# Exhibit 15B Soil Survey, Collector Line Stantec

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# 1.0 INTRODUCTION

The proposed Bowers Wind Project includes approximately five miles of new collector line connecting wind turbine strands in the southern portion of the project area to a substation near the northern border of Carroll Plantation. Stantec Consulting (Stantec) is providing this modified Class L Soil Survey for the collector corridor, located entirely in Carroll Plantation, Penobscot County, Maine. This "modified" level of soil survey was performed to satisfy the requirements of Dave Rocque, State Soil Scientist, and the Maine Land Use Regulation Commission guidelines for linear transmission line corridor projects.

## 2.0 PURPOSE

The purpose of our investigation was to provide taxonomic classification for soils identified along the proposed collector corridor and to identify limitations for development with respect to soil drainage, physical properties and depth to bedrock. Additionally, areas containing "hydrologically sensitive features" such as surface drainages and groundwater seeps were surveyed and described. These areas are not mapped as jurisdictional wetlands or streams but have a seasonal or permanent hydrology that may pose erosion and sediment control risks during construction.

Due to the relatively low impacts of installing a collector line (compared to other linear projects such as roads), it was not necessary to perform a traditional Class L Soil Survey where soils are surveyed and described at the Class A High Intensity Map Unit size. Instead, the complete corridor was surveyed and soils were investigated and described where landscape features such as slope or cover type changed, as well as in areas suspected of containing "hydrologically sensitive features". This approach should address Dave Rocque's concern with retaining hydraulic connections and maintain the natural perched ground water and surface run-off pattern as much as is feasible, as well as properly dealing with sensitive soil areas for erosion and sediment control.

Stantec's soil and wetland scientists examined the proposed collector line corridor and identified and survey-located areas where soils are poorly or very poorly drained, exhibit oxyaquic conditions, or concentrate surface water runoff during periods of spring snowmelt or heavy precipitation.

# 3.0 METHODOLOGY

Soils identification and mapping were based on the techniques derived from standards adopted by the Maine Association of Professional Soil Scientists (revised 2004/2009).

Soils are described using standard soil terminology developed by the U.S. Department of Agriculture Natural Resources Conservation Service, which is the origin of soil interpretation records for each soil series described in Maine. Where important, distinctions are made between hydric and non-hydric soils. The Maine Association of Professional Soil Scientists Key to Soil Drainage Classes was also utilized, as well as a list of regional indicators for identification of hydric soils (Interim Regional Supplement to the Corps of Engineers Wetland Delineation Manual: Northcentral and Northeast Region, Version 7.0, 2010).

The proposed collector line corridor soils were examined in the field on November 15, 16 and 17, 2010. Test pits and borings were located using a Global Positioning System (GPS) unit with submeter accuracy. Field work consisted of documenting soil morphology and characteristics with hand dug test pits and borings. Soil types were identified and depicted on the proposed project Site Plan 1" = 200'.

The soil investigations were performed using a tile spade shovel and hand soil auger to excavate test pits to a depth of 40 inches or until refusal due to encountering bedrock, boulders or basal lodgement till. Test pits were identified on-site with pink numbered flagging tape. Bedrock outcroppings were located by a GPS receiver to further identify shallow to bedrock soil map units. It should be noted that these soils were not observed with profile depths suitable for classifications to the series level. It is not feasible to observe soil profiles to depths greater than 60 inches without any excavating equipment; however, sufficient data were collected to determine the underlying soils limitations for this modified Class "L" Soil Survey.

Soil map units were designed to report the pertinent soil characteristics along with their soil limitations for the proposed use and management of a collector line corridor project. *Ad hoc* symbols were used in places on the map to provide locations of bedrock outcroppings, surface boulders, channelized surface water runoff and soil areas comprised of oxyaquic soils.

A preliminary soils map was developed by obtaining the electronic layer of the Natural Resource Conservation Service medium intensity map and importing the soil boundary information into the project CAD file (State Plane). Soil test pit excavations data and two-foot contour data were used to upgrade, refine, and modify the map within the proposed corridor.

The soils data provide useful information for engineering by anticipating existing and proposed conditions with regards to depth to bedrock that will affect construction techniques, soil drainage characteristics that will affect erosion and sediment control, and slopes that will affect construction techniques and erosion and sediment control.

# 4.0 SITE LOCATION/SETTING

The proposed Bowers Wind Project collector line is located entirely within Carroll Plantation, Maine. The corridor is approximately five miles in length. The project area is gently to steeply sloping and is comprised mainly of forested land except for portions that cross existing roadways or areas which have been cleared for agriculture.

# 5.0 GENERAL SITE AND SUBSURFACE CONDITIONS

The site includes primarily forested side and shoulder slopes and hilltop ridges. Soil landforms generally consist of silt loam soils with coarse fragments derived from glacial till. The hill tops and shoulders are generally bedrock controlled and exhibit shallow to bedrock soils or exposed bedrock outcrops. The sideslopes tend to be comprised of deeper soils and commonly exhibit a firm substratum that produces a perched groundwater table.

# 6.0 SOIL MAP UNIT DESCRIPTIONS

The soil map unit descriptions included in Appendix C provide taxonomic details regarding the soil series most closely matching soils encountered in the portions of the soil profile that could be excavated using hand tools. Descriptions also include a summary of the composition and soil characteristics of soils within a given map unit, as well as a list of similar and dissimilar soil series inclusions which occur within a given mapping unit. Slope gradient ranges are provided and refer to slope phases indicated in the soil survey map and in the soil legend. The soil narrative report is provided to describe the soil composition and physical characteristics and the general soil limitations for the proposed use and management. The soils map (Appendix B) depicts the spatial location of the soil series or complexes within the project site.

# 7.0 CONCLUSIONS AND RECOMMENDATIONS

Based on our observations of the project site and our knowledge of the proposed use of the property, the soils within the development area are generally suitable for the proposed collection line. However, areas of somewhat poorly, poorly, or very poorly drained soils where seasonal high groundwater tables may be within 12 inches of the mineral soil surface for a significant portion of the year may need special erosion and sediment control measures if field work takes place on unfrozen ground and/or during periods of heavy precipitation.

Areas identified as unique hydrologic features (see Appendix F) will require site-specific erosion control measures due to their mucky surface horizons, susceptibility to large quantities of sheet flow, and areas of channelized flow at or near the mineral soil surface.

Areas identified as poorly or very poorly drained hydric soils have limitations due to instability and prolonged saturation and may have additional permitting implications due to their identification as jurisdictional wetlands.

Areas of the project where stony or rubbly soil surfaces were observed may impede vehicular traffic or require additional time and cost to clear the soil surface for use.

# APPENDIX A Limitations

This soil narrative report and accompanying soil survey map have been prepared by Stantec Consulting (Stantec) for its specific application to the proposed Bowers Wind Farm Project in Carroll Plantation and Kossuth Township, Maine. Stantec conducted the work in accordance with generally accepted soil science practices outlined in the Maine Association of Professional Soil Scientists guidelines and the Maine Board of Certification of Geologists and Soil Scientists guidelines. No other warranty, expressed or implied, is made.

It should be recognized that map unit design is influenced by the intended use of the soil survey information, and may not be adequate or sufficient to evaluate for uses other than that for which the specific soil survey was developed. Soils which are non-limiting for one use may be considered a limitation for different use than that identified.

The analysis contained herein is based on data obtained during subsurface exploration of the site, and the interpretation of published information by the U.S. Department of Agriculture Natural Resources Conservation Services. Due to the glaciations of Maine and the complexity of the landscaping, variations in subsurface conditions may exist between exploration sites, which may not become evident until significant project excavation begins. Should significant variations in subsurface conditions become evident after the submission of this report, it may be necessary to re-evaluate the nature of the variation in light of the recommendations enclosed herein.

Due to the combination of remoteness, current inaccessibility of heavy excavation equipment (e.g., backhoe, excavator, drill auger) and permitting constraints, Stantec used hand shovels and soil augers. Refusal or depth limitation to hand operated equipment may be due to bedrock and/or large stone or boulders.

# APPENDIX B Modified Class L (Linear) Soil Survey Map

Purpose – This soil survey standard is designed to provide the minimum soil information necessary to allow for the design and construction of long, narrow projects such as access roads, utility lines or trails with little or no adjacent development. Soil observations were made entirely by use of a hand shovel and soil auger.

- 1. Modified Class L soil survey map units were differentiated on the basis of parent material, slope, soil texture, soil depth to dense till or bedrock and soil wetness. Map unit sizes are based on field observations as well as phase changes indicated by the slope map; some map units may contain inclusions slightly larger than that allowed for Class A High Intensity Surveys. The preferred method of naming the soil map units is by assigning a soil series name or names for complexes. Soil classifications have been made to the series level despite soils information coming from shallow observations only; conditions in the unobserved subsoil layer could affect actual soils series and/or drainage class. Areas containing "unique hydrologic features" are identified within soil series map units and are addressed in Appendix F.
- 2. Scale is 1 inch equals 200 feet.
- 3. Ground Control base line and test pits for which detailed data are recorded are located to submeter accuracy under the direction of a qualified professional.
- 4. Base map with two foot contours.



00522-F01-TLineSoils.mxd

12/10/2010





200 Feet

0

Client/Project Bowers Wind Project Carroll Plt, Maine

Figure No. 2 Title **Class L Soil Survey** 12/10/2010

00522-F02-TLineSoils.mxd





200 Feet

0

**Client/Project** Bowers Wind Project Carroll Plt, Maine

Figure No. 3 Title **Class L Soil Survey** 12/10/2010

00522-F03-TLineSoils.mxd





200 0 Feet

Client/Project Bowers Wind Project Carroll Plt, Maine

Figure No. 4 Title **Class L Soil Survey** 12/10/2010

00522-F04-TLineSoils.mxd





200 Feet

0

Client/Project Bowers Wind Project Carroll Plt, Maine



00522-F05-TLineSoils.mxd

12/10/2010





200 Feet

0

Client/Project Bowers Wind Project Carroll Plt, Maine



00522-F06-TLineSoils.mxd

12/10/2010





200 Feet

0

Client/Project Bowers Wind Project Carroll Plt, Maine

Figure No. 7 Title **Class L Soil Survey** 12/10/2010

00522-F07-TLineSoils.mxd





200 Feet

Client/Project Bowers Wind Project Carroll Plt, Maine



00522-F08-TLineSoils.mxd

12/10/2010





200 Feet

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Client/Project Bowers Wind Project Carroll Plt, Maine



00522-F09-TLineSoils.mxd



12/10/2010





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200 Feet

Client/Project Bowers Wind Project Carroll Plt, Maine



00522-F11-TLineSoils.mxd





200 Feet

0

Client/Project Bowers Wind Project Carroll Plt, Maine

Figure No. 12 Title

**Class L Soil Survey** 12/10/2010

00522-F12-TLineSoils.mxd





200 Feet

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Client/Project Bowers Wind Project Carroll Plt, Maine



00522-F13-TLineSoils.mxd

12/10/2010





200 Feet

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Client/Project Bowers Wind Project Carroll Plt, Maine



**Class L Soil Survey** 12/10/2010

00522-F14-TLineSoils.mxd





200 Feet

0

Client/Project Bowers Wind Project Carroll Plt, Maine



00522-F15-TLineSoils.mxd



00522-F16-TLineSoils.mxd

Class L Soil Survey

12/10/2010

# APPENDIX C Soil Map Unit Descriptions

# **BANGOR SERIES**

## Setting

Parent Material:Coarse-loamy glacial tillLandform:Till plains and ridgesPosition in Landscape:Upper positions in landscapeSlope Gradient Ranges:(B) 3-8%

# **Composition and Soil Characteristics**

Typical Profile:

Ap--0 to 5 inches; dark grayish brown (10YR 4/2) silt loam; friable; 10 percent gravel
Bs1--5 to 11 inches; brown to dark brown (7.5YR 4/4) silt loam; friable; 10 percent gravel
Bs2--11 to 21 inches; yellowish brown (10YR 5/8) silt loam; friable; 10 percent gravel
Bs3--21 to 24 inches; light olive brown (2.5Y 5/4) silt loam; friable; 10 percent gravel;
BC--24 to 27 inches; light olive brown (2.5Y 5/4) silt loam; friable; 5 percent gravel
C1--27 to 33 inches; olive (5Y 5/4) silt loam; firm; 10 percent gravel
C2--33 to 65 inches; olive (5Y 5/4) gravelly silt loam; firm; 15 percent gravel; gray (5Y 6/1) faces of peds

# **Taxonomic Class**

Coarse-loamy, isotic, frigid Typic Haplorthods

Drainage Class Well drained

Hydrologic Group Group C

**Permeability** Moderate throughout the soil profile

**Depth to Bedrock** Very deep; greater than 60"

Hazard to Flooding None

Typical InclusionsSimilar:Elliotsville, DixmontDissimilar:Monarda, Telos

#### **Use and Management**

There are few limitations associated with this soil type relative to the proposed development.

# **BURNHAM SERIES**

Setting	
Parent Material:	Coarse-loamy glacial till
Landform:	Nearly level and depressional areas
Position in Landscape:	Lower positions in landscape, bases of long slopes, swales and depressions
Slope Gradient Ranges:	(A) 0-3%

## **Composition and Soil Characteristics**

Typical Profile:

Oa1--0 to 4 inches; black (10YR 2/1) muck (sapric material); very friable

Oa2--4 to 13 inches; dark reddish brown (5YR 2/2) muck (sapric material); friable

Bg--13 to 18 inches; gray (N 5/0) channery silt loam; firm; many coarse prominent olive (5YR 5/3) masses of iron accumulation; 10 percent channers, 5 percent cobbles

Cdg1--18 to 34 inches; olive gray (5Y 4/2) channery silt loam; firm; many coarse prominent dark gray (N 4/0) iron depletions and many medium prominent light olive brown (2.5Y 5/4) masses of iron accumulation; 15 percent channers

Cdg2--34 to 65 inches; dark grayish brown (2.5Y 4/2) channery silt loam; firm; many medium distinct gray (5Y 5/1) iron depletions and many medium prominent yellowish brown (10YR 5/4) masses of iron accumulation; 20 percent channers

# **Taxonomic Class**

Loamy, mixed, superactive, nonacid, frigid, shallow Histic Humaquepts

# Drainage Class

Very poorly drained soils.

#### Hydrologic Group

Group D

#### Permeability

Permeability is moderately slow to moderately rapid in the organic surface, moderately slow in the subsoil, and slow or very slow in the substratum.

#### **Depth to Bedrock**

Very deep; greater than 60 inches.

#### **Hazard to Flooding**

Soil is not flooded but frequently ponded

# Typical Inclusions

Similar:	Monarda, Wonsqueak, Peat and Muck
Dissimilar:	None

#### **Use and Management**

The limiting factor for site development is wetness due to the presence of a water table at or near the soil surface for a significant portion of the year. Burnham soil has severe limitations for construction, due to the instability of thick organic deposits and ponding. Proper drainage or other site modification is recommended for construction. This soil type is listed as hydric.

# CHESUNCOOK SERIES

#### Setting

Coarse-loamy glacial till			
Till plains, hills, ridges and mountains			
Upper positions in landscape			
(C) 8-15% (D) 15-25%			

# **Composition and Soil Characteristics**

Typical Profile:

Oa--0 to 1 inch; black (5YR 2/1) sapric material

E--1 to 4 inches; pinkish gray (7.5YR 6/2) silt loam; very friable; 10 percent gravel and channers, 2 percent cobbles and 1 percent stones

Bhs--4 to 5 inches; dark reddish brown (5YR 3/3) silt loam; very friable; 10 percent gravel and channers, 3 percent cobbles and 1 percent stones

Bs1--5 to 11 inches; reddish brown (5YR 4/4) silt loam; very friable; 10 percent gravel and channers, 3 percent cobbles and 1 percent stones

Bs2--11 to 18 inches; dark yellowish brown (10YR 4/4) gravelly silt loam; very friable; 15 percent gravel and channers, 3 percent cobbles and 1 percent stones;

BC--18 to 21 inches; light olive brown (2.5Y 5/4) gravelly loam; friable; common medium prominent dark yellowish brown (10YR 4/6) masses of iron accumulation and few medium distinct grayish brown (2.5Y 5/2) iron depletions; 20 percent gravel and channers, 3 percent cobbles and 1 percent stones

Cd--21 to 65 inches; light olive brown (2.5Y 5/3) gravelly loam; light brownish gray (2.5Y 6/2) faces of prisms which are separated by a thin layer of strong brown (7.5YR 5/6); common medium prominent strong brown (7.5YR 4/6) masses of iron accumulation and common coarse distinct light olive gray (5Y 6/2) iron depletions; 25 percent gravel and channers, 3 percent cobbles and 1 percent stones

#### **Taxonomic Class**

Coarse-loamy, isotic, frigid Aquic Haplorthods

#### **Drainage Class**

Moderately well drained soils

# Hydrologic Group

Group C

# Permeability

Permeability is moderate in the solum, and slow or very slow in the dense substratum.

#### Depth to Bedrock

Very deep; greater than 60 inches.

Hazard to Flooding None

#### **Typical Inclusions**

Similar:ElliotsvilleDissimilar:Monson, Telos, Danforth, Daigle

#### **Use and Management**

There are few limitations for the proposed development within this map unit. These soils may have wetness due to the presence of a perched water table within 18 inches of the mineral soil surface during some portion of the year.

# **DIXMONT SERIES**

# Setting

Parent Material: Coarse-loamy glacial till			
Landform:	Till plains and ridges		
Position in Landscape:	Upper positions in landscape		
Slope Gradient Ranges:	(B) 3-8% (C) 8-15%		

# **Composition and Soil Characteristics**

Typical Profile:

- A--0 to 2 inches, very dark grayish brown (10YR 3/2) silt loam, light brownish gray (2.5Y 6/2) dry; friable; 10 percent rock fragments
- Bs1--2 to 8 inches, brown (7.5YR 4/4) silt loam; friable; many fine roots; 10 percent rock fragments
- Bs2--8 to 13 inches; dark yellowish brown (10YR 4/4) gravelly silt loam; friable; 15 percent rock fragments
- Bs3--13 to 20 inches; olive brown (2.5Y 4/4) silt loam; friable; 10 percent rock fragments; many coarse prominent yellowish red (5YR 5/6) masses of iron accumulation and many distinct grayish brown (2.5Y 5/2) iron depletions
- BC--20 to 26 inches, light olive brown (2.5Y 5/4) silt loam; firm in place, friable when removed; 10 percent rock fragments; many coarse prominent light brownish gray (10YR 6/2) iron depletions; many fine prominent strong brown (7.5YR 5/6) and coarse distinct light olive brown (2.5Y 5/6) masses of iron accumulation
- C--26 to 65 inches, olive (5Y 5/3) silt loam; firm; 10 percent rock fragments; many coarse prominent strong brown (7.5YR 5/6) masses of iron accumulation

**Taxonomic Class** 

Coarse-loamy, isotic, frigid Aquic Haplorthods

#### **Drainage Class**

Moderately well to somewhat poorly drained

# Hydrologic Group

Group C

#### Permeability

Permeability is moderate in the A and upper part of the B horizons, and moderately slow or slow in the lower B and C horizons

#### Depth to Bedrock

Very deep; greater than 60"

Hazard to Flooding None

#### **Typical Inclusions**

Similar: Penquis, Bangor Dissimilar: Abram, Thorndike, Monarda, Burnham

#### **Use and Management**

There are few limitations associated with this soil type. Some areas within this map unit may have a groundwater table within 1 foot of the mineral soil surface during heavy precipitation or following spring snowmelt.

# ELLIOTTSVILLE SERIES

# Setting

Parent Material:	Coarse-loamy glacial till
Landform:	Till plains, hills, ridges and mountains
Position in Landscape:	Upper positions in landscape
Slope Gradient Ranges:	(D) 15-25%

## **Composition and Soil Characteristics**

# Typical Profile

Oa--0 to 1 inch; dark reddish brown (5YR 2.5/2) sapric material; very friable E--1 to 2 inches; pinkish gray (7.5YR 7/2) silt loam; friable; 10 percent channers Bh--2 to 4 inches; dark reddish brown (5YR 3/4) silt loam; very friable; 10 percent channers Bs--4 to 11 inches; strong brown (7.5YR 5/6) flaggy loam; very friable; 15 percent channers and 10 percent flagstones BC--11 to 17 inches; light olive brown (2.5Y 5/6) channery loam; friable; 10 percent channers and 5 percent flagstones C--17 to 26 inches; olive (5Y 5/4) channery loam; friable; 10 percent channers and 5 percent flagstones R--26 inches; slate.

**Taxonomic Class** Coarse-loamy, isotic, frigid Typic Haplorthods

Drainage Class Well drained

Hydrologic Group Group B

**Permeability** Permeability is moderate

**Depth to Bedrock** Very deep; greater than 60"

Hazard to Flooding None

#### **Typical Inclusions**

Similar:ChesuncookDissimilar:Monson, Telos, Danforth, Daigle

#### Use and Management

Soils within this map unit may have bedrock within 20 inches of the mineral soil surface. Drilling or blasting may be necessary for the proposed development.

# HOWLAND SERIES

## Setting

Parent Material:Coarse-loamy glacial tillLandform:Drumlins and till ridgesPosition in Landscape:Upper positions and side slopesSlope Gradient Ranges:(B) 3-8% (C) 8-15% (D) 15-25%

# **Composition and Soil Characteristics**

Typical Profile:

Oa--0 to 1 inch; black (10YR 2/1) sapric material; very friable

E--1 to 2 inches; grayish brown (10YR 5/2) silt loam; very friable; 5 percent gravel

Bh--2 to 4 inches; dark reddish brown (5YR 3/4) silt loam; very friable; 5 percent gravel

Bs1--4 to 13 inches; dark brown (7.5YR 4/4) silt loam; very friable; 5 percent gravel, 3 percent cobbles

Bs2--13 to 17 inches; yellowish brown (10YR 5/6) gravelly silt loam; very friable; 15 percent gravel and 3 percent cobbles

- BC1--17 to 21 inches; light olive brown (2.5Y 5/4) gravelly silt loam; very friable; few fine prominent strong brown (7.5YR 4/6) masses of iron accumulation; 15 percent gravel, 3 percent cobbles and 1 percent stones
- BC2--21 to 25 inches; olive (5Y 5/3) gravelly silt loam; friable; common coarse faint light olive gray (5Y 6/2) iron depletions; 15 percent gravel, 3 percent cobbles and 1 percent stones
- Cd--25 to 65 inches; olive (5Y 4/3) gravelly silt loam; very firm; common coarse prominent light brownish gray (2.5Y 6/2) iron depletions; 20 percent gravel, 5 percent cobbles and 3 percent stones

# **Taxonomic Class**

Coarse-loamy, isotic, frigid Aquic Haplorthods

#### **Drainage Class**

Moderately well to somewhat poorly drained.

# Hydrologic Group

Group C

**Permeability** Moderate in the solum and moderately slow or slow in the dense substratum.

#### **Depth to Bedrock**

Deep, greater than 60 inches.

Hazard to Flooding None

#### **Typical Inclusions**

Similar: Plaisted, Penquis Dissimilar: Thorndike, Monson, Monarda, Elliotsville

## **Use and Management**

The limiting factor for proposed development is depth to seasonal high groundwater table, which is 1.0' - 3.5' beneath the soil surface. Regrading or other site modifications may be necessary to mitigate concerns over sheet flow drainage, which can be perched on top of the dense substratum. Proper foundation drainage or import of sandy granular fill is recommended for construction.

# MONARDA SERIES

# Setting

Parent Material:	Loamy	glacial till								
Landform:	Lower	slopes or sl	light	t depressions	on till	plai	ns			
Position in Landscape:	Lower	positions	in	landscape,	bases	of	long	slopes,	swales	and
	depress	ions								
Slope Gradient Ranges: (A)	0-3% (B)	) 3-8% (	C)	8-15%						

# **Composition and Soil Characteristics**

Typical Profile:

Oe--0 to 3 inches; black (5YR 2/1) mucky peat (hemic material); very friable

Eg--3 to 6 inches; light gray (10YR 7/2) silt loam; friable; 5 percent gravel

Bg1--6 to 11 inches; light brownish gray (2.5Y 6/2) silt loam; friable; many medium distinct pale olive (5Y 6/3) masses of iron accumulation; 10 percent gravel

Bg2--11 to 16 inches; light olive gray (5Y 6/2) silt loam; firm; many medium prominent light olive brown (2.5Y 5/4) masses of iron accumulation; 10 percent gravel; (The combined thickness of the Bg horizon is 2 to 16 inches.)

BC--16 to 20 inches; olive (5Y 5/4) silt loam; firm; many medium distinct light olive brown (2.5Y 5/4) masses of iron accumulation and common fine distinct gray (5Y 6/1) iron depletions; 10 percent gravel

Cd--20 to 65 inches; olive (5Y 4/3) gravelly silt loam; firm, olive gray (5Y 5/2) faces of prisms which are separated from interiors of prisms by a thin layer of brown (7.5YR 4/4); common fine distinct gray (5Y 6/1) iron depletions and common medium distinct light olive brown (2.5Y 5/4) masses of iron accumulation; 15 percent gravel

# **Taxonomic Class**

Loamy, mixed, active, acid, frigid, shallow Aeric Endoaquepts

#### **Drainage Class**

Poorly drained

# Hydrologic Group

Group D

#### Permeability

Permeability is moderate to moderately rapid in the subsurface, moderate to moderately slow in the upper part of the subsoil and slow or very slow in the lower part of the subsoil and in the substratum.

**Depth to Bedrock** Very deep; greater than 60"

Hazard to Flooding None

Typical Inclusions	
Similar:	Burnham, Peat and Muck
Dissimilar:	Dixmont, Telos, Howland

#### Use and Management

The potential erosion hazard for these soils is slight. However, equipment limitations may be severe for Monarda soils. These soils have a seasonal high water table close to the mineral soil surface, and can be compacted if exposed to heavy equipment when wet. This can be circumvented by performing activities during dry (July – September) or frozen seasons. This series is listed as a hydric soil.

# **MONSON SERIES**

## Setting

Parent Material: Landform: Position in Landscape: Slope Gradient Ranges: Loamy glacial till Knolls of till plains, hills, ridges and mountains Upper positions in landscapes (B) 3-8% (C) 8-15%

# **Composition and Soil Characteristics**

Typical Profile:

Oa--0 to 4 inches; dark reddish brown (5YR 2/2) sapric material; very friable E--4 to 5 inches; light gray (10YR 7/1) channery silt loam; very friable; 15 percent channers Bh--5 to 6 inches; dark reddish brown (2.5YR 2/4) silt loam; very friable; 5 percent channers Bs1--6 to 9 inches; brown (7.5YR 4/4) silt loam; very friable; 5 percent channers Bs2--9 to 11 inches; yellowish brown (10YR 5/8) silt loam; very friable; 10 percent channers BC--11 to 19 inches; light olive brown (2.5Y 5/4) channery silt loam; friable; 20 percent channers and 10 percent flagstones R--19 inches; slate.

# **Taxonomic Class**

Loamy, isotic, frigid Lithic Haplorthods

# Drainage Class Somewhat excessively drained

Hydrologic Group Group C/D

**Permeability** Permeability is moderate

# Depth to Bedrock

Shallow; less than 20" to bedrock

Hazard to Flooding None

Typical Inclusions

Similar: Elliotsville, Danforth Dissimilar: Telos, Monarda, Chesuncook, Perham, Daigle

#### **Use and Management**

Soils within this map unit may have bedrock within 10 inches of the mineral soil surface. Drilling or blasting may be necessary for the proposed development.

# **PENQUIS SERIES**

#### Setting

amy glacial till
plains and ridges
per positions in landscape
3-8% (C) 8-15%
; )

# **Composition and Soil Characteristics**

## Typical Profile

Oe--0 to 1 inch; moderately decomposed needles

Ap--1 to 8 inches; dark brown (10YR 4/3) silt loam, light yellowish brown (10YR 6/4) dry; very friable; 5 percent channers

Bs1--8 to 12 inches; yellowish red (5YR 4/6) silt loam; very friable; 10 percent channers

Bs2--12 to 15 inches; dark yellowish brown (10YR 4/4) silt loam; very friable; 10 percent channers BC--15 to 26 inches; olive brown (2.5Y 4/4) channery silt loam; friable; 20 percent channers; some rock fragments can be crushed to very fine sand and silt

C--26 to 33 inches; olive (5Y 5/4) channery silt loam; friable; 20 percent channers, 5 percent cobbles; some rock fragments can be crushed to very fine sand and silt; few weathered rock fragments of olive (5Y 5/3)

R--33 inches; hard bedrock.

# Taxonomic Class

Coarse-loamy, isotic, frigid Typic Haplorthods

Drainage Class Well drained

#### Hydrologic Group Group C

**Permeability** Permeability is moderate throughout the soil.

#### **Depth to Bedrock** Moderately deep; 20-40"

woderately deep, 20-40

Hazard to Flooding None

# **Typical Inclusions**

Similar: Dixmont, Bangor Dissimilar: Abram, Thorndike, Monarda, Burnham

#### Use and Management

There are few limitations associated with this soil type relative to the proposed development

# PLAISTED SERIES

## Setting

5					
Parent Material:	Loamy glacial till				
Landform:	Drumlins and till ridges				
Position in Landscape:	Upper positions in landscape				
Slope Gradient Ranges:	(B) 3-8% (C) 8-15% (D) 15-25%				

# **Composition and Soil Characteristics**

**Typical Profile** 

- Oa--0 to 2 inches; dark reddish brown (5YR 2/2) highly decomposed plant material; very friable
- E--2 to 3 inches; grayish brown (10YR 5/2) silt loam; very friable; 5 percent gravel and 1 percent cobbles
- Bh--3 to 4 inches; reddish brown (5YR 4/3) silt loam; very friable; 5 percent gravel and 2 percent cobbles
- Bs1--4 to 7 inches; brown (7.5YR 4/4) silt loam; very friable; 5 percent gravel and 5 percent cobbles
- Bs2--7 to 9 inches; strong brown (7.5YR 5/6) silt loam; friable; 5 percent gravel and 5 percent cobbles
- Bs3--9 to 19 inches; yellowish brown (10YR 5/4) silt loam; friable; 5 percent gravel and 5 percent cobbles
- BC--19 to 28 inches; light olive brown (2.5Y 5/4), with yellowish brown (10YR 5/4) faces of peds, gravelly silt loam; friable; strong brown (7.5YR 5/6) channels from decayed roots; 10 percent gravel and 5 percent cobbles
- Cd--28 to 65 inches; olive (5Y 4/3), with light olive brown (2.5Y 5/4) faces of peds, and olive (5Y 5/3) crushed, gravelly silt loam; firm; 15 percent gravel and 10 percent cobbles

# **Taxonomic Class**

Coarse-loamy, isotic, frigid Oxyaquic Haplorthods

# **Drainage Class**

Well drained.

# Hydrologic Group

Group C

**Permeability** Moderate in the solum and moderately slow or slow in substratum.

# Depth to Bedrock

Deep, greater than 60 inches.

Hazard to Flooding None

# **Typical Inclusions**

Similar:Howland, PenquisDissimilar:Thorndike, Monson, Monarda, Elliotsville

#### **Use and Management**

This soil presents few limitations relative to the proposed project. Shrink-swell potential is low and there is no flooding or ponding hazard. Certain areas within this map unit are extremely stony or rubbly and may require additional time/cost to clear the soil surface for use.

# **TELOS SERIES**

## Setting

Parent Material:	Loamy dense basal till			
Landform:	Till plains, hills and ridges			
Position in Landscape:	Lower side slopes			
Slope Gradient Ranges:	(A) 0-3% (B) 3-8%			

# **Composition and Soil Characteristics**

Typical Profile

Oa--0 to 2 inches; dark reddish brown (5YR 2/2) highly decomposed organic material; very friable E--2 to 4 inches; pinkish gray (7.5YR 6/2) silt loam; friable; 5 percent gravel Bhs--4 to 7 inches; dark reddish brown (5YR 3/3) silt loam; friable; 5 percent gravel Bs1--7 to 12 inches; brown (7.5YR 4/4) silt loam; friable; 5 percent gravel Bs2--12 to 15 inches; dark yellowish brown (10YR 4/4) silt loam; friable; common medium distinct pinkish gray (7.5YR 6/2) iron depletions; 10 percent gravel BC--15 to 20 inches; light olive brown (2.5Y 5/4) silt loam; friable; many medium prominent pinkish gray (7.5YR 6/2) iron depletions; 10 percent gravel Cd--20 to 65 inches; olive (5Y 5/3) gravelly silt loam; firm; light olive gray (5Y 6/2) faces of prisms; many medium and common fine distinct dark yellowish brown (10YR 4/4) masses of iron accumulation; 20 percent gravel

# **Taxonomic Class**

Loamy, isotic, frigid, shallow Aquic Haplorthods

Drainage Class

Somewhat poorly drained

# Hydrologic Group

Group C

#### Permeability

Moderate in the solum and slow or very slow in substratum.

# Depth to Bedrock

Very deep, greater than 60 inches.

# Hazard to Flooding None

# **Typical Inclusions**

Similar:Chesuncook, DaigleDissimilar:Monson, Danforth, Elliotsville, Monarda

#### **Use and Management**

The soil limiting factor for the proposed development is wetness, which imposes high potential for frost action. Special erosion and sediment control is recommended.

# APPENDIX D Soil Profile Descriptions

FORM	E

# SOIL PROFILE/CLASSIFICATION INFORMATION

195600522

Dreis	of Nome:		De Applicant Name:	tailed Description of Subs	urface Cond	tions at Project Sites	Project Location (municipality):		
Proje	Bowers Wind	Project	Applicant Name:	Champlain Wind Ener	gy, LLC		Carro	oll Plt, Penobscot Co	ounty, ME
		SOIL DESCRIPTION AND	CLASSIFICATION				SOIL DESCRIPTION AN	DCLASSIFICATION	
	Exploration Symbol:	B-41	Test Pit	Boring	Ex	oloration Symbol:	" Dooth of Organia Harizon About	Test Pit	Boring
0	Texture	Consistency	Color	Mottling	0	Texture	Consistency	Color	Mottling
2	SILT LOAM	FRIABLE	LIGHT YELLOW		2				
4			BROWN		4				
s					(s				
Inche					Inche			/	/
ACE (					ACE (				
					12 14				
5 7/OS		VERY FIRM			5 TIO				
S AL S					20 20 20			/	
MINE 									
MO.					MO:				
DEPTI					DEPTI				
J 4					J 40				<u> </u> ]
50					50	/	1		
					80				
	budria	Slope 9/	limiting foster	n around water		bydec	Slope 9/	l imiting factor	
•	nyaric non-hydric	3-8	12"	ground water     restrictive layer     bedrock	•	nyoric non-hydric	Siope %	Limiting factor	ground water     restrictive layer     bedrock
C.S.S.	Soil Series / phase name: BANGOR		 Drainage Class	C Hydrologic Group	c.s.s.	1 Series / phase name:		Drainage Class	Hydrologic Group
L.S.E.	Soil Classification:	N/A Profile	N/A Drainage Class	<u>N/A</u>	L.S.E. SO	I Classification:	Profile		
		SOIL DESCRIPTION AND			/		SOIL DESCRIPTION AN		
	Exploration Symbol:	" Depth of Organic Horizon Above	Test Pit	Boring	Ex	oloration Symbol:	Depth of Organic Horizon Above	Mineral Soil	Boring
	Texture	Consistency	Color	Mottling	0	Texture	Consistency	Color	Mottling
2					2				
4					4				
6 (a)					6				
nches			/		7 NChee			/	
0 = 10					9 (I				
16 S T/C					s 7/C				
AL S(					AT S(				
INER					INER				
M MC					M MC				
BELO					BEL(				
ЕРТН					EPTH				
		/					/		
40	/	/			40	/	1		
50					50				1
60					60				
0	hydric non-hydric	Slope %	Limiting factor	ground water     restrictive layer     bedrock	•	hydric non-hydric	Slope %	Limiting factor	ground water     restrictive layer     bedrock
c.s.s.	Soil Series / phase name:		Drainage Class	Hydrologic Group	C.S.S.	Series / phase name:		Drainage Class	Hydrologic Group
L.S.E.	Soil Classification:	Profile	Drainage Class	Design Class	LSE. SO	I Classification:	Profile	Drainage Class	Design Class
Profe C.S.S.	signature:	s (as applicable)			Date: Lic.#: Date:				
L.9.E.	signature:					11/15/10			
	na <b>stanted/weetonsu</b>	Michael Gless	ner		Lic.#:	397	affix professional seal		Page 11

FO	FORM F SOIL PROFILE/C					ION INFORMATIO	N		195600522
Proje	ct Name: Bowers Winc	Project	De Applicant Name:	tailed Description of Subs Champlain Wind Ener	urface Co gy, LLC	onditions at Project Sites	Project Location (m Carre	unicipality): oll Plt, Penobscot Co	unty, ME
	Exploration Symbol:	SOIL DESCRIPTION AND B-37	CLASSIFICATION Test Pit	Boring		Exploration Symbol:	SOIL DESCRIPTION AN	D CLASSIFICATION Test Pit	Boring
0	0 Texture	Depth of Organic Horizon Above	Mineral Soil Color	Mottling	a	0	Depth of Organic Horizon Abov	e Mineral Soil Color	Mottling
1	LOAM	MUCKY	BLACK		1	SILT LOAM	FRIABLE	DARK OLIVE BROWN	
3	STONY	FRIABI F	LIGHT OLIVE GRAY		4				
nes)	SILT LOAM				hes)				
CE (INC			DARK OLIVE GRAY	MANY, COARSE, PROMINENT	CE (Inc	CRAVELLY	EIDM		
10 12 14	LI	MIT OF EXCAVATION = 9"	; FREE WATER @ SURF	ACE		SILT LOAM	FINM	BROWN	DISTINCT
16 100 18					5 7/OS		REFUS	AL @ 13"	
					NERAL				
					IM MO				
30					rH BEL				
- - -					DEP1				
40					40				
50 60					60				
	hydric	Slope %	Limiting factor	<ul> <li>ground water</li> </ul>	0	hydric	Slope %	Limiting factor	<ul> <li>ground water</li> </ul>
	non-hydric	0-3	0"	restrictive layer     bedrock	•	non-hydric	3-8	8"	restrictive layer     bedrock
.S.S.	MONARDA/BURNHAM	N/A	Drainage Class	Hydrologic Group	C.S.S.	DIXMONT Soil Classification:	N/A	Drainage Class	Hydrologic Group
S.E.		Profile SOIL DESCRIPTION AND	Drainage Class	Design Class	L.S.E.		Profile SOIL DESCRIPTION AN	Drainage Class	Design Class
-	Exploration Symbol:	B-39 _" Depth of Organic Horizon Above	Test Pit	Boring		Exploration Symbol:	B-40	Test Pit	Boring
0	Texture	Consistency	Color	Mottling	1	Texture	Consistency	Color	Mottling
3	SILT LOAM	FRIABLE	DARK YELLOWISH BROWN		3	SILT LOAM	FRIABLE	LIGHT GRAYISH BROWN	
5	GRAVELLY		LIGHT OLIVE						
7 8	SILT LOAM		BROWN		(Inches				
9 10 12						GRAVELLY SILT LOAM		LIGHT OLIVE BROWN	COMMON, MEDIUM, DISTINCT
13 13 15									
00 16 18					0S 742	REFUSA	L @ 13"; EXTREMELY	BOULDERY; FREE W	ATER @ 0"
20					MINEF				
				MANY, COARSE, PROMINENT	MO13				
а <u>н</u> ні ні					EPTH E				
วี 40					۲ <u>۵</u>				
50					50				
60					60				
	hydric non-hydric	Slope %	Limiting factor 22"	ground water     restrictive layer	•	hydric non-hydric	Slope % 0-3	Limiting factor <b>0</b> "	<ul> <li>ground water</li> <li>restrictive layer</li> </ul>
s.s.	Soil Series / phase name:		<u>MWD</u>	Dearock     C	C.S.S.	Soil Series / phase name:	I	PD Drainage Close	<u> </u>
.S.E.	Soil Classification:	N/A Profile	  Drainage Class	N/A Design Class	L.S.E.	Soil Classification:	N/A Profile	N/A Drainage Class	  Design Class
					<u> </u>				
Profe	ssional Endorsemen	ts (as applicable)				ato:			
C.S.S.	signature:				Di	ale:			
	-				Li	c.#:			
	name printed/typed:				יח	ate:			
S.E.	signature:					11/15/10			
					Li	c.#:	1		

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Page 10

			SO	IL PROFILE/CLASS	IFICATI	ON INFORMATIC	N		
roje	ect Name: Bowers Wind	Project	De Applicant Name:	tailed Description of Subsu	urface Cor	nditions at Project Site	s Project Location (m	unicipality):	inty ME
	Dowers wind				gy, LLO				inty, in∟
	Exploration Symbol:	B-33	Test Pit	Boring		Exploration Symbol:	B-34	Test Pit	Boring
	2	_" Depth of Organic Horizon Abo Consistency	/e Mineral Soil Color	Mottling	0	Texture	Depth of Organic Horizon Abov     Consistency	e Mineral Soil Color	Mottling
	SILT LOAM	FRIABLE	LIGHT BROWNISH		2	GRAVELLY	FRIABLE	YELLOWISH BROWN	
3	3		GRAY		3	SILI LOAM			
5	5				5				
7	7			MANY, COARSE,	(səl				
٤	3			PROMINENT	(Incl			OLIVE BROWN	
10	)				9 10				
12	2		CAVATION = 10"				REFUS	ΔL @ 12"	
16	3				S 7/0				
18	3				OS 720				
					ERA				
					NIN				
					MO				
30			+		BEL				
			1		HTC				
			+	<u> </u>	DEF				<u> </u>
40	þ		1		40				1
F/					50		<u>_</u>		<u>_</u>
~			1		bd				<u> </u>
60					60				
	hydric	Slope %	Limiting factor	<ul> <li>ground water</li> </ul>	٥	hydric	Slope %	Limiting factor	<ul> <li>ground water</li> </ul>
	non-hydric	3-8	5"	<ul> <li>restrictive layer</li> <li>bedrock</li> </ul>	•	non-hydric	8-15	>12"	<ul> <li>restrictive layer</li> <li>bedrock</li> </ul>
1	Soil Series / phase name:		PD	D	C.S.S.	Soil Series / phase name		MWD	C
1	MONARDA	<b>N</b> 1/A	Drainage Class	Hydrologic Group		DIXMONT	N/A	Drainage Class	Hydrologic Group
ļ	Soil Classification:	Profile	Drainage Class	N/A Design Class	L.S.E.	Soil Classification:	Profile	Drainage Class	N/A Design Class
	<b>I</b>	SOIL DESCRIPTION AN					SOIL DESCRIPTION A		
	Exploration Symbol:	" Depth of Organic Horizon Abo	ve Mineral Soil	Boring	-	Exploration Symbol:	. B-36 0 * Depth of Organic Horizon Abov	e Mineral Soil	Boring
1	Texture	Consistency	Color	Mottling	0	Texture	Consistency	Color	Mottling
2		FRIABLE			2	LOAM	MUCKY	BLACK	
4			OLIVE BROWN		4	STONY	FRIABLE	LIGHT OLIVE GRAY	
6	5				(s) 6	SILT LOAM			
7	3				7 8 8			DARK OLIVE GRAY	MANY, COARSE
ç					с () СЕ ()				PROMINENT
10	SILT LOAM		STRONG BROWN		10 12	l	IMIT OF EXCAVATION = 9	; FREE WATER @ SURFA	ACE
14	1	FIRM			In 14				
16	3		-		7/03				
20			-		S 74				
			-						
			1		NEF				
	1				W MINEF				
30					ELOW MINEF				
30					TH BELOW MINEF				
					JEPTH BELOW MINEF				
30					DEPTH BELOW MINEF				
40					DEPTH BELOW MINE				
40					DEPTH BELOW MINE				
30 40 50					DEPTH BELOW MINE				
30 40 50	)	Sinne %	Limiting factor	g ground water	DEPTH BELOW MINE	hydric	Sinne %	Limiting factor	
30 40 50	hydric non-hydric	Slope % 3-8	Limiting factor	ground water     restrictive layer	DEPTH BELOW MINE	hydric non-hydric	Slope % 3-8	Limiting factor	ground water     restrictive layer
30 40 50	hydric non-hydric Soil Series / ohase name:	Slope % 3-8	Limiting factor	ground water     restrictive layer     bedrock     C		hydric non-hydric Soil Series / bhase name	Slope %	Limiting factor	ground water     restrictive layer     bedrock     D
	hydric non-hydric Soil Series / phase name: PLAISTED	Slope % 3-8	Limiting factor	ground water     restrictive layer     bedrock  Hydrologic Group	ISUM MOTER LA CONTRACTOR IN INCLUSION INCLUSION IN INCLUSION IN INCLUSION INCLUSION IN INCLUSION IN INCLUSION INCLUS INCLU	hydric non-hydric Soil Series / phase name <b>VONARDA/BURNHAM</b>	Slope % 3-8	Limiting factor	ground water     restrictive layer     bedrock  Hydrologic Group
30 40 50 8.	hydric non-hydric Soil Series / phase name: PLAISTED	Slope % 	Limiting factor	a ground water f restrictive layer bedrock C Hydrologic Group N/A		hydric non-hydric Soil Series / phase name <b>MONARDA/BURNHAM</b> Soil Classification:	Slope % 	Limiting factor 	ground wate     ground wate     a restrictive layer     bedrock     D Hydrologic Group
	hydric non-hydric Soil Series / phase name: PLAISTED Soil Classification:	Slope % 	Limiting factor Limiting factor Drainage Class Drainage Class	ground water     restrictive layer     bedrock  Hydrologic Group    N/A    Design Class	ISNW MOTBHLLAD	hydric non-hydric Soil Series / phase name <b>VONARDA/BURNHAM</b> Soil Classification:	Slope % 	Limiting factor 	ground water     restrictive layer     bedrock  Hydrologic Group  Design Class
	hydric non-hydric Soil Series / phase name: PLAISTED Soil Classification:	Slope % 	Limiting factor Limiting factor Drainage Class Drainage Class	a ground water ■ restrictive layer ■ bedrock ■ C Hydrologic Group ■ N/A Design Class	ISUM MOTER HLAED	hydric non-hydric Soil Series / phase name MONARDA/BURNHAM Soil Classification: ie:	Slope % 	Limiting factor 	ground water     restrictive layer     bedrock  Hydrologic Group    N/A Design Class
30 40 50 60 60	hydric non-hydric Soil Series / phase name: PLAISTED Soil Classification: essional Endorsemen	Slope % 	Limiting factor	a ground water restrictive layer bedrock <u>C</u> Hydrologic Group <u>N/A</u> Design Class	Lice	hydric non-hydric Soil Series / phase name MONARDA/BURNHAM Soil Classification: Soil Classification:	Slope % 	Limiting factor  	ground water     restrictive layer     bedrock  Hydrologic Group    NA    Design Class
	hydric non-hydric Soil Series / phase name: PLAISTED Soil Classification: essional Endorsemen signature: name printed/typed:	Slope % 	Limiting factor	a ground water restrictive layer bedrock C Hydrologic Group N/A Design Class	ISUM MOTER HLAE	hydric non-hydric Soil Series / phase name <b>MONARDA/BURNHAM</b> Soil Classification: Soil Classification:		Limiting factor  	ground water     ground water     restrictive layer     bedrock      Hydrologic Group    NA    Design Class
	hydric non-hydric Soil Series / phase name: PLAISTED Soil Classification: essional Endorsemen signature: name printed/typed:	Slope % 	Limiting factor	□ ground water ■ restrictive layer □ bedrock ■ C Hydrologic Group N/A Design Class	ISUM MOTER HLAE	hydric non-hydric Soil Series / phase name <b>MONARDA/BURNHAM</b> Soil Classification: le: #: te: #:		Limiting factor  	ground water     restrictive layer     bedrock  Hydrologic Group    N/A    Design Class
	by by by by by by by comparison by	Slope % 	Limiting factor	□ ground water ■ restrictive layer □ bedrock ■ C Hydrologic Group N/A Design Class	ISUM MOTING AND	hydric non-hydric Soil Series / phase name <b>MONARDA/BURNHAM</b> Soil Classification: Soil Classification:		Limiting factor  	ground water     restrictive layer     bedrock  Hydrologic Group    N/A    Design Class

FC	DRM F								195600522
			SO				N		
Proje	ect Name:		Applicant Name:	tailed Description of Subsi	urrace Co	nditions at Project Sites	Project Location (mu	unicipality):	
	Bowers Wind	l Project		Champlain Wind Ener	gy, LLC		Carro	oll Pit, Penobscot Cou	nty, ME
	Exploration Symbol:	SOIL DESCRIPTION AN	D CLASSIFICATION	Boring		Exploration Symbol:	SOIL DESCRIPTION AN	D CLASSIFICATION	Boring
	2	Depth of Organic Horizon Abov	e Mineral Soil			6	Depth of Organic Horizon Above	Mineral Soil	Doning
0	Texture	Consistency	Color	Mottling	0	Texture	Consistency	Color	Mottling
2	CHANNERY SILT LOAM	FRIABLE	VERY DARK GRAYISH BROWN		2	SILT LOAM	FRIABLE	DARK GRAY	MANY, COARSE, PROMINENT
4	0.2.1.207.8.1				4				
s					(s) =		PONDED WATE	R > 8" IN PLACES	
nche.			YELLOWISH BROWN		<sup>7</sup> vche				
CE (					0 P				
S 710					S 710				
AL S		DEEUO			IS 747 S				
INER		REFUS	AL @ 18"		INER				
M MC					M MC				
BEL C					BELC				
PTH					PTH				
DE					DE				
40					40				
50					50				
60					60				
•	hydric pop-bydric	Slope %	Limiting factor	ground water ground water	•	hydric	Slope %	Limiting factor	ground water
-	Hon-Hydric	0-3	_>18"	<ul> <li>bedrock</li> </ul>		non-nyane	0-3	0"	bedrock
c.s.s.	Soil Series / phase name: PENQUIS		 Drainage Class	 Hydrologic Group	C.S.S.	Soil Series / phase name: MONARDA/ BURNHAM		 Drainage Class	 Hydrologic Group
L.S.E.	Soil Classification:	N/A Profile	N/A Drainage Class	N/A Design Class	L.S.E.	Soil Classification:	N/A Profile	N/A Drainage Class	N/A Design Class
		SOIL DESCRIPTION AN	D CLASSIFICATION				SOIL DESCRIPTION AN		Design oldss
	Exploration Symbol:	B-31	Test Pit     Mineral Soil	Boring		Exploration Symbol:	B-32     Depth of Organic Horizon Above	Mineral Soil	Boring
	Texture	Consistency	Color	Mottling	0	Texture	Consistency	Color	Mottling
2		SOMEWHAT FIRM	DARK GREENISH		2	GRAVELLY	FRIABLE	DARK YELLOWISH	
4	LOAM		GRAT		4	SILTEOAN		BROWN	
6	VERY CHANNERY		OLIVE BROWN &	PROMINENT	6				
nche:	SILTY CLAY LOAM		DARK GREENISH GRAY	MANGANESE COATS	pche.	FINE SANDY LOAM		LIGHT GRAY	
oce (i ₀   ₀				ON PED FACES	0 0 0				
		REFUS	SAL @ 9"		URFA				
16 S 7/C					S 710	GRAVELLY		10% STRONG BROWN	
AL S(					18 20 21 20	SILTEOAM		30% DARK BROWN	
INER.					INER		REFUS	AL @ 18"	
M M(					W M				
BELC					BELC				
НТЧ					T				
• 11 I					11 H				
ם					DEPTI				
10   4					DEPTH				
10 10					1LLJJD				
D D B									
	hydric	Slope %	Limiting factor	ground water     restrictive laver	DEPTH 0 0 0 0 0 0 0 0 0 0 0 0 0	hydric non-hydric	Slope %	Limiting factor	ground water     restrictive laver
	hydric non-hydric Soil Series / phase name:	Slope % 	Limiting factor	ground water     restrictive layer     bedrock	■ ■ DEPT	hydric non-hydric Soil Series / nhase name:	Slope % 3-8_	Limiting factor	ground water     restrictive layer     bedrock     C
Q 40 50 80 €.S.S.	hydric non-hydric Soil Series / phase name: BURNHAM	Slope % 	Limiting factor	ground water     restrictive layer     bedrock  Hydrologic Group	1Ld 30	hydric non-hydric Soil Series / phase name: PLAISTED/HOWLAND	Slope % 3-8	Limiting factor _>18"_ WD/MWD Drainage Class	ground water     restrictive layer     bedrock    C Hydrologic Group
Q 	hydric non-hydric Soil Series / phase name: BURNHAM Soil Classification:	Siope % 	Limiting factor 0"	ground water     restrictive layer     bedrock  Hydrologic Group     N/A     Design Class	114	hydric non-hydric Soil Series / phase name: PLAISTED/HOWLAND Soil Classification:	Slope % 	Limiting factor _>18"	ground water     restrictive layer     bedrock  Hydrologic Group    NA_  Design Class
C.S.S.	hydric non-hydric Soil Series / phase name: BURNHAM Soil Classification: pessional Endorsemen signature: name printed/typed:	Slope % 	Limiting factor  	ground water     restrictive layer     bedrock     D     Hydrologic Group     N/A     Design Class	LLA G C.S.S. LSE LSE LSE	hydric non-hydric Soil Series / phase name: PLAISTED/HOWLAND Soil Classification: te: #:	Slope % 	Limiting factor 	ground water     restrictive layer     bedrock  Hydrologic Group    NA  Design Class

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Michael Glessner

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#### SOIL PROFILE/CLASSIFICATION INFORMATION

195600522

Dotai	lad Descriptic	n of Subeu	rface Conditi	ions at Project	Sitos

Proje	oject Name: Applicant Name:							Project Location (mu	nicipality):	
	Bowers Wind	Project		Champlain Wind Ener	gy, I	LLC		Carro	II Plt, Penobscot Cou	nty, ME
		SOIL DESCRIPTION AND	CLASSIFICATION					SOIL DESCRIPTION AN	D CLASSIFICATION	
	Exploration Symbol:	TP-25	Test Pit	Boring		ļ	Exploration Symbol:	B-26	Test Pit	Boring
	1	Depth of Organic Horizon Above	Mineral Soil			F	1	Depth of Organic Horizon Above	Mineral Soil	
0	Texture	Consistency	Color	Mottling		0	Texture	Consistency	Color	Mottling
2	GRAVELLY	FRIABLE	DARK GRAY			2	GRAVELLY	FRIABLE	DARK GRAY	
3	SILT LOAM					3	SILT LOAM			
4						4				
						6				
2 hes					sequ	7				
÷					<i>ul)</i>	9				
10					ACH	10				
H 12	FINE SAND	VERYFIRM	LIGHT GRAY	FEW, FINE, FAINT	URF	5 12 14	FINE SAND	VERY FIRM	LIGHT GRAY	FEW, FINE, FAINT
S 16					S II	16				
S	REFL	JSAL @ 12"; FREE WAT	TER @ 6"; VERY BOUL	DERY	SO SO	8 18	LI	MIT OF EXCAVATION =	16"; FREE WATER @	15"
ERAI					-RAI	5 -20				
4INE					INF					
м					V M	-				
 ≣_C						30				
<u>н</u> —					НВ					
EP.					FPT	ίt				
7						' <u> </u>				└──── <b>─</b>
40						40				
50						50				
60						60				
					L	30				
	hydric non-bydric	Slope %	Limiting factor	<ul> <li>ground water</li> <li>restrictive laver</li> </ul>			hydric	Slope %	Limiting factor	ground water
-	non nyune	3-8	6"	<ul> <li>bedrock</li> </ul>	Ľ		non nyuno	3-8	9"	<ul> <li>bedrock</li> </ul>
c.s.s.	Soil Series / phase name:		PD	<u>D</u>	C.5	s.s.	Soil Series / phase name:		SWPD	<u>C</u>
	MONARDA Soil Classification:	N/A	Drainage Class	Hydrologic Group	-		DIXMONT	N/A	Drainage Class	Hydrologic Group
L.S.E.	Soli Classification:	Profile	Drainage Class	Design Class	L.S	5.E.	Soli Classification:	Profile	Drainage Class	Design Class
		SOIL DESCRIPTION AND	CLASSIFICATION	_				SOIL DESCRIPTION AN	D CLASSIFICATION	
	Exploration Symbol:	TP-27	Test Pit	Boring		1	Exploration Symbol:	TP-28	Test Pit	Boring
	0	Depth of Organic Horizon Above	Mineral Soil	Mottling		I		Depth of Organic Horizon Above	Mineral Soil	Mottling
1	Texture	Consistency	DARK GRAYISH	wotting		1	Texture	Consistency	000	Motting
2	SILT LOAM	FRIABLE	BROWN			2	LOAM	FRIABLE	DARK BROWN	
4			OLIVE BROWN			3				
5						5				
Se -7					(Se	3 7			YELLOWISH BROWN	
" "					hch	8	0121 20/11			
<u>н</u>					) H (					
10 12					8FA(	10				
10 14					SUF	5 14				
7/O	SILT LOAM		BROWN		10	15				
AL 5					AI S	20	VERY CHANNERY		OLIVE BROWN	
Ä –		SOMEWHAT FIRM			VFR.	į —	SILT LOAM			
W L		LIMIT OF EXC	AVATION = 20"		/ WII			LIMIT OF EXC	AVATION = 22"	
ло <u>г</u>					NO,	5 _				
HBE 3					, BF	30				
PTF					PTH	: 7				
Н —					Ę	3 —				
40						40				
60						50				
						~				
60						60				
	hydric	Slope %	Limiting factor	ground water		1	hydric	Slope %	Limiting factor	ground water
•	non-hydric	3-8	18"	<ul> <li>restrictive layer</li> <li>bedrock</li> </ul>	•		non-hydric	0-3	>22"	restrictive layer
	Soil Series / phase name:	_	MWD	C			Soil Series / phase name:		WD	C
0.0.5.	DIXMONT		Drainage Class	Hydrologic Group	C.	J.J.	PENQUIS		Drainage Class	Hydrologic Group
L.S.E.	Soil Classification:	N/A Profile	N/A Drainage Class	N/A Design Close	L.S	5.E.	Soil Classification:	N/A	N/A_	N/A
/		1 IUIIIG	Dramaye Oldss	Dooiyii Oidoo				I IUIIC	Draillaye Oldss	Design Class
								1		
Profe	essional Endorsomen	ts (as applicable)								
. 1016	Solonal Endorsement									
c.s.s.						Da	e:			
	signature:									
-					-	Lic	#:			
	name printed/typed:									
						_				
L.S.E.						Da	e.			
	signature:					1.	11/15/10			
						Lic	#:			
	nase printed/typed Const	Michael Gless	ner				397	affix professional seal		Pana 7
		-								i ugo i

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## SOIL PROFILE/CLASSIFICATION INFORMATION

195600522

	SOIL PROFILE/CLASSIFICATION INFORMATION										
Proj	ect Name:		De Applicant Name:	ailed Description of Subs	urface	e Co	Inditions at Project Sites	Project Location (mu	unicipality):		
	Bowers Wind	l Project		Champlain Wind Ener	gy, L	LC		Carro	oll Plt, Penobscot Cou	inty, ME	
	1	SOIL DESCRIPTION AND						SOIL DESCRIPTION AN		_	
	Exploration Symbol:	B-21	Test Pit	Boring			Exploration Symbol:	B-22	Test Pit	Boring	
	Texture	Consistency	Color	Mottling		0	Texture	Consistency	Color	Mottling	
	2					1	SILT LOAM	FIRM	DARK GRAYISH		
_	3	ORGANIC OV				3			BROWN		
	*					5	GRAVELLY	VERY FIRM	OLIVE BROWN		
(sec)	3				(səu	6 7	SILT LOAM				
(Incl	3				(Incl	8					
ACE	0				ACE	10					
SURF	2				SURF	12		REFUS	AL @ 10"		
	3				S TIO	16					
AL S	)				S AL S	20					
INER					INER						
N M					MM	-					
3ELO ≋ELO					3EL O	30					
THE					TH E						
DEF					DEF	-				┨─────────────────────────────────────	
40	0					40					
50	2					50					
6/						60				┞─────────────────────────────────────	
<u> </u>	bustein	Olana 0/	ipalita a Lootoo				buddie	Olana ()/	(partition of \$		
	non-hydric	Siope % 3-8	Limiting factor	<ul> <li>ground water</li> <li>restrictive layer</li> </ul>			nyaric non-hydric	Siope % 0-3	O"	<ul> <li>ground water</li> <li>restrictive layer</li> </ul>	
	Soil Series / phase name:		VPD	bedrock	-	h	Soil Series / phase name:		VPD	D bedrock	
C.S.S.	PEAT		Drainage Class	Hydrologic Group	C.S	i.S.	MONARDA/BURNHAM		Drainage Class	Hydrologic Group	
L.S.E.	Soil Classification:	N/A Profile	<u>N/A</u> Drainage Class	N/A Design Class	L.S.	.E.	Soil Classification:	N/A Profile	N/A Drainage Class	N/A Design Class	
		SOIL DESCRIPTION AND			_	,		SOIL DESCRIPTION AN			
	Exploration Symbol:	" Depth of Organic Horizon Above	Test Pit	Boring			Exploration Symbol:	" Depth of Organic Horizon Above	Test Pit	Boring	
	Texture	Consistency	Color	Mottling		0	Texture	Consistency	Color	Mottling	
	GRAVELLY	FRIABLE	LIGHT BROWNISH			2	LOAMY VERY FINE	FRIABLE	LIGHT GRAY		
	SILT LOAM		GRAY			3	SAND				
	*					5					
(sec)	3		OLIVE BROWN	DISTINCT	(sau	6	SILT LOAM		YELLOWISH BROWN		
(Inct	3	FIRM			(Inct	8			LIGHT OLIVE BROWN		
ACE	j J	FIRM		MANY, COARSE,	ACE	9 10					
	2			PROMINENT	SURF	12				FEW, FINE, FAINT	
	3 LI	MIT OF EXCAVATION =	12"; FREE WATER @	10"	oil S	15	GRAVELLY SILT LOAM	FIRM	OLIVE	COMMON, MEDIUM, DISTINCT	
AL S	0				AL S	20	L	MIT OF EXCAVATION =	12"; FREE WATER @	12"	
I					INER	24					
ΜM					ΜM	_					
]∝	)				3ELO	30					
TH E					TH E						
DEF					DEF	_					
40	0					40					
50	0					50					
60						60				┨	
_	bydric	Slope %	Limiting factor	<ul> <li>around water</li> </ul>	_	_	bydric	Slope %	Limiting factor	around water	
	non-hydric	3-8	5"	<ul> <li>ground water</li> <li>restrictive layer</li> </ul>	•		non-hydric	0-3	10"	<ul> <li>ground water</li> <li>restrictive layer</li> </ul>	
	Soil Series / phase name:		PD	Dedrock			Soil Series / phase name:	I	SWPD	Dedrock     C	
0.0.8.	MONARDA	N1/A	Drainage Class	Hydrologic Group	0.5		TELOS (ON MOUND)	N1/A	Drainage Class	Hydrologic Group	
L.S.E.	Sul Classification:	Profile	Drainage Class	Design Class	L.S.	.E.	SUIL CIASSIFICATION:	Profile	Drainage Class	Design Class	
Prof	essional Endersomer	te (as applicable)									
101	essional Endorsemen	as applicable)				Г					
c.s.s						Da	ate:				
	signature:					1.10	× #·				
1						LIC	<i></i>				
<u> </u>	name printed/typed:					+					
L.S.E						Da	ate:				
	signature:					1.5	. #.				
1		Michael Glass	nor			LIC	20 <b>7</b>				
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# SOIL PROFILE/CLASSIFICATION INFORMATION

195600522

Detailed	Description	of Subsurfa	ace Condition	s at Project Sites	

Proje	ect Name:		Applicant Name:				Project Location (municipality):		
	Bowers Wind	Project		Champlain Wind Energy	, LLC		Carro	Il Plt, Penobscot Cou	nty, ME
		SOIL DESCRIPTION AND	CLASSIFICATION				SOIL DESCRIPTION AN	D CLASSIFICATION	_
	Exploration Symbol:	TP-17	Test Pit	Boring		Exploration Symbol:	TP-18	Test Pit	Boring
	2	Depth of Organic Horizon Above	Mineral Soil			4	Depth of Organic Horizon Above	Mineral Soil	
0	Texture	EVIDENCE OF THIN	Color WAVY F HORIZON	Mottling	0	Texture	Consistency	Color	Mottling
2	SILT LOAM				2	VERY FINE SANDY	FRIABLE	LIGHT GRAY	
3		FRIABLE	50%STRONG BROWN		3	LOAM			
5					5				
(Se 7					(se -				
nche °				DECAYED ROOT	" show	GRAVELLY		STRONG BROWN	
)E (	GRAVELLY			CHANNELS	) = (I	SILT LOAM			
	SILT LOAM				01 12				
InS 14									
16 10		REFUSAL @ 12"; F	REE WATER @ 10"	1	10 16			LIGHT YELLOWISH	
47 S					S 7			BROWN	
VER.									FEW, FINE, FAINT
IIN.					IW I				,
-0M					мо	L	IMIT OF EXCAVATION	24"; FREE WATER @ 2	4"
I BEI					BEI				
ртн 					PTH				
DE					DE DE				
40					40				
50				<u> </u>	50				
					- 30				
60					60				
0	hydric	Slope %	Limiting factor	<ul> <li>ground water</li> </ul>	•	hydric	Slope %	Limiting factor	<ul> <li>ground water</li> </ul>
•	non-hydric	0-3	10"	restrictive layer	•	non-hydric	0-3	21"	restrictive layer
<b>k</b>	Soil Series / phase name:		SWPD	C		Soil Series / phase name:		SWPD	C
0.0.0.	PLAISTED/HOWLAND VA	R.	Drainage Class	Hydrologic Group	0.5.5.	PLAISTED/HOWLAND VA	AR.	Drainage Class	Hydrologic Group
L.S.E.	Soil Classification:	N/A	<u>N/A</u>	N/A	L.S.E.	Soil Classification:	N/A Brofile	N/A	N/A
		SOIL DESCRIPTION AND	CLASSIFICATION	Design Class			SOIL DESCRIPTION AN	D CLASSIFICATION	Design Class
	Exploration Symbol:	TP-19	Test Pit	Boring		Exploration Symbol:	B-20	Test Pit	Boring
	2	Depth of Organic Horizon Above	Mineral Soil			2	Depth of Organic Horizon Above	Mineral Soil	
1	Texture	Consistency	Color	Mottling	1	Texture	EVIDENCE OF	Color THIN WAVY E	Mottling
2	COARSE	FRIABLE	LIGHT OLIVE		2	SILT LOAM			
3	GRAVELLY SILT LOAM		BROWN		3		FRIABLE	50% STRONG BROWN	
5	OILT LOAM				5			SO / TELEOMON BROWN	
(Se					(se -				
°∟~					» / »	LOAMY VERY		GRAY	
SE (1					с 1 2 1 2	FINE SAND			
10 12					01 12				
14 SUR									
7/03					7/O	SILT LOAM		TELLOWISH BROWN	
AL S  ∞		FIRM			AL S				
VER.			AVATION - 15"		JER –	RE	FUSAL @ 16"; COBBL	ES AT OR NEAR SURF	ACE
IN NIL					JIN ,				
100					мо-				
H BE.					H BE				
PTH					:PTh				
H –					Щ —				
40					40				
50				<u> </u>	50				
					_				
60				<u> </u>	60				
	hydric	Slope %	Limiting factor	ground water		hydric	Slope %	Limiting factor	ground water
•	non-hydric	0-3	15"	<ul> <li>restrictive layer</li> <li>bedrock</li> </ul>		non-hydric		>16"	<ul> <li>restrictive layer</li> <li>bedrock</li> </ul>
c.s.s	Soil Series / phase name:		WD	C	c.s.s	Soil Series / phase name:	-	WD/MWD	C
	BANGOR	<b>N1/A</b>	Drainage Class	Hydrologic Group	$\vdash$	PLAISTED/HOWLAND	N1/A	Drainage Class	Hydrologic Group
L.S.E.	SUI Classification:	N/A Profile	Drainage Class	 Design Class	L.S.E.	Sull Classification:	Profile	Drainage Class	A Design Class
				ě – – – – – – – – – – – – – – – – – – –	· · ·			×	· ·
Profe	essional Endorsement	s (as applicable)							
		, ,, ,							
c.s.s.					Da	ate:			
	signature:					- //			
					Lie	D.#:			
	name printed/typed:								
					D	ate:			
L.S.E.						11/15/10			
	signature:					11/1 <b>3/10</b>			
		Michael Class	nor						
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# SOIL PROFILE/CLASSIFICATION INFORMATION

195600522

Proj	Detailed Description of Sub- Project Name: Applicant Name: Champeline Wind East				onditions at Project Sites	Project Location (m	unicipality):	. ME	
	Bowers Wind	Project		Champiain Wind Ene	rgy, LLC		Carro	oll Pit, Penobscot Col	Inty, ME
	Exploration Symbol:	SOIL DESCRIPTION AND TP-13	Test Pit	Boring		Exploration Symbol:	SOIL DESCRIPTION AN TP-14	Test Pit	Boring
	2	" Depth of Organic Horizon Above	Mineral Soil	Mottling		Taxtura	_* Depth of Organic Horizon Abov	e Mineral Soil	Mottling
		EVIDENCE OF	THIN E HORIZON	worning					Motting
	3 SILT LOAM	FRIABLE	YELLOWISH BROWN			GRAVELLY SILT LOAM	FRIABLE	BROWN	
	5					5			
les)	6				les)	3			
(Inch	8				(Inch	3			
=ACE					FACE	) 		1	
SURF	SILT LOAM		BROWN	FEW, FINE, FAINT	SURF	2		LIGHT YELLOWISH	
= = SOIL -	6 B				SOIL			BROWN	
RAL :	D L	IMIT OF EXCAVATION	= 19"; FREE WATER @	9"	RAL :	LEDGE OR	BOULDER @ 13"; EXT	REMELY BOULDERY A	AT SURFACE
MINE					MINE				
MO	-				Mo				
H BEI					H BEI	1			
EPTI					EPTI				
7	D								<u> </u>
_	p								
5									
-									
•	hydric non-hydric	Slope %	Limiting factor	<ul> <li>ground water</li> <li>restrictive layer</li> </ul>	•	hydric non-hydric	Slope %	Limiting factor	<ul> <li>ground water</li> <li>restrictive layer</li> </ul>
	Soil Series / phase name:			bedrock     C		Soil Series / phase name			bedrock     C
C.S.S.	HOWLAND VAR.	N1/4	Drainage Class	Hydrologic Group	C.S.S.	PLAISTED	<b>L</b> 1/4	Drainage Class	Hydrologic Group
L.S.E.	Soil Classification:	Profile	N/A Drainage Class	N/A Design Class	L.S.E.	Soil Classification:	N/A Profile	 Drainage Class	N/A Design Class
	Exploration Symbol:	SOIL DESCRIPTION AND TP-15	Test Pit	Boring		Exploration Symbol:	SOIL DESCRIPTION AN TP-16	Test Pit	Boring
	0	" Depth of Organic Horizon Above	e Mineral Soil			4	Depth of Organic Horizon Abov	e Mineral Soil	
_	Texture	Consistency	Color	Mottling		Texture	Consistency	Color	Mottling
		FRIABLE	VERY DARK GRAY				FRIABLE	LIGHT YELLOWISH BROWN	
	4							Бкотк	
(s)	5				(s)	3			
nches)	5 6 7 8				nches)	5 5 7			
CE (Inches)	5 6 7 8 9				CE (Inches)	5 5 7 2 4			MANY, COARSE.
JRFACE (Inches)	5 7 4 4 5 5 6 7 7 7 7 7 7 7 7 7 7 7 7 7				JRFACE (Inches)	5 7 8 9 9 9 9 9 9 9 9 9 9 9 9 9		LIGHT OLIVE BROWN	MANY, COARSE, PROMINENT
וב אין ביון ביון ביון ביון ביון ביון ביון בי		EDGE OR BOULDER	11"; FREE WATER @	3"	ון SURFACE (Inches) ביין ביין ביין ביין ביין ביין ביין ביין			LIGHT OLIVE BROWN	MANY, COARSE, PROMINENT
4L SOIL SURFACE (Inches)   8   글   글   그   그   그   _   _   _   _   _   _   _	5 2 7 4 5 6 6 6 6 7 7 7 7 7 7 7 7 7 7 7 7 7	EDGE OR BOULDER @ VERY BO	11"; FREE WATER @ OULDERY	3"	4L SOIL SURFACE (Inches) b   =   =   =   =   =   =   =   =   =			LIGHT OLIVE BROWN	MANY, COARSE, PROMINENT
NERAL SOIL SURFACE (Inches) 		EDGE OR BOULDER @ VERY BO	2 11"; FREE WATER @ OULDERY	3"	NERAL SOIL SURFACE (Inches)		REFUSAL @ 18";	LIGHT OLIVE BROWN FREE WATER @ 2"	MANY, COARSE, PROMINENT
W MINERAL SOIL SURFACE (Inches)	5 6 7 7 8 9 9 9 9 9 9 9 9 9 9 9 9 9	EDGE OR BOULDER @ VERY B	2 11"; FREE WATER @ OULDERY	3"	W MINERAL SOIL SURFACE (Inches)		REFUSAL @ 18";	LIGHT OLIVE BROWN FREE WATER @ 2"	MANY, COARSE, PROMINENT
3ELOW MINERAL SOIL SURFACE (Inches)   6         1   5   5   5   5   5   5   5	5 5 6 7 7 7 8 9 9 9 9 9 9 9 9 9 1 1 1 1 1 1 1 1 1 1 1 1 1	EDGE OR BOULDER @ VERY BO	0 11"; FREE WATER @ DULDERY	3"	BELOW MINERAL SOIL SURFACE (Inches)  ∞		REFUSAL @ 18";	LIGHT OLIVE BROWN FREE WATER @ 2"	MANY, COARSE, PROMINENT
PTH BELOW MINERAL SOIL SURFACE (Inches)           I		EDGE OR BOULDER @ VERY BO	2 11"; FREE WATER @ OULDERY	3"	PTH BELOW MINERAL SOIL SURFACE (Inches)		REFUSAL @ 18";	LIGHT OLIVE BROWN FREE WATER @ 2"	MANY, COARSE, PROMINENT
DEPTH BELOW MINERAL SOIL SURFACE (Inches)		EDGE OR BOULDER @ VERY BO	2 11"; FREE WATER @ OULDERY	3"	DEPTH BELOW MINERAL SOIL SURFACE (Inches)		REFUSAL @ 18";	LIGHT OLIVE BROWN FREE WATER @ 2"	MANY, COARSE, PROMINENT
DEPTH BELOW MINERAL SOIL SURFACE (Inches)	5 6 7 7 7 8 9 9 9 9 9 9 9 9 9 9 9 9 9	EDGE OR BOULDER @ VERY B	2 11"; FREE WATER @ OULDERY	3"	DEPTH BELOW MINERAL SOIL SURFACE (Inches)		REFUSAL @ 18";	LIGHT OLIVE BROWN FREE WATER @ 2"	MANY, COARSE, PROMINENT
DEPTH BELOW MINERAL SOIL SURFACE (Inches)        a         a         a         a		EDGE OR BOULDER @ VERY BO	011"; FREE WATER @ OULDERY	3" 	DEPTH BELOW MINERAL SOIL SURFACE (Inches)		REFUSAL @ 18";	LIGHT OLIVE BROWN FREE WATER @ 2"	MANY, COARSE, PROMINENT
DEPTH BELOW MINERAL SOIL SURFACE (Inches)         Image: Image and Image a	5 6 7 7 8 9 9 9 9 9 9 9 9 9 9 9 9 9	EDGE OR BOULDER @ VERY B	2 11"; FREE WATER @ DULDERY	3" 	DEPTH BELOW MINERAL SOIL SURFACE (Inches)       0		REFUSAL @ 18";	LIGHT OLIVE BROWN FREE WATER @ 2"	MANY, COARSE, PROMINENT
DEPTH BELOW MINERAL SOIL SUPFACE (Inches)	b       b       c <t< td=""><td>EDGE OR BOULDER @ VERY B(</td><td>2 11"; FREE WATER @ OULDERY</td><td>3" ground water</td><td>DEPTH BELOW MINERAL SOIL SURFACE (Inches)   </td><td>hydric .</td><td>REFUSAL @ 18";</td><td>LIGHT OLIVE BROWN FREE WATER @ 2"</td><td>MANY, COARSE, PROMINENT</td></t<>	EDGE OR BOULDER @ VERY B(	2 11"; FREE WATER @ OULDERY	3" ground water	DEPTH BELOW MINERAL SOIL SURFACE (Inches)	hydric .	REFUSAL @ 18";	LIGHT OLIVE BROWN FREE WATER @ 2"	MANY, COARSE, PROMINENT
a         DEPTH BELOW MINERAL SOIL SURFACE (Inches)           b         b         b         b         b         b         c	s s s s s s s s s s s s s s	EDGE OR BOULDER @ VERY Bo	2 11"; FREE WATER @ OULDERY	3" ground water restrictive layer bedrock	DEPTH BELOW MINERAL SOIL SURFACE (hohes)       0   <	hydric hydric	REFUSAL @ 18";	LIGHT OLIVE BROWN FREE WATER @ 2"	MANY, COARSE, PROMINENT
DEPTH BELOW MINERAL SOIL SURFACE (Inches)       """       """       """       """	b	EDGE OR BOULDER @ VERY BO	Limiting factor	3" ground water restrictive layer bedrock Hydrologic Groun	0     0 <td>hydric non-hydric Soil Series / phase name:</td> <td>REFUSAL @ 18";</td> <td>LIGHT OLIVE BROWN FREE WATER @ 2" FREE WATER @ 2"</td> <td>MANY, COARSE, PROMINENT</td>	hydric non-hydric Soil Series / phase name:	REFUSAL @ 18";	LIGHT OLIVE BROWN FREE WATER @ 2" FREE WATER @ 2"	MANY, COARSE, PROMINENT
B     B     DEPTH BELOW MINERAL SOIL SURFACE (Inches)	b	EDGE OR BOULDER @ VERY Bo	Limiting factor		DEPTH BELOW MINERAL SOIL SURFACE (Inches)	hydric non-hydric soil Series / phase name: DIXMONT/MONARDA Soil Classification:	REFUSAL @ 18";	LIGHT OLIVE BROWN FREE WATER @ 2" FREE WATER @ 2" Limiting factor  Drainage Class  Drainage Class	MANY, COARSE, PROMINENT
P         DEPTH BELOW MINERAL SOIL SURFACE (Inches)           """"""""""""""""""""""""""""""""""""	hydric non-hydric soil Series / phase name: MONARDA Soil Classification:	EDGE OR BOULDER @ VERY Bo VERY Bo Slope %  	Limiting factor Drainage Class		BEPTH BELOW MINERAL SOIL SURFACE (Inches)       B	hydric non-hydric Soil Series / phase name: DIXMONT/MONARDA Soil Classification:	REFUSAL @ 18";	LIGHT OLIVE BROWN FREE WATER @ 2" FREE WATER @ 2" Limiting factor  	MANY, COARSE, PROMINENT
B     B <td></td> <td>EDGE OR BOULDER @ VERY Bo</td> <td>Limiting factor</td> <td></td> <td>PEPTH BELOW MINERAL SOIL SURFACE (Inches)       """"""""""""""""""""""""""""""""""""</td> <td>hydric non-hydric Soil Series / phase name: DIXMONT/MONARDA Soil Classification:</td> <td>REFUSAL @ 18";</td> <td>LIGHT OLIVE BROWN FREE WATER @ 2" FREE WATER @ 2" Limiting factor 2" PD Drainage Class </td> <td>MANY, COARSE, PROMINENT</td>		EDGE OR BOULDER @ VERY Bo	Limiting factor		PEPTH BELOW MINERAL SOIL SURFACE (Inches)       """"""""""""""""""""""""""""""""""""	hydric non-hydric Soil Series / phase name: DIXMONT/MONARDA Soil Classification:	REFUSAL @ 18";	LIGHT OLIVE BROWN FREE WATER @ 2" FREE WATER @ 2" Limiting factor 2" PD Drainage Class 	MANY, COARSE, PROMINENT
Image: Solution of the second seco		EDGE OR BOULDER @ VERY BOULDER @ VERY BOULDER @ Slope % 	2 11"; FREE WATER @ OULDERY Limiting factor  Drainage Class  Drainage Class	3" 3" ground water restrictive layer bedrock D Hydrologic Group N/A Design Class	(seque) = 1 = 1 = 1 = 1 = 1 = 1 = 1 = 1 = 1 =	hydric non-hydric Soil Series / phase name: DIXMONT/MONARDA Soil Classification:	REFUSAL @ 18";	LIGHT OLIVE BROWN FREE WATER @ 2" FREE WATER @ 2" Limiting factor 2" PD Drainage Class N/A Drainage Class	MANY, COARSE, PROMINENT
Jack         DEPTH BELOW MINERAL SOIL SURFACE (inches)           image: state st	s sinal Endorsemen	EDGE OR BOULDER @ VERY BO VERY BO Slope % 	2 11"; FREE WATER @ OULDERY Limiting factor 	3" ground water ground water restrictive layer bedrock M/A Design Class	DEPTH BELOW MINERAL SOIL SURFACE (hothes)	hydric non-hydric Soil Series / phase name: DIXMONT/MONARDA Soil Classification:	REFUSAL @ 18";	LIGHT OLIVE BROWN FREE WATER @ 2" FREE WATER @ 2" Limiting factor  	MANY, COARSE, PROMINENT
Solution         DEPTH BELOW MINERAL SOIL SURFACE (inches)           Image: Solution of the state of th		EDGE OR BOULDER ( VERY BOULDER ( VERY BOULDER ( Slope % 	Limiting factor	3" 3" arr and the second s	DEPTH BELOW MINERAL SOIL SURFACE (Inches)	ate:	REFUSAL @ 18";	LIGHT OLIVE BROWN FREE WATER @ 2" FREE WATER @ 2" Limiting factor 	MANY, COARSE, PROMINENT
Prof C.	s signature:	EDGE OR BOULDER ( VERY Bo	Limiting factor	3" ground water restrictive layer bedrock Hydrologic Group N/A Design Class		hydric non-hydric Soil Series / phase name: DIXMONT/MONARDA Soil Classification:	REFUSAL @ 18";	LIGHT OLIVE BROWN FREE WATER @ 2" Comparison of the second	MANY, COARSE, PROMINENT
Image: Decision of the state of the stat		EDGE OR BOULDER @ VERY Bo VERY Bo Slope %  	2 11"; FREE WATER @ DULDERY Limiting factor             Drainage Class  Drainage Class	3" ground water restrictive layer bedrock D Hydrologic Group N/A Design Class	T     D     DEPTH BELOW MINERAL SOIL SURFACE (Inches)       T     0     0     0	hydric non-hydric Soil Series / phase name: DIXMONT/MONARDA Soil Classification:	REFUSAL @ 18";	LIGHT OLIVE BROWN FREE WATER @ 2" FREE WATER @ 2" Limiting factor 2" Drainage Class NIA Drainage Class	MANY, COARSE, PROMINENT
		EDGE OR BOULDER @ VERY Bounds of the second	2 11"; FREE WATER @ OULDERY Limiting factor 		DEPTH BELOW MINERAL SOIL SURFACE (Inches)	hydric non-hydric Soil Series / phase name: DIXMONT/MONARDA Soil Classification:	REFUSAL @ 18";	LIGHT OLIVE BROWN FREE WATER @ 2"	MANY, COARSE, PROMINENT
		EDGE OR BOULDER @ VERY BOULDER @ VERY BOULDER @ Slope % 	Limiting factor BD Limiting fact			hydric non-hydric Soil Series / phase name: DIXMONT/MONARDA Soil Classification:	REFUSAL @ 18";	FREE WATER @ 2" FREE WATER @ 2	MANY, COARSE, PROMINENT
Image: Second state	signature: signature: signature: signature: signature: signature:	EDGE OR BOULDER @ VERY BOULDER @ VERY BOULDER @ Slope % 	2 11"; FREE WATER @ OULDERY Limiting factor  Drainage Class  Drainage Class	3" ground water restrictive layer bedrock D Hydrologic Group N/A Design Class	C S.S.     DE DLH BELOW MINERAL SOIL SURFACE (Incres)     Surface (Incres)     C S.S.     D     L C S.S.     D     L C S.S.     D	Image: state in the s	REFUSAL @ 18";	LIGHT OLIVE BROWN FREE WATER @ 2"	MANY, COARSE, PROMINENT
Image: Second		EDGE OR BOULDER @ VERY BO VERY BO Slope % 	2 11"; FREE WATER @ OULDERY ULIMITING factor 	3" ground water ground water restrictive layer bedrock D Hydrologic Group N/A Design Class		Image: state in the s	REFUSAL @ 18";	LIGHT OLIVE BROWN FREE WATER @ 2"	MANY, COARSE, PROMINENT

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#### SOIL PROFILE/CLASSIFICATION INFORMATION

195600522

A Phase of Marcala	Drainat Lagation
Applicant Name:	Project Location
Champlain Wind Energy, LLC	

	Project		Champlain Wind Ener	gy, LLC		Carro	oll Pit, Penobscot Cou	inty, ME
Exploration Symbol:	SOIL DESCRIPTION AN	Test Pit	Boring		Exploration Symbol:	SOIL DESCRIPTION AN	Test Pit	Boring
0	Depth of Organic Horizon Abor Consistency	ve Mineral Soil Color	Mottling	0	2 Texture	Depth of Organic Horizon Above     Consistency	e Mineral Soil Color	Mottling
	MUCKY	BLACK		1	FINE SANDY LOAM	FRIABLE	LIGHT BROWN GRAY	
GRAVELLY	FRIABLE	DARK GRAYISH	FEW, FINE, FAINT	3	SILT LOAM		STRONG BROWN	
SILT LOAM		BROWN		6 6	SILT LOAM W/ COARSE FRAGS		BROWN	
				1 rches				
				aCE (				
				11 14 14			50% STRONG BROWN	DECAYED ROO
				7/OS		FIRM	50% YELLOW BROWN	CHANNELS
LIMI	I OF EXCAVATION = ?	15", FREE WATER ABO	VE PII	ERAL 0				
		<u> </u>		NIW A		DEFUS		
				SEL OV		REFUS	AL @ 24*	
		<u> </u>		РТН Е				
				DE				
		<u>+</u>	<u> </u>	40				
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buddie.	0la 0/		-	60	la calaiz	Clar - N	Linghia a Caratan	
nyaric non-hydric	<b>0-3</b>	O"	<ul> <li>ground water</li> <li>restrictive layer</li> <li>bodrook</li> </ul>	•	nyaric non-hydric	3-8	Limiting factor	<ul> <li>ground wate</li> <li>restrictive layer</li> <li>bedrook</li> </ul>
Soil Series / phase name:		VPD	D	C.S.S.	Soil Series / phase name:		WD/MWD	
MONARDA/ BURNHAM Soil Classification:	N/A	Drainage Class N/A	Hydrologic Group N/A	L.S.E.	PLAISTED/HOWLAND Soil Classification:	N/A	Drainage Class N/A	Hydrologic Group
	Profile SOIL DESCRIPTION AN	Drainage Class	Design Class			Profile SOIL DESCRIPTION AN	Drainage Class	Design Class
Exploration Symbol:	B-11	Test Pit	Boring		Exploration Symbol:	* Depth of Organic Horizon Above	Test Pit	Boring
Texture	Consistency	Color	Mottling	0	Texture	Consistency	Color	Mottling
GRAVELLY	FRIABLE	DARK GRAY		2	LOAM	MUCKY	BLACK	
				4	STONY			
				(Se	SILT LOAM	FRIABLE	OLIVE BROWN	
				(Inche				
				FACE ₅  ₅   "				
				12 14				
		<u> </u>		7/OS			BROWN	
	REFUSAL @ 18"	; FREE WATER @ 3"		ERAL	L	IMIT OF EXCAVATION	L = 16"; FREE WATER @	2"
	(noodpiain c							
				≈ 10738				
				PTH I				
				<u> </u>				
		1	<u> </u>	40				
				50				
bydric	Slope 9/	Limiting factor	around water	60	hydric	Slope %	Limiting factor	
nyuno non hudria	0-3	3"	<ul> <li>ground water</li> <li>restrictive layer</li> <li>bedrock</li> </ul>	•	non-hydric	3-8	2"	<ul> <li>ground wate</li> <li>restrictive layer</li> <li>bedrock</li> </ul>
non-nyunc		PD		C.S.S.	Soil Series / phase name:	-	PD	<u>C/D</u>
Soil Series / phase name:		Drainage Class	nyurologic Group	L.S.E.	Soil Classification:	N/A		
Soil Series / phase name: <b>VONARDA</b> Soil Classification:	N/A	<u>N/A</u>	<u>_N/A</u>					Design Cless
Soil Series / phase name: MONARDA Soil Classification:	N/A Profile	<u>N/A</u> Drainage Class	 Design Class			Profile	Drainage Class	Design Class
Soil Classification:	N/A Profile	N/A Drainage Class	_ <b>N/A</b> Design Class			Profile	Drainage Class	Design Class
Soil Series / phase name: MONARDA Soil Classification:	N/A_ Profile	 Drainage Class	N/A Design Class			Profile	Drainage Class	Design Class
Soil Series / phase name: <b>MONARDA</b> Soil Classification: Ssional Endorsement	<u>N/A</u> Profile ts (as applicable)	 Drainage Class		Da	te:	Profile	Drainage Class	Design Class
Soil Series / phase name: <b>MONARDA</b> Soil Classification: Ssional Endorsement signature:		<u>N/A</u> Drainage Class		Da	te: .#:	Profile	Drainage Class	Design Glass
Soil Series / phase name: MONARDA Soil Classification: ssional Endorsement signature: name printed/typed:	_N/A_ Profile	 Drainage Class	N/A Design Class	Da	te: .#:	Profile	Drainage Class	Design Glass
Soil Series / phase name: MONARDA Soil Classification: ssional Endorsement signature: name printed/typed:	N/A Profile ts (as applicable)	 Drainage Class	 Design Class	Da Lic Da	te: .#: te:	Profile	Drainage Class	Design Class
Soil Series / phase name: <b>XONARDA</b> Soil Classification: <b>ssional Endorsemen</b> signature: ignature:	 Profile ts (as applicable)	 Drainage Class	N/A Design Class	L I Da	te: .#: te: <u>11/15/10</u>	Profile	Drainage Class	Design Glass

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#### SOIL PROFILE/CLASSIFICATION INFORMATION

195600522

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Proje	ect Name: Bowers Wind	l Project	Applicant Name:	Champlain Wind Energ	y, LLC		Project Location (mi	unicipality): oll Plt, Penobscot Co	unty, ME
	Exploration Symbol:	SOIL DESCRIPTION AND TP-5	Test Pit	Boring		Exploration Symbol:	SOIL DESCRIPTION AN TP-6	Test Pit	Boring
	Texture	Consistency	Color	Mottling	0	Texture	Consistency	Color	Mottling
	SILT LOAM	FRIABLE	DARK BROWNISH		2	GRAVELLY	FRIABLE	DARK YELLOWISH	
4			GRAT		3	SILT LOAM		BROWN	
) () ()					s)				
Inche					Inche				
ACE (					ACE (				
	GRAVELLY SILT LOAM		OLIVE BROWN	MANY, COARSE, PROMINENT	16 18 10S				
ERAL .			LIGHT OLIVE BROWN	WITH ORGANIC STREAKING	ERAL .				
NINE NINE					MINE		FIRM @ 19"; FR	EE WATER @ 12"	
MO 7:	LI	MIT OF EXCAVATION =	= 23"; FREE WATER @ '	17"	S TOW				
TH BE					TH BE				
DEP					DEP				
40					40		-		
50					50				
60					60				
•	hydric	Slope %	Limiting factor	ground water	•	hydric	Slope %	Limiting factor	<ul> <li>ground water</li> <li>restrictive lower</li> </ul>
Ŀ		3-8		<ul> <li>bedrock</li> </ul>	Ľ.		3-8	12"	bedrock
C.S.S.	DIXMONT		Drainage Class	L Hydrologic Group	C.S.S.	DIXMONT		Drainage Class	L Hydrologic Group
L.S.E.	Soil Classification:	N/A Profile	N/A Drainage Class	N/A Design Class	L.S.E.	Soil Classification:	N/A Profile	<b>N/A</b> Drainage Class	<b>N/A</b> Design Class
	Exploration Symbol:	SOIL DESCRIPTION AND TP-7	Test Pit	Boring		Exploration Symbol:	SOIL DESCRIPTION AN TP-8	Test Pit	Boring
	0	_ Depth of Organic Horizon Above	e Mineral Soil			(	) Depth of Organic Horizon Abov	e Mineral Soil	
1	Texture	Consistency	Color	Mottling	0	Texture	Consistency	Color	Mottling
3	LOAM	FRIABLE	VERY DARK GRAYISH BROWN		2	LOAM	FRIABLE	BLACK	
4					4		AREAS OF		
hes)					hes)	SILT LOAM W/ CHANNERS	FRIABLE	STRONG BROWN	
E (Inc	SILT LOAM		DARK YELLOWISH		E (Inc				
			BROWN						
				COMMON, MEDIUM, DISTINCT	13 13 INS 71			YELLOWISH BROWN	COMMON, MEDIUM,
OS 7	GRAVELLY		LIGHT OLIVE BROWN	MANY, COARSE,	18 0S 7	GRAVELLY SILT LOAM			DISTINCT W/ ORGANIC STREAKING
NER/	SILT LOAM			PROMINENT	NER/				
IW MO		FIRM @ 24", FR	EE WATER @ 12"		IW MI		REFUS	AL @ 21"	
BELC					BELC				
EPTH					ЕРТН				
FT					50				
-									
	hydric	Slope %	Limiting factor	ground water		hydric	Slope %	Limiting factor	around water
•	non-hydric	<u>3-8</u>	12"	<ul> <li>restrictive layer</li> <li>bedrock</li> </ul>	•	non-hydric	<u>8-15</u>	13"	<ul> <li>restrictive layer</li> <li>bedrock</li> </ul>
C.S.S.	Soil Series / phase name:		SWPD		c.s.s.	Soil Series / phase name:		_SWPD_	
L.S.E.	Soil Classification:	N/A	N/A		L.S.E.	Soil Classification:	N/A	N/A	
<u>–</u> ′	·	Profile	Drainage Class	Design Class			Profile	Drainage Class	Design Class
De-C	actional Enderson	to (an application)							
Profe	essional Endorsemen	ts (as applicable)					1		
c.s.s	aignoture				Da	ale:			
<u> </u>	signaturė:				Lic	c.#:	1		
	name printed/typed:						1		
L.S.E					Da	ate:			
	signature:					11/15/10	1		
1		Michael Glass	snor		Lic	207			
	nase printed/typed	ulting	SHEI			397	affix professional seal		Page 2

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#### SOIL PROFILE/CLASSIFICATION INFORMATION

195600522

Proje	ect Name: Bowers Wind	Project	Applicant Name:	Champlain Wind Fne	rav. LL	C.	Project Location (m	unicipality): oll Plt. Penobscot Cou	inty. ME
					J,	-			···· <b>··</b> ···
	Exploration Symbol:		Test Pit	Boring		Exploration Symbol:	TP-2	Test Pit	Boring
	0	" Depth of Organic Horizon Above	e Mineral Soil	Mattling		Tautura	Depth of Organic Horizon Abov	e Mineral Soil	Mattling
1	Texture	Consistency	Color	Mottling		o Texture	Consistency	Color	wottling
2	GRAVELLY SILT LOAM	FRIABLE	OLIVE BROWN		-	3 SILT LOAM	FRIABLE	DARK BROWN	
4					-   -	4	EVIDENCE OF	THIN E HORIZON	
(s) =					s)	6			
<sup>7</sup> wche					Inche	8		BROWN	PROMINENT
0 UE					UE (	9			
					URF/	12 GRAVELLY		BROWN	
S TIC			LIGHT OLIVE		S TIC	16 SILT LOAM			
AL S(			BROWN		AL S(	20			
INER					INER				
M MC		LIMIT OF EXC	AVATION = 17"		M MO		ROCK OR LEDGE @ 2	4"; FREE WATER @ 13	," 
BELC					BELC	30			
HTH:					HTH				
DE					DE				
40			 	 	-	40	<u> </u>	 	<u> </u>
50					-	50			
60					=	60	+		
	hydric	Slope %	Limiting factor	ground water	•	hydric	Slope %	Limiting factor	ground water
┞	non-hydric	3-8	_>17"	<ul> <li>restrictive layer</li> <li>bedrock</li> </ul>		non-hydric	3-8	5"	<ul> <li>restrictive layer</li> <li>bedrock</li> </ul>
C.S.S.	Soil Series / phase name: BANGOR		WD Drainage Class	C Hydrologic Group	C.S.S.	Soil Series / phase nam	e:	PD_ Drainage Class	C
L.S.E.	Soil Classification:	<u>N/A</u>	N/A	<u>N/A</u>	L.S.E.	Soil Classification:	N/A	N/A	_ <u>N/A_</u>
/		Profile SOIL DESCRIPTION AND	Drainage Class D CLASSIFICATION	Design Class		/	Profile SOIL DESCRIPTION AN	Drainage Class	Design Class
	Exploration Symbol:	" Depth of Organic Horizon Above	Test Pit	Boring		Exploration Symbol:	. TP-4	Test Pit	Boring
0	Texture	Consistency	Color	Mottling		• Texture	Consistency	Color	Mottling
2	LOAM	FRIABLE	DARK BROWN			2 SILT LOAM	FRIABLE	DARK GRAYISH	
4						4		БКОИК	
(s) =					(s	6			
nche.					hche	8			
0 UE (		LEDG	E @ 7"		CE (I	9			
					URF/				
S 7/C					S TIC	SILT LOAM			
18 20 M S 7 F					4L SC		LEDGE @ 14", FREE W	ATER @ 12"; BOULDEF	RY
NER.					NER.				
W M					W M				
BELC					BELC	30			
PTH					PTH				
DE DE					E E				
40					-	40			
50					-	50			
60					-	60			
•	hydric	Slope %	Limiting factor	ground water	-	hydric	Slope %	Limiting factor	ground water
Ľ,	поп-пуапс			restrictive layer     bedrock		non-nyaric	8-15	12"	<ul> <li>restrictive layer</li> <li>bedrock</li> </ul>
c.s.s.	Soil Series / phase name: MONSON		<u>ED</u> Drainage Class	<u>C/D</u> Hydrologic Group	C.S.S.	Soil Series / phase nam DIXMONT VAR.	e:	<u>SWED</u> Drainage Class	 Hydrologic Group
L.S.E.	Soil Classification:	N/A Profile	N/A Drainage Class	N/A Design Class	L.S.E.	Soil Classification:	N/A Profile	N/A	N/A Design Class
<u> </u>		1 IONIE	Dramaye OldSS	Design Oldss		<i>ı</i>	i ionie	Drainaye Oldss	Design Glass
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Profe	essional Endorsemen	ts (as applicable)							
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<u> </u>	name printed/typed:						-		
L.S.E.					ſ	Date:			
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	name printed/typed:	Michael Gless	sner		ľ	397	affix professional seal		
	<del>Junice Const</del>	unning							Page 1

# APPENDIX E Glossary of Soil Terminology

## **Depth Classes**

These refer to the depth of the particle control section used to describe the central concept of each taxonomic unit. These are as follows:

Very shallow	less than 10" to bedrock
Shallow	10" to 20" to bedrock
Moderately deep	20" to 40" to bedrock
Deep	40" to 60" deep
Very deep	greater than 60"

## Drainage Class

Drainage class is a reference to the frequency and duration of periods of soil saturation and/or action by seasonal groundwater tables, as evidenced by soil morphologic features identified within each respective soil profile.

Seven classes of soil drainage are recognized:

 Excessively drained	water is removed from the soil very rapidly. These are commonly very shallow to bedrock and are often very coarse-textured and rocky. Soils are free of redoximorphic features due to wetness.
Somewhat excessively drained	water is removed from the soil rapidly. Many somewhat excessively drained soils are sandy-textured and very pervious/porous. Some are shallow. Some occur on steep slopes where much of the water they receive is lost as runoff. Soils are free of redoximorphic features due to wetness.
<u>Well drained</u>	Water is removed from the soil readily, but not rapidly. Water may be available for plant growth at the deepest rooting depths, but soil is not so wet as to inhibit the growth of plant roots for significant periods during most growing seasons. Well drained soils are often medium textured and may contain restrictive subhorizons below 24". They are free of redoximorphic features related to wetness in the upper 40".
Moderately well drained water is remov	ed from the soils somewhat slowly during heavy rains and wet seasons. Moderately well drained soils are saturated in the upper soil profile for short duration during the growing season. Often, they contain a slowly pervious (or restrictive) layer beneath the solum, and may receive additional runoff from upslope areas.
Somewhat poorly drained	water is removed slowly such that the soil is wet for significant periods during the growing season. Somewhat poorly drained soils commonly have an impervious substratum that contributes to a perched water table, additional water through sideslope seeps, long continuous sheet flows below large watershed areas with few or no outlets, or a combination of these together.

<u>Poorly drained</u> water is removed from these soils so slowly that the soil is saturated during the growing season or remains wet for long durations. Water is present during the growing

season which may be prohibitive to plant root growth due to anaerobic/saturated conditions. These soils are classified as hydric.

<u>Very poorly drained</u> water is removed from these soils so slowly that free water can be observed at or very near the mineral soil surface for long durations during the growing season. These commonly occur in nearly level or depressional areas, and can be frequently ponded. Often they include thick organic surface horizons. These soils are classified as hydric.

# Hydrologic Soil Groups

A hydrologic soil group is a class of numerous soil series that all have the same runoff potential under similar climate and vegetative conditions. Soil properties that can influence runoff are those that affect minimum infiltration rates for a bare soil after prolonged wetting and with no frozen ground surface. Most important are depth to seasonal high groundwater table, permeability rates after prolonged wetting, and depth to slowly permeable (restrictive) layer.

#### Permeability

Permeability is the soil property which enables water to move downward through the soil profile. It is measured as the number of inches per hour of water that can be added to a particular soil as it moves downward through the unsaturated soil. Terminology and ranges are as flows:

Very slow	less than 0.06 in./hr
Slow	0.06 to 0.20 in./hr
Moderately slow	0.20 to 0.60 in./hr
Moderate	0.6 to 2.0 in./hr
Moderately rapid	2.0 to 6.0 in./hr
Rapid	6.0 to 20 in./hr

#### Soil Texture

Soil texture refers to the USDA classification for the relative proportions by weight of the three soil particle size classes (sand, silt, clay) that are finer than 2 millimeters in diameter and form the fine earth fraction. (Materials larger than 2 mm. in diameter are considered rock fragments).

Soil texture can influence on plant growth, or the soil mechanics of a particular site when used as construction and/or backfill material for foundations, etc. It influences such physical properties as load bearing strength, permeability, shrink/swell potential (frost action or due to wetness), compressibility and compaction. Rock fragment size and content can also affect applications for use as construction materials.

#### Soil Texture Modifiers

Named soil texture classes can be further modified by the addition of appropriate adjectives when rock fragment content approaches 15% by volume (i.e. gravelly sandy loam). "Mucky" or "peaty" are modifying terms used when organic matter content reaches 5% (i.e. mucky silt loam).

# **Additional Soil Terms**

#### Flooding (Hazard to flooding)

Flooding is the temporary covering of the soil surface by flowing water from any source, including but not limited to: streams or rivers overflowing their banks, runoff from adjacent or upslope areas, inflow from

high tide action, or a combination of sources. Water due to snowmelt is excluded from this definition, as is standing or ponded water that forms a permanent or semi-permanent cover above the soil surface.

Flooding hazard is further expressed by frequency classes, duration, and the time of year that the flooding occurs. The velocity and depth of the floodwater are also important factors.

#### Ponding

Ponding is standing water in a closed depression. The water is removed only by evaporation, transpiration by plants, or percolation through the ground.

#### Soil complex

A map unit that consist of two or more kinds of soils (i.e. soil series/taxonomic unit) that occur on a non-regular, non-repeating pattern that cannot be separated out at the scale provided. The order of the soils named are generally in order of predominance within the map unit.

#### Soil map unit

A collection of soils or soil areas that are delineated during soils mapping. It generally is an aggregate of several soil entities with a predominant named soil type. Kinds of soil map units may include complexes, consociations, or associations.

#### Soil slope gradient range

The slope identified for any given map unit, based on the immediate topography within a specific portion of the mapping site. Designations generally are as follows:

A	0-3%	nearly level to level
В	3-8%	gently sloping
С	8-15%	strongly sloping
D	15-25%	moderately steep
E	25-45%	steep

#### **Stoniness**

This is a phase of surface characteristic that may be identified in soils mapping, ranging from stony or bouldery (0.01 to 0.1% of soil surface covered with stones) to rubbly or rubble land, in which up to 75% of the soil surface is covered with stones. Extremely stony sites or sites with rubble land may have additional limitations for use of mechanized equipment.

# APPENDIX F Hydrologically Sensitive Features Evaluation Bowers Wind Project Collection Corridor

# 1.0 Introduction

In November 2010, Stantec Consulting (Stantec) conducted a survey to identify hydrologically sensitive features in association with the collector line project located in Carroll Plantation, Penobscot County, Maine. The proposed project will involve construction of approximately 5 miles of new transmission line and is part of the Bowers Wind Project.

The purpose of this report is to describe areas along the corridor identified during the survey where natural hydrology unique to the geographic region has created soil conditions that will require additional planning prior to construction of roads and infrastructure.

# 2.0 Purpose of Unique Soil Feature Evaluation

Soils that have wetland hydrology generally develop readily identifiable morphological indicators (redoximorphic features, depleted soil matrix) in response to the anaerobic conditions caused by the groundwater table. Certain soils, however, will mask or fail to develop redoximorphic features despite the presence of groundwater. This phenomenon occurs in Maine, most commonly in northern, mountainous portions of the state, where soils have been altered, have dark parent materials, contain translocated soil materials or where groundwater remains oxygenated.

Areas with rolling to very steep topography may contain unique soils features (groundwater seeps, surface drainages, underground streams, boulderfields, etc.) where groundwater is seasonally or permanently near the mineral soils surface yet typical redoximorphic features are not observable. These areas are usually not mapped as jurisdictional wetlands or streams because soils do not meet current hydric soils criteria and surface flows occur too infrequently for stream characteristics (defined banks, aquatic vegetation, etc) to develop. Due to the small area encompassed by these features, they do not appear as soil series in a Class D Medium-Intensity Soil Survey. Therefore, despite presenting a potential for alteration of natural hydrology that often exceeds that of mapped wetland areas, unique soil features like those described above are frequently not identified or described on any resource maps used for project planning.

When planned for, these areas can be avoided or construction practices can be used which minimize the alteration of natural hydrology. For this reason, we have identified these unique soils features where they occur within the proposed collector line corridor and map and describe them in the "unique soil feature evaluation" that follows. This survey is intended for use in conjunction with the modified Class L Linear Soil Survey and the Delineated Natural Resource Map, both of which are included in this report.

# 3.0 Methods

During the week of November 15, 2010, Stantec Consulting (Stantec) surveyed the length of the proposed collector line corridor in search of soils with unique hydrologic features. Areas of concern were those which had not been mapped as jurisdictional streams and wetlands but where groundwater showed the potential to approach or reach the mineral soil surface during spring snowmelt or heavy rain events. Rainfall was very heavy throughout the week of survey and trees had already dropped their leaves; this must be taken into account when comparing pits or making interpretations based on free water in soil pits.

During the survey, site conditions were used to determine where specifically to dig test pits; these conditions included landscape position, soil surface stoniness, soil surface topography (pit-mound topo), vegetation type and rooting depth and surface soil consistence (muckiness).

At each selected location, test pits or borings were dug to a depth of 18" or greater using a drain spade and/or hand auger. Pits were marked in the field with pink flagging labeled with a unique pit identifier (eg. TP-6) and GPS-located using a Trimble Pro-XH backpack unit. In addition, GPS points were taken to mark other areas of interest (surface drainages, boulderfields, outcrops).

# 4.0 Findings

In total, 13 soil pits or borings identified areas as having "hydrologically sensitive features" which should be taken into account during project planning. Test pit and boring locations as well as other located site features are shown on the modified Class L Soil Survey in Appendix B.

Six locations (TP-2, TP-7, TP-12, TP-15 and TP-23) occurred on gentle (3-8%) concave toeslopes. These areas generally showed some boulder cover and were located upslope from jurisdictional wetlands. Pits contained free water within 12 inches of the mineral soil surface. TP-2 and TP-23 both had redoximorphic features within 5 inches of the mineral soil surface; TP-5, TP-7, TP-12 and TP-15 had dark mucky surface horizons.

Three locations (TP-4, TP-25, B-40) are on strong (8-15%) bouldery sideslopes which are near the base of long, sustained slopes. These locations had thick, dark silty surface horizons and free water within 12 inches of the mineral soil surface despite strong slopes; groundwater percolation at these sites was slowed by ledge or hardpan.

The four remaining locations (TP-9, B-30, B-36, B-37) exhibited hydric soils but due to a lack of hydrophytic vegetation, were not flagged as jurisdictional wetlands. These locations were level or nearly level (0-3% slope) and had standing water or free water at the mineral soil surface. These locations are contiguous with mapped, jurisdictional wetlands.

# 5.0 Recommendations

There were areas identified along the proposed Bowers collector corridor where unique hydrologic features must be taken into account when planning collector line construction. For all areas of the corridor, the modified Class L Soil Survey and map unit descriptions (Appendix B and C, respectively) provide information on extent of soil types, soil properties and limitations and should be consulted prior to construction. The soil survey map shows all test pits dug along the proposed collector line as well as areas which have been identified as "hydrologically sensitive". For these areas, as well as areas where surface drainages have been identified, temporary or permanent hydrology at or near the soil surface must be taken into account prior to construction.

Areas on gentle to strong slopes likely have flowing groundwater near the soil surface; this hydrology may be permanently altered if roads or equipment remove surface rocks and boulders or cut into the water table. These areas should be avoided when possible; when it is necessary for roads or infrastructure to transect these sloped areas care should be taken not to remove or disturb surface boulders and mucky surface soil horizons. Roads in these areas should be constructed along the contours and a rock sandwich road base design should be used to allow groundwater and sheet flow to pass and be discharged on the down-gradient side of the road without channelizing flow.

Areas with nearly level slopes that are near or between wetlands should be treated in the same manner as the adjacent wetlands; timber mats should be laid down prior to crossing these areas with heavy equipment and tree removal should be done as specified in wetland areas. Work should be performed during winter months when the ground is frozen if possible.