

Integrated Pest Management Plan for Northeast BC

Liard North

Liard South

Dilly Creek

Cordova

2019 – 2023

Reference Number: Nexen PMP 2019/2023

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1.0 INTRODUCTION

CNOOC Petroleum North America ULC (CNOOC) (formerly Nexen Energy ULC) is an upstream oil and gas company operating in British Columbia (BC). CNOOC strives to take a proactive approach to invasive plant and noxious weed management, and to comply with Provincial and Municipal regulations.

A Pest Management Plan (PMP) is required for herbicide application for the control of noxious weeds and invasive plants in the province of British Columbia on more than 50 hectares of Crown land per year. This is regulated by Section 24(2)(g) of the Government of British Columbia's 2008 Integrated Pest Management Regulation (IPMR).

1.1 DEFINITIONS AND ABBREVIATIONS

PMP - Pest Management Plan - (a) a program for managing pest populations or reducing damage caused by pests based on integrated pest management (b) the methods of handling, preparing, mixing, applying and otherwise using pesticides within the program. (IPMR)

IPM – Integrated Pest Management

NEIPC – North East Invasive Plant Committee

NWIPC – North West Invasive Plant Committee

PMP – Pest Management Plan

1.2 PURPOSE AND OBJECTIVES

1.2.1 PURPOSE

The purpose of this PMP plan is to provide a comprehensive document which outlines the approach and planning process for IPM throughout the Company's operating areas in northeast BC (Appendix A). This PMP will strive to include a multi-agency approach, protect environment and human health, and include public participation.

1.2.2 OBJECTIVES

The objectives of this PMP are to:

- Comply with Federal, Provincial and local government laws and regulations
- Ensure the incorporation and use of IPM
- Encourage Public and First Nations awareness of, and input into invasive pest management
- Identify and protect environmentally sensitive areas and land uses
- Ensure the responsible use of herbicides
- Continue to consider alternative, non-chemical methods of invasive plant management while recognizing that herbicides may be required for management for a number of species
- Ensure existing invasive plant populations are kept from expanding beyond a defined management area.

1.3 IDENTIFYING INFORMATION

The holder of this PMP is:

CNOOC Petroleum North America ULC
Unit 106 5415 51st Ave. West
Fort Nelson, BC
VOC 1R0

1.3.1 CONTACT INFORMATION FOR PERSON RESPONSIBLE FOR PMP

The contact person at CNOOC responsible for coordinating the management of invasive plants under this PMP is:

Fort Nelson
Mike Mitchell or Kent Worth
(250)774-5465

CNOOC Petroleum North America ULC
Unit 106 5415 51st Ave. West
Fort Nelson, BC
VOC 1R0

1.3.2 GEOGRAPHIC DESCRIPTION OF THE PMP AREA

The plan area includes the Company's operating area in the vicinity of the Northern Rockies Regional Municipality. Treatment areas include well sites, access roads, borrow pits, work yards, seismic lines, pipelines, aircraft landing areas, equipment staging and storage sites, compressor sites, sump sites, work spaces, and camps. Fort Nelson is the nearest community to the plan areas. The general locations of the operating areas covered under this plan are:

- Liard North – Approx. 135km NW of Fort Nelson, BC
- Liard South – Approx. 85km NW of Fort Nelson, BC
- Cordova – Approx. 150km NE of Fort Nelson, BC
- Dilly Creek – Approx. 70km N of Fort Nelson, BC

1.3.3 OPERATING AREA

The operating areas are located on Crown Land. Transportation corridors located on Crown Land, including road systems and utility corridors, serve as vectors for the movement of invasive plant species. Utility corridors are recognized as principal areas from which invasive plants spread, therefore control of invasive plants in these areas is critical for invasive plant management.

The primary government agencies involved in the management of natural resources in this region are:

- BC Oil and Gas Commission
- Ministry of Energy, Mines & Petroleum Resources

- Ministry of the Environment & Climate Change Strategy
- Ministry of Forest, Lands and Natural Resource Operations and Rural Development
- Ministry of Transportation and Infrastructure
- Ministry of Agriculture
- Ministry of Tourism, Arts and Culture
- Department of Fisheries and Oceans
- Northern Rockies Municipality

Activities in the area include oil and gas development, forest management, hunting, trapping, tourism and First Nation's Traditional Uses (Fort Nelson Land and Resource Management Plan). The Operating Area is outside of Agricultural Land Reserves, Federal First Nations Lands, Provincial/Federal parks, wilderness areas or municipalities / settled areas.

1.4 TERM OF PLAN

This plan will be in force for five years from the date that a Confirmation of a Pesticide Use Notice is obtained from section 5.3.1. of the IPMA's IPMR.

1.5 THE BC MINISTRY OF ENVIRONMENT & CLIMATE CHANGE STRATEGY INTEGRATED PEST MANAGEMENT (IPM) PROGRAM

The BC Ministry of Environment & Climate Change Strategy is responsible for the protection of human and environmental health. The IPM Program of the Ministry regulates the use of pesticides in British Columbia through the IPM Act and Regulation. A PMP be prepared and a pesticide use notice (PUN) confirmation must be received before application of specified industrial pesticides on more than 20 ha/year of land managed by a single entity for the purpose of managing noxious weeds or invasive plants.

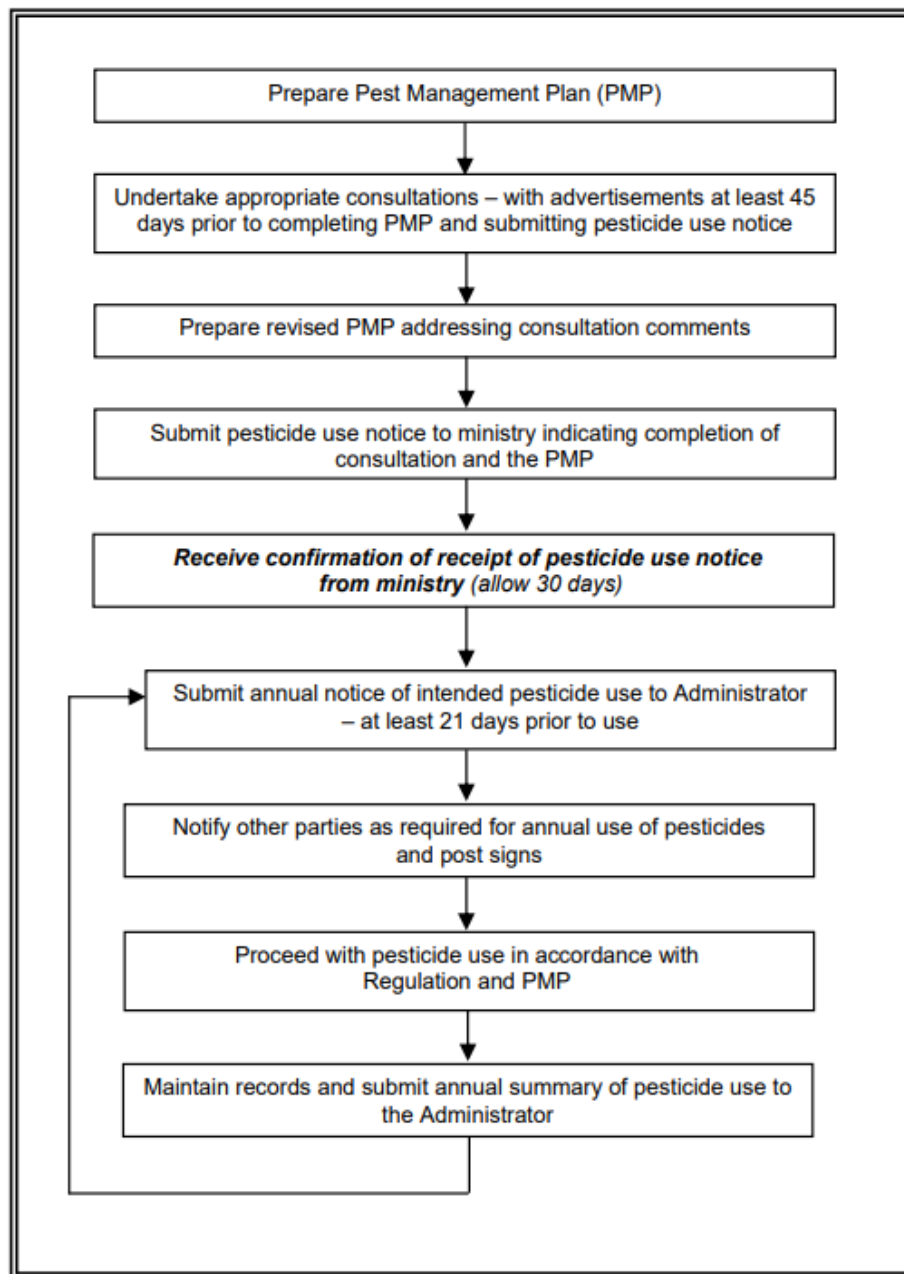


FIGURE 1: THE PEST MANAGEMENT PREPARATION AND PESTICIDE USE NOTICE CONFIRMATION PROCESS

2.0 INVASIVE ALIEN PLANTS AND NOXIOUS WEEDS

Invasive plants are non-native plants which have found their way to British Columbia. They cause ecological, economic, and social problems. Invasive plants lack natural insect predators or susceptibility to local plant pathogens which naturally control populations. Invasive plants often spread out of control, especially on disturbed sites where they may have an advantage over native species. The spread of invasive plants adversely affects economic and natural resources, reduces recreation and crop values, displaces native vegetation, reduces forage for wildlife and livestock, reduces biodiversity, including species at risk, and damages native ecosystems.

2.1 DEFINITIONS AND ABBREVIATIONS

Alien – a plant that did not exist in the target area in British Columbia prior to European settlement, and/or its natural range did not include the target area in British Columbia

FNIPMASC – Fort Nelson Invasive Plant Management Area Steering Committee

Invasive Plant – a prescribed species of invasive plant listed under the Invasive Plants Regulation.

Noxious Weed – a weed designated by regulation to be a noxious weed, and includes the seeds of the noxious weed BC Weed Control Act (WCA).

2.2 GENERAL CHARACTERISTICS OF INVASIVE PLANTS

Invasive plants often have characteristics that permit them to rapidly invade new areas and out-compete native plants for light, water, and nutrients. These characteristics include:

- Early maturation;
- Profuse reproduction by seeds and/or vegetative structures;
- Specially adapted seeds that disperse via wind, water or animals;
- Prickles, spines, thorns or sap that cause physical injury and repel animals;
- The ability to parasitize other plants;
- Allelopathy (production of chemicals that inhibit the growth of other plants);
- High photosynthetic rates.

POTENTIAL FOR THE SPREAD OF INVASIVE PLANTS

CNOOC recognizes that human activity is often the primary cause of the introduction and spread of invasive plants. The following business activities may encourage invasive plant spread:

- Gas and oil exploration and development including: well drilling, pipeline construction, movement of machinery, and creating temporary and permanent openings in the forest.

- Construction and maintenance of transportation and utility corridors.
- Disturbing, transporting, moving, and storing soil and fill.
- Construction operations including machinery movement, land clearing, and equipment hauling.
- Reclamation practices including selecting the correct species to vegetate cleared areas.

2.3 ECOLOGICAL IMPACTS

Invasion by alien species is the second leading factor in biodiversity loss globally (IPPC Secretariat, 2005). Invasive plants can create ecological problems which have adverse economic impacts. This is a result of the ability of invasive plants to outcompete native plants.

Ecological problems associated with invasive plants include:

- Competing with native vegetation for light, moisture and nutrients;
- Declines in biodiversity;
- Changing nutrient and hydrological cycles;
- Reducing soil productivity by affecting mycorrhizal fungi or changing soil chemistry;
- Negatively impacting the habits of rare and at-risk species;
- Reducing food availability for plant-feeding insects and wildlife;
- Decreasing water quality, quantity and fish habitat;
- Changing ecological community structure and function;
- Increasing wildfire hazard;
- Altering ecosystem components by dominating sites for prolonged periods and;
- Hindering restoration efforts and increasing costs to rehabilitate disturbed ecosystems.

2.4 SPECIES OF CONCERN

Invasive plant species of concern are identified by Federal, Provincial, Municipal and non-profit organizations. An overview of some of the organizations involved in British Columbia is available in Figure 2. NEIPC (a regional non-profit organization) is part of the Peace River Regional District Weed Committee and publishes a list of invasive plants of concern at the regional level (Table 1).

CNOOC has participated in the Fort Nelson Invasive Plant Steering Committee, a local subcommittee of the NEIPC. The Fort Nelson Invasive Plant Steering Committee also publishes a list of invasive species of concern specific to local Fort Nelson area.

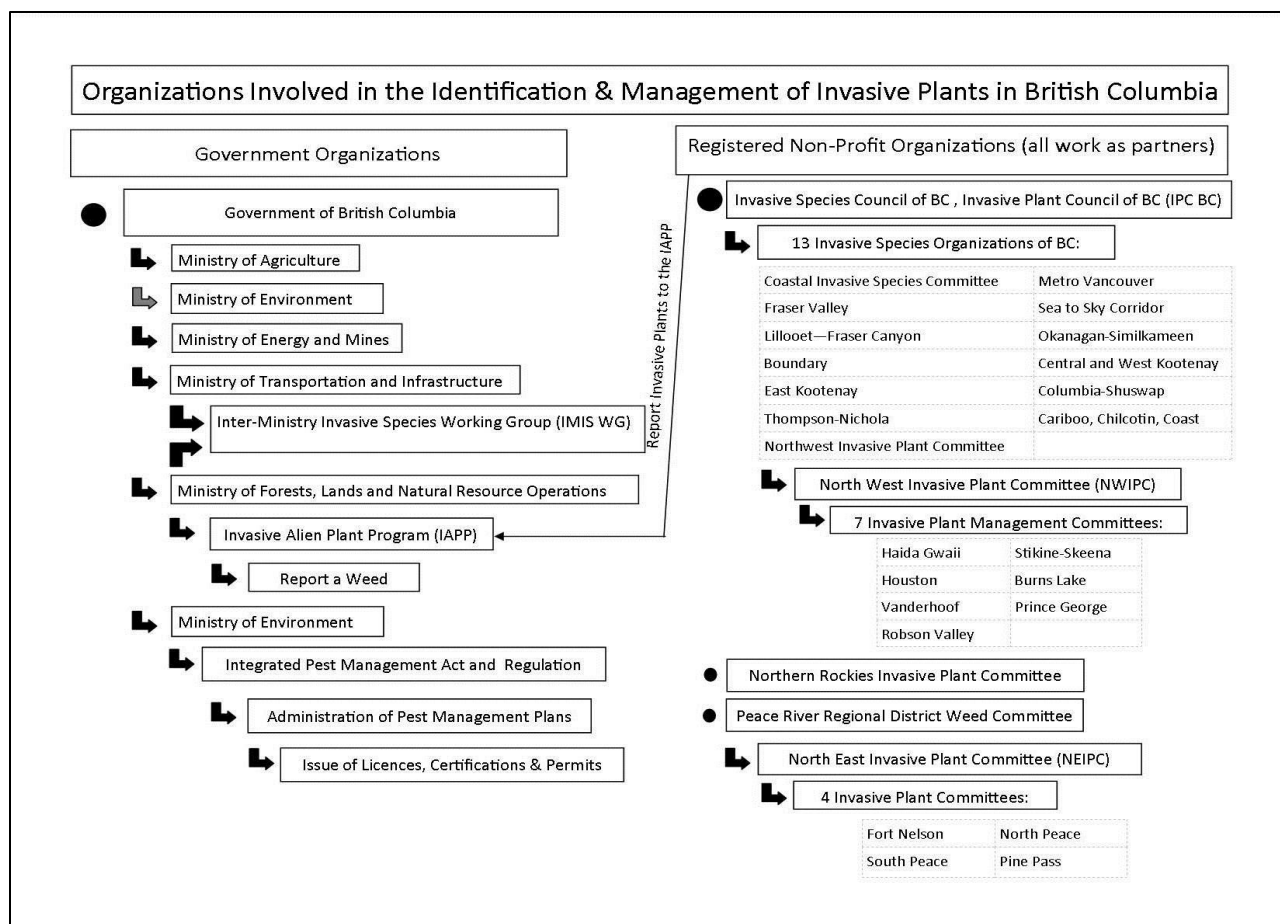


FIGURE 2: A FLOW CHART SHOWING THE ORGANIZATIONS AND COMMITTEES INVOLVED IN INVASIVE PLANT MANAGEMENT IN BRITISH COLUMBIA.

The B.C. Weed Control Act imposes a duty on all land occupiers to control designated noxious plants. Under the BC Weed Control Act the following weeds are classified as Noxious within all Regions of British Columbia:

- Annual Sowthistle (*Sonchus oleraceus*)
- Canada Thistle (*Cirsium arvense*)
- Crupina (*Crupina vulgaris*)
- Dalmatian Toadflax (*Linaria dalmatica*)
- Diffuse Knapweed (*Centaurea diffusa*)
- Dodder (*Cuscuta* spp.)
- Gorse (*Ulex europaeus*)
- Hound's-tongue (*Cynoglossum officinale*)
- Jointed Goatgrass (*Aegilops cylindrica*)
- Leafy Spurge (*Euphorbia esula*)
- Perennial Sowthistle (*Sonchus arvensis*)
- Purple Nutsedge (*Cyperus rotundus*)

- Rush Skeletonweed (*Chondrilla juncea*)
- Scentless Chamomile (*Matricaria maritima*)
- Spotted Knapweed (*Centaurea maculosa*)
- Tansy Ragwort (*Senecio jacobaea*)
- Velvetleaf (*Abutilon theophrasti*)
- Wild Oats (*Avena fatua*)
- Yellow Nutsedge (*Cyperus esculentus*)
- Yellow Starthistle (*Centaurea solstitialis*)
- Yellow Toadflax (*Linaria vulgaris*)

The Following Common Nuisance Weeds are Not Regulated by the BC Weed Control Act:

- Annual Bluegrass (*Poa annua*)
- Baby's-Breath (*Gypsophila paniculata*)
- Barnyardgrass (*Echinochloa crusgalli*)
- Bladder Campion (*Silene cucubalus*)
- Bog Rush (*Juncus effusus*)
- Broad-Leaved Plantain (*Plantago major*)
- Bull Thistle (*Cirsium vulgare*)
- Common Chickweed (*Stellaria media*)
- Chicory (*Cichorium intybus*)
- Corn Spurry (*Spergula arvensis*)
- Creeping Buttercup (*Ranunculus repens*)
- Cudweed (*Gnaphalium uliginosum*)
- Curled Dock (*Rumex crispus*)
- Field Bindweed (*Convolvulus arvensis*)
- Foxtail Barley (*Hordeum jubatum*)
- Western Goat's-Beard (*Tragopogon dubius*)
- Giant Hogweed (*Heracleum mantegazzianum*)
- Groundsel (*Senecio vulgaris*)
- Hemp-Nettle (*Galeopsis tetrahit*)
- Henbit (*Lamium amplexicaule*)
- Himalayan Balsam (*Impatiens glandulifera*)
- Field Horsetail (*Equisetum arvense*)
- Japanese Knotweed (*Polygonum cuspidatum*)
- Lady's-Thumb (*Polygonum persicaria*)
- Lamb's-Quarters (*Chenopodium album*)
- Common Mallow (*Malva neglecta*)
- Showy Milkweed (*Asclepias speciosa*)
- Mullein (*Verbascum thapsus*)

- Nightshade (*Solanum* species)
- Nodding Beggar-Ticks (*Bidens cernua*)
- Nodding Thistle, a.k.a. Musk Thistle (*Carduus nutans*)
- Pineappleweed (*Matricaria matricariodes*)
- Redroot Pigweed (*Amaranthus retroflexus*)
- Scotch Broom (*Cytisus scoparius*)
- Sheep Sorrel (*Rumex acetosella*)
- Shepherd's-Purse (*Capsella bursa-pastoris*)
- Spiny Annual Sow-thistle (*Sonchus asper*)
- St. John's-Wort (*Hypericum perforatum*)
- Stinkweed (*Thlapsi arvense*)
- Cluster Tarweed (*Madia glomerata*)
- Water Hemlock (*Cicuta douglasii*)
- Wild Buckwheat (*Polygonum convolvulus*)
- Witchgrass (*Panicum capillare*)

TABLE 1: THE NEIPC TABLE OF INVASIVE PLANT CATEGORIES FOR NORTHEAST BC. (NEIPC, 2006)

INVASIVE PLANT CATEGORIES FOR NORTH EAST BC

1. Prohibited Invasive Plants Prohibited invasive plants are highly competitive with an ability to spread rapidly.	2. Primary Invasive Plants. Primary invasive plants have the ability to spread rapidly but are not as aggressive as prohibited invasive plants.	Category 3 Secondary Invasive Plants Secondary invasive plants can spread easily but the requirement to contain them is usually site specific. Invasive plants under successful biological control and native plants that behave in a weedy like fashion may be included in this category.
<ul style="list-style-type: none"> hawkweeds, orange & yellow, <u>Hieracium spp</u> hound's tongue, <u>Cynoglossum officinale</u>, (not reported in the region but expected to show up soon). goatgrass, jointed, <u>Aegilops cylindrica</u> knapweeds, <u>Centaurea diffusa</u>, diffuse knapweed, <u>C. maculosa</u>, spotted knapweed; and others that may show up knotweed, Japanese & giant – <u>Polygonum spp</u> leafy spurge & cypress spurge, <u>Euphorbia esula</u> & <u>cyparissias</u> marsh plume thistle, <u>Cirsium palustre</u> scabious, field or blue buttons <u>Knautia arvensis</u> rush skeletonweed <u>Chondrilla juncea</u>, tansy, common, <u>Tanacetum vulgare</u> velvetleaf, <u>Abutilon theophrasti</u> 	<ul style="list-style-type: none"> blueweed, <u>Echium vulgare</u> buckwheat, tartary, <u>Fagopyrum tataricum</u> burdocks, <u>Arctium spp.</u> canada thistle, <u>Cirsium arvense</u> chamomile, scentless, <u>Matricaria maritima</u> cockle or campion, white <u>Lychnis alba</u>, Hoary Cress, <u>Cardaria drapa</u> green foxtail, <u>Sertaria viridis</u> Pepper weed, <u>Lepidium spp</u> plumeless thistle, (not reported in the region), <u>Carduus acanthoides</u>, kochia, <u>Kochia scoparia</u> loosestrife, <u>Lythrum spp.</u> mustard, wild, <u>Sinapsis arvensis</u> night-flowering catchfly, <u>Silene noctiflora</u> oxeye daisy, <u>Chrysanthemum leucanthemum</u> pepperweed – <u>Lepidium spp.</u> russian thistle, <u>Salsola kali</u> sow thistles, <u>Sonchus spp.</u> tansy ragwort, (not reported in the region), <u>Senecio jacobaeae</u> toadflax, dalmation & common, <u>Linaria dalmatica</u> & <u>vulgaris</u> 	<ul style="list-style-type: none"> bladder campion, <u>Silene cucubalus</u> bluebur, western, <u>Lappula echinata</u> buckwheat, wild, <u>Polygonum convolvulus</u> bull thistle, <u>Cirsium vulgare</u> chickweed, mouse eared – <u>Cerastium spp.</u> chicory, <u>Cichorium intybus</u> cleavers, <u>Galium aparine</u> curled dock and sheep sorrel, <u>Rumex spp.</u> dragonhead, American - <u>Dracocephalum parviflorum</u> - native goat's-beard or oyster plant, <u>Tragopogon dubious</u> Flixweed, <u>Descurainia sophia</u> foxtail barley (native?), <u>Hordeum jubatum</u> groundsel, common, <u>Senecio vulgaris</u> hawksbeard, narrowleaf, <u>Crepis tectorum</u> hemp nettle, <u>Galeopsis tetrahit</u> lamb's-quarters, <u>Chenopodium spp.</u> mallow, <u>Malva neglecta</u> mullein, <u>Verbascum thapsus</u> mustard, dog - <u>Erucasstrum gallicum</u> mustards, <u>Sisymbrium spp.</u> nodding thistle, <u>Carduus nutans</u> pineapple weed, <u>Matricaria matricarioides</u> Prickly lettuce – <u>Lactuca serriola</u> quackgrass, <u>Agropyron repens</u> smartweed – <u>Polygonum spp.</u> St. John's-wort, <u>Hypericum perforatum</u> stinkweed, <u>Thlaspi arvense</u> stork's bill, <u>Erodium spp.</u> spurry, corn, <u>Spergula arvensis</u> tarweed, (native?), <u>Madia glomerata</u> water hemlock, western, (native), <u>Cicuta douglasii</u> wild carrot – <u>Daucus carota</u> wild oats, <u>Avena fatua</u> wormwood or absinthium, <u>Artemisia absinthium</u> yarrow – <u>Achillea millefolium</u> - native

Fort Nelson Invasive Plant Committee has identified the following species as the greatest concern for the Fort Nelson area:

- Canada thistle / Creeping thistle, (*Cirsium arvense*)
- Common tansy, (*Tanacetum vulgare*)
- Common toadflax, (*Linaria vulgaris*)
- Narrowleaf hawksbeard, (*Crepis tectorum*)
- Orange and Yellow hawkweeds, (*Hieracium* spp.)
- Oxeye daisy, (*Chrysanthemum leucanthemum* or *Leucanthemum vulgare*)
- Wild caraway, (*Carum carvi*)
- Scentless chamomile, (*Matricaria perforate* or *Tripleurospermum inodorum*)
- Sow thistles, (*Sonchus* spp).
- Tall buttercup, (*Ranunculus acris*)
- Smooth Brome, (*Bromus inermis*)
- White and yellow sweet clover, (*Melilotus alba* and *M. officinalis*)
- Crested wheatgrass, (*Agropyron cristatum* subsp. *pectinatum*)

3.0 MANAGEMENT PROGRAM

This section outlines the objectives and steps for managing invasive plants in the Company's operating areas.

The aim of this PMP is to:

- Achieve long term invasive plant prevention and management compatible with applicable legislation.
- Meet or exceed the needs of humans, wildlife, and environmental resources.
- Successfully combine several pest control methods to solve current and prevent future infestation from multiple species.

The elements of this PMP are to:

- Prevent invasive plant species from entering or establishing
- Identify invasive plant species, as well as native, beneficial, or at risk species
- Establish injury levels and treatment thresholds
- Review and consider multiple pest treatment options and treatment methods
- Control of invasive plant species
- Conduct post treatment evaluations
- Conduct monthly well inspections for noxious weeds
- Promote re-establishment of desirable native species on reclaimed areas
- Determine means of dispersal and limit the introduction and spread of invasive plants

In accordance with the IPMR and requirements under the Weed Control Act, CNOOC is committed to preventing the introduction and establishment of invasive weed species within the project area. Steps to achieve this goal include:

- Topsoil and subsoil stockpiles will be revegetated as soon as possible
- Cultural control of weeds (i.e., hand-roguing of weed species prior to seed production) will be used
- Mechanical control will be implemented along ditches, adjacent to above-ground pipelines and around structures
- For control of noxious and restricted weeds, non-persistent herbicides will be applied as necessary – only to be considered if manual or mechanical weed control methods are ineffective
- The use of herbicides will prompt the need for a PMP under the IPM Act (24.2(b)(ii)) for management of noxious weeds and invasive plants on more than 20 hectares of land per year
- Washing vehicles and equipment prior to coming and going from the Company's operating areas
- Monitor cargo and water shipments
- Education initiatives to help field staff identify weed species and report to the EFS
- The EFS will rely on inspectors to map infested areas
- The IPM Plan will provide guidance to treatment
- Ongoing monitoring/inspections of all sites

IPM is a decision-making process for determining what actions will be taken when pest problems occur. All of the possible actions are considered in order to find the most effective and environmentally sound solution. The first step is prevention, the next step is keeping plants at or below a level which causes damage. These steps will help reduce the negative social, economic and environmental impacts.

The steps for an effective invasive plant management plan:

1. Define management objectives and determine financial and human resource capabilities
2. Identify high risk sites and identify high priority plants
3. Develop treatment plan(s)
4. Implement treatment plan(s)
5. Monitor efficacy to determine whether treatment thresholds were met (if not, repeat steps 3, 4, and 5)
6. If necessary, implement rehabilitation or restorations strategies

Use of tenured roads are administered through Road Use Agreement(s) (RUA) with other agencies, including oil and gas companies and forest licensees. Unless stipulated in the RUA, CNOOC does not have responsibility for weed/invasive plant control on RUA roads. In these situations, the Company will actively monitor, record and report infestations to the owners. Lack of control over infested areas along RUA access roads is a significant limitation for the Company to effectively maintain weed free sites.

3.1 DEFINITIONS AND ABBREVIATIONS

Containment – Is the process of keeping a population within a defined geographic region (polygon), or outside of an established boundary. Containment is used when localized populations must be kept from expanding to new locations. Preventing or reducing access to infested areas is a containment strategy.

Extirpation – the permanent removal of all members or a plant species from a treatment site. Extirpation is usually only possible for small, isolated patches of invasive plants, and may take years to achieve.

EFS –Environmental Field Supervisor.

Injury Level – the level of invasive plant populations at a specific site after which some unacceptable impact will be caused, for example public safety, recreation, natural or managed ecosystems.

Rehabilitation – is used when there are widespread incidences of invasive plant species. Treatments are focused on areas where impacts would be the greatest if the species was not managed, and for areas where bio control agents may be effective. Management is aimed at reducing invasive plant populations to sizes that have a limited impact on the environment.

Treatment Threshold – the level of plant invasion when a particular treatment should be applied in order to keep a given plant population at a given site from reaching injury level.

3.2 PREVENTION

The easiest and most effective method to prevent species invasion is preventing early establishment. There are a number of initiatives through the Canadian Food Inspection Agency and the Invasive Plant Council of British Columbia which provides local knowledge for assessing the risk presented by alien plants and for establishing detection systems.

For plants which have been detected in a given area, the most effective method of control is to prevent the plants from establishing and spreading. This will be achieved by training staff and contractors who conduct site visits on what to look for and how to report findings. The reports will be used in tandem with an assessment process and response system to quickly implement the management before the species have a chance to establish.

For established plants, prevention of further spread can be accomplished by the promotion of healthy, weed resistant habitats. Disturbed areas such as those created by oil and gas development can cause vulnerability to invasive species; therefore, it is important to clean equipment and footwear to prevent the introduction and spread of invasive plant species to these vulnerable sites. When areas have been disturbed, prompt seeding will help to re-establish healthy, weed resistant plant populations.

The following land management options will be implemented when feasible and applicable:

- Prevent the movement of soils contaminated with invasive plant seed and vegetative plant parts (e.g., gravel and clay used in road and lease construction and maintenance)
- Educate roadside mower, grader operators on invasive plant identification
- Educate roadside mower, excavator and grader operators on work practices which will reduce the spreading of invasive plant seeds and plant parts
- Keep equipment yards and storage areas free of invasive plants
- Prior to leaving areas with invasive plants - inspect vehicles, equipment and clothing and remove (by cleaning or washing) plant seeds or plant parts
- Where roadside infestations are present, keep plants at sufficient distance from the road to prevent inadvertent transport out of the infested area
- Keep equipment out of infested areas
- During road and lease construction or maintenance - proactively re-vegetate disturbed areas by encouraging rapid native plant succession, artificially seeding and fertilizing or a combination thereof

3.3 PEST IDENTIFICATION

The identification of invasive plants is critical as they require control under municipal and provincial laws. Control and management methods may differ depending on the plant (weed) species, ecosystem, land use and geographic location. In addition, control may or may not be required depending on a plant's growth stage, growth rate, characteristics, physical location, and degree of invasiveness.

3.3.1 AVAILABLE PLANT IDENTIFICATION RESOURCES

A basic understanding of plant biology including knowledge of growth stages, life cycles, and classification is required in order to administer the safest, most appropriate and effective control methods. Fact sheets, Weed Alerts, guidebooks, brochures and web-based information are readily available to assist in the management and control of invasive plants. The following is a list of websites where invasive plant information relevant to northern and central British Columbia can be found.

TABLE 2: PLANT IDENTIFICATION RESOURCE WEBSITES FOR INVASIVE PLANT IN BC.

NWIPC	http://nwipc.org/
BC Ministry of Agriculture	www.weedsbc.ca Error! Hyperlink reference not valid. www.agf.gov.bc.ca/cropprot/weedguid/weedguid.htm
Invasive Plant Council of BC (Fact Sheets)	http://invasiveplantcouncilbc.ca
BC Ministry of Forests, Lands and Natural Resource Operations	http://www.for.gov.bc.ca/HRA/Plants
Northern Rockies Invasive Plant Committee	https://static1.squarespace.com/static/53398742e4b00464fc5bdb49/t/538f9fd3e4b06bb63f0fc7bb/1401921491795/2014+NRIPC+Strategy+FINAL.pdf
Northern Rockies Regional Municipality	http://www.northernrockies.ca/EN/main/city/public-works/invasive_plants.html
Peace River Regional District	https://prrd.bc.ca/wp-content/uploads/page/plans-reports-invasive-plants/2017-Strategic-Plan-and-Profile.pdf
Invasive Species Council of BC	https://bcinvasives.ca/

3.3.2 CURRENT INITIATIVES AND PROGRAMS IN BRITISH COLUMBIA

The Northwest Invasive Plant Council (NWIPC), North East Invasive Plant Committee (NEIPC) and the Invasive Plant Council of BC have the following initiatives in central and northern BC. The Company's operating areas lie mostly within the NEIPC jurisdiction.

- Grow Me Instead/Plantwise Program – promotes responsible gardening.
- Targeted Invasive Plant Solutions (TIPs) – promotes awareness and provides training focused on the best management practices and integrated pest management principles for operational activities or specific invasive species.
- Spotters Network Workshop – workshops for local community groups or organizations to learn about identifying, managing and reporting invasive plants.
- NWIPC & NEIPC members attend events provide training and promote awareness on identification of invasive plants, best management practices, and reporting.
- NWIPC & NEIPC Training Sessions – open to all interested persons with strong encouragement for contractors to attend. Training on invasive plant identification.
- Invasive Species of British Columbia's Best Practices a Pocket Guide for British Columbia's Oil and Gas Workers

3.4 MONITORING

Field monitoring inspections will be conducted by the Company once in the spring. Monitoring will consist of ongoing assessment of sites; determining priority, based on risk level and species priority. Monitoring will be used in conjunction with education awareness, treatment, and planning to adjust goals to provide an iterative program. Data will be used to determine what, if any, actions need to be taken.

CNOOC Site Supervisors & Operations will be responsible for:

- Inspecting sites/equipment for invasive plants and identifying species
- Auditing practices of other groups
- Following up on outside sightings/reports
- Identifying threats during pre-construction assessments
- Identifying high risk sites
- Identifying infestations
- Developing treatment plans
- Monitoring control effectiveness
- Documenting program activities
- Maintaining compliance with pesticide application permits
- Education and outreach for workers
- Coordinating and supervising control crews

3.4.1 CONDUCTING INVASIVE PLANT INVENTORIES/SURVEYS

The British Columbia Invasive Alien Plant Program (IAPP) contains information and forms to assist with monitoring. The IAPP Application is the database for invasive plants in British Columbia, in which information from both government and non-government agencies share information. The Map display feature is freely accessible and can be used to display and query the data within the application and create custom maps. The second component of the application, the data entry module is limited and required authorization for use.

Information can be found at: <http://www.for.gov.bc.ca/HRA/Plants/application.htm>

CNOOC efforts for inspections, treatment and monitoring may use the IAPP's field forms (Appendix E) or equivalent type field forms. Spatial occurrence of all known invasive plant infestations will be maintained in the company's internal Silvacom land management tracking system.

3.4.2 MONITORING INVASIVE PLANT POPULATIONS

CNOOC staff and contractors will monitor for invasive plants on susceptible sites on a regular basis. Invasive species information and associated goals will be reviewed regularly. Data collected during monitoring will be used to determine what action, if any is necessary. The changes to the NEIPC goals, (and NWIPC where relevant) will also be monitored.

Monitoring will be conducted visually and critical observations will be recorded. To ensure the most efficient use of all available resources, all Company sites (in a geographic region) will be assessed at the pre-construction assessment stage. Monitoring will provide a record of information about invasive plant occurrence, density and site conditions.

High risk sites will be routinely inspected for potential or existing problems. Sites will be evaluated for species composition and projected growth rates as well as site, human, and financial factors. The frequency of inspections will be based on these factors.

3.5 INJURY LEVELS AND TREATMENT THRESHOLDS

Invasive plant management is a continually changing process which occurs over many years. Treatment areas will be prioritized in order to provide the most effective program. Thresholds will be established to determine when actions will occur.

The decision to apply treatment to a site is based on results from the monitoring program and available resources. There is no predetermined schedule, and each site is likely to have unique requirements.

3.5.1 ESTABLISHING INJURY LEVELS

INVASIVE ALIEN PLANTS

For invasive alien plants not currently in BC, the goal is to prevent entrance into the Province. Contractors bringing equipment or materials in from out of province will be required to ensure vehicles and cargo are weed free before entering the Company's operating areas. Sanitization of vehicles, equipment and cargo is preferred management approach to protect against inter-Provincial infections.

AGGRESSIVE INVASIVE ALIEN PLANTS

For established plants, the aggressiveness of the species will be evaluated. If the species is likely to cause damage without intervention establishing a containment area is the preferred management action.

REHABILITATION OF INFESTED AREAS

When invasive plants establish and cannot be contained within a containment area, a categorization rating will be applied to the species and the site will be ranked for prioritization.

3.5.2 CATEGORIZING INVASIVE PLANTS

NWIPC and NEIPC methods are used to estimating the range of habitats and aggressiveness of plants within the habitats that the invasive plants will infest and dominate or degrade. Steps in assessment may include reviewing literature on the habitat, range and aggressiveness of invasive plants, seeking advice from scientists and/or the

NWIPC and NEIPC. The project is reviewed on an ongoing basis. Categories of invasive plants are available through the NWIPC and NEIPC.

Table 3 will be used for categorizing the invasive plants Table 4 will be used to develop the site priorities.

TABLE 3: NEIPC (2006) INVASIVE PLANT CATEGORIES FOR NORTH EAST BRITISH COLUMBIA.

INVASIVE PLANT CATEGORIES FOR NORTH EAST BC

1. Prohibited Invasive Plants Prohibited invasive plants are highly competitive with an ability to spread rapidly.	2. Primary Invasive Plants. Primary invasive plants have the ability to spread rapidly but are not as aggressive as prohibited invasive plants.	Category 3 Secondary Invasive Plants Secondary invasive plants can spread easily but the requirement to contain them is usually site specific. Invasive plants under successful biological control and native plants that behave in a weedy like fashion may be included in this category.
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¹ An invasive plant species can become so well established over a large area that it is no longer practical to treat it in that area, and treatment efforts become focused on preventing the plant from expanding into surrounding areas. This involves the establishment of a 'containment line'; outside the containment area the species will be treated aggressively, whereas treatments within the line will be performed as resources allow

TABLE 4: NEIPC (2006) INVASIVE PLANT SITE PRIORITY DESCRIPTIONS.

SITE PRIORITIES

Priority	Purpose or Intent
1 Extremely High Opportunity for Control	To stop the spread of invasive plants threatening currently uninfested, highly susceptible areas. These sites are less than or equal to 0.25 ha. and there is a good expectation of control. This priority also includes sites that are threatening a large neighbouring economic base, for example, seed and other high value crops.
2 High Opportunity for Control	To stop the enlargement of sites in highly susceptible areas. These sites are less than or equal to 0.5 ha. Must have a reasonably good expectation of control.
3 Moderate Opportunity for Control	To stop the enlargement of sites that are greater than or equal to 0.5 ha in highly susceptible areas, or less than or equal to 0.5 ha in moderately susceptible areas.
4 Low Opportunity for Control	To stop the enlargement/contain sites greater than 0.5 ha.

3.5.3 TREATMENT THRESHOLDS

Treatment threshold will be based on plant count or density. Some ecosystems may have native plants with no tolerance for invasive species, whereas some may have a number of plants that can be tolerated before treatment is required. Invasive plant control may be based on the native plant's life cycle.

Treatments are ideally executed when invasive plant populations are low, long before the injury threshold is reached. Treating invasive plants when their density is low will reduce expenses and unnecessary introduction of treatment agents into the environment. Thresholds are often a function of available financial and human resources. A combination of Tables 3, 4 and 5 will be used to determine when the treatment threshold has been reached.

TABLE 5: NEIPC (2006) PROGRAM THRESHOLD TABLE.

PROGRAM THRESHOLD TABLE		
INVASIVE PLANT CATEGORY	SITE PRIORITY	CONTROL REQUIREMENT
1	1	Critical level - control is required. The immediate requirement is to prevent newly arriving and invasive plants that have low population in northeast BC from establishing and or spreading. The goal is to eliminate the local population of the IP.
1	2	
1	3	
1	4	
2	1	
2	2	Containment level – Control is usually required but the need for control is reviewed in the context of the support and demands of agencies, area residents and goals for the area. The requirement is to identify the areas infested with invasive plants, as well as uninfested habitats, and use this information to prevent further expansion of invasive plant populations. This level doesn't deal with all invasive plant problems but keeps things from getting worse.
2	3	
3	1	
3	2	Comprehensive level –Control and rehabilitation will be attempted when biological control agents are available and effective. Control and rehabilitation using methods other than biological control require specific requests and justification by an analysis of risk, cost and benefit.
3	3	

3.6 PEST TREATMENT OPTIONS

Treatment will occur when monitoring indicates thresholds have been reached. Integrated weed management utilizes a variety of control methods. The selection of a particular treatment to control noxious weeds/invasive plants will depend on:

- Season of treatment.
- The species of noxious weed/invasive plant being targeted.
- Size of the infestation to be controlled.
- Site characteristics including proximity to water sources, rare plants and other environmental sensitivities.
- Presence of desirable native species.

For the purpose of this PMP, techniques involving chemical and mechanical/manual control are proposed for use. Control methods will be determined based on the results of an annual inspection and management priorities.

Pest treatment is separated into four categories:

1. Manual and mechanical control (non-chemical)
2. Selective and spot applications of herbicides (chemical)
3. Cultural control (non-chemical)
4. Use of biological control agents (non-chemical)

3.6.1 TREATMENT SELECTION

Integration of a number of treatment strategies is more effective than choosing a single method. Generally, invasive plants cannot be controlled using a single treatment. Treatment success is dependent on the type of invasive plant and site conditions and other considerations including time of year, weather conditions, financial and human resources, site accessibility, site conditions, target species composition and density, and the consequences of not treating. Treatment selection is based on information compiled from monitoring.

TABLE 6: A SUMMARY OF GENERAL CONDITIONS ASSOCIATED WITH TREATMENT OPTIONS.

Treatment	Examples	Condition for Use
Manual and Mechanical Methods	Covering, smothering, cutting, digging, excavating, girdling, hand pulling, mowing, pruning, stabbing, tilling, flaming	<ul style="list-style-type: none"> • New, small incursions – used to limit rhizomatous root spread to prevent seed production • Applicable to most species, but aggravate some situations (e.g., larger hawkweed sites) • May requires rehabilitation by seeding or other activities
Chemical Control	Strategic use of herbicides	<ul style="list-style-type: none"> • Reasonable efforts to use non-chemical control options have been exhausted • Incursion size is variable • Restricted use within close proximity to species at risk, domestic water intakes, waterways, agricultural and food production areas, environmentally sensitive areas, riparian areas, or public use areas.
Bio-Control	Systematic release of insects or disease	<ul style="list-style-type: none"> • Older more established incursions generally with wide spread occurrences of target species beyond treatment site • Currently applicable to thistles, knapweeds, toadflaxes, tansy ragwort, leafy spurge, and St. John's Wort.
Cultural Control	Target Grazing	<ul style="list-style-type: none"> • Similar to mechanical treatment with variable incursion size. • Feasible if livestock industries present in the area • Experience with husbandry of livestock required • Infrastructure such as fencing, watering facilities and shelter may be required

² To the best of the Company's knowledge, plant species commonly targeted with biocontrol agents currently do not exist in the PMP area. Bio control is not a control method likely to be considered within the term of this plan.

³ Cultural control through target grazing using trained livestock is currently not a practical option available in the Company's operating areas.

3.6.2 MANUAL AND MECHANICAL CONTROL

Mechanical and manual methods of weed control prevent weeds from producing seeds and reduce the vigor of invasive plants. Mechanical and manual control includes:

- Mowing
- Cutting, pruning, root stabbing
- Hand pulling
- Digging/Excavation
- Girdling
- Tilling
- Burning
- Covering or smothering

ADVANTAGES

- If timed correctly desirable native forbs and grasses can be protected.
- Mechanical and manual controls can be used in areas where herbicides cannot be used.
- Can be effective in reducing invasive plant infestations and limiting their movement off site.
- Has only small and short-term impacts on fish and wildlife.
- For some methods, the plant debris protects the soil from erosion.
- New seeds can be prevented from entering the seed bed.

LIMITATIONS

- Depending on the amount of invasive species control necessary, it may be difficult to protect wildlife or native plants.
- Mowing low-growing plants can result in more stem growth, and cannot be used in conjunction with flower-feeding bio-control agents.
- Cutting is effective only with the correct plant species, stem diameter, age of plant, and time of cut.
- Burning creates potential risks when done in proximity to a forest.
- Some invasive species respond positively to burning and mowing.
- Covering or smothering can be costly and labour intensive, and require frequent monitoring to detect and repair torn material.
- Covering or smothering can cause soil compaction.
- Excavation can be costly and labour intensive, and all root material must be removed to prevent re-growth.
- Rehabilitation and restoration, including prompt seeding of native vegetation to prevent the establishment of invasive plant species, and soil erosion. Follow-up treatments are required for 3 to 5 years minimum.

DISPOSAL OF INVASIVE PLANTS AND PLANT PARTS

- Proper disposal is required in order to prevent further spread of invasive species. Plants, plant parts and seeds will be bagged and burned at on-site incineration facilities.

GUIDELINES FOR HANDLING PLANT PARTS

- Weed whips, hand scythes, or hand pulling will be used on patches of noxious weeds or single scattered invasive plants.
- If hand-pulled plants are flowering, the plants will be bagged immediately on site.
- Larger infested areas will be cut with a large mower. Care will be taken to ensure vegetation will not be mowed too short (<15 cm) to avoid damaging re-establishing native plants.
- If mowing is required, sites will be mowed before seed is set. Weeds will not be mowed once seed set has occurred, as this will spread seed and cause a larger infestation.
- Once sites are first mowed in spring a second mowing later in the summer (mid- late July) will increase effectiveness.
- While mowing is effective for annual species (before seed set) creeping roots of perennial plants will persist unless mowed frequently in order to destroy the root system.
- Mowing will not be effective on low spreading plants. An alternate method of management such as hand pulling or selective herbicide application will be required for these species.

3.6.3 CHEMICAL CONTROL METHODS

Herbicide application will be critical to control the spread of invasive plants, but will only be one component of the PMP. Herbicide application under this PMP will be targeted on invasive plants, and emphasis will be placed on minimizing damage to non-target species. Chemical selection will be determined by site location, sensitivities, weed species, existing desirable vegetation, and whether or not a residual effect is wanted.

For large plant populations, herbicides might be used as an initial treatment to reduce populations to levels where manual methods will be effective. Herbicides might also be used to treat the core of large populations, while manual methods are used along the edges. Early summer herbicide treatments may be followed up by late summer or early fall manual treatments if necessary. Herbicides might also be used along with fertilizers for improved performance of the native species.

The general policy is to consider selective application of herbicides before broadcast treatments. Selective application is effective in areas where native species are established. Selective spraying in these areas to target small infestations of noxious/invasive species will remove or reduce the invasive species while minimizing disturbance to native or desired species. Elimination of the invasive species will give native species a better competitive chance. Broadcast treatments may be considered over larger areas where the goal is no vegetation, such as within a soil stock pile or berm.

ADVANTAGES

- Efficiency and degree of control is available at a relatively low economic cost.
- Manual and mechanical methods often require herbicide application to prevent further spread of invasive plants.
- Herbicides have specific instructions with prescribed rates and target species on the label.

- The impacts of carefully applied, targeted herbicides may be less significant than environmental degradation caused by invasive plant species.

DISADVANTAGES

- Herbicides cannot be applied close to water bodies
- At least one follow up application or manual treatment is generally required.
- Exposure to herbicides may present a risk to workers, the public, animals and untargeted plants

GENERAL USAGE TIPS

- For some species, spraying with herbicides when the plants are in the early emergent stages (2-4 leaves) is effective, and lower application rates may be possible at this time (follow label requirements). Therefore, considerations and planning will begin before late spring (mid to late May) when application may need to commence depending on target species. If required, a second selective application will likely need to be applied 1.5 to 2 months later (end of June to early July).
- For other species, fall spraying of some herbicides may be most beneficial.
- When herbicides are applied to areas where re-vegetation of native species is desirable, only selective herbicides will be used. If non-selective herbicides are required, spot treatments will be used.
- Prior to any application the manufacturer's directions and product label will be read to ensure the applicator is aware of any precautions and restrictions, as well as safety and environmental considerations. All manufacturers' directions will be followed. The manufacturer will be contacted by the applicator if additional information is required.
- Application of any herbicides will be conducted by a licensed pesticide applicator.

3.6.4 BIOLOGICAL CONTROL AGENTS

The most common biological control option is the introduction of insects to attack and weaken plants populations. This option would occur after consultation with provincial and local government as well as the NEIPC.

ADVANTAGES

- Have been proven to reduce well established plant populations and are effective where other methods will not work due to extensive invasive plant cover.
- Can reduce invasive plant populations below levels of environmental or economic damage.
- Inexpensive, long-term solutions.
- Few known public safety issues.

LIMITATIONS

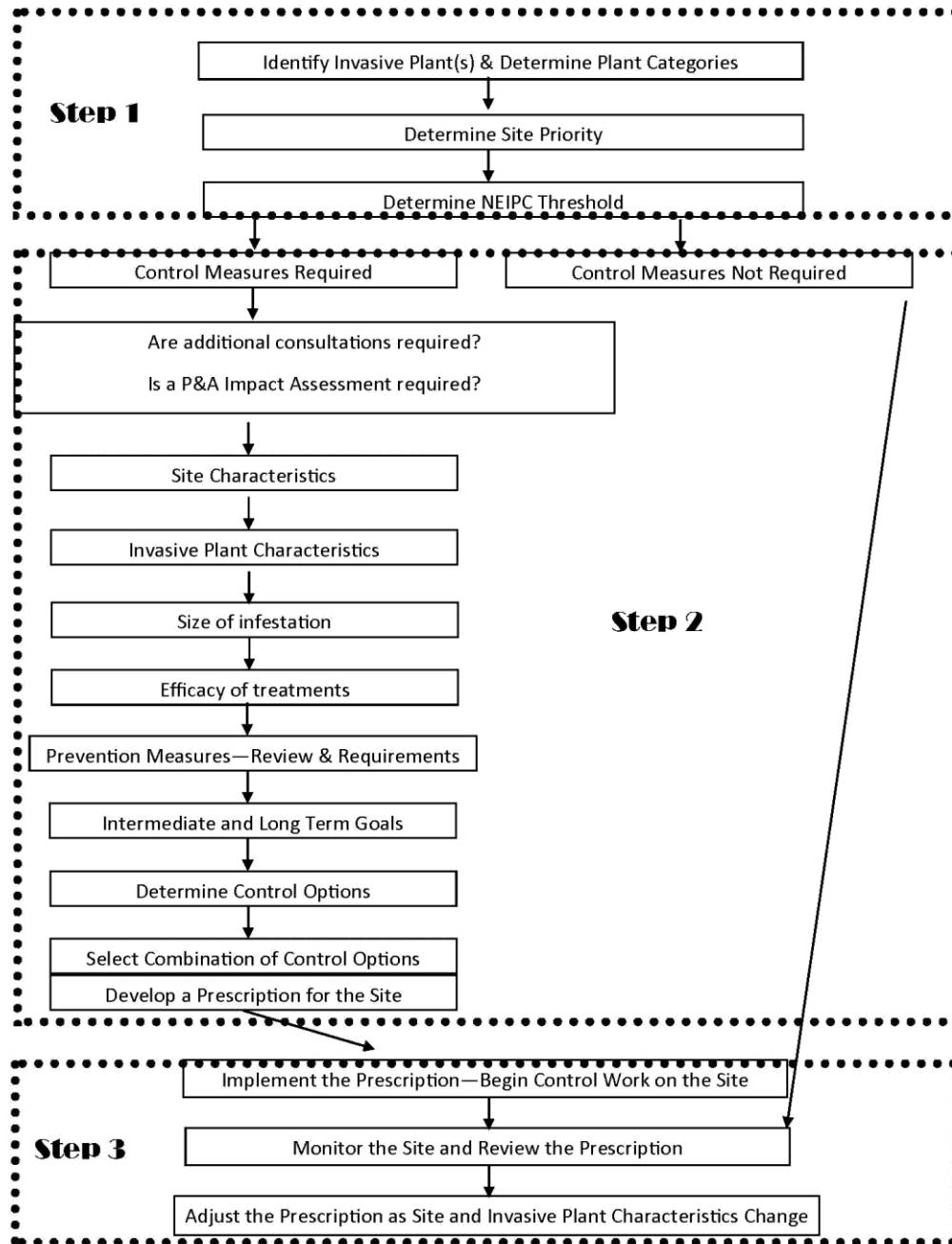
- Results can take 5 – 10 years to establish numbers large enough to have an impact.
- Does not result in elimination of invasive plant species and several agents may be required to result in measurable impacts on populations.

- Ongoing monitoring is required to determine establishment, dispersion and impact on invasive plant populations.
- Specialized training and equipment is required for transporting, releasing, distributing and monitoring the biological control agents.
- Costs and time to develop, study, rear and prepare agents for release are high
- Biological control is not available for all invasive species.
- There is some uncertainty about impacts on native flora and fauna.

3.6.5 CULTURAL CONTROL

The only current cultural control in British Columbia is grazing by livestock. Since there are currently no grazing livestock near CNOOC's sites this is not a viable option at present. Cultural controls will be considered if any viable options are presented.

FIGURE 3: FLOW CHART FOR DETERMINING PEST MANAGEMENT OPTIONS AND STEPS TO TAKE.



3.7 POST TREATMENT EVALUATIONS

During application, inspections will be conducted to assess mechanical, manual, and chemical treatments, public and worker safety, environmental concerns, completion schedules, and adherence to schedules.

Post application field monitoring will occur at select treated sites. Timing of the inspections will be dependent on the treatment method. A reasonable timeline for inspections is within one year of the application for mechanical, manual or chemical treatments. Biological treatments will be inspected for agent establishment within 2 years of species release, after which effectiveness can be evaluated. The following records will be made to determine whether:

- Control technique(s) provide acceptable control.
- Environmentally sensitive areas are adequately protected.
- There are any observable off-site or non-target impacts resulting from herbicide application.
- Herbicide rates need to be adjusted.
- Re-growth of invasive plants occurred after mechanical or manual treatments.
- Follow-up applications are required.
- The treatment was cost-effective.
- Appropriate signage for herbicide application was in place (if inspected within two weeks).

Treated sites will be evaluated to ensure:

- The treatment complied with this PMP, the IPMA and IPMR.
- The required level of control was achieved.
- The treatments were necessary and appropriate to attain the goals.
- Information is collected and shared.

3.7.1 NON-COMPLIANCE

Any detection of non-compliance will be reported to the British Columbia Ministry of Environment & Climate Change Strategy, Environmental Protection Division. Any other government or stakeholders that may be impacted will also be notified.

In the case of a non-compliance event, a case specific response plan will be developed. The most likely area of non-compliance will be application near a water body. In this case water sampling will occur, and other sampling (i.e., soil / vegetation) as required. Relevant standards/criteria listed in the Contaminated Sites Regulation will be used to assess impacts. If any applicable standards/criteria are exceeded, herbicide application in the effected watershed will be stopped. The Ministry of Environment & Climate Change Strategy, Department of Fisheries and Oceans, and other stakeholders will be consulted on further actions and mitigations.

3.7.2 PROTECTING WATER QUALITY

Concerns about contamination or potential impacts to watercourses during herbicide application are expected. No herbicides will be applied within the designated non-treatment zones, pesticide free zones, or buffers zones located next to any water body. Herbicides labels will be followed to ensure water impacts do not occur. If monitoring becomes necessary, options will be discussed with the NEIPC and Government of British Columbia. Environmental protection is further discussed in Section 5: Environmental Protection.

4.0 APPLICATION OF HERBICIDES

Under this PMP, a person must not use, handle, release, transport, store, dispose of or sell a pesticide in a manner that causes or is likely to cause an unreasonable adverse effect.

4.1 DEFINITIONS AND ABBREVIATIONS

IPMA – Integrated Pest Management Act

IPMR – Integrated Pest Management Regulation

SDS – Safety Data Sheets

TDG – Transportation of Dangerous Goods

WHMIS – Workplace Hazardous Materials Information System

4.2 PESTICIDE APPLICATOR QUALIFICATIONS

Herbicide applications will be supervised or conducted by a person who holds a Pesticide Applicator Certificate for the appropriate class of pesticide. The pesticide applicators are required to:

- Have proof of certification.
- Be in continuous attendance during herbicide application.
- Supervise 4 or less uncertified assistants at once, while maintaining auditory and/or visual contact.
- Comply with the standards of Division 7 of the IMPR.
- Hold WHMIS and TDG Training certificates.
- Hold all other CNOOC required safety certifications.

4.3 TRANSPORTATION, STORAGE AND HANDLING OF HERBICIDES

The transportation, storage, handling, application and storage of pesticides are governed by both Federal and Provincial legislation. The required practices are outline in:

- Worker's Compensation Board of British Columbia (2018) Occupational Health and Safety Regulation – BC Regulation 296/97.
- Worker's Compensation Board of British Columbia (2010) Standard Practices for Pesticide Applicators.
- BC Ministry of Environment & Climate Change Strategy, Lands and Parks (2005) Handbook for Pesticide Applicators and Dispensers.

4.3.1 SAFE TRANSPORTATION OF HERBICIDES

The TDG Act, along with the IPMA and IPMR, regulate the safe handling and transportation of poisonous substances. CNOOC will ensure personnel responsible for handling and transporting herbicides for the company will adhere to the following procedures:

- Appropriate documents such as operations records and safety data sheets (SDS) will be carried in each vehicle during herbicide transport and use.
- Ensure the vehicle operator reads and understands the herbicide labels and product SDS.
- Ensure usage of all documents, placards and procedures outlined in the TDG Act and the IMPA or IPMR.
- Ensure the vehicle is equipped with a first aid kit, fire extinguisher, spill contingency plan and the vehicle operator is trained on spill response.
- Inspect herbicide containers for defects prior to use or transportation.
- Store herbicides away from food and drink, safety gear and people.
- Limited amounts of herbicide concentrate will be carried in any one vehicle. The quantity will be no more than what is necessary for each project.
- Ensure that herbicides are carried in a compartment secured against spillage or unauthorized access.
- Ensure herbicides are either (a) kept in their original containers or (b) in appropriate containers with the name of the herbicide, active ingredient and concentration and the pesticide registration number.
- Spill containment and clean up equipment will be carried separately from herbicides but in close proximity to herbicide on each vehicle during herbicide transport and use.

4.3.2 SAFE STORAGE OF HERBICIDES

CNOOC will ensure personnel responsible for safely storing herbicides for the company adhere to the following procedures:

- Ensure storage conditions comply with the TDG Act and the IMPA or IPMR.
- Ensure the person responsible for the storage area notifies the fire department of the presence of herbicides onsite.
- Ensure the product SDS, a first aid kit, and necessary spill equipment are available.
- Store herbicides away from work and living areas, areas that may flood, flammable materials, bodies of water and water sources.
- Ensure herbicides are either (a) kept in their original containers or (b) in appropriate containers with the name of the herbicide, active ingredient and concentration and the pesticide registration number.

- Storage facilities are to be locked when unattended, ventilated to the outside atmosphere, and only entered by authorized personnel.
- A placard affixed on the outdoor of each door in block letters should clearly read “WARNING – CHEMICAL STORAGE – AUTHORIZED PERSONS ONLY”.
- Herbicides which release vapours and bare a ‘poison’ symbol cannot be stored in a facility attached or within a building with living accommodations.

4.3.3 SAFE MIXING, LOADING, AND APPLYING OF HERBICIDES

CNOOC will ensure personnel responsible for safely storing herbicides for the company adhere to the following procedures:

- A Certified Pesticide Applicator will carry out or supervise all mixing, loading and application of herbicides.
- Mixing, loading and application of herbicides will be done in a safe manner and at minimum 15 meters from pesticide-free zones, no treatment zones, water bodies, fish or wildlife habitat, water sources, or other environmentally sensitive areas.
- Ensure that, to prevent treatment of watercourses, the suction hoses used for herbicide(s) will not be used to pick up water from natural sources such as streams or ponds. The intake of water for mixing will be protected from backflow into the natural source by an “air gap” or “reservoir” between the source and the mixing tank.
- Manufacturer’s recommendations will be followed including recommended site re- entry times, and required personal protective equipment.
- Containers and equipment used to mix or apply herbicides are not to be washed or submerged in any water bodies.
- Ensure each of the following are available: product SDS, a first aid kit, eye wash station, required personal protective equipment, necessary spill equipment, spill response plans, emergency contact information, a copy of this PMP.
- Ensure that the listed herbicides in this PMP will only be mixed with water and surfactants to dilute herbicide concentrations.
- Site medical staff will be informed in advance of the planned use of herbicides. The specific chemicals and their SDS will be supplied to site medical staff and notice will be given when herbicides are in use and the number of people handling/exposed on a daily basis.

4.3.4 SAFE DISPOSAL OF EMPTY HERBICIDE CONTAINERS

Contractors will be responsible for the disposal of herbicide containers and unused herbicides.

- Containers are to be disposed of in a manner which meets the requirements set out by the BC Environmental Management Act, Hazardous Waste Regulation and in accordance with the manufacturer’s instructions.
- Containers should be (a) returned to the herbicide distributor for recycling, or (b) triple rinsed or pressure rinsed, then altered so they cannot be reused, and disposed of in an approved disposal site.

- Leftover herbicide should be stored in a manner consistent with the storage rules outlined above in section 4.3.2 Safe Storage of Herbicides, which could be at the herbicide distributor's warehouse or another approved facility.

4.4 HERBICIDE SPILL RESPONSE

The following procedures should be followed when responding to herbicide spills. Contractors may use their own spill response plan if it meets or exceeds the following plan:

Contractors or employees carrying herbicides should have the following items with them:

- A copy of the spill response plan
- Emergency telephone numbers
- Absorbent granules, large plastic bags, shovels
- An ABC fire extinguisher
- 3 m x 3 m polyethylene or plastic tarp
- Shop brush and dust pan
- Flagging tape and rope
- Herbicide First Aid Kit
- Personal protective equipment including rubber gloves and safety glasses
- Any other items outlined on the SDS for the herbicide

In the event of a spill, the following procedures will be followed:

- 1 Stop work.
- 2 Ensure safety of personnel.
- 3 Any person exposed to a herbicide spill shall be removed from the vicinity of the spill and assessed to determine if first aid is required.
- 4 First aid should be administered if required.
- 5 Notify supervisors and Company representatives.
- 6 All personnel will don personal protective clothing and any other safety gear required. Consult the SDS if necessary.
- 7 Stop the source of the spill.
- 8 Stop the material from spreading by creating a ridge or dam.
- 9 If applicable spread absorbent material over any free fluids.
- 10 Collect absorbent material in plastic bags or containers, clearly mark and remove from the spill site.
- 11 Contaminated soil or other material will be placed in garbage bags or containers and removed from the spill site.
- 12 As per BC's Environmental Management Act Ministerial Order No. M329, when more than 5 kg or 5 litres of product or herbicide is spilled on land, or any amount into a waterbody, the person responsible for the project will immediately report it to Emergency Management BC by telephoning 1-800-663-9453 and an approved

representative of CNOOC will be notified of the details related to the spill as soon as is practical by the Contractor project supervisor.

4.5 TYPES OF HERBICIDES AND MANNERS OF APPLICATION

Further information on the application of herbicides and appropriate herbicide choice can be obtained from the NEIPC. The following is a list of active ingredients and common names for herbicides. Active ingredients may be marketed under many registered product names. Any products registered for use in Canada which contains one or more of the following active ingredients can be used under this PMP, for example:

TABLE 7: HERBICIDE TRADE NAME AND ACTIVE INGREDIENT

Trade Name	Active Ingredient
Vantage	Glyphosate
Roundup	Glyphosate
Garlon XRT	Triclopyr
Arsenal	Imazapyr
Tordon 22K	Picloram
Kerb SC	Propyzamide
2, 4-D Amine	2, 4-D
Branvel VM	Dicamba
Vanquish	Dicamba
MCPA 600	MCPA
Lontrel 360	Clpyralid
Clearview	Metsulfuron methyl / Aminopyralid
Milestone	Aminopyralid
Esplanade	Indaziflam

The Health Canada Consumer Product Safety website is a valuable tool for identifying product composition and application details <http://pr-rp.hc-sc.gc.ca/lr-re/index-eng.php>.

4.5.1 APPLICATION EQUIPMENT

The equipment which may be used to apply herbicides under this PMP is as follows:

Backpack and Hand Held Sprayers:

A portable, manually operated, low pressure container with a nozzle and a positive shut- off system. Used for spot application of herbicides onto foliage.

ATV/Quad Unit:

A motorized all-terrain vehicle equipped with a pump, holding tank for herbicide mix, and low pressure nozzles attached to handguns, booms and/or boomless nozzles used for spot and broadcast applications of herbicides onto foliage.

Truck Mounted Sprayer:

A truck or other motorized vehicle equipped with a pump, holding tank for herbicide mix and low pressure nozzles attached to handguns, booms and or boomless nozzles used for the spot and broadcast applications of herbicides onto foliage.

4.6 SELECTION OF HERBICIDE AND PROPER APPLICATION METHODS

4.6.1 SELECTION OF HERBICIDE

A non-selective herbicide kills or damages all plant species. A selective herbicide kills or damages a particular species or groups of species with little or no injury to other plants. Non-selective herbicides may be applicable in areas where no vegetation is desirable such as well sites. Non-selective herbicides may also be used selectively on small infestations. Selective herbicides should be used for reclaimed and re-vegetated areas and any sites where natural succession of native vegetation is a desirable.

Product information will be read on individual herbicides and tank mixes prior to purchase to ensure that application will have no negative impacts to wildlife. In addition, the manufacturer's buffer zones or the legislated buffer zones will be adhered to, whichever is greater.

4.6.2 PROPER RATE AND VOLUME OF HERBICIDE

The required volume of herbicide for a site and the rate at which it is applied varies with plant species, type and growth stage and site conditions. Higher rates are required when plants are larger, in heavy populations, or growing under stressful condition (hot, cold, dry, wet etc.) (Saskatchewan Agriculture 2008). Lower rates will be used when weeds are small (2 to 6 leaf stage) and actively growing. It is important to obtain adequate coverage but not excessive amounts that will contaminate the adjacent environment.

4.6.3 PROPER TIME

Proper timing is species and site dependent. Plants are most sensitive to foliar sprays when they are growing vigorously and the leaves are fully expanded. For some species, spraying with herbicides when the plants are in the early emergent stages (2-6 leaves) is effective, which for many plants is in late spring. If required, a second selective application will likely need to be applied 1.5 to 2 months later. For other species, fall spraying of some herbicides may be most beneficial. Research will be conducted into proper timing during the development of the prescription.

4.6.4 PROPER METHOD

Manufacturer's directions for the herbicide will be followed. Application equipment will be in good condition with the nozzles properly placed. Mixing-loading equipment will provide adequate agitation to mix emulsions and suspension properly and rapidly. The dispersal mechanisms will be calibrated and the swath width determined for

the proper amount of spray material for a unit area. Best coverage will result if spraying is done under calm, cool conditions. Spraying will be discontinued when the average wind velocity exceeds 8 km/hr and the temperature exceeds 30°C (Worksafe BC, 2009). Weather conditions are further discussed in sections 5.3 and 5.4.

4.6.5 HERBICIDE RESISTANCE

To avoid herbicide resistance, herbicides with varying modes of action will be rotated.

4.6.6 HERBICIDE RESIDUE

Only non-residual or short-term residual herbicides will be used. This will reduce environmental impacts and ensure no future problems are created for restoration of a given site.

5.0 ENVIRONMENTAL PROTECTION

5.1 DEFINITIONS AND ABBREVIATIONS

NTZ – No treatment zone

PFZ – Pesticide free zone

PMRA – Pest Management Regulatory Agency – the branch of Health Canada which regulates pesticides.

5.2 RESOURCES FOR DETERMINING RISKS, MITIGATIONS, STANDARDS AND GUIDELINES

The goal of this PMP is to manage and reduce risk and environmental impacts. Harm can come from invasive plants or treatment methods. Many resources are available to assist with invasive plant management. This includes Health Canada's Pest Management Regulatory Agency (PMRA), British Columbia Ministry of Environment & Climate Change Strategy & Climate Change Strategy, NEIPC, and many others.

5.2.1 REGULATIONS AND RISK REDUCTION

There is a significant amount of science documenting the risks that alien species present. (IPPC Secretariat. 2005). The intention of this PMP is to manage and minimize negative risk.

Health Canada regulates herbicides under the Pest Control Products Act. The PMRA branch of Health Canada scientifically evaluates pesticides. Pesticides are evaluated for human health, environmental, and agricultural risks. In order to register or review a product, thousands of journal articles, studies, and regulatory reviews from other countries are conducted, submitted, and reviewed to determine if a product should be registered, and what restriction and use conditions will be required. These reviews are meant to reduce risk to the environment and

human health. They determine restrictions and requirements, such as buffer zones, which are incorporated on the product labels.

The Government of British Columbia uses the IPMA to impose further restriction on the use of pesticides on Crown Land. This PMP will adhere to all regulations set out by Health Canada and the Province of BC.

The following factors are considered when registering pesticides:

Assessment of Acceptability

- Integration of assessment from health, environment, value, chemistry.
- Dietary and non-dietary health risks.
- Value considerations, efficacious, phytotoxicity, lowest effective rate, socio-economic considerations.

Consideration

- Complete scientific database for all areas.
- Adequacy and quality of submitted data for all areas.
- Persistency and similar issues.
- Risk management considerations.
- Mitigation measures required.

Registration Decision Options

- No registration – unacceptable health or environmental risk.
- No registration – insufficient information.
- Registration – acceptable risks and value.
- Registration with conditions – for example, requires confirmatory chemistry, or long term monitoring.

Consultation

- Public consultation will occur on all proposed major regulatory decisions for new registration and re-evaluations, generally 30 day comment period.
- All comments considered and assessments revised as necessary.
- Decisions are published, including responses to comments.
- Stakeholders have the option of filing notice of objection within 30 days of the decision.

5.2.2 MITIGATION

The British Columbia Ministry of Environment & Climate Change Strategy uses the IPMA to impose further restriction for the use of pesticides on Crown Land. For example, Regulation 73 and 74 applies a Pesticide Free Zone for the herbicide aminopyralid which exceeds the conditions on the manufacturer's label.

Appendix D contains information on the PMRA status, science, environmental, toxicological and other parameters used to assist in deciding when herbicides should be prescribed.

The following strategies and science are used to protect the environment when using herbicides:

- Treatment is only necessary when a serious environmental, economic or cultural risk exists from the establishment or spread of an invasive plant species and detection is early enough to provide feasible management.
- Reasonable efforts to use effective non-chemical means have been exhausted.
- A site assessment has been conducted including; soil texture, target and competing vegetation, slope, distance to water courses, probability of shallow aquifers, uses and potential uses are assessed.
- Characteristics of the invasive alien plants are assessed to indicate the most suitable times for treatments by different methods. Efficacy of various treatment methods and the time frame for re-visits.
- Herbicide characteristics such as mobility, persistence and ecological impacts are assessed in respect to site characteristics and application methods and minimal or no risk is determined.
- Application methods such as spot spraying, wick application and stem injection are assessed in respect to site characterization and a method which reduces any possible risks is selected.
- Treatment prescriptions which integrate the various methods, invasive plant characteristics and site characteristics are developed, implemented, monitored and adjusted to ensure the most effective treatment.

5.2.3 PROTECTION OF COMMUNITY WATERSHEDS, DOMESTIC, AND AGRICULTURAL WATER

The following minimum boundaries apply for community watershed protection:

- Community watersheds, registered domestic and agricultural water sources shall be visually identified or will be identified using the BC Ministry of Environment & Climate Change Strategy Community Watershed Database at the following website:
http://www.env.gov.bc.ca/wsd/data_searches/comm_watersheds/index.html.
- Before a pesticide is applied in a community watershed, the water licensee must be notified and provided with a copy of the pesticide-use permit application.
- A minimum 10 m pesticide-free zone, except for biological pesticides, must be maintained around all streams, lakes and other water bodies in a community watershed.
- A pesticide-free zone must be maintained within 100 m upslope of the community watershed intake.
- Pesticides must not be stored in a community watershed for more than 24 hours before application and 7 days beyond the conclusion of the application, unless they are contained within a permanent structure.
- If a pesticide or pesticide breakdown product is detected at a community watershed intake, then no further pesticides will be used until the Ministry of Health (MOH) medical health officer is satisfied that all necessary measures have been taken to preserve water quality.

Table 8: Minimum Protective Measures Under the IPMR to Protect Domestic and Agricultural Water Sources.

Pesticide Type	IPMR Section	Permitted Applications	NTZ
All pesticide applications except bacterial pesticides	71(3)	General Rule – Must maintain a 30 m NTZ around a water supply intake or well used for domestic or agricultural purposes, including water for livestock and irrigation.	30 m
All pesticide applications except bacterial pesticides	71(4)	May reduce the NTZ under section 71(3) if reasonable satisfied that the smaller zone will ensure that pesticide from the use will not enter the water supply intake or well	Discretion of Applicator

5.2.4 PROTECTION OF FISH AND WILDLIFE, RIPARIAN AREAS, BODIES OF WATER, AND HABITAT

In order to protect fish, wildlife, riparian areas, bodies of water, and wildlife habitat from adverse effects during invasive plant management (chemical and non-chemical) the following strategies will be used:

- Where mechanical, manual or herbicide control methods are implemented efforts will be made to eliminate harmful alteration, or damage to fish or their habitat. This includes reducing negative impacts on stream bank vegetation, which reduce erosion and water turbidity.
- Ditches containing water are considered to be a water body under the IPMR unless they are self-contained (no inflow or outflow at any time of year).
- A 10 metre PFZ will be maintained around all water bodies for all herbicides except glyphosate.
- The 10m pesticide free zone must not receive any pesticide spray drift, run off or leachate. An additional buffer zone of a suitable width to prevent any release of pesticide into the pesticide free zone will be established on a site-by site basis.
- For glyphosate the PFZ can be reduced to 1 metre if selective treatment is used. If a ditch contains water that is temporary and free-standing and at no time is or flows into fish habitat, glyphosate can be applied up to the high water mark. The pesticide free zone can only be made narrower in cases where the ministry is confident that the water body and riparian areas are adequately protected from pesticide contamination.
- Additional PFZ or NTZ spacing will be implemented as per Appendix D.
- Agencies responsible for species at risk should be consulted prior to invasive plant management treatment, so protective measures can be taken. Sensitive ecosystems or ‘at risk’ plant, vertebrate or invertebrate species identified in other plants, or wildlife management areas will be taken into account and managed accordingly.
- Ensure best management strategies recommended in species habitat, lifecycle information and location documents are practiced during invasive plant management.
- For herbicide application in Karst lands, the Ministry of Forestry and Range (MFR) “Karst Management Handbook for British Columbia” should be consulted to ensure best practices are utilized.

- Pre-work meetings between CNOOC, any third party contractors and affected agencies should be held to ensure all parties involved in the invasive plant management process can competently protect species at risk, riparian areas, bodies of water and wildlife habitat during the course of the work.
- Contract documentation and prescriptions should include general environmental safety procedures such as no refueling of machinery or herbicide mixing within 15 metres of a riparian zone, no clean-up or disposal of herbicide material within 15 metre of a riparian zone (with the exception of emergency spills), riparian zones should be flagged or marked and labelled as such.
- Ensure minimum protection measures for applying pesticides near water bodies are adhered to, summarized in the following table.

Table 9: IPMR Minimum Protection Standards for the Protection of Water Bodies and Fish Bearing Water Bodies.

Pesticide Type		IPMR Section	Permitted Applications	PFZ
Non-glyphosate and aminopyralid Applications		71(3)	Around or along a body of water or dry stream and classified wetland using any pesticide except glyphosate, subject to label restrictions and including all application methods.	30 metres
Glyphosate Applications		74(2) and 77(2)	If the glyphosate product is applied by selective application methods up to but not below the high water mark of temporary, free-standing bodies of water that are not fish- bearing at any time of year and do not drain directly into a fish-bearing body of water.	1 metre above the high water mark
Glyphosate Applications		74(2)(b)	If the glyphosate product is applied by selective application methods over a dry stream that is not fish- bearing at any time of the year and do not drain directly into a fish- bearing body of water.	0 metre
Glyphosate Applications		71(1)(a)i	If the glyphosate product is applied by selective application methods in proximity of a body of water or a classified wetland that is fish bearing or that drains directly into a fish bearing body of water or a dry stream that when wet is fish bearing or drains directly into a fish bearing body of water.	2 metres

5.2.5 PROTECTION OF FOOD INTENDED FOR HUMAN CONSUMPTION

Berry picking, bee keeping, vegetable gardening, and First Nations harvesting of plants potentially might occur in the project area. Prior to herbicide application strategies will be developed and implemented to protect contamination of any potential food.

- During the consultation process, First Nations and the public will be invited to bring forward any plants which are of cultural importance. Continual formal and informal consultation will be conducted on an ongoing basis to determine the location of these plants. Measures will be taken to assess and accommodate these species, including delay of treatment or alteration of treatment boundaries.
- Where possible, herbicide treatments will be conducted at times that minimize impact on food plants (i.e., after fruit has dropped from the plant).
- Non-chemical methods will be considered where applicable.
- If herbicide application is required, no treatment zones may be extended to protect food.
- Treatment notices will be posted at public access points to proposed treatment herbicide advising of treatment near food crops to ensure public awareness.

5.3 PRE-TREATMENT INSPECTIONS

A pre-treatment inspection will be conducted to ensure treatment area boundaries are identified and clearly marked prior to herbicide application.

- A pre-treatment inspection will be conducted to establish treatment boundaries and document any environmentally sensitive areas.
- Maps of the treatment area and environmentally sensitive features will be created.
- The contractor will be provided with a copy of the map.
- A pre-season meeting will be held between the contractor and the plan holder (or a representative) to confirm procedures for determining treatment area boundaries and the locations of environmentally sensitive features.
- Marking/flagging of all pesticide free zones and no treatment zones will be completed prior to herbicide application.

5.4 MAINTENANCE AND CALIBRATION OF APPLICATION EQUIPMENT

Herbicide application equipment used under this PMP will be well-maintained, clean, safe and appropriate for the herbicide being applied. All backpack sprayers will be calibrated prior to the commencement of herbicide application each year and weekly throughout the season. Backpack sprayers may require extra calibration if there is a change in herbicide product or the nozzle output being to vary. Backpack calibration instructions are available in Appendix C. Calibration sheets are to be submitted by contractors prior to the start of a project and at intervals specified by CNOOC.

5.5 WEATHER MONITORING AND RECORDS

Wind speed and temperature will be determined prior to and periodically during herbicide application to ensure weather conditions are suitable for application. This will be done using of an anemometer and thermometer.

For foliar application, wind speed and direction, precipitation, temperature and cloud cover records are required. To ensure all necessary information is collected, the following records are required for herbicide application:

- Wind speed and direction
- Precipitation, frost and dew
- Temperature
- Cloud Cover (clear, overcast, cloudy, partly cloudy)

Persons applying herbicides are required to adhere to product label guidelines for pesticide application under various weather conditions.

5.5.1 STOP TREATMENT CONDITIONS

The certified pesticide applicator has the final authority on when herbicide application should be stopped due to adverse weather, or site conditions. Application will be stopped for any or a combination of the following scenarios:

- The herbicide product label indicates it should not be applied.
- Effective application according to the product label is hindered, for example during rain or snow.
- Wind speed or direction causes drift, or the product to miss the targeted invasive plants.
- Ground wind velocity is over 8 km/hour for foliar application.
- The maximum or minimum temperature stated on the herbicide product label is exceeded, or is 30°C.
- It begins to rain, increasing the chance of runoff and leaching.
- There is frost on the foliage.

6.0 REPORTING, NOTIFICATION AND CONSULTATION

Accurate record keeping is required for the plan holder and the IPMA to monitor the quantity of herbicide used, ensure compliance with the IPMR, ensure compliance with this PMP and ensure compliance with the content of the Pesticide Use Notice.

6.1 DEFINITIONS AND ABBREVIATIONS

IAPP – Invasive Alien Plant Program

6.2 RECORDS

6.2.1 REQUIRED RECORDS

CNOOC and the contractors whom apply herbicides must maintain daily record of herbicide use. The following records will be kept for each treatment location and each day of use:

- Date and time of application.
- For each herbicide used the trade name of herbicide and its registration number, the method and the rate of application.
- Name of invasive plant targeted by the herbicide.
- The prevailing meteorological conditions, including temperature, precipitation, wind direction and velocity. Measured at the beginning of the day before starting treatment, and at the end of the day. Measured again if notable changes occur throughout the day.
- Proof of calibration for any herbicide application equipment which requires calibration.
- Legal Location/UTM coordinate of infestation.
- Land use and habitat type.
- Weed species and description.
- Degree of infestation and approximate infested area:
 - Trace (Rare) = <1% Cover
 - Low (Occasional Plants) = $\geq 1\%$ and <5% cover
 - Moderate (Scattered Plants) = $\geq 5\%$ and <25% cover
 - High (Fairly dense) = $\geq 25\%$ cover
 - Linear (i.e. Trail, Seismic line etc.)

The following records associated with site treatment must also be retained:

- Site assessment and invasive plant forms.
- Treatment notifications.
- Maps of invasive plant sites, treatment and biological control.
- Pre and post treatment records of site.
- Project checklists, including equipment, first aid and spill kits.

6.2.2 ANNUAL REPORTING

The IPMR requires an annual report, submitted to the Regional Ministry of Environment & Climate Change Strategy Administrator in accordance with section 39 of the IPMA. The following information is required for each calendar year by January 31 the following calendar year for operations conducted under this PMP.

- The name and address of the confirmation holder, and their confirmation number.
- Trade name and active ingredients of the herbicide(s) applied, including their Pest Control Product (PCP) numbers.
- Location and total area treated in hectares.

- Quantity of each active ingredient applied in kilograms.

6.3 NOTIFICATIONS

The following notifications will be provided with respect to this PMP:

6.3.1 NOTICE OF PMP CONFIRMATION

For the term of the confirmation, a copy of the confirmation, the PMP and relevant maps will be made available to the public within 7 days of the plan confirmation date at the CNOOC office in Fort Nelson BC.

Address: 5203 46th Avenue, Fort Nelson, BC V0C 1R0

6.3.2 ANNUAL NOTICE OF INTENT TO TREAT

An annual Notice of Intent to Treat will be submitted to the Ministry of the Environment at least 21 days prior to treatment for each year the PMP is in effect. The Notice of Intent to Treat will be provided to each regional office within the geographical region in which herbicide application is proposed. As part of the Notice of Intent to Treat, and as per section 42 of the IPMR, CNOOC will ensure IAPP contains up to date information. The proposed treatment areas and geographic and sensitive features will be provided. This will allow the use of the IAPP to produce detailed maps of proposed treatment locations.

Information to be included in the Notice of Intent to Treat:

- Name and business location of confirmation holder(s).
- Proposed treatment areas.
- Proposed treatments.
- Herbicide proposed for use and application methods.
- Total area proposed for treatment.

6.3.3 PMP AMENDMENTS

Proposed amendments will be forwarded in writing to the BC Ministry of the Environment & Climate Change Strategy. Amendments requesting new active ingredients will require further public advertisement and First Nation consultation. Amendments for new techniques or similar changes will not require further consultation.

No changes to active ingredients are proposed in this plan.

6.3.4 NOTIFICATION OF CONTRAVENTION

Section 72(1)(d) of the IPMR requires a confirmation holder give written notice to the administrator on a contravention of the IPMA or IPMR that involves the release of a pesticide into the environment.

Failure of a contractor to observe the following requirements may be cause for dismissal:

- Violation of IPMR or IPMA requirements.
- Failure to properly calibrate equipment.
- Handling, storing, mixing or applying herbicides in a manner that violates product labels.
- Mixing of herbicides in inappropriate or environmentally sensitive areas.
- Failure to wear personal protective equipment required by the product label.
- Application of herbicides by uncertified personnel without appropriate supervision.
- Application of herbicides within prohibited zones.
- Application of herbicides under inappropriate or unsafe conditions.
- Improper disposal of unused herbicides or containers.
- Improper reporting or clean-up of spills.
- Failure to submit daily operation records.

6.3.5 PUBLIC NOTIFICATION PRIOR TO TREATMENT

Notification procedures should be agreed upon at the time of public consultation. This may include individuals, communities, organizations and the time and manner in which the notification should take place. A record of notification should be kept for each treatment area.

6.3.6 FIRST NATIONS NOTIFICATION PRIOR TO TREATMENT

Notification procedures will be agreed upon at the time of First Nations consultation. This may include individuals, communities, organizations and the time and manner in which the notification should take place. A record of notification will be kept for each operating area.

6.3.7 EMPLOYEE AND THIRD PARTY NOTIFICATION PRIOR TO TREATMENT

Any employees or contractors who may be affected by the herbicide application to a treatment area should be notified by electronic mail, bulletins and Treatment Notice postings. CNOOC safety staff and on site medics will be informed notified prior to herbicide treatments taking place. The type and locations of the treatment areas will be communicated and safety precautions and SDS sheets will also be distributed.

6.3.8 POSTING OF TREATMENT NOTICES

During treatment, Treatment Notices will be posted in access locations and areas where they are clearly visible and legible for employees, the public and contractors. The signs will be posted for 2 weeks after herbicide application and include the following information:

- The trade name and active ingredient of the herbicide that will be used.
- The date and time of the application.
- The purpose of the treatment.
- Precautions to take to prevent harm for people entering the treatment area.
- The PMP confirmation number.
- The plan holder(s) contact information.

The Treatment Notice sign shall be:

- A minimum of 550 cm².
- Water resistant.
- Display the title “Notification of Herbicide Application” in bold letters which are clearly legible to people approaching the area.

An example of the Treatment Notice is available in Appendix B.

6.3.9 EXEMPTION FROM POSTING NOTICES

Section 60 (2) (i) of the IPMA states that an applicant for a permit is exempt from the requirement for a 30 day comment period if the applicant satisfies the administrator that:

(a) the application relates to an unforeseen pest problem and the delay in applying the pesticide required to carry out the consultations is likely to result in an unreasonable adverse effect,

(b) the particular pesticide use to which application relates is

(i) to such a small area, or

(ii) to such a remote area that the use is unlikely to affect any person, other than the person who owns the treatment area, or any other person's property

6.4 CONSULTATIONS

6.4.1 PUBLIC CONSULTATION PLAN

A public consultation will be carried out prior to submitting a PUN to BC’s Ministry of Environment & Climate Change Strategy.

The objectives for conducting consultations on the draft PMP are:

- To ensure the public have an opportunity to present any concerns and discuss possible solutions with the PMP holder before a Pesticide Use Notice is submitted.
- To increase public awareness of the PMP process and the principles of integrated pest management.
- To ensure a transparent and accountable review process for the PMP.

- To educate the public on invasive plants and the need to manage them.
- To explain the planning process described in the PMP and emphasize the need to protect human and environmental health.

The public consultation will be advertised in a local community newspaper within the geographical boundary of the plan. As per section 6 (1) of the IPMR, the advertisement will run 45 days prior to submitting a PUN, the first 2 notices will be published within a 2 week period and be at least 40 cm² in size. During the public consultation process the draft PMP will be accessible to the public at the location stated in the public notifications to allow the public to view PMP and maps.

During the consultation process, First Nations and the public will be invited to bring forward any plants which are of cultural importance. Continual formal and informal consultation will be conducted on an ongoing basis to determine the location of these plants.

6.4.2 PUBLIC CONSULTATION REPORT

A public consultation report will be submitted to the IPMA which contains the following:

- A summary of public consultations, including the names of people who expressed concern or recommendations or provided other input, and the plan holder's response to this input.
- A list of the newspapers in which the notifications of the pending PMP appeared, along with the publication dates and a copy (or photocopy) of a representative advertisement.

6.4.3 FIRST NATIONS CONSULTATION

First Nations consultations will occur in addition to public consultations. The Ministry of Environment & Climate Change Strategy has outlined procedures for First Nations consultations in the 2006 document Draft Guidelines for IPM Proponents Conducting Consultations with First Nations. Consultation will take into account the BC Treaty negotiation process and current litigation actions by First Nations, respecting aboriginal land use or sovereignty. These guidelines will be used to avoid infringement on aboriginal rights, treaty rights, or cultural values. First Nations concerns will be addressed and cultural interests accommodated. CNOOC will establish and maintain positive relationships with First Nations through respectful and meaningful consultation.

During the consultation process, First Nations and the public will be invited to bring forward any plants which are of cultural importance. Continual formal and informal consultation should be conducted on an ongoing basis to determine the location of these plants.

First Nations within the operating areas covered by this PMP are:

Cordova

Fort Nelson

Dene Tha

Dilly/Ootla

Fort Nelson

Liard North

Fort Nelson

Acho Dene Koe (Fort Liard First Nation)

Kaska Dene Council

Daylu Dene Council

Liard First Nation

Liard South

Fort Nelson

Kaska Dene Council

Daylu Dene Council

Liard First Nation

Traditional Territory and Land Claim maps will be consulted to determine if additional First Nations need to be consulted.

6.4.4 FIRST NATIONS CONSULTATION REPORT

The plan holder will prepare a report that describes the First Nation consultation process and outcome. The report will be submitted in conjunction with the PUN to the Administrator of the IPMA. A copy of the report will also be provided to the First Nations with whom consultation took place, along with a letter which indicates that concerns or comments about the report may be submitted to the Ministry. A copy of the report will also be provided to the Ministry of the Environment and Climate Change Strategy prior to pesticide application.

6.4.5 INTERAGENCY CONSULTATION AND COORDINATION

CNOOC is interested in working with other stakeholders to strengthen the invasive plant management in British Columbia. The Company will strive to share information on the invasive plant inventories, treatment and biological weed control with other stakeholders, Ministries and other agencies. Other interested parties may include:

- BC Oil and Gas Commission
- BC Ministry of Agriculture
- BC Ministry of Transportation and Infrastructure
- BC Ministry of Environment & Climate Change Strategy
- BC Ministry of Forests, Lands, Natural Resource Operations & Rural Development
- First Nation Communities
- Ministry of Indigenous Relations & Reconciliation
- Local Governments
- NWIPC and NEIPC
- Fort Nelson Invasive Plant Management Area Steering Committee
- Range Act and Forest Act agreement holders
- Outfitters and Trappers
- CN Rail
- BC Hydro
- BC Transmission Corporation
- Mining Companies
- Oil and Gas Companies

7.0 GLOSSARY AND ABBREVIATIONS

Definitions were compiled using information from the BC Ministry of Forests, Lands, Natural Resource Operations & Rural Development (2010), Ministry of Environmental Protection & Sustainability.

Alien – describing a plant that did not exist in the target area in British Columbia prior to European settlement, and/or its natural range did not include the target area in British Columbia

Containment – Is the process of keeping a population within a defined geographic region (polygon), or outside of an established boundary. Containment is used when localized populations must be kept from expanding to new locations. Preventing or reducing access to infested areas is a containment strategy.

Ditches with water – Under the IPMR, ditches containing water are considered to be water bodies unless they are self-contained. Self-contained is defined as having no inflow or outflow at any time of year. Therefore, unless a ditch is self-contained a 10 m PFZ must be maintained for all herbicides except glyphosate. For glyphosate, a 1 m PFZ can be maintained if a selective treatment is used. For temporary, self-contained ditches and at no time is or flows into a fish bearing water body, glyphosate can be applied up, but not below to the high water mark.

Ditches that are dry – If the ditch is a dry stream, as defined by the IPMR, the same regulations apply as if it held water, except for glyphosate which may be applied directly over a dry stream that does not drain directly into a fish bearing habitat at any time. There are no regulations for dry ditches that are not dry streams. It is recommended

to maintain a PFZ around ditches that are located within 100m of, or when wet flow into fish bearing habitats or riparian areas.

Ditches that are contained – There are no regulations for pesticide use beside water in ditches that are self-contained. These ditches are not considered water bodies under the IPMR.

Extirpation – the permanent removal of all members or a plant species from a treatment site. Extirpation is usually only possible for small, isolated patches of invasive plants, and may take years to achieve.

Injury Level – the level of invasive plant populations at a specific site after which some unacceptable impact will be caused, for example public safety, recreation, natural or managed ecosystems.

IPMA – Integrated Pest Management Act – Brought into force on December 31, 2004 replacing the Pesticide Control Act. Written and enforced by the BC Ministry of Environment & Climate Change Strategy this act is meant to establish regulatory requirements based on degree of risk to humans and the environment, promote environmental stewardship and integrated pest management and set clear and enforceable standards.

IPMR – Integrated Pest Management Regulation

IPM – Integrated Pest Management – A proactive and preventative approach to pest management, IPM reduces dependence on pesticides it is comprised of:

- Planning and managing ecosystems to prevent organisms from becoming pests.
- Identifying pest problems and potential pest problems.
- Monitoring pest and beneficial populations, damage caused by pests and environmental conditions
- Using injury threshold in making treatment decisions
- Evaluating the effectiveness of implemented techniques
- Suppressing pest populations to acceptable levels using strategies based on consideration of:
 - Appropriate combinations of biological, physical, cultural, mechanical, behavioral and chemical controls
 - Environmental and human health protection

IAPP – Invasive Alien Plant Program – The Invasive Alien Plant Program Application is the database for invasive plants in BC. It is intended to coordinate and share information about invasive plant management. It is comprised of a public map feature and a restricted database entry feature. Contributions come from both government and non-government agencies. Information shared includes site details, plant inventory information, planning, treatment methods and data and monitoring data.

Invasive Plant – a plant that aggressively forms dense stands approaching monocultures and can cause detrimental impacts to humans, animals or ecosystems, causing social, economic or environmental harm. These species may be

listed under the BC Ministries of Forest Range Forest & Range Practices Act (FRPA), Invasive Plant Regulation. The term includes both alien plants and noxious weeds.

SDS – Safety data sheets

NEIPC - The North East Invasive Plant Committee

NWIPC – North West Invasive Plant Committee

Noxious Weed – any weed designated by regulation to be noxious by the BC Ministry of Agriculture and Land's BC Weed Control Act (WCA) and Regulations.

PMP - Pest Management Plan - (a) a program for managing pest populations or reducing damage caused by pests based on integrated pest management (b) the methods of handling, preparing, mixing, applying and otherwise using pesticides within the program.

PMRA – Pesticide Management Regulatory Agency – The branch of Health Canada which review and regulates pesticide use and approval in Canada.

PUN – Pesticide Use Notice – Is applied for by the PMP holder and issues by the Ministry of Environment & Climate Change Strategy. Required for applying select herbicides over areas of a minimum size.

Rehabilitation – is used when there are widespread incidences of invasive plant species. Treatments are focused on areas where impacts would be the greatest if the species was not managed, and for areas where bio control agents may be effective. Management is aimed at reducing invasive plant populations to sizes that have a limited impact on the environment.

TDG – Transportation of Dangerous Goods

Treatment Threshold – the level of plant invasion when a particular treatment should be applied in order to keep a given plant population at a given site from reaching injury level.

WHMIS – Workplace Hazardous Material Information System

8.0 REFERENCES

BC Ministry of Agriculture and Lands BC Weed Control Act (WCA) and Regulations.

BC Ministry of Environment May 2006 Draft Guidelines for IPM Proponents Conducting Consultations with First Nations.

BC Ministries of Forest Range Forest & Range Practices Act (FRPA), Invasive Plant Regulation.

BC Ministry of Forests, Lands and Natural Resource Operations. 2013. Biological Control.
Province in British Columbia. <http://www.for.gov.bc.ca/hra/Plants/biocontrol/what.htm>.

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Government of British Columbia. (2003) Integrated Pest Management Regulation. (IPMR).

Holecheck et al. 1998. Range Management principles and practices. Toronto. Prentice-Hall Canada Inc.

IPPC Secretariat. 2005. Identification of risks and management of invasive alien species using the IPPC framework. Proceedings of the workshop on invasive alien species and the International Plant Protection Convention, Braunschweig, Germany, 22–26 September 2003. Rome, Italy, FAO. xii + 301 pp.

Province of British Columbia Regulation of the Minister of Environment and Climate Change Strategy Environmental Management Act Ministerial Order No. M329.B.C.Reg. 263/90 October 30, 2017.

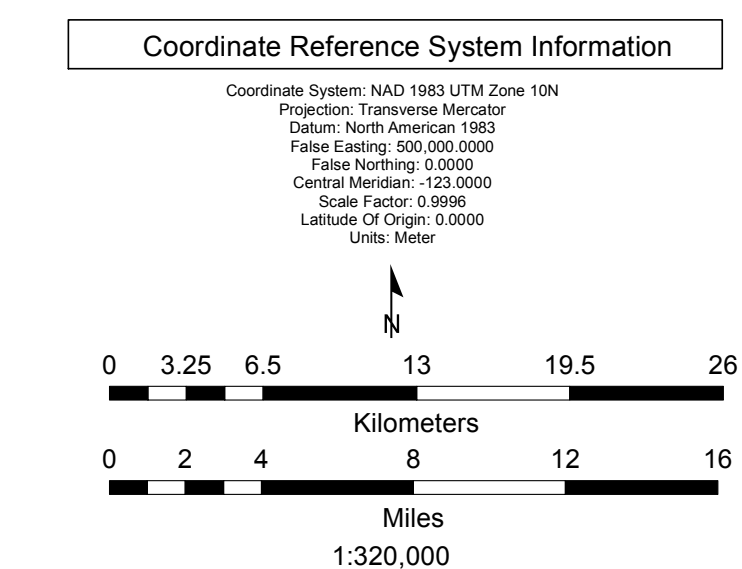
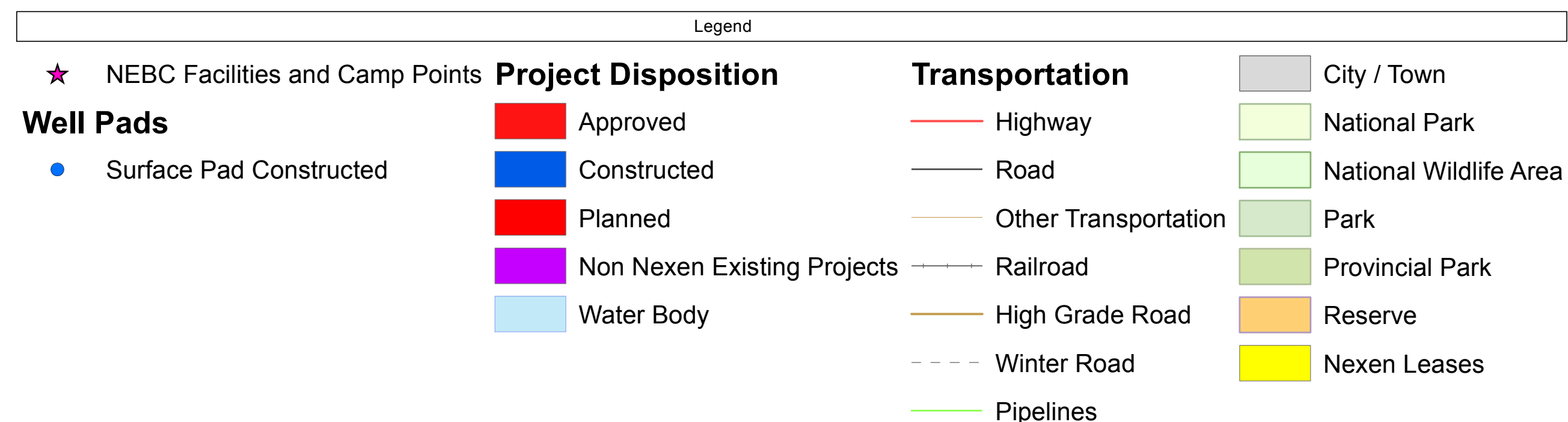
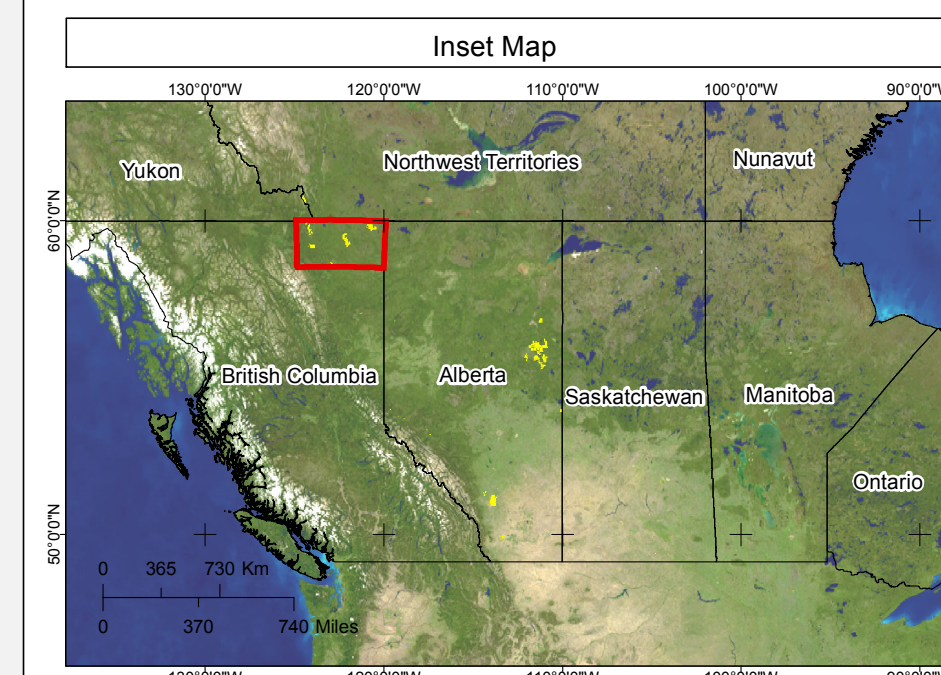
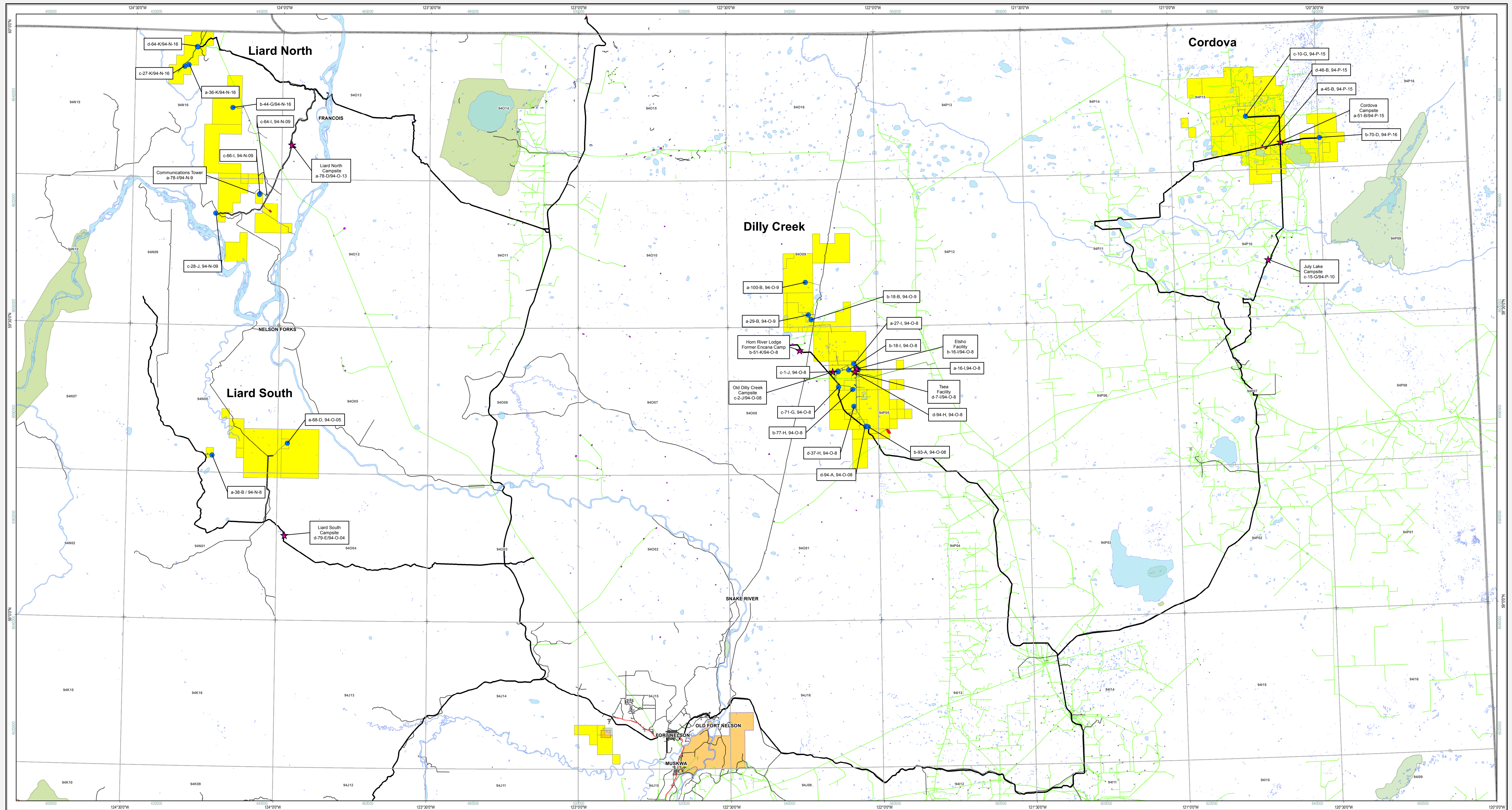
Saskatchewan Agriculture. 2008. Crop Protection Guide. Regina. Saskatchewan Agriculture. 2008. Crop protection information.

9.0 PMP QUALIFIED ENVIRONMENTAL PROFESSIONAL (QEP)

The PMP has been compiled in accordance with all requirements of the CNOOC PMP. The reported information is true and based on signatory current knowledge as of the date completed. Where data gaps exist in this report, the judgement of a qualified professional has been used. The signatory has demonstrable experience with preparing EPP's with the expertise relevant to the construction activities covered by the EPP.

APPENDIX A –

MAP OF THE PEST MANAGEMENT PLAN AREAS



Disclaimer: Use of this map is strictly at user's own risk. Nexen Energy ULC and each of its affiliates (collectively "Nexen") makes no representation, warranty or guarantee about this map or its contents, including, without limitation, accuracy, completeness, or fitness for any purpose. Nexen shall have no liability for any errors, omissions, or inaccuracies in the information provided. Nexen assumes no liability for any decisions made or actions taken or not taken in reliance upon the data furnished on this map. Usage, manipulation, or reproduction, in any form, of the data and information contained herein is prohibited without permission of Nexen.

NEBC Overview Map

Requested By: NEBC Team
Created By: A. Pike
Dept.: Shale Gas

Date: November 03, 2016
Plot Date: April 8, 2018
File No.: CA17819.mxd

NEXEN ENERGY ULC 801 - 7th Ave SW Calgary AB Canada T2P 3P7
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Canadian Operations - NEBC

APPENDIX B –

SAMPLE TREATMENT NOTICE

Notification of Herbicide Application

SPOT TREATMENT OF INVASIVE
PLANTS (WEEDS)

For Information Contact



See Back of Sign for Additional Details

CHECK IF	HERBICIDE (ACTIVE	REGISTRATION NUMBER
<input type="checkbox"/>	Tordon 22K (Picloram)	#9005
<input type="checkbox"/>	Grazon (Picloram and 2,4-D)	#26649
<input type="checkbox"/>	Roundup (Glyphosate)	#13644
<input type="checkbox"/>	Transline (Clopyralid)	#24085
<input type="checkbox"/>	Milestone (Aminopyralid)	#28137
<input type="checkbox"/>		
<input type="checkbox"/>		
<input type="checkbox"/>		
<input type="checkbox"/>		

TARGET SPECIES:	
PESTICIDE PERMIT PESTICIDE USE OR	
APPLICATION TIME:	: AM <input type="checkbox"/> PM <input type="checkbox"/>
APPLICATION DATE:	DAY/MONTH/YEAR

SAFETY CAUTION: AVOID SKIN CONTACT
WITH TREATED VEGETATION FOR 24 HOURS
AFTER APPLICATION

APPENDIX C –

CALIBRATION OF BACKPACK SPRAYERS

Date	Company	Applicator Name	Spray Equipment Description	Spray Equipment Serial Number	Time to Release 1 L of water (sec)	Calibration Attempt (sec)
						1
						2
						3
						1
						2
						3
						1
						2
						3
						1
						2
						3
						1
						2
						3
						1
						2
						3
						1
						2
						3
						1
						2
						3
						1
						2
						3

APPENDIX D –

PESTICIDE PEST MANAGEMENT REGULATORY AGENCY AND TOXICOLOGICAL INFORMATION

***Excerpt taken from BC Ministry of Forests, Lands, Natural Resource Operations (2010) Invasive Alien Plants on Provincial Crown Lands in Central and Northern British Columbia (PMP Confirmation #: 402-0657-2010/15)**

PRMA Status for Herbicides Proposed for Use in the PMP.

HERBICIDE	PMRA STATUS	PMRA & OTHER NOTES	CONSULTATION & PMP NOTES
aminopyralid	Regulatory Note: Aminopyralid January 17, 2007	PMRA - Granted temporary registration Registered under the EPA's Reduced Risk Pesticide Initiative. New Milestone™ herbicide has been reviewed and registered under the Reduced Risk Pesticide Initiative of the U.S. Environmental Protection Agency. This unique designation is reserved for compounds that demonstrate lower risk to the environment and humans than marketplace standards.	The BC Ministry of Agriculture and Lands began including aminopyralid in the timing rate trials they run in the NWIPC & NEIPC areas in 2006. After initial assessment and evaluation NWIPC began using aminopyralid on a trial basis in 2007. By 2008 both NWIPC and NEIPC included Milestone as an herbicide in the programs. The Peace River Regional District, (NEIPC member), has requested the Ministry of Environment & Climate
Picloram	Re-Evaluation Decision Document: picloram January 14, 2009 http://www.hc-sc.gc.ca/cps-spc/pubs/pest/decision_s/rvd2009-02/index-eng.php	After a re-evaluation of the herbicide picloram, Health Canada's Pest Management Regulatory Agency (PMRA), under the authority of the <i>Pest Control Products Act</i> and Regulations, is granting continued registration of products containing picloram for sale and use in Canada. An evaluation of available scientific information found that products containing picloram do not present unacceptable risks to human health or the environment when	
Clopyralid	PMRA Re-evaluation work plan (Feb. 2, 2010) http://www.hc-sc.gc.ca/cps-spc/pubs/pest/decision_s/rev2009-02/index-eng.php	The PMRA's re-evaluation program examines older pesticides using current scientific standards to make sure they are still acceptable. The PMRA considers potential risks as well as value of pesticide products to ensure they meet modern standards established to protect human health	PMP will be adjusted based on findings of Re-evaluation
Glyphosate	PMRA Re-evaluation work plan (April 2009 to March 2010) http://www.hc-sc.gc.ca/cps-spc/alt_formats/pdf/pu	The PMRA's re-evaluation program examines older pesticides using current scientific standards to make sure they are still acceptable. The PMRA considers potential risks as well as value of pesticide products to ensure they meet modern standards established to protect human health	PMP will be adjusted based on findings of Re-evaluation

Metsulfuron methyl	<p>Re-Evaluation Decision Document: metsulfuron methyl, 10 November, 2008</p> <p>http://www.hc-sc.gc.ca/cps-spc/pubs/pest/decision_s/rvd2008-</p>	<p>An evaluation of available scientific information found that products containing metsulfuron methyl have value in the food and crop industry and do not present unacceptable risks to human health or the environment when used according to revised label directions. As a condition of the continued registration of metsulfuron methyl uses, new risk-reduction measures must be included on the</p>	<p>There are no plans to use Metsulfuron methyl in the formulation Escort. New herbicides may contain metsulfuron methyl and will only be used under this PMP after timing rate trials have been conducted by the BC Ministry of Agriculture and Lands in the NWIPC and or NEIPC areas and results,</p>
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Environmental Parameters Considered in the Use of Herbicides.

Active Ingredient	Persistence	Mobility / solubility in water	Impacts on aquatic and some
aminopyralid	<ul style="list-style-type: none"> • rapid photo transformation in upper layers of surface water, otherwise is persistent in water- aqueous photolysis (half-life=0.6 days¹), aerobic aquatic half- life 462-990 days, and stable in anaerobic aquatic systems • classified as non- persistent to slightly • persistent in most soils (half-life of 6-39 days), but can be persistent in others (half-life of 330-533 days) Aerobic soil half-life 103.5 days and longer in some soils. • Tier 1 modelling 	<ul style="list-style-type: none"> • Because aminopyralid is highly water soluble (2.5 g/L), is stable to hydrolysis and aquatic biotransformation and does not photo transform on soil, it is expected to be mobile in soil meaning it has the potential to leach through the soil column and reach ground and surface water. This predicted behaviour has resulted in the following mitigation statements on the label: • Site characteristics and conditions that may lead to runoff include, but are not limited to: heavy rainfall, moderate to steep slope, bare soil, poorly draining soil (e.g., soils that are compacted or fine textured such as clay). • To reduce leaching and runoff, 	<ul style="list-style-type: none"> • fish do not appear to be highly sensitive to aminopyralid and aminopyralid has been classified as practically nontoxic to fish by the U.S. EPA,, • The aquatic risk assessment determined that there was negligible risk to freshwater and marine invertebrates, fish and algae from the proposed uses and use rate of Aminopyralid Liquid Concentrate Herbicide (assuming a maximum application rate of 120 g a.i./ha). The risk to potentially susceptible aquatic plants such as submerged or emergent dicots and monocots is unknown as no data are
	<p>using the longest half lives did not result in aquatic concentrations that approach levels of concern for aquatic plants and animals.</p> <ul style="list-style-type: none"> • In aquatic systems, the primary route of degradation is photolysis in upper layers of surface water, otherwise aminopyralid is persistent in water, 	<p>avoid application of this product when heavy rain is forecast.</p> <ul style="list-style-type: none"> • Contamination of aquatic areas as a result of runoff may be reduced by including a vegetative strip between the treated area and the edge of the water body. • Avoid use where soils are permeable (e.g., sandy soil) and/or the depth to the water table is shallow. 	<p>available. These plants are an important part of the aquatic ecosystem, providing food and shelter for many species both aquatic and terrestrial. Aquatic dicot and monocot rooted plants may be susceptible to aminopyralid based on studies with terrestrial plants (high to very high risk). Therefore, in lieu of new data requirements, it is recommended that the</p>

Picloram	<ul style="list-style-type: none"> moderately to highly persistent in the soil environment, with reported field half-lives from 20 to 300 days and an estimated average of 90 days In laboratory studies, sunlight readily broke down picloram in water, with a half- life of 2.6 days but is stable in anaerobic sediments. According to EFSA, picloram has a photolysis half-life of 2 days in natural waters and 3.5 days in the laboratory study (equated at summer sunlight at 40 degrees 	<ul style="list-style-type: none"> Classified as highly water soluble and highly mobile in soil. According to the EPA RED (EPA-738-F-95-018, August 1995) "eventual contamination of groundwater is virtually certain in areas where picloram residues persist in overlying soil. Once in ground water, picloram is unlikely to degrade, even over a period of several years.,, Water-soluble. It can move with water in irrigation or drainage ditches. Do not apply to soils that are very permeable (textures of sandy loam to sand) throughout the entire profile and which also have an underlying shallow aquifer. Do not apply to soils 	<p>moderately toxic to fish</p> <p>Picloram is a systemic herbicide effective against dicotyledonous species. The risk to potentially susceptible aquatic plants such as submerged or emergent dicots is unknown as no data are available. These plants are an important part of the aquatic ecosystem, providing food and shelter for many species both aquatic and terrestrial.</p> <p>A transformation product of picloram, found in water is aminopyralid (the 3,6-dichloro analogue) Ref. EFSA Journal 2009; 7(12):1390 http://www.efsa.europa.eu/en/e</p>
Clopyralid	<ul style="list-style-type: none"> It is degraded almost entirely by microbial metabolism in soils and aquatic sediments. Classified as non- persistent to persistent in aerobic soils, depending on environmental conditions that maximize soil microbial population and activity. In soil, stable to photolysis i.e. or not expected to undergo photolysis is not degraded by sunlight or hydrolysis. Considered persistent in anaerobic aquatic environments but classified as 	<ul style="list-style-type: none"> Is more water-soluble and has a lower adsorption capacity than picloram. Water solubility is 143 g/L @ 20 degrees C, classified as highly water soluble and does not adsorb strongly to soils and therefore may leach into groundwater and enter surface water in run-off. Water monitoring has revealed clopyralid residues in groundwater as well as surface water. 	<ul style="list-style-type: none"> Classified as practically non-toxic to fish and aquatic invertebrates but slightly to moderately toxic to algae It's LC50s for bluegill sunfish and rainbow trout are 125 mg/L and 104 mg/L, respectively. classified as slightly toxic to practically non-toxic to birds on an acute oral basis and slightly toxic on a dietary basis classified as practically non-toxic to honeybees and no effects on earthworms up to 1.50 mg/kg soil negligible risk to wild mammals at highest application rate of 298.9 g a.i./ha the assessment of clopyralid indicates risk of

			through runoff.
Glyphosate	<ul style="list-style-type: none"> moderately persistent in soil, with an estimated average half-life of 47 days. Reported field half-life range from 1 to 174 days. field studies conducted in agricultural and forest soils indicate an aerobic soil half-life of 32 days (half-life of 32 days is classified as slightly persistent) glyphosate under goes microbial degradation in the aquatic environment with a typical half-life of 7-14 days which is classified as 	<ul style="list-style-type: none"> strongly adsorbed to most soils, even those with lower organic and clay content. Thus, even though it is highly soluble in water, field and laboratory studies show it does not leach appreciably, but does have the potential to contaminate surface waters through soil erosion, as it adsorbs to soil particles suspended in runoff. 	<ul style="list-style-type: none"> Technical glyphosate acid is practically nontoxic to fish and may be slightly toxic to aquatic invertebrates. Under certain use conditions may cause adverse effects to non-target aquatic plants. Additional data are needed to fully evaluate the effects of glyphosate on non-target terrestrial plants. Considered non-toxic to honeybees In general, glyphosate alone is less toxic than the common
Metsulfuron methyl	<ul style="list-style-type: none"> Half-life estimates for metsulfuron-methyl in soil are wide ranging from 10 - 178 days, with an overall average of reported values of 30 days. Persistent in anaerobic soil In the aerobic aquatic environment, metsulfuron-methyl is moderately persistent to persistent (half-life 43-294 days) and in anaerobic aquatic conditions is moderately persistent (half-life 49-76 days). 	<ul style="list-style-type: none"> Both metsulfuron methyl and its breakdown products are mobile and hence can move freely in soil. However, field studies have shown varying degrees of leaching. The potential for leaching is especially prominent in non-acidic soils because of increased solubility and decreased soil adsorption. Leaching in terrestrial field studies ranged from very little leaching beyond the 22 cm soil depth to leaching up to and further than 35 cm soil depths (soils depths lower than 35 cm were not sampled in these studies). Water runoff on the soil surface can move the residues into nearby bodies of water such as ponds and rivers. Water monitoring of these bodies of water have revealed residues, but at concentrations below levels of environmental concern. 	<ul style="list-style-type: none"> no adverse toxicological effects on terrestrial invertebrates (including honeybees), birds or mammals on an acute oral, dietary and reproductive basis. not considered toxic to freshwater invertebrates and fish on an acute basis. Chronic effects to freshwater fish and invertebrates are not expected. As metsulfuron methyl is a herbicide, adverse effects to non-target terrestrial plants are expected. Plant emergence and vegetative vigour studies conducted with 10 plant species indicated that, although the seeds of most plant species emerged successfully, plants did not follow normal growth patterns. The effects are likely due to the ability of metsulfuron methyl to inhibit a plant enzyme responsible for cell division and plant growth Metsulfuron methyl

dicamba	<ul style="list-style-type: none"> moderately persistent in soil. The half-life of dicamba in soil is typically 1 to 4 weeks. Aerobic soil biotransformation half-life 	<ul style="list-style-type: none"> studies suggest the order of mobility is dicamba>picloram>2,4-D² dicamba is highly soluble in water (6.07 g/L), has organic carbon partition coefficients (K_{oc}s) ranging from 3.5-21 and has the potential to leach to groundwater. 	<ul style="list-style-type: none"> low toxicity to fish. The LC50 (96-hour) for technical dicamba is 135 mg/L in rainbow trout and bluegill sunfish, greater than 100 mg/L in grass shrimp, and greater than 180 mg/L in fiddler
	<p>2.9-21 days) and is considered non persistent to slightly persistent under anaerobic soil conditions half life was 84 days and is considered moderately persistent</p> <ul style="list-style-type: none"> In water, microbial degradation is the main route of dicamba disappearance. Photolysis is not an important route of transformation. Aquatic hydrolysis, volatilization, adsorption to sediments, and bioconcentration are not expected to be significant. Dicamba is moderately persistent in aerobic aquatic environments (half-lives ranging from 39.8-45.5 days). Volatilization (vapour pressure = 3.4×10^{-5} mm Hg at 25°C) from soil and plant surfaces may contribute to the dissipation of dicamba in the environment which may lead to adverse effects on non-target plants, through redeposition, in the vicinity of the treatment field. Laboratory studies investigating the volatility of dicamba confirm that some dicamba will volatilize from the treatment field and could potentially cause damage to crops in adjacent fields 	<ul style="list-style-type: none"> Surface water monitoring for dicamba (provided by Environment Canada and provincial authorities) indicates that dicamba is a common active ingredient detected in Canadian surface waters 	<p>crab and sheepshead minnow. The LC50 (48-hour) for dicamba is 35 mg/L in rainbow trout, 40 mg/L in bluegill, 465 mg/L in carp³, and 110 mg/L in <i>Daphnia magna</i>, a small freshwater crustacean</p>

2,4-D	<ul style="list-style-type: none"> • Soil microbes are primarily responsible for its disappearance. • photo transformation is not a major route of transformation for 2,4-D and hydrolysis is not an important route of transformation for 2,4-D acid or the amine forms • aerobic soil half-lives range from 0.22 - 31 days and 	<ul style="list-style-type: none"> • Relatively immobile in the soil. studies suggest the order of mobility is dicamba>picloram>2,4-D* • 2,4-D acid and the amine forms are very soluble in water and adsorption to soil is very weak ($K_{oc} < 150$). This means the potential for leaching of 2,4-D to groundwater is high, if the downward flow of water is rapid. Provided the rate of movement is slow, leaching will be attenuated by rapid biotransformation in the 	<ul style="list-style-type: none"> • Some formulations of 2,4-D are highly toxic to fish while others are less so. For example, the LC50 ranges between 1.0 and 100 mg/L in cutthroat trout, depending on the formulation used. 2,4-D esters are much more toxic to aquatic invertebrates and fish than the acid and amine forms. • The lowest 96-hour LC50s for cold water
	<p>environmental compartments).</p> <ul style="list-style-type: none"> • Under anaerobic conditions, 2,4-D is classified as persistent in soil and aquatic systems. 	<p>MAFF 1993). In a national survey of 68 000 wells throughout agricultural areas of the United States, 2,4-D was found to be the third most frequently detected pesticide. It was detected in 2.3% of samples collected (USEPA 1992, Wood and Anthony 1995).</p> <p>The proposed 2,4-D products: 2,4-D Grazon Herbicide (Reg. No. 26649), Tordon (Reg. No. 9007), Restore (Reg. Nos. 28551 and 28552) and 2,4-D Amine 500</p>	<p>and 0.47 mg a.e./L (rainbow trout) for butoxyethyl ester (BEE). For warm water fish (bluegill sunfish).</p> <ul style="list-style-type: none"> • For warm water fish (bluegill sunfish), the lowest 96- hour LC50s are 40 mg a.e./L for the 2,4-D acid and the amines, > 5.0 mg a.e./L for EHE and 0.61 mg a.e./L for BEE. The lowest chronic (embryo larval stage) NOECs are 17.1 mg a.e./L (fathead

Triclopyr	<ul style="list-style-type: none"> In natural soil and in aquatic environments, the ester and amine salt formulations rapidly convert to the acid, which in turn is neutralized to a relatively nontoxic salt. It is effectively degraded by soil microorganisms and has a moderate persistence in soil environments. Hydrolysis of the ester in water is base-catalyzed, and under conditions of low pH and cool temperatures, can be slow (e.g., DT50 of 208 days at 15°C and pH 5). Photolysis seems to be the most rapid means of transformation of the ester in the aquatic environment (DT50 of 1.5-2.0 days). The half-life in soil ranges from 30 to 90 days, depending on soil type and environmental conditions, with an average of about 46 days. The DT50 of triclopyr in lab studies ranged from 9.6 days in high organic soil at 35 degrees Celsius to 361 days in low organic carbon soils at 15 degrees Celsius. Field studies done in Northern Ontario showed DT50s of about 14 days for both sandy and clay soils at approximately 13 degrees Celsius. 	<ul style="list-style-type: none"> is not strongly adsorbed to soil particles and is highly soluble in water therefore has the potential to be mobile. 	<ul style="list-style-type: none"> The triclopyr acid and triclopyr amine salt are practically nontoxic to fish. LC50 (96-hour) of 117 mg/L in rainbow trout and 148 mg/L in bluegill sunfish. Triclopyr ester is classified as highly toxic to rainbow trout (96 hour LC50: 0.74 mg/L) , bluegill sunfish (96 hour LC50: 0.87 mg/L) and coho salmon (96 hour LC50: 1.3 mg/L) Triclopyr acid is practically nontoxic to aquatic invertebrates (<i>Daphnia magna</i> 24 hour LC50 of 203 mg/L and 48 hour LC50 of 133 mg/L). Triclopyr butoxyethyl ester is slightly toxic to aquatic invertebrates - EC50 12 mg/L <p>McCall et al. (1988) have explained the difference in fish toxicity as being the result of different rates of uptake of the ester and acid. In the absence of any environmental dissipation of the ester, the authors estimated the bioconcentration factor at 400 for the ester as compared to 0.5 for the acid. The ester, therefore, is taken up rapidly by the fish; then it is metabolized to the acid which increases in</p>
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1. Aqueous photolysis data was corrected for natural sunlight at 40 degrees latitude, sunlight in northern B.C. is expected to be of less intensity and aqueous photolysis may be longer than 0.6 days. Also, under environmental conditions, slower photo transformation is expected due to light interception by suspended solids, cloud cover and wave length attenuation by water depth i.e. intensity of sunlight decreases with water depth.

2. Mobility of Dicamba, Picloram and 2,4-D in Soil Columns. R. Grover, Weed Science, Vol. 25, No. 2 (Mar., 1977), pp. 159-162

3. Unable to verify values, not part of the PMRAs endpoints database.

4. McCall, P.J.; Laskowski, D.A.; and Bidlack, H.D. (1988). Simulation of the Aquatic Fate of Triclopyr Butoxyethyl Ester and its Predicted Effects on Coho Salmon. Environ. Toxicol. Chem. 7: 517-527.

Toxicological Parameters Considered in the Use of Herbicides

Active Ingredient	Summary, Chronic toxicity No Observed	References ¹
aminopyralid	<ul style="list-style-type: none"> Rainbow trout: 96 hour LC50 >100 mg/L-"fish do not appear to be highly sensitive to aminopyralid and aminopyralid has been classified as practically nontoxic to fish by the U.S. EPA,, Aminopyralid was found to be practically non toxic in acute toxicity tests on terrestrial and aquatic animals. Leopard frog: 96 hour LC50>95.2 mg/L Earthworms: acute LC50>1000 mg/kg soil Honeybee oral: LD50>100 ug/bee 	<ul style="list-style-type: none"> http://www.fs.fed.us/foresthealth/pesticide/pdfs/062807_Aminopyralid.pdf Environmental Fate and Ecological Risk Assessment for Registration of Aminopyralid, (http://www.epa.gov/opprd001/factsheets/aminopyralidEFEDRA.pdf)http://www.epa.gov/opprd001/factsheets/aminopyralidEFEDRA.pdf <p>For more details see PMRA's REG2007-01 at:</p> <ul style="list-style-type: none"> PMRA Regulatory Note 2007-01, http://www.hc-sc.gc.ca/cps-spc/pubs/pest/_decisions/reg2007-01/index-eng.php
Picloram	<ul style="list-style-type: none"> Canadian Water Quality Guidelines for the Protection of Aquatic Life - 29 ug/L moderately toxic to fish NOEL 20 to 50 mg/kg LC50* 70 mg/L LC50** 17.5 - 20 mg/L EPA RED lists the following endpoints: Rainbow trout, acute LC50: 5.50 mg/L Bluegill sunfish acute LC50: 	<ul style="list-style-type: none"> http://ceqg-rcqe.ccme.ca/ & http://www.riverinstitute.ca/envtech/Documents/WQA/CEQG%20aquatic%20life.pdf http://www.epa.gov/iris/subst/0256.htm http://www.hc-sc.gc.ca/ewh-semt/pubs/water-eau/picloram-piclorame/index-eng.php Ecotox had 253 studies for LC EPA RED Picloram EPA 738-R95-019 August 1995 http://www.epa.gov/oppsrrd1/REDs/0096.pdf
Clopyralid	<ul style="list-style-type: none"> NOEL** 50 TO 1500 mg/kg/day LC50** 94.4 to 2,802 mg/L Rainbow trout acute (96 hour) LC50: >100 mg/L Bluegill sunfish acute (96 hour) LC50: >102 mg/L Fathead minnow, early life stage (34 day) NOEC: 10.8 mg/L <i>Daphnia magna</i> 48 hour EC50: >99 mg/L <i>C. Riparius</i> 28-day EC50 (emergence): >97 mg/L 	<ul style="list-style-type: none"> http://www.epa.gov/EPA-PEST/1997/May/Day-16/p12913.htm LC50 for trout http://www.invasive.org/gist/products/handbook/11.Clopyralid.pdf Draft Assessment Report - public version- Clopyralid Volume 3, Annex B, B.9, February 2005 EFSA Scientific Report (2005) 50, 1-65, Conclusion on the peer review of clopyralid http://dar.efsa.europa.eu/dar-web/provision
Glyphosate	<ul style="list-style-type: none"> Canadian Water Quality Guidelines for the Protection of Aquatic Life - 65 ug/L NOEL was considered to be 100 mg/kg bw per day.28 	<ul style="list-style-type: none"> http://www.hc-sc.gc.ca/ewh-semt/pubs/water-eau/glyphosate/index-eng.php & http://www.riverinstitute.ca/envtech/Documents/WQA/CEQG%20aquatic%20life.pdf 227 studies for LC50 salmon on Ecotox

	<p>on the use of IRIS</p> <ul style="list-style-type: none"> From US EPA Ecotox Database 2005 cold water fish (rainbow trout) 96 hr LC50: 140 mg/L; warm water fish (Bluegill sunfish) 96 hr LC50: 140 mg/L, marine estuarine fish (Sheepshead minnow) 96 hr LC50: 1000 mg/L; <i>Daphnia magna</i> acute, 48 hr LC50: 780 mg/L 	<ul style="list-style-type: none"> Torstensson, N.T.L., L.N. Lundgren, and J. Stenström. 1989. Influence of climate and edaphic factors on persistence of glyphosate and 2,4-D in forest soils. <i>Ecotoxicol. Environ. Safety</i> 18:230-239. http://www.epa.gov/oppefed1/general/databasesdescription.htm#ecotoxicity
Metsulfuron methyl	<ul style="list-style-type: none"> Refer to Table 2 in PRVD2008-08 for a complete list of ecotox endpoints used by PMRA 	<ul style="list-style-type: none"> http://extoxnet.orst.edu/pips/metsulfu.htm
Dicamba	<ul style="list-style-type: none"> Canadian Water Quality Guidelines for the Protection of Aquatic Life - irrigation, .000 ug/l, livestock watering 10 ug/L NOEL** 3-1500 mg/kg/day Please refer to Section 5.2 of 	<ul style="list-style-type: none"> http://www.riverinstitute.ca/envtech/Documents/WQA/CEQG%20aquatic%20life.pdf http://www.epa.gov/iris/subst/0223.htm Ecotox had 85 LC50 studies
2,4-D	<ul style="list-style-type: none"> Canadian Water Quality Guidelines for the Protection of Aquatic Life - 4 ug/L NOEL** 30 - 98 mg/kg/day Please refer to 	<ul style="list-style-type: none"> http://www.riverinstitute.ca/envtech/Documents/WQA/CEQG%20aquatic%20life.pdf http://www.epa.gov/EPA-PEST/1997/April/Day-11/p9371.htm
Triclopyr	<ul style="list-style-type: none"> NOEL** 3 - 400 mg/kg/day Please refer to E91-02 for endpoints used by PMRA 	<ul style="list-style-type: none"> http://www.epa.gov/iris/subst/0223.htm 253 studies for LC50

There are hundreds of studies that indicate a wide range of LC50s & NOEL. This table provides some example ranges from the literature.

1. Please note that the references in this table to IRIS (EPA's Integrated Risk Information System) should not be used in reference to ecotoxicological parameters - IRIS is intended for the use of human health risk assessments and are appropriate for use in determining ecotox or environmental fate endpoints. The EPA maintains ecotox and environmental fate databases - for contact info see: <http://www.epa.gov/oppefed1/general/databasesdescription.htm#ecotoxicity>

* LC 50s, from the Handbook for Pesticide Applicators and Dispensers, British Columbia Ministry of Environment. Fifth Edition, 2005,

** LC 50 & NOEL from Ecotox - U.S. Environmental Protection Agency.

Buffer zones and Pesticide Free Zones Adjacent to Water Proposed for the PMP.

Active Ingredient	Pest Control Products	Integrated Pest Management	Additional Conditions for PMP	TREATMENT NOTES
Non chemical treatments, manual, cutting mowing, sea water, targeted				For sensitive habitats such as stream and river banks care will be taken to remove only target vegetation and keep disturbances to a minimum when doing treatments like hand pulling
All herbicides		10 meters except for applications done under IPM Act Regulation 74	Herbicides used only after other treatment options have been exhausted.	Spot treatments of targeted species usually with wick applicators, stem injector, back pack, hand held sprayers or hand guns. If near monoculture of targeted species are present booms or boomless nozzles may be used if the
aminopyralid	<ul style="list-style-type: none"> • 10 meters downwind, no buffers required upwind. 	10 meters	<ul style="list-style-type: none"> • 10 meters • The Peace River Regional District, a NEIPC partners, has requested and is working with the 	<p>Due to its reduced risk status aminopyralid will be the preferred herbicide to use if possible.</p> <p>Only one application per</p>
			of aminopyralid in the IPMA reg. 74. If and when that change occurs the guidelines provided to crews by NWIPC & NEIPC will be updated. I.e., aminopyralid would be considered when treatments are	
Picloram	Contact appropriate provincial regulatory authorities	10 meters	<ul style="list-style-type: none"> • The 10 meter buffer will be increased to 30 meters if up slope from fish bearing water courses.* • Picloram containing products will not be used in 	<ul style="list-style-type: none"> • Do not use if there are any possibilities that soil will be moved from site. • Picloram is very difficult to clean from sprayers. Use a different sprayer for applying other materials to desirable plants

Clopyralid	<ul style="list-style-type: none"> Avoid contamination of non-target land, water or irrigation ditches. Do not use Lontrel 360 Herbicide in the following areas: standing or flowing water; the inner banks or 	10 meters	<ul style="list-style-type: none"> Clopyralid may replace picloram containing products when applications are up slope, (30 m+), of fish bearing water courses. 	<ul style="list-style-type: none"> Unlike picloram, clopyralid is less damaging to trees and should be used as an alternate to picloram when treating broad leaved invasive species that are near or under the canopies of trees.
Glyphosate	<ul style="list-style-type: none"> 15 meters for field sprayers, 10 meters if they are shrouded. 	<ul style="list-style-type: none"> Reg 74 in table 8 - up to 2 meters to fish bearing waters if selective application method used. 	<ul style="list-style-type: none"> No broadcast applications. Treatments under IPMA reg 74 will be done with wick, dauber applicators or stem injection. If back pack sprayers are used individual plants will be treated. 	<ul style="list-style-type: none"> Glyphosate is non selective and kills the vegetation, e.g., grasses, that are needed to reduce re-invasion of sites and only selective application methods should be used so that only target plants are killed. Do not apply glyphosate to stream or river banks if the soils are unvegetated and likely to move or be washed into the watercourse.
Metsulfuron methyl	<ul style="list-style-type: none"> 15 meters 	<ul style="list-style-type: none"> Label requirements 		<ul style="list-style-type: none"> Metsulfuron methyl is rarely used in the program but may be an ingredient in future products.
Dicamba	<ul style="list-style-type: none"> Leave an adequate buffer zone between areas to be treated and sensitive 	<ul style="list-style-type: none"> 10 meters** 	<ul style="list-style-type: none"> Dicamba is rarely used. 	<ul style="list-style-type: none"> Dicamba may be required if hoary alysum continues to move into central and northern BC
2,4-D	<ul style="list-style-type: none"> Appropriate buffer zone should be established between treatment areas and 	<ul style="list-style-type: none"> 10 meters 		<ul style="list-style-type: none"> 2,4-D is usually used as a component of herbicides such as Grazon. As Grazon contains picloram the restriction mentioned above apply.
Triclopyr	<ul style="list-style-type: none"> Consult with the appropriate provincial authority 	<ul style="list-style-type: none"> 10 		Triclopyr has not been used by NWIPC & NEIPC and may not be used in the future. This PMP and the NWIPC & NEIPC guidelines will be reviewed before triclopyr is used.

