




**Landscape Integration and
Harmonization Assessment Guide**

Wind Farm Siting Project on Public Land

Québec 



Landscape Integration and
Harmonization Assessment Guide

Wind Farm Siting Project on Public Land

Production : Direction générale de la gestion du territoire public

Research and writing : Marc-André Bouchard
Michèle Boudart

Technical assistance : Micheline Arsenault
Marc Lauzon
Carole Lizotte
Patricia Munoz
Cécile Poirier

Contribution : Céline Guimont

Copy editing : Luce Sainte-Marie

Translation : Michele Scott

Graphic design : Christiane Leclerc Communication

Publisher : Direction des communications

Distribution : Direction générale de la gestion du territoire public

Ministère des Ressources naturelles et de la Faune
5700, 4^e Avenue Ouest, bureau B-302
Québec (Québec) G1H 6R1
Tel.: (418) 627-8609

© Gouvernement du Québec
Legal Deposit - 1st quarter 2005
Bibliothèque nationale du Québec
ISBN-2-550-44111-7
Diffusion code: 2005-2008

Table of Contents

Note Readers	5
MRNF Requirements for Landscape Integration and Harmonization Based on Element Categories for the Territory Concerned	6
Content of the Landscape Integration and Harmonization Assessment	7
1. Description of the Receiving Environment	7
1.1 Geographic location of the project	7
1.2 Delineation of the study area	7
1.3 Determination of landscape units affected by the project	7
1.4 Characterization and description of landscape units	7
1.5 Description of viewpoints	8
2. Project Description	8
2.1 Description of the site	8
2.2 Description of the wind farm	8
2.3 Description of infrastructure	8
2.4 Description of the work to be carried out	9
2.5 Maintenance and operating procedures	9
3. Project Integration and Visual Impact Determination	9
3.1 Analysis and presentation of issues	10
3.2 Wind farm integration: siting scenario	10
3.2.1 <i>Visual simulations</i>	10
3.2.1.1 <i>Photomontage from strategic viewpoints</i>	10
3.2.1.2 <i>Project's visual perimeter in 3D simulation</i>	11
3.3 Impact determination and assessment criteria	11
3.3.1 <i>Sources of impacts</i>	11
3.3.2 <i>Scope of impacts</i>	11
3.3.3 <i>Duration and frequency of impacts</i>	11
3.3.4 <i>Evaluation of landscape unit resistance</i>	11
3.3.5 <i>Significance of impacts</i>	12
3.4 Cumulative impacts on the visual environment	12
3.5 Evaluation of co-visibility	13
4. Mitigation of Visual Impacts	13
4.1 Mitigation and compensation measures	13
5. Comparative Analysis	13
6. Consultation of the Population and Organizations	14
Appendix 1	15
Appendix 2	17
Bibliography	21

Note to Readers

This document, entitled Landscape Integration and Harmonization Assessment Guide - Wind Farm Siting Project on Public Land and referred to hereafter as the “Guide,” is intended as a reference tool for analyzing projects submitted by proponents. The Guide will be used by the Secteur du territoire of the Ministère des Ressources naturelles et de la Faune (MRNF) to evaluate projects and issue leases for parcels of public land designated for the installation of wind turbines.

The Guide is a supplement to the “Directive pour la réalisation d’une étude d’impact sur l’environnement d’un projet de parc éolien” (guidelines for environmental impact assessments of wind farm projects) produced by the Direction des évaluations environnementales of the Ministère du Développement durable, de l’Environnement et des Parcs (MDDEP), under which proponents must file an environmental impact assessment with the MDDEP and present it to the Bureau d’audiences publiques sur l’environnement (BAPE) during public hearings. The MDDEP guidelines include a number of elements that proponents must consider in their impact studies as well as information required for project evaluation purposes. The MRNF data requirements specified in this Guide need not be reproduced in a document other than the environmental impact assessment.

This Guide identifies the main landscape issues associated with wind farm. Its purpose is to provide proponents with the tools to demonstrate the impacts of a wind farm on the landscape and present measures aimed at minimizing these impacts. Landscape integration and harmonization must take into account all of the environments affected, both natural and man-made. The various landscape impact issues identified in the integration and harmonization study carried out by proponents will facilitate the project’s evaluation and assessment by land managers. However, the MRNF requirements are limited to the impacts affecting landscapes on public lands, which generally contain uninhabited yet frequented natural landscapes. While private lands, buildings and dwellings must be considered by proponents in their impact studies, notably with respect to visual harmony, they are not the responsibility of the MRNF.

The content of the landscape integration and harmonization assessment dealing with wind farm projects is non-exhaustive. It must be progressive and adaptable to the particularities of the projects and of the social and natural environments in which wind farms will be installed.

In addition, all wind farm projects presented to the MRNF must meet the objectives and criteria of the Regional Plan for Public Land Development - Industrial Section - Wind Energy (PRDTP - Wind Energy) of the region concerned by the wind project. The Guide presents a summary (on page 2) of the objectives and criteria of the PRDTP - Wind Energy Gaspésie and Matane Regional County Municipality (MRC). For all other lands designated for wind energy development, those objectives and criteria can be used or adapted from the PRDTP - Wind Energy of the concerned territory.

Appendix 1 presents the wind farm landscape integration and harmonization principles for public lands in Québec. These principles are given as guidelines. They are not obligatory requirements. The proponent’s obligations with respect to public lands in Québec and the minimum content of the landscape integration and harmonization assessment are defined in Appendix 2. The content of this Appendix may vary according to the PRDTP - Wind Energy of the region concerned.

Wind farm projects with a total nominal capacity of 10 MW or less are not subject to the MDDEP guidelines and BAPE public hearings. However, proponents must comply with this Guide and the minimum consultation requirements defined in Section 6 applicable to such projects (10 MW or less). The public consultation procedures specified in Appendix 2 apply to all projects regardless of total output.



MRNF Requirements for Landscape Integration and Harmonization Based on Element Categories for the Territory Concerned

The following table, which is based on table 3 of the PRDTP - Wind Energy, Gaspésie and Matane MRC, summarizes the different requirements applicable to strategic views onto elements of interest in the study area. The requirements associated with every element of the territory concerned are detailed in Appendix 2. These procedures are applicable to territory in the Gaspésie and Matane MRC. These requirements can be adapted according to the particular directions and criteria of the PRDTP - Wind Energy for other territories. For regions without PRDTP - Wind Energy, these procedures must be followed.

<i>MRNF requirements with regard to landscape</i>	<i>Elements considered</i>
1. Elements requiring a wind farm harmonization and integration assessment and, where applicable, mitigation measures (i.e., all of the elements covered in this Guide).	Visual enframement of roads representing a recognized tourism product (e.g., Route 132): all sections of the road where wind turbines are visible must be evaluated to ensure that they meet the requirements of the PRDTP.
2. Elements requiring a wind farm harmonization assessment; mitigation measures not required (i.e., some of the elements covered in this Guide).	Visual enframement of scenic road corridors or those covered by an agreement for the protection of visible landscapes (e.g., Route 197 in the Gaspésie region, the International Appalachian Trail): all sections of these roads or trails where wind turbines are visible must be evaluated to ensure that they meet the requirements of the PRDTP.
3. Elements requiring impact mitigation measures (i.e., some of the elements covered in this Guide).	Salmon rivers: all sections of canoeing circuits, portages, campgrounds and fishing areas where wind turbines are visible must be evaluated to ensure that they meet the requirements of the PRDTP.
4. Elements for which a demonstration is required to show that wind turbines are barely visible or completely invisible or that they do not disturb activities (or that mitigation measures are unnecessary).	Visual enframement of scenic views or national parks and other specified sites of interest.
5. Elements requiring compliance with rights.	Visual enframement of recreational trails and other elements of interest where development is anticipated (recreational/tourism sites or facilities).



1. Description of the Receiving Environment

1.1 Geographic location of the project

- Representation of the site at various mapping scales: location in the administrative region, location in relation to nearby towns and villages, immediate location in relation to main access points and transportation corridors, location according to specific territories (national parks, wildlife habitat, etc.) and physical structural elements (rivers, etc.), accurate representation of the wind farm site, cadastral (lot, range, township) and administrative location (municipality, MRC), etc.

1.2 Delineation of the study area* (visual enframing)

- Map delineation of the entire area potentially affected by the project, i.e., visual enframing: the entire perimeter from which at least one wind turbine is visible. The area should include all viewpoints onto the wind turbines.
- Description of the physical and human environment concerned: the chosen natural environment must correspond to the entire area that may be subject to visual impact, taking into account the height of wind turbines and that of trees, which may limit impacts. The chosen human environment must encompass all localities and dwellings, as well as frequented areas where visual impacts are anticipated. The delineation must also include areas where impacts are deemed limited or where the MRNF does not anticipate landscape impacts. Level of impact determination is outlined in Section 3.

1.3 Determination of landscape units affected by the project

- Map delineation and representation of the various landscape units contained within the study area: the landscape units are generally determined based on the combination of biophysical (forest environment, topography, etc.) and anthropogenic characteristics (forest use, village cores, vacation sites, etc.). Proponents may choose among the various landscape architectural approaches used to determine the landscape units in the study area.

1.4 Characterization and description of landscape units

- Description of each landscape unit (physical, biological and human components, landscape characteristics including shape, colour, texture, anthropogenic uses and status of the lands, etc.): descriptions of the components must be accompanied by a qualification or appreciation (e.g., vulnerable plant species, rare wildlife species, village core, historic district, protected area, resource harvesting, sensitive environment, etc.). The same is required for landscape units (e.g., signature landscapes, tourism-based structural landscapes, forest or agricultural landscape, etc.).

* The asterisk accompanying the section titles signifies content required by the MDDEP for environmental impact assessments prepared by proponents.

- Background of landscape units in relation to the region, surrounding land uses (urban, forest, agricultural, conservation, etc.), nearby activities, tourist or protected sites, heritage features, etc.
- Qualification of landscape units according to legibility, sensitivity and complexity based on the scale of evaluation and nature of the perception (static, temporary, partial, frequent, etc.): The panoramic quality of the landscape unit can be evaluated based on land characteristics such as relief, vegetation, hydrous environment, play of colours produced by the combination of landscape elements, quality of adjacent units, rarity of the landscape, etc. The value of a landscape unit and level of sensitivity to change can be determined based on all of these characteristics combined.
- Consideration of the interests of socio-economic stakeholders (e.g., tourists, land managers, target user groups, etc.) in the description of landscape units.

The consultation of populations affected (Section 6) will help proponents to determine level of interest and sensitivity with respect to landscapes impacted by the wind farm.

1.5 Description of viewpoints

The project site and its infrastructure can be viewed from a number of view points in every landscape unit, some of which are strategic or of greater significance.

- Identification of strategic viewpoints for every landscape unit: proponents must justify and explain their choice of strategic viewpoints. They must also qualify them (varying or permanent, static or dynamic, distant or near; frequency, duration, observation angle, season, visibility conditions, etc.). The presentation and analysis of strategic viewpoints are discussed further in Section 3.1.



2. Project Description

2.1 Description of the site*

- Presentation of the visual characteristics of the selected site (altitude, slope, other physiographic characteristics, vegetation cover, anthropogenic uses, etc.) prior to the project: the use of recent aerial photographs of the site and sector or other visual presentation tools is recommended.

2.2 Description of the wind farm*

- Presentation of the characteristics related to wind farm installation (number of wind turbines, layout, equidistance, along ridge lines, etc.) and explanation of the choice of layout for the wind farm and infrastructure based on the receiving environment: wind farm layout design and the various viewpoints (e.g., plan view) onto the site and its components.
- Presentation, where applicable, of different implementation scenarios.

2.3 Description of infrastructure*

- Presentation of infrastructure, namely that which may create a visual impact (turbines, access roads, electrical connections, rotor blades, related equipment).
- Presentation of turbine characteristics (height, colour, number of rotor blades, shape, etc.).
- Location of power lines and substations for the connections.

2.4 Description of the work to be carried out*

- Presentation of the work plan (tree removal, backfilling, construction, access development, planting, etc.).
- Description of temporary installations and infrastructure: location of access roads, watercourse crossings, receiving areas, material storage, parking areas, etc.
- Presentation of the duration of construction work and explanation of the various development phases including the impacts of each phase on the landscape.

2.5 Maintenance and operating procedures*

- Presentation of the wind farm maintenance and operating procedures (road use, frequency of traffic, etc.).



3. Project Integration and Visual Impact Determination

Explanation of the integration and harmonization context, i.e., presentation of the relationship between the receiving environment (Section 1) and the project (Section 2).

The following elements are intended as guidelines for evaluating impacts and level of integration in order to present a summary analysis of issues related to visual impact. Any recognized method may be used as a substitute to the proposed methods.

The assessment of visual impacts on the landscape and evaluation of integration level must be presented in the form of a territorial analysis at various scales; impact zones must also be mapped. The following approach, which is based on three levels of analysis, is recommended:

- 1) Integration of wind turbines in terms of visual enframement (including the three impact zones described below) within a vast perimeter from which they may be visible. Where applicable, this analysis must take into account cumulative impacts (see Section 3.4) and co-visibility (see Section 3.5) of the project with other wind farms or major infrastructure.
- 2) Integration in terms of the surrounding landscape (intermediate impact zone), taking into account the key features of the landscape around the site. The surrounding landscape includes all areas from which the wind turbines are highly visible (high frequency, etc.) and for which impacts will be presented.
- 3) Integration in terms of the immediate area (direct impact zone), taking into account signage, access roads and connection to the electrical grid. This assessment must take into consideration nearby infrastructure, inhabited areas, tourist sites and lands with special use designations such as protected areas. The direct impact zone should include features for which the risk of impact is high (e.g., elements of interest, scenic route, national park, historical monument, etc.), those situated in proximity and those for which visibility frequency is high.

Analysis and assessment scales can be determined based on the following European guidelines, which include three visual impact zones (or areas of influence). However, this approach must be adapted to the particularities of the territory and landscape scale concerned:

- 1) A **direct impact zone** of a radius approximately 10 times the total height of the wind turbines, i.e., 600 to 1,000 metres from the wind farm boundaries, based on the height of the turbines used.

- 2) An **intermediate impact zone** of a radius approximately 100 times the total height of the wind turbines, i.e., 6 to 10 km from the wind farm boundaries, based on the height of the turbines used. This zone starts at the end of the direct impact zone.
- 3) An **indirect impact zone** is an area in which wind turbines remain visible.

It should be noted that the determination of impact zones must take into account other influencing factors besides distance from the wind farm, topography and vegetation, such as the significance or value afforded a particular feature (e.g., scenic route), visibility frequency, observer mobility (e.g., ditches and lookouts or roads and trails), the permanent nature of a view on the wind farm (construction phase or operation phase), etc.

3.1 Analysis and presentation of issues

- Analysis of the various harmonization issues in order to quantify and qualify visual impacts based on the scenarios evaluated and the chosen landscape integration scenario for the wind farm: given the multidimensionality of the notion of landscape (environmental, visual, social, patrimonial, etc.) and the interdependence of these dimensions, the presentation of issue analysis outcomes should enable stakeholders and the public to fully understand the pros and cons associated with the installation.

3.2 Wind farm integration: siting scenario

- Presentation and justification of the wind farm siting scenario in terms of harmonization with the landscape and impacts on the landscape.
- Presentation of the impact analysis from the various strategic viewpoints determined for each landscape unit and simulation of visual impacts: the strategic viewpoints identified and evaluated must take into account the territorial components of maps of the PRDTP - Wind Energy (e.g., villages, main roads, protected areas, tourist sites, etc.) of the concerned region. Any other method agreed to between the proponent and the MRNF will be accepted.
- Visual impacts simulation (see Section 3.2.1)

The study should include a list of the elements to consider in terms of landscape integration, and a hierarchical presentation of the different issues affecting landscape units, sites and strategic viewpoints. The study should define the various types of issues involved: patrimonial (e.g., historical monument), environmental (e.g., vantage points), tourism (e.g., structural tourist site), etc. The preliminary process involving the consultation of stakeholders is helpful in determining the list of elements to be considered as well as the issues involved.

3.2.1 Visual simulations

Visual simulation methods and tools are generally useful in demonstrating the project's integration into the landscape and in presenting impacts. Visual simulations are strongly recommended as they help to put wind farm integration and harmonization into context.

Simulations must take into consideration key sites of interest and strategic viewpoints, for example, significant visual impacts from lookout points (roads, trails or protected areas), inhabited areas, main roads, well-known tourist sites, sectors frequented by user groups, etc. The following methods and tools are often used for visual simulations and are given as examples.

3.2.1.1 Photomontage from strategic viewpoints

In a photomontage, wind turbines, developed to scale, are generally inserted into landscape photographs taken from several angles and at various scales in order to reflect viewpoints familiar to inhabitants, highly

frequented by tourists or viewpoints of interest. Photomontages must be presented using photos taken at various times of day or levels of light and must take into account the heavy traffic areas affected (roads, trails, etc.) or other sites where strategic viewpoints have been identified.

3.2.1.2 Project's visual perimeter in 3D simulation

Three-dimensional simulations are generally produced using a digital elevation model (DEM), and integrate wind turbines, to scale, into the landscape. The presentation must include different angles and distances of observation. Different approaches can be used. Following are two examples:

- 1) A systematic survey consisting of digital photos from strategic viewpoints (dwellings, lookouts, scenic route, trails, etc.), a sequence of shots of nearby routes or elements deemed significant, using computer retouching to integrate the wind turbines based on the 3D landscape presentation;
- 2) A systematic digital landscape reconstruction including geomorphology, vegetation and land use, and simulation of the various views of the wind farm using a 3D digital layout of the area.

3.3 Impact determination and assessment criteria*

In the landscape integration and harmonization assessment, all landscape units and their strategic viewpoints must be evaluated for visual impacts according to the impact determination and assessment criteria described in this section. The criteria and terms used to determine anticipated impacts and their classification according to level of significance or disturbance must be clearly defined and their choice justified. The criteria presented in this section are not mandatory, but are commonly used to determine and evaluate a project's visual impacts on the landscape. While landscape architects are not required to use them, it is recommended that they do.

3.3.1 Sources of impacts

Qualification of the sources of impacts: the sources of impact are directly related to the observable elements of the wind farm (e.g., wind turbines), their characteristics (size, colour, shape, etc.) and the nature of views (observation time, distance, frequency, angle of observation, etc.). Visual simulations are used to present the source of impacts and to put them into context.

3.3.2 Scope of impacts

- Presentation of the spatial dimension of impacts and the area affected for each landscape unit.
- Presentation of the different levels of impact based on the distance and nature of the views. This analysis should also take into account angle of observation and other factors causing the level of impact to vary.

3.3.3 Duration and frequency of impacts

- Determination of the duration and time of the view (temporal aspect) as well as the irreversible nature of the change in landscape.
- Determination of the frequency of impacts based on the nature of the project and viewpoints.
- Determination of the probability of impacts. This analysis also takes into account the speed at which wind turbines are observed, which can cause the level of impact to vary.

3.3.4 Evaluation of landscape unit resistance

All landscape units must be evaluated in terms of resistance to wind farm implementation. The level of resistance must be explained and qualified. Resistance determination can be carried out using the following method.

The *resistance level* of a landscape unit can be established using two criteria, i.e., the *anticipated level of impact* on the landscape unit and the *value attributed* to the landscape unit.

- 1) The *anticipated level of impact* is the capacity of a landscape unit to integrate new components and the degree to which the landscape is transformed. The goal is to determine the ability of a landscape unit to absorb a transformation and accept the introduction of new components without affecting its very nature. The *absorption capacity* of a landscape refers to its capacity for concealment, while *insertion capacity* depends on the physical, visual and symbolic compatibility (e.g., architectural styles) of the landscape with the nature of the components to be inserted.
- 2) The *attributed value* is determined based on the intrinsic qualities of the landscape unit and its level of interest for various populations. Evaluation of the intrinsic quality of landscape units takes into account aspects such as uniqueness, harmony and integrity. The level of interest for various groups depends on the activity carried on in the unit and the nature of the activity (temporary, extended, etc.), and whether it is symbolic or associated with community identity. The public consultation process should enable proponents to determine the target landscape's level of interest for the various populations.

It may be desirable to determine the resistance level of a landscape unit by combining the anticipated level of impact and the attributed value, based on a predetermined classification (e.g., three levels of impact anticipated and five values attributed).

It should be noted that other recognized approaches may be used by professionals responsible for presenting the landscape integration approach and visual impacts.

3.3.5 Significance of impacts

- Evaluation of the linkage effect (link between the affected components and other components), of the intensity of visual disturbances based on the level of sensitivity or vulnerability of landscape components, of the uniqueness or rarity of components, etc. lighting conditions and common weather conditions (e.g., fog) can affect the significance of visual impacts.
- Determination of the value of components for the various populations. Consideration of special status designations (protected area, archaeological site, historic area, etc.).

The significance of impacts can be established based on level of resistance and level of integration, and any other evaluated criterion (angle, duration, etc.). The combination of various analysis criteria permits the significance of visual impacts within the context of the identified issues to be presented from different angles. The significance of impacts must be explained based on the value attributed to the resistance of the landscape, the landscape's capacity to integrate the wind farm and the perception or level of interest of various populations.

Evaluation of the significance of visual impacts must also take into account, if applicable, the management of shadows cast by the rotor blades and the flicker effect. A simulation of the shadow effect may be necessary.

3.4 Cumulative impacts on the visual environment*

- Presentation of the overall and cumulative visual impacts on natural and cultural resources (built heritage, historical components, etc.) and on the surrounding land uses (agricultural lands, forests, urban areas, villages, tourist and vacation sites, protected areas, hunting and fishing grounds, etc.).
- Transposition of impacts according to their effects on the visual character of the landscape (introduction of new elements into the field of vision, change in the nature of a landscape's aesthetic quality, etc.). These impacts are best demonstrated through visual simulations (see Section 3.2.1).

The notion of cumulative effects refers to the potential for the permanent residual impacts of the project to add to the impacts of other past, present or future projects or interventions in the same sector. This evaluation takes into account certain major components of the area concerned (lands with special status designations, structural tourist sites, major infrastructure, etc.).

3.5 Evaluation of co-visibility

Co-visibility analysis takes into account other wind farms and major structures affecting the landscape, such as power lines and pylons, communication antennas, etc. A co-visibility map should demonstrate the various ranges of co-visibility (direct, indirect, total, partial, etc.). The co-visibility analysis should be presented at different scales determined by the proponent and deemed necessary to understanding the implementation scenario.



4. Mitigation of Visual Impacts

4.1 Mitigation and compensation measures*

Mitigation measures: after presenting the issues analysis, implementation scenario and anticipated visual impacts, proponents must demonstrate the measures selected for the visual and architectural integration of wind turbines (planting, addition of equipment or development to enhance landscape features and aesthetic quality, power line undergrounding, etc.), in a context of optimal harmonization with the landscape. Mitigation measures must be provided for every landscape unit, every component of the area and every strategic viewpoint. Mitigation measures are also required and must be presented for the construction site.

Compensation measures: where applicable, a series of measures must be established and identified to compensate for the inescapable impacts of the wind farm on the landscape, in order to create visual harmony and balance. These measures can be determined based on the requirements of the MRNF, MDDEP, MRCs and municipalities, or on public concerns.

Proponents must explain in their study their choice of layout for the wind farm (visual harmony, access road constraints, tree planting, etc.) with respect to the landscape in question. They must also explain the reasoning behind their choice of mitigation and compensation measures.



5. Comparative Analysis

The landscape integration and harmonization assessment must include a comparative analysis of the project against other wind farm projects of the same nature (type of farm, type of turbines, receiving environment and landscape, tourist nature of the area, etc.).

For example, a method involving *comparison by analogy* can be used. This method consists of comparing the project with existing developments of the same nature (with reference photos taken from different distances and multiple angles of observation: 100 m, 200 m, 500 m, 1 km, 2 km, 5 km, 10 km, 15 km, etc.).



6. Consultation of Populations and Organizations*

Given the social, cultural, personal and emotional dimensions of the concept of landscape, any intervention affecting the landscape requires public consultation. This consultation can be carried out prior to the project development process or following it. Depending on the circumstances, the consultation can be in the form of a study, using recognized techniques, of the perception of the landscape by the public or various user groups.

For projects subject to the Environment Quality Act and the Regulation respecting environmental impact assessment and review (over 10 MW), the MDDEP environmental guidelines strongly advise proponents to consult the public as early as possible in the process. Furthermore, proponents must make public their project impact assessment. Subsequently, any requests filed with the MDDEP may result in public hearings by the BAPE. These projects may be required to comply with certain consultation and information obligations set forth by the MRNF, in addition to the MDDEP guidelines. These requirements are specified in Appendix 2 of this Guide.

This procedure does not apply to wind farm projects with a capacity of less than 10 MW. However, proponents are strongly advised to consult and inform the organizations, local populations and tourism clientele concerned during the project development stage. Where applicable, a survey of the population's perception of the project in the landscape should be considered (details in Appendix 2).



Appendix 1

MRNF Landscape Integration Principles for Public Territory

The principles presented in this appendix are intended to guide and structure the implementation of wind farms and optimize landscape integration by facilitating their social acceptability. These are the same principles applied by some European administrations where wind power is widely used. The principles are not required standards, but rather objectives which wind projects should strive to attain while ensuring adaptability to the characteristics of the environment concerned (physical, biological, landscape, cultural and human).

General principles for harmonizing wind farms with the landscape

- Ensure visual harmony and balance. The wind farm must be coherent with other elements (natural, patrimonial, etc.) of the landscape.
- Ensure visual and environmental integrity (shape, colour, etc.) of the entire wind farm and coherence in the spatial layout of turbines.
- Distance the wind farm as much as possible from inhabited areas and highly frequented areas.
- Protect heritage sites: do not create competition with attractions in the exploration of sites or with their shape, materials, colour, texture, historical connotation or reference.
- Protect certain ridge lines: i.e., the distinguishing boundaries of landscape units, defining elements in the geomorphological or geographical understanding of an area, and highly or frequently observed features. Proponents should strive for the harmonious enhancement of any elements that cannot be protected.
- Take into account species adapted to the physical environment when planting trees to limit visual impacts.
- Avoid installing wind turbines on small-scale landscapes, or on landscapes which exaggerate the height of turbines and make them appear enormous.

Implementation principles for the geographical layout of wind farms and turbines

- Wind turbines should be aligned in harmony with the physical contours of the area (coasts, ridge lines, hilltops and plateaus, limits of occupation such as fields, roads, coastlines, in between two hills benefiting from a tunnel effect, on the peak of hills benefiting from a hill effect, etc.).
- In flat topography it is preferable to place turbines in a simple geometrical pattern, which is easily perceived by the viewer. Turbines aligned equidistantly is also a good solution, but a simple geometrical pattern is neither acceptable nor optimal in all cases.
- In hilly landscapes it is preferable to have the turbines follow altitude contours or physical markers (fencing, roads, coastline, property limits, etc.) or any other architectural characteristic or feature of the landscape.
- Whenever possible, wind farms should be installed near electrical grids to facilitate connection.

Principles concerning complementary infrastructure and the construction site

- Adequately manage the construction site and post-construction, paying careful attention to finishings (transformers, substations, development of surrounding areas, etc.) and ensuring the removal of debris to prevent the visual and physical pollution of the site, accidental spills during construction, noise and dust, traffic on and around the site, restoration of access roads, meticulous clean-up of the site, planting and adapted signage.
- Reduce or avoid the visibility of complementary infrastructure and equipment, in other words, whenever possible, limit views to the wind turbines alone. For example, bury power lines, limit accessory structures (ancillary buildings, transformers, measuring pylons), etc.
- Minimize access roads and related work.
- Minimize visibility of roads by ensuring non-perpendicular alignment with sensitive viewpoints.

Principles concerning turbine characteristics

- Use harmonious colours that blend with the landscape (light grey or white are commonly used).
- Whenever possible, prioritize the use of large wind turbines. They are more efficient and generally integrate more easily into the landscape, since fewer turbines are required and their lower rotational speed does not attract the eye the way smaller, faster moving turbines do.
- Use tubular towers instead of lattice towers.
- Ensure that all wind turbines in a farm possess the same physical characteristics (size, colour, number of rotor blades, etc.).
- Include aesthetic obstacle markings for safe aviation. For example: ensure daytime lighting with white flashing light, visible from 360°, at the top of the nacelle on wind turbines situated at the farm perimeters. Ensure night-time lighting of the wind farm with red lights, visible from 360°, at the top of the nacelle on turbines situated at the farm perimeters. These measures, defined by NAV Canada, are sufficient for ensuring aviation safety.



Appendix 2

MRNF Requirements for Wind Farm Installation on Public Lands¹

This appendix was developed as part of the PRDTP - Wind Energy plan and includes the MRNF requirements for the harmonious integration of wind farm infrastructure into the landscape. It links the elements of public land situated in the study area, for which proponents must take into account visual quality, with the assessment requirements covered in the Guide.

Visual enframing of roads representing a recognized tourism product

With respect to the visual enframing of roads representing a recognized tourism product (e.g., Gaspésie's Route 132), all of the landscape assessment requirements contained in this Guide apply. Section 6 provides for the survey of tourist perception of wind farm projects on the landscape and at least one public information event.

Visual enframing of scenic corridors (identified in the public land use plan (PATP) or Entente régionale pour la protection des paysages visibles)

With respect to the visual enframing of scenic corridors identified in the MRNF public land use plan (PATP) and other scenic corridors covered by regional agreements for the protection of visible landscapes (e.g., Gaspésie's Route 197, 198 and 299):

- All of the requirements set forth in the Guide shall apply for lands situated within the direct impact zone (see Section 3), except for those contained in Section 5, which are optional;
- Only those elements explicitly identified in the MDDEP environmental guidelines shall apply for lands situated within the intermediate impact zone (see Section 3);
- At least one information event is to be held for the consultation of local populations and interested groups.

Visual enframing of international recreational trails

Regarding the visual enframing of international trails (e.g., International Appalachian Trail), some elements of this Guide can be adapted:

- For lands situated within the direct impact zone (see Section 3), all of the requirements set forth in the Guide shall apply, except for those contained in Section 5, which are optional;
- For lands located within the intermediate impact zone (see Section 3), the entire Guide, except for Section 5 which is optional, shall apply to only those elements deemed to be trail-related attractions. Identification of such attractions should be carried out in consultation with trail managers and, if necessary, with regional organizations involved in trail development (e.g., Gaspésie–Îles-de-la-Madeleine (e.g., l'Unité régionale loisirs et sport Gaspésie–Îles-de-la-Madeleine (URLS GÎM));
- Moreover, to preserve existing uses, proponents must take into account rights granted and trail-related infrastructure, as outlined in the Recreational trails section of this appendix.
- As noted in Section 6, proponents must hold an information meeting with the trail managers concerned and, if necessary, with the regional organizations involved in trail development (e.g., URLS GÎM).

¹ The content of Appendix 2 is based on the Gaspésie and Matane MRC PRDTP - Wind Energy. This content can be adapted to reflect the specific requirements of the PRDTP - Wind Energy adopted for other territories.

Visual enframing of salmon rivers used for fishing or recreational activities

A demonstration of landscape integration is not required for projects affecting the visual enframing of salmon rivers. However, proponents must propose either impact mitigation measures (Section 4) that meet the principles set forth in Appendix 1 of this Guide or other documented or generally accepted methods. To determine the required mitigation measures, proponents must conduct a summary analysis of the project's impacts on visual quality from various points of interest along salmon rivers. The following table² lists the steps proponents must follow, which are presented in this Guide.

Table 1

General elements included in the MDDEP environmental guidelines ³	Specific supplementary elements of MRNF to be considered
<p><i>1.2 Delineation of the study zone (visual enframing)</i></p> <p>Proponents must conduct this analysis by geographically locating the various elements of interest on sections of rivers that are frequented or used. For example, in the case of a river section used for fishing, ditches and access roads are considered to be elements of interest. In the case of sections used for canoeing or kayaking, campgrounds, portage trails and the circuit are considered to be elements of interest. This exercise is also helpful in the identification of viewpoints to be preserved.</p> <p><i>4. Mitigation of visual impacts</i></p> <p>Proponents must use documented impact mitigation methods or generally accepted methods. The principles outlined in Appendix 1 may be used for this purpose.</p> <p><i>6. Consultation of local populations and interested groups</i></p> <p>Proponents must hold an information event to explain to salmon fishers or other user groups how they have taken into account the concerns of river managers and their choice of mitigation measures.</p>	<p><i>1.3 and 1.4 Delineation and characterization of landscape units</i></p> <p>Proponents must take into account salmon rivers during the assessment phase in cases where the landscape surrounding the river presents different anthropogenic uses (e.g., inhabited areas or vacation sites, fishing, camping, industry, etc.) or where the landscape presents distinctive natural features (e.g., the junction of mountains and plains).</p> <p><i>1.5 Description of strategic viewpoints onto the natural environment</i></p> <p>Proponents are required to identify the strategic viewpoints of salmon rivers, and qualify their value or significance. For example, they may conduct a qualitative analysis by consulting land managers and target user groups, and by identifying the portions of landscape already disturbed by human activity. They may also conduct a quantitative analysis by considering the economic spin-offs generated by recreational activities, traffic level and the duration of the estimated visual impact on the clientele.</p>

² The elements in this table refer to the sections in this Guide.

³ It should be noted that the table does not provide a systematic list of all the required elements outlined in the MDDEP environmental guidelines, but only those for which the MRNF has formulated additional requirements.

Visual enframingent of national park scenic views

Concerning the visual enframingent of national park scenic views (trails, lookouts, etc.), proponents must evaluate visual impacts, demonstrate that wind turbines blend well with the landscape from scenic viewpoints and, if necessary, propose measures for mitigating significant or inescapable visual impacts. This requires the identification and location of the national park's strategic viewpoints and the determination of impact zones (direct, intermediate, indirect - see Section 3). Subsequently, if necessary, proponents must identify and explain relevant mitigation measures. For example:

- For scenic views that must be protected or the quality of which must be maintained, and for the delineation of impact zones, proponents must comply with sections 1, 2 and 3 of this Guide and use established methods.
- For wind turbines visible within direct and intermediate impact zones, proponents must propose mitigation measures (Section 4) based on the principles outlined in Appendix 1 of this Guide or based on established methods.
- Following this, proponents must conduct a perception study among tourists (Section 6), present the results of their impact study and justify the installation scenario at the information meeting with local populations.
- It is also recommended that proponents conduct comparative analyses as described in Section 5 of this Guide.

Recreational trails

With regard to recreational trails, the MRNF is concerned with the preservation of existing uses and their quality. As a result, projects must take into account rights granted and trail-related infrastructure (lookouts, sanctuaries, shelters, hospitality facilities, etc.). The use of trails and other related infrastructure can depend on the quality or characteristics of the landscape. It is therefore important to the Department that proponents take into consideration existing uses. While proponents are required to comply with the guidelines presented in this Guide, it is possible to adapt them to the specific characteristics of an area. Proponents must explain their choice of approach. Table 2 presents the steps to follow for hiking trails that:

- have been identified by the Department as development priorities;
- have a protected strip of land 30 metres wide, in accordance with the *Regulation respecting standards of forest management for forests in the public domain* (RNI);
- enjoy regional recognition by all regional stakeholders.

In the case of equestrian or dog-sledding trails that have been identified as development priorities, it is also recommended that proponents meet the requirements listed in table 2.

For other regional trails (such as snowmobile and ATV trails) located in direct impact zones, mitigation measures are required with respect to trail-related infrastructure (e.g., lookouts and sanctuaries). An information event (Section 6) must be held with the regional associations concerned (e.g., snowmobiling club).

Table 2

General elements included in the MDDEP environmental guidelines ⁴	Specific supplementary elements of MRNF to be considered
<p><i>1.2 Delineation of the study zone (visual enframement)</i></p> <p>Proponents must conduct this analysis by geographically locating existing trails and related infrastructure. This infrastructure will serve to identify and locate the strategic viewpoints to be considered (Section 1.5).</p> <p><i>4. Mitigation of visual impacts</i></p> <p>If necessary, proponents must use established mitigation measures or generally accepted methods or, where applicable, compensation measures. The measures or principles outlined in Appendix 1 may be used for this purpose or new trails may be proposed.</p> <p>In cases where a proponent anticipates modifications to a trail route or the relocation of certain infrastructure, the approval of trail managers and, if applicable, regional organizations involved in trail development (e.g., URLS GÎM) must be obtained.</p>	<p><i>1.3 and 1.4 Delineation and characterization of landscape units</i></p> <p>Proponents must take trails into account during the assessment phase. It is recommended that proponents identify strategic sites and viewpoints which could serve as compensation measures in the event of trail relocation.</p> <p><i>1.5 Description of strategic viewpoints onto the natural environment</i></p> <p>Proponents are required to identify strategic viewpoints and qualify their significance. This identification exercise must take into account the concerns of regional organizations involved in trail development (e.g., URLS GÎM, Parcs Bas-Saint-Laurent, etc.) as well as those of trail managers, land managers, etc.</p> <p>View qualification should take into account the portions of landscape already disturbed by human activity, the condition of infrastructure and duration of the estimated visual impact on the clientele from the strategic viewpoints.</p> <p>If necessary, proponents may also identify strategic viewpoints that are not associated with existing infrastructure. These strategic viewpoints may serve as compensation measures in the redefining of trail routes or relocation of certain infrastructure.</p> <p><i>3. Project integration and determination of visual impacts</i></p> <p>Traffic level, clientele origin and viewpoint qualification must be taken into consideration in the delineation of impact zones.</p>

Other recreational/tourist sites or equipment

Consideration must be given to other recreational/tourist sites or equipment. Existing or anticipated vacation sites identified in a development plan, campgrounds, outdoor recreational centres, golf courses and ski resorts are examples of sites requiring mitigation measures or special measures to ensure the maintenance of visual quality. The area surrounding these sites may therefore be included as part of the direct impact zone, if necessary. The mitigation measures under consideration must be presented to the public during an information event and, where applicable, a perception study of the project in the landscape among the target clientele may be required.

⁴ It should be noted that the table does not provide a systematic list of all the required elements outlined in the MDDEP environmental guidelines, but only those for which the MRNF has formulated additional requirements.



Bibliography

AL-MASRI, Adib, *Landscape design principles*.
<http://www.geocities.com/adibmasri/>

Agence de l'Environnement et de la Maîtrise de l'Énergie.
Outils d'insertion sociale et territoriale des éoliennes (ISTE), France, décembre 2002
http://www.ademe.fr/Etudes/Socio/Gestion_energie.htm

Agence de l'Environnement et de la Maîtrise de l'Énergie et Comité de Liaison Énergies Renouvelables,
Des éoliennes dans votre environnement?, France, février 2002.
<http://www.cler.org/info/IMG/pdf/doc-23.pdf>

Les Autorités fédérales de la Confédération Suisse, Office fédéral de l'environnement, des forêts et du paysage,
Paysages et infrastructures, Suisse.
http://www.umwelt-schweiz.ch/buwal/fr/fachgebiete/fg_landinfra/freizeit/index.html

Avel Pen Ar Bed. *Éoliennes en Bretagne, Énergie éolienne - A propos des impacts : Une visibilité incontestable*, France,
http://www.apab.org/fr/page.php?id_rubrique=4&id_sous_rubrique=14

Comité de Liaison Énergies Renouvelables, *Un projet d'éoliennes sur votre territoire : Guide à l'intention des élus et des associations*, France, août 2002.
<http://aude.eolienne.free.fr/fichiers/GuideElus.pdf>

Conférence-débat du 08/05/2002 à Celles avec Monsieur le Ministre José DARAS : *Implantation d'éoliennes en Région wallonne : mythes et réalité*, Belgique, 2002.
<http://ifrance.com/celles-info/facilitateur.htm>

Conseil d'Architecture, d'Urbanisme et d'Environnement de la Seine-Maritime, *La mise en situation des projets éoliens dans le paysage : bilan et perspectives de l'expérience du Finistère*, France, octobre 2003.
http://www.caue76.org/c_envipay/AG%20eoliennes.htm

Danish Wind Industry Association, *L'insertion paysagère des éoliennes*, Danemark, mai 2003.
<http://www.windpower.org/fr/tour/env/>

Document tiré du Journal des Maires, France.
<http://www.journaldesmaires.com/lettre/circulaires/circ276.pdf>

Espace Éolien Développement, *ANEMONE - Analyse Environnementale et Modélisation Numérique Eolienne*, France, 2004.
<http://www.espace-eolien.fr/lille/General/ANEM01.htm>

Gouvernement du Québec, ministère de l'Environnement, Direction des évaluations environnementales, *Directive pour la réalisation d'une étude d'impact sur l'environnement d'un projet de parc éolien*, Québec, mars 2003.

Gouvernement du Québec, *Loi sur la qualité de l'environnement*, L.R.Q., c. Q-2.

Gouvernement du Québec, *Règlement sur l'évaluation et l'examen des impacts sur l'environnement*, R.R.Q., 1981, c. Q-2, r. 9.

Règlement sur les normes d'intervention dans les forêts du domaine public, *Remplacé, D. 498-96, 1996 G.O. 2, 2570; eff. 96-05-23; voir c. F-4.1, r. 1.001.1*

INGRAM, D. L., *Basic principles of landscape design*, États-Unis, juin 1991.
<http://www.mastergardenproducts.com/commercial/principleslandscapedesign.htm>

Office fédéral de l'énergie, Office fédéral de l'environnement, des forêts et du paysage et Office fédéral du développement territorial, *Concept d'énergie éolienne pour la Suisse : Bases pour la localisation de parcs éoliens*, Suisse, août 2004.
<http://www.juracretes.ch/d2wfiles/document/5020/74/0/Concept%20énergie%20éolienne%20CH.pdf>

La Préfecture de l'Aude, *Projet de « code de bonnes conduites » pour l'implantation raisonnée de l'éolien dans l'Aude*, France, mai 2003.
<http://www.aude.pref.gouv.fr/actualite/code-eolien.asp>

RGB Technologies, ministère des Ressources naturelles du Québec et Université du Québec à Rimouski, *Eole : Énergie verte*, Québec.
<http://www.eole.org/EneVerF.htm>

RODIE, S., et Anne STREICH, NebGuide, University of Nebraska, *Landscape Sustainability*, États-Unis, mai 2000.
<http://ianrpubs.unl.edu/horticulture/g1405.htm>

STEPHENS, Tom. *Principles & Elements of Landscape Design*, 2004.
<http://www.yourlandscapesolutions.com/principleelementsoflandscape.htm>

Town of Castle Rock, *Landscape Regulations & Principles, Section 4*, Colorado, États-Unis, juillet 2003.
<http://www.townofcastlerock.org/page.asp?navid=525>

United States Government, Department of the Interior, Bureau of Land Management, Washington Office - Recreation Group, *Visual Resource Management*, États-Unis, 2003.
<http://www.blm.gov/nstc/VRM/>

