

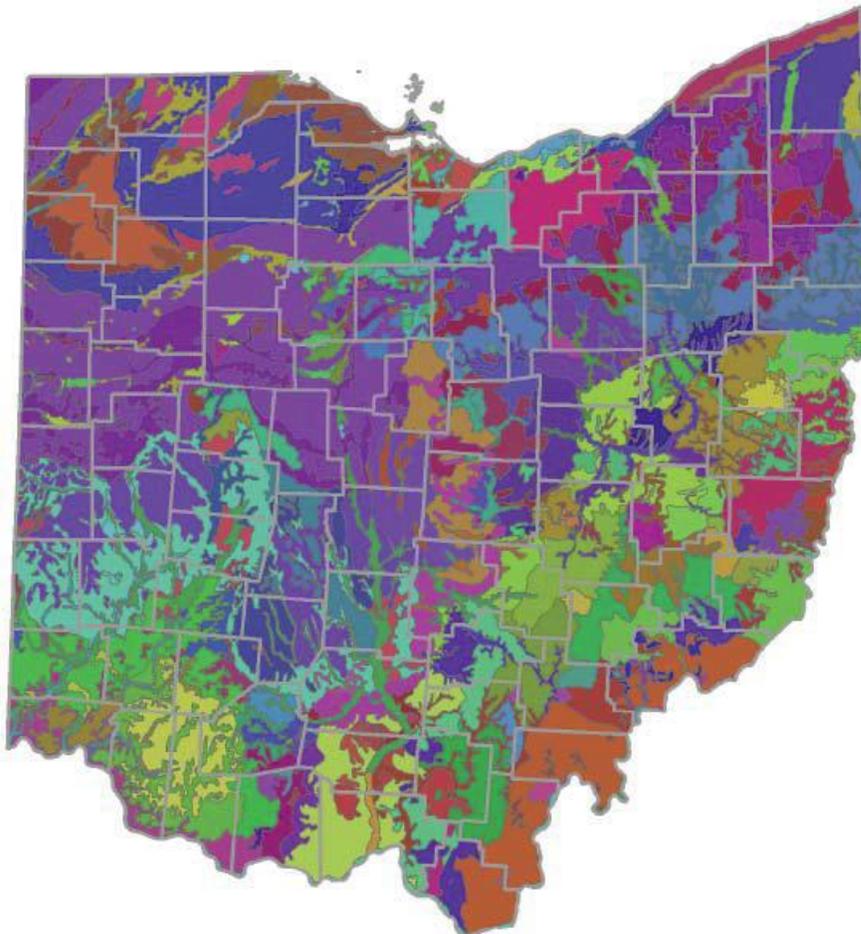


July 2014

Evaluation of Background Metal Soil  
Concentrations in Montgomery County –  
Dayton Area

DEVELOPED IN SUPPORT OF  
THE OHIO VOLUNTARY ACTION PROGRAM

Summary Report



\*Generalized soil map for the State of Ohio,  
Ohio Department of Natural Resources

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## **Acknowledgements**

This summary report was developed by a workgroup representing Ohio EPA staff from the Division of Environmental Response and Revitalization (DERR) and environmental consultants, some of whom are Certified Professionals (CPs) for Ohio EPA's Voluntary Action Program (VAP).

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## **Disclaimer**

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The summary report serves as a tool in the aid of investigation and evaluation of environmentally impacted sites in Ohio. It is not meant as a regulatory document and any statements provided herein are not legally binding.

## ACRONYMS

amsl	Above mean sea level
BGG	Brookville Golden Gate Park
bgs	Below ground surface
BYP	Bill Yeck Park
$C_v$	Coefficient of variation
DERR	Division of Environmental Response and Revitalization
DRP	Don Rusk Park
EAM	Eastwood Metropark
EWM	Englewood Metropark
ft	Feet
FP-XRF	Field Portable X-ray Fluorescence
GOF	Goodness-of-fit
GTM	Germantown Metropark
KM	Kaplan-Meier
mg/kg	Milligram per kilogram
$n_b$	Number of background observations
OAC	Ohio Administrative Code
ODNR	Ohio Department of Natural Resources
OEPA	Ohio Environmental Protection Agency
PCM	Possum Creek Metropark
QA	Quality Assurance
QAPP	Quality Assurance Project Plan
RCRA	Resource Conservation Recovery Act
SAP	Sampling and Analysis Plan
$S_b$	Standard deviation
SIFU	Site Investigation Field Unit
TAL	Target Analyte List
TAP	Triangle Park
TBA	Targeted Brownfields Assessment
TOC	Total Organic Carbon
TPK	Twin Creek Metropark
TVM	Taylorville Metropark
UCL	Upper confidence level
USCS	Unified Soil Classification System
USDA	United States Department of Agriculture
USEPA	United States Environmental Protection Agency
UPL	Upper prediction limit
UTL	Upper tolerance limit
VAP	Voluntary Action Program
VAP UL	Voluntary Action Program Upper Limit

## EXECUTIVE SUMMARY

Ohio EPA Division of Environmental Response and Revitalization (DERR) sampled and analyzed surface soils at 10 Dayton-area properties for background concentrations of Resource Conservation and Recovery Act (RCRA) metals (As, Ba, Cd, Cr, Pb, Hg, and Se) in addition to nickel (Ni) and thallium (Tl). Silver was removed from the RCRA analytical suite due to repeated non-detections found in other Ohio counties. Soil sample locations met the location restriction requirements of OAC 3745-300-07(H)(1)(b).

A reconnaissance was performed whereby one preliminary soil boring was installed at each property. The reconnaissance evaluated the shallow soil horizon (less than four feet deep) to ensure that areas of the property where samples were collected met location restrictions. Select soil samples from the preliminary borings were screened for metals concentrations using Ohio EPA's mobile laboratory field-portable X-ray fluorescence (FP-XRF) analyzer. Screening results were used to further evaluate the suitability of the sampling locations and depth intervals.

Ten soil samples per targeted soil horizon at each property were collected to provide a statistically representative data set as described by OAC 3745-300-07(H)(1)(d)(i). Ohio EPA collected all surficial soil samples between the ground surface and depth of two feet using a hand auger. Sample locations were within a 15 ft. radius of the preliminary soil boring location. Upon sample collection completion all samples were sent to a fixed-base, VAP-certified laboratory for analyses of each soil sample.

Statistical evaluations were performed to determine the representative background concentrations for each metal. Background soil concentrations were calculated in accordance with the VAP rules effective April 23, 2012, found in OAC 3745-300-07(H)(1)(d)(ii). All statistical analyses, including outlier tests, were run using ProUCL version 4.1. A summary of the background determination results for Montgomery County are provided in tabular format as part of this report. Final and representative background concentrations of metals in Montgomery County are as follows:

Arsenic	9.90 mg/kg
Barium	109.5 mg/kg
Cadmium	0.566 mg/kg
Chromium	13.6 mg/kg
Lead	25.2 mg/kg
Mercury	0.062 mg/kg
Nickel	23.3 mg/kg
Selenium	0.51 mg/kg
Thallium	0.37 mg/kg

## TABLE OF CONTENTS

1.0 INTRODUCTION.....	1
2.0 SCOPE.....	2
3.0 DAYTON AREA SOIL TYPES.....	4
4.0 PROPERTY USE AND REGULATORY HISTORY .....	5
5.0 SUMMARY OF SAMPLING STRATEGY AND FIELD ACTIVITIES .....	5
5.1 PROPERTY RECONNAISSANCE AND PRELIMINARY SOIL BORING EVALUATION .....	5
5.2 SOIL SAMPLING AND ANALYSIS.....	6
5.3 FIELD SAMPLING EQUIPMENT DECONTAMINATION .....	7
5.4 LABORATORY ANALYSES .....	7
6.0 SAMPLING LOCATIONS.....	8
6.1 PROPERTY DESCRIPTIONS AND LOCATIONS.....	8
7.0 METHOD OF BACKGROUND VALUE DETERMINATION .....	8
7.1 OUTLIER TEST.....	8
7.2 NONDETECT TEST.....	9
7.3 SOIL BACKGROUND MEAN.....	9
7.4 STANDARD DEVIATION .....	9
7.5 COEFFICIENT OF VARIATION.....	10
7.6 DISTRIBUTION .....	10
7.7 VAP UPPER LIMIT .....	10
8.0 DAYTON-AREA BACKGROUND VALUES .....	11
8.1 ARSENIC .....	11
8.2 BARIUM .....	12
8.3 CADMIUM .....	12
8.4 CHROMIUM.....	12
8.5 LEAD .....	13
8.6 MERCURY .....	13
8.7 NICKEL .....	13
8.8 SELENIUM.....	14
8.9 THALLIUM.....	14

## TABLE OF CONTENTS (CONT.)

9.0 APPLICATION OF THIS REPORT .....	15
10.0 REFERENCES.....	16

### LIST OF FIGURES

- FIGURE 1: SAMPLE LOCATIONS, MONTGOMERY COUNTY, OHIO  
FIGURE 2: GENERAL SOIL MAP, MONTGOMERY COUNTY, OHIO

### LIST OF TABLES

- TABLE 1A: SOIL SAMPLING PROPERTY INFORMATION SUMMARY: LOCATIONS, SETTINGS & TOPOGRAPHY  
TABLE 1B: SOIL SAMPLING PROPERTY INFORMATION SUMMARY: SOIL MAPPING UNITS, PARENT MATERIALS & SOIL TYPES  
TABLE 2: SUMMARY OF SOIL GEOTECHNICAL TESTING RESULTS  
TABLE 3: BACKGROUND STATISTICS FOR MONTGOMERY COUNTY  
SUMMARY RESULTS FOR NINE METALS IN SOILS  
TABLE 4: PROPERTY ABBREVIATION KEY  
TABLE 5: SUMMARY OF ARSENIC DATA  
TABLE 6: SUMMARY OF BARIUM DATA  
TABLE 7: SUMMARY OF CADMIUM DATA  
TABLE 8: SUMMARY OF CHROMIUM DATA  
TABLE 9: SUMMARY OF LEAD DATA  
TABLE 10: SUMMARY OF MERCURY DATA  
TABLE 11: SUMMARY OF NICKEL DATA  
TABLE 12: SUMMARY OF SELENIUM DATA  
TABLE 13: SUMMARY OF THALLIUM DATA

### LIST OF APPENDICES

- APPENDIX A: BORING LOGS (PRELIMINARY SOIL BORINGS)  
APPENDIX B: FP-XRF SOIL ANALYTICAL SCREENING RESULTS  
APPENDIX C: USCS AND USDA SOIL CLASSIFICATION  
AND TEXTURAL COMPOSITION ANALYSES  
APPENDIX D: ProUCL RUNS

## 1.0 INTRODUCTION

Evaluation of metals in soils for the assessment and remediation of brownfield sites often requires that “background” concentrations be determined. Background metal concentrations are typically attributed to the natural composition of soil and not from the impact of hazardous substances or petroleum, hazardous or solid wastes, or wastewater. Background concentrations are assumed to be largely dependent on soil texture and composition (i.e., the percentages of sand, silt and clay; the specific mineral components present; and the naturally occurring organic matter present) and also the types of geologic material from which the soil has been derived (e.g., sand and gravel outwash, shale bedrock, till, etc.).

Background metal concentrations in urban soils are particularly challenging to characterize as opposed to background concentrations in suburban or rural areas. Urban soils often have been subjected to decades of various unregulated anthropogenic activities that can elevate background metal concentrations. For example, aerial deposition of particulate matter from fuel combustion or industrial activities in urban areas may increase the concentrations of lead, arsenic, zinc and certain other metals in soils. Construction activities, demolition activities, and surface water runoff from roofs and paved areas may also increase soil metal concentrations.

This investigation evaluates background metal concentrations in urban, suburban and rural surface soils to provide a dataset that may be used as a reference to help satisfy the requirements of, in part, Ohio Voluntary Action Program (VAP) rules (OAC Chapter 3745-300). Specifically, this summary report applies to Montgomery County and Dayton-area brownfield properties being assessed and remediated under the Ohio VAP. For the purposes of this investigation, “Montgomery County – Dayton area urban soils” means surficial soils within the City of Dayton or adjacent municipalities, including suburban areas and metro parks within suburban or rural areas.

## 2.0 SCOPE

Under the direction of Ohio EPA – VAP Central Office, the Ohio EPA Site Investigation Field Unit (SIFU) sampled and analyzed surface soils at 10 Dayton-area properties for background concentrations of Resource Conservation and Recovery Act (RCRA) metals (As, Ba, Cd, Cr, Pb, Hg, and Se) in addition to nickel and thallium. Silver was removed from the RCRA metals analytical suite due to repeated non-detections found in soil samples collected from other counties. The property locations are shown on Figure 1, and Tables 1A and 1B provide additional location information and property characteristics including setting (land use), topography and general soil data. The properties were selected based on the following criteria:

- The ability to obtain access from local governments or private property owners.
- Compliance with the VAP location restrictions for background soil sampling investigations [OAC 3745-300-07(H)(1)(b)].
- Design of an investigation that provided representative data for the major soil mapping units within Montgomery County as described on the “General Soil Map, Montgomery County, Ohio” of the *Soil Survey of Montgomery County, Ohio* (USDA Soil Conservation Service) to the extent possible given limitations imposed by the first two criteria.

In addition, at each property one representative sample of the targeted soil horizon was submitted to a contract soil laboratory for USCS and USDA soil texture classification based on sieve, hydrometer and Atterberg limits analyses.

Prior to performing sampling activities, SIFU performed a reconnaissance and collected one preliminary soil boring at each property. The objectives of the reconnaissance were to evaluate the shallow (less than four feet deep) soil horizons present and select a target sampling horizon, ensure that areas of the property where samples were collected met location restrictions, and select a general sampling area. Each preliminary soil boring (one per sampling area) was field logged in accordance with the Unified Soil Classification System (USCS) and the USDA soil classification system to evaluate the soil types present and screen the sampling location for fill or waste materials. In addition, selected soil samples from the preliminary borings were screened for metals concentrations using Ohio EPA’s mobile laboratory field-portable X-ray fluorescence (FP-XRF) analyzer. The screening results were used to further evaluate the suitability of the sampling locations and depth intervals for background data.

Data quality objectives (DQOs) for this project included the following:

1. Soil samples from Dayton-area urban properties meeting the location restriction requirements of OAC 3745-300-07(H)(1)(b)
2. USCS field classification of each preliminary soil boring per ASTM D2488, Standard Practice for Description and Identification of Soils (Visual–Manual Procedure)
3. USDA field classification of each preliminary soil boring using “texture-by-feel” analysis (Presley and Thien, 2008)
4. FP-XRF analyzer screening of each preliminary soil boring for selected metals (Ti, Cr, Mn, Fe, Co, Ni, Cu, Zn, As, Se, Rb, Sr, Zr, Mo, Ag, Cd, Sn, Sb, Hg and Pb) meeting the requirements of SW-846 Method 6200
5. Analysis of 10 soil samples per targeted soil horizon at each property to provide a statistically representative data set as described by OAC 3745-300-07(H)(1)(d)(i)
6. Fixed-base, VAP-certified laboratory analyses of each soil sample for RCRA metals (As, Ba, Cd, Cr, Pb, Hg, Se and Ag), nickel, and thallium meeting the requirements of Ohio EPA’s Voluntary Action Program
7. USCS and USDA classification and textural composition of one selected soil sample per property based on soil laboratory testing in accordance with ASTM D422, Standard Test Method for Particle Size Analysis of Soils (modified to provide USDA soil particle size classes); ASTM D4318, Test Method for Liquid Limit, Plastic Limit, and Plasticity Index of Soils; and ASTM D2487, Standard Practice for Classification of Soils for Engineering Purposes (Unified Soil Classification System)

### 3.0 DAYTON-AREA SOIL TYPES

Figure 2 (“General Soil Map, Montgomery County, Ohio” from the Soil Survey of Montgomery County, Ohio) shows the general soil mapping units present in the Dayton-area (USDA Soil Conservation Service, 1980). These include the following:

1. “Lewisburg-Brookston-Pyrmont association: Deep, nearly level to moderate steep, well-drained to very poorly drained soils that have a moderate fine textured and fine textured subsoil; formed in thin loess and glacial till.”
2. “Miamiian-Celina association: Deep, mainly gently sloping to moderately steep, well drained and moderately well drained soils that have a moderately fine textured and fine textured subsoil; formed in thin loess and glacial till.”
3. “Brookston-Crosby association: Deep, mainly level to gently sloping, very poorly drained and somewhat poorly drained soils that have a moderately fine textured and fine textured subsoil; formed in thin loess and glacial till.”
4. “Brookston-Fincastle association: Deep, mainly nearly level to gently sloping, very poorly drained and somewhat poorly drained soils that have moderately fine textured subsoil; formed in thick loess and glacial till.”
5. “Xenia-Russell association: Deep, mainly nearly level to gently sloping, moderately well drained and well drained soils that have a moderately fine textured subsoil; formed in thick loess and glacial till.”
6. “Milton-Ritchey-Millsdale association: Moderately deep and shallow, nearly level to very steep, well-drained and very poorly drained soils that have a moderately fine textured and fine textured subsoil; formed in glacial till over limestone.”
7. “Fox-Ockley association: Deep, nearly level to moderately steep, well drained soils that have a moderately fine textured subsoil; formed in loess and loamy outwash underlain by calcareous sand and gravel.”
8. “Westland-Montgomery association: Deep, nearly level to depressional, very poorly drained soils that have a dominantly moderately fine textured and fine textured subsoil; formed in loamy outwash and clayey lacustrine material.”
9. “Ross-Medway association: Deep, nearly level, well drained and moderately well drained soils that have a dominantly moderately coarse textured and medium textured subsoil or underlying material; formed in loamy alluvium.”

The majority of the soils in Montgomery County are formed on silt- and clay-rich glacial till and loess.

In summary, properties were selected to incorporate as many of these general soil mapping units as possible to provide a background metal data set that is representative with respect to the soils present in the Dayton-area.

#### **4.0 PROPERTY USE AND REGULATORY HISTORY**

Properties evaluated for soil sampling included public parks that were not underlain by engineered or structural fill [OAC 3745-300-01(A)(43)] or industrial fill [OAC 3745-300-01(A)(72)], and where industrial or waste disposal activities have not occurred (Tables 1A and 1B and Figure 1). Soil types where disposal has occurred must be excluded from background determinations by rule. The reconnaissance effort conducted prior to the actual sampling event prevented sampling of these prohibited soil types.

Properties underlain by native fill may be sampled [OAC 3745-300-01(A)(83)]. “Native fill” is soil material derived from the property and transferred from one area of the property to another area in such a manner that the original soil structure and physical properties may be altered from the initial pre-excavation conditions, but the chemical and physical properties remain consistent with other undisturbed native soils at the property.

#### **5.0 SUMMARY OF SAMPLING STRATEGY AND FIELD ACTIVITIES**

##### **5.1 Property Reconnaissance and Preliminary Soil Boring Evaluation**

SIFU performed a property reconnaissance to evaluate potential sampling areas and inspect the property soils. The results of the reconnaissance were used to select the general area where samples were ultimately collected, as well as determine the soil horizon sampled for chemical (metals) and soil texture analysis (classification).

Prior to each property reconnaissance, a review of property soil descriptions provided by the Soil Survey of Montgomery County, Ohio was conducted. During site reconnaissance, field staff evaluated sampling location restrictions based on OAC 3745-300-07(H)(1)(b), which include:

- (i) Areas underlain by engineered fill, structural fill or industrial fill
- (ii) Areas where the management, treatment, handling, storage or disposal of hazardous substances or petroleum, solid or hazardous wastes, waste waters or material handling areas are known or are suspected to have occurred
- (iii) Areas within three feet of a roadway
- (iv) Parking lots or areas surrounding parking lots or other paved areas

- (v) Railroad tracks or railway areas or other areas affected by their runoff
- (vi) Areas of concentrated air pollution depositions or areas affected by their runoff
- (vii) Storm drains or ditches presently or historically receiving industrial or urban runoff
- (viii) Spill areas

The sampling locations were evaluated based on visual inspection of the property, interviews with the property owners or representatives, review of Sanborn Maps and other historical records, and sampling and inspection of property soils.

A hand auger was used to collect a preliminary soil boring at each proposed sampling area to evaluate the upper four (4) feet of surficial soils, which were field-classified in accordance the USCS (ASTM D2488) and the USDA soil classification system (Presley and Thien, 2008). Soil boring logs are included in Appendix A.

Ohio EPA analyzed selected soil samples from each preliminary soil boring for selected metals (Ti, Cr, Mn, Fe, Co, Ni, Cu, Zn, As, Se, Rb, Sr, Zr, Mo, Ag, Cd, Sn, Sb, Hg, and Pb) using the FP – XRF analyzer in accordance with SW-846 Method 6200. The results were used to evaluate the influence of anthropogenic activities on the soil metal concentrations. Based on the screening results, the soil metal concentrations did not appear to be elevated by anthropogenic activities at any of the selected properties.

The FP-XRF results also were used to examine the vertical distributions of metal concentrations in the soil profile at each preliminary soil boring location. The results appear to indicate that some metal concentrations may be depth-related (e.g., at some locations, lead concentrations are higher near the ground surface and decrease with depth). The trends were not tested for statistical significance. However, based on these results, a sampling interval of ground surface to two feet deep (or until refusal on shallow bedrock) was selected for all analytical samples to avoid introducing additional variation in the analytical data set due to potential variability associated with an inconsistent sampling depth interval.

The XP-XRF analytical results are considered ‘screening’ level data quality under the current VAP rules. As such, these results cannot be used as part of a background demonstration where comparison to soil applicable standards is required. However, the results are provided in Appendix B for general reference purposes.

## **5.2 Soil Sampling and Analysis**

Based on the results of the preliminary field investigation, the team selected 10 soil sampling localities (properties) to collect soil samples for RCRA metal laboratory analysis (excluding silver), including nickel and thallium.

At each locality, Ohio EPA collected 10 surficial soil samples between the ground surface and depth of two feet using a hand auger. At each of the 10 locations Ohio EPA was able to auger to the the minimum required depth interval (i.e., two-feet below ground surface). At a few locations auger refusal was encountered on very stiff to hard or heaving clays before reaching the target depth of four feet, and the sampling interval was slightly smaller (e.g., ground surface to 3.0 feet), but was never less than two feet. Locations where auger refusal occurred included Don Rusk Park, Englewood MetroPark, Twin Creek MetroPark, and Taylorsville MetroPark.

The sample locations were within a 15 ft. radius of the preliminary soil boring location (the sampling area circular with an approximate diameter of 30 ft. with the preliminary soil boring location in the center). Ohio EPA collected the geotechnical and 10 analytical samples within an area approximately 30 feet in diameter to ensure that the soil samples were similar in texture and composition (i.e., from the same population). The Ohio EPA SIFU sampling team used this approach at all sampling localities for a consistent investigative approach across all properties sampled.

At each locality, the first analytical sample (e.g., EAM-1, TAP-1, TVM-1, etc.) and the geotechnical sample were collected adjacent to the preliminary soil boring location. The other nine analytical samples were collected at random locations within a radius of 15 ft. of the preliminary soil boring. Upon completion, each sampling location was backfilled with native soil.

Each soil sample (approximately three to four pounds) was homogenized in a stainless steel mixing pan. A two-ounce subsample was collected and preserved on ice at 4° C and submitted to Ohio EPA's contract laboratory for RCRA metals, nickel and thallium analysis. Approximately two (2) pounds of soil were collected for laboratory USCS and USDA classification and soil texture composition based on sieve, hydrometer, and Atterberg limits testing (one per sampling area).

### **5.3 Field Sampling Equipment Decontamination**

Hand augers, sampling spoons, mixing bowls, and other field equipment used to sample soils were decontaminated between properties by washing with a solution of non-phosphate detergent and potable water and rinsing with deionized water.

### **5.4 Laboratory Analyses**

Ohio EPA's contract laboratory (Microbac Laboratories, Inc.) analyzed 110 soil samples (10 per site) for RCRA metals (As, Ba, Cd, Cr, Pb, Hg and Se), nickel (Ni), and thallium (Tl) using Inductively Coupled Plasma (ICP) and/or Graphite Furnace Atomic Absorption Spectrophotometry (GFAAS) via U.S. EPA Method 6020 and Method 7471. Geotechnics, subcontracted by Microbac, Inc. performed the USCS and USDA classification (see Table 2 and Appendix C) and soil texture composition in accordance with ASTM D422, Standard Test Method for Particle Size Analysis of Soils (modified to

provide USDA soil particle size classes); ASTM D4318, Test Method for Liquid Limit, Plastic Limit, and Plasticity Index of Soils; and ASTM D2487, Standard Practice for Classification of Soils for Engineering Purposes (Unified Soil Classification System). Data received from Microbac are considered certified under the Ohio EPA VAP certified laboratory program.

## **6.0 SAMPLING LOCATIONS**

### **6.1 Property Descriptions and Locations**

Details for the 10 locations sampled for this investigation are included in Tables 1A and 1B. Information contained in Table 1A provides property information such as site location (latitude/longitude), generalized setting (e.g., urban, suburban or rural), and the topography (e.g., level, gently sloping, etc.). Surveying the location of each sampling point was determined not to be practical; therefore, the longitude and latitude coordinates are presented for the approximate location of the preliminary soil boring. As noted in Section 5.0, samples were collected within a 15-foot radius of the original preliminary sample boring. Table 1B provides information relative to the soil survey for Montgomery County. Specific details on the table includes the mapping (soil type) unit at each property and the underlying parent material (e.g., bedrock, lake deposits, etc.) underlying each property.

## **7.0 METHOD OF BACKGROUND VALUE DETERMINATION**

Upon receipt of all laboratory data, statistical evaluations were performed to determine the representative background concentrations. It was determined that data collected from all 10 property locations would be incorporated into a single data set. Preliminary evaluations were performed whereby a comparison of properties was performed. Using this method statistically similar sites were combined into a single data set. Though statistically correct, this method was found to be cumbersome such that multiple background values were generated per metal. Therefore, the more direct approach was selected whereby all data points were combined into a single data set and outliers were removed as the entire data set was analyzed. The result was that a single, representative background number was generated for each metal. Background values were determined for the 0-2 ft bgs interval from all 10 property locations.

### **7.1 Outlier Test**

The data set was evaluated for the presence of outliers in accordance with the VAP Rule OAC 3745-300-07(H)(1)(d)(ii)(d). The presence of outliers in the background data sets could yield higher or lower estimates of the upper limits. Statistical outlier tests give evidence that a value does not fit with the distribution of the remainder of the data and is, therefore, a statistical outlier. The outlier identification was performed by the Rosner

outlier test utilizing ProUCL. All outliers were removed prior to completing background calculations.

## **7.2 Nondetect Test**

According to the ProUCL user's guide, when the percentage of nondetects in a data set is high (greater than 50 percent (%)) or when multiple detection limits are present, it is hard to reliably perform goodness-of-fit (GOF) tests to determine data distribution. In those cases, the uncertainty associated with the GOF tests is high, especially with smaller data sets (less than 10 to 20 samples). In those situations, the use of nonparametric methods such as the Kaplan-Meier (KM) method to compute statistics such as upper confidence limits, upper prediction limits (UPLs), and upper tolerance limits (UTLs) is preferred because nonparametric methods do not require any distributional assumptions about the data sets.

By example, Table 3 shows that cadmium results had approximately 57% non-detectable values (depending on the data set). In this scenario the KM method was not used, however the maximum value in the dataset was chosen as the representative concentration by ProUCL. Due to the elevated number of non-detects a definitive distribution of the dataset could not be determined. Further evaluation of the data set detailed below shows that this provides an acceptable representation of the data obtained.

## **7.3 Soil Background Mean**

The background mean ( $X_b$ ) for data sets without nondetects was calculated by ProUCL by dividing the sum of the total background values ( $X_n$ ) by the total number of background readings ( $n_b$ ):

$$X_b = \frac{X_1 + X_2 + X_3 \text{ (etc.)}}{n_b}$$

The background mean for data sets with nondetects was calculated by ProUCL using the appropriate method based on the distribution (e.g., the KM method for nonparametric data sets with multiple detection limits).

## **7.4 Standard Deviation**

The standard deviation ( $S_b$ ) for data sets without nondetects was calculated by ProUCL by taking the square root of the sum of the squares of each value ( $X_n$ ) minus the mean ( $X_b$ ), divided by the degrees of freedom (number of background soil samples minus one):

$$S_b = \left[ \frac{(X_1 - X_b)^2 + (X_2 - X_b)^2 + (X_3 - X_b)^2 (\text{etc.})}{n_b - 1} \right]^{1/2}$$

For data sets with nondetects, the standard deviation was calculated by ProUCL using the appropriate method based on the distribution (e.g., the KM method for nonparametric data sets with multiple detection limits).

### **7.5 Coefficient of Variation**

The  $C_v$  is the ratio of the standard deviation ( $S_b$ ) to the mean ( $X_b$ ) and describes the magnitude of sample values and the variation within them:

$$C_v = \frac{S_b}{X_b}$$

The  $C_v$  is used to evaluate the distribution of the data, where generally a  $C_v$  of less than 0.5 indicates a normal distribution. A  $C_v$  was calculated only for data sets without nondetects.

### **7.6 Distribution**

The distribution of each data set was also evaluated using ProUCL to determine if the distributions were normal, lognormal, or gamma distributed. The upper limits for the data sets that were normal were then calculated as described below. Data sets that were not normally distributed were evaluated for the upper limits using nonparametric methods. Nonparametric methods do not assume a particular population probability distribution, and are therefore valid for data from any population with any probability distribution, which can remain unknown.

### **7.7 VAP Upper Limit (UL)**

In accordance with the VAP background soil determination requirements in OAC 3745-300-07(H)(1), the background mean plus two standard deviations is the maximum allowable limit or upper limit for normally distributed data. The background upper limit for normally distributed data sets was calculated by multiplying the standard deviation by two and adding the background mean such that:

$$\text{VAP UL} = X_b + (2 \times S_b)$$

If the data follows a lognormal, nonparametric, or gamma distribution, the upper limit was calculated using ProUCL to determine the 95% upper prediction limit (UPL) based on the best fit distribution. This is noted in Tables 3A and 3B.

## **8.0 DAYTON-AREA SOIL BACKGROUND VALUES**

Background soil concentrations were calculated in accordance with the VAP rules effective April 23, 2012, found in OAC 3745-300-07(H)(1)(d)(ii). As noted in Section 7.7, for normally distributed data, the background mean plus two standard deviations is the maximum allowable limit, or UL, which was calculated by multiplying the standard deviation by two and then adding the mean concentration. Normally distributed data were observed in the arsenic, mercury, and nickel data sets. The 95% upper tolerance limit was used as the representative background concentrations for the barium, lead, selenium, and thallium data sets. The maximum value was used in the cadmium data set.

A summary of the background determination results for Montgomery County are provided in Table 3. Seven of the eight original RCRA metals are presented. As previously discussed, silver was not included in this study due to the characteristically high number of nondetects found for other county-wide soil background studies completed in the State. Therefore, silver has been determined not to be a significant contributor to elevated background concentrations across the Montgomery County region. As a replacement both nickel and thallium were added to the suite of metals analyses.

The ProUCL output data sheets are provided in Appendix D. Analytical results for each metal are provided in Tables 5 through 13. Metal concentrations for each sample at each location are provided. Summary statistics including maximum, minimum, average, and standard deviation are also provided. The following sections are a narrative of the summary results.

### **8.1 Arsenic**

Concentrations of arsenic ranged from 2.92 to 11.1 mg/kg with no nondetects. There were 100 valid data points, with no outliers removed. The data set mean was calculated to be 7.00 mg/kg, with a standard deviation of 1.85 mg/kg. The VAP UL was determined to be 10.7 mg/kg, however the VAP UL cannot be used as the background concentration because the data are not normally distributed. The 95% UTL was calculated to be 9.90 mg/kg as the data were calculated using a nonparametric approach. This value is determined to be the representative soil background concentration for arsenic.

## **8.2 Barium**

Concentrations of barium ranged from 41.1 to 128 mg/kg with no nondetects. There were 80 valid data points with 20 outliers removed. Outliers were determined to be both the Eastwood Metropark and Possum Creek Metropark data sets. The data set mean was calculated to be 69.2 mg/kg, with a standard deviation of 17.8 mg/kg. The VAP UL for was determined to be 104.9 mg/kg, however the VAP UL cannot be used as the background concentration because the data are not normally distributed. The 95% UTL was calculated to be 109.5 mg/kg. This value is determined to be the representative soil background concentration for barium.

## **8.3 Cadmium**

Detected concentrations of cadmium ranged from 0.212 to 0.566 mg/kg. There were 100 valid data points with no outliers removed. There were 57 nondetects, or 57%, of the final data set. Due to the elevated number of nondetections in the overall data set no meaningful statistics could be performed on the cadmium data. Therefore, the cadmium representative background concentration was determined to be the maximum concentration of the dataset.

## **8.4 Chromium**

Concentrations of chromium ranged from 3.58 to 13.6 mg/kg with no nondetects. There were 100 valid data points with no outliers removed. The data set mean was calculated to be 8.63 mg/kg, with a standard deviation of 2.04 mg/kg. The VAP UL was determined to be 12.7 mg/kg. The VAP UL cannot be used as the representative concentration because the data have a lognormal distribution. The 95% UTL with 95% coverage was determined to be 13.6 mg/kg. This value is determined to be the representative soil background concentration for chromium.

## **8.5 Lead**

Detected concentrations of lead ranged from 8.76 to 28.9 mg/kg. There were 98 valid data points, after the removal of two outliers. There were no nondetects in the data set. The data set mean was calculated to be 16.9 mg/kg, with a standard deviation of 3.75 mg/kg. The VAP UL was determined to be 24.4 mg/kg which cannot be used as the data set is non normally distributed. The 95% UTL with 95% coverage was determined to be 25.2 mg/kg. This value is determined to be the representative soil background concentration for lead.

## **8.6 Mercury**

Concentrations of mercury ranged from 0.0102 to 0.0762 mg/kg. There were 99 valid data points after removal of one outlier. There were no nondetects in the data set. The data for mercury at all 10 sites were combined to form one normally distributed group. The data set mean was calculated to be 0.038 mg/kg, with a standard deviation of 0.012 mg/kg. The VAP UL for the entire data set was determined to be 0.062 mg/kg. The VAP UL was determined to be the representative soil background concentration for mercury.

## **8.7 Nickel**

Detected concentrations of nickel ranged from 8.53 to 19.9 mg/kg. There were 100 valid data points, with no outliers removed. There were no nondetects in the data set. The data set mean was calculated to be 18.3 mg/kg, with a standard deviation of 2.49 mg/kg. The VAP UL was determined to be 23.3 mg/kg. This value is determined to be the representative soil background concentration for nickel.

## **8.8 Selenium**

Detected concentrations of selenium ranged from 0.103 to 0.51 mg/kg. There were 100 valid data points with no outliers removed. There were 26 nondetects, or 26%, of the final data set. The VAP UL was determined to be 0.77 mg/kg which cannot be used as the data set is non-normally distributed. The 95% UTL with 95% coverage was determined to be 0.51 mg/kg. This value is determined to be the representative soil background concentration for selenium.

## **8.9 Thallium**

Concentrations of thallium ranged from 0.0218 to 0.381 mg/kg with no nondetects. There were 100 valid data points with no outliers. The data set mean was calculated to be 0.22 mg/kg, with a standard deviation of 0.065 mg/kg. The VAP UL was determined to be 0.35 mg/kg. The VAP UL cannot be used as the representative concentration because the data have a lognormal distribution. The 95% UTL with 95% coverage was determined to be 0.37 mg/kg. This value is determined to be the representative soil background concentration.

## 9.0 APPLICATION OF THIS REPORT AND SUMMARY OF BACKGROUND DETERMINATION

Background results generated in this report are specific to Montgomery County. Users of this report may elect to utilize the results presented in Section 8.0 and Table 3 for direct comparison purposes to other properties in Montgomery County in accordance with VAP soil background rule requirements (OAC 3745-300-07(H)(2)). It is generally inappropriate to apply these background values to properties located in non-adjacent or surrounding counties. Exceptions to this provision may be allowable if the user can demonstrate that the subject property has a similar soil provenance and type to one or more soil types listed for properties within this study. Geotechnical analysis of the subject property soil type is advisable to make the soil type comparison. Additionally, samples collected at the subject property must be representative of the zone (e.g., 0-2 ft. bgs.) assessed in this study.

The following results are the background upper limits for metal soil concentrations in Montgomery County – Dayton Area:

Arsenic	9.90 mg/kg
Barium	109.5 mg/kg
Cadmium	0.566 mg/kg
Chromium	13.6 mg/kg
Lead	25.2 mg/kg
Mercury	0.062 mg/kg
Nickel	23.3 mg/kg
Selenium	0.51 mg/kg
Thallium	0.37 mg/kg

## 10.0 REFERENCES

ASTM D2487, Standard Practice for Classification of Soils for Engineering Purposes (Unified Soil Classification System)

ASTM D2488, Standard Practice for Description and Identification of Soils (Visual – Manual Procedure)

ASTM D422, Standard Test Method for Particle Size Analysis of Soils

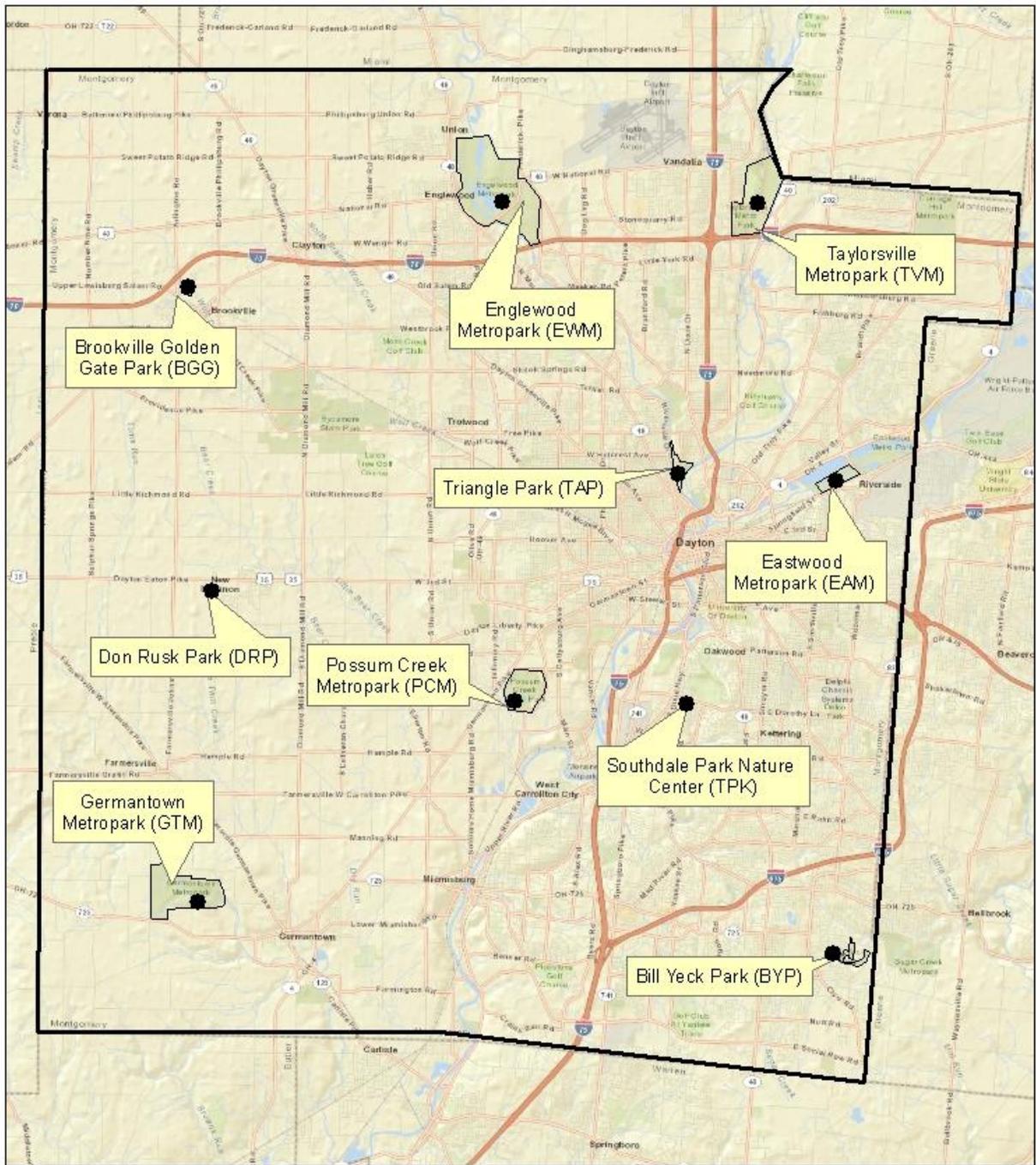
ASTM D4318, Test Method for Liquid Limit, Plastic Limit, and Plasticity Index of Soils

Presley, D., and S. Thien, September 2008, Estimating Soil Texture By Feel, Kansas State University Department of Agronomy, MF-2852

USDA Soil Conservation Service, December 1980, Soil Survey of Montgomery County, Ohio

U.S. EPA SW-846 Method 6200 (Revision 0, February 2007), Field Portable X-ray Fluorescence Spectrometry for the Determination of Elemental Concentrations in Soil or Sediment

U.S. EPA, U.S. EPA Statistical Software ProUCL 4.1 for Environmental Applications for Data Sets With and Without Non-detect Observations

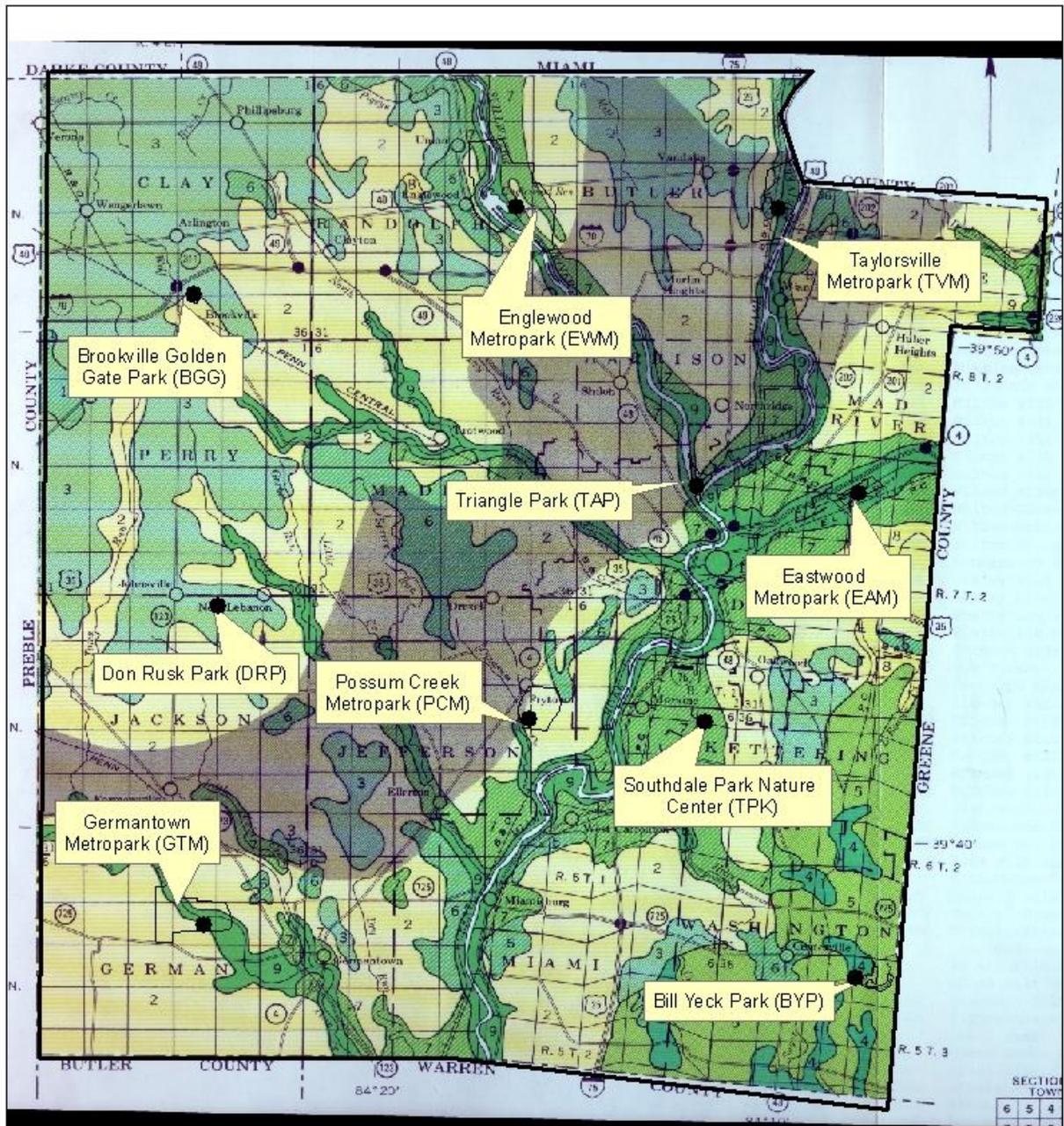


MONTGOMERY COUNTY BACKGROUND SOIL STUDY  
 MONTGOMERY COUNTY, OHIO  
 WORLD STREET MAP

**FIGURE 1: SAMPLE LOCATIONS**

Ohio Environmental Protection Agency





MONTGOMERY COUNTY BACKGROUND SOIL STUDY  
 MONTGOMERY COUNTY, OHIO  
 GENERAL SOILS MAP

**FIGURE 2: SAMPLE LOCATIONS**

Ohio Environmental Protection Agency



**TABLE 1A**  
**Soil Sampling Property Information Summary: Locations, Settings & Topography**

Sampled Property	Property Abbreviation (Sample ID)	Location			Setting	Topography
		Address	Latitude <sup>1</sup>	Longitude <sup>1</sup>		
Bill Yeck Park	<b>BYP</b>	8798 Rooks Mill Lane, Centerville, OH 45458	39.621508	-84.128843	suburban park	moderately to steeply sloping hillside
Brookville Golden Gate Park	<b>BGG</b>	545 Upper Lewisburg Salem Rd, Brookville, OH 45309	39.845333	-84.419128	suburban park	level upland area
Don Rusk Park	<b>DRP</b>	201 South Fuls Road, New Lebanon, OH 45345	39.740214	-84.405897	rural park	level upland area
Eastwood MetroPark	<b>EAM</b>	1385 Harshman Road, Dayton, OH 45431	39.783056	-84.131131	urban park	level floodplain area (Mad River)
Englewood MetroPark	<b>EWM</b>	4361 National Road, Vandalia, OH 45377	39.875570	-84.282260	suburban park	gently sloping upland area 0.5 miles NE of the Still Water River
Germantown MetroPark	<b>GTM</b>	7501 Conservancy Road, Germantown, OH 45327	39.635328	-84.408122	rural park	level to gently sloping upland area
Possum Creek MetroPark	<b>PCM</b>	4790 Frytown Road, Dayton, OH 45418	39.710210	-84.267557	rural park	level upland area
Southdale Park Nature Center	<b>TPK</b>	[3000-3099] Bellflower Street, Kettering, OH 45409	39.704700	-84.195286	urban park	moderately to steeply sloping hillside
Taylorville MetroPark	<b>TVM</b>	2000 State Route 40, Vandalia, OH 45377	39.877959	-84.168809	suburban park	level floodplain area 0.5 miles NW of the Great Miami River
Triangle Park	<b>TAP</b>	2500 Ridge Avenue, Dayton, OH 45414	39.787131	-84.199772	suburban park	gently to moderately sloping upland area between Still Water River and Great Miami River

**Note:**

<sup>1</sup> Latitude and longitude values (GPS field measurements) are for the approximate center of area from which soil samples were collected.

**TABLE 1B****Soil Sampling Property Information Summary: Soil Mapping Units, Classification and Parent Materials**

Sampled Property	Preliminary Soil Boring <sup>1</sup> & Location			Soil Mapping Units, Classification and Parent Material			
	PSB	Latitude <sup>2</sup>	Longitude <sup>2</sup>	Mapping Unit	USCS	USDA	Parent Material
Bill Yeck Park	BYP-PSB	39.621508	-84.128843	Miamian silt loam (MIB)	lean clay with sand (CL)	loam	glacial till
Brookville Golden Gate Park	BGG-PSB	39.845333	-84.419128	Russell silt loam (RuB)	lean clay (CL)	silty clay loam	loess (wind-deposited silt, clay and fine sand) & glacial till
Don Rusk Park	DRP-PSB	39.740214	-84.405897	Celina silt loam (CeB)	lean clay with sand (CL)	silty clay loam	glacial till
Eastwood MetroPark	EAM-PSB	39.783056	-84.131131	Ross-Urban land complex (Rt)	elastic silt (MH)	silty clay loam	floodplain alluvium
Englewood MetroPark	EWM-PSB	39.875570	-84.282260	Miamian silt loam (MIB)	lean clay with sand (CL)	silt loam	glacial till
Germantown MetroPark	GTM-PSB	39.635328	-84.408122	Miamian silt loam (MIB)	lean clay with sand (CL)	clay loam	glacial till
Possum Creek MetroPark	PCM-PSB	39.710210	-84.267557	Miamian silt loam (MIB)	fat clay (CH)	silty clay loam	loess
Southdale Park Nature Center	TPK-PSB	39.704700	-84.195286	Fox-Urban land complex (FuB)	sandy lean clay (CL)	clay loam	silty/clayey glacial outwash (stream terrace)
Taylorville MetroPark	TVM-PSB	39.877959	-84.168809	Ross silt loam (Rs)	sandy fat clay (CH)	loam	floodplain alluvium
Triangle Park	TAP-PSB	39.787131	-84.199772	Miamian silt loam (MIB)	lean clay (CL)	silt loam	loess

**Note:**

- 1 One preliminary soil boring (PSB) was installed at each sampling location to evaluate soil conditions prior to collecting analytical samples; PSB logs (with field soil descriptions) are included in Appendix A.
- 2 Latitude and longitude values (GPS field measurements) are for the approximate center of area from which soil samples were collected.

**TABLE 2**  
**Summary of Geotechnical Testing Results for Montgomery County Background Soils**

Soil Sample	Soil Parent Material	Unified Soil Classification System (USCS)								USDA Soil Classification System				
		USCS Soil Type	Particle Size Distribution				Atterberg Limits			USDA Soil Type	Particle Size Distribution			
			% Gravel	% Sand	% Silt	% Clay	LL	PL	PI		% Gravel	% Sand	% Silt	% Clay
			(>4.76 mm)	(<=4.76 mm, >0.074 mm)	(<=0.074 mm, >0.002 mm)	(<=0.002 mm)					(>2 mm)	(<=2 mm, >0.05 mm)	(<=0.05 mm, >0.002 mm)	(<=0.002 mm)
BYP-1	glacial till	Lean Clay with Sand (CL)	3.23	24.03	48.13	24.61	32	15	17	Loam	7.37	24.75	43.26	24.61
BGG-1	loess (wind-deposited silt, clay and fine sand) & glacial till	Lean Clay (CL)	0.45	11.91	58.62	29.02	47	22	25	Silty Clay Loam	0.88	14.69	55.40	29.02
DRP-1	glacial till	Lean Clay with Sand (CL)	1.22	18.43	45.14	35.22	47	23	24	Silty Clay Loam	3.38	19.00	42.40	35.22
EAM-1	floodplain alluvium	Elastic Silt (MH)	0.66	12.54	59.69	27.11	58	34	24	Silty Clay Loam	1.02	17.13	54.73	27.11
EWM-1	glacial till	Lean Clay with Sand (CL)	2.03	19.39	56.56	22.03	37	22	15	Silt Loam	3.14	22.10	52.73	22.03
GTM-1	glacial till	Lean Clay with Sand (CL)	0.73	18.61	52.87	27.80	39	16	23	Clay Loam	1.74	22.31	48.16	27.80
PCM-1	loess	Fat Clay (CH)	0.00	5.56	59.89	34.55	51	24	27	Silty Clay Loam	0.33	9.35	55.77	34.55
TPK-1	silty/clayey glacial outwash (stream terrace)	Sandy Lean Clay (CL)	7.40	41.35	21.83	29.42	48	21	27	Clay Loam	15.62	34.73	20.23	29.42
TVM-1	floodplain alluvium	Sandy Fat Clay (CH)	3.27	30.15	42.49	24.09	51	25	26	Loam	5.24	32.04	38.64	24.09
TAP-1	loess	Lean Clay (CL)	0.00	7.90	69.57	22.53	38	19	19	Silt Loam	0.40	12.94	64.13	22.53

**Table 3**  
**Background Statistics for Montgomery County**  
**Summary Results for Nine Metals**

Metal	Number of Sites Included <sup>(1)</sup>	Number of Outliers	% ND	Data points	Maximum	Mean	SD	Distribution	VAP UL	95% UTL with 95% Coverage	95% UPL	Units	Comments
Arsenic	10	0	0%	100	11.1	7.00	1.85	Normal	10.7	<b>9.90</b>	9.68	mg/kg	
Barium <sup>(1)</sup>	10	20	0%	80	128	69.2	17.76	Lognormal	104.7	<b>109.5</b>	102	mg/kg	Omit EAM and PCM data
Cadmium <sup>(3)</sup>	10	0	57%	100	<b>0.566</b>	-	-	-	-	-	-	mg/kg	> 50% nondetect, use max value
Chromium	10	0	0%	100	13.6	8.63	2.04	Lognormal	12.7	<b>13.6</b>	12.7	mg/kg	
Lead	10	2	0%	98	28.9	16.9	3.75	Lognormal	24.4	<b>25.2</b>	23.8	mg/kg	Two outliers removed
Mercury	10	1	0%	99	0.0762	0.038	0.012	Normal	<b>0.062</b>	0.069	0.064	mg/kg	One outlier removed
Nickel	10	0	0%	100	19.9	18.3	2.49	Normal	<b>23.3</b>	19.1	18.1	mg/kg	
Selenium	10	0	26%	100	0.513	0.22	0.129	Lognormal	0.77	<b>0.51</b>	0.50	mg/kg	Highest value used as standard
Thallium	10	0	0%	100	0.381	0.22	0.065	Lognormal	0.35	<b>0.37</b>	0.344	mg/kg	

- (1) Barium concentrations for two sites Eastwood Metropark (EAM) and Possum Creek Metropark (PCM) were substantially greater than remaining population. Data from the two sites are determined to be outliers.
- (2) The data for mercury at all 10 sites were combined to form one normally distributed group. No statistical distinction is made for mercury content in either clay-rich or sandy-rich soils.
- (3) Maximum observed value was used for cadmium due to high number of non-detects. No statistical evaluations were made (e.g., mean, SD, distribution).

{ } = mean + 2SD calculated, but dataset is not normal or lognormal and value may not be appropriate for use as the UL.

**Bold Number** = Representative background value for associated metal

Note: ND – Nondetect  
SD – Standard deviation  
VAP UL – Voluntary Action Program upper limit  
UTL – Upper tolerance limit  
UPL – Upper prediction limit

**Table 4**  
**Property Abbreviation Key**

<b>Abbreviation</b>	<b>Property &amp; General Location</b>
BYP	Bill Yeck Park
BGG	Brookville Golden Gate Park
DRP	Don Rusk Park
EAM	Eastwood Metropark
EWM	Englewood Metropark
GRM	Germantown Metropark
PCM	Possum Creek Metropark
TPK	Twin Creek Metropark
TVM	Taylorsville Metropark
TAP	Triangle Park

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**Table 5**  
**Summary of Arsenic Data**  
**Montgomery County Background Soils Summary Report**

Sample	Location		BYP	BGG	DRP	EAM	EWM	GTM	PCM	TPK	TVM	TAP
	Units											
1	mg/kg		5.29	4.29	8.00	8.22	7.50	7.35	7.96	7.78	6.67	3.20
2	mg/kg		7.28	3.35	6.78	9.94	7.64	8.49	8.83	2.92	6.10	6.54
3	mg/kg		7.98	5.47	4.89	9.37	6.08	8.31	8.71	8.98	7.17	3.18
4	mg/kg		8.07	5.18	7.72	9.68	3.10	8.15	7.77	10.8	6.51	3.77
5	mg/kg		7.67	4.29	6.84	6.92	7.14	8.29	8.47	8.57	4.82	5.75
6	mg/kg		8.33	4.71	6.17	8.45	7.22	9.18	8.34	8.31	7.02	5.16
7	mg/kg		8.69	4.32	7.72	6.31	6.54	11.1	7.53	8.36	7.67	7.25
8	mg/kg		8.56	4.15	7.38	6.56	7.62	8.54	8.47	9.65	4.65	3.24
9	mg/kg		8.30	5.26	6.60	8.78	4.73	9.46	8.35	7.46	4.58	6.45
10	mg/kg		7.36	5.94	6.91	5.30	6.31	9.81	9.58	5.32	4.69	7.25

Notes:

mg/kg = milligrams per kilogram

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**Table 6**  
**Summary of Barium Data**  
**Montgomery County Background Soils Summary Report**

Sample	Location		BYP	BGG	DRP	EAM	EWM	GTM	PCM	TPK	TVM	TAP
	Units											
1	mg/kg		54.0	72.0	67.9	224	56.1	51.1	144	105	86.2	59.1
2	mg/kg		53.9	78.2	83.7	213	57.7	61.7	133	76.7	90.3	54.5
3	mg/kg		62.7	65.9	53.8	179	46.6	48.3	113	104	73.0	63.4
4	mg/kg		79.7	83.7	76.0	196	44.4	46.7	155	108	83.4	54.6
5	mg/kg		56.9	70.9	74.5	197	45.8	68.3	124	91.2	78.0	48.9
6	mg/kg		63.9	70.1	68.6	220	51.5	64.0	142	87.1	78.3	65.7
7	mg/kg		67.3	98.0	71.0	209	43.3	46.6	120	109	128	52.6
8	mg/kg		62.7	84.0	78.7	191	43.8	52.4	153	107	86.7	50.8
9	mg/kg		66.4	76.8	69.2	228	49.2	49.5	147	79.0	81.1	65.2
10	mg/kg		57.7	81.7	69.6	210	41.1	69.3	134	76.0	74.3	62.7

Notes:  
mg/kg = milligrams per kilogram

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**Table 7**  
**Summary of Cadmium Data**  
**Montgomery County Background Soils Summary Report**

Sample	Location		BYP	BGG	DRP	EAM	EWM	GTM	PCM	TPK	TVM	TAP
	Units											
1	mg/kg		<0.200	<0.228	0.339	0.363	<0.215	<0.221	0.273	<0.209	0.373	<0.200
2	mg/kg		<0.190	<0.232	0.484	0.366	<0.214	<0.201	0.228	<0.200	0.307	<0.243
3	mg/kg		<0.197	<0.209	0.252	0.345	<0.218	<0.220	<0.209	<0.207	0.283	<0.223
4	mg/kg		<0.209	0.215	0.443	0.372	<0.206	<0.200	0.290	<0.239	0.347	<0.252
5	mg/kg		<0.217	<0.238	0.300	0.315	<0.206	<0.204	0.212	<0.213	0.306	<0.239
6	mg/kg		<0.210	<0.225	0.277	0.346	<0.198	<0.211	0.264	<0.219	0.241	<0.209
7	mg/kg		<0.200	0.345	0.385	0.461	<0.203	<0.205	0.266	<0.212	0.340	<0.221
8	mg/kg		<0.192	<0.237	0.566	0.427	<0.209	<0.205	0.290	<0.220	0.330	<0.210
9	mg/kg		<0.217	0.248	0.305	0.379	<0.203	<0.194	0.269	<0.215	0.276	<0.196
10	mg/kg		<0.200	0.277	0.301	0.370	<0.207	<0.264	0.240	<0.219	0.556	<0.205

Notes:  
mg/kg – milligrams per kilogram

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**Table 8**  
**Summary of Chromium Data**  
**Montgomery County Background Soils Summary Report**

Sample	Location		BYP	BGG	DRP	EAM	EWM	GTM	PCM	TPK	TVM	TAP
	Units											
1	mg/kg		6.71	6.26	7.94	7.40	8.34	8.17	7.62	13.0	6.70	5.76
2	mg/kg		5.34	8.19	9.37	7.63	7.15	9.26	9.39	10.1	5.95	9.42
3	mg/kg		5.87	7.38	7.45	7.90	6.80	11.7	8.98	13.6	5.73	9.38
4	mg/kg		5.40	5.77	10.6	8.26	10.3	10.7	8.94	11.3	3.58	10.5
5	mg/kg		5.98	8.43	9.22	7.33	8.53	9.51	8.22	11.9	9.14	10.6
6	mg/kg		8.19	7.18	9.24	7.37	8.28	11.4	7.55	10.6	4.26	9.17
7	mg/kg		4.92	5.49	10.3	9.47	10.2	12.0	6.69	11.0	6.14	11.6
8	mg/kg		7.02	9.96	8.71	8.01	8.80	10.1	6.86	11.2	11.2	8.06
9	mg/kg		7.48	8.54	10.3	8.21	7.05	11.6	7.85	10.8	9.67	10.7
10	mg/kg		8.49	9.21	9.49	7.48	7.70	12.8	8.21	7.89	6.56	9.36

Notes:

mg/kg – milligrams per kilogram

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**Table 9**  
**Summary of Lead Data**  
**Montgomery County Background Soils Summary Report**

Sample	Location		BYP	BGG	DRP	EAM	EWM	GTM	PCM	TPK	TVM	TAP
	Units											
1	mg/kg		8.76	15.0	13.4	14.7	20.3	18.1	16.3	17.0	15.9	21.1
2	mg/kg		9.54	16.9	15.2	16.2	18.6	12.9	15.9	17.2	15.8	20.3
3	mg/kg		12.9	18.8	10.9	16.4	18.0	15.5	16.2	19.4	15.7	20.6
4	mg/kg		14.5	18.6	14.2	17.4	17.4	15.4	16.7	21.8	33.1	20.3
5	mg/kg		11.2	19.2	14.8	14.6	14.9	13.8	15.9	19.9	19.3	17.1
6	mg/kg		11.3	11.4	15.5	15.9	16.5	13.7	16.3	18.2	16.1	25.0
7	mg/kg		14.1	28.2	13.7	19.2	18.3	15.6	16.5	19.3	27.4	22.3
8	mg/kg		10.9	17.3	14.6	17.7	16.6	18.0	16.4	23.1	31.4	21.8
9	mg/kg		11.1	18.6	13.3	17.7	17.1	15.2	17.1	15.5	17.6	21.1
10	mg/kg		10.4	15.4	13.4	16.9	15.3	16.2	17.0	14.8	25.8	23.8

Notes:

mg/kg – milligrams per kilogram

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**Table 10**  
**Summary of Mercury Data**  
**Montgomery County Background Soils Summary Report**

Sample	Location		BYP	BGG	DRP	EAM	EWM	GTM	PCM	TPK	TVM	TAP
	Units											
1	mg/kg		0.0138	0.0507	0.0438	0.0493	0.0441	0.0308	0.0351	0.0494	0.0451	0.0455
2	mg/kg		0.0202	0.0501	0.0342	0.0437	0.0442	0.0227	0.0307	0.0632	0.0449	0.0290
3	mg/kg		0.0190	0.0427	0.0294	0.0619	0.0450	0.0282	0.0273	0.0385	0.0425	0.0314
4	mg/kg		0.0232	0.0410	0.0360	0.0596	0.0404	0.0243	0.0300	0.0475	0.0486	0.0359
5	mg/kg		0.0230	0.0383	0.0346	0.0467	0.0421	0.0421	0.0289	0.0166	0.0351	0.0280
6	mg/kg		0.0229	0.0418	0.0278	0.0617	0.0438	0.0326	0.0284	0.0443	0.0367	0.0589
7	mg/kg		0.0170	0.0389	0.0211	0.0658	0.0472	0.0393	0.0323	0.0762	0.0451	0.0426
8	mg/kg		0.0203	0.0351	0.0332	0.0502	0.0388	0.0268	0.0287	0.0626	0.0467	0.0507
9	mg/kg		0.0191	0.0365	0.0280	0.0519	0.0457	0.0283	0.0318	0.0911	0.0466	0.0273
10	mg/kg		0.0227	0.0332	0.0337	0.0453	0.0421	0.0449	0.0304	0.0513	0.0470	0.0391

Notes:

mg/kg – milligrams per kilogram

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**Table 11**  
**Summary of Nickel Data**  
**Montgomery County Background Soils Summary Report**

Sample	Location		BYP	BGG	DRP	EAM	EWM	GTM	PCM	TPK	TVM	TAP
	Units											
1	mg/kg		14.1	11.2	14.3	12.4	15.1	10.9	14.3	13.5	18.0	9.87
2	mg/kg		11.2	12.1	15.9	12.9	15.0	15.6	15.7	11.6	16.9	10.5
3	mg/kg		9.29	9.18	10.7	12.9	13.1	12.2	12.3	14.3	15.1	10.0
4	mg/kg		12.1	10.4	19.9	13.1	16.1	13.3	16.0	14.0	12.3	12.9
5	mg/kg		11.4	8.62	13.4	12.3	15.4	16.5	13.1	13.2	16.1	12.1
6	mg/kg		14.9	8.87	12.2	12.5	15.2	18.0	14.2	11.3	14.8	10.1
7	mg/kg		8.53	14.2	15.9	13.5	16.1	15.5	12.8	13.3	18.8	13.6
8	mg/kg		12.1	10.5	16.1	12.8	14.8	13.9	15.6	15.3	19.3	10.2
9	mg/kg		13.6	11.2	13.6	12.6	12.8	15.6	14.5	12.9	17.7	10.8
10	mg/kg		12.2	17.8	13.7	13.0	13.4	18.6	13.1	8.87	14.4	11.2

Notes:

mg/kg – milligrams per kilogram

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**Table 12**  
**Summary of Selenium Data**  
**Montgomery County Background Soils Summary Report**

Sample	Location		BYP	BGG	DRP	EAM	EWM	GTM	PCM	TPK	TVM	TAP
	Units											
1	mg/kg		0.123	0.247	0.513	0.493	0.243	0.136	0.401	<0.119	0.293	<0.111
2	mg/kg		<0.111	<0.124	0.484	0.503	0.240	0.212	0.288	0.140	0.209	<0.130
3	mg/kg		0.245	0.332	0.316	0.329	0.156	0.199	0.278	<0.117	0.120	<0.127
4	mg/kg		0.192	0.234	0.405	0.511	<0.114	<0.108	0.310	<0.121	0.213	0.236
5	mg/kg		0.124	<0.126	0.393	0.191	0.154	0.116	0.412	<0.126	0.125	<0.128
6	mg/kg		<0.113	0.138	0.444	0.256	0.152	0.195	0.407	<0.113	0.140	0.130
7	mg/kg		0.345	0.201	0.442	0.250	0.191	<0.115	0.421	<0.120	0.361	<0.112
8	mg/kg		0.198	0.166	0.433	0.311	0.242	0.205	0.383	<0.122	0.196	<0.108
9	mg/kg		0.138	0.317	0.487	0.326	0.152	0.181	0.421	<0.115	0.188	<0.113
10	mg/kg		<0.110	<0.122	0.352	0.452	0.119	0.165	0.271	<0.112	0.151	<0.110

Notes:

mg/kg – milligrams per kilogram

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**Table 13**  
**Summary of Thallium Data**  
**Montgomery County Background Soils Summary Report**

Sample	Location		BYP	BGG	DRP	EAM	EWM	GTM	PCM	TPK	TVM	TAP
	Units											
1	mg/kg		0.141	0.177	0.335	0.172	0.368	0.226	0.194	0.207	0.223	0.116
2	mg/kg		0.172	0.145	0.349	0.208	0.349	0.217	0.207	0.102	0.194	0.232
3	mg/kg		0.182	0.201	0.247	0.228	0.288	0.174	0.254	0.209	0.173	0.129
4	mg/kg		0.201	0.203	0.381	0.203	0.243	0.187	0.228	0.296	0.193	0.117
5	mg/kg		0.175	0.220	0.315	0.128	0.356	0.207	0.195	0.253	0.169	0.162
6	mg/kg		0.237	0.219	0.280	0.150	0.327	0.231	0.208	0.215	0.187	0.156
7	mg/kg		0.217	0.181	0.333	0.139	0.326	0.236	0.172	0.222	0.248	0.242
8	mg/kg		0.194	0.180	0.314	0.149	0.354	0.203	0.238	0.245	0.193	0.116
9	mg/kg		0.307	0.200	0.344	0.144	0.202	0.228	0.212	0.203	0.162	0.193
10	mg/kg		0.202	0.203	0.327	0.111	0.315	0.275	0.236	0.145	0.191	0.252

Notes:

mg/kg – milligrams per kilogram

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## **APPENDIX A**

BORING LOGS (PRELIMINARY SOIL BORINGS)



**Ohio Environmental Protection Agency**

4675 Homer Ohio Lane  
 Groveport, OH 43215  
 Telephone: (614) 836-8820, Fax: (614) 836-8795  
 jeff.martin@epa.ohio.gov

**Bill Yeck Park**  
 8798 Rooks Mill Lane  
 Centerville, OH 45458  
 Montgomery County, SWDO

Project No./Type: NA/County Soil Background

**DERR-SIFU**  
**Soil Boring Log**

**BYP-PSB**  
 Page 1 of 1

**LAT/LONG and/or LOCATION DESCRIPTION:** Lat 39.621508° / Long -84.128843°

<b>GROUND ELEVATION:</b> 933.0 ft	<b>TOC ELEVATION:</b> NA	<b>DRILLING SERVICES:</b> Ohio EPA SIFU
<b>START DATE:</b> 6/12/13	<b>COMPLETION DATE:</b> 6/12/13	<b>DRILLER:</b> Wendy Vorwerk
<b>DRILLING &amp; SAMPLING METHODS:</b> Hand Auger		<b>LOGGED BY:</b> Wendy Vorwerk, Jeff Martin
<b>GROUND WATER LEVELS</b>		
<b>DIAMETER (in):</b> 1.5	<b>TOTAL DEPTH (ft):</b> 4	<b>REFUSAL (ft):</b> NE
<b>NOTES:</b>		<b>Date</b> <b>Time</b> <b>Depth (ft)</b> <b>Notes</b>
		06/12/13    00:00          not encountered

DEPTH (ft)	CORING		SAMPLING			REMARKS	GRAPHIC LOG	USCS	MATERIAL DESCRIPTION	
	Core Type	Core Interval/Recovery (ft)	Sample Interval (ft)	Sample Purpose/ID	PID (ppmv)					
1	HA	0.0-0.5 0.5	0.0- 0.5	Field Classification & FP-XRF Screening (selected samples, see remarks)	NA	1	0.5'	CL	USCS Lean Clay (USDA Silty Clay Loam): dark brown with yellowish brown mottling; low to medium plasticity; few sand	
	HA	0.5-1.0 0.5	0.5- 1.0					CL	USCS Lean Clay with Sand (USDA Clay Loam): dark yellowish brown; low to medium plasticity; little sand, trace gravel	
2	HA	1.0-1.5 0.5	1.0- 1.5				2	1.5'	CL	USCS Sandy Lean Clay (USDA Clay Loam): dark yellowish brown; low to medium plasticity; little to some sand, trace gravel
	HA	1.5-2.0 0.5	1.5- 2.0						CL	...dark yellowish brown with dark brown mottles; medium plasticity
3	HA	2.0-2.5 0.5	2.0- 2.5	3	2.5'	CL	CL	...dark brown with dark yellowish brown mottles; parent material appears to be till		
	HA	2.5-3.0 0.5	2.5- 3.0							
4	HA	3.0-3.5 0.5	3.0- 3.5	4	4'	CL	CL			
	HA	3.5-4.0 0.5	3.5- 4.0							

**REMARKS:**

- FP-XRF screening sample BYP 0.0-2.0 ft
- Homogenized soil from 0.0-2.0 ft deep (sampling location BYP-1) consists of **USCS Lean Clay with Sand (CL) / USDA Loam** based on lab analysis

**SURVEY BENCHMARK & DATUM:** GPS

OHIO EPA BACKGROUND SOIL LOG - OHIO EPA GEOPROBE LOG.GDT - 5/9/14 14:50 - G:\GINT\PROJECTS\MONTGOMERY COUNTY SOILS\BILL YECK PARK.GPJ

**Ohio Environmental Protection Agency**

4675 Homer Ohio Lane  
 Groveport, OH 43215  
 Telephone: (614) 836-8820, Fax: (614) 836-8795  
 jeff.martin@epa.ohio.gov

**Brookville Golden Gate Park**  
 545 Upper Lewisburg Salem Rd  
 Brookville, OH 45309  
 Montgomery County, SWDO

Project No./Type: NA/County Soil Background

**DERR-SIFU**  
**Soil Boring Log**

**BGG-PSB**  
 Page 1 of 1

**LAT/LONG and/or LOCATION DESCRIPTION:** Lat 39.845333° / Long -84.419128°

**GROUND ELEVATION:** 1,027.0 ft      **TOC ELEVATION:** NA      **DRILLING SERVICES:** Ohio EPA SIFU

**START DATE:** 5/24/13      **COMPLETION DATE:** 5/24/13      **DRILLER:** Wendy Vorwerk

**DRILLING & SAMPLING METHODS:** Hand Auger      **LOGGED BY:** Wendy Vorwerk, Jeff Martin

**GROUND WATER LEVELS**

**DIAMETER (in):** 1.5      **TOTAL DEPTH (ft):** 4      **REFUSAL (ft):** NE

**NOTES:**      Date: 05/24/13      Time: 00:00      Depth (ft):      Notes: not encountered

OHIO EPA BACKGROUND SOIL LOG - OHIO EPA GEOPROBE LOG GDT - 5/9/14 14:51 - G:\GINT\PROJECTS\MONTGOMERY COUNTY SOILS\BROOKVILLE GOLDEN GATE PARK.GPJ

DEPTH (ft)	CORING		SAMPLING			REMARKS	GRAPHIC LOG	USCS	MATERIAL DESCRIPTION
	Core Type	Core Interval/Recovery (ft)	Sample Interval (ft)	Sample Purpose/ID	PID (ppmv)				
1	HA	0.0-0.5 0.5	0.0- 0.5	Field Classification & FP-XRF Screening (selected samples, see remarks)	NA	1	0.5'	CL	USCS Lean Clay (USDA Silt Loam): very dark brown; low plasticity; trace sand
	HA	0.5-1.0 0.5	0.5- 1.0					CL	USCS Lean Clay (USDA Silt Loam to Silty Clay Loam): dark grayish brown; low to medium plasticity; trace to few sand
HA	1.0-1.5 0.5	1.0- 1.5	CH				USCS Fat Clay (USDA Silty Clay Loam to Silty Clay): dark brown; high plasticity; few sand		
2	HA	1.5-2.0 0.5	1.5- 2.0				CH	...mottled dark yellowish brown and dark brown; fractures and slickensides	
	HA	2.0-2.5 0.5	2.0- 2.5				CH	... few to little sand; fractures with carbonate and manganese mineralization	
3	HA	2.5-3.0 0.5	2.5- 3.0				CL	USCS Lean Clay with Sand (USDA Silty Clay to Clay Loam): mottled dark yellowish brown and dark grayish brown; medium plasticity; little sand; fractures with carbonate and manganese mineralization	
	HA	3.0-3.5 0.5	3.0- 3.5	CL	USCS Sandy Lean Clay (USDA Clay Loam to Sandy Clay): dark yellowish brown; low to medium plasticity; trace gravel; weathered till				
4	HA	3.5-4.0 0.5	3.5- 4.0			4'			

**REMARKS:**

1. FP-XRF screening sample BGG 0.0-0.5 ft
2. FP-XRF screening sample BGG 0.5-1.0 ft
3. FP-XRF screening sample BGG 1.0-1.5 ft
4. FP-XRF screening sample BGG 1.5-2.0 ft
5. Homogenized soil from 0.0-2.0 ft deep (sampling location BGG-1) consists of **USCS Lean Clay (CL) / USDA Silty Clay Loam** based on lab analysis
6. FP-XRF screening sample BGG 2.0-2.5 ft

**SURVEY BENCHMARK & DATUM:** GPS

**Ohio Environmental Protection Agency**

4675 Homer Ohio Lane  
 Groveport, OH 43215  
 Telephone: (614) 836-8820, Fax: (614) 836-8795  
 jeff.martin@epa.ohio.gov

**Don Rusk Park**  
 201 S. Fuls Rd  
 New Lebanon, OH 45345  
 Montgomery County, SWDO

Project No./Type: NA/County Soil Background

**DERR-SIFU**  
**Soil Boring Log**

**DRP-PSB**  
 Page 1 of 1

**LAT/LONG and/or LOCATION DESCRIPTION:** Lat 39.740214° / Long -84.405897°

**GROUND ELEVATION:** 948.0 ft

**TOC ELEVATION:** NA

**DRILLING SERVICES:** Ohio EPA SIFU

**START DATE:** 5/24/13

**COMPLETION DATE:** 5/24/13

**DRILLER:** Wendy Vorwerk

**DRILLING & SAMPLING METHODS:** Hand Auger

**LOGGED BY:** Wendy Vorwerk, Jeff Martin

**GROUND WATER LEVELS**

**DIAMETER (in):** 1.5

**TOTAL DEPTH (ft):** 3

**REFUSAL (ft):** 3

Date	Time	Depth (ft)	Notes
05/24/13	00:00		not encountered

**NOTES:**

OHIO EPA BACKGROUND SOIL LOG - OHIO EPA GEOPROBE LOG.GDT - 5/9/14 14:53 - G:\GINT\PROJECTS\MONTGOMERY COUNTY SOILS\DON RUSK PARK.GPJ

DEPTH (ft)	CORING		SAMPLING			REMARKS	GRAPHIC LOG	USCS	MATERIAL DESCRIPTION				
	Core Type	Core Interval/Recovery (ft)	Sample Interval (ft)	Sample Purpose/ID	PID (ppmv)								
0.0-0.5	HA	0.0-0.5	0.0-0.5	Field Classification & FP-XRF Screening (selected samples, see remarks)	NA	1	[Hatched Pattern]	CL	USCS Lean Clay (USDA Silty Clay Loam to Silty Clay): very dark grayish brown; low to medium plasticity; trace to few sand				
0.5-1.0	HA	0.5-1.0	0.5-1.0							2	CL	...medium plasticity	
1.0-1.5	HA	1.0-1.5	1.0-1.5							3	CL	...medium to high plasticity	
1.5-2.0	HA	1.5-2.0	1.5-2.0							4	CL/CH	USCS Lean Clay to Fat Clay (USDA Silty Clay Loam to Silty Clay): very dark grayish brown; high plasticity; trace to few sand	
2.0-2.5	HA	2.0-2.5	2.0-2.5							5			...few sand
2.5-3.0	HA	2.5-3.0	2.5-3.0							6			...mottled very dark grayish brown, very dark gray and dark yellowish brown; trace gravel; glacial till (massive structure)

**REMARKS:**

1. FP-XRF screening sample DRP 0.0-0.5 ft
2. FP-XRF screening sample DRP 0.5-1.0 ft
3. FP-XRF screening sample DRP 1.0-1.5 ft
4. FP-XRF screening sample DRP 1.5-2.0 ft
5. Homogenized soil from 0.0-2.0 ft deep (sampling location DRP-1) is **USCS Lean Clay with Sand (CL) / USDA Silty Clay Loam** based on lab analysis
6. FP-XRF screening sample DRP 2.0-2.5 ft

**SURVEY BENCHMARK & DATUM:** GPS

**Ohio Environmental Protection Agency**

4675 Homer Ohio Lane  
 Groveport, OH 43215  
 Telephone: (614) 836-8820, Fax: (614) 836-8795  
 jeff.martin@epa.ohio.gov

**Eastwood MetroPark**  
 1385 Harshman Road  
 Dayton, OH 45431  
 Montgomery County, SWDO

Project No./Type: NA/County Soil Background

**DERR-SIFU**  
**Soil Boring Log**

**EAM-PSB**  
 Page 1 of 1

**LAT/LONG and/or LOCATION DESCRIPTION:** Lat 39.783056° / Long -84.131131°

**GROUND ELEVATION:** 765.0 ft

**TOC ELEVATION:** NA

**DRILLING SERVICES:** Ohio EPA SIFU

**START DATE:** 6/12/13

**COMPLETION DATE:** 6/12/13

**DRILLER:** Wendy Vorwerk

**DRILLING & SAMPLING METHODS:** Hand Auger

**LOGGED BY:** Wendy Vorwerk, Jeff Martin

**GROUND WATER LEVELS**

**DIAMETER (in):** 1.5

**TOTAL DEPTH (ft):** 4

**REFUSAL (ft):** NE

**Date**      **Time**      **Depth (ft)**      **Notes**

**NOTES:**

06/12/13      00:00           not encountered

OHIO EPA BACKGROUND SOIL LOG - OHIO EPA GEOPROBE LOG.GDT - 5/9/14 14:54 - G:\GINT\PROJECTS\MONTGOMERY COUNTY SOIL\EA\STWOOD METROPARK.GPJ

DEPTH (ft)	CORING		SAMPLING			REMARKS	GRAPHIC LOG	USCS	MATERIAL DESCRIPTION									
	Core Type	Core Interval/Recovery (ft)	Sample Interval (ft)	Sample Purpose/ID	PID (ppmv)													
1	HA	0.0-0.5	0.0-0.5	Field Classification & FP-XRF Screening (selected samples, see remarks)	NA		[Diagonal Hatching]	CL	USCS Sandy Lean Clay (USDA Clay Loam to Sandy Clay Loam): very dark grayish brown; low plasticity; little to some sand									
	HA	0.5-1.0	0.5-1.0							[Diagonal Hatching]	CL	...dark yellowish brown, trace gravel						
	HA	1.0-1.5	1.0-1.5							[Dotted]	SP	USCS Poorly Graded Sand (USDA Loamy Sand): dark brown; nonplastic; little to some sand, trace gravel						
2	HA	1.5-2.0	1.5-2.0				Field Classification & FP-XRF Screening (selected samples, see remarks)	NA		[Diagonal Hatching]	CL	USCS Sandy Lean Clay (USDA Sandy Loam to Loam to Sandy Clay Loam): very dark brown; low plasticity; little to some sand, trace gravel						
	HA	2.0-2.5	2.0-2.5										[Diagonal Hatching]	CL				
	HA	2.5-3.0	2.5-3.0										[Diagonal Hatching]	CL				
3	HA	3.0-3.5	3.0-3.5							Field Classification & FP-XRF Screening (selected samples, see remarks)	NA		[Diagonal Hatching]	SC	USCS Clayey Sand (USDA Sandy Loam): very dark brown; low plasticity; little to some sand, trace gravel; parent material appears to be stream alluvium			
	HA	3.5-4.0	3.5-4.0													[Diagonal Hatching]	SC	
	HA	3.5-4.0	3.5-4.0													[Diagonal Hatching]	SC	

**REMARKS:**

1. FP-XRF screening sample EAM 0.0-0.5 ft
2. FP-XRF screening sample EAM 0.5-1.0 ft
3. FP-XRF screening sample EAM 1.0-1.5 ft
4. FP-XRF screening sample EAM 1.5-2.0 ft
5. Homogenized soil from 0.0-2.0 ft deep (sampling location EAM-1) is **USCS Elastic Silt (MH) / USDA Silty Clay Loam** based on lab analysis
6. FP-XRF screening sample EAM 2.0-2.5 ft
7. FP-XRF screening sample EAM 2.5-3.0 ft
8. FP-XRF screening sample EAM 3.0-3.5 ft
9. FP-XRF screening sample EAM 3.5-4.0 ft

**SURVEY BENCHMARK & DATUM:** GPS

**Ohio Environmental Protection Agency**  
 4675 Homer Ohio Lane  
 Groveport, OH 43215  
 Telephone: (614) 836-8820, Fax: (614) 836-8795  
 jeff.martin@epa.ohio.gov

**Englewood MetroPark**  
 4361 National Road  
 Vandalia, OH 45377  
 Montgomery County, SWDO

**DERR-SIFU**  
**Soil Boring Log**  
  
**EWM-PSB**  
 Page 1 of 1

Project No./Type: NA/County Soil Background

**LAT/LONG and/or LOCATION DESCRIPTION:** Lat 39.875570° / Long -84.282260°

<b>GROUND ELEVATION:</b> 810.0 ft	<b>TOC ELEVATION:</b> NA	<b>DRILLING SERVICES:</b> Ohio EPA SIFU
<b>START DATE:</b> 5/24/13	<b>COMPLETION DATE:</b> 5/24/13	<b>DRILLER:</b> Wendy Vorwerk
<b>DRILLING &amp; SAMPLING METHODS:</b> Hand Auger		<b>LOGGED BY:</b> Wendy Vorwerk, Jeff Martin

<b>DIAMETER (in):</b> 1.5	<b>TOTAL DEPTH (ft):</b> 3.5	<b>REFUSAL (ft):</b> 3.5	<b>GROUND WATER LEVELS</b>		
<b>NOTES:</b>			<b>Date</b>	<b>Time</b>	<b>Depth (ft)</b>
			05/24/13	00:00	not encountered

OHIO EPA BACKGROUND SOIL LOG - OHIO EPA GEO PROBE LOG.GDT - 5/9/14 14:55 - G:\GINT\PROJECTS\MONTGOMERY COUNTY SOILS\ENGLEWOOD METROPARK.GPJ

DEPTH (ft)	CORING		SAMPLING		REMARKS	GRAPHIC LOG	USCS	MATERIAL DESCRIPTION
	Core Type	Core Interval/Recovery (ft)	Sample Interval (ft)	Sample Purpose/ID				
0.0-0.5	HA	0.0-0.5	0.0-0.5	Field Classification & FP-XRF Screening (selected samples, see remarks)	NA		<p><b>USCS Lean Clay (USDA Silty Clay Loam):</b> dark brown; low plasticity; trace to few sand            ...dark yellowish brown, few sand</p> <p><b>USCS Lean to Fat Clay (USDA Silty Clay Loam to Silty Clay):</b> dark yellowish brown; high plasticity; few sand            ...few to little sand, trace gravel</p> <p><b>USCS Lean to Fat Clay with Sand (USDA Silty Clay Loam to Clay Loam):</b> dark yellowish brown; high plasticity; little sand, trace gravel; weathered till (massive structure)</p> <p><b>USCS Sandy Lean to Fat Clay (USDA Clay Loam):</b> dark yellowish brown; high plasticity; little to some sand, trace gravel; weathered till (massive structure)</p> <p>Soil analytical and geotechnical testing samples EWM-1 through EWM-10 were collected on 8/22/13. EWM-1 was collected adjacent to the EWM-PSB location, and EWM-2 through EWM-10 were collected at random locations within a 15 ft radius of EWM-PSB. Each sample was collected from ground surface to a depth of 2 ft using a 1.5- to 2-inch inside diameter hand auger. Each sample was homogenized in the field and submitted to Microbac Laboratories of Marietta, OH for RCRA metals analysis (As, Ba, Cd, Cr, Pb, Hg, Se) with Ni substituted for Ag and TI added. In addition, sample EWM-1 was submitted to Geotechnics of Pittsburgh, PA for sieve and hydrometer analyses, Atterberg limits, and USDA and USCS laboratory soil classification.</p>	
0.5-1.0	HA	0.5-1.0	0.5-1.0					
1.0-1.5	HA	1.0-1.5	1.0-1.5					
1.5-2.0	HA	1.5-2.0	1.5-2.0					
2.0-2.5	HA	2.0-2.5	2.0-2.5					
2.5-3.0	HA	2.5-3.0	2.5-3.0					
3.0-3.5	HA	3.0-3.5	3.0-3.5					

**REMARKS:**

- FP-XRF screening sample EWM 0.0-0.5 ft
- FP-XRF screening sample EWM 0.5-1.0 ft
- FP-XRF screening sample EWM 1.0-1.5 ft
- FP-XRF screening sample EWM 1.5-2.0 ft
- Homogenized soil from 0.0-2.0 ft deep (sampling location EWM-1) is **USCS Lean Clay with Sand (CL) / USDA Silt Loam** based on lab analysis
- FP-XRF screening sample EWM 2.0-2.5 ft

**SURVEY BENCHMARK & DATUM:** GPS

**Ohio Environmental Protection Agency**  
 4675 Homer Ohio Lane  
 Groveport, OH 43215  
 Telephone: (614) 836-8820, Fax: (614) 836-8795  
 jeff.martin@epa.ohio.gov

**Germantown MetroPark**  
 7501 Conservancy Road  
 Germantown, OH 45327  
 Montgomery County, SWDO  
 Project No./Type: NA/County Soil Background

**DERR-SIFU**  
**Soil Boring Log**  
  
**GMT-PSB**  
 Page 1 of 1

**LAT/LONG and/or LOCATION DESCRIPTION:** Lat 39.635328° / Long -84.408122°

**GROUND ELEVATION:** 878.0 ft      **TOC ELEVATION:** NA      **DRILLING SERVICES:** Ohio EPA SIFU  
**START DATE:** 6/12/13      **COMPLETION DATE:** 6/12/13      **DRILLER:** Wendy Vorwerk  
**DRILLING & SAMPLING METHODS:** Hand Auger      **LOGGED BY:** Wendy Vorwerk, Jeff Martin

**DIAMETER (in):** 1.5      **TOTAL DEPTH (ft):** 4      **REFUSAL (ft):** NE

**NOTES:**

Date	Time	Depth (ft)	Notes
06/12/13	00:00		not encountered

DEPTH (ft)	CORING		SAMPLING		REMARKS	GRAPHIC LOG	USCS	MATERIAL DESCRIPTION
	Core Type	Core Interval/Recovery (ft)	Sample Interval (ft)	Sample Purpose/ID				
1	HA	0.0-0.5	0.0-0.5	Field Classification & FP-XRF Screening (selected samples, see remarks)	NA		CL	USCS Lean Clay (USDA Silty Clay Loam): mottled dark grayish brown and very dark grayish brown; medium plasticity; trace to few sand, trace gravel
	HA	0.5-1.0	0.5-1.0					
2	HA	1.0-1.5	1.0-1.5				CL	USCS Lean Clay (USDA Silty Clay Loam to Silty Clay): dark grayish brown with very dark grayish brown mottling; medium to high plasticity; few to little sand, trace gravel
	HA	1.5-2.0	1.5-2.0					
3	HA	2.0-2.5	2.0-2.5				CL	USCS Lean Clay with Sand (USDA Silty Clay Loam to Clay Loam): dark grayish brown with very dark grayish brown and dark yellowish brown mottling; medium plasticity; little to some sand, trace gravel
	HA	2.5-3.0	2.5-3.0					
4	HA	3.0-3.5	3.0-3.5				CL	USCS Sandy Lean Clay (USDA Clay Loam to Sandy Clay Loam): dark grayish brown with very dark grayish brown and dark yellowish brown mottling; low to medium plasticity; some sand, trace gravel (limestone); parent material appears to be alluvium
	HA	3.5-4.0	3.5-4.0					

**REMARKS:**

- FP-XRF screening sample GMT 0.0-2.0 ft
- Homogenized soil from 0.0-2.0 ft deep (sampling location GMT-1) is **USCS Lean Clay with Sand (CL) / USDA Clay Loam** based on lab analysis

**SURVEY BENCHMARK & DATUM:** GPS

OHIO EPA BACKGROUND SOIL LOG - OHIO EPA GEOPROBE LOG.GDT - 5/9/14 14:57 - G:\GINT\PROJECTS\MONTGOMERY COUNTY SOILS\GERMANTOWN METROPARK.GPJ

**Ohio Environmental Protection Agency**  
 4675 Homer Ohio Lane  
 Groveport, OH 43215  
 Telephone: (614) 836-8820, Fax: (614) 836-8795  
 jeff.martin@epa.ohio.gov

**Possum Creek MetroPark**  
 4790 Frytown Road  
 Dayton, OH 45418  
 Montgomery County, SWDO

**DERR-SIFU  
 Soil Boring Log**  
  
**PCM-PSB**  
 Page 1 of 1

Project No./Type: NA/County Soil Background

**LAT/LONG and/or LOCATION DESCRIPTION:** Lat 39.710210° / Long -84.267557°

**GROUND ELEVATION:** 838.0 ft

**TOC ELEVATION:** NA

**DRILLING SERVICES:** Ohio EPA SIFU

**START DATE:** 6/12/13

**COMPLETION DATE:** 6/12/13

**DRILLER:** Wendy Vorwerk

**DRILLING & SAMPLING METHODS:** Hand Auger

**LOGGED BY:** Wendy Vorwerk, Jeff Martin

**GROUND WATER LEVELS**

**DIAMETER (in):** 1.5

**TOTAL DEPTH (ft):** 4

**REFUSAL (ft):** NE

**Date**    **Time**    **Depth (ft)**    **Notes**

06/12/13    00:00

not encountered

**NOTES:**

DEPTH (ft)	CORING		SAMPLING			REMARKS	GRAPHIC LOG	USCS	MATERIAL DESCRIPTION
	Core Type	Core Interval/Recovery (ft)	Sample Interval (ft)	Sample Purpose/ID	PID (ppmv)				
0.0-0.5	HA	0.0-0.5 0.5	0.0-0.5 0.5	Field Classification & FP-XRF Screening (selected samples, see remarks)	NA	1	CL	USCS Lean Clay (USDA Silty Clay Loam): brown; low to medium plasticity; trace sand ←...medium plasticity	
0.5-1.0	HA	0.5-1.0 0.5	0.5-1.0 1.0						
1.0-1.5	HA	1.0-1.5 0.5	1.0-1.5 1.5						
1.5-2.0	HA	1.5-2.0 0.5	1.5-2.0 2.0						
2.0-2.5	HA	2.0-2.5 0.5	2.0-2.5 2.5						
2.5-3.0	HA	2.5-3.0 0.5	2.5-3.0 3.0						
3.0-3.5	HA	3.0-3.5 0.5	3.0-3.5 3.5						
3.5-4.0	HA	3.5-4.0 0.5	3.5-4.0 4.0						
4.0									

**REMARKS:**

1. FP-XRF screening sample PCM 0.0-0.5 ft
2. FP-XRF screening sample PCM 0.5-1.0 ft
3. FP-XRF screening sample PCM 1.0-1.5 ft
4. FP-XRF screening sample PCM 1.5-2.0 ft
5. Homogenized soil from 0.0-2.0 ft deep (sampling location PCM-1) is **USCS Fat Clay (CH) / USDA Silty Clay Loam** based on lab analysis
6. FP-XRF screening sample PCM 2.0-2.5 ft
7. FP-XRF screening sample PCM 2.5-3.0 ft
8. FP-XRF screening sample PCM 3.0-3.5 ft
9. FP-XRF screening sample PCM 3.5-4.0 ft

**SURVEY BENCHMARK & DATUM:** GPS

OHIO EPA BACKGROUND SOIL LOG - OHIO EPA GEOPROBE LOG.GDT - 5/9/14 14:58 - G:\GINT\PROJECTS\MONTGOMERY COUNTY SOILS\POSSUM CREEK METROPARK.GPJ

**Ohio Environmental Protection Agency**  
 4675 Homer Ohio Lane  
 Groveport, OH 43215  
 Telephone: (614) 836-8820, Fax: (614) 836-8795  
 jeff.martin@epa.ohio.gov

**Southdale Nature Park**  
 [3000-3099] Bellflower Street  
 Kettering, OH 45409  
 Montgomery County, SWDO

**DERR-SIFU  
 Soil Boring Log**  
  
**TPK-PSB**  
 Page 1 of 1

Project No./Type: NA/County Soil Background

**LAT/LONG and/or LOCATION DESCRIPTION:** Lat 39.704700° / Long -84.195286°

**GROUND ELEVATION:** 803.0 ft

**TOC ELEVATION:** NA

**DRILLING SERVICES:** Ohio EPA SIFU

**START DATE:** 9/25/13

**COMPLETION DATE:** 9/25/13

**DRILLER:** Wendy Vorwerk

**DRILLING & SAMPLING METHODS:** Hand Auger

**LOGGED BY:** Wendy Vorwerk, Jeff Martin

**GROUND WATER LEVELS**

**DIAMETER (in):** 1.5

**TOTAL DEPTH (ft):** 2.5

**REFUSAL (ft):** 2.5

**Date**      **Time**      **Depth (ft)**      **Notes**

09/25/13      00:00           not encountered

**NOTES:**

DEPTH (ft)	CORING		SAMPLING			REMARKS	GRAPHIC LOG	USCS	MATERIAL DESCRIPTION
	Core Type	Core Interval/Recovery (ft)	Sample Interval (ft)	Sample Purpose/ID	PID (ppmv)				
0.0-0.5	HA	0.0-0.5	0.0-0.5	Field Classification & FP-XRF Screening (selected samples, see remarks)	NA	1	CL	USCS Lean Clay with Sand to Sandy Lean Clay (USDA Clay Loam): dark yellowish brown; medium plasticity; trace gravel (limestone clasts), little to some sand ...sand is medium to coarse-grained; carbonate mineralization present	
0.5-1.0	HA	0.5-1.0	0.5-1.0						
1.0-1.5	HA	1.0-1.5	1.0-1.5						
1.5-2.0	HA	1.5-2.0	1.5-2.0						
2.0-2.5	HA	2.0-2.5	2.0-2.5						
								USCS Sandy Lean Clay (USDA Clay Loam to Clay): dark yellowish brown with yellowish brown mottling; medium to high plasticity; increase in clay content	
								USCS Sandy Lean Clay (USDA Sandy Clay Loam): yellowish brown; low medium plasticity; trace to few gravel (limestone clasts) increase in sand content; very dense	
								USCS Sandy Lean Clay to Clayey Sand (USDA Sandy Loam): yellowish brown; low plasticity; increase in sand content, trace to few gravel; very dense ...auger refusal at 2.5 ft	

**REMARKS:**

1. FP-XRF screening was not performed on the TPK-PSB samples
2. Homogenized soil from 0.0-2.0 ft deep (sampling location TPK-1) is **USCS Sandy Lean Clay (CL) / USDA Clay Loam** based on lab analysis

**SURVEY BENCHMARK & DATUM:** GPS

OHIO EPA BACKGROUND SOIL LOG - OHIO EPA GEOPROBE LOG.GDT - 5/9/14 15:01 - G:\GINT\PROJECTS\MONTGOMERY COUNTY SOILS\SOUTHDALE NATURE PARK.GPJ

**Ohio Environmental Protection Agency**  
 4675 Homer Ohio Lane  
 Groveport, OH 43215  
 Telephone: (614) 836-8820, Fax: (614) 836-8795  
 jeff.martin@epa.ohio.gov

**Taylorville MetroPark**  
 2000 State Route 40  
 Vandalia, OH 45377  
 Montgomery County, SWDO

**DERR-SIFU**  
**Soil Boring Log**  
  
**TVM-PSB**  
 Page 1 of 1

Project No./Type: NA/County Soil Background

**LAT/LONG and/or LOCATION DESCRIPTION:** Lat 39.877959° / Long -84.168809°

**GROUND ELEVATION:** 787.0 ft

**TOC ELEVATION:** NA

**DRILLING SERVICES:** Ohio EPA SIFU

**START DATE:** 5/24/13

**COMPLETION DATE:** 5/24/13

**DRILLER:** Wendy Vorwerk

**DRILLING & SAMPLING METHODS:** Hand Auger

**LOGGED BY:** Wendy Vorwerk, Jeff Martin

**GROUND WATER LEVELS**

**DIAMETER (in):** 1.5

**TOTAL DEPTH (ft):** 3

**REFUSAL (ft):** 3

**Date**      **Time**      **Depth (ft)**      **Notes**

**NOTES:**

05/24/13      00:00           not encountered

OHIO EPA BACKGROUND SOIL LOG - OHIO EPA GEOPROBE LOG.GDT - 5/9/14 15:02 - G:\GINT\PROJECTS\MONTGOMERY COUNTY SOILS\TAYLORVILLE METROPARK.GPJ

DEPTH (ft)	CORING		SAMPLING			REMARKS	GRAPHIC LOG	USCS	MATERIAL DESCRIPTION				
	Core Type	Core Interval/Recovery (ft)	Sample Interval (ft)	Sample Purpose/ID	PID (ppmv)								
0.0 - 0.5	HA	0.0-0.5 0.5	0.0 - 0.5	Field Classification & FP-XRF Screening (selected samples, see remarks)	NA	1	0.5'	CL	USCS Lean Clay (USDA Loam): very dark brown to black; low plasticity; few to little sand				
0.5 - 1.0	HA	0.5-1.0 0.5	0.5 - 1.0							2	1'	CL	USCS Lean Clay (USDA Silt Loam): very dark brown; low to medium plasticity; few to little sand
1.0 - 1.5	HA	1.0-1.5 0.5	1.0 - 1.5							3	1.5'	CL	USCS Lean Clay with Sand (USDA Loam): very dark brown; low plasticity; little sand, trace gravel (subrounded)
1.5 - 2.0	HA	1.5-2.0 0.5	1.5 - 2.0							4	3'	CL	USCS Sandy Lean Clay (USDA Loam to Silt Loam): very dark brown; low to medium plasticity; little to some sand, trace gravel (subrounded); glacial outwash? ...carbonate mineralization present
2.0 - 2.5	HA	2.0-2.5 0.5	2.0 - 2.5							5			
2.5 - 3.0	HA	2.5-3.0 0.5	2.5 - 3.0							6			

Soil analytical and geotechnical testing samples TVM-1 through TVM-10 were collected on 8/22/13. TVM-1 was collected adjacent to the TVM-PSB location, and TVM-2 through TVM-10 were collected at random locations within a 15 ft radius of TVM-PSB. Each sample was collected from ground surface to a depth of 2 ft using a 1.5- to 2-inch inside diameter hand auger. Each sample was homogenized in the field and submitted to Microbac Laboratories of Marietta, OH for RCRA metals analysis (As, Ba, Cd, Cr, Pb, Hg, Se) with Ni substituted for Ag and Tl added. In addition, sample TVM-1 was submitted to Geotechnics of Pittsburgh, PA for sieve and hydrometer analyses, Atterberg limits, and USDA and USCS laboratory soil classification.

**REMARKS:**

1. FP-XRF screening sample TVM 0.0-0.5 ft
2. FP-XRF screening sample TVM 0.5-1.0 ft
3. FP-XRF screening sample TVM 1.0-1.5 ft
4. FP-XRF screening sample TVM 1.5-2.0 ft
5. Homogenized soil from 0.0-2.0 ft deep (sampling location TVM-1) consists of **USCS Sandy Fat Clay / USDA Loam** based on lab analysis
6. FP-XRF screening sample TVM 2.0-2.5 ft

**SURVEY BENCHMARK & DATUM:** GPS

**Ohio Environmental Protection Agency**  
 4675 Homer Ohio Lane  
 Groveport, OH 43215  
 Telephone: (614) 836-8820, Fax: (614) 836-8795  
 jeff.martin@epa.ohio.gov

**Triangle Park**  
 2500 Ridge Avenue  
 Dayton, OH 45414  
 Montgomery County, SWDO  
 Project No./Type: NA/County Soil Background

**DERR-SIFU**  
**Soil Boring Log**  
  
**TAP-PSB**  
 Page 1 of 1

LAT/LONG and/or LOCATION DESCRIPTION: Lat 39.787131° / Long -84.199772°

GROUND ELEVATION: 776.0 ft TOC ELEVATION: NA DRILLING SERVICES: Ohio EPA SIFU  
 START DATE: 6/12/13 COMPLETION DATE: 6/12/13 DRILLER: Wendy Vorwerk  
 DRILLING & SAMPLING METHODS: Hand Auger LOGGED BY: Wendy Vorwerk, Jeff Martin

GROUND WATER LEVELS			
Date	Time	Depth (ft)	Notes
06/12/13	00:00		not encountered

DEPTH (ft)	CORING		SAMPLING		REMARKS	GRAPHIC LOG	USCS	MATERIAL DESCRIPTION		
	Core Type	Core Interval/Recovery (ft)	Sample Interval (ft)	Sample Purpose/ID					PID (ppmv)	
1	HA	0.0-0.5 0.5	0.0-0.5 0.5	Field Classification & FP-XRF Screening (selected samples, see remarks)	NA		CL	USCS Lean Clay (USDA Silt Loam): dark brown; low plasticity; trace sand		
	HA	0.5-1.0 0.5	0.5-1.0 1.0					CL	...dark yellowish brown	
2	HA	1.0-1.5 0.5	1.0-1.5 1.5				CL	USCS Lean Clay (USDA Silty Clay Loam): dark yellowish brown; low to medium plasticity; trace sand, increase in clay content		
	HA	1.5-2.0 0.5	1.5-2.0 2.0				CL	...brown, medium plasticity		
3	HA	2.0-2.5 0.5	2.0-2.5 2.5				CL		CL	USCS Lean Clay with Sand (USDA Clay Loam): brown; medium plasticity; few to little sand
	HA	2.5-3.0 0.5	2.5-3.0 3.0							CL
4	HA	3.0-3.5 0.5	3.0-3.5 3.5						CL	...little sand
	HA	3.5-4.0 0.5	3.5-4.0 4.0						CL	...little sand, trace gravel; parent material appears to be till

**REMARKS:**

- FP-XRF screening sample TAP 0.0-2.0 ft
- Homogenized soil from 0.0-2.0 ft deep (sampling location TAP-1) consists of **USCS Lean Clay (CL) / USDA Silt Loam** based on lab analysis

**SURVEY BENCHMARK & DATUM:** GPS

OHIO EPA BACKGROUND SOIL LOG - OHIO EPA GEOPROBE LOG.GDT - 5/9/14 14:59 - G:\GINT\PROJECTS\MONTGOMERY COUNTY SOIL\TRIANGLE PARK.GPJ

## **APPENDIX B**

### FP-XRF SOIL ANALYTICAL SCREENING RESULTS



FP-XRF Screening Results for Metals, Evaluation of Background Metal Soil Concentrations in Montgomery County

Innov-X Tube-Based Alpha Series™ Handheld XRF Analyzer: analytical results in parts-per-million (ppm), LOD = Level of Detection (ppm)

Sample Location	Sample Identification	Sample Depth (ft)	Sampling Date	Screening (Analysis) Date	Reading Number	Titanium (LOD 10-100)	Chromium (LOD 10-100)	Manganese (LOD 10-100)	Iron (LOD 10-100)	Cobalt (LOD 10-100)	Nickel (LOD 10-100)	Copper (LOD 10-100)
QA/QC	Pass Internal Standardization	N/A	N/A	06/10/13	1	Pass	Pass	Pass	Pass	Pass	Pass	Pass
QA/QC	Pass Internal Standardization	N/A	N/A	07/03/13	1	Pass	Pass	Pass	Pass	Pass	Pass	Pass
QA/QC	SiO <sub>2</sub> Blank	N/A	N/A	06/10/13	1	< LOD	< LOD	< LOD	< LOD	< LOD	< LOD	< LOD
QA/QC	SiO <sub>2</sub> Blank	N/A	N/A	07/03/13	1	< LOD	< LOD	< LOD	< LOD	< LOD	< LOD	< LOD
Brookville Golden Gate Park	BGG (0.0-0.5')	0.0-0.5'	5/24/13	06/10/13	1	4,265.89	<LOD	233.44	16,799.73	<LOD	<LOD	<LOD
					2	3,523.03	<LOD	290.06	15,981.11	<LOD	<LOD	<LOD
	BGG (0.5-1.0')	0.5-1.0'	5/24/13	06/10/13	1	4,793.56	<LOD	284.80	17,553.20	<LOD	68.09	<LOD
					2	2,950.50	<LOD	264.06	16,160.88	<LOD	<LOD	<LOD
	BGG (1.0-1.5')	1.0-1.5'	5/24/13	06/10/13	1	4,088.22	<LOD	661.59	29,370.21	214.45	<LOD	<LOD
					2	3,443.27	<LOD	397.85	28,233.11	<LOD	<LOD	<LOD
	BGG (1.5-2.0')	1.5-2.0'	5/24/13	06/10/13	1	3,689.43	<LOD	801.13	47,469.04	<LOD	<LOD	46.87
					2	3,616.77	<LOD	797.56	46,843.36	264.96	<LOD	<LOD
	BGG (2.0-2.5')	2.0-2.5'	5/24/13	06/10/13	1	3,509.24	<LOD	492.23	39,452.39	<LOD	<LOD	35.65
					2	3,899.20	<LOD	479.40	38,306.59	<LOD	<LOD	<LOD
Bill Yeck Park	BYP (0.0-2.0')	0.0-2.0'	6/12/13	07/03/13	1	3,892.79	<LOD	492.05	25,251.23	<LOD	55.71	<LOD
					2	3,141.81	158.54	524.31	26,141.97	<LOD	75.46	<LOD
Don Rusk Park	DRP (0.0-0.5')	0.0-0.5'	5/24/13	06/10/13	1	3,986.00	<LOD	299.86	22,171.12	<LOD	<LOD	<LOD
					2	4,346.11	144.28	411.30	22,873.58	<LOD	<LOD	<LOD
	DRP (0.5-1.0')	0.5-1.0'	5/24/13	06/10/13	1	4,129.01	<LOD	316.13	23,579.18	<LOD	<LOD	33.54
					2	4,119.57	<LOD	270.37	24,147.94	165.40	<LOD	27.48
	DRP (1.0-1.5')	1.0-1.5'	5/24/13	06/10/13	1	3,302.67	<LOD	275.50	23,670.19	<LOD	<LOD	29.17
					2	4,019.07	<LOD	379.29	25,018.12	209.56	<LOD	<LOD
	DRP (1.5-2.0')	1.5-2.0'	5/24/13	06/10/13	1	3,185.74	<LOD	364.90	32,522.59	<LOD	<LOD	<LOD
					2	3,322.04	180.99	179.16	30,906.49	<LOD	<LOD	<LOD
	DRP (2.0-2.5')	2.0-2.5'	5/24/13	06/10/13	1	4,204.07	<LOD	274.38	33,698.71	<LOD	<LOD	33.31
					2	3,325.37	<LOD	258.73	34,108.28	<LOD	<LOD	<LOD

FP-XRF Screening Results for Metals, Evaluation of Background Metal Soil Concentrations in Montgomery County

Innov-X Tube-Based Alpha Series™ Handheld XRF Analyzer: analytical results in parts-per-million (ppm), LOD = Level of Detection (ppm)

Sample Location	Sample Identification	Sample Depth (ft)	Sampling Date	Screening (Analysis) Date	Reading Number	Titanium (LOD 10-100)	Chromium (LOD 10-100)	Manganese (LOD 10-100)	Iron (LOD 10-100)	Cobalt (LOD 10-100)	Nickel (LOD 10-100)	Copper (LOD 10-100)
Eastwood Metropark	EAM (0.0-0.5')	0.0-0.5'	6/12/13	07/03/13	1	3,419.25	150.53	383.50	26,118.89	<LOD	61.76	<LOD
					2	3,441.73	<LOD	483.72	28,214.45	<LOD	<LOD	32.16
	EAM (0.5-1.0')	0.5-1.0'	6/12/13	07/03/13	1	3,053.87	183.76	414.56	24,608.16	<LOD	<LOD	<LOD
					2	3,294.27	165.24	399.50	26,237.18	<LOD	<LOD	<LOD
	EAM (1.0-1.5')	1.0-1.5'	6/12/13	07/03/13	1	1,953.27	143.56	389.82	14,589.01	<LOD	<LOD	<LOD
					2	2,063.81	<LOD	411.93	15,023.37	<LOD	57.79	26.67
	EAM (1.5-2.0')	1.5-2.0'	6/12/13	07/03/13	1	2,845.49	<LOD	590.83	25,089.02	<LOD	61.46	28.88
					2	2,764.33	<LOD	537.61	22,655.96	<LOD	50.86	32.34
	EAM (2.0-2.5')	2.0-2.5'	6/12/13	07/03/13	1	3,127.50	<LOD	659.51	23,355.15	<LOD	<LOD	<LOD
					2	2,471.52	<LOD	705.35	22,360.58	<LOD	50.80	<LOD
	EAM (2.5-3.0')	2.5-3.0'	6/12/13	07/03/13	1	3,243.83	<LOD	866.78	23,537.09	<LOD	<LOD	<LOD
					2	2,571.99	<LOD	665.36	23,893.72	<LOD	<LOD	<LOD
	EAM (3.0-3.5')	3.0-3.5'	6/12/13	07/03/13	1	1,809.83	<LOD	773.55	19,400.19	<LOD	64.89	<LOD
					2	2,025.25	<LOD	1,144.47	22,502.26	<LOD	51.38	<LOD
EAM (3.5-4.0')	3.5-4.0'	6/12/13	07/03/13	1	3,099.62	211.97	1,197.92	24,841.11	<LOD	<LOD	<LOD	
				2	1,992.09	<LOD	1,204.81	23,312.61	<LOD	50.54	<LOD	
Englewood Metropark	EWM (0.0-0.5')	0.0-0.5'	5/24/13	06/10/13	1	4,205.92	<LOD	893.08	20,838.14	147.52	<LOD	25.73
					2	3,998.42	<LOD	645.33	19,776.13	<LOD	<LOD	<LOD
	EWM (0.5-1.0')	0.5-1.0'	5/24/13	06/10/13	1	3,640.85	<LOD	830.38	22,832.48	207.63	<LOD	27.90
					2	4,273.27	<LOD	725.80	22,939.81	<LOD	<LOD	<LOD
	EWM (1.0-1.5')	1.0-1.5'	5/24/13	06/10/13	1	4,503.21	207.03	615.73	34,801.14	<LOD	<LOD	35.60
					2	4,304.66	<LOD	554.96	34,316.68	<LOD	<LOD	29.84
	EWM (1.5-2.0')	1.5-2.0'	5/24/13	06/10/13	1	3,443.44	<LOD	530.77	44,488.28	<LOD	<LOD	36.82
					2	4,520.89	<LOD	626.63	44,216.23	<LOD	<LOD	<LOD
	EWM (2.0-2.5')	2.0-2.5'	5/24/13	06/10/13	1	3,220.78	<LOD	603.69	44,985.10	<LOD	<LOD	<LOD
					2	4,161.09	<LOD	528.43	44,550.31	<LOD	<LOD	29.32
Germantown Metropark	GMP (0.0-2.0')	0.0-2.0'	6/12/13	07/03/13	1	4,095.86	<LOD	259.49	32,312.62	<LOD	59.16	<LOD
					2	3,796.29	<LOD	303.81	31,126.57	<LOD	54.37	<LOD



FP-XRF Screening Results for Metals, Evaluation of Background Metal Soil Concentrations in Montgomery County

Innov-X Tube-Based Alpha Series™ Handheld XRF Analyzer: analytical results in parts-per-million (ppm), LOD = Level of Detection (ppm)

Sample Location	Sample Identification	Sample Depth (ft)	Sampling Date	Screening (Analysis) Date	Reading Number	Zinc (LOD 10-100)	Arsenic (LOD 10-100)	Selenium (LOD 10-100)	Rubidium (LOD 10-100)	Strontium (LOD 10-100)	Zirconium (LOD 10-100)	Molybdenum (LOD 10-100)	
QA/QC	Pass Internal Standardization	N/A	N/A	06/10/13	1	Pass	Pass	Pass	Pass	Pass	Pass	Pass	
QA/QC	Pass Internal Standardization	N/A	N/A	07/03/13	1	Pass	Pass	Pass	Pass	Pass	Pass	Pass	
QA/QC	SiO <sub>2</sub> Blank	N/A	N/A	06/10/13	1	< LOD	< LOD	< LOD	< LOD	< LOD	< LOD	< LOD	
QA/QC	SiO <sub>2</sub> Blank	N/A	N/A	07/03/13	1	< LOD	< LOD	< LOD	< LOD	< LOD	< LOD	< LOD	
Brookville Golden Gate Park	BGG (0.0-0.5')	0.0-0.5'	5/24/13	06/10/13	1	65.77	<LOD	<LOD	76.19	119.22	266.58	<LOD	
					2	67.67	<LOD	<LOD	71.37	128.70	262.75	<LOD	
	BGG (0.5-1.0')	0.5-1.0'	5/24/13	06/10/13	1	52.74	11.72	<LOD	71.45	120.82	305.49	9.33	
					2	44.97	<LOD	<LOD	71.89	119.71	287.98	<LOD	
	BGG (1.0-1.5')	1.0-1.5'	5/24/13	06/10/13	1	67.87	<LOD	<LOD	84.28	121.07	270.29	<LOD	
					2	77.17	<LOD	<LOD	82.49	117.25	266.61	<LOD	
	BGG (1.5-2.0')	1.5-2.0'	5/24/13	06/10/13	1	106.28	14.71	<LOD	88.50	123.74	249.89	<LOD	
					2	98.06	16.27	<LOD	85.49	121.51	244.27	<LOD	
	BGG (2.0-2.5')	2.0-2.5'	5/24/13	06/10/13	1	99.17	15.61	<LOD	91.38	122.83	199.17	<LOD	
					2	93.80	24.53	<LOD	93.96	128.24	221.27	<LOD	
	Bill Yeck Park	BYP (0.0-2.0')	0.0-2.0'	6/12/13	07/03/13	1	58.98	<LOD	<LOD	65.61	124.29	255.33	<LOD
						2	72.73	13.94	<LOD	67.04	137.75	252.66	<LOD
Don Rusk Park	DRP (0.0-0.5')	0.0-0.5'	5/24/13	06/10/13	1	77.74	10.46	<LOD	83.17	107.41	212.84	<LOD	
					2	77.87	<LOD	<LOD	84.63	110.89	208.54	<LOD	
	DRP (0.5-1.0')	0.5-1.0'	5/24/13	06/10/13	1	93.61	10.10	<LOD	86.85	123.19	219.59	<LOD	
					2	82.27	9.41	<LOD	88.51	120.83	229.00	<LOD	
	DRP (1.0-1.5')	1.0-1.5'	5/24/13	06/10/13	1	81.75	12.99	<LOD	87.07	119.65	238.61	<LOD	
					2	86.58	<LOD	4.37	96.52	114.67	238.90	<LOD	
	DRP (1.5-2.0')	1.5-2.0'	5/24/13	06/10/13	1	101.86	13.91	<LOD	98.01	120.28	180.16	<LOD	
					2	95.75	9.63	<LOD	101.96	119.18	192.03	<LOD	
	DRP (2.0-2.5')	2.0-2.5'	5/24/13	06/10/13	1	104.16	11.04	<LOD	107.78	116.48	207.25	<LOD	
					2	101.79	<LOD	<LOD	95.55	123.80	192.05	<LOD	

**FP-XRF Screening Results for Metals, Evaluation of Background Metal Soil Concentrations in Montgomery County**

Innov-X Tube-Based Alpha Series™ Handheld XRF Analyzer: analytical results in parts-per-million (ppm), LOD = Level of Detection (ppm)

Sample Location	Sample Identification	Sample Depth (ft)	Sampling Date	Screening (Analysis) Date	Reading Number	Zinc (LOD 10-100)	Arsenic (LOD 10-100)	Selenium (LOD 10-100)	Rubidium (LOD 10-100)	Strontium (LOD 10-100)	Zirconium (LOD 10-100)	Molybdenum (LOD 10-100)
Eastwood Metropark	EAM (0.0-0.5')	0.0-0.5'	6/12/13	07/03/13	1	85.37	11.70	<LOD	70.74	117.72	234.69	<LOD
					2	82.03	16.29	<LOD	70.90	124.12	264.86	<LOD
	EAM (0.5-1.0')	0.5-1.0'	6/12/13	07/03/13	1	73.50	11.45	<LOD	53.21	151.73	164.34	<LOD
					2	72.31	12.03	<LOD	62.15	148.50	199.29	<LOD
	EAM (1.0-1.5')	1.0-1.5'	6/12/13	07/03/13	1	58.74	9.74	<LOD	40.15	232.48	95.50	<LOD
					2	54.29	9.25	<LOD	37.90	231.04	87.71	<LOD
	EAM (1.5-2.0')	1.5-2.0'	6/12/13	07/03/13	1	96.26	16.90	<LOD	65.69	196.42	133.90	<LOD
					2	85.80	15.19	<LOD	60.03	193.66	131.17	<LOD
	EAM (2.0-2.5')	2.0-2.5'	6/12/13	07/03/13	1	66.49	14.68	<LOD	59.80	224.25	159.72	<LOD
					2	66.04	<LOD	<LOD	56.62	215.57	184.60	<LOD
	EAM (2.5-3.0')	2.5-3.0'	6/12/13	07/03/13	1	60.41	13.23	<LOD	62.06	211.54	149.39	<LOD
					2	55.52	13.08	<LOD	57.81	209.66	158.61	<LOD
	EAM (3.0-3.5')	3.0-3.5'	6/12/13	07/03/13	1	37.25	<LOD	<LOD	45.28	178.40	103.11	<LOD
					2	51.56	11.90	<LOD	54.75	180.02	118.15	<LOD
	EAM (3.5-4.0')	3.5-4.0'	6/12/13	07/03/13	1	66.59	<LOD	<LOD	53.24	193.51	135.67	<LOD
					2	53.68	11.31	<LOD	52.46	175.18	115.54	<LOD
Englewood Metropark	EWM (0.0-0.5')	0.0-0.5'	5/24/13	06/10/13	1	68.68	<LOD	<LOD	76.85	119.89	271.34	<LOD
					2	74.20	8.86	<LOD	75.69	122.37	286.42	<LOD
	EWM (0.5-1.0')	0.5-1.0'	5/24/13	06/10/13	1	67.75	10.40	<LOD	80.23	113.64	257.04	<LOD
					2	60.22	12.96	<LOD	76.82	112.71	310.71	<LOD
	EWM (1.0-1.5')	1.0-1.5'	5/24/13	06/10/13	1	104.68	15.25	<LOD	94.44	106.52	226.72	<LOD
					2	97.75	16.26	<LOD	100.62	105.80	236.75	<LOD
	EWM (1.5-2.0')	1.5-2.0'	5/24/13	06/10/13	1	107.98	20.42	<LOD	106.62	111.38	214.88	<LOD
					2	113.11	15.18	<LOD	106.85	115.02	234.54	<LOD
EWM (2.0-2.5')	2.0-2.5'	5/24/13	06/10/13	1	134.63	21.44	<LOD	106.19	123.60	213.24	10.95	
				2	110.96	19.28	<LOD	104.69	117.82	199.77	11.49	
Germantown Metropark	GMP (0.0-2.0')	0.0-2.0'	6/12/13	07/03/13	1	78.01	8.25	<LOD	79.99	114.67	287.44	<LOD
					2	88.06	<LOD	<LOD	82.87	115.47	266.97	<LOD









## **APPENDIX C**

### **USCS AND USDA SOIL CLASSIFICATION AND TEXTURAL COMPOSITION ANALYSES**





October 18, 2013

Project No. 2013-455-001

Stephanie Mossburg  
Microbac Laboratories, Inc.  
158 Starlite Drive  
Marietta, OH 45750

**Transmittal**  
**Laboratory Test Results**  
**OHIO EPA – Montgomery Co. L13091617**

Please find attached the laboratory test results for the above referenced project. The tests were outlined on the Project Verification Form that was transmitted to your firm prior to the testing. The testing was performed in general accordance with the methods listed on the enclosed data sheets. The test results are believed to be representative of the samples that were submitted for testing and are indicative only of the specimens that were evaluated. We have no direct knowledge of the origin of the samples and imply no position with regard to the nature of the test results, i.e. pass/fail and no claims as to the suitability of the material for its intended use.

The test data and all associated project information provided shall be held in strict confidence and disclosed to other parties only with authorization by our Client. The test data submitted herein is considered integral with this report and is not to be reproduced except in whole and only with the authorization of the Client and Geotechnics. The remaining sample materials for this project will be retained for a minimum of 90 days as directed by the Geotechnics' Quality Program.

We are pleased to provide these testing services. Should you have any questions or if we may be of further assistance, please contact our office.

Respectively submitted,  
**Geotechnics, Inc.**

  
David R. Backstrom  
Laboratory Director

***We understand that you have a choice in your laboratory services  
and we thank you for choosing Geotechnics.***

GCN Data Transmittal Letter Date: 1/28/05 Rev.: 1

544 Braddock Avenue • East Pittsburgh, PA 15112 • 412-823-7600 • FAX 412-823-8999 • [www.geotechnics.net](http://www.geotechnics.net)

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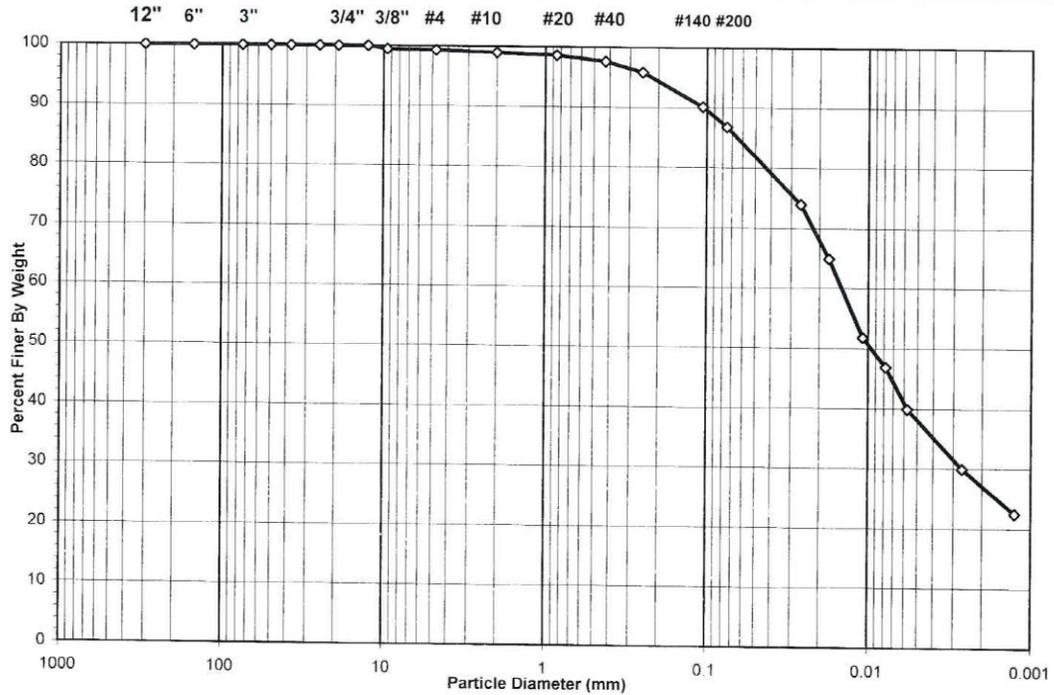


**SIEVE AND HYDROMETER ANALYSIS**  
 ASTM D 422-63 (2007)/AASHTO T88-00



Client:	MICROBAC	Boring No.:	NA
Client Reference:	OHIO EPA - MONTGOMERY CO. L13091617	Depth (ft):	NA
Project No.:	2013-455-001	Sample No.:	EAM-1
Lab ID:	2013-455-001-001	Soil Color:	DARK BROWN

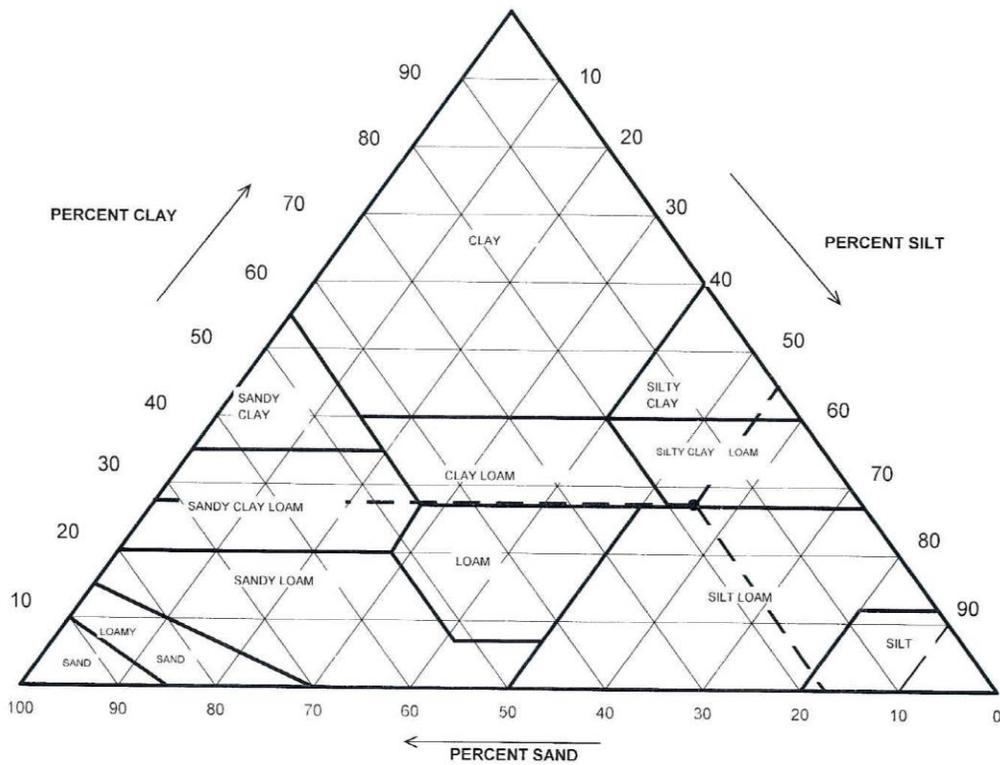
USCS USDA	SIEVE ANALYSIS					HYDROMETER	
	cobbles	gravel		sand		silt and clay fraction	
	cobbles	gravel		sand		silt	clay



USCS Summary		
Sieve Sizes (mm)		Percentage
Greater Than #4	Gravel	0.66
#4 To #200	Sand	12.54
Finer Than #200	Silt & Clay	86.80
<b>USCS Symbol</b> <i>MH, TESTED</i>		
<b>USCS Classification</b> <i>ELASTIC SILT</i>		

## USDA CLASSIFICATION CHART

Client:	MICROBAC	Boring No.:	NA
Client Reference:	OHIO EPA - MONTGOMERY CO. L1	Depth (ft):	NA
Project No.:	2013-455-001	Sample No.:	EAM-1
Lab ID:	2013-455-001-001	Soil Color:	DARK BROWN



Particle Size (mm)	Percent Finer (%)	USDA SUMMARY	Actual Percentage (%)	Corrected % of Minus 2.0 mm material for USDA Classificat. (%)
		<i>Gravel</i>	1.02	<b>0.00</b>
2	98.98	<i>Sand</i>	17.13	<b>17.31</b>
0.05	81.84	<i>Silt</i>	54.73	<b>55.29</b>
0.002	27.11	<i>Clay</i>	27.11	<b>27.39</b>
<b>USDA Classification:</b>		<b><i>SILTY CLAY LOAM</i></b>		



**WASH SIEVE ANALYSIS**  
ASTM D 422-63 (2007)/AASHTO T88-00

Client:	MICROBAC	Boring No.:	NA
Client Reference:	OHIO EPA - MONTGOMERY CO. L13091617	Depth (ft):	NA
Project No.:	2013-455-001	Sample No.:	EAM-1
Lab ID:	2013-455-001-001	Soil Color:	DARK BROWN

Moisture Content of Passing 3/4" Material		Water Content of Retained 3/4" Material	
Tare No.	2487	Tare No.	NA
Wt. of Tare & Wet Specimen (g)	463.36	Wt. of Tare & Wet Specimen (g)	NA
Wt. of Tare & Dry Specimen (g)	380.99	Wt. of Tare & Dry Specimen (g)	NA
Weight of Tare (g)	92.33	Weight of Tare (g)	NA
Weight of Water (g)	82.37	Weight of Water (g)	NA
Weight of Dry Specimen (g)	288.66	Weight of Dry Specimen (g)	NA
<b>Moisture Content (%)</b>	<b>28.5</b>	<b>Moisture Content (%)</b>	<b>NA</b>

Wet Weight of -3/4" Sample (g)	NA	Weight of the Dry Specimen (g)	288.66
Dry Weight of -3/4" Sample (g)	38.10	Weight of - #200 material (g)	250.56
Wet Weight of +3/4" Sample (g)	NA	Weight of + #200 material (g)	38.10
Dry Weight of +3/4" Sample (g)	0.00		
Total Dry Weight of Sample (g)	NA		

Sieve Size	Sieve Opening (mm)	Weight of Soil Retained (g)	Percent Retained (%)	Accumulated Percent Retained (%)	Percent Finer (%)	Accumulated Percent Finer (%)
12"	300	0.00	0.00	0.00	100.00	100.00
6"	150	0.00	0.00	0.00	100.00	100.00
3"	75	0.00	0.00	0.00	100.00	100.00
2"	50	0.00	0.00	0.00	100.00	100.00
1 1/2"	37.5	0.00	0.00	0.00	100.00	100.00
1"	25.0	0.00	0.00	0.00	100.00	100.00
3/4"	19.0	0.00	0.00	0.00	100.00	100.00
1/2"	12.5	0.00	0.00	0.00	100.00	100.00
3/8"	9.50	1.54	0.53	0.53	99.47	99.47
#4	4.75	0.37	0.13	0.66	99.34	99.34
#10	2.00	1.04	0.36	1.02	98.98	98.98
#20	0.85	1.10	0.38	1.40	98.60	98.60
#40	0.425	2.91	1.01	2.41	97.59	97.59
#60	0.250	5.12	1.77	4.18	95.82	95.82
#140	0.106	16.34	5.66	9.85	90.15	90.15
#200	0.075	9.68	3.35	13.20	86.80	86.80
Pan	-	250.56	86.80	100.00	-	-

Tested By **PC** Date **10/7/13** Checked By **KC** Date **10/17/13**

**HYDROMETER ANALYSIS**  
ASTM D 422-63 (2007)/AASHTO T88-00



Client:	MICROBAC	Boring No.:	NA
Client Reference:	OHIO EPA - MONTGOMERY CO. L13091617	Depth (ft):	NA
Project No.:	2013-455-001	Sample No.:	EAM-1
Lab ID:	2013-455-001-001	Soil Color:	DARK BROWN

Elapsed Time (min)	R Measured	Temp. (°C)	Composite Correction	R Corrected	N (%)	K Factor	Diameter (mm)	N'
0	NA	NA	NA	NA	NA	NA	NA	NA
2	49.5	23.1	4.49	45.0	85.2	0.01296	0.0262	<b>73.9</b>
5	44.0	23.1	4.49	39.5	74.8	0.01296	0.0175	<b>64.9</b>
15	36.0	23.1	4.49	31.5	59.6	0.01296	0.0108	<b>51.8</b>
30	33.0	23.1	4.49	28.5	54.0	0.01296	0.0078	<b>46.8</b>
60	29.0	22.4	4.71	24.3	46.0	0.01307	0.0057	<b>39.9</b>
304	23.0	22.2	4.77	18.2	34.5	0.01310	0.0027	<b>29.9</b>
1440	18.5	22.1	4.80	13.7	25.9	0.01311	0.0013	<b>22.5</b>

Soil Specimen Data		Other Corrections	
Tare No.	669		
Weight of Tare & Dry Material (g)	151.55	a - Factor	0.99
Weight of Tare (g)	94.24		
Weight of Deflocculant (g)	5.0	Percent Finer than # 200	86.80
Weight of Dry Material (g)	52.31	Specific Gravity	2.7 Assumed

**Note:** Hydrometer test is performed on - # 200 sieve material.

Tested By TO Date 10/8/13 Checked By KC Date 10/17/13

page 4 of 4

DCN: CT-S3A DATE: 3/18/13 REVISION: 11

Sievehyd.xls

**ATTERBERG LIMITS**  
ASTM D 4318-10 / AASHTO T89-10

Client:	MICROBAC	Boring No.:	NA
Client Reference:	Ohio EPA-Montgomery Co. L13091617	Depth (ft):	NA
Project No.:	2013-455-001	Sample No.:	EAM-1
Lab ID:	2013-455-001-001	Soil Description:	<b>DARK BROWN ELASTIC SILT</b>

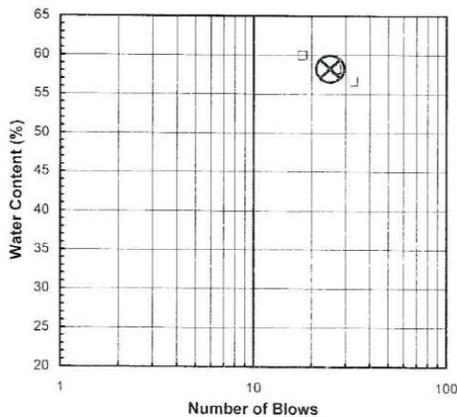
*Note: The USCS symbol used with this test refers only to the minus No. 40 sieve material. See the "Sieve and Hydrometer Analysis" graph page for the complete material description.*

Liquid Limit Test	1	2	3	
Tare Number	440	1291	1227	M
Wt. of Tare & Wet Sample (g)	38.62	38.67	33.54	U
Wt. of Tare & Dry Sample (g)	30.55	30.90	25.92	L
Wt. of Tare (g)	17.08	17.54	12.46	T
Wt. of Water (g)	8.1	7.8	7.6	I
Wt. of Dry Sample (g)	13.5	13.4	13.5	P
				O
				I
<b>Moisture Content (%)</b>	<b>59.9</b>	<b>58.2</b>	<b>56.6</b>	<b>N</b>
<b>Number of Blows</b>	<b>18</b>	<b>27</b>	<b>33</b>	<b>T</b>

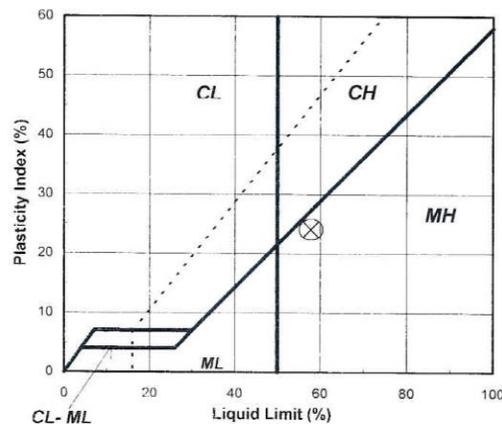
Plastic Limit Test	1	2	Range	Test Results
Tare Number	151	1252		Liquid Limit (%) <b>58</b>
Wt. of Tare & Wet Sample (g)	25.30	25.44		Plastic Limit (%) <b>34</b>
Wt. of Tare & Dry Sample (g)	23.74	23.78		Plasticity Index (%) <b>24</b>
Wt. of Tare (g)	19.19	18.83		USCS Symbol <b>MH</b>
Wt. of Water (g)	1.6	1.7		
Wt. of Dry Sample (g)	4.6	5.0		
<b>Moisture Content (%)</b>	<b>34.3</b>	<b>33.5</b>	<b>0.8</b>	

*Note: The acceptable range of the two Moisture contents is  $\pm 2.6$*

Flow Curve



Plasticity Chart



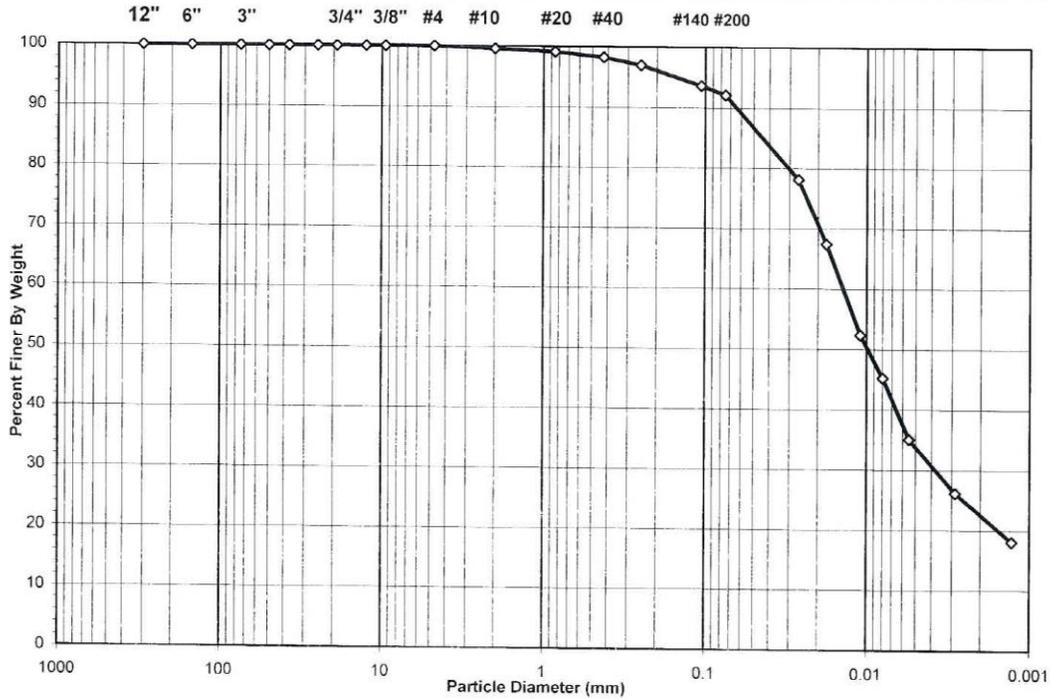
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page 1 of 1	DCN:	CT-S4B	DATE:	3/18/13	REVISION:	4	3ptlimit.xls

**SIEVE AND HYDROMETER ANALYSIS**  
 ASTM D 422-63 (2007)/AASHTO T88-00



Client:	MICROBAC	Boring No.:	NA
Client Reference:	OHIO EPA - MONTGOMERY CO. L13091617	Depth (ft):	NA
Project No.:	2013-455-001	Sample No.:	TAP-1
Lab ID:	2013-455-001-002	Soil Color:	DARK BROWN

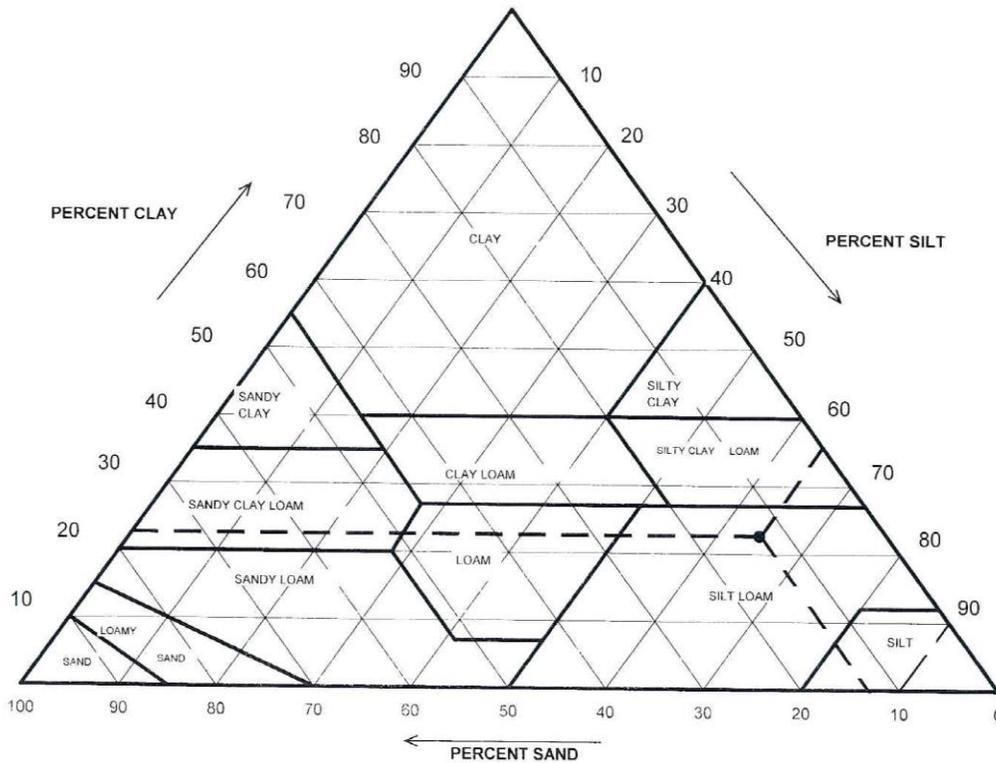
USCS USDA	SIEVE ANALYSIS				HYDROMETER	
	cobbles	gravel	sand		silt and clay fraction	
	cobbles	gravel	sand		silt	clay



USCS Summary		
Sieve Sizes (mm)		Percentage
Greater Than #4	Gravel	0.00
#4 To #200	Sand	7.90
Finer Than #200	Silt & Clay	92.10
<b>USCS Symbol</b>	<b>CL, TESTED</b>	
<b>USCS Classification</b>	<b>LEAN CLAY</b>	

### USDA CLASSIFICATION CHART

Client:	MICROBAC	Boring No.:	NA
Client Reference:	OHIO EPA - MONTGOMERY CO. L1	Depth (ft):	NA
Project No.:	2013-455-001	Sample No.:	TAP-1
Lab ID:	2013-455-001-002	Soil Color:	DARK BROWN



Particle Size (mm)	Percent Finer (%)	USDA SUMMARY	Actual Percentage (%)	Corrected % of Minus 2.0 mm material for USDA Classificat. (%)
2	99.60	Gravel	0.40	0.00
0.05	86.66	Sand	12.94	12.99
0.002	22.53	Silt	64.13	64.38
		Clay	22.53	22.62
		<b>USDA Classification:</b>	<b>SILT LOAM</b>	



### WASH SIEVE ANALYSIS

ASTM D 422-63 (2007)/AASHTO T88-00

Client:	MICROBAC	Boring No.:	NA
Client Reference:	OHIO EPA - MONTGOMERY CO. L13091617	Depth (ft):	NA
Project No.:	2013-455-001	Sample No.:	TAP-1
Lab ID:	2013-455-001-002	Soil Color:	DARK BROWN

Moisture Content of Passing 3/4" Material		Water Content of Retained 3/4" Material	
Tare No.	690	Tare No.	NA
Wt. of Tare & Wet Specimen (g)	499.51	Wt. of Tare & Wet Specimen (g)	NA
Wt. of Tare & Dry Specimen (g)	447.40	Wt. of Tare & Dry Specimen (g)	NA
Weight of Tare (g)	95.61	Weight of Tare (g)	NA
Weight of Water (g)	52.11	Weight of Water (g)	NA
Weight of Dry Specimen (g)	351.79	Weight of Dry Specimen (g)	NA
<b>Moisture Content (%)</b>	<b>14.8</b>	<b>Moisture Content (%)</b>	<b>NA</b>

Wet Weight of -3/4" Sample (g)	NA	Weight of the Dry Specimen (g)	351.79
Dry Weight of -3/4" Sample (g)	27.79	Weight of - #200 material (g)	324.00
Wet Weight of +3/4" Sample (g)	NA	Weight of + #200 material (g)	27.79
Dry Weight of +3/4" Sample (g)	0.00		
Total Dry Weight of Sample (g)	NA		

Sieve Size	Sieve Opening (mm)	Weight of Soil Retained (g)	Percent Retained (%)	Accumulated Percent Retained (%)	Percent Finer (%)	Accumulated Percent Finer (%)
12"	300	0.00	0.00	0.00	100.00	100.00
6"	150	0.00	0.00	0.00	100.00	100.00
3"	75	0.00	0.00	0.00	100.00	100.00
2"	50	0.00	0.00	0.00	100.00	100.00
1 1/2"	37.5	0.00	0.00	0.00	100.00	100.00
1"	25.0	0.00	0.00	0.00	100.00	100.00
3/4"	19.0	0.00	0.00	0.00	100.00	100.00
1/2"	12.5	0.00	0.00	0.00	100.00	100.00
3/8"	9.50	0.00	0.00	0.00	100.00	100.00
#4	4.75	0.00	0.00	0.00	100.00	100.00
#10	2.00	1.39	0.40	0.40	99.60	99.60
#20	0.85	1.71	0.49	0.88	99.12	99.12
#40	0.425	2.95	0.84	1.72	98.28	98.28
#60	0.250	4.51	1.28	3.00	97.00	97.00
#140	0.106	11.86	3.37	6.37	93.63	93.63
#200	0.075	5.37	1.53	7.90	92.10	92.10
Pan	-	324.00	92.10	100.00	-	-

Tested By PC Date 10/7/13 Checked By KC Date 10/17/13

**HYDROMETER ANALYSIS**  
ASTM D 422-63 (2007)/AASHTO T88-00



Client:	MICROBAC	Boring No.:	NA
Client Reference:	OHIO EPA - MONTGOMERY CO. L13091617	Depth (ft):	NA
Project No.:	2013-455-001	Sample No.:	TAP-1
Lab ID:	2013-455-001-002	Soil Color:	DARK BROWN

Elapsed Time (min)	R Measured	Temp. (°C)	Composite Correction	R Corrected	N (%)	K Factor	Diameter (mm)	N' (%)
0	NA	NA	NA	NA	NA	NA	NA	NA
2	48.5	23.1	4.49	44.0	84.8	0.01296	0.0265	<b>78.1</b>
5	42.5	23.1	4.49	38.0	73.3	0.01296	0.0177	<b>67.5</b>
15	34.0	23.1	4.49	29.5	56.9	0.01296	0.0110	<b>52.4</b>
30	30.0	23.1	4.49	25.5	49.2	0.01296	0.0080	<b>45.3</b>
70	24.5	22.3	4.74	19.8	38.1	0.01308	0.0055	<b>35.1</b>
273	19.5	22.2	4.77	14.7	28.4	0.01310	0.0029	<b>26.1</b>
1440	15.0	22.1	4.80	10.2	19.7	0.01311	0.0013	<b>18.1</b>

Soil Specimen Data		Other Corrections	
Tare No.	2488		
Weight of Tare & Dry Material (g)	153.91	a - Factor	0.99
Weight of Tare (g)	97.55		
Weight of Deflocculant (g)	5.0	Percent Finer than # 200	92.10
Weight of Dry Material (g)	51.36	Specific Gravity	2.7 Assumed

**Note:** Hydrometer test is performed on - # 200 sieve material.

Tested By TO Date 10/8/13 Checked By KC Date 10/17/13

**ATTERBERG LIMITS**  
ASTM D 4318-10 / AASHTO T89-10

Client:	MICROBAC	Boring No.:	NA
Client Reference:	Ohio EPA-Montgomery Co. L13091617	Depth (ft):	NA
Project No.:	2013-455-001	Sample No.:	TAP-1
Lab ID:	2013-455-001-002	Soil Description:	<b>BROWN LEAN CLAY</b>

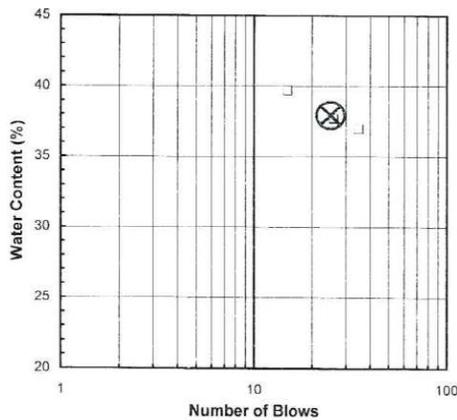
*Note: The USCS symbol used with this test refers only to the minus No. 40 sieve material. See the "Sieve and Hydrometer Analysis" graph page for the complete material description.*  
(Minus No. 40 sieve material, Airdried)

Liquid Limit Test	1	2	3	
Tare Number	375	394	2045	M
Wt. of Tare & Wet Sample (g)	40.32	41.72	48.00	U
Wt. of Tare & Dry Sample (g)	33.00	34.15	39.77	L
Wt. of Tare (g)	13.19	14.07	19.03	T
Wt. of Water (g)	7.3	7.6	8.2	I
Wt. of Dry Sample (g)	19.8	20.1	20.7	P
				O
				I
<b>Moisture Content (%)</b>	<b>37.0</b>	<b>37.7</b>	<b>39.7</b>	<b>N</b>
<b>Number of Blows</b>	<b>35</b>	<b>26</b>	<b>15</b>	<b>T</b>

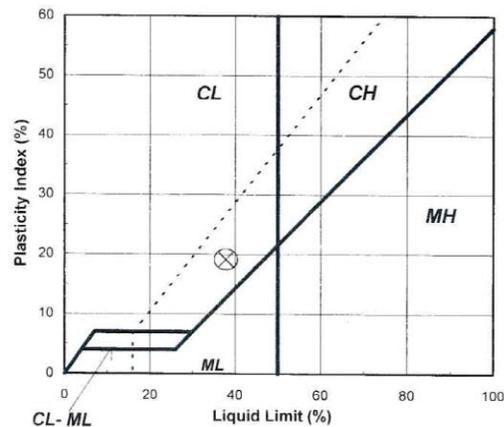
Plastic Limit Test	1	2	Range	Test Results
Tare Number	1239	284		Liquid Limit (%) <b>38</b>
Wt. of Tare & Wet Sample (g)	19.32	24.57		Plastic Limit (%) <b>19</b>
Wt. of Tare & Dry Sample (g)	18.24	23.57		Plasticity Index (%) <b>19</b>
Wt. of Tare (g)	12.69	18.37		USCS Symbol <b>CL</b>
Wt. of Water (g)	1.1	1.0		
Wt. of Dry Sample (g)	5.6	5.2		
<b>Moisture Content (%)</b>	<b>19.5</b>	<b>19.2</b>	<b>0.2</b>	

*Note: The acceptable range of the two Moisture contents is  $\pm 2.6$*

Flow Curve



Plasticity Chart



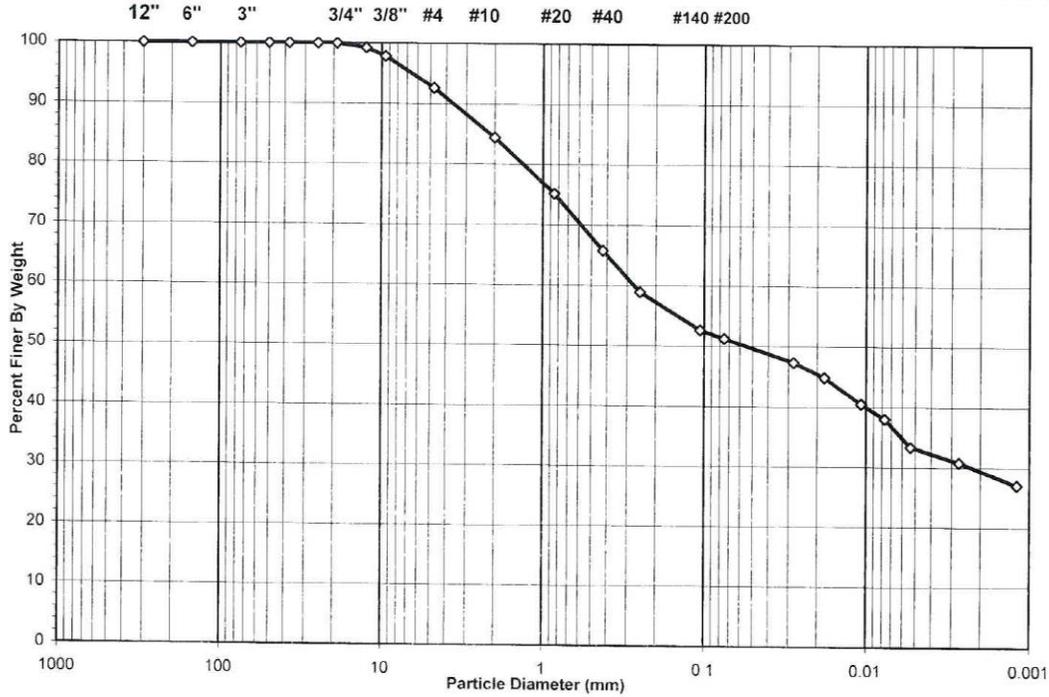
Tested By	TO	Date	10/9/13	Checked By	KC	Date	10/17/13
page 1 of 1	DCN:	CT-S4B	DATE:	3/18/13	REVISION:	4	3ptlimit.xls

**SIEVE AND HYDROMETER ANALYSIS**  
ASTM D 422-63 (2007)/AASHTO T88-00



Client:	MICROBAC	Boring No.:	NA
Client Reference:	OHIO EPA - MONTGOMERY CO. L13091617	Depth (ft):	NA
Project No.:	2013-455-001	Sample No.:	TPK-1
Lab ID:	2013-455-001-003	Soil Color:	BROWN

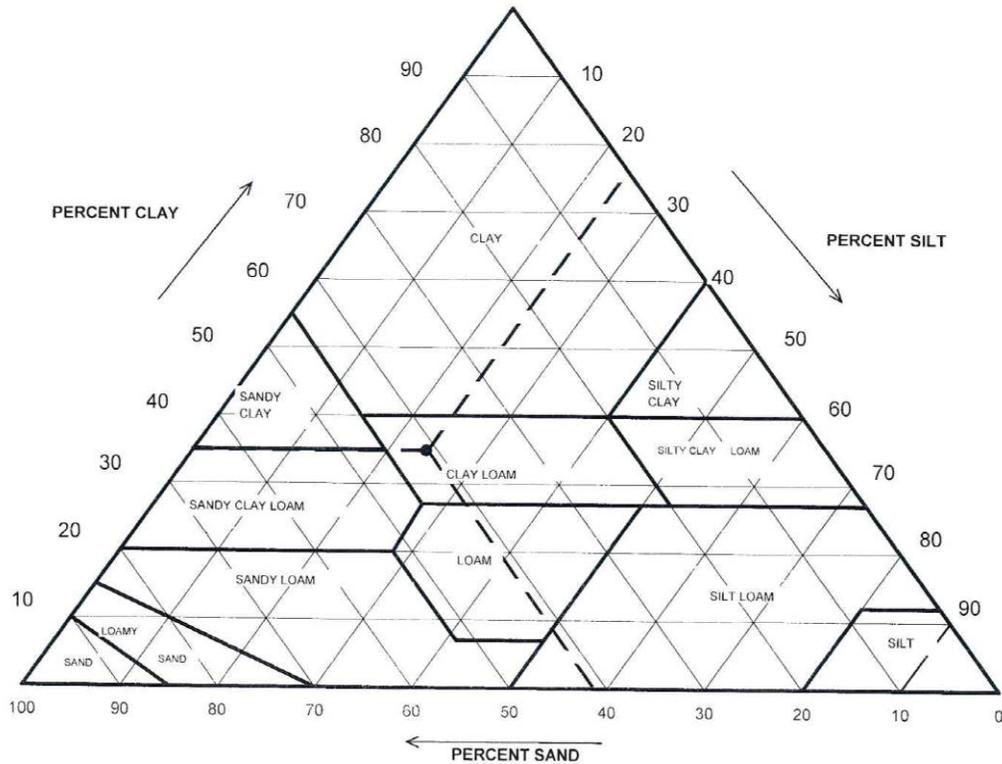
USCS USDA	SIEVE ANALYSIS					HYDROMETER	
	cobbles	gravel		sand		silt and clay fraction	
	cobbles	gravel		sand		silt	clay



USCS Summary		
Sieve Sizes (mm)		Percentage
Greater Than #4	Gravel	7.40
#4 To #200	Sand	41.35
Finer Than #200	Silt & Clay	51.25
USCS Symbol	<b>CL, TESTED</b>	
USCS Classification	<b>SANDY LEAN CLAY</b>	

### USDA CLASSIFICATION CHART

Client:	MICROBAC	Boring No.:	NA
Client Reference:	OHIO EPA - MONTGOMERY CO. L1	Depth (ft):	NA
Project No.:	2013-455-001	Sample No.:	TPK-1
Lab ID:	2013-455-001-003	Soil Color:	BROWN



Particle Size (mm)	Percent Finer (%)	USDA SUMMARY	Actual Percentage (%)	Corrected % of Minus 2.0 mm material for USDA Classificat. (%)
2	84.38	Gravel	15.62	0.00
0.05	49.65	Sand	34.73	41.16
0.002	29.42	Silt	20.23	23.97
		Clay	29.42	34.87
		<b>USDA Classification:</b>	<b>CLAY LOAM</b>	



**WASH SIEVE ANALYSIS**  
ASTM D 422-63 (2007)/AASHTO T88-00

Client:	MICROBAC	Boring No.:	NA
Client Reference:	OHIO EPA - MONTGOMERY CO. L13091617	Depth (ft):	NA
Project No.:	2013-455-001	Sample No.:	TPK-1
Lab ID:	2013-455-001-003	Soil Color:	BROWN

Moisture Content of Passing 3/4" Material		Water Content of Retained 3/4" Material	
Tare No.	2326	Tare No.	NA
Wt. of Tare & Wet Specimen (g)	627.00	Wt. of Tare & Wet Specimen (g)	NA
Wt. of Tare & Dry Specimen (g)	540.70	Wt. of Tare & Dry Specimen (g)	NA
Weight of Tare (g)	97.09	Weight of Tare (g)	NA
Weight of Water (g)	86.30	Weight of Water (g)	NA
Weight of Dry Specimen (g)	443.61	Weight of Dry Specimen (g)	NA
<b>Moisture Content (%)</b>	<b>19.5</b>	<b>Moisture Content (%)</b>	<b>NA</b>

Wet Weight of -3/4" Sample (g)	NA	Weight of the Dry Specimen (g)	443.61
Dry Weight of -3/4" Sample (g)	216.26	Weight of - #200 material (g)	227.35
Wet Weight of +3/4" Sample (g)	NA	Weight of + #200 material (g)	216.26
Dry Weight of +3/4" Sample (g)	0.00		
Total Dry Weight of Sample (g)	NA		

Sieve Size	Sieve Opening (mm)	Weight of Soil Retained (g)	Percent Retained (%)	Accumulated Percent Retained (%)	Percent Finer (%)	Accumulated Percent Finer (%)
12"	300	0.00	0.00	0.00	100.00	100.00
6"	150	0.00	0.00	0.00	100.00	100.00
3"	75	0.00	0.00	0.00	100.00	100.00
2"	50	0.00	0.00	0.00	100.00	100.00
1 1/2"	37.5	0.00	0.00	0.00	100.00	100.00
1"	25.0	0.00	0.00	0.00	100.00	100.00
3/4"	19.0	0.00	0.00	0.00	100.00	100.00
1/2"	12.5	3.30	0.74	0.74	99.26	99.26
3/8"	9.50	6.33	1.43	2.17	97.83	97.83
#4	4.75	23.19	5.23	7.40	92.60	92.60
#10	2.00	36.46	8.22	15.62	84.38	84.38
#20	0.85	40.67	9.17	24.79	75.21	75.21
#40	0.425	41.82	9.43	34.21	65.79	65.79
#60	0.250	30.49	6.87	41.09	58.91	58.91
#140	0.106	27.88	6.28	47.37	52.63	52.63
#200	0.075	6.12	1.38	48.75	51.25	51.25
Pan	-	227.35	51.25	100.00	-	-

Tested By BK Date 10/8/13 Checked By KC Date 10/17/13



**HYDROMETER ANALYSIS**  
ASTM D 422-63 (2007)/AASHTO T88-00

Client:	MICROBAC	Boring No.:	NA
Client Reference:	OHIO EPA - MONTGOMERY CO. L13091617	Depth (ft):	NA
Project No.:	2013-455-001	Sample No.:	TPK-1
Lab ID:	2013-455-001-003	Soil Color:	BROWN

Elapsed Time (min)	R Measured	Temp. (°C)	Composite Correction	R Corrected	N (%)	K Factor	Diameter (mm)	N' (%)
0	NA	NA	NA	NA	NA	NA	NA	NA
2	42.5	23.1	4.49	38.0	92.4	0.01296	0.0280	<b>47.4</b>
5	40.5	23.1	4.49	36.0	87.6	0.01296	0.0180	<b>44.9</b>
15	37.0	23.1	4.49	32.5	79.0	0.01296	0.0107	<b>40.5</b>
30	35.0	23.1	4.49	30.5	74.2	0.01296	0.0077	<b>38.0</b>
67	31.5	22.3	4.74	26.8	65.1	0.01308	0.0053	<b>33.3</b>
270	29.5	22.2	4.77	24.7	60.1	0.01310	0.0027	<b>30.8</b>
1440	26.5	22.1	4.80	21.7	52.8	0.01311	0.0012	<b>27.0</b>

Soil Specimen Data		Other Corrections	
Tare No.	672		
Weight of Tare & Dry Material (g)	143.09	a - Factor	0.99
Weight of Tare (g)	97.37		
Weight of Deflocculant (g)	5.0	Percent Finer than # 200	51.25
Weight of Dry Material (g)	40.72	Specific Gravity	2.7 Assumed

**Note:** Hydrometer test is performed on - # 200 sieve material.

Tested By TO Date 10/8/13 Checked By KC Date 10/17/13  
 page 4 of 4 DCN: CT-53A DATE: 3/18/13 REVISION: 11 Sievehyd.xls

**ATTERBERG LIMITS**  
ASTM D 4318-10 / AASHTO T89-10

Client:	MICROBAC	Boring No.:	NA
Client Reference:	Ohio EPA-Montgomery Co. L13091617	Depth (ft):	NA
Project No.:	2013-455-001	Sample No.:	TPK-1
Lab ID:	2013-455-001-003	Soil Description:	<b>BROWN LEAN CLAY</b>

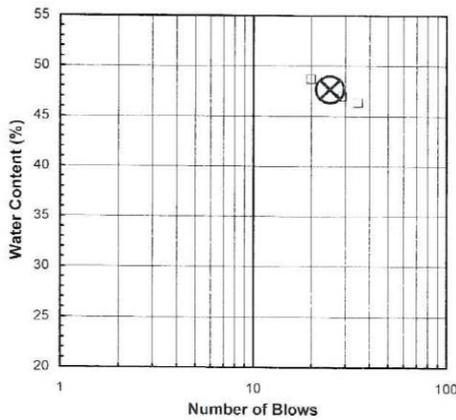
*Note: The USCS symbol used with this test refers only to the minus No. 40 sieve material. See the "Sieve and Hydrometer Analysis" graph page for the complete material description.*  
(Minus No. 40 sieve material, Airdried)

Liquid Limit Test	1	2	3	
Tare Number	1263	1241	117	M
Wt. of Tare & Wet Sample (g)	39.85	39.45	42.27	U
Wt. of Tare & Dry Sample (g)	32.47	32.53	35.28	L
Wt. of Tare (g)	17.31	17.79	20.19	T
Wt. of Water (g)	7.4	6.9	7.0	I
Wt. of Dry Sample (g)	15.2	14.7	15.1	P
				O
				I
<b>Moisture Content (%)</b>	<b>48.7</b>	<b>46.9</b>	<b>46.3</b>	<b>N</b>
<b>Number of Blows</b>	<b>20</b>	<b>29</b>	<b>35</b>	<b>T</b>

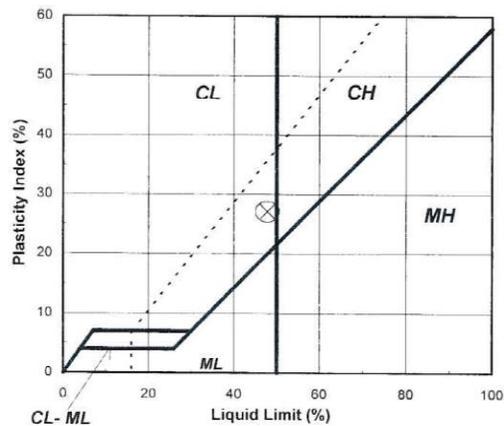
Plastic Limit Test	1	2	Range	Test Results
Tare Number	1226	109		<b>Liquid Limit (%)</b> 48
Wt. of Tare & Wet Sample (g)	21.87	21.81		<b>Plastic Limit (%)</b> 21
Wt. of Tare & Dry Sample (g)	20.82	20.75		<b>Plasticity Index (%)</b> 27
Wt. of Tare (g)	15.78	15.53		<b>USCS Symbol</b> CL
Wt. of Water (g)	1.1	1.1		
Wt. of Dry Sample (g)	5.0	5.2		
<b>Moisture Content (%)</b>	<b>20.8</b>	<b>20.3</b>	<b>0.5</b>	

*Note: The acceptable range of the two Moisture contents is  $\pm 2.6$*

Flow Curve



Plasticity Chart



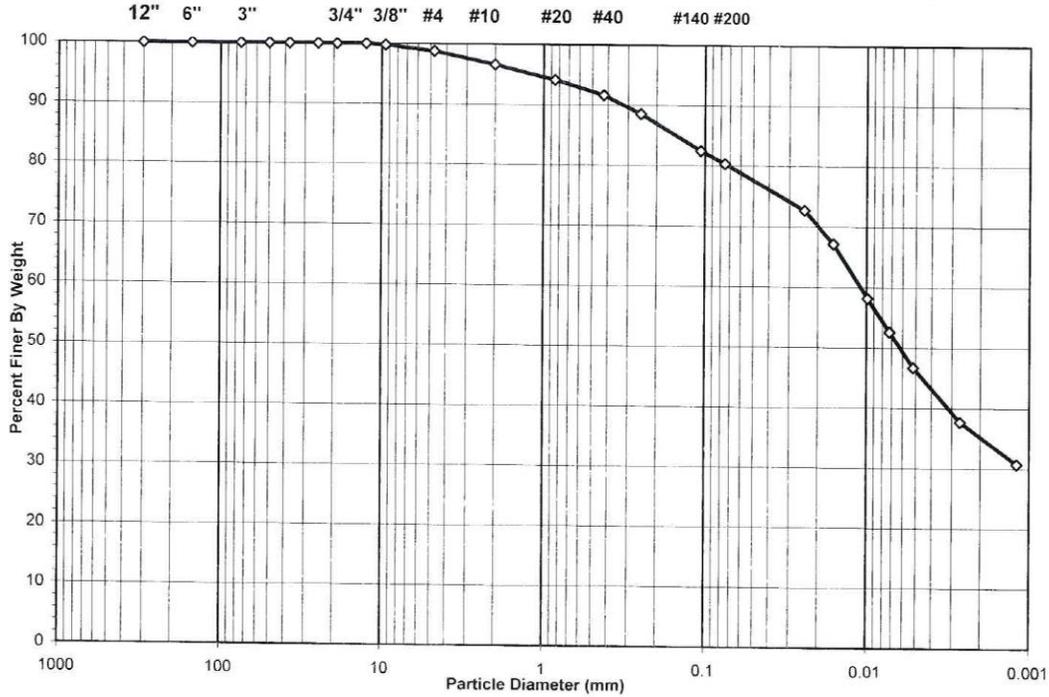
Tested By BK Date 10/9/13 Checked By KC Date 10/17/13  
page 1 of 1 DCN: CT-S4B DATE: 3/18/13 REVISION: 4 3ptlimit.xls

**SIEVE AND HYDROMETER ANALYSIS**  
 ASTM D 422-63 (2007)/AASHTO T88-00



Client:	MICROBAC	Boring No.:	NA
Client Reference:	OHIO EPA - MONTGOMERY CO. L13091617	Depth (ft):	NA
Project No.:	2013-455-001	Sample No.:	DRP-1
Lab ID:	2013-455-001-004	Soil Color:	BROWN

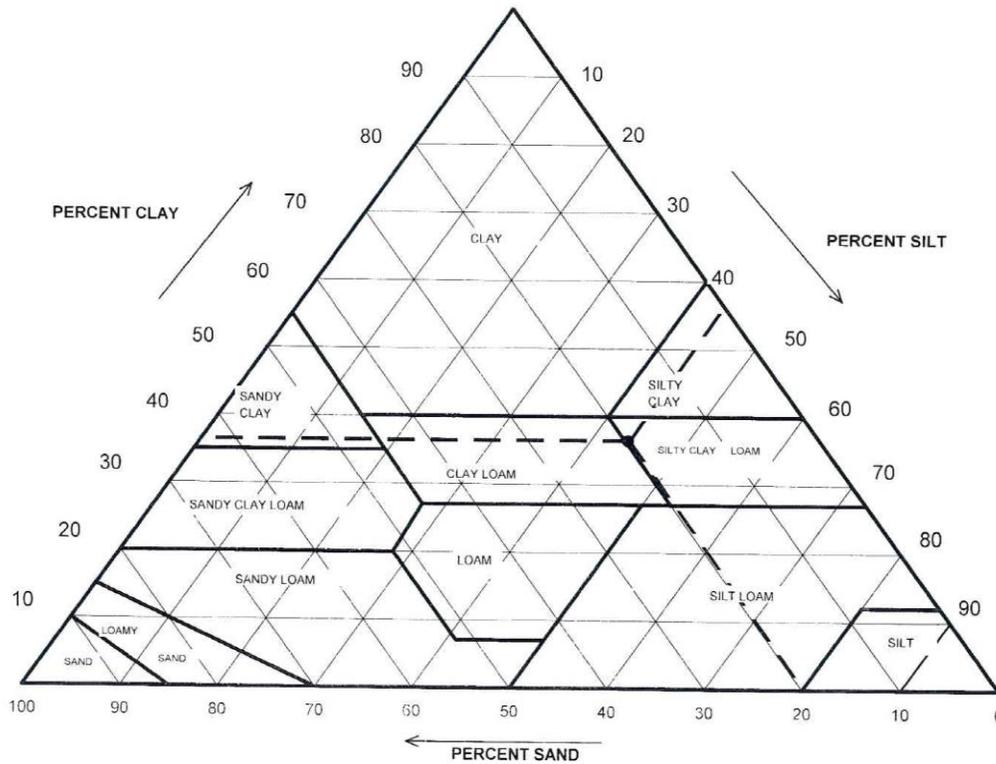
USCS USDA	SIEVE ANALYSIS					HYDROMETER	
	cobbles	gravel		sand		silt and clay fraction	
	cobbles	gravel		sand		silt	clay



USCS Summary		
Sieve Sizes (mm)		Percentage
Greater Than #4	Gravel	1.22
#4 To #200	Sand	18.43
Finer Than #200	Silt & Clay	80.36
<b>USCS Symbol</b> <i>CL, TESTED</i>		
<b>USCS Classification</b> <i>LEAN CLAY WITH SAND</i>		

### USDA CLASSIFICATION CHART

Client:	MICROBAC	Boring No.:	NA
Client Reference:	OHIO EPA - MONTGOMERY CO. L1	Depth (ft):	NA
Project No.:	2013-455-001	Sample No.:	DRP-1
Lab ID:	2013-455-001-004	Soil Color:	BROWN



Particle Size (mm)	Percent Finer (%)	USDA SUMMARY	Actual Percentage (%)	Corrected % of Minus 2.0 mm material for USDA Classificat. (%)
2	96.62	Gravel	3.38	0.00
0.05	77.62	Sand	19.00	19.67
0.002	35.22	Silt	42.40	43.88
		Clay	35.22	36.46
		<b>USDA Classification:</b>	<b>SILTY CLAY LOAM</b>	



**WASH SIEVE ANALYSIS**  
ASTM D 422-63 (2007)/AASHTO T88-00

Client:	MICROBAC	Boring No.:	NA
Client Reference:	OHIO EPA - MONTGOMERY CO. L13091617	Depth (ft):	NA
Project No.:	2013-455-001	Sample No.:	DRP-1
Lab ID:	2013-455-001-004	Soil Color:	BROWN

Moisture Content of Passing 3/4" Material		Water Content of Retained 3/4" Material	
Tare No.	1321	Tare No.	NA
Wt. of Tare & Wet Specimen (g)	737.23	Wt. of Tare & Wet Specimen (g)	NA
Wt. of Tare & Dry Specimen (g)	635.40	Wt. of Tare & Dry Specimen (g)	NA
Weight of Tare (g)	97.60	Weight of Tare (g)	NA
Weight of Water (g)	101.83	Weight of Water (g)	NA
Weight of Dry Specimen (g)	537.80	Weight of Dry Specimen (g)	NA
<b>Moisture Content (%)</b>	<b>18.9</b>	<b>Moisture Content (%)</b>	<b>NA</b>

Wet Weight of -3/4" Sample (g)	NA	Weight of the Dry Specimen (g)	537.80
Dry Weight of -3/4" Sample (g)	105.65	Weight of - #200 material (g)	432.15
Wet Weight of +3/4" Sample (g)	NA	Weight of + #200 material (g)	105.65
Dry Weight of +3/4" Sample (g)	0.00		
Total Dry Weight of Sample (g)	NA		

Sieve Size	Sieve Opening (mm)	Weight of Soil Retained (g)	Percent Retained (%)	Accumulated Percent Retained (%)	Percent Finer (%)	Accumulated Percent Finer (%)
12"	300	0.00	0.00	0.00	100.00	100.00
6"	150	0.00	0.00	0.00	100.00	100.00
3"	75	0.00	0.00	0.00	100.00	100.00
2"	50	0.00	0.00	0.00	100.00	100.00
1 1/2"	37.5	0.00	0.00	0.00	100.00	100.00
1"	25.0	0.00	0.00	0.00	100.00	100.00
3/4"	19.0	0.00	0.00	0.00	100.00	100.00
1/2"	12.5	0.00	0.00	0.00	100.00	100.00
3/8"	9.50	1.07	0.20	0.20	99.80	99.80
#4	4.75	5.48	1.02	1.22	98.78	98.78
#10	2.00	11.61	2.16	3.38	96.62	96.62
#20	0.85	13.56	2.52	5.90	94.10	94.10
#40	0.425	13.34	2.48	8.38	91.62	91.62
#60	0.250	16.57	3.08	11.46	88.54	88.54
#140	0.106	32.54	6.05	17.51	82.49	82.49
#200	0.075	11.48	2.13	19.64	80.36	80.36
Pan	-	432.15	80.36	100.00	-	-

Tested By BK Date 10/8/13 Checked By KC Date 10/17/13

**HYDROMETER ANALYSIS**  
ASTM D 422-63 (2007)/AASHTO T88-00



Client:	MICROBAC	Boring No.:	NA
Client Reference:	OHIO EPA - MONTGOMERY CO. L13091617	Depth (ft):	NA
Project No.:	2013-455-001	Sample No.:	DRP-1
Lab ID:	2013-455-001-004	Soil Color:	BROWN

Elapsed Time	R Measured	Temp.	Composite Correction	R Corrected	N	K Factor	Diameter	N'
(min)		(°C)			(%)		(mm)	(%)
0	NA	NA	NA	NA	NA	NA	NA	NA
2	57.0	23.1	4.49	52.5	90.5	0.01296	0.0242	<b>72.7</b>
5	53.0	23.1	4.49	48.5	83.6	0.01296	0.0160	<b>67.2</b>
15	46.5	23.1	4.49	42.0	72.4	0.01296	0.0099	<b>58.2</b>
30	42.5	23.1	4.49	38.0	65.5	0.01296	0.0072	<b>52.6</b>
64	38.5	22.3	4.74	33.8	58.2	0.01308	0.0052	<b>46.7</b>
267	32.0	22.2	4.77	27.2	46.9	0.01310	0.0027	<b>37.7</b>
1440	27.0	22.1	4.80	22.2	38.3	0.01311	0.0012	<b>30.7</b>

Soil Specimen Data		Other Corrections	
Tare No.	846		
Weight of Tare & Dry Material (g)	159.28	a - Factor	0.99
Weight of Tare (g)	96.83		
Weight of Deflocculant (g)	5.0	Percent Finer than # 200	80.36
Weight of Dry Material (g)	57.45	Specific Gravity	2.7 Assumed

**Note:** Hydrometer test is performed on - # 200 sieve material.

Tested By TO Date 10/8/13 Checked By KC Date 10/17/13  
page 4 of 4 DCN: CT-S3A DATE: 3/18/13 REVISION: 11 Sievehyd.xls

**ATTERBERG LIMITS**  
ASTM D 4318-10 / AASHTO T89-10

Client:	MICROBAC	Boring No.:	NA
Client Reference:	Ohio EPA-Montgomery Co. L13091617	Depth (ft):	NA
Project No.:	2013-455-001	Sample No.:	DRP-1
Lab ID:	2013-455-001-004	Soil Description:	<b>BROWN LEAN CLAY</b>

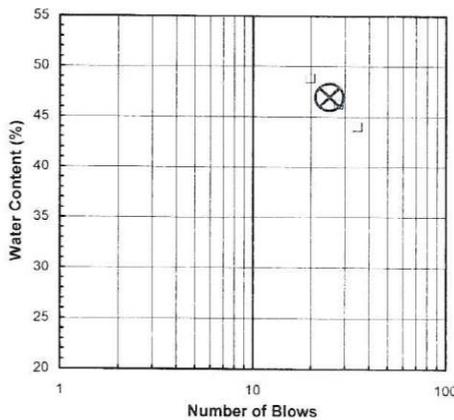
*Note: The USCS symbol used with this test refers only to the minus No. 40 sieve material. See the "Sieve and Hydrometer Analysis" graph page for the complete material description.*

Liquid Limit Test	1	2	3	
Tare Number	349	1229	310	M
Wt. of Tare & Wet Sample (g)	41.82	27.71	41.68	U
Wt. of Tare & Dry Sample (g)	34.13	20.86	34.68	L
Wt. of Tare (g)	18.37	6.03	18.76	T
Wt. of Water (g)	7.7	6.9	7.0	I
Wt. of Dry Sample (g)	15.8	14.8	15.9	P
				O
				I
<b>Moisture Content (%)</b>	<b>48.8</b>	<b>46.2</b>	<b>44.0</b>	<b>N</b>
<b>Number of Blows</b>	<b>20</b>	<b>28</b>	<b>35</b>	<b>T</b>

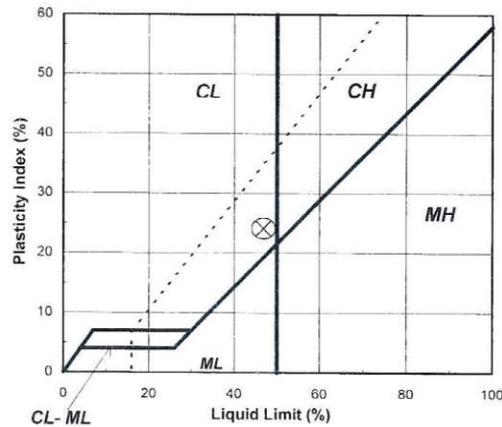
Plastic Limit Test	1	2	Range	Test Results
Tare Number	325	267		<b>Liquid Limit (%)</b> <b>47</b>
Wt. of Tare & Wet Sample (g)	25.11	19.42		<b>Plastic Limit (%)</b> <b>23</b>
Wt. of Tare & Dry Sample (g)	23.93	18.32		<b>Plasticity Index (%)</b> <b>24</b>
Wt. of Tare (g)	18.81	13.35		<b>USCS Symbol</b> <b>CL</b>
Wt. of Water (g)	1.2	1.1		
Wt. of Dry Sample (g)	5.1	5.0		
<b>Moisture Content (%)</b>	<b>23.0</b>	<b>22.1</b>	<b>0.9</b>	

*Note: The acceptable range of the two Moisture contents is  $\pm 2.6$*

Flow Curve



Plasticity Chart



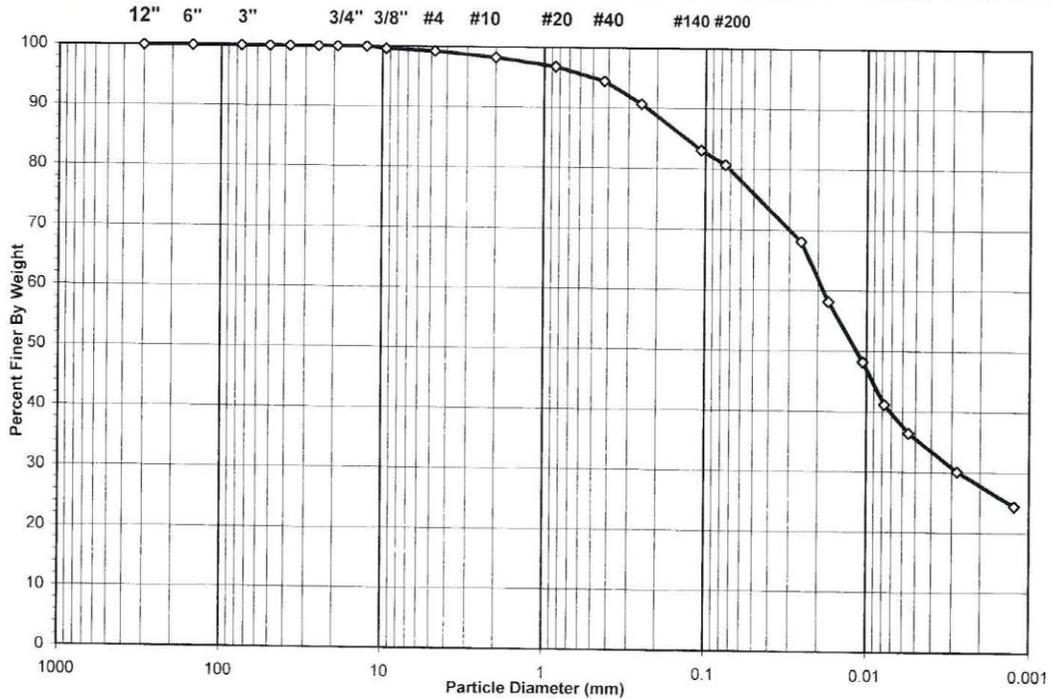
Tested By BK    Date 10/9/13    Checked By KC    Date 10/17/13  
page 1 of 1    DCN: CT-S4B    DATE: 3/18/13    REVISION: 4    3ptlimit.xls

**SIEVE AND HYDROMETER ANALYSIS**  
 ASTM D 422-63 (2007)/AASHTO T88-00



Client:	MICROBAC	Boring No.:	NA
Client Reference:	OHIO EPA - MONTGOMERY CO. L13091617	Depth (ft):	NA
Project No.:	2013-455-001	Sample No.:	GTM-1
Lab ID:	2013-455-001-005	Soil Color:	BROWN

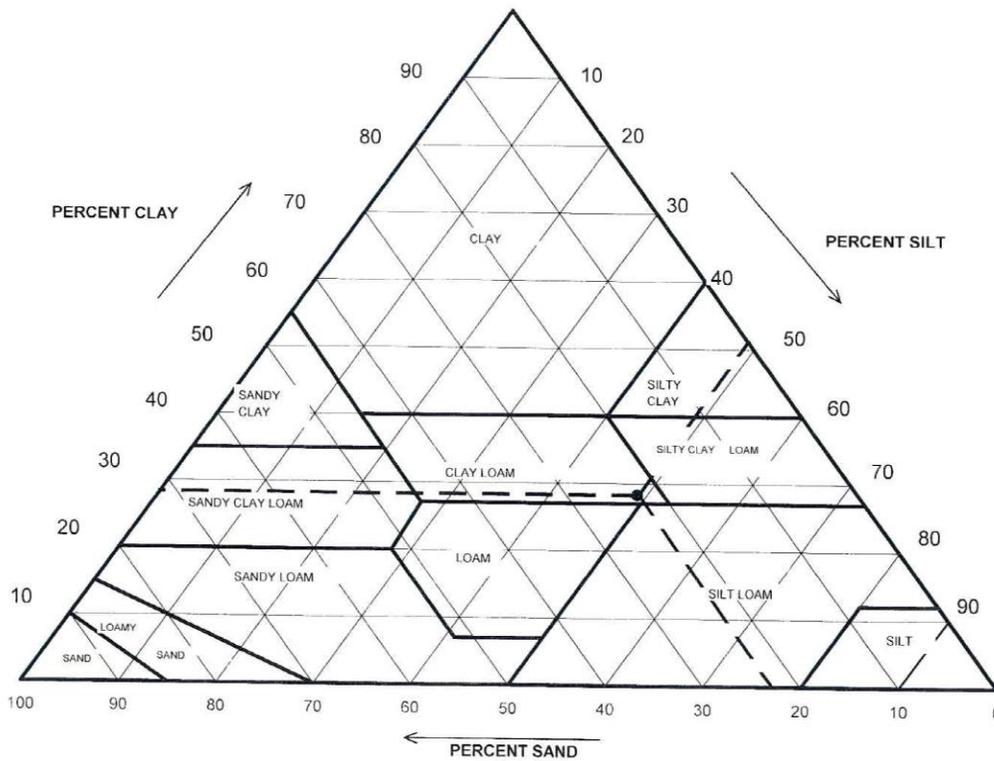
USCS USDA	SIEVE ANALYSIS				HYDROMETER	
	cobbles	gravel		sand	silt and clay fraction	
	cobbles	gravel		sand	silt	clay



USCS Summary		
Sieve Sizes (mm)		Percentage
Greater Than #4	Gravel	0.73
#4 To #200	Sand	18.61
Finer Than #200	Silt & Clay	80.67
<b>USCS Symbol</b> <i>CL, TESTED</i>		
<b>USCS Classification</b> <i>LEAN CLAY WITH SAND</i>		

### USDA CLASSIFICATION CHART

Client:	MICROBAC	Boring No.:	NA
Client Reference:	OHIO EPA - MONTGOMERY CO. L1	Depth (ft):	NA
Project No.:	2013-455-001	Sample No.:	GTM-1
Lab ID:	2013-455-001-005	Soil Color:	BROWN



Particle Size (mm)	Percent Finer (%)	USDA SUMMARY	Actual Percentage (%)	Corrected % of Minus 2.0 mm material for USDA Classificat. (%)
		Gravel	1.74	0.00
2	98.26	Sand	22.31	22.70
0.05	75.96	Silt	48.16	49.01
0.002	27.80	Clay	27.80	28.29
		<b>USDA Classification:</b>	<b>CLAY LOAM</b>	



**WASH SIEVE ANALYSIS**  
ASTM D 422-63 (2007)/AASHTO T88-00

Client:	MICROBAC	Boring No.:	NA
Client Reference:	OHIO EPA - MONTGOMERY CO. L13091617	Depth (ft):	NA
Project No.:	2013-455-001	Sample No.:	GTM-1
Lab ID:	2013-455-001-005	Soil Color:	BROWN

Moisture Content of Passing 3/4" Material		Water Content of Retained 3/4" Material	
Tare No.	1923	Tare No.	NA
Wt. of Tare & Wet Specimen (g)	673.37	Wt. of Tare & Wet Specimen (g)	NA
Wt. of Tare & Dry Specimen (g)	593.80	Wt. of Tare & Dry Specimen (g)	NA
Weight of Tare (g)	96.04	Weight of Tare (g)	NA
Weight of Water (g)	79.57	Weight of Water (g)	NA
Weight of Dry Specimen (g)	497.76	Weight of Dry Specimen (g)	NA
<b>Moisture Content (%)</b>	<b>16.0</b>	<b>Moisture Content (%)</b>	<b>NA</b>

Wet Weight of -3/4" Sample (g)	NA	Weight of the Dry Specimen (g)	497.76
Dry Weight of -3/4" Sample (g)	96.24	Weight of - #200 material (g)	401.52
Wet Weight of +3/4" Sample (g)	NA	Weight of + #200 material (g)	96.24
Dry Weight of +3/4" Sample (g)	0.00		
Total Dry Weight of Sample (g)	NA		

Sieve Size	Sieve Opening (mm)	Weight of Soil Retained (g)	Percent Retained (%)	Accumulated Percent Retained (%)	Percent Finer (%)	Accumulated Percent Finer (%)
12"	300	0.00	0.00	0.00	100.00	100.00
6"	150	0.00	0.00	0.00	100.00	100.00
3"	75	0.00	0.00	0.00	100.00	100.00
2"	50	0.00	0.00	0.00	100.00	100.00
1 1/2"	37.5	0.00	0.00	0.00	100.00	100.00
1"	25.0	0.00	0.00	0.00	100.00	100.00
3/4"	19.0	0.00	0.00	0.00	100.00	100.00
1/2"	12.5	0.00	0.00	0.00	100.00	100.00
3/8"	9.50	1.82	0.37	0.37	99.63	99.63
#4	4.75	1.81	0.36	0.73	99.27	99.27
#10	2.00	5.01	1.01	1.74	98.26	98.26
#20	0.85	7.20	1.45	3.18	96.82	96.82
#40	0.425	11.69	2.35	5.53	94.47	94.47
#60	0.250	18.88	3.79	9.32	90.68	90.68
#140	0.106	37.92	7.62	16.94	83.06	83.06
#200	0.075	11.91	2.39	19.33	80.67	80.67
Pan	-	401.52	80.67	100.00	-	-

Tested By BK Date 10/8/13 Checked By KC Date 10/17/13



**HYDROMETER ANALYSIS**  
ASTM D 422-63 (2007)/AASHTO T88-00

Client:	MICROBAC	Boring No.:	NA
Client Reference:	OHIO EPA - MONTGOMERY CO. L13091617	Depth (ft):	NA
Project No.:	2013-455-001	Sample No.:	GTM-1
Lab ID:	2013-455-001-005	Soil Color:	BROWN

Elapsed Time (min)	R Measured	Temp. (°C)	Composite Correction	R Corrected	N (%)	K Factor	Diameter (mm)	N'
0	NA	NA	NA	NA	NA	NA	NA	NA
2	52.5	23.1	4.49	48.0	84.4	0.01296	0.0254	68.1
5	45.5	23.1	4.49	41.0	72.1	0.01296	0.0172	58.2
15	38.5	23.1	4.49	34.0	59.8	0.01296	0.0106	48.2
30	33.5	23.1	4.49	29.0	51.0	0.01296	0.0078	41.1
64	30.5	22.1	4.80	25.7	45.2	0.01311	0.0055	36.4
267	26.0	22.2	4.77	21.2	37.3	0.01310	0.0028	30.1
1440	22.0	22.1	4.80	17.2	30.2	0.01311	0.0012	24.4

Soil Specimen Data		Other Corrections	
Tare No.	708		
Weight of Tare & Dry Material (g)	159.41	a - Factor	0.99
Weight of Tare (g)	98.1		
Weight of Deflocculant (g)	5.0	Percent Finer than # 200	80.67
Weight of Dry Material (g)	56.31	Specific Gravity	2.7 Assumed

**Note:** Hydrometer test is performed on - # 200 sieve material.

Tested By TO Date 10/8/13 Checked By KC Date 10/17/13  
page 4 of 4 DCN: CT-S3A DATE: 3/18/13 REVISION: 11 Sievehyd.xls

**ATTERBERG LIMITS**  
ASTM D 4318-10 / AASHTO T89-10

Client:	MICROBAC	Boring No.:	NA
Client Reference:	Ohio EPA-Montgomery Co. L13091617	Depth (ft):	NA
Project No.:	2013-455-001	Sample No.:	GTM-1
Lab ID:	2013-455-001-005	Soil Description:	<b>BROWN LEAN CLAY</b>

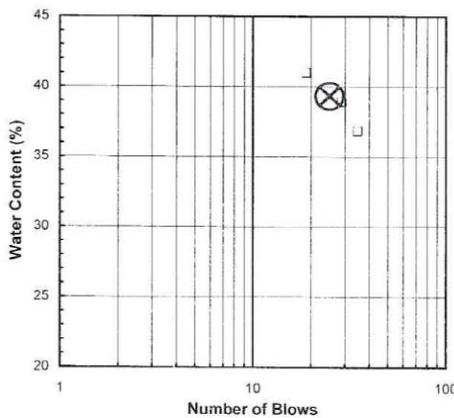
*Note: The USCS symbol used with this test refers only to the minus No. 40 sieve material. See the "Sieve and Hydrometer Analysis" graph page for the complete material description.* (Minus No. 40 sieve material, Airdried)

Liquid Limit Test	1	2	3	
Tare Number	1277	441	1259	M
Wt. of Tare & Wet Sample (g)	43.71	47.32	44.22	U
Wt. of Tare & Dry Sample (g)	36.52	39.23	36.08	L
Wt. of Tare (g)	16.99	18.42	16.21	T
Wt. of Water (g)	7.2	8.1	8.1	I
Wt. of Dry Sample (g)	19.5	20.8	19.9	P
				O
				I
<b>Moisture Content (%)</b>	<b>36.8</b>	<b>38.9</b>	<b>41.0</b>	<b>N</b>
<b>Number of Blows</b>	<b>35</b>	<b>29</b>	<b>19</b>	<b>T</b>

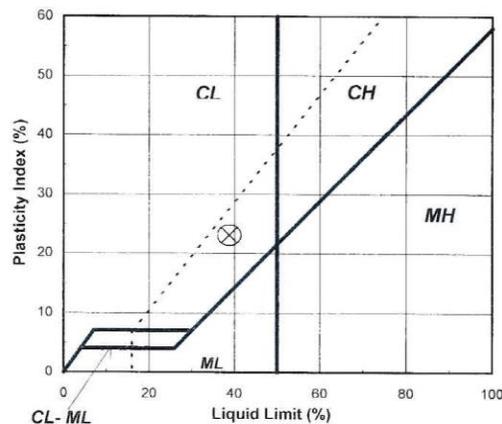
Plastic Limit Test	1	2	Range	Test Results
Tare Number	1293	457		Liquid Limit (%) 39
Wt. of Tare & Wet Sample (g)	27.16	19.16		Plastic Limit (%) 16
Wt. of Tare & Dry Sample (g)	26.25	18.26		Plasticity Index (%) 23
Wt. of Tare (g)	20.73	12.60		USCS Symbol CL
Wt. of Water (g)	0.9	0.9		
Wt. of Dry Sample (g)	5.5	5.7		
<b>Moisture Content (%)</b>	<b>16.5</b>	<b>15.9</b>	<b>0.6</b>	

*Note: The acceptable range of the two Moisture contents is  $\pm 2.6$*

Flow Curve



Plasticity Chart



Tested By TO Date 10/9/13 Checked By KC Date 10/17/13

page 1 of 1

DCN: CT-S4B DATE: 3/18/13 REVISION: 4

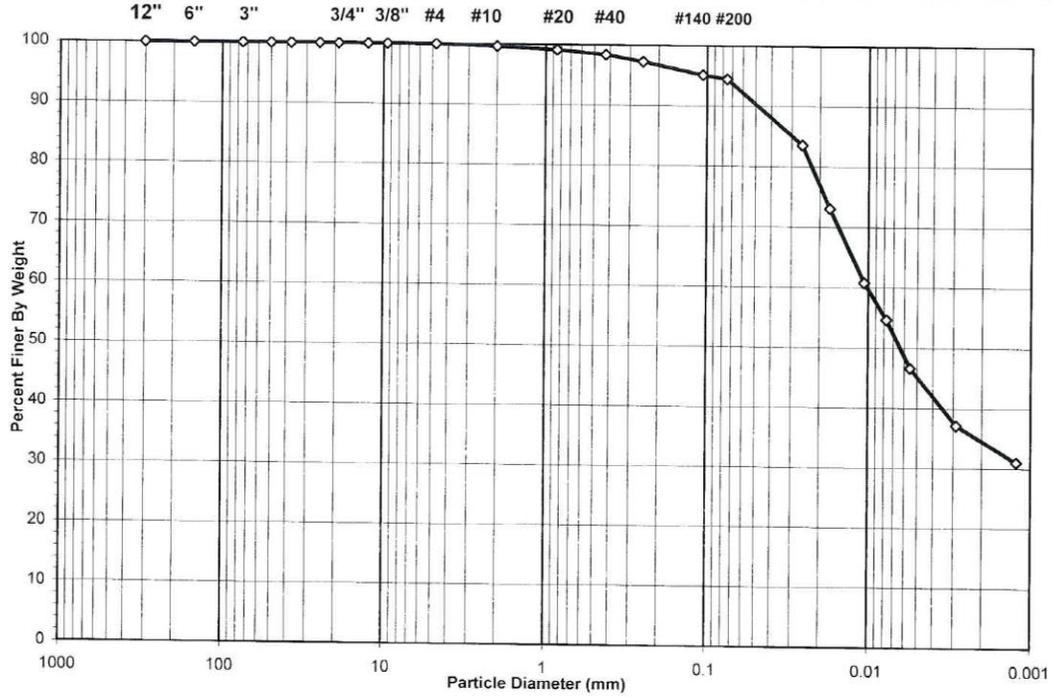
3plimit.xls

**SIEVE AND HYDROMETER ANALYSIS**  
 ASTM D 422-63 (2007)/AASHTO T88-00



Client:	MICROBAC	Boring No.:	NA
Client Reference:	OHIO EPA - MONTGOMERY CO. L13091617	Depth (ft):	NA
Project No.:	2013-455-001	Sample No.:	PCM-1
Lab ID:	2013-455-001-006	Soil Color:	BROWN

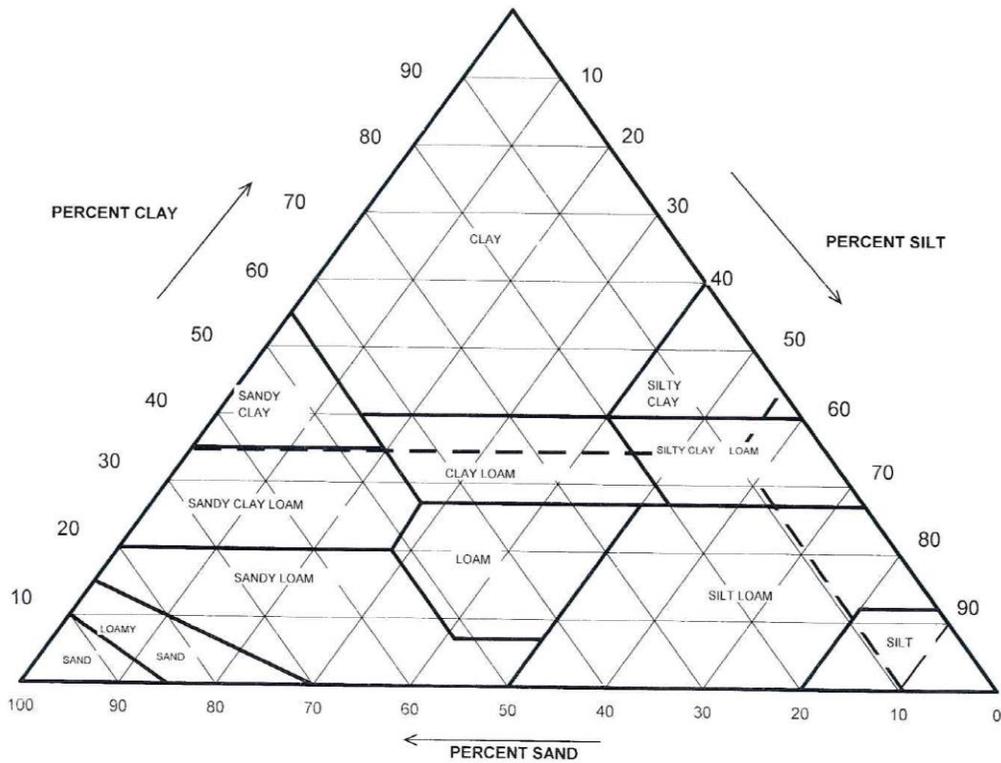
USCS USDA	SIEVE ANALYSIS				HYDROMETER	
	cobbles	gravel	sand		silt and clay fraction	
	cobbles	gravel	sand		silt	clay



USCS Summary		
Sieve Sizes (mm)		Percentage
Greater Than #4	Gravel	0.00
#4 To #200	Sand	5.56
Finer Than #200	Silt & Clay	94.44
<b>USCS Symbol</b> CH, TESTED		
<b>USCS Classification</b> FAT CLAY		

### USDA CLASSIFICATION CHART

Client:	MICROBAC	Boring No.:	NA
Client Reference:	OHIO EPA - MONTGOMERY CO. L1	Depth (ft):	NA
Project No.:	2013-455-001	Sample No.:	PCM-1
Lab ID:	2013-455-001-006	Soil Color:	BROWN



Particle Size (mm)	Percent Finer (%)	USDA SUMMARY	Actual Percentage (%)	Corrected % of Minus 2.0 mm material for USDA Classificat. (%)
2	99.67	Gravel	0.33	0.00
0.05	90.32	Sand	9.35	9.38
0.002	34.55	Silt	55.77	55.96
		Clay	34.55	34.67
		<b>USDA Classification:</b>	<b>SILTY CLAY LOAM</b>	



**WASH SIEVE ANALYSIS**  
ASTM D 422-63 (2007)/AASHTO T88-00

Client:	MICROBAC	Boring No.:	NA
Client Reference:	OHIO EPA - MONTGOMERY CO. L13091617	Depth (ft):	NA
Project No.:	2013-455-001	Sample No.:	PCM-1
Lab ID:	2013-455-001-006	Soil Color:	BROWN

Moisture Content of Passing 3/4" Material		Water Content of Retained 3/4" Material	
Tare No.	2343	Tare No.	NA
Wt. of Tare & Wet Specimen (g)	673.41	Wt. of Tare & Wet Specimen (g)	NA
Wt. of Tare & Dry Specimen (g)	568.60	Wt. of Tare & Dry Specimen (g)	NA
Weight of Tare (g)	94.27	Weight of Tare (g)	NA
Weight of Water (g)	104.81	Weight of Water (g)	NA
Weight of Dry Specimen (g)	474.33	Weight of Dry Specimen (g)	NA
<b>Moisture Content (%)</b>	<b>22.1</b>	<b>Moisture Content (%)</b>	<b>NA</b>

Wet Weight of -3/4" Sample (g)	NA	Weight of the Dry Specimen (g)	474.33
Dry Weight of -3/4" Sample (g)	26.38	Weight of - #200 material (g)	447.95
Wet Weight of +3/4" Sample (g)	NA	Weight of + #200 material (g)	26.38
Dry Weight of +3/4" Sample (g)	0.00		
Total Dry Weight of Sample (g)	NA		

Sieve Size	Sieve Opening (mm)	Weight of Soil Retained (g)	Percent Retained (%)	Accumulated Percent Retained (%)	Percent Finer (%)	Accumulated Percent Finer (%)
12"	300	0.00	0.00	0.00	100.00	100.00
6"	150	0.00	0.00	0.00	100.00	100.00
3"	75	0.00	0.00	0.00	100.00	100.00
2"	50	0.00	0.00	0.00	100.00	100.00
1 1/2"	37.5	0.00	0.00	0.00	100.00	100.00
1"	25.0	0.00	0.00	0.00	100.00	100.00
3/4"	19.0	0.00	0.00	0.00	100.00	100.00
1/2"	12.5	0.00	0.00	0.00	100.00	100.00
3/8"	9.50	0.00	0.00	0.00	100.00	100.00
#4	4.75	0.00	0.00	0.00	100.00	100.00
#10	2.00	1.57	0.33	0.33	99.67	99.67
#20	0.85	2.59	0.55	0.88	99.12	99.12
#40	0.425	3.50	0.74	1.61	98.39	98.39
#60	0.250	5.34	1.13	2.74	97.26	97.26
#140	0.106	10.07	2.12	4.86	95.14	95.14
#200	0.075	3.31	0.70	5.56	94.44	94.44
Pan	-	447.95	94.44	100.00	-	-

Tested By BK Date 10/8/13 Checked By KC Date 10/17/13

**HYDROMETER ANALYSIS**  
ASTM D 422-63 (2007)/AASHTO T88-00



Client:	MICROBAC	Boring No.:	NA
Client Reference:	OHIO EPA - MONTGOMERY CO. L13091617	Depth (ft):	NA
Project No.:	2013-455-001	Sample No.:	PCM-1
Lab ID:	2013-455-001-006	Soil Color:	BROWN

Elapsed Time (min)	R Measured	Temp. (°C)	Composite Correction	R Corrected	N (%)	K Factor	Diameter (mm)	N'
0	NA	NA	NA	NA	NA	NA	NA	NA
2	52.5	22.1	4.80	47.7	88.5	0.01311	0.0257	<b>83.6</b>
5	46.5	22.1	4.80	41.7	77.4	0.01311	0.0173	<b>73.1</b>
15	39.5	22.1	4.80	34.7	64.4	0.01311	0.0106	<b>60.8</b>
30	36.0	22.1	4.80	31.2	57.9	0.01311	0.0077	<b>54.7</b>
63	31.5	21.9	4.87	26.6	49.4	0.01314	0.0055	<b>46.7</b>
250	26.0	22.1	4.80	21.2	39.3	0.01311	0.0029	<b>37.1</b>
1440	22.5	22.2	4.77	17.7	32.9	0.01310	0.0012	<b>31.1</b>

Soil Specimen Data		Other Corrections	
Tare No.	920		
Weight of Tare & Dry Material (g)	156.59	a - Factor	0.99
Weight of Tare (g)	98.23		
Weight of Deflocculant (g)	5.0	Percent Finer than # 200	94.44
Weight of Dry Material (g)	53.36	Specific Gravity	2.7 Assumed

**Note:** Hydrometer test is performed on - # 200 sieve material.

Tested By TO Date 10/9/13 Checked By KC Date 10/17/13

page 4 of 4

DCN: CT-S3A DATE: 3/18/13 REVISION: 11

Sievehyd.xls

**ATTERBERG LIMITS**  
ASTM D 4318-10 / AASHTO T89-10

Client:	MICROBAC	Boring No.:	NA
Client Reference:	Ohio EPA-Montgomery Co. L13091617	Depth (ft):	NA
Project No.:	2013-455-001	Sample No.:	PCM-1
Lab ID:	2013-455-001-006	Soil Description:	<b>BROWN FAT CLAY</b>

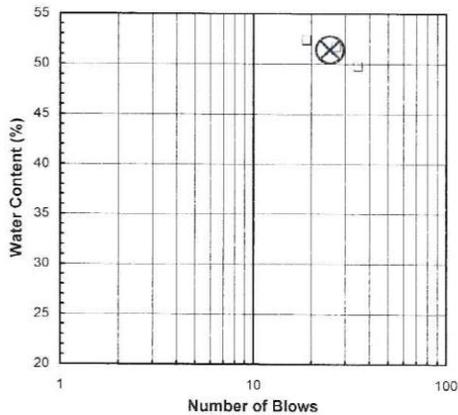
*Note: The USCS symbol used with this test refers only to the minus No. 40 sieve material. See the "Sieve and Hydrometer Analysis" graph page for the complete material description.* (Minus No. 40 sieve material, Airdried)

Liquid Limit Test	1	2	3	
Tare Number	1283	1223	453	M
Wt. of Tare & Wet Sample (g)	33.12	31.85	35.42	U
Wt. of Tare & Dry Sample (g)	25.54	24.67	28.01	L
Wt. of Tare (g)	11.06	10.78	13.11	T
Wt. of Water (g)	7.6	7.2	7.4	I
Wt. of Dry Sample (g)	14.5	13.9	14.9	P
				O
				I
<b>Moisture Content (%)</b>	<b>52.3</b>	<b>51.7</b>	<b>49.7</b>	<b>N</b>
<b>Number of Blows</b>	<b>19</b>	<b>27</b>	<b>35</b>	<b>T</b>

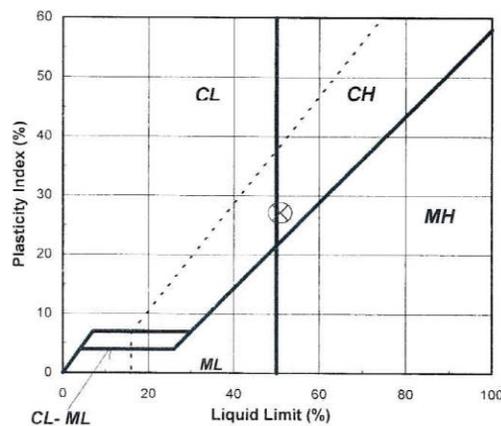
Plastic Limit Test	1	2	Range	Test Results
Tare Number	443	415		Liquid Limit (%)
Wt. of Tare & Wet Sample (g)	21.72	19.14		51
Wt. of Tare & Dry Sample (g)	20.50	17.92		Plastic Limit (%)
Wt. of Tare (g)	15.49	12.82		24
Wt. of Water (g)	1.2	1.2		Plasticity Index (%)
Wt. of Dry Sample (g)	5.0	5.1		27
				USCS Symbol
<b>Moisture Content (%)</b>	<b>24.4</b>	<b>23.9</b>	<b>0.4</b>	<b>CH</b>

*Note: The acceptable range of the two Moisture contents is  $\pm 2.6$*

Flow Curve



Plasticity Chart



Tested By BK Date 10/8/13 Checked By KC Date 10/9/13

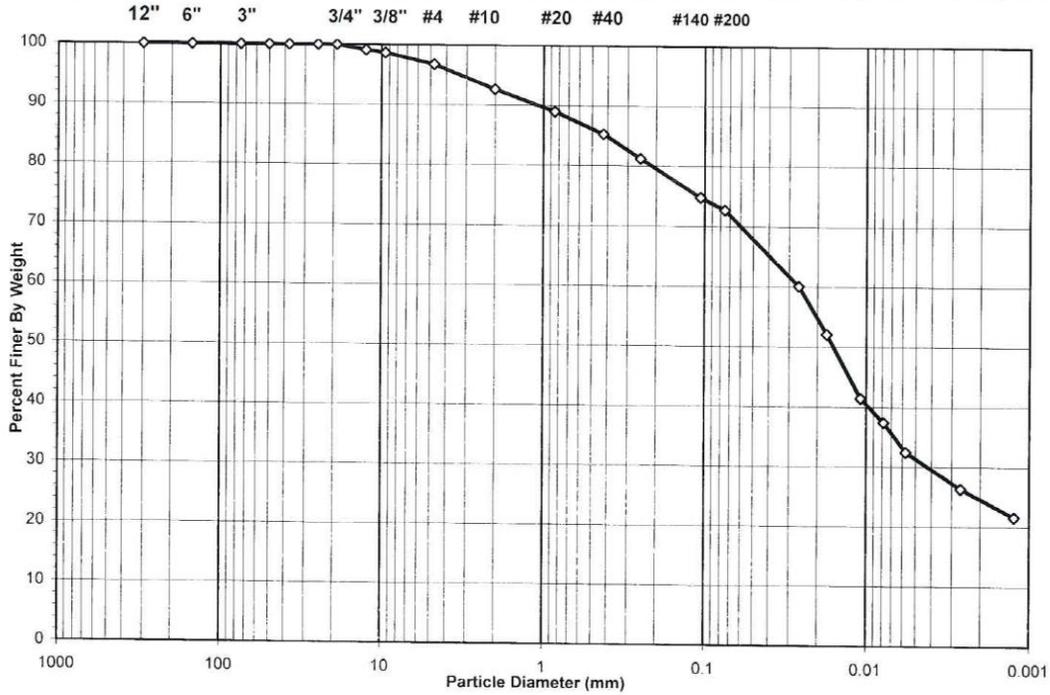
page 1 of 1 DCN: CT-S4B DATE: 3/18/13 REVISION: 4 3ptlimit.xls

**SIEVE AND HYDROMETER ANALYSIS**  
 ASTM D 422-63 (2007)/AASHTO T88-00



Client:	MICROBAC	Boring No.:	NA
Client Reference:	OHIO EPA - MONTGOMERY CO. L13091617	Depth (ft):	NA
Project No.:	2013-455-001	Sample No.:	BYP-1
Lab ID:	2013-455-001-007	Soil Color:	BROWN

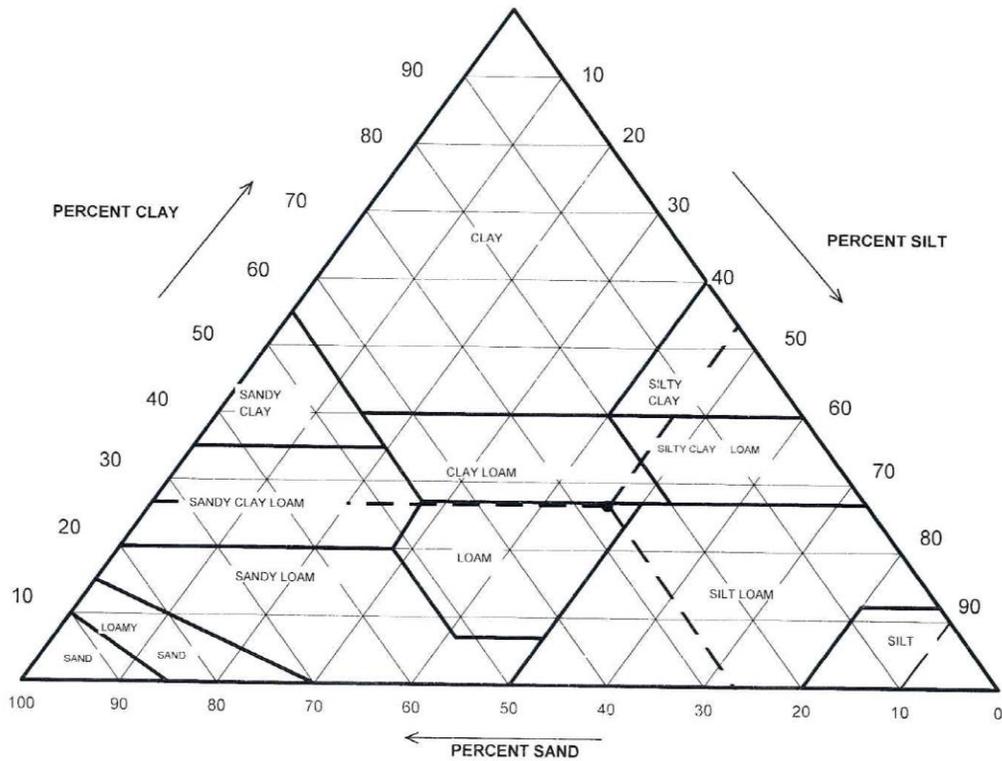
USCS USDA	SIEVE ANALYSIS					HYDROMETER	
	cobbles	gravel		sand		silt and clay fraction	
	cobbles	gravel		sand		silt	clay



USCS Summary		
Sieve Sizes (mm)		Percentage
Greater Than #4	Gravel	3.23
#4 To #200	Sand	24.03
Finer Than #200	Silt & Clay	72.74
USCS Symbol	CL, TESTED	
USCS Classification	LEAN CLAY WITH SAND	

## USDA CLASSIFICATION CHART

Client:	MICROBAC	Boring No.:	NA
Client Reference:	OHIO EPA - MONTGOMERY CO. L1	Depth (ft):	NA
Project No.:	2013-455-001	Sample No.:	BYP-1
Lab ID:	2013-455-001-007	Soil Color:	BROWN



Particle Size (mm)	Percent Finer (%)	USDA SUMMARY	Actual Percentage (%)	Corrected % of Minus 2.0 mm material for USDA Classificat. (%)
		<i>Gravel</i>	7.37	0.00
2	92.63	<i>Sand</i>	24.75	26.72
0.05	67.87	<i>Silt</i>	43.26	46.71
0.002	24.61	<i>Clay</i>	24.61	26.57
		<b>USDA Classification:</b>	<b>LOAM</b>	



**WASH SIEVE ANALYSIS**  
ASTM D 422-63 (2007)/AASHTO T88-00

Client:	MICROBAC	Boring No.:	NA
Client Reference:	OHIO EPA - MONTGOMERY CO. L13091617	Depth (ft):	NA
Project No.:	2013-455-001	Sample No.:	BYP-1
Lab ID:	2013-455-001-007	Soil Color:	BROWN

Moisture Content of Passing 3/4" Material		Water Content of Retained 3/4" Material	
Tare No.	1092	Tare No.	NA
Wt. of Tare & Wet Specimen (g)	831.27	Wt. of Tare & Wet Specimen (g)	NA
Wt. of Tare & Dry Specimen (g)	744.40	Wt. of Tare & Dry Specimen (g)	NA
Weight of Tare (g)	100.26	Weight of Tare (g)	NA
Weight of Water (g)	86.87	Weight of Water (g)	NA
Weight of Dry Specimen (g)	644.14	Weight of Dry Specimen (g)	NA
<b>Moisture Content (%)</b>	<b>13.5</b>	<b>Moisture Content (%)</b>	<b>NA</b>

Wet Weight of -3/4" Sample (g)	NA	Weight of the Dry Specimen (g)	644.14
Dry Weight of -3/4" Sample (g)	175.59	Weight of - #200 material (g)	468.55
Wet Weight of +3/4" Sample (g)	NA	Weight of + #200 material (g)	175.59
Dry Weight of +3/4" Sample (g)	0.00		
Total Dry Weight of Sample (g)	NA		

Sieve Size	Sieve Opening (mm)	Weight of Soil Retained (g)	Percent Retained (%)	Accumulated Percent Retained (%)	Percent Finer (%)	Accumulated Percent Finer (%)
12"	300	0.00	0.00	0.00	100.00	100.00
6"	150	0.00	0.00	0.00	100.00	100.00
3"	75	0.00	0.00	0.00	100.00	100.00
2"	50	0.00	0.00	0.00	100.00	100.00
1 1/2"	37.5	0.00	0.00	0.00	100.00	100.00
1"	25.0	0.00	0.00	0.00	100.00	100.00
3/4"	19.0	0.00	0.00	0.00	100.00	100.00
1/2"	12.5	5.51	0.86	0.86	99.14	99.14
3/8"	9.50	2.95	0.46	1.31	98.69	98.69
#4	4.75	12.35	1.92	3.23	96.77	96.77
#10	2.00	26.69	4.14	7.37	92.63	92.63
#20	0.85	23.80	3.69	11.07	88.93	88.93
#40	0.425	23.74	3.69	14.75	85.25	85.25
#60	0.250	25.95	4.03	18.78	81.22	81.22
#140	0.106	41.38	6.42	25.21	74.79	74.79
#200	0.075	13.22	2.05	27.26	72.74	72.74
Pan	-	468.55	72.74	100.00	-	-

Tested By BK Date 10/8/13 Checked By KC Date 10/17/13



**HYDROMETER ANALYSIS**  
ASTM D 422-63 (2007)/AASHTO T88-00

Client:	MICROBAC	Boring No.:	NA
Client Reference:	OHIO EPA - MONTGOMERY CO. L13091617	Depth (ft):	NA
Project No.:	2013-455-001	Sample No.:	BYP-1
Lab ID:	2013-455-001-007	Soil Color:	BROWN

Elapsed Time (min)	R Measured	Temp. (°C)	Composite Correction	R Corrected	N (%)	K Factor	Diameter (mm)	N' (%)
0	NA	NA	NA	NA	NA	NA	NA	NA
2	49.5	23.1	4.49	45.0	82.6	0.01296	0.0262	<b>60.1</b>
5	43.5	23.1	4.49	39.0	71.6	0.01296	0.0175	<b>52.1</b>
15	35.5	23.1	4.49	31.0	56.9	0.01296	0.0108	<b>41.4</b>
30	32.5	23.1	4.49	28.0	51.4	0.01296	0.0078	<b>37.4</b>
60	29.0	22.4	4.71	24.3	44.6	0.01307	0.0057	<b>32.4</b>
301	24.5	22.2	4.77	19.7	36.2	0.01310	0.0026	<b>26.3</b>
1440	21.0	22.1	4.80	16.2	29.7	0.01311	0.0012	<b>21.6</b>

Soil Specimen Data		Other Corrections	
Tare No.	2485		
Weight of Tare & Dry Material (g)	154.71	a - Factor	0.99
Weight of Tare (g)	95.79		
Weight of Deflocculant (g)	5.0	Percent Finer than # 200	72.74
Weight of Dry Material (g)	53.92	Specific Gravity	2.7 Assumed

**Note:** Hydrometer test is performed on - # 200 sieve material.

Tested By TO Date 10/9/13 Checked By KC Date 10/17/13

**ATTERBERG LIMITS**  
ASTM D 4318-10 / AASHTO T89-10

Client:	MICROBAC	Boring No.:	NA
Client Reference:	Ohio EPA-Montgomery Co. L13091617	Depth (ft):	NA
Project No.:	2013-455-001	Sample No.:	BYP-1
Lab ID:	2013-455-001-007	Soil Description:	<b>BROWN LEAN CLAY</b>

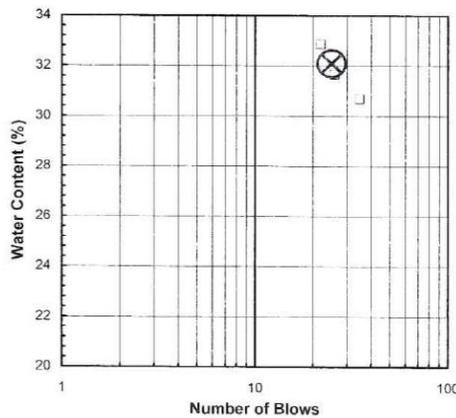
*Note: The USCS symbol used with this test refers only to the minus No. 40 sieve material. See the "Sieve and Hydrometer Analysis" graph page for the complete material description.* (Minus No. 40 sieve material, Airdried)

Liquid Limit Test	1	2	3	
Tare Number	313	113	376	M
Wt. of Tare & Wet Sample (g)	46.39	45.10	41.69	U
Wt. of Tare & Dry Sample (g)	39.83	38.79	34.94	L
Wt. of Tare (g)	18.44	18.85	14.40	T
Wt. of Water (g)	6.6	6.3	6.8	I
Wt. of Dry Sample (g)	21.4	19.9	20.5	P
				O
				I
<b>Moisture Content (%)</b>	<b>30.7</b>	<b>31.6</b>	<b>32.9</b>	<b>N</b>
<b>Number of Blows</b>	<b>35</b>	<b>26</b>	<b>22</b>	<b>T</b>

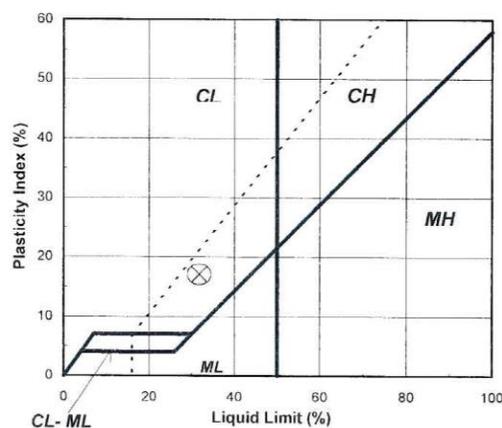
Plastic Limit Test	1	2	Range	Test Results
Tare Number	1247	274		Liquid Limit (%) 32
Wt. of Tare & Wet Sample (g)	25.40	25.99		Plastic Limit (%) 15
Wt. of Tare & Dry Sample (g)	24.54	25.21		Plasticity Index (%) 17
Wt. of Tare (g)	18.94	19.96		USCS Symbol CL
Wt. of Water (g)	0.9	0.8		
Wt. of Dry Sample (g)	5.6	5.3		
<b>Moisture Content (%)</b>	<b>15.4</b>	<b>14.9</b>	<b>0.5</b>	

*Note: The acceptable range of the two Moisture contents is  $\pm 2.6$*

Flow Curve



Plasticity Chart



Tested By BK Date 10/9/13 Checked By KC Date 10/17/13

page 1 of 1

DCN: CT-S4B

DATE: 3/18/13

REVISION: 4

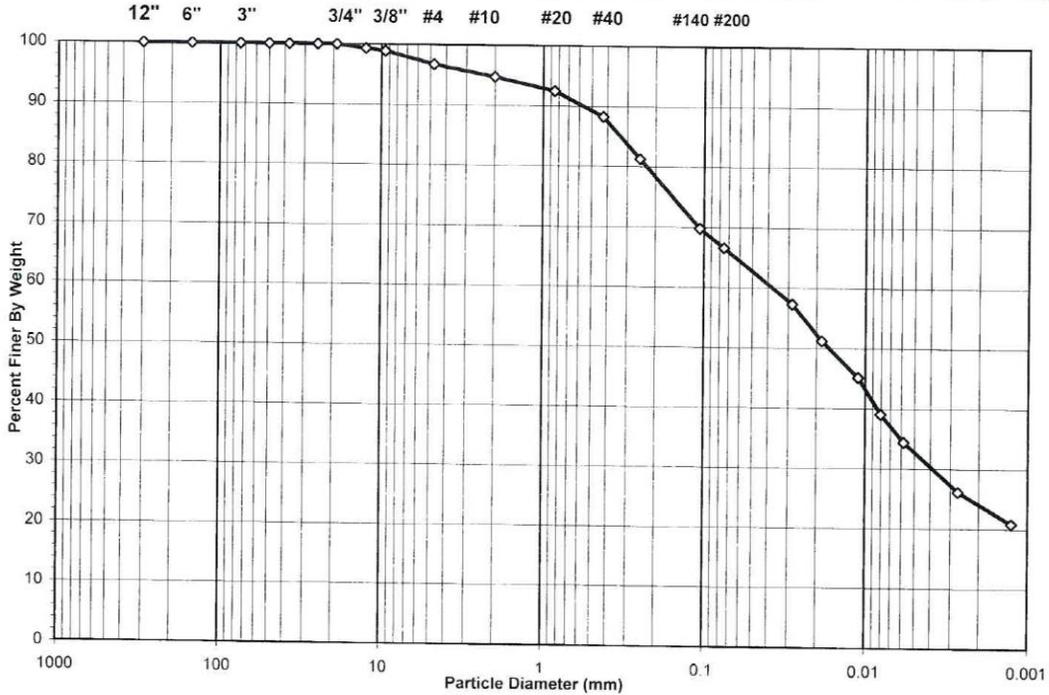
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**SIEVE AND HYDROMETER ANALYSIS**  
 ASTM D 422-63 (2007)/AASHTO T88-00



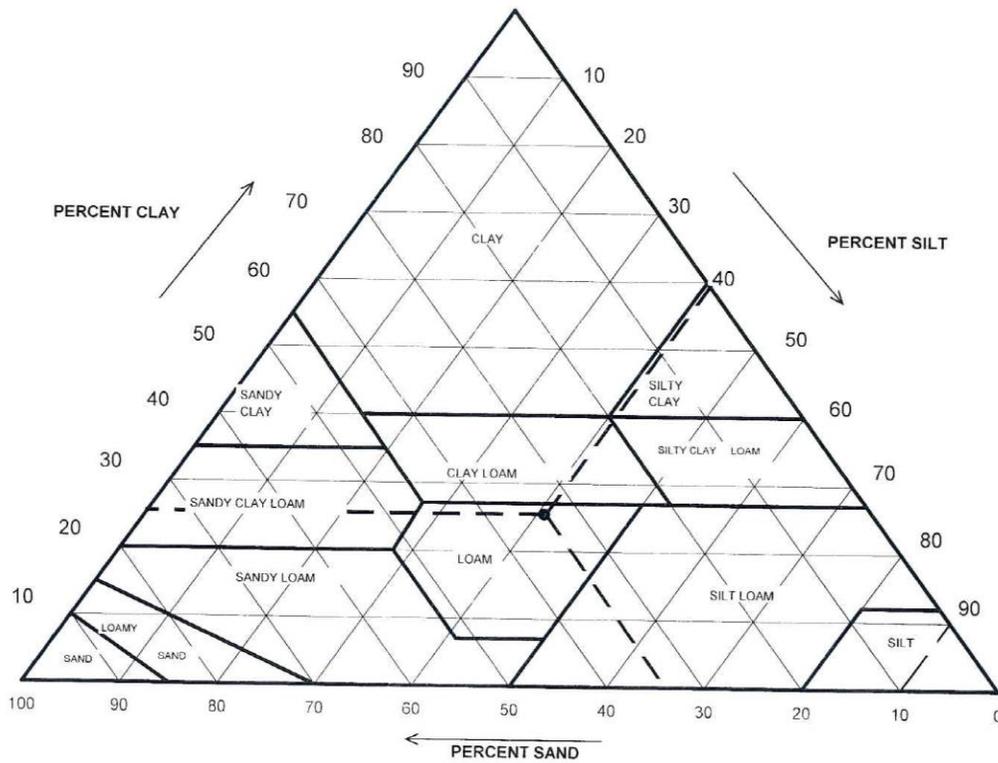
Client:	MICROBAC	Boring No.:	NA
Client Reference:	OHIO EPA - MONTGOMERY CO. L13091617	Depth (ft):	NA
Project No.:	2013-455-001	Sample No.:	TVM-1
Lab ID:	2013-455-001-008	Soil Color:	DARK BROWN

USCS USDA	SIEVE ANALYSIS					HYDROMETER	
	cobbles	gravel		sand		silt and clay fraction	
	cobbles	gravel		sand		silt	clay



## USDA CLASSIFICATION CHART

Client:	MICROBAC	Boring No.:	NA
Client Reference:	OHIO EPA - MONTGOMERY CO. L1	Depth (ft):	NA
Project No.:	2013-455-001	Sample No.:	TVM-1
Lab ID:	2013-455-001-008	Soil Color:	DARK BROWN



Particle Size (mm)	Percent Finer (%)	USDA SUMMARY	Actual Percentage (%)	Corrected % of Minus 2.0 mm material for USDA Classificat. (%)
		<i>Gravel</i>	5.24	0.00
2	94.76	<i>Sand</i>	32.04	33.81
0.05	62.73	<i>Silt</i>	38.64	40.77
0.002	24.09	<i>Clay</i>	24.09	25.42
<b>USDA Classification:</b>		<b>LOAM</b>		



**WASH SIEVE ANALYSIS**  
ASTM D 422-63 (2007)/AASHTO T88-00

Client:	MICROBAC	Boring No.:	NA
Client Reference:	OHIO EPA - MONTGOMERY CO. L13091617	Depth (ft):	NA
Project No.:	2013-455-001	Sample No.:	TVM-1
Lab ID:	2013-455-001-008	Soil Color:	DARK BROWN

Moisture Content of Passing 3/4" Material		Water Content of Retained 3/4" Material	
Tare No.	1466	Tare No.	NA
Wt. of Tare & Wet Specimen (g)	738.83	Wt. of Tare & Wet Specimen (g)	NA
Wt. of Tare & Dry Specimen (g)	624.90	Wt. of Tare & Dry Specimen (g)	NA
Weight of Tare (g)	112.59	Weight of Tare (g)	NA
Weight of Water (g)	113.93	Weight of Water (g)	NA
Weight of Dry Specimen (g)	512.31	Weight of Dry Specimen (g)	NA
<b>Moisture Content (%)</b>	<b>22.2</b>	<b>Moisture Content (%)</b>	<b>NA</b>

Wet Weight of -3/4" Sample (g)	NA	Weight of the Dry Specimen (g)	512.31
Dry Weight of -3/4" Sample (g)	171.20	Weight of -#200 material (g)	341.11
Wet Weight of +3/4" Sample (g)	NA	Weight of + #200 material (g)	171.20
Dry Weight of +3/4" Sample (g)	0.00		
Total Dry Weight of Sample (g)	NA		

Sieve Size	Sieve Opening	Weight of Soil Retained	Percent Retained	Accumulated Percent Retained	Percent Finer	Accumulated Percent Finer
	(mm)	(g)	(%)	(%)	(%)	(%)
12"	300	0.00	0.00	0.00	100.00	100.00
6"	150	0.00	0.00	0.00	100.00	100.00
3"	75	0.00	0.00	0.00	100.00	100.00
2"	50	0.00	0.00	0.00	100.00	100.00
1 1/2"	37.5	0.00	0.00	0.00	100.00	100.00
1"	25.0	0.00	0.00	0.00	100.00	100.00
3/4"	19.0	0.00	0.00	0.00	100.00	100.00
1/2"	12.5	3.40	0.66	0.66	99.34	99.34
3/8"	9.50	2.01	0.39	1.06	98.94	98.94
#4	4.75	11.35	2.22	3.27	96.73	96.73
#10	2.00	10.07	1.97	5.24	94.76	94.76
#20	0.85	11.82	2.31	7.54	92.46	92.46
#40	0.425	21.56	4.21	11.75	88.25	88.25
#60	0.250	35.61	6.95	18.70	81.30	81.30
#140	0.106	58.72	11.46	30.17	69.83	69.83
#200	0.075	16.66	3.25	33.42	66.58	66.58
Pan	-	341.11	66.58	100.00	-	-

Tested By BK Date 10/8/13 Checked By KC Date 10/17/13



**HYDROMETER ANALYSIS**  
ASTM D 422-63 (2007)/AASHTO T88-00

Client:	MICROBAC	Boring No.:	NA
Client Reference:	OHIO EPA - MONTGOMERY CO. L13091617	Depth (ft):	NA
Project No.:	2013-455-001	Sample No.:	TVM-1
Lab ID:	2013-455-001-008	Soil Color:	DARK BROWN

Elapsed Time (min)	R Measured	Temp. (°C)	Composite Correction	R Corrected	N (%)	K Factor	Diameter (mm)	N' (%)
0	NA	NA	NA	NA	NA	NA	NA	NA
2	42.5	22.1	4.80	37.7	86.1	0.01311	0.0283	57.3
5	38.5	22.1	4.80	33.7	77.0	0.01311	0.0185	51.2
15	34.5	22.1	4.80	29.7	67.8	0.01311	0.0110	45.2
30	30.5	22.1	4.80	25.7	58.7	0.01311	0.0080	39.1
60	27.5	21.9	4.87	22.6	51.7	0.01314	0.0058	34.4
301	22.0	22.1	4.80	17.2	39.3	0.01311	0.0027	26.1
1440	18.5	22.2	4.77	13.7	31.4	0.01310	0.0013	20.9

Soil Specimen Data		Other Corrections	
Tare No.	927		
Weight of Tare & Dry Material (g)	148.45	a - Factor	0.99
Weight of Tare (g)	100.1		
Weight of Deflocculant (g)	5.0	Percent Finer than # 200	66.58
Weight of Dry Material (g)	43.35	Specific Gravity	2.7 Assumed

**Note:** Hydrometer test is performed on - # 200 sieve material.

Tested By TO Date 10/9/13 Checked By KC Date 10/17/13

**ATTERBERG LIMITS**  
ASTM D 4318-10 / AASHTO T89-10

Client:	MICROBAC	Boring No.:	NA
Client Reference:	Ohio EPA-Montgomery Co. L13091617	Depth (ft):	NA
Project No.:	2013-455-001	Sample No.:	TVM-1
Lab ID:	2013-455-001-008	Soil Description:	<b>DARK BROWN FAT CLAY</b> (Minus No. 40 sieve material, Airdried)

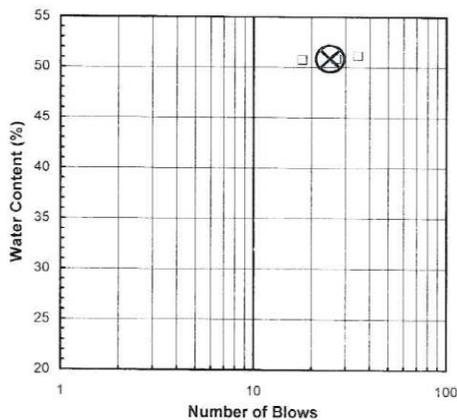
*Note: The USCS symbol used with this test refers only to the minus No. 40 sieve material. See the "Sieve and Hydrometer Analysis" graph page for the complete material description.*

Liquid Limit Test	1	2	3	
Tare Number	1279	458	1251	M
Wt. of Tare & Wet Sample (g)	34.29	38.04	39.33	U
Wt. of Tare & Dry Sample (g)	27.46	31.26	31.08	L
Wt. of Tare (g)	13.99	17.92	14.94	T
Wt. of Water (g)	6.8	6.8	8.3	I
Wt. of Dry Sample (g)	13.5	13.3	16.1	P
				O
				I
<b>Moisture Content (%)</b>	<b>50.7</b>	<b>50.8</b>	<b>51.1</b>	<b>N</b>
<b>Number of Blows</b>	<b>18</b>	<b>27</b>	<b>35</b>	<b>T</b>

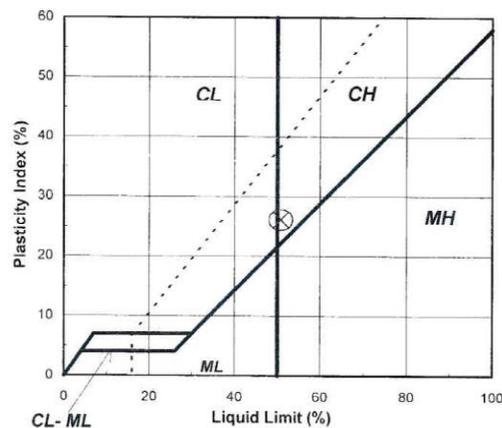
Plastic Limit Test	1	2	Range	Test Results
Tare Number	182	1280		<b>Liquid Limit (%)</b> <b>51</b>
Wt. of Tare & Wet Sample (g)	24.82	21.88		<b>Plastic Limit (%)</b> <b>25</b>
Wt. of Tare & Dry Sample (g)	23.58	20.57		<b>Plasticity Index (%)</b> <b>26</b>
Wt. of Tare (g)	18.56	15.36		<b>USCS Symbol</b> <b>CH</b>
Wt. of Water (g)	1.2	1.3		
Wt. of Dry Sample (g)	5.0	5.2		
<b>Moisture Content (%)</b>	<b>24.7</b>	<b>25.1</b>	<b>-0.4</b>	

*Note: The acceptable range of the two Moisture contents is  $\pm 2.6$*

Flow Curve



Plasticity Chart



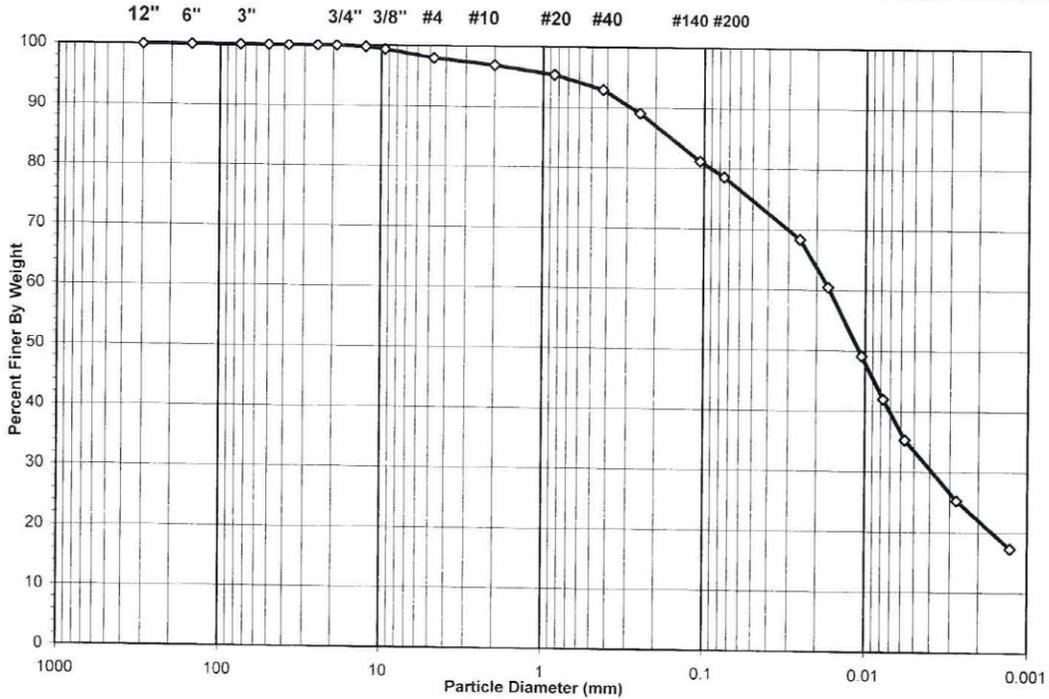
Tested By	BK	Date	10/9/13	Checked By	KC	Date	10/17/13
page 1 of 1	DCN:	CT-S4B	DATE:	3/18/13	REVISION:	4	3ptlimit.xls

**SIEVE AND HYDROMETER ANALYSIS**  
 ASTM D 422-63 (2007)/AASHTO T88-00



Client:	MICROBAC	Boring No.:	NA
Client Reference:	OHIO EPA - MONTGOMERY CO. L13091617	Depth (ft):	NA
Project No.:	2013-455-001	Sample No.:	EWM-1
Lab ID:	2013-455-001-009	Soil Color:	BROWN

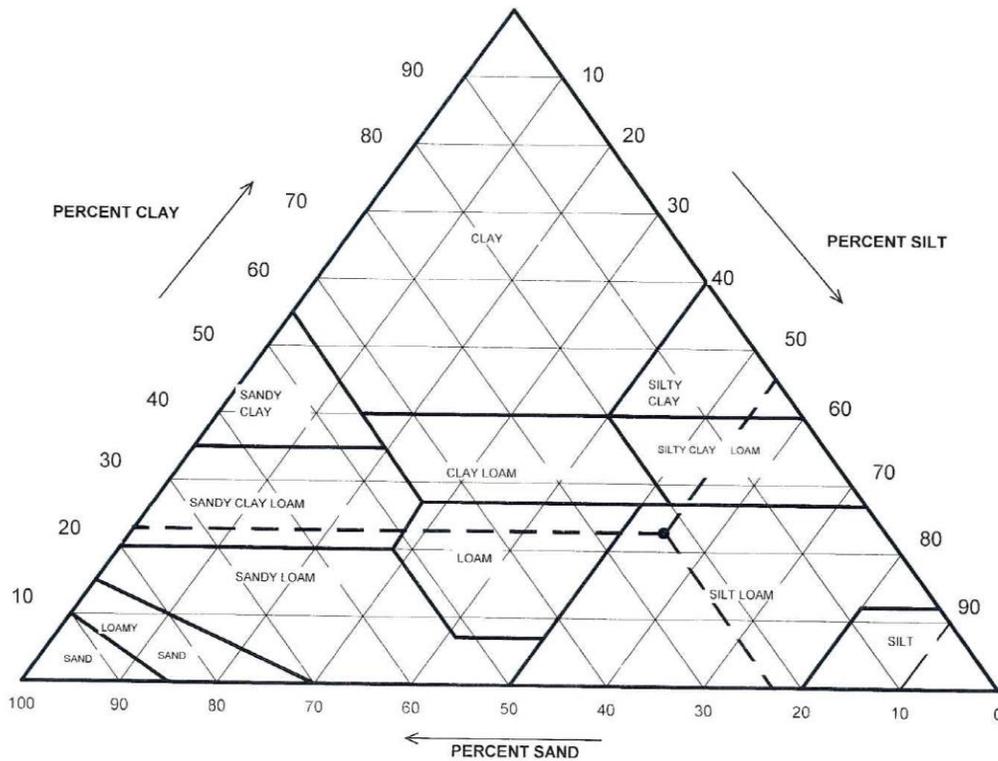
USCS USDA	SIEVE ANALYSIS					HYDROMETER	
	cobbles	gravel		sand		silt and clay fraction	
	cobbles	gravel		sand		silt	clay



USCS Summary		
Sieve Sizes (mm)		Percentage
Greater Than #4	Gravel	2.03
#4 To #200	Sand	19.39
Finer Than #200	Silt & Clay	78.59
USCS Symbol	<b>CL, TESTED</b>	
USCS Classification	<b>LEAN CLAY WITH SAND</b>	

### USDA CLASSIFICATION CHART

Client:	MICROBAC	Boring No.:	NA
Client Reference:	OHIO EPA - MONTGOMERY CO. L1	Depth (ft):	NA
Project No.:	2013-455-001	Sample No.:	EWM-1
Lab ID:	2013-455-001-009	Soil Color:	BROWN



Particle Size (mm)	Percent Finer (%)	USDA SUMMARY	Actual Percentage (%)	Corrected % of Minus 2.0 mm material for USDA Classificat. (%)
		Gravel	3.14	0.00
2	96.86	Sand	22.10	22.82
0.05	74.76	Silt	52.73	54.44
0.002	22.03	Clay	22.03	22.74
		<b>USDA Classification:</b>	<b>SILT LOAM</b>	



**WASH SIEVE ANALYSIS**  
ASTM D 422-63 (2007)/AASHTO T88-00

Client:	MICROBAC	Boring No.:	NA
Client Reference:	OHIO EPA - MONTGOMERY CO. L13091617	Depth (ft):	NA
Project No.:	2013-455-001	Sample No.:	EWM-1
Lab ID:	2013-455-001-009	Soil Color:	BROWN

Moisture Content of Passing 3/4" Material		Water Content of Retained 3/4" Material	
Tare No.	1681	Tare No.	NA
Wt. of Tare & Wet Specimen (g)	612.00	Wt. of Tare & Wet Specimen (g)	NA
Wt. of Tare & Dry Specimen (g)	536.30	Wt. of Tare & Dry Specimen (g)	NA
Weight of Tare (g)	100.11	Weight of Tare (g)	NA
Weight of Water (g)	75.70	Weight of Water (g)	NA
Weight of Dry Specimen (g)	436.19	Weight of Dry Specimen (g)	NA
<b>Moisture Content (%)</b>	<b>17.4</b>	<b>Moisture Content (%)</b>	<b>NA</b>

Wet Weight of -3/4" Sample (g)	NA	Weight of the Dry Specimen (g)	436.19
Dry Weight of -3/4" Sample (g)	93.41	Weight of - #200 material (g)	342.78
Wet Weight of +3/4" Sample (g)	NA	Weight of + #200 material (g)	93.41
Dry Weight of +3/4" Sample (g)	0.00		
Total Dry Weight of Sample (g)	NA		

Sieve Size	Sieve Opening (mm)	Weight of Soil Retained (g)	Percent Retained (%)	Accumulated Percent Retained (%)	Percent Finer (%)	Accumulated Percent Finer (%)
12"	300	0.00	0.00	0.00	100.00	100.00
6"	150	0.00	0.00	0.00	100.00	100.00
3"	75	0.00	0.00	0.00	100.00	100.00
2"	50	0.00	0.00	0.00	100.00	100.00
1 1/2"	37.5	0.00	0.00	0.00	100.00	100.00
1"	25.0	0.00	0.00	0.00	100.00	100.00
3/4"	19.0	0.00	0.00	0.00	100.00	100.00
1/2"	12.5	0.85	0.19	0.19	99.81	99.81
3/8"	9.50	1.78	0.41	0.60	99.40	99.40
#4	4.75	6.21	1.42	2.03	97.97	97.97
#10	2.00	4.87	1.12	3.14	96.86	96.86
#20	0.85	6.57	1.51	4.65	95.35	95.35
#40	0.425	10.54	2.42	7.07	92.93	92.93
#60	0.250	16.78	3.85	10.91	89.09	89.09
#140	0.106	34.31	7.87	18.78	81.22	81.22
#200	0.075	11.50	2.64	21.41	78.59	78.59
Pan	-	342.78	78.59	100.00	-	-

Tested By BK Date 10/8/13 Checked By KC Date 10/17/13



**HYDROMETER ANALYSIS**  
ASTM D 422-63 (2007)/AASHTO T88-00

Client:	MICROBAC	Boring No.:	NA
Client Reference:	OHIO EPA - MONTGOMERY CO. L13091617	Depth (ft):	NA
Project No.:	2013-455-001	Sample No.:	EWM-1
Lab ID:	2013-455-001-009	Soil Color:	BROWN

Elapsed Time	R Measured	Temp.	Composite Correction	R Corrected	N	K Factor	Diameter	N'
(min)		(°C)			(%)		(mm)	(%)
0	NA	NA	NA	NA	NA	NA	NA	NA
2	52.5	23.1	4.49	48.0	87.0	0.01296	0.0254	<b>68.4</b>
5	47.0	23.1	4.49	42.5	77.0	0.01296	0.0170	<b>60.5</b>
15	39.0	23.1	4.49	34.5	62.5	0.01296	0.0105	<b>49.1</b>
30	34.0	23.1	4.49	29.5	53.5	0.01296	0.0077	<b>42.0</b>
60	29.5	22.4	4.71	24.8	44.9	0.01307	0.0057	<b>35.3</b>
289	22.5	22.2	4.77	17.7	32.1	0.01310	0.0027	<b>25.2</b>
1440	17.0	22.1	4.80	12.2	22.1	0.01311	0.0013	<b>17.4</b>

Soil Specimen Data		Other Corrections	
Tare No.	889		
Weight of Tare & Dry Material (g)	162.04	a - Factor	0.99
Weight of Tare (g)	102.4		
Weight of Deflocculant (g)	5.0	Percent Finer than # 200	78.59
Weight of Dry Material (g)	54.64	Specific Gravity	2.7 Assumed

**Note:** Hydrometer test is performed on - # 200 sieve material.

Tested By	TO	Date	10/8/13	Checked By	KC	Date	10/17/13
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page 4 of 4 DCN: CT-S3A DATE: 3/18/13 REVISION: 11 Sievehyd.xls

**ATTERBERG LIMITS**  
ASTM D 4318-10 / AASHTO T89-10

Client:	MICROBAC	Boring No.:	NA
Client Reference:	Ohio EPA-Montgomery Co. L13091617	Depth (ft):	NA
Project No.:	2013-455-001	Sample No.:	EWM-1
Lab ID:	2013-455-001-009	Soil Description:	<b>BROWN LEAN CLAY</b>

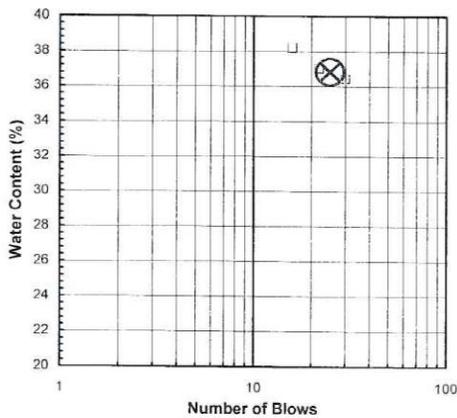
*Note: The USCS symbol used with this test refers only to the minus No. 40 sieve material. See the "Sieve and Hydrometer Analysis" graph page for the complete material description.*  
(Minus No. 40 sieve material, Airdried)

Liquid Limit Test	1	2	3	
Tare Number	1249	458	376	<b>M</b>
Wt. of Tare & Wet Sample (g)	32.51	38.02	34.60	<b>U</b>
Wt. of Tare & Dry Sample (g)	26.56	32.59	29.20	<b>L</b>
Wt. of Tare (g)	10.98	17.92	14.37	<b>T</b>
Wt. of Water (g)	6.0	5.4	5.4	<b>I</b>
Wt. of Dry Sample (g)	15.6	14.7	14.8	<b>P</b>
<b>Moisture Content (%)</b>	<b>38.2</b>	<b>37.0</b>	<b>36.4</b>	<b>O</b>
<b>Number of Blows</b>	<b>16</b>	<b>22</b>	<b>30</b>	<b>I</b>
				<b>N</b>
				<b>T</b>

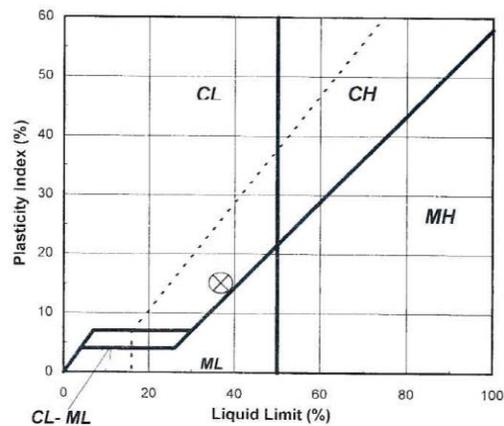
Plastic Limit Test	1	2	Range	Test Results
Tare Number	1258	322		<b>Liquid Limit (%)</b> <b>37</b>
Wt. of Tare & Wet Sample (g)	19.17	25.93		<b>Plastic Limit (%)</b> <b>22</b>
Wt. of Tare & Dry Sample (g)	18.09	24.82		<b>Plasticity Index (%)</b> <b>15</b>
Wt. of Tare (g)	13.14	19.80		<b>USCS Symbol</b> <b>CL</b>
Wt. of Water (g)	1.1	1.1		
Wt. of Dry Sample (g)	5.0	5.0		
<b>Moisture Content (%)</b>	<b>21.8</b>	<b>22.1</b>	<b>-0.3</b>	

*Note: The acceptable range of the two Moisture contents is  $\pm 2.6$*

Flow Curve



Plasticity Chart

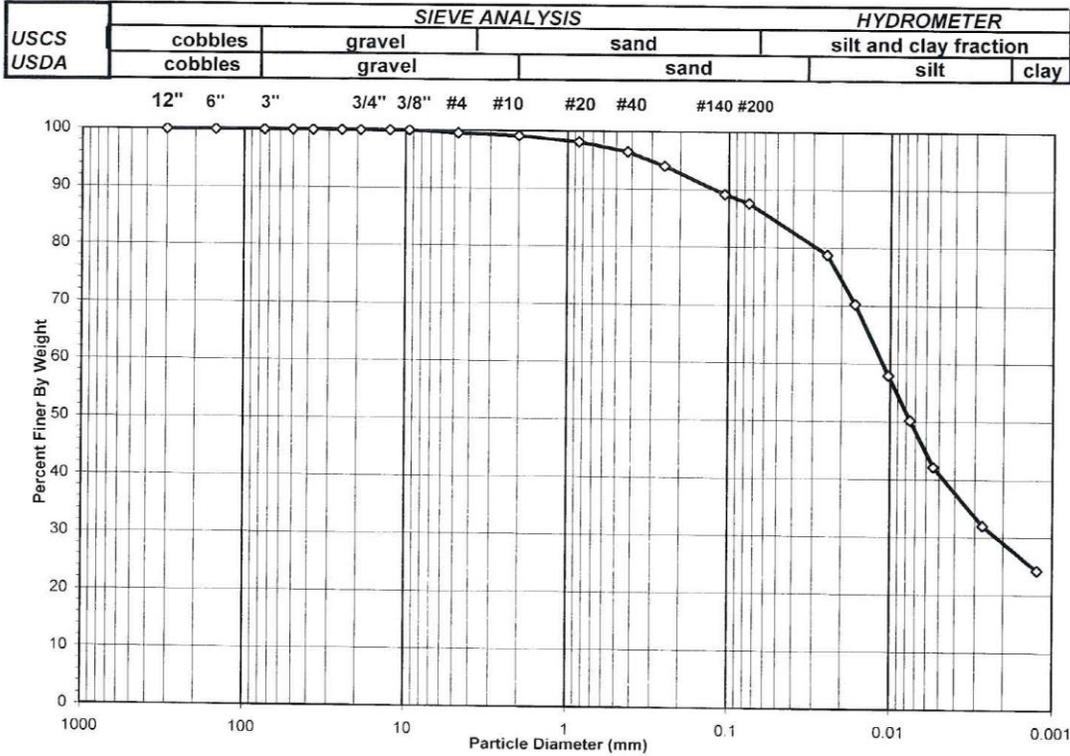


Tested By	<i>BK</i>	Date	<i>10/16/13</i>	Checked By	<i>KC</i>	Date	<i>10/17/13</i>
page 1 of 1	DCN:	CT-S4B	DATE:	3/18/13	REVISION:	4	3plimit.xls

**SIEVE AND HYDROMETER ANALYSIS**  
 ASTM D 422-63 (2007)/AASHTO T88-00



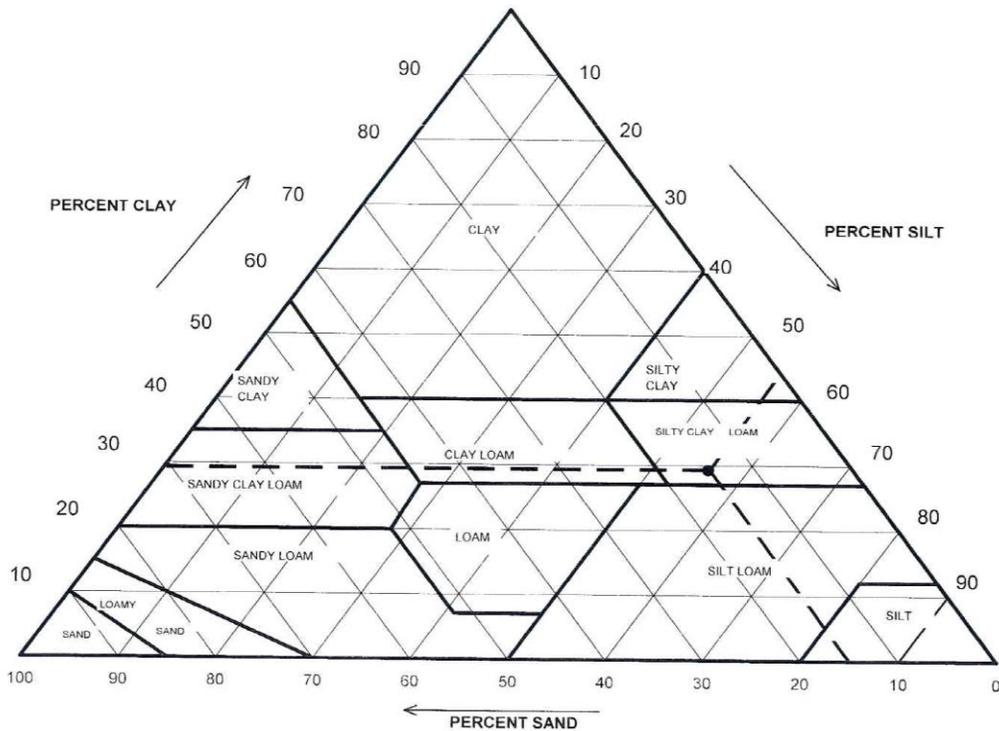
Client:	MICROBAC	Boring No.:	NA
Client Reference:	OHIO EPA - MONTGOMERY CO. L13091617	Depth (ft):	NA
Project No.:	2013-455-001	Sample No.:	BGG-1
Lab ID:	2013-455-001-010	Soil Color:	BROWN



USCS Summary		
Sieve Sizes (mm)		Percentage
Greater Than #4	Gravel	0.45
#4 To #200	Sand	11.91
Finer Than #200	Silt & Clay	87.64
USCS Symbol	<b>CL, TESTED</b>	
USCS Classification	<b>LEAN CLAY</b>	

## USDA CLASSIFICATION CHART

Client:	MICROBAC	Boring No.:	NA
Client Reference:	OHIO EPA - MONTGOMERY CO. L1	Depth (ft):	NA
Project No.:	2013-455-001	Sample No.:	BGG-1
Lab ID:	2013-455-001-010	Soil Color:	BROWN



Particle Size (mm)	Percent Finer (%)	USDA SUMMARY	Actual Percentage (%)	Corrected % of Minus 2.0 mm material for USDA Classificat. (%)
2	99.12	<i>Gravel</i>	0.88	<b>0.00</b>
0.05	84.42	<i>Sand</i>	14.69	<b>14.82</b>
0.002	29.02	<i>Clay</i>	29.02	<b>29.28</b>
		<b>USDA Classification:</b>	<b>SILTY CLAY LOAM</b>	



### WASH SIEVE ANALYSIS

ASTM D 422-63 (2007)/AASHTO T88-00

Client:	MICROBAC	Boring No.:	NA
Client Reference:	OHIO EPA - MONTGOMERY CO. L13091617	Depth (ft):	NA
Project No.:	2013-455-001	Sample No.:	BGG-1
Lab ID:	2013-455-001-010	Soil Color:	BROWN

Moisture Content of Passing 3/4" Material		Water Content of Retained 3/4" Material	
Tare No.	975	Tare No.	NA
Wt. of Tare & Wet Specimen (g)	710.84	Wt. of Tare & Wet Specimen (g)	NA
Wt. of Tare & Dry Specimen (g)	587.06	Wt. of Tare & Dry Specimen (g)	NA
Weight of Tare (g)	97.76	Weight of Tare (g)	NA
Weight of Water (g)	123.78	Weight of Water (g)	NA
Weight of Dry Specimen (g)	489.30	Weight of Dry Specimen (g)	NA
<b>Moisture Content (%)</b>	<b>25.3</b>	<b>Moisture Content (%)</b>	<b>NA</b>

Wet Weight of -3/4" Sample (g)	NA	Weight of the Dry Specimen (g)	489.30
Dry Weight of -3/4" Sample (g)	60.47	Weight of - #200 material (g)	428.83
Wet Weight of +3/4" Sample (g)	NA	Weight of + #200 material (g)	60.47
Dry Weight of +3/4" Sample (g)	0.00		
Total Dry Weight of Sample (g)	NA		

Sieve Size	Sieve Opening (mm)	Weight of Soil Retained (g)	Percent Retained (%)	Accumulated Percent Retained (%)	Percent Finer (%)	Accumulated Percent Finer (%)
12"	300	0.00	0.00	0.00	100.00	100.00
6"	150	0.00	0.00	0.00	100.00	100.00
3"	75	0.00	0.00	0.00	100.00	100.00
2"	50	0.00	0.00	0.00	100.00	100.00
1 1/2"	37.5	0.00	0.00	0.00	100.00	100.00
1"	25.0	0.00	0.00	0.00	100.00	100.00
3/4"	19.0	0.00	0.00	0.00	100.00	100.00
1/2"	12.5	0.00	0.00	0.00	100.00	100.00
3/8"	9.50	0.00	0.00	0.00	100.00	100.00
#4	4.75	2.19	0.45	0.45	99.55	99.55
#10	2.00	2.14	0.44	0.88	99.12	99.12
#20	0.85	4.88	1.00	1.88	98.12	98.12
#40	0.425	7.96	1.63	3.51	96.49	96.49
#60	0.250	11.99	2.45	5.96	94.04	94.04
#140	0.106	23.90	4.88	10.84	89.16	89.16
#200	0.075	7.41	1.51	12.36	87.64	87.64
Pan	-	428.83	87.64	100.00	-	-

Tested By PC Date 10/7/13 Checked By KC Date 10/17/13



**HYDROMETER ANALYSIS**  
ASTM D 422-63 (2007)/AASHTO T88-00

Client:	MICROBAC	Boring No.:	NA
Client Reference:	OHIO EPA - MONTGOMERY CO. L13091617	Depth (ft):	NA
Project No.:	2013-455-001	Sample No.:	BGG-1
Lab ID:	2013-455-001-010	Soil Color:	BROWN

Elapsed Time (min)	R Measured	Temp. (°C)	Composite Correction	R Corrected	N (%)	K Factor	Diameter (mm)	N'
0	NA	NA	NA	NA	NA	NA	NA	NA
2	55.5	23.1	4.49	51.0	89.9	0.01296	0.0246	<b>78.8</b>
5	50.0	23.1	4.49	45.5	80.2	0.01296	0.0165	<b>70.3</b>
15	42.0	23.1	4.49	37.5	66.1	0.01296	0.0103	<b>57.9</b>
30	37.0	23.1	4.49	32.5	57.3	0.01296	0.0076	<b>50.2</b>
64	32.0	22.4	4.71	27.3	48.1	0.01307	0.0054	<b>42.2</b>
286	25.5	22.2	4.77	20.7	36.5	0.01310	0.0027	<b>32.0</b>
1440	20.5	22.1	4.80	15.7	27.7	0.01311	0.0012	<b>24.2</b>

Soil Specimen Data	Other Corrections	
Tare No.	1465	
Weight of Tare & Dry Material (g)	159.97	
Weight of Tare (g)	98.79	
Weight of Deflocculant (g)	5.0	
Weight of Dry Material (g)	56.18	
	a - Factor	0.99
	Percent Finer than # 200	87.64
	Specific Gravity	2.7 Assumed

**Note:** Hydrometer test is performed on - # 200 sieve material.

Tested By TO Date 10/8/13 Checked By KC Date 10/17/13  
page 4 of 4 DCN: CT-S3A DATE: 3/18/13 REVISION: 11 Sievehyd.xls

**ATTERBERG LIMITS**  
ASTM D 4318-10 / AASHTO T89-10

Client:	MICROBAC	Boring No.:	NA
Client Reference:	Ohio EPA-Montgomery Co. L13091617	Depth (ft):	NA
Project No.:	2013-455-001	Sample No.:	BGG-1
Lab ID:	2013-455-001-010	Soil Description:	<b>BROWN LEAN CLAY</b>

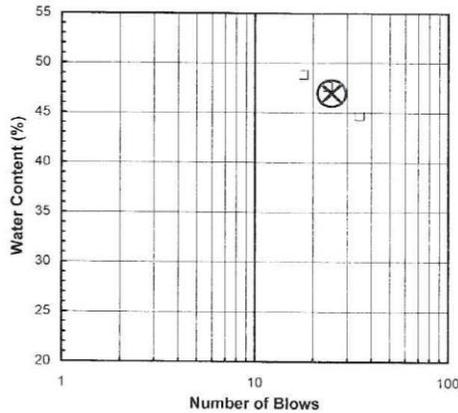
*Note: The USCS symbol used with this test refers only to the minus No. 40 sieve material. See the "Sieve and Hydrometer Analysis" graph page for the complete material description.* (Minus No. 40 sieve material, Airdried)

Liquid Limit Test	1	2	3	
Tare Number	1882	453	396	<b>M</b>
Wt. of Tare & Wet Sample (g)	42.29	35.87	38.60	<b>U</b>
Wt. of Tare & Dry Sample (g)	34.73	28.53	32.14	<b>L</b>
Wt. of Tare (g)	19.24	13.11	17.68	<b>T</b>
Wt. of Water (g)	7.6	7.3	6.5	<b>I</b>
Wt. of Dry Sample (g)	15.5	15.4	14.5	<b>P</b>
<b>Moisture Content (%)</b>	<b>48.8</b>	<b>47.6</b>	<b>44.7</b>	<b>O</b>
<b>Number of Blows</b>	<b>18</b>	<b>24</b>	<b>35</b>	<b>I</b>
				<b>N</b>
				<b>T</b>

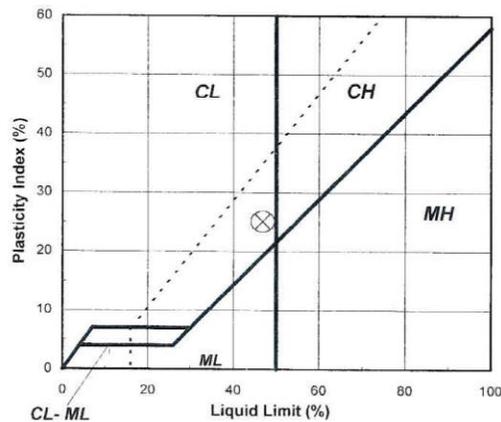
Plastic Limit Test	1	2	Range	Test Results
Tare Number	12368	1278		<b>Liquid Limit (%)</b> <b>47</b>
Wt. of Tare & Wet Sample (g)	18.35	23.05		<b>Plastic Limit (%)</b> <b>22</b>
Wt. of Tare & Dry Sample (g)	17.17	21.88		<b>Plasticity Index (%)</b> <b>25</b>
Wt. of Tare (g)	11.90	16.57		<b>USCS Symbol</b> <b>CL</b>
Wt. of Water (g)	1.2	1.2		
Wt. of Dry Sample (g)	5.3	5.3		
<b>Moisture Content (%)</b>	<b>22.4</b>	<b>22.0</b>	<b>0.4</b>	

*Note: The acceptable range of the two Moisture contents is  $\pm 2.6$*

Flow Curve



Plasticity Chart



Tested By *BK*      Date *10/16/13*      Checked By *KC*      Date *10/17/13*  
page 1 of 1      DCN: CT-S4B      DATE: 3/18/13      REVISION: 4      *3plimit.xls*

## **APPENDIX D**

PROUCL DATASET RUNS



	A	B	C	D	E	F	G	H	I	J	K	L	M
1	<b>Nonparametric Background Statistics for Uncensored Full Data Sets</b>												
2	<b>User Selected Options</b>												
3	Time of Computation		6/19/2014 3:26:47 PM										
4	From File		Mont_As_pro.xls										
5	Full Precision		OFF										
6	Confidence Coefficient		95%										
7	Coverage		95%										
8	Bootstrap Operations		2000										
9													
10	<b>Order-As</b>												
11													
12	<b>General Statistics</b>												
13	Total Number of Observations				100		Number of Distinct Observations				92		
14	Minimum				2.92		First Quartile				5.68		
15	Second Largest				10.8		Median				7.315		
16	Maximum				11.1		Third Quartile				8.343		
17	Mean				7.004		SD				1.854		
18	Coefficient of Variation				0.265		Skewness				-0.369		
19	Mean of logged Data				1.905		SD of logged Data				0.302		
20													
21	<b>Critical Values for Background Threshold Values (BTVs)</b>												
22	Tolerance Factor K (For UTL)				1.923		d2max (for USL)				3.21		
23													
24	<b>Nonparametric Distribution Free Background Statistics</b>												
25	<b>Data do not follow a Discernible Distribution (0.05)</b>												
26													
27	<b>Nonparametric Upper Limits for Background Threshold Values</b>												
28	Order of Statistic, r		98		95% UTL with 95% Coverage				9.94				
29	Approximate f		1.719		Confidence Coefficient (CC) achieved by UTL				0.882				
30	Percentile Bootstrap UTL with 95% Coverage		9.94		5% BCA Bootstrap UTL with 95% Coverage				9.94				
31	95% UPL		9.679		90% Percentile				9.184				
32	90% Chebyshev UPL		12.59		95% Percentile				9.652				
33	95% Chebyshev UPL		15.12		99% Percentile				10.8				
34	95% USL		11.1										
35													
36	Note: The use of USL to estimate a BTV is recommended only when the data set represents a background data set free of outliers and consists of observations collected from clean unimpacted locations.												
37													
38	The use of USL tends to provide a balance between false positives and false negatives provided the data represents a background data set and when many onsite observations need to be compared with the BTV.												
39													
40													

	A	B	C	D	E	F	G	H	I	J	K	L	M
1	<b>Lognormal Background Statistics for Uncensored Full Data Sets</b>												
2	<b>User Selected Options</b>												
3	Time of Computation	6/19/2014 3:38:55 PM											
4	From File	Mont_Ba_pro_a.xls											
5	Full Precision	OFF											
6	Confidence Coefficient	95%											
7	Coverage	95%											
8	Future K Observations	1											
9	Bootstrap Operations	2000											
10													
11	<b>Barium</b>												
12													
13	<b>General Statistics</b>												
14	Total Number of Observations	81				Number of Distinct Observations				75			
15	Minimum	41.1				First Quartile				54.5			
16	Second Largest	109				Median				68.3			
17	Maximum	128				Third Quartile				78.7			
18	Mean	69.2				SD				17.76			
19	Coefficient of Variation	0.25				Skewness				0.784			
20	Mean of logged Data	4.20				SD of logged Data				0.25			
21													
22	<b>Critical Values for Background Threshold Values (BTVs)</b>												
23	Tolerance Factor K (For UTL)	1.95				d2max (for USL)				3.136			
24													
25	<b>Lognormal GOF Test</b>												
26	Shapiro Wilk Test Statistic	0.97				Shapiro Wilk Lognormal GOF Test							
27	5% Shapiro Wilk P Value	0.31				Data appear Lognormal at 5% Significance Level							
28	Lilliefors Test Statistic	0.06				Lilliefors Lognormal GOF Test							
29	5% Lilliefors Critical Value	0.09				Data appear Lognormal at 5% Significance Level							
30	<b>Data appear Lognormal at 5% Significance Level</b>												
31													
32	<b>Background Statistics assuming Lognormal Distribution</b>												
33	95% UTL with 95% Coverage	109.5				90% Percentile (z)				92.42			
34	95% UPL (t)	102				95% Percentile (z)				101.2			
35	95% USL	146.9				99% Percentile (z)				120			
36													
37	Note: The use of USL to estimate a BTV is recommended only when the data set represents a background												
38	data set free of outliers and consists of observations collected from clean unimpacted locations.												
39	The use of USL tends to provide a balance between false positives and false negatives provided the data												
40	represents a background data set and when many onsite observations need to be compared with the BTV												
41													

	A	B	C	D	E	F	G	H	I	J	K	L	M	
1	Background Statistics for Uncensored Full Data Sets													
2	User Selected Options													
3	Time of Computation	6/19/2014 3:42:02 PM												
4	From File	G:\Projects2\background\Mont_Cr_pro.xls												
5	Full Precision	OFF												
6	Confidence Coefficient	95%												
7	Coverage	95%												
8	Future K Observations	1												
9	Bootstrap Operations	2000												
10														
11	Chrome													
12														
13	General Statistics													
14	Total Number of Observations	101					Number of Distinct Observations					90		
15	Minimum	3.58					First Quartile					7.37		
16	Second Largest	13.3					Median					8.43		
17	Maximum	13.6					Third Quartile					10.11		
18	Mean	8.637					SD					2.044		
19	Coefficient of Variation	0.237					Skewness					0.126		
20	Mean of logged Data	2.127					SD of logged Data					0.25		
21														
22	Critical Values for Background Threshold Values (BTVs)													
23	Tolerance Factor K (For UTL)	1.922					d2max (for USL)					3.213		
24														
25	Normal GOF Test													
26	Shapiro Wilk Test Statistic	0.984					Normal GOF Test							
27	5% Shapiro Wilk P Value	0.731					Data appear Normal at 5% Significance Level							
28	Lilliefors Test Statistic	0.0545					Lilliefors GOF Test							
29	5% Lilliefors Critical Value	0.0882					Data appear Normal at 5% Significance Level							
30	Data appear Normal at 5% Significance Level													
31														
32	Background Statistics Assuming Normal Distribution													
33	95% UTL with 95% Coverage	12.56					90% Percentile (z)					11.26		
34	95% UPL (t)	12.05					95% Percentile (z)					12		
35	95% USL	15.2					99% Percentile (z)					13.39		
36														
37	Gamma GOF Test													
38	A-D Test Statistic	0.238					Anderson-Darling Gamma GOF Test							
39	5% A-D Critical Value	0.75					Data appear Gamma Distributed at 5% Significance Level							
40	K-S Test Statistic	0.0499					Kolmogrov-Smirnov Gamma GOF Test							
41	5% K-S Critical Value	0.089					Data appear Gamma Distributed at 5% Significance Level							
42	Detected data appear Gamma Distributed at 5% Significance Level													
43														
44	Gamma Statistics													
45	k hat (MLE)	17.09					k star (bias corrected MLE)					16.59		
46	Theta hat (MLE)	0.505					Theta star (bias corrected MLE)					0.521		
47	nu hat (MLE)	3453					nu star (bias corrected)					3351		
48	MLE Mean (bias corrected)	8.637					MLE Sd (bias corrected)					2.12		
49														
50	Background Statistics Assuming Gamma Distribution													
51	Wilson Hilferty (WH) Approx. Gamma UPL	12.42					90% Percentile					11.44		
52	Wilkens Wixley (HW) Approx. Gamma UPL	12.49					95% Percentile					12.4		
53	Approx. Gamma UTL with 95% Coverage	13.11					99% Percentile					14.32		
54	Approx. Gamma UTL with 95% Coverage	13.21												
55	95% WH USL	17.03					95% HW USL					17.38		
56														
57	Lognormal GOF Test													
58	Shapiro Wilk Test Statistic	0.972					Shapiro Wilk Lognormal GOF Test							
59	5% Shapiro Wilk P Value	0.19					Data appear Lognormal at 5% Significance Level							
60	Lilliefors Test Statistic	0.0604					Lilliefors Lognormal GOF Test							
61	5% Lilliefors Critical Value	0.0882					Data appear Lognormal at 5% Significance Level							
62	Data appear Lognormal at 5% Significance Level													
63														
64	Background Statistics assuming Lognormal Distribution													
65	95% UTL with 95% Coverage	13.56					90% Percentile (z)					11.55		
66	95% UPL (t)	12.73					95% Percentile (z)					12.65		
67	95% USL	18.73					99% Percentile (z)					15.01		
68														
69	Nonparametric Distribution Free Background Statistics													
70	Data appear Normal at 5% Significance Level													
71														
72	Nonparametric Upper Limits for Background Threshold Values													
73	Order of Statistic, r	99					95% UTL with 95% Coverage					13		
74	Approximate f	1.737					Confidence Coefficient (CC) achieved by UTL					0.886		
75	Percentile Bootstrap UTL with 95% Coverage	13					BCA Bootstrap UTL with 95% Coverage					12.8		
76	95% UPL	11.99					90% Percentile					11.3		
77	90% Chebyshev UPL	14.8					95% Percentile					11.9		
78	95% Chebyshev UPL	17.59					99% Percentile					13.3		
79	95% USL	13.6												
80														
81	Note: The use of USL to estimate a BTV is recommended only when the data set represents a background													
82	data set free of outliers and consists of observations collected from clean unimpacted locations.													
83	The use of USL tends to provide a balance between false positives and false negatives provided the data													
84	represents a background data set and when many onsite observations need to be compared with the BT													
85														

	A	B	C	D	E	F	G	H	I	J	K	L
1	Background Statistics for Uncensored Full Data Sets											
2	User Selected Options											
3	Time of Computation	6/19/2014 4:01:41 PM										
4	From File	G:\Projects2\background\Mont_Hg_pro.xls										
5	Full Precision	OFF										
6	Confidence Coefficient	95%										
7	Coverage	95%										
8	Future K Observations	1										
9	Bootstrap Operations	2000										
10												
11	Hq											
12												
13	General Statistics											
14	Total Number of Observations	99					Number of Distinct Observations	86				
15	Minimum	0.0138					First Quartile	0.029				
16	Second Largest	0.0658					Median	0.0388				
17	Maximum	0.0762					Third Quartile	0.0454				
18	Mean	0.0384					SD	0.0121				
19	Coefficient of Variation	0.315					Skewness	0.385				
20	Mean of logged Data	-3.312					SD of logged Data	0.334				
21												
22	Critical Values for Background Threshold Values (BTVs)											
23	Tolerance Factor K (For UTL)	1.925					d2max (for USL)	3.206				
24												
25	Normal GOF Test											
26	Shapiro Wilk Test Statistic	0.973					Normal GOF Test					
27	5% Shapiro Wilk P Value	0.233					Data appear Normal at 5% Significance Level					
28	Lilliefors Test Statistic	0.0555					Lilliefors GOF Test					
29	5% Lilliefors Critical Value	0.089					Data appear Normal at 5% Significance Level					
30	Data appear Normal at 5% Significance Level											
31												
32	Background Statistics Assuming Normal Distribution											
33	95% UTL with 95% Coverage	0.0617					90% Percentile (z)	0.0539				
34	95% UPL (t)	0.0586					95% Percentile (z)	0.0583				
35	95% USL	0.0771					99% Percentile (z)	0.0665				
36												
37	Gamma GOF Test											
38	A-D Test Statistic	0.606					Anderson-Darling Gamma GOF Test					
39	5% A-D Critical Value	0.752					Detected data appear Gamma Distributed at 5% Significance Level					
40	K-S Test Statistic	0.0908					Kolmogrov-Smirnov Gamma GOF Test					
41	5% K-S Critical Value	0.0899					Data Not Gamma Distributed at 5% Significance Level					
42	Detected data follow Appr. Gamma Distribution at 5% Significance Level											
43												
44	Gamma Statistics											
45	k hat (MLE)	9.721					k star (bias corrected MLE)	9.433				
46	Theta hat (MLE)	0.00395					Theta star (bias corrected MLE)	0.00407				
47	nu hat (MLE)	1925					nu star (bias corrected)	1868				
48	MLE Mean (bias corrected)	0.0384					MLE Sd (bias corrected)	0.0125				
49												
50	Background Statistics Assuming Gamma Distribution											
51	Wilson Hilferty (WH) Approx. Gamma UPL	0.0612					90% Percentile	0.055				
52	Wilks Wixley (HW) Approx. Gamma UPL	0.0617					95% Percentile	0.061				
53	Approx. Gamma UTL with 95% Coverage	0.0656					99% Percentile	0.0733				
54	Approx. Gamma UTL with 95% Coverage	0.0664										
55	95% WH USL	0.091					95% HW USL	0.0939				
56												
57	Lognormal GOF Test											
58	Shapiro Wilk Test Statistic	0.968					Shapiro Wilk Lognormal GOF Test					
59	5% Shapiro Wilk P Value	0.104					Data appear Lognormal at 5% Significance Level					
60	Lilliefors Test Statistic	0.104					Lilliefors Lognormal GOF Test					
61	5% Lilliefors Critical Value	0.089					Data Not Lognormal at 5% Significance Level					
62	Data appear Approximate Lognormal at 5% Significance Level											
63												
64	Background Statistics assuming Lognormal Distribution											
65	95% UTL with 95% Coverage	0.0693					90% Percentile (z)	0.0559				
66	95% UPL (t)	0.0636					95% Percentile (z)	0.0631				
67	95% USL	0.106					99% Percentile (z)	0.0793				
68												
69	Nonparametric Distribution Free Background Statistics											
70	Data appear Normal at 5% Significance Level											
71												
72	Nonparametric Upper Limits for Background Threshold Values											
73	Order of Statistic, r	97					95% UTL with 95% Coverage	0.0632				
74	Approximate f	1.702					Confidence Coefficient (CC) achieved by UTL	0.878				
75	Percentile Bootstrap UTL with 95% Coverage	0.0632					BCA Bootstrap UTL with 95% Coverage	0.0632				
76	95% UPL	0.0619					90% Percentile	0.0508				
77	90% Chebyshev UPL	0.0748					95% Percentile	0.0617				
78	95% Chebyshev UPL	0.0913					99% Percentile	0.066				
79	95% USL	0.0762										
80												
81	Note: The use of USL to estimate a BTV is recommended only when the data set represents a background											
82	data set free of outliers and consists of observations collected from clean unimpacted locations.											
83	The use of USL tends to provide a balance between false positives and false negatives provided the data											
84	represents a background data set and when many onsite observations need to be compared with the BTV.											
85												

	A	B	C	D	E	F	G	H	I	J	K	L	M
1	<b>Lognormal Background Statistics for Uncensored Full Data Sets</b>												
2	<b>User Selected Options</b>												
3	e/Time of Computation			6/19/2014 4:05:27 PM									
4	From File			Mont_Pb_pro.xls									
5	Full Precision			OFF									
6	Confidence Coefficient			95%									
7	Coverage			95%									
8	Future K Observations			1									
9	f Bootstrap Operations			2000									
10													
11	<b>OrderPb</b>												
12													
13	<b>General Statistics</b>												
14	Total Number of Observations				99		Number of Distinct Observations				66		
15	Minimum				8.76		First Quartile				14.85		
16	Second Largest				28.2		Median				16.4		
17	Maximum				28.9		Third Quartile				18.6		
18	Mean				16.9		SD				3.751		
19	Coefficient of Variation				0.22		Skewness				0.801		
20	Mean of logged Data				2.80		SD of logged Data				0.219		
21													
22	<b>Critical Values for Background Threshold Values (BTVs)</b>												
23	Tolerance Factor K (For UTL)				1.92		d2max (for USL)				3.206		
24													
25	<b>Lognormal GOF Test</b>												
26	Shapiro Wilk Test Statistic				0.97		<b>Shapiro Wilk Lognormal GOF Test</b>						
27	5% Shapiro Wilk P Value				0.18		Data appear Lognormal at 5% Significance Level						
28	Lilliefors Test Statistic				0.08		<b>Lilliefors Lognormal GOF Test</b>						
29	5% Lilliefors Critical Value				0.08		Data appear Lognormal at 5% Significance Level						
30	<b>Data appear Lognormal at 5% Significance Level</b>												
31													
32	<b>Background Statistics assuming Lognormal Distribution</b>												
33	95% UTL with 95% Coverage				25.1		90% Percentile (z)				21.87		
34	95% UPL (t)				23.8		95% Percentile (z)				23.69		
35	95% USL				33.3		99% Percentile (z)				27.51		
36													
37	te: The use of USL to estimate a BTV is recommended only when the data set represents a backgrou												
38	data set free of outliers and consists of observations collected from clean unimpacted locations.												
39	e use of USL tends to provide a balance between false positives and false negatives provided the de												
40	resents a background data set and when many onsite observations need to be compared with the B												
41													

	A	B	C	D	E	F	G	H	I	J	K	L	M
1	Background Statistics for Uncensored Full Data Sets												
2	User Selected Options												
3	Time of Computation 6/19/2014 4:09:00 PM												
4	From File G:\Projects2\background\Mont_Ni_pro.xls												
5	Full Precision OFF												
6	Confidence Coefficient 95%												
7	Coverage 95%												
8	Future K Observations 1												
9	Bootstrap Operations 2000												
10													
11	Nickel												
12													
13	General Statistics												
14	Total Number of Observations				101				Number of Distinct Observations				64
15	Minimum				8.53				First Quartile				12.1
16	Second Largest				19.3				Median				13.3
17	Maximum				19.9				Third Quartile				15.2
18	Mean				13.53				SD				2.487
19	Coefficient of Variation				0.184				Skewness				0.227
20	Mean of logged Data				2.588				SD of logged Data				0.187
21													
22	Critical Values for Background Threshold Values (BTVs)												
23	Tolerance Factor K (For UTL)				1.922				d2max (for USL)				3.213
24													
25	Normal GOF Test												
26	Shapiro Wilk Test Statistic				0.975				Normal GOF Test				
27	5% Shapiro Wilk P Value				0.288				Data appear Normal at 5% Significance Level				
28	Lilliefors Test Statistic				0.0624				Lilliefors GOF Test				
29	5% Lilliefors Critical Value				0.0882				Data appear Normal at 5% Significance Level				
30	Data appear Normal at 5% Significance Level												
31													
32	Background Statistics Assuming Normal Distribution												
33	95% UTL with 95% Coverage				18.31				90% Percentile (z)				16.71
34	95% UPL (t)				17.68				95% Percentile (z)				17.62
35	95% USL				21.52				99% Percentile (z)				19.31
36													
37	Gamma GOF Test												
38	A-D Test Statistic				0.245				Anderson-Darling Gamma GOF Test				
39	5% A-D Critical Value				0.75				Data appear Gamma Distributed at 5% Significance Level				
40	K-S Test Statistic				0.0697				Kolmogrov-Smirnov Gamma GOF Test				
41	5% K-S Critical Value				0.089				Data appear Gamma Distributed at 5% Significance Level				
42	Detected data appear Gamma Distributed at 5% Significance Level												
43													
44	Gamma Statistics												
45	k hat (MLE)				29.49				k star (bias corrected MLE)				28.62
46	Theta hat (MLE)				0.459				Theta star (bias corrected MLE)				0.473
47	nu hat (MLE)				5956				nu star (bias corrected)				5781
48	MLE Mean (bias corrected)				13.53				MLE Sd (bias corrected)				2.528
49													
50	Background Statistics Assuming Gamma Distribution												
51	Wilson Hilferty (WH) Approx. Gamma UPL				17.96				90% Percentile				16.85
52	Wilks Wixley (HW) Approx. Gamma UPL				18.01				95% Percentile				17.94
53	Approx. Gamma UTL with 95% Coverage				18.74				99% Percentile				20.09
54	Approx. Gamma UTL with 95% Coverage				18.81								
55	95% WH USL				23.05				95% HW USL				23.32
56													
57	Lognormal GOF Test												
58	Shapiro Wilk Test Statistic				0.973				Shapiro Wilk Lognormal GOF Test				
59	5% Shapiro Wilk P Value				0.217				Data appear Lognormal at 5% Significance Level				
60	Lilliefors Test Statistic				0.0793				Lilliefors Lognormal GOF Test				
61	5% Lilliefors Critical Value				0.0882				Data appear Lognormal at 5% Significance Level				
62	Data appear Lognormal at 5% Significance Level												
63													
64	Background Statistics assuming Lognormal Distribution												
65	95% UTL with 95% Coverage				19.05				90% Percentile (z)				16.9
66	95% UPL (t)				18.17				95% Percentile (z)				18.09
67	95% USL				24.26				99% Percentile (z)				20.55
68													
69	Nonparametric Distribution Free Background Statistics												
70	Data appear Normal at 5% Significance Level												
71													
72	Nonparametric Upper Limits for Background Threshold Values												
73	Order of Statistic, r				99				95% UTL with 95% Coverage				18.8
74	Approximate confidence Coefficient (CC) achieved by UTL				1.737				BCA Bootstrap UTL with 95% Coverage				0.886
75	Antile Bootstrap UTL with 95% Coverage				18.8				95% Percentile				18.6
76	95% UPL				18				90% Percentile				16.5
77	90% Chebyshev UPL				21.02				95% Percentile				18
78	95% Chebyshev UPL				24.42				99% Percentile				19.3
79	95% USL				19.9								
80													
81	Note: The use of USL to estimate a BTV is recommended only when the data set represents a background												
82	data set free of outliers and consists of observations collected from clean unimpacted locations.												
83	The use of USL tends to provide a balance between false positives and false negatives provided the data												
84	represents a background data set and when many onsite observations need to be compared with the BT												
85													

	A	B	C	D	E	F	G	H	I	J	K	L	M
1	<b>Lognormal Background Statistics for Uncensored Full Data Sets</b>												
2	<b>User Selected Options</b>												
3	Time of Computation	6/19/2014 4:14:52 PM											
4	From File	Mont_Se_Pro.xls											
5	Full Precision	OFF											
6	Confidence Coefficient	95%											
7	Coverage	95%											
8	Future K Observations	1											
9	Bootstrap Operations	2000											
10													
11	LnROS_Se												
12													
13	<b>General Statistics</b>												
14	Total Number of Observations	100	Number of Distinct Observations								83		
15	Minimum	0.07	First Quartile								0.114		
16	Second Largest	0.51	Median								0.194		
17	Maximum	0.51	Third Quartile								0.316		
18	Mean	0.22	SD								0.129		
19	Coefficient of Variation	0.57	Skewness								0.741		
20	Mean of logged Data	-1.65	SD of logged Data								0.579		
21													
22	<b>Critical Values for Background Threshold Values (BTVs)</b>												
23	Tolerance Factor K (For UTL)	1.92	d2max (for USL)								3.21		
24													
25	<b>Lognormal GOF Test</b>												
26	Shapiro Wilk Test Statistic	0.92	<b>Shapiro Wilk Lognormal GOF Test</b>										
27	5% Shapiro Wilk P Value	7.3218E-08	Data Not Lognormal at 5% Significance Level										
28	Lilliefors Test Statistic	0.084	<b>Lilliefors Lognormal GOF Test</b>										
29	5% Lilliefors Critical Value	0.084	Data appear Lognormal at 5% Significance Level										
30	<b>Data appear Approximate Lognormal at 5% Significance Level</b>												
31													
32	<b>Background Statistics assuming Lognormal Distribution</b>												
33	95% UTL with 95% Coverage	0.58	90% Percentile (z)								0.401		
34	95% UPL (t)	0.50	95% Percentile (z)								0.495		
35	95% USL	1.22	99% Percentile (z)								0.734		
36													
37	Note: The use of USL to estimate a BTV is recommended only when the data set represents a background												
38	data set free of outliers and consists of observations collected from clean unimpacted locations.												
39	The use of USL tends to provide a balance between false positives and false negatives provided the data												
40	represents a background data set and when many onsite observations need to be compared with the BTV												
41													

	A	B	C	D	E	F	G	H	I	J	K	L
1	<b>Lognormal Background Statistics for Uncensored Full Data Sets</b>											
2	<b>User Selected Options</b>											
3	e/Time of Computation			6/19/2014 4:18:03 PM								
4	From File			Mont_TI_pro.xls								
5	Full Precision			OFF								
6	Confidence Coefficient			95%								
7	Coverage			95%								
8	Future K Observations			1								
9	f Bootstrap Operations			2000								
10												
11	TI											
12												
13	<b>General Statistics</b>											
14	Total Number of Observations				100		Number of Distinct Observations				74	
15	Minimum				0.102		First Quartile				0.179	
16	Second Largest				0.368		Median				0.207	
17	Maximum				0.381		Third Quartile				0.246	
18	Mean				0.22		SD				0.0645	
19	Coefficient of Variation				0.293		Skewness				0.641	
20	Mean of logged Data				-1.555		SD of logged Data				0.292	
21												
22	<b>Critical Values for Background Threshold Values (BTVs)</b>											
23	Tolerance Factor K (For UTL)				1.923		d2max (for USL)				3.21	
24												
25	<b>Lognormal GOF Test</b>											
26	Shapiro Wilk Test Statistic				0.963		<b>Shapiro Wilk Lognormal GOF Test</b>					
27	5% Shapiro Wilk P Value				0.0438		Data Not Lognormal at 5% Significance Level					
28	Lilliefors Test Statistic				0.0695		<b>Lilliefors Lognormal GOF Test</b>					
29	5% Lilliefors Critical Value				0.0886		Data appear Lognormal at 5% Significance Level					
30	<b>Data appear Approximate Lognormal at 5% Significance Level</b>											
31												
32	<b>Background Statistics assuming Lognormal Distribution</b>											
33	95% UTL with 95% Coverage				0.37		90% Percentile (z)				0.307	
34	95% UPL (t)				0.344		95% Percentile (z)				0.341	
35	95% USL				0.54		99% Percentile (z)				0.417	
36												
37	Note: The use of USL to estimate a BTV is recommended only when the data set represents a background											
38	data set free of outliers and consists of observations collected from clean unimpacted locations.											
39	The use of USL tends to provide a balance between false positives and false negatives provided the data											
40	represents a background data set and when many onsite observations need to be compared with the BTV.											
41												