

# Wetland Ways



7

## Interim Guidelines for Wetland Protection and Conservation in British Columbia

March 2009

### Chapter Seven

## OIL AND GAS EXTRACTION

7.1.	Introduction .....	1
7.2.	Legislation.....	2
7.3.	Objectives .....	3
7.4.	Guidelines.....	4
7.4.1.	Exploration .....	4
	General.....	4
	Oil and Gas Exploration .....	5
7.4.2.	Construction and Operation .....	6
	Oil and Gas Operations.....	6
7.4.3.	Reclamation .....	8
	General.....	8
	Oil and Gas Well Sites .....	8
7.4.4.	Roads and Trails.....	8
	Road and Trail Design .....	9
	Road Construction .....	10
	Trail Construction .....	13
	Road Operation and Maintenance .....	13
	Roads and Trail Reclamation .....	14
7.5.	References and Further Reading.....	14
	Government Offices .....	14

---

Websites.....	14
References.....	14

**These interim guidelines will be updated using experience from pilot testing and feedback from user groups. If you would like to comment on these guidelines, please send your comments to [wsp@gov.bc.ca](mailto:wsp@gov.bc.ca)**

Cover photos: Robert Cox





## CHAPTER 7: OIL AND GAS EXTRACTION

### 7.1. INTRODUCTION

This chapter provides guidelines for the protection and management of wetlands when resource extraction activities—notably oil and gas activities—take place nearby. It is intended to be read in conjunction with [CHAPTER 2: GENERAL GUIDELINES](#).

Resource extraction, including exploration and associated access as well as reclamation activities, can destroy or damage wetlands in their immediate vicinity or downstream.

**Direct loss and/or fragmentation:** Major site development (processing facilities) can destroy or damage wetlands through clearing and excavation. Road and trail access and associated drainage, if improperly sited and installed, can cause infilling and drying out of wetlands, as well as creating a barrier to wildlife movement that impacts breeding and feeding activities.



Changes to water quality can impact animals and their habitats.  
Pacific tree frog on algal mat.  
PHOTO: SARMA LIEPENS

**Sedimentation:** Initial soil disturbance from site preparation and road construction exposes soil and makes it more susceptible to erosion. This can be more severe where roads are on steeper slopes, soils are easily erodible, and where activities are carried out during wet periods. Ongoing erosion and sedimentation can occur from road surfaces, ditches, and road crossings. Sedimentation in wetlands may reduce biological productivity, stress wildlife (changing feeding and breeding behaviours), and may also affect downstream habitats.

**Water Quality:** Changes to water quality (e.g. chemical contamination) in or near wetlands and riparian areas can result in impacts to plants and animals and their habitats.

**Other impacts:** Resource extraction activities can result in direct disturbance of species from encroachment and excessive noise. New roads create a distribution system for invasive, non-native species (by humans and vehicles) and provide opportunities for recreational impacts to spread (e.g., boating and ATV use on wetlands).



All B.C. legislation can be found at <http://www.bclaws.ca/>.  
Federal legislation can be found at <http://laws.justice.gc.ca/>.

## 7.2. LEGISLATION

See [CHAPTER 2](#) for legislation that applies to all land managers. The oil and gas industry in British Columbia is managed by a broad range of legislation. Currently government is undertaking a process to consolidate various pieces of legislation under a comprehensive *Oil and Gas Act*. Initial regulations are being developed and may be introduced in 2009. Legislation governing oil and gas extraction currently includes the following.

- ♦ [\*Oil and Gas Commission Act\*](#): Under the Act, the Oil and Gas Commission regulates oil and gas activities including fostering a healthy environment. The Act gives the Commission the authority to issue permits for the short term use and diversion of water under the [\*Water Act\*](#).
- ♦ [\*Petroleum and Natural Gas Act\*](#): Sets out the basic requirements for oil and gas exploration and development in the province including access to public and private lands.
- ♦ [\*Pipeline Act\*](#): Provides process for pipeline companies for entry and occupation onto public and private land for the purposes of building and maintaining pipelines and other infrastructure including roads and compressor stations.
- ♦ [\*Geothermal Resources Act\*](#): Regulates activities including drilling to access geothermal resources. Can set requirements for drilling in and around water covered areas and controlling release of 'geothermal resources water'.
- ♦ [\*Waste Management Act\*](#), [\*Oil and Gas Waste Regulation\*](#): The regulation authorizes waste discharges to the environment from the upstream oil and gas industry.
- ♦ [\*Environmental Assessment Act\*](#): Sets out procedures and requirements for major project reviews. Legislation is managed by the Environmental Assessment Office.



PHOTO: JUDITH CULLINGTON



### 7.3. OBJECTIVES

As outlined in [CHAPTER 2](#), there are three major objectives for the protection and management of wetlands:

- ◆ Protect and maintain water quantities;
- ◆ Protect and maintain water qualities; and,
- ◆ Protect and maintain habitats and species.

This can be achieved by:

- ◆ Knowing what you have (inventory and mapping) (see [CHAPTER 2](#));
- ◆ Protecting wetlands with buffer zones; and,
- ◆ Minimizing impacts from human activities, such as resource extraction.

Following the guidelines in this document will help landowners and land managers demonstrate that they have applied due diligence. Monitoring the impacts of activities will assist in meeting the objectives. For more information, see [CHAPTER 12: MONITORING AND REPORTING](#).



Oil and gas well operation. PHOTO: ROBERT COX



## 7.4. GUIDELINES

### 7.4.1. Exploration

Initially, resource exploration activities generally occur broadly across the landscape. However, as exploration progresses to later stages impacts can be more localized and intensive. Oil and gas development requires extensive access networks including trails, roads and seismic lines. Where practical, existing road and trail networks are utilized. Impacts of these activities are discussed in [CHAPTER 1](#).

#### *General*



Seismic lines should be handcut adjacent to wetlands to minimize disturbance to riparian vegetation.  
PHOTO: ROBERT COX

#### PLAN TO AVOID IMPACTS TO WETLANDS

- Identify the location, size and type of wetlands from topographic maps, aerial photos, and other available information. Include information on vegetation types, the 100-year flood plain, and the presence of threatened or endangered species where available. Groundtruth this information when conducting reconnaissance surveys.
- Plan operations to avoid wetlands as much as possible.
- Ensure that you have all the necessary legislative approvals and permits before commencing any work.
- Schedule activities to avoid critical breeding and rearing seasons. Conduct exploration activities when these will have the least impacts on wetland habitat (e.g., winter or dry periods). Regional least-risk windows for fish and wildlife are available at the [Ministry of Environment website](#).

#### MINIMIZE IMPACTS FROM EXPLORATION CAMPS

- Locate camps and sewage disposal facilities at least 100 m from the normal high water mark of wetlands to prevent possible pollution or siltation. Never discharge wastes directly to wetlands.
- Minimize disturbance to wetland wildlife and habitat by limiting or preventing access to wetlands, including riparian areas.

#### DISPOSE OF HAZARDOUS WASTES SAFELY

- Transport any special wastes such as paint and paint cans, waste oil and filters solvents to an authorized disposal site. Never discard these on or near wetlands.



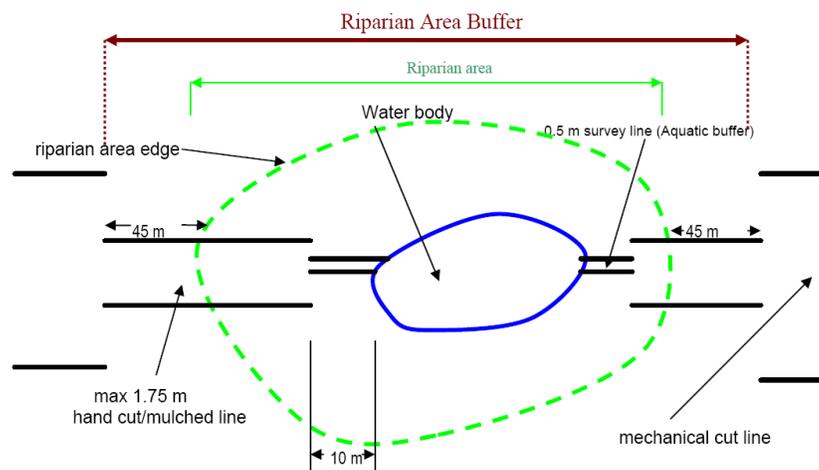
## Oil and Gas Exploration

### CONDUCT GEOPHYSICAL SURVEYS CAREFULLY

- Schedule survey programs to minimize impacts on wetland wildlife habitats and species, for example by conducting operations outside breeding and rearing seasons. Conducting operations in winter when the ground is frozen helps to minimize wetland impacts.
- When using helicopters for aerial surveys and crew transport, avoid flying over wetlands during breeding and rearing seasons for waterfowl and other sensitive species.
- Use existing seismic lines and trails wherever possible to minimize disturbance in or near wetlands.

### PROTECT WATER QUALITY AND QUANTITY

- Maintain the riparian area as a machine-free zone. Hand cut seismic lines within 15 m of wetland boundaries. Keep line widths adjacent to wetlands to a minimum while meeting operational and safety requirements.
- Ensure machine-cut trails do not interrupt natural drainage patterns or cause erosion or sedimentation.
- Minimize use of explosives within riparian areas. Locate drill holes a minimum of 45 m from wetland high water. If explosives must be utilized within the 45m zone to meet operational requirements, refer to the [Alberta SRD Policy and Procedures Document for submitting a Geophysical Field Report and the Geophysical Field Report – Riparian Area Buffer and the Riparian Area waiver](#). Operations within the 45 m zone should also be planned to minimize site disturbance.



Riparian buffers. FROM: ALBERTA SRD POLICY AND PROCEDURES DOCUMENT



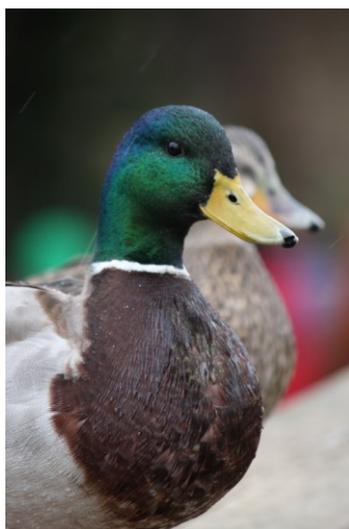
- Closely monitor weather conditions and cease activities prior to break-up (spring thaw) to minimize potential erosion and sediment delivery to wetlands.
-  Avoid the use of explosives in wetlands.

## 7.4.2. Construction and Operation

Although well site development is often focused on upland areas, they can have significant wetland impacts such as direct loss through site clearing and excavation, pollutant impacts on water quality and increased road and infrastructure development leading to increased human disturbance. Well sites typically have an operating life of approximately 20–25 years.

### *Oil and Gas Operations*

Wells are normally drilled as a ‘group’ as part of a program designed to delineate the extent of oil and gas potential identified during geophysical surveys. Producing wells are tied together with pipelines which take oil and gas to processing facilities. Combined with exploration activities this is referred to as the ‘upstream’ end of the industry



Locaate drilling sites away from wetland areas. PHOTO: ROBERT COX

### **LOCATE DRILLING SITES AWAY FROM WETLAND AND RIPARIAN AREAS**

-  Avoid locating drilling sites on wetlands or within wetland riparian areas.
- Keep well bores at least 100 m from the natural high water of wetlands.
- Where permission is granted to locate closer to wetlands, minimize the size of the lease while accounting for rig size, safety and drilling time.
- Consider directional and horizontal drilling. This reduces the number of roads, power lines, and pipelines necessary to serve the site and reduces the amount of land maintenance and reclamation.

### **CONTAIN DRILLING WASTES**

Drilling waste is the mud and cuttings generated from drilling a well and from directional drilling and boring for the purpose of pipeline construction and other related below-ground boring activities.

- Ensure that drilling mud and fluids do not seep, leach, or otherwise get transported to wetlands.



Wyoming's best management practices for oil and gas exploration can be found at <http://gf.state.wy.us/wildlife/nongame/LIP/BestMgmtPractices/index.asp>

### REDUCE NOISE DURING SENSITIVE TIMES

- Locate or manage constant noise generators (e.g., drill rigs, compressor stations) to minimize the effects of continuous noise on sensitive bird populations, particularly during the bird nesting season.

### AVOID PIPELINE CROSSINGS WHERE POSSIBLE

Pipelines are used to tie in well site production to processing facilities as part of up-stream oil and gas activities. Major transport and export pipelines are dealt with in [CHAPTER 9: ROAD AND UTILITY CORRIDORS](#).

-  Avoid crossing wetlands with pipelines. Where practical, use directional or horizontal drilling methods to bore under smaller wetlands.
- If wetlands must be crossed by pipelines, minimize impacts by using common or shared wetland corridors to reduce erosion and sediment during construction and operation and limit habitat fragmentation.
- Stabilize pipeline corridors by establishing native grasses and plants consistent with pipeline operational maintenance and safety.

### LOCATE PROCESSING FACILITIES AWAY FROM WETLANDS

Processing facilities include facilities used to 'clean up' gas (e.g., remove sulphur and other hydrocarbon by-products) from up-stream production prior to transporting via major pipelines to distribution centres.

- Locate oil and gas processing facilities at least 500 m from wetlands to minimize disturbance from noise and manage surface water flows (off-site and on-site) to prevent potential transport of contaminated water to wetlands.

### AVOID IMPACTS FROM PRODUCED WATER FROM COAL BED METHANE OPERATIONS

Coal bed methane (CBM) is natural gas that is found in most coal deposits. As part of the production process, pressure in the coal seam is reduced by 'dewatering', allowing the gas to flow more freely. The water removed from the coal seam is referred to as 'produced water'. Produced water may contain contaminants such as salts and metals.

#### CODE OF PRACTICE FOR COALBED GAS OPERATIONS

Management of produced water from coal seams is regulated under the Code of Practice for the Discharge of Produced Water from Coalbed Gas Operations, under the *Environmental Management Act*

<http://www.env.gov.bc.ca/epd/industrial/regs/codes/coalbed/>



- Locate drill sites at least 100 m from wetlands.
-  Do not discharge produced water to wetlands or streams.
-  Ensure that the dewatering production process does not impact wetland hydrological processes by affecting groundwater recharge.

### 7.4.3. Reclamation

#### *General*

##### **AIM TO RECREATE NATURAL, PRE-DEVELOPMENT VEGETATION**

- Re-vegetate exposed soils adjacent to wetlands with a mix of native species that will re-establish the site complexity that existed prior to disturbance. Seed mixes should be certified weed-free.
- Plant directly by hand to minimize further impacts to wetland soils and remaining vegetation.
- Maintain the site to prevent the establishment and spread of weeds and invasive species until native vegetation is self-sustaining.

#### *Oil and Gas Well Sites*

##### **RESTORE NATURAL DRAINAGE PATTERNS**

- Divert surface water around well sites and associated disturbed areas to prevent erosion and potential delivery of sediment and other pollutants to wetland areas.
- Restore natural drainage volumes and locations as near as possible to the pre-existing natural state.

### 7.4.4. Roads and Trails

Road and trail construction and use can be a major source of sediment delivery to wetlands. Roads in or close to wetlands can cause habitat loss through infilling or dewatering. Roads and crossings can also lead to habitat fragmentation. Once in place, roads can also facilitate the distribution of invasive, non-native species and provide opportunities for increased recreational impacts. Building roads in or near wetlands is difficult and expensive.

For information on minimizing impacts from road and trail building, see [CHAPTER 9: ROADS AND CORRIDORS](#).



## Road and Trail Design

### DESIGN ROADS TO AVOID OR MINIMIZE WETLAND IMPACTS

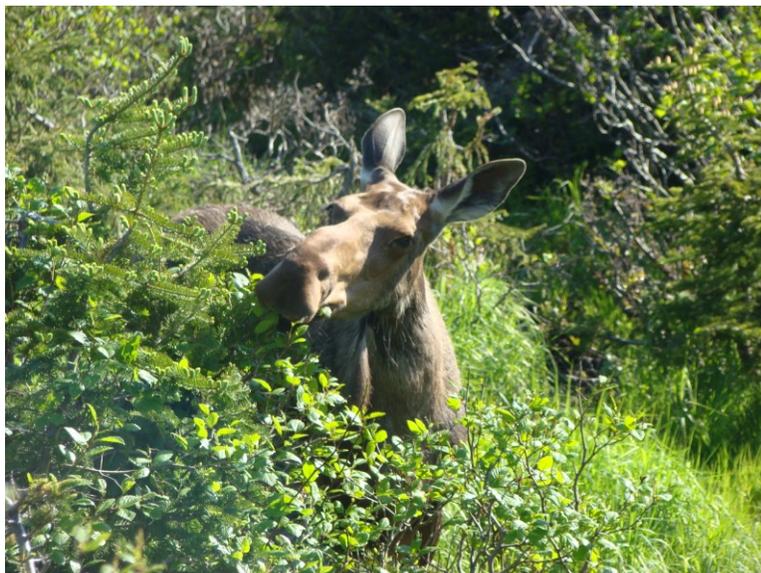
- Ensure you have all necessary permits and authorizations prior to working in or about wetland areas. Crossings for operations are regulated under Part 9 of the *Water Act*. (The *Water Act* regulations stipulate that mineral exploration activities follow requirements in the Mineral Exploration Code—see [SECTION 7.2: LEGISLATION](#)).
- Keep roads and trails outside riparian areas except at designated stream or wetland crossings.
-  Avoid constructing roads through wetlands unless there are no reasonable alternatives. Constructing roads in areas where the soil is prone to erosion and compaction (i.e., fine and wet soils) leads to soil erosion, wetland pollution, and destruction of wildlife habitat.
- If wetlands must be crossed, select a route that minimizes the area impacted by construction and operation. Use existing roads or trails wherever possible. New crossings should be parallel to the direction of water flow to the degree practical.

### MINIMIZE THE NUMBER OF WETLAND AND STREAM CROSSINGS.

- Minimize the width of roads consistent with maintaining safety and road design considerations.

### DESIGN TO AVOID EROSION AND SEDIMENTATION

- Design the road to follow the natural contour of the land, as this will avoid the need for extensive cut and fill.



Minimize wetland impacts. PHOTO: JUDITH CULLINGTON



- Minimize the changes in the natural stability of the land—place roads on high ground, keep out of streamside management zones and wet areas, and keep off the toe of banks and slopes.
- Design approaches to wetlands so that surface runoff carrying potential sediment is diverted before entering the wetland.
-  Avoid steep downhill approaches to prevent erosion from high velocity runoff.
- Determine the type and depth of wetland subsoil to ensure proper design and construction.

### **Road Construction**

#### **PROTECT WILDLIFE AND WILDLIFE HABITAT**

- Design, install and maintain wetland road crossings to provide for passage of fish and other aquatic organisms.
- Carry out construction activities during periods of least risk windows to minimize impacts to wildlife during critical periods (migration, breeding, etc.). Contact your [local Ministry of Environment office](#) for information on timing windows.

#### **MINIMIZE EROSION**

- Install and maintain erosion control measures if exposed soils might cause sedimentation in nearby wetlands.
- Apply straw, mulch, or fibre mats on exposed soils until the area can be vegetated to prevent erosion. This protects and holds soil particles from the erosive effects of rainfall and also helps to prevent the spread of noxious weeds.
- Direct ditch waters onto undisturbed forest floor or other vegetated areas at frequent intervals prior to reaching wetlands to allow water to infiltrate and sediment to settle out. Never drain road side ditches directly into wetlands or streams.
- Suspend or limit operations when soils become saturated. Check weather forecasts make sure operations are not at a critical stage when wet weather arrives.

B.C. Ministry of Environment offices: see <http://www.env.gov.bc.ca/main/regions.html>

Fisheries and Oceans Canada offices: see [http://www.pac.dfo-mpo.gc.ca/pages/default\\_e.htm](http://www.pac.dfo-mpo.gc.ca/pages/default_e.htm)



### MAINTAIN NATURAL WATER FLOWS

- Maintain the natural hydrograph. Provide cross drainage to maintain natural surface and subsurface flows. Ensure that drainage systems continue to function during construction.
- Construct ditches in wetland crossings, where necessary, to intercept and carry surface and subsurface water (the top 30 cm) to, through, and away from culverts.
-  Avoid having ditches create outlets that will result in drainage of the wetland.
-  Do not constrict wetland drainage (inlets or outlets) with undersized culverts. Clear span bridges are the preferred crossing method.
- Place culverts at the low points of the wetland to pass surface water flows through the road embankments.

### USE CLEAN MATERIAL FOR FILL

- Construct road fills in wetlands only when absolutely necessary. Use clean gravel or crushed rock as fill to provide for water movement.
-  Do not sidecast road construction material into riparian areas. Place sidecast or fill material above the ordinary high water mark of any wetland. Use fill from upland sources to minimize impacts on wetland habitat.

### AVOID IMPACTS FROM WINTER ACCESS

Activities are often conducted during the winter in areas where wet ground conditions make summer operations difficult. Once winter conditions are acceptable snow crossings of wetlands may be done by pushing and compacting clean snow fill onto frozen wetlands to provide a level crossing for equipment. In sites with deeper water, ice bridges may be used to provide access. In both cases care must be taken not to introduce sediment and debris into the wetland during construction, operating and decommissioning.

- Locate ice bridges so as to minimize cutting into the wetland or streambank during construction of the approaches.
- Use only clean snow to construct winter snow roads across wetlands. Ensure the surface is clean and free of any debris when road use is finished or prior to thaw.
- Construct approaches with clean compacted snow and ice and build to a thickness adequate to protect wetland and streambanks and riparian vegetation. Construction should begin from the ice surface.



Where limited snow is available, locally available gravel from approved pits can be used to build up approaches, but this should be removed when the ice bridge is deactivated.

- Clear snow in a manner that leaves the surface of the ground undisturbed. This will help avoid damage to the natural soil surface and excessive soil loss in the spring as the ground thaws.
- Remove any accumulated debris and dirt from the bridge and place at a stable location above the high water mark of the wetland. Ensure erosion protection measures are in place where required.
- Remove all ice bridge approaches during deactivation. Where streambanks have been exposed to mineral soil, they should be re-contoured and re-vegetated using all appropriate measures to stabilize the site and facilitate its return to a vegetated state.
- Remove all snowfills and support materials before the spring melt. Removed snow should be placed above the normal high water mark of the stream to prevent it from contributing to sedimentation and erosion. Deactivation should include the use of all appropriate measures to stabilize the site and facilitate its return to a vegetated state.



Avoid impacts from winter access. PHOTO: CHRISTOPHER OKRAINETZ



## Trail Construction

### CONSTRUCT ACCESS TRAILS WITH CARE

- Avoid grubbing, grading and blading<sup>1</sup> whenever possible. Retain existing natural vegetation wherever possible as it provides the best and lowest cost runoff and erosion control.
- Limit or delay grubbing where clearing is required until grading and construction is to proceed; the root masses and associated organic matter provide substantial erosion control.

## Road Operation and Maintenance

### MANAGE ACCESS

- Manage entry to operational areas during and after extraction activities where unauthorized use is impacting wetland species and habitat (e.g., mud bogging).

### OPERATE VEHICLES ONLY ON ESTABLISHED ROADS AND TRAILS.

- Minimize traffic on roads during wet conditions. Consider using geomat or rock to reduce road damage.

### MAINTAIN ROADS AND DRAINAGE

- Inspect wetland crossings frequently during operations to determine if erosion is being controlled. Banks should be stable and soil movement into the wetland should be minimal.
- Maintain road running surfaces, ditches and cross drains to minimize erosion and sediment delivery. Correct any problems immediately.



Geomat textile.

IMAGE FROM [HTTP://WWW.ECPLAZA.NET/](http://www.ecplaza.net/)

### MANAGE FUEL AND OTHER HAZARDOUS MATERIALS

- Follow appropriate fuel management regulations.
- Locate pumps and accompanying machinery in a manner that does not cause the wetland bank to erode or introduce sediment into the watercourse:
- Provide fuel spill and leakage containment around the pump.
- Store fuel or other toxic fluids at least 100 m from wetlands. Provide containment so spills or other leakage will not be transported to wetlands.

<sup>1</sup> Blading: exposing soils



## ***Roads and Trail Reclamation***

### **PUT UNUSED ROADS TO BED**

- When all activities are completed, reshape the roadbed if needed. Open all drainage systems and stabilize erosion-prone areas.
- Remove temporary fills and structures in wetlands to the extent practical when use is complete.

### **RE-VEGETATE DISTURBED SITES**

- Establish a vegetative cover planting on erodible areas that were cultivated in the fall but will not be planted until spring and where natural vegetation is not sufficient to stabilize the soil.
- Use native grasses or other plant species to reseed bare, erodible areas; never introduce invasive, non-native plants.

## **7.5. REFERENCES AND FURTHER READING**

### ***Government Offices***

B.C. Ministry of Environment regional offices.

<http://www.env.gov.bc.ca/main/regions.html>

Fisheries and Oceans Canada offices. [http://www.pac.dfo-mpo.gc.ca/pages/default\\_e.htm](http://www.pac.dfo-mpo.gc.ca/pages/default_e.htm)

### ***Websites***

B.C. legislation. <http://www.bclaws.ca/>

Federal legislation. <http://laws.justice.gc.ca/>

B.C. Environmental Assessment Office.

[http://www.eao.gov.bc.ca/ea\\_process.html](http://www.eao.gov.bc.ca/ea_process.html)

Canadian Association of Geophysical Contractors. <https://www.cagc.ca/>

Canadian Association of Petroleum Producers.

<http://www.capp.ca/Pages/default.aspx>

Oil and Gas Commission. <https://www.ogc.gov.bc.ca/>

### ***References***

Alberta Environment. 2007. Alberta tier 1 soil and groundwater remediation guidelines.

<http://environment.gov.ab.ca/info/library/7751.pdf>

B.C. Ministry of Environment, Lands and Parks. 1994. Environmental guidelines for seismic and drilling operations in Northeast British



- Columbia. Victoria. Available from Ministry of Forests library,  
<http://www.for.gov.bc.ca/hfd/library/>
- B.C. Ministry of Environment. 2007. Oil and Gas Waste Regulation.  
Users guide. Draft.  
[http://www.env.gov.bc.ca/epd/industrial/regs/oil\\_gas/pdf/ogwr\\_guide.pdf](http://www.env.gov.bc.ca/epd/industrial/regs/oil_gas/pdf/ogwr_guide.pdf)
- B.C. Ministry of Water, Land and Air Protection. 2002. A field guide to  
fuel handling, transportation and storage.  
[http://wlapwww.gov.bc.ca/epd/epdpa/industrial\\_waste/petrochemical/fuel\\_handle\\_guide.pdf](http://wlapwww.gov.bc.ca/epd/epdpa/industrial_waste/petrochemical/fuel_handle_guide.pdf)
- Matrix Energy Solutions. 2008. Study to evaluate flowing shot hole risk  
North Eastern Alberta. Prepared for MEG Energy Group.  
<https://www.cagc.ca/files/studies/20080730091227.pdf>
- Oil and Gas Commission. 2003. Approaching cumulative impact  
management in North Eastern British Columbia.
- Illinois EPA. Best management practices for oil exploration and  
extraction. <http://www.epa.state.il.us/p2/fact-sheets/bmp-oil-exploration.html>
- State of Colorado. 2007. Standard management practices to reduce  
wildlife impacts associated with oil and gas development.  
Department of Wildlife. Denver CO.  
<http://www.csmla.org/wildlife/standardoperatingpractices.doc>
- Western Governor's Association. 2006. Best management practices for  
coal bed methane. Denver CO.  
<http://www.westgov.org/wga/initiatives/coalbed/CoalBedMethane.pdf>
- Wyoming Game and Fish. Best management practices -3685.  
<http://gf.state.wy.us/wildlife/nongame/LIP/BestMgmtPractices/index.asp>