



ATLANTIC TESTING LABORATORIES

**REPORT OF PRELIMINARY SUBSURFACE INVESTIGATION
AND
GEOTECHNICAL EVALUATION**

**PROPOSED WIND TURBINES
HORSE CREEK WIND POWER PROJECT
TOWNS OF CLAYTON AND ORLEANS
JEFFERSON COUNTY, NEW YORK**

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**PRELIMINARY SUBSURFACE INVESTIGATION
AND
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**PROPOSED WIND TURBINES
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JEFFERSON COUNTY, NEW YORK**

1.0 INTRODUCTION

Atlantic Testing Laboratories, Limited (ATL) performed a preliminary subsurface investigation and geotechnical evaluation for PPM Energy, Inc.'s Horse Creek Wind Power Project to ascertain the subsurface soil and groundwater conditions at select wind turbine sites. The purpose was to evaluate the engineering significance of these findings, and to provide recommendations related to preliminary foundation design and construction. The subsurface investigation was performed on November 12 and 13, 2007.

The proposed project consists of constructing sixty-two (62) wind turbines and associated underground electric lines in the Towns of Clayton and Orleans located in Jefferson County, New York. The project coordinates at the approximate center of the site are N 44° 7' 34" latitude and W 76° 2' 42" longitude. The project area is bound by County Route 12 to the north, Tracey, Wilder and Miller Roads to the East, County Route 125 to the south, and Depauville Road to the west. A **Site Location Plan** is included in **Appendix A**.

The preliminary subsurface investigation consisted of the excavation of test pits at six (6) of the proposed sixty-two (62) turbine locations, and one test pit at the proposed interconnect substation. The test pit locations were selected by ATL and approved by PPM Energy, Inc. to provide spatial coverage across the proposed project site.

All elevations and dimensions referenced in this document are reported in units of feet, unless otherwise indicated.

2.0 PROJECT DESCRIPTION

The following information, regarding the proposed wind turbine generators, was provided to ATL by PPM Energy, Inc. The proposed wind turbines will be Suzlon 2.1 MW S88 wind turbines. The turbines will be supported on towers approximately 80 meters high at the rotor hub with a rotor diameter of approximately 88 meters.

3.0 PREVIOUS INVESTIGATION

A Preliminary Geotechnical Engineering Assessment was performed by GZA GeoEnvironmental in support of the project. Reference GZA's Preliminary Geotechnical Assessment Report (File No. 21.0056285) dated January 26, 2007.

4.0 GENERAL SITE CONDITIONS AND GEOLOGY

The proposed project site generally consists of rolling hills and agricultural fields. There are some interconnected paved roads in the area.

The site is located between the Adirondack Mountains and Lake Ontario in the Black River Valley. The underlying bedrock consists of the Black River bedrock group, specifically the Chaumont Limestone. The bedrock consists of limestone (calcium carbonate) that is locally cherty (a fine-grained silica-rich, finely-crystalline, sedimentary rock that can contain small fossils). This bedrock is primarily marine sediment of early to mid-Ordovician age (about 400 million years old). The bedrock is relatively flat-lying and undeformed. Within the last 12,000 to 1 million years, the Horse Creek area was covered by glaciers which removed material and rounded the topography, leaving behind glacial till (unsorted clay-rich soil) and outwash (sand and gravel).

5.0 SUBSURFACE INVESTIGATION & SAMPLING METHODOLOGY

Test pits were advanced at the proposed substation and within the foundation footprint at the center of the proposed wind turbine location and at a 50 foot offset to evaluate the general bedrock profile. The test pit locations were staked in the field and the surface elevations were obtained by Thew Associates PE/LS, PLLC. A **Turbine Location Plan** is included in **Appendix B**.

The test pits were excavated using a Kamatsu WB140 rubber tired backhoe to evaluate the soil and groundwater conditions, depth to bedrock, and to collect bulk soil samples for laboratory testing. The soil samples were visually classified in the field by a geotechnical engineer using the Burmister Soil Classification System. The **Test Pit Logs** and **Select Photographs** are included in **Appendix C and D**, respectively.

The test pits were backfilled with on-site soil upon completion. It is important that the backfilled test pits be monitored for settlement or subsidence. This will be the responsibility of PPM Energy, Inc. ATL assumes no liability for test pit settlement.

6.0 SITE SUBSURFACE CONDITIONS

The following description of subsurface conditions is based on the soils and rock encountered at the locations investigated. Actual subsurface conditions may vary in both the horizontal and vertical dimensions. Detailed subsurface descriptions are provided on the individual Test Pit Logs.

6.1 Test Pits

Test pits at locations T-20A, T-42, T-42A, T-50, T-50A, T-55, T-55A, and the substation generally encountered a surficial 2 to 12 inch layer of topsoil and organic material underlain by clay with varying portions of silt, sand, and gravel. The clay extended to test pit termination due to bucket refusal on limestone bedrock at depths ranging from 2.5 to 4.1 feet below the surface.

Test pits T-7 and T-7A encountered a surficial 2 to 8 inch layer of topsoil and organic material underlain by weathered rock. The weathered rock extended to test pit termination due to bucket refusal on limestone bedrock at a depth of 1.5 feet below the surface.

Test pits T-1, T-1A, and T-20 encountered a surficial 8 to 9 inch layer of topsoil and organic material underlain by clay with varying portions of silt, sand, and gravel that extended to depths ranging from 1.9 to 2.5 feet below the surface. Underlying the clay was silty sand and clayey sand with varying portions of gravel that extended to test pit termination due to bucket refusal on limestone bedrock at depths ranging from 2.6 to 5.5 feet below the surface.

A **Test Pit Summary Table** is included in **Appendix E**.

6.2 Groundwater

Groundwater was not encountered in the test pits, with the exception of test pit T-20. Slight groundwater seepage was encountered in test pit T-20 at a depth of 2.5 feet below the ground surface and appeared to be perched on the underlying bedrock.

7.0 ELECTRICAL RESISTIVITY

7.1 Field Ground Resistivity Tests

Electrical resistivity tests were performed utilizing a Nilsson Model 400, Soil Resistivity Meter, Serial No. 4-7542, in accordance with ASTM G57-95a.

Two tests were performed at each of the six selected tower locations and at the proposed interconnect substation. The tests were performed using spacings of 5, 10, 15, and 20 feet in the directions depicted on the **Resistivity Layout Maps** included in **Appendix F**. The **Field Soil Resistivity Test Results** are included in **Appendix G**.

8.0 LABORATORY ANALYSES

Select soil samples were submitted to ATL's geotechnical laboratory for analyses. The laboratory tests included Particle Size Analysis, Moisture Content Determination, Laboratory Compaction, Atterberg Limits, Direct Shear Strength, Thermal Resistivity, and Chemical Analysis. The samples were selected based on our field observations and the subsurface soil conditions encountered in the test pits.

8.1 Particle Size Analysis

Eight (8) soil samples were selected for particle size analysis at locations T-1 (2), T-20 (2), T-42, T-50, T-55, and the substation. The tests were performed in accordance with ASTM D422 "Particle Size Analysis of Soils." The test results are summarized in the **Particle Size Analysis Summary Table** provided in **Appendix H**.

Soil samples collected from test pit excavations are generally classified as brown silty clay, silty sand, and clayey sand using the Unified Soil Classification System (USCS), with group symbols CH, SM, and SC, respectively.

8.2 Moisture Content

Eight (8) soil samples were selected for natural moisture content determination at locations T-1 (2), T-20 (2), T-42, T-50, T-55, and the substation. The tests were performed in accordance with ASTM D2216 "Laboratory Determination of Water (Moisture) Content of Soil and Rock." The test results are summarized in the **Natural Moisture Content Results Table** provided in **Appendix I**.

The natural moisture content of the clay and sand samples collected at the test pit locations ranged between 28.6 and 38.1 %, and 9.1 to 9.8 %, respectively.

8.3 Atterberg Limits

Four (4) soil samples were selected for Atterberg Limits determination at locations T-1, T-20, T-50, and the substation. The tests were performed in accordance with ASTM D4318 "Liquid Limit, Plastic Limit, and Plasticity Index of Soils." The test results are summarized in the **Atterberg Limits Results Table** provided in **Appendix J**.

The plasticity index of the samples analyzed ranged from 10 to 42.

8.4 Laboratory Compaction

Seven (7) soil samples were selected for Laboratory Compaction testing at locations T-1 (2), T-20 (2), T-42, T50 and T-55. The tests were performed in accordance with ASTM D1557 "Laboratory Compaction Characteristics of Soil Using Modified Effort." The test results are summarized in the **Laboratory Compaction Results Table** provided in **Appendix K**.

The corrected optimum moisture content and corrected maximum dry density of the clay samples collected at the test pit locations ranged between 14.0 and 19.0 %, and 105.0 and 110.0 pcf, respectively. The optimum moisture content and corrected maximum dry density of the sand samples ranged between 5.0 and 7.5 %, and 134.0 and 142.5 pcf, respectively.

8.5 Chemical Analysis

Five (5) soil samples were selected for pH, chlorides, and soluble sulfate determination at locations T-1 (2), T-20, T-50, and T-SUB. The test results are summarized in the **Table of Chemical Analysis** provided in **Appendix L**.

The pH of the samples analyzed ranged between 5.2 and 7.6 standard units (S.U.). The chloride results in all the samples analyzed was less than 0.10 %, and the soluble sulfate results ranged between less than 0.10 and 0.63 %.

8.6 Thermal Resistivity

Six (6) soil samples were selected for thermal resistivity analysis to include resistivity and moisture content at turbine locations T-1 (2), T-20, T-42, T-50, and T-55. The test results are summarized in the **Table of Thermal Resistivity Analysis** provided in **Appendix M**.

The thermal resistivity of the samples analyzed ranged between 0.031 and 15.068 Mk/w in dry conditions, and between 0.922 and 9.067 Mk/w at optimum moisture conditions.

9.0 GEOTECHNICAL ENGINEERING DISCUSSION

9.1 Subsurface Soil Conditions

The test pits generally encountered a surficial 2 to 12 inch layer of topsoil and organic material underlain by clay with varying portions of silt, sand, and gravel that extended to bucket refusal on limestone bedrock at depths ranging from 1.5 to 4.1 feet below the surface. Underlying the clay in test pits T-1, T-1A, and T-20 was sand with varying portions of silt, clay, and gravel that extended to the surface of the limestone bedrock at depths ranging from 2.6 to 5.5 feet. Test pits T-7 and T-7A encountered weathered bedrock underlying the topsoil and organic material. The bedrock appeared to be relatively level between the two test pits performed at each location.

The natural moisture content of the soils encountered is generally above the optimum moisture content determined from the laboratory compaction tests.

The percentage of fines passing the No. 200 sieve contained in the samples ranged between 31 and 99 %. Based on the fines contents, the site soils are considered moisture sensitive and frost susceptible.

9.2 Groundwater Conditions

Based on the test pit observations, it does not appear that the groundwater table was encountered during the subsurface investigation. Slight groundwater seepage was observed at test pit T-20; however, is likely a perched condition due to the current site topography and underlying bedrock. Based on our knowledge of the project area, a perched groundwater condition may exist during the wetter periods of the year. Supplemental investigation activities consisting of soil borings and rock coring at each of the turbine locations, along with the installation of temporary groundwater observation wells, is required to determine the actual groundwater conditions for final foundation

design. Fluctuations in groundwater levels may occur due to seasonal and climatic variations, changes in the surface runoff patterns, construction activity, and subsequent site development, along with other interrelated factors.

It is anticipated that any groundwater encountered during foundation excavations could be controlled by pumping from sumps installed around the perimeter of the foundation excavations.

9.3 Foundations

Based on the information collected during the preliminary subsurface investigation, the subsurface conditions are suitable for support of the turbine foundations on a shallow spread foundation system. Based on our experience, typical spread foundations are designed using an allowable soil bearing pressure of 4000 psf. Since shallow bedrock was encountered at the test pit locations, other potential alternatives for supporting the proposed turbines include rock anchors and rock socketed piers. Each of the potential foundation alternatives are discussed below.

Supplemental subsurface investigation activities consisting of soil borings and rock coring at each of the proposed turbine locations, seismic testing, and additional laboratory testing of recovered soil and rock samples are required to evaluate soil and rock parameters, and groundwater conditions for final foundation design.

9.3.1 Shallow Spread Foundations

Typical octagonal spread foundation designs have foundation widths ranging from 50 to 65 feet and are usually founded at depths ranging from 7.5 to 8.5 feet below finished grade. Since bedrock was encountered shallower than 7.5 feet at all test pit locations, shallow foundations will likely bear on bedrock, however, it is possible that bedrock exists at greater depths at other locations. Supplemental soil borings with Standard Penetration Testing (SPT) are required to evaluate the safe allowable soil bearing capacity where the depth to bedrock is greater than the proposed bottom of footing depth.

Shallow foundations will likely require rock excavation or blasting at most locations to achieve the planned foundation depth, or placing the foundations at the bedrock surface and raising the site grade to provide the required soil cover over the foundations for overturning stability. A pre-blast survey and blasting plan should be prepared prior to performing any blasting activities. If the bedrock surface slopes significantly, or a combination of soil and rock is encountered at the planned foundation elevation, lean concrete will be required to create a level, uniform bearing surface to support the foundations.

At locations where loose or soft soil conditions exist within approximately 15 feet of the surface, in-situ soil improvement or overexcavation and replacement with compacted structural fill will be required to support the foundations.

9.3.2 Rock Anchors

Rock anchor foundations, consisting of grouted multi-strand wire or threaded steel bars, are designed to resist tension forces caused by overturning moments and typically utilize a smaller concrete foundation than shallow spread footings. Compressive forces are resisted by the rock that the foundation is founded on.

Rock anchors are typically installed by a specialty contractor and a more comprehensive investigation and laboratory testing program will be required for a rock anchor foundation design. Additionally, a rock anchor foundation would likely require additional engineering, design, and planning as compared to the spread footing.

9.3.3 Rock Socketed Piers

Rock socketed piers are constructed by drilling or blasting a socket into the underlying bedrock a certain depth and replacing with reinforced concrete to support the turbines. This foundation type may not be economical due to the deep pier depths that may be required to resist the overturning forces of the turbines.

9.4 Foundation Stiffness

Seismic testing consisting of MASW and seismic refraction should be performed at select turbine locations to determine Poisson's ratio and the shear modulus of the underlying soil and bedrock.

9.5 Sliding Stability

Coefficient of friction values of 0.45 and 0.55 may be used for preliminary foundation design to evaluate sliding stability of the turbine foundations for concrete footings founded on the underlying sand soils and bedrock, respectively.

9.6 Foundation Backfill

To prevent surface runoff and/or perched water from collecting around the foundations, the on-site soils or impervious fill should be utilized as foundation backfill, provided the backfill provides sufficient weight for overturning stability. All foundation backfill should have maximum particle size limited to 4 inches and should be compacted to a minimum of 90% of the maximum dry density, as determined by ASTM D 1557, and the minimum specified unit weight to provide overturning stability. The site must be graded to convey water away from the tower foundations.

Due to the fine grained soil encountered in the test pits and high natural moisture content, it may be difficult to achieve the required unit weight during placement and compaction of the fine grained on-site material, requiring the use of imported fill. Additionally, due to the presence of shallow bedrock, sufficient quantities of on-site material may not be available for use as backfill.

9.7 Chemical Analysis

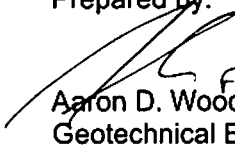
Based on a chemical analysis of select soil samples, the soils encountered at the test pit locations ranged from slightly acidic to neutral, and sulfate exposure from the foundation soil is considered negligible to severe. The potential for sulfate exposure should be considered in the foundation concrete design.

10.0 SUMMARY

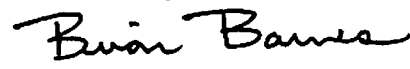
The test pit logs and this report in its entirety are presented as a preliminary subsurface investigation and geotechnical evaluation, and may not be representative of the site subsurface conditions across the entire project area, but only what was found at the individual test locations at the time the preliminary investigation was performed.

This report was prepared to present the findings of our preliminary subsurface investigation and geotechnical engineering evaluation. Further investigation activities will be required for final foundation design.

Prepared by:


Aaron D. Woods, I.E.
Geotechnical Engineer

Reviewed by:

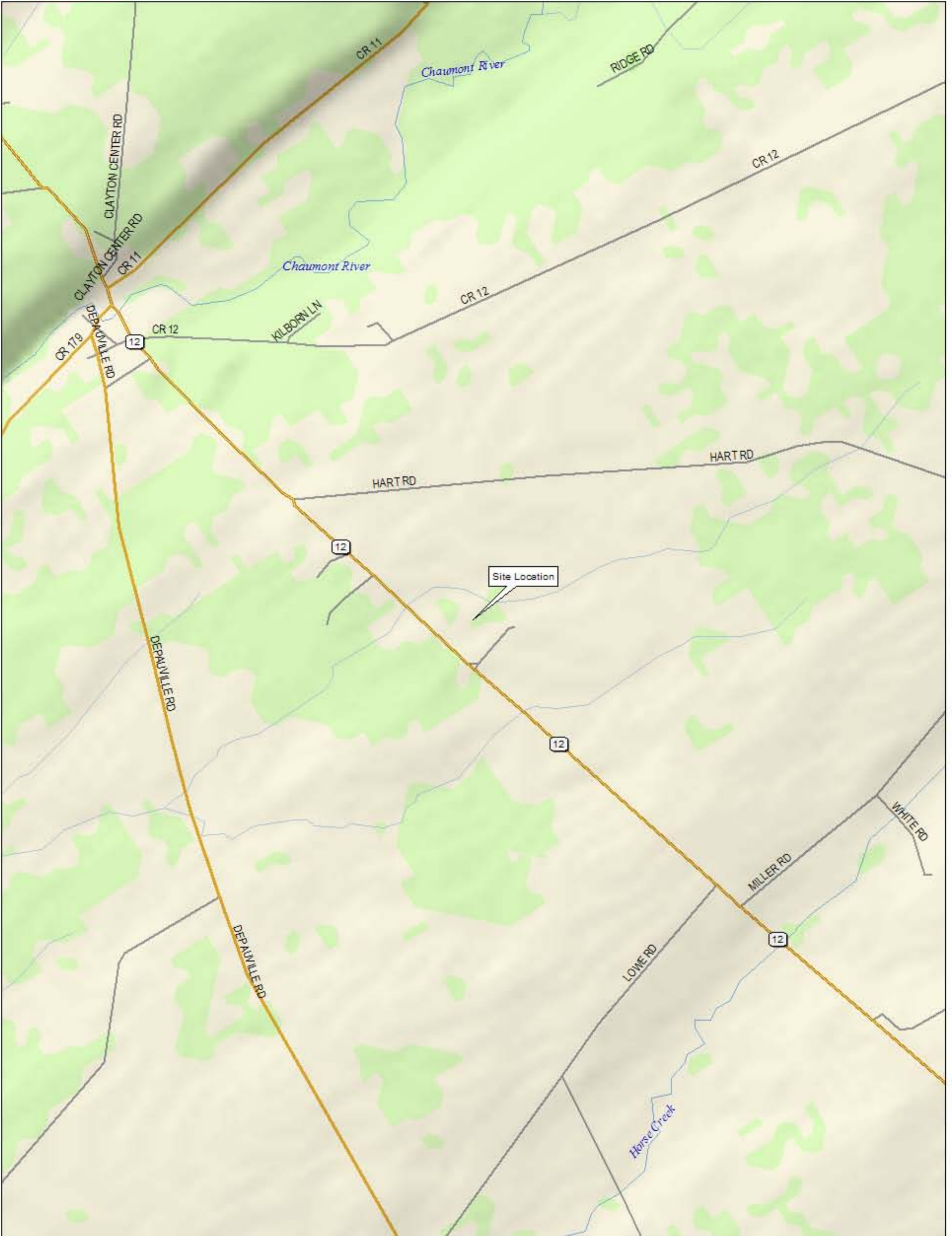

Brian T. Barnes, P.E.
Senior Engineer

ADW/BTB/adw

APPENDIX G

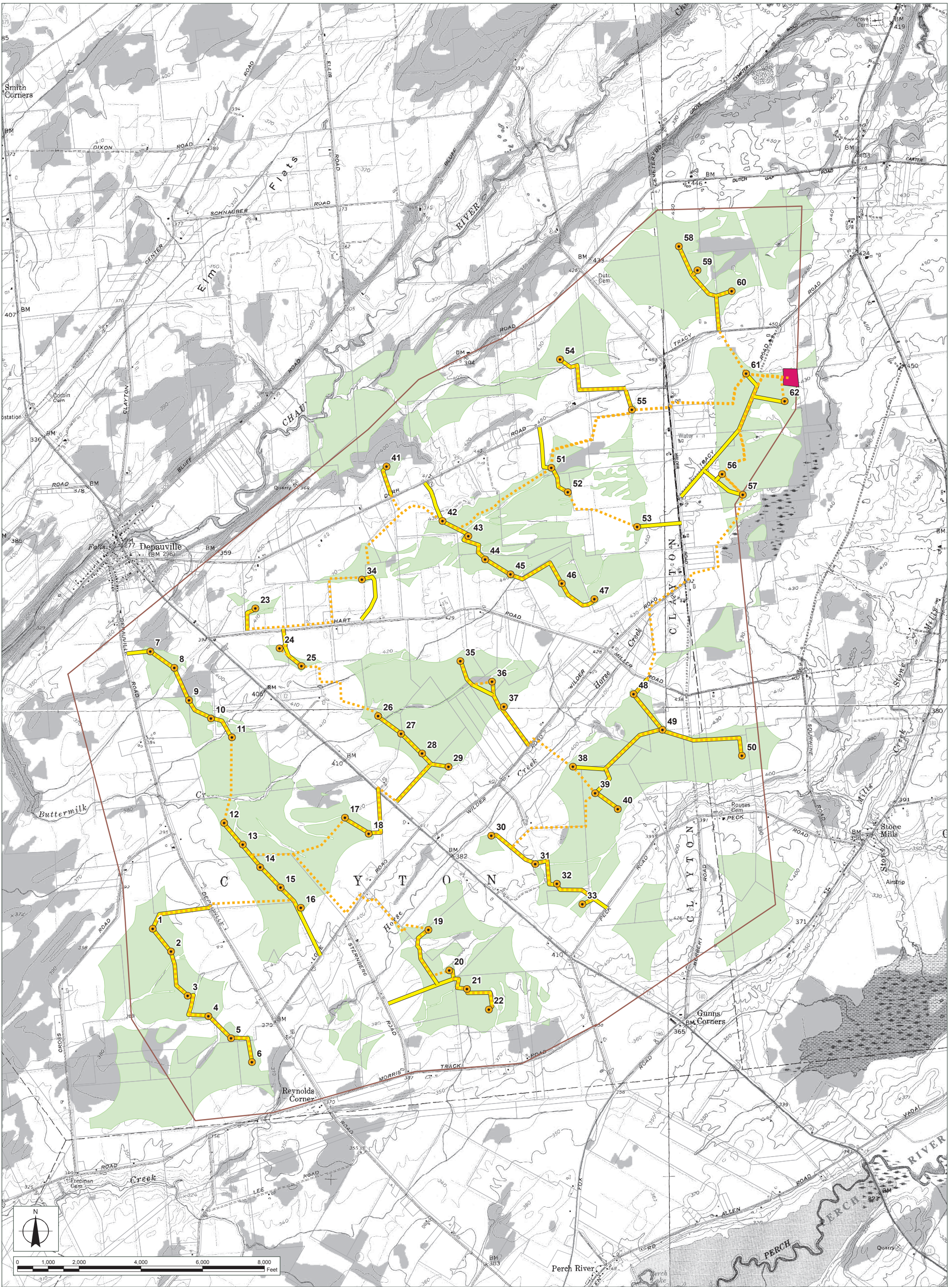
FIELD SOIL RESISTIVITY TEST RESULTS

APPENDIX A
SITE LOCATION PLAN



APPENDIX B

TURBINE LOCATION PLAN



Horse Creek Wind Farm

Towns of Clayton and Orleans - Jefferson County, New York

Figure 5: Proposed Project Layout

- Proposed Wind Turbine
- - - Electrical Interconnect
- Access Road
- Substation
- Parcel Boundary
- Potentially Developable Areas

Notes:
 Base Map: USGS 1:24000
 Clayton, LaFargeville, Dexter,
 Brownville Quadrangles

February 2007



APPENDIX C

TEST PIT LOGS



ATLANTIC TESTING LABORATORIES

TEST PIT LOG

Client: ATL Engineering, P.C. Project No.: CD2795
 Project: Horse Creek Wind Farm Test Pit No.: T-7A
 Test Pit Location: Turbine No. 7 Date: 11/12/07
50' OS South from Proposed Tower Center Surface Elevation: 387.2'
 Northing: 1505241.86 Easting: 956744.66

GROUNDWATER OBSERVATIONS

Date	Time	Hole Depth	Water Depth	Water Elevation
11/12/07	12:08 PM	3.0'	None Observed	--

SOIL STRATIGRAPHY

Sample Number	Depth of Sample		Depth of Change	CLASSIFICATION OF MATERIALS (‘C’ COARSE, ‘M’ MEDIUM, ‘F’ FINE) (‘AND’ 35-50%, ‘SOME’ 20-35%, ‘LITTLE’ 10-20%, ‘TRACE’ 0-10%)
	From	To		
			0.7	TOPSOIL and ORGANIC MATERIAL
S-1			3.0	Grey Weathered Limestone BEDROCK
				Grey Limestone BEDROCK
				Test pit terminated at 3.0 feet due to bucket refusal.

NOTES

1. Type of Excavator: Komatsu WB140 Rubber Tired Backhoe
2. The limestone bedrock was rippable where vertical fractures were exposed.
3. The bedrock had 1" to 2" horizontal beds.

ATL Representative: Adam Schneider & Aaron Woods



ATLANTIC TESTING LABORATORIES

TEST PIT LOG

Client: ATL Engineering, P.C. Project No.: CD2795
 Project: Horse Creek Wind Farm Test Pit No.: T-7
 Test Pit Location: Turbine No. 7 Date: 11/12/07
Proposed Tower Center Surface Elevation: 385.5'
 Northing: 1505290.02 Easting: 956731.02

GROUNDWATER OBSERVATIONS

Date	Time	Hole Depth	Water Depth	Water Elevation
11/12/07	12:25 PM	1.5'	None Observed	--

SOIL STRATIGRAPHY

Sample Number	Depth of Sample		Depth of Change	CLASSIFICATION OF MATERIALS (‘C’ COARSE, ‘M’ MEDIUM, ‘F’ FINE) (‘AND’ 35-50%, ‘SOME’ 20-35%, ‘LITTLE’ 10-20%, ‘TRACE’ 0-10%)
	From	To		
			0.3	TOPSOIL and ORGANIC MATERIAL with ROCK Outcrops
			1.5	Grey Weathered Limestone BEDROCK
				Grey Limestone BEDROCK
				Test pit terminated at 1.5 feet due to bucket refusal.

NOTES

1. Type of Excavator: Komatsu WB140 Rubber Tired Backhoe
2. The limestone bedrock was rippable where vertical fractures were exposed.
3. The bedrock had 4" to 6" horizontal beds.

ATL Representative: Aaron Woods & Adam Schneider



ATLANTIC TESTING LABORATORIES

TEST PIT LOG

Client: ATL Engineering, P.C. Project No.: CD2795
 Project: Horse Creek Wind Farm Test Pit No.: T-1
 Test Pit Location: Turbine No. 1 Date: 11/12/07
Proposed Tower Center Surface Elevation: 400.7'
 Northing: 1496457.02 Easting: 956777.03

GROUNDWATER OBSERVATIONS

Date	Time	Hole Depth	Water Depth	Water Elevation
11/12/07	2:10 PM	4.0'	None Observed	--

SOIL STRATIGRAPHY

Sample Number	Depth of Sample		Depth of Change	CLASSIFICATION OF MATERIALS (‘C’ COARSE, ‘M’ MEDIUM, ‘F’ FINE) (‘AND’ 35-50%, ‘SOME’ 20-35%, ‘LITTLE’ 10-20%, ‘TRACE’ 0-10%)
	From	To		
			0.7	TOPSOIL and ORGANIC MATERIAL
S-1	2.0	2.5	2.5	Brown CLAY; and SILT; trace mf SAND; trace c GRAVEL (wet, plastic) w=38.1%
S-2	3.0	4.0	4.0	Brown cmf SAND; some SILT; some CLAY; little cmf GRAVEL (moist, very slightly plastic) w=9.1%
				Grey Limestone BEDROCK
				Test pit terminated at 4.0 feet due to bucket refusal.

NOTES

1. Type of Excavator: Komatsu WB140 Rubber Tired Backhoe
2. The limestone bedrock was not rippable with the excavator.
3. _____

ATL Representative: Aaron Woods & Adam Schneider



ATLANTIC TESTING LABORATORIES

TEST PIT LOG

Client: ATL Engineering, P.C. Project No.: CD2795
 Project: Horse Creek Wind Farm Test Pit No.: T-1A
 Test Pit Location: Turbine No. 1 Date: 11/12/07
50' OS North from Proposed Tower Center Surface Elevation: 400.5'
 Northing: 1496504.77 Easting: 956762.09

GROUNDWATER OBSERVATIONS

Date	Time	Hole Depth	Water Depth	Water Elevation
11/12/07	1:30 PM	5.5'	None Observed	--

SOIL STRATIGRAPHY

Sample Number	Depth of Sample		Depth of Change	CLASSIFICATION OF MATERIALS ('C' COARSE, 'M' MEDIUM, 'F' FINE) ('AND' 35-50%, 'SOME' 20-35%, 'LITTLE' 10-20%, 'TRACE' 0-10%)
	From	To		
			0.8	TOPSOIL and ORGANIC MATERIAL
			2.5	Brown CLAY; and SILT; trace mf SAND; trace c GRAVEL (wet, plastic)
			5.5	Brown cmf SAND; some SILT; some CLAY; little cmf GRAVEL (moist, very slightly plastic)
				Grey Limestone BEDROCK
				Test pit terminated at 5.5 feet due to bucket refusal.

NOTES

1. Type of Excavator: Komatso WB140 Rubber Tired Backhoe
2. The limestone bedrock was not rippable with the excavator.
3. _____

ATL Representative: Aaron Woods & Adam Schneider



ATLANTIC TESTING LABORATORIES

TEST PIT LOG

Client: ATL Engineering, P.C. Project No.: CD2795
 Project: Horse Creek Wind Farm Test Pit No.: T-20
 Test Pit Location: Turbine No. 20 Date: 11/13/07
Proposed Tower Center Surface Elevation: 405.8'
 Northing: 1495107.96 Easting: 966375.94

GROUNDWATER OBSERVATIONS

Date	Time	Hole Depth	Water Depth	Water Elevation
11/13/07	11:55 AM	2.6'	See note 3	--

SOIL STRATIGRAPHY

Sample Number	Depth of Sample		Depth of Change	CLASSIFICATION OF MATERIALS (‘C’ COARSE, ‘M’ MEDIUM, ‘F’ FINE) (‘AND’ 35-50%, ‘SOME’ 20-35%, ‘LITTLE’ 10-20%, ‘TRACE’ 0-10%)
	From	To		
			0.7	TOPSOIL and ORGANIC MATERIAL
S-1	1.0	1.9	1.9	Brown CLAY; some SILT; trace mf SAND; trace f GRAVEL (wet, plastic) w=34.0%
S-2	1.9	2.6	2.6	Brown cmf SAND; some SILT; some cmf GRAVEL; some cmf GRAVEL; trace CLAY; trace COBBLES (moist, very slightly plastic) w=9.8%
				Grey Limestone BEDROCK
				Test pit terminated at 2.6 feet due to bucket refusal.

NOTES

1. Type of Excavator: Komatsu WB140 Rubber Tired Backhoe
2. The limestone bedrock was not rippable with the excavator.
3. Slight groundwater seepage observed at a depth of 2.5 feet and at the bedrock surface.

ATL Representative: Aaron Woods



ATLANTIC TESTING LABORATORIES

TEST PIT LOG

Client: ATL Engineering, P.C. Project No.: CD2795
 Project: Horse Creek Wind Farm Test Pit No.: T-20A
 Test Pit Location: Turbine No. 20 Date: 11/13/07
50' OS South from Proposed Tower Center Surface Elevation: 406.5'
 Northing: 1495063.87 Easting: 966399.59

GROUNDWATER OBSERVATIONS

Date	Time	Hole Depth	Water Depth	Water Elevation
11/13/07	11:30 AM	2.7'	None Observed	--

SOIL STRATIGRAPHY

Sample Number	Depth of Sample		Depth of Change	CLASSIFICATION OF MATERIALS (‘C’ COARSE, ‘M’ MEDIUM, ‘F’ FINE) (‘AND’ 35-50%, ‘SOME’ 20-35%, ‘LITTLE’ 10-20%, ‘TRACE’ 0-10%)
	From	To		
			0.7	TOPSOIL and ORGANIC MATERIAL
			2.7	Brown CLAY; some SILT; trace mf SAND; trace f GRAVEL (wet, plastic)
				Grey Limestone BEDROCK
				Test pit terminated at 2.7 feet due to bucket refusal.

NOTES

1. Type of Excavator: Komatsu WB140 Rubber Tired Backhoe
2. The limestone bedrock was not rippable with the excavator.
3. _____

ATL Representative: Aaron Woods



ATLANTIC TESTING LABORATORIES

TEST PIT LOG

Client: ATL Engineering, P.C. Project No.: CD2795
 Project: Horse Creek Wind Farm Test Pit No.: T-42
 Test Pit Location: Turbine No. 42 Date: 11/13/07
Proposed Tower Center Surface Elevation: 427.4'
 Northing: 1509654.02 Easting: 966157.98

GROUNDWATER OBSERVATIONS

Date	Time	Hole Depth	Water Depth	Water Elevation
11/13/07	07:50 AM	3.9'	None Observed	--

SOIL STRATIGRAPHY

Sample Number	Depth of Sample		Depth of Change	CLASSIFICATION OF MATERIALS (‘C’ COARSE, ‘M’ MEDIUM, ‘F’ FINE) (‘AND’ 35-50%, ‘SOME’ 20-35%, ‘LITTLE’ 10-20%, ‘TRACE’ 0-10%)
	From	To		
			0.6	TOPSOIL and ORGANIC MATERIAL
S-1	2.0	3.0	3.9	Brown CLAY; and SILT; trace mf SAND (wet, plastic) w=28.6%
				Grey Limestone BEDROCK
				Test pit terminated at 3.9 feet due to bucket refusal.

NOTES

1. Type of Excavator: Komatsu WB140 Rubber Tired Backhoe
2. The limestone bedrock was not rippable with the excavator.
3. _____

ATL Representative: Aaron Woods



ATLANTIC TESTING LABORATORIES

TEST PIT LOG

Client: ATL Engineering, P.C. Project No.: CD2795
 Project: Horse Creek Wind Farm Test Pit No.: T-42A
 Test Pit Location: Turbine No. 42 Date: 11/13/07
50' OS East from Proposed Tower Center Surface Elevation: 428.2'
 Northing: 1509660.20 Easting: 966207.63

GROUNDWATER OBSERVATIONS

Date	Time	Hole Depth	Water Depth	Water Elevation
11/13/07	08:15 AM	4.1'	None Observed	--

SOIL STRATIGRAPHY

Sample Number	Depth of Sample		Depth of Change	CLASSIFICATION OF MATERIALS (‘C’ COARSE, ‘M’ MEDIUM, ‘F’ FINE) (‘AND’ 35-50%, ‘SOME’ 20-35%, ‘LITTLE’ 10-20%, ‘TRACE’ 0-10%)
	From	To		
			0.6	TOPSOIL and ORGANIC MATERIAL
			4.1	Brown CLAY; and SILT; trace mf SAND (wet, plastic)
				Grey Limestone BEDROCK
				Test pit terminated at 4.1 feet due to bucket refusal.

NOTES

1. Type of Excavator: Komatsu WB140 Rubber Tired Backhoe
2. The limestone bedrock was not rippable with the excavator.
3. _____

ATL Representative: Aaron Woods



ATLANTIC TESTING LABORATORIES

TEST PIT LOG

Client: ATL Engineering, P.C. Project No.: CD2795
 Project: Horse Creek Wind Farm Test Pit No.: T-50
 Test Pit Location: Turbine No. 50 Date: 11/13/07
Proposed Tower Center Surface Elevation: 431.1'
 Northing: 1502887.96 Easting: 972338.06

GROUNDWATER OBSERVATIONS

Date	Time	Hole Depth	Water Depth	Water Elevation
11/13/07	10:20 AM	2.7'	None Observed	--

SOIL STRATIGRAPHY

Sample Number	Depth of Sample		Depth of Change	CLASSIFICATION OF MATERIALS (‘C’ COARSE, ‘M’ MEDIUM, ‘F’ FINE) (‘AND’ 35-50%, ‘SOME’ 20-35%, ‘LITTLE’ 10-20%, ‘TRACE’ 0-10%)
	From	To		
			0.7	TOPSOIL and ORGANIC MATERIAL
S-1	1.0	2.0	2.7	Brown CLAY; some SILT; little mf SAND (wet, plastic) w=32.8%
				Grey Limestone BEDROCK
				Test pit terminated at 2.7 feet due to bucket refusal.

NOTES

1. Type of Excavator: Komatsu WB140 Rubber Tired Backhoe
2. The limestone bedrock was not rippable with the excavator.
3. _____

ATL Representative: Aaron Woods



ATLANTIC TESTING LABORATORIES

TEST PIT LOG

Client: ATL Engineering, P.C. Project No.: CD2795
 Project: Horse Creek Wind Farm Test Pit No.: T-50A
 Test Pit Location: Turbine No. 50 Date: 11/13/07
50' OS North from Proposed Tower Center Surface Elevation: 431.5'
 Northing: 1502902.64 Easting: 972385.82

GROUNDWATER OBSERVATIONS

Date	Time	Hole Depth	Water Depth	Water Elevation
11/13/07	10:40 AM	2.7'	None Observed	--

SOIL STRATIGRAPHY

Sample Number	Depth of Sample		Depth of Change	CLASSIFICATION OF MATERIALS (‘C’ COARSE, ‘M’ MEDIUM, ‘F’ FINE) (‘AND’ 35-50%, ‘SOME’ 20-35%, ‘LITTLE’ 10-20%, ‘TRACE’ 0-10%)
	From	To		
			0.5	TOPSOIL and ORGANIC MATERIAL
			2.7	Brown CLAY; some SILT; little mf SAND (wet, plastic)
				Grey Limestone BEDROCK
				Test pit terminated at 2.7 feet due to bucket refusal.

NOTES

1. Type of Excavator: Komatsu WB140 Rubber Tired Backhoe
2. The limestone bedrock was not rippable with the excavator.
3. _____

ATL Representative: Aaron Woods



ATLANTIC TESTING LABORATORIES

TEST PIT LOG

Client: ATL Engineering, P.C. Project No.: CD2795
 Project: Horse Creek Wind Farm Test Pit No.: T-55
 Test Pit Location: Turbine No. 55 Date: 11/12/07
Proposed Tower Center Surface Elevation: 458.6'
 Northing: 1513280.93 Easting: 972353.94

GROUNDWATER OBSERVATIONS

Date	Time	Hole Depth	Water Depth	Water Elevation
11/12/07	3:35 PM	3.3'	None Observed	--

SOIL STRATIGRAPHY

Sample Number	Depth of Sample		Depth of Change	CLASSIFICATION OF MATERIALS (‘C’ COARSE, ‘M’ MEDIUM, ‘F’ FINE) (‘AND’ 35-50%, ‘SOME’ 20-35%, ‘LITTLE’ 10-20%, ‘TRACE’ 0-10%)
	From	To		
			0.8	TOPSOIL and ORGANIC MATERIAL
S-1	1.8	2.5	3.3	Brown CLAY; some SILT; trace cmf SAND (wet, plastic) w=32.6%
				Grey Limestone BEDROCK
				Test pit terminated at 3.3 feet due to bucket refusal.

NOTES

1. Type of Excavator: Komatsu WB140 Rubber Tired Backhoe
2. The limestone bedrock was not rippable with the excavator.
3. _____

ATL Representative: Aaron Woods



ATLANTIC TESTING LABORATORIES

TEST PIT LOG

Client: ATL Engineering, P.C. Project No.: CD2795
 Project: Horse Creek Wind Farm Test Pit No.: T-55A
 Test Pit Location: Turbine No. 55 Date: 11/12/07
50' OS West from Proposed Tower Center Surface Elevation: 458.9'
 Northing: 1513304.81 Easting: 972397.97

GROUNDWATER OBSERVATIONS

Date	Time	Hole Depth	Water Depth	Water Elevation
11/12/07	15:10 PM	3.0'	None Observed	--

SOIL STRATIGRAPHY

Sample Number	Depth of Sample		Depth of Change	CLASSIFICATION OF MATERIALS ('C' COARSE, 'M' MEDIUM, 'F' FINE) ('AND' 35-50%, 'SOME' 20-35%, 'LITTLE' 10-20%, 'TRACE' 0-10%)
	From	To		
			1.0	TOPSOIL and ORGANIC MATERIAL
			3.0	Brown CLAY; some SILT; trace cmf SAND (wet, plastic)
				Grey Limestone BEDROCK
				Test pit terminated at 3.0 feet due to bucket refusal.

NOTES

1. Type of Excavator: Komatso WB140 Rubber Tired Backhoe
2. The limestone bedrock was not rippable with the excavator.
3. _____

ATL Representative: Aaron Woods & Adam Schneider



ATLANTIC TESTING LABORATORIES

TEST PIT LOG

Client: ATL Engineering, P.C. Project No.: CD2795
 Project: Horse Creek Wind Farm Test Pit No.: T-SUB
 Test Pit Location: Proposed Substation Date: 11/13/07
Center of Proposed Substation Surface Elevation: 434.3'
 Northing: 1514715.71 Easting: 977791.78

GROUNDWATER OBSERVATIONS

Date	Time	Hole Depth	Water Depth	Water Elevation
11/13/07	09:15 AM	2.5'	None Observed	--

SOIL STRATIGRAPHY

Sample Number	Depth of Sample		Depth of Change	CLASSIFICATION OF MATERIALS (‘C’ COARSE, ‘M’ MEDIUM, ‘F’ FINE) (‘AND’ 35-50%, ‘SOME’ 20-35%, ‘LITTLE’ 10-20%, ‘TRACE’ 0-10%)
	From	To		
			0.7	TOPSOIL and ORGANIC MATERIAL
S-1	1.5	2.5	2.5	Brown CLAY; some SILT; little cmf SAND (wet, plastic) w=37.6%
				Grey Limestone BEDROCK
				Test pit terminated at 2.5 feet due to bucket refusal.

NOTES

1. Type of Excavator: Komatsu WB140 Rubber Tired Backhoe
2. The limestone bedrock was not rippable with the excavator.
3. _____

ATL Representative: Aaron Woods

APPENDIX D

SELECT PHOTOGRAPHS



Turbine No. T-42: Proposed Tower Center



Turbine No. T-42: 50' OS East from Proposed Tower Center



Substation



Turbine No. T-50: Proposed Tower Center



Turbine No. T-50: 50' OS North from Proposed Tower Center



Turbine No. T-20: 50' OS South from Proposed Tower Center



Turbine No. T-20: Proposed Tower Center

APPENDIX E

TEST PIT SUMMARY TABLE

Test Pit Summary
Horse Creek Wind Farm
ATL Report No. WTCD2795E-01-12-07

Test Pit Data								
Test Pit No.	Date	Northing	Easting	Surface Elevation (ft)	Groundwater Depth (ft)	Groundwater Elevation (ft)	Termination Depth (ft)	Termination Elevation (ft)
1	12-Nov	1496457.02	956777.03	400.7	None Observed	---	4.0 ²	396.7
1A	12-Nov	1496504.77	956762.09	400.5	None Observed	---	5.5 ²	395.0
7	12-Nov	1505290.02	956731.02	385.5	None Observed	---	1.5 ²	384.0
7A	12-Nov	1505241.86	956744.66	387.2	None Observed	---	3.0 ²	384.2
20	13-Nov	1495107.96	966375.94	405.8	2.5 ¹	403.3	2.6 ²	403.2
20A	13-Nov	1495063.87	966399.59	406.5	None Observed	---	2.7 ²	403.8
42	13-Nov	1509654.02	966157.98	427.4	None Observed	---	3.9 ²	423.5
42A	13-Nov	1509660.20	966207.63	428.2	None Observed	---	4.1 ²	424.1
50	13-Nov	1502887.96	972338.06	431.1	None Observed	---	2.7 ²	428.4
50A	13-Nov	1502902.64	972385.82	431.5	None Observed	---	2.7 ²	428.8
55	12-Nov	1513280.93	972353.94	458.6	None Observed	---	3.3 ²	455.3
55A	12-Nov	1513304.81	972397.97	458.9	None Observed	---	3.0 ²	455.9
SUB	13-Nov	1514715.71	977791.78	434.3	None Observed	---	2.5 ²	431.8

¹ Slight groundwater seepage was observed at the surface of bedrock

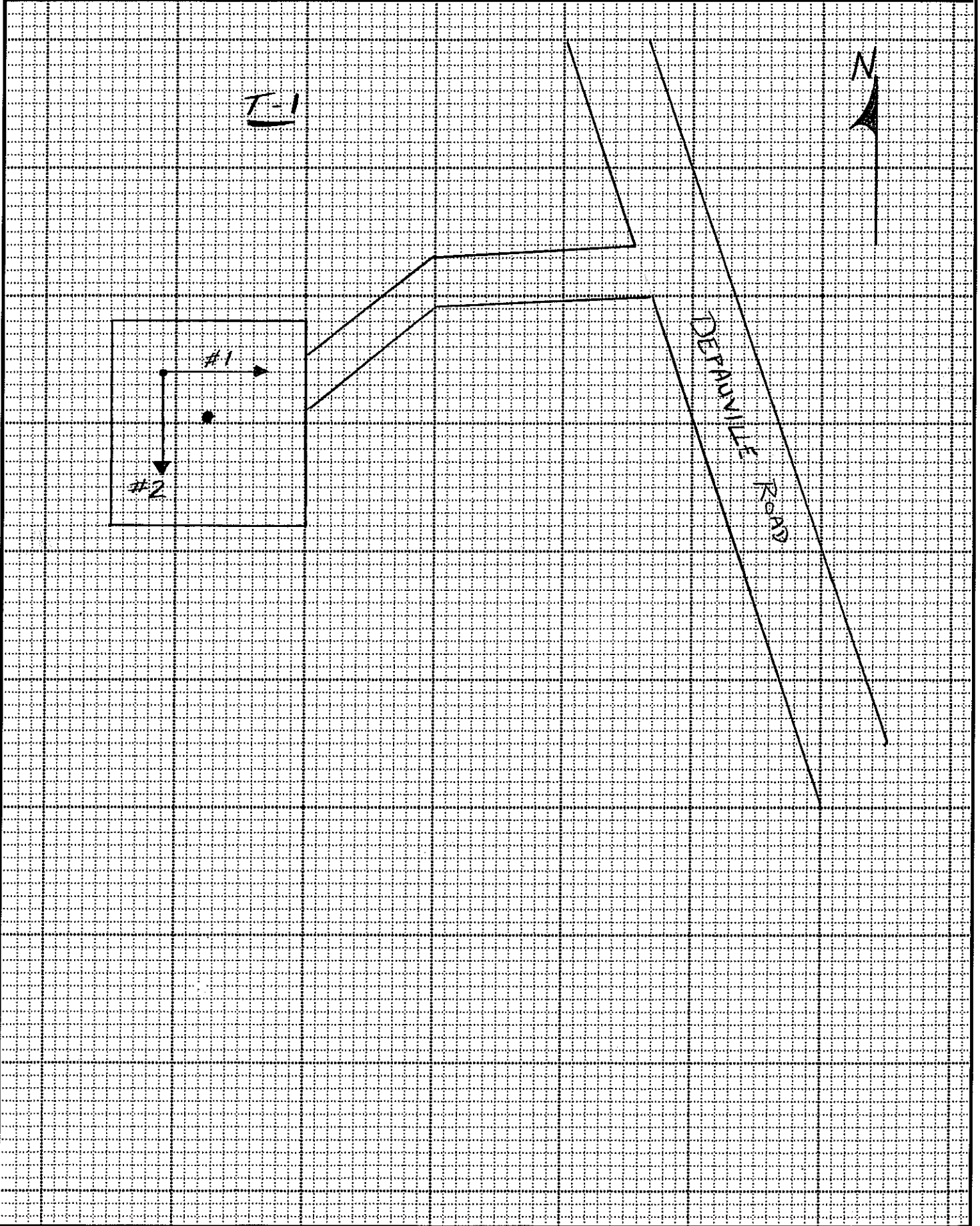
² Test pit terminated due to bucket refusal on apparent limestone bedrock

APPENDIX F

RESISTIVITY LAYOUT MAPS



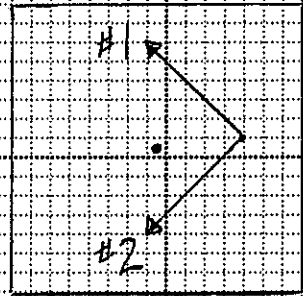
SUBJECT HORSE CREEK WIND FARM	JOB NO. AE027	BY AW	DATE 11-20-07	SHEET 1 of 6
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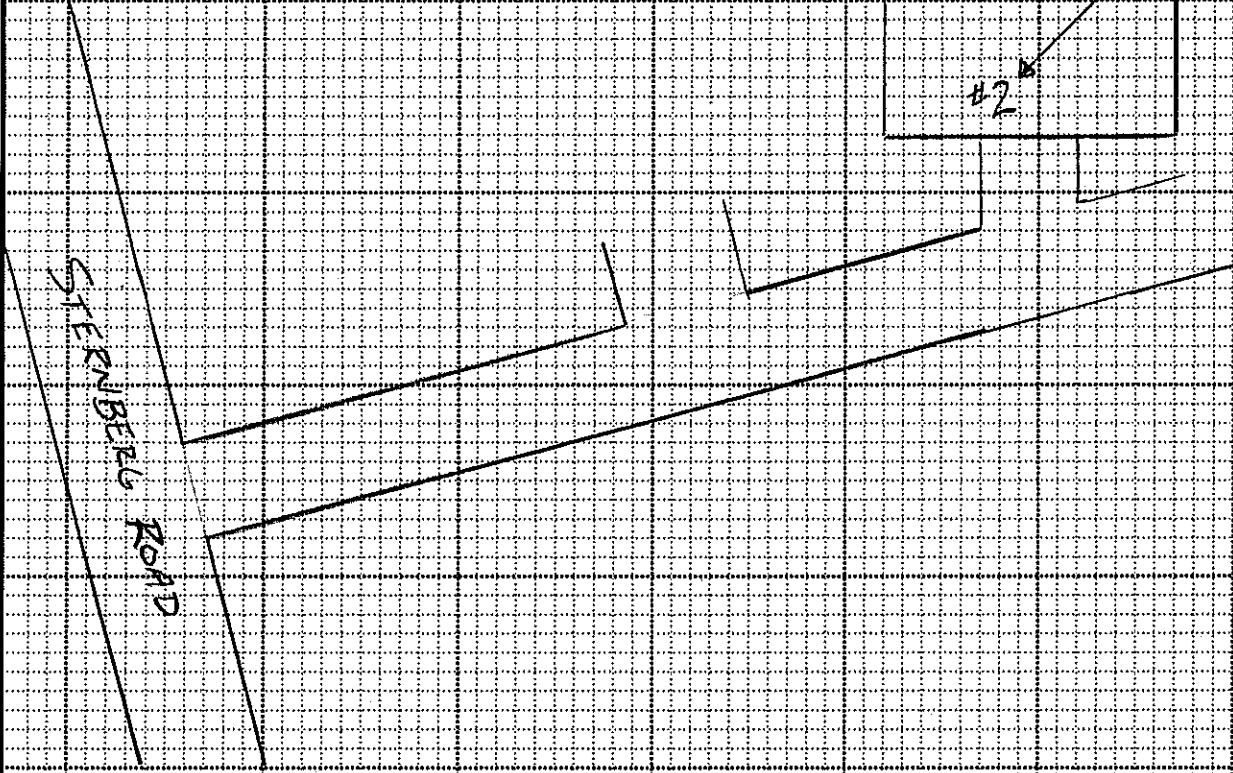


SUBJECT <i>HORSE CREEK WIND FARM</i>	JOB NO. <i>AEO27</i>	BY <i>AW</i>	DATE <i>11-20-07</i>	SHEET <i>2 of 6</i>
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T-20



SPENBERG ROAD



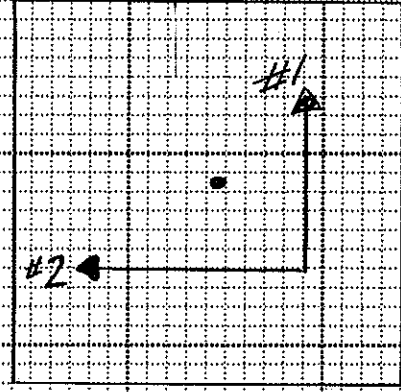
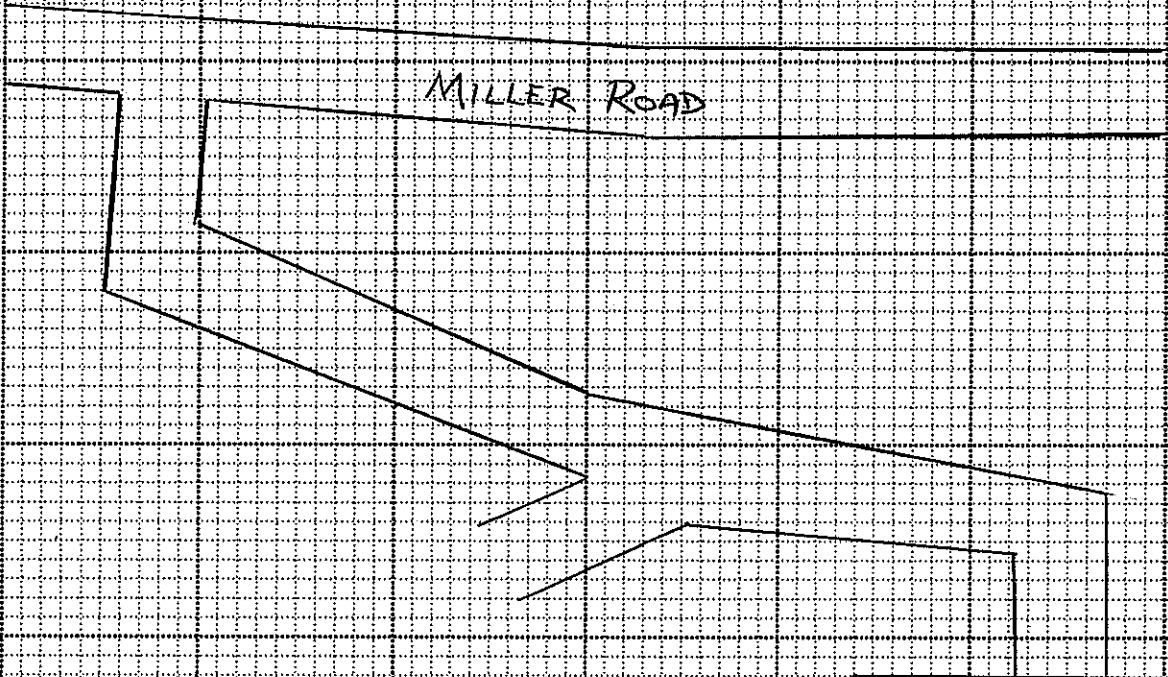


SUBJECT HORSE CREEK WIND FARM	JOB NO. AEO27	BY AW	DATE 11-20-07	SHEET 3 of 6
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T-50:



MILLER ROAD



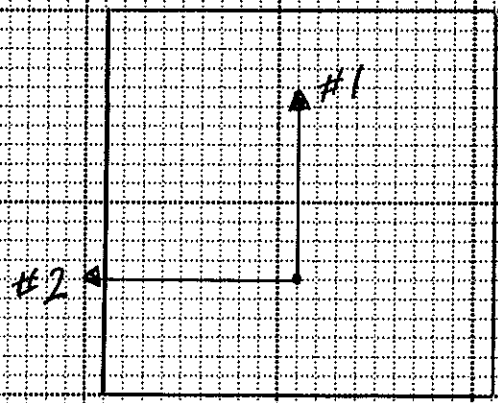


SUBJECT HORSE CREEK WIND FARM	JOB NO. AE027	BY AW	DATE 11-27-07	SHEET 4 of 6
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SUBSTATION:



TRACEY ROAD





SUBJECT

HORSE CREEK WIND FARM

JOB NO.

AE027

BY

AW

DATE

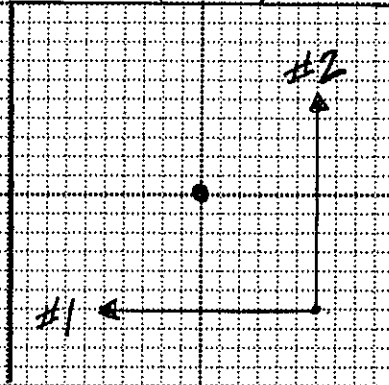
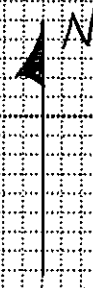
11-27-07

SHEET

5 of 6

T-55:

COUNTY ROUTE 12





SUBJECT

HORSE CREEK WIND FARM

JOB NO.

AE027

BY

AW

DATE

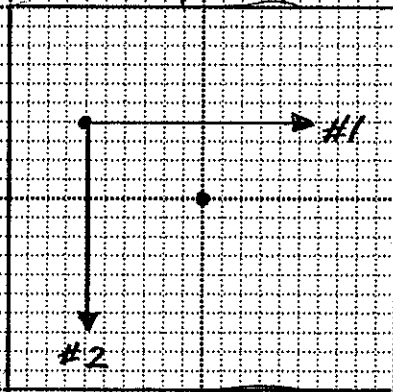
11-27-07

SHEET

6 OF 6

T-42 :

COUNTY ROUTE 12



APPENDIX G

FIELD SOIL RESISTIVITY TEST RESULTS

ATLANTIC TESTING LABORATORIES, Limited

Field Soil Resistivity Test Results

JOB NO: AE027
 DATE: 11/19/07
 SITE NAME: Horse Creek Wind Farm

Field Technician: Aaron Woods
 Test Instrument: Nilsson Model 400
 Procedure: 4 point soil resistivity test

LOCATION (attach map)	DEPTH TESTED (spacing in feet)	METER READING (ohms)	CALCULATED SOIL RESISTIVITY =191.5 x SPACING (ft) x R (ohms)
T1 #1	5	8.0	7,660
	10	7.9	15,129
	15	7.3	20,969
	20	6.9	26,427
T1 #2	5	9.1	8,713
	10	7.4	14,171
	15	6.8	19,533
	20	6.3	24,129
T20 #1	5	8.9	8,522
	10	10.0	19,150
	15	10.7	30,736
	20	10.6	40,598
T20 #2	5	9.6	9,192
	10	12.0	22,980
	15	11.0	31,598
	20	11.0	42,130
T50 #1	5	11.0	10,533
	10	10.7	20,491
	15	9.6	27,576
	20	9.5	36,385
T50 #2	5	11.0	10,533
	10	11.0	21,065
	15	10.0	28,725
	20	9.8	37,534
Substation #1	5	4.6	4,405
	10	4.7	9,001
	15	5.9	16,948
	20	6.6	25,278
Substation #2	5	4.0	3,830
	10	4.3	8,235
	15	6.4	18,384
	20	7.0	26,810

ATLANTIC TESTING LABORATORIES, Limited

Field Soil Resistivity Test Results

JOB NO: AE027

DATE: 11/19/07

SITE NAME: Horse Creek Wind Farm

Field Technician: Aaron Woods

Test Instrument: Nilsson Model 400

Procedure: 4 point soil resistivity test

LOCATION (attach map)	DEPTH TESTED (spacing in feet)	METER READING (ohms)	CALCULATED SOIL RESISTIVITY =191.5 x SPACING (ft) x R (ohms)
T42 #1	5	4.5	4,309
	10	3.5	6,703
	15	3.7	10,628
	20	3.7	14,171
T42 #2	5	4.9	4,692
	10	3.7	7,086
	15	3.9	11,203
	20	3.4	13,022
T55 #1	5	7.1	6,798
	10	6.4	12,256
	15	5.5	15,799
	20	5.3	20,299
T55 #2	5	7.0	6,703
	10	6.5	12,448
	15	7.0	20,108
	20	6.5	24,895

APPENDIX H

PARTICLE SIZE ANALYSIS SUMMARY TABLE



ATLANTIC TESTING LABORATORIES

**Particle Size Analysis Results
Horse Creek Wind Farm
ATL Report No. WTCD2795E-01-12-07**

Turbine No.	Sample No.	Depth (ft)	Percent Passing											
			6"	4"	3"	2"	1"	3/4"	1/2"	#4	#10	#40	#200	5 μ m
T-1	S-1	2.0-2.5	100	100	100	100	---	99	---	---	99	97	95	59
T-1	S-2	3.0-4.0	100	100	100	98	95	93	90	86	78	67	49	23
T-20	S-1	1.0-1.9	100	100	100	100	100	---	---	99	98	93	80	55
T-20	S-2	1.9-2.6	100	93	---	---	89	88	81	66	60	--	31	
T-42	S-1	2.0-3.0	100	100	100	100	100	100	100	100	100	100	99	60
T-50	S-1	1.0-2.0	100	100	100	100	100	100	100	100	100	95	82	
T-55	S-1	1.8-2.5	100	100	100	100	100	100	100	100	97	95	91	61
T-SUB	S-1	1.5-2.5	100	100	100	100	100	100	100	100	99	97	89	

APPENDIX I

NATURAL MOISTURE CONTENT RESULTS TABLE



ATLANTIC TESTING LABORATORIES

**Natural Moisture Content Results
Horse Creek Wind Farm
ATL Report No. WTCD2795E-01-12-07**

Turbine No.	Sample No.	Depth (ft)	Natural Moisture Content (%)
T-1	S-1	2.0-2.5	38.1
T-1	S-2	3.0-4.0	9.1
T-20	S-1	1.0-1.9	34.0
T-20	S-2	1.9-2.6	9.8
T-42	S-1	2.0-3.0	28.6
T-50	S-1	1.0-2.0	32.8
T-55	S-1	1.8-2.5	32.6
T-SUB	S-1	1.5-2.5	37.6

APPENDIX J

ATTERBERG LIMITS RESULTS TABLE



ATLANTIC TESTING LABORATORIES

**Atterberg Limits Results
Horse Creek Wind Farm
ATL Report No. WTCD2795E-01-12-07**

Turbine No.	Sample No.	Depth (ft)	Soil Type	USCS Symbol	Plastic Limit	Liquid Limit	Plasticity Index
T-1	S-1	2.0-2.5	Brown CLAY; and SILT; trace mf SAND; trace c GRAVEL	CH	23	65	42
T-1	S-2	3.0-4.0	Brown cmf SAND; some SILT; some CLAY; little cmf GRAVEL	SC	12	22	10
T-20	S-1	1.0-1.9	Brown CLAY; some SILT; trace mf SAND; trace f GRAVEL	CH	20	55	35
T-50	S-1	1.0-2.0	Brown CLAY; some SILT; little mf SAND	CH	24	64	40
T-SUB	S-1	1.5-2.5	Brown CLAY; some SILT; little mf SAND	CH	25	66	41

APPENDIX K

LABORATORY COMPACTION RESULTS TABLE



ATLANTIC TESTING LABORATORIES

**Laboratory Compaction Results
Horse Creek Wind Farm
ATL Report No. WTCD2795E-01-12-07**

Turbine No.	Sample No.	Depth (ft)	USCS Symbol	Natural Moisture Content (%)	Optimum Moisture Content (%)	Maximum Dry Density (pcf)
T-1	S-1	2.0-2.5	CH	38.1	14.0	105.0
T-1	S-2	3.0-4.0	SC	9.1	7.5	134.0
T-20	S-1	1.0-1.9	CH	34.0	15.5	110.0
T-20	S-2	1.9-2.6	SM	9.8	5.0	142.5
T-42	S-1	2.0-3.0	CH	28.6	18.0	105.0
T-50	S-1	1.0-2.0	CH	32.8	19.0	106.5
T-55	S-1	1.8-2.5	CH	32.6	17.5	109.5

APPENDIX L

TABLE OF CHEMICAL ANALYSIS



ATLANTIC TESTING LABORATORIES

**Chemical Analysis Results
Horse Creek Wind Farm
ATL Report No. WTCD2795E-01-12-07**

Turbine No.	Sample No.	Depth (ft)	Chemical Analysis		
			pH (S.U.)	Chlorides (%)	Soluble Sulfate (%)
T-1	S-1	2.0-2.5	7.6	< 0.1	0.42
T-1	S-2	3.0-4.0	7.6	< 0.1	< 0.1
T-20	S-1	1.0-1.9	6.7	< 0.1	0.12
T-50	S-1	1.0-2.0	7.4	< 0.1	0.63
T-SUB	S-1	1.5-2.5	5.2	< 0.1	0.53

APPENDIX M

TABLE OF THERMAL RESISTIVITY RESULTS



ATLANTIC TESTING LABORATORIES

**Thermal Resistivity Analysis Results
Horse Creek Wind Farm
ATL Report No. WTCD2795E-01-12-07**

Boring No.	Sample No.	Sample Depth (ft.)	Moisture Content (%)	Thermal Resistivity (Mk/w)
T-1	S-1	2.0-2.5	Dry	10.320
				10.251
			14.0	9.067
				8.821
T-1	S-2	3.0-4.0	Dry	0.084
				0.082
			8.0	3.526
				3.729
T-20	S-1	1.0-1.9	Dry	0.056
				0.057
			15.5	0.927
				0.922



ATLANTIC TESTING LABORATORIES

Thermal Resistivity Analysis Results (Cont'd)
Horse Creek Wind Farm
ATL Report No. WTCD2795E-01-12-07

Boring No.	Sample No.	Sample Depth (ft.)	Moisture Content (%)	Thermal Resistivity (Mk/w)
T-42	S-1	2.0-3.0	Dry	0.031
				0.035
			18.0	2.005
				1.995
T-50	S-1	1.0-2.0	Dry	14.812
				15.068
			19.0	1.089
				1.084
T-55	S-1	1.8-2.5	Dry	0.103
				0.083
			17.5	1.201
				1.188

APPENDIX N

LABORATORY TEST REPORTS

Particle Size Distribution Report

Project: Horse Creek Wind Power Project

Report No.: CD2795SL-02-12-07

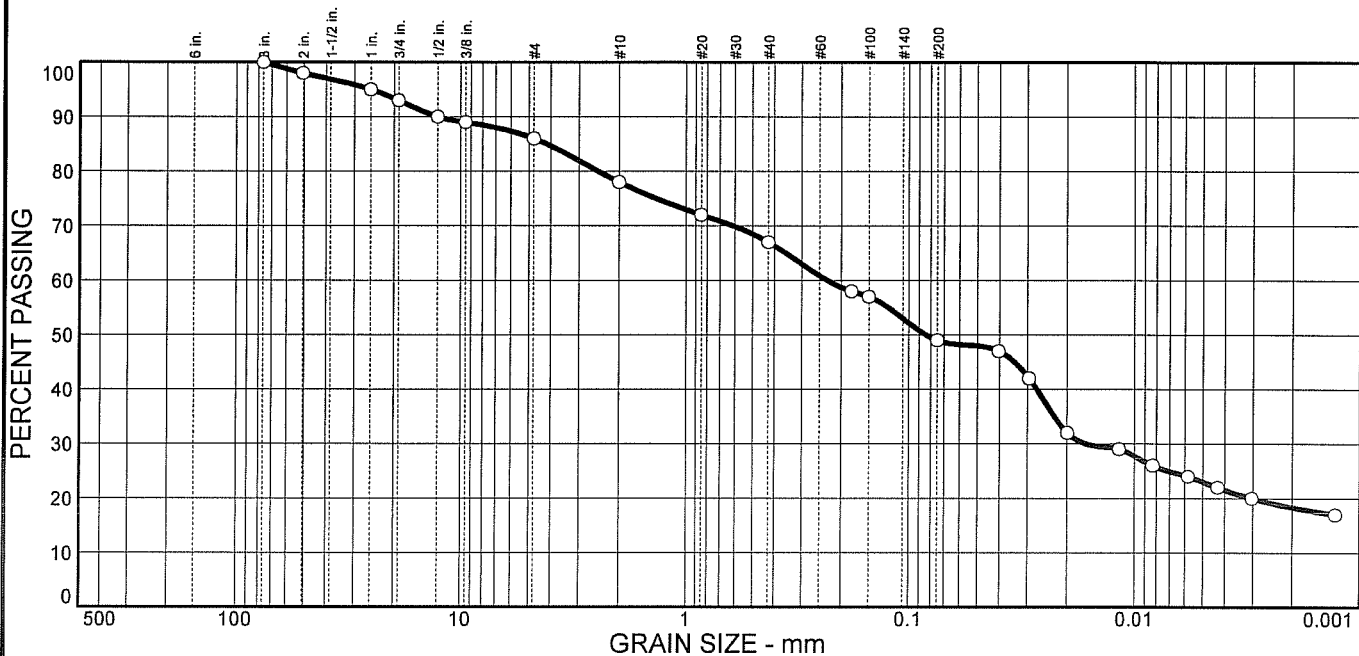
Client: ATL Engineering, P.C.

Date: 12/3/07

Sample No: S-2
Location: In-Situ

Source of Sample: T-1

Elev./Depth: 3.0 - 4.0'



% COBBLES	% GRAVEL		% SAND			% FINES	
	CRS.	FINE	CRS.	MEDIUM	FINE	SILT	CLAY
0	7	7	8	11	18	26	23

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	OUT OF SPEC. (X)
3 in.	100		
2 in.	98		
1 in.	95		
3/4 in.	93		
1/2 in.	90		
3/8 in.	89		
#4	86		
#10	78		
#20	72		
#40	67		
#80	58		
#100	57		
#200	49		

Soil Description

Brown cmf SAND; some SILT; some CLAY; little cmf GRAVEL

Atterberg Limits

PL= 12 LL= 22 PI= 10

Coefficients

D₈₅= 4.17 D₆₀= 0.230 D₅₀= 0.0840
D₃₀= 0.0165 D₁₅= D₁₀=
C_u= C_c=

Classification

USCS= SC AASHTO=

Remarks

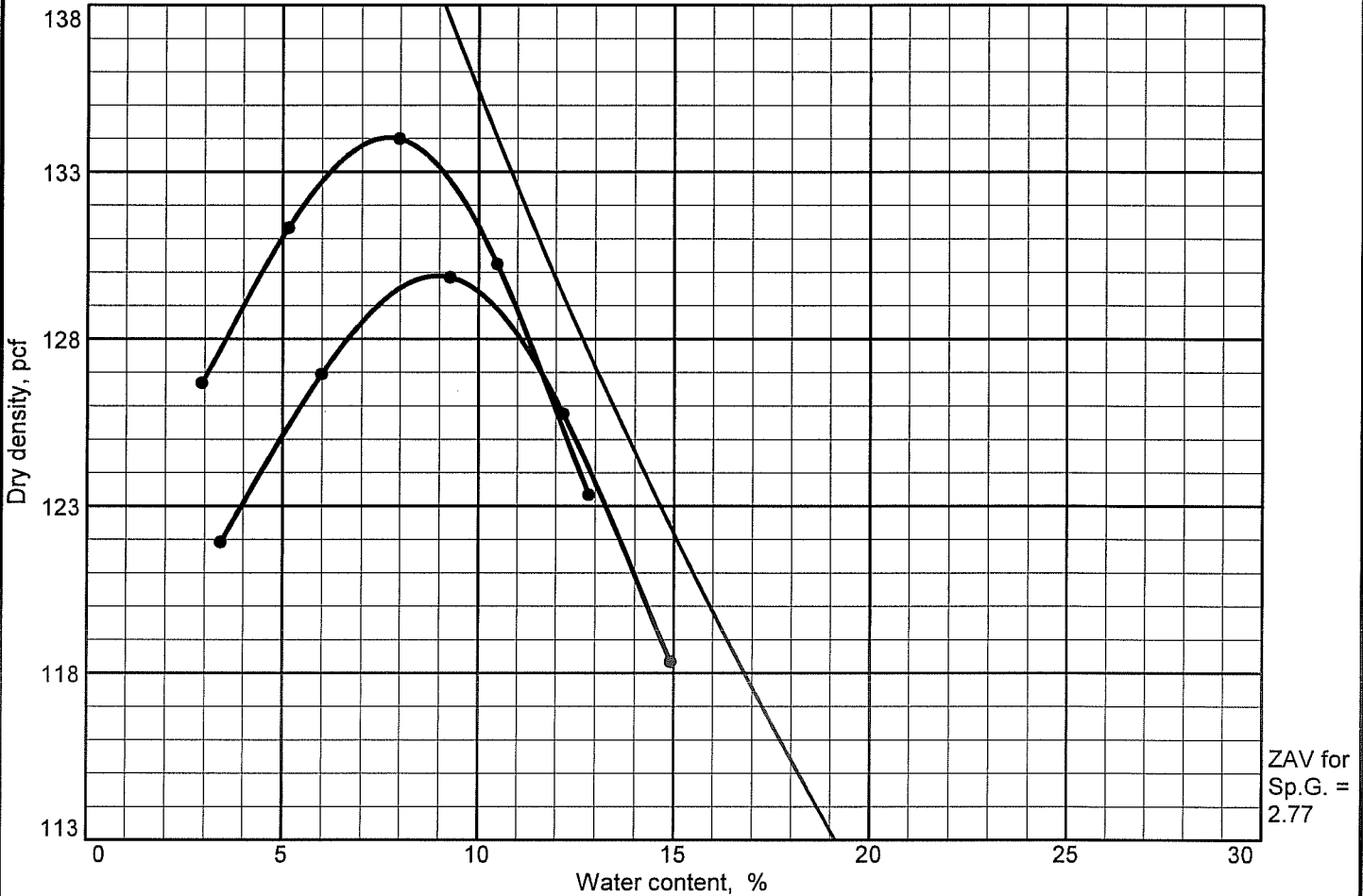
Sample collected by A. Woods on 11/12/07.
Moisture content 9.1%

* (no specification provided)

Reviewed by: Ryan Anthony

Date: 12/24/07

COMPACTION TEST REPORT



Test specification: ASTM D 1557-00 Procedure A Modified
 Oversize correction applied to each point

Elev/ Depth	Classification		Received Moist.	Sp.G.	LL	PL	PI	% > No.4
	USCS	AASHTO						
3.0 - 4.0'	SC		9.1	2.77	22	12	10	14.0

TEST RESULTS	MATERIAL DESCRIPTION
Maximum dry density = 134 pcf Optimum moisture = 7.5 %	Brown cmf SAND; some SILT; some CLAY; little cmf GRAVEL
Report No.: _____ Client: ATL Engineering, P.C. Project: Horse Creek Wind Power Project Sample No.: S-2 Source of Sample: T-1 Location: In-Situ Date: 12/5/07	Remarks: Sample collected by A. Woods on 11/12/07. Dry preparation Rammer: Mechanical Specific Gravity: Assumed
COMPACTON TEST REPORT ATLANTIC TESTING LABORATORIES, LIMITED	

Reviewed by: *Ryan Anthony*

Date: 12/24/07

Particle Size Distribution Report

Project: Horse Creek Wind Power Project

Report No.: CD2795SL-03-12-07

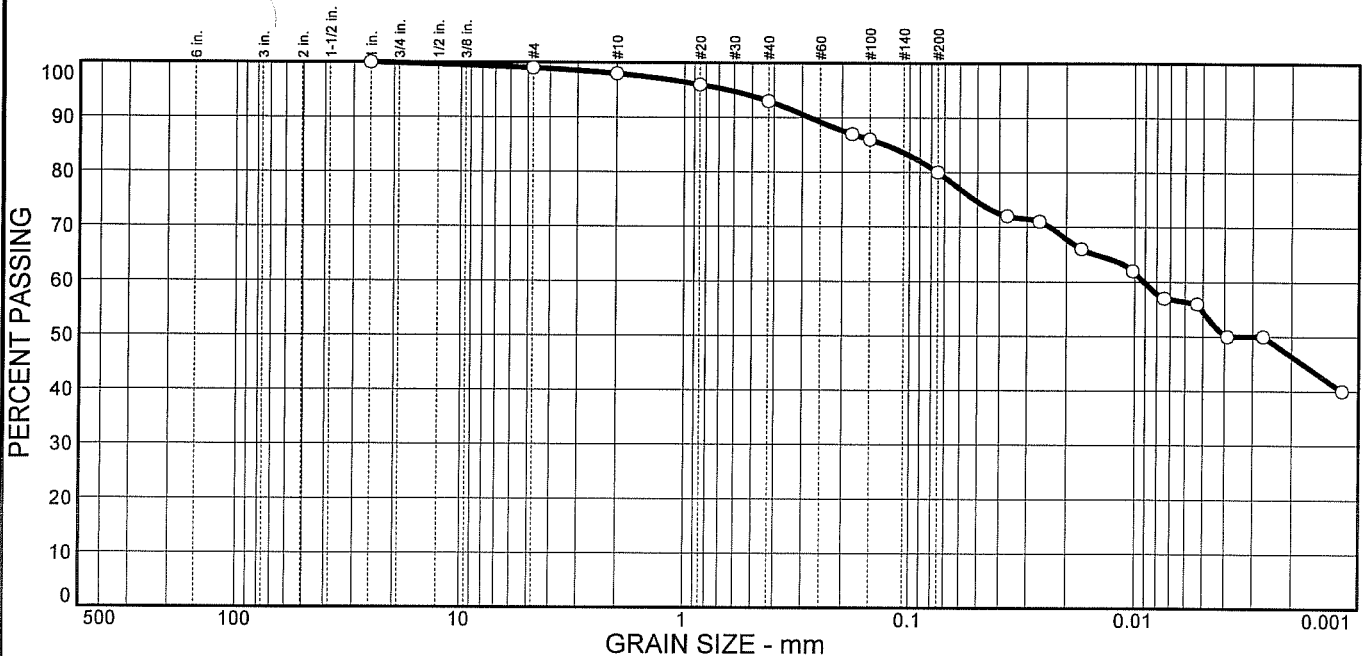
Client: ATL Engineering, P.C.

Date: 12/10/07

Sample No: S-1
Location: In-Situ

Source of Sample: T-20

Elev./Depth: 1.0 - 1.9'



% COBBLES	% GRAVEL		% SAND			% FINES	
	CRS.	FINE	CRS.	MEDIUM	FINE	SILT	CLAY
0	0	1	1	5	13	25	55

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	OUT OF SPEC. (X)
1 in.	100		
#4	99		
#10	98		
#20	96		
#40	93		
#80	87		
#100	86		
#200	80		

Soil Description

Brown CLAY; some SILT; trace mf SAND; trace f GRAVEL

Atterberg Limits

PL= 20 LL= 55 PI= 35

Coefficients

D₈₅= 0.128 D₆₀= 0.0091 D₅₀= 0.0027
D₃₀= D₁₅= D₁₀=
C_u= C_c=

Classification

USCS= CH AASHTO=

Remarks

Sample collected by A. Woods on 11/13/07.
Moisture content 34.0%

* (no specification provided)

ATLANTIC TESTING LABORATORIES, LIMITED

Reviewed by: Ryan Chantry

Date: 12/24/07

Particle Size Distribution Report

Project: Horse Creek Wind Power Project

Report No.: CD2795SL-04-12-07

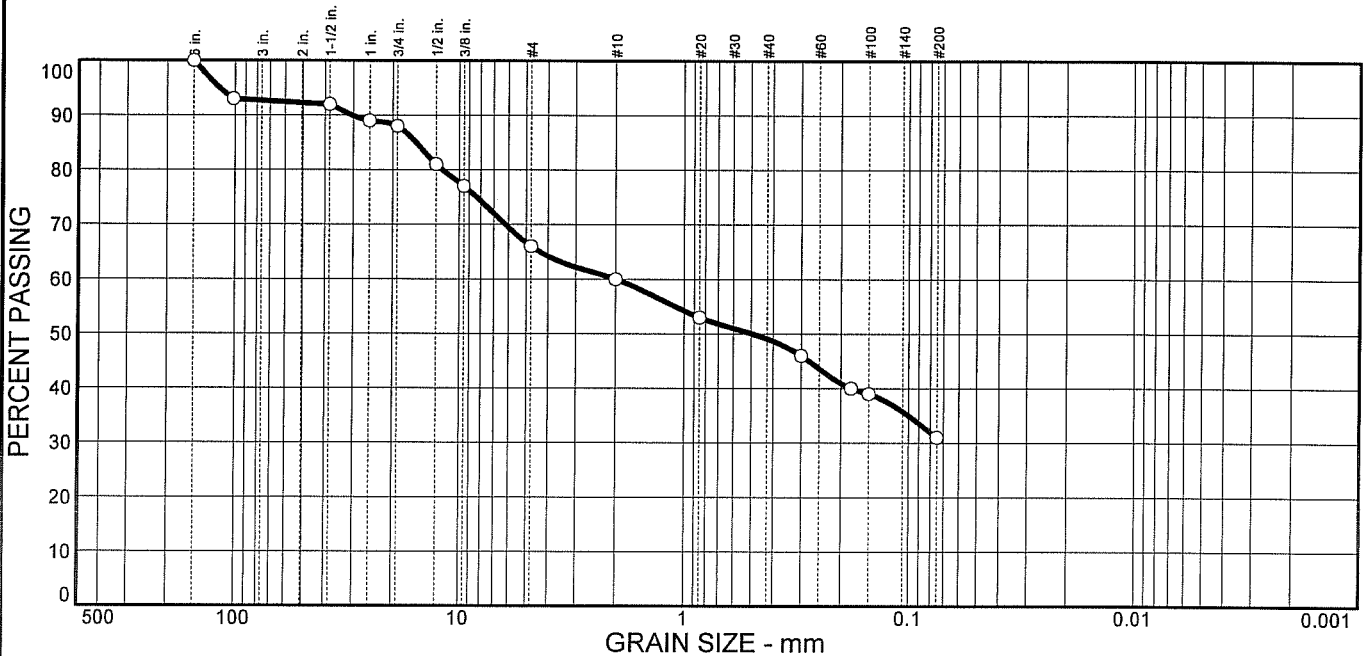
Client: ATL Engineering, P.C.

Date: 12/11/07

Sample No: S-2
Location: In-Situ

Source of Sample: T-20

Elev./Depth: 1.9 - 2.6'



% COBBLES	% GRAVEL		% SAND			% FINES	
	CRS.	FINE	CRS.	MEDIUM	FINE	SILT	CLAY
7	5	22	6	11	18	31	

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	OUT OF SPEC. (X)
6 in.	100		
4 in.	93		
1.5 in.	92		
1 in.	89		
3/4 in.	88		
1/2 in.	81		
3/8 in.	77		
#4	66		
#10	60		
#20	53		
#50	46		
#80	40		
#100	39		
#200	31		

Soil Description

Brown c-mf SAND; some SILT; some c-mf GRAVEL; trace CLAY; trace COBBLES

Atterberg Limits

PL= -- LL= -- PI= --

Coefficients

D₈₅= 15.7 D₆₀= 2.00 D₅₀= 0.494
D₃₀= D₁₅= D₁₀=
C_u= C_c=

Classification

USCS= SM AASHTO=

Remarks

Sample collected by A. Woods on 11/13/07.
Moisture content 9.8%

* (no specification provided)

ATLANTIC TESTING LABORATORIES, LIMITED

Reviewed by: *Ryan D. [Signature]*

Date: 12/24/07

Particle Size Distribution Report

Project: Horse Creek Wind Power Project

Report No.: CD2795SL-05-12-07

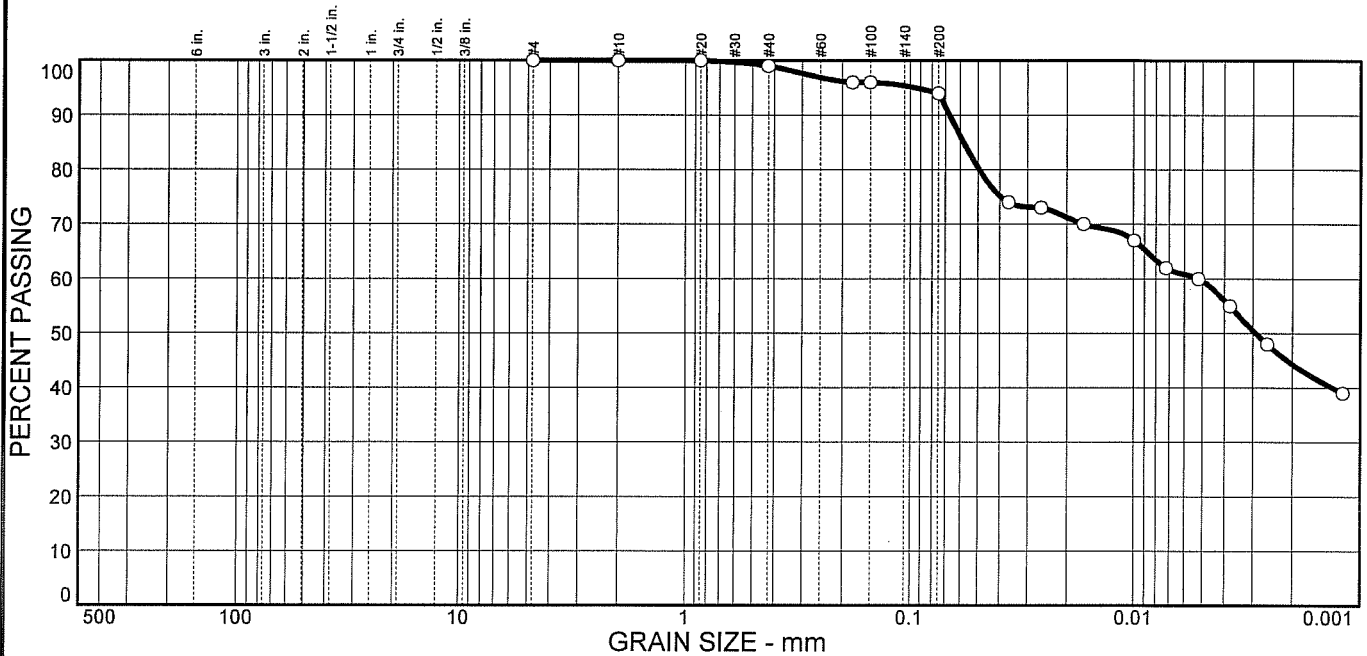
Client: ATL Engineering, P.C.

Date: 12/06/07

Sample No: S-1
Location: In-Situ

Source of Sample: T-42

Elev./Depth: 2.0 - 3.0'



% COBBLES	% GRAVEL		% SAND			% FINES	
	CRS.	FINE	CRS.	MEDIUM	FINE	SILT	CLAY
0	0	0	0	1	5	34	60

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	OUT OF SPEC. (X)
#4	100		
#10	100		
#20	100		
#40	99		
#80	96		
#100	94		
#200	94		

Soil Description

Brown CLAY; and SILT; trace mf SAND

Atterberg Limits

PL= -- LL= -- PI= --

Coefficients

D₈₅= 0.0581 D₆₀= 0.0052 D₅₀= 0.0029
D₃₀= D₁₅= D₁₀=
C_u= C_c=

Classification

USCS= CH AASHTO=

Remarks

Sample collected by A. Woods on 11/13/07.
Moisture content 28.6%

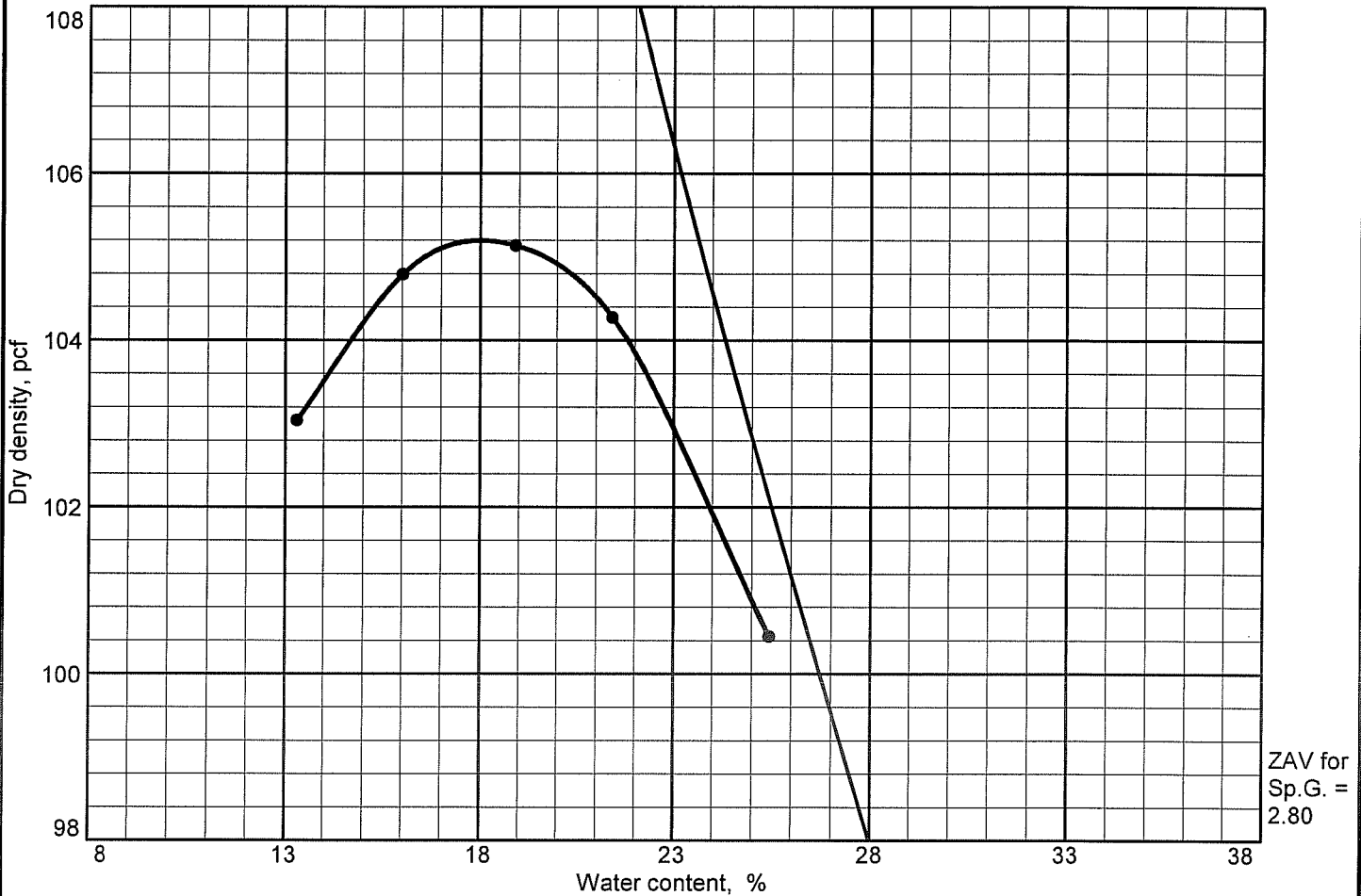
* (no specification provided)

ATLANTIC TESTING LABORATORIES, LIMITED

Reviewed by: *Ryan Auty*

Date: 12/24/07

COMPACTION TEST REPORT



Test specification: ASTM D 1557-00 Procedure A Modified

Elev/ Depth	Classification		Received Moist.	Sp.G.	LL	PL	PI	% > No.4
	USCS	AASHTO						
2.0 - 3.0'	CH		28.6	2.80	--	--	--	0.0

TEST RESULTS	MATERIAL DESCRIPTION
Maximum dry density = 105 pcf Optimum moisture = 18 %	Brown CLAY; and SILT; trace mf SAND

Report No.: CD2795SL-05-12-07 **Client:** ATL Engineering, P.C.
Project: Horse Creek Wind Power Project
Sample No.: S-1 **Source of Sample:** T-42
Location: In-Situ **Date:** 12/6/07

Remarks:
 Sample collected by A. Woods on 11/13/07.
 Dry preparation

COMPACTON TEST REPORT
ATLANTIC TESTING LABORATORIES, LIMITED

Rammer: Mechanical
Specific Gravity: Assumed

Reviewed by: *Ryan A. Taylor*

Date: 12/24/07

Particle Size Distribution Report

Project: Horse Creek Wind Power Project

Report No.: CD2795SL-06-12-07

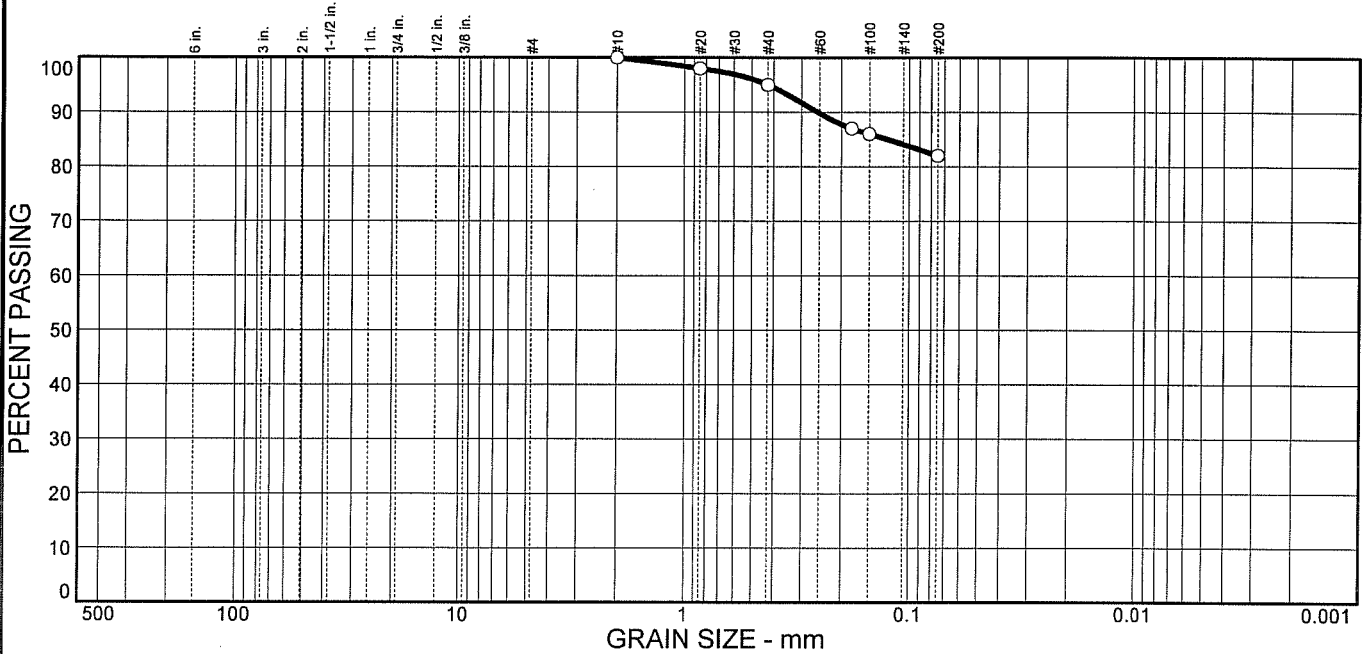
Client: ATL Engineering, P.C.

Date: 12/3/07

Sample No: S-1
Location: In-Situ

Source of Sample: T-50

Elev./Depth: 1.0 - 2.0'



% COBBLES	% GRAVEL		% SAND			% FINES	
	CRS.	FINE	CRS.	MEDIUM	FINE	SILT	CLAY
0	0	0	0	5	13	82	

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	OUT OF SPEC. (X)
#10	100		
#20	98		
#40	95		
#80	87		
#100	86		
#200	82		

Soil Description

Brown CLAY; some SILT; little mf SAND

Atterberg Limits

PL= 29 LL= 62 PI= 33

Coefficients

D₈₅= 0.124 D₆₀= D₅₀=
D₃₀= D₁₅= D₁₀=
C_u= C_c=

Classification

USCS= CH AASHTO=

Remarks

Sample collected by A. Woods on 11/13/07.
Moisture content 32.8%

* (no specification provided)

Reviewed by: Ryan Clancy

Date: 12/24/07

Particle Size Distribution Report

Project: Horse Creek Wind Power Project

Report No.: CD2795SL-07-12-07

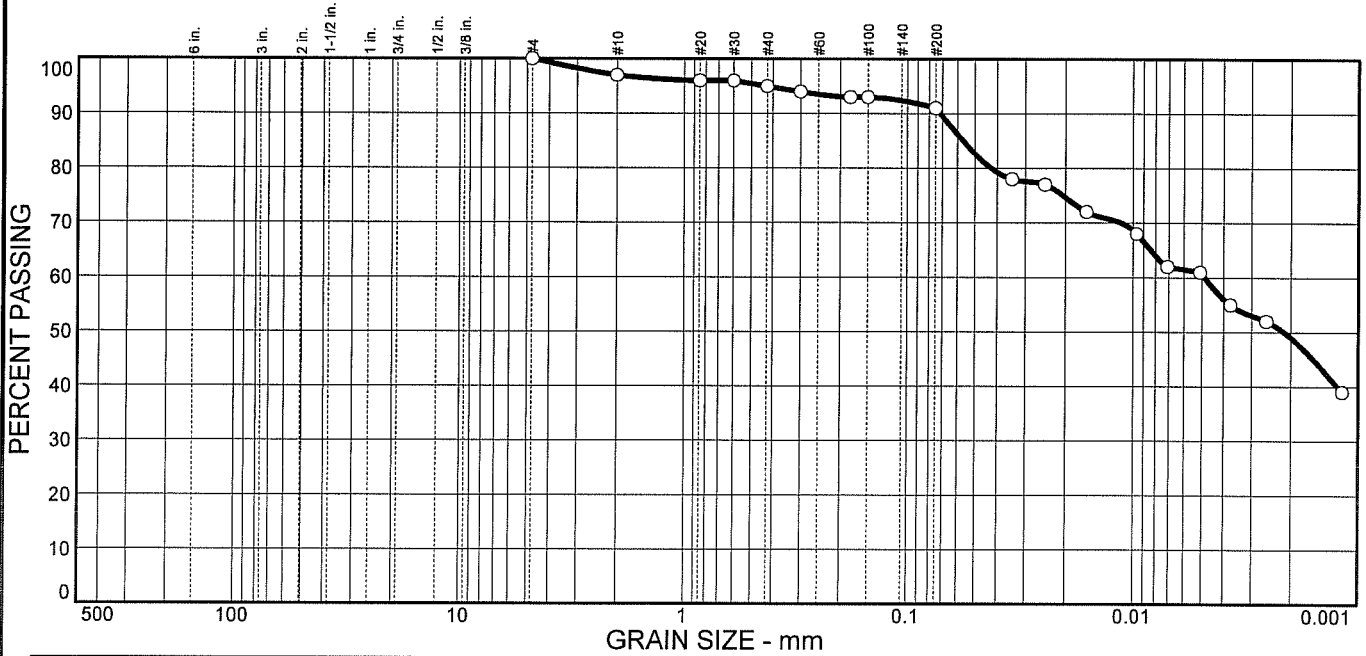
Client: ATL Engineering, P.C.

Date: 12/6/07

Sample No: S-1
Location: In-Situ

Source of Sample: T-55

Elev./Depth: 1.8 - 2.5'



% COBBLES	% GRAVEL		% SAND			% FINES	
	CRS.	FINE	CRS.	MEDIUM	FINE	SILT	CLAY
0	0	0	3	2	4	30	61

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	OUT OF SPEC. (X)
#4	100		
#10	97		
#20	96		
#30	96		
#40	95		
#50	94		
#80	93		
#100	93		
#200	91		

Soil Description

Brown CLAY; some SILT; trace cmf SAND

Atterberg Limits

PL= -- LL= -- PI= --

Coefficients

D₈₅= 0.0565 D₆₀= 0.0049 D₅₀= 0.0022
D₃₀= D₁₅= D₁₀=
C_u= C_c=

Classification

USCS= CH AASHTO=

Remarks

Sample collected by A. Woods on 11/12/07.
Moisture content 32.6%

* (no specification provided)

Reviewed by: *[Signature]*

Date: 12/24/07

Particle Size Distribution Report

Project: Horse Creek Wind Power Project

Report No.: CD2795SL-08-12-07

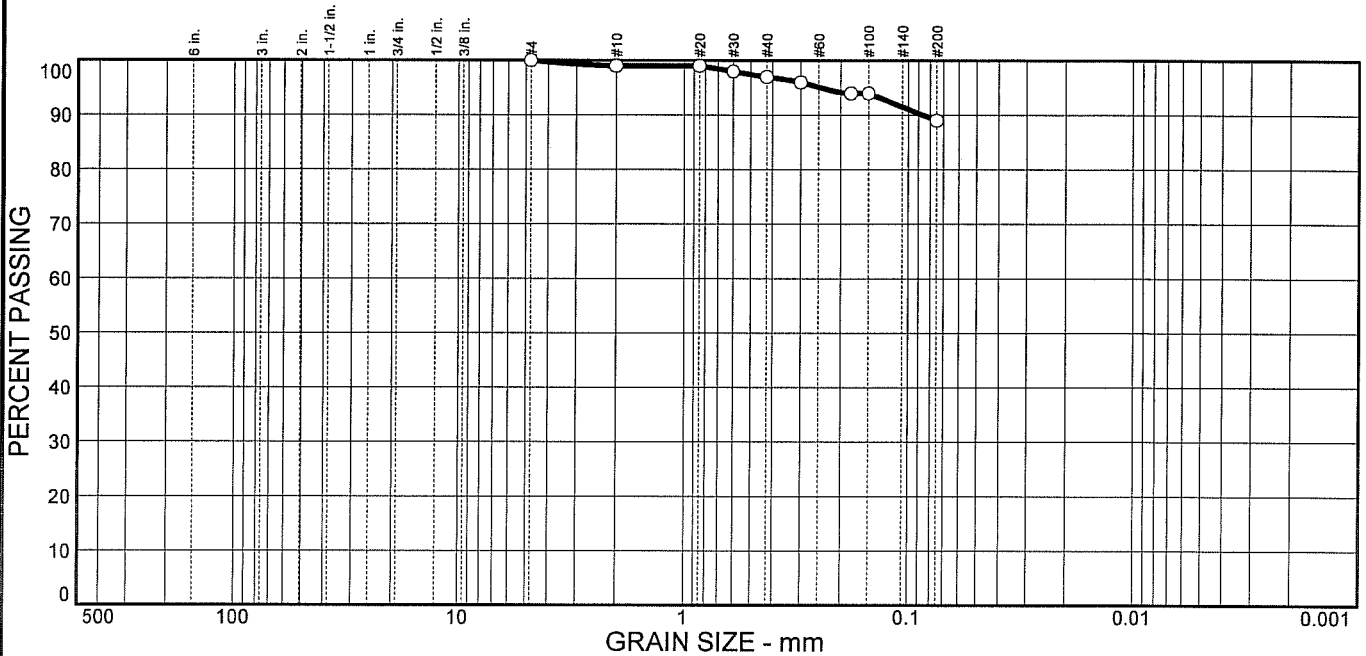
Client: ATL Engineering, P.C.

Date: 12/06/07

Sample No: S-1
Location: In-Situ

Source of Sample: T-SUB

Elev./Depth: 1.5 - 2.5'



% COBBLES	% GRAVEL		% SAND			% FINES	
	CRS.	FINE	CRS.	MEDIUM	FINE	SILT	CLAY
0	0	0	1	2	8	89	

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	OUT OF SPEC. (X)
#4	100		
#10	99		
#20	99		
#30	98		
#40	97		
#50	96		
#80	94		
#100	94		
#200	89		

Soil Description

Brown CLAY; some SILT; little cmf SAND

Atterberg Limits

PL= 25 LL= 66 PI= 41

Coefficients

D₈₅= D₆₀= D₅₀=
D₃₀= D₁₅= D₁₀=
C_u= C_c=

Classification

USCS= CH AASHTO=

Remarks

Sample collected by A. Woods on 11/12/07.
Moisture content 37.6%

* (no specification provided)

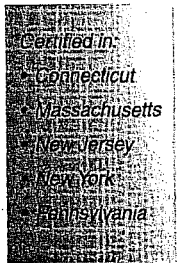
Reviewed by: *Ryan Atty*

Date: 12/24/07



Environmental
LABORATORY SERVICES

7280 Caswell Street, Hancock Air Park, North Syracuse, NY 13212
(315) 458-8033, FAX (315) 458-0526, (800) 842-4667



Laboratory Analysis Report

ATLANTIC TESTING LABORATORIES
P.O. Box 29
6431 U.S. Highway 11
Canton, NY 13617
ATTN: Mr. Ryan Armstrong

PROJECT #: 226515
RECEIVED: 12/04/2007 @ 11:30
REVISED: 12/18/07
Site Address:
HORSE CREEK WIND FARM

CLIENT JOB NUMBER: CD2795

TEST PERFORMED	RESULTS	UNITS	DATE/TIME PERFORMED	METHOD NUMBER	PERFORMED BY
SAMPLE #: 465540	CLIENT SAMPLE ID:	T-50, S-1		DATE/TIME SAMPLED:	@
CHLORIDE	<0.1	PERCENT	12/10/07	EPA 325.2	LBA
SOLIDS, TOTAL	73	PERCENT	12/05/07	SM18 2540B	LBA
SULFATE	0.63	PERCENT	12/06/07	EPA 375.2	LBA
SAMPLE #: 465541	CLIENT SAMPLE ID:	T-SUB, S-1		DATE/TIME SAMPLED:	@
CHLORIDE	<0.1	PERCENT	12/10/07	EPA 325.2	LBA
SOLIDS, TOTAL	72	PERCENT	12/05/07	SM18 2540B	LBA
SULFATE	0.53	PERCENT	12/06/07	EPA 375.2	LBA
SAMPLE #: 465542	CLIENT SAMPLE ID:	T-1, S-2		DATE/TIME SAMPLED:	@
CHLORIDE	<0.1	PERCENT	12/10/07	EPA 325.2	LBA
SOLIDS, TOTAL	92	PERCENT	12/05/07	SM18 2540B	LBA
SULFATE	<0.1	PERCENT	12/13/07	EPA 375.2	LBA
SAMPLE #: 465543	CLIENT SAMPLE ID:	T-20, S-1		DATE/TIME SAMPLED:	@
CHLORIDE	<0.1	PERCENT	12/10/07	EPA 325.2	LBA
SOLIDS, TOTAL	76	PERCENT	12/05/07	SM18 2540B	LBA
SULFATE	0.12	PERCENT	12/06/07	EPA 375.2	LBA
SAMPLE #: 465544	CLIENT SAMPLE ID:	T-1, S-1		DATE/TIME SAMPLED:	@
CHLORIDE	<0.1	PERCENT	12/10/07	EPA 325.2	LBA
SOLIDS, TOTAL	76	PERCENT	12/05/07	SM18 2540B	LBA
SULFATE	0.42	PERCENT	12/06/07	EPA 375.2	LBA

ATLANTIC TESTING LABORATORIES
P.O. Box 29
6431 U.S. Highway 11
Canton, NY 13617
ATTN: Mr. Ryan Armstrong

PROJECT #: 226515
RECEIVED: 12/04/2007 @ 11:30
REVISED: 12/18/07
Site Address:
HORSE CREEK WIND FARM

CLIENT JOB NUMBER: CD2795

TEST PERFORMED	RESULTS	UNITS	DATE/TIME PERFORMED	METHOD NUMBER	PERFORMED BY
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Sample Receipt Temperature: 11.6 Degrees C


David R. Hill
Laboratory Manager

12/18/2007
Print Date

All tests performed under NYS ELAP Laboratory Certification # 11375 unless otherwise stated.
Report relates only to the samples as received by the laboratory and shall not be reproduced
except in full, without written approval from Environmental Laboratory Services.





ATLANTIC TESTING LABORATORIES

ENVIRONMENTAL - CHAIN OF CUSTODY

226515

Albany
22 Corporate Drive
Clifton Park, NY 12065
518/383-9144 (T)
518/383-9166 (F)

Binghamton
406 North Street
Endicott, NY 13670
607/757-9326 (T)
607/757-9252 (F)

Canton
6431 U.S. Highway 11
Canton, NY 13617
315/386-4578 (T)
315/386-1012 (F)

Plattsburgh
1080 Military Turnpike
Plattsburgh, NY 12901
518/563-5878 (T)
518/562-1321 (F)

Poughkeepsie
251 Upper North Road
Highland, NY 12590
845/691-6098 (T)
845/691-6099 (F)

Syracuse
6085 Court Street Road
Syracuse, NY 13206
315/699-5281 (T)
315/699-3374 (F)

Utica
301 St. Anthony Street
Utica, NY 13501
315/735-3309 (T)
315/735-0742 (F)

Watertown
P.O. Box 91
Fells Mills, NY 13638
315/773-5390 (T)
315/773-0334 (F)

Project No.	Client Name	QA/QC Code	Parameters			Report Distribution		
			NYSDDEC	NYSDOH	Other	Dates Required:	Send Reports To:	Fax Results:
022795	Horse Creek Wind Farm	SW-846	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	STANDARD	R. Armsstrong	<input type="checkbox"/> Yes <input type="checkbox"/> No
	T-50, S-1	0	1				465540	
	T-SUB, S-1	0	1				465541	
	T-1, S-2	0	1				465542	
	T-20, S-1	0	1				465543	
	T-1, S-1	0	1				465544	

Received for Name: ATL
 Laboratory Signature: [Signature]
 Date: 12/4/07
 Time: 11:30

Samples Relinquished By:
 Name: Julie Mackley
 Signature: [Signature]
 Date: 12/3/07
 Time: 17:00

Samples Received By:
 Name: [Signature]
 Signature: [Signature]
 Date:
 Time:

Sample Type Code Key:
 Description: C Composite, G Grab, O QA/QC, Other
 Matrix: DW Drinking Water, GW Groundwater, O Oil, S Soil, SL Sludge, MW Wastewater

Shipment Rec'd Intact? Yes No
 Laboratory Remarks: 548 1160

Think Quality

Distribution: White with Samples
Yellow to Laboratory
Pink to ATL Files