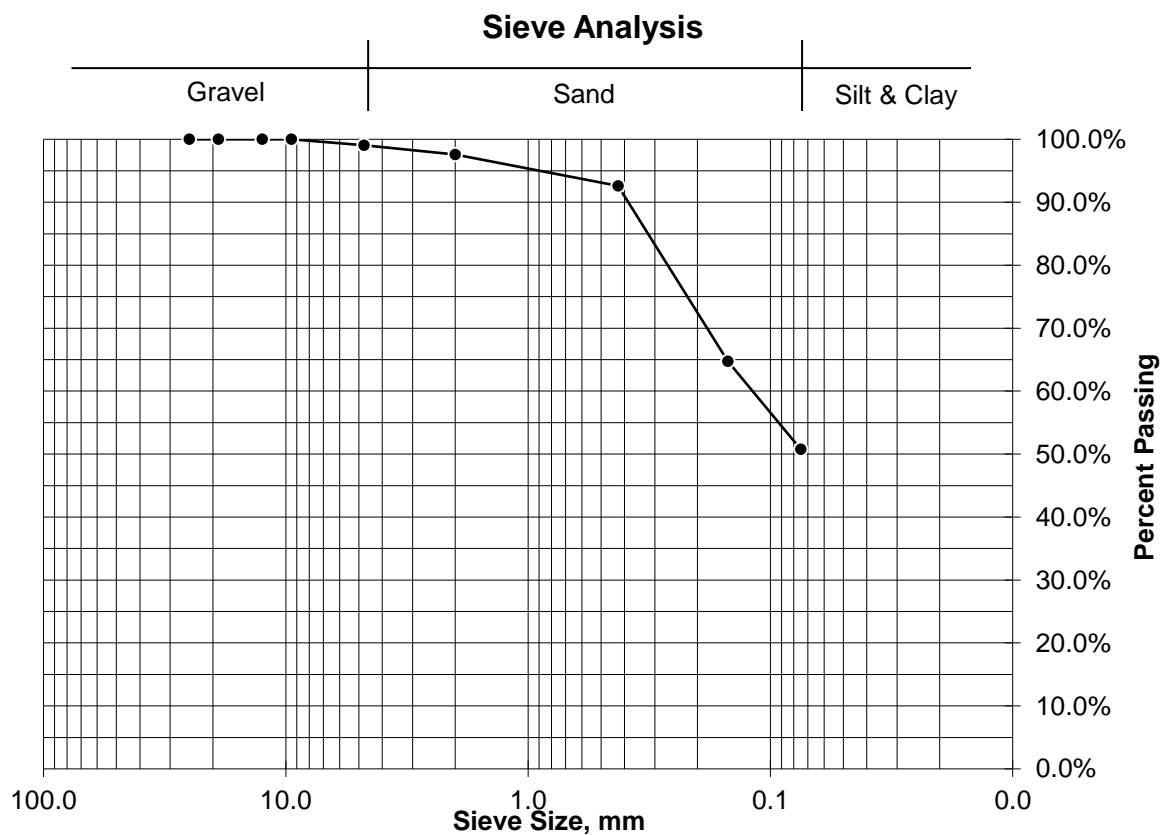
## Mechanical Sieve Analysis: ASTM D 422



1030 Wilmer Ave., Ste. 100  
Richmond, VA 23227

Army Corps of Engineers Certified Laboratory

Sieve Size	Weight Retained	Percent Retained	Sieve Size, mm	Percent Passing
1"	0.00	0.0%	25.0	100.0%
3/4"	0.00	0.0%	19.0	100.0%
1/2"	0.00	0.0%	12.5	100.0%
3/8"	0.00	0.0%	9.50	100.0%
No. 4	0.80	0.9%	4.75	99.1%
No. 10	1.28	1.5%	2.00	97.6%
No. 40	4.24	5.0%	0.425	92.6%
No. 100	23.80	27.9%	0.15	64.8%
No. 200	11.94	14.0%	0.075	50.8%
Pan	0.30	0.4%		
Total	42.36	49.6%		



## Soil Classification Calculations

Green Ridge, Cumberland Landfill

DAA# 18020117-030102

Prepared By: CBW



1030 Wilmer Ave., Ste. 100

Richmond, VA 23227

Army Corps of Engineers Certified Laboratory

Sample ID DAA-40

Sample Depth 10'

Visual Sample Description Reddish-brown Silty SAND

Sample Received: 4/15/2019

Date Tested: 4/22/2019

### Natural Moisture Content: ASTM D 2216

Pan ID	35
Pan Wt	192.68 grams
Pan + Soil (wet)	303.95 grams
Pan + Soil (dry)	285.48 grams
Natural Moisture Content	19.9%

### Coarse or Fine Grained: ASTM D 422

Pan + Soil retained on No. 200 sieve

(dry) 247.54 grams

Percent Passing No. 200 Sieve 40.9%

Pan + Soil retained on No. 4 sieve

(dry) 193.35 grams

Percent Passing No. 4 Sieve 99.3%

Soil Classifies as Coarse-Grained Soil

### Atterberg Limits: ASTM D 4318

Date Tested: 5/7/2019

#### Liquid Limit

No of Blows	16	29	30
Pan ID	101	64	107
Pan Wt	23.99	10.96	25.10
Pan + Soil (wet)	32.60	24.88	35.01
Pan + Soil (dry)	29.87	20.82	32.22
Moisture Content	46.4%	41.2%	39.1%
Liquid Limit	44	42	40
Liquid Limit	42		

#### Plastic Limit

Pan ID	75	315
Pan Weight	4.22	9.15
Pan + Soil (wet)	14.54	20.20
Pan + Soil (dry)	12.05	17.53
Moisture Content	31.8%	31.9%
Plastic Limit	32	
Plastic Index	10	

### USCS Classification: ASTM D 2487

Group Symbol **SM**

Group Name **Silty SAND**

## Grain Size Distribution Calculations

Green Ridge, Cumberland Landfill

DAA# 18020117-030102

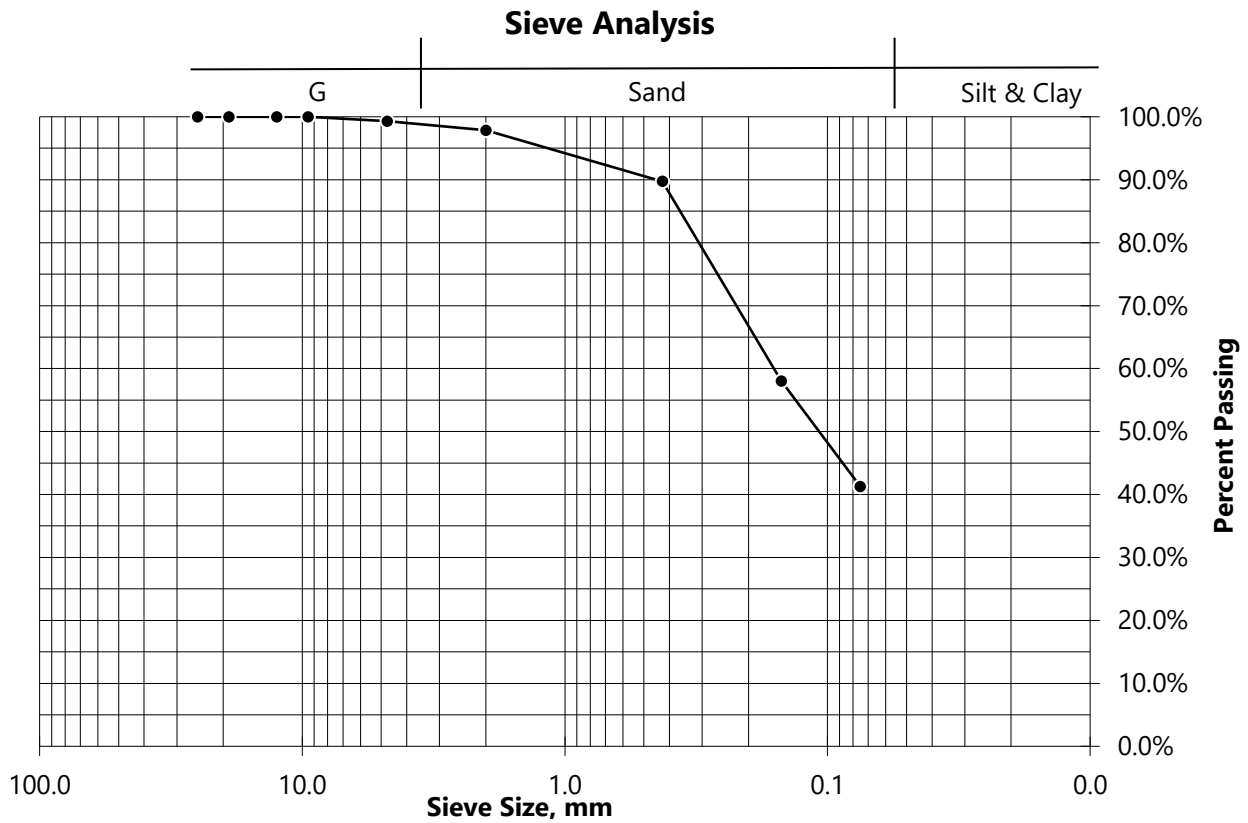
Prepared By: CBW

Sample ID DAA-40

Sample Depth 10'

### Mechanical Sieve Analysis: ASTM D 422

Sieve Size	Weight Retained	Percent Retained	Sieve Size, mm	Percent Passing
1"	0.00	0.0%	25.0	100.0%
3/4"	0.00	0.0%	19.0	100.0%
1/2"	0.00	0.0%	12.5	100.0%
3/8"	0.00	0.0%	9.50	100.0%
No. 4	0.67	0.7%	4.75	99.3%
No. 10	1.32	1.4%	2.00	97.9%
No. 40	7.53	8.1%	0.425	89.7%
No. 100	29.43	31.7%	0.15	58.0%
No. 200	15.55	16.8%	0.075	41.3%
Pan	0.33	0.4%		
Total	54.83	59.1%		



## Soil Classification Calculations

Green Ridge, Cumberland Landfill

DAA# 18020117-030102

Prepared By: CBW



1030 Wilmer Ave., Ste. 100

Richmond, VA 23227

Army Corps of Engineers Certified Laboratory

Sample ID DAA-40

Sample Depth 15'

Visual Sample Description Brown Silty SAND

Sample Received: 4/15/2019

Date Tested: 4/17/2019

### Natural Moisture Content: ASTM D 2216

Pan ID	114
Pan Wt	123.19 grams
Pan + Soil (wet)	230.16 grams
Pan + Soil (dry)	208.83 grams
Natural Moisture Content	24.9%

### Coarse or Fine Grained: ASTM D 422

Pan + Soil retained on No. 200 sieve

(dry) 170.44 grams

Percent Passing No. 200 Sieve 44.8%

Pan + Soil retained on No. 4 sieve

(dry) 123.37 grams

Percent Passing No. 4 Sieve 99.8%

Soil Classifies as Coarse-Grained Soil

### Atterberg Limits: ASTM D 4318

Date Tested: 6/4/2019

#### Liquid Limit

No of Blows	15	25	34
Pan ID	92	93	94
Pan Wt	25.62	30.06	23.74
Pan + Soil (wet)	32.10	37.18	30.23
Pan + Soil (dry)	29.45	34.44	27.83
Moisture Content	69.1%	62.6%	58.8%
Liquid Limit	65	63	61
Liquid Limit	63		

#### Plastic Limit

Pan ID	76	79
Pan Weight	4.22	4.23
Pan + Soil (wet)	14.27	16.19
Pan + Soil (dry)	11.74	13.14
Moisture Content	33.6%	34.2%
Plastic Limit	34	
Plastic Index	29	

### USCS Classification: ASTM D 2487

Group Symbol **SM**

Group Name **Silty SAND**

## Grain Size Distribution Calculations

Green Ridge, Cumberland Landfill

DAA# 18020117-030102

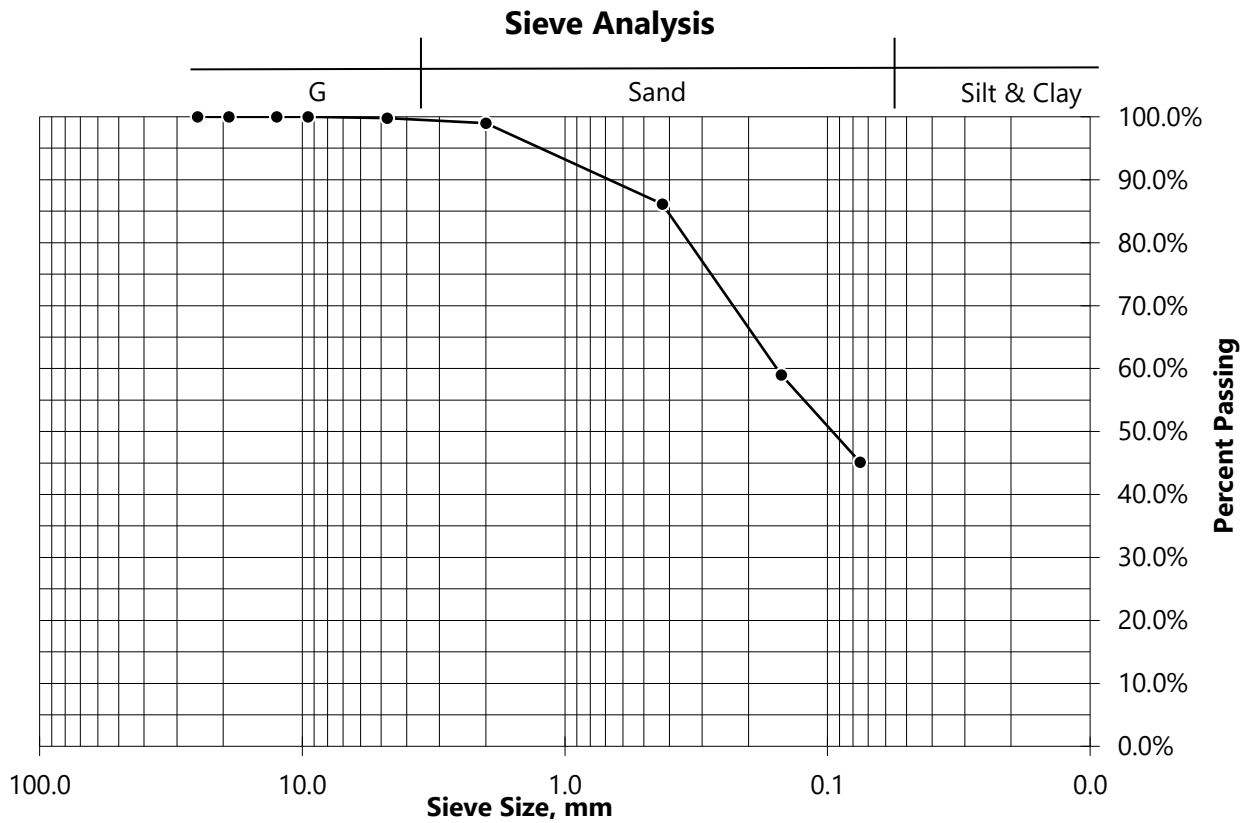
Prepared By: CBW

Sample ID DAA-40

Sample Depth 15'

### Mechanical Sieve Analysis: ASTM D 422

Sieve Size	Weight Retained	Percent Retained	Sieve Size, mm	Percent Passing
1"	0.00	0.0%	25.0	100.0%
3/4"	0.00	0.0%	19.0	100.0%
1/2"	0.00	0.0%	12.5	100.0%
3/8"	0.00	0.0%	9.50	100.0%
No. 4	0.18	0.2%	4.75	99.8%
No. 10	0.70	0.8%	2.00	99.0%
No. 40	11.01	12.9%	0.425	86.1%
No. 100	23.23	27.1%	0.15	59.0%
No. 200	11.90	13.9%	0.075	45.1%
Pan	0.23	0.3%		
Total	47.25	55.2%		





## Soil Classification Calculations

### Cumberland Landfill

DAA# 18020117-030102

Prepared By: CBW



1030 Wilmer Ave., Ste. 100  
Richmond, VA 23227

Army Corps of Engineers Certified Laboratory

Sample ID DAA-40

Sample Depth 25'

Visual Sample Description Brown Silty SAND

Sample Received: 4/17/2019

Date Tested: 4/22/2019

### Natural Moisture Content: ASTM D 2216

Pan ID	40
Pan Wt	192.72 grams
Pan + Soil (wet)	302.04 grams
Pan + Soil (dry)	290.44 grams
Natural Moisture Content	11.9%

### Coarse or Fine Grained: ASTM D 422

Pan + Soil retained on No. 200 sieve

(dry) 255.31 grams

Percent Passing No. 200 Sieve 35.9%

Pan + Soil retained on No. 4 sieve

(dry) 199.47 grams

Percent Passing No. 4 Sieve 93.1%

Soil Classifies as Coarse-Grained Soil

### Atterberg Limits: ASTM D 4318

Date Tested: 5/1/2019

#### Liquid Limit

No of Blows			
Pan ID		Non-plastic	
Pan Wt			
Pan + Soil (wet)			
Pan + Soil (dry)			
Moisture Content			
Liquid Limit			
Liquid Limit			

#### Plastic Limit

Pan ID		
Pan Weight	Non-plastic	
Pan + Soil (wet)		
Pan + Soil (dry)		
Moisture Content		
Plastic Limit		
Plastic Index		

### USCS Classification: ASTM D 2487

Group Symbol **SM**

Group Name **Silty SAND**

# Grain Size Distribution Calculations

Cumberland Landfill

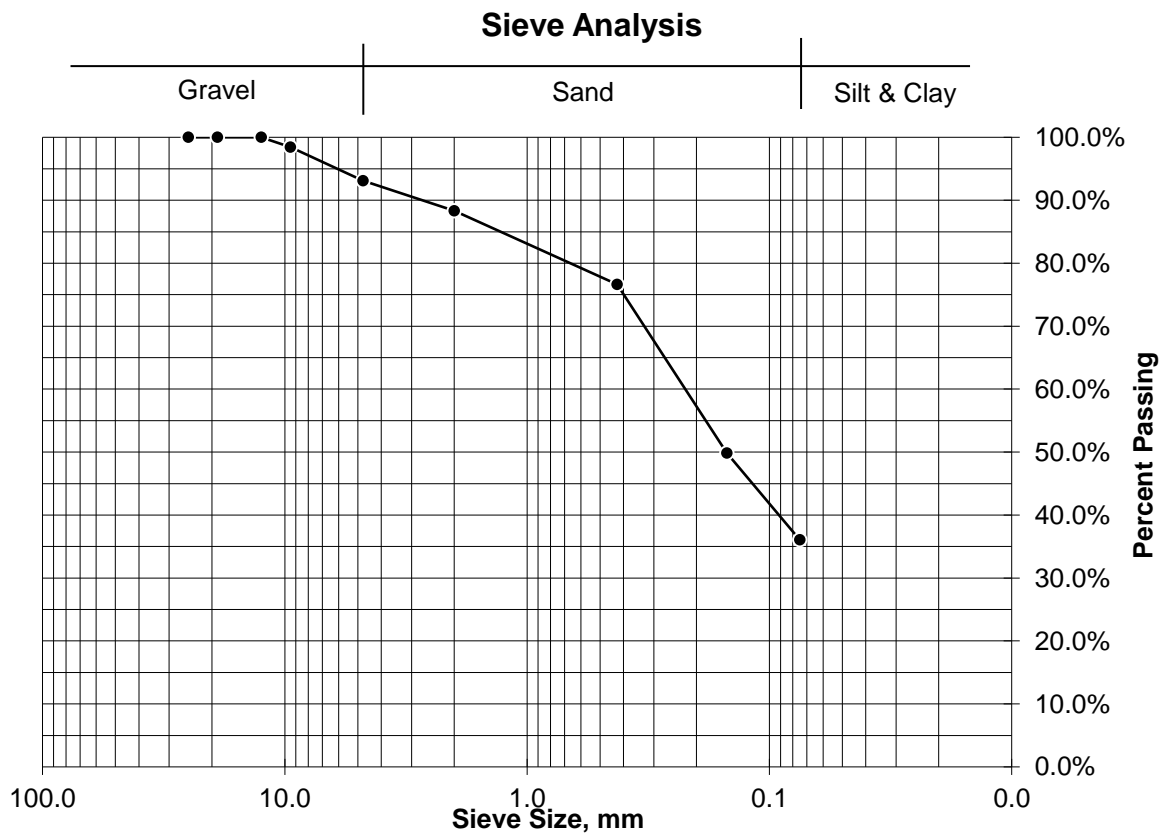
DAA# 18020117-030102

Prepared By: CBW

Sample ID DAA-40  
Sample Depth 25'

## Mechanical Sieve Analysis: ASTM D 422

Sieve Size	Weight Retained	Percent Retained	Sieve Size, mm	Percent Passing
1"	0.00	0.0%	25.0	100.0%
3/4"	0.00	0.0%	19.0	100.0%
1/2"	0.00	0.0%	12.5	100.0%
3/8"	1.52	1.6%	9.50	98.4%
No. 4	5.23	5.4%	4.75	93.1%
No. 10	4.65	4.8%	2.00	88.3%
No. 40	11.45	11.7%	0.425	76.6%
No. 100	26.14	26.7%	0.15	49.9%
No. 200	13.47	13.8%	0.075	36.1%
Pan	0.13	0.1%		
Total	62.59	64.1%		



## Soil Classification Calculations

**Cumberland Landfill**

**DAA# 18020117-030102**

**Prepared By: CBW**

Sample ID East  
 Sample Depth 0'-2.5'  
 Visual Sample Description Brown Clayey SAND

Sample Received: 4/11/2019

Date Tested: 4/15/2019

### **Natural Moisture Content: ASTM D 2216**

Pan ID 101  
 Pan Wt 122.74 grams  
 Pan + Soil (wet) 486.18 grams  
 Pan + Soil (dry) 454.83 grams  
*Natural Moisture Content 9.4%*

### **Coarse or Fine Grained: ASTM D 422**

Pan + Soil retained on No. 200 sieve  
 (dry) 342.33 grams  
 Percent Passing No. 200 Sieve 33.9%  
 Pan + Soil retained on No. 4 sieve  
 (dry) 127.58 grams  
 Percent Passing No. 4 Sieve 98.5%  
*Soil Classifies as Coarse-Grained Soil*

### **Atterberg Limits: ASTM D 4318**

Date Tested: 4/15/2019

#### **Liquid Limit**

No of Blows	18	23	33
Pan ID	1	72	65
Pan Wt	11.22	11.08	11.07
Pan + Soil (wet)	34.59	33.46	31.71
Pan + Soil (dry)	28.32	27.89	26.91
Moisture Content	36.7%	33.1%	30.3%
Liquid Limit	35	33	31
<i>Liquid Limit</i>	33		

#### **Plastic Limit**

Pan ID	313	354
Pan Weight	9.15	9.14
Pan + Soil (wet)	19.63	19.44
Pan + Soil (dry)	17.91	17.75
Moisture Content	19.6%	19.6%
<i>Plastic Limit</i>	20	
<i>Plastic Index</i>	13	

### **USCS Classification: ASTM D 2487**

Group Symbol **SC**

Group Name **Clayey SAND**

## Grain Size Distribution Calculations

Cumberland Landfill

DAA# 18020117-030102

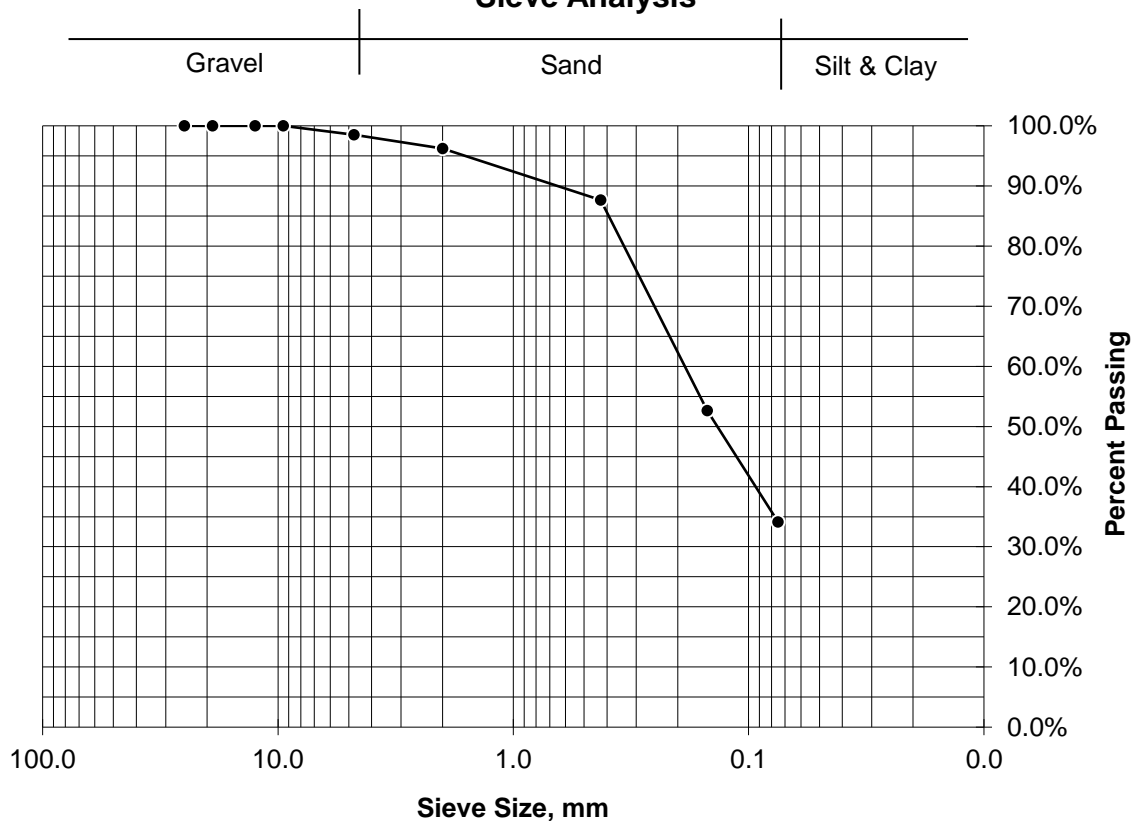
Prepared By: CBW

Sample ID East  
Sample Depth 0'-2.5'

### Mechanical Sieve Analysis: ASTM D 422

Sieve Size	Weight Retained	Percent Retained	Sieve Size, mm	Percent Passing
1"	0.00	0.0%	25.0	100.0%
3/4"	0.00	0.0%	19.0	100.0%
1/2"	0.00	0.0%	12.5	100.0%
3/8"	0.00	0.0%	9.5	100.0%
No. 4	4.84	1.5%	4.75	98.5%
No. 10	7.67	2.3%	2.0	96.2%
No. 40	28.50	8.6%	0.425	87.7%
No. 100	116.30	35.0%	0.15	52.6%
No. 200	61.42	18.5%	0.075	34.1%
Pan	0.84	0.3%		
Total	219.57	66.1%		

### Sieve Analysis



**Proctor Test Report**  
**Cumberland Landfill**  
**DAA# 18020117-030102**  
**Prepared By: CBW**

 **Draper Aden Associates**  
*Engineering • Surveying • Environmental Services*  
 1030 Wilmer Ave., Ste. 100  
 Richmond, VA 23227  
*Army Corps of Engineers Certified Laboratory*

**Soil and Test Method Data**

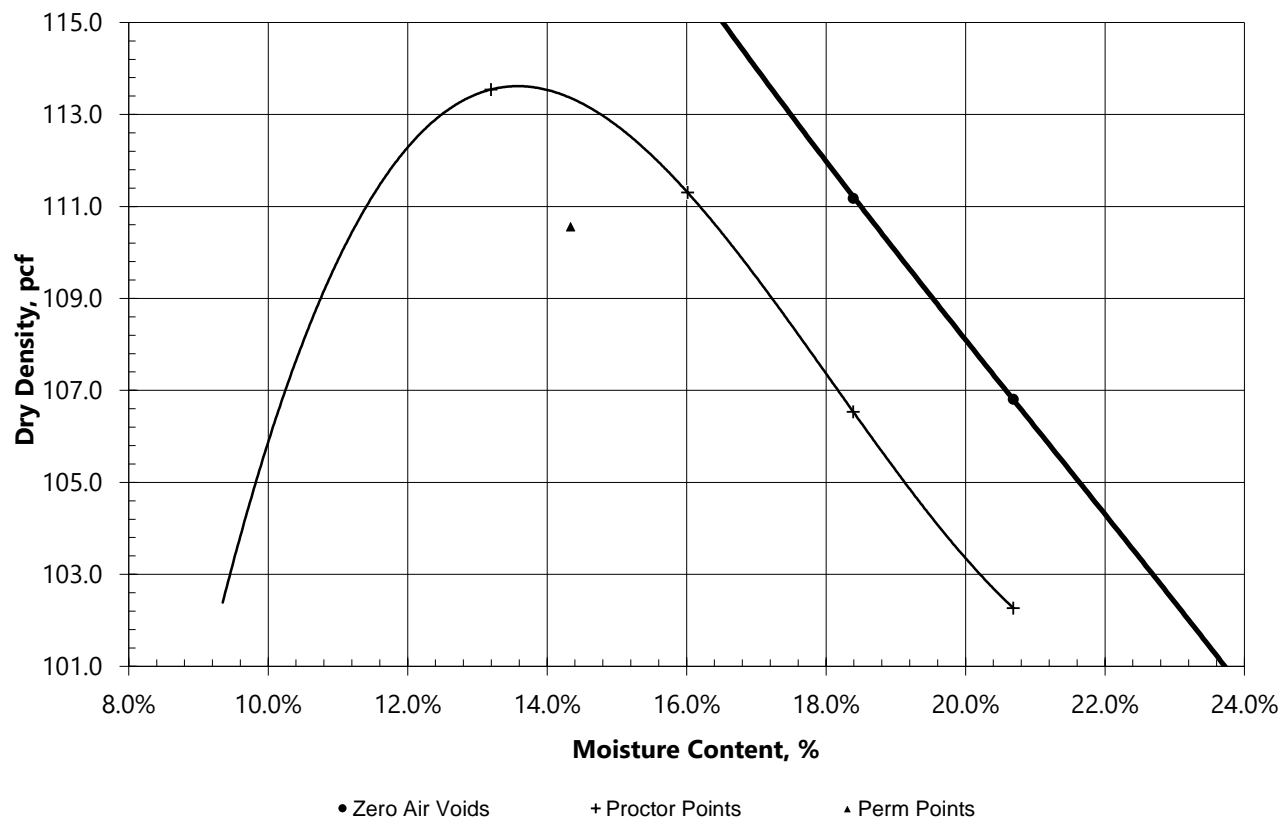
Sample ID East  
 Sample Depth 0'-2.5'  
 Sample Classification Clayey SAND  
 USCS Group Symbol SC  
 Test Method ASTM D698, Method B, with mechanical hammer  
 Sample Preparation Air dried and sieved through a 3/8" sieve.  
 Mold Size, in 4.0  
 Assumed Specific Gravity: 2.65

Sample Received: 4/11/2019  
 Date Tested: 4/18/2019

Test Data	#1	#2	#3	#4	#5
Moisture Content	13.2%	16.0%	18.4%	20.7%	
Dry Density, pcf	113.5	111.3	106.5	102.3	

**Moisture-Density Curve**

**Maximum Dry Density, pcf = 113.7 , Optimum Moisture, % = 13.6**



## **Permeability Calculations**

### **Cumberland Landfill**

**DAA# 18020117-030102**

**Prepared By: CBW**

Sample ID: East  
 Sample Depth: 0'-2.5'  
 Permeability Method: ASTM D5084  
 Sample Length, in: 3.26  
 Sample Diameter, in: 2.86  
 Sample Condition: Remolded

Sample Received: 4/11/2019  
 Date Tested: 5/1/2019

### **Moisture Content**

Pan Wt 6.64 grams  
 Pan + Soil (wet) 342.71 grams  
 Pan + Soil (dry) 300.57 grams  
 Moisture Content 14.3%

### **Dry Density**

Soil (wet) 695.38 grams  
 Wet Density 126.5 pcf  
 Dry Density 110.6 pcf

### **Test Conditions**

Backpressure, psi 40.0  
 Cell Pressure, psi 50.0  
 Influent Buret Area, cm<sup>2</sup> 0.03142  
 Effluent Buret Area, cm<sup>2</sup> 0.76712  
 Effective Stress, psi 10.0  
 Pearment Liquid Temp.(°C):

De-aired Water

### **Initial Data**

Assumed Specific Gravity 2.65  
 Percent Voids 33.1%  
 Actual Volume of Voids 113.7 ml  
 Porosity 33.1%  
 Saturation 76.7%

### **Permeability Trials**

Time min	Influent Head, cm	Influent Flow, cm <sup>3</sup>	Effluent Head, cm	Effluent Flow, cm <sup>3</sup>	Flow Deviation Ratio	Gradient mm-Hg	Permeability, k cm/sec
2-May 17:50	15.500		1.600				
2-May 17:51	15.000	0.016	1.620	0.016	1.00	21.07	3.1E-07
2-May 17:52	14.800	0.006	1.629	0.006	1.00	20.28	1.3E-07
2-May 17:53	14.500	0.009	1.641	0.009	1.00	19.96	1.9E-07
2-May 17:54	14.000	0.016	1.661	0.016	1.00	19.49	3.3E-07
2-May 17:55	13.700	0.009	1.674	0.009	1.00	18.70	2.1E-07
2-May 17:56	13.500	0.006	1.682	0.006	1.00	18.23	1.4E-07
2-May 17:57	13.300	0.006	1.690	0.006	1.00	17.91	1.4E-07
2-May 17:58	13.200	0.003	1.694	0.003	1.00	17.60	7.2E-08
2-May 18:04	12.500	0.022	1.723	0.022	1.00	17.44	8.7E-08

### **Average Permeability**

1.1E-07 cm/sec

Corrected for 20°C

### **Final Data**

Assumed Specific Gravity 2.65  
 Final Weight of Sample 719.46 grams  
 Final Moisture Content 18.3%  
 Percent Voids 32.3%  
 Actual Volume of Voids 109.4 ml  
 Porosity 32.3%  
 Saturation 100.0%

Final Sample Length, in: 3.22  
 Final Sample Diameter, in: 2.86  
 Wet Density 132.5 pcf  
 Dry Density 112.0 pcf

## Soil Classification Calculations

**Cumberland Landfill**

**DAA# 18020117-030102**

**Prepared By: CBW**

Sample ID East  
 Sample Depth 2.5'-5'  
 Visual Sample Description Light Brown Clayey SAND

Sample Received: 4/11/2019

Date Tested: 4/15/2019

### **Natural Moisture Content: ASTM D 2216**

Pan ID 104  
 Pan Wt 125.63 grams  
 Pan + Soil (wet) 538.52 grams  
 Pan + Soil (dry) 515.37 grams  
*Natural Moisture Content 5.9%*

### **Coarse or Fine Grained: ASTM D 422**

Pan + Soil retained on No. 200 sieve  
 (dry) 398.08 grams  
 Percent Passing No. 200 Sieve 30.1%  
 Pan + Soil retained on No. 4 sieve  
 (dry) 126.51 grams  
 Percent Passing No. 4 Sieve 99.8%  
*Soil Classifies as Coarse-Grained Soil*

### **Atterberg Limits: ASTM D 4318**

Date Tested: 4/26/2019

#### **Liquid Limit**

No of Blows	16	22	35
Pan ID	107	102	96
Pan Wt	25.10	23.97	24.80
Pan + Soil (wet)	42.64	42.16	43.15
Pan + Soil (dry)	37.79	37.49	38.84
Moisture Content	38.2%	34.5%	30.7%
Liquid Limit	36	34	32
<i>Liquid Limit</i>	34		

#### **Plastic Limit**

Pan ID	315	316
Pan Weight	9.16	9.08
Pan + Soil (wet)	21.90	19.35
Pan + Soil (dry)	19.81	17.66
Moisture Content	19.6%	19.7%
<i>Plastic Limit</i>	20	
<i>Plastic Index</i>	14	

### **USCS Classification: ASTM D 2487**

Group Symbol **SC**

Group Name **Clayey SAND**



## Grain Size Distribution Calculations

Cumberland Landfill

DAA# 18020117-030102

Prepared By: CBW

Sample ID East  
Sample Depth 2.5'-5'



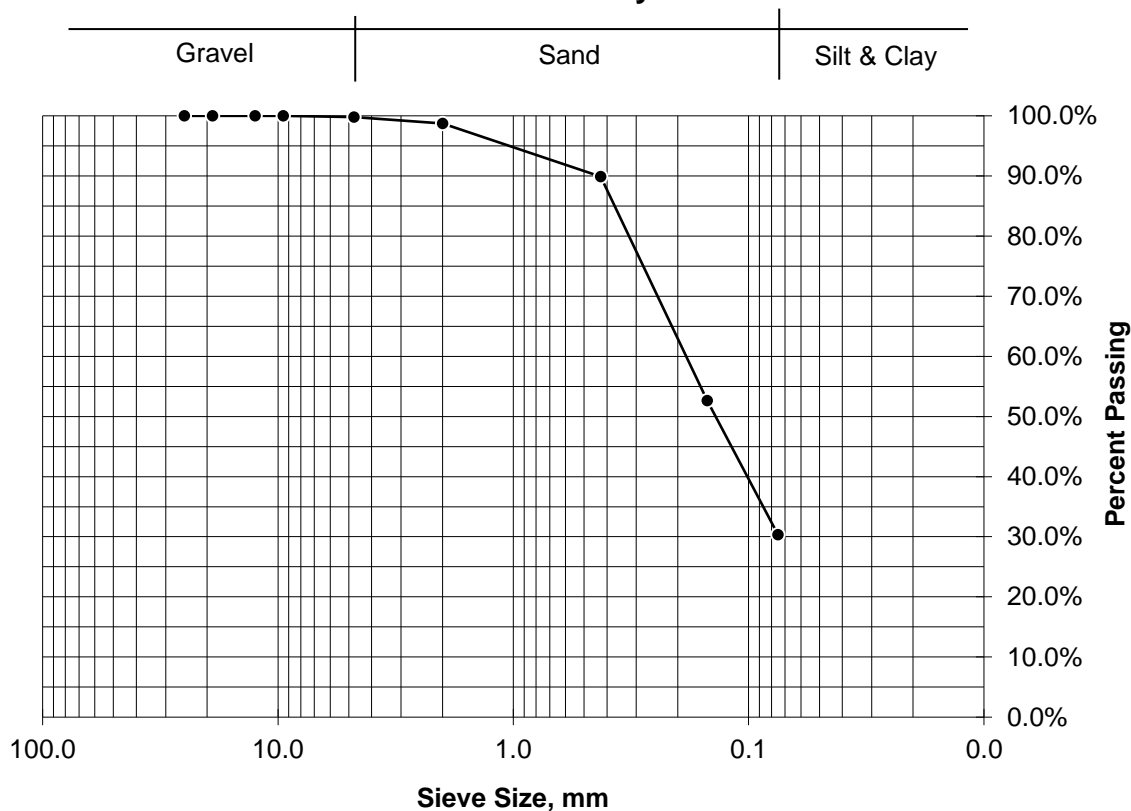
1030 Wilmer Ave., Ste. 100  
Richmond, VA 23227

Army Corps of Engineers Certified Laboratory

### Mechanical Sieve Analysis: ASTM D 422

Sieve Size	Weight Retained	Percent Retained	Sieve Size, mm	Percent Passing
1"	0.00	0.0%	25.0	100.0%
3/4"	0.00	0.0%	19.0	100.0%
1/2"	0.00	0.0%	12.5	100.0%
3/8"	0.00	0.0%	9.5	100.0%
No. 4	0.88	0.2%	4.75	99.8%
No. 10	4.05	1.0%	2.0	98.7%
No. 40	34.43	8.8%	0.425	89.9%
No. 100	145.18	37.3%	0.15	52.7%
No. 200	87.01	22.3%	0.075	30.3%
Pan	0.90	0.2%		
Total	272.45	69.9%		

### Sieve Analysis



**Proctor Test Report**  
**Cumberland Landfill**  
**DAA# 18020117-030102**  
**Prepared By: CBW**

 **Draper Aden Associates**  
*Engineering • Surveying • Environmental Services*  
 1030 Wilmer Ave., Ste. 100  
 Richmond, VA 23227  
*Army Corps of Engineers Certified Laboratory*

**Soil and Test Method Data**

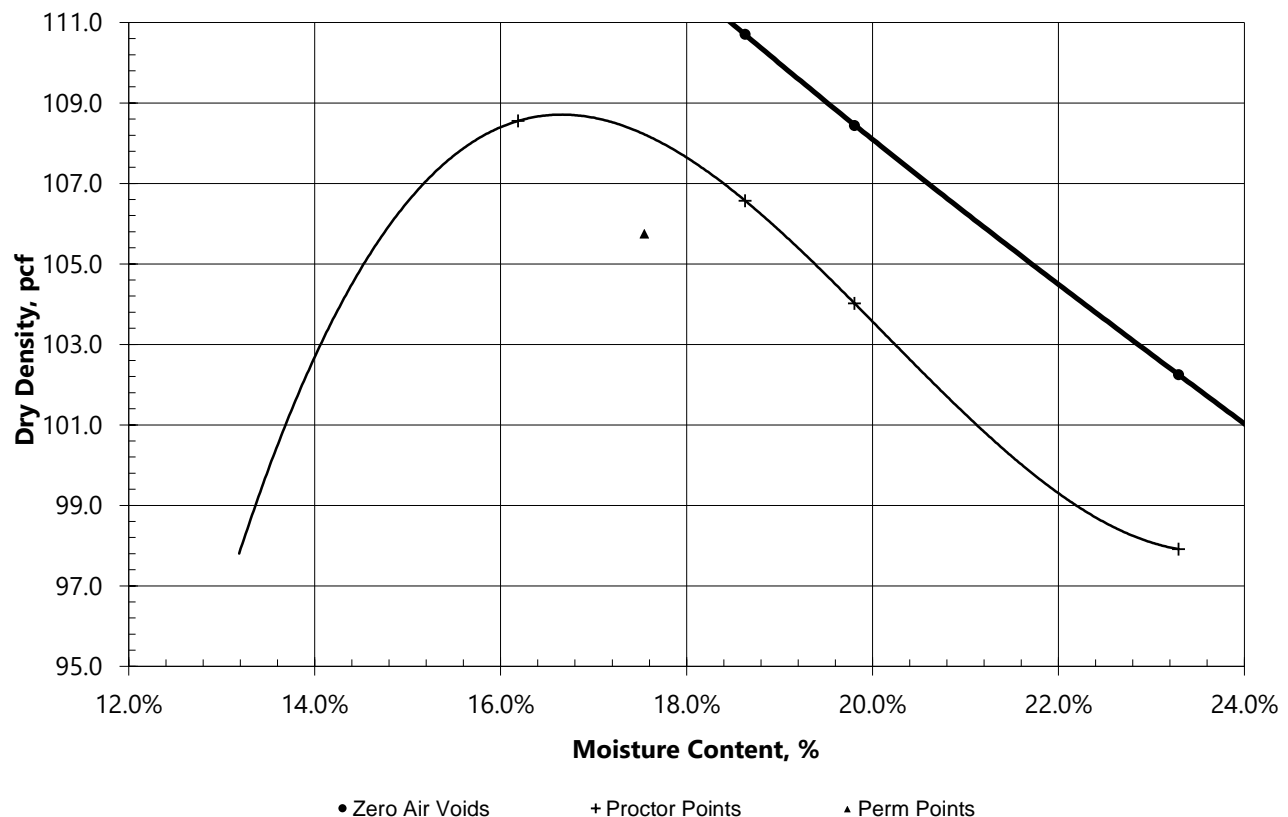
Sample ID East  
 Sample Depth 2.5'-5'  
 Sample Classification Clayey SAND  
 USCS Group Symbol SC  
 Test Method ASTM D698, Method B, with mechanical hammer  
 Sample Preparation Air dried and sieved through a 3/8" sieve.  
 Mold Size, in 4.0  
 Assumed Specific Gravity: 2.65

Sample Received: 4/11/2019  
 Date Tested: 4/18/2019

Test Data	#1	#2	#3	#4	#5
Moisture Content	16.2%	18.6%	19.8%	23.3%	
Dry Density, pcf	108.6	106.6	104.0	97.9	

**Moisture-Density Curve**

**Maximum Dry Density, pcf = 108.8 , Optimum Moisture, % = 16.7**



## **Permeability Calculations**

### **Cumberland Landfill**

**DAA# 18020117-030102**

**Prepared By: CBW**

Sample ID: East  
 Sample Depth: 2.5'-5'  
 Permeability Method: ASTM D5084  
 Sample Length, in: 3.29  
 Sample Diameter, in: 2.85  
 Sample Condition: Remolded

Sample Received: 4/11/2019  
 Date Tested: 5/1/2019

### **Moisture Content**

Pan Wt 6.62 grams  
 Pan + Soil (wet) 307.15 grams  
 Pan + Soil (dry) 262.29 grams  
 Moisture Content 17.5%

### **Dry Density**

Soil (wet) 685.35 grams  
 Wet Density 124.4 pcf  
 Dry Density 105.8 pcf

### **Test Conditions**

Backpressure, psi 40.0  
 Cell Pressure, psi 50.0  
 Influent Buret Area, cm<sup>2</sup> 0.03142  
 Effluent Buret Area, cm<sup>2</sup> 0.76712  
 Effective Stress, psi 10.0  
 Pearment Liquid Temp.(°C):

De-aired Water

### **Initial Data**

Assumed Specific Gravity 2.65  
 Percent Voids 36.0%  
 Actual Volume of Voids 123.9 ml  
 Porosity 36.0%  
 Saturation 82.6%

### **Permeability Trials**

Time min	Influent Head, cm	Influent Flow, cm <sup>3</sup>	Effluent Head, cm	Effluent Flow, cm <sup>3</sup>	Flow Deviation Ratio	Gradient mm-Hg	Permeability, k cm/sec
2-May 17:35	15.700		1.600				
2-May 17:36	15.400	0.009	1.612	0.009	1.00	21.18	1.8E-07
2-May 17:37	15.100	0.009	1.625	0.009	1.00	20.71	1.9E-07
2-May 17:38	14.900	0.006	1.633	0.006	1.00	20.24	1.3E-07
2-May 17:39	14.700	0.006	1.641	0.006	1.00	19.92	1.3E-07
2-May 17:40	14.500	0.006	1.649	0.006	1.00	19.61	1.3E-07
2-May 17:41	14.300	0.006	1.657	0.006	1.00	19.30	1.3E-07
2-May 17:42	14.100	0.006	1.666	0.006	1.00	18.99	1.4E-07
2-May 17:43	13.950	0.005	1.672	0.005	1.00	18.67	1.0E-07
2-May 17:48	13.700	0.008	1.682	0.008	1.00	18.44	3.5E-08

### **Average Permeability**

1.0E-07 cm/sec

Corrected for 20°C

### **Final Data**

Assumed Specific Gravity 2.65  
 Final Weight of Sample 704.08 grams  
 Final Moisture Content 20.8%  
 Percent Voids 35.7%  
 Actual Volume of Voids 122.1 ml  
 Porosity 35.7%  
 Saturation 99.1%

Final Sample Length, in: 3.25  
 Final Sample Diameter, in: 2.86  
 Wet Density 128.4 pcf  
 Dry Density 106.4 pcf

## Soil Classification Calculations

**Cumberland Landfill**

**DAA# 18020117-030102**

**Prepared By: CBW**

Sample ID West  
 Sample Depth 0'-2.5'  
 Visual Sample Description Brown Clayey SAND

Sample Received: 4/11/2019

Date Tested: 4/15/2019

### **Natural Moisture Content: ASTM D 2216**

Pan ID 5  
 Pan Wt 194.83 grams  
 Pan + Soil (wet) 551.40 grams  
 Pan + Soil (dry) 495.88 grams  
*Natural Moisture Content 18.4%*

### **Coarse or Fine Grained: ASTM D 422**

Pan + Soil retained on No. 200 sieve  
 (dry) 354.62 grams  
 Percent Passing No. 200 Sieve 46.9%  
 Pan + Soil retained on No. 4 sieve  
 (dry) 196.72 grams  
 Percent Passing No. 4 Sieve 99.4%  
*Soil Classifies as Coarse-Grained Soil*

### **Atterberg Limits: ASTM D 4318**

Date Tested: 4/26/2019

#### **Liquid Limit**

No of Blows	17	23	31
Pan ID	64	69	70
Pan Wt	10.99	10.97	10.99
Pan + Soil (wet)	31.87	28.30	29.17
Pan + Soil (dry)	24.06	22.08	22.96
Moisture Content	59.7%	56.0%	51.8%
Liquid Limit	57	55	53
<i>Liquid Limit</i>	55		

#### **Plastic Limit**

Pan ID	2	4
Pan Weight	9.01	9.00
Pan + Soil (wet)	19.06	19.15
Pan + Soil (dry)	17.23	17.30
Moisture Content	22.3%	22.3%
<i>Plastic Limit</i>	22	
<i>Plastic Index</i>	33	

### **USCS Classification: ASTM D 2487**

Group Symbol **SC**

Group Name **Clayey SAND**

## Grain Size Distribution Calculations

Cumberland Landfill

DAA# 18020117-030102

Prepared By: CBW

Sample ID West  
Sample Depth 0'-2.5'

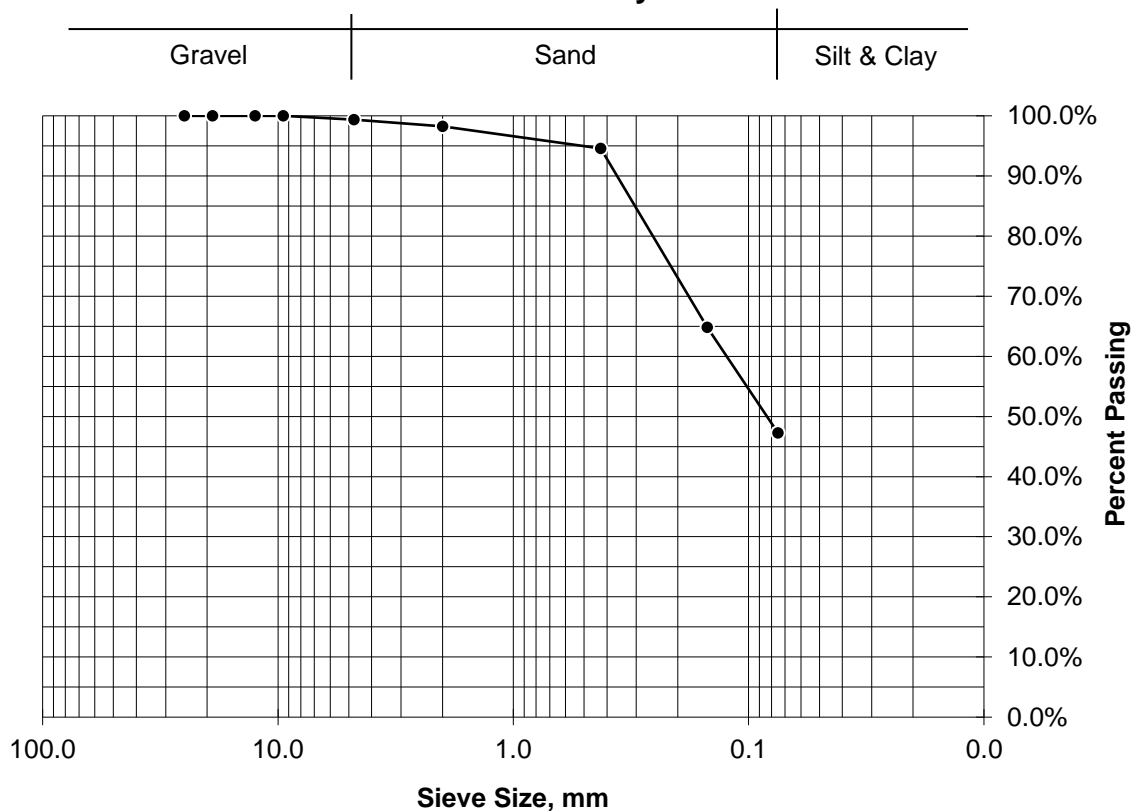
### **Mechanical Sieve Analysis: ASTM D 422**

1030 Wilmer Ave., Ste. 100  
Richmond, VA 23227

Army Corps of Engineers Certified Laboratory

Sieve Size	Weight Retained	Percent Retained	Sieve Size, mm	Percent Passing
1"	0.00	0.0%	25.0	100.0%
3/4"	0.00	0.0%	19.0	100.0%
1/2"	0.00	0.0%	12.5	100.0%
3/8"	0.00	0.0%	9.5	100.0%
No. 4	1.89	0.6%	4.75	99.4%
No. 10	3.42	1.1%	2.0	98.2%
No. 40	11.00	3.7%	0.425	94.6%
No. 100	89.53	29.7%	0.15	64.8%
No. 200	52.95	17.6%	0.075	47.3%
Pan	0.99	0.3%		
Total	159.78	53.1%		

### **Sieve Analysis**



**Proctor Test Report**  
**Cumberland Landfill**  
**DAA# 18020117-030102**  
**Prepared By: CBW**

 **Draper Aden Associates**  
 Engineering • Surveying • Environmental Services  
 1030 Wilmer Ave., Ste. 100  
 Richmond, VA 23227  
 Army Corps of Engineers Certified Laboratory

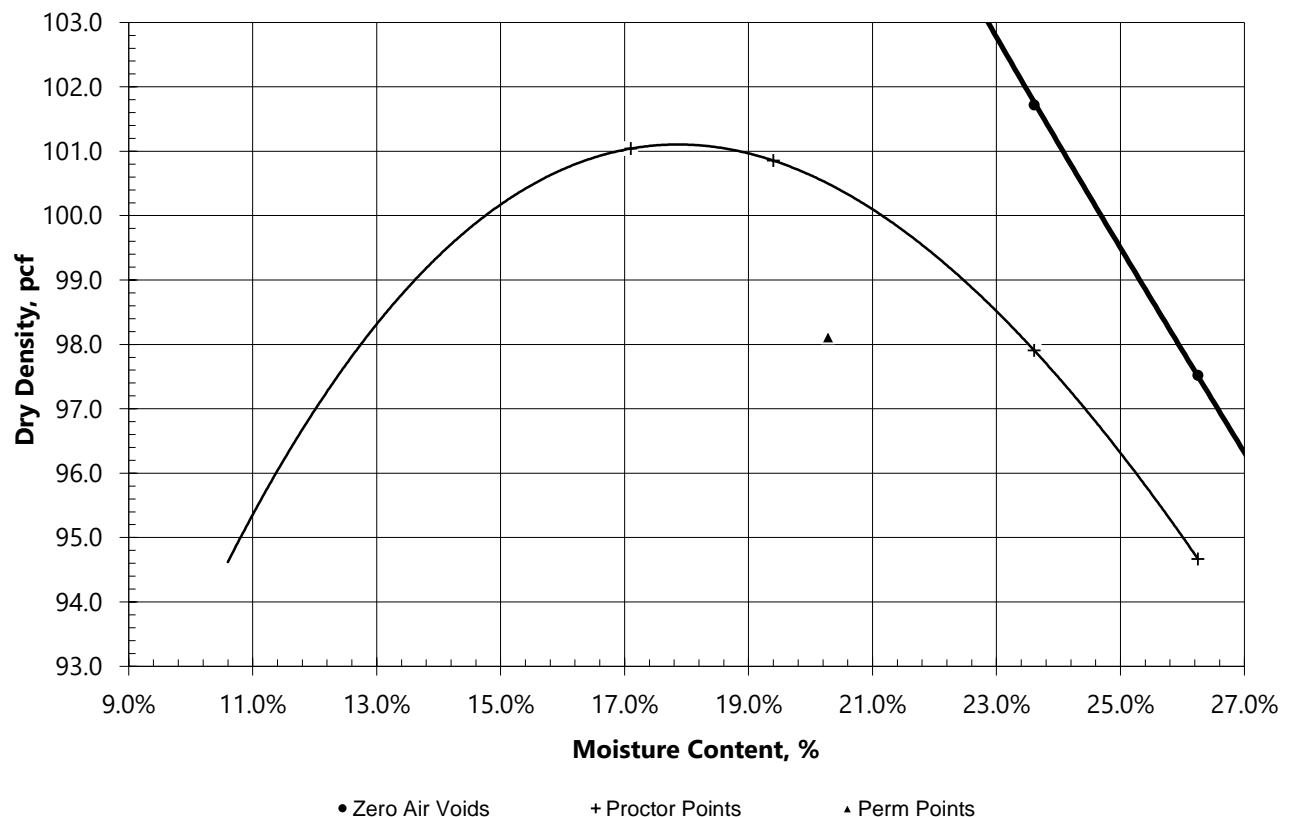
**Soil and Test Method Data**

Sample ID West	Sample Received: 4/11/2019
Sample Depth 0'-2.5'	Date Tested: 4/18/2019
Sample Classification Clayey SAND	
USCS Group Symbol SC	
Test Method ASTM D698, Method B, with mechanical hammer	
Sample Preparation Air dried and sieved through a 3/8" sieve.	
Mold Size, in 4.0	
Assumed Specific Gravity: 2.65	

Test Data	#1	#2	#3	#4	#5
Moisture Content	17.1%	19.4%	23.6%	26.3%	
Dry Density, pcf	101.0	100.9	97.9	94.7	

**Moisture-Density Curve**

**Maximum Dry Density, pcf = 101.2 , Optimum Moisture, % = 18.0**



## **Permeability Calculations**

### **Cumberland Landfill**

**DAA# 18020117-030102**

**Prepared By: CBW**

Sample ID: West  
 Sample Depth: 0'-2.5'  
 Permeability Method: ASTM D5084  
 Sample Length, in: 3.62  
 Sample Diameter, in: 2.85  
 Sample Condition: Remolded

Sample Received: 4/11/2019  
 Date Tested: 5/1/2019

### **Moisture Content**

Pan Wt 6.59 grams  
 Pan + Soil (wet) 218.55 grams  
 Pan + Soil (dry) 182.81 grams  
 Moisture Content 20.3%

### **Dry Density**

Soil (wet) 715.49 grams  
 Wet Density 118.0 pcf  
 Dry Density 98.1 pcf

### **Test Conditions**

Backpressure, psi 40.0  
 Cell Pressure, psi 50.0  
 Influent Buret Area, cm<sup>2</sup> 0.03142  
 Effluent Buret Area, cm<sup>2</sup> 0.76712  
 Effective Stress, psi 10.0  
 Pearment Liquid Temp.(°C):

De-aired Water

### **Initial Data**

Assumed Specific Gravity 2.65  
 Percent Voids 40.7%  
 Actual Volume of Voids 153.9 ml  
 Porosity 40.7%  
 Saturation 78.4%

### **Permeability Trials**

Time min	Influent Head, cm	Influent Flow, cm <sup>3</sup>	Effluent Head, cm	Effluent Flow, cm <sup>3</sup>	Flow Deviation Ratio	Gradient mm-Hg	Permeability, k cm/sec
2-May 16:55	15.500		1.600				
2-May 16:56	15.000	0.016	1.620	0.016	1.00	18.97	3.4E-07
2-May 16:57	14.800	0.006	1.629	0.006	1.00	18.26	1.4E-07
2-May 16:58	14.600	0.006	1.637	0.006	1.00	17.98	1.4E-07
2-May 16:59	14.400	0.006	1.645	0.006	1.00	17.69	1.4E-07
2-May 17:00	14.200	0.006	1.653	0.006	1.00	17.41	1.5E-07
2-May 17:01	14.100	0.003	1.657	0.003	1.00	17.13	7.5E-08
2-May 17:02	14.000	0.003	1.661	0.003	1.00	16.98	7.5E-08
2-May 17:03	13.900	0.003	1.666	0.003	1.00	16.84	7.6E-08
2-May 17:08	13.400	0.016	1.686	0.016	1.00	16.70	7.8E-08

### **Average Permeability**

7.6E-08 cm/sec

Corrected for 20°C

### **Final Data**

Assumed Specific Gravity 2.65  
 Final Weight of Sample 745.09 grams  
 Final Moisture Content 25.3%  
 Percent Voids 40.4%  
 Actual Volume of Voids 152.4 ml  
 Porosity 40.4%  
 Saturation 98.6%

Final Sample Length, in: 3.58  
 Final Sample Diameter, in: 2.86  
 Wet Density 123.4 pcf  
 Dry Density 98.5 pcf



## Soil Classification Calculations

**Cumberland Landfill**

**DAA# 18020117-030102**

**Prepared By: CBW**

Sample ID West  
 Sample Depth 2.5'-5'  
 Visual Sample Description Brown Sandy Fat CLAY

Sample Received: 4/11/2019

Date Tested: 4/16/2019

### **Natural Moisture Content: ASTM D 2216**

Pan ID 111  
 Pan Wt 123.54 grams  
 Pan + Soil (wet) 443.36 grams  
 Pan + Soil (dry) 396.90 grams  
*Natural Moisture Content 17.0%*

### **Coarse or Fine Grained: ASTM D 422**

Pan + Soil retained on No. 200 sieve  
     (dry) 237.27 grams  
 Percent Passing No. 200 Sieve 58.4%  
 Pan + Soil retained on No. 4 sieve  
     (dry) 123.81 grams  
 Percent Passing No. 4 Sieve 99.9%  
*Soil Classifies as Fine-Grained Soil*

### **Atterberg Limits: ASTM D 4318**

Date Tested: 4/29/2019

#### **Liquid Limit**

No of Blows	18	21	32
Pan ID	92	94	108
Pan Wt	25.60	23.78	33.14
Pan + Soil (wet)	43.31	40.76	50.43
Pan + Soil (dry)	36.76	34.75	44.60
Moisture Content	58.7%	54.8%	50.9%
Liquid Limit	56	54	52
<i>Liquid Limit</i>	54		

#### **Plastic Limit**

Pan ID	75	78
Pan Weight	4.26	4.25
Pan + Soil (wet)	14.50	14.80
Pan + Soil (dry)	12.67	12.90
Moisture Content	21.8%	22.0%
<i>Plastic Limit</i>	22	
<i>Plastic Index</i>	32	

### **USCS Classification: ASTM D 2487**

Group Symbol **CH**

Group Name **Sandy Fat CLAY**

## Grain Size Distribution Calculations

Cumberland Landfill

DAA# 18020117-030102

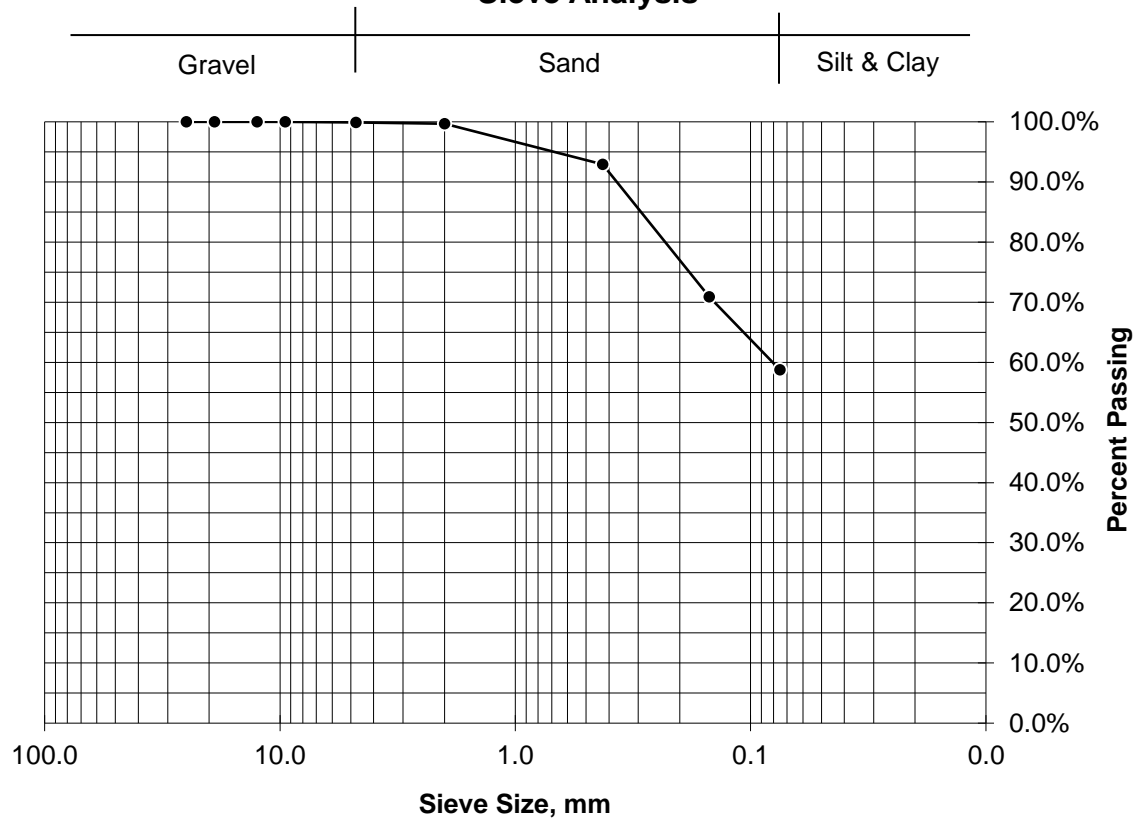
Prepared By: CBW

Sample ID West  
Sample Depth 2.5'-5'

### Mechanical Sieve Analysis: ASTM D 422

Sieve Size	Weight Retained	Percent Retained	Sieve Size, mm	Percent Passing
1"	0.00	0.0%	25.0	100.0%
3/4"	0.00	0.0%	19.0	100.0%
1/2"	0.00	0.0%	12.5	100.0%
3/8"	0.00	0.0%	9.5	100.0%
No. 4	0.27	0.1%	4.75	99.9%
No. 10	0.60	0.2%	2.0	99.7%
No. 40	18.40	6.7%	0.425	93.0%
No. 100	60.25	22.0%	0.15	70.9%
No. 200	33.27	12.2%	0.075	58.7%
Pan	0.94	0.3%		
Total	113.73	41.6%		

### Sieve Analysis



**Proctor Test Report**  
**Cumberland Landfill**  
**DAA# 18020117-030102**  
**Prepared By: CBW**

 **Draper Aden Associates**  
 Engineering • Surveying • Environmental Services  
 1030 Wilmer Ave., Ste. 100  
 Richmond, VA 23227  
 Army Corps of Engineers Certified Laboratory

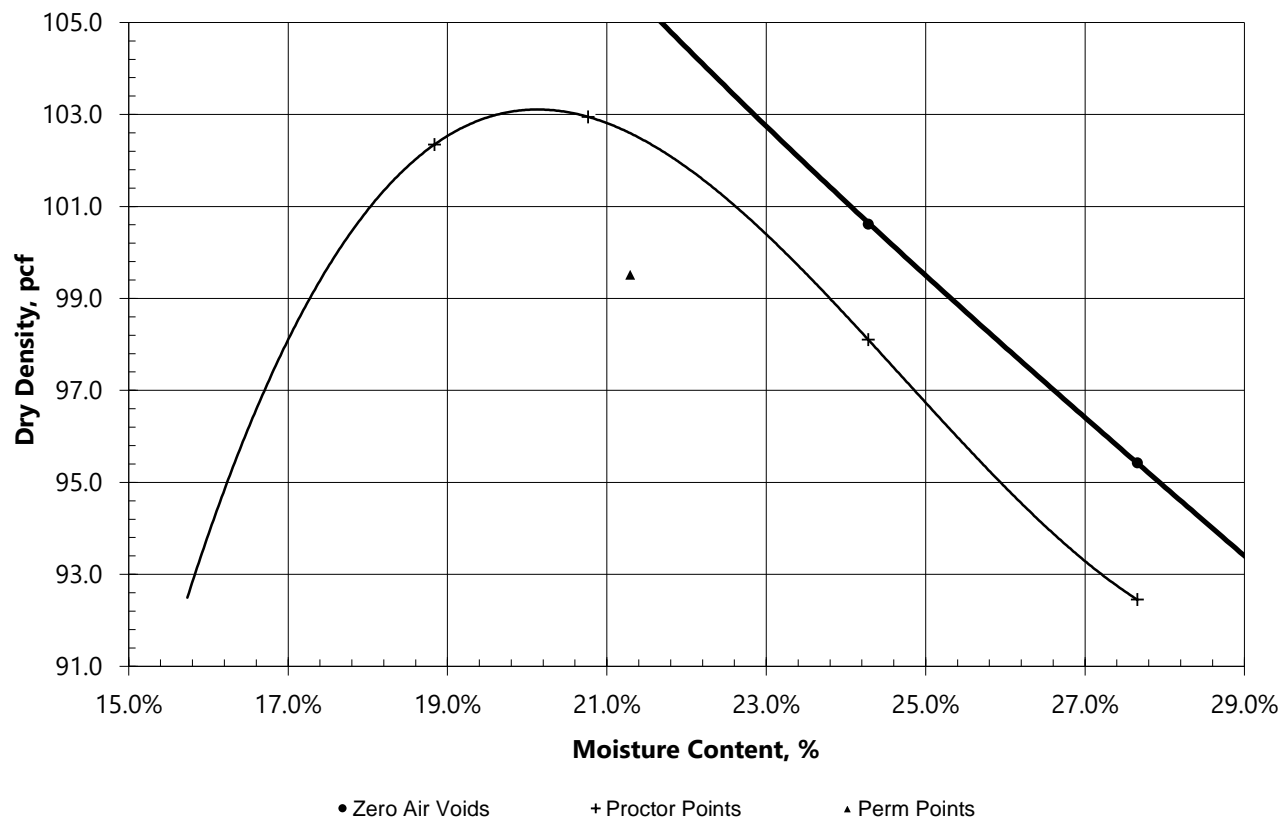
**Soil and Test Method Data**

Sample ID West	Sample Recieved: 4/11/2019
Sample Depth 2.5'-5'	Date Tested: 4/18/2019
Sample Classification Sandy Fat CLAY	
USCS Group Symbol CH	
Test Method ASTM D698, Method B, with mechanical hammer	
Sample Preparation Air dried and sieved through a 3/8" sieve.	
Mold Size, in 4.0	
Assumed Specific Gravity: 2.65	

Test Data	#1	#2	#3	#4	#5
Moisture Content	18.8%	20.8%	24.3%	27.7%	
Dry Density, pcf	102.3	102.9	98.1	92.5	

**Moisture-Density Curve**

**Maximum Dry Density, pcf = 103.2 , Optimum Moisture, % = 20.1**



## **Permeability Calculations**

### **Cumberland Landfill**

**DAA# 18020117-030102**

**Prepared By: CBW**

Sample ID: West  
 Sample Depth: 2.5'-5'  
 Permeability Method: ASTM D5084  
 Sample Length, in: 3.64  
 Sample Diameter, in: 2.86  
 Sample Condition: Remolded

Sample Received: 4/11/2019  
 Date Tested: 5/2/2019

### **Moisture Content**

Pan Wt 6.65 grams  
 Pan + Soil (wet) 241.12 grams  
 Pan + Soil (dry) 199.96 grams  
 Moisture Content 21.3%

### **Dry Density**

Soil (wet) 741.01 grams  
 Wet Density 120.7 pcf  
 Dry Density 99.5 pcf

### **Test Conditions**

Backpressure, psi 40.0  
 Cell Pressure, psi 50.0  
 Influent Buret Area, cm<sup>2</sup> 0.03142  
 Effluent Buret Area, cm<sup>2</sup> 0.76712  
 Effective Stress, psi 10.0  
 Pearment Liquid Temp.(°C):

De-aired Water

### **Initial Data**

Assumed Specific Gravity 2.65  
 Percent Voids 39.8%  
 Actual Volume of Voids 152.6 ml  
 Porosity 39.8%  
 Saturation 85.2%

### **Permeability Trials**

Time min	Influent Head, cm	Influent Flow, cm <sup>3</sup>	Effluent Head, cm	Effluent Flow, cm <sup>3</sup>	Flow Deviation Ratio	Gradient mm-Hg	Permeability, k cm/sec
7-May 8:45	15.500		1.600				
7-May 8:46	14.900	0.019	1.625	0.019	1.00	18.87	4.1E-07
7-May 8:47	14.700	0.006	1.633	0.006	1.00	18.02	1.4E-07
7-May 8:48	14.600	0.003	1.637	0.003	1.00	17.74	7.2E-08
7-May 8:49	14.500	0.003	1.641	0.003	1.00	17.60	7.2E-08
7-May 8:50	14.400	0.003	1.645	0.003	1.00	17.45	7.3E-08
7-May 8:51	14.300	0.003	1.649	0.003	1.00	17.31	7.3E-08
7-May 8:52	14.200	0.003	1.653	0.003	1.00	17.17	7.4E-08
7-May 8:53	14.100	0.003	1.657	0.003	1.00	17.03	7.4E-08
7-May 8:58	13.700	0.013	1.674	0.013	1.00	16.89	6.1E-08

### **Average Permeability**

7.1E-08 cm/sec

Corrected for 20°C

### **Final Data**

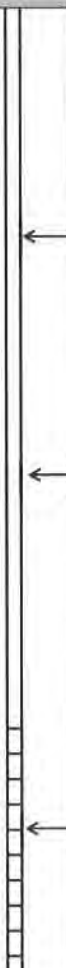
Assumed Specific Gravity 2.65  
 Final Weight of Sample 761.99 grams  
 Final Moisture Content 24.7%  
 Percent Voids 39.6%  
 Actual Volume of Voids 151.1 ml  
 Porosity 39.6%  
 Saturation 100.0%

Final Sample Length, in: 3.60  
 Final Sample Diameter, in: 2.87  
 Wet Density 124.6 pcf  
 Dry Density 99.9 pcf



Project: CC-1100		Drilling Company: Blue Ridge Drilling, Inc.		ELEVATION (FT - AMSL)	Stickup: 1.2 ft.	WELL CONSTRUCTION DETAILS
Client: J. H. Martin		Driller: P. Smith				
Location: B-1		G S Technician: J. Patterson				
Date: 11/29-30/2017		Boring Method: 3.25" ID H. S. Auger				
Depth	Soil/Rock Description	Blow Count	Remarks			
2	Red brown sandy SILT, trace organic matter, moist	3		372.0		Push Cap
		3				
		4				
		5				
4		5				
		8				
		10				
		12				
6		5				
		8				
		9				
		10				
8	Red brown SILT with sand, trace rock fragments @10 ft., moist	5				
		6				
		7				
		7				
10		3				
		5				
		6				
		5				
12		4				
		3				
		4				
		5				
14		6				
		4				
		3				
		3				
16	White gray pink very fine SAND, dry (saprolitic structure)	4				
		2				
		3				
		3				
18		4				
		4				
		3				
		4				
20		4				
		4				
		5				
		5				




Project: CC-1100		Drilling Company: Blue Ridge Drilling, Inc.		ELEVATION (FT. - AMSL)		WELL CONSTRUCTION DETAILS
Client: J. H. Martin		Driller: P. Smith				
Location: B-1		G S Technician: J. Patterson				
Date: 11/29-30/2017		Boring Method: 3.25" ID H. S. Auger				
Depth	Soil/Rock Description	Blow Count	Remarks			
22	Light brown very fine SAND, dry	4		337.0		
		7				
		7				
		8				
24	White black micaceous very fine SAND, trace rock fragments, dry (increasing structure with depth)	7				
		8				
		6				
		5				
26	Light brown light gray micaceous SILTY SAND (saprolitic structure at base)	6				
		7				
		6				
		6				
28		3				
		4				
		4				
		5				
30	Light brown brown SILTY SAND, moist	5				
		5				
		5				
		7				
32	Light gray very fine SAND, dry	3				
		11				
		15				
		15				
34	Light gray very fine SAND, trace rock fragments @ 32.5 ft., dry	9				
		14				
		13				
		14				
36	Red pink black weathered granite, dry	14				
		17				
		17				
		18				
38	Gray dark gray, some white banding, very fine SAND, dry	23				
		28				
		50/6				
		50/3				
40	Dark gray black micaceous very fine SAND, dry					




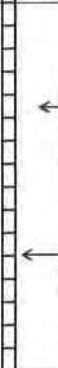
Project: CC-1100		Drilling Company: Blue Ridge Drilling, Inc.		ELEVATION (FT - AMSL)		WELL CONSTRUCTION DETAILS
Client: J. H. Martin		Driller: P. Smith				
Location: B-1		G S Technician: J. Patterson				
Date: 11/29-30/2017		Boring Method: 3.25" ID H. S. Auger				
Depth	Soil/Rock Description	Blow Count	Remarks			
	Dark gray black micaceous very fine SAND, trace rock fragments, dry	50/3	Saturated @ 41 ft.	331.0		
42						
	Dark gray black micaceous very fine SAND, trace rock fragments, dry	50/3				
44						
	Dark gray black micaceous very fine SAND, trace rock fragments, dry	50/3				
46						
	Dark gray black micaceous very fine SAND, trace rock fragments, dry	50/3				
48						
	Dark gray black micaceous very fine SAND, trace rock fragments, dry	50/3	Auger Refusal @ 51.0 ft.	321.0		
50						
51	Dark gray black micaceous very fine SAND, trace rock fragments, dry	50/3				






Project: CC-1100		Drilling Company: Blue Ridge Drilling, Inc.		ELEVATION (FT - AMSL)	Stickup: 1.0 ft.	WELL CONSTRUCTION DETAILS
Client: J. H. Martin		Driller: P. Smith				
Location: B-2		GS Technician: J. Patterson				
Date: 11/30/2017		Boring Method: 3.25" ID H. S. Auger/Wireline Core				
Depth	Soil/Rock Description	Blow Count	Remarks	359.0		
2						
		3				
	Red brown SILT, trace clay, moist	5				
4		7				
		8				
	Red brown SILT, trace clay, moist	5				
	Red brown SILT, dry	6				
6		7				
	Light brown SILT, trace organic matter at base, dry	7				
	Light brown SILT, trace structure at base, dry	4				
8		4				
		5				
	Yellow brown SILT, trace rock fragments, dry	4				
10		3				
		3				
		2				
12						
14	Yellow brown SANDY SILT, some quartz fragments, moist	3				
		4				
		6				
16						
18						
	Yellow brown SILT, some quartz fragments, dry	15				
	White light gray fine to medium	11				
20	SAND with structure, dry	9				



Project: CC-1100		Drilling Company: Blue Ridge Drilling, Inc.		ELEVATION (FT - AMSL)		WELL CONSTRUCTION DETAILS
Client: J. H. Martin		Driller: P. Smith				
Location: B-2		GS Technician: J. Patterson				
Date: 11/30/2017	Depth: 42.0 ft.	Boring Method: 3.25" ID H. S. Auger/Wireline Core				
Depth	Soil/Rock Description	Blow Count	Remarks			
22				332.0		1.25" ID Push Coupling PVC Pipe          Natural Formation
24	Black white felspathic granodiorite residuum, dry	23				
	Yellow brown light gray fine to coarse SAND, some rock fragments, dry	32				
		50/5				
26						
28						
30	Dark gray gray white brown fine SAND, trace rock fragments, dry	50/3				
32			Saturated at 32 ft. Auger Refusal @ 32 ft.			
34			Run 1: 32-37 ft. Recovery - 38/60 Inches = 63% RQD = 22.75/38 Inches = 60%			
36	Biotite rich gneiss with felspathic banding					
38			Run 2: 37-42 ft. Recovery - 60/60 inches = 100% RQD = 59/60 inches = 98%	327.0		Rock   Hand Slotted Screen 1.25" ID PVC Pipe
40						



Project: CC-1100		Drilling Company: Blue Ridge Drilling, Inc.		ELEVATION (FT - AMSL)		WELL CONSTRUCTION DETAILS
Client: J. H. Martin		Driller: P. Smith				
Location: B-2		G S Technician: J. Patterson				
Date: 11/30/2017	Depth: 42.0 ft.	Boring Method: 3.25" ID H. S. Auger/Wireline Core				
Depth	Soil/Rock Description	Blow Count	Remarks			
	Blotite rich gneiss with felspathic banding		Run 2 - 37-42 ft. Recovery - 60/60 inches = 100% RQD = 59/50 inches = 98%			
42					317.0	

Total Depth @ 42 ft.

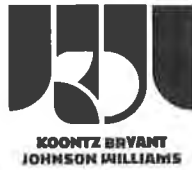


**KOONTZ BRYANT  
JOHNSON WILLIAMS**

Project: CC-1100		Drilling Company: Blue Ridge Drilling, Inc.		ELEVATION (FT - AMSL)
Client: J. H. Martin		Driller: P. Smith		
Location: B-3		G S Technician: J. Patterson		
Date: 11/30-12/1/17	Depth: 35.5 ft.	Boring Method: 3.25" ID H. S. Auger/Wireline Core		
Depth	Soil/Rock Description	Blow Count	Remarks	353.0
2				
	Light brown red brown CLAYEY SILT, moist, organic matter at top, rock fragments at 3 ft.	4		
		6		
		7		
4		10		
	Light brown red brown CLAYEY SILT, moist	4		
		7		
	Light brown red brown SILT, trace rock fragments at 6 ft., dry	6		
6		10		
		4		
		5		
	Dark brown biotite rich SILT, dry	5		
8		7		
	Red brown SILT, structure at base, dry	6		
		6		
		5		
10		7		
12				
14	Biotite rich very fine SAND, trace muscovite, with structure, dry	10		
		13		
		11		
16				
18				
			50/3	
20				



Project: CC-1100		Drilling Company: Blue Ridge Drilling, Inc.		ELEVATION (FT - AMSL)	
Client: J. H. Martin		Driller: P. Smith			
Location: B-3		G S Technician: J. Patterson			
Date: 11/30-12/1/17	Depth: 35.5 ft.	Boring Method: 3.25" ID H. S. Auger/Wireline Core			
Depth	Soil/Rock Description	Blow Count	Remarks		
22	Biotite rich very fine SAND, trace muscovite, with structure, dry	50/2		327.5	
24					
26					
26	25.5-26.7 ft. - Banded granodiorite gneiss		Auger Refusal @ 25.5 ft.		
28	26.7--27 ft. - Quartz rich granodiorite 27-27.9 ft.-Granodiorite, two parallel vertical fractures		Run 1 - 25.5-30.5 ft. Recovery - 60/60 inches = 100% RQD = 51.5/60 inches = 86%		
30	27.9-30.5 ft. - Granodiorite gneiss		Rock		
32	Biotite rich granodiorite gneiss, dry, vertical fracture @ 32.5-32.7 ft.				Run 2 - 30.5-35.5 ft. Recovery - 60/60 inches = 100% RQD = 47.5/60inches = 79%
34					
					Rock



Project: CC-1100		Drilling Company: Blue Ridge Drilling, Inc.		ELEVATION (FT - AMSL)
Client: J. H. Martin		Driller: P. Smith		
Location: B-4		G S Technician: J. Patterson		
Date: 12/1/2017	Depth: 25.5 ft.	Boring Method: 3.25" ID H. S. Auger		
Depth	Soil/Rock Description	Blow Count	Remarks	335.0
2				
	Light brown very fine SAND, dry	14		
		35		
4	White light brown very fine SAND, with structure, dry	43		
		36		
	White light brown very SILTY SAND with structure, dry	18		
		25		
6	Biotite rich weathered granodiorite, dry	28		
		47		
	Light brown dark brown very fine SAND, some structure, dry	25		
		50/5		
8				
	Light brown brown white very fine SAND, some structure, dry	50/5		
10				
12				
14	Light brown very fine SAND with structure, dry	22		
		25		
	Red brown dark gray very fine SAND, trace quartz fragments, dry	28		
16				
18				
	Light gray light brown fine to medium SAND with horizontal structure, trace rock fragments, dry	50/3		
20				



KOONTZ BRYANT  
JOHNSON WILLIAMS

Project: CC-1100		Drilling Company: Blue Ridge Drilling, Inc.		ELEVATION (FT - AMSL)
Client: J. H. Martin		Driller: P. Smith		
Location: B-4		G S Technician: J. Patterson		
Date: 12/1/2017		Boring Method: 3.25" ID H. S. Auger		
Depth: 25.5 ft.				
Depth	Soil/Rock Description		Blow Count	Remarks
22				
24	Light gray light brown micaceous fine to medium		50/6	
	SAND, dry			

Auger Refusal @ 25.5 ft.





Project: CC-1100		Drilling Company: Blue Ridge Drilling, Inc.		ELEVATION (FT - AMSL)
Client: J. H. Martin		Driller: P. Smith		
Location: B-5		G S Technician: J. Patterson		
Date: 12/4/2017	Depth: 10 ft.	Boring Method: 3.25" ID H. S. Auger		
Depth	Soil/Rock Description	Blow Count	Remarks	320.0
2				
	Light brown light gray SILT, dry	13 50/6		
4				
	Light brown light gray very fine SANDY SILT, dry biotite rich from 4-4.5 ft.	17 50/5		
6				
	Gray brown very fine SILT, dry	33 50/3		
8				
	No Return	50/0		
10				310.0

Auger Refusal @ 10 ft.



KOONTZ BRYANT  
JOHNSON WILLIAMS

Project: CC-1100		Drilling Company: Blue Ridge Drilling, Inc.		ELEVATION (FT - AMSL)
Client: J. H. Martin		Driller: P. Smith		
Location: B-6		G S Technician: J. Patterson		
Date: 12/12/2017	Depth: 50 ft.	Boring Method: 3.25" ID H. S. Auger/Wireline Core		
Depth	Soil/Rock Description	Blow Count	Remarks	353.0
2				
	Red micaceous CLAYEY SILT, moist	2		
		4		
		4		
4		5		
	Red micaceous SILT, trace quartz fragments at top of sample, moist to dry	3		
		3		
		3		
6		4		
	Dark brown light brown micaceous SILT, dry	3		
		3		
		3		
8		3		
	Light brown light gray micaceous SILT, trace quartz fragments, dry	2		
		3		
		3		
10		3		
12				
14	Light gray light brown micaceous SILT, dry	4		
		6		
		7		
16				
18				
	Light gray light brown micaceousSANDY SILT, dry	6		
		11		
20		17		



KOONTZ BRYANT  
JOHNSON WILLIAMS

Project: CC-1100		Drilling Company: Blue Ridge Drilling, Inc.		ELEVATION (FT - AMSL)
Client: J. H. Martin		Driller: P. Smith		
Location: B-6		G S Technician: J. Patterson		
Date: 12/12/2017	Depth: 50 ft.	Boring Method: 3.25" ID H. S. Auger/Wireline Core		
Depth	Soil/Rock Description	Blow Count	Remarks	
22				
24	Light gray light brown SANDY SILT, weathered granite at base, dry	29 50/5		
26				
28				
	Light gray light brown micaceous SANDY SILT with quartz fragments, dry	50/2		
30				
32				
34		NR		
36				
38				
		NR		
40				

Auger Refusal @ 40 ft.

313.0



Project: CC-1100		Drilling Company: Blue Ridge Drilling, Inc.		ELEVATION (FT - AMSL)
Client: J. H. Martin		Driller: P. Smith		
Location: B-6		G S Technician: J. Patterson		
Date: 12/12/2017	Depth: 50 ft.	Boring Method: 3.25" ID H. S. Auger/Wireline Core		
Depth	Soil/Rock Description	Blow Count	Remarks	303.0
	Biotite rich banded GNEISS with quartz, dry		Run 1 - 40-45 ft. Recovery - 52/60 inches = 87% RQD = 44/60 inches = 73%  Rock	
42	Massive quartz intrusion, dry			
44				
	Highly weathered biotite rich SCHIST, dry			
46	Highly weathered SCHIST, dry			
	Weathered biotite rich GNEISS with quartz, dry			
	Biotite rich GNEISS with quartz banding, pyrite noted throughout, dry			
48				
50				

Total Depth @ 50 ft.



Project: CC-1100		Drilling Company: Blue Ridge Drilling, Inc.		ELEVATION (FT - AMSL)	Stickup: 13 ft.	WELL CONSTRUCTION DETAILS
Client: J. H. Martin		Driller: P. Smith				
Location: B-7		G S Technician: J. Patterson				
Date: 12/4-5/2017		Boring Method: 3.25" ID H. S. Auger				
Depth	Soil/Rock Description	Blow Count	Remarks			
				352.0		
2						
4	Red brown micaceous SILT, moist	5 4 6 8				Push Cap
6	Red brown SILT trace quartz fragments, dry	5 5 7 8				
8	Light brown SILT, trace structure, dry	5 6 4				
	Light brown white very fine SANDY SILT, dry	3				
	Light brown light gray SANDY SILT, dry	3 6 7 4				1.25 " ID Push Coupling PVC Pipe
10						
12						
14	Light gray white very fine SANDY SILT, dry	4 5				Natural Formation
	Light gray light brown fine to medium SAND, dry	5				
16						
18						
20	Light gray white very fine SANDY SILT, dry	7 11 10				

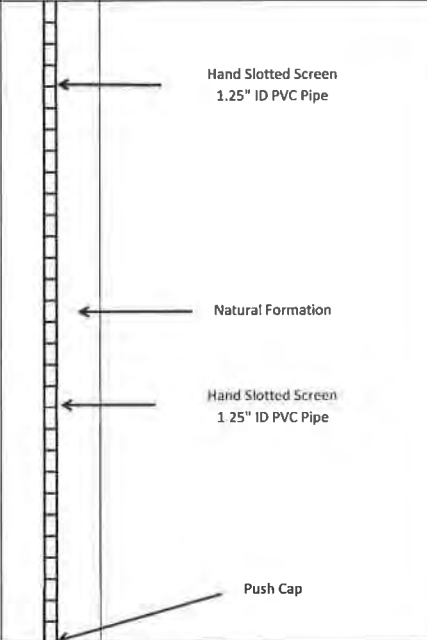


Project: CC-1100		Drilling Company: Blue Ridge Drilling, Inc.		ELEVATION (FT - AMSL)		WELL CONSTRUCTION DETAILS
Client: J. H. Martin		Driller: P. Smith				
Location: R-7		G.S. Technician: J. Patterson				
Date: 12/4-5/2017		Boring Method: 3.25" ID H. S. Auger				
Depth	Soil/Rock Description	Blow Count	Remarks			
22						
24		7				
	Light brown light gray micaceous very fine SANDY SILT, trace rock fragments at top, dry	12				
		14				
26						
28						
	Light brown red black micaceous very fine SANDY SILT, dry	9				
	White light gray very fine SANDY	31				
30	SILT with rock fragments, dry	25				
32						
34		20				
	White light brown micaceous SANDY SILT, dry	12				
		23				
36						
38						
		21				
	Light brown white light gray black micaceous very fine SANDY SILT, dry	36				
40		50/3				

1.25" ID Push Coupling PVC Pipe

Natural Formation



Project: CC-1100		Drilling Company: Blum Ridge Drilling, Inc.		ELEVATION (FT. AMSL)	WELL CONSTRUCTION DETAILS
Client: J. H. Martin		Driller: P. Smith			
Location: 8-7		GS Technician: J. Patterson			
Date: 12/4-5/2017	Depth: 55 ft	Boring Method: 3.25" ID H. S. Auger			
Depth	Soil/Rock Description	Blow Count	Remarks		
42			Saturated @ 43.5 ft.	312.0	
44	Light brown light gray very fine SANDY SILT with rock fragments at the top, saturated	50/5		308.5	
46					
48					
50	Light brown light gray biotite rich very fine SANDY SILT, saturated	50/6			
52					
54	No Return, saturated spoon	50/0			
55				297.0	
Auger Refusal @ 55 ft.					





Project: CC-1100		Drilling Company: Blue Ridge Drilling, Inc.		ELEVATION (FT - AMSL)	Stickup: 1.0 ft.	WELL CONSTRUCTION DETAILS
Client: J. H. Martin		Driller: P. Smith				
Location: B-8		GS Technician: J. Patterson				
Date: 12/4/2017		Boring Method: 3.25" ID H. S. Auger				
Depth	Soil/Rock Description	Blow Count	Remarks			
				315.0		
2						
	Brown light brown SILT, some CLAYEY	3				
	SILT from 2.3-2.7 ft., moist to dry	4				
4		4				
		8				
	Red brown light brown SILT with biotite	8				
	banding, trace quartz rock fragments, dry	9				
6		16				
		15				
	Light brown SILT, trace quartz fragments,	9				
	dry	11				
8		10				
		13				
	Light brown SANDY SILT with micaceous	19				
	banding, dry	18				
10		13				
		16				
12						
14	Light brown SILT with micaceous banding,	8				
	dry	12				
	Yellow brown white very fine SAND, dry	50/3				
16						
18						
	Light brown brown micaceous SILT, trace	13				
	quartz fragments, structure, dry	18				
20		17				

Push Cap

1.25 " ID Push Coupling PVC Pipe

Natural Formation



Project: CC-1100		Drilling Company: Blue Ridge Drilling, Inc.		ELEVATION (FT - AMSL)		WELL CONSTRUCTION DETAILS	
Client: J. H. Martin		Driller: P. Smith					
Location: B-8		GS Technician: J. Patterson					
Date: 12/4/2017	Depth: 36 ft.	Boring Method: 3.25" ID H.S. Auger					
Depth	Soil/Rock Description	Blow Count	Remarks				
22				289.0			
24	Light brown very fine SANDY SILT, dry	50/6				1.25" ID Push Coupling PVC Pipe	
26							
28						Natural Formation	
30	Light brown white fine to medium SAND, some quartz fragments, dry	50/5				Hand Slotted Screen 1.25" ID PVC Pipe	
32							
34	No Return	50/1					
36					279.0		Push Cap

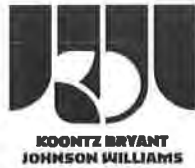
Auger Refusal @ 36 ft.

Auger Refusal @ 36 ft.



**KOONTZ BRYANT  
JOHNSON WILLIAMS**

Project: CC-1100		Drilling Company: Blue Ridge Drilling, Inc.		ELEVATION (FT - AMSL)
Client: J. H. Martin		Driller: P. Smith		
Location: B-9		G S Technician: J. Patterson		
Date: 12/1/2017	Depth: 21 ft.	Boring Method: 3.25" ID H. S. Auger		
Depth	Soil/Rock Description	Blow Count	Remarks	310.0
2				
	Light brown dark brown micaceous SANDY SILT, moist	3		
		7		
4		7		
	Brown dark brown SILT with horizontal structure, moist	16		
		27		
		50/2		
6				
	White light gray light brown black very fine SAND, dry	30		
		50/5		
8				
	Light gray light brown black fine SANDY SILT with structure, dry	44		
		50/2		
10				
12				
14	Light gray light brown black fine SANDY SILT with structure, dry	14		
		9		
		20		
16				
18				
	Light brown light gray fine SANDY SILT, dry	50/3		
20				




Project: CC-1100			Drilling Company: Blue Ridge Drilling, Inc.		ELEVATION (FT - AMSL)
Client: J. H. Martin			Driller: P. Smith		
Location: B-9			G S Technician: J. Patterson		
Date: 12/1/2017		Depth: 21 ft.	Boring Method: 3.25" ID H. S. Auger		
Depth	Soil/Rock Description		Blow Count	Remarks	
21					289.0

Auger Refusal @ 21 ft.

289.0



Project: CC-1100		Drilling Company: Blue Ridge Drilling, Inc.		ELEVATION (FT. - AMSL)	Stickup: 1.0 ft.	WELL CONSTRUCTION DETAILS
Client: J. H. Martin		Driller: P. Smith				
Location: B-10		G S Technician: J. Patterson				
Date: 12/5/2017		Boring Method: 3.25" ID H. S. Auger				
Depth	Soil/Rock Description	Blow Count	Remarks	325.0		Push Cap
2						
		11				
	light brown light gray very fine SANDY	12				
	SILT, trace rock fragments & structure at	15				
4	base, dry	14				
		20				
	Light brown light gray SILT with horizontal	26				
	structure, dry	15				
6		14				
	Light gray light brown very fine SANDY	10				
	SILT, dry	11				
	Light gray light brown micaceous SILT with	12				
8	and, some structure, dry	16				
	Light gray light brown very fine SANDY	28				
	SILT, dry	50/5				
10						
12						
14	Black white light brown weathered	13				
	granodiorite with gneissic banding, dry	17				
	White light gray very fine SANDY SILT with	19				
16	structure, dry					
18						
	White light gray very fine SANDY SILT with	6				
	structure, dry	8				
20	Light brown micaceous Silt, dry	11				



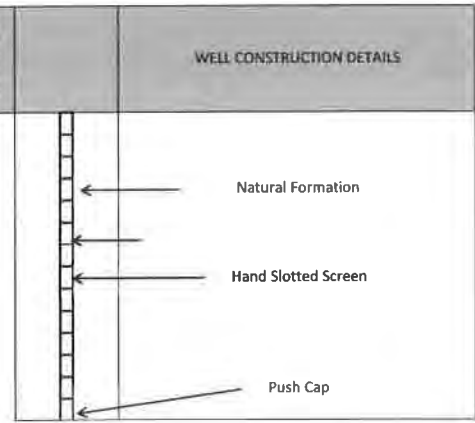
Project: CC-1100		Drilling Company: Blue Ridge Drilling, Inc.		ELEVATION (FT. - AMSL)	WELL CONSTRUCTION DETAILS	
Client: J. H. Martin		Driller: P. Smith				
Location: B-10		G.S. Technician: J. Patterson				
Date: 12/5/2017		Boring Method: 3.25" ID H. S. Auger				
Depth	Soil/Rock Description	Blow Count	Remarks			
22			Saturated @ 34 ft	293.0		Natural Formation
24	Light brown white micaceous SILT, dry	13 16 28				
26						
28						
30	Light brown light gray white micaceous SILT with plagioclase feldspar from 28.6-28.7 ft., with structure dry	30 50/6				
32						
34	Black white micaceous SILT, moist to saturated @ 34 ft.	50/6				
36						
38						
40	Dark brown brown gray black micaceous SILT with banding, saturated	20 48 50/4				



Project: CC-1100		Drilling Company: Blue Ridge Drilling, Inc.		ELEVATION (FT - AMSL)		WELL CONSTRUCTION DETAILS
Client: J. H. Martin		Driller: P. Smith				
Location: B-10		GS Technician: J. Patterson				
Date: 12/5/2017	Depth: 47 ft.	Boring Method: 3.25" ID H. S. Auger				
Depth	Soil/Rock Description	Blow Count	Remarks			
42						
44	Dark gray gray light green black micaceous SILT, saturated	50/6				
46						
47				278.0		

Auger Refusal @ 47 ft.

278.0







Project: CC-1100		Drilling Company: Blue Ridge Drilling, Inc.		ELEVATION (FT - AMSL)
Client: J. H. Martin		Driller: P. Smith		
Location: B-11		G S Technician: J. Patterson		
Date: 12/5/2017	Depth: 40 ft.	Boring Method: 3.25" ID H. S. Auger		
Depth	Soil/Rock Description	Blow Count	Remarks	310.0
2				
		3		
		5		
		5		
4	Light brown micaceous SILT, moist	7		
		5		
		7		
		11		
6	Yellow brown very fine SANDY SILT, dry	11		
	Light brown white SILT, dry	42		
	Light gray white fine SAND with quartz fragments, dry	46		
		20		
8	Brown light brown red brown black weathered granodiorite, dry	12		
		13		
		14		
	Light brown red brown SILT, dry	14		
10		14		
12				
14	Light gray light brown yellow brown micaceous very fine SANDY SILT, structure increasing with depth, dry	10		
		12		
		12		
16				
18				
	Light brown light gray black weathered granodiorite with gneissic banding, dry	25		
20		50/4		

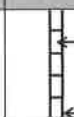


Project: CC-1100		Drilling Company: Blue Ridge Drilling, Inc.		ELEVATION (FT - AMSL)
Client: J. H. Martin		Driller: P. Smith		
Location: B-11		G S Technician: J. Patterson		
Date: 12/5/2017	Depth: 40 ft.	Boring Method: 3.25" ID H. S. Auger		
Depth	Soil/Rock Description	Blow Count	Remarks	
22	Light brown light gray black weathered granodiorite with gneissic banding, dry	8		
		12		
24		17		
26	Light gray black very fine micaceous SANDY SILT, with structure, dry	50/4		
28				
30	Light gray black micaceous SILT (weathered gneiss), dry	50/3		
32				
34	No Return	50/1		
36				
38				
40				

Auger Refusal @ 40 ft.

270.0



Project: CC-1100		Drilling Company: Blue Ridge Drilling, Inc.		ELEVATION (FT. - AMSL)		WELL CONSTRUCTION DETAILS
Client: J. H. Martin		Driller: P. Smith				
Location: B-14		G S Technician: J. Patterson				
Date: 12/7/2017	Depth: 42.5 ft.	Boring Method: 3.25" ID H. S. Auger				
Depth	Soil/Rock Description	Blow Count	Remarks			
42				277.5	1.25" ID Hand Slotted PVC Screen	Push Cap



Project: CC-1100		Drilling Company: Blue Ridge Drilling, Inc.		ELEVATION (FT - AMSL)	Stickup: 1.2 ft.	WELL CONSTRUCTION DETAILS
Client: J. H. Martin		Driller: P. Smith				
Location: B-12		G S Technician: J. Patterson				
Date: 12/6/2017		Boring Method: 3.25" ID H. S. Auger				
Depth	Soil/Rock Description	Blow Count	Remarks			
				330.0		
2	Red brown CLAYEY SILT, moist	8				Push Cap
		7				
4	Red brown micaceous SILT, moist	7				
		8				
	Red brown CLAYEY SILT, moist	4				
	Red brown yellow SILT with horizontal structure, dry	6				
6	White black micaceous Silt with structure, dry	8				
		4				
	Light brown micaceous SILT, dry	5				
		7				
8		3				
	Light brown SILT, trace quartz fragments at 8.5 ft., horizontal structure, dry	4				
		6				
10		6				1.25 " ID Push Coupling PVC Pipe
		5				
12						
14	Light brown light gray SILT with sand, biotite rich at base with horizontal structure, dry	4				
		3				
		4				Natural Formation
16						
18						
	Light brown white micaceous SILT, dry	7				
		10				
20	White pink light brown very fine SANDY SILT with quartz fragments, dry	9				

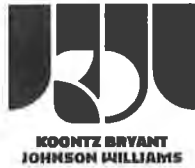


Project: CC-1100		Drilling Company: Blue Ridge Drilling, Inc.		ELEVATION (FT. - AMSL)		WELL CONSTRUCTION DETAILS
Client: J. H. Martin		Driller: P. Smith				
Location: B-12		G S Technician: J. Patterson				
Date: 12/6/2017		Boring Method: 3.25" ID H. S. Auger				
Depth	Soil/Rock Description	Blow Count	Remarks			
			Saturated @ 27 ft.	310.0		
22						
24	Light brown light gray SILT with pink plagioclase banding at 24 ft., dry	21				
		13				
		12				
26						
28						
	Light brown light gray white black SILT with horizontal banding, trace quartz	12				
		18				
30	fragments at base, saturated at 27 ft. (seen on rod)	23				
32						
34	Light brown light gray white black SILT with horizontal banding, trace quartz	12				
		12				
	fragments at base, saturated	25				
36						
38						
	Light brown light gray white black SILT with horizontal banding, trace quartz	50/5				
40	fragments at top, saturated					



Project: CC-1100		Drilling Company: Blue Ridge Drilling, Inc.		ELEVATION (FT - AMSL)		WELL CONSTRUCTION DETAILS
Client: J. H. Martin		Driller: P. Smith				
Location: 6-12		G S Technician: J. Patterson				
Date: 12/6/2017	Depth: 45.5 ft.	Boring Method: 3.25" ID H. S. Auger				
Depth	Soil/Rock Description	Blow Count	Remarks	284.50		
42						
44	Dark brown black micaceous SILT, saturated	50/3				

Auger Refusal @ 45.5 ft.



Project: CC-1100		Drilling Company: Blue Ridge Drilling, Inc.		ELEVATION (FT - AMSL)
Client: J. H. Martin		Driller: P. Smith		
Location: B-13		G S Technician: J. Patterson		
Date: 12/6-7/2017	Depth: 26 ft.	Boring Method: 3.25" ID H. S. Auger/Wireline Core		
Depth	Soil/Rock Description	Blow Count	Remarks	305.0
2				
	Light brown brown CLAYEY SILT, trace organic matter at the top, wet	3		
		5		
		5		
4		6		
	Light brown light gray micaceous SILT with rock fragments at 4-5 ft., dry	20		
		17		
		16		
6		21		
	Light brown micaceous SILT, dry	7		
		10		
		17		
8		19		
	Light brown micaceous SILT, dry	13		
		14		
		14		
10		16		
12				
14	Light brown SILT with quartz fragments, dry	50/4		
	Light brown white fine to medium SAND with silt, dry			
16				
18				
	Light brown light gray micaceous SILT with biotite banding, dry	32		
		35		
20		50/4		





Project: CC-1100		Drilling Company: Blue Ridge Drilling, Inc.		ELEVATION (FT - AMSL)
Client: J. H. Martin		Driller: P. Smith		
Location: B-13		G S Technician: J. Patterson		
Date: 12/6-7/2017	Depth: 26 ft.	Boring Method: 3.25" ID H. S. Auger/Wireline Core		
Depth	Soil/Rock Description	Blow Count	Remarks	
22				
24	Light brown light gray SILT, trace biotite mica,	50/3		
	horizontal structure, dry		Run 1: 25-26 ft. Recovery - 12/12" = 100% RQD - 0/12" = 0%	280.0
	Highly weathered micaceous SILT, dry		Auger Refusal@ 25 ft. Rock Core Lock Up @ 26 ft.	279.0



Project: CC-1100		Drilling Company: Blue Ridge Drilling, Inc.		ELEVATION (FT. - AMSL)	Stickup: 1.5 ft.	WELL CONSTRUCTION DETAILS
Client: J. H. Martin		Driller: P. Smith				
Location: B-14		G S Technician: J. Patterson				
Date: 12/7/2017		Boring Method: 3.25" ID H. S. Auger				
Depth	Soil/Rock Description	Blow Count	Remarks	320.0		
2						
		5				
	Light brown micaceous SILT, moist to dry	6				
4		11				
		14				
		8				
	Light brown red brown micaceous SILT structure at the base, dry	20				
6		28				
		26				
	Red brown light gray SILT with structure, trace biotite mica at base, dry	16				
8		18				
		17				
		23				
	Light brown SILT, trace rock fragments, horizontal structure, dry	20				
10		24				
		29				
		50/4				
12						
14	Light brown light gray black SILT, trace rock fragments at 14 ft., horizontal structure, dry	32				
		43				
		41				
16						
18						
	Light brown micaceous SILT, horizontal structure, dry	35				
20		50/3				



Project: CC-1100		Drilling Company: Blue Ridge Drilling, Inc.		ELEVATION (FT - AMSL)		WELL CONSTRUCTION DETAILS
Client: J. H. Martin		Driller: P. Smith				
Location: B-14		G.S. Technician: J. Patterson				
Date: 12/7/2017		Boring Method: 3.25" ID H. S. Auger				
Depth	Soil/Rock Description	Blow Count	Remarks			
22						
	Light brown light gray micaceous SILT, dry	50/2				
24						
26						
28						
	Light brown micaceous SILT, dry	27				
	Red brown SANDY SILT, trace quartz fragments, dry	50/5				
30						
32						
	Brown dark brown micaceous SANDY SILT, dry	14				
		25				
34		28				
36						
38						
	Red brown black micaceous SILT, wet to saturated	20				
	Red brown micaceous SANDY SILT, saturated	50/6				
40			Saturated @ 39 ft.	281.0		

287.50

281.0

Natural Formation

1.25" ID Push Coupling PVC Pipe

Natural Formation



Project: CC-1100		Drilling Company: Blue Ridge Drilling, Inc.		ELEVATION (FT - AMSL)
Client: J. H. Martin		Driller: P. Smith		
Location: B-15		G S Technician: J. Patterson		
Date: 12/8/2017	Depth: 11 ft.	Boring Method: 3.25" ID H. S. Auger		
Depth	Soil/Rock Description	Blow Count	Remarks	283.0
2				
	Light brown micaceous SILT, dry	4		
	Dark gray dark brown biotite rich SILT with	8		
4	structure, dry	20		
		45		
	Light brown light gray micaceous SILT, dry	30		
		39		
6		50/6		
	Gray brown white micaceous SILT, dry	29		
		40		
8	Gray brown white micaceous SANDY SILT, trace rock fragments, dry	50/3		
	Dark gray brown biotite rich micaceous SILT, trace rock fragments, dry	35		
		50/4		
10				

Auger Refusal @ 11 ft.

272.0



Project: CC-1100		Drilling Company: Blue Ridge Drilling, Inc.		ELEVATION (FT - AMSL)
Client: J. H. Martin		Driller: P. Smith		
Location: B-16		G S Technician: J. Patterson		
Date: 12/8/2017	Depth: 30 ft.	Boring Method: 3.25" ID H. S. Auger		
Depth	Soil/Rock Description	Blow Count	Remarks	
2				
4	Red brown micaceous SILT, dry	3 3 3 5		
6	Red brown micaceous SILT, dry	4 6 5 7		
8	Light brown micaceous SILT, dry	6		
	White light brown micaceous SILT, dry	8 5 7		
10	White light brown micaceous SILT, dry	6 7 6 7		
12				
14				
	Light brown light gray micaceous SILT, dry	6 7 8		
16				
18				
20	Light brown light gray micaceous SILT, some white plagioclase, dry	6 9 10		



Project: CC-1100		Drilling Company: Blue Ridge Drilling, Inc.		ELEVATION (FT - AMSL)
Client: J. H. Martin		Driller: P. Smith		
Location: B-16		G S Technician: J. Patterson		
Date: 12/8/2017	Depth: 30 ft.	Boring Method: 3.25" ID H. S. Auger		
Depth	Soil/Rock Description	Blow Count	Remarks	313.0
22				
	Light brown brown gray micaceous SILT, trace rock fragments, dry	39 50/3		
24				
26				
28				
	Light brown light gray micaceous SANDY SILT, dry	50/3		
30				

Auger Reusal @ 30 ft.

283.0



Project: CC-1100		Drilling Company: Blue Ridge Drilling, Inc.		ELEVATION (FT. - AMSL)	Stickup: 2.2 ft.	WELL CONSTRUCTION DETAILS
Client: J. H. Martin		Driller: P. Smith				
Location: B-17		G S Technician: J. Patterson				
Date: 12/12/2017		Boring Method: 3.25" ID H. S. Auger				
Depth	Soil/Rock Description	Blow Count	Remarks	380.0		
2						
	Red brown micaceous SILT, moist	4				
		7				
		11				
4		14				
	Red brown micaceous SILT, trace quartz fragments at top of sample, moist	5				
		8				
		11				
6		13				
	Red brown micaceous SILT, dry	4				
		4				
		4				
8		4				
	Red brown light brown micaceous SILT with sand, dry	3				
		4				
		5				
10		7				
12						
14	Red brown light brown micaceous SILT, structure at base, dry	3				
		3				
		4				
16						
18						
	Red brown micaceous SILT, dry	3				
		4				
20	Brown black micaceous SILT, dry	3				

WELL CONSTRUCTION DETAILS

Push Cap

1.25" ID Push Coupling PVC Pipe

Natural Formation



Project: CC-1100		Drilling Company: Blue Ridge Drilling, Inc.		ELEVATION (FT - AMSL)		WELL CONSTRUCTION DETAILS
Client: J. H. Martin		Driller: P. Smith				
Location: 8-17		G S Technician: J. Patterson				
Date: 12/12/2017		Boring Method: 3.25" ID H. S. Auger				
Depth	Soil/Rock Description	Blow Count	Remarks			
22			Saturated @ 33.5 ft.	353.0		
	Red brown micaceous SILT, dry	3				
		4				
24	Dark brown SANDY SILT, dry	6				
26						
28						
		12				
30	Light gray gray micaceous SANDY SILT, dry	18				
		14				
32						
34	Light brown light gray gray black micaceous SANDY SILT (weathered gneiss) with quartz fragments, saturated @ 33.5 ft.	10				
		19				
		25				
36						
38						
40	Light brown light gray gray black micaceous SANDY SILT (weathered gneiss) with quartz fragments, saturated	40				
		50/4				

Saturated @ 33.5 ft.


Natural Formation

1.25" ID Hand Slotted PVC Screen

Natural Formation





Project: CC-1100		Drilling Company: Blue Ridge Drilling, Inc.		ELEVATION (FT - AMSL)		WELL CONSTRUCTION DETAILS
Client: J. H. Martin		Driller: P. Smith				
Location: B-17		G S Technician: J. Patterson				
Date: 12/12/2017		Boring Method: 3.25" ID H. S. Auger				
Depth	Soil/Rock Description	Blow Count	Remarks			
42						
44	Biotite rich SANDY SILT with quartz fragments, saturated (minor anticlinal with arch towards top of spoon)	27 50/3				1.25" ID Hand Slotted PVC Screen
46						
Auger Refusal @ 47.0 ft.				333.0		Push Cap

1.25" ID Hand Slotted PVC Screen

Push Cap



Project: CC-1100		Drilling Company: Blue Ridge Drilling, Inc.		ELEVATION (FT. - AMSL)	Stickup: 0.8 ft.	WELL CONSTRUCTION DETAILS
Client: J. H. Martin		Driller: P. Smith				
Location: B-18		G S Technician: J. Patterson				
Date: 12/14/2017		Boring Method: 3.25" ID H. S. Auger/Wireline Core				
Depth	Soil/Rock Description	Blow Count	Remarks			
				368.0		Push Cap
2		3				
	Red brown SILT, moist	7				
		9				
4		13				
	Red brown SILT, trace rock fragments, moist	5				
		12				
6		17				
		20				
	Red brown SILT, trace rock fragments, moist	8				
		13				
		12				
8		12				
	Red brown light gray SILT, dry	5				
		10				
		12				
10		14				1.25" ID Push Coupling PVC Pipe
12						
14	Red brown dark brown micaceous SILT, structure at base of sample, dry	2				
		2				
		3				Natural Formation
16				353.0		
18						
	Red brown dark brown micaceous SILT, dry	2				
		4				
20	Light gray SILT, wet	8				1.25" ID Hand Slotted PVC Screen



Project: CC-1100		Drilling Company: Blue Ridge Drilling, Inc.		ELEVATION (FT - AMSL)	WELL CONSTRUCTION DETAILS	
Client: J. H. Martin		Driller: P. Smith				
Location: B-18		G S Technician: J. Patterson				
Date: 12/14/2017		Boring Method: 3.25" ID H.S. Auger/Wireline Core				
Depth	Soil/Rock Description	Blow Count	Remarks			
22			Saturated @ 21 ft.	347.0		
24	Light brown light gray micaceous weathered GNEISS with quartz banding, saturated (slight anticlinal folding at top of sample)	7 41 50/1				
26						
28						
30	Red brown dark gray SANDY SILT with quartz fragments, saturated	50/2				
32	30-30.7 ft. - Fine grained banded GNEISS with biotite & muscovite, minor fractures at 45° & 90° (water staining of fractures noted), saturated		Auger Refusal @ 30 ft.	338.0		
34	30.7-31.6 ft. - Muscovite rich SCHIST, trace quartz fragments at 31.2 ft. & 31.5 ft saturated		Run 1: 30-35 ft. Recovery - 30/60" = 50% RQD - 8/60" = 13%			
36	21.5-32.5 ft. - Biotite rich SCHIST with quartz fragments, some muscovite, saturated					
38	35-36.3 ft. - Weathered biotite rich GNEISS with water stained folding, saturated		Run 2: 35-40 ft Recovery - 61.5/60" = 103% RQD - 41/60" = 68%			
40	36.3-36.4 ft. - Weathered quartz, sat. 36.4-37.1 ft. - Biotite rich quartz banded GNEISS with minor stained fractures, sat. 37.1-37.2 ft. - Highly weathered biotite rich GNEISS, saturated 37.2-40 ft - Biotite rich GNEISS with some folding & quartz banding, sat.			328.0		
Total Depth @ 40 ft.						



Project: CC-1100		Drilling Company: Blue Ridge Drilling, Inc.		ELEVATION (FT - AMSL)
Client: J. H. Martin		Driller: P. Smith		
Location: B-19		G S Technician: J. Patterson		
Date: 12/13/2017	Depth: 46.5 ft.	Boring Method: 3.25" ID H. S. Auger		
Depth	Soil/Rock Description	Blow Count	Remarks	358.0
2				
		5		
		8		
	Light gray light brown SILT, dry	13		
4		15		
		10		
	Light gray light brown SILT with sand, dry	22		
		43		
6		50/3		
	Light gray light brown SILT, dry	50/2		
8				
		25		
	Light gray light brown micaceous SILT, trace structure at base, dry	29		
		50/5		
10				
12				
14	Light gray light brown micaceous SILT, trace structure at base, dry	28		
		50/2		
16				
18				
	Light brown light gray micaceous SILT, dry	50/6		
20				



Project: CC-1100			Drilling Company: Blue Ridge Drilling, Inc.		ELEVATION (FT - AMSL)
Client: J. H. Martin			Driller: P. Smith		
Location: B-19			G S Technician: J. Patterson		
Date: 12/13/2017		Depth: 46.5 ft.	Boring Method: 3.25" ID H. S. Auger		
Depth	Soil/Rock Description		Blow Count	Remarks	
22					
24	Dark brown biotite rich SANDY SILT, horizontal		50/5		
	structure, dry				
26					
28					
	Dark brown biotite rich SANDY SILT, horizontal		33		
30	structure, dry		50/3		
	Light brown SANDY SILT, dry				
32					
34	Light brown brown SANDY SILT, dry		50/3		
36					
38					
	Light brown brown SANDY SILT, dry		50/1		
40					



Project: CC-1100		Drilling Company: Blue Ridge Drilling, Inc.		ELEVATION (FT - AMSL)
Client: J. H. Martin		Driller: P. Smith		
Location: B-19		G S Technician: J. Patterson		
Date: 12/13/2017	Depth: 46.5 ft.	Boring Method: 3.25" ID H. S. Auger		
Depth	Soil/Rock Description	Blow Count	Remarks	
42				
44	Light brown brown SANDY SILT, dry	50/1		
46				

311.5

Auger Refusal @ 46.5 ft.



Project: CC-1100		Drilling Company: Blue Ridge Drilling, Inc.		ELEVATION (FT - AMSL)	Stickup: 0.6 ft.	WELL CONSTRUCTION DETAILS
Client: J. H. Martin		Driller: P. Smith				
Location: B-20		G S Technician: J. Patterson				
Date: 12/13/ & 15/2017		Depth: 48.0 ft. Boring Method: 3.25" ID H. S. Auger/Wireline Core				
Depth	Soil/Rock Description	Blow Count	Remarks	320.0		
2						
4	Gray micaceous SILT with quartz fragments at base, dry	14 30 50/4				
6	Light brown SILT, some quartz fragments, dry	15 50/5				
8	Red brown SANDY SILT, trace quartz fragments, dry	13 25				
	Black brown white micaceous SANDY SILT with quartz fragments, dry	26 37				
10	Light gray SANDY SILT, trace quartz fragments at top of sample, dry	15 35 50/4				
12						
14	Light gray gray micaceous SANDY SILT with quartz fragments, dry	33 50/5				
16						
18						
20	Brown gray black micaceous SILT, trace quartz fragments, dry	40 43 50/4				

Push Cap

1.25 " ID Push Coupling PVC Pipe

Natural Formation

WELL CONSTRUCTION DETAILS

Push Cap

1.25" ID Push Coupling PVC Pipe

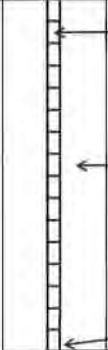
Natural Formation



Project: CC-1100		Drilling Company: Blue Ridge Drilling, Inc.		ELEVATION (FT - AMSL)		WELL CONSTRUCTION DETAILS
Client: J. H. Martin		Driller: P. Smith				
Location: B-20		G S Technician: J. Patterson				
Date: 12/13/ & 15/2017		Boring Method: 3.25" ID H. S. Auger/Wireline Core				
Depth	Soil/Rock Description	Blow Count	Remarks			
22						
24	Light brown SANDY SILT with quartz fragments at the top of the sample, with structure, dry	19 50/3				
26						Natural Formation
28						
30	Light brown gray black mlaceous SILT, dry	50/6				1.25" ID Push Coupling PVC Pipe
32						
34	Light brown light gray micaceous SILT, dry	12 50/5		287.0		
36						
38						1.25" ID Hand Slotted PVC Screen
40	Quartz rich GNEISS with pink plagioclase feldspar		Auger refusal @ 38 ft Run 1: 38-43 ft. Recovery - 22/60" = 37% ROD - 0/60" = 0%	282.0		Rock
	Biotite rich GNEISS, rock weathering increasing with depth					





Project: CC-1100		Drilling Company: Blue Ridge Drilling, Inc.		ELEVATION (FT - AMSL)	WELL CONSTRUCTION DETAILS
Client: J. H. Martin		Driller: P. Smith			
Location: B-20		G S Technician: J. Patterson			
Date: 12/13/2017	Depth: 48.0 ft.	Boring Method: 3.25" ID H. S. Auger/Wireline Core			
Depth	Soil/Rock Description	Blow Count	Remarks	272.0	
42	Biotite rich GNEISS with quartz banding, weathered to highly weathered, dry		Run2: 43-48 ft. Recovery - 36/60" = 60% RQD - 14/60" = 23%		
44					
46					
48					
Total Depth @ 48 ft.					