MARBLE RIVER WIND FARM
WETLAND QUALITY FUNCTIONAL ASSESSMENT

1.0 OBJECTIVE

The ability to identify and determine the relative importance of the specific functions and values of the wetlands located at the proposed Marble River Wind Farm (the Site) will ultimately define the goals and objectives for the development of an appropriate mitigation plan. A wetland functional assessment should fully consider ecological functions included in the Section 404(b)(1) Guidelines and replacement should provide, at a minimum, one-to-one functional replacement, that is, 'no net loss' of wetland functions. To meet this goal, an accurate assessment of the current functions and values of the affected site is necessary. In addition to a function and value assessment method proposed by U.S. Army Corps of Engineers (USACE), the applicant proposes to assess wetland quality with the following method.

2.0 BACKGROUND

Correspondence from the, USACE representative, dated 6 September 2006 indicated that a "best professional judgment" descriptive methodology should be used to assess wetland function. Considering this guidance and the Federal guidance contained in the Army-EPA MOA "Concerning the Determination of Mitigation under the CWA section 404(b)(1) Guidelines" (February 6, 1990), and U.S. Army, Regulatory Guidance Letter 02-2 "Guidance on Compensatory Mitigation projects for Aquatic resource Impacts Under the Corps regulatory Program Pursuant to section 404 CWA and Section 10 RHA 1899" (December 24 2002, a wetland functions and values assessment (dated April 2007) was conducted for all potentially affected wetlands associated with the site using the USACE New England District Highway Methodology Supplement, Wetland Functions and Values Descriptive Approach (USACE 1999). This method employs a descriptive approach to evaluate eight wetland functions (groundwater recharge or discharge, fish and shellfish habitat, floodflow alteration, sediment retention, nutrient removal, production export, shoreline stabilization, and wildlife habitat) and five wetland values (recreation, education and scientific value, uniqueness, aesthetics, and endangered species habitat). Wildlife habitat was found to be the most prevalent function of the evaluated wetlands; approximately 88 percent of the wetlands were considered principally functioning in this capacity. Approximately six percent of the evaluated wetlands functioned to stabilize the banks of streams with moderate to high flow; six percent were also found to be providing floodflow alteration. Groundwater discharge was found to be occurring at three percent of the evaluated wetlands; and production export was found to be occurring at two percent.

Guidance regarding mitigation ratios by cover class was provided by the USACE, however discussions also addressed mitigation that replaces lost functions and values. For wetlands, the objective is to provide, at a minimum, one-to-one functional replacement, i.e., no net loss of functions, with an appropriate margin of safety to account for anticipated success. Focusing on the replacement of the functions provided by a wetland, rather than a simple calculation of acreage affected or restored results in a more accurate and effective way to achieve the objectives of the no net loss policy. In the absence of more definitive information on the functions of a specific wetland site, the following mitigation ratios were suggested as a surrogate for no net loss of functions:

- Emergent 1 acre of wetlands created/restored for every 1 acre disturbed;
- Scrub-Shrub 1.5 acres of wetlands created/restored for every 1 acre disturbed; and
- Forested 2.0 acres of wetlands created/restored for every 1.0 acre disturbed.

Despite the Project's rural location, many of the site wetlands and associated 100-foot adjacent areas demonstrate some degree of disturbance such as activities associated with timber harvest operations, active livestock grazing, and agricultural practices related to the production and harvest of field crops while other have been disturbed as a result of development around them and by loss of buffering. As such, it is believed that the functions and values currently being provided by these affected wetlands is less than what would be provided by undisturbed "pristine" wetlands. For example, a young second growth red maple stand located roadside, and a mature white cedar swamp located in a relatively pristine area both functioning as forested wildlife habitat but each would not be expected to provide functions and values at equivalent levels.

In following the Federal mitigation guidance specific site conditions warrant an analysis that adequately represents present wetland conditions and quality, as well as describing wetlands in terms of their functions and values. Thus, the use of an integrated descriptive and numerical approach will provide a more complete assessment of the wetland conditions present at the site and it will lead to a more equitable and appropriate mitigation plan. Several of the wetland areas within the project footprint have been affected by past silvaculture and agriculture. Silvacultural activities not only affect wetlands by harvesting the canopy but heavy equipment used to access remote areas has left skidder trails that impede and change flow patterns, adversely altering hydrological regimes and at time inadvertently converting some areas to nonwetlands. The Best Management Practices (BMP's) required for Silvaculture and agriculture do not require avoidance, minimization, and mitigation to the level that the Federal and State regulatory programs do.

3.0 DATA

Data for the functional quality assessment will be compiled from various field and geospatial sources. Field delineation of wetlands was conducted at the site from September through November 2005 and May through December 2006. Wetland boundaries were delineated in the field using the Routine Onsite Determination Method as described in the Corps of Engineers Wetlands Delineation Manual (Environmental Laboratory 1987) and the 1985 New York State Freshwater Wetlands Delineation Manual (Browne *et al*. 1995). These methods incorporate a three-parameter approach using hydrophytic vegetation, hydric soils, and wetland hydrology to demonstrate the presence of freshwater wetlands. Field data used for the assessment will be derived from wetland delineation/stream crossing data forms, photography, field sketches, and any field notes. Geographic Information Systems (GIS) data sources that will be used in the analysis will include NYSDEC wetland and stream data, the United States Geological Survey (USGS) National Hydrography Dataset (NHD), recent 2-foot digital orthoimagery (2006), and USGS National Land Cover Data (NLCD). Data were examined using tools in ArcGIS 9.1 (ESRI, Redlands, CA, USA). In addition, lists of Federal- or State-listed threatened, endangered, protected, and exploitably vulnerable species will be consulted for the assessment.

4.0 METHODOLOGY

The wetlands affected by the construction of the proposed Marble River Wind Farm will be evaluated to determine the relative quality of each wetland. Two general categories will be evaluated: biological attributes and disturbance factors. Attributes that will be considered for the biological index include vegetation characteristics, hydrologic connectivity, size, and NYSDEC class. Factors proposed for the disturbance index were developed using the U.S. EPA's *Methods for Evaluating Wetland Condition: Developing Metrics and Indexes of Biological Integrity* (USEPA 2002) as a framework and include wetland habitat alteration, hydrological alteration, and buffer disturbance.

4.1 Biological Attributes

Biological attributes will be scored according to the following scoring system:

Biological Attribute Index	Score
Vegetation	
Wetland exhibits a high degree of plant species richness (>5 taxa)	+1.0
Wetland exhibits a high degree of structural diversity e.g., tree/shrub/vine/grasses/mosses (>3 classes)	+0.5
Wetland contains endangered or threatened species, or species of special concern	+1.0
Wetland contains species listed as 'exploitably vulnerable' in NY State	+0.5
Wetland contains a rare community type: Black spruce-tamarack bog Red maple-tamarack peat swamp Northern white cedar swamp Rich shrub fen	+1.0
Wetland contains an invasive species with >5 percent cover	-1.0
Hydrologic connectivity	
Wetland is associated with a watercourse (distance <50 ft) that is listed as or that drains to a NYSDEC stream classified as A, AA, B, BB, C, C(T)	+1.0
Wetland is isolated including any of the following conditions: • Wetland is located above the headwater point or is "connected" by sheet flow only • Wetland is "connected" via a culvert, manmade drainage feature • Wetland is "technically" connected however there are physical barriers for connection	-1.0
Wetland Size	
Overall wetland size >0.25 acres	+1.0

4.1.1 Vegetation

Wetlands with greater plant species diversity and structural diversity may have a higher capacity to function in the areas of nutrient removal, retention, and transformation; productivity; and wildlife habitat. Wetlands with greater than 5 taxa and with greater than 3 structural groups (i.e., tree/shrub/vine/grasses/mosses) will receive scores of +1.0 and +0.5, respectively.

There are no known occurrences of threatened or endangered species within the Project area. Wetlands containing species listed as 'exploitably vulnerable' in New York State will receive a

score of +1.0. Exploitably vulnerable plant species found within the Project area include the following:

Scientific Name	Common Name
Huperzia lucidula	Shining firmoss / Shining clubmoss
Ilex verticillata	Common winterberry
Kalmia angustifolia	Sheep laurel
Matteuccia struthiopteris	Ostrich fern
Osmunda cinnamomea	Cinnamon fern
Osmunda claytoniana	Interrupted fern
Osmunda regalis	Royal fern
Rhododendron viscosum	Swamp azalea
Thelypteris palustris	Eastern marsh fern
Thelypteris simulata	Massachusetts fern / Bog fern

Wetlands that contain an Edinger (2002) community type that is not common to the area will receive a +1.0 score. Relevant communities within the Project area include black spruce-tamarack bog, red maple-tamarack peat swamp, Northern white cedar swamp, and rich shrub fen.

Invasive species often threaten native populations by out competing them for resources. Wetlands with invasive species cover of greater than five percent will receive a -1.0 score. Invasive species include purple loosestrife (*Lythrum salicaria*), common reed (*Phragmites australis*), reed canary grass (*Phalaris arundinacea*) and cattail (*Typha* spp.). Although broad-leaved cattail and common reed are native, the USACE considers them to be nuisance species because of their ability and tendency to form dense, monotypic stands that displace native species and decrease biodiversity.

4.1.2 Hydrologic Connectivity

Under the Environmental Conservation Law (Article 15), New York regulates surface freshwater resources as best usage classifications (6 NYCRR Part 701) or as Wild, Scenic and Recreation Rivers (6 NYCRR Part 666). Wild, Scenic and Recreation Rivers were not identified at the Site. State water quality classifications of watercourses within the survey area fall into two categories, Class C and Class D streams. Classification C waters support fisheries and are suitable for non-contact activities and Classification D waters are suitable for fishing and contact recreation. Class C Waters may also have a standard of (T), indicating that it may support a trout population. In addition, small lakes and ponds with a surface area of 10 acres or less, located within the course of a stream, are considered to be part of a stream and are subject to regulation under the stream protection category of Protection of Waters. Only streams classified as A, AA, B, BB, or C(T) are regulated by the State. At the Site, the English River, Marble River, and several unnamed tributaries of these rivers are classified as C(T) streams by the NYSDEC. There are no NYSDEC stream classified as A, AA, B or BB at the Site. Wetlands associated with a watercourse (distance <50 ft) that is listed as or that drains to a NYSDEC stream classified as C(T) will receive a score of +1.0.

Wetlands that are geographically isolated wetlands are depressional and do not appear to be linked to other wetlands or waters via a well-defined surface water connection (Tiner 2003).

Thus, isolated wetlands do not provide production export and are limited in their capacity to function as fish habitat; sediment and shoreline stabilization; areas for sediment, toxicant, and pathogen retention; and areas for nutrient removal, retention and transformation. Isolated wetlands will receive a score of -1.0.

4.1.3 Size

As wetland habitat becomes fragmented, populations become isolated and undesired edge effects increase. Larger, contiguous wetland systems provide better habitat and home range requirements for wildlife as they often have greater biological integrity, and species and structural diversity. Larger wetlands also have a greater capacity for floodflow alteration and retention, whereas the capacity for smaller wetlands to store floodwaters can be easily exceeded. Wetlands greater than a quarter of an acre in size will receive a score of +1.0.

4.2 Disturbance Factors

Disturbance factors for this assessment include wetland habitat alteration, hydrological alteration, and adjacent area disturbance. According to the U.S. EPA's *Methods for Evaluating Wetland Condition: Developing Metrics and Indexes of Biological Integrity* (USEPA 2002), sites should be categorized according to degrees of human disturbance. Furthermore, the integration of several parameters in the disturbance score can account for multiple stressors. Examples of moderate human disturbance include present conditions that suggest past human activity such as old field, young (<20 yr.) second growth woodlot, and shrub land. Significant human disturbances include active pasture, intensive agriculture, newly fallowed fields, impervious surfaces, residential development, and active construction. Disturbance factors will be scored according to the following scoring system:

Disturbance Factors Index	Score
Wetland Habitat Alteration	
No evidence of disturbance	+1.0
Low-intensity alteration or past alteration that is not currently affecting wetland	-1.0
Highly altered, but some recovery if previously altered	-2.0
Hydrological Alteration	
No evidence of disturbance	+1.0
Low-intensity alteration or past alteration that is not currently affecting wetland	-1.0
Currently active and major disturbance to natural hydrology	-2.0
Adjacent Area Disturbance	
No evidence of disturbance	+1.0
Predominately undisturbed, some human use disturbance	+0.5
Significant human disturbance, buffer area altered by human use	-1.0

4.2.1 Wetland Habitat Alteration

Vegetation removal disturbances will consider mowing, grazing, tree plantations, tree removal, shrub removal, course woody debris removal, and removal of emergent vegetation. Substrate/soil disturbances and sedimentation will consider grading/bulldozing, filling, vehicle use, dredging, sediments input (from inflow or erosion), and livestock hooves. Wetlands with no evidence of disturbance will receive a score of +1.0. Low-intensity alteration (or past alteration

that is not currently affecting the wetland) and high-intensity alteration will receive scores of -1.0 and -2.0, respectively. Fragmentation will also be considered a low-intensity alteration.

4.2.2 Hydrologic Alteration

Hydrologic alteration will consider ditch inlets, tile inlet point source inputs, installed outlets, weir dredging, grading or fill, berms and dams, road and railroad beds, levees, unnatural connections to other waters, dewatering in or near wetlands, source water changes, and drainage. Wetlands with no evidence of disturbance will receive +1.0. Low- and high- intensity hydrologic alteration will receive scores of -1.0 and -2.0, respectively.

4.2.3 Adjacent Area Disturbance

Wetland adjacent areas are state regulated buffers that surround a wetland and reduce adverse impacts to wetlands functions and values from adjacent land uses. They can reduce wetland impacts by moderating the effects of runoff including stabilizing soil to prevent erosion, and filtering nutrients, sediment, and toxicants. Adjacent areas also provide habitat and cover for wetland-associated wildlife species. Wetlands with no evidence of disturbance in their 100-foot adjacent areas will receive a score of +1.0. Wetlands with predominately undisturbed adjacent areas will receive a score of +0.5. Those with significant anthropogenic disturbances in their adjacent areas (e.g., paved roads, maintained agriculture) will receive a score of -1.0.

4.3 Total Wetland Quality Score

Attribute scores (biological and disturbance) will be tallied for each affected wetland using a table as identified in Attachment 1. These biological and disturbance scores will be used to determine appropriate mitigation ratios based on wetland quality. Overall quality of the wetland will fall into three categories based on the following scores:

Very Low Quality less than 2

- Low quality: 3 or 4
- Moderate quality: 5 to 7
- High quality: greater than 7

5.0 MITIGATION RATIOS

Therefore, regardless of wetland quality, a ratio of 1 to 1 is proposed for the emergent Site wetlands. However, wetland quality would be considered for the proposed scrub shrub and forested wetland mitigation ratios. This proposed "range of ratios" will range from 0.5:1 to 1.5:1 for scrub shrub wetlands and 0.5:1 to 2:1 for forested wetlands. Applicable mitigation ratio ranges would be as follows:

- Shrub scrub
- Very Low Quality 0.5 to 1
  - Low quality: 1 to 1
  - Moderate to High quality: 1.5 to 1

- Forested
- Very Low Quality 0.5 to 1
  - Low quality: 1 to 1
  - Moderate quality: 1.5 to 1

- High quality: 2 to 1

6.0 SUMMARY

Mitigation goals and objectives will be based on total temporary and permanent impacts to wetlands and the results of the wetland quality assessment. The goal of the proposed mitigation plan will aim to ensure 'no net loss' of wetland functions through the creation and restoration of self-sustaining, contiguous wetland systems capable of replacing wetland functions and values that will be affected by the construction of the proposed Marble River Wind Farm.

7.0 REFERENCES

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