REPORT OF PRELIMINARY
ON-SITE WASTEWATER FEASIBILITY EVALUATION

CREBILLY FARM

Westtown Township, Chester County, Pennsylvania

March 2017

Prepared For:

TOLL BROTHERS, INC.
516 North Newtown Street Road
Newtown Square, PA 19073

Attn: Mr. Gary Chase

Prepared By:

GEO-TECHNOLOGY ASSOCIATES, INC.
Geotechnical and Environmental Consultants
3445-A Box Hill Corporate Center Drive
Abingdon, Maryland 21009
Fax: (410) 515-4895
(410) 515-9446
www.gtaeng.com

GTA Job No: 31161348

GEO-TECHNOLOGY ASSOCIATES, INC.

GEOTECHNICAL AND
ENVIRONMENTAL CONSULTANTS

A Practicing Geoprofessional Business Association Member Firm

March 27, 2017

Toll Brothers, Inc.
516 North Newtown Street Road
Newtown Square, PA 19073

Attn: Mr. Gary Chase

Re: Report of Preliminary On-site Wastewater Feasibility Evaluation
Crebilly Farm
Westtown Township, Chester County, Pennsylvania

Dear Gary:

In accordance with our Agreement dated June 6, 2016, Geo-Technology Associates, Inc. (GTA) has performed a preliminary on-site wastewater suitability evaluation for the proposed residential subdivision, located on the Crebilly Farm property in Westtown Township, Chester County, Pennsylvania. In accordance with direction from Toll Brothers, Inc., this evaluation is based on a 250 gallon per day design wastewater flow rate for each proposed residential unit, including for the purposes of groundwater mounding analysis, preliminary area requirements for drip irrigation, etc. The results of field testing and analysis associated with the preliminary evaluation are summarized in the attached report.

We appreciate the opportunity to have been of assistance to you on this project. Should you have questions, please contact the undersigned at (410) 515-9446.

Sincerely,
GEO-TECHNOLOGY ASSOCIATES, INC.

Paul S. Scott, P.G.
Vice President

Greg McKee
Staff Scientist

PSS/GM/mlw
31161348
\\psmc-data\gta\Shared\Aquifer\Reports\2016 Projects\31161348 Crebilly Farm\Report\31161348 Crebilly Farm ww PFeas_3_2017.doc

TABLE OF CONTENTS

LIST OF APPENDICES

REPORT OF PRELIMINARY
ON-SITE WASTEWATER FEASIBILITY EVALUATION

CREBILLY FARM
WESTTOWN TOWNSHIP, CHESTER COUNTY, PENNSYLVANIA
MARCH 2017

1.0 INTRODUCTION

This Report presents the results of our preliminary on-site wastewater evaluation performed on the Crebilly Farm property (site) located immediately northwest of the intersection of West Street Road and Wilmington Pike in Westtown Township, Chester County, Pennsylvania. Geo-Technology Associates, Inc. (GTA) understands that Toll Brothers is considering the purchase of the subject site for construction of a residential community, and is also considering potential service via an on-site community wastewater disposal system.

The gross site area is approximately 322.4 +/- acres. GTA was provided with two concept plans designated Plan B and the Overall Open Space Plan (Site Plan), prepared by Eastern States Engineering (ESE). The concept plans indicate the two alternate layouts of the subdivision and stormwater management areas. The proposed subdivision will be a mix of estate/executive lots, executive/courtyard lots, and carriage homes. According to the concept plans, the house totals may range from 317 (Site Plan) to 397 (Plan B) units. The plans included boundary information, potential lot and roadway configuration, and the locations of the proposed stormwater management facilities. Proposed and existing grades and utility locations were not provided for our review at the time this Report was prepared.

In conjunction with the proposed development, GTA was retained to perform a preliminary on-site wastewater evaluation at the northwestern portion of the project site (evaluated area). The preliminary evaluation included test pit exploration, soil profile evaluation, infiltrometer testing, soil borings, preliminary hydraulic testing of soil borings, water quality evaluation and mounding analysis. Preliminary conclusions and recommendations provided herein regarding the suitability of soil and groundwater conditions for on-site wastewater disposal were derived from analysis of field and laboratory data, and review of the previously referenced concept plans. In conjunction with the area-specific wastewater evaluation

at the northwestern portion of the site, GTA also reviewed published information and the results of GTA's previous geotechnical evaluation, for preliminary evaluation of general feasibility at the site.

2.0 SITE AND EVALUATED AREA DESCRIPTION AND INFORMATION REGARDING POTENTIAL ON-SITE WASTEWATER DISPOSAL

2.1 Site Description

The subject site is located northwest of the intersection of Wilmington-West Chester Pike (Route 202) and West Street Road (Route 926), in Westtown Township, Chester County, Pennsylvania, as shown on the *Site Location Map, Figure 1*, included in *Appendix A*. Specifically, the subject site is comprised of eleven lots, identified as Tax Parcels 67-4-029, 67-4-029.1 through 67-4-029.4, 67-4-030 through 67-4-033, 67-4-033.1, and 67-4-134, totaling approximately 322.4 +/- acres. At the time the field exploration was performed, the subject site was primarily an undeveloped property containing a few single-story and two-story residential structures, barns, stables, and horse training facilities in the central and western portions of the site. The site also contained asphalt paved and gravel driveways and various utilities associated with the existing structures. GTA understands that there were residential structures on the eastern portion of the site that were demolished. Remnant slabs and demolition debris were present on this portion of the site at the time our field exploration was performed.

The site topography is generally gently to steeply sloping, with surface drainage generally directed toward Radley Run and the unnamed tributaries to the south and west. Ground surface elevations range from approximately elevation (EL) 380 in the southeast corner of the site, near the residential structure located adjacent to the intersection of West Street Road and Wilmington-West Chester Pike, to approximately EL 250 in the southwest portion of the site, near Radley Run. Ground surface elevations were based on Google Earth Imagery from 2011 and limited survey data and should be considered approximate. A stream, identified as Radley Run, is located in the southwest portion of the site near the farm entrance. Additionally, unnamed tributaries to Radley Run are situated at the southern-central and northwestern portions of the site.

2.2 Description of Proposed Wastewater Disposal Areas

GTA was directed by Toll Brothers to evaluate an approximate 32-acre area located at the northwestern corner of the site (evaluated area). The evaluated area is indicated on the *Test Pit and Observation Hole Location Plan*, attached to this Report in *Appendix A*. The Overall Open Space Plan (Site Plan; attached in *Appendix A*), prepared by ESE and dated October 7, 2016 depicts the overall site area and the 317 residential unit layout. Proposed wastewater disposal areas are indicated on the Site Plan, and total approximately 25.5 acres in area; two relatively large disposal areas are indicated at the northwestern and southeastern portions of the site, with two smaller areas shown at the east-central portion. At the time of the preliminary evaluation the evaluated area was under soybean crop cover and GTA was instructed to perform all exploration and testing outside of the soybean crop area. Thus, the test pits and soil borings used to evaluate the potential disposal area were generally outside of, or on the margins of the area. Based on topographic information provided by ESE, the evaluated area is situated over a ridgeline/topographic divide, with about half to two thirds of the area sloping to the southeast and toward the immediately adjacent unnamed tributary to Radley Run, and the other portion sloping to the northwest and toward another unnamed tributary (off-site) to Radley Run.

2.3 Proposed Wastewater Flows and Potential System Types

Based on discussions with Mr. Andrew Semon of Toll Brothers, this evaluation was performed assuming wastewater flows for the proposed 317 residential units and two community centers, as well as a scenario including 397 residential units with the aforementioned community centers. In accordance with direction from Toll Brothers, Inc., this evaluation is based on a 250 gallon per day (gpd) design wastewater flow rate for each proposed equivalent dwelling unit (EDU), including for the purposes of groundwater mounding analysis, preliminary area requirements for drip irrigation, etc. Also, based on information provided to GTA by Toll Brothers, the flows associated with each community center is 750 gpd, or 3 EDUs. Thus, the potential wastewater flows assumed in this Report for the 317 (Site Plan) and 397 (Plan B) residential unit scenarios are 80,750 and 100,750 gpd, respectively. GTA understands that each of the development concept plans, i.e., the *Site Plan* and *Plan B,* are proposed to be served by an on-site community drip irrigation wastewater treatment and disposal system.

Options for wastewater disposal systems at the site may include spray irrigation, drip irrigation and deeper bed-type systems, depending upon wastewater flows and suitability of site conditions. Spray or drip irrigation systems may be used to apply up to a maximum 2-inches per week of wastewater per acre of suitable area. Storage is required for winter months when wastewater cannot be applied via spray irrigation. For the maximum application rate of 2-inches per week, 30 or more acres may be necessary for an initial spray irrigation system, not including storage area. Depending upon site conditions and based on information provided in the Treatment and Dispersal Packages Design Manual prepared by the American Manufacturing Company and dated March 1999, initial system area requirements for a drip irrigation system may be 20 acres or more, not including storage area or infrastructure. Bed type systems generally require less area but due to the greater concentration of wastewater, groundwater mounding is effectively enhanced and can be more challenging to large system implementation, depending upon site conditions.

It is noted that there are many PADEP design and system siting requirements for each of the aforementioned systems which may influence the size and practicable implementation of the systems. Refer to the PADEP Manual for Land Application (October 15, 1997) and PADEP Code Chapter 73 for additional information. Some of the requirements include setbacks that may be 100 feet (e.g., from property lines); avoidance of slopes greater than 25 percent, etc. For existing potable water supply wells the required horizontal isolation distance is indicated as 100 feet.

Based on discussions with PADEP personnel, the PADEP does not require a replacement area for a large system. However, through the planning process the local municipality or controlling authority as applicable may require a replacement area to be held in reserve.

3.0 SOILS AND HYDROGEOLOGY

3.1 Soils

According to the U.S. Department of Agriculture (USDA) web soil survey, the soils underlying the site are mapped as the Glenville silt loam (GlB, GlC), Glenelg silt loam (GgB, GgC), Chester silt loam (CdB), Baile silt loam (Ba), Codorus silt loam (Co), Gaila silt loam

(GaD) and Hatboro silt loam (Ha) series soils. The Glenelg, Chester and Gaila series soils are described as being well-drained, with depths to the water of more than 6 feet and a depth to bedrock generally ranging from 60 to 120 inches. The evaluated area of the site for potential on-site wastewater disposal appears to be underlain primarily by the Glenelg and Chester soils. A map indicating soil types at the site based on USDA information is attached to this Report in *Appendix B.*

The Glenville and Codorus series soils are described as being moderately well-drained, with depths to the water of approximately 6 to 36 inches and a depth to bedrock generally ranging from 15 to 99 inches. The Baile and Hatboro series soils are described as being poorly-drained, with depths to the water of approximately 0 to 6 inches and a depth to bedrock generally ranging from 60 to 99 inches. These soils were typically mapped in the low lying areas. Refer to the publications for additional information.

3.2 Hydrogeology

According to *The Preliminary Bedrock Geologic Map of a Portion of The Wilmington 30-by 60- Minute Quadrangle, Southeastern Pennsylvania*, published by Pennsylvania Department of Conservation and Natural Resources (2005), the subject site is primarily situated within the Glenarm Wissahickon formation of the Piedmont Physiographic Province. Specifically, the map indicates that the majority if the site is underlain by the Doe Run schist which is identified as garnet-staurolite-kyanite pelitic schist with abundant biotite and muscovite. The residual soils resulting from the weathering of the parent bedrock of the Doe Run schist can result in low plasticity silts and clays transitioning to non-plastic sands with lesser percentages of silt and clay. These materials generally become increasingly stiff or dense with depth; although, differential weathering can often result in softer zones within otherwise very dense weathered rock material.

The above-referenced bedrock geology map also indicates that a small portion of the site along the western property boundary may be underlain by Ultramafic rock, which is described as primarily serpentinite containing magnesium-rich rocks derived from pyroxenite and peridotite. The residual soils resulting from the weathering of the parent bedrock of the Ultramafic rock can result in high plasticity soils with low unit weights. The Ultramafic rock does not appear to be

mapped within the evaluated area for potential on-site wastewater disposal.

The *Geohydrology of Southeastern Pennsylvania*, published by the USGS in 2002, indicates median hydraulic conductivity (K) values of 0.25, 0.55 and 1.0 for three schist members of the Wissahickon Formation. In GTA's experience with hydraulic testing of residual soils of the Wissahickon, K-values have generally ranged from about 0.5 to 2 ft/day, although in some instances values have been lower or higher.

4.0 SUBSURFACE EXPLORATION AND INFILTROMETER TESTING

Subsurface exploration and infiltrometer testing was performed on July 27, 2016, to preliminarily evaluate the soil conditions for accommodation of a large community wastewater disposal system. The exploration/testing included excavation of 10 test pits by R. Keating and Sons, Inc., using a rubber-tire backhoe at the approximate locations depicted on the *Test Pit and Observation Hole Location Plan* (Plan), attached to this Report in *Appendix A*. As previously noted, at the time of the preliminary evaluation the evaluated area was under soybean crop cover and GTA was instructed to perform all exploration and testing outside of the soybean crop area. Thus, the test pits used to evaluate the potential disposal area were generally outside of, or on the margins of the proposed disposal area. Thus, these results are preliminary and it will be necessary to perform additional soil evaluation within the proposed disposal area. GTA subcontracted the services of DelMarva Environmental, Inc. (DEI) for assistance with preliminary detailed soil profile evaluation and infiltrometer testing performed by a Certified Professional Soil Scientist/Soil Classifier. Please see the report prepared by DEI for the site, attached to this Report in *Appendix B*, for additional details regarding the results of the preliminary detailed soil profile evaluation and infiltrometer testing.

The test pits were excavated to depths ranging from approximately 7 to 14 feet below the existing ground surface (ft bgs). Groundwater was encountered in Test Pit TP-438 at a depth of approximately 12 ft bgs. Mottling, which may be an indicator of seasonally saturated (possibly perched water) soil conditions, was observed within test pits TP-437, TP-438, and TP-440 at about 2.5 ft bgs. It is noted that these three test pits are situated at relatively low topographic settings in the evaluated area, and within about 100 feet of the stream.

Single ring infiltrometer tests were conducted within Test Pits TP-435, TP-441, and TP-443 on July 28, 2016. Two tests were conducted in each test pit within horizons that potentially represent the most hydraulically restrictive soil material. Infiltration rates ranged from 8.6 minutes per inch (mpi) at a depth of 20 inches below the ground surface (in bgs) in TP-441, to 240 mpi at a depth of 18 in bgs in TP-435. Percolation tests were also performed in TP-435 and TP-441 at respective depths of 43 and 48 in bgs. Percolation rates for TP-435 and TP-441 were estimated at 10.7 and 18.7, respectively. For more information regarding infiltration and percolation test rates and this preliminary soil evaluation, see the DEI report attached in *Appendix B* of this Report.

5.0 SOIL BORING DRILLING AND HYDRAULIC TESTING

Four soil borings, identified as OH-1 through OH-4, were drilled by GTA on August 9, 2016. The borings were drilled by making use of a truck-mounted hollow-stem auger rig. The borings were drilled at the locations indicated on the Plan, attached in Appendix A. Boring OH-1 was drilled to a depth of about 44.3 ft bgs, and had a static water level of approximately 16.12 ft bgs. Boring OH-2 was drilled to a depth of about 33.4 ft bgs, and had a static water level of approximately 4.31 ft bgs. Boring OH-3 was drilled to a depth of about 35.2 ft bgs, and had a static water level of approximately 11.03 ft bgs. Boring OH-4 was drilled to a depth of about 38.1 ft bgs, and had a static water level of approximately 12.4 ft bgs. Temporary PVC casing and perforated piping was installed within the borings to facilitate water level measurement and preliminary hydraulic testing.

Preliminary hydraulic testing was performed to facilitate preliminary estimation of hydraulic properties of subsurface materials encountered by borings OH-1 through OH-4. Slug tests were performed within OH-1 through OH-4 by rapidly lowering and removing cylindrical slugs composed of stainless steel into and out of each boring, causing water level displacement. Changing groundwater levels were measured using a Solinst Levelogger pressure transducer, supplemented with manual hand measurements via a Solinst Model 101 water level meter. A barologger was used to measure barometric pressure changes during the testing period.

Test data obtained were barometrically compensated and reduced for input to analytical models for hydraulic conductivity (K) estimation. The Aqtesolv program was used to analyze hydraulic test data, resulting in K-value estimates ranging from approximately 0.5 to 1.2 ft/day for borings OH-1, OH-2, and OH-3. It is noted that the water level response at OH-4 was anomalously slow (essentially no measureable water level change); this location was excluded from our analysis. Hydraulic test results are attached to this Report in *Appendix C.*

6.0 GROUNDWATER SAMPLING

GTA performed groundwater quality sampling and analysis within observation holes OH-1 through OH-4 on August 10, 2016. Samples were collected and analyzed for nitrate, nitrite, and TKN. Submersible pumps were deployed within each sampled observation hole, and utilized to purge groundwater prior sampling. Field measurements of pH, temperature and conductivity were collected during purging. The samples were collected after approximately 3 well volumes of groundwater were evacuated from the wells and the groundwater temperature, electrical conductance, and pH appeared to have stabilized, or, in the case of OH-4, after the boring was pumped to effective dryness and allowed to recover. The laboratory results of the groundwater quality monitoring within observation holes OH-1 through OH-4 are attached to this report in *Appendix D.*

The samples were decanted directly into laboratory-cleaned sampling containers, and each sample container was placed on ice immediately after filling, and remained so until delivery to the laboratory. The groundwater samples were transported to SGS Accutest for analysis, with completed Chain of Custody documentation.

TKN and nitrite concentrations were either not detected or were detected at concentrations of about 0.5 mg/L or less. Nitrate concentrations ranged from about 5.4 mg/L to 6.4 mg/L at locations OH-1, OH-2 and OH-3, and at OH-4, a relatively low concentration of 0.5 mg/L was detected. Nitrate concentrations for all locations were below the USEPA Maximum Contaminant Level (MCL) of 10 mg/L. Concentrations of nitrate below the MCL may allow for some flexibility in treatment requirements.

7.0 INFORMATION FROM GTA'S PRELIMINARY GEOTECHNICAL EXPLORATION

GTA performed a preliminary geotechnical exploration of the site, the results of which are summarized in GTA's *Report of Preliminary Geotechnical Exploration*, dated August 2016 (GTA, 2016). The exploration included the drilling of 40 soil borings, the excavation of 22 test pits and the performance of 13 infiltrometer tests. In agreement with the published geology, the test borings and test pits typically encountered surficial topsoil underlain by residual soils consistent with the Wissahickon Formation throughout the maximum depths explored. Below the topsoil and/or existing fill, the preliminary borings and test pits encountered fine-grained residual soils visually classified as silts and clays with lesser percentages of sand and rock fragments to depths of approximately 2 to 9½ feet blow existing grades. Underlying the fine-grained soils, the borings and test pits typically encountered granular residual soils visually classified as silty sand with varying amounts of rock fragments, generally transitioning into highly weathered rock. At several locations the drill rig was able to auger through the weathered rock. Auger refusal was not encountered to the explored depths. Highly weathered rock was also identified at some test pit locations at depths of approximately 7 to 10½ feet below ground surface.

Uncorrected SPT N-values for the encountered surficial fine-grained soils ranged from 2 to 14 blows per foot (bpf), averaging 6 bpf, indicating these soils are generally medium stiff. The uncorrected N-Values for the granular materials ranged from 4 to 50, averaging 16, which indicates the soils were generally medium dense. The silty sands generally transformed into highly weathered rock materials with uncorrected N-values of 50 or more blows per increment. Hard augering and excavation difficulties were also experienced in the highly weathered rock at depths ranging from about 5 to 13 feet below existing grades and as indicated on the logs in GTA (2016).

Groundwater was observed at 11 of the exploration locations at depths ranging from about 4.4 to 12.9 feet below the ground surface, corresponding to elevations ranging from approximately EL 302 to 337. The remaining test locations were dry to their cave-in or termination depths.

Groundwater levels were recorded during the exploration and again prior to backfilling the exploration holes. Most of the test borings were left open to collect 24-hour groundwater measurements; however, test borings conducted within the horse pastures and the test pits were backfilled upon completion for safety considerations. The observed water levels in the higher areas of the site are likely perched water trapped in sandy lenses over dense weathered rock. Water levels encountered in the exploration locations in the low lying areas are considered to be the seasonal water table. It should be noted that fluctuations of ground water levels of several feet typically occur seasonally with variations in precipitation and runoff. During the wet season of the year (late winter/early spring) groundwater or "perched" water conditions can develop locally within existing granular soils above the less permeable layers such as the very dense weathered rock and/or bedrock surface. Refer to the GTA (2016) for additional information.

Thirteen proposed stormwater management (SWM) facility locations were evaluated for infiltration potential of the underlying soils. Single-ring infiltrometer tests were performed within holes offset from Test Pits TP-1 through TP-13. The test depths were established to maintain a minimum of 3 feet of separation between the test elevations and hydraulically limiting zones.

The testing consisted of seating an open-bottom 12-inch diameter casing approximately 4 inches into the hand-trimmed subgrade soils. The holes were then pre-soaked, and water level measurements were taken with time until a steady state condition was observed. The tests were conducted for approximately 2 hours, and the unfactored steady-state values recorded over the last 1-hour time period were about 1 to 2 inches per hour (in/hr) for 8 of the locations, 4 in/hr for one location, 0.5 in/hr for 2 locations and no discernable movement of water level for 2 locations. It should be noted that infiltration rates can vary widely with variations in soil texture and gradation. See GTA (2016) for more information including test locations.

8.0 GROUNDWATER MOUNDING ANALYSIS

A groundwater mounding analysis (GMA) for the proposed wastewater flows at the site was performed by simulating groundwater flow and the potential mounding effects due to introduction of the proposed flows to the water table. As previously mentioned, the proposed

wastewater flows for the site are estimated at approximately 80,750 gpd (317 residential units) for the proposed development, up to 100,750 gpd (if 397 units were proposed). The model construction details and results of the GMA are summarized herein.

8.1 Groundwater Flow Model

The mounding analysis was performed by utilizing the MODFLOW program, developed by M. McDonald and A. Harbaugh, and incorporated into Visual MODFLOW, Version 4.1 by Waterloo Hydrogeologic, Inc. A MODFLOW model of the site, with grid dimensions of 6,000 by 4,000 feet, and 50- to 100-foot grid spacing, was constructed. Two layers were incorporated into the model to represent the unconsolidated overburden and upper portion of the underlying crystalline rock. A saturated thickness of approximately 40 feet was assumed in the model for the overburden (Layer 1) and the upper approximate 150 feet of the underlying rock was simulated as Layer 2. Model parameters included K-values of approximately 0.75 ft/day and 0.55 ft/day input for Layer1 and 2, respectively.

No-flow boundaries were assigned to the north to represent an apparent groundwater flow divide associated with a topographic divide, and the drain package was used to simulate Radley Run to the west and its tributaries that flank the evaluated area to the north and south. River segments were assigned elevations based on the USGS Westchester Topographic Quadrangle (USGS, 2016). An initial recharge value of 0.0019 ft/day (USGS WRI 93-4055) was specified for the entirety of the model, based on approximately 20 percent of precipitation (40 inches per year) recharging the groundwater table.

The largest two of the four proposed disposal areas indicated on the Site Plan are separated by streams (hydraulic barriers) and over 3,400 feet of distance; no hydraulic communication between these two disposal areas when is anticipated. In like manner, the remaining two smaller disposal areas indicated on the Site Plan are also isolated. In order to provide a conservative evaluation of mounding potential in any one of these four disposal areas, the largest area with the highest potential inflows was selected for simulation, i.e., the evaluated area at the northwest portion of the site, where based on area proportionality about 50% of the total flows associated with the 317 and 397 unit scenarios may be directed. Thus, about 40,000

and 50,000 gpd of the respective total 80,750 (317 unit) and 100,750 (397 unit) gpd flows were input to the simulated, evaluated area at the northwestern portion of the site. Groundwater mounding in the other three proposed disposal areas is expected to be lower due to lower flows; therefore inflows to these other areas were not simulated.

8.2 Model Runs and GMA Results

A steady state simulation was performed without the simulated wastewater influx in order to obtain a set of initial heads for the transient simulation. Transient simulations were then performed, incorporating the flows associated with 317 and 397 unit scenarios (see Section 8.1) over a 10-year stress period. The simulated wastewater flows were evenly distributed over the disposal area and added to the applicable natural recharge rate for each area. The transient mound-height estimation maps are attached to this Report in *Appendix E*.

Based on the GMA results, the simulated 10-year, maximum groundwater mound heights beneath the proposed disposal area are approximately 10 and 12 feet for the respective 317 and 397 unit scenarios, tapering to less than two feet toward the unnamed stream tributaries. Generally, GTA understands that an approximate 2 to 4 foot treatment zone is required to be maintained below the wastewater disposal system, depending upon design limitations and regulatory evaluation. Observed groundwater levels in the evaluated area ranged from about 4 ft bgs at OH-2 within about 100 feet of the stream to about 16 ft bgs about 400 feet upslope of the stream at OH-1 (see the Test Pit and Observation Hole Location Plan in *Appendix A* for surface elevations). Location OH-1, with the observed groundwater depth of about 16 ft bgs is the nearest Observation Hole to the disposal area proposed at the northwestern portion of the site. It appears based on the results of this evaluation, including this mounding analysis, that the required treatment zone beneath the system can be maintained for areas of relatively high topographic elevation with groundwater level depths such as observed at Location OH-1. Considering the potential for seasonal groundwater levels to rise several feet from the levels observed, a groundwater mound of similar height and extent to that simulated for this preliminary evaluation may impinge on a required 4-foot treatment zone for a drip irrigation system in a relatively low-lying area, e.g., relatively near to the stream adjacent to the evaluated area.

9.0 CONCLUSIONS AND RECOMMENDATIONS

Based upon the results of this preliminary evaluation, it is our opinion that on-site wastewater disposal of the proposed flows is feasible for implementation at the site; additional soil and hydrogeologic evaluation will be necessary to evaluate the required size and configuration of the initial system, and the required area for initial system accommodation. Based on the results of our preliminary evaluation (see additional conclusion information in the following paragraphs), it appears that an area with suitable subsurface conditions totaling approximately 25.5 acres –the combined acreage which is shown on the proposed Site Plan - would be sufficient to accommodate the proposed flows via a drip irrigation system. It is again noted that with the exception of one location in a drainage swale at the central portion of the approximate 32-acre evaluated area, the preliminary wastewater exploration/testing locations were either on the margins or outside of the proposed evaluated area due to instructions to avoid crop damage.

It is noted that there are many PADEP design and system siting requirements for drip irrigation systems which may influence the size and practicable implementation of the systems. Based on discussions with PADEP personnel, the PADEP does not require a replacement area for a large system. However PADEP personnel indicated that through the planning process a local municipality or controlling authority, as applicable, may require additional area for system replacement/repair to be established at a site.

Based on the test pits excavated for this evaluation, the observed depths to limiting conditions such as groundwater or rock and the drainage characteristics (soils appeared generally to be well drained) appeared to be generally favorable for wastewater disposal. Infiltration/percolation rates were variable, with generally suitable rates observed at two locations at multiple depths, and relatively very slow rates observed at a third tested location. For GTA's (2016) preliminary geotechnical evaluation, 9 of 13 infiltration test rates resulted in infiltration rates that appear generally favorable for wastewater disposal, while four of the results appear marginal to unsuitable.

The residual soils appear to be relatively deep at the locations of the soil borings, with borings ranging in depth from about 33 to 44 ft bgs; groundwater depths at the borings ranged from about 4 to 16 ft bgs. It is noted that topographically higher portions of the evaluated area, such as the topographic knob at the central portion, may be associated with relatively shallow rock. Groundwater levels may rise by several feet seasonally relative to depths observed for this preliminary evaluation.

The residual soils/highly weathered rock at the site appears to be relatively dense and potentially relatively low in permeability, based on field observations for the four borings at/near the evaluated area, and the soil borings performed for the preliminary geotechnical evaluation at the site (GTA, 2016). Hydraulic testing results for the preliminary wastewater evaluation within three of the four tested soil borings resulted in relatively low K-values, but generally within the range of residual soil K-values in GTA's experience for the Wissahicken. One of the tested locations was associated with anomalously slow water level response to testing, and potentially a relatively low K-value. It is possible that this location from a hydraulics testing standpoint, was adversely influenced by borehole smearing/skin effects during the drilling process, or that the materials at that location are relatively dense and of low permeability. Hydraulic test results were variable.

The preliminary groundwater mounding analysis for this evaluation indicated potential groundwater mound heights, after 10 years of continuous operation at the proposed flow rates, of up to 10 (317 units) to 12 (397 units) feet at the central portion of the simulated system, tapering toward the margins. Depending on the configuration of the groundwater table in the vicinity of a proposed disposal area a groundwater mound of similar height and extent to that simulated for this preliminary evaluation may impinge on the required treatment zone beneath a shallow system such as a drip irrigation system. This potentially would result in the necessity of a reduction of flows, or reconfiguration/splitting of system flows. The splitting of flows such that they are directed to hydraulically discrete portions of the site, separated by relatively great distances, as is indicated on the Site Plan should substantially reduce groundwater mounding potential relative to a system where all wastewater flows for the site are concentrated into one area. Systems installed such that

they straddle topographic/groundwater divides in applicable areas can also reduce the potential for groundwater mounding.

Depending upon the type of system that is selected for implementation for the site, e.g., drip irrigation, spray irrigation or subsurface bed type systems, the testing requirements, area requirements, storage requirements etc., will vary. For example, a spray irrigation system may require more land than other types of systems for both the application area and for storage during times of the year associated with low temperatures. However, mounding analysis requirements may be relaxed for spray systems due to PADEP's recognition that a large fraction of applied waste water evapo-transpires, and never reaches the water table.

The following recommendations are included with respect to pursuit of a large on-site wastewater disposal system for the site:

- Confirm/refine anticipated water usage/wastewater flows.
- Perform additional soils and hydrogeologic evaluation of area(s) proposed for wastewater disposal.
- Considering land availability, practical site constraints and soil/hydrogeologic conditions, select a system type for proposed implementation at the site.
- Engage the PADEP and other applicable agencies/governmental entities to review the proposal and provide feedback on system configuration, proposed flows, potential requirements such as replacement area, etc.
- The system should be configured such that it occupies topographically relatively high areas that are suitable, and straddles topographic divides where applicable. The system should be configured to avoid relatively low permeability and/or shallow rock/groundwater areas as applicable.

10.0 LIMITATIONS

This report, including all supporting test boring, test pit logs, field data, field notes, laboratory test data, calculations, estimates, and other documents prepared by GTA in connection with this project, has been prepared for the exclusive use of Toll Brothers pursuant to the agreement between GTA and Toll Brothers, Inc., and in accordance with generally accepted soil evaluation practice. No warranty, express or implied, is given herein. Use and reproduction of this report by any other person without the expressed written permission of GTA and Toll Brothers, Inc. is unauthorized and such use is at the sole risk of the user.

The analysis and recommendations contained in this report are based on assumed design wastewater flows of 250 gpd per EDU/residential unit, and the data obtained from limited observation and testing of the encountered materials, from locations that were generally outside of the evaluated disposal areas. Thus the results, conclusions and recommendations provided herein must be considered preliminary until additional exploration and testing is performed within the proposed disposal area(s). Test borings and test pits indicate soil conditions only at specific locations and times and only to the depths penetrated. They do not necessarily reflect strata variations that may exist between the test pit locations. Consequently, the analysis and recommendations must be considered preliminary until the subsurface conditions can be verified by direct observation at the time of construction. If variations in subsurface conditions from those described are noted during construction, recommendations in this report may need to be re-evaluated.

In the event that any changes in the nature, design, or location of the facilities or lots are planned, the conclusions and recommendations contained in this report should not be considered valid unless the changes are reviewed and conclusions of this report are verified in writing. GTA is not responsible for any claims, damages, or liability associated with interpretation of subsurface data or re-use of the subsurface data or engineering analysis without the expressed written authorization of GTA.

The scope of our services for this preliminary evaluation did not include any environmental assessment or investigation for the presence or absence of wetlands, or hazardous or toxic materials in the soil, surface water, groundwater or air, on or below or around this site. Any statements in this report or on the logs regarding odors or unusual or suspicious items or conditions observed are strictly for the information of our Client.

This Report and the attachments are instruments of service. The subject matter of this report is limited to the facts and matters stated herein. Absence of a reference to any other conditions or subject matter shall not be construed by the reader to imply approval by the writer.

31161348 **GEO-TECHNOLOGY ASSOCIATES, INC.**

APPENDIX A

SITE LOCATION MAP

TEST PIT AND OBSERVATION HOLE LOCATION PLAN

SITE PLAN – OVERALL OPEN SPACE PLAN

N

Notes: (1) Layout was obtained from a Google Earth Imagery, dated October 7, 2011.

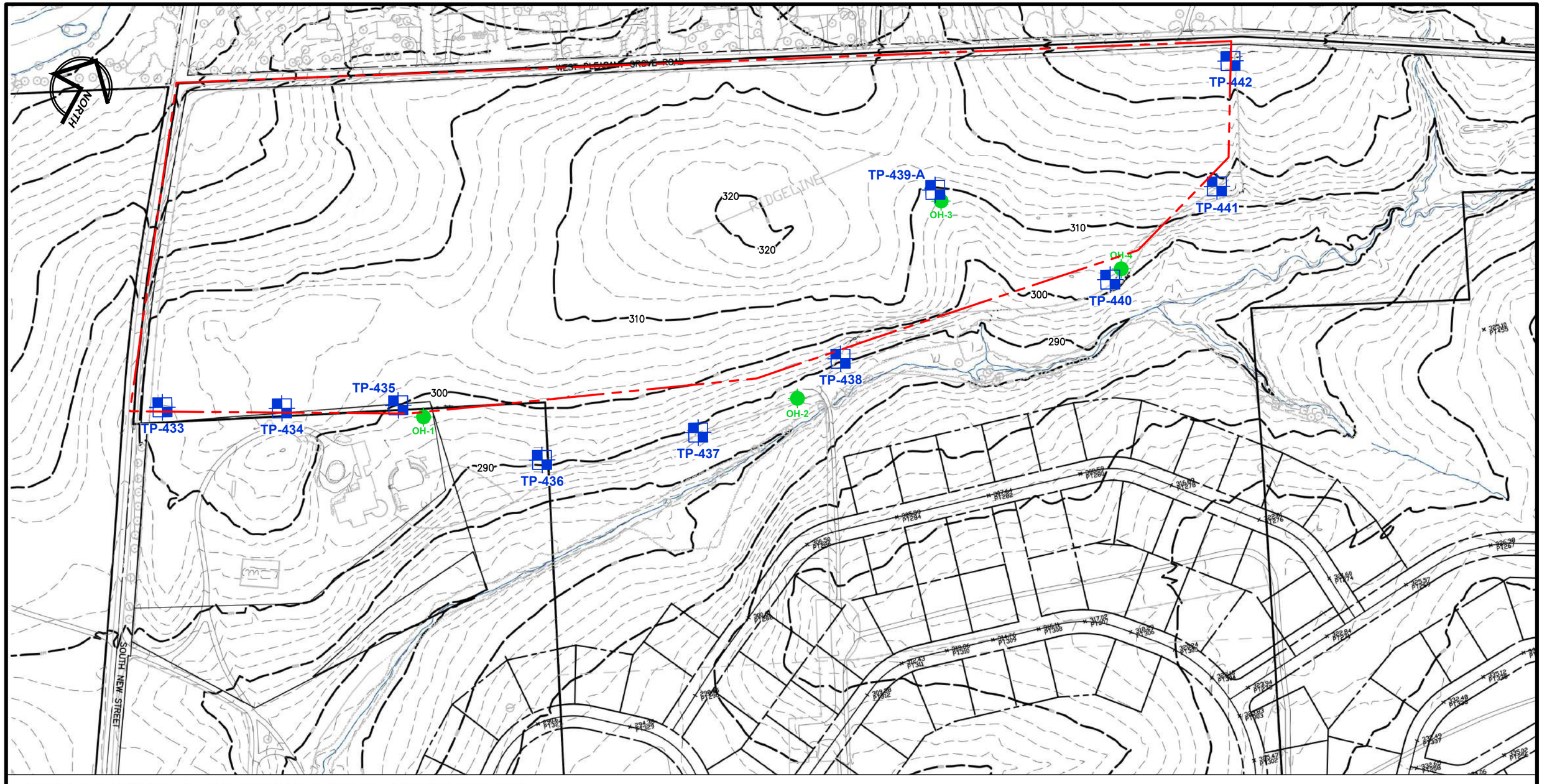
GEO-TECHNOLOGY ASSOCIATES, INC.
Geotechnical and Environmental Consultants
18 Boulden Circle, Suite 36
New Castle, Delaware 19720
(302) 326-2100
Fax (302) 326-2399

SITE LOCATION MAP

CREBILLY FARM

WESTTOWN TOWNSHIP
CHESTER COUNTY, PENNSYLVANIA

SCALE	DATE	DRAWN BY	REVIEW BY	JOB NO.	FIGURE:
NTS	AUG 2016	GOOGLE	CMR	161348	1



SOURCE: PLAN IS ADAPTED FROM A PLAN PRODUCED BY ESE CONSULTANTS, INC. AND EMAILED TO GTA ON AUGUST 9, 2016

LEGEND

- EVALUATED AREA
- TP-436 — APPROXIMATE TEST PIT LOCATION
- OH-2 — APPROXIMATE OBSERVATION HOLE LOCATION

0' 50' 100' 200' 400'

SCALE: 1"=200'

GEO-TECHNOLOGY ASSOCIATES, INC.
GEOTECHNICAL AND ENVIRONMENTAL CONSULTANTS
3445-A BOX HILL CORPORATE CENTER DRIVE
ABINGDON, MARYLAND 21009
410-515-9446
FAX: 410-515-4895
WWW.GTAENG.COM

TEST PIT AND OBSERVATION HOLE LOCATION PLAN
CREBILLY FARM
Chester County, Pennsylvania

JOB NO.	SCALE	DATE	DRAWN BY	REVIEW BY	FIGURE:
31161348	1"=200'	SEPTEMBER 2016	GMM	PSS	

G:\GTA\31161348 - Crebilly Farm\plot\31161348-Site Plan.dwg

OPEN SPACE DATA:
CURRENT ZONING: A/C AGRICULTURAL CLUSTER RESIDENTIAL DISTRICT & R-1
PROPOSED: FLEXIBLE DEVELOPMENT OPTION

SITE AREA: 322.36 ACRES
ADJUSTED TRACT ACREAGE: 290.20 ACRES

REQUIRED OPEN SPACE: 60% (193.41 AC)

PROPOSED OPEN SPACE:
61% (197.15 AC)

PROPOSED NATURAL AREAS
93 ACRES

INFILTRATION AREAS
8 ACRES

PROPOSED EFFLUENT DISPOSAL AREA
25.5 ACRES

ALL OTHER AREAS SHALL BE CLASSIFIED AS LAWN

HORIZONTAL GRAPHIC SCALE
200 0 200 400
(IN FEET)
1" = 200 FEET

ESE Consultants, Inc.
250 Gibraltar Road, Suite 2E
Horsham, PA 19044
Tel: 215-914-2050
Fax: 215-293-5488

ESE Land Planning Engineering Land Surveying

REV.	DATE	DESCRIPTION

DRAWN

OVERALL OPEN SPACE PLAN

CREBILLY FARM
WESTTOWN TOWNSHIP, CHESTER COUNTY, PENNSYLVANIA

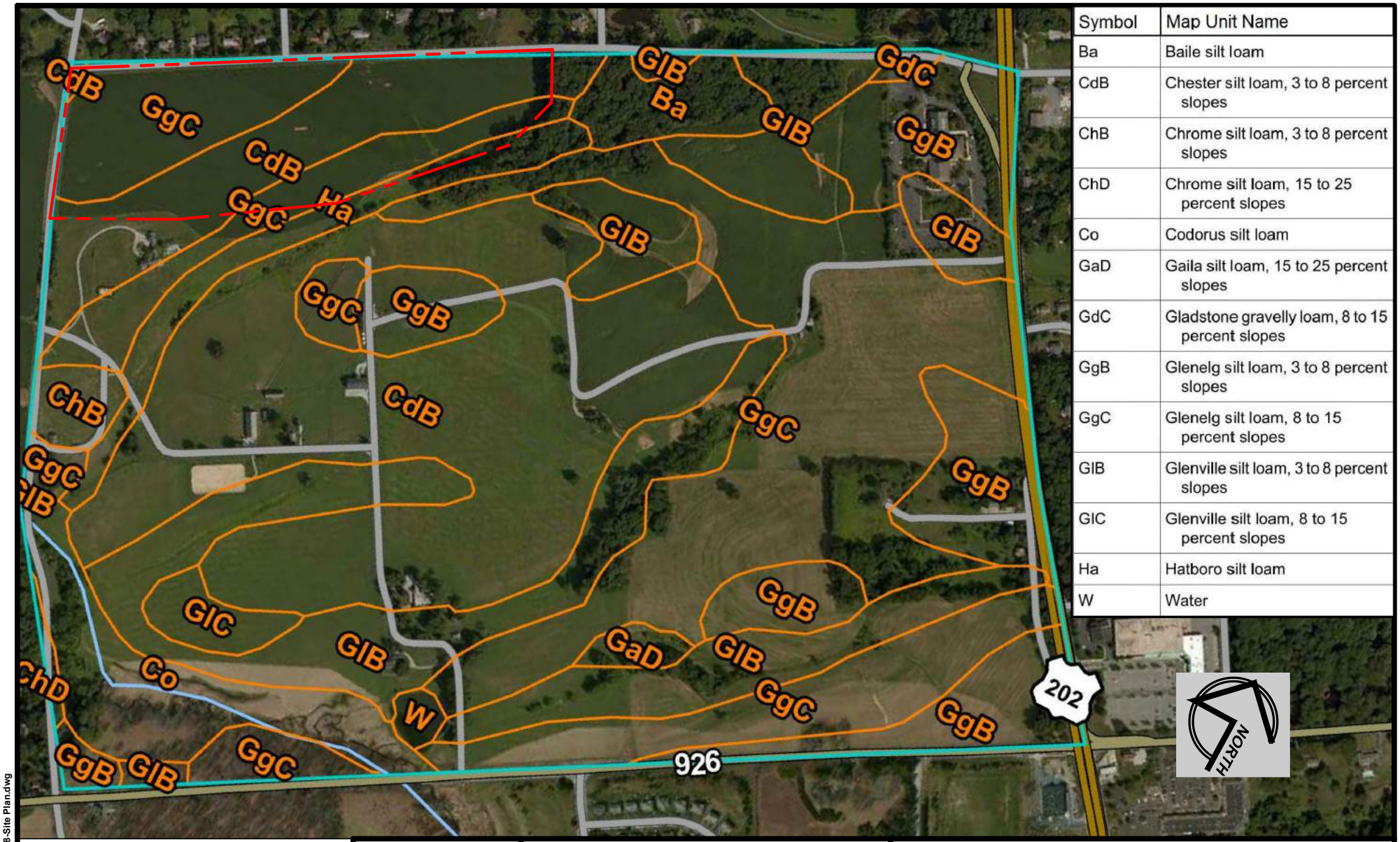
DATE: 10-7-16	SCALE: 1" = 200'
DESIGN: EES	DRAWN: EES
JOB NO.: 4050	FILE NAME: 4050-S-OPENSPACE
REF. NO.: SD04.02	
SHEET NO.: 4 OF 45	

ESE.CTB
N:\PROJECTS\PENNSYLVANIA\4050-CREBILLY FARM\DRAWINGS\4050-S-OPENSPACE.DWG--eskrygal--10/17/2016 1:30 PM

APPENDIX B

WEB SOIL SURVEY – SOILS MAP

DELMARVA ENVIRONMENTAL— PRELIMINARY SOIL INVESTIGATION REPORT



Symbol	Map Unit Name
Ba	Baile silt loam
CdB	Chester silt loam, 3 to 8 percent slopes
ChB	Chrome silt loam, 3 to 8 percent slopes
ChD	Chrome silt loam, 15 to 25 percent slopes
Co	Codorus silt loam
GaD	Gaila silt loam, 15 to 25 percent slopes
GdC	Gladstone gravelly loam, 8 to 15 percent slopes
GgB	Glenelg silt loam, 3 to 8 percent slopes
GgC	Glenelg silt loam, 8 to 15 percent slopes
GlB	Glenville silt loam, 3 to 8 percent slopes
GlC	Glenville silt loam, 8 to 15 percent slopes
Ha	Hatboro silt loam
W	Water

SOURCE: PLAN IS ADAPTED FROM WEB SOIL SURVEY SOIL INFORMATION, PROVIDED BY THE U.S. DEPARTMENT OF AGRICULTURE

LEGEND

EVALUATED AREA

GEO-TECHNOLOGY ASSOCIATES, INC.
GEOTECHNICAL AND ENVIRONMENTAL CONSULTANTS
3445-A BOX HILL CORPORATE CENTER DRIVE
ABINGDON, MARYLAND 21009
410-515-9446
FAX: 410-515-4895
WWW.MRAGTA.COM

WEB SOIL SURVEY - SOILS MAP

CREBILLY FARM

Chester County, Pennsylvania

JOB NO.	31161348	SCALE:	NTS	DATE:	SEPTEMBER 2016	DRAWN BY:	GMM	REVIEW BY:	PSS	FIGURE:

G:\GTA\31161348 - Crebilly Farm\plot\31161348-Site Plan.dwg

DELMARVA ENVIRONMENTAL, Inc.

Soil, Water, And Environmental Consulting

PRELIMINARY SOIL INVESTIGATION

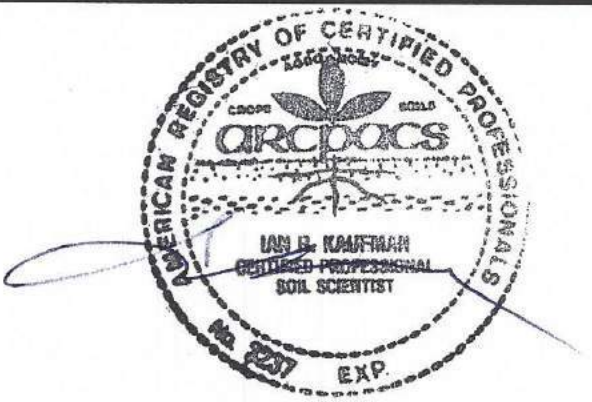
For

CREBILLY FARM

CHESTER COUNTY, PENNSYLVANIA

JULY 2016

For:
Geo-Technology Associates, Inc. (GTA)
Paul Scott, P.G.
3445-A Box Hill Corporate Center Drive
Abingdon, MD 21009



Certified Professional Soil Scientist/Soil Classifier

PO Box 117
Dagsboro, DE 19939

Ian R. Kaufman
e-mail IRKaufman@mediacombb.net

Office (302) 732-9858
Mobile (302) 542-3356

PRELIMINARY SOIL INVESTIGATION REPORT
for
CREBILLY FARM
Chester County, Pennsylvania
JULY 2016

INTRODUCTION:

Delmarva Environmental, Inc. has performed a Preliminary Soil Investigation for the above referenced property located on the north side of East Street Road (Route 926) between South New Road and Old Wilmington Pike (Route 202) in Chester County, Pennsylvania. A limited area was evaluated for a proposed community on-site wastewater treatment and disposal system to serve a proposed development project for residential use. A Concept Plan of the project "Crebilly Farm; Concept Plan B" indicated a proposed 347 homes on approximately 322 acres. Approximately 30 acres in the northwest corner of the site was evaluated. The evaluation was hindered by that area being actively farmed with full season soybeans and only the margin of that area was available for observations.

Under Pennsylvania Department of Environmental (PADEP) Regulations and Policies there are three basic methods of community wastewater disposal. They are Spray Irrigation, Drip Irrigation, and Incised Beds or Trenches. For Spray Irrigation and Drip Irrigation a limiting zone such as depth to a seasonal high water table or rock must be at least 40 inches below the existing ground surface. This can be reduced to 20 inches, with design limitations, for Spray Irrigation and Drip Irrigation. For Incised Beds the limiting zone must be 72 to 84 inches below ground surface or deeper. Limiting zones can be a seasonal high groundwater level, a seasonal perched groundwater level, depth to bedrock, depth to rock with greater than 50 percent coarse fragments, slowly permeable material, and possibly other encumbrances for wastewater disposal. This limitations for soils do not include other potential limitations associated with buffer requirements and results of hydrological testing such as mounding analysis.

The Web Soil Survey ((NRCS) Natural Resource Conservation Service: United State Department of Agriculture) of the evaluated area indicates that the evaluated area is potentially underlain by well drained Glenelg silt loam, 8 to 15 percent slopes (GgC) and well drained Chester silt loam, 3 to 8 percent slopes (CdB) with poorly drained Hatboro silt loam (Ha) at the lowest elevations associated with a stream just outside of the evaluated area. GgC soils are described as having a water table deeper than 80 inches and a paralithic contact at 72 to 120 inches. CdB soils are described as having a water table and paralithic contact deeper than 80 inches. The capacity of the most limiting layer to transmit water (Ksat) in these soils is indicated to be 0.57 to 2.00 inches per hour.

The property as a whole is dominated by GgC and CdB soils. Moderately well drained Glenville silt loam, 3 to 18 percent slopes (GlB) with a slowly permeable Fragipan is a significant mapped soil unit in the general area. Glenelg silt loam, 3 to 8 percent slopes (GgB) is also a significant soil mapping unit in the general area. Other soils mapped on the property are minor inclusions and include poorly drained Baile silt loam (Ba); moderately well drained Codorus silt loam (Co); moderately well drained Glenville silt loam, 8 to 15 percent slopes (GlC); well drained Chrome silt loam, 3 to 8 percent slopes (ChB) and 15 to 25 percent slopes (ChD); and well drained Gaila silt loam 15 to 25 percent slopes (GaD).

Certified Professional Soil Scientist/Soil Classifier
Ian R. Kaufman
PO Box 117
Dagsboro, DE 19939
e-mail IRKaufman@mediacombb.net
Office (302) 732-9858
Mobile (302) 542-3356

PROCEDURES:

Ten locations around the soybean field were located for conducting test pits to a depth of approximately 84 inches below ground surface. An extendadahoe backhoe was utilized to excavate the test pits. Test pits were described by an ARCPACS Certified Professional Soil Scientist/Soil Classifier utilizing the general guidance of the Field Book for Describing and Sampling Soils Version 3.0 (NRCS, 2012). Several test pits were excavated to the maximum depth of the backhoe to observe depth to rock or groundwater if encountered. Three sets of preliminary infiltration testing was conducted in the upper and lower portion of the soil profile at those locations to estimate potential limiting infiltration rates for wastewater disposal.

FINDINGS:

TABLE 1: Summary of Selected Observations from Test Pit Descriptions

Test Pit	Depth to Estimated Seasonal High Water Table (inches below ground surface (bgs))	Depth to Lithic or Paralithic Contact (inches bgs)	Depth to Observed Groundwater (inches bgs)	Soil Classification
433	>84	~57	>84	Typic Hapludult
434	>84	~128	>128	Typic Hapludult
435	>84	~65	>84	Typic Hapludult
436	>84	~36	>84	Typic Dystrudept
437	~34	~62	>84	Oxyaquic Hapludult
438	~40	>84	~144	Typic Hapludult
439-A	>84	~20	>84	Typic Hapludult
440	~40	>84	>84	Typic Hapludult
441	>84	>84	>164	Typic Hapludult
442	>84	~54	>84	Typic Hapludult

Table 1 above is a summary of the observations from the test pits. Groundwater does not appear to be a major limitation to siting a large wastewater disposal facility. Drainage appears to follow the contour with the most moderately well drained observations being at the lowest relative elevations. Depth to lithic or paralithic contact may be a more limiting factor. There is a great deal of variability observed in the degree of weathering at the lowest strata observed. Test Pit 436 was the most unweathered saprolitic material at approximately 36 inches below ground surface with more than 50 percent coarse fragments that were saprolitic but somewhat intact. Much of the paralithic material observed was completely weathered and no remnant of the rock material was left. In Test Pit 439-A, which is located in a broad draw between two knobs was observed to have large cobbles of weathered quartzite material not observed in other pits.

In general soil conditions were very similar with an abrupt Ap (plowzone) Horizon, immediately underlain by a distinct argillic Bt (increased clay) Horizon, underlain by a zone of transition of weathered saprolitic material and is consistent with the soil mapping by the Web Soil Survey.

Certified Professional Soil Scientist/Soil Classifier
Ian R. Kaufman
PO Box 117
Dagsboro, DE 19939
e-mail IRKaufman@mediacombb.net
Office (302) 732-9858
Mobile (302) 542-3356

The main limiting factor for a large community wastewater facility is likely to be related to infiltration rates. Preliminary infiltration rates were conducted at two depths at three locations. Test depths were selected to represent the Bt Horizon and the Saprolitic subsoils as potentially representative of the most hydraulically restrictive soil material. Tests were not necessarily carried to equilibrium especially at Test Pit 433 and additional percolation testing was preliminarily conducted at Test Pits 435 and 441 to evaluate the variability of the saprolitic material deep in the soils. Findings are summarized in Table 2 below.

The numbers below should be utilized to estimate loading rates and are just one factor that goes into the design considerations. Loading rates for Spray Disposal uses one set of criteria and the subsurface distribution utilizes another set of criteria. The criteria is set forth in the PADEP Manual for Land Treatment of Wastewater.

Table 2: Preliminary Infiltration Test Results

Test Pit & Type of Test	Depth of Test Inches Below Ground Surface	Minutes Per Inch	Inches Per Hour
443 Single Ring	20	43.6	1.4
443 Single Ring	48	40.0	1.5
435 Single Ring	18	240	0.25
435 Single Ring	43	160	0.38
435 Percolation Test	43	10.7	5.6
441 Single Ring	20	8.6	7.0
441 Single Ring	48	53	1.1
441 Percolation Test	48	18.7	3.2

Based on 347 proposed homes and he above referenced manual the design flows would be 400 gallons per day per dwelling or 138,800 gallons per day not including additional wastewater needs such as a community center or banquet hall. Based on the acreage available and the uniformity of the soil mapping units it is Delmarva Environmental's opinion that this site has the potential to support a large community wastewater disposal system. Additional testing will need to be conducted to determine the variability and limitations of the site. Hydrogeological testing such as mounding analysis is also required and could be potentially more limiting than the loading rates based on soil limitations alone. Consultation with the PADEP including a Planning Meeting is required as part of the process to further evaluate if the area will meet the requirements and the information provided in this Report should be helpful in planning further investigations.

Certified Professional Soil Scientist/Soil Classifier
Ian R. Kaufman
PO Box 117
Dagsboro, DE 19939
e-mail IRKaufman@mediacombb.net
Office (302) 732-9858
Mobile (302) 542-3356

LIMITATIONS:

This Report represents the technical opinion of Delmarva Environmental, Inc. based on the information presented in this Report. This is not a permit for any regulated activities. Conditions between observation points and below the depth of observation are unknown and additional testing, observations, and evaluations could significantly alter the conclusions presented in this Report.

ATTACHMENTS:

1. Web Soil Survey Soil Mapping and Soil Mapping Unit Descriptions (9 pages)
2. Soil Profile Descriptions (10 pages)
3. Infiltration Testing Data Sheets (3 pages)

Certified Professional Soil Scientist/Soil Classifier
Ian R. Kaufman
PO Box 117
Dagsboro, DE 19939
e-mail IRKaufman@mediacombb.net
Office (302) 732-9858
Mobile (302) 542-3356

Soil Map—Chester County, Pennsylvania
(Crebilly)

Map Scale: 1:14,000 if printed on A landscape (11" x 8.5") sheet.

N

Meters: 0 200 400 800 1200

Feet: 0 500 1000 2000 3000

Map projection: Web Mercator Corner coordinates: WGS84 Edge tics: UTM Zone 18N WGS84

MAP LEGEND

Area of Interest (AOI)
- Area of Interest (AOI)

Soils
- Soil Map Unit Polygons
- Soil Map Unit Lines
- Soil Map Unit Points

Special Point Features
- Blowout
- Borrow Pit
- Clay Spot
- Closed Depression
- Gravel Pit
- Gravelly Spot
- Landfill
- Lava Flow
- Marsh or swamp
- Mine or Quarry
- Miscellaneous Water
- Perennial Water
- Rock Outcrop
- Saline Spot
- Sandy Spot
- Severely Eroded Spot
- Sinkhole
- Slide or Slip
- Sodic Spot
- Spoil Area
- Stony Spot
- Very Stony Spot
- Wet Spot
- Other
- Special Line Features

Water Features
- Streams and Canals

Transportation
- Rails
- Interstate Highways
- US Routes
- Major Roads
- Local Roads

Background
- Aerial Photography

MAP INFORMATION

The soil surveys that comprise your AOI were mapped at 1:24,000.

Please rely on the bar scale on each map sheet for map measurements.

Source of Map: Natural Resources Conservation Service
Web Soil Survey URL: http://websoilsurvey.nrcs.usda.gov
Coordinate System: Web Mercator (EPSG:3857)

Maps from the Web Soil Survey are based on the Web Mercator projection, which preserves direction and shape but distorts distance and area. A projection that preserves area, such as the Albers equal-area conic projection, should be used if more accurate calculations of distance or area are required.

This product is generated from the USDA-NRCS certified data as of the version date(s) listed below.

Soil Survey Area: Chester County, Pennsylvania
Survey Area Data: Version 7, Nov 16, 2015

Soil map units are labeled (as space allows) for map scales 1:50,000 or larger.

Date(s) aerial images were photographed: Mar 19, 2011—Sep 22, 2014

The orthophoto or other base map on which the soil lines were compiled and digitized probably differs from the background imagery displayed on these maps. As a result, some minor shifting of map unit boundaries may be evident.

Drainage Class

Drainage Class— Summary by Map Unit — Chester County, Pennsylvania (PA029)				
Map unit symbol	Map unit name	Rating	Acres in AOI	Percent of AOI
Ba	Baile silt loam	Poorly drained	6.9	2.2%
CdB	Chester silt loam, 3 to 8 percent slopes	Well drained	94.3	30.5%
ChB	Chrome silt loam, 3 to 8 percent slopes	Well drained	2.3	0.8%
ChD	Chrome silt loam, 15 to 25 percent slopes	Well drained	0.3	0.1%
Co	Codorus silt loam	Moderately well drained	16.2	5.2%
GaD	Gaila silt loam, 15 to 25 percent slopes	Well drained	1.8	0.6%
GgB	Glenelg silt loam, 3 to 8 percent slopes	Well drained	24.0	7.8%
GgC	Glenelg silt loam, 8 to 15 percent slopes	Well drained	91.8	29.6%
GlB	Glenville silt loam, 3 to 8 percent slopes	Moderately well drained	58.2	18.8%
GlC	Glenville silt loam, 8 to 15 percent slopes	Moderately well drained	3.7	1.2%
Ha	Hatboro silt loam	Poorly drained	8.9	2.9%
W	Water		1.2	0.4%
Totals for Area of Interest			**309.6**	**100.0%**

Description

"Drainage class (natural)" refers to the frequency and duration of wet periods under conditions similar to those under which the soil formed. Alterations of the water regime by human activities, either through drainage or irrigation, are not a consideration unless they have significantly changed the morphology of the soil. Seven classes of natural soil drainage are recognized-excessively drained, somewhat excessively drained, well drained, moderately well drained, somewhat poorly drained, poorly drained, and very poorly drained. These classes are defined in the "Soil Survey Manual."

Rating Options

Aggregation Method: Dominant Condition

Component Percent Cutoff: *None Specified*

Tie-break Rule: Higher

Chester County, Pennsylvania

GgC—Glenelg silt loam, 8 to 15 percent slopes

Map Unit Setting

National map unit symbol: pjbk
Elevation: 200 to 2,000 feet
Mean annual precipitation: 40 to 55 inches
Mean annual air temperature: 45 to 61 degrees F
Frost-free period: 110 to 235 days
Farmland classification: Farmland of statewide importance

Map Unit Composition

Glenelg and similar soils: 90 percent
Minor components: 10 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Glenelg

Setting

Landform: Hillslopes
Landform position (two-dimensional): Shoulder, backslope
Landform position (three-dimensional): Side slope, nose slope
Down-slope shape: Linear, convex
Across-slope shape: Convex, linear
Parent material: Residuum weathered from mica schist

Typical profile

Ap - 0 to 8 inches: silt loam
Bt - 8 to 22 inches: silt loam
C - 22 to 60 inches: fine sandy loam

Properties and qualities

Slope: 8 to 15 percent
Depth to restrictive feature: 72 to 120 inches to paralithic bedrock
Natural drainage class: Well drained
Runoff class: Medium
Capacity of the most limiting layer to transmit water (Ksat): Moderately high to high (0.60 to 2.00 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Available water storage in profile: High (about 9.3 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 3e
Hydrologic Soil Group: B

Minor Components

Glenville

Percent of map unit: 10 percent
Landform: Hillslopes
Landform position (two-dimensional): Footslope, backslope
Landform position (three-dimensional): Side slope, head slope
Down-slope shape: Linear, concave
Across-slope shape: Concave, linear

Data Source Information

Soil Survey Area: Chester County, Pennsylvania
Survey Area Data: Version 7, Nov 16, 2015

Chester County, Pennsylvania

CdB—Chester silt loam, 3 to 8 percent slopes

Map Unit Setting

National map unit symbol: 2tt7y
Elevation: 10 to 1,170 feet
Mean annual precipitation: 40 to 55 inches
Mean annual air temperature: 48 to 57 degrees F
Frost-free period: 150 to 192 days
Farmland classification: All areas are prime farmland

Map Unit Composition

Chester and similar soils: 80 percent
Minor components: 20 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Chester

Setting

Landform: Hillslopes
Landform position (two-dimensional): Summit
Landform position (three-dimensional): Interfluve
Down-slope shape: Linear, convex
Across-slope shape: Linear, convex
Parent material: Residuum weathered from mica schist

Typical profile

Ap - 0 to 10 inches: silt loam
BE - 10 to 17 inches: silt loam
Bt1 - 17 to 22 inches: clay loam
Bt2 - 22 to 30 inches: clay loam
Bt3 - 30 to 38 inches: clay loam
Bt4 - 38 to 56 inches: loam
C - 56 to 92 inches: fine sandy loam

Properties and qualities

Slope: 3 to 8 percent
Depth to restrictive feature: More than 80 inches
Natural drainage class: Well drained
Capacity of the most limiting layer to transmit water (Ksat): Moderately high to high (0.57 to 1.98 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Available water storage in profile: High (about 9.9 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 2e
Hydrologic Soil Group: B

Minor Components

Glenville

Percent of map unit: 10 percent
Landform: Hillslopes
Landform position (two-dimensional): Footslope, toeslope
Landform position (three-dimensional): Head slope
Down-slope shape: Linear
Across-slope shape: Concave

Gladstone

Percent of map unit: 5 percent
Landform: Hillslopes
Landform position (two-dimensional): Summit, shoulder, backslope
Landform position (three-dimensional): Interfluve
Down-slope shape: Linear, convex
Across-slope shape: Convex, linear

Mt. airy

Percent of map unit: 5 percent
Landform: Hillslopes
Landform position (two-dimensional): Summit, shoulder
Landform position (three-dimensional): Nose slope, crest, side slope
Down-slope shape: Convex
Across-slope shape: Convex

Data Source Information

Soil Survey Area: Chester County, Pennsylvania
Survey Area Data: Version 7, Nov 16, 2015

Chester County, Pennsylvania

Ha—Hatboro silt loam

Map Unit Setting

National map unit symbol: 1lwqq
Elevation: 200 to 800 feet
Mean annual precipitation: 36 to 50 inches
Mean annual air temperature: 48 to 57 degrees F
Frost-free period: 140 to 200 days
Farmland classification: Not prime farmland

Map Unit Composition

Hatboro and similar soils: 95 percent
Minor components: 5 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Hatboro

Setting

Landform: Flood plains
Landform position (two-dimensional): Toeslope
Landform position (three-dimensional): Tread
Down-slope shape: Concave, linear
Across-slope shape: Concave, linear
Parent material: Alluvium derived from metamorphic and sedimentary rock

Typical profile

Ap - 0 to 9 inches: silt loam
Bg - 9 to 44 inches: silt loam
Cg - 44 to 56 inches: sandy clay loam
C - 56 to 70 inches: stratified gravelly sand to clay

Properties and qualities

Slope: 0 to 3 percent
Depth to restrictive feature: 60 to 99 inches to lithic bedrock
Natural drainage class: Poorly drained
Runoff class: Very high
Capacity of the most limiting layer to transmit water (Ksat): Moderately high to high (0.60 to 2.00 in/hr)
Depth to water table: About 0 to 6 inches
Frequency of flooding: Frequent
Frequency of ponding: None
Available water storage in profile: High (about 9.7 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 4w
Hydrologic Soil Group: B/D

Minor Components

Glenville

Percent of map unit: 5 percent
Landform: Hillslopes
Landform position (two-dimensional): Footslope, backslope
Landform position (three-dimensional): Side slope, head slope
Down-slope shape: Linear, concave
Across-slope shape: Concave, linear

Data Source Information

Soil Survey Area: Chester County, Pennsylvania
Survey Area Data: Version 7, Nov 16, 2015

DELMARVA ENVIRONMENTAL, Inc.
Soil, Water, And Environmental Consulting

SOIL PROFILE NOTES

Profile #: TEST PIT 433 **Job Number:** 16086

Date of Observation: 7/27/2016

Tax ID Number: —
Project Name: CREBILLY FARM
Location;

Slope: 2-5%
Relief: SHOULDER

Depth to Redoximorphic Features or other potential limiting factor: >84"
Estimated Permeability based on field estimates of soil textures: —
Free water at time of observation: >84"
Soil Classification: TYPIC HAPLUDULT

GPS Coordinates: N39.92000 °, W75.59606 °

Horizon	Depth (inches)		Moist Munsell Colors: Matrix	Redoximorphic Features (RMF)	Non-RMF & Mottles	RMF or Non-RMF Colors; Quantity/Size/Contrast	Field Estimated Soil Texture	Structure Grade/Size/Type	Consistence (moist)
Ap	0	10	10YR4/4			abrupt boundary	L	2MGR	FR
Bt	10	26	10YR5/6	gradual	10YR5/4 (worm channels)	C 3 F	L	2MSBK	FR
BC	26	32	10YR5/6	gradual	HIGHLY VERIGATED 2.5Y5/4	VERIGATED C 3 F	SL	1MSBK	FR
C	32	57	HIGHLY VERIGATED (STRATIFIED)				15-30% SL	COARSE FRAGMENTS 0 MA	FR
Cr	57	84	HIGHLY VERIGATED (CRATER)	Gradual			30% Coarse Fragments GRSL	0 MA	FR

Nomenclature and abbreviations are adapted from the *Field Book for Describing and Sampling Soils; Version 3.0* (NRCS, 2012)

Comments: • C HORIZON IS HIGHLY VERIGATED WEATHERED RESIDUAL MATERIAL

Ian R. Kaufman, CPSS/SC (ARCPACS #03237)
Delaware Class B & D License (#2175)
Virginia LAOSE (#1940001206)

Certified Professional Soil Scientist/Soil Classifier
Ian R. Kaufman
irkaufman@mediacombb.net

PO Box 117
Dagsboro, DE 19939

Office (302) 732-9858
Mobile (302) 542-3356

DELMARVA ENVIRONMENTAL, Inc.
Soil, Water, And Environmental Consulting

SOIL PROFILE NOTES

Profile #: Test Pit 434 **Job Number:** 16086

Date of Observation: 7/27/2016

Tax ID Number: —
Project Name: CREBILLY
Location;

Slope: 2-5%
Relief: LOCAL SUMMIT

Depth to Redoximorphic Features or other potential limiting factor: >84"
Estimated Permeability based on field estimates of soil textures: —
Free water at time of observation: >128"
Soil Classification: TYPIC HAPLUDULT

GPS Coordinates: N39.92015 °, W75.59525 °

Horizon	Depth (inches)		Moist Munsell Colors: Matrix	Redoximorphic Features (RMF)	Non-RMF & Mottles	RMF or Non-RMF Colors; Quantity/Size/Contrast	Field Estimated Soil Texture	Structure Grade/Size/Type	Consistence (moist)
Ap	0	10	10YR4/4			abrupt boundary	SL	2MGR	FR
Bt	10	22	10YR5/6			gradual	SL	2MSBK	FR
C1	22	54	2.5Y5/2 10YR5/6	LITHO-CHROMIC	2.5Y6/2	gradual	SL	0 MA	FR
C2	54	84	2.5Y5/2 2.5Y6/1	LITHO-CHROMIC	2.5Y6/6	C 2 D	SL	0 MA	VFR/FR

Nomenclature and abbreviations are adapted from the *Field Book for Describing and Sampling Soils; Version 3.0* (NRCS, 2012)

Comments:
- A FEW COARSE FRAGMENTS BUT MOSTLY COMPLETELY WEATHERED MATERIAL BELOW 54"
- DUG PIT TO LIMITS OF BACKHOE AFTER DESCRIBING TO 84"
- HARD DIGGING BELOW ~128"

Ian R. Kaufman, CPSS/SC (ARCPACS #03237)
Delaware Class B & D License (#2175)
Virginia LAOSE (#1940001206)

Certified Professional Soil Scientist/Soil Classifier
Ian R. Kaufman
irkaufman@mediacombb.net

PO Box 117
Dagsboro, DE 19939

Office (302) 732-9858
Mobile (302) 542-3356

DELMARVA ENVIRONMENTAL, Inc.
Soil, Water, And Environmental Consulting

SOIL PROFILE NOTES

Profile #: TEST PIT 435 **Job Number:** 16086

Date of Observation: 7/27/2016

Tax ID Number: —
Project Name: CREBILLY
Location; —

Slope: —
Relief: BACKSLOPE

Depth to Redoximorphic Features or other potential limiting factor: >84"
Estimated Permeability based on field estimates of soil textures: —
Free water at time of observation: >84"
Soil Classification: TYPIC HAPLUDULT

GPS Coordinates: N 39.93048°, W75.59447°

Horizon	Depth (inches)		Moist Munsell Colors: Matrix	Redoximorphic Features (RMF)	Non-RMF & Mottles	RMF or Non-RMF Colors; Quantity/Size/Contrast	Field Estimated Soil Texture	Structure Grade/Size/Type	Consistence (moist)
A	0	10	10YR4/4	—	—	—	SL	2MGR	FR
Bt	10	20	10YR5/6	—	WORM CHANNELS		SL	2MSBK	FR
BC	20	35	10YR5/4	—	WORM CHANNELS & WEATHERED ROCKS		SL	1MSBK	FR
C	35	65	10YR5/3 2.5Y5/1	LITHOCHROMIC	10YR5/4	C 3 D	SL	0 MA	FR
CSAP	65	84	2.5Y5/1	LITHOCHROMIC	HIGHLY MICACEOUS 10YR8/1	M 1 P	SL/LS	0 MA COMPETENT WEATHERED	VFR/FR

Nomenclature and abbreviations are adapted from the *Field Book for Describing and Sampling Soils; Version 3.0* (NRCS, 2012)

Comments:

Ian R. Kaufman, CPSS/SC (ARCPACS #03237)
Delaware Class B & D License (#2175)
Virginia LAOSE (#1940001206)

Certified Professional Soil Scientist/Soil Classifier
Ian R. Kaufman
irkaufman@mediacombb.net

PO Box 117
Dagsboro, DE 19939

Office (302) 732-9858
Mobile (302) 542-3356

DELMARVA ENVIRONMENTAL, Inc.
Soil, Water, And Environmental Consulting

SOIL PROFILE NOTES

Profile #: TEST PIT 436 **Job Number:** 16086

Date of Observation: 7/27/2016

Tax ID Number: —
Project Name: CREBILLY
Location; —

Slope: 5-15%
Relief: BACKSLOPE

Depth to Redoximorphic Features or other potential limiting factor: >84" (~36")
Estimated Permeability based on field estimates of soil textures: —
Free water at time of observation: >84"
Soil Classification: Typic Dystrudept

GPS Coordinates: N39.92058 °, W75.59334 °

Horizon	Depth (inches)		Moist Munsell Colors: Matrix	Redoximorphic Features (RMF)	Non-RMF & Mottles	RMF or Non-RMF Colors; Quantity/Size/Contrast	Field Estimated Soil Texture	Structure Grade/Size/Type	Consistence (moist)
Ap	0	10	10YR 4/4	—	—		15% coarse FRAGS SL	2 MGR	FR
Bw	10	36	2.5Y 5/4	—	—	Large 3-4" coarse FRAGMENTS 40% coarse Fr.	CRSL	1 M SBK	VFR/FR
Cr	36	84	2.5Y 5/1 2.5Y 5/2	LITHO CHROMIC	—	50% coarse FRAGS.	GRSL/CRCS	0 MA	VFR

Nomenclature and abbreviations are adapted from the *Field Book for Describing and Sampling Soils; Version 3.0* (NRCS, 2012)

Comments:

Ian R. Kaufman, CPSS/SC (ARCPACS #03237)
Delaware Class B & D License (#2175)
Virginia LAOSE (#1940001206)

Certified Professional Soil Scientist/Soil Classifier
Ian R. Kaufman
irkaufman@mediacombb.net
PO Box 117
Dagsboro, DE 19939
Office (302) 732-9858
Mobile (302) 542-3356

DELMARVA ENVIRONMENTAL, Inc.
Soil, Water, And Environmental Consulting

SOIL PROFILE NOTES

Profile #: TEST PIT 437 **Job Number:** 16086

Date of Observation: 7/27/2016

Tax ID Number: —
Project Name: CREEKILL
Location; —

Slope: 5-15%
Relief: BACKSLOPE

Depth to Redoximorphic Features or other potential limiting factor: ~34"
Estimated Permeability based on field estimates of soil textures: —
Free water at time of observation: >84"
Soil Classification: Oxyaquic Hapludult

GPS Coordinates: N39.92114 °, W75.57239 °

Horizon	Depth (inches)		Moist Munsell Colors: Matrix	Redoximorphic Features (RMF)	Non-RMF & Mottles	RMF or Non-RMF Colors; Quantity/Size/Contrast	Field Estimated Soil Texture	Structure Grade/Size/Type	Consistence (moist)
A	0	18	10YR4/4	—	—	—	10% Coarse Frags L	2 M CR	FR
Bt	18	34	10YR4/6				15% Coarse Frags L	2 MSBK	FR
C1	34	46	10YR5/6	7.5YR6/8	—	C 3 D	SL	0 MA	FR
C2	46	62	10YR5/6	10YR7/1 10YR5/8	—	C 2 P C 2 F	FSL/SIL	0 MA	FR
C_{SAP}	62	84	N9/	LITHO-CHROMIC	—	HIGHLY WEATHERED NATIVE ROCK HIGHLY MICACEOUS			

Nomenclature and abbreviations are adapted from the *Field Book for Describing and Sampling Soils; Version 3.0* (NRCS, 2012)

Comments: CLOSE TO WETLANDS

Ian R. Kaufman, CPSS/SC (ARCPACS #03237)
Delaware Class B & D License (#2175)
Virginia LAOSE (#1940001206)

Certified Professional Soil Scientist/Soil Classifier
Ian R. Kaufman
irkaufman@mediacombb.net

PO Box 117
Dagsboro, DE 19939

Office (302) 732-9858
Mobile (302) 542-3356

DELMARVA ENVIRONMENTAL, Inc.
Soil, Water, And Environmental Consulting

SOIL PROFILE NOTES

Profile #: TEST PIT 438 **Job Number:** 16086

Date of Observation: 7/27/2016

Tax ID Number: —
Project Name: CREBILLY
Location; —

Slope: 2-5%
Relief: BACKSLOPE

Depth to Redoximorphic Features or other potential limiting factor: 240"
Estimated Permeability based on field estimates of soil textures: —
Free water at time of observation: 144"
Soil Classification: TYPIC HAPLUDULT

GPS Coordinates: N 39.52188 °, W 75.59171 °

Horizon	Depth (inches)		Moist Munsell Colors: Matrix	Redoximorphic Features (RMF)	Non-RMF & Mottles	RMF or Non-RMF Colors: Quantity/Size/Contrast	Field Estimated Soil Texture	Structure Grade/Size/Type	Consistence (moist)
Ap	0	13	10YR4/4	—	—	—	SL	2MGR	FR
Bt	13	30	10YR4/6	—	—	—	SCL	2MSBK	FR
BC	30	40	10YR5/6	—	—	—	SL	1MSBK	FR
C	40	84	10YR5/6	10YR7/1 10YR6/8	—	C 2 D C 2 D	SL	0 MA	FR

Nomenclature and abbreviations are adapted from the *Field Book for Describing and Sampling Soils; Version 3.0* (NRCS, 2012)

Comments:
- NEAR WETLANDS
- FEW COARSE FRAGMENTS MOSTLY ABOVE 30"
- DUG TO 144"+ AFTER DESCRIBING

Ian R. Kaufman, CPSS/SC (ARCPACS #03237)
Delaware Class B & D License (#2175)
Virginia LAOSE (#1940001206)

Certified Professional Soil Scientist/Soil Classifier
Ian R. Kaufman
irkaufman@mediacombb.net

PO Box 117
Dagsboro, DE 19939

Office (302) 732-9858
Mobile (302) 542-3356

DELMARVA ENVIRONMENTAL, Inc.
Soil, Water, And Environmental Consulting

SOIL PROFILE NOTES

Profile #: TEST PIT 439-A **Job Number:** 16086

Date of Observation: 7/27/2016

Tax ID Number: —
Project Name: CRABILL
Location;

Slope: 5-15%
Relief: BACKSLOPE

Depth to Redoximorphic Features or other potential limiting factor: >84" to SHWT (120")
Estimated Permeability based on field estimates of soil textures: —
Free water at time of observation: >84"
Soil Classification: Typic Hapludult

GPS Coordinates: N39.92301 °, W75.59164 °

Horizon	Depth (inches)		Moist Munsell Colors: Matrix	Redoximorphic Features (RMF)	Non-RMF & Mottles	RMF or Non-RMF Colors; Quantity/Size/Contrast	Field Estimated Soil Texture	Structure Grade/Size/Type	Consistence (moist)
Ap	0	9	10YR4/4				L	2M GR	FR
Bt	9	20	10YR5/6			MICACEOUS	SL	2M SBK	FR
Cr1	20	48	BROWNISH YELLOW TO GRAY	UNORGANIZED HIGHLY MICACEOUS		WITH COBBLES	>50% Coarse FRAGS SL	0 MA	FR
Cr2	48	84	GRAY WITH YELLOWISH	STRATIFIED HIGHLY WEATHERED BROWN BANDS			SMALL SL	COARSE FRAG 20% 0 MA	FR

Nomenclature and abbreviations are adapted from the *Field Book for Describing and Sampling Soils; Version 3.0* (NRCS, 2012)

Comments:
- SIGNIFICANTLY UP-SLOPE FROM STAKE 439
- MIDDLE OF SOYBEANS
- LARGE QUATZITE COBBLES NEAR SURFACE 6" to 10" ANGULAR BLOCKS IN Cr1 HORIZON

7/28/16 Adjacent Pit with less Coarse fragments (Better)

Ian R. Kaufman, CPSS/SC (ARCPACS #03237)
Delaware Class B & D License (#2175)
Virginia LAOSE (#1940001206)

Certified Professional Soil Scientist/Soil Classifier
Ian R. Kaufman
irkaufman@mediacombb.net
PO Box 117
Dagsboro, DE 19939
Office (302) 732-9858
Mobile (302) 542-3356

DELMARVA ENVIRONMENTAL, Inc.
Soil, Water, And Environmental Consulting

SOIL PROFILE NOTES

Profile #: TEST PIT 440 **Job Number:** 16086

Date of Observation: 7/27/2016

Tax ID Number:
Project Name: CREBILLY
Location;

Slope: 2-5%
Relief: TOESLOPE

Depth to Redoximorphic Features or other potential limiting factor: ~40"
Estimated Permeability based on field estimates of soil textures:
Free water at time of observation: >84"
Soil Classification: Typic Hapludult

GPS Coordinates: N 39.92305° W 75.59017°

Horizon	Depth (inches)		Moist Munsell Colors: Matrix	Redoximorphic Features (RMF)	Non-RMF & Mottles	RMF or Non-RMF Colors; Quantity/Size/Contrast	Field Estimated Soil Texture	Structure Grade/Size/Type	Consistence (moist)
Ap	0	11	10YR4/4	—	—	—	L	2MGR	FR
A2	11	30	10YR4/4	—	—	—	L	2MGR	FR
Bt	30	40	10YR5/6	—	—	—	SCL/L	2MSBK	FR
C1	40	60	10YR6/6	10YR6/2 7.5YR6/8	HIGHLY VERIGATED	C 2 D C 2 F	SL/L	0 MA	FR
C2	60	84	10YR5/4	10YR6/2 7.5YR6/8	HIGHLY VERIGATED	C 2 D C 2 D	SL	0 MA	FR

Nomenclature and abbreviations are adapted from the *Field Book for Describing and Sampling Soils; Version 3.0* (NRCS, 2012)

Comments: FEW RANDOM COARSE FRAGMENT THROUGHOUT 3" to 6" IN SIZE

Ian R. Kaufman, CPSS/SC (ARCPACS #03237)
Delaware Class B & D License (#2175)
Virginia LAOSE (#1940001206)

Certified Professional Soil Scientist/Soil Classifier
Ian R. Kaufman
irkaufman@mediacombb.net
PO Box 117
Dagsboro, DE 19939
Office (302) 732-9858
Mobile (302) 542-3356

DELMARVA ENVIRONMENTAL, Inc.
Soil, Water, And Environmental Consulting

SOIL PROFILE NOTES

Profile #: TEST PIT 441 **Job Number:** 16086

Date of Observation: 7/27/16

Tax ID Number: —
Project Name: CREBILLY
Location;

Slope: 5-10%
Relief: BACKSLOPE

Depth to Redoximorphic Features or other potential limiting factor: >84"
Estimated Permeability based on field estimates of soil textures: —
Free water at time of observation: >164"
Soil Classification: Typic Hapludult

GPS Coordinates: N 39.92375°, W75.58971°

Horizon	Depth (inches)		Moist Munsell Colors: Matrix	Redoximorphic Features (RMF)	Non-RMF & Mottles	RMF or Non-RMF Colors; Quantity/Size/Contrast	Field Estimated Soil Texture	Structure Grade/Size/Type	Consistence (moist)
A	0	7	10YR4/4	—	—	—	L	2MGR	FR
Bt	7	14	10YR5/6	—	—	10% COARSE FRAGS	SCL	2MSBK	FR
BC	14	28	10YR5/4	—	7.5YR5/8 10YR6/8	F 3 D C 3 D	SL	1MSBK	FR
C1	28	48	10YR5/4	—	7.5YR5/8	20% COARSE FR. F 3 D	SL	0 MA	FR/VFR
C2	48	64	7.5YR6/8	HIGHLY WEATHERED	20% COARSE FR		SL	0 MA	FR
C3	64	84	10YR5/1	LITHOCHROMIC	—	—	LS	0 MA	VFR

Nomenclature and abbreviations are adapted from the *Field Book for Describing and Sampling Soils; Version 3.0* (NRCS, 2012)

Comments: DUE TO LIMIT OF BACKHOE AFTER DESCRIPTION

Ian R. Kaufman, CPSS/SC (ARCPACS #03237)
Delaware Class B & D License (#2175)
Virginia LAOSE (#1940001206)

Certified Professional Soil Scientist/Soil Classifier
Ian R. Kaufman
irkaufman@mediacombb.net
PO Box 117
Dagsboro, DE 19939
Office (302) 732-9858
Mobile (302) 542-3356

DELMARVA ENVIRONMENTAL, Inc.
Soil, Water, And Environmental Consulting

SOIL PROFILE NOTES

Profile #: TEST PIT 442 **Job Number:** 16056

Date of Observation: 7/27/16

Tax ID Number: —
Project Name: CREBILLY
Location; —

Slope: 2-5%
Relief: UPPER BACKSLOPE

Depth to Redoximorphic Features or other potential limiting factor: >84"
Estimated Permeability based on field estimates of soil textures: —
Free water at time of observation: >84"
Soil Classification: Typic Hapludult

GPS Coordinates: N 39.92444 °, N 75.59010 °

Horizon	Depth (inches)		Moist Munsell Colors: Matrix	Redoximorphic Features (RMF)	Non-RMF & Mottles	RMF or Non-RMF Colors; Quantity/Size/Contrast	Field Estimated Soil Texture	Structure Grade/Size/Type	Consistence (moist)
Ap	0	7	10YR5/4	—	—	—	L	2MGR	FR
Bt	7	27	10YR5/6	—	—	—	10% CF; SCL/SCL	2MSBK	FR
C1	27	32	10YR4/6 10YR4/4	—	—	—	SL	0 MA	FR
C2	32	42	10YR4/6	VARIEGATED DARK YELLOWISH BROWN			COSL	0 MA	VFR/FR
C3	42	54	2.5Y6/3		2.5Y7/3 10YR7/6	C 2 D C 2 P	FSL	0 MA	FR
CSAP	54	84	LITHOCHROMIC	GRAY & WHITE		HIGHLY MICACEOUS	FSL/SIL	0 MA	FR

Nomenclature and abbreviations are adapted from the *Field Book for Describing and Sampling Soils; Version 3.0* (NRCS, 2012)

Comments: , A FEW COARSE FRAGMENTS (C.Fr) 3"-5"
, SLOW ESTIMATED PERMEABILITY BELOW 54"

Ian R. Kaufman, CPSS/SC (ARCPACS #03237)
Delaware Class B & D License (#2175)
Virginia LAOSE (#1940001206)

Certified Professional Soil Scientist/Soil Classifier
Ian R. Kaufman
irkaufman@mediacombb.net

PO Box 117
Dagsboro, DE 19939

Office (302) 732-9858
Mobile (302) 542-3356

DELMARVA ENVIRONMENTAL, Inc.
Soil, Water, And Environmental Consulting
302-732-9858

Infiltration Testing Data Sheet

Double Rings ___ Single Rings ✓ Percolation Test ___

Project Name: CREBILLY
Tax Map Number: ___
Job Number: 16089

Test Number: TEST PIT 433
Test Depth: ~20+"
Date of Test: 7/27/16

Time	Interval (minutes)	Depth of Water	Drop in Inches
0	—	12	—
30	30	—	1 1/8
0	—	12	—
30	30	—	1 1/16

Rate in Minutes Per Inch (MPI)= 43.6
Rate in Inches Per Hour = 1.4

Test Run By:

Test Number: TEST PIT 433
Test Depth: ~48"
Date of Test: 7/27/16

Time	Interval	Depth of Water	Drop in Inches
0	—	12	0
30	30	—	1 1/16
0	—	12	—
30	30	—	3/4

Rate in Minutes Per Inch (MPI)= 40.0
Rate in Inches Per Hour = 1.5

Test Run By:

Test Number: ___
Test Depth: ___
Date of Test: ___

Time	Interval	Depth of Water	Drop in Inches

Rate in Minutes Per Inch (MPI)= ___
Rate in Inches Per Hour = ___

Test Run By:

Supervised by Ian R. Kaufman, CPSS/SC
Delaware Licsenced Class-D Soil Scientist
Certified Professional Soil Scientist/Soil Classifier

DELMARVA ENVIRONMENTAL, Inc.
Soil, Water, And Environmental Consulting
302-732-9858

Infiltration Testing Data Sheet

Double Rings ___ Single Rings ✓ Percolation Test ✓

Project Name: CREALLY
Tax Map Number: ___
Job Number: 16086

Test Number: 435
Test Depth: 13"
Date of Test: 7/28/16
SINGLE RING

Time	Interval (minutes)	Depth of Water	Drop in Inches
0	–	0	–
30	30	–	9/16
0	–	0	–
30	30	–	1/4
0	–	0	–
30	30	–	1/4
0	–	0	–
30	30	–	1/8
0	–	0	–
30	30	–	1/8

Rate in Minutes Per Inch (MPI)= 240
Rate in Inches Per Hour = 0.25

Test Run By:

Test Number: 435
Test Depth: 43"
Date of Test: 7/28/16
SINGLE RING

Time	Interval	Depth of Water	Drop in Inches
0	–	0	–
30	30	–	9/16"
0	–	0	–
30	30	–	3/16
0	–	0	–
30	30	–	3/16
0	–	0	–
30	30	–	5/16
0	–	0	–
30	30	–	3/16

Rate in Minutes Per Inch (MPI)= 160
Rate in Inches Per Hour = 0.38

Test Run By:

Test Number: 435
Test Depth: 43"
Date of Test: 7/28/16
PERC TEST

Time	Interval	Depth of Water	Drop in Inches
0			0
4:16	4:16		1/2
~5:00	~10:44		

TEST ABANDONED DUE TO THUNDERSTORM

Rate in Minutes Per Inch (MPI)= ~10.7
Rate in Inches Per Hour = ~5.6

Test Run By:

Supervised by Ian R. Kaufman, CPSS/SC
Delaware Licsenced Class-D Soil Scientist
Certified Professional Soil Scientist/Soil Classifier

DELMARVA ENVIRONMENTAL, Inc.

Soil, Water, And Environmental Consulting

302-732-9858

Infiltration Testing Data Sheet

Project Name: 441

Tax Map Number:

Job Number: 11086

Double Rings ___ Single Rings ✓ Percolation Test ✓

Test Number: 441
Test Depth: 48"
Date of Test: 7/28/16
SINGLE RING

Time	Interval (minutes)	Depth of Water	Drop in Inches
30	—	0	—
30	30	—	1
0	—	0	—
30	30	—	3/4
0	—	0	—
30	30	—	5/8
0	—	0	—
30	30	—	9/16
0	—	0	—
30	30	—	9/16
0	—	0	—
30	30	—	9/16

Rate in Minutes Per Inch (MPI)= 53.3
Rate in Inches Per Hour = 1.1

Test Run By:

Test Number: 441
Test Depth: 20"
Date of Test: 7/28/16
SINGLE RING

Time	Interval	Depth of Water	Drop in Inches
0	—	0	—
30	30	—	41/2
0	—	0	—
30	30	—	33/4
0	—	0	—
30	30	—	3 5/8
0	—	0	—
30	30	—	3 1/2
0	—	0	—
30	30	—	3 7/16
0	—	0	—
30	30	—	3 1/2

Rate in Minutes Per Inch (MPI)= 8.6
Rate in Inches Per Hour = 7.0

Test Run By:

Test Number: 441
Test Depth: 48"
Date of Test: 7/28/16
PERC TEST

Time	Interval	Depth of Water	Drop in Inches
0	—		—
16:50	16:50		1
35:30	18:40		2

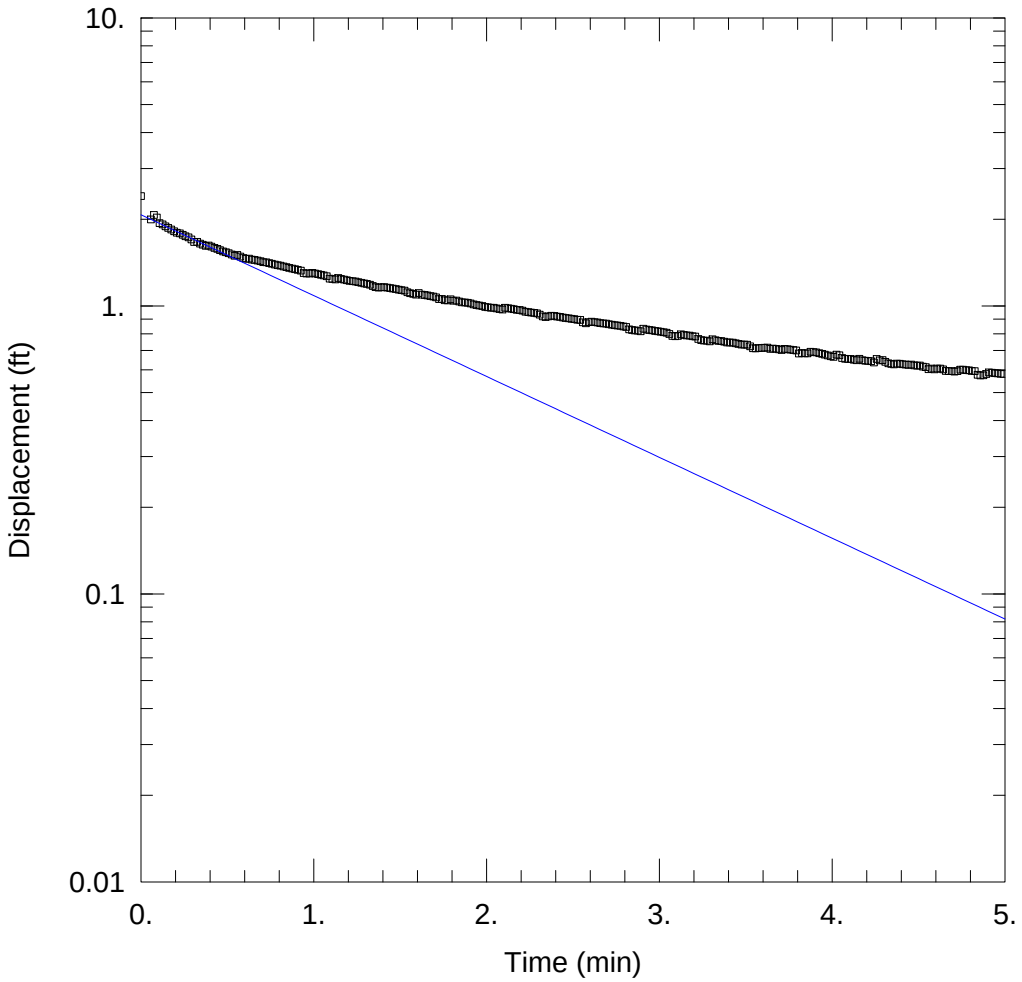
Rate in Minutes Per Inch (MPI)= 18.7
Rate in Inches Per Hour = 3.2

Test Run By:

Supervised by Ian R. Kaufman, CPSS/SC
Delaware Licsenced Class-D Soil Scientist
Certified Professional Soil Scientist/Soil Classifier

APPENDIX C

HYDRAULIC TESTING RESULTS



WELL TEST ANALYSIS

Data Set: L:\...\OH-1-RisingHead1.aqt
Date: 09/02/16 Time: 13:20:46

PROJECT INFORMATION

Company: GTA
Project: 31161348
Location: Crebilly
Test Well: OH-1
Test Date: 8/17/2016

AQUIFER DATA

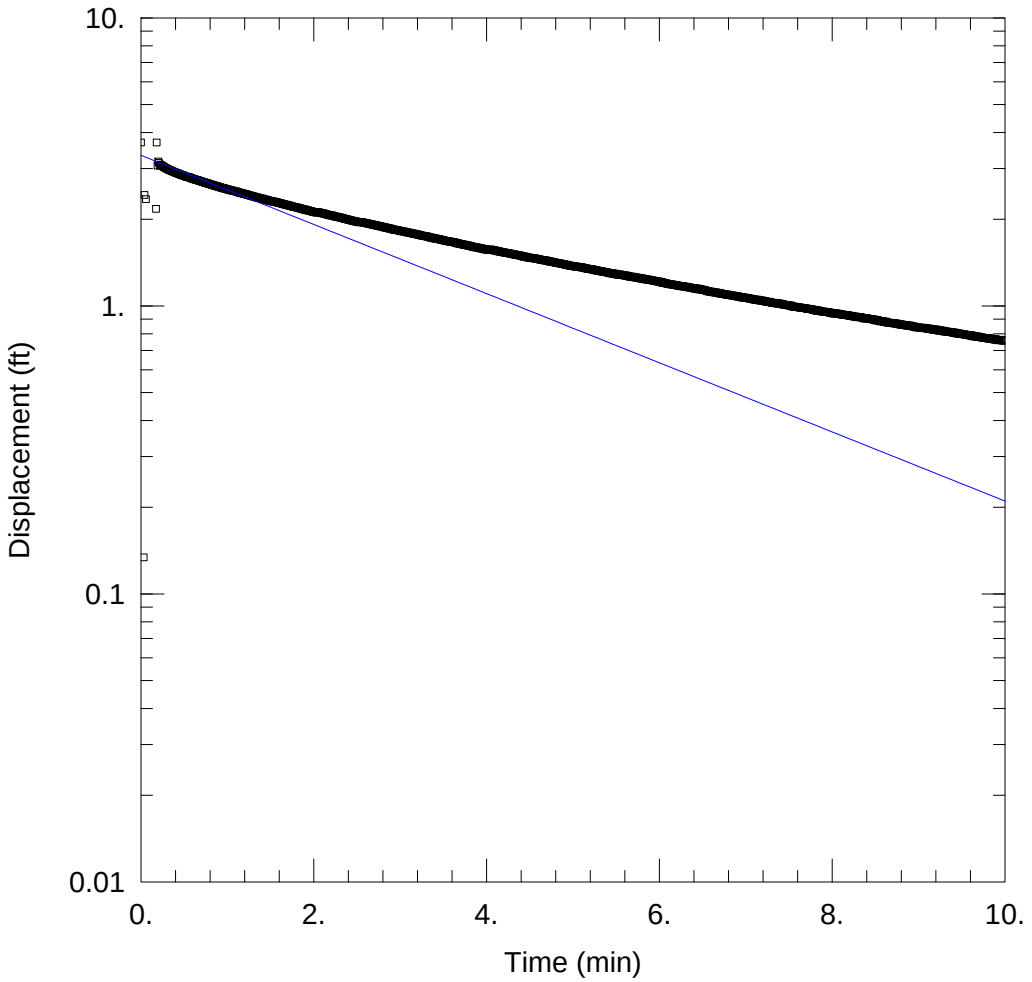
Saturated Thickness: 30. ft Anisotropy Ratio (Kz/Kr): 1.

WELL DATA (OH-1)

Initial Displacement: 2.406 ft
Total Well Penetration Depth: 25.25 ft
Casing Radius: 0.083 ft
Static Water Column Height: 25.25 ft
Screen Length: 10. ft
Well Radius: 0.25 ft

SOLUTION

Aquifer Model: Unconfined
Solution Method: Hvorslev
K = 1.183 ft/day
y0 = 2.073 ft



WELL TEST ANALYSIS

Data Set: L:\...\OH-2-RisingHead2.aqt
Date: 09/02/16 Time: 13:22:23

PROJECT INFORMATION

Company: GTA
Project: 31161348
Location: Crebilly
Test Well: OH-2
Test Date: 8/17/2016

AQUIFER DATA

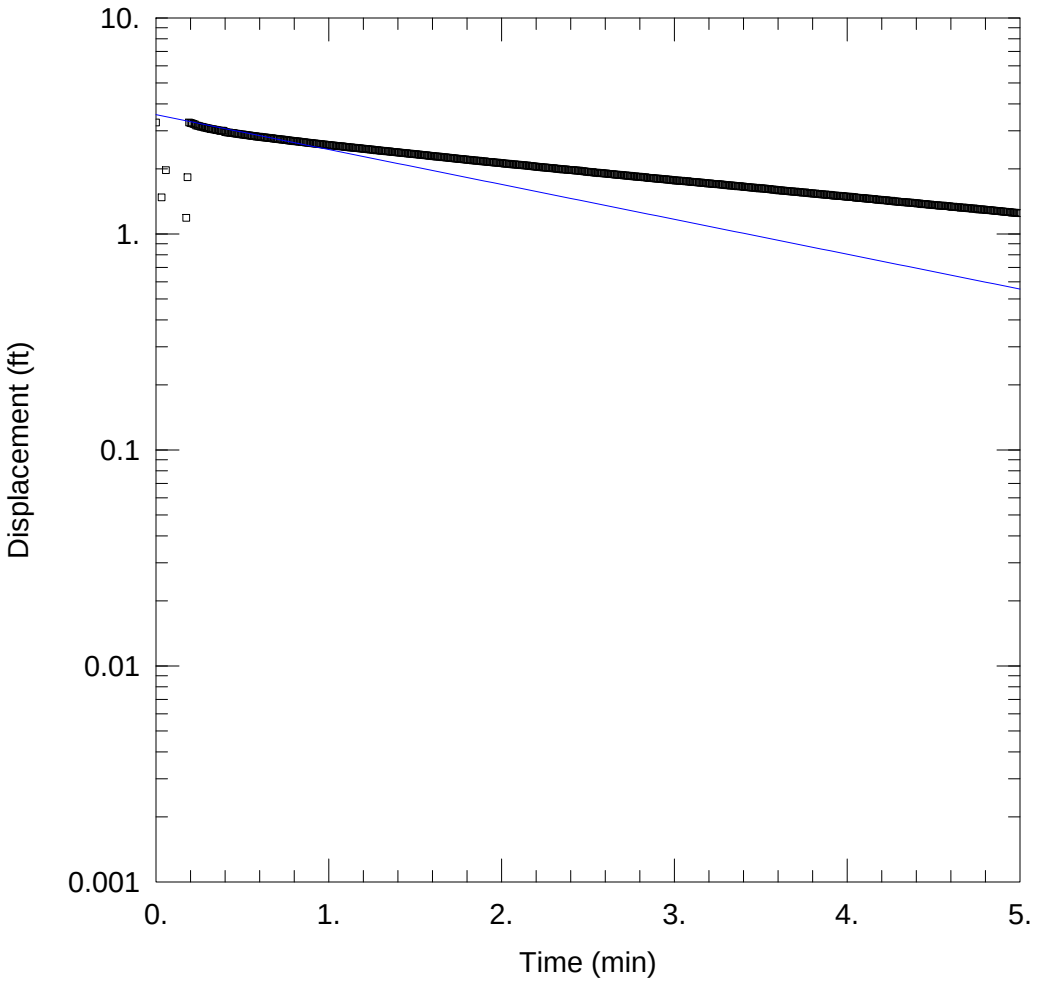
Saturated Thickness: 30. ft Anisotropy Ratio (Kz/Kr): 1.

WELL DATA (OH-2)

Initial Displacement: 3.695 ft
Total Well Penetration Depth: 29.08 ft
Casing Radius: 0.083 ft
Static Water Column Height: 29.08 ft
Screen Length: 10. ft
Well Radius: 0.25 ft

SOLUTION

Aquifer Model: Unconfined
Solution Method: Hvorslev
K = 0.5057 ft/day
y0 = 3.333 ft



WELL TEST ANALYSIS

Data Set: L:\...\OH-3-RisingHead2.aqt
Date: 09/02/16 Time: 13:23:44

PROJECT INFORMATION

Company: GTA
Project: 31161348
Location: Crebilly
Test Well: OH-3
Test Date: 8/17/2016

AQUIFER DATA

Saturated Thickness: 30. ft Anisotropy Ratio (Kz/Kr): 1.

WELL DATA (OH-3)

Initial Displacement: 3.281 ft
Total Well Penetration Depth: 24.07 ft
Casing Radius: 0.083 ft
Static Water Column Height: 24.07 ft
Screen Length: 10. ft
Well Radius: 0.25 ft

SOLUTION

Aquifer Model: Unconfined
Solution Method: Hvorslev
K = 0.6802 ft/day
y0 = 3.564 ft

APPENDIX D

LABORATORY RESULTS

e-Hardcopy 2.0
Automated Report

Technical Report for

Geo-Technology Associates

Crebilly Farms, 501 West Street Road, West Chester, PA

31161348

SGS Accutest Job Number: JC25567

Sampling Date: 08/10/16

Report to:

Geo-Technology Associates
3445-A Box Hill Corporate Center Drive
Abingdon, MD 21009
gmckee@gtaeng.com; pscott@gtaeng.com

ATTN: Greg McKee

Total number of pages in report: **12**

Test results contained within this data package meet the requirements of the National Environmental Laboratory Accreditation Program and/or state specific certification programs as applicable.

Nancy Cole
Laboratory Director

Client Service contact: Tammy McCloskey 732-329-0200

Certifications: NJ(12129), NY(10983), CA, CT, DE, FL, IL, IN, KS, KY, LA, MA, MD, MI, MT, NC, OH VAP (CL0056), AK (UST-103), AZ (AZ0786), PA, RI, SC, TN, TX, VA, WV, DoD ELAP (L-A-B L2248)

Sections: 1 2 3 4

Table of Contents

Sample Summary

Geo-Technology Associates

Job No: JC25567

Crebilly Farms, 501 West Street Road, West Chester, PA
Project No: 31161348

Sample Number	Collected Date	Time	By	Received	Matrix Code	Type	Client Sample ID
JC25567-1	08/10/16	10:15	GM	08/10/16	AQ	Ground Water	OH-1
JC25567-2	08/10/16	11:40	GM	08/10/16	AQ	Ground Water	OH-2
JC25567-3	08/10/16	12:30	GM	08/10/16	AQ	Ground Water	OH-3
JC25567-4	08/10/16	13:10	GM	08/10/16	AQ	Ground Water	OH-4

Summary of Hits

Job Number: JC25567
Account: Geo-Technology Associates
Project: Crebilly Farms, 501 West Street Road, West Chester, PA
Collected: 08/10/16

Lab Sample ID / Analyte	Client Sample ID	Result/ Qual	RL	MDL	Units	Method
JC25567-1	**OH-1**					
Nitrogen, Nitrate [a]		6.4	0.31		mg/l	EPA353.2/SM4500NO2B
Nitrogen, Nitrate + Nitrite		6.5	0.30		mg/l	EPA 353.2/LACHAT
Nitrogen, Nitrite		0.074	0.010		mg/l	SM4500NO2 B-11
Nitrogen, Total Kjeldahl		0.54	0.20		mg/l	EPA 351.2/LACHAT
JC25567-2	**OH-2**					
Nitrogen, Nitrate [a]		6.4	0.31		mg/l	EPA353.2/SM4500NO2B
Nitrogen, Nitrate + Nitrite		6.4	0.30		mg/l	EPA 353.2/LACHAT
Nitrogen, Total Kjeldahl		0.21	0.20		mg/l	EPA 351.2/LACHAT
JC25567-3	**OH-3**					
Nitrogen, Nitrate [a]		5.4	0.31		mg/l	EPA353.2/SM4500NO2B
Nitrogen, Nitrate + Nitrite		5.4	0.30		mg/l	EPA 353.2/LACHAT
Nitrogen, Total Kjeldahl		0.21	0.20		mg/l	EPA 351.2/LACHAT
JC25567-4	**OH-4**					
Nitrogen, Nitrate [a]		0.50	0.11		mg/l	EPA353.2/SM4500NO2B
Nitrogen, Nitrate + Nitrite		0.50	0.10		mg/l	EPA 353.2/LACHAT
Nitrogen, Total Kjeldahl		0.31	0.20		mg/l	EPA 351.2/LACHAT

(a) Calculated as: (Nitrogen, Nitrate + Nitrite) - (Nitrogen, Nitrite)

Sample Results

Report of Analysis

Report of Analysis

Client Sample ID:	OH-1		
Lab Sample ID:	JC25567-1	**Date Sampled:**	08/10/16
Matrix:	AQ - Ground Water	**Date Received:**	08/10/16
		Percent Solids:	n/a
Project:	Crebilly Farms, 501 West Street Road, West Chester, PA		

General Chemistry

Analyte	Result	RL	Units	DF	Analyzed	By	Method
Nitrogen, Nitrate [a]	6.4	0.31	mg/l	1	08/12/16 13:56	YZ	EPA353.2/SM4500NO2B
Nitrogen, Nitrate + Nitrite	6.5	0.30	mg/l	3	08/12/16 13:56	YZ	EPA 353.2/LACHAT
Nitrogen, Nitrite	0.074	0.010	mg/l	1	08/10/16 21:54	IO	SM4500NO2 B-11
Nitrogen, Total Kjeldahl	0.54	0.20	mg/l	1	08/16/16 12:05	BM	EPA 351.2/LACHAT

(a) Calculated as: (Nitrogen, Nitrate + Nitrite) - (Nitrogen, Nitrite)

RL = Reporting Limit

Report of Analysis

Client Sample ID:	OH-2		
Lab Sample ID:	JC25567-2	**Date Sampled:**	08/10/16
Matrix:	AQ - Ground Water	**Date Received:**	08/10/16
		Percent Solids:	n/a
Project:	Crebilly Farms, 501 West Street Road, West Chester, PA		

General Chemistry

Analyte	Result	RL	Units	DF	Analyzed	By	Method
Nitrogen, Nitrate [a]	6.4	0.31	mg/l	1	08/12/16 13:59	YZ	EPA353.2/SM4500NO2B
Nitrogen, Nitrate + Nitrite	6.4	0.30	mg/l	3	08/12/16 13:59	YZ	EPA 353.2/LACHAT
Nitrogen, Nitrite	< 0.010	0.010	mg/l	1	08/10/16 21:54	IO	SM4500NO2 B-11
Nitrogen, Total Kjeldahl	0.21	0.20	mg/l	1	08/16/16 12:06	BM	EPA 351.2/LACHAT

(a) Calculated as: (Nitrogen, Nitrate + Nitrite) - (Nitrogen, Nitrite)

RL = Reporting Limit

Report of Analysis

Client Sample ID:	OH-3		
Lab Sample ID:	JC25567-3	**Date Sampled:**	08/10/16
Matrix:	AQ - Ground Water	**Date Received:**	08/10/16
		Percent Solids:	n/a
Project:	Crebilly Farms, 501 West Street Road, West Chester, PA		

General Chemistry

Analyte	Result	RL	Units	DF	Analyzed	By	Method
Nitrogen, Nitrate [a]	5.4	0.31	mg/l	1	08/12/16 14:00	YZ	EPA353.2/SM4500NO2B
Nitrogen, Nitrate + Nitrite	5.4	0.30	mg/l	3	08/12/16 14:00	YZ	EPA 353.2/LACHAT
Nitrogen, Nitrite	< 0.010	0.010	mg/l	1	08/10/16 21:54	IO	SM4500NO2 B-11
Nitrogen, Total Kjeldahl	0.21	0.20	mg/l	1	08/16/16 12:06	BM	EPA 351.2/LACHAT

(a) Calculated as: (Nitrogen, Nitrate + Nitrite) - (Nitrogen, Nitrite)

RL = Reporting Limit

Report of Analysis

Client Sample ID:	OH-4		
Lab Sample ID:	JC25567-4	**Date Sampled:**	08/10/16
Matrix:	AQ - Ground Water	**Date Received:**	08/10/16
		Percent Solids:	n/a
Project:	Crebilly Farms, 501 West Street Road, West Chester, PA		

General Chemistry

Analyte	Result	RL	Units	DF	Analyzed	By	Method
Nitrogen, Nitrate [a]	0.50	0.11	mg/l	1	08/12/16 13:23	YZ	EPA353.2/SM4500NO2B
Nitrogen, Nitrate + Nitrite	0.50	0.10	mg/l	1	08/12/16 13:23	YZ	EPA 353.2/LACHAT
Nitrogen, Nitrite	< 0.010	0.010	mg/l	1	08/10/16 21:54	IO	SM4500NO2 B-11
Nitrogen, Total Kjeldahl	0.31	0.20	mg/l	1	08/16/16 12:07	BM	EPA 351.2/LACHAT

(a) Calculated as: (Nitrogen, Nitrate + Nitrite) - (Nitrogen, Nitrite)

RL = Reporting Limit

Misc. Forms

Custody Documents and Other Forms

Includes the following where applicable:

- Chain of Custody

GW

SGS ACCUTEST — CHAIN OF CUSTODY

SGS Accutest - Dayton
2235 Route 130, Dayton, NJ 08810
TEL. 732-329-0200 FAX: 732-329-3499/3480
www.accutest.com

PAGE 1 OF 1

E

FED-EX Tracking #: | Bottle Order Control #:
SGS Accutest Quote #: | SGS Accutest Job #: JC25567

Client / Reporting Information

Company Name: Geo-Technology Associates
Street Address: 3445-A Box Hill Corp Center Dr
City: Abingdon State: MD Zip: 21009
Project Contact: Greg McKee E-mail: gmckee@gtaenv.com
Phone #: 443-243-9714 Fax #:
Sampler(s) Name(s): Greg McKee Phone #: 443-243-9714

Project Information

Project Name: Crebilly Farms
Street: 501 W Street Rd
City: West Chester State: PA
Project #: 31161348
Client Purchase Order #:
Project Manager: Paul Scott (410-515-9446)

Billing Information (if different from Report to)

Company Name:
Street Address:
City State Zip:
Attention:

Requested Analysis (see TEST CODE sheet)

NO3, NO2, FKN (xNO3) | TKN

Matrix Codes

DW - Drinking Water
GW - Ground Water
WW - Water
SW - Surface Water
SO - Soil
SL- Sludge
SED-Sediment
OI - Oil
LIQ - Other Liquid
AIR - Air
SOL - Other Solid
WP - Wipe
FB-Field Blank
EB-Equipment Blank
RB- Rinse Blank
TB-Trip Blank

SGS Accutest Sample #	Field ID / Point of Collection	MEOH/DI Vial #	Collection Date	Collection Time	Sampled by	Matrix	# of bottles	Preserved: HCl	NaOH	HNO3	H2SO4	NONE	DI Water	MEOH	ENCORE	NO3, NO2, FKN (xNO3)	TKN	LAB USE ONLY
1	OH-1		8/10/2016	10:15	GM	GW	2				X	X				X	X	G21
2	OH-2			11:40							X	X				X	X	
3	OH-3			12:30							X	X				X	X	
4	OH-4			13:10							X	X				X	X	

INITIAL ASSESSMENT 3BO
LABEL VERIFICATION JV

Turnaround Time (Business days)

Approved By (SGS Accutest PM): / Date:

- [ ] Std. 10 Business Days
- [x] 5 Day RUSH
- [ ] 3 Day RUSH
- [ ] 2 Day RUSH
- [ ] 1 Day RUSH
- [ ] other

Emergency & Rush T/A data available VIA Lablink

Data Deliverable Information

- [ ] Commercial "A" (Level 1)
- [ ] Commercial "B" (Level 2)
- [ ] FULLT1 (Level 3+4)
- [ ] NJ Reduced
- [ ] Commercial "C"
- [ ] NJ Data of Known Quality Protocol Reporting
- [ ] NYASP Category A
- [ ] NYASP Category B
- [ ] State Forms
- [ ] EDD Format
- [ ] Other

Commercial "A" = Results Only, Commercial "B" = Results + QC Summary
NJ Reduced = Results + QC Summary + Partial Raw data

Comments / Special Instructions

Matrix Was AQ on delivery request form

Sample inventory is verified upon receipt in the Laboratory

Sample Custody must be documented below each time samples change possession, including courier delivery.

	Relinquished by Sampler:	Date Time:	Received By:	Relinquished By:	Date Time:	Received By:
1		8/10/2016 1410	1	2	8/10/16 1900	2 Matthew Fralia
3	Matthew	8/10/16 1900	3	4	Date Time:	4 Received By:
5	Relinquished by:	Date Time:	5 Received By:	Custody Seal # 922	☐ Intact ☐ Not intact	Preserved where applicable	On Ice ☐ 0.1 4.0 C	Cooler Temp. 1-9

SGS Accutest Sample Receipt Summary

Job Number: JC25567 **Client:** _____ **Project:** _____

Date / Time Received: 8/10/2016 6:00:00 PM **Delivery Method:** _____ **Airbill #'s:** _____

Cooler Temps (Raw Measured) °C: Cooler 1: (0.4);

Cooler Temps (Corrected) °C: Cooler 1: (1.3);

Cooler Security	Y	or	N		Y	or	N
1. Custody Seals Present:	☑		☐	3. COC Present:	☑		☐
2. Custody Seals Intact:	☑		☐	4. Smpl Dates/Time OK	☑		☐

Cooler Temperature	Y	or	N
1. Temp criteria achieved:	☑		☐
2. Cooler temp verification:	IR Gun		
3. Cooler media:	Ice (Bag)		
4. No. Coolers:	1		

Quality Control _Preservation	Y	or	N	N/A
1. Trip Blank present / cooler:	☐		☑	☐
2. Trip Blank listed on COC:	☐		☑	☐
3. Samples preserved properly:	☑		☐	
4. VOCs headspace free:	☐		☐	☑

Sample Integrity - Documentation	Y	or	N
1. Sample labels present on bottles:	☑		☐
2. Container labeling complete:	☑		☐
3. Sample container label / COC agree:	☑		☐

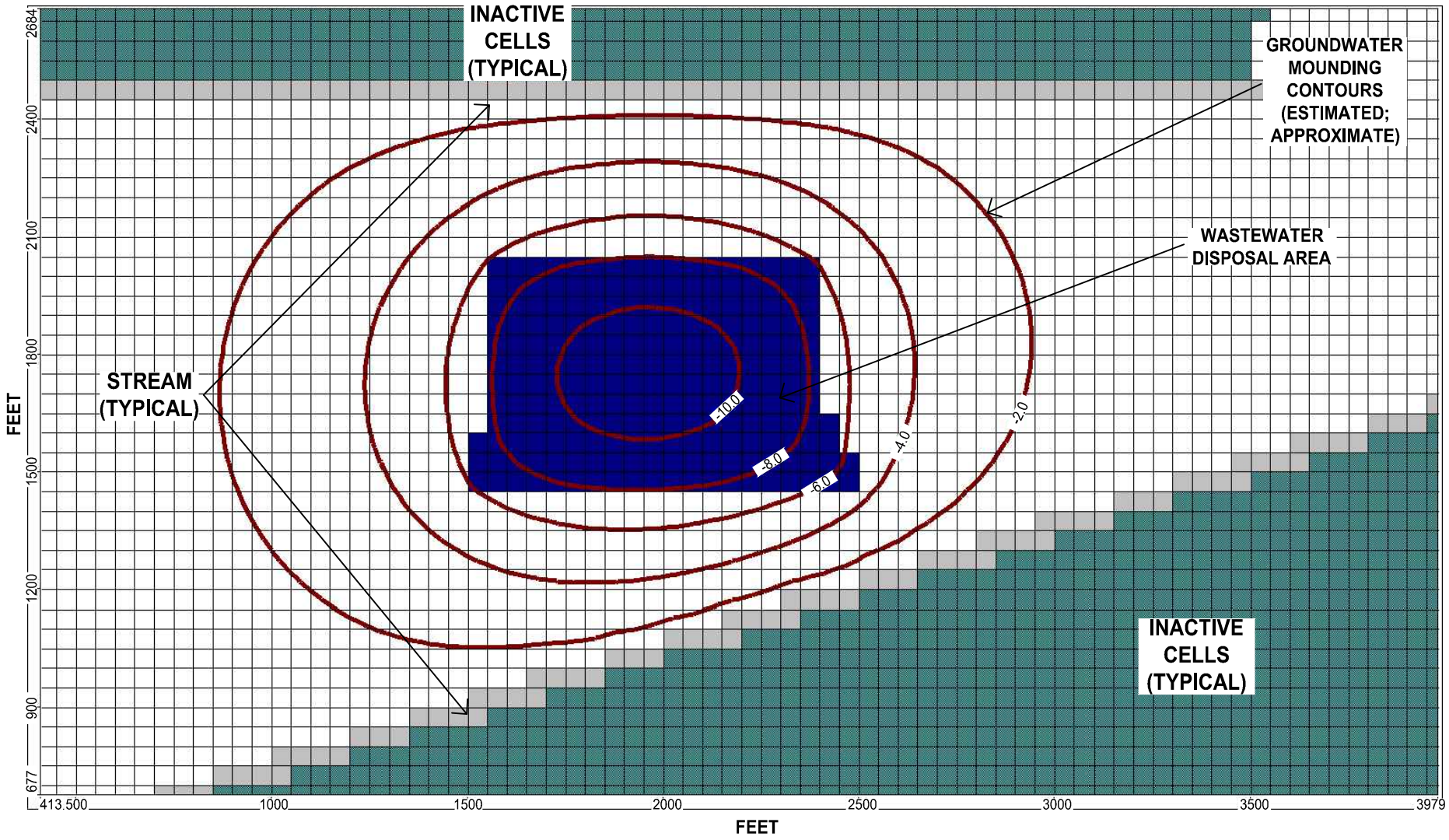
Sample Integrity - Condition	Y	or	N
1. Sample recvd within HT:	☑		☐
2. All containers accounted for:	☑		☐
3. Condition of sample:	Intact		

Sample Integrity - Instructions	Y	or	N	N/A
1. Analysis requested is clear:	☑		☐	
2. Bottles received for unspecified tests	☐		☑	
3. Sufficient volume recvd for analysis:	☑		☐	
4. Compositing instructions clear:	☐		☐	☑
5. Filtering instructions clear:	☐		☐	☑

Comments

APPENDIX E

GROUNDWATER MOUNDING ANALYSIS RESULTS



SOURCE: THIS FIGURE WAS CREATED USING OUTPUT RESULTS MODFLOW (MCDONALD AND HARBAUGH, 1988) AS INCORPORATED INTO VISUAL MODFLOW, VERSION 2011 BY SCHLUMBERGER WATER SERVICES

GEO-TECHNOLOGY ASSOCIATES, INC.
GEOTECHNICAL AND ENVIRONMENTAL CONSULTANTS
3445-A BOX HILL CORPORATE CENTER DRIVE
ABINGDON, MARYLAND 21009
410-515-9446
FAX: 410-515-4895
WWW.GTAENG.COM

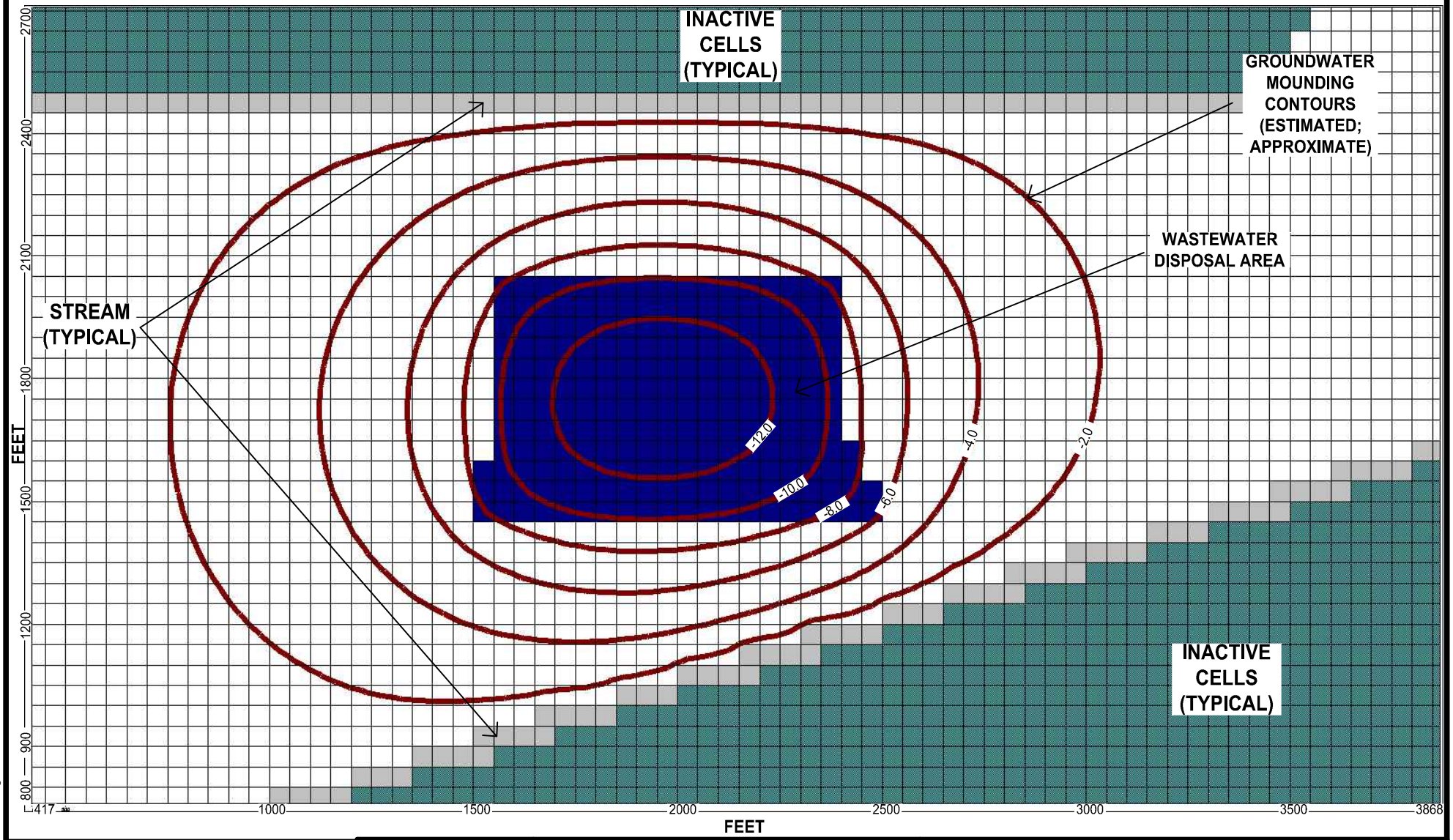
GROUNDWATER MOUNDING ANALYSIS RESULTS; 10-YEAR LOADING PERIOD EVALUATED AREA; FLOWS ASSOCIATED WITH 317 UNITS

CREBILLY FARM

Chester County, Pennsylvania

JOB NO.	SCALE:	DATE:	DRAWN BY:	REVIEW BY:	FIGURE:
31161348	NTS	MARCH 2017	GMM	PSS	1

G:\GTA\31161348 - Crebilly Farm\plot\31161348-Site Plan.dwg



SOURCE: THIS FIGURE WAS CREATED USING OUTPUT RESULTS MODFLOW (MCDONALD AND HARBAUGH, 1988) AS INCORPORATED INTO VISUAL MODFLOW, VERSION 2011 BY SCHLUMBERGER WATER SERVICES

GEO-TECHNOLOGY ASSOCIATES, INC.
GEOTECHNICAL AND ENVIRONMENTAL CONSULTANTS
3445-A BOX HILL CORPORATE CENTER DRIVE
ABINGDON, MARYLAND 21009
410-515-9446
FAX: 410-515-4895
WWW.GTAENG.COM

GROUNDWATER MOUNDING ANALYSIS RESULTS; 10-YEAR LOADING PERIOD EVALUATED AREA; FLOWS ASSOCIATED WITH 397 UNITS

CREBILLY FARM

Chester County, Pennsylvania

JOB NO.	SCALE:	DATE:	DRAWN BY:	REVIEW BY:	FIGURE:
31161348	NTS	MARCH 2017	GMM	PSS	2

G:\GTA\31161348 - Crebilly Farm\plot\31161348-Site Plan.dwg