

Invasive Species Management Plan

Antrim Wind Energy Project,
Antrim, New Hampshire



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Project Background
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1.0 PROJECT BACKGROUND

Antrim Wind Energy LLC (AWE), a subsidiary of Walden Green Energy, LLC, has proposed construction of the Antrim Wind Project (project), a wind energy facility in Antrim, New Hampshire (Figure 1). The project is proposed to include 9 turbines capable of generating up to 28.8 megawatts (MW) of electricity. The project will also include above ground and underground electrical collector lines, a substation, an Operations and Maintenance (O&M) building, one permanent meteorological tower, and new project access roads. Collectively, the project is expected to occupy approximately 11.3 acres of privately owned land once constructed, with an initial clearing area of approximately 57 acres (project area).

The turbine areas, access roads, and collector line are proposed to be located in primarily undeveloped forest areas where timber harvesting has occurred in the past and some new vegetation clearing will be required for the construction of the project components. The natural communities present in the project area will be converted from forested communities to communities dominated by shrubs and herbaceous vegetation for the life of the project. Because of this disturbance, the turbine areas, new electrical line, and new roads could be subject to colonization by invasive plant species, either by natural colonization from existing adjacent populations or as a result of construction activities.

This Invasive Species Management Plan (ISMP) addresses the anticipated procedures for managing invasive plant species within the project area. This ISMP is designed to address the requests of the New Hampshire Fish and Game Department (NHFG) to manage invasive plant species in the post-construction operations period of the project.

2.0 MANAGEMENT PLAN GOALS AND OBJECTIVES

The overall goal of this ISMP is to control the introduction and spread of invasive plant species as a direct result of project construction. The ISMP has been prepared to meet the purpose of the New Hampshire Department of Agriculture's Chapter Agr 3800, Invasive Species, namely to prevent and control the spread of invasive plant species, to minimize the adverse environmental and economic effects of invasive species, and to protect the public from potential health problems attributed to invasive species.¹

The ISMP has also been prepared to meet the goals and objectives of the U.S. Army Corps of Engineers' (Corps) Invasive Species Policy.² Ultimately, the Corps' goal is to "prevent introduction and establishment of invasive species to reduce their impact on the environment, economy,

¹ New Hampshire Department of Agriculture. Chapter Agr 3800 Invasive Species. Available at: http://www.gencourt.state.nh.us/rules/state_agencies/agr3800.html

² Department of the Army. U.S. Army Corps of Engineers. *U.S. Army Corps of Engineers Invasive Species Policy*. June 2, 2009. Available at: <http://www.nae.usace.army.mil/Missions/Regulatory/Invasive-Species/>

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and health of the United States” and to employ an early detection and rapid response system in order to “develop and enhance the capacity to identify, report, and effectively respond to newly discovered/localized invasive species”. Further, this ISMP was developed to preserve and enhance the functions and values of the wetlands and uplands within the project area. While complete eradication of invasive species is not a stated or realistic goal, this ISMP is designed to limit the spread of these species to the maximum extent practicable. The ISMP includes the following objectives:

- Identify locations within the project area in which invasive species presently exist in order to develop a baseline for future monitoring;
- Provide a plan for monitoring the status of invasive species within the project area and report the results of the monitoring to involved natural resource agencies;
- Outline the anticipated schedule and duration of monitoring; and
- Identify appropriate strategies for controlling and/or limiting the spread of invasive plant species within the project area (e.g., mechanical cutting, herbicide application, biological control, or a combination thereof).

3.0 INVASIVE SPECIES BACKGROUND

Invasive plants are non-native species whose introduction to an area causes or is likely to cause environmental or economic harm. Invasive plants often lack natural predators and can successfully colonize and thrive beyond their natural ranges, often out-competing native plants and contributing to the decline of native plant species diversity. Generally, these species have competitive adaptations, aggressive reproductive strategies, and efficient dispersal methods.

The New Hampshire Department of Agriculture, Markets & Food, Division of Plant Industry is the lead state agency responsible for the evaluation, publication and development of rules on invasive plant species. Chapter Agr 3800 establishes the New Hampshire Prohibited Invasive Plant Species List, provided in Table 1 below. The ISMP will focus on the species provided in this list.

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Table 1. New Hampshire Prohibited Invasive Plant Species List¹

Scientific Name	Common Name
<i>Acer platanoides</i>	Norway maple
<i>Ailanthus altissima</i>	Tree of heaven
<i>Alliaria petiolata</i>	Garlic mustard
<i>Berberis thunbergii</i>	Japanese barberry
<i>Berberis vulgaris</i>	European barberry
<i>Celastrus orbiculatus</i>	Oriental bittersweet
<i>Centaurea biebersteinii</i>	Spotted knapweed
<i>Cynanchum nigrum</i>	Black swallow-wort
<i>Cynanchum rossicum</i>	Pale swallow-wort
<i>Elaeagnus umbellata</i>	Autumn olive
<i>Euonymus alatus</i>	Burning bush
<i>Heracleum mantegazzianum</i>	Giant hogweed
<i>Hesperis matronalis</i>	Dame's rocket
<i>Iris pseudacorus</i>	Water-flag iris
<i>Lepidium latifolium</i>	Perennial pepperweed
<i>Ligustrum obtusifolium</i>	Blunt-leaved privet
<i>Lonicera x bella</i>	Showy bush honeysuckle
<i>Lonicera japonica</i>	Japanese honeysuckle
<i>Lonicera morrowii</i>	Morrow's honeysuckle
<i>Lonicera tatarica</i>	Tatarian honeysuckle
<i>Microstegium vimineum</i>	Japanese stilt grass
<i>Polygonum cuspidatum (Fallopia japonica)</i>	Japanese knotweed
<i>Polygonum perfoliatum</i>	Mile-a-minute vine
<i>Reynoutria x bohemica</i>	Bohemia knotweed
<i>Rhamnus cathartica</i>	Common buckthorn
<i>Rhamnus frangula (Frangula alnus)</i>	Glossy buckthorn
<i>Rosa multiflora</i>	Multiflora rose

¹New Hampshire Department of Agriculture, Markets & Food. *Fact Sheet: Prohibited Invasive Plant Species Rules, Agr 3800.*

4.0 EXISTING CONDITIONS

Between 2011 and 2014, TRC Environmental Corporation (TRC) has performed numerous natural resource surveys within the project area, including wetland delineations, vernal pool surveys, rare plant surveys, and natural community mapping. During these surveys, no incidental observations of invasive species were noted.

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Invasive Species Monitoring Program
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5.0 INVASIVE SPECIES MONITORING PROGRAM

5.1 GOALS AND OBJECTIVES

The goal of the monitoring program is to implement a plan to monitor and assess the status of invasive plant species within the project area and to identify areas where invasive species control measures will be required to maintain or enhance the functions and values of uplands and wetlands. The monitoring will target potential new occurrences of the invasive plant species listed in Table 1 and provide recommendations that will be used to select and implement appropriate control options for each invasive species location.

The objectives of the monitoring will be to:

- Document the distribution and density of invasive species within the project area to target areas where control measures will be required;
- Recommend the type(s) of control measures that are most appropriate for each invasive species occurrence; and
- Monitor the effectiveness of control efforts and evaluate whether alternate or additional control measures should be implemented to provide effective control of the identified invasive species.

5.2 METHODS

Upon completion of construction, AWE will retain a qualified botanist or ecologist to conduct the invasive plant species monitoring. The monitoring will consist of field surveys of the project area to determine whether invasive species are present and to provide recommendations concerning control options. For each invasive species occurrence, monitors will complete invasive species monitoring data forms, take photographs of the species and the surrounding landscape, and record the location of the invasive species using a Global Positioning System (GPS) receiver. Conditions that may influence the use of a particular type of invasive species control method will also be noted (e.g., wetlands, streams, vernal pools, private residences). If populations of invasive species are observed immediately outside of the project area, the occurrences will be noted but control strategies for these populations will not be developed. Field surveys will be conducted during the growing season when plant species are most easily identifiable. The monitoring effort will occur prior to the control effort and should be scheduled to allow time for invasive species control treatments to be implemented in the same growing season.

Invasive species monitoring within the project area will be initiated in the first full calendar year following the completion of project construction and will continue for 2 additional years, for a total of 3 years.

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5.3 MONITORING REPORT

AWE will prepare an annual report summarizing the methods and results of each year of monitoring. Annual invasive species monitoring reports will include a summary of the field survey methods, a table that identifies the invasive species observed within the project area, a summary and discussion of the results, a figure(s) showing the GPS location of each occurrence, copies of the monitoring forms, and representative photographs. As appropriate, comparisons will be made as to whether invasive species distribution and/or densities are increasing or decreasing, based on pre-construction conditions and the results of the previous year's monitoring results. The monitoring report will include recommendations regarding where invasive species control measures are required, the suggested type of control strategy, and the schedule for the implementation of control measures.

The monitoring report will be provided to NHFG and the New Hampshire Department of Environmental Services (NHDES) by January 31 of the year following the year in which the monitoring was conducted (e.g., for monitoring conducted in the summer of 2017, the monitoring report will be submitted by January 31, 2018).

Implementation of invasive species control measures recommended in the report will be based on the results of the monitoring and will not require approval from the regulatory agencies. Control measures, specifically herbicide applications, will be performed pursuant to any standard permit and safety requirements governing such activities.

6.0 INVASIVE SPECIES CONTROL PROGRAM

6.1 GOALS AND OBJECTIVES

The goal of the invasive species control program is to limit the distribution and spread of invasive species within the project area, specifically those species or populations that became established after, or as a result of, project construction activities.

The objectives of the control program include:

- Use the recommendations provided during the invasive species monitoring program to identify appropriate control strategies based on the species, habitat, and project location; and
- Perform control efforts focused on reducing the density and distribution of identified invasive species.

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6.2 FACTORS INFLUENCING INVASIVE SPECIES CONTROL

To develop an effective approach for controlling invasive species within the project area, the following factors will be considered:

- The characteristics of each invasive species observed, including growth rates, susceptibility to herbicides, etc.;
- The density and distribution within each occurrence and within the project area;
- The characteristics of the habitats at each invasive species occurrence;
- Proximity of the occurrence to sensitive areas within the project area, including wetlands, streams, vernal pools, rare or endangered species or communities, and protected wildlife habitat; and
- Proximity of the occurrence to adjacent land uses (residential development, agricultural land, etc.), which can influence the choice of control strategies.

As a result of these factors, invasive species control measures may not be practicable or highly effective in all areas within the project area. Additionally, as stated above, complete eradication of invasive species is not a stated goal of the control program, given the aggressive nature of most invasive species once they become established. Rather, the goal of the control effort is to prevent the introduction and spread of invasive plant species into new areas not previously colonized.

6.3 TYPES OF INVASIVE SPECIES CONTROL

There are 4 primary types of invasive species control methods: cultural, mechanical, chemical, and biological. These control methods may be combined to provide a more effective control strategy.

6.3.1 Cultural Control

Cultural controls are important methods to reduce the spread of invasive species to areas not previously colonized. Methods such as immediate seeding with an approved, native seed mix and mulching disturbed soils can be effective at minimizing the opportunities for the establishment of invasive plant species. Additional cultural controls such as vehicle washing, isolation of excavated soils, washing of timber mats, and vehicle inspections are also effective in limiting the spread of invasive species as a result of construction activities.

6.3.2 Mechanical Control

Mechanical control measures such as digging, pulling, and cutting individual plants may be effective in controlling isolated invasive plants or small stands of plants. These methods are often necessary in sensitive natural resource areas such as wetlands, streams, protected wildlife habitats, etc., where chemical control is not permitted or ecologically appropriate. However,

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such techniques may be labor-intensive and may be impractical in areas with dense infestations of invasive species such as common reed (*Phragmites australis*), purple loosestrife (*Lythrum salicaria*), and Japanese knotweed (*Fallopia japonica*).

6.3.3 Chemical Control

Chemical control (i.e., herbicides) is a common alternative used for controlling invasive species. If used selectively and in limited areas by licensed professionals, herbicides can be applied in an environmentally sound manner to provide effective control while adhering to applicable state and federal herbicide application regulations. In addition, herbicide applications often provide the most cost-effective method for controlling dense infestations of invasive species. However, chemical control may not be permitted in certain portions of the project area based on the presence of sensitive natural resources.

6.3.4 Biological Control

Biological controls can be effective in controlling some invasive species (e.g., purple loosestrife and mile-a-minute vine [*Polygonum perfoliatum*]) under certain conditions but are not yet proven for the control of other species that could be present within the project area. Consultation with the Corps indicates that species such as loosestrife beetles (*Galerucella californiensis* and *Galerucella pusilla*) native to Europe and Asia may be useful in controlling populations of purple loosestrife. Similarly, a stem-boring weevil (*Rhynoncomimus latipes*) native to Asia has been shown to provide control of mile-a-minute vine in the United States. However, at this time, the use of biological controls is unlikely to be recommended for this project.

6.4 CONTROL OF EXISTING INVASIVE SPECIES

The Bird and Bat Conservation Strategy for the Antrim Wind Energy Project (BBCS)³, prepared by TRC and Stantec, describes the best management practices that AWE will implement should any invasive species be detected during construction.

6.5 INVASIVE SPECIES CONTROL IMPLEMENTATION SCHEDULE

After construction is complete, AWE recognizes that early detection and rapid response can prevent the spread of invasive species. As a result, AWE will implement invasive species controls in the first full calendar year following the completion of construction. Particular treatment methods will be focused on preserving and enhancing the habitat characteristics of the wetlands and uplands in the project area.

Based on the results of the invasive species monitoring efforts described in Section 5.0 above, AWE will schedule invasive species control efforts annually, as soon as practicable after the field

³ TRC Engineers and Stantec Consulting Services Inc. *Bird and Bat Conservation Strategy for the Antrim Wind Energy Project*. July 9, 2015.

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monitoring recommendations are received. The schedule for the treatment will depend on the types of controls recommended and the species identified. For example, cultural controls and mechanical removal of certain species can be performed almost any time of the year when plant species are identifiable, while herbicide applications may require that work be done during the growing season to be most effective. For locations where invasive species controls are implemented, monitoring performed in subsequent years of the monitoring period will serve to assess the effectiveness of such measures.

6.6 ANTICIPATED CONTROL STRATEGIES

Specific control strategies will be developed based on the results of the annual monitoring. It is anticipated, however, that the most effective general approach for controlling invasive species within the project area will be a combination of cultural methods (i.e., prevention of invasive species introduction and spread), mechanical removal, and application of herbicides in selected locations. If large populations of invasive species are observed, repeated manual control and/or herbicide applications may be required in multiple growing seasons in order to achieve effective control.

The need for and types of chemical control of invasive species will be carefully evaluated, particularly in and around sensitive areas such as wetlands and streams. Additionally, invasive species may be observed outside the defined project area boundaries. AWE has no authority to attempt to control invasive species that may be present in those areas outside of the project area.

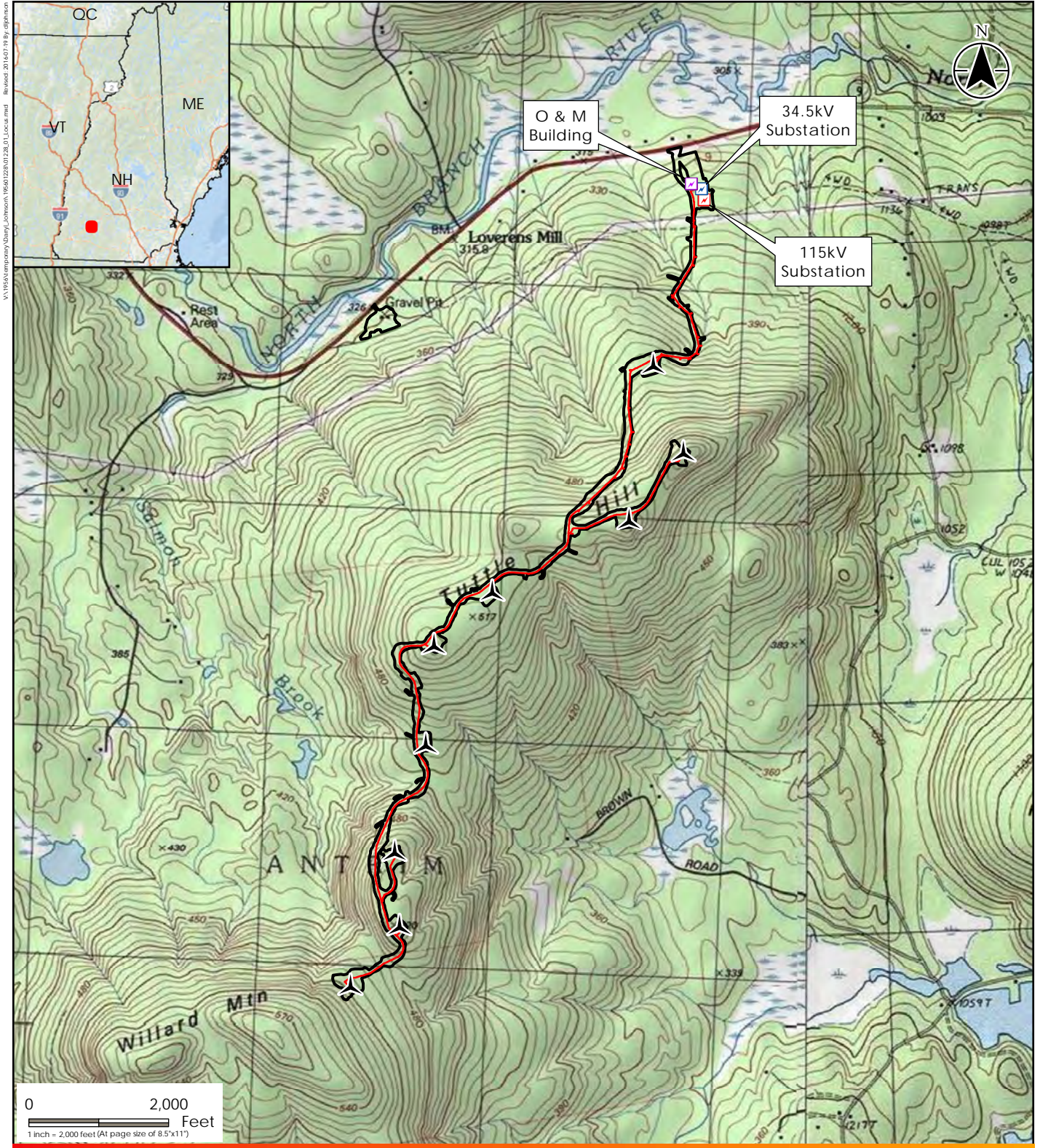
Herbicide applications will be performed according to applicable laws and regulations put forth by the New Hampshire Department of Agriculture, Markets & Food, Division of Pesticide Control, as well as NHDES and the U.S. Environmental Protection Agency. The type of herbicide(s) to be used, method of application, and schedule for application will be determined based on the locations of the targeted areas and the particular invasive species to be controlled.

Similarly, the use of any biological control measures, while not expected for this project, will be coordinated with NHDES and the Corps. The species used for biological control will be obtained from approved sources.

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Appendix A Project Location Map
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Appendix A PROJECT LOCATION MAP



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Legend

-  Proposed Turbine Location
-  115kV Substation (Approximate)
-  34.5kV Substation (Approximate)
-  O&M Building (Approximate)
-  Proposed Collector
-  Proposed Limit of Disturbance

Client/Project
 Walden Green Energy
 Antrim Wind Project
 Antrim, New Hampshire

Figure No.
 1

Title
 Project Location Map
 7/19/2016