



# **British Columbia Noise Control Best Practices Guideline**

**March 2009**

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## **1. Introduction**

### **1.1 Purpose of the Best Practices Guideline**

*The British Columbia Noise Control Best Practices Guideline* outlines the requirements for noise control as they apply to operations, production facilities and gas processing plants (“facilities”) under the jurisdiction of the BC Oil and Gas Commission (the Commission). The guideline also provides background information and guidance regarding noise management.

### **1.2 Requirements and Expectations**

Recommended best practices are identified throughout this guideline and are numbered sequentially within each section.

For the purposes of this guideline, “operator” is used to designate the responsible duty holder (e.g., licensee, operator, company, applicant, approval holder, or permit holder) as specified in regulation and legislation.

#### **1.2.1 Need for Balance**

This guideline considers the interests of both nearby residents and the operator. It is not a guarantee that residents will not hear noise from a facility; rather, it aims to address indoor noise levels for residents near a facility. The guideline sets out Permissible Sound Levels (PSLs) for outdoor noise and attenuation of noise through the walls of a dwelling to decrease indoor sound levels so that normal sleep patterns are not disturbed.

#### **1.2.2 Receptor Based**

The guideline refers to noise at the point of the receptor (dwelling), rather than at the property line.

Measuring noise levels at the dwelling allows an operator to take maximum advantage of the normally substantial distance in rural areas between a facility and any dwellings. The only exception is for facilities in remote areas where a receptor is not present. In such cases, a PSL of 40 decibels absolute energy level equivalent (dBA Leq) during nighttime hours (the period between 22:00 and 07:00) should be met at 1.5 kilometers (km).

### **1.2.3 Industrial Noise and Domestic Animals and Wildlife**

Landowners, residents and First Nations have often expressed concern about the impact of industrial noise on domestic animals and wildlife. The Commission continues to examine peer-reviewed scientific literature and traditional environmental knowledge on this subject and may address it further in future guideline revisions.

### **1.2.4 Best Practices**

Operators are encouraged to adopt and incorporate a best practices approach to noise management within their maintenance and operating procedures. This includes regular fence-line measurements to determine if there are any significant changes to sound emanating from the facility and improving notification measures to neighbors of a planned noisy event. Operators wishing more information on a best practices approach may contact the Commission.

## **1.3 Scope Levels**

This guideline applies to oil and gas activities approved under the *Oil and Gas Commission Act*, the *Petroleum & Natural Gas Act*, and the *Pipeline Act*.

Primary considerations are production facilities and gas processing plants, and, more specifically, compressor, process cooler, pump, and electrical generator installations.

It is expected that some cases will need to be dealt with on a site-specific, issues-oriented basis. For example, while the guideline does not set specific noise limits for construction activity, these activities should be conducted with consideration for potential noise. For more details about construction noise, see Section 3.1.1.

### **1.3.1 Noise Levels at Well Sites or Facility Operations**

For drilling and servicing activities, well operators are responsible for noise control at well sites. Noise control practices during drilling and servicing activities are evaluated on a project and site-specific basis only and are initially assessed by Commission Field Inspection Staff.

While noise associated with heavy truck traffic and vibrations from facility operations are not specifically addressed in this guideline, operators are encouraged to take reasonable

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measure to minimize the impacts of heavy truck traffic and vibration.

If a noise complaint is received for a facility, a comprehensive sound survey may indicate that the cumulative facility contribution is equal to or less than the PSL. In situations where a comprehensive sound survey is not practical (equipment availability, time constraints) the Commission will accept a noise management plan.

Operators will be given a reasonable timeline to undertake corrective action. This includes time for sound monitoring, analysis, evaluation, equipment procurement and installation. Operators should be in communication with any complainants through all phases of corrective action.

### **1.3.2 Development of Dwellings**

Operators are reminded to consider noise when choosing sites, designing facilities, and negotiating leases where future dwellings may be constructed. Operators are encouraged to communicate with nearby residents to identify potential future developments. Applicants' or operators' representatives are then requested to work proactively to minimize potential impacts on new developments.

Operators should communicate existing noise levels (using existing noise survey data or modeling data extrapolated to the proposed building site) to any landowners, residents, and developers proposing dwellings near a facility. In all cases, the operator is encouraged to keep documentation of communication between the operator and landowners, residents, and developers.

Where landowners, residents, or developers build dwellings near an existing facility, the PSL will be the existing noise level permissible at the new dwelling. The Commission requests operators to be prepared to meet the practices outlined in this guideline when new developments result in the facility exceeding the PSL.

## **2. Determining Sound Levels and Adjustments**

### **2.1 Acceptable Sound Level**

New facilities should meet a PSL of 40 dBA Leq (nighttime) at the nearest dwelling, or at 1.5 km from the facility fence line, whichever is the lesser distance.

If dwellings exist within 1.5 km, the PSL is determined as described below. Cases where development occurs after a facility has begun operations are covered in Section 1.3.2.

This section sets out the tables used to determine PSLs, basic sound levels (BSLs), and adjustments. The PSL is generally derived from the BSL, which includes a 5 dBA allowance to the ambient sound level, plus adjustments intended to more accurately reflect specific aspects of the facility and the environment.

The PSL is determined for the nearest dwelling(s) or dwelling(s) most directly in line with potential noise and is assigned to that dwelling unit.

Predicted facility noise levels, plus average rural ambient levels, are compared to the PSL in a Noise Impact Assessment (NIA) (Section 3.2). Actual isolated facility noise levels are compared to the PSL in complaint situations.

As the vast majority of noise concerns for residents occur during the summer months, the PSL definition is based on summertime (May 1<sup>st</sup> to October 1<sup>st</sup>) conditions. If complaints do occur in the winter, the PSL may be modified to reflect site-specific winter conditions.

The PSL is calculated as follows:

$$\begin{array}{rcccccc}
 \textit{Permissible} & = & \textit{Basic Sound} & + & \textit{Daytime} & + & \textit{Class A} & + & \textit{Class B} \\
 \textit{Sound Level} & & \textit{Level} & & \textit{Adjustment} & & \textit{Adjustment} & & \textit{Adjustment} \\
 & & \textit{(Table 1)} & & & & \textit{(Table 2)} & & \textit{(Table 3)}
 \end{array}$$

***The PSL should not exceed 40 dBA Leq during nighttime hours which is the period between 22:00 and 07:00.***

PSLs do not apply in emergency situations.

An emergency is an unplanned event requiring immediate action. Events occurring more than four times a year at any one facility are not considered unplanned. Planned maintenance or operational events (e.g., blow downs, catalyst changes) may be considered temporary activities and thus qualify. Prior to such events, operators should inform nearby residents of the potential for increased sound levels and should make every attempt to schedule events during daytime hours to reduce the noise impact on nearby residents.

## 2.2 Basic Sound Level

Nighttime BSLs can be determined from Table 1. See Section 2.3.1 for the adjustment used for daytime values. Based on research conducted by a neighboring jurisdiction, the average rural ambient sound level is approximately 35 dBA Leq at night. Therefore, the

BSL is determined to be 40 dBA Leq (5 dBA Leq above ambient) to generate the minimum PSL. Moving down each column in Table 1, an adjustment is made to the BSL for proximity to transportation noise sources. Moving across each row, an adjustment to the BSL is made for higher population density.

*Table 1 - Basic Sound Levels for Nighttime\**

Proximity to Transportation	Dwelling unit density per quarter section of land		
	1 - 8 dwellings; 22:00 - 07:00 (nighttime) (dBA Leq)	9 - 160 dwellings; 22:00 - 07:00 (nighttime) (dBA Leq)	>160 dwellings; 22:00 - 07:00 (nighttime) (dBA Leq)
Category 1	40	43	46
Category 2	45	48	51
Category 3	50	53	56

Notes:

- The average rural ambient noise level is 5 dBA less than the BSL.
- Category 1—dwelling units more than 500 m from heavily travelled roads and/or rail lines and not subject to frequent aircraft flyovers.
- Category 2—dwelling units more than 30 m but less than 500 m from heavily travelled roads and/or rail lines and not subject to frequent aircraft flyovers.
- Category 3—dwelling units less than 30 m from heavily travelled roads and/or rail lines and/or subject to frequent aircraft flyovers.
- Density per quarter section—refers to a quarter section with the affected dwelling at the centre (a 451 m radius). For quarter sections with various land uses or with mixed densities, the density chosen is then averaged for the area under consideration.

## 2.3 Adjustments to Basic Sound Level

### 2.3.1 Daytime Adjustment

The daytime adjustment recognizes that daytime ambient sound levels are commonly 10 dBA Leq higher than nighttime levels and that nighttime noise disturbances are generally considered less acceptable. The daytime period is 07:00 to 22:00, and the daytime adjustment is 10 dBA Leq above the nighttime.



### 2.3.2 Class A Adjustments

Class A adjustments are based on the nature of the activity and/or actual ambient sound levels.

Technical verification should be supplied to use any of the adjustments to the BSL. More than one Class A adjustment may be claimed for permanent facilities if applicable to a maximum of 10 dBA Leq.

*Table 2 – Adjustments to Basic Sound Levels*

Class	Reason for Adjustment	Value (dBA Leq)
A1	Seasonal adjustment (wintertime conditions)	0 to + 5
A2	Ambient monitoring adjustment	-10 to +10

\*Class A Adjustment = Sum of A1 and A2 (as applicable), but not to exceed a maximum of 10 dBA Leq.

### 2.3.3 A1 – Seasonal Adjustment

The PSL determination is for summertime conditions. Therefore, a seasonal adjustment may be approved for wintertime complaints. However, operators should not add this adjustment when determining the PSL for design purposes. Seasonal adjustment should only be used when warranted under the best practices guideline.

In consultation with the Commission, the PSL may be modified to reflect site-specific conditions for seasonal issues. For example, if it is demonstrated that the facility may affect a winter recreation area where a quiet environment is a key aspect, the seasonal adjustment is not permitted.

### 2.3.4 A2 – Ambient Monitoring Adjustment

The ambient sound level (ASL) is the average sound environment in a given area without contribution from any energy-related industry. An adjustment for an incremental change to the BSL is applicable only when BSLs (Table 1) are thought not to be representative of the actual sound environment and when ASLs have been measured. The only two cases where it may be necessary to determine the ambient sound level are:

- areas considered to be pristine (defined in Appendix 1), and
- areas with non-energy industrial activity that would impact the background noise levels.

In either case, operators should obtain prior approval from the Commission to determine if an ambient sound adjustment is applicable.

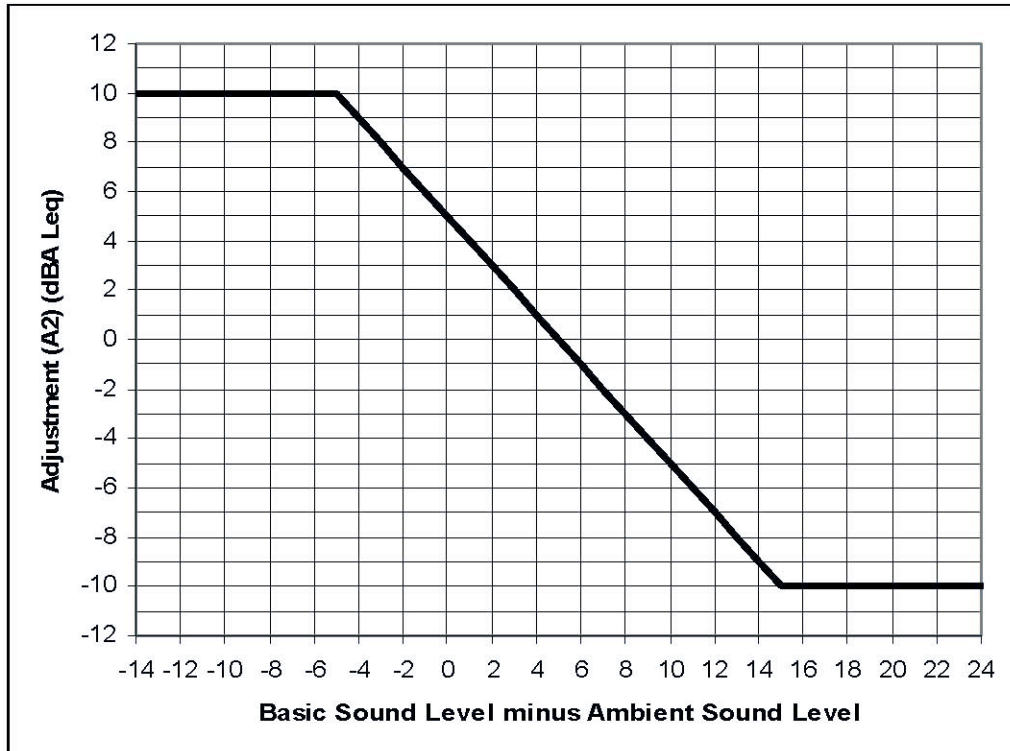
Operators may choose to conduct background noise surveys determining the total noise levels currently existing in an area. The background noise levels include all current noise sources (such as energy-related industry, non-energy industry, transportation).

An ambient sound monitoring survey consists of a 24-hour continuous sound monitoring survey, with measured ASLs presented for daytime and nighttime periods, conducted 15 m from the nearest dwelling or dwelling most likely to be affected and under representative conditions. The 15 m requirement may be altered if it is considered to be physically impossible or acoustically illogical.

Ambient sound surveys should be conducted *without* any energy-related industrial components.

See Figure 1 to determine the appropriate adjustment value, A2, which will be added to any other applicable Class A adjustment factors.

Figure 1 - Ambient Monitoring Adjustment, A2



### To Use Figure 1:

- Determine the difference between the BSL (Table 1) for the appropriate dwelling density and transportation proximity and the measured ASL to the nearest whole number.
- Look up this difference on the x-axis of Figure 1
- Move up on the figure until the plotted line is intersected
- Move left on the figure and read off the applicable A2 adjustment factor; it may be positive or negative.
- Add this adjustment factor to any other applicable Class A adjustment factors to arrive at the Class A adjustment. Note that if the sign of A2 is negative, you will be adding a negative number to arrive at the Class A adjustment.

### 2.3.5 Class B Adjustment

These values are intended to permit adjustments to the BSLs based on responses to temporary noise-generating activity. Temporary activities will be considered appropriately.

In order to use this adjustment, operators should inform residents of the duration and character of the noise.

Note that for the purposes of the best practices guideline, any activity lasting longer than 60 days is not considered temporary (drilling, geophysical operations and lease or road construction).

*Table 3 - Class B Adjustments\**

Class	Duration of Activity	Value (dBA Leq)
B1	1 day	+ 15
B2	7 days	+ 10
B3	≤ 60 days	+ 5
B4	> 60 days	0

\*Class B Adjustment = one only of B1, B2, B3, or B4.

## 2.4 Permissible Sound Level (PSL) Determination for pre-1998 Facilities

Facilities constructed and in operation prior to October 1998 are considered ‘deferred facilities’. Such facilities are excused from following the same criteria as facilities constructed after this time period.

This does not exempt these facilities from guideline best practices, but recognizes that they were potentially designed without the same consideration for noise as recently constructed facilities.

Deferred facilities without outstanding noise complaints registered against them with the Commission are considered to meet community noise tolerance levels. This existing noise level is considered to be the PSL for the facility if it is currently above the PSL as calculated using Section 2.

In cases where a complaint is registered, the PSLs are determined by application of the BSLs and adjustments (Section 2).

For facilities not meeting appropriate site-specific PSL levels as set out in this best practices guideline, operators may be required to bring the facility into alignment with this guideline.

The pre-expansion or pre-modification PSL will become the PSL for the expanded facility if it is currently above the PSL as calculated using Section 2.

Existing noise sources at a facility should be reduced in acoustic output to make room for the introduction of new noise sources so that there is no net increase in noise emitted from the facility.

### **3. Noise Impact Assessments (NIA)**

#### **3.1 Intent and Objective**

An NIA is required to ensure that operators consider possible noise impacts before a facility is constructed or in operation.

It is suggested that a facility be designed with a suitable margin of safety (for example, 5 dBA Leq below the PSL) to cover absolute worst-case situations such as possible low frequency noise and inability to mitigate noise measures to meet performance levels. The cost to retrofit may be significantly more than if noise mitigation measures are incorporated into the design of a facility.

An NIA predicts what the sound level will be from the proposed facility at the nearest or most likely to be affected permanent or seasonally occupied dwelling. Best practical technology (accounting for cost versus benefit) should be considered to minimize potential noise for existing dwellings.

#### **The facility should be modeled under operating conditions.**

For example, if the compressor is modeled to operate with doors and windows closed, the facility should operate under those conditions to meet the PSL. Operators are encouraged to consider the potential for future development of dwellings.

Operators moving into an area should establish good relationships by discussing noise matters with area residents during the design, construction, and operating phases of an energy facility

If a complaint is registered after a facility is in operation, operators should meet the PSL as determined by this guideline.

It is in the operator's best interest to achieve the most accurate predicted sound level possible.

An applicant planning a facility in an area where there is already an energy industry presence should ensure that the new facility will not cause overall sound levels to exceed the PSL.

The applicant may wish to discuss the proposed project with adjacent operators to examine potential sound attenuation measures that are both effective and economical.

### **3.1.1 Construction Noise**

Operators should take the following reasonable mitigating measures to reduce construction noise from new facilities or modifications to existing facilities. Operators should:

- conduct construction activity between the hours of 07:00 and 22:00;
- advise nearby residents of potential noise-causing activities and schedule these events to reduce disruption;
- ensure all internal combustion engines are fitted with appropriate muffler systems; and,
- take advantage of acoustical screening from existing on-site buildings to shield dwellings from construction equipment noise.

In the event a complaint is made during construction, operators are requested to work with the complainant to resolve or come to a mutually agreed upon resolution.

### **3.2 NIA Requirement**

Applicants should complete an NIA for any new facility where there is reasonable expectation of a continuous noise source; for modifications to existing facilities where there is a reasonable expectation of changes in noise source or level; and if there is a receptor within 1.5 km distance. The Commission may request an NIA without notice of operator expectation of noise increases.

Unless specified by the Commission, an NIA does not have to be included with the facility application if analysis indicates consistency with best practices in this guideline.

Applicants should keep a copy of the NIA and have it available in case of audit. If an NIA indicates inability to meet with the PSL, the applicant should consider further attenuation measures. If such measures are not practical, the applicant should include the completed NIA with the application, along with reasons why the measures proposed to reduce noise levels are not practical.

Drilling and servicing rigs fall into the temporary facility category even if they are expected to be at a location more than 60 days. Temporary activities generally do not require an NIA. Operators are responsible for noise control.

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### 3.3 Reporting Requirements for an Acceptable NIA

As part of a facility application, operators may be required to show that the facility meets the requirements in this guideline. All supporting information should also be available:

- in case the Commission conducts an audit on the facility application, and
- for reference if a noise complaint is registered.

Acceptable NIAs should include the following information:

**PSL** - Identify the PSL and the direction and distance to the nearest or most impacted dwelling(s). This includes all details on how the PSL was calculated and any adjustments claimed.

**Sound Source Identification** - Identify major sources of noise (such as cooler fans, exhaust noise, and pump noise) from the facility and their associated sound power/pressure levels.

- Indicate the source of sound data (vendors, field measurements, theoretical estimates, etc). Note that use of any theoretical data or extrapolation techniques can lead to inaccuracies and are therefore less reliable than actual field measurements made once equipment is in place.

**Operating Conditions** - When using manufacturer's data for expected performance, it may be necessary to modify the data to account for actual operating conditions (indicate design conditions, such as operating with open or closed compressor building windows and doors).

**Noise Model Parameters** - The following should be clearly stated within an NIA in case of potential audit by the Commission:

- type of model used (models or hand calculations may be used to obtain the predicted sound level),
- standards selected,
- source directivity considerations,
- ground absorption conditions,
- meteorological parameters,
- terrain parameters selected,
- reflection parameters, and
- any adjustments made. (Documentation of power level calculation assumptions made should be provided, e.g. source size considerations)

If sound pressure levels are determined using estimates, the NIA should clearly show the methodology used.

#### Predicted Sound Level

- Identify the predicted overall (cumulative) sound level at the nearest or most likely affected dwelling. Only nighttime sound levels are considered necessary, however, if there are differences between day and night operations, both levels should be calculated.
- Indicate whether the facility is consistent with best practices.

#### Attenuation Measures

- If predicted sound levels indicate inconsistency with this best practices guideline, attenuation measures that the operator is committing to and implementing should be identified.
- If predicted sound levels indicate inconsistency with this best practices guideline and further attenuation measures are not practical, the NIA should be included with the application, along with reasons why the measures proposed to reduce the impacts are not practical.

#### Analyst's Information

- Provide the name and contact information for the person conducting the NIA.

## 4. Adherence to Best Practices

### 4.1 Noise Complaints and Noise Management Plans (NMP)

Facilities are following best practices guideline if a Comprehensive Sound Level (CSL) survey conducted at representative conditions obtains results equal to or lower than the established PSL, considering Low Frequency Noise (LFN). Alternatively, if the Commission agrees that a CSL survey is not practical, a detailed Noise Management Plan (NMP) approved by the Commission may be used.

#### 4.1.1 Noise Management Plans

A NMP should include:

- identification of noise sources,
- assessment of current noise mitigation programs,
- methods of noise measurement,
- best practices programs, and
- continuous improvement programs.



In all cases, a NMP should be discussed with and incorporate input from all potentially affected persons, such as local neighbors, First Nations, regulated and non-regulated industries, and local government. The Commission is willing to assist in the process if requested by the lead industrial operator.

## **4.2 Risk-Assessed Audits**

The Commission may conduct random audits on facility applications, and expects sound levels and NIAs to be complete and technically relevant as set out in this best practices guideline.

If the Commission determines that an event causes noise levels exceeding the PSL or an unacceptable noise impact on nearby residents, the Commission may suspend operations.

## Glossary of Terms

Abnormal noise events	Noises that are sufficiently infrequent as to be uncharacteristic of an area or that occur so close to the microphone as to dominate the measurements in an unrealistic manner. Consideration should be given to deleting occurrences of abnormal noise from the measurements to obtain a reasonably accurate representation of the sound environment. Examples of abnormal noises include a dog barking close to the microphone, a vehicle passing nearby, people talking in the vicinity of the microphone in a quiet environment, or a passing road grader.
Ambient noise	All noises that exist in an area and are not related to a facility covered by this guideline. Ambient noise includes sound from other industrial noise not subject to this guideline such as transportation sources, animals, and nature.
Ambient sound level (ASL)	The sound level that is a composite of different airborne sounds from many sources far away from and near the point of measurement. The ASL does not include any energy-related industrial component and should be measured without it. The ASL can be measured when the sound level in an area is not believed to be represented by the basic sound levels in Table 2. The ASL should be measured under representative conditions. As with comprehensive sound levels, representative conditions do not constitute absolute worst-case conditions (i.e. the most quiet day in this case) but conditions that portray typical conditions for the area.
A-weighted sound level	The sound level as measured on a sound level meter using a setting that emphasizes the middle frequency components similar to the frequency response of the human ear at levels typical of rural backgrounds in mid frequencies.

Background noise	The total noise from all sources that currently exist in an area. Background noise includes sounds from the energy industry, as well as other industrial noise not subject to this directive such as transportation sources, animals, and nature.
Basic sound level (BSL)	The A-weighted Leq sound level commonly observed to occur in the designated land-use categories with industrial presence. The BSL is assumed to be 5 dBA above the ASL and is set out in Table 2.
Calibration	The procedure used for the adjustment of a sound level meter using a reference source of a known sound pressure level and frequency. Field calibration should take place before and after the sound level measurements.
Category	A classification of a dwelling unit in relation to transportation routes used to arrive at a BSL.
Category 1	Dwelling units more than 500 m from heavily travelled roads and/or rail lines and not subject to frequent aircraft flyovers.
Category 2	Dwelling units more than 30 m but less than 500 m from heavily travelled roads and/or rail lines and not subject to frequent aircraft flyovers.
Category 3	Dwelling units less than 30 m from heavily travelled roads and/or rail lines and/or subject to frequent aircraft flyovers.
Class A adjustment	Consists of the sum of adjustments that account for the seasonal nature of the noise source (cannot be used for design state) and the actual ambient sound level in an area. It cannot exceed +10 dBA. The Class A adjustment is added to the BSL, the daytime adjustment, and the Class B adjustment to arrive at the permissible sound level.
Class B adjustment	An adjustment based on the duration of a noisy activity that recognizes that additional noise can be tolerated if it is known that the duration will be limited. An adjustment of B1, B2, B3, or B4 may be selected as applicable.

**Comprehensive sound level (CSL)** The sound level that is a composite of different airborne sounds from many sources far away from and near the point of measurement. The CSL does include industrial components and should be measured with them, but it should exclude abnormal noise events. The CSL is used to determine whether a facility is consistent with this guideline.

**Cumulative noise level** The sound level that is the total contribution of all industrial noise sources (existing and proposed) from Commission-regulated facilities at the receptor.

**C-weighted sound level** The C-weighting approximates the sensitivity of human hearing at industrial noise levels (above about 85 dBA). The C-weighted sound level (i.e., measured with the C-weighting) is more sensitive to sounds at low frequencies than the A-weighted sound level and is sometimes used to assess the low-frequency content of complex sound environments.

**Daytime** Defined as the hours from 07:00 to 22:00.

**Daytime adjustment** An adjustment that allows a 10 dBA increase because daytime ambient sound levels are generally about 10 dBA higher than nighttime values.

**dB (decibel)** A unit of measure of sound pressure that compresses a large range of numbers into a more meaningful scale. Hearing tests indicate that the lowest audible pressure is about  $2 \times 10^{-5}$  Pa (0 dB), while the sensation of pain is about  $2 \times 10^2$  Pa (140 dB). Generally, an increase of 10 dB is perceived as twice as loud.

$$\begin{aligned} \text{Sound pressure level (dB)} &= 10 \log \left( \frac{p^2}{p_o^2} \right) \\ &= 20 \log \left( \frac{p}{p_o} \right) \end{aligned}$$

$p$  = root-mean-square sound pressure (Pa)

$p_o$  = reference root-mean-square-sound pressure, generally  $2 \times 10^{-5}$  Pa

dBA	The decibel (dB) sound pressure level filtered through the A filtering network to approximate human hearing response at low intensities. Also see <i>dB</i> and <i>A-weighted sound level</i> .
Dwelling unit	Any permanently or seasonally occupied residence with the exception of an employee or worker residence, dormitory, or construction camp located within an industrial plant boundary. Trailer parks and campgrounds may qualify as a dwelling unit if it can be demonstrated that they are in regular and consistent use during the applicable season.
Deferred facility	Facilities constructed and in operation prior to October 1998. This does not exempt them from following the best practices guideline but does recognize that they were potentially designed without the same considerations for noise.
Density per quarter section	Refers to a quarter section, with the most likely affected dwelling at the centre (a 451 m radius). For quarter sections with various land uses or with mixed densities, the density chosen should be factored for the area under consideration.
Dwelling unit (most impacted)	The nearest dwelling unit may not necessarily be the one most likely affected because of factors such as topography or man-made features. For example, the nearest dwelling unit to a facility may be behind an intervening ridge, while a more distant dwelling unit may be in direct line of sight with the facility. Care should be taken in determining the most likely affected dwelling unit. Also see <i>Dwelling unit</i> .
Low Frequency Noise (LFN)	Where a clear tone is present below and including 250 Hz and the difference between the overall C-weighted sound level and the overall A-weighted sound level exceeds 20 dB.
Heavily travelled road	Road or access that has frequent use or is travelled by commercial and industrial traffic

Nighttime	Defined as the hours from 22:00 to 07:00.
Noise	Generally associated with the unwanted portion of sound.
Noise impact assessment (NIA)	An NIA identifies the expected sound level emanating from a facility as measured 15 m from the nearest or most likely affected permanently or seasonally occupied dwelling. It also identifies what the permissible sound level is and how it was calculated.
Permissible sound level (PSL)	The maximum sound level that a facility should not exceed at a point 15 m from the nearest or most impacted dwelling unit. The PSL is the sum of the BSL, daytime adjustment, Class A adjustment, and Class B adjustment.
Practical	Action or activity performed in a timely manner taking into consideration availability of required equipment to perform the action or activity, access requirements, season, and location of project.
Pristine area	A pure, natural area that might have a dwelling but no industrial presence, including energy, agricultural, forestry, manufacturing, recreational, or other industries that already impact the noise environment.



## Appendix 1 Noise Impact Assessment Form

British Columbia Oil and Gas Commission

Licensee: \_\_\_\_\_

Facility Name: \_\_\_\_\_ Type: \_\_\_\_\_

Legal Location: \_\_\_\_\_

Contact: \_\_\_\_\_ Telephone: \_\_\_\_\_

### 1. Permissible Sound Level (PSL) Determination (*Noise Control Guideline*)

(Note that the PSL for a pre-1998 facility undergoing modifications may be the sound pressure level (SPL) that currently exists at the dwelling if no complaint exists and the current SPL exceeds the calculated PSL from Section 2.)

Complete the following for the nearest or most impacted dwelling(s):

Distance from facility	Direction from facility	BSL (dBA)	Daytime adjustment (dBA)	Class A adjustment (dBA)	Class B adjustment (dBA)	Nighttime PSL (dBA)	Daytime PSL (dBA)

### 2. Sound Source Identification

For the new and existing equipment, identify major sources of noise from the facility, their associated sound power level (PWL) or sound pressure level (SPL), the distance (far or free field) at which it was calculated or measured, and whether the sound data are from vendors, field measurement, theoretical estimates, etc.

New Equipment	Predicted	OR	Measured	Data Source	Distance calculated or measured (m)
	<input type="checkbox"/> PWL (dBA) <input type="checkbox"/> SPL (dBA)		<input type="checkbox"/> PWL (dBA) <input type="checkbox"/> SPL (dBA)		
_____	_____		_____	_____	_____
_____	_____		_____	_____	_____
_____	_____		_____	_____	_____
_____	_____		_____	_____	_____
_____	_____		_____	_____	_____

### 3. Operating Conditions

When using manufacturer's data for expected performance, it may be necessary to modify the data to account for actual operating conditions (for example, indicate conditions such as operating with windows/doors open or closed). Describe any considerations and assumptions used in conducting engineering estimates:

### 4. Modeling Parameters

If modeling was conducted, identify the parameters used (see Section 3):

### 5. Predicted Sound Level

Identify the predicted overall (cumulative) sound level at the nearest of most impacted dwelling. Typically, only the nighttime sound level is necessary, as levels do not often change from daytime to nighttime. However, if there are differences between day and night operations, both levels should be calculated.

Predicted sound level to the nearest or most impacted dwelling from new facility (including any existing facilities):

\_\_\_\_\_ dBA (night)  
 If applicable: \_\_\_\_\_ dBA (day)

Permissible sound level: \_\_\_\_\_ dBA (night)  
 Permissible sound level: \_\_\_\_\_ dBA (day)

Is the predicted sound level less than the permissible sound level? Yes \_\_\_\_\_ No \_\_\_\_\_  
 If **YES**, go to number 7.

### 6. Attenuation Measures

(a) If 5 is **NO**, identify the noise attenuation measures the licensee is committing to:

Predicted sound level to the nearest or most impacted dwelling from the facility (**with** noise attenuation measures):  
 \_\_\_\_\_ dBA (night); if applicable: \_\_\_\_\_ dBA (day)

Is the predicted sound level less than the permissible sound level? Yes \_\_\_\_\_ No \_\_\_\_\_  
 If **YES**, go to number 7.

(b) If 6(a) is **NO** or the licensee is not committing to any noise attenuation measures, the facility is not consistent with best practices. If further attenuation measures are not practical, provide the reasons why the measures proposed to reduce the impacts are not practical.

**Note: If 6(b) is NO, the Noise Impact Assessment should be included with the application filed as non-routine.**

8. Analyst's Name: \_\_\_\_\_  
 Company: \_\_\_\_\_  
 Title: \_\_\_\_\_  
 Telephone: \_\_\_\_\_ Date: \_\_\_\_\_

(continued)  
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## Appendix 2 Noise Complaint Investigation Form - Part 1

### British Columbia Oil and Gas Commission

Date (D/M/Y): \_\_\_\_\_  
 Resident: \_\_\_\_\_ Licensee representative: \_\_\_\_\_  
 Legal Location: \_\_\_\_\_ Licensee: \_\_\_\_\_  
 Address: \_\_\_\_\_ Address: \_\_\_\_\_  
 \_\_\_\_\_  
 Telephone: \_\_\_\_\_ Telephone: \_\_\_\_\_

#### Noise Characterization

Identify the quality and characteristics of the noise.

Distance to source: \_\_\_\_\_ (m) When is the noise a problem (day/night)? \_\_\_\_\_  
 Pitch (high/low): \_\_\_\_\_ Where is the noise most annoying (inside/outside)? \_\_\_\_\_  
 Is there a noticeable tone? \_\_\_\_\_ Describe: \_\_\_\_\_  
 Is noise steady/intermittent/pulsating? \_\_\_\_\_ Describe: \_\_\_\_\_  
 Is the noise heard and/or a vibration felt? \_\_\_\_\_ Describe: \_\_\_\_\_  
 What is noise comparable to? \_\_\_\_\_  
 Other Comments: \_\_\_\_\_

#### Weather Conditions

Identify the weather conditions under which the noise is most noticeable.

Temperature: \_\_\_\_\_ Direction wind is coming from: \_\_\_\_\_  
 Wind Speed (km/h): \_\_\_\_\_ Cloud Cover: \_\_\_\_\_ Precipitation: \_\_\_\_\_  
 Ground cover between dwelling and facility (snow, water, grass, crop, trees, ice, etc.):  
 \_\_\_\_\_  
 Other Comments: \_\_\_\_\_  
 \_\_\_\_\_  
 \_\_\_\_\_

#### Representative Conditions

From the above, identify the conditions that should exist as closely as possible during a comprehensive sound survey.

## Noise Complaint Investigation Form - Part 2 (Event Log)

Resident: \_\_\_\_\_ Licensee Contact: \_\_\_\_\_  
 Telephone: \_\_\_\_\_ Telephone: \_\_\_\_\_

List any details related to the sound from the industrial facility that is annoying you. Refer to the descriptions at the bottom for assistance in providing information.

<b>Date (D/M/Y)</b>	<b>Time a.m./p.m.</b>	<b>Noise Characteristics</b>	<b>Weather Conditions</b>	<b>Ground Cover</b>	<b>Receiver Location</b>

**Noise Characteristics:** Describe the sound as a high or low tone, steady or pulsing. What would you compare the sound to?

**Weather Conditions:** If possible, provide details on temperature, wind direction and speed, cloud conditions (clear or cloudy), and existence of precipitation when the sound is a problem.

**Ground Cover:** Describe what is covering the ground between you and the facility; for example, is it snow, water, grass, crop, trees, ice?

**Receiver Locations:** Note where you were when the sound was annoying (outdoors, such as on the deck or in the yard or corrals, or indoors, such as in the bedroom or living room).

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