

A Visual Effects Assessment Guidebook for Wind Energy Developments in British Columbia



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Ministry of
Forests, Lands and
Natural Resource Operations

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List of Acronyms used in this Guidebook

AIR	Application Information Requirements
BCGW	British Columbia Geographic Warehouse
C&E	Compliance and Enforcement
EAO	Environmental Assessment Office
FN	First Nation
FLNRO	Ministry of Forests Lands and Natural Resource Operations
LSA	Local Study Area
RVQC	Recommended Visual Quality Class
VC	Valued Component
VEA	Visual Effects Assessment
VQO	Visual Quality Objective
VSA	Visually Sensitive Area
VSC	Visual Sensitivity Class
WTG	Wind Turbine Generator

1.0 Introduction

Environmental assessments are conducted across Canada by provinces, territories and the federal government to assist in determining whether proposed major projects should proceed and, if so, under which terms and conditions. In British Columbia, major projects are assessed for their impacts by the Major Projects Office (MPO) of FLNRO or the BC Environmental Assessment Office (EAO).

During the assessment of a wind energy project in British Columbia, the Environmental Assessment Office (EAO) may require that the proponent assess visual impacts as part of the environmental assessment. Visual impacts can be an important consideration during the siting and construction of wind energy developments. The BC Environmental Assessment Office recognized this potential early on when reviewing the first wind energy project proposals in British Columbia. In many cases one of the valued components that must be addressed as part of the environmental assessment is Visual Quality (see Figure 1).

An environmental assessment is not required for projects under 50 MW. These sub-threshold projects go through the Ministry of Forests, Lands and Natural Resource Operations Major Projects Office (MPO) but require a development plan that addresses impacts.

While the environmental assessment for either process may require visual impacts to be assessed, it does not provide specifics in terms of what should be assessed, how it should be assessed and to what standard.

The approach described in this visual effects assessment (VEA) guidebook has been developed specifically to support the process for environmental assessments of terrestrial wind energy projects conducted by the EAO and MPO. However, the approach to assessing visual effects may be applicable to other sectors and projects.

1.1 Visual Effect Assessment

The role of a visual effects assessment (VEA) is to simulate in perspective/landscape view the appearance of a proposed wind energy development and evaluate the potential visual effect of the development. Visual Quality Objectives (VQO) convey societies desired level of visual quality on the landscape and are designated by government to guide management activities on the landscape. VQOs will be used as the benchmark for identifying, evaluating and mitigating the impacts of wind energy developments.

The VEA examines two aspects of a proposed development:

- the impacts of access roads, site clearing, meteorological towers and transmission lines and
- the impacts of the Wind Turbine Generators.

1.2 EAO - Local Study Area (or Local Assessment Area)

During the environmental assessment process, proponents are required to identify local and regional study areas as they provide the context for assessing project effects. (Ref: Environmental Assessment Office 2013) The Local Study Area (LSA) encompasses the zone of influence of the project, including areas that may be affected by project effects, such as air contaminants, noise, light, effluents, wastes,

employment and use of services and infrastructure. In some cases modelling may be required to determine the appropriate extent of the Local Study Area. To determine what a reasonable LSA radius should be for visual quality, FLNRO conducted a literature review. Sullivan *et al.* (2014) found that wind energy developments could be major sources of contrast at up to 16 kilometers and would be seen by casual viewers up to 32 kilometres. Vissering (2011) suggests that modern day projects using 2.0 MW or larger turbines are easily visible 24.1-32.2 Km under clear weather conditions. The Highland Council in the United Kingdom adopted a distance of 35 Km as the standard for evaluating the impacts of wind turbines. During its study FLNRO found that WTGs were clearly visible 17 kilometres away and could be seen by the casual viewer 35 kilometers distance. Based on the information above it is suggested that 20 kilometers be used as the default radius for the Visual LSA, but may vary depending on local project-specific criteria (e.g. proximity or orientation to nearby communities). There will undoubtedly be some circumstances where this distance may have to be increased to reflect local circumstances related to recreation or habitation. The decision on the final local study area and regional study area for visuals rests with EAO.

1.3 Dealing with Potential Adverse Effects

The environmental assessment in BC provides an integrated process for identifying, evaluating and mitigating the potential significant adverse environmental, economic, social, heritage, and health effects that may occur during the life of a reviewable project. The role of the visual effects assessment process is to determine if the proposed development will be consistent with visual quality objectives and the effects to the values component. In those cases where the VEA process determines that a project proposal will exceed the VQO, this will be interpreted to be an adverse effect. Where an adverse effect has been determined to occur it will be up to the EAO to specify in the draft environmental assessment certificate Schedule B, or the table of conditions, what specific measures will be required to prevent or mitigate any significant adverse effects.

1.4 When and where should a Visual Effect Assessment be completed?

Proponents are encouraged to complete a Visual Effects Assessment as early as possible in the environmental assessment process (including consultation on the choice of viewpoints –see section 1.5) Once a proponent has a concept plan with preliminary tower locations, the design should be tested from significant public viewpoints through modelling. If potential problems are detected changes can be made well before any major investment has been made. As shown in Figure 2, Visual Effects Assessments fall into two categories:

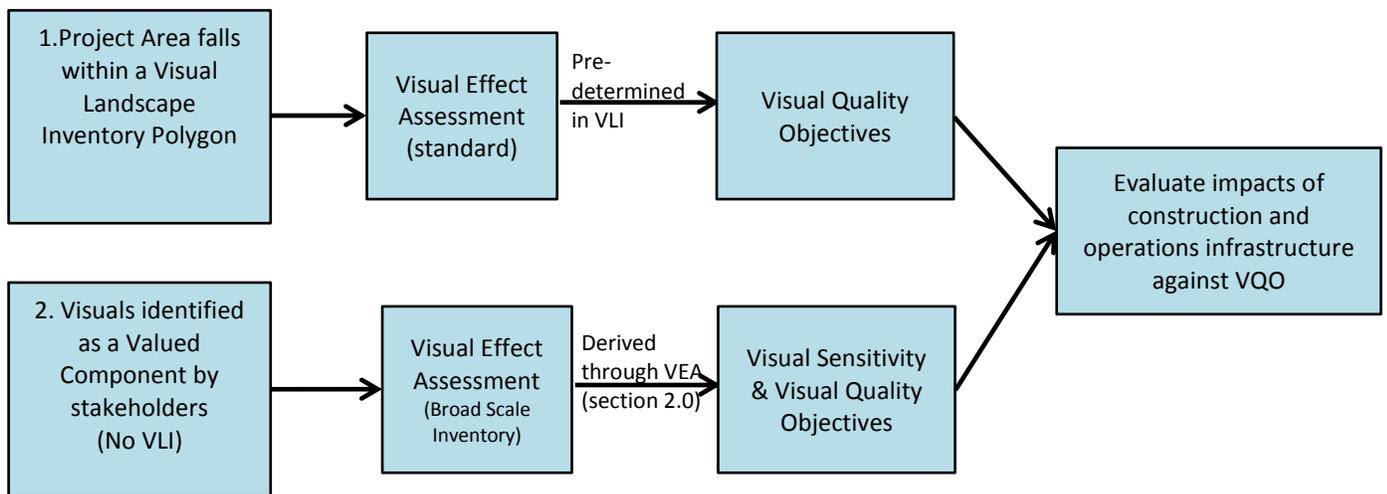
1. projects that fall within visual landscape Inventory polygons with a VQO; and/or,
2. projects where stakeholders or the public have identified viewpoints and/or areas of visual value for the environmental assessment.

Environmental Assessment Process with Visual Effect Assessment interaction shown.

A visual effects assessment should be completed for all projects that fall within visually sensitive areas as identified by the MFLNRO visual landscape inventory (VLI) mapping. VLI information can be viewed on-line using iMapBC (<http://maps.gov.bc.ca/ess/sv/imapbc/>) or the Visual Inventory Viewer

(<http://maps.gov.bc.ca/ess/sv/visinv/>). Proponents can download this information from DataBC (<http://catalogue.data.gov.bc.ca/dataset/visual-landscape-inventory>).

Figure 1 Flow Chart showing two VEA scenarios

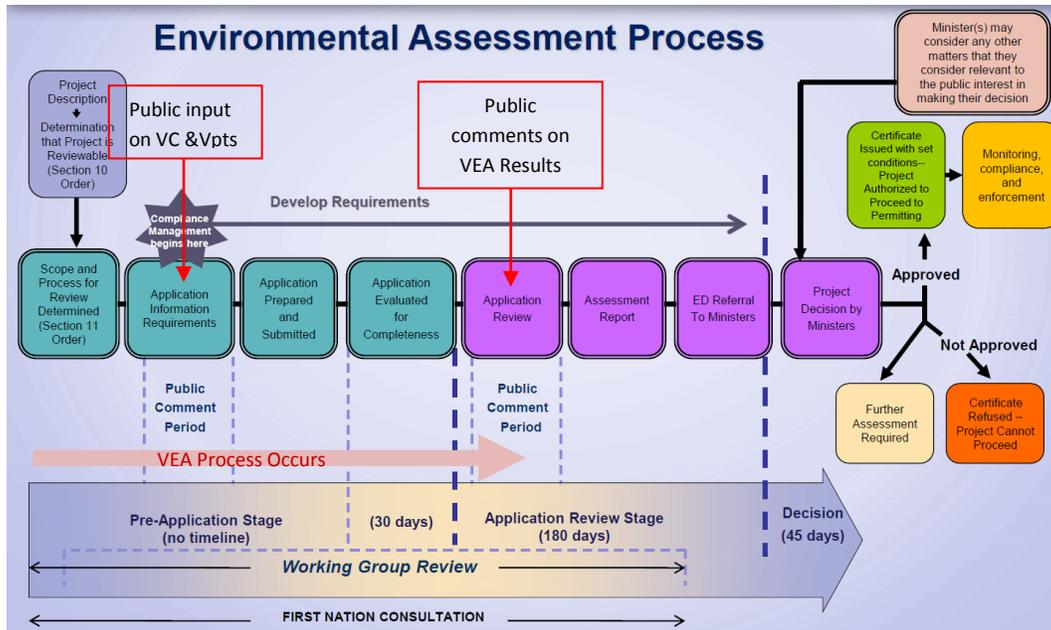


When proponents carry out their consultations as part of the environmental assessment requirements, the public, government agencies, local government, First Nations or recreation community may identify or raise issues about visual impacts for areas with and without VLI mapping. Such issues typically lead to selecting “Visual Quality” as a VC as part of the Application for Information Requirements (AIR). A visual effects assessment would then be completed for inventoried and non-inventoried areas. . Procedures to address non-inventoried areas are included in section 2.0.

1.5 Choosing Viewpoints for use in Visual Effect Assessment

A key part of the EA process is to seek input respecting a proposed project from the public, interests groups, government agencies, First Nations, stakeholders, etc. This ensures that concerns relevant to the assessment are identified so they may be examined and addressed. The first consultation for the proposed project is normally conducted on the valued components selected and/or on the draft Application Information Requirements (dAIR). Open houses are generally conducted at this stage (and at the Application review stage). Open houses are an appropriate time to gather information on the potential locations from which to conduct a VEA. Proponents could meet with Public Recreation groups, local government, FLNRO staff, Tourism Operators, First Nations, Park Officials, Guide Outfitters etc. with a map and seek their advice regarding viewpoints that should be used for assessing the visual effect of the proposed development. Considerations should also include First Nations spiritual sites and their importance/significance. Specific viewpoints selection will be discussed in more detail in section 3.2.1. If present, proponents should not rely exclusively on viewpoints tied to the VLI as these were created for a different purpose than visual effect assessments and may not relate specifically to the proposed project.

Figure 2 Environment Assessment Process with Visual Effect Assessment interaction shown.



2.0 Visual Sensitivity and Visual Quality Objectives

The first step in managing the visual resource in British Columbia is to determine what is visible and learn how sensitive a particular landscape is to change. The Ministry of Forests, Lands and Natural Resource Operations (MFLNRO) conducts visual landscape inventory work to achieve this goal.

Once completed the visual landscape inventory (VLI) identifies which landscapes are visible from communities, travel corridors, and other view locations throughout the province and rates how sensitive landscapes are to visual alteration. Approximately 15 million Hectares (16%) of the province has been mapped.

When completing inventory work the landscape is physically mapped from specific view locations and by travelling waterways and highway corridors. As the landscape is mapped, it is assessed using 35 factors and rated for its visual sensitivity to forest alterations and assigned a Visual Sensitivity Class between 1 and 5.

2.1 Visual Sensitivity Class

Visual Sensitivity Class (VSC) is an overall measure of the sensitivity of the landscape to visual alteration. It is an assessment of the likelihood that carrying out forest practices or other resource development activities on the landscape would give rise to some degree of criticism or concern. This could be of an economic nature (negative impact on a tourism operation) or a social nature (negative impact on a public recreation opportunity or the public's appreciation or enjoyment of an existing visual landscape).

Visual Sensitivity Class is expressed in terms of 5 classes. (See Table 1.)

Table 1 Visual Sensitivity Class Definitions

VSC Class	Description
1	Very high sensitivity to human-made visual alteration. The area is extremely important to viewers. There is a very high probability that the public would be concerned if the Visual Sensitivity Unit was visually altered in any way or to any scale.
2	High sensitivity to human-made visual alteration. The area is very important to viewers. There is a high probability that the public would be concerned if the Visual Sensitivity Unit was visually altered.
3	Moderate sensitivity to human-made visual alteration. The area is important to viewers. There is a probability that the public would be concerned if the Visual Sensitivity Unit was visually altered.
4	Low sensitivity to human-made visual alteration. The area is moderately important to viewers. There is a risk that the public would be concerned if the Visual Sensitivity Unit was visually altered.
5	Very low sensitivity to human-made visual alteration. The area may be somewhat important to viewers. There is a small risk that the public would be concerned if the Visual Sensitivity Unit was visually altered.

In the course of an inventory, certain areas will not be visible from any view locations and travel corridors and these areas are marked as “NVS” (Not Visually Sensitive) under the VSC field of the database. Other areas across the province not subject to development pressure or inaccessible to the public have not been inventoried and these are marked as “UA” (Unclassified Area) in the database.

A VLI database records both the spatial and attribute data in the corporate BC Geographic Warehouse (BCGW) which is accessible to the public. A variety of internet mapping framework viewers (Mapview, iMapBC and Visual Inventory Online) are available to view the data. VLI data can also be downloaded from the BCGW via DataBC.

If a Wind Energy project proposal falls outside the mapped VLI area (spatial area), normally no additional work is required. However, if the EAO working group or public identifies an area of concern or the proponent identifies Visual Resources or Visual Quality as a Valued Component (VC), a Broad Scale Assessment may be required. The role of the Broad Scale Assessment is to determine the visual sensitivity of the landscape within the wind energy project area. The Broad Scale Assessment used to classify non-VLI areas is described in appendix 2.

It is not expected that Broad scale assessment will take much time or add cost to a given project, as any mapping would involve only a few polygons, and is primarily an office exercise.

2.2 Visual Quality Objectives

Once the visual sensitivity of a landscape has been determined, a Visual Quality Objective (VQO) is established to guide management of industrial activities on the landscape.

A VQO is a resource management objective established by government to reflect societies desired level of visual quality on the landscape based on the physical characteristics and social concern for an area.

When a wind energy development foot print overlaps a VQO polygon(s), the VQO provides guidance as to the level of effect that is acceptable. In some circumstances the proposal may fall on a landscape with more than one VQO as seen from a given viewpoint. For these cases, use the VQO which makes up the greatest proportion of the area seen from the viewpoint.

VQOs may be brought into force through legal orders, Land Use Plans, or by making them a permit condition or contractual obligation. Once designated, VQOs guide management activities on the landscape.

Disclaimer:
 Natural Resource District offices may have established VQO's more recently via Government Actions Regulation (GAR) Orders which may not yet be represented within the BCGW. Therefore it is important to confirm the information currency with the Natural Resource District office before proceeding with the VEA.

There will be circumstances where wind energy projects are proposed on visually sensitive landscapes without an established VQO. In these circumstances the proponent should take direction from the recommended visual quality class (RVQC) contained in the visual landscape inventory. If the VLI does not include a rating in the RVQC field, then a default VQO rating can be derived using the visual sensitivity class-VQO conversion shown in Table 2. The known or anticipated level of public concern for a proposal may help in selecting which of the two VQO ratings is the most appropriate for the given VSC.

Table 2 VSC-VQO Conversion table.

VSC	Default Objective
VSC 1	<i>Preservation or Retention.</i>
VSC 2	<i>Retention or Partial Retention.</i>
VSC 3	<i>Partial Retention or Modification.</i>
VSC 4	<i>Partial Retention or Modification.</i>
VSC 5	<i>Modification or Maximum Modification.</i>

2.3 Roads, Site Clearing and Transmission Lines (Construction Phase)

The Forest Planning and Practices Regulation S.1.1 defines 5 categories of alteration that pertain to forestry operations (clearing and roads). The five categories are: Preservation, Retention, Partial Retention, Modification and Maximum Modification. See Table 3 for VQO definitions.

The construction of wind energy access roads and site clearing for transmission facilities produce impacts like forest operations and therefore will likely be evaluated in a manner consistent with the prescribed impacts associated with each established VQO.

Table 3 VQO Definitions for Clearing, Transmission Facilities and Road Impacts

VQO	Basic Definition
	"preservation" means an alteration of a forest landscape resulting from the presence of cut blocks or roads, such that when assessed from a viewpoint that is representative of significant public viewing opportunities, the alteration is

Preservation (P)	(a) very small in scale, and (b) designed to be indistinguishable from the pre-harvest landscape;
Retention (R)	"retention" means an alteration of a forest landscape resulting from the presence of cut blocks or roads, such that when assessed from a viewpoint that is representative of significant public viewing opportunities, the alteration (a) is difficult to see, (b) is small in scale, and (c) has a design that mimics natural occurrences;
Partial Retention (PR)	"partial retention" means an alteration of a forest landscape resulting from the presence of cut blocks or roads, such that, when assessed from a viewpoint that is representative of significant public viewing opportunities, the alteration (a) is easy to see, (b) is small to moderate in scale, and (c) has a design that appears natural and is not angular or geometric;
Modification (M)	"modification" means an alteration of a forest landscape resulting from the presence of cut blocks or roads, such that, when assessed from a viewpoint that is representative of significant public viewing opportunities, the alteration is very easy to see and is either (a) large in scale with a design that is natural in its appearance, or (b) small to moderate in scale but with a design that has some angular characteristics;
Maximum Modification (MM)	"maximum modification" means an alteration of a forest landscape resulting from the presence of cut blocks or roads, such that, when assessed from a viewpoint that is representative of significant public viewing opportunities, the alteration is extremely easy to see and one or both of the following apply: (a) the alteration is very large in scale; (b) the alteration is angular and geometric;

Note: "Significant public viewpoint" means a place or location on the land or water that is accessible to the public, provides a viewing opportunity and has relevance to the landform being assessed".

2.4 Wind Turbine Generators (Operational Phase)

The impact of the wind turbine generators are assessed using different VQO criteria than forestry operations. Wind energy developments create impacts as a result of their visibility, viewing distance, size, colour, number, position and distribution of wind turbine generators (WTG's) on the landscape.

Based on wind energy research in other jurisdictions, and with reference to VQO definitions currently in use in BC's forest sector the following Visual Quality Objective definitions have been adapted for application to wind turbine generators.

Table 4 VQO Definitions for WTG Impacts

VQO	Description
Preservation	Turbines are not visible within the broader landscape. The size of the turbines is so small, that they appear to be non-existent.
Retention	Element within Distant Landscape – Turbines are indistinct and form minor insignificant elements within a broader landscape. The apparent size of the turbines is very small.

Partial Retention	Noticeable – The turbines are clearly visible but not intrusive. The wind farm is noticeable as an element in the landscape. The turbines appear small in the overall view. Some change to the landscape setting.
Modification	Visually Intrusive – The turbines appear fairly large in scale, and are a distinct element in the landscape. However, they do not necessarily dominate the field of view.
Maximum Modification	Visually dominant – the turbines dominate the field of view and appear large scale. The character of the immediate area is substantially altered.

Adapted from Stevenson & Griffiths (1994)

These definitions have been tested and were validated through a public perception survey and were found to correlate well to public preference ratings.

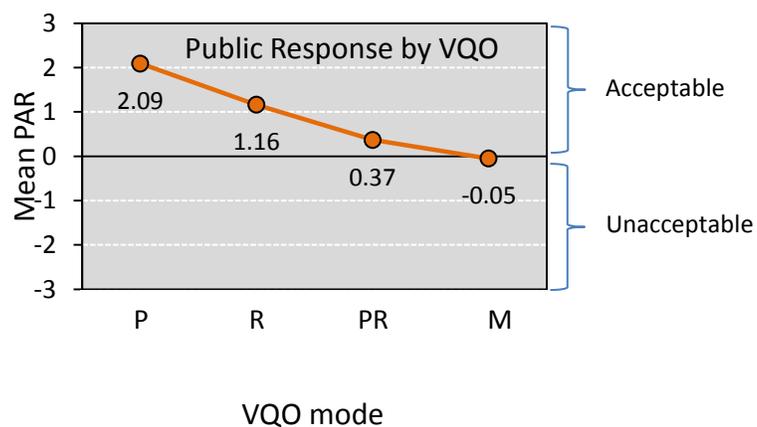
<https://www.for.gov.bc.ca/hfp/values/visual/Publications/VQ%20Wind%20Energy%20Web.pdf>

Reference: “Wind Energy Developments on Forested Landscapes”. Section 3.3.2 page 19.

MFLNRO incorporated this terminology in its public perception study done in 2014 to determine the public response to the various visual quality classes. The response was that the visual quality class A (Preservation) landscapes were most preferred. Successively, Class B (Retention) was preferred over Class C (Partial Retention), which was preferred over class D (Modification). Modification landscapes were the only class that did not receive a positive rating. This finding is highly significant for several reasons:

- Public response to the visual impact of WTGs is more positive than similar levels of visual impact from forestry operations.
- Wind Energy developments that meet Visual Quality Classes of Preservation, Retention and Partial Retention will generally be visually successful, while projects meeting a visual quality class of Modification may require some adjustments.

Figure 3 Public Acceptance Rating (PAR) to Visual Quality Classes



Once the images in the study had been classified by the public using the Stevenson & Griffiths table, (Table 4 above) statistical analysis was carried out to determine if an attribute or combination of attributes could be used to predict a visual quality class. The report concluded that 4 attributes (viewing

distance, viewing position, number and spacing of WTGs) used in combination could predict the visual quality objective of a development. Table 5 was subsequently developed as a decision support aid. It gives the Probabilities (%) of visual quality objective (P, R, PR, M) using four site attributes (Number of WTGs, spacing, viewing distance and viewing position).

Table 5 Visual Quality Class Predictor Table.

No. wind turbines	Turbine spacing	Viewing distance (km)											
		1			5			10			15		
		Viewing position			Viewing position			Viewing position			Viewing position		
		Above	Level	Below	Above	Level	Below	Above	Level	Below	Above	Level	Below
1	NA	PR	PR	PR	R	R	R	P	P	P	P	P	P
		90	86	53	82	85	70	89	94	99	100	100	100
2	NA	PR	PR	PR	R	R	R	P	P	P	P	P	P
		90	87	56	80	85	72	87	93	99	100	100	100
5	Uniform	PR	PR	PR	PR	PR	R	R	R	P	P	P	P
		63	75	90	73	59	79	65	51	86	99	100	100
	M	M	PR	PR	PR	PR	R	R	R	P	P	P	P
	80	68	75	90	88	60	86	84	52	95	97	100	
Irregular	M	PR	PR	PR	PR	R	R	R	P	P	P	P	
	65	50	85	87	81	57	83	75	66	97	99	100	
10	Uniform	M	PR	PR	PR	PR	R	R	R	P	P	P	P
		51	63	89	82	72	70	76	65	77	99	99	100
	M	M	PR	PR	PR	PR	R	R	R	P	P	P	P
	88	79	63	89	90	73	83	86	65	91	95	99	
Irregular	M	M	PR	PR	PR	PR	R	R	R	P	P	P	P
	77	64	77	90	87	56	86	82	52	95	97	100	
15	Uniform	M	M	PR	PR	PR	R	R	R	P	P	P	P
		66	50	85	88	81	57	83	76	65	97	99	100
	M	M	M	PR	PR	PR	PR	R	R	R	P	P	P
	93	87	51	84	89	82	77	84	76	84	91	99	
Irregular	M	M	PR	PR	PR	PR	R	R	R	P	P	P	P
	86	76	66	89	90	69	84	85	62	92	95	99	

Note: In the case of turbine spacing, Uniform means towers are evenly spaced or equidistant apart, Irregular means the distance between towers varies & Mixed means part of the development is seen as uniform and part of the development is seen as irregular.

Where from here?

Once the proponent knows what the VQO (management direction) is, the project can be planned and designed to be consistent with the objective or compatible with the visual sensitivity of the landscape. A Visual Effects Assessment (VEA) is the tool used to determine if the proposed development will be consistent with the objective.

3.0 Procedures for Conducting a Visual Effects Assessment

This section describes a step by step process for completing a visual effects assessment and identifies the various products that are required as part of the VEA submission.

3.1 Planning and pre-field trip preparation

The purpose of this step is to gather and transfer onto maps all of the information known, and record this information on the VEA Summary Form prior to carrying out the fieldwork. It is also a good time to contact Natural Resource District staff, Outdoor Recreation Groups, Tourism Operators and First Nation groups to confirm potential viewpoints to be used for the assessment. This was most likely done during the dAIR consultation phase.

For people who live, work, and recreate in a region, the landscape consists of layers of meaning which may not be fully understood by an outside professional conducting a visual assessment. If local residents and other interested parties can participate in the selection of viewpoints to be used for simulations the result of the process will usually be more widely accepted. For example First Nations may identify a feature that is of Cultural significance that they want protected.

Make a preliminary list of the locations from which the wind energy project may be visible based on consultations and background research (e.g. Parks, highway rest areas, recreation sites, communities, groups of homes and tourist-related commercial enterprises) and transfer them onto the map prepared for the assessment package. Field maps should include visual inventory polygons, inventory and other potential viewpoints, location of proposed development components, contours and other base data. Consult the visual landscape inventory database and mapping for the area of the proposed wind energy project. <http://maps.gov.bc.ca/ess/sv/visinv/> If the project falls outside the mapped VLI area, normally no additional work is required. However, if the public identifies an area of concern or the proponent identifies Visual Quality/Visual Resources as a valued component, a mini inventory (see Appendix 4) may be required to accomplish two things: Identify the visual sensitivity of the landscape and derive a VQO so that the VEA can be evaluated against that objective.

Caution: Viewpoints found on Visual Landscape Inventory mapping are used to derive visual sensitivity unit boundaries and to rate the sensitivity of these units to visual alterations. They are not specifically selected for the purposes of a Visual Effect Assessment so their appropriateness should be verified in the field prior to the simulations.

Complete photography and the assessment from the viewpoints that provide the best view of the landform or unit on which the wind energy project is proposed. Use the Visual Effects Assessment form (Appendix 1) to summarize the results of the assessment as described in the following sections. Complete one VEA form for each of the viewpoints selected for assessment.

3.1.1 Complete VEA Header

In the first section of the form, record the site information and identify the viewpoint number and location. Record the viewpoint number out of the total number of viewpoints used for the assessment e.g. 1 of 4, 2 of 4, etc.



**Wind Energy
Visual Effects Assessment
Summary Form**
(To be completed from each viewpoint analysed)

Viewpoint Number ___ of ___

3.1.1 Site Information (Office)	
Resource District _____	Viewpoint Location _____
Proponent _____	Wind Energy Project _____

3.1.2 Record VLI and VQO data on the VEA form

In the second section –either record the derived VSC and derived VQO if there is no VLI in place or the VSC rating and established VQO (or land use plan objective if applicable) currently in place that will guide the assessment.

3.1.2 VLI Information (Office)		
No Inventory	Visual Sensitivity Class	Established VQO or HLP Direction
Derived VSC _____	VLI Polygon No. _____	VLI Polygon No. _____
	VSC _____	Established VQO _____
Derived VQO _____		Date of Establishment _____
		Source Document _____
		HLP (If Applicable) _____

3.2 Field Visit

Following the assembly of information at the office, the next step of the VEA procedure is to gain an on-the-ground familiarity with the planning area from a visual perspective, to locate the pre-selected viewpoints, to investigate additional viewpoints, and to complete site photography. This step is also necessary to confirm whether the pre-selected viewpoints require updating on the basis of the actual viewing conditions.

3.2.1 Selecting Final Viewpoint(s) for VEA:

- Conduct the assessment using the means of travel most often used by the average visitor or traveler (i.e., vehicle, boat, on foot or any combination of the above).
- Estimate the location and visibility of the wind energy development and locate the viewpoints pre-identified in the office to confirm if they would provide the best view of the proposal being assessed. Add/delete from the pre-selection of viewpoints as required to ensure all possible view angles have been covered.
- Identify and number the final viewpoints selected on the topographic base map (1:20 000 scale or larger). Familiarize yourself with the landscape and the proposed development by

travelling throughout the study area as much as possible, taking note of special features, road stops, viewpoints, traffic pull-offs, and traffic conditions.

3.2.2 Taking photographs

At each selected viewpoint:

- Take a photograph, or a set of overlapping photographs, of the landscape to capture the entire landform where the development is proposed. Use high-resolution digital photography (e.g., TIFF or Fine JPEG format). Panoramas are best taken with a tripod. Refer to Appendix 2 for photography and presentation criteria.
- Use a DSLR camera with a 50 to 55-mm lens or equivalent to photograph the setting and landform of the alteration (human eye equivalency is 57 mm). This may necessitate a series of overlapping photographs (25% overlap minimum) to capture the entire scene. The photographs will later be spliced or stitched together to provide a broad panorama. Because it is crucial to capture images with proportions equivalent to what the naked eye sees, point-and-shoot or compact cameras are not suited for VEAs as typically, the focal length cannot be controlled.

Points to keep in mind:

- Take photographs in the spring, summer or early fall when illumination is best and there is no snow on the ground.
- Weather should be clear (90% cloud free) and the scene well illuminated for optimal photography. Avoid cloud shadows on landform for photography.
- East-facing units are best viewed in the morning and west-facing units are best viewed in the afternoon. Side lighting is beneficial for accentuating terrain detail.
- Photographs should be taken with a standard 50-mm lens or digital equivalent that creates a 38.6° angle of view, which most closely matches human visual perception. Shorter (wider) focal lengths tend to flatten out topography and the vertical impression of the turbines, while longer (narrower) focal lengths tend to exaggerate these features.
- When taking overlapping photographs, hold the camera as steady as possible, moving left to right while staying level and do not modify camera settings between shots.
- Panoramas can be taken either horizontally or vertically if dealing with large landforms.
- Photographs should be taken at minimum 5 mega pixel resolution, but preferably higher.
- Field workers should wear bright safety vests and use traffic cones when stopped and working along busy highways

3.2.3 Fill in the field section of VEA Form.

On the Visual Effects Assessment form (Appendix 1), record information about the viewpoint location, including GPS co-ordinates, elevation, viewing direction and vertical angle, distance to closest WTG and photography parameters.

3.2.3 Viewpoint (Field)	Photography (Field)
GPS Longitude (ddm) _____ GPS Latitude (ddm) _____ Viewing Direction (deg) _____ Vertical Viewing Angle (deg) _____ Viewing Distance (km) _____ Elevation (m) _____	Photo ID No's: _____ Camera Lens used (50-60 mm optimum) _____ Viewpoint Description _____ Viewpoint Importance: (Low) 1 2 3 4 5 (High) Digital

- *Viewpoint coordinates* – Identify the viewpoint location using a GPS unit and record the position using longitude and latitude coordinates (i.e., record degrees, minutes, and decimal seconds) and elevation (m).
- *View direction* – Record viewing direction using a compass bearing (0–360°) from the viewpoint to the centre of the proposed development being assessed.
- *Vertical View Angle* – Take a clinometer reading, using the degree scale, to the base of the landform and to the top of the landform. Where both numbers are positive, subtract the low number from the higher number to determine the field of view height. If the base number is negative, add this to the top measure to get the total field of view height. Example: If the two readings were +5° and -2°, the height of view would be 7° (5+2).
- *Viewing distance* – Measure the distance from each viewpoint to the closest proposed WTG. This can be done with a scale ruler on a hardcopy map, within the GIS environment, or by going online and using the measuring tool of Mapview for example.
- *Elevation* – Record elevation of viewpoint in meters using an altimeter or GPS unit.
- *Photo ID Nos.* - self explanatory
- *Focal length used* - 35mm equivalent focal length (50-55mm recommended)
- *Viewpoint description* – Record what the viewpoint is (i.e., rest stop, boat launch, lake surface, highway pullout, etc.).
- *Viewpoint importance* – Record the viewpoint importance using one of the 5 categories defined below:
 1. *glimpse view, less than 10 seconds,*
 2. *sustained side view,*
 3. *sustained focal view, traveling toward the alteration for more than one minute,*
 4. *viewpoint is at a rest stop, campsite, or other static short-term view location,*
 5. *viewpoint is the location of a community, commercial tourist-related enterprise, or other static long-term view location.*

Viewpoint importance is used to weigh the assessment results obtained from multiple viewpoints in the event that individual assessments differ in determining VQO achievement.

3.3 Prepare Visual Simulations

Prepare visualizations from each of the selected viewpoints to show the visual impact of access roads, clearing operations, transmission lines, meteorological towers and wind turbine generators (WTGs) on the landscape. Several types of simulations can be used to help predict how the project will appear. The most commonly used and recommended simulations use digital elevation models to either create realistic looking computer renderings or create accurate photographic renderings by digitally overlaying project components onto the photographs.

3.3.1 Photographic Simulations

Photographic simulations or photomontages based on still photographs taken from selected viewpoints are the most common (Figure 2.) and most realistic for the public. When using photographs it is imperative that access roads, transmission lines and WTGs are placed on the photo as accurately as possible. To accomplish this, a digital terrain model (DTM) is produced to spatially locate the WTGs on the landscape. The positions of the WTGs are then transferred from the DTM to the photograph by superimposing the photo on top of the DTM.



Figure 4 Photomontage showing proposed Westbank Wind Energy Project from Pennask Lake Provincial Park. Courtesy Zero Emission Energy Developments Inc.

3.3.2 Computer Simulations

Some professionals prefer 3-D visualization models, which create a digital image from selected viewpoints. These images eliminate the variability and lack of clarity in some photographs and can depict conditions ranging from clear blue skies to night time lighting conditions, but they are not as realistic in appearance and detailed as a photographic simulation.

Creating technically accurate simulations is critically important, so any manipulations that would either exaggerate or minimize the visual impacts of a proposed project must be avoided.

To create an accurate simulation, it is first necessary to build a Digital Elevation Model (DEM) using provincial TRIM data for the project area. This can be done in Visual Nature Studio or using other 3-D modelling software. Next, add the appropriate vegetation cover to the model by importing vegetation inventory data from the provincial geographic warehouse. Once this has been done, place the roads,

meteorological towers, transmission towers, and WTG's on the model by either importing available GIS data or placing the facilities using GPS coordinates collected in the field.



Figure 5 World Construction Set[®] rendering of proposed Quality Wind Development from Viewpoint 3 on Highway #52. Courtesy: EPCOR Power Development (BC) Limited Partnership

Once the model has been created it is now possible to produce views of the proposed development from each of the viewpoints visited in the field. To replicate the same view as is visible in the photograph it will be necessary to use the same GPS co-ordinates, the same horizontal and vertical viewing angles and the same camera lens (focal length). If the modelling is done accurately, the simulation will match the photograph taken from the same location i.e. ridgelines and creek draws in photo will match those in the model when produced at the same scale.



Figure 6 Post construction photograph from viewpoint 3 above.

Visual Nature Studio 3-D software is the industry standard used in BC to model forestry activities and has also been used extensively to model wind energy projects in other parts of the world.

3.3.3 Presentation Formats

The relationship between the size of the photograph and the distance of the observer is important for creating a realistic image. A minimum image size of "9 x 12" can be viewed at a comfortable arm's length, and it is preferable to smaller simulations. Poster-size simulations that can be viewed from about 4-5 ft away are suitable for public display.

The formula for determining the correct size of the image in relation to the distance viewed is as follows: Distance from viewer = Width of image / (2 • tan (HFOV1 / 2))

Where HFOV = Horizontal Field of View.

HFOV should equal 38.6 degrees when using a 50-mm lens or equivalent.

What is this dot in the above formula supposed to mean?

3.4 Assessing the Visual Simulation

The purpose of this step is to evaluate what visual impact the proposed wind energy project will have on the landscape and to determine if the impact is within the parameters of the VQO for the landscape. As described earlier the VEA will look at two aspects of a proposed development:

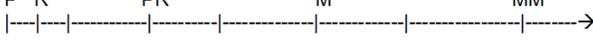
- the impacts of access roads, site clearing and transmission facilities and
- the impacts of the WTGs and meteorological towers.

3.4.1 Assessing roads, site clearing and transmission facilities

The impacts of the roads, transmission facilities and site clearing is to be assessed using the Forest Planning and Practices regulation terminology as discussed in section 2.3.

To assess this impact, compare what is visible in the visualization/simulation to the VQO definitions shown in Table 3 on Page 9.

Determine which definition best describes the impact and record the result in section 3.4.1 of the VEA form. Circle the location on the scale bar that best represents what is seen. If necessary refine the determination toward the lower or upper range for the class. For example, if an alteration is rated as PR, it may be closer to R, or to M, or somewhere in between. Identify the key words that rationalize the position that you chose and enter them to the right of the scale e.g. for Partial Retention it may be that clearing operations were “easy to see, small in scale and natural appearing”.

3.4.1 Assessing Visual Simulation: Clearing, site disturbance and transmission facilities	
Which VQO definition (category of alteration) will the proposed alteration achieve? Circle where in the range for that VQO.	
<p>P R PR M MM</p> 	Notes:

3.4.2 Assessing Wind Turbine Generators

To assess the WTGs and meteorological towers impacts, determine the viewing distance, viewing position, WTG number and WTG distribution associated with each visualization. This bracket does not make too much sense! Using this information go to the Visual Quality Class Predictor Table 5 to determine the most likely visual Quality Objective that the wind energy installation would achieve.

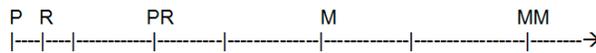
Record the predicted VQC/VQO in section 3.4.2 of the VEA form. Circle the location on the scale bar that the Table 5 predicts. Note: Table 5 does not cover every conceivable combination of attributes so some interpolation may be necessary. In this respect err on the side of caution. For example, if your viewing distance is 12 kilometers, use the 10 Km as opposed to 15 km. The opposite applies in terms of WTG numbers: If 13 WTGs are visible, use 15 not 10. Table 5 comes with % confidence ratings.

If necessary, refine the determination toward the lower or upper range for the class. For example, if an alteration is rated as PR, it may be closer to R or to M, or somewhere in between. A 100% confidence rating in Table 5 would allow you to circle the center point of each VQO on the scale bar. If the confidence is 60% this suggests that the development is trending towards another class. In this case you may circle the bar chart to one side or the other of the VQO and add a note to the right of the scale explaining why.

3.4.2 Assessing Visual Simulation: WTG size, shape, position etc.

Which VQO definition will the WTG's meet? Circle where in the range for that VQO:

Notes:



3.4.3 Determine Final Assessment

To make the final assessment as to whether the objective would be achieved, compare the results of the two assessments to the established VQO or derived VQO as described in box 3.4.3 below, and tick the appropriate box on the VEA form.

If both assessments result in the objective being met, this should be noted in the VEA write-up and no additional action is required.

If one assessment meets the objective but the other doesn't, determine how far from the objective you are and how important the viewpoint is.

If both assessment methods conclude the VQO will not be met, then some level of mitigation may be required to reduce adverse effects of the development.

3.4.3 Final Assessment

- | | |
|--|---|
| <input type="checkbox"/> VQO will clearly not be met | Both clearing activities and WTG impacts are well in excess of VQO range. |
| <input type="checkbox"/> VQO may not be met | Clearing activities will meet VQO, but WTG array will not. |
| <input type="checkbox"/> Borderline | Clearing activities and WTG array are on class boundary for VQO. |
| <input type="checkbox"/> VQO will be met | Both clearing activities and WTG impacts are well within VQO range. |

Though meeting the VQO is important, visual effects are considered in a proposed project because they are important to the stakeholders and the general public. As a result, projects subject to EA that are certified, may include construction, operations, or decommissioning conditions to mitigate project effects beyond those determined through a VEA. EAO in consultation with stakeholders and with input from subject matter experts may include conditions in the Table of Conditions (Schedule B) of the Certificate to mitigate any adverse visual effects of the proposed Project.

3.5 Assembling a Visual Effects Assessment Package

The recommended visual effects assessment package format and content is described below. Using this format will ensure that there is consistency in the way that information is submitted and will accelerate the review process. It will also provide reviewers and the public with consistent set of information in a standard format. While there are many factors influencing the type and amount of information needed in a visual effects assessment package, the following basic information is considered essential to any package.

1. Topographic or hill shade map (1:50 000 or larger scale) showing:
 - o Viewpoint locations and number.
 - o Major highways, roadways and other standard base map data.
 - o Conceptual WTG layout with tower positions identified.

- Proposed Wind energy clearing(s) and access road(s)
 - Transmission lines, meteorological towers and,
 - Visual sensitivity unit boundaries and VQO.
2. Pre-operations colour photograph(s) from each viewpoint (minimum size: 9 x 12").
 3. Visual simulation products showing proposed development from each viewpoint.
 4. Completed visual effects assessment summary form from each viewpoint. (Appendix 1).
 5. Commentary on projects conformance to VQO.

4.0 Glossary

Visual Quality Objective (VQO): A resource management objective established under the Government Action Regulation that reflects the public's desired level of visual quality based on the physical characteristics and social concern for the area.

Visually Sensitive Area (VSA): is an area that I considered sufficiently sensitive to visual alteration to warrant special consideration in strategic and operational planning. These areas may include viewsheds visible from communities, public use areas, travel corridors, including roadways and waterways.

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5.0 Appendices

Appendix 1 Visual Effects Assessment Summary Form.

Appendix 2 Broad Scale Assessment to Classify Non VLI Areas

Appendix 3 Photography and Presentation Criteria

Appendix 4 Visual Simulation Presentation Criteria

Appendix 5 Example Visual Effects Assessment from one Viewpoint

Appendix 6 Sample Visual Quality Class photo sheet.

Appendix 1 Visual Effects Assessment Summary Form



Wind Energy
Visual Effects Assessment
Summary Form
(To be completed from each viewpoint analysed)

Viewpoint Number ___ of ___

3.1.1 Site Information (Office)		
Resource District _____	Viewpoint Location _____	
Proponent _____	Wind Energy Project _____	
3.1.2 VLI Information (Office)		
No Inventory	Visual Sensitivity Class	Established VQO or HLP Direction
Derived VSC _____	VLI Polygon No. _____	VLI Polygon No. _____
Derived VQO _____	VSC _____	Established VQO _____
		Date of Establishment _____
		Source Document _____
		HLP (If Applicable) _____
3.2.3 Viewpoint (Field)		Photography (Field)
GPS Longitude (ddm) _____	GPS Latitude (ddm) _____	Photo ID No's: _____
Viewing Direction (deg) _____	Vertical Viewing Angle (deg) _____	Camera Lens used (50-60 mm optimum) _____
Viewing Distance (km) _____	Elevation (m) _____	Viewpoint Description _____
		Viewpoint Importance: (Low) 1 2 3 4 5 (High) Digital
3.4.1 Assessing Visual Simulation: Clearing, site disturbance and transmission facilities		
Which VQO definition (category of alteration) will the proposed alteration achieve? Circle where in the range for that VQO.		
	Notes: _____	
3.4.2 Assessing Visual Simulation: WTG size, shape, position etc.		
Which VQO definition will the WTG's meet? Circle where in the range for that VQO:		
	Notes: _____	
3.4.3 Final Assessment		
<input type="checkbox"/> VQO will clearly not be met	Both clearing activities and WTG impacts are well in excess of VQO range.	
<input type="checkbox"/> VQO may not be met	Clearing activities will meet VQO, but WTG array will not.	
<input type="checkbox"/> Borderline	Clearing activities and WTG array are on class boundary for VQO.	
<input type="checkbox"/> VQO will be met	Both clearing activities and WTG impacts are well within VQO range.	
Comments: In the event that the development will not be consistent with the VQO, describe what mitigating actions will be taken to reduce the impact of the development.		
Prepared By: _____		
Signature: _____	Date VEA Completed: _____	

Appendix 2 Broad Scale Assessment to Classify Non VLI Areas

When a wind energy development falls outside the provincial Visual Landscape Inventory mapping for an area, normally no additional visual work is required. However, if the EAO working groups or public identifies an area of concern outside mapped areas or the proponent identifies Visual Resources as a valued component (VC), a broad scale assessment may be required to determine a visual sensitivity class and subsequently a VQO for the project area.

The role of the broad scale assessment is to identify Visually Sensitive Areas (VSAs) in and around the project area as seen from potential view locations. This is largely an office mapping exercise generally completed at a scale that covers the project area and the potential view locations. The selection or field visit of site-specific viewpoints is not a pre-requisite for a broad-scale assessment but may prove useful in delineating VSAs if known.

The broad scale assessment consists of three steps:

- Information Assembly/Consultation Input
- Visually Sensitive Areas Mapping
- Classification of Visual Sensitive Areas

STEP 1: Information Assembly/Consultation Input

Generate a topographical map at the appropriate scale using the BCGS 20m contour intervals and include all the usual base data. Add Parks and Protected Areas, Recreation Sites and Trails, and commercial tourism centres/areas, all of which can be found on the BC Data Warehouse. Finally add to the map the project footprint and all associated components.

On this map record all the input received during the environmental assessment first consultation phase (dAIR stage) with respect to areas that public, First Nations, or stakeholders value from a visual standpoint.

It will be important to record detail such as:

- location of viewpoints and viewsapes valued by the public;
- types of user activities;
- an indication of amount of use; and
- viewer expectations and concerns.

Also record any existing information showing areas with visual concern or sensitivity that may exist for the general area under the proposal. For example: existing reports, land-use plans (e.g. SRMPs, LRMPs), or referral comments by ministry or other agency staff, First Nations, stakeholders or the public which provide indications of visual concerns for specific areas in and around the project proposal.

STEP 2: Visually Sensitive Areas Mapping

Visually sensitive areas are delineated using a combination of biophysical and social attributes. Where no previous Visual Landscape Inventories, higher level plans or district manager decisions have previously identified a VSA on a map, use the height of land on either side of a highway/water corridor, height of land encircling a lake or physical landforms (mountains, hills, plateaus) to define an initial VSA polygon boundary. This initial spatial boundary may be refined using the public input received in Step 1. Next, identify and record why the area is visually sensitive by consulting Table 1 below and recording the code (s) that best describe the unit being assessed.

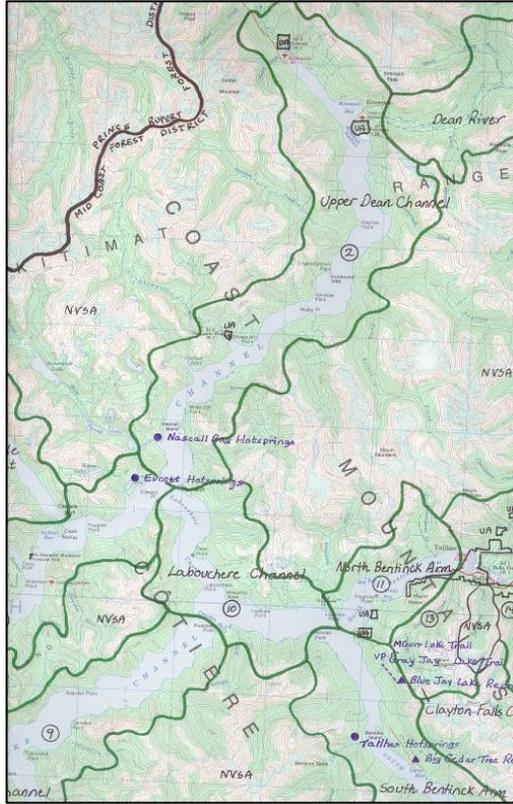
Table 1. Visually Sensitive Area (VSA) Descriptions	
1.	Areas visible from communities, public use areas, or travel corridors;
2.	Areas seen by a large number of viewers;
3.	Areas where public expectations for scenic quality are well above average (viewshed around backcountry lodge, tourism destination, highway rest stop, area adjacent to a Forest Service trail/site);
4.	Areas containing regional or local topographic features that are valued by the public;
5.	Areas that possess inherent visual or scenic values
6.	Areas identified as visually sensitive or scenic through referral or planning process (e.g. SRMPs, LRMPs);
7.	Areas of proposed new highway routes or changes to highway alignment;
8.	Areas visible from important high elevation viewpoints;
9.	Areas identified by tourism operators as important for tourism;
10.	Areas adjacent to high-use Forest Service roads which lead to popular recreation areas;
11.	Areas around important recreation features that attract the public;
12.	Areas that of are Spiritual Importance to First Nations; and
13.	Other (specify):

Use local knowledge gathered at the consultation phase to delineate further VSAs that meet the criteria.

After line work has been completed (polygons delineated), assign a unique identification number to each VSA for reference.

Any visual input received during the formal EAO consultation process or the additional input sought as described above should be tracked as part of the EA process.

Figure 1. Example of a Completed Visually Sensitive Area Map



STEP 3: Classification of Visually Sensitive Areas

Once the visually sensitive areas have been mapped (polygons delineated), complete the VSA Classification Form included below for the mapped area, each VSA on its own line. The purpose of classifying VSAs is to compile the base data necessary to derive visual sensitivity classes (VSC) and visual quality objectives (VQO), both of which being defined in Section 2 of these guidelines. The form is designed to document the mapper's reasoning. It also attempts to standardize ratings.

First complete the administration section of the VSA Classification Form i.e. boxes 1 to 6.

If you have mapped more than one VSA, record the unique number assigned earlier in box 7. Record the name of the VSA in box 8 using the name or number of a highway, or geographic reference such as lake name, mountain name etc. In box 9 record the VSA codes derived in Step 2 (Table 1).

Determine Viewer Rating (Visual Sensitivity)

Next derive the viewer rating. Viewer rating is a measure of the **number** of people likely to view the VSA and the preferences, **expectations** or concerns they have about how they would like the VSA to look.

Number of Viewers is a measure of the number of people who view or look at a VSA. The greater the number of viewers, the more sensitive the VSA. The type of activity pursued by viewers will often

determine whether viewer numbers are large or small. The size of a nearby community may also determine the number of viewers.

The rating for *Number of Viewers* is determined as follows: using local knowledge of use patterns, results of visitor surveys (if available) and information from the public input, compare what is known about viewer numbers to the examples in the table below; record the appropriate rating (H, M, or L) on the VSA Classification Form (box 10).

Examples:

High (3)	Moderate (2)	Low (1)
A. large numbers of viewers relative to type of activity being pursued	A. moderate numbers of viewers relative to the activities being pursued	A. low numbers of viewers relative to the type of activity being pursued
B. 5,000 vehicles per day or 500,000 vehicles per year over a given highway	B. 1,000 vehicles per day or 100,000 vehicles per year	B. 200 vehicles per day or 20,000 vehicles per year
C. >5,000 users per year at a BCFS recreation site	C. 500 - 5000 users per year at a BCFS recreation site	C. 0 - 500 users per year at a BCFS recreation site
D. 1,000 kayakers per year	D. 200 kayakers per year	D. 50 kayakers per year
E. 1,000 hikers per year on a given trail	E. 200 hikers per year	E. 50 hikers per year
F. other	F. other	F. other

Viewer Expectations/Concerns is a measure of the importance the public places on the Visual Sensitivity Area. The higher the importance, the more sensitive the VSA. Landscapes are viewed by a wide range of people, often with different values, perceptions and expectations. Some landscapes, such as back country lake settings, may be viewed by relatively few people, but are visually sensitive due to the viewer's high expectations for a natural setting. People with an economic interest (e.g. tourism operator's), or personal attachment (e.g. resident, repeat recreationist) to a particular landscape will generally have a higher level of concern for its visual quality than people passing through the same landscape (e.g. highway traveler). On the other hand, some people who have an attachment to the landscape (i.e. make their living from the forest) may have a different expectation for the visual quality.

The rating for *Viewer Expectations/Concerns* is determined as follows: using local knowledge of resident expectations and information from the consultation/public input process, compare what is known about viewer expectations or concerns to the descriptions below, then determine which best describes viewer expectations/concerns. Record the appropriate rating (H, M, or L) on the VSA Classification Form (box 11).

High (3)	Moderate (2)	Low (1)
A. scenic quality is of primary importance to the activity or experience pursued (e.g. boating, kayaking, cruise ships, commercial tourism operations); or;	A. scenic quality is of secondary importance to the activity or experience pursued (e.g. sport fishing, BC Ferry passenger, highway traveler); or;	A. scenic quality is of little interest or importance to the activity or experience pursued (e.g. resource development activities such as logging, mining); or,
B. majority of viewers have high expectations/concerns for visual quality	B. majority of viewers have moderate expectations/ concerns for visual quality	B. majority of viewers have low or no expectations/ concerns for visual quality

Derived Visual Sensitivity Class

To determine the visual sensitivity class for the VSA, add together the values for viewer numbers and viewer expectations to get a total score. (High = 3 points, Moderate = 2 points and Low = 1 point). For example, if Number of Viewers is High (3 Points) and Viewer Expectations is High (3 Points), the total score would be 6. Compare the number for your combination with the table below and record the predicted VSC rating on the VSA Classification Form (box 12).

Total numeric values of Numbers & Expectations	Predicted VSC
6	2
4 - 5	3
2 - 3	4

Derived VQO

Based on VSC derived above, use the default VQO provided below for management purposes and record the VQO rating on the VSA Classification Form (box 13).

If VSC=2, VQO=R

If VSC=3, VQO=PR

If VSC=4, VQO=M

Finally, enter any pertinent comment in box 14 of the VSA Classification Form.

Appendix 3 Photography and photograph presentation criteria in perspective view.

Taking photographs

- Take photographs that provide the best views of the proposed wind energy development area.
- Weather should be clear (90% cloud free) and the scene well illuminated for optimal photography. Illumination is strongest in the summer months. Avoid cloud shadows on landform for photography.
- Photographs should be taken with a 50-mm lens or digital equivalent that creates a 38.6° angle of view, which most closely matches human visual perception. Shorter (wider) focal lengths (28 & 35 mm) tend to flatten out topography and the vertical impression of the turbines, while longer (narrower) focal lengths (100+ mm) tend to exaggerate these features.
- The human eye is much sharper than any camera lens, so photographs should be taken at the highest resolution possible.
- Take enough photographs to capture entire landforms (i.e., panoramic shots), even if no proposals are planned for adjacent landforms. Once juxtaposed and mounted, these photomontages provide the visual context necessary to assess the overall visual impact of specific development proposals.
- Mark photo locations(s) on map (i.e., identify photo point on the topographic map to within 50 m on road or water).
- Use a Global Positioning System (GPS) to more accurately determine the x, y, and z co-ordinates of each viewpoint. Also record the horizontal view direction (using a compass) and vertical angle of view (using a clinometer) for each photograph or set of photographs for panoramic views.
- When taking overlapping photographs, go from left to right while staying level and do not modify camera settings between shots.
- Panoramas can be taken either horizontally or vertically if dealing with large landforms.

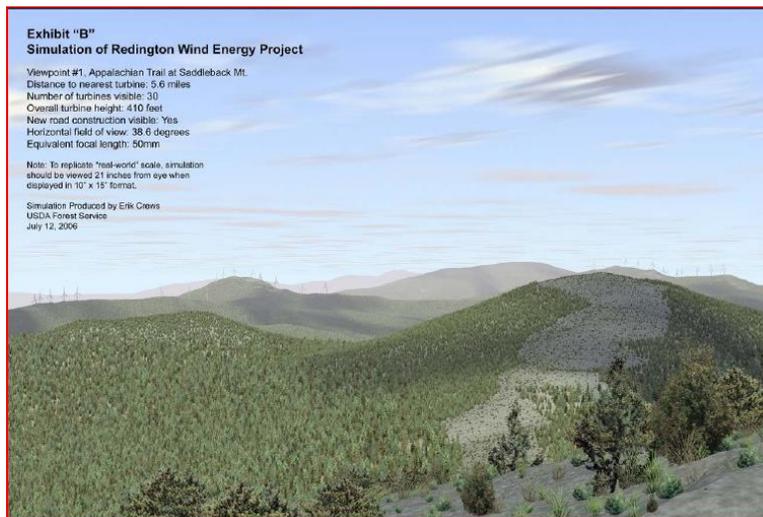
Presenting Photographs

- The recommended print size for presentation is 9 x 12 inches . A large print size helps to overcome the illusion of compression created by small print sizes and is easier to work with.
- Splice together overlapping photographs to present broad panoramas.
- If the photomontages will be used for public meetings or for displays, mount them on a rigid backing such as foam core boards.
- Label the photo with the photo location (e.g., "Viewpoint #1 or name"), the date photographs were taken, the lens used (e.g., 50 mm) and direction of view.
- Print the relevant portion of the topographic map for the area to show the photo point, direction of view, and the portion of the development area seen; and attach this to the photographs for easy reference.

Appendix 4 Visual Simulation Presentation Criteria

The following information should be included with or shown on each visual simulation plot:

- Title (e.g., "Simulation of. . .")
- Geographic area name (e.g., Lake X, Highway XX)
- Viewpoint number and name.
- Viewpoint co-ordinates longitude and latitude degrees, minutes decimal seconds
- Elevation of viewpoint above ground (normally 1.6 m)
- Distance to nearest turbine
- Number of turbines visible
- Turbine Spacing
- Viewing Position
- Turbine height
- Proponent name
- Average tree height used for forest cover
- Lens size, MFLNRO recommends 50-60 mm.
- Direction of view angle in degrees (centreline of vision cone)
- Vertical viewing angle (degrees)
- Vertical exaggeration (MFLNRO requests none)
- Name and contact information for person who produced simulation.
- Date produced.

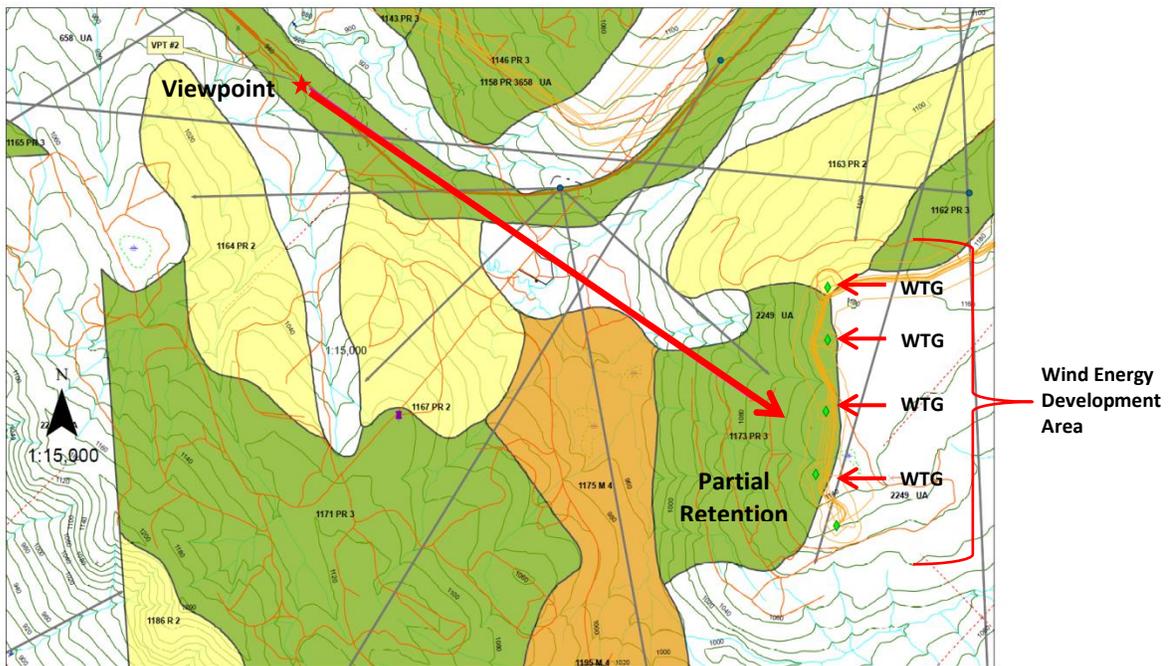


Notes:

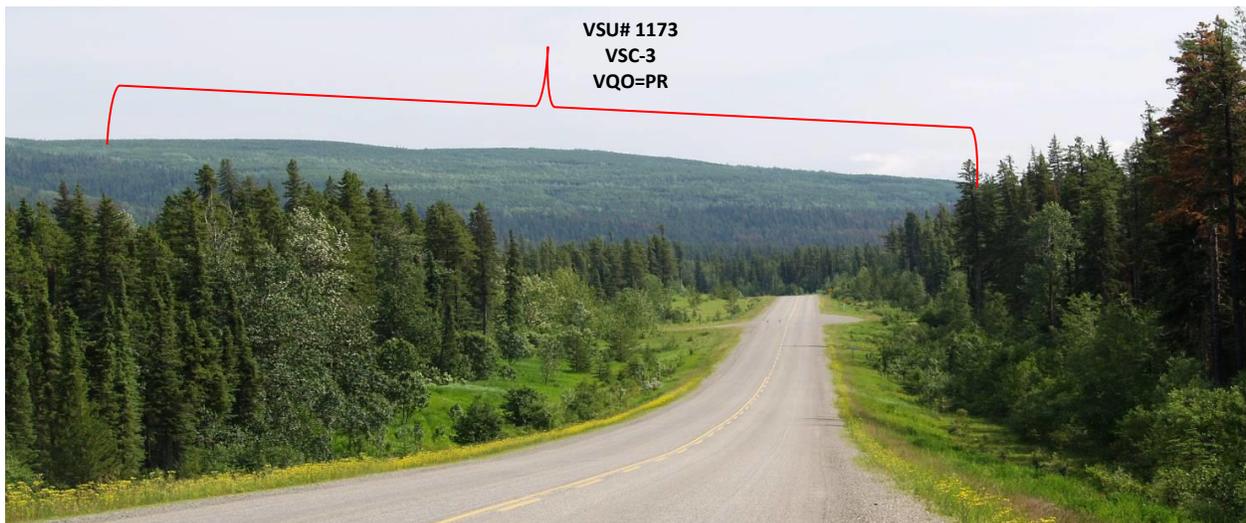
- The recommended visual simulation plot size is 11 x 17 inches or larger if the panorama is made up of many individual shots so that proper proportions can be maintained.
- A photograph or series of photographs spliced together taken from the same viewpoint location as the simulation should also be attached to the plot, especially if used for public presentation.
- The plan-view map DTM plot and photograph(s) should all be oriented in the same way in relation to each other.

- If colour codes are used on the plot instead of labels, then a colour-coded legend should be used to differentiate between water features, existing and proposed roads, and existing and proposed clearings.

Appendix 5 Example Visual Effects Assessment from one Viewpoint



Step 1 Identify wind energy development area, preliminary WTG locations and VQO for area.



Step 2 Photograph existing Landscape from selected viewpoint and identify VQO that applies.



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Step 3 Prepare a simulation of the proposed development from selected viewpoint.

No. wind turbines	Turbine spacing	Viewing distance (km)											
		1			5			10			15		
		Viewing position			Viewing position			Viewing position			Viewing position		
		Above	Level	Below	Above	Level	Below	Above	Level	Below	Above	Level	Below
1	NA	PR	PR	PR	R	R	R	P	P	P	P	P	P
		90	86	53	82	85	70	89	94	99	100	100	100
2	NA	PR	PR	PR	R	R	R	P	P	P	P	P	P
		90	87	56	80	85	72	87	93	99	100	100	100
5	Uniform	PR	PR	PR	PR	PR	R	R	R	P	P	P	P
		63	75	90	73	59	79	65	51	86	99	100	100
	Mixed	M	M	PR	PR	PR	R	R	R	P	P	P	P
		80	68	75	90	88	60	86	84	52	95	97	100
	Irregular	M	PR	PR	PR	PR	R	R	R	P	P	P	P
		65	50	85	87	81	57	83	75	66	97	99	100
10	Uniform	M	PR	PR	PR	PR	R	R	R	P	P	P	P
		51	63	89	82	72	58	76	65	77	99	99	100
	Mixed	M	M	PR	PR	PR	R	R	R	P	P	P	P
		88	79	63	89	90	73	83	86	65	91	95	99
	Irregular	M	M	PR	PR	PR	R	R	R	P	P	P	P
		77	64	77	90	87	56	86	82	52	95	97	100
15	Uniform	M	M	PR	PR	PR	R	R	R	P	P	P	P
		66	50	85	88	81	57	83	76	65	97	99	100
	Mixed	M	M	M	PR	PR	PR	R	R	R	P	P	P
		93	87	51	84	89	82	77	84	76	84	91	99
	Irregular	M	M	PR	PR	PR	R	R	R	P	P	P	P
		86	76	66	89	90	69	84	85	62	92	95	99

Viewing Distance = 4.3 Km (closest)
 No. WTGs Visible = 8
 Viewing Position = Below
 Turbine Spacing = Mixed

3.4.2 Assessing Visual Simulation: WTG size, shape, position etc.

Which VQO definition will the WTG's meet? Circle where in the range for that VQO: Notes:

P R PR M MM

Step 4 Evaluate predicted VQO using predictor table.

VSU# 1173
VSC-3
VQO=PR

3.4.3 Final Assessment

VQO will clearly not be met Both clearing activities and WTG impacts are well in excess of VQO range.

VQO may not be met Clearing activities will meet VQO, but WTG array will not.

Borderline Clearing activities and WTG array are on class boundary for VQO.

VQO will be met Both clearing activities and WTG impacts are well within VQO range.

Partial Retention – The turbines are clearly visible but not intrusive. The wind farm is noticeable as an element in the landscape. The turbines appear small in the overall view. Some change to the landscape setting.

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Step 5 Identify final assessment combination that applies. In this case the VEA concludes that the VQO of Partial Retention will be achieved.

Appendix 6 Wind Energy Visual Quality Class Examples.

The following photo sheet provides some examples of wind energy scenes broken down by visual quality class as obtained by the public perception study done in British Columbia in 2014. The average Public Acceptance Rating (PAR) is presented to the right. The survey ratings were +3 very acceptable to -3 very unacceptable.

<p>Class A - Preservation Turbines are not visible within the broader landscape. The size of the turbines is so small, that they appear to be non-existent</p>		<p>Average PAR + 2.09</p>
<p>Class B- Retention Element within Distant Landscape – Turbines are indistinct and form minor insignificant elements within a broader landscape. The apparent size of the turbines is very small.</p>		<p>Average PAR +1.16</p>
<p>Class C-Partial Retention Noticeable – The turbines are clearly visible but not intrusive. The wind farm is noticeable as an element in the landscape. The turbines appear small in the overall view.</p>		<p>Average PAR +0.37</p>
<p>Class D-Modification Visually Intrusive – The turbines appear fairly large in scale, and are a distinct element in the landscape. However, they do not necessarily dominate the field of view.</p>		<p>Average PAR -0.05</p>