Cumulative Effects Framework

Assessing and Managing Cumulative Effects in British Columbia

Howe Sound Cumulative Effects Project

Visual Quality – Current Condition Report

South Coast Natural Resource Region

Ministry of Forests, Lands, Natural Resource Operations and Rural Development

November 27, 2018

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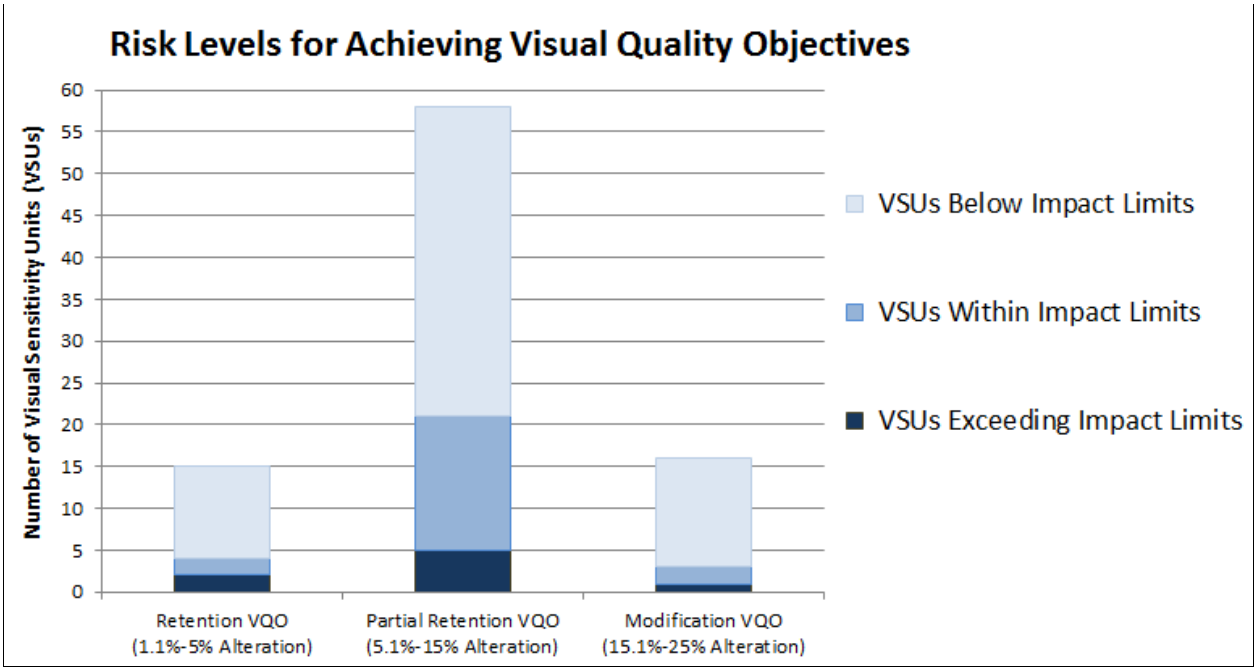
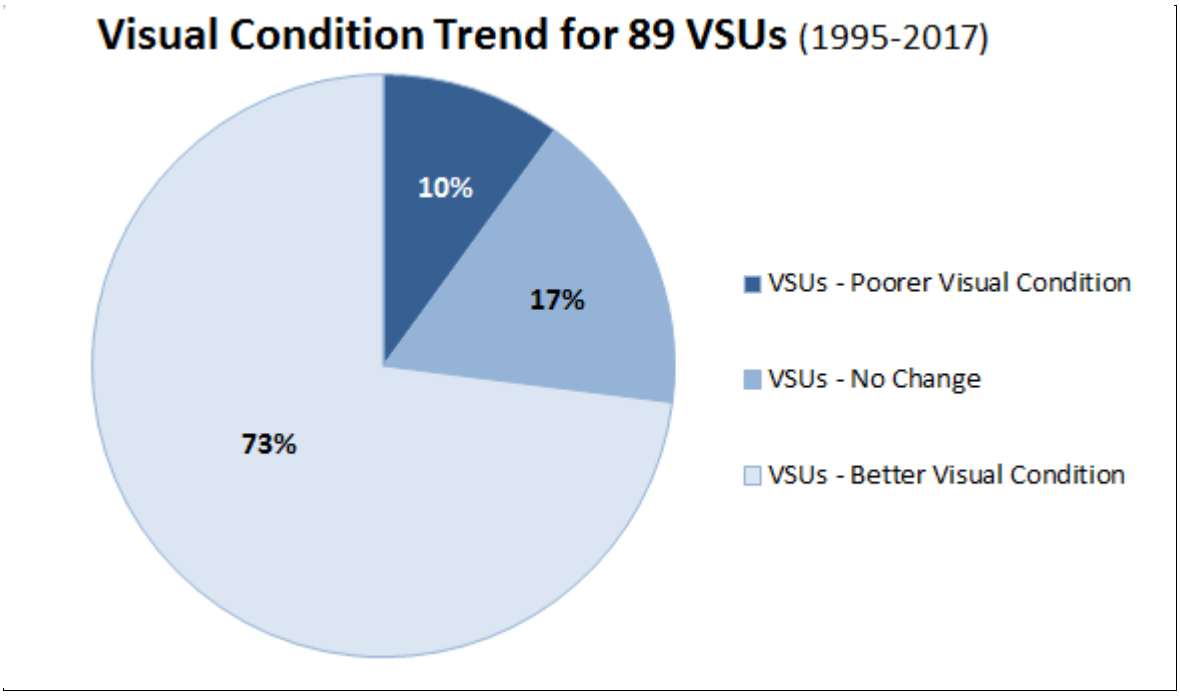
Executive Summary

The Howe Sound Cumulative Effects Project represents the Province's initial application of the Cumulative Effects Framework in the South Coast Natural Resource Region of the Ministry of Forests, Lands, Natural Resource Operations and Rural Development (FLNRORD). This report presents a current condition assessment of visual quality in the Howe Sound area.

This report is mainly comprised of one forest visual quality indicator map, one forest visual condition trend map and several supplemental information maps. The assessment approach is based upon the draft South Coast Visual Quality CE Assessment Procedures. It estimates forest visual quality by calculating the percent of forest alteration from a planimetric view (map view) rather than a perspective view (on-the-ground public view points). The results from this assessment provide a general indication of the current condition of the forest visual quality value by estimating the extent that the Visual Quality Objectives (VQOs) for 89 identified Visual Sensitivity Units (VSUs) in the Howe Sound CE Project area have been achieved. The following graphics provide a general summary of the assessment results and show the respective risk levels for the 89 VSUs as categorized by the three VQOs in the Howe Sound area.



The results for this visual condition assessment indicate that 81 of 89 VSUs (91%) are likely achieving their visual quality objectives. The risk levels for the 89 VSUs are: 61 VSUs (69%) are likely below their alteration limits; 20 VSUs (22%) are likely within their alteration limits; and 8 VSUs (9%) are likely exceeding their alteration limits. Validation of these results from a perspective view is needed to confirm whether legal VQOs in the area are actually being met.



The visual condition trend data (planimetric view) from 1995 to 2017 indicates that 90% of the VSUs in 2017 are showing less disturbance or no change in their forest visual condition as compared to the visual condition in 1995 (73% of VSUs have less disturbance and 17% no change). This reduction in forest disturbance levels in 65 VSUs is likely due to old cutblocks having been reforested and achieving visual green-up, and also to more constraints on forest harvesting. Overall, the results from this general planimetric assessment indicate that forest licensees working in the area are adhering to provincial VQOs.

Most of the VSUs in the project area have experienced some kind of visual impact from other economic sectors but this is not captured in this assessment as those other sectors are not subject to legal visual quality objectives (e.g. energy right of ways, mineral/aggregate extraction, highway infrastructure etc.). As of 2017, 53% of the VSUs in the project area had experienced visual impacts from permanent land developments. Developments on private land adjacent to Crown forest lands are also having an impact on visual quality in the broader Howe Sound area (e.g. industrial and residential development).

FLNRORD is currently exploring a number of actions in response to these results such as: updating VQOs for any new tourism/recreation areas; validating the existing results with perspective view assessments and site-level forest inventory; and applying these risk assessments to land and resource planning and management decisions where possible.

Long-term monitoring and validation of the assessment results is important to the management of the visual forest condition and meeting legal visual quality objectives. Comparing the assessment results to complementary on-the-ground forest visual condition information will more accurately confirm or reject the results and predictions. The Province's Forest, Range and Evaluation Program (FREP) conducts periodic Visual Quality assessments from public viewpoints in the Howe Sound area to verify if VQOs are actually being met. Collectively, these results offer information that can be considered immediately in certain statutory decisions (i.e. major projects, urban land development and forest management) and public discussions on visual quality.

The results of this assessment will also be incorporated into new decision-support tools and processes that FLNRORD-South Coast is currently developing. These tools and processes will: integrate and communicate resource value objectives; assess how well these objectives are being achieved; and provide the basis for the development of integrated resource management responses. The management of forests and forest visual quality has evolved considerably over the past several decades but still has room for improvement when it comes to its broader application to the whole natural resource sector.

The results from this assessment provide a coarse filter estimate of the current visual condition by VSU and may not reflect the actual visual condition. The GIS-based planimetric approach used in this assessment is cost effective and can provide a general overview of some factors relating to visual quality but it is not intended to replace more accurate perspective visual assessments from key public view points. Therefore, the results in this assessment do not necessarily tell the whole story and more field validation is warranted.

1. Introduction

The Howe Sound Cumulative Effects Project represents the province's initial application of the Cumulative Effects Framework in FLNRORD's South Coast Natural Resource Region. This report presents an initial current condition assessment of forest visual quality in the Howe Sound CE Project area (Appendix I). Other values being assessed for current condition in the Howe Sound area include: Aquatic Ecosystems, Old Growth Forests, Forest Biodiversity, Grizzly Bear, Roosevelt Elk and Marbled Murrelet.

The Province of British Columbia views the assessment and management of cumulative effects as a vital part of sustainable and integrated resource management, and an important foundational piece for addressing First Nations rights and interests. As population and resource demands grow, we must be able to measure the effect of all natural resource activities, large and small, on values that are important to the people of British Columbia. In January 2014, cabinet provided direction for the development and phased-implementation of the BC *Cumulative Effects Framework* (CEF). The intent of the CEF is to incorporate the combined effects of all activities and natural processes into decision-making to help avoid unintended impacts to key economic, social and environmental values. For more, see the CEF website: http://www2.gov.bc.ca/gov/content/environment/natural-resource-stewardship/cumulative-effects-framework .

The Howe Sound Cumulative Effects Project will help with the implementation of a coordinated, multi-sector approach to assessing and managing cumulative effects. This will be achieved by providing transparent decision-support information to the province, First Nations, other levels of government, and non-government stakeholders (e.g. forest licensees).

FLNRORD's South Coast Natural Resource Region has identified forest visual quality as one of its initial values for CE assessment in the Howe Sound area. Forest visual quality is important to local First Nations, communities, stakeholders and the broader public (see Appendix II). BC's visual resource management program conducts a range of activities that strive to maintain scenic quality. The Sea-to-Sky/Howe Sound area is an international tourism corridor that relies on its natural areas and scenic beauty. The area also supports a number of natural resource-based industries that support the local economy. The Province uses legal objectives (see Appendix III) and also encourages forest licensees to be innovative in their forest management practices to help maintain scenic values and balance many other public values in the area.

The intent of this report is to provide an assessment of the forest visual condition based upon the VQOs in the project area. The assessment uses a planimetric view and one forest visual condition indicator derived from the Visual Quality CE Assessment Procedures (Appendix IV) to

estimate the extent to which the VQOs in the area have been achieved. The results provide an indication of *Forest Act* tenure holders' (i.e. forestry operations) impacts to the forest visual condition in the project area, while also providing additional context. The report contains one indicator map, a trend map and some supplemental maps and contextual information (Appendix V) to help with the initial interpretation of the results. The report does not assess the degree to which other sectors like residential development, energy development, mining development, and transportation development affect the forest visual condition.

The results from this assessment will be considered by FLNRORD to inform future assessments, planning projects, management decisions and resource management objectives. The current condition results provide some important information on forest visual quality by VSU in the Howe Sound area. Further validation, analysis and contextual examination will be required before assessing the actual risk to forest visual quality in these assessment units. Therefore, the results in this assessment (relative to risk level benchmarks) do not necessarily tell the whole story and more investigation is required to determine if special management actions are warranted.

2. Assessment Approach for Visual Quality

The conceptual model is intended to provide an initial foundation for a consistent approach to a region-wide assessment of visual quality using standardized GIS methodologies and consistently available data sources. This conceptual model focuses on an initial indicator (forest visual condition) as a foundation for what is expected to become a larger suite of additional GIS-based and field-based indicators that may help to improve the quality of visual quality assessment across a range of spatial scales in the future (Figure 1). For more detailed information on the assessment approach see the Visual Quality CE Assessment Procedures in Appendix IV.

The indicator used in this conceptual model provides data/results that estimate the current condition using a numerical assessment from a planimetric view and may not reflect the actual perspective view of the current condition from a given viewpoint. Further development of the visual quality assessment indicators (and benchmarks), beyond the core indictor presented in this document, is a focus of the province's ongoing CE protocol refinement activities and regional cumulative effects work.

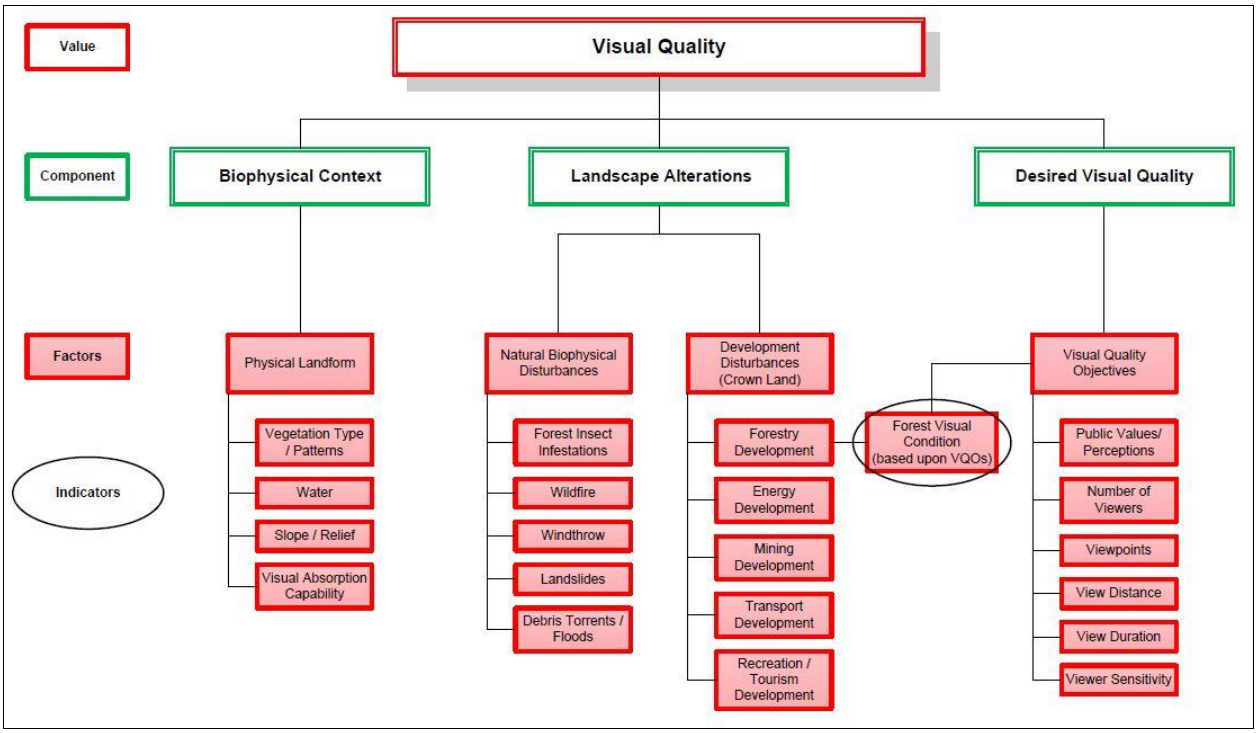


Figure 1. Conceptual Model for Visual Quality CE Assessment

The following terms are provided for additional context and clarification:

Conceptual Models for values describe how components and indicators influence or interact to affect the condition of a value.

Components (green) are features and attributes of the value that should be measured and managed to meet objectives associated with values.

Factors (red) are influential processes or states that act on a component and include both positive and negative effects. They may be used as indicators.

Indicators (black circles) are the metrics used to directly or indirectly measure and report on the condition of a component (state indicators) or the processes that act upon or influence the condition of a component (pressure indicators).

Desired Visual Quality Component

The Desired Visual Quality component is the goal that results from appropriate consideration and management of visual values. Scenic Areas are established because they have been identified as visually important areas that require special management due to their physical characteristics and public interest. For the purposes of cumulative effects, the key indicator assessed under this component is referred to as the Forest Visual Condition, which is compared to the established Visual Quality Objective (VQO). VQOs are legally designated and assigned to each Visual Sensitivity Unit (VSU) polygon to inform forest management activities in order to achieve an acceptable visual condition. VSUs are distinct topographical units as viewed from one or more viewpoints, and are delineated based on the homogeneity of the landform and biophysical elements.

A number of factors are considered when establishing VQOs, such as the public values and perceptions of the area, the number of viewers and the locations where viewers can see the landforms, the viewing distance and duration of views, and the level of viewer sensitivity to forest alteration. VQOs are evaluated against the cumulative visual impact of timber harvesting and road construction, each of which influences the condition of the desired visual quality. The extent of timber harvesting influence on the forest visual condition will vary depending on how the forest management activities are designed, including how they consider factors associated with the physical landform such as slope, relief, vegetation type, and other landform texture patterns (e.g. visually effective green-up of regenerating forests).

In practice, VQOs are assessed by examining landforms from significant public viewpoints. VSU polygons are utilized in this analysis process as a surrogate for landforms, using the current legal inventory (established 1995). As discussed in more detail in Appendix IV, using VSUs as a surrogate for landforms should be field verified to determine the adequacy of this approach.

Potential future updates to the visual landscape inventory (after undergoing public review prior to legal establishment) could result in adjustments to visual quality objectives, which would be considered in future assessments.

The five VQO categories defined in Provincial Visual Resource Management are shown in Table 1. Each VQO category describes an acceptable level of forest alteration that is visible when assessed from a significant public viewpoint. The description of desired condition is legally defined in FRPA, while the percent alteration in the planimetric and perspective views are provided in policy for interpretation purposes[1].

Table 1. Acceptable Range of Percent Non-visually Effective Green-up and Description of VQO

VQO	Acceptable Limit Range of Percent alteration in ***Planimetric View*** (looking from directly above in map/plan view)	Acceptable Limit Range of Percent alteration in ***Perspective View*** (looking from selected public viewpoint)	Description of desired condition
Preservation	0 – 1.0 %	0% of ground may be visible	Alteration is very small in scale, and not easily distinguishable from the pre-harvest landscape
Retention	1.1 – 5.0 %	0% to 1.5% of ground may be visible	Alteration is difficult to see, small in scale, and natural in appearance
Partial Retention	5.1 – 15.0 %	1.6% to 7% of ground may be visible	Alteration is easy to see, small to medium in scale, and natural and not rectilinear or geometric in shape
Modification	15.1 – 25.0 %	7.1 to 18% of ground may be visible	Alteration is very easy to see, and is: A) large in scale and natural in its appearance, or B) small to medium in scale but with some angular characteristics
Maximum Modification	25.1 – 40.0 %	18.1 to 30% of ground may be visible	Alteration is very easy to see, and is: A) very large in scale, B) rectilinear and geometric in shape, or C) both

[1] http://www2.gov.bc.ca/assets/gov/farming-natural-resources-and-industry/forestry/visual-resource-mgmt/vrm_a_guide_to_visual_quality_objectives.pdf

Forest Visual Condition Indicator

The forest visual condition indicator identified in the conceptual asessment model represents the initial and only CE indicator for the visual quality value at this time. Visual quality objectives are legally and spatially identified through FRPA and provide provincial benchmarks. Other factors influencing visual quality e.g. non-forestry industrial development, do not have benchmarks associated with them as they are generally permanent removals from the provincial forest. Although these factors cannot be managed under current regulatory regimes, disturbances associated with them can potentially be calculated and provided as supplemental information and context for future analysis.

Forest disturbances that occur from natural processes (i.e. landslides and avalanches) also influence the forest visual condition and do not have benchmarks associated with them but may be reviewed as contextual information in future analysis to assist understanding of how they impact the desired visual quality. Natural processes observed in the project area are generally comprised of: avalanche paths on steep slopes, landslide areas on steep slopes initiated by heavy rainfall, small openings created by blowdown or rock outcrops caused by poor regeneration after wildfire.

Benchmarks for visual quality indicators evolved from a foundation of existing methodology and policy, like the Visual Impact Assessment Guidebook (1995 & 2001) that was used to support implementation of the old *Forest Practices Code Act*. This guidebook has served as standard guidance and policy for the assessment of visual quality by forestry managers since its introduction in 1995. Prior to that, the Forest Landscapes Handbook (1981) introduced the concepts and principles for managing scenic landscapes, which are generally understood as steep forested hillsides that can be readily viewed by the public. Both the indicators and benchmarks from the guidebook have been updated on the basis of current science and research, and augmented with subject matter expert opinion to support assessment assumptions and minimize uncertainty. Identified benchmarks are not “thresholds” for disturbance, but provide information and guidance to support management practices that maintain scenic areas and visual quality.

VQO’s are the legal description of the desired forest visual condition (Forest Visual Condition Indicator). The percent range of the non-visually effective green-up area (in Table 1) acts as a surrogate for the described Forest Visual Condition indicator. This allows for a review of the entire study area using GIS interpretation. Validation of the results would require additional field assessments. A complementary visual assessment can be done through the Forest and Range Evaluation Program (FREP). An example of this type of validation exercise is included in Figure 3 and Appendix VII and of this report.

Limitations and Assumptions

It should be noted that the conceptual model and GIS analysis supporting this assessment are not equivalent to the review process currently carried out through the Forest and Range Evaluation Program (FREP), whereby a random sampling of forestry blocks are assessed (by landform not VSU) in the field in perspective view. The results from this report indicate the general state of visual polygons in the working forest area. The GIS-based exercise used in this CE assessment used an overhead view (2-dimensional planimetric view) using computer modelling. The modelled view could be validated by further field work as resources permit. For most locations, the VSU is not equivalent to the landform, and in many instances the VSU may be a collection of landforms or a merging of landforms. Simply put, the landform boundaries are largely dependent on the viewing location. This may contribute to validation challenges, since the VQO is intended to be assessed using the landform rather than the entire VSU.

GIS modeling for visuals can provide a good overview of some of the factors relating to visual quality but is not intended as a replacement for field assessments from a perspective view. Viewing locations can be varied and difficult to determine with GIS modeling (e.g. highways, established viewpoints, communities). While the current analysis product provides a good baseline, the following improvements could be made to the assessment procedure:

- A raster-based analysis may be more appropriate to run large areas quickly as opposed to the current polygon based analysis;
- A visibility component (similar to FREP assessment) could be added to the analysis that uses known viewpoints, elevation models as well as road networks to help determine what portions of a VSU polygon can actually be viewed and factor only viewable areas into calculating forest visual condition;
- The number of missing (unaccounted) harvest blocks may also be reduced. Before an analysis is conducted on an area, satellite/aerial imagery could capture additional blocks that have not yet been entered into the Reporting Silviculture Updates and Land Status Tracking System (RESULTS);

Overall, the results from this GIS-based CE assessment provide a general indication of the forest visual condition in the Howe Sound area. Some further technical refinement and comparison with field sampling (e.g. FREP Visual Quality assessments) would help to improve confidence in the results.

3. Current Condition Assessment Results

The current condition assessment results vary by Visual Quality Objective and Visual Sensitivity Unit but some general observations can be derived from the results. Tables 2 and 3 below provide a summary of the current visual condition and trend information for the 89 VSUs in the Project area. Appendix VI contains the current visual condition and trend information for each of the 89 VSUs.

Table 2. Summary of Forest Visual Condition Risk Levels

	Retention VQO			Partial Retention VQO			Modification VQO			Total		
Risk Level	CFLB Ha	VSU Ha	VSUs #	CFLB Ha	VSU Ha	VSUs #	CFLB Ha	VSU Ha	VSUs #	CFLB Ha	VSU Ha	VSUs # (%)
Below Limits	3451	5079	**11**	8491	18736	**37**	5961	8084	**13**	17903	31899	**61 (69%)**
Within Limits	1250	1440	**2**	10107	14637	**16**	737	904	**2**	12094	16981	**20 (22%)**
Exceeding Limits	608	1121	**2**	1976	3379	**5**	139	259	**1**	2723	4759	**8 (9%)**
Grand Total	**5309**	**7640**	**15**	**20574**	**36752**	**58**	**6837**	**9247**	**16**	**32720**	**53639**	**89 (100%)**

Table 3. Identification of Forest Visual Condition Trend

	Retention VQO	Partial Retention VQO	Modification VQO	Total
Disturbance Level Trend (1995-2017)	# of VSUs (%)	# of VSUs (%)	# of VSUs (%)	# of VSUs (%)
Less Disturbance	**13**	**40**	**12**	**65 (73%)**
No Change	**1**	**14**	**0**	**15 (17%)**
More Disturbance	**1**	**4**	**4**	**9 (10%)**
Grand Total	**15 (17%)**	**58 (65%)**	**16 (18%)**	**89 (100%)**

Initial Observations and Interpretation of the Current Condition Results

Based upon the planimetric analysis, here are some initial observations and possible key drivers:

- The results suggest that there is general adherence to provincial VQOs by forest licensees.
- The assessment indicates that 81 of the 89 Visual Sensitivity Units in the Howe Sound project area (91%) appear to be achieving their legal visual quality objectives;

- There are 61 VSUs (69%) 'Below Limits', 20 VSUs (22%) 'Within Limits' and 8 VSUs (9%) 'Exceeding Limits' for achieving their legal visual quality objectives;
- These results are considered useful at the landscape level as the assessment procedures can support timber supply analysis decisions; however, they are not intended to replace on-the-ground perspective view assessments that review harvest blocks by landform to determine whether legal visual quality objectives are being met or not.
- In terms of VSU area (ha), about 91% of the total VSU area is meeting their respective VQOs. 59% of the total VSU area is below the risk limits set out by their VQOs and the other 32% of the total VSU area is within the range of acceptable risk limits set by their VQOs;
- Based upon the planimetric view used in this Forest Visual Quality assessment, 8 out of the 89 VSUs (9% of VSUs) in the Project area have a forest disturbance rating that exceeds their risk limits identified in their respective visual quality objectives;
- The visual condition trend data from 1995 to 2017 indicates that 90% of the VSUs in 2017 are showing less disturbance or no change in their forest visual condition as compared to the visual condition in 1995 (73% less disturbance and 17% no change). This reduction in forest disturbance levels for 65 of the VSUs is likely due to old cutblocks now being reforested and achieving green-up, and also due to more constraints on forest harvesting;
- 10% of the VSUs are showing more forest visual disturbance in 2017 as compared to the existing visual condition in 1995. This is a reflection of more recent forest harvesting activities in some VSUs and is not an indication of VSU alteration limits being exceeded;
- VSUs #504 (Partial Retention) and #506 (Retention) exceed their respective VQO limits in 2017 (planimetric view) but also have a better forest visual condition in 2017 than they did in 1995. This is due to logged areas in VSUs having achieved visual green-up since 1995;
- Currently 53% of the established VSUs in the project area have experienced visual impacts from permanent land developments;
- The VSUs can have significant forest visual impacts from other economic sectors that are not captured in this assessment and are not subject to legal visual quality objectives at this time (i.e. private land, energy right of ways, mining developments, etc.);
- Ongoing development adjacent to the Crown forest land base will continue to impact visual quality in scenic areas as there are no Provincial legal provisions to protect scenic values on nearby/adjacent private lands;
- The 8 VSUs exceeding their risk limits may have less, or more, significant visual impacts from a perspective view (common public view points) depending on the viewpoint; and
- Figures 2 and 3 look at VSU #504 in greater detail to illustrate how a VSU can exceed VQO limits based on a planimetric view (map view) and at the same time can be within VQO limits if a perspective view (common public viewpoints) is used. These figures and their descriptions will demonstrate how the results from this current condition assessment are quite general and would benefit from perspective view assessments in the future to help validate the results from this assessment.

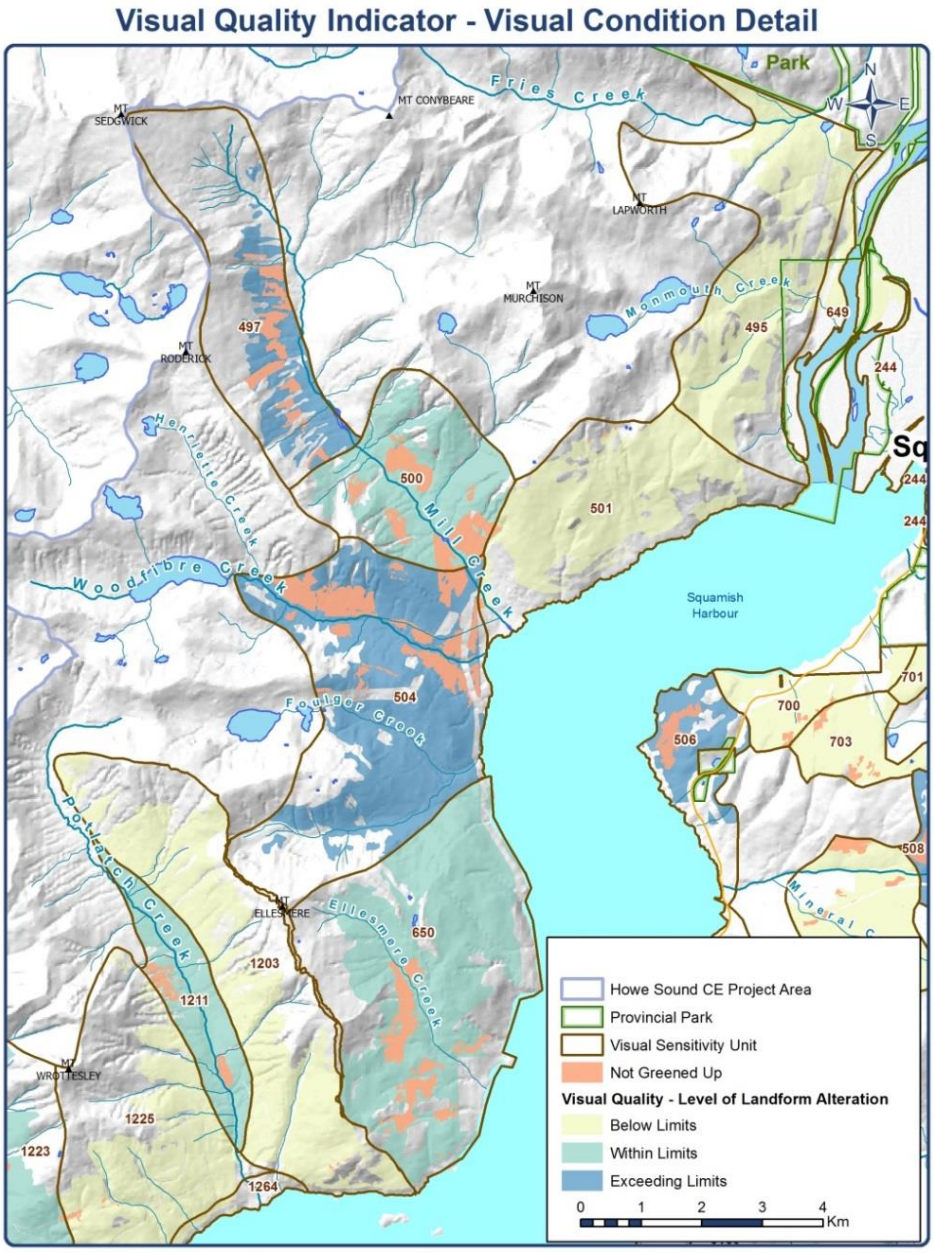


Figure 2. Visual Condition Detail of VSU # 504 Exceeding VQO Limits

This map is a subset of the forest visual condition map from page 12. It shows the VSUs south of Squamish that are exceeding VQO alteration limits from a planimetric view. According to the GIS-based CE assessment, VSU #504 by Woodfibre Creek exceeds the VQO limits and may indicate a level of landform alteration that can be seen clearly in a perspective view from common public viewpoints.

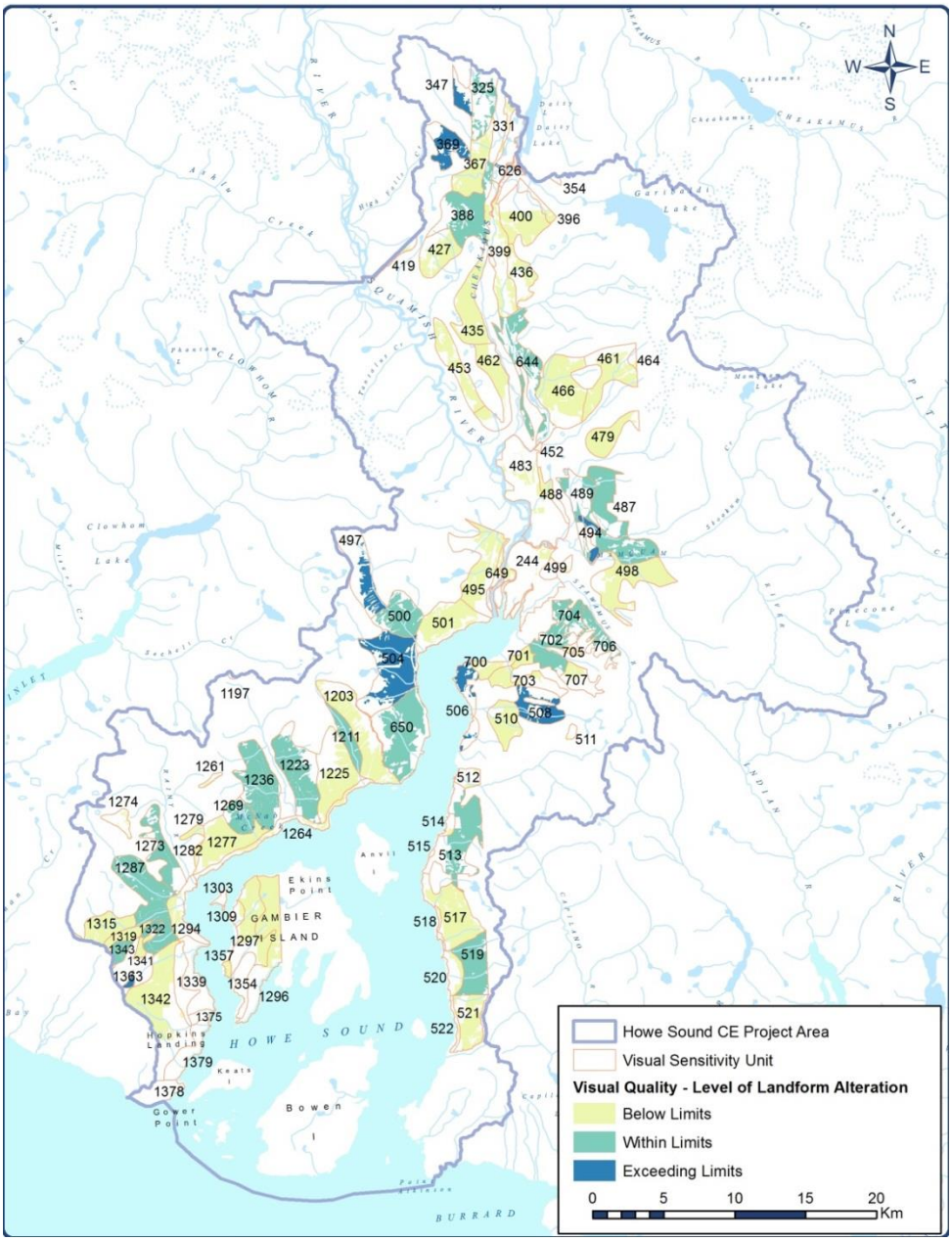
Figure 3. VSU #504, Assessed by the Forest & Range Evaluation Program (FREP) in 2016

This photo provides a perspective view of VSU #504 from a 2016 Forest & Range Evaluation Program[2] (FREP) assessment. The FREP assessment shows that VSU # 504 is within limits of the VQO for Partial Retention. The FREP assessment reported forest alteration at 5.76% while the CE assessment (in planimetric view) reported forest alteration as 16.3%, or slightly above the expected limit range for Partial Retention of 5% to 15.0% (see Table 1). See the completed FREP form evaluating VSU # 504 in Appendix VII. This demonstrates how the results from this GIS-based Visual Quality assessment are an estimate of VQO achievement and that the results would benefit from further assessment and validation from a perspective view.

Note: The visible alteration from a perspective view will vary depending on several variables such as the viewing: direction, distance and season (e.g. snow can highlight forest alteration more easily than green vegetation).

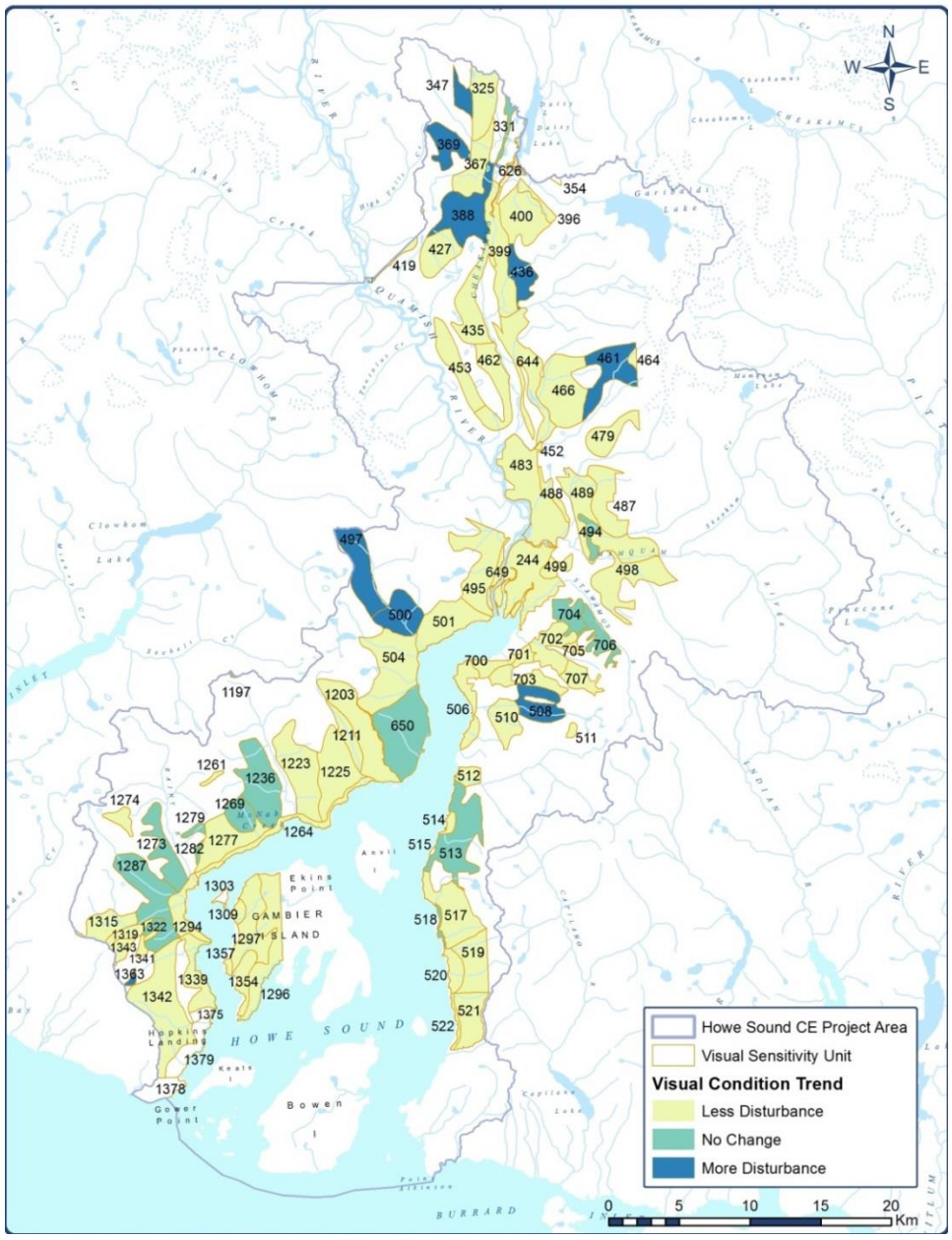
[2] http://www2.gov.bc.ca/gov/content/industry/forestry/managing-our-forest-resources/integrated-resource-monitoring/forest-range-evaluation-program

Indicator - Forest Visual Condition



This map estimates the extent to which forest alteration within the project area has satisfied the visual quality objective. The GIS analysis (planimetric view) compares the percentage of forest not achieving visual effective green-up with the desired visual condition based upon the specific legally established visual quality objective. The VSU polygons that have exceeded their acceptable alteration limits may indicate that they are not achieving the VQOs, and these may be subject to further analysis and field verification from a perspective view in order to determine whether the GIS analysis has accurately assessed the current condition. Several islands in Howe Sound were not included in the analysis as they do not have legal VQOs.

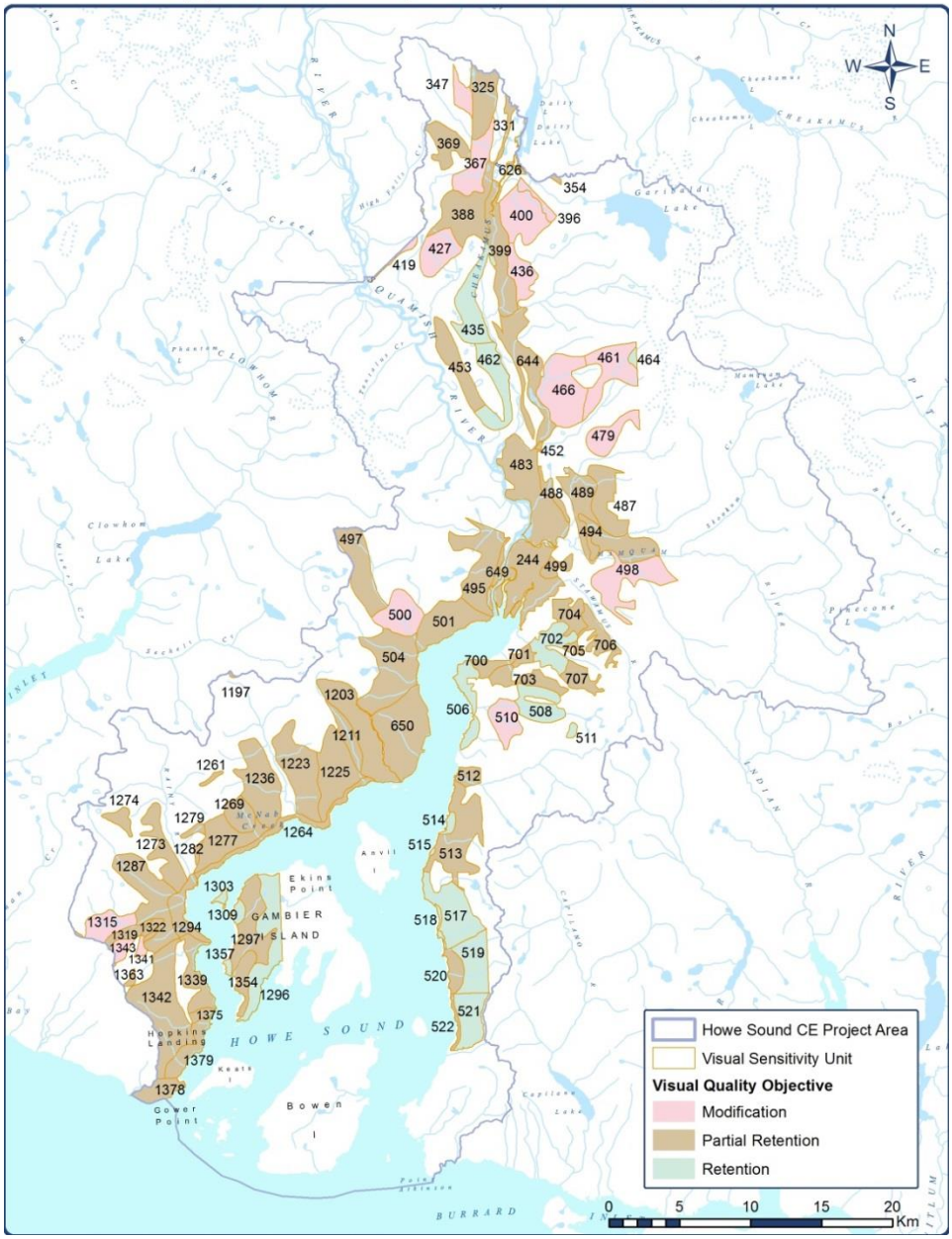
Forest Visual Condition Trend (1995 to 2017)



This map illustrates how the visual landscape in the project area has changed over time, comparing the existing visual condition (EVC) observed in the field in 1995 against the GIS analysis (planimetric view) completed in 2017. While 1995 EVC assessment method was slightly different than the assessment method used in 2017, it still provides a useful comparison. A tabular report of this comparison to the 1995 EVC is located in Appendix VI and illustrates how past harvesting has now achieved visual effective green-up, blending in with other forest types resulting in lower visual impact; alternatively, more recent harvest blocks show where greater visual disturbance has taken place since 1995, and are either within or exceeding limits.

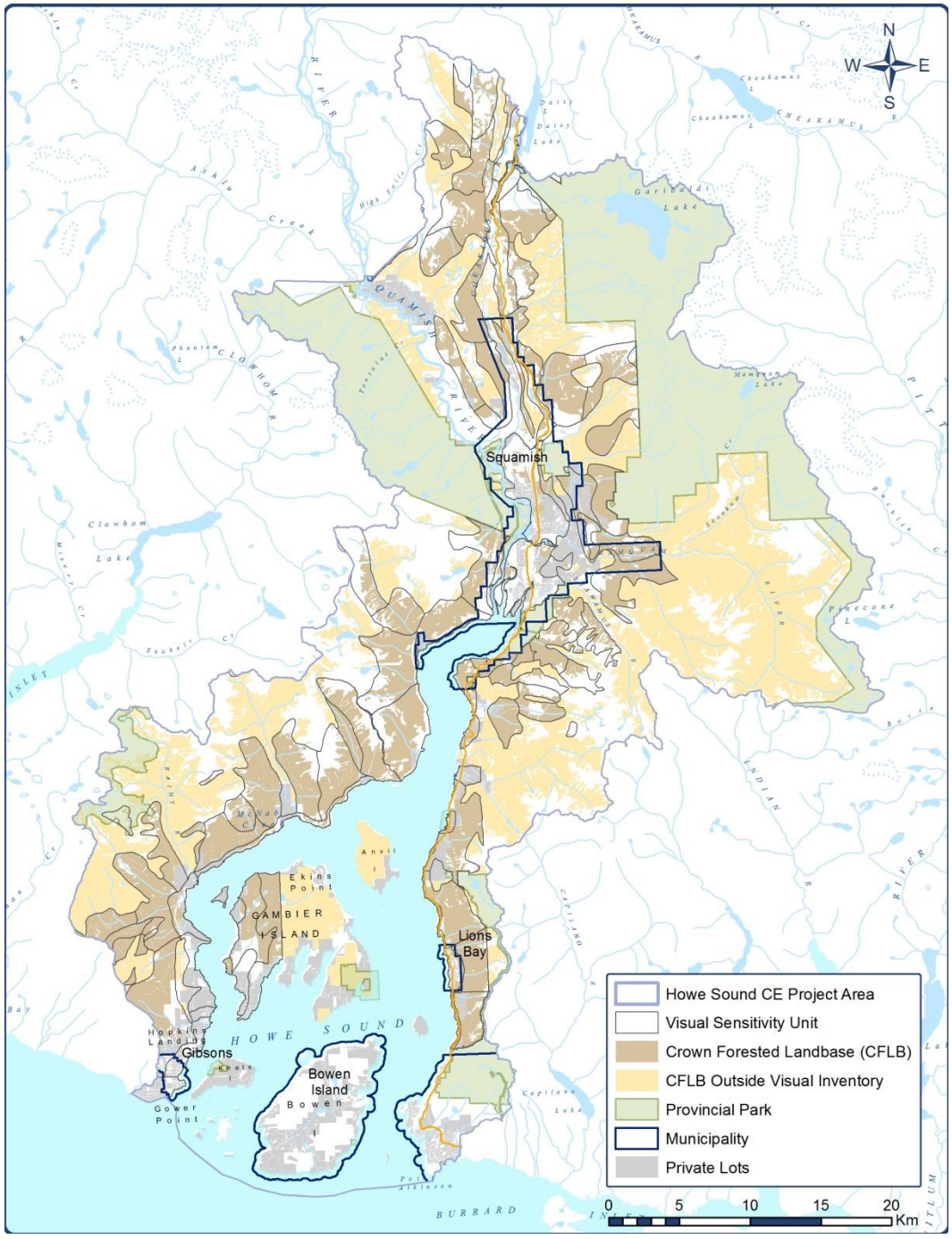
4. Supplemental Information

Supplemental Map - Visual Quality Objective



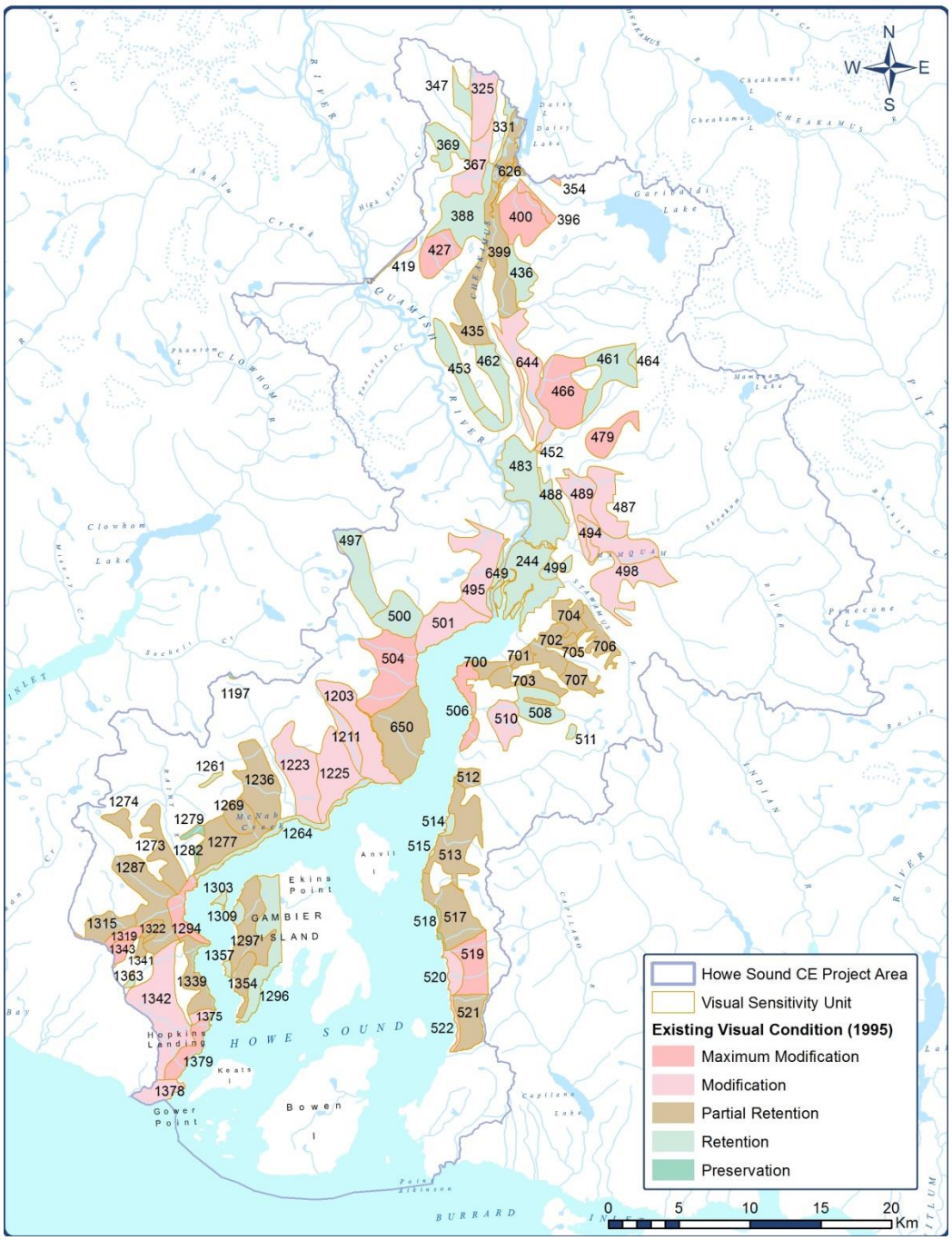
This supplemental map for visual quality objectives shows each VSU and corresponding identification number, colour-coded with its associated visual quality objective. As identified in Table 2, 15 VSUs are classed as *Retention*, 58 VSUs are classed as *Partial Retention*, and 16 VSUs are classed as *Modification*. A description of these VQOs is in Table 1 on Page 5. Note: Draft non-legal VSU polygons on Gambier Island and Anvil Island are not included in this analysis.

Supplemental Map - Crown Forested Landbase



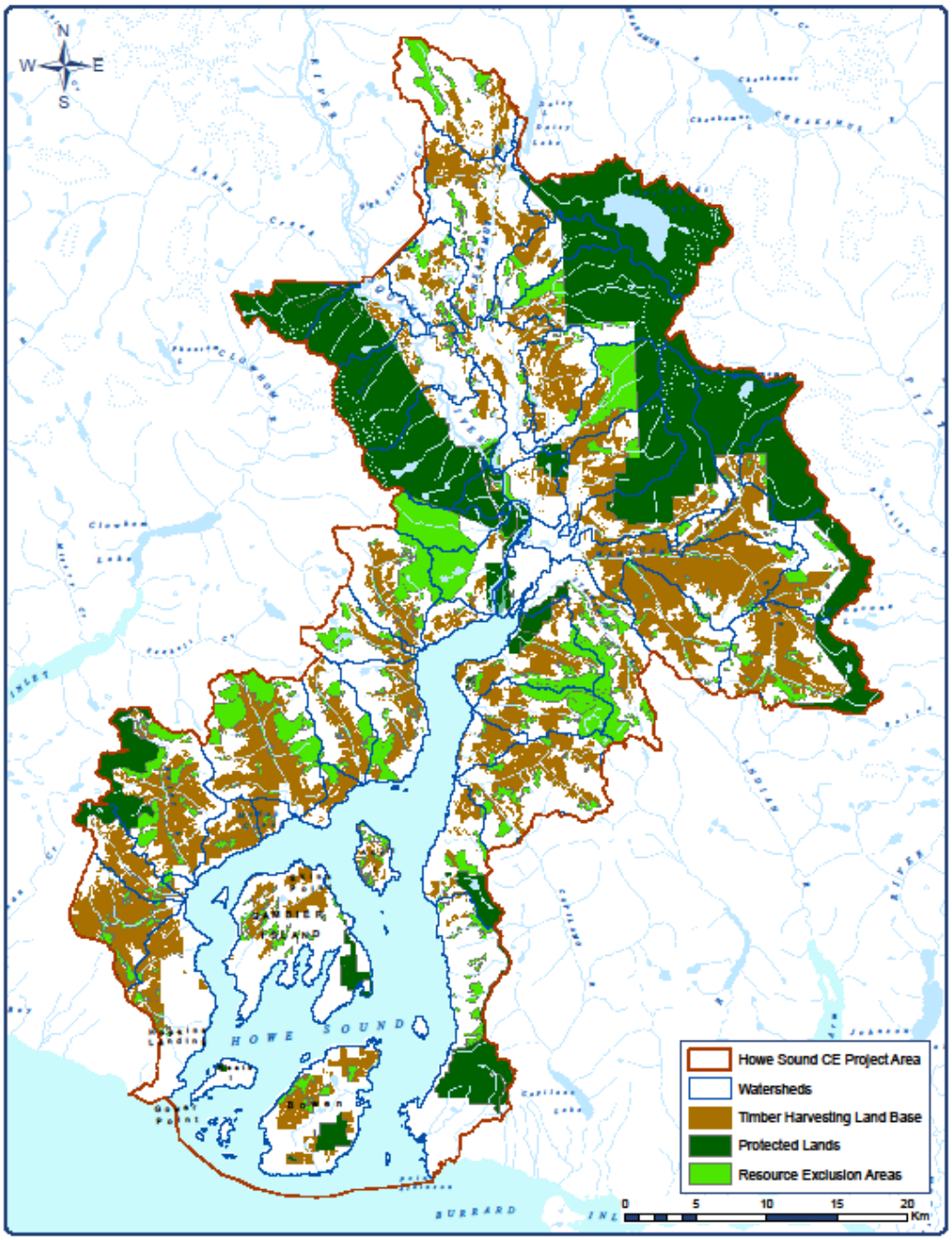
This map shows the full coverage of the Crown forest land base (CFLB) throughout the Howe Sound project area, including area within each of the VSU polygons. The CFLB throughout the Howe Sound area amounts to 130,883 ha as compared to 32,720 ha within the VSUs. CFLB located outside of the VSU polygons are considered non-visible, except for areas where any draft visual inventory polygons have not yet been established. Visual quality objectives are not established in areas where they cannot be seen easily from a significant public viewpoint.

Supplemental Map - Existing Visual Condition (in 1995)



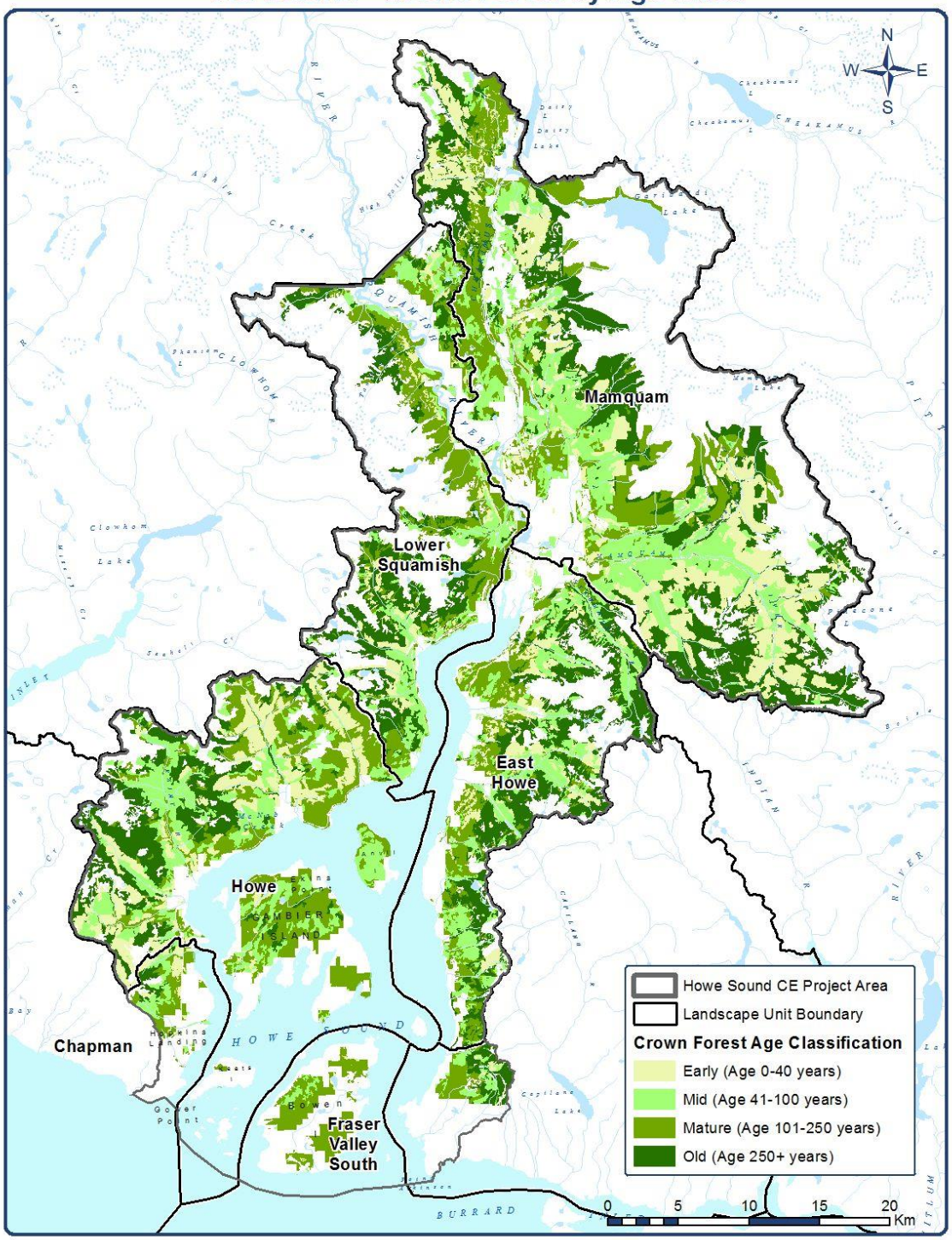
This map shows the existing visual condition (EVC) from 1995, which identifies the condition of the VSUs impacted from human-made landscape alterations when the inventory was conducted. Comparing the EVCs to the forest visual condition core indicator illustrates how tree growth over time improves the visual condition in some VSUs, while in other VSUs the visual condition may decline due to ongoing forestry activities that have not yet sufficiently regenerated with enough height to achieve visual effective green-up. Note: A description of these VQOs is in Table 1 on Page 5.

Protected Lands and Timber Harvesting Land Base



This map shows the main areas where timber harvesting is excluded (Protected Lands and Resource Exclusion Areas) and where it can be considered (Timber Harvesting Land Base). The provincial Resource Exclusion Areas in the Howe Sound area are primarily made up of Wildland Areas, Old Growth Management Areas, Ungulate Winter Range Areas (ones with no timber harvesting) and Wildlife Habitat Areas (ones with no timber harvesting). For more information on *Protected Lands* and *Resource Exclusion Areas*, please go to: http://wwwd.env.gov.bc.ca/soe/indicators/land/land-designations.html

Old Growth - Crown Forest by Age Class



This map shows general forest age by age class category. The lightest green areas are recently harvested/disturbed areas that are regenerating forest areas. The areas in dark green are old-growth forests in the Howe Sound CE Project area that are identified as being over 250 years old.

5. Discussion of Assessment Results

The current condition assessment results in this report should be viewed as initial coarse filter information for consideration in strategic, tactical and operational decision-making at all levels of governance. The results are not intended to replace visual impact assessments, such as what licensees may conduct to support harvest block development, or the Forest and Range Evaluation Program (FREP) undertakes to assess whether landforms are meeting visual quality objectives. The planimetric assessment results in this report would benefit from further validation and assessment work. The assessment results should also be considered in the context of: First Nations' interests, local community interests, scenic quality expectations for the Sea-to-Sky corridor, forest sector economic interests, energy development impacts, climate change and other important contextual information before determining if, and what kind of, a management response is warranted.

The assessment results in this report provide some general insight into the current condition of the forest visual quality value in the Howe Sound area by showing the extent to which *Forest Act* tenure holders may, and may not, have achieved Visual Quality Objectives. Based on this planimetric visual quality assessment, it appears that *Forest Act* tenure holders are, for the most part, meeting VQOs in the Howe Sound area (91% of VSUs area meeting VQOs). The overall trend information is positive as 73% of VSUs in the area have a better forest visual condition in 2017 than in 1995 and 10% of the VSUs are now in worse visual condition. The results highlight some VSUs as needing further attention to explore why they are not meeting their VQOs and what management actions might be taken over time to improve the situation. Forest licensees in the Howe Sound area work on a highly visible and constrained landbase and are challenged to design cut-blocks that meet VQOs but are also large enough to be economically viable. Therefore, licensees are creative in the way they design their cutblocks but they currently have no requirement to share with government any visual impact assessments they may conducted prior to harvesting to estimate the visual impacts of their operations. Further validation work should be conducted on some sample areas to ground truth the results before determining if further management responses are warranted.

At the scenic area level, the ministry is exploring a number of actions in response to these results such as: updating VQOs in proximity to any new tourism/recreation areas; validating the existing results with complementary perspective view assessments and site-level forest inventory; and applying these risk assessments, where possible, to land and resource management decisions. Some examples of these potential responses are offered in Table 4. Sample management responses are provided for three separate Visual Sensitivity Units that were selected for their different risk levels to demonstrate how this information could be applied in varying circumstances.

Table 4. Examples of Potential Interpretation and Management Responses by VSU

	Existing Visual Condition and Trend				
Visual Sensitivity Unit (polygon ID) (ha)	VQO	Risk Level	EVC-1995	EVC-2017	Trend
VSU 508 (639.0 ha) (near Sky Pilot Wildland and East of Britannia Beach)	**R** (1.1-5%)	Exceeding Limits	**R** (1.1-5%)	**PR** (5.1-15%)	More Disturbance
Initial Interpretation	➢ Non-veg area is 11.7% of the VSU, exceeding limits for Retention VQO ➢ Unclear why this VSU has a Retention VQO as the VSU is difficult to see from main public view points. May relate to visibility from Sky Pilot?				
Recommended Further Assessment	➢ Ocular field check at perspective level to confirm visibility of VSU and percent of alteration (non-veg area). ➢ Consider adjacent area that may be visible and has no established VQO				
Potential Management Responses	➢ Field check VSU for potential boundary adjustment ➢ Any further proposed cutblocks in VSU should be assessed for incremental impacts using results from the perspective level. ➢ If necessary after perspective assessment, refer findings to C&E branch for investigation				
VSU 650 (1668.4 ha) (East Howe Sound mountainside across from Porteau Cove)	**PR** (5.1-15%)	Within Limits	**PR** (5.1-15%)	**PR** (5.1-15%)	No Change
Initial Interpretation	➢ Non-veg is 9% of the VSU, within limits for Partial Retention VQO ➢ Area is highly visible from Howe Sound, Hwy 99, and Porteau Cove ➢ Recent harvest blocks are obvious and may not conform to VQO legal definition.				
Recommended Further Assessment	➢ Recommend perspective view (FREP) assessment to confirm VSU conforms to VQO legal definition and is within limits				
Potential Management Responses	➢ Adjust assessment protocol as necessary to make results more precise. ➢ If not within limits, refer findings to C&E branch for investigation				
VSU 400 (954.5 ha) (Near Rubble Crk outside Garibaldi Prov Park	**M** (15.1-25%)	Below Limits	**MM** (25.1-40%)	**R** (1.1-5%)	Less Disturbance
Initial Interpretation	➢ Non-veg is 5.6, well below the limit of 25% ➢ Area of historic harvesting (1960's and 1980's) has regenerated well				
Recommended Further Assessment	➢ No further assessment recommended				
Potential Management Responses	➢ No management response needed				

FLNRORD staff are developing tools and processes designed to integrate and communicate resource value objectives, assess how well these objectives are being achieved (including results from this report) and respond with integrated resource management approaches to help achieve these objectives. In the spirit of the United Nations Declaration on the Rights of Indigenous Peoples, FLNRORD will share these assessments with key local First Nations in the

Howe Sound CE Project area and collaborate on the development of any warranted management responses.

Possible Management Considerations

The following information is to be considered in future visual quality assessment, management and related authorization decisions:

- Cumulative impacts on the visual quality value should be considered by all land decision-makers/managers in this time of new development, recreational use and climate change, in order to sustain visual quality in identified scenic areas, even though the legal obligations to do so might not be in place at this time for each government sector;
- Currently, legal visual quality objectives apply only to forest harvesting activities conducted by tenure holders operating through a Forest Stewardship Plan. However, the Environmental Assessment Office can also address visual quality by establishing major project certificate conditions that relate to visual quality;
- Crown land decision-makers could ask project proponents that are not subject to legal visual quality objectives to voluntarily consider visual quality in their proposed developments that fall within scenic areas;
- Forest management should consider CE visual quality assessments at the best scale available in their responsibility to mitigate forest visual impacts in scenic areas. Forest management, as it relates to mitigating visual impacts, should focus primarily on timber harvesting layout, forest retention levels, road siting, forest regeneration, visual landscape design and the siting of related forestry infrastructure;
- New and old natural resource sector roads (e.g. mines, energy, forestry and recreation) that have been designed and constructed without consideration for their impact to visual quality objectives can also have a significant negative impact on visual quality. Possible mitigation measures may include road forest screening or road deactivation and forest restoration;
- Impacts to visual quality from other natural resource sectors can have a significant impact on a viewer's perception of visual quality and VQO achievement (e.g. Energy right of ways). In the future, it would be worth exploring how visual impacts from other natural resource sectors might also be considered in this visual quality CE assessment;
- The steep mountainous scenic areas in Howe Sound are much more visible than some of its less steep areas at lower elevations, like the estuaries and lower slopes surrounding Squamish. As a result, more time is often required for trees to grow and reach suitable heights to provide visual effective green-up for any new harvest areas on steep slopes, which may have an economic impact to the forest tenure holder as it impacts their ability to achieve their allocation the allowable annual cut;

- Consider including the stewardship aspects of forest management when sharing public information on visual management so the public can become more aware of the other values being managed for besides visual management (i.e. forage openings for bears and ungulates, wildfire risk reduction, forest seral stage distribution, forest biodiversity);
- Some degree of permanent visual impact from forestry activities is to be expected on the timber harvesting land base in identified Scenic Areas as long as Visual Quality Objectives are met; and
- The use of this GIS-based planimetric view for this initial assessment of visual quality is cost-effective but may not accurately predict actual visual quality from common public view points. Complementary FREP assessments (perspective view) from key public viewpoints would help to validate the results of this initial planimetric assessment.

6. References and Resources

Province of British Columbia. 2018. *Forest & Range Evaluation Program (FREP)*. Web. http://www2.gov.bc.ca/gov/content/industry/forestry/managing-our-forest-resources/integrated-resource-monitoring/forest-range-evaluation-program

Province of British Columbia. 2018. *Forest & Range Evaluation Program Visual Quality Monitoring Protocols*. Web. https://www2.gov.bc.ca/gov/content/industry/forestry/managing-our-forest-resources/integrated-resource-monitoring/forest-range-evaluation-program/frep-monitoring-protocols/visual-quality

Province of British Columbia. 2018. *FREP Multiple Resource Value Assessments*. Web. https://www2.gov.bc.ca/gov/content/industry/forestry/managing-our-forest-resources/integrated-resource-monitoring/forest-range-evaluation-program/frep-multiple-resource-value-assessments

Province of British Columbia. 2018. *Report of Natural Resource Violation*. Web. https://www.for.gov.bc.ca/hen/nrv/report.htm

Province of British Columbia. 2018. *Strategic Land and Resource Planning: Sea-to-Sky Land and Resource Management Plan (S2S LRMP).* Web. https://www.for.gov.bc.ca/tasb/SLRP/plan79.html

Province of British Columbia. 2018. *Visual Resource Management*. Web. http://www2.gov.bc.ca/gov/content/industry/forestry/managing-our-forest-resources/visual-resource-management

Province of British Columbia. 2013. *A Guide to Visual Quality Objectives: Categories of Visually Altered Forest Landscapes*. Web. 1p. http://www2.gov.bc.ca/assets/gov/farming-natural-resources-and-industry/forestry/visual-resource-mgmt/vrm_a_guide_to_visual_quality_objectives.pdf

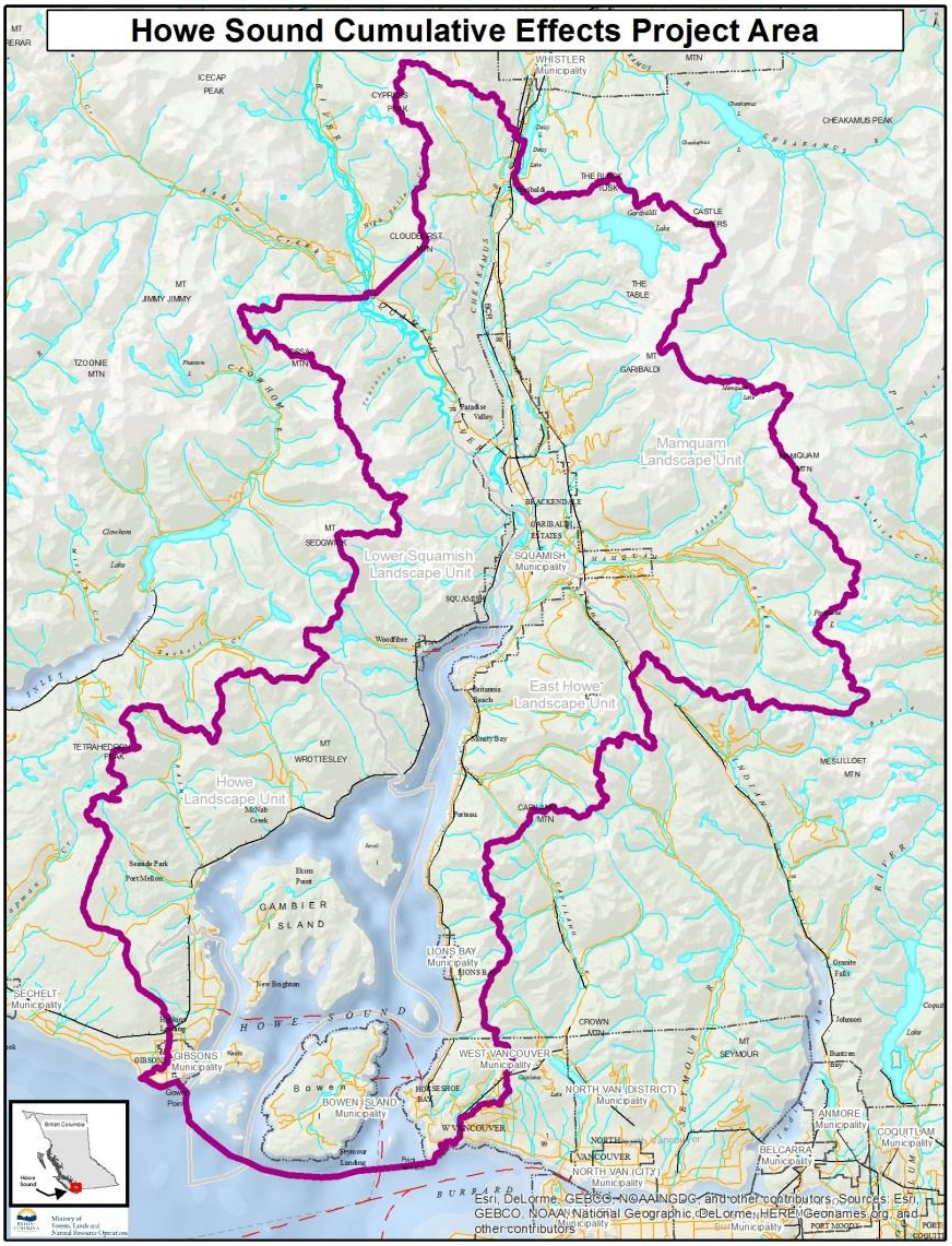
Province of British Columbia. 1999. *Forest Practices Code of British Columbia: Green-up Guidebook, 2nd edition*. Web. 29pp. https://www.for.gov.bc.ca/ftp/hfp/external/!publish/FPC%20archive/old%20web%20site%20contents/fpc/fpcguide/greenup/zipped/greenup.pdf

Province of British Columbia. 1998. *Procedures for Factoring Visual Resources into Timber Supply Analyses*. Web. 12pp. https://www2.gov.bc.ca/assets/gov/farming-natural-resources-and-industry/forestry/visual-resource-mgmt/vrm_procedures_for_factoring_timber_supply_analyses.pdf

Sea to Sky Gondola. 2018. *Sea to Sky Gondola*. Web. https://www.seatoskygondola.com/

Appendix I

Map of the Howe Sound Cumulative Effects Project Area



The CE Project area was tailored to include the Howe Sound area to meet the expressed interests of local stakeholders who have common interests. Local communities expressed a shared interest in CE value assessments that were focussed on a more natural boundary like the lower portion of the Howe Sound watershed instead of the three separate provincial administrative districts that straddle the Howe Sound area. The project area essentially follows the height of land around Howe Sound and aligns with Provincial Landscape Unit boundaries except at the entrance to Howe Sound where the boundary was extended to capture the area from West Vancouver around Bowen Island to Gibsons considering bathometry lines.

Appendix II

Forest Visual Quality Value Description

Forest Visual Quality Value

General Description

The Government of British Columbia is entrusted with managing visual impacts on Crown forest land from forestry activities. B.C.'s visual resource management program conducts a range of activities to maintain scenic quality expectations of the public and the tourism industry. This is achieved by: establishing and maintaining visual inventories; reviewing how well those inventories are being managed by the forest industry; and conducting surveys among the public and other stakeholders to establish an understanding of how strongly they react to seeing the visual impacts of forest operations, and how much their livelihood depends on effective visual management, e.g. tourism and recreation businesses.

Forested hillsides in public view areas are usually identified for scenic management. These landscape features are managed for a range of natural resource values, some of them crucial to supporting key B.C. industries like tourism and forestry. Scenic locations with high levels of viewers may be prioritized for visual management, while remote locations with equally scenic views may be prioritized for forest harvesting. Establishing appropriate Visual Quality Objectives (VQOs) across the landscape is crucial to maintaining those other values.

B.C.'s reputation as an international tourism destination depends on its spectacular natural beauty, and through a combination of legal objectives and innovative forest-management practices, tourism and forestry can coexist. The *Forest and Range Practices Act* explicitly directs scenic value management, and the visual resource management program provides a suite of tools that support this coexistence. In the Crown Forest Land Base (CFLB), the Province aims to balance the effective management of all values, where no one value prohibits the progress of all other activities. Where portions of the Crown forest are set aside as parks, there are no impacts to the scenic values. Natural forest impacts such as wildfire or blowdown may influence the visual condition but are not considered the visual quality assessment. Properly designed forest harvesting will consider view point locations and landform characteristics in order to mimic disturbances caused by natural processes in the surrounding area.

Appendix III

Management Objectives for Visual Quality

Management Objectives

Visual Quality Objectives

The Ministry of Forests, Lands, Natural Resource Operations and Rural Development (FLNRORD) is entrusted with the responsibility of managing forestry's visual impacts on Crown forest land. A visual inventory is developed that identifies scenic areas, and establishes visual quality objectives (VQOs) that, through the rate and distribution of forest harvesting by licensees, is intended to meet the scenic quality expectations of the public, tourism, and First Nations.

The objective to manage visual quality is achieved through effective forestry management practices. Once a landscape is assessed and determined to be visually sensitive, a visual quality objective (VQO) is established to manage forest alteration. VQOs are the primary method to manage for visual values. Where VQOs are established, the rate and distribution of forest harvesting activities are intended to achieve a desired condition to maintain scenic quality, in support of the public and tourism sector interests[3]. Scenic areas with VQOs are not intended to be excluded from harvesting; rather, they are to be managed such that timber harvesting does not compromise the visual condition.

VQOs describe levels of visual alteration appropriate for landscapes based on their visual sensitivity, and the appropriate level of alteration is determined at the local level by the FLNRORD district manager in consultation with First Nations, the public and other stakeholders. The Forest Planning and Practices Regulation (FPPR) define five VQO categories: Preservation, Retention, Partial Retention, Modification and Maximum Modification. Each of these classes is described by observable features, for example whether the alteration is easy to see or difficult to see, and by how well the alteration fits with the surrounding landscape features and has boundary lines that are either natural or rectilinear in shape and appearance.

Under the *Forest and Range Practices Act* (FRPA), the Government Action Regulation (GAR) provides the authority, criteria and process for establishing scenic areas and VQOs. Many of B.C.'s scenic areas and VQOs were carried forward in the transition from the *Forest Practices Code* to FRPA. In cases where scenic areas lacked VQOs or the VQOs were flexible, VQOs have been established through GAR orders.

Measuring how well forestry alterations achieve the desired VQO is completed through the Forest and Range Evaluation Program (FREP)[4]. FREP effectiveness evaluations determine if visual quality values are being managed appropriately. These evaluations are conducted from a

[3] http://www2.gov.bc.ca/gov/content/industry/forestry/managing-our-forest-resources/visual-resource-management

[4] https://www2.gov.bc.ca/gov/content/industry/forestry/managing-our-forest-resources/integrated-resource-monitoring/forest-range-evaluation-program/frep-monitoring-protocols/visual-quality

perspective view (key on-the-ground public viewpoints) and then can be provided to the relevant forestry licensee, the FLNRORD district manager and the compliance and enforcement staff (when issues are identified). The public can also file complaints about forestry alterations not achieving VQOs[5].

Forest Visual Quality Management

Forest visual quality management in BC is conducted through a professional reliance regime, whereupon forest licensees prepare Forest Stewardship Plans that include results and strategies describing how their operations will be consistent with the visual quality objectives set by the province. Two tools are used to ensure forest licensees meet VQOs: (i) visual design techniques (e.g., shaping harvest openings, retaining trees with openings, minimizing road visibility) so that logging looks more natural and is in scale with the natural landscape character; and (ii) the preparation of visual impact assessments to model proposed harvests and evaluate consistency with the VQO.

The province monitors licensee performance by periodically conducting visual quality effectiveness evaluations (through the Forest & Range Effectiveness Evaluation Program-FREP) following forest harvesting. In addition, VQO inspections are used by compliance and enforcement staff to ensure VQOs are being met. These assessments evaluate visual impact on individual landforms by using a perspective view from a single significant public viewpoint.

The Visual Quality assessment approach used in the Howe Sound CE Project varies from the FREP evaluation approach by assessing visual impact to the entire VQO polygon (Visual Sensitivity Units) using a GIS-based planimetric view (two dimensional map view), similar to the approach used to predict the timber supply impact of visual management. Although this planimetric GIS analysis doesn't consider view distance, landform visibility, viewing duration, slope, or the effect of tree screening, it does provide a quantitative assessment of the VSU from a completely unobstructed map view. In other words, this assessment provides an initial estimate of forest visual quality in the Howe Sound area.

[5] https://www.for.gov.bc.ca/hen/nrv/report.htm

Appendix IV

Visual Quality CE Assessment Procedures

CE Assessment Procedures for Visual Quality Value
GIS Analysis Technical Summary

1. Analysis Objective

The objective of the Visual Quality risk model was to identify the state of forested visual polygons within an area of interest and assess whether the defined visual areas are below, within or exceeding visual green-up targets. Criteria used to assess visual polygons include tree height in a harvested area, slope of the land in relation to tree height, crown forest designation, and acceptable forest alteration targets within a visual polygon. When all these factors were assessed a risk designation was assigned to a visual polygon indicating the amount of existing forest meeting visually effective green up (VEG) in relation to the percent VEG within a polygon. Targets for visual polygons are expressed as a low and high target percentage range of non-VEG.

The document "*Procedures for Factoring Visual Resources into Timber Supply Analyses*[6]" was used as a reference to develop analysis criteria. This document provided researched target percent alteration limits to determine potential visual risk of provincial visual polygons. Table 2 and Table 3 of the document provide target percent alteration limits.

It should be noted that the analysis process described here is a surrogate for much more thorough field assessment procedures and standards described in the Protocol for Visual Quality Effectiveness Evaluation, and conducted through the Forest and Range Evaluation Program[7].

2. Method

Overview: Indicators and Thresholds

Programming was developed in the Python scripting language to automate the analysis process. The script used in this analysis was modified from what was used for the Merritt TSA pilot project, created by Regional Geomatics Analyst Graham Macgregor. The area of interest and appropriate input variables specific to Howe Sound are designated in the programming. The program is run and a file geodatabase is created, appropriate data is extracted, slope data and slope categories are created and all data is then overlaid in the GIS. The overlay resultant file is then assessed for non-natural openings (Forest Harvested Areas) and assessed to determine if they meet visually effective green-up (VEG). VEG is determined according to guidelines that assess the re-establishing tree height in relation to the slope of land the trees are on. Visual polygons are then summarized for percentage of area not greened up and assigned risk according to the non-greened up target percentage range assigned to the polygon.

[6] http://www.for.gov.bc.ca/hfp/values/visual/Publications/timber_supply/TSR10.pdf

[7] http://www2.gov.bc.ca/gov/content/industry/forestry/managing-our-forest-resources/integrated-resource-monitoring/forest-range-evaluation-program/frep-monitoring-protocols/visual-quality

Data Collection and Preparation

Various data sources were used in the analysis, with some prepared for analysis within a file geodatabase, while other data was directly extracted from the provincial geographic data warehouse. The input of forest cover that provides the tree height was updated from the source data (2014) to include all known harvesting that has occurred since the last forest cover update. Tree heights were calculated based on district average age/height relationships from the RESULTS silviculture reporting system.

Two sets of visual inventory polygons were available for use in this analysis; the current legal layer available in the BC Geographic Warehouse, and the as-yet not approved but latest available visual landscape re-inventory data (circa 2006) that is currently in draft form for both the Sea to Sky and the Sunshine Coast Natural Resource Districts. The draft polygons are expected to become legalised through the Government Actions Regulation following licensee, public, and First Nations review within the next year, to replace the existing inventory (circa 1995). All private lands and provincial parks are removed from the visual inventory polygons, and do not form part of the analysis area.

The visual inventory polygons used in the analysis are based on current visual landscape inventory data from the Sea to Sky and Sunshine Coast natural resource districts, including unpublished polygons established by the Government Action Regulation (GAR) Ministerial Order for the Shannon watershed in 2016. The analysis only summarizes areas within the Crown Forested Landbase (CFLB), with the majority of alterations resulting from primary forestry activities.

Table 1. Data Sources

Description	Source	Source File	Criteria	Assumptions
Area of Interest (AOI)	User defined	Howe Sound Cumulative Effects Project boundary. (2015/12/07 version)	The user defines an area where they want to measure. Can be shape file or feature layer. Area is broken into tiles with tile names as unique text field.	A text field in the AOI breaking the area into smaller units can be incorporated so overlay size limitations are not encountered.
Vegetation Resource Inventory	BCGW.sde\WHSE_FOREST_VEGETATION.VEG_COMP	Project Geodatabase folder		Recent cutblocks were incorporated into

(VRI), c. 2016	_LYR_R1_POLY	HoweSoundVRI.gdb\vri_updated		final source file to capture missing VRI harvest.
Visual landscape inventory (VLI)	BCGW.sde\\WHSE_FOREST_VEGETATION.REC_VIMS_VLI_SVW	Project Geodatabase folder HoweSoundCE.gdb\VLI_2016_CE	Legal VSU polygons having a valid REC_EVQO_CODE (draft VSU polygons used rVQC) were used in the analysis.	Draft areas to become legalized under GAR. Combined Sunshine Coast and Soo data within project AOI
Crown Forest Land Base	Soo Timber Supply Area and Sunshine Coast Timber Supply Area TSR3 CFLB definition	Project Geodatabase folder HoweSoundCE.gdb\CFLB	Not 'Excluded' portions of landbase	Clipped and combined from TSR3 to use in analysis to assess biodiversity only on Crown land. CFLB_FLAG= 'YES'
Slope Percent	Source Ascii files of prepared slope data. O:\dem\slope\trim_25m\percent\bcalbers\esri_ascii_grid	Data imported to a separate file geodatabase if it does not already exist. File Geodatabase output is named VQO_SLOPE.gdb. Slope data is named by the tile name specified in the Area of Interest.		250k mapsheets are assessed for overlap with the AOI and corresponding ascii files are imported and merged.
250k mapsheet grid.	BCGW.sde/WHSE_BASEMAPPING.NTS_250K_GRID	BCGW.sde/WHSE_BASEMAPPING.NTS_250K_GRID		Mapsheets that intersect AOI are extracted and used to import predefined government slope ascii models

Analysis Criteria

Each VSU polygon in the Howe Sound study area has a legally-established Visual Quality Objective (VQO) that is assigned based on the visual sensitivity of the landform, assessed from important public viewpoints such as roadways, cities, and tourist or recreation areas where the visual values and aesthetic importance of an area is high. Each of these VQOs corresponds to an upper limit of allowable forest harvesting that is measured as a target percentage of non-visually effective green-up area within the polygon. For the purposes of analysis, the target percentage is measured at the planemetric (overhead mapping) scale rather than the typical perspective view that a person would see the landscape in the field from a ground viewpoint.

Higher sensitivity polygons that have a greater visual importance will have a lower limit range percentage of non-VEG, while a higher limit range percentage indicates lower sensitivity polygons that may be more difficult to see and less visually sensitive.

Table 2: VQO and limit range percentage of acceptable non-greened up area within a polygon

REC_EVQO_CODE (Source data field)	**VQO**	**Limit Range Target/Acceptable % Non-VEG for VQC class of land base polygon**	**Description of desired condition**
P	Preservation	0 – 1.0 %	Alteration is very small in scale, and not easily distinguishable from the pre-harvest landscape
R	Retention	1.1 – 5.0 %	Alteration is difficult to see, small in scale, and natural in appearance
PR	Partial Retention	5.1 – 15.0 %	Alteration is easy to see, small to medium in scale, and natural and not rectilinear or geometric in shape
M	Modification	15.1 – 25.0 %	Alteration is very easy to see, and is: A) large in scale and natural in its appearance, or B) small to medium in scale but with some angular characteristics

MM	Maximum Modification	25.1 – 40.0 %	Alteration is very easy to see, and is: A) very large in scale, B) rectilinear and geometric in shape, or C) both

Tree height is assessed in relation to slope percent to determine if a forest harvest disturbance is greened up. If the tree height is less than what is the designated height (in meters) for a slope class, then it is considered Non Greened-up. This assumes that when VEG is achieved, the height of the renewed forest cover generally blocks views of site disturbances such as stumps, slash, road cuts, and exposed rock and soils.

Research has found that the tree height required to achieve VEG is very dependent on the slope of the land. On flat ground VEG may be achieved with 3 metre trees, while on a 60% slope a forest stand of 8.5 metre trees will be needed to achieve VEG and obstruct the previous site disturbance.

Table 3 indicates the approximate tree heights that will achieve VEG for a given range of slope class, assuming that the renewed stand is well stocked, there is little site disturbance, the site is viewed from a middle ground location, and the vertical viewing angle does not exceed 20%.

Table 3: Slope and tree height to achieve Visually Effective Green-up (VEG).

Slope class %	0-5	6-10	11-15	16-20	21-25	26-30	31-35	36-45	46-50	51-55	56-60	60+
Tree Height (Meters)	3.0	3.5	4.0	4.5	5.0	5.5	6.0	6.5	7.0	7.5	8.0	8.5

When VQO polygons are summarized, risk is determined by the percentage of the visual polygon not in VEG in relation to the VQO polygon target. Only the crown forested landbase (CFLB) portion of the visual polygon is evaluated for risk in this analysis. There are several methods to establish what comprises the CFLB. For the purposes of this analysis, the CFLB established in the most recent timber supply review (TSR3) was utilized. Since the project area covers three timber supply areas (Soo TSA, Sunshine Coast TSA, Fraser TSA), the CFLB in this project is a combination of data from all three TSAs.

Risk = (Non VEG hectares/ forested VQO polygon area) * 100 in relation to acceptable non VEG percentage limits for a polygon

Table 4: VQO polygon risk designation

Percent of VQO polygon disturbed but not Visually Effective Greenup (VEG)	Risk Classification
Disturbance to Visual polygon is less than VQO scale of alteration guidelines	Below the limit range
Disturbance to Visual polygon is within VQO scale of alteration guidelines	Within the limit range
Disturbance to Visual polygon is exceeding VQO scale of alteration guidelines	Exceeding the limit range

Example: A Partial Retention polygon currently has 13% of its crown forested area not meeting visually effective green-up (VEG). This is within the limit range of 5.1% - 15% acceptable alteration for the visual polygon objective of Partial Retention, so it falls into the "Within the limit range" risk category.

Data Processing Steps

- The data analysis processing steps were as follows:
    1. File Geodatabase is created at a user defined location and an area of interest feature is identified.
    2. Map sheets of 1:250,000 scale are selected within the area of interest, and slope grids are generated for each map sheet. Slope data is prepared in ascii format to save steps in elevation model creation as well as slope derivation. Slope source data is located on the imagery server, O:\dem\slope\trim_25m\percent\bcalbers\esri_ascii_grid. Data is created in a separate VQO_SLOPE file Geodatabase. If the file Geodatabase or Feature name for a slope tile already exists then the slope feature will not be remade. This saves large amounts of processing time if the analysis is repeated over the same area with the same area of interest tiles.
    3. Slope grids created in VQO_SLOPE.GDB are then merged and clipped to the area of interest. The slope is also reclassified into percent grouping categories, reflected in Table 3.
    4. Based on the area of interest, data is extracted from a variety of sources, or local project data is referenced. Only specific fields required for the analysis are kept for the input data sources. For VRI, all fields were kept. Reducing fields helps minimize the size of attribute tables that are overlaid for analysis and can speed up processing time.
        - Programming was also developed so that if the area of interest is too large for analysis it can be to be broken into smaller analysis tiles. Once all tiles are analyzed, they are merged together to create an area of interest resultant coverage that is then used for summary analysis.
    5. Once all data sources are extracted, they are overlaid in the GIS to create an area of interest resultant file.
        - Grid raster slope classes are converted to polygon features for overlay analysis.
    6. VQO polygons are extracted from the resultant file to create a much smaller file for reference and summary.

7. The VQO resultant then has fields added which are used in the calculation of VEG and risk. These include:
    - SLOPE_CLASS - calculate from slope value field from slope data
    - GREEN_UP_CATEGORY - Used to calculate how close to green up it is
    - GREENUP_HEIGHT_TARGET - The target forest height for a cut block to reach (VEG)
    - GREENUP_HEIGHT_DIFF - The difference between the actual height and the target green up height
    - VISUAL_AREA_HA – Gross area of visual polygon (includes Non CFLB)
    - VISUAL_CONTRIBUTING - Polygon Contributes to VQO area. YES = it is contributing to the visual quality summary.
    - VISUAL_CONTRIBUTING_AREA_HA - Hectares that contribute to Visual quality
    - NON_GREEN_UP_AREA_HA – Hectares not visual equivalent green up
    - NSR_AREA_HA – Hectares that are a NCBR or NSR
    - GREEN_UP_AREA_HA - Hectares that are visually effective green up
    - NON_GREEN_UP_FLAT_HA - Hectares not visually effective green up. Excludes hectares on flat land (0-10% slope).
8. Key resultant field calculations.
    - Visual Contributing = 'YES' and VISUAL_CONTRIBUTING_AREA_HA = polygon area if ((NON_PRODUCTIVE_DESCRIPTOR_CD IS NULL OR NON_PRODUCTIVE_DESCRIPTOR_CD = '') and CFLB_FLAG is = 'YES')
    - GREENUP_HEIGHT_TARGET = Green up height target see criteria table 3.
    - GREENUP_HEIGHT_DIFF = Actual forest height - GREENUP_HEIGHT_TARGET
    - NSR_AREA_HA = Polygon Area if (VISUAL_CONTRIBUTING = 'YES' AND NON_FOREST_DESCRIPTOR IN ('NCBR','NSR'))
    - NON_GREEN_UP_AREA_HA = Polygon Area if (VISUAL_CONTRIBUTING = 'YES' AND GREENUP_HEIGHT_DIFF < 0)
    - GREEN_UP_AREA_HA = Polygon Area if (VISUAL_CONTRIBUTING = 'YES' AND GREENUP_HEIGHT_DIFF >= 0)
    - NON_GREEN_UP_FLAT_HA = Polygon Area if (VISUAL_CONTRIBUTING = 'YES' AND GREENUP_HEIGHT_DIFF < 0 AND GREENUP_HEIGHT_TARGET in (3,3.5))
9. Resultant files are then summarized by VQO polygon for the previously calculated fields, providing sum hectares of contributing land, VEG and non-VEG.
10. The summary file is then populated with target percents, VEG percent, non-VEG percent and non-VEG percent with flat areas taken out.
11. Risk is then calculated for each VQO polygon assessing the target percentages in relation to the actual VEG percentage of the VQO polygon (see criteria table 4.)
    - VLI_RISK is calculated as (Less than Limits, Within Limits, Exceeding Limits)
    - VLI_RISK_FLATADJUST is calculated as (Less than Limits, Within Limits, Exceeding Limits)

3. Results

Data Outputs

1. File Geodatabase

When the analysis is run the user can enter parameters to create a name for the file Geodatabase. In the case of this analysis the name was "CEA_VQORISK". The user also controls the time period run and a value describing extent of the file Geodatabase e.g. the Geodatabase name will have the following structure: Name of analysis (User variable defined) + Year the analysis is being run for (User variable defined) + Extent of analysis value (User variable defined) + Date the analysis was run (system defined).

Output example of file Geodatabase created for the 2016 analysis year.
e.g. CEA_VQORISK _2016_TME_20161121

Slope Classification Data:

For the analysis slope classification data is created in a separate file geodatabase. When the programming is run it will check for the existence of the VQO_Slope.gdb. If the slope feature does not exist for the tile it is generated in the VQO_slope file geodatabase. By assessing for pre-existing slope data the features do not have to be to be created each time a different analysis is generated for the same area of interest.

2. Feature classes

The following feature classes are contained in the output file Geodatabases. If a tiled area of interest analysis is run then the tile prefix name will be contained within the layer name output. e.g. Area1_HS_CFLB.

Extracted Feature data:

(Analysis) File Geodatabase data

The (Area#) tag in the output features is from the tiled text field used for data extraction. This field is used to break the analysis into smaller components, so large areas can be run for the analysis.

Layer Name	Comments
(Area#)_CFLB	CFLB layer based on the Area of interest tile
(Area#)_VLI_2016_CE	Visual polygon data for the area of interest tile
(Area#)_vri_updated	VRI data with forest ages.
(Area#)RISKJOIN	Visual polygon data with CFLB based on an Area of interest tile.
Bnd_(Area#)	The Boundary area which the tiled analysis was conducted from.

(Slope) File Geodatabase data

Layer Name	Comments
(Area#)_slopeRclsCLP	Reclassed slope category GRID file based on Table 3 classifications. Grid file is created from the bounds of the area tile being analyzed.
(Area#)_ slopeRclsCLPPOLY	Reclassed slope category GRID file based on Table 3 classification. This is a polygon conversion of the Grid slope class.
Bnd_(Area#)	The Boundary area which the tiled analysis was conducted from.

Resultant files:

Resultant files are the overlay of extracted polygon data above. (CFLB, VQO, VRI, Slope)

Layer Name	Comments
(Area#)_RESULTANT2	Resultant layer generated for tiled area within area of interest.
Allresultant_merge	Final resultant file merged from each (Area#)_RESULTANT2 file
Allresultant_merge_CFLB	Final resultant file merged from each (Area#)_RESULTANT2 file. Only contains polygons within CFLB.

Summary/Statistics table files:

Summary tables are the summary of calculated data in the resultant files

Table Name	Comments
allstatisticsVLI	Summary statistics from allresultant_merge_cflb. This table summarizes fields from resultant, then percentages and risk are evaluated and calculated in the summary table. This table is used to link visual risk back to VQO polygons.

Additional Feature Classes:

Table Name	Comments
VQO_Polygons_all	VQO Polygons extracted for the whole area of interest. Used in final layer files to define and show bounds of VQO polygons. Risk tables could be attached to this feature, but areas of CFLB will not be defined. Used in mapping to show VQO polygon bounds

Final risk layer features:

The final risk layer has the same name as the file geodatabase. Layer only contains data that is in VQO polygon and within CLFB.

Table Name	Comments
CEA_VQORISK_(Year)_(Area)_(Date)	Example: CEA_VQORISK_2016_TME_20161123 This feature contains the risk assessment information for each VQO polygon. VQO polygons only represent risk where the land is within the Crown forest Land Base.

3. Data Dictionary

The data dictionary reflects fields contained in the final risk layer CEA_VQORISK_(Year)_(Area)_(Date). Fields are consistent for each year of VQO risk analysis. Field names found in the summary table are also in the resultant output if the "SUM_" prefix at the start of the field name is removed. The Spatial risk layer contains a VLI_POLYGON_NO that is used as the key to link risk summary tables back to spatial data.

Field Name	Field Description
Visual Quality Objectives Risk Table fields	***All data is summarized by the VQO Polygon Number**
VLI_POLYGON_NO	The unique number for the visual polygon area.
FREQUENCY	The total number of polygons summarized
SUM_VISUAL_AREA_HA	The sum hectares of the visual polygon area
SUM_VISUAL_CONTRIBUTING_AREA_HA	The sum hectares that contributes to calculating visual risk. This area excludes Natural non-forested areas as well as non-CFLB areas.

SUM_NON_GREEN_UP_AREA_HA	The sum hectares of harvest areas that are not in a Visual Effective Green up state (VEG).
SUM_NON_GREENUP_FLAT_HA	The sum hectares of harvest areas that are not in a Visual Effective Green up state (VEG). This excludes non VEG areas that are on less than 10% slope. The purpose is to adjust for flat areas that are not in VEG, but likely cannot be seen from surrounding viewpoints.
SUM_GREEN_UP_AREA_HA	The sum hectares of area that is in a VEG condition. Includes harvested and non-harvested areas.
REC_EVQO_CODE	The visual objective classification code which defines the acceptable percentage of Non (VEG) that can exist in a VQO polygon.
VLI_TARGETS_UPPER_PERCENT	The upper level percent of Non (VEG) area accepted in the VQO polygon.
VLI_TARGETS_LOWER_PERCENT	The lower level percent of Non (VEG) area accepted in the VQO polygon.
GREENUP_PERCENT	The existing percentage of the VQO polygon in a (VEG)/greened up condition. (SUM_GREEN_UP_AREA_HA /SUM_VISUAL_CONTRIBUTING_AREA_HA) * 100
NON_GREEN_UP_PERCENT	The existing percentage of the VQO polygon **NOT** in a (VEG)/greened up condition. (SUM_NON_GREEN_UP_AREA_HA /SUM_VISUAL_CONTRIBUTING_AREA_HA) * 100
NON_GREEN_UP_PERCENT_NOFLAT	The existing percentage of the VQO polygon **NOT** in a (VEG)/greened up condition. Percentage does no include Non (VEG) area on less than 10% slopes. (SUM_NON_GREENUP_FLAT_HA /SUM_VISUAL_CONTRIBUTING_AREA_HA) * 100
VLI_RISK	Final risk classification based on relation of NON_GREEN_UP_PERCENT compared to VLI_TARGETS_UPPER_PERCENT
VLI_RISK_FLATADJUST	Final risk classification based on relation of NON_GREEN_UP_PERCENT_NOFLAT compared to VLI_TARGETS_UPPER_PERCENT

4. Data Notes
    1. Sum_visual_contributing_area can = 0 and have a larger sum_visual_area. This is because sometimes a VQO polygon can be completely outside the crown forest landbase.
    2. In some cases the totals of sum_green_up_area and sum_non_green_up_area will not total Sum_Visual_contributing_area_ha . This is due to the NCBR and NSR areas are included into the contributing_area but not included into the green up / non green up hectares. This was done because these areas are likely openings but have no associated height at which to determine green up. See recommendations regarding this below.
    3. VLI_RISK is not calculated or = “Null” if there is no contributing area in the VQO polygon.

5. Layer Files

    A single VQO risk layer has been developed for the analysis (CEA VQO RISK TME.LYR).

    For each individual year, three layers are used to display risk and VQO polygons.

    1. Outline of VQO polygons. VQO_Polygons_all: Outline of all VQO polygons within the area of interest.
    2. VQO risk of crown forest land base adjusted for flat slopes. Risk summary for this layer excludes accounting for 0-10% slopes in contributing to visual risk. The layer is named as CEA_VQORISK_(Year being analyzed)_(Area of Interest)_(Date analysis run) and is symbolized for visual risk by the field (VLI_RISK_FLATADJUST).
    3. VQO risk of crown forest land base on all slopes. Risk summary includes all slope percentages contributing to visual risk assessment. The layer is named as CEA_VQORISK_(Year being analyzed)_(Area of Interest)_(Date analysis run) and is symbolized for visual risk by the field (VLI_RISK).

Conclusions

Recommendations and Learnings

The VQO risk analysis should be used as a guideline indicator to the state of visual polygons. A number of factors play a role in the visual quality of an area and GIS modeling for visuals can only look at a cursory level of the data. Locations which visual areas are viewed from can be varied and hard to determine with GIS modeling.

Potential modifications: While the current analysis product provides a good but not perfect baseline the following improvements could be assessed in refining the analysis. Currently the analysis uses a polygon based analysis that gets quite large as the area of interest increases in size.

1. A raster based analysis may be more appropriate to run large areas quickly.

2. Adding a visibility component to the analysis that uses known viewpoints, elevation models as well as road networks will help determine what portions of a VQO polygon can actually be viewed and factor only viewable areas into calculating Visual risk.

3. The number of missing (unaccounted) harvest blocks can be reduced. Before an analysis is conducted on an area, satellite/aerial imagery can be used to capture additional blocks that have not yet been entered into the RESULTS system.

The effectiveness of the above recommendations would however need to be tested to determine whether they provide any improvement to the analysis, including what amount of additional time is needed for the analysis development and completion.

Future time requirements

Current analysis time requirements: Data preparation is minimal for the visual risk analysis with most preparation required for updating the VRI input with missing cut blocks. If a large analysis is conducted (e.g. TSA) it can take a day for the analysis to run.

Total Time: Each TSA would probably take about 3 days with some of the time allocated to processing and potential data issues that sometime arise with large analyses.

Modified analysis: If the analysis was converted to a raster based analysis, the programming would need to be modified. A similar approach would be used, just with raster data that processes much faster.

Total Time: Once the programming was completed each TSA it is estimated would take 1 day of preparation and processing time.

References

Procedures for Factoring Visual Resources into Timber Supply Analyses. Ministry of Forests (March 1998) *www.for.gov.bc.ca/hfp/publications/00038/tsr10.pdf*

Appendix V

Howe Sound Context for Visual Quality

Howe Sound Context for Visual Quality

Location and Topography

Howe Sound contains one of the southernmost fjords on British Columbia's coast. The entrance to Howe Sound is located about 10 km northwest of the city of Vancouver and stretches from the Strait of Georgia heading north for about 43 km up to the Squamish River Estuary. The Project area contains 218,277 ha of land of which about 79% (145,042 ha) is forested. Of this forested land, about 40% of it (53,639 ha) has legally established visual quality objectives.

The sound itself is a triangular shaped inlet bounded by steep coastal mountains ranging in height from 1,200 m in the south up to about 2,700 m in the north. The southern portion of the sound contains four major islands (Bowen, Keats, Gambier and Anvil) and numerous smaller islands, while the northern portion of the sound narrows to a 3 km wide channel becoming a fjord for 15 km before reaching the Squamish estuary. The estuary is fed by the Squamish River and the associated Cheakamus and Mamquam river drainages, with many other smaller rivers and creeks in watersheds throughout the sound.

Human Settlement and Public Influences

The Howe Sound CEP project area falls within the traditional homelands of Coast Salish people like the Tsleil-Waututh, Musqueam, and Squamish First Nations. The Squamish Nation has numerous reserves and cultural sites within the Howe Sound area and Squamish River watershed. The quality of the visual landscape is important to the people that live, work and recreate in the Howe Sound area.

Overall, about 40-50,000 people live in the Howe Sound area with the majority of people residing in the communities of Squamish, Horseshoe Bay, Lions Bay, Gibsons, Bowen Island and Britannia Beach. The popular Sea-to-Sky highway runs through the Project area and is used by most of the more than 9.5 million people that visit the Whistler ski resort each year. The high level of tourism and recreation traffic in this scenic travel corridor clearly has an influence on public values such as visual quality.

The topography in the area has restricted most of the settlement to the coastline, valley bottoms and lower lying island areas. It is estimated that the population in the Sea-to-Sky corridor could increase by almost 30% over the next 25 years. Approximately 13,000 units are currently being planned in the broader Howe Sound area through resort and housing development proposals. Commercial services, tourism and recreational use in the area are also expected to increase during this period. Consequently, it is anticipated that the demand to maintain or improve scenic areas in the Howe Sound area will also increase.

Scenic Areas

Scenic areas and visual values are established solely for the purposes of public enjoyment but visuals can also be considered by some as an indicator of good forest management. Scenic areas may be altered in order to adapt to new developments that encroach on the forested landscape and have their own impacts on visual quality. For example, a number of new development proposals in the project area (e.g. Garibaldi at Squamish resort, South Britannia Beach housing development, Woodfibre liquefied natural gas plant, and McNab Creek aggregate mine), if they are approved and proceed to development, are likely to influence factors that influence forest visual conditions, such as increasing the number and location of significant public viewpoints, additional removals of forest from Crown and private land, and more roads.

Land Use

The Howe Sound project area, with its close proximity to Vancouver, has long been an interface area between wilderness and increasing human settlement, development, tourism and recreational activity. The area has multiple competing economic, social, cultural and environmental values that are considered together when determining land use decisions. Land use direction for the eastern and northern portions of Howe Sound is contained in the Sea-to-Sky Land and Resource Management Plan (S2SLRMP) which was completed in 2008 through a multi-stakeholder process. The S2SLRMP was harmonized with land use direction from land use planning agreements with participating First Nations, and continues to provide land use certainty and greater clarity on the vision and objectives for land and resource management[8].

Other types of land use development activities besides forestry operations may also impact visual quality in the Howe Sound area; however, these activities are beyond the scope of this report. Permanent human disturbance (i.e. roads, housing, and infrastructure) accounts for about 7% of the land in the project area. These other land uses generally occur in lower elevations and are very easy to see but they are not part of the CFLB or the visual inventory.

The economy in the project area is diversifying and becoming less reliant on natural resource extraction as improved highway access and tourism infrastructure spurs new resort, housing, tourism, recreation, commercial and industrial development interests. These new activities, though improving the diversity of economic and social development, can also have a visual impact on the natural character of this more forested area. However, the public often perceives the permanent deforestation impacts from these types of developments as being more acceptable than the temporary visual impacts from sustainable clear-cut forest harvesting[9].

[8] https://www.for.gov.bc.ca/tasb/SLRP/plan79.html
[9] http://www2.gov.bc.ca/gov/content/industry/forestry/managing-our-forest-resources/visual-resource-management

Recreation and Tourism

The Project area is seeing an increase in front-country and back-country recreation from visitors that primarily come from outside the Howe Sound area. Some of the recreational activities include: motor biking, ATV use, mountain biking, windsports, mountain climbing and front-country and backcountry camping. The large number of accessible resource roads in the area creates many access opportunities for motorized and non-motorized recreationalists, and this increased recreational use and activity in the area also increases the number of locations where the public may view scenic landscapes ("viewpoints"). New viewpoints are likely to expand the viewable scenic area and result in the establishment of new visual sensitivity units and associated visual quality objectives.

The Sea to Sky Gondola[10], a recently established business in the Squamish area which provides thousands of daily visitors easy access to a previously inaccessible backcountry area, is an example of a new tourism and recreation activity that has led to the development of new visual quality objectives. Once the Sea to Sky Gondola business was established, FLNRO redefined the visual sensitivity units in the area to include the new viewpoints, and established new visual quality objectives to ensure that any timber harvesting in the area would be conducted in consideration for this new visual inventory. These new visual objectives are intended to support the public desire for visual management, but they also carefully consider the impacts on timber objectives to achieve Crown revenue and corporate targets that enable continued employment and economic benefits.

Forest Visual Quality

Approximately 29% (53,639 ha) of the total land area in the project area (183,625 ha) and about 40% (53,639 ha) of the forested land (145,042 ha) in the project area have established scenic areas that guide forest management with legal visual quality objectives. These visual quality objectives only apply to forest sector industries, which have legally established tenure through the *Forest and Range Practices Act* (*FRPA*). About 71% (130,883 ha) of the project land area is part of the Crown Forest Land Base, which is the area of productive forested Crown land in a defined area. CFLB does not include private land, non-forested areas like alpine, lakes, roads, or non-productive forest. About 29% (42,743 ha) of the CFLB is considered available for timber harvesting, defined as the timber harvesting land base (THLB).

FLNRORD is currently completing a complementary visual quality assessment in the Howe Sound area to evaluate the on-the-ground current visual condition and conformance to established VQOs (forestry and other human development visual impacts). Only three VQO categories are assigned to the 89 VSU polygons in the Howe Sound CE Project area: Partial Retention VQO (36,752 ha); Modification VQO (9,247ha) and the Retention VQO (7,640 ha).

[10] https://www.seatoskygondola.com/

Appendix VI

Table of Howe Sound Visual Quality Assessment Results

Visual Sensitivity Units		Existing Visual Condition (EVC) & Trend			
Retention VQO (1.1 – 5% Alteration)					
Polygon ID	Area (ha)	EVC Risk Level	EVC 1995	EVC 2017	Trend
435	918.4	Below limits	**PR** (5.1-15%)	**P** (0-1%)	Less disturbance
462	813.5	Below limits	**R** (1.1-5%)	**P** (0-1%)	Less disturbance
464	57.2	Below limits	**R** (1.1-5%)	**P** (0-1%)	Less disturbance
506	483.3	Exceeding limits	**MM** (25.1-40%)	**M** (15.1-25%)	Less disturbance
508	639.0	Exceeding limits	**R** (1.1-5%)	**PR** (5.1-15%)	More disturbance
511	55.5	Below limits	**R** (1.1-5%)	**P** (0-1%)	Less disturbance
514	90.7	Below limits	**R** (1.1-5%)	**P** (0-1%)	Less disturbance
517	1082.5	Below limits	**PR** (5.1-15%)	**P** (0-1%)	Less disturbance
518	64.9	Below limits	**P** (0-1%)	**P** (0-1%)	No change
519	786.6	Within limits	**MM** (25.1-40%)	**R** (1.1-5%)	Less disturbance
521	681.1	Below limits	**PR** (5.1-15%)	**P** (0-1%)	Less disturbance
702	654.2	Within limits	**PR** (5.1-15%)	**R** (1.1-5%)	Less disturbance
1296	1145.7	Below limits	**R** (1.1-5%)	**P** (0-1%)	Less disturbance
1309	122.2	Below limits	**R** (1.1-5%)	**P** (0-1%)	Less disturbance
1357	52.2	Below limits	**R** (1.1-5%)	**P** (0-1%)	Less disturbance
Partial Retention VQO (5.1 – 15% Alteration)					
244	1539.5	Below limits	**R** (1.1-5%)	**P** (0-1%)	Less disturbance
325	767.2	Within limits	**M** (15.1-25%)	**PR** (5.1-15%)	Less disturbance
331	154.1	Below limits	**R** (1.1-5%)	**R** (1.1-5%)	No change
369	556.9	Exceeding limits	**R** (1.1-5%)	**MM** (25.1-40%)	More disturbance
388	1158.2	Within limits	**R** (1.1-5%)	**PR** (5.1-15%)	More disturbance
399	1040.3	Below limits	**PR** (5.1-15%)	**P** (0-1%)	Less disturbance
452	19.5	Below limits	**M** (15.1-25%)	**P** (0-1%)	Less disturbance
453	699.6	Below limits	**R** (1.1-5%)	**P** (0-1%)	Less disturbance
483	1752.9	Below limits	**R** (1.1-5%)	**P** (0-1%)	Less disturbance
487	775.3	Within limits	**M** (15.1-25%)	**PR** (5.1-15%)	Less disturbance
488	188.9	Below limits	**R** (1.1-5%)	**P** (0-1%)	Less disturbance
489	1394.7	Within limits	**M** (15.1-25%)	**PR** (5.1-15%)	Less disturbance
494	200.0	Exceeding limits	**M** (15.1-25%)	**M** (15.1-25%)	No change
495	1217.6	Below limits	**M** (15.1-25%)	**P** (0-1%)	Less disturbance
497	963.6	Exceeding limits	**R** (1.1-5%)	**M** (15.1-25%)	More disturbance
499	208.7	Below limits	**R** (1.1-5%)	**P** (0-1%)	Less disturbance
501	967.1	Below limits	**M** (15.1-25%)	**P** (0-1%)	Less disturbance
504	1615.2	Exceeding limits	**MM** (25.1-40%)	**M** (15.1-25%)	Less disturbance
512	203.3	Below limits	**PR** (5.1-15%)	**P** (0-1%)	Less disturbance
513	1341.6	Within limits	**PR** (5.1-15%)	**PR** (5.1-15%)	No change
520	288.7	Below limits	**M** (15.1-25%)	**P** (0-1%)	Less disturbance
522	88.5	Below limits	**M** (15.1-25%)	**P** (0-1%)	Less disturbance
644	1214.2	Within limits	**M** (15.1-25%)	**PR** (5.1-15%)	Less disturbance
649	144.7	Below limits	**R** (1.1-5%)	**P** (0-1%)	Less disturbance
650	1668.4	Within limits	**PR** (5.1-15%)	**PR** (5.1-15%)	No change
700	232.7	Below limits	**PR** (5.1-15%)	**R** (1.1-5%)	Less disturbance
701	135.1	Below limits	**PR** (5.1-15%)	**P** (0-1%)	Less disturbance
703	482.1	Below limits	**PR** (5.1-15%)	**R** (1.1-5%)	Less disturbance

704	422.2	Within limits	**PR** (5.1-15%)	**PR** (5.1-15%)	No change
705	72.3	Below limits	**PR** (5.1-15%)	**P** (0-1%)	Less disturbance
706	456.7	Within limits	**PR** (5.1-15%)	**PR** (5.1-15%)	No change
707	354.6	Below limits	**PR** (5.1-15%)	**P** (0-1%)	Less disturbance
1197	16.7	Below limits	**P** (0-1%)	**P** (0-1%)	No change
1203	1304.7	Below limits	**M** (15.1-25%)	**P** (0-1%)	Less disturbance
1211	366.0	Within limits	**M** (15.1-25%)	**PR** (5.1-15%)	Less disturbance
1223	1275.6	Within limits	**M** (15.1-25%)	**PR** (5.1-15%)	Less disturbance
1225	1168.5	Below limits	**M** (15.1-25%)	**P** (0-1%)	Less disturbance
1236	1237.3	Within limits	**PR** (5.1-15%)	**PR** (5.1-15%)	No change
1261	51.2	Below limits	**R** (1.1-5%)	**P** (0-1%)	Less disturbance
1264	525.8	Below limits	**R** (1.1-5%)	**P** (0-1%)	Less disturbance
1269	413.9	Within limits	**PR** (5.1-15%)	**PR** (5.1-15%)	No change
1273	706.5	Within limits	**PR** (5.1-15%)	**PR** (5.1-15%)	No change
1274	194.7	Below limits	**PR** (5.1-15%)	**P** (0-1%)	Less disturbance
1277	894.6	Below limits	**PR** (5.1-15%)	**R** (1.1-5%)	Less disturbance
1279	86.2	Below limits	**P** (0-1%)	**P** (0-1%)	No change
1282	46.9	Below limits	**P** (0-1%)	**P** (0-1%)	No change
1287	1353.3	Within limits	**PR** (5.1-15%)	**PR** (5.1-15%)	No change
1294	479.1	Below limits	**MM** (25.1-40%)	**P** (0-1%)	Less disturbance
1297	976.8	Below limits	**PR** (5.1-15%)	**R** (1.1-5%)	Less disturbance
1319	245.9	Below limits	**M** (15.1-25%)	**R** (1.1-5%)	Less disturbance
1322	93.6	Within limits	**PR** (5.1-15%)	**PR** (5.1-15%)	No change
1336	34.2	Below limits	**PR** (5.1-15%)	**P** (0-1%)	Less disturbance
1339	606.2	Below limits	**PR** (5.1-15%)	**P** (0-1%)	Less disturbance
1342	1968.3	Below limits	**M** (15.1-25%)	**R** (1.1-5%)	Less disturbance
1353	xx	Below limits	**PR** (5.1-15%)	**P** (0-1%)	Less disturbance
1354	356.3	Below limits	**PR** (5.1-15%)	**P** (0-1%)	Less disturbance
1360	7.3	Below limits	**M** (15.1-25%)	**P** (0-1%)	Less disturbance
1363	45.2	Exceeding limits	**R** (1.1-5%)	**M** (15.1-25%)	More disturbance
Modification VQO (15.1 – 25% Alteration)					
347	259.6	Exceeding limits	**R** (1.1-5%)	**MM** (25.1-40%)	More disturbance
367	689.0	Below limits	**M** (15.1-25%)	**PR** (5.1-15%)	Less disturbance
396	164.3	Below limits	**MM** (25.1-40%)	**P** (0-1%)	Less disturbance
400	954.5	Below limits	**MM** (25.1-40%)	**R** (1.1-5%)	Less disturbance
419	121.5	Below limits	**M** (15.1-25%)	**PR** (5.1-15%)	Less disturbance
427	654.7	Below limits	**MM** (25.1-40%)	**R** (1.1-5%)	Less disturbance
436	477.4	Below limits	**R** (1.1-5%)	**PR** (5.1-15%)	More disturbance
461	925.1	Below limits	**R** (1.1-5%)	**PR** (5.1-15%)	More disturbance
466	1332.1	Below limits	**MM** (25.1-40%)	**R** (1.1-5%)	Less disturbance
479	521.2	Below limits	**MM** (25.1-40%)	**P** (0-1%)	Less disturbance
498	1124.1	Below limits	**M** (15.1-25%)	**PR** (5.1-15%)	Less disturbance
500	735.2	Within limits	**R** (1.1-5%)	**M** (15.1-25%)	More disturbance
510	536.9	Below limits	**M** (15.1-25%)	**R** (1.1-5%)	Less disturbance
1315	515.9	Below limits	**PR** (5.1-15%)	**R** (1.1-5%)	Less disturbance
1341	72.8	Below limits	**PR** (5.1-15%)	**P** (0-1%)	Less disturbance
1343	169.1	Within limits	**MM** (25.1-40%)	**M** (15.1-25%)	Less disturbance

Appendix VII

FREP Form for WF2/VSU #504

BRITISH COLUMBIA Forest and Range Evaluation Program

Visual Quality Effectiveness Evaluation
Resource Stewardship Monitoring
Page 1

2.1.2 Site Information (Office)

Forest District: DSQ
Licensee: Black Mount Logging
Licence No.: A19215 CP No.: 122
General Location: Woodfibre Creek
Sample Code: DSQ-72
Date of Field Evaluation: 07/28/2016
Block: WF2
Results Opening ID: 1648719

2.1.3 VLI Information (Office)

Date of Update: 01/01/1991 VAC: M Established VQO: PR
Polygon No.: 504 VSC: 2 Date of Establishment: 01/01/1995
EVC: MM Recommended VQO: ... Source Document: DM Letter

2.2.1 Viewpoint (Field)

Viewpoint No.: 1 GPS Latitude: 49 37 44.6 Viewing Direction: 313
GPS Longitude: 123 15 45.0 Elevation (m): 0 Viewing Distance: 3.00

2.2.2 Photography (Field)

Roll No.: ____ ID Nos.: ____ Viewpoint Importance (low) 1 2 3 4 5 (high) Field of View Width(degrees): 25
Digital Photo ID Nos: 5100-03 L.D. Viewpoint Description: from Howe Sound Field of View Height(degrees): 13

2.2.3 Assess Basic VQC (Field)

Alterations meet with Basic VQC definition? Circle where in the range for that VQC.
Basic VQC: P R | PR | X | M | MM →

Notes: High contrast, easy to see, slightly rectilinear, just in PR.

2.2.4 Design Observations (Field)

Design Elements	S (-1)	M (0)	P (+1)
Response to visual force lines	○	◉	○
Borrows from natural character	○	○	◉
Edge treatments incorporated	○	◉	○
Distance from the viewpoint	○	◉	○
Position on the landform	○	◉	○
Total Design	____	1	____

2.3.4 Partial Cut Alterations

Partial cutting
% removed: ...
Average tree height (m): ...
Clearcut equivalent ____ % alteration as read from Table 4.
Record this value on line 2.3.2 a.

2.3.2 Assess Initial VQC (Office)

a) % of landform altered by recent openings: 3.17
b) % of landform with site disturbance outside openings: 1.06
c) % non veg contribution of old openings: 0.27
X = (a+b+c) = 4.50 % alteration **Initial VQC**: PR

2.3.3 Assess Adjusted VQC (Office)

d) Impact of roads, side cast, etc. (within openings): 1
☐ None ☒ Subordinate ☐ Significant ☐ Dominant Adj. Factor
e) Tree retention
☐ Good ☐ Moderate ☒ Poor Adj. Factor: 0
f) Design (enter total from 2.2.4 above) Adj. Factor: 1
Total adjustment Y = (d+e+f) Adj. Total: 2
Calculate adjusted % alteration X*(1 + 0.14*Y) = 5.76
Adjusted VQC: P R | PR | X | M | MM →
Adjusted % alt: 0 1.5 4 7 12 18 24 30 ++>

2.3.6 Determining EE Rating for the Landform by Comparing Basic VQC with Adjusted VQC (Office)

1 ☐ **Clearly not met** (Neither method indicates VQO achievement, both are far from class boundary)
2 ☐ **Not met** (Neither method indicates VQO achievement, but both are close to class boundary)
3 ☐ **Borderline** (One method indicates VQO achievement, one does not)
4 ☒ **Met** (Both methods indicate VQO achievement, but one or both are close to the high end "maximum % alteration limit.")
5 ☐ **Well met** (Both methods indicate VQO achievement and are on the lower % alteration limit or mid-range for the class)

2.3.7 Allowance for Over-ride

Over-ride EE: ...
Rationale for over-ride

Evaluated by: Lloyd Davies, Dave Charbula
Signature: ____

FS1252 2008/04