

HYDROGEOLOGIC TECHNICAL REPORT PROFESSIONAL SERVICES



PENNYTOWN-KOOLTRONIC SITES WASTEWATER TREATMENT AND DISPOSAL ASSESSMENT TOWNSHIP OF HOPEWELL, MERCER COUNTY, NEW JERSEY BSG JOB NO. 60606100000

JANUARY 11, 2013

PREPARED FOR

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BIRDSALL SERVICES GROUP
ENGINEERS & CONSULTANTS



LIST OF ATTACHMENTS

<u>Plate No.</u>	<u>Description</u>
1	Site Location Map
2	Test Pit Location Plan
3A through 3P	Soil Logs
4	USDA Soil Classification System

<u>Appendix No.</u>	<u>Description</u>
1	Soil Logs Provided in the 2009 Report
2	Well Records in the 2009 Report
3	Soil Particle Size Analyses in the 2009 Report
4	Limitations

1.0 INTRODUCTION

This report presents the results of a subsurface investigation performed by Birdsall Services Group (BSG) for use in the initial evaluation of the project to accommodate wastewater flows. The site is located in the Township of Hopewell, New Jersey. The site location is depicted on the Site Location Map, Plate 1.

2.0 PROJECT BACKGROUND

It is our understanding that Hopewell Township was proposing a hamlet style development on the two-part site known as Pennytown/Kooltronic. The proposed development site will be located on two parcels. First is Kooltronic, an existing manufacturing facility that will remain in operation, located on Block 37 Lots 17.01-17.04. The Kooltronic portion is located on the south side of Pennington-Hopewell Road and encompasses an area of approximately 60 acres. The second parcel is currently known as Pennytown site and is located on Block 33 Lot 1. The initial concept plan associated with this report includes 348 residential units of various sizes and 15,000 square feet of commercial space. The proposed development will generate estimated design wastewater flow of approximately 85,000 gpd. It is also our understanding that because there is no central sewer system connection available nearby, the proposed development will be served by an on-site wastewater treatment facility with a discharge to groundwater type disposal system. The capital cost of improvements of wastewater treatment and disposal vary greatly depending on the discharge limits and hydrogeologic setting of a particular site.

It should be noted that changes were made to the plans during the course of our work. The changes are relatively minor in the context of this report and as such are not reflected in this report.

An initial hydrogeologic technical report was recommended by BSG at this juncture due to the relatively large estimated flow on the order of 85,000 gallons per day. The initial report is intended to provide guidance in identifying the locations, dimensions, and anticipated capabilities of the disposal fields to optimize land use, minimize construction costs, infrastructure conflicts and environmental impacts. Based upon our extensive experience with the New Jersey Department of Environmental Protection New Jersey Pollutant Discharge Elimination System (NJPDDES) Permitting Program, it is our belief that pretreatment to groundwater II standards will be required. As such, background water quality analysis was not conducted as a part of our services. Targeted specific benefits of preparing a hydrogeologic report include the following:

1. Identifying the directions of groundwater flow to site disposal fields in areas that will be most beneficial for achieving groundwater quality standards at required compliance points.



2. Identifying variations on site conditions to facilitate locating disposal fields in areas which will reduce disposal field sizes and potential costs such as soil replacement or disposal field mounding to the extent practical.
3. The initial groundwater mounding analyses will provide an estimate of the maximum amount of disposal field area and associated disposal field geometries that can be clustered into one disposal location.

It should be noted that relatively abundant and severe site constraints that would prohibit the site development as proposed became apparent during the execution of our work, prompting the preparation of an interim report, dated April 9, 2012, and a meeting with the project team on May 11, 2012. Based on the meeting, the project was redirected.

The following is our understanding of the project status as of this writing. We were requested to update the interim report to include reference to the September 6, 2012 report issued by M² Associates, titled "Re: Status Update on Hydrogeologic Evaluation of the Pennytown – Kooltronics Re-Development Site in Hopewell Township, Mercer County, New Jersey". Due to the relatively poor site conditions found to date, the project team will no longer pursue efforts in identifying on-site water supply and on-site disposal system areas to accommodate the proposed construction. Therefore, we were requested to provide an updated report in this context without the completion of the balance of the original scope items which includes the installation of piezometers and other efforts. Additional detail regarding the scope items are provided below.

A report dated May 1, 2009, titled "Pennytown Village, Wastewater System Evaluation, by Edward A. Clerico, P.E., Alliance Environmental, LLC, in cooperation with Applied Water Management Inc., 2 Clerico Lane, Suite 210 and Suite 1 respectively, in Hillsborough, NJ, was reviewed as part of this report and will be referenced as the "2009 report" in subsequent sections of this report.

3.0 PURPOSE AND SCOPE OF WORK

The purpose of our services was to:

- A. Explore the subsurface soil, rock and groundwater conditions within potential disposal field areas.
- B. Perform field permeability testing of soils within potential disposal field areas.
- C. Perform textural grain size analyses of soils within the proximity of potential infiltrative surfaces.
- D. Provide a general description of the proposed facility, estimated depth to bedrock, geologic description of the formation which would receive the wastewater, relevant features presented on

published topographic and soil survey maps, and areas prone to flooding as presented on published flood insurance maps;

- E. Perform groundwater mounding analysis for potential disposal areas;
- F. Estimate the Long Term Acceptance Rates of the potential disposal bed areas;
- G. Determine the direction of groundwater flow in the vicinity of the potential disposal bed areas based on piezometer well data;
- H. Install, survey and certify the locations and elevations of the piezometer wells to complete the NJDEP Well Certification Forms A and B.

To accomplish these purposes, a subsurface exploration program consisting of 6 supervised test borings to depths ranging from approximately 20 to 30 feet below the existing surface grades including vertical and horizontal permeability testing at selected test boring locations, as well as the installation of 6 piezometer wells and the observation of 16 soil profile pits at the site was proposed.

The actual subsurface exploration program performed for this report was limited to the 16 soil profile pits (test pits) and 2 permeability tests within bedrock encountered in the test pits. The locations of the test pits are shown on the Test Pit Location Plan, Plate 2.

All field work was performed under the direct technical observation of a representative from BSG. Our representative located the test pits in the field, maintained continuous logs of the explorations as the work progressed, and completed the soil sampling operations as well as the field permeability testing to develop the required subsurface information.

Soil samples suitable for identification purposes were extracted from the test pit excavations. Detailed descriptions of the materials encountered in the test pit excavations are presented on the individual Soil Logs, Plates 3A through 3P. The soil samples were visually classified in accordance with the textural classification scheme of the USDA Soil Classification System, described on Plate 4.

All soil samples were brought back to our office, where they were further examined in our soil mechanics laboratory.

The results of the subsurface exploration program, field testing and review of available information have provided the basis for our engineering analysis and design recommendations. The conclusions and recommendations presented herein are subject to the limitations attached as Appendix 4 to this report.



It should be noted that continuation of the subsurface exploration program to install the piezometers and related work items were not performed at the Client's direction in light of the findings presented in the April 9 interim report and discussed at the above referenced meeting.

Specifically the piezometer related work items include the initial test borings at the piezometer locations, water level readings, in-situ testing and subsequent analyses.

4.0 SITE CONDITIONS

Surface Features: Based on our visual observations, the proposed development will be located in relatively level to gently sloping tracts of land in a proposed mixed use area. The land adjacent to the Kooltronic facility appears to consist of open fields and partially wooded. Based on our visual observations, the Pennytown area appears to include developed areas with portions that have been selectively demolished. The approximate area of the project boundaries as well as a delineation of the Kooltronic manufacturing facility that will remain intact are shown on the Test Pit Location Plan, Plate 2.

Subsurface Conditions: In general, the 16 test pits completed for this interim report indicate that the majority of the proposed development is underlain by relatively uniform subsurface conditions. Topsoil was encountered in all 16 test pit locations, ranging from approximately 6 to 12 inches in thickness. The topsoil was found to be underlain by friable silt loam soils in Test Pits 1 through 11, 14, and 15 and friable silty clay loam in Test Pits 13 and 16. These soils were found to be uniformly underlain by a relatively thin layer of firm silty clay loam containing appreciable amounts of shale fragments, considered to be representative of a highly weathered bedrock stratum. The highly weathered shale stratum was found to be underlain by moderately weathered shale grading to slightly weathered shale at depth in Test Pits 1 through 15. The slightly weathered shale was found immediately beneath the highly weathered shale in Test Pit 16. The slightly weathered shale extended to the maximum depth explored, 10.5 feet below the existing surface grades.

Seepage was encountered in Test Pits 1 through 15. The test pits were observed 1 to 4.5 hours following initial excavation for ponded water and the associated water levels were found to range from 4 to 9 feet below the existing ground surface. Further, mottling, indicative of seasonal high groundwater conditions, was encountered in Test Pits 7 and 16, at initial depths of 2.5 to 2 feet below the existing surface grades, respectively. It should be anticipated that the groundwater level at the site may fluctuate in response to seasonal variations in the rainfall, groundwater recharge and other factors at the time the explorations were performed. Further discussion of groundwater is provided in subsequent sections of this report.

Based on our review of available information, 6 test pits were completed by others and the soil logs are attached to this report as Appendix 1. The locations of the test pits are shown on the Test Pit Location Plan, Plate 2. A categorization of the information contained in these 6 logs and the

materials encountered in the 16 BSG test pits as they relate to the subsurface information provided in published literature will be provided in a subsequent section of this report.

5.0 PERMEABILITY TESTS

A total of 2 field permeability tests were performed by BSG utilizing the pit bail technique. The testing indicated average permeability rates of 29 and 22 inches per hour (in/hr) within the day of excavation in Test Pits 8 and 9 respectively. Recalculated permeability tests performed by others for test pits presented in the logs attached to this report as Appendix 1 were reported as 2.26, 19.35, and 0.00 in/hr for Soil Profile Test Pit Logs 0325-1, 0325-4, and 0325-5.

The single well pump tests of Wells OW-1 through OW-3 and OW-6 completed by others were reviewed. The locations are shown on the Test Pit Location Plan and the well records are attached to this report as Appendix 2. The average hydraulic conductivity was reported in terms of feet per day, when converted BSG indicated average permeability of less than 0.1 for wells 1, 3 and 6. Two tests of OW-2 indicated an average permeability rate of approximately 18 in/hr.

A set of eight Soil Particle Size Analysis Reports prepared by others were reviewed and are attached to this report as Appendix 3. Permeability class ratings as well as textural classifications were interpreted by BSG based on a review of the reports and soil logs. The results of our review are shown in the following table.

Test Pit ID	Stratum Depth	Soil Texture	Permeability Class
SL0325-1	12-47"	Loam	K-0
SL0325-1	47-74"	Silt Loam	K-0
SL0325-2	10-40"	Loam	K-1
SL0325-3	10-32"	Loam	K-1
SL0325-4	12-27"	Silt Loam	K-0
SL0325-4	27-48"	Loam	K-0
SL0325-5	9-16"	Silt Loam	K-0
SL0325-5	16-62"	Silt Loam	K-0

The permeability class rating system groups permeability rates for septic field design purposes. Soils which have a K-0 rating are unsuitable, considered to be hydraulically restrictive. Soils which have a K-1 rating are marginally suitable.

6.0 SEASONAL HIGH WATER TABLE

Seepage and/or mottling indicating seasonal high water levels were observed in Test Pits 1 through 16 at depths ranging from 2 to 9 feet below the existing surface grades. Available information (reported static water levels from OW- 1 through OW-6 and Kooltronic well data) suggests partially confined conditions.

7.0 GROUNDWATER FLOW DIRECTION

Based on the encountered subsurface conditions and available information the site may contain perched groundwater which may vary over the course of time due to changes in precipitation and other factors. Due to indications of partially confined conditions, delineating between groundwater and perched groundwater may be difficult and/or transitional at the site.

The static water levels of Wells OW-1 through OW-6 completed by others were reviewed. The locations are shown on the Test Pit Location Plan and the well records are attached to this report as Appendix 2. Static water levels ranging between 6 to 8 feet below the existing surface grades were reported for wells 1 through 3 and 6. Wells 4 and 5 were completed to depths of 25 feet below the existing surface grades and were reported as dry.

A component of groundwater flow is presently assumed to be generally eastward toward Stony Brook with a southward component toward the unnamed stream that traverses the site.

8.0 SOIL SUITABILITY CLASSIFICATION

Soil suitability classification was developed by others to aid in identifying subsurface limitations for support of septic fields and to facilitate guidance on design constraints to address site limitations. Published literature is available which provides preliminary indications of these limitations correlated to soil series mapped by the USDA Natural Resources Conservation Service. Comparison of the 16 soil logs completed by BSG, the 2009 report, and the soil suitability classification correlations based on soil series indicate relatively good agreement and as such may be utilized to facilitate site planning.

Bucks Silt Loam soil (Buc) is the predominant soil series mapped at the site. This soil series is correlated with 2 typical limitations being massive rock or hydraulically restrictive substrata at 4 to 9 feet (IISr) and fractured rock or excessively coarse substrata at 0 to 5 feet (IISc). It should be noted that although the Buc does not include hydraulically restrictive soils as a typical classification, the combination of soil textures, structures and relatively high levels of mottling compared to seepage levels observed in the test pits completed by BSG suggest that at a minimum, a portion of the Buc soils may be hydraulically restrictive.

Other soils at the site include soils that are generally associated with additional and more severe restrictions the details of which are not expanded upon in this interim report. However, it should be noted that based on the above DOZA and REFA soil series should be avoided. These soils are generally located in central and western portions of the Pennytown site. Further, it may be prudent to avoid areas within 100 feet of the stream and ponds and limit disposal field areas to north of the stream.



A summary table of the soil profiles, limitations and explorations reviewed for this report is provided below. Additional soil series and associated typical classifications are located in the vicinity of the stream and ponds and are not included in this interim report for brevity.

Soil Series (Variant) Name	Typical Classification(s)	Explorations
Buc, Bucks, Silt Loam, 0-12% Slopes	IISc; IISr	TP-1 through 16, WS-2 and 3, SL 0325-2 and 3, SL 0327-1, PW-1 and 2, OW-3, 5, and 6(edge)
Doza, Doylestown and Reaville Variant, Silt Loam	IIISrWr/IIISrWp(IIHc)	SL 0325-5, OW-1
REFA, Readinton and Abbotstown, Silt Loam	IIHrWp(IISc); IIWpSrSc; IIWrSc/IIHr; Wp(IIISc); IISr; Wp(IIISc)	WS-1, OW-2 and 4, SL 0325-4

9.0 GROUNDWATER MOUNDING ANALYSIS

The sensitivity of the analyses is related to fixed design constraints being the transmissivity, depth to groundwater and specific yield of the underlying geologic formation as well as controlled design parameters including the width, length and separation distances of the disposal fields/trenches.

The following summary table is based on single well pump test data provided in the 2009 report:

Test Date	Well ID	Average Transmissivity (ft ² /d)	Inferred Average Permeability (in/hr)
3/11/2009	OW-1	2.05	0.06
3/11/2009 and 3/13/2009	OW-2	742.86 and 667.97	18.8 and 17.1
3/12/2009	OW-3	1.15	0.03
	OW-4 and OW-5	Dry wells	Dry wells
3/12/2009	OW-6	3.02	0.09

The information presented in the table above suggests two categories related to the permeability of the underlying slightly weathered bedrock that being relatively impermeable and moderately permeable. If the transmissivity values in the range of 1 to 3 is used for design purposes, then the groundwater mounding analysis would indicate groundwater mound heights reaching the ground surface under most if not all anticipated design conditions. This would be an unacceptable condition. The transmissivity of the bedrock is an integral component to assessing the capacity of the aquifer to meet the water demands for the proposed construction. The transmissivity values



from the potable water supply evaluation report by M² Associates dated May 21, 2009 are substantially more favorable.

The details of the evaluation were discussed with M² Associates for applicability in the disposal system design. It is our understanding that additional testing was considered by M² Associates as necessary to identify an adequate water supply and that such information would benefit the development of engineering parameters for mounding analyses.

Additional on-site testing following the interim report was not performed by our office and reportedly not performed by M² Associates.

10.0 CONCLUSIONS AND RECOMENDATIONS

The site contains numerous complex design constraints for both small and relatively large scale subsurface disposal systems. The most difficult design constraint appears to be the sites apparent sensitivity to the development of unacceptably high groundwater mounds beneath the disposal fields/trenches. It is our opinion that the following disposal system strategy may be adopted to address design constraints to the extent practical.

10.1 GENERAL LOCATION

We recommend avoiding the use of the western and central portions of the Pennytown portion of the site as well as areas within 100 feet of the stream and ponds.

10.2 SOIL PERMEABILITY

The soils encountered in the 16 test pits completed by BSG for this project generally consist of silt loam soils atop a relatively thin, firm silty clay loam layer. These soil conditions are expected to have lower average permeability rates compared to the underlying moderately fractured bedrock. It may be prudent to consider excavation of the soils and replacement with more permeable material to facilitate discharge.

10.3 BEDROCK PERMEABILITY

The moderately fractured bedrock is considered to have average permeability rates substantially higher than the underlying slightly weathered substratum. Most of the transmissivity values reported in the 2009 report for on-site testing indicate values which would result in unacceptable groundwater mounds. The transmissivity values from the potable water supply evaluation report by M² Associates dated May 21, 2009 are substantially more favorable. The details of the evaluation were discussed with M² Associates for applicability in the disposal system design. Based on those discussions, it is our understanding that M² Associates recommends evaluating the results in terms of the continuity of fractures to the levels of infiltration or similar hydraulic connection.

10.4 DISPOSAL FIELD DIMENSIONS

All other components being equal, for a given disposal field length to width ratio; the mound height will increase as the field footprint increases. Increasing the length to width ratio for a given footprint area decreases the mound height. It may be prudent to consider utilizing disposal trenches on the order of 5 feet in width and spaced a minimum of 100 feet apart. The trenches should be approximately aligned with ground surface elevation contours.

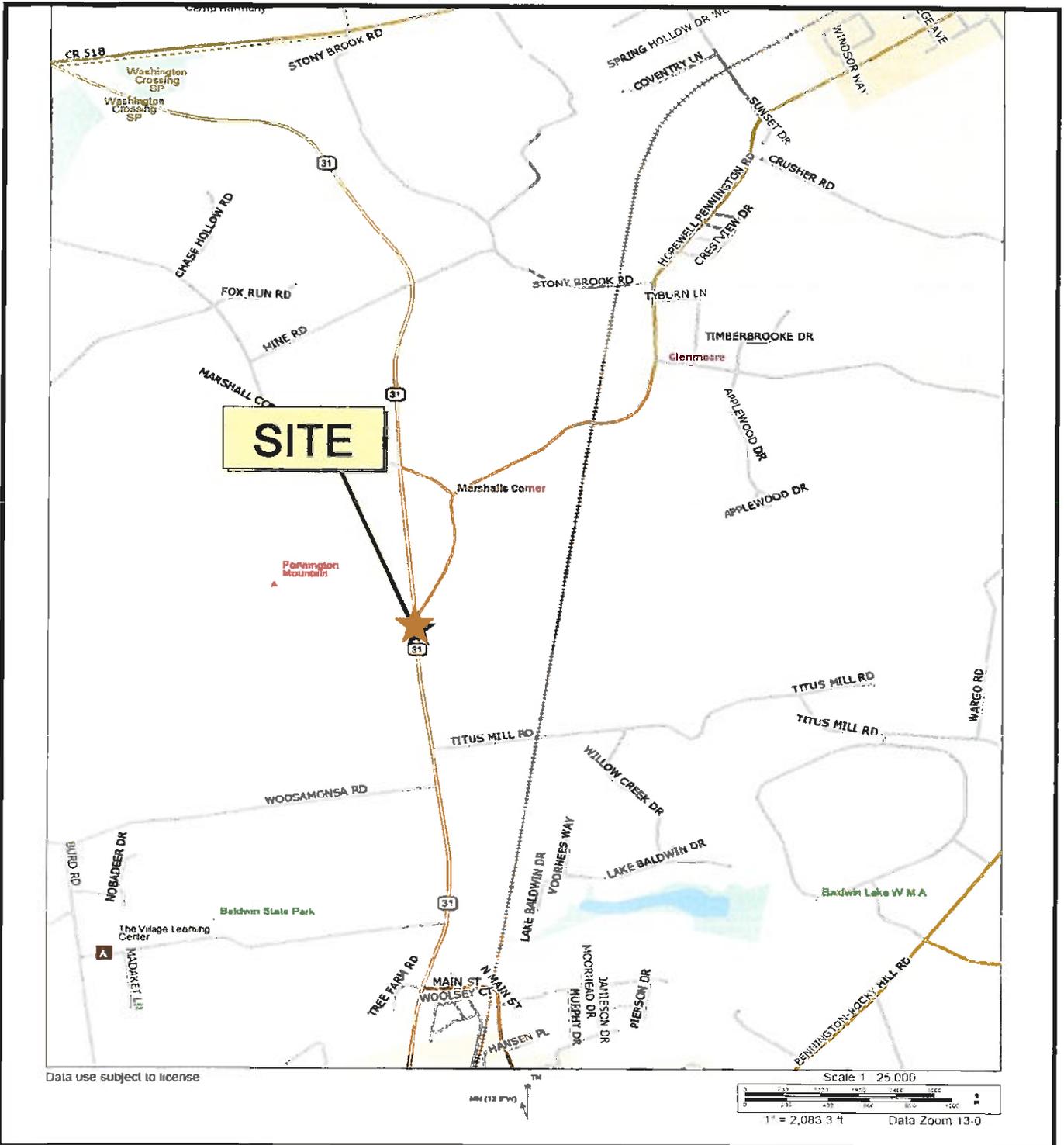
10.5 LONG TERM ACCEPTANCE RATE

It may be prudent to consider pumps and/or controls to enable varying the amounts of daily discharge into individual trenches. It is anticipated that natural bedrock substratum variations, particularly in the fracture patterns and attributes, throughout the site will vary the efficiency of effluent transfer. The pumps and/or controls will enable maximizing the disposal capacity for each trench based on monitoring of the mound heights that will develop.

Limiting the infiltration rate in a given area limits the development of the underlying mound. An assumed conservative average permeability class of K-1 (0.2-0.6 in/hr) will be utilized at this juncture for system sizing, although a more accurate average infiltration rate may be developed based on additional fieldwork and subsequent analyses. Based on K-1, a discharge of 85,000 gpd would require an aggregate infiltration surface of 249,900 sq.ft.

11.0 CLOSING

In closing, although conclusions and recommendations are provided to aid in addressing the numerous complex design constraints for both small and relatively large scale subsurface disposal systems it should be reiterated that this report is an initial hydrogeologic technical report. The testing and analysis required for final design purposes and to obtain an NJDEP NJPDES permit are expected to disclose limitations and development constraints in a more exacting manner.



SITE LOCATION MAP

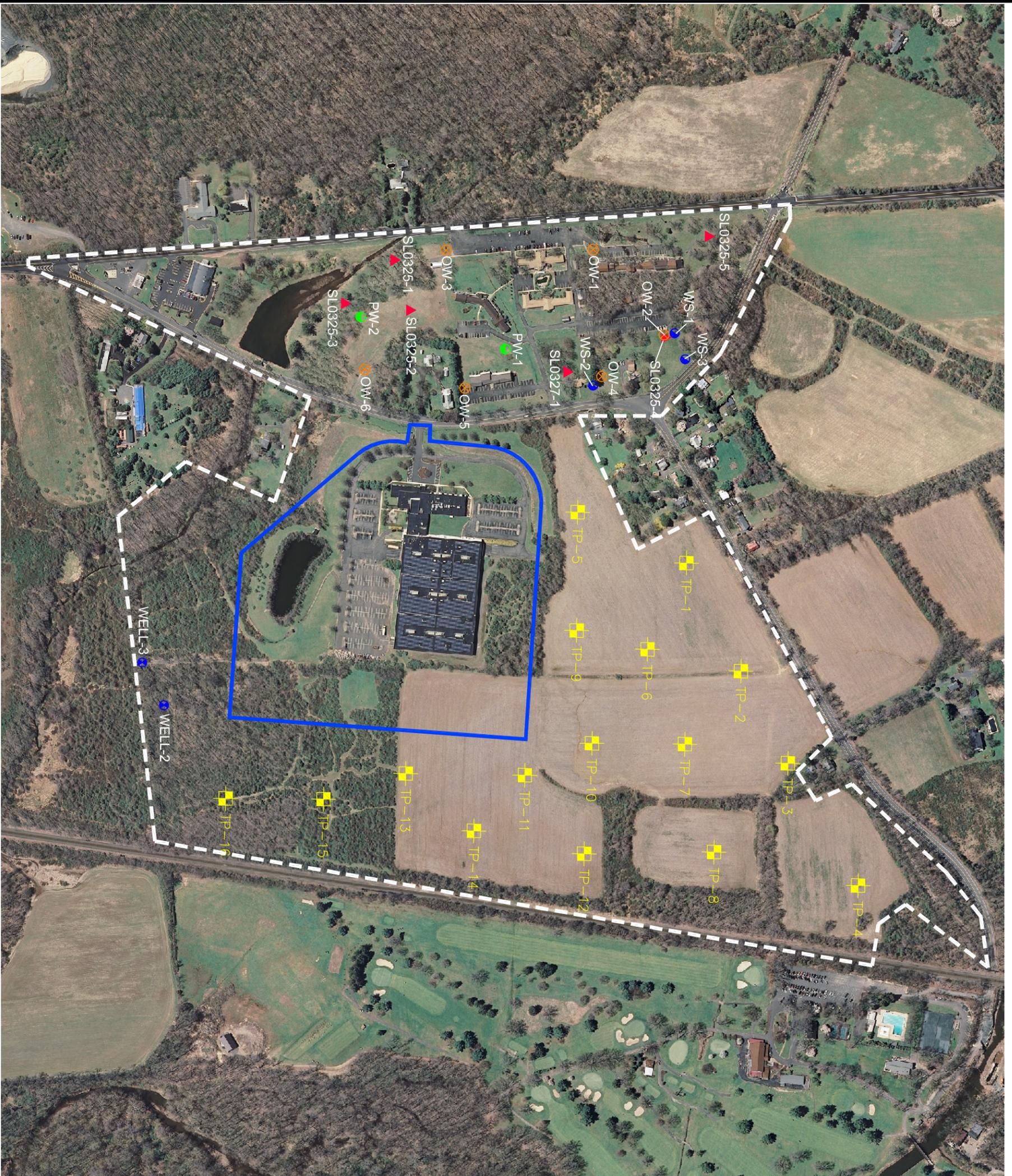
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DRAWN BY: SC	DATE: 4/10/2012
CHECKED BY: RB	SCALE: ---
PROJECT NO: 60606100000	PLATE: 1



LEGEND

- TP-1 [Symbol] -- NUMBER AND APPROXIMATE LOCATION OF TEST PITS COMPLETED BY BSG.
- [Symbol] -- SOIL LOGS COMPLETED BY OTHERS.
- [Symbol] -- PIEZOMETERS COMPLETED BY OTHERS.
- [Symbol] -- WATER SUPPLY TEST WELLS COMPLETED BY OTHERS.
- [Symbol] -- WASTE WATER TEST WELLS COMPLETED BY OTHERS.
- [Symbol] -- WATER SUPPLY WELLS COMPLETED BY OTHERS.
- [Symbol] -- KOOLTRONIC TRACT
- [Symbol] -- APPROXIMATE PROJECT BOUNDARY.

NOTE: ALL LOCATIONS ARE APPROXIMATE AND BASED ON AVAILABLE INFORMATION, SUBJECT TO FIELD VERIFICATION.



TEST PIT LOCATION PLAN PROPOSED COAH DEVELOPMENT

SITUATED IN
 TOWNSHIP OF HOPEWELL, MERCER COUNTY, NEW JERSEY



65 Jackson Drive
 Marlton, NJ 08053
 NJ License No. 3612000000
 TEL: 609.584.8800
 FAX: 609.584.8801
 WWW.BIRDSALL.COM

Job No. 45112 Date 4/5/12 Scale 1"=300'
 (N) (V) (W) (E) (S) (D) (U) (O) (A) (R) (I) (T) (L) (E) (P) (L) (A) (T) (E) (2)



SOIL LOG

Municipality Hopewell Twp. Project # 60606100000 Page 1 of 1

County Mercer Client Name: Hopewell Twp. Project Name: COAH Development

Log Number: TP-1 Block: _____ Lot: _____

Date: 3/9/12 Method: Test Pit

<u>Depth (ft)</u>	<u>Description</u>
0-1	Light brown topsoil
1-3	Dark yellowish brown (10YR 4/6) silt loam, 0% coarse fragments, subangular blocky, friable
3-4.5	Dark reddish brown (2.5YR 2.5/4) silty clay loam (highly weathered shale), 30% coarse fragments, subangular blocky, firm
4.5-6.5	Dark reddish brown (2.5YR2.5/4) moderately weathered shale
6.5-7.5	Dark reddish brown (2.5YR2.5/4) slightly weathered shale

Groundwater Observations:

Seepage – Depth (ft): not initially evident
 Exploration Flooded – Depth (ft): 7.4 After: 4.5 Hours

Comments: Disturbed sample collected @ 2'

Mottling not encountered

Refusal @ 7.5'

Project Manager: RB

Field Engineer: MC



SOIL LOG

Municipality Hopewell Twp. Project # 60606100000 Page 1 of 1

County Mercer Client Name: Hopewell Twp. Project Name: COAH Development

Log Number: TP-2 Block: _____ Lot: _____

Date: 3/8/12 Method: Test Pit

<u>Depth (ft)</u>	<u>Description</u>
0-0.75	Light brown topsoil
0.75-4	Dark yellowish brown (10YR 4/6) silt loam, 0% coarse fragments, subangular blocky, friable
4-5.5	Dark reddish brown (2.5YR 3/4) silty clay loam (highly weathered shale), 45% coarse fragments, subangular blocky, firm
5.5-9.25	Dark reddish brown (2.5YR 3/4) moderately weathered shale, grading to highly weathered shale

Groundwater Observations:

Seepage – Depth (ft): not initially evident
 Exploration Flooded – Depth (ft): 9 After: 3 Hours

Comments: Disturbed samples collected @ 3' and 5'

Mottling not encountered

Refusal @ 9.25'

Project Manager: RB

Field Engineer: MC



SOIL LOG

Municipality Hopewell Twp. Project # 60606100000 Page 1 of 1

County Mercer Client Name: Hopewell Twp. Project Name: COAH Development

Log Number: TP-3 Block: _____ Lot: _____

Date: 3/8/12 Method: Test Pit

<u>Depth (ft)</u>	<u>Description</u>
0-1	Light brown topsoil
1-3.5	Dark yellowish brown (10YR 4/6) silt loam, 0% coarse fragments, subangular blocky, friable
3.5-5.5	Dark reddish brown (2.5YR 2.5/4) silty clay loam (highly weathered shale), 15% coarse fragments, subangular blocky, firm
5.5-6.5	Dark reddish brown (2.5YR 2.5/4) moderately weathered shale
6.5-7.5	Dark reddish brown (2.5YR2.5/4) slightly weathered shale

Groundwater Observations:

Seepage – Depth (ft): 6 (localized)
 Exploration Flooded – Depth (ft): 7 After: 1 Hours

Comments: Disturbed sample collected @ 2.5'
Mottling not encountered
Refusal @ 7.5'

Project Manager: RB Field Engineer: MC



SOIL LOG

Municipality Hopewell Twp. Project # 60606100000 Page 1 of 1

County Mercer Client Name: Hopewell Twp. Project Name: COAH Development

Log Number: TP-4 Block: _____ Lot: _____

Date: 3/9/12 Method: Test Pit

<u>Depth (ft)</u>	<u>Description</u>
0-1	Light brown topsoil
1-3.5	Dark yellowish brown (10YR 4/6) silt loam, 0% coarse fragments, subangular blocky, friable
3.5-4	Dark reddish brown (5YR 3/3) silty clay loam (highly weathered shale), 40% coarse fragments, subangular blocky, firm
4-6	Dark reddish brown (5YR 3/3) moderately weathered shale
6-9	Dark reddish brown (5YR 3/3) slightly weathered shale

Groundwater Observations:

Seepage - Depth (ft): 7.5 (localized)
 Exploration Flooded - Depth (ft): 8 After: 2 Hours

Comments: Tube sample and disturbed sample @ 2'

Mottling not encountered

Refusal @ 9'

Slow seepage

Project Manager: RB

Field Engineer: MC



SOIL LOG

Municipality Hopewell Twp. Project # 60606100000 Page 1 of 1

County Mercer Client Name: Hopewell Twp. Project Name: COAH Development

Log Number: TP-5 Block: _____ Lot: _____

Date: 3/9/12 Method: Test Pit

<u>Depth (ft)</u>	<u>Description</u>
0-1	Light brown topsoil
1-4	Dark yellowish brown (10YR 4/6) silt loam, 0% coarse fragments, subangular blocky, friable
4-6	Dark reddish brown (2.5YR 2.5/4) silty clay loam, (highly weathered shale), 20% coarse fragments, subangular blocky, firm
6-7.5	Dark reddish brown (2.5YR 2.5/4) moderately weathered shale
7.5-9.75	Dark reddish brown (2.5YR 2.5/4) slightly weathered shale

Groundwater Observations:

Seepage – Depth (ft): 9 (localized)
 Exploration Flooded – Depth (ft): 9 After: 4.5 Hours

Comments: Tube sample and disturbed sample @ 2.5'
Mottling not encountered
Refusal @ 9.75'
Slow seepage

Project Manager: RB Field Engineer: MC



SOIL LOG

Municipality Hopewell Twp. Project # 60606100000 Page 1 of 1

County Mercer Client Name: Hopewell Twp. Project Name: COAH Development

Log Number: TP-6 Block: _____ Lot: _____

Date: 3/9/12 Method: Test Pit

<u>Depth (ft)</u>	<u>Description</u>
0-1	Light brown topsoil
1-4	Dark yellowish brown (10YR 4/6) silt loam, 0% coarse fragments, subangular blocky, friable
4-5	Dark reddish brown (2.5YR 2.5/4) silty clay loam, (highly weathered shale), 50% coarse fragments, subangular blocky, firm
5-6.5	Dark reddish brown (2.5YR 2.5/4) moderately weathered shale
6.5-8.5	Dark reddish brown (2.5YR 2.5/4) slightly weathered shale

Groundwater Observations:

Seepage – Depth (ft): 7 (localized)
 Exploration Flooded – Depth (ft): 7.5 After: 3.5 Hours

Comments: Perm tube and disturbed sample @ 2'
Mottling not encountered
Refusal @ 8.5'
Moderate seepage

Project Manager: RB Field Engineer: MC



SOIL LOG

Municipality Hopewell Twp. Project # 60606100000 Page 1 of 1

County Mercer Client Name: Hopewell Twp. Project Name: COAH Development

Log Number: TP-7 Block: _____ Lot: _____

Date: 3/9/12 Method: Test Pit

<u>Depth (ft)</u>	<u>Description</u>
0-1	Light brown topsoil
1-2.5	Dark yellowish brown (10YR 4/6) silt loam, 0% coarse fragments, subangular blocky, friable
2.5-4	Dark brown (7.5YR 3/4) silty clay loam, (highly weathered shale), 40% coarse fragments, subangular blocky, firm, common, medium distinct, olive yellow (5Y 6/6) and olive gray (5Y 5/2) mottles
4-6	Dark brown (7.5YR 3/4) moderately weathered shale
6-9	Dark brown (7.5YR 3/4) slightly weathered shale

Groundwater Observations:

Seepage – Depth (ft): 7 (localized)
 Exploration Flooded – Depth (ft): 8 After: 2.5 Hours

Comments: Disturbed sample @ 2'
Refusal @ 9'
Slow seepage

Project Manager: RB Field Engineer: MC



SOIL LOG

Municipality Hopewell Twp. Project # 60606100000 Page 1 of 1

County Mercer Client Name: Hopewell Twp. Project Name: COAH Development

Log Number: TP-8 Block: _____ Lot: _____

Date: 3/8/12 Method: Test Pit

<u>Depth (ft)</u>	<u>Description</u>
0-1	Light brown topsoil
1-3	Brown/Dark brown (7.5YR 4/4) silt loam, 0% coarse fragments, subangular blocky, friable
3-4.5	Dark reddish brown (2.5YR 3/4) silty clay loam, (highly weathered shale), 50% coarse fragments, subangular blocky, firm
4.5-10.5	Dark reddish brown (2.5YR 3/4) moderately weathered shale grading to slightly weathered shale

Groundwater Observations:

Seepage – Depth (ft): 8 (localized)
 Exploration Flooded – Depth (ft): 6 After: 3.5 Hours

Comments: Disturbed samples @ 2.5 and 3.5'

Mottling not encountered

Refusal @ 10.5'

Moderate seepage

Project Manager: RB

Field Engineer: MC



SOIL LOG

Municipality Hopewell Twp. Project # 60606100000 Page 1 of 1

County Mercer Client Name: Hopewell Twp. Project Name: COAH Development

Log Number: TP-9 Block: _____ Lot: _____

Date: 3/8/12 Method: Test Pit

<u>Depth (ft)</u>	<u>Description</u>
0-0.5	Light brown topsoil
0.5-4	Dark yellowish brown (10YR 4/6) silt loam, 0% coarse fragments, subangular blocky, friable
4-5	Dark reddish brown (5YR 3/3) silty clay loam, (highly weathered shale), 20% coarse fragments, subangular blocky, firm
5-9.5	Dark reddish brown (5YR 3/3) moderately weathered shale grading to slightly weathered shale

Groundwater Observations:

Seepage – Depth (ft): 6 (localized)
 Exploration Flooded – Depth (ft): 5.5 After: 4.5 Hours

Comments: Disturbed samples @ 3' and 5'

Mottling not encountered

Refusal @ 9.5'

Rapid seepage

Project Manager: RB

Field Engineer: MC



SOIL LOG

Municipality Hopewell Twp. Project # 60606100000 Page 1 of 1

County Mercer Client Name: Hopewell Twp. Project Name: COAH Development

Log Number: TP-10 Block: _____ Lot: _____

Date: 3/9/12 Method: Test Pit

<u>Depth (ft)</u>	<u>Description</u>
0-1	Light brown topsoil
1-4	Dark yellowish brown (10YR 4/6) silt loam, 0% coarse fragments, subangular blocky, friable
4-5	Dark red (2.5YR 3/2) silty clay loam, (highly weathered shale), 50% coarse fragments, subangular blocky, firm
5-7.5	Dark red (2.5YR 3/2) moderately weathered shale
7.5-10	Dark red (2.5YR 3/2) slightly weathered shale

Groundwater Observations:

Seepage – Depth (ft): 8 (localized)
 Exploration Flooded – Depth (ft): 7.5 After: 3 Hours

Comments: Disturbed sample and tube sample @ 2'
Mottling not encountered
Refusal @ 10'
Moderate to slow seepage. side caving in

Project Manager: RB Field Engineer: MC



SOIL LOG

Municipality Hopewell Twp. Project # 60606100000 Page 1 of 1

County Mercer Client Name: Hopewell Twp. Project Name: COAH Development

Log Number: TP-11 Block: _____ Lot: _____

Date: 3/8/12 Method: Test Pit

<u>Depth (ft)</u>	<u>Description</u>
0-0.75	Light brown topsoil
0.75-2.5	Dark yellowish brown (10YR 4/6) silt loam, 0% coarse fragments, subangular blocky, friable
2.5-3.5	Dark reddish brown (2.5YR 3/4) silty clay loam, (highly weathered shale), 40% coarse fragments, subangular blocky, firm
3.5-5.5	Dark reddish brown (2.5YR 3/4) moderately weathered shale
5.5-7.5	Dark reddish brown (2.5YR 3/4) slightly weathered shale

Groundwater Observations:

Seepage - Depth (ft): 5 (localized)
 Exploration Flooded - Depth (ft): 6.5 After: 3.5 Hours

Comments: Disturbed samples @ 2' and 3'
Mottling not encountered
Difficult digging @ 7' expected refusal @ 9'
Slight to moderate seepage

Project Manager: RB Field Engineer: MC



SOIL LOG

Municipality Hopewell Twp. Project # 60606100000 Page 1 of 1

County Mercer Client Name: Hopewell Twp. Project Name: COAH Development

Log Number: TP-12 Block: _____ Lot: _____

Date: 3/8/12 Method: Test Pit

<u>Depth (ft)</u>	<u>Description</u>
0-0.75	Light brown topsoil
0.75-3	Dark brown (7.5YR 3/4) silty clay loam, (highly weathered shale) 10% coarse fragments, subangular blocky, firm
3-4.5	Dark brown (7.5YR 3/4) moderately weathered shale
4.5-5.5	Dark brown (7.5YR 3/4) slightly weathered shale

Groundwater Observations:

Seepage – Depth (ft): not initially evident
 Exploration Flooded – Depth (ft): 5.4 After: 2 Hours

Comments: Disturbed sample @ 1.5'

Mottling not encountered

Refusal @ 5.5'

Project Manager: RB

Field Engineer: MC



SOIL LOG

Municipality Hopewell Twp. Project # 60606100000 Page 1 of 1

County Mercer Client Name: Hopewell Twp. Project Name: COAH Development

Log Number: TP-13 Block: _____ Lot: _____

Date: 3/8/12 Method: Test Pit

<u>Depth (ft)</u>	<u>Description</u>
0-0.5	Light brown topsoil
0.5-3	Reddish brown (5YR 4/4) silty clay loam, 5% coarse fragments, subangular blocky, friable
3-4.5	Reddish brown (5YR 4/4) silty clay loam (highly weathered shale) 45% coarse Fragments, subangular blocky, friable
4.5-6	Reddish brown (5YR 4/4) moderately weathered shale
6-7.5	Gray (2.5YR 6/0) slightly weathered shale

Groundwater Observations:

Seepage - Depth (ft): 5 (localized)
 Exploration Flooded - Depth (ft): 7 After: 3 Hours

Comments: Disturbed sample @ 2'
Mottling not encountered
Refusal @ 7.5'
Slow seepage

Project Manager: RB Field Engineer: MC



SOIL LOG

Municipality Hopewell Twp. Project # 60606100000 Page 1 of 1

County Mercer Client Name: Hopewell Twp. Project Name: COAH Development

Log Number: TP-14 Block: _____ Lot: _____

Date: 3/9/12 Method: Test Pit

<u>Depth (ft)</u>	<u>Description</u>
0-0.75	Light brown topsoil
0.75-2.25	Dark yellowish brown (10YR 4/6) silt loam, 0% coarse fragments, subangular blocky, friable
2.25-2.5	Dark reddish brown (2.5YR 3/4) silty clay loam (highly weathered shale) 40% coarse fragments, subangular blocky, firm
2.5-3.5	Dark reddish brown (2.5YR 3/4) moderately weathered shale
3.5-5	Dark reddish brown (2.5YR 3/4) slightly weathered shale

Groundwater Observations:

Seepage – Depth (ft): 4 (localized)
 Exploration Flooded – Depth (ft): 4.5 After: 2 Hours

Comments: Perm tube and disturbed sample @ 2'
Mottling not encountered
Refusal @ 5'
Slow seepage

Project Manager: RB Field Engineer: MC



SOIL LOG

Municipality Hopewell Twp. Project # 60606100000 Page 1 of 1

County Mercer Client Name: Hopewell Twp. Project Name: COAH Development

Log Number: TP-15 Block: _____ Lot: _____

Date: 3/9/12 Method: Test Pit

<u>Depth (ft)</u>	<u>Description</u>
0-1	Light brown topsoil
1-3	Strong brown (7.5YR 4/6) silt loam, 0% coarse fragments, subangular blocky, Friable
3-4	Dark reddish brown (2.5YR 2.5/4) silty clay loam (highly weathered shale) 40% coarse fragments, subangular blocky, firm
4-6	Dark reddish brown (2.5YR 2.5/4) moderately weathered shale
6-8	Dark reddish brown (2.5YR 2.5/4) slightly weathered shale

Groundwater Observations:

Seepage – Depth (ft): 4.5 (localized)
 Exploration Flooded – Depth (ft): 5.25 After: 2 Hours

Comments: Disturbed sample @ 2.5'
Mottling not encountered
Refusal @ 8'
Moderate seepage

Project Manager: RB Field Engineer: MC



SOIL LOG

Municipality Hopewell Twp. Project # 60606100000 Page 1 of 1

County Mercer Client Name: Hopewell Twp. Project Name: COAH Development

Log Number: TP-16 Block: _____ Lot: _____

Date: 3/9/12 Method: Test Pit

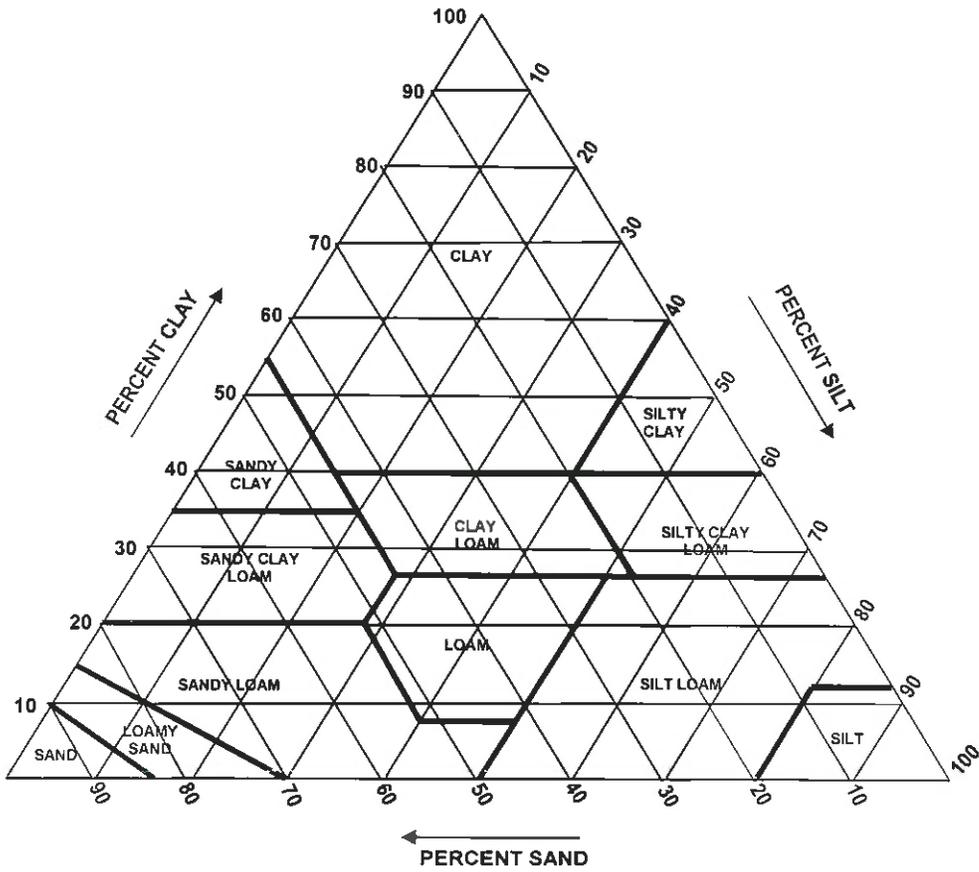
<u>Depth (ft)</u>	<u>Description</u>
0-2	Light brown topsoil
2-3	Dark brown/brown (7.5YR 4/4) silty clay loam, 0% coarse fragments, subangular blocky, firm, strong brown (7.5YR 5/6) common fine faint mottles
3-3.5	Reddish brown (5YR 4/4) silty clay loam (highly weathered shale) 50% coarse fragments, subangular blocky, firm
3.5-4.5	Reddish brown (5YR 4/4) slightly weathered shale

Groundwater Observations:

Seepage – Depth (ft): not observed
 Exploration Flooded – Depth (ft): N/A After: 0 Hours

Comments: Disturbed sample @ 2'
Refusal @ 4.5'

Project Manager: RB Field Engineer: MC



USDA SOIL CLASSIFICATION SYSTEM

CHECKED BY:	RB	DATE:	4/10/2012
PROJECT NO.:	6060610000	SCALE:	AS SHOWN



APPENDIX 1
SOIL LOGS PROVIDED IN THE 2009 REPORT



2 Clerico Lane
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SOIL PROFILE TEST PIT LOG

Project Pennytown Village
WWTP Evaluation
Township Hopewell Township
County / State Mercer County, New Jersey
AWM Project # E01286AA

Soil Log ID No SL0325-1
Total Depth (in-bgl) 85
Location As Noted
Weather Clear, 70-50°
Date 4/28/2009

DEPTH (ft) (BGL)	DEPTH (in-BGL)	SYMBOL	INTERVAL DEPTH (in-BGL)	MUNSELL COLOR		IDENTIFICATION OF SOILS AND LITHOLOGY
				NOTATION	NAME	
0	0		0-6	7.5YR 4/3	Brown	(0-6") Loam, subangular blocky, soft with 10 percent shale gravel, gradual and smooth boundary.
			6-12	7.5YR 4/3	Brown	(6-12") Set loam, subangular blocky and platy, soft with 20 to 30 percent shale and silstone gravel and cobble, clear and wavy boundary.
5	60		12-47	5YR 4/4	Reddish Brown	(12-47") Silty clay loam, angular blocky, friable, 30 to 40 percent shale and silstone gravel with many, medium, and distinct 7.5YR 4/1 and 7.5YR 4/8 (dark gray and strong brown, respectively) mottles between 12 and 47 inches below grade, clear and wavy boundary.
			47-74	5YR 4/2-4/3	Dark Reddish Gray to Reddish Brown	(47-74") Silty clay to clay, massive, firm with few, coarse, and distinct 10YR 8/2 (light brownish gray) mottles between 60 and 74 inches below grade.
			74-85		Brownish Red	(74-85") Shale, open with lines, 10 to 20 percent reddish brown silty clay fillings, moderately fractured, light.
10	120					<p>End of Soil Test Pit</p> <p>Test Stopped 85 (in-bgl) - Machine Refusal</p> <p>Seepage (Slight) - 56 to 74 in-bgl</p> <p>Seepage (Moderate) - 74 to 85 in-bgl</p>
15	180					
20	240					
25	300					

GROUNDWATER INFORMATION

Static Water Level (bgl - in.) 58.5 After: 24 Hours
Seepage (bgl - in.) 56 - 85
Permeability Tests (Y/N): Y (PB0326-2)

Soils Evaluator D. Geddes
Excavating Equipment Komatsu PC-130
Excavating Operator M. Sacek



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SOIL PROFILE TEST PIT LOG

Project	<u>Pennytown Village</u>	Soil Log ID No.	<u>SL0325-2</u>
	<u>WWTP Evaluation</u>	Total Depth (in-bgl)	<u>72</u>
Township	<u>Hopewell Township</u>	Location	<u>As Noted</u>
County / State	<u>Mercer County, New Jersey</u>	Weather	<u>Clear, 20-50°</u>
AWM Project #	<u>E01286AA</u>	Date	<u>4/23/2009</u>

DEPTH (FT-BGL)	DEPTH (IN-BGL)	SYMBOL	INTERVAL DEPTH (IN-BGL)	MUNSELL COLOR		IDENTIFICATION OF SOILS AND LITHOLOGY
				NOTATION	NAME	
0	0		0-10	7.5YR 4/4	Brown	(0-10") Loam subangular blocky, loose with 10 percent shale gravel, gradual and wavy boundary
			10-40	5YR 4/3	Reddish Brown	(10-40") Silt loam subangular blocky soft with 40 to 50 percent siltstone gravel and cobbles, staining and weathering of cobble rinds observed between 30 and 40 inches below ground level, clear and wavy boundary.
5	60		40-72		Reddish Brown	(40-72") Siltstone open with fines, up to 20 percent 5YR 4/3 (Reddish Brown) silt loam fillings, moderately fractured with mineral stains throughout, light.
						End of Soil Test Pit
						Test Stopped 72 (in-bgl) - Machine Refusal No Groundwater or Seepage Encountered
10	120					
15	180					
20	240					
25	300					

GROUNDWATER INFORMATION

Static Water Level (bgl - in.) n/a After: -- Hours
 Seepage (bgl - in.) n/a
 Permeability Tests (Y/N): Y

Soils Evaluator	<u>D. Geddes</u>
Excavating Equipment	<u>Komatsu PC-130</u>
Excavating Operator	<u>M. Sacek</u>



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SOIL PROFILE TEST PIT LOG

Project Pennycott Village
 WWTP Evaluation
 Township Hopewell Township
 County / State Mercer County, New Jersey
 AWM Project # E01286AA

Soil Log ID No. SL0325-3
 Total Depth (in-bgl) 83
 Location As Noted
 Weather Clear 20-39°
 Date 4/28/2009

DEPTH (FT)	DEPTH (IN-BGL)	SYMBOL	INTERVAL DEPTH (IN-BGL)	MUNSELL COLOR		IDENTIFICATION OF SOILS AND LITHOLOGY
				NOTATION	NAME	
0	0		0-10	7.5YR 4/4	Brown	(0-10") Loam, crumb, loose with 10 percent shale and siltstone gravel, gradual and wavy boundary
			10-32	5YR 4/4	Reddish Brown	(10-32") Silt loam, subangular blocky, soft to slightly hard with 30 to 40 percent red, gray and olive shale and siltstone gravel and cobble, gradual and irregular boundary.
5	60		32-83		Reddish Brown and Purplish Gray	(32-83") Shale and siltstone, open with fines, 30 percent 5YR 6.4 (brown) silt loam fillings with mineral staining throughout. Red shale is blocky and moderately fractured. Gray shale is foggy and highly fractured.
10	120					
15	180					
20	240					
25	300					

End of Soil Test Pit
 Test Stopped 83 (in-bgl) - Machine Refusal
 Seepage (Very Slight) - 83 in-bgl

GROUNDWATER INFORMATION

Static Water Level (bgl - in.) n/a After: -- Hours
 Seepage (bgl - in.) 83
 Permeability Tests (Y/N): N

Soils Evaluator D. Geddes
 Excavating Equipment Komatsu PC-130
 Excavating Operator M. Sacek



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SOIL PROFILE TEST PIT LOG

Project Pennytown Village Soil Log ID No SL0325-4
 WWTP Evaluation Total Depth (in-bgl) 124
 Township Hopewell Township Location As Noted
 County / State Mercer County, New Jersey Weather Clear, 20-50°
 AWM Project # E01288AA Date 4/28/2009

DEPTH (FT - BGL)	DEPTH (IN-BGL)	SYMBOL	INTERVAL DEPTH (IN-BGL)	MUNSELL COLOR		IDENTIFICATION OF SOILS AND LITHOLOGY
				NOTATION	NAME	
0	0					
			0-6	7.5YR 4/3	Brown	(0-6") Loam, crumb, loose, clear and smooth boundary.
			6-12	7.5YR 4/3	Brown	(6-12") Silt loam, subangular blocky and platy, slightly hard with 10 percent shale gravel, gradual and wavy boundary
5	60		12-27	5YR 5/6	Yellowish Red	(12-27") Silt loam to silty clay loam, angular blocky and platy, slightly hard with 10 to 20 percent shale and siltstone gravel, clear and wavy boundary
			27-48	2.5YR 4/4-3/4	Reddish Brown to Dark Reddish Brown	(27-48") Silt loam to silty clay loam, subangular blocky, slightly hard to hard with 30 percent red, tan and gray siltstone and shale gravel, gradual and irregular boundary
			48-124		Reddish Brown	(48-124") Shale and siltstone, open with fines, up to 30 percent 2.5YR 3/4 (dark reddish brown) silty clay loam fillings
10	120					
15	180					
20	240					
25	300					

GROUNDWATER INFORMATION

Static Water Level (bgl - in.) 70.5 After: 24 Hours
 Seepage (bgl - in.) 68 - 124
 Permeability Tests (Y/N): Y (PB0328-3)

Soils Evaluator D. Geddes
 Excavating Equipment Komatsu PC-130
 Excavating Operator M. Sacek



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SOIL PROFILE TEST PIT LOG

Project: Pennytown Village Soil Log ID No. SL0325-5
WWTP Evaluation Total Depth (m-bgl) 72
 Township: Hopewell Township Location As Noted
 County / State: Mercer County, New Jersey Weather Clear, 20-50°
 AWM Project #: E01286AA Date 4/28/2009

DEPTH (FT. - BGL)	DEPTH (IN. - BGL)	SYMBOL	INTERVAL DEPTH (IN. - BGL)	MUNSELL COLOR		IDENTIFICATION OF SOILS AND LITHOLOGY
				NOTATION	NAME	
0	0		0-9	7.5YR 4/4	Brown	(0-9") Silt loam to silty clay loam, crumb to subangular blocky, loose with 20 to 30 percent rounded quartzite gravel, non-native; gradual and smooth boundary
			9-16	5YR 4/4	Reddish Brown	(9-16") Silty clay loam, angular blocky and platy, slightly hard with 10 percent shale gravel, smooth and wavy boundary
5	60		16-62	7.5YR 5/6	Strong Brown	(16-62") Silty clay loam, angular blocky, firm, 10 percent shale gravel, with common coarse to medium and distinct 7.5YR 6/2 to 7.5R 6/3 (pinkish gray to light brown) mottles between 18 and 62 inches below ground level.
			62-72		Reddish Brown	(62-72") Siltstone and shale, open with fines, 10 to 20 percent 2.5YR 4/3 (reddish brown) silty clay loam fillings, tight.
10	120					End of Soil Test Pit
						Test Stopped 72 (m-bgl) - Machine Refusal Seepage (Slight) - 70 m-bgl
15	180					
20	240					
25	300					

GROUNDWATER INFORMATION

Static Water Level (bgl - in.) 58 After: 24 Hours
 Seepage (bgl - in.) 70
 Permeability Tests (Y/N): Y (PB0326-1)

Soils Evaluator D. Goddes
 Excavating Equipment Komatsu PC-130
 Excavating Operator M. Sacek



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SOIL PROFILE TEST PIT LOG

Project Pennytown Village
 WWTP Evaluation
 Township Hopewell Township
 County / State Mercer County, New Jersey
 AWM Project # E01286AA

Soil Log ID No. SL0327.1
 Total Depth (in-bgl) 52
 Location As Noted
 Weather Clear, 40-60°
 Date 4/28/2009

DEPTH (FT-BGL)	DEPTH (IN-BGL)	SYMBOL	INTERVAL DEPTH (IN-BGL)	MUNSELL COLOR	
				NOTATION	NAME
0	0		0-7	7.5YR 3/3	Dark Brown
			7-20	5YR 4/6	Yellowish Red
5	60		20-30	5YR 4/6	Yellowish Red
			30-52		Reddish Brown
10	120				
15	180				
20	240				
25	300				

IDENTIFICATION OF SOILS AND LITHOLOGY

(0-7") Silty clay loam, crumb, friable with 10 percent shale gravel, gradual and wavy boundary.

(7-20") Silty clay loam, angular blocky, friable with 20 to 30 percent shale gravel and few, fine, and faint 5YR 6/3 (light reddish brown) mottles between 7 and 20 inches below ground level.

(20-30") Silt loam to silty clay loam, angular blocky, slightly hard to hard with 30 to 40 percent shale and siltstone gravel and cobbles with many, coarse, and distinct 5YR 6/4 (light reddish brown) mottles between 20 and 30 inches below ground level, gradual and irregular boundary.

(30-52") Siltstone, open with fines, up to 30 percent 5YR 4/6 (yellowish red) silt loam fillings, tight.

End of Soil Test Pit

Test Stopped 52 (in bgl) - Machine Refusal
 Seepage (Slight) - 18 in-bgl
 Seepage (Very Slight) - 41 in-bgl

GROUNDWATER INFORMATION

Static Water Level (bgl - in.) n/a After: -- Hours
 Seepage (bgl - in.) 18:41
 Permeability Tests (Y/N): N

Soils Evaluator D. Geddes
 Excavating Equipment Komatsu PC-130
 Excavating Operator M. Sacek



APPENDIX 3
SOIL PARTICLE SIZE ANALYSES IN THE 2009 REPORT



2 Clerco Lane
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SOIL PARTICLE SIZE ANALYSIS REPORT

Date Collected: 03/25/2009
 Collected By: DG
 Tested By: MS
 Block: 33
 Lot: 1.02

Job #: E01286AA
 Client: Alianza Environmental, LLC
 Lab Tray #: 1
 Municipality: Hopewell
 County / State: Mercer / NJ

Test Number: 1

Replicate (Letter): A

Sample Identification: SI.0325-1 12-47"

Coarse Fragment Content:

Total Weight of Sample, (W.T.) = 536.9 grams
 Weight of Material Retained on 2 mm sieve, (W.C.F.) = 129.1 grams
24.0 %

Hydrometer Analysis:

Oven Dry Weight (24 hrs @ 105°C) of 40 gram Air Dry Sample, Wt. = 38.40 grams
 Hydrometer Calibration, Rc = 5.0
 Hydrometer Reading - 40 seconds, R1 = 31.0
 Corrected Hydrometer Reading, R1' = 26.0
 Hydrometer Calibration - 2 hours, Rc' = 5.0
 Hydrometer Reading - 2 hours, R2 = 14.0
 Corrected Hydrometer Reading, R2' = 9.0
 % Sand = 32.3 %
 % Clay = 23.4 %
 % Silt = 44.3 %

Sieve Analysis:

Oven Dry Weight (2 hrs., 105°C) Total Sand Fraction (Soil Retained on 0.047 mm Sieve) = 10.30 grams
 Weight of Fine Plus Very Fine Sand Fraction (Soil Passing 0.25 mm Sieve) = 5.30 grams
 % Fine and Very Fine Sand = 51.5 %

Test conducted in strict conformance with procedure identified in ASTM D 422-63 "Standard Test Method for Particle-Size Analysis of Soils.



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SOIL PARTICLE SIZE ANALYSIS REPORT

Date Collected: 03/25/2009
Collected By: DG
Tested By: MS
Block: 33
Lot: 1.02

Job #: E01286AA
Client: Alliance Environmental, LLC
Lab Tray #: 2
Municipality: Hopewell
County / State: Mercer / NJ

Test Number: 1

Replicate (Letter): A

Sample Identification: SL0325-1 47-74*

Coarse Fragment Content:

Total Weight of Sample, (W.T.) = 490 grams
Weight of Material Retained on 2 mm sieve, (W.C.F.) = 0.8 grams
0.2 %

Hydrometer Analysis:

Oven Dry Weight (24 hrs @ 105°C) of 40 gram Air Dry Sample, W1 = 40.00 grams
Hydrometer Calibration, Rc = 5.0
Hydrometer Reading - 40 seconds, R1 = 38.0
Corrected Hydrometer Reading, R1' = 33.0
Hydrometer Calibration - 2 hours, Rc' = 5.0
Hydrometer Reading - 2 hours, R2 = 13.0
Corrected Hydrometer Reading, R2' = 8.0
% Sand = 17.5 %
% Clay = 20.0 %
% Silt = 62.5 %

Sieve Analysis:

Oven Dry Weight (2 hrs., 105°C) Total Sand Fraction (Soil Retained on 0.047 mm Sieve) = 2.70 grams
Weight of Fine Plus Very Fine Sand Fraction (Soil Passing 0.25 mm Sieve) = 1.70 grams
% Fine and Very Fine Sand = 63.0 %

Test conducted in strict conformance with procedure identified in ASTM D 422-63 "Standard Test Method for Particle-Size Analysis of Soils."



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SOIL PARTICLE SIZE ANALYSIS REPORT

Date Collected: 03/25/2009
Collected By: DG
Tested By: MS
Block: 33
Lot: 1.02

Job #: E01286AA
Client: Alliance Environmental, LLC
Lab Tray #: 3
Municipality: Hopewell
County / State: Mercer / NJ

Test Number: 1

Replicate (Letter): A

Sample Identification: SL0325-2 10-40*

Coarse Fragment Content:

Total Weight of Sample, (W.T.) = 677.4 grams
Weight of Material Retained on 2 mm sieve, (W.C.F.) = 375.3 grams
55.4 %

Hydrometer Analysis:

Oven Dry Weight (24 hrs @ 105°C) of 40 gram Air Dry Sample, Wt. = 39.40 grams
Hydrometer Calibration, Rc = 5.0
Hydrometer Reading - 40 seconds, R1 = 29.0
Corrected Hydrometer Reading, R1' = 24.0
Hydrometer Calibration - 2 hours, Rc' = 5.0
Hydrometer Reading - 2 hours, R2 = 14.0
Corrected Hydrometer Reading, R2' = 9.0
% Sand = 39.1 %
% Clay = 22.8 %
% Silt = 38.1 %

Sieve Analysis:

Oven Dry Weight (2 hrs., 105°C) Total Sand Fraction (Soil Retained on 0.047 mm Sieve) = 12.40 grams
Weight of Fine Plus Very Fine Sand Fraction (Soil Passing 0.25 mm Sieve) = 5.00 grams
% Fine and Very Fine Sand = 40.3 %

Test conducted in strict conformance with procedure identified in ASTM D 422-63 "Standard Test Method for Particle-Size Analysis of Soils."



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F 908.358.8886

SOIL PARTICLE SIZE ANALYSIS REPORT

Date Collected: 03/25/2009
Collected By: DG
Tested By: MS
Block: 33
Lot: 1.02

Job #: E01286AA
Client: Alliance Environmental, LLC
Lab Tray #: 4
Municipality: Hopewell
County / State: Mercer / NJ

Test Number: 1

Replicate (Letter): A

Sample Identification: SL0325-3 10-32"

Coarse Fragment Content:

Total Weight of Sample, (W.T.) = 758.6 grams
Weight of Material Retained on 2 mm sieve, (W.C.F.) = 477.0 grams
62.9 %

Hydrometer Analysis:

Oven Dry Weight (24 hrs @ 105°C) of 40 gram Air Dry Sample, Wt. = 39.20 grams
Hydrometer Calibration, Rc = 5.0
Hydrometer Reading - 40 seconds, R1 = 30.0
Corrected Hydrometer Reading, R1' = 25.0
Hydrometer Calibration - 2 hours, Rc' = 5.0
Hydrometer Reading - 2 hours, R2 = 14.0
Corrected Hydrometer Reading, R2' = 9.0
% Sand = 36.2 %
% Clay = 23.0 %
% Silt = 40.8 %

Sieve Analysis:

Oven Dry Weight (2 hrs., 105°C) Total Sand Fraction (Soil Retained on 0.047 mm Sieve) = 11.40 grams
Weight of Fine Plus Very Fine Sand Fraction (Soil Passing 0.25 mm Sieve) = 3.20 grams
% Fine and Very Fine Sand = 28.1 %

Test conducted in strict conformance with procedure identified in ASTM D 422-63 "Standard Test Method for Particle-Size Analysis of Soils.



2 Clerco Lane
Suite # 1
Horseshore, NJ 08844
T 908.359.5901
F 908.359.8288

SOIL PARTICLE SIZE ANALYSIS REPORT

Date Collected: 03/25/2009
Collected By: DG
Tested By: MS
Block: 33
Lot: 1.02

Job #: E01286AA
Client: Alliance Environmental, LLC
Lab Tray #: 27
Municipality: Hopewell
County / State: Mercer / NJ

Test Number: 1

Replicate (Letter): A

Sample Identification: SL0325-4 12-27*

Coarse Fragment Content:

Total Weight of Sample, (W.T.) = 362 grams
Weight of Material Retained on 2 mm sieve, (W.C.F.) = 8.5 grams
2.3 %

Hydrometer Analysis:

Oven Dry Weight (24 hrs @ 105°C) of 40 gram Air Dry Sample, Wt. = 38.40 grams
Hydrometer Calibration, Rc = 5.0
Hydrometer Reading - 40 seconds, R1 = 35.0
Corrected Hydrometer Reading, R1' = 30.0
Hydrometer Calibration - 2 hours, Rc' = 5.0
Hydrometer Reading - 2 hours, R2 = 15.0
Corrected Hydrometer Reading, R2' = 10.0
% Sand = 21.9 %
% Clay = 26.0 %
% Silt = 52.1 %

Sieve Analysis:

Oven Dry Weight (2 hrs., 105°C) Total Sand Fraction (Soil Retained on 0.047 mm Sieve) = 3.60 grams
Weight of Fine Plus Very Fine Sand Fraction (Soil Passing 0.25 mm Sieve) = 1.90 grams
% Fine and Very Fine Sand = 52.8 %

Test conducted in strict conformance with procedure identified in ASTM D 422-63 "Standard Test Method for Particle-Size Analysis of Soils."



2 Clanco Lane
Suite # 1
Hillsborough, NJ 08844
T 908.359.5501
F 908.359.8286

SOIL PARTICLE SIZE ANALYSIS REPORT

Date Collected: 03/25/2009
Collected By: DG
Tested By: MS
Block: 33
Lot: 1.02

Job #: E01286AA
Client: Alliance Environmental, LLC
Lab Tray #: 28
Municipality: Hopewell
County / State: Mercer / NJ

Test Number: 1

Replicate (Letter): A

Sample Identification: SL0325-4 27-48"

Coarse Fragment Content:

Total Weight of Sample, (W.T.) = 390.1 grams
Weight of Material Retained on 2 mm sieve, (W.C.F.) = 32.1 grams
8.2 %

Hydrometer Analysis:

Oven Dry Weight (24 hrs @ 105°C) of 40 gram Air Dry Sample, W1 = 37.60 grams
Hydrometer Calibration, Rc = 5.0
Hydrometer Reading - 40 seconds, R1 = 27.0
Corrected Hydrometer Reading, R1' = 22.0
Hydrometer Calibration - 2 hours, Rc' = 5.0
Hydrometer Reading - 2 hours, R2 = 14.0
Corrected Hydrometer Reading, R2' = 9.0
% Sand = 41.5 %
% Clay = 23.9 %
% Silt = 34.6 %

Sieve Analysis:

Oven Dry Weight (2 hrs., 105°C) Total Sand Fraction (Soil Retained on 0.047 mm Sieve) = 13.60 grams
Weight of Fine Plus Very Fine Sand Fraction (Soil Passing 0.25 mm Sieve) = 4.90 grams
% Fine and Very Fine Sand = 36.0 %

Test conducted in strict conformance with procedure identified in ASTM D 422-63 *Standard Test Method for Particle-Size Analysis of Soils.



2 Clerico Lane
Suite # 1
Hillsborough, NJ 08844
T 908.359.5301
F 908.359.8286

SOIL PARTICLE SIZE ANALYSIS REPORT

Date Collected: 03/25/2009
Collected By: DG
Tested By: MS
Block: 33
Lot: 1.02

Job #: E01286AA
Client: Alliance Environmental, LLC
Lab Tray #: 29
Municipality: Hopewell
County / State: Mercer / NJ

Test Number: 1

Replicate (Letter): A

Sample Identification: SL0325-5 9-18"

Coarse Fragment Content:

Total Weight of Sample, (W.T.) = 333.9 grams
Weight of Material Retained on 2 mm sieve, (W.C.F.) = 41.3 grams
12.4 %

Hydrometer Analysis:

Oven Dry Weight (24 hrs @ 105°C) of 40 gram Air Dry Sample, Wt. = 37.90 grams
Hydrometer Calibration, Rc = 5.0
Hydrometer Reading - 40 seconds, R1 = 33.0
Corrected Hydrometer Reading, R1' = 28.0
Hydrometer Calibration - 2 hours, Rc' = 5.0
Hydrometer Reading - 2 hours, R2 = 13.0
Corrected Hydrometer Reading, R2' = 8.0
% Sand = 26.1 %
% Clay = 21.1 %
% Silt = 52.8 %

Sieve Analysis:

Oven Dry Weight (2 hrs., 105°C) Total Sand Fraction (Soil Retained on 0.047 mm Sieve) = 5.30 grams
Weight of Fine Plus Very Fine Sand Fraction (Soil Passing 0.25 mm Sieve) = 2.10 grams
% Fine and Very Fine Sand = 39.6 %

Test conducted in strict conformance with procedure identified in ASTM D 422-63 "Standard Test Method for Particle-Size Analysis of Soils."



2 Clerco Lane
Suite # 1
Hillsborough, NJ 08844
T 908.359.5501
F 908.359.8286

SOIL PARTICLE SIZE ANALYSIS REPORT

Date Collected: 03/25/2009
Collected By: DG
Tested By: MS
Block: 33
Lot: 1.02

Job #: E01286AA
Client: Alliance Environmental, LLC
Lab Tray #: 30
Municipality: Hopewell
County / State: Mercer / NJ

Test Number: 1

Replicate (Letter): A

Sample Identification: SL0325-5 16-62*

Coarse Fragment Content:

Total Weight of Sample, (W.T.) = 329.9 grams
Weight of Material Retained on 2 mm sieve, (W.C.F.) = 9.5 grams
2.9 %

Hydrometer Analysis:

Oven Dry Weight (24 hrs @ 105°C) of 40 gram Air Dry Sample, Wt. = 38.50 grams
Hydrometer Calibration, Rc = 5.0
Hydrometer Reading - 40 seconds, R1 = 37.0
Corrected Hydrometer Reading, R1' = 32.0
Hydrometer Calibration - 2 hours, Rc' = 5.0
Hydrometer Reading - 2 hours, R2 = 15.0
Corrected Hydrometer Reading, R2' = 10.0
% Sand = 16.9 %
% Clay = 26.0 %
% Silt = 57.1 %

Sieve Analysis:

Oven Dry Weight (2 hrs., 105°C) Total Sand Fraction (Soil Retained on 0.047 mm Sieve) = 2.80 grams
Weight of Fine Plus Very Fine Sand Fraction (Soil Passing 0.25 mm Sieve) = 1.70 grams
% Fine and Very Fine Sand = 60.7 %

Test conducted in strict conformance with procedure identified in ASTM D 422-63 "Standard Test Method for Particle-Size Analysis of Soils."



APPENDIX 2
WELL RECORDS IN THE 2009 REPORT

New Jersey Department of Environmental Protection
Bureau of Water Allocation

Well Permit Number

P200901416

Atlas Sheet Coordinates

2715114

MONITORING WELL RECORD

OWNER IDENTIFICATION HOPEWELL TOWNSHIP

Address 201 WASHINGTON CROSSING-PENNINGTON ROAD

City Tinsville State New Jersey

Zip Code 08560

WELL LOCATION - If not the same as owner please give address

Owner's Well No. OW-1

County Mercer Municipality Hopewell Twp

Lot No. 1.02 Block No. 33

Address 145 RT 31 NORTH PENNYTOWN SHOPPING VILLAGE / OW-01

WELL USE Monitoring

DATE WELL STARTED 3/4/09

DATE WELL COMPLETED 3/4/09

WELL CONSTRUCTION

Total Depth Drilled 23 ft.

Finished Well Depth 23 ft.

Borehole Diameter:

Top 8 in.

Bottom 8 in.

Well was finished: above grade

flush mounted

If finished above grade, casing height (stick up) above land surface 2 ft.

Steel protective casing installed?

Yes No

Static Water Level after drilling 6 ft.

Water Level was Measured Using m-scope

Well was developed for 1 hours

at 1 gpm

Method of development Submersible pump

Pump Capacity _____ gpm

Pump Type _____

Drilling fluid Air Type of Rig Reichdrill 65C

Health and Safety Plan Submitted? Yes No

Level of Protection used on site (circle one) None (D) C B A

I certify that I have constructed the above referenced well in accordance with all well permit requirements and applicable State rules and regulations.

Drilling Company SAMUEL STOHOFF CO INC

Well Driller (Print) Jim Kintzel

Driller's Signature Jim Kintzel

Registration No. 1077J Date 3 /16 /09

Note: Measure all depths from land surface	Depth to Top (ft.)	Depth to Bottom (ft.)	Diameter (inches)	Material	Wgt./Rating (lbs/sch no.)
Single/Inner Casing	2	3	4	PVC	Sch 40
Middle Casing (for triple cased wells only)					
Outer Casing (largest diameter)					
Open Hole or Screen (No. Used .020)	3	23	4	PVC	Sch 40
Blank Casings (No. Used)					
Gravel Pack	2	3	8x4	#00 gravel	
Gravel Pack	3	23	8x4	#2 gravel	
Grout	0	2	8x4	Neat Cement Bentonite	94 lbs

Grouting Method Pressure grout w/tremie line

Drilling Method Air rotary

GEOLOGIC LOG

Note each depth where water was encountered in consolidated formations

0' - 5' Soil

5' - 23' Weathered shale

AS-BUILT WELL LOCATION (NAD 83 HORIZONTAL DATUM)

NJ STATE PLANE COORDINATE IN US SURVEY FEET
NORTHING: 556564 EASTING: 409015

OR

LATITUDE: _____ LONGITUDE: _____

ORIGINAL: DEP

COPIES: DRILLER

OWNER

HEALTH DEPARTMENT

MONITORING WELL RECORD

P200901417

Atlas Sheet Coordinates

2715114

OWNER IDENTIFICATION HOPEWELL TOWNSHIP
Address 201 WASHINGTON CROSSING-PENNINGTON ROAD
City Titusville State New Jersey

Zip Code 08560

WELL LOCATION - If not the same as owner please give address
County Mercer Municipality Hopewell Twp Owner's Well No. OW-2
Lot No. 1.02 Block No. 33

Address 145 RT 31 NORTH PENNYTOWN SHOPPING VILLAGE / OW-02

WELL USE Monitoring

DATE WELL STARTED 3/5/09

DATE WELL COMPLETED 3/6/09

WELL CONSTRUCTION

Total Depth Drilled 23 ft.

Finished Well Depth 23 ft.

Borehole Diameter:

Top 8 in.

Bottom 8 in.

Well was finished: above grade
 flush mounted

If finished above grade, casing height (stick up) above land surface 2 ft.

Steel protective casing installed?

Yes No

Static Water Level after drilling 6 ft.

Water Level was Measured Using m-scope

Well was developed for 1 hours

at 1.5 gpm

Method of development Submersible pump

Pump Capacity _____ gpm

Pump Type _____

Drilling Fluid Air Type of Rig Reichdrill 650

Health and Safety Plan Submitted? Yes No

Level of Protection used on site (circle one) None (D) C B A

Note: Measure all depths from land surface	Depth to Top (ft.)	Depth to Bottom (ft.)	Diameter (inches)	Material	Wgt./Rating (lbs/sch no.)
Single/Inner Casing	2	3	4	PVC	Sch 40
Middle Casing (for triple cased wells only)					
Outer Casing (largest diameter)					
Open Hole or Screen (No. Used .020)	3	23	4	PVC	Sch 40
Blank Casings (No. Used)					
Gravel Pack	2	3	8x4	#00 gravel	
Gravel Pack	3	23	8x4	#2 gravel	
Grout	0	2	8x4	Neat Cement Bentonite	94 lbs

Grouting Method Pressure grout w/tremie line

Drilling Method Air rotary

GEOLOGIC LOG

Note each depth where water was encountered in consolidated formations

0' - 4' Soil

4' - 23' Weathered shale

AS-BUILT WELL LOCATION
(NAD 83 HORIZONTAL DATUM)

NJ STATE PLANE COORDINATE IN US SURVEY FEET

NORTHING: 556836 EASTING: 409345

OR

LATITUDE: " " LONGITUDE: " "

I certify that I have constructed the above referenced well in accordance with all well permit requirements and applicable State rules and regulations.

Drilling Company SAMUEL STOTHOFF CO INC

Well Driller (Print) Jim Kintzel

Driller's Signature Jim Kintzel

Registration No. 10771 Date 3 /16 / 09

ORIGINAL: DEP.

COPIES: DRILLER

OWNER

HEALTH DEPARTMENT

P200901418

Atlas Sheet Coordinates

2715114

MONITORING WELL RECORD

OWNER IDENTIFICATION HOPEWELL TOWNSHIP
Address 201 WASHINGTON CROSSING-PENNINGTON ROAD
City Titusville State New Jersey Zip Code 08560

WELL LOCATION - If not the same as owner please give address
County Mercer Municipality Hopewell Twp Owner's Well No. OW-3
Address 145 RT 31 NORTH PENNYTOWN SHOPPING VILLAGE / OW-03 Lot No. 1.02 Block No. 33

WELL USE Monitoring DATE WELL STARTED 3/4/09
DATE WELL COMPLETED 3/4/09

WELL CONSTRUCTION

Total Depth Drilled 23'9" ft.
Finished Well Depth 23'9" ft.
Borehole Diameter:
Top 8 in.
Bottom 8 in.

Well was finished: above grade
 flush mounted
If finished above grade, casing height
(stick up) above land surface 2 ft.

Steel protective casing installed?
 Yes No

Static Water Level after drilling 6 ft.

Water Level was Measured Using m-scope

Well was developed for 1 hours

aSeapagegpm

Method of development Submersible pump

Pump Capacity _____ gpm

Pump Type _____

Drilling Fluid air Type of Rig Reichdrill 650

Health and Safety Plan Submitted? Yes No

Level of Protection used on site (circle one) None (D) C B A

I certify that I have constructed the above referenced well in accordance with all well permit requirements and applicable State rules and regulations.

Drilling Company SAMUEL STOTHOFF CO INC

Well Driller (Print) Jim Kintzel

Driller's Signature Jim Kintzel

Registration No. 1077J Date 3 / 16 / 09

Note: Measure all depths from land surface	Depth to Top (ft.)	Depth to Bottom (ft.)	Diameter (inches)	Material	Wgt./Rating (lbs/sch no.)
Single/Inner Casing	2	3'9"	4	PVC	Sch 40
Middle Casing (for triple cased wells only)					
Outer Casing (largest diameter)					
Open Hole or Screen (No. Used .020)	3'9"	23'9"	4	PVC	Sch 40
Blank Casings (No. Used)					
Gravel Pack	2'9"	3'9"	8x4	#00 gravel	
Gravel Pack	3'9"	23'9"	8x4	#2 gravel	
Grout	0	2'9"	8x4	Neat Cement Bentonite	.94 lbs lbs

Grouting Method Pressure grout w/tremie line
Drilling Method Air rotary

GEOLOGIC LOG	
Note each depth where water was encountered in consolidated formations	
0' - 5'	Soil
5' - 23'9"	Weathered Shale

AS-BUILT WELL LOCATION (NAD 83 HORIZONTAL DATUM)	
NJ STATE PLANE COORDINATE IN US SURVEY FEET	
NORTHING: <u>555993</u>	EASTING: <u>409023</u>
OR	
LATITUDE: <u> </u> ° <u> </u> ' <u> </u> "	LONGITUDE: <u> </u> ° <u> </u> ' <u> </u> "

ORIGINAL: DEP

COPIES: DRILLER

OWNER

HEALTH DEPARTMENT

Bureau of Water Allocation

P200901419

MONITORING WELL RECORD

Atlas Sheet Coordinates

2715114

OWNER IDENTIFICATION HOPEWELL TOWNSHIP
 Address 201 WASHINGTON CROSSING-PENNINGTON ROAD
 City Titusville State New Jersey

Zip Code 08560

WELL LOCATION - If not the same as owner please give address
 County Mercer Municipality Hopewell Twp Owner's Well No. OW-4
 Lot No. 1.02 Block No. 33
 Address 145 RT 31 NORTH PENNYTOWN SHOPPING VILLAGE / OW-04

WELL USE Monitoring **DATE WELL STARTED** 3/6/09
DATE WELL COMPLETED 3/6/09

WELL CONSTRUCTION
 Total Depth Drilled 25 ft.
 Finished Well Depth 25 ft.
 Borehole Diameter:
 Top 8 in.
 Bottom 8 in.
 Well was finished: above grade
 flush mounted
 If finished above grade, casing height (stick up) above land surface 2 ft.

Note: Measure all depths from land surface	Depth to Top (ft.)	Depth to Bottom (ft.)	Diameter (inches)	Material	Wgt./Rating (lbs/sch no.)
Single/Inner Casing	2	5	4	PVC	Sch 40
Middle Casing (for triple cased wells only)					
Outer Casing (largest diameter)					
Open Hole or Screen (No. Used .020)	5	25	4	PVC	Sch 40
Blank Casings (No. Used)					
Gravel Pack	4	5	8x4	#00 gravel	
Gravel Pack	5	25	8x4	#2 gravel	
Grout	0	4	8x4	Neat Cement Bentonite	94 lbs

Steel protective casing installed?
 Yes No
 Static Water Level after drilling Dry ft.
 Water Level was Measured Using m-scope

Grouting Method Pressure grout w/tremie line
 Drilling Method Air rotary

Well was developed for hours
 at gpm
 Method of development
 Pump Capacity gpm
 Pump Type
 Drilling Fluid Air Type of Rig Reichdrill 650
 Health and Safety Plan Submitted? Yes No
 Level of Protection used on site (circle one) None (D) C B A

GEOLOGIC LOG	
Note each depth where water was encountered in consolidated formations	
0' - 4'	Soil
4' - 25'	Weathered shale

AS-BUILT WELL LOCATION
 (NAD 83 HORIZONTAL DATUM)
 NJ STATE PLANE COORDINATE IN US SURVEY FEET
 NORTHING: 556592 EASTING: 409548
 OR
 LATITUDE: " " " " LONGITUDE: " " " "

I certify that I have constructed the above referenced well in accordance with all well permit requirements and applicable State rules and regulations.

Drilling Company SAMUEL STOTHOFF CO INC
 Well Driller (Print) Jim Kintzel
 Driller's Signature [Signature]
 Registration No. 10775 Date 3/6/09

ORIGINAL: DEP COPIES: DRILLER OWNER HEALTH DEPARTMENT

New Jersey Department of Environmental Protection
Bureau of Water Allocation

Well Permit Number

P200901421

Atlas Sheet Coordinates

2715117

MONITORING WELL RECORD

OWNER IDENTIFICATION HOPEWELL TOWNSHIP
Address 201 WASHINGTON CROSSING-PENNINGTON ROAD
City Titusville State New Jersey

Zip Code 08560

WELL LOCATION - If not the same as owner please give address

Owner's Well No. OW-6

County Mercer Municipality Hopewell Twp

Lot No. 1.02 Block No. 33

Address 145 RT 31 NORTH PENNYTOWN SHOPPING VILLAGE / OW-06

WELL USE Monitoring

DATE WELL STARTED 3/5/09

DATE WELL COMPLETED 3/6/09

WELL CONSTRUCTION

Total Depth Drilled 25 ft.

Finished Well Depth 25 ft.

Borehole Diameter:

Top 8 in.

Bottom 8 in.

Well was finished: above grade

flush mounted

If finished above grade, casing height (stick up) above land surface 2 ft.

Steel protective casing installed?

Yes No

Static Water Level after drilling 8 ft.

Water Level was Measured Using m-scope

Well was developed for 1 hours

*Seepage gpm

Method of development Submersible

Pump Capacity _____ gpm

Pump Type _____

Drilling Fluid Air Type of Rig Reichdrill 650

Health and Safety Plan Submitted? Yes No

Level of Protection used on site (circle one) None (D) C B A

I certify that I have constructed the above referenced well in accordance with all well permit requirements and applicable State rules and regulations.

Drilling Company SAMUEL STOTTI OFF CO INC

Well Driller (Print) Jim Kintzel

Driller's Signature Jim Kintzel

Registration No. 1077J Date 3/16/09

Note: Measure all depths from land surface	Depth to Top (ft.)	Depth to Bottom (ft.)	Diameter (inches)	Material	Wgt./Rating (lbs/sch no.)
Single/Inner Casing	2	5	4	PVC	Sch 40
Middle Casing (for triple cased wells only)					
Outer Casing (largest diameter)					
Open Hole or Screen (No. Used .020)	5	25	4	PVC	Sch 40
Blank Casings (No. Used)					
Gravel Pack	4	5	8x4	#00 gravel	
Gravel Pack	5	25	8x4	#2 gravel	
Grout	0	4	8x4	Neat Cement Bentonite	94 lbs

Grouting Method Pressure grout w/tremie line

Drilling Method Air rotary

GEOLOGIC LOG	
Note each depth where water was encountered in consolidated formations	
0' - 4'	Soil
4' - 25'	Weathered shale

AS-BUILT WELL LOCATION (NAD 83 HORIZONTAL DATUM)	
NJ STATE PLANE COORDINATE IN US SURVEY FEET	
NORTHING: <u>555696</u>	EASTING: <u>409496</u>
OR	
LATITUDE: <u>0</u>	LONGITUDE: <u>0</u>

ORIGINAL: DEP

COPIES: DRILLER

OWNER

HEALTH DEPARTMENT



**APPENDIX 4
LIMITATIONS**



LIMITATIONS

A. SUBSURFACE INFORMATION

Locations: The locations of the explorations were determined by field measurement from existing site features. The locations of the explorations should be considered accurate only to the degree implied by the method used.

Interface of Strata: The stratification lines shown on the individual logs of the subsurface explorations represent the approximate boundary between soil types, and the transition may be gradual.

Field Logs/Final Logs: A field log was prepared for each exploration by a member of our staff. The field log contains factual information and interpretation of the soil conditions between samples.

We must emphasize that our recommendations are based on the final logs and the information contained therein, and not on the field logs.

The final logs represent our interpretation of the contents of the field logs, and the results of the laboratory observations and tests of the field samples. The final logs are included in the engineering report.

Water Levels: Water level readings have been made in the explorations at times and under conditions stated on the individual logs. This data has been reviewed and interpretations made in the text of this report. However, it must be noted that fluctuations in the level of the groundwater may occur due to variations in rainfall, groundwater recharge, and other factors at the time measurements were made.

Pollution/Contamination: Unless specifically indicated to the contrary in this report, the scope of our services was limited only to investigation and evaluation of the geotechnical engineering aspects of the site conditions, and did not include any consideration of potential site pollution or contamination resulting from the presence of chemicals, metals, radioactive elements, etc. This report offers no facts or opinions related to potential pollution/contamination of the site.

Environmental Considerations: Unless specifically indicated to the contrary in this report, this report does not address environmental considerations which may affect the site development, e.g., wetlands determinations, flora and fauna, wildlife, etc. The conclusions and recommendations of this report are not intended to supersede any environmental conditions which should be reflected in the site planning.

APPLICABILITY OF REPORT

This report has been prepared in accordance with generally accepted soils engineering practices for the exclusive use of Hopewell Township for specific application to design of the proposed sanitary effluent management system. No other warranty, expressed or implied, is made.

C. REINTERPRETATION OF RECOMMENDATIONS

Change in Location or Nature of Facilities: In the event that any changes in the nature, design or location of the proposed construction is planned, the conclusions and recommendations contained in this report shall not be considered valid unless the changes are reviewed and conclusions of this report modified or verified in writing.

Changed Conditions During Construction: The analyses and recommendations submitted in this report are based in part upon the data obtained from 16 widely spaced test pits performed for this study. The nature and extent of variations between the explorations may not become evident until construction. If variations then appear evident, it will be necessary to reevaluate the recommendations of this report.

Changes in State-of-the-Art: The conclusions and recommendations contained in this report are based upon the applicable standards of our profession at the time this report was prepared.

Use of Report by Prospective Bidders: This report was prepared for the project by **BSG** for design purposes only, and may not be sufficient to prepare an accurate bid. Contractors utilizing the information in the report should do so with the expressed understanding that its scope is limited to design considerations. Prospective bidders should obtain the owner's permission to perform whatever additional explorations or data gathering they deem necessary to prepare their bid accurately.

Construction Observation: We recommend that **BSG** be retained to provide on-site soils engineering services during the earthwork construction phases of the work. This is to observe compliance with the design concepts and to allow changes in the event that subsurface conditions differ from those anticipated prior to the start of construction.



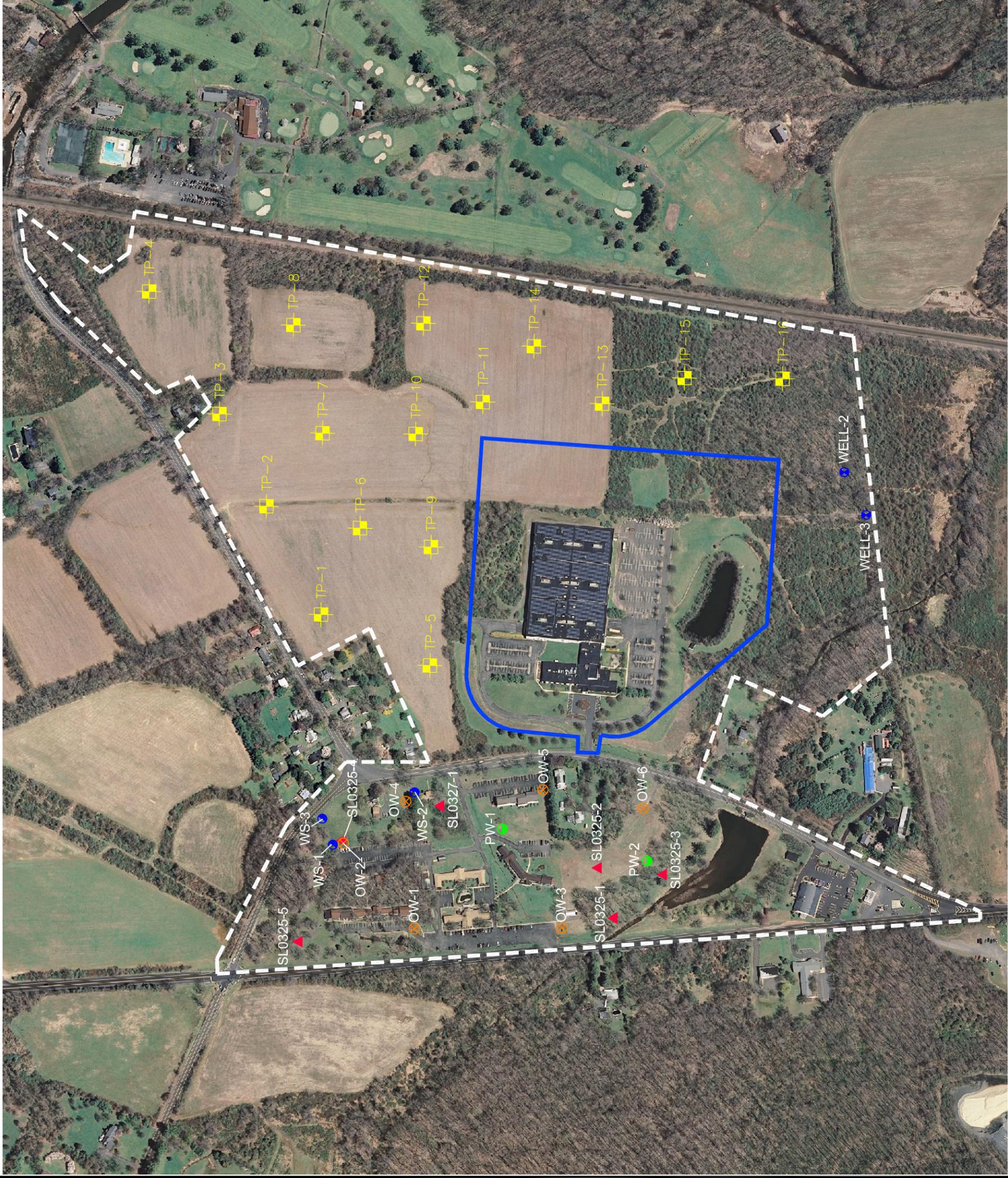
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BIRDSALL SERVICES GROUP
ENGINEERS & CONSULTANTS

PLATES



LEGEND

- TP-1 - NUMBER AND APPROXIMATE LOCATION OF TEST PITS COMPLETED BY BSG.
- SOIL LOGS COMPLETED BY OTHERS.
- PIEZOMETERS COMPLETED BY OTHERS.
- WATER SUPPLY TEST WELLS COMPLETED BY OTHERS.
- WASTE WATER TEST WELLS COMPLETED BY OTHERS.
- WATER SUPPLY WELLS COMPLETED BY OTHERS.
- KOOLTRONIC TRACT
- APPROXIMATE PROJECT BOUNDARY.

NOTE: ALL LOCATIONS ARE APPROXIMATE AND BASED ON AVAILABLE INFORMATION, SUBJECT TO FIELD VERIFICATION.



TEST PIT LOCATION PLAN	
PROPOSED COAH DEVELOPMENT	
SITUATED IN TOWNSHIP OF HOPEWELL, MERCER COUNTY, NEW JERSEY	
BIRDSALL SERVICES GROUP ENGINEERS & CONSULTANTS	
65 Jackson Drive Hopewell, NJ 08520 NJ Certificate of Registration No. 34CA3069690 Tel.: 908-997-8900 Fax: 908-997-8901 WWW.BIRDSALL.COM	
JOB No. 60606100000	Date: 4/5/12
Scale(H) 1"=300'	Scale(V) 1"=100'
PLATE 2	