December 2015

PARKER CARIBOU RANGE

Parker Range Restoration: Zone 1 Implementation Plan

Submitted to:

Ken Paulson, Fund Manager
BC OGRIS REMB
300-398 Harbour Road
Victoria BC
V9A 0B7

REPORT

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Distribution:

Brian Thomson, Steven Wilson, Megan Watters, Shawn Williams, Lisa Helmer, Mary Viszlai-Beale, Ben Rauscher, Gary Sargent

Golder Associates

Acknowledgements

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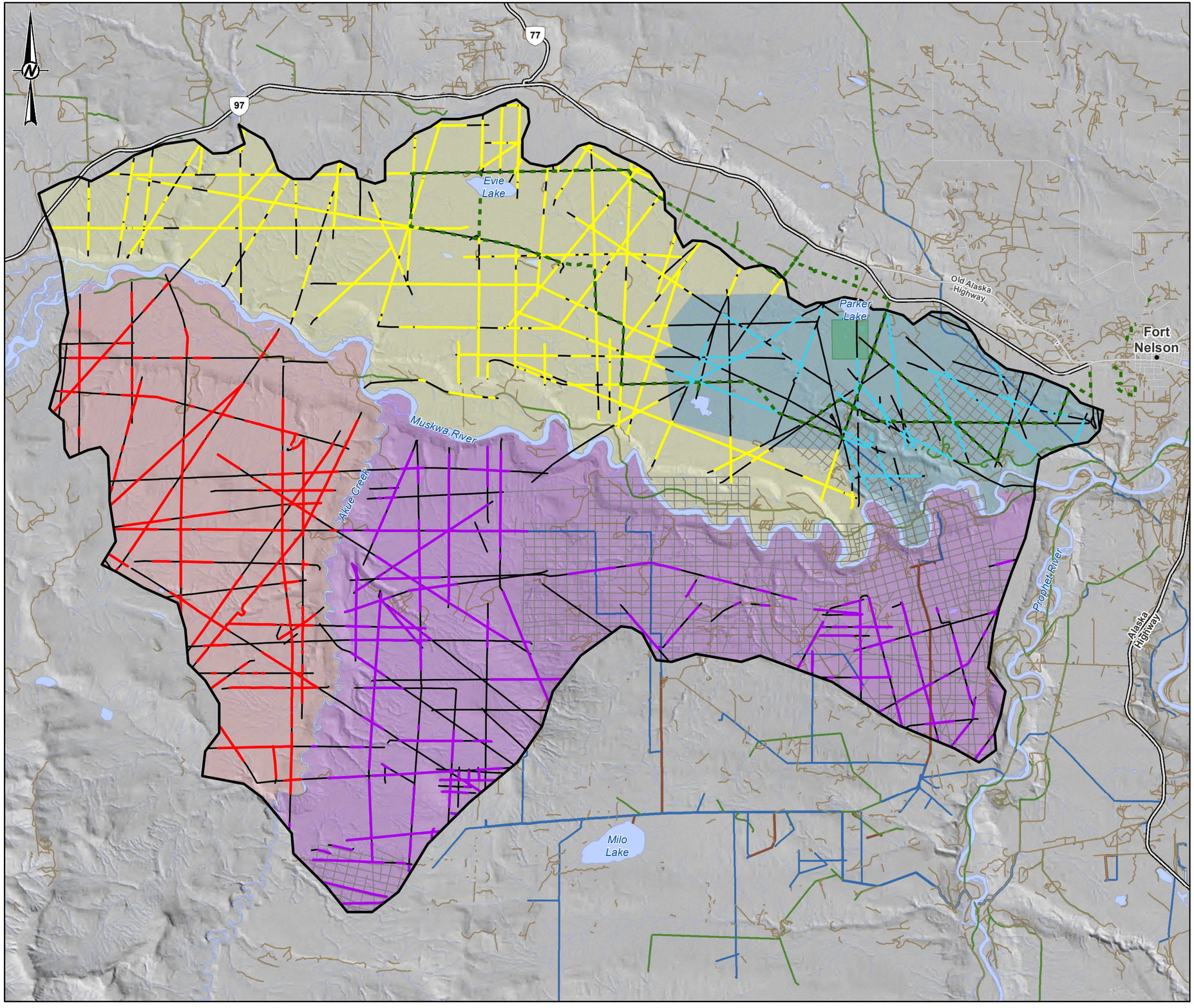
1.0 INTRODUCTION

The Boreal Caribou (Parker Range) Habitat Restoration Pilot Program Plan (the Program Plan) was initiated in April 2015 by the Research and Effectiveness Monitoring Board (REMB) of the BCIP initiative, with funding for the Program Plan provided by the BC Oil and Gas Research and Innovation Society (BC OGRIS). The Program Plan is the first plan to propose application of restoration techniques over an entire boreal caribou range in Canada. The Program Plan was developed to guide a multi-year, range scale, restoration program, with field implementation planned for January 2017 (Golder 2015a). The Program Plan is designed to guide the implementation of habitat restoration treatments along treatment areas identified during the desktop linear classification exercise and confirmed through ground-truthing, throughout the entire Parker Range.

A high-level tactical plan has been included within the Program Plan to apply restoration treatments within the Parker Range. The tactical plan is based on treatment of zones within the Parker Range, numbered one to four, which have been created and prioritized based on ecological and logistical considerations associated with each zone. This Zone 1 Implementation Plan has been developed to focus on treating specific areas throughout Zone 1 of the four Zones identified in the Parker Range Program Plan (Figure 1).

Zone 1 is an area approximately 9,215 hectares in size, containing approximately143 kilometers of traditional seismic line, with approximately 52 kilometers designated for treatment and the remaining 90 kilometers will be left for natural regeneration. There is a total of approximately 38 kilometers of seismic or road that is considered as No Treatment because it is a recreational trail, resource road, or forestry service road.



LEGEND

- PARKER CARIBOU RANGE

TACTICAL PLAN TREATMENT ZONES AND TREATMENT CORRIDORS

TREATMENT SITE
- ZONE 1 (EAST)

TREATMENT CANDIDATE SITE
- ZONE 2 (NORTH)
- ZONE 3 (SOUTH)
- ZONE 4 (WEST)

OTHER
- LINEAR DISTURBANCE - NO TREATMENT REQUIRED
- EXCLUDED LINEAR DISTURBANCE (LOW IMPACT SEISMIC)
- PARKER LAKE ECOLOGICAL RESERVE
- WATERBODY
- WATERCOURSE
- TOWN

TRANSPORTATION
- HIGHWAY
- MAJOR ROAD
- LOCAL ROAD
- RESOURCE ROAD
- UNCLASSIFIED ROAD
- BC OGC PETROLEUM ACCESS ROAD
- BC OGC PETROLEUM DEVELOPMENT ROAD
- FORESTRY SERVICE ROAD / ROAD PERMIT
- RECREATIONAL TRAIL

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REFERENCES

1. 2D SEISMIC CUTLINES, WATERCOURSE, WATERBODY, POPULATED AREA, ROADS, TOWN AND PROVINCIAL BOUNDARY OBTAINED FROM FROM CANVEC © DEPARTMENT OF NATURAL RESOURCES CANADA. ALL RIGHTS RESERVED.
2. 2D SEISMIC AND LIS CUTLINES AND BC OGC PETROLEUM ACCESS ROAD OBTAINED FROM BC OIL AND GAS COMMISSION.
3. ROAD/ACCESS OBTAINED FROM DIGITAL ROAD ATLAS.
4. BC OGC PETROLEUM ACCESS AND DEVELOPMENT ROAD OBTAINED FROM THE BC OIL AND GAS COMMISSION.
5. PARKER CARIBOU RANGE, RECREATIONAL TRAIL, ECOLOGICAL RESERVE AND HILLSHADE OBTAINED FROM B.C. GOV. CONTAINS INFORMATION LICENCED UNDER THE OPEN GOVERNMENT LICENCE - BRITISH COLUMBIA.

COORDINATE SYSTEM: NAD 1983 UTM ZONE 10N

CLIENT
BC OIL AND GAS RESEARCH AND INNOVATION SOCIETY

PROJECT
PARKER CARIBOU RANGE
ZONE 1 IMPLEMENTATION PLAN

TITLE
TACTICAL PLAN TREATMENT ZONES

CONSULTANT
Golder Associates

YYYY-MM-DD	2015-12-30
DESIGNED	BC
PREPARED	RH
REVIEWED	BC
APPROVED	PB

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2.0 CARIBOU HABITAT RESTORATION OBJECTIVES AND STRATEGIES

Caribou-related research suggests that predators and primary prey are utilizing linear corridors for their own benefits, resulting in detriments for caribou. Research has demonstrated that linear access corridors facilitate wolf travel and hunting behaviour within caribou range (James 1999; James and Stuart-Smith 2000). In response to this research, the focus for caribou habitat restoration has been to establish treatments that will reduce or eliminate benefits that linear disturbances provide to predators and primary prey. These treatments include access control that is effective in the short term, while setting the vegetation response on a trajectory to restore the site to the equivalent pre-disturbed habitat. Functional habitat, in regard to habitat restoration of historical linear disturbances, has been defined by the Canadian Association of Petroleum Producers (Wilson 2015) as: "The application of techniques on anthropogenic disturbances that deter the interaction between caribou and their predators in the near term, and supports habitat recovery in the long-term". Based on this definition, the objectives of the habitat restoration treatments are:

- Access control targeting human and predator access along linear disturbance features; and
- Directly restore habitat by promoting the rate of recovery of naturally occurring and introduced vegetation, which may require tree/shrub seedling planting or seeding.

2.1 HABITAT RESTORATION TREATMENT OPTIONS

The REMB has identified restoration techniques designed to speed the recovery of existing linear features and other non-linear features that are not re-vegetating well naturally, that are outlined in the Boreal Caribou Habitat Restoration Operational Toolkit for British Columbia (Golder 2015b). Refer to Table 1 for a detailed list of the restoration techniques identified for treatment of linear features in the Parker Range, all of which are seismic lines.

Table 1 Habitat Restoration Prescription Types (Restoration Techniques) for Seismic Lines

Type of Mitigation Prescription	Objective(s)	Specifications	Positive Experiences with this Technique	Considerations to take into account	Ideal Timing for Treatment	References
Mechanical site preparation: Mounding and/or ripping using an excavator	▪ Create microsites in areas where it is deemed to be effective for enhanced survival and growth of planted seed and seedlings, and natural regrowth of woody species ▪ Access control	▪ For access control purposes, mounds should be created using an excavator. The holes left behind by the mounds should generally be approximately 0.75 m deep, if feasible. The excavated material is positioned right beside the hole, creating the mounds. ▪ Ripping should focus on upland sites where excessive moisture is not a concern. ▪ Troughs created by ripping should be positioned to reduce erosion potential. ▪ Target density of mounding for this plan is 1200 mounds/hectare (Appendix A) ▪ When completing in synergy with seedling planting, seedlings are generally planted near the hinge of the mound: – Slightly higher up from the hinge for lowland and transitional sites – At or slightly lower than the hinge for upland sites	▪ For the purposes of enhancing microsites for planted seedlings, mounding is a well-researched site preparation technique in the silviculture industry. It is commonly used in wetter, low-lying areas to create higher, better-drained microsites for seedlings ▪ Mounding treed fen and bog areas can enhance a site to promote natural revegetation over time, as higher, drier spots are created that seed can eventually settle into and germinate ▪ Mounding has been used as an access control measure on decommissioned roads, seismic lines, and pipelines to discourage off-road vehicle activity. It is effective immediately following implementation ▪ Ripping is a standard site preparation method that has been modified in this case for tighter workspaces	▪ Sufficient frost is required to access sites in the winter when crossing lowland areas: This varies from winter to winter ▪ Research regarding machines that can operate in lowlands during non-frozen conditions is underway in NE Alberta	▪ Winter (frozen ground conditions)	▪ Macadam and Bedford 1998 ▪ Roy *et al.* 1999 ▪ MacIsaac *et al.* 2004 ▪ Golder 2010, 2015b, 2015c ▪ OSLI 2012a, 2012b ▪ Nexen 2013 ▪ CRRP 2007 ▪ Archuleta and Baxter 2008 ▪ USDA 2009 ▪ BC MFR 2014a ▪ BC Forest Service 1998 ▪ BC MOF 2000 ▪ BC MFR 1998
Tree/shrub seedling planting and/or seeding	▪ access control ▪ erosion control ▪ reduce line-of-sight ▪ restore habitat	▪ Tree/shrub species are determined based on the treatment table located in the Operational Toolkit (Appendix A) ▪ Coniferous tree species (Spruce sp., Pine sp.) are recommended to meet caribou habitat needs. Considerations for the use of shrubs: – Alder is generally planted because it forms an effective access control and line of sight break in a relatively quick period of time – Alder has a similar palatability rating for ungulates as conifer species (CRRP 2007) – Willow is avoided due to the high palatability rating for ungulates (CRRP 2007) ▪ Shrub and tree seedlings are often planted together, depending on site conditions and anticipated natural revegetation of both species	▪ Seedling planting is considered a long-term restoration treatment due to the length of time it takes to establish effective hiding cover and access deterrents ▪ Seedlings should ideally be sourced at least six months prior to planned planting dates ▪ Seedlings and/or seed for growing seedlings may not be available for every species prescribed and therefore seed may need to be collected and grown in the nursery ▪ Seedling planting during winter is generally restricted to lowland and transitional sites with organic soil that have been treated with mechanical site preparation immediately prior to planting, although trials are underway to plant upland sites using a drill. ▪ Seedling planting density is based on the treatment table from the Operational Toolkit (Appendix A). ▪ For this plan all sites scheduled for seedling planting will be planted to 1200 stems/hectare and some upland sites will be seeded to lodgepole pine, as required.	▪ Use of frozen seedlings needs to consider preparation of nursery stock, storage, planting temperature, and use of snow packing following planting to avoid winter freeze/thaw seedling mortality	▪ Seedlings can be planted on frozen sites in the winter (OSLI 2012; MEG 2014; Cenovus 2013) ▪ Non-frozen stock are generally planted as summer stock in consideration of the Least Risk Timing Windows for caribou	▪ AENV 2010, 2011 ▪ BC MFR 1998 ▪ Cenovus 2013 ▪ CRRP 2007 ▪ DES 2004 ▪ Golder 2005, 2010, 2011, 2012a, 2012b, 2015b, 2015c ▪ MEG 2014 ▪ OSLI 2012a, 2012b ▪ Nexen 2013 ▪ NEIPC 2010
Spreading of woody material	▪ control of human access during snow free periods ▪ erosion control ▪ protect planted seedlings from extreme weather, wildlife trampling, and damage from ATVs ▪ provide site nutrients when the wood decomposes ▪ provide microsites for natural seed ingress	▪ Spread woody material evenly across the entire corridor ▪ Ensure woody material is consistently dense enough on the ground to discourage ATV and wildlife use ▪ The Guide to Fuel Hazard Assessment and Abatement in British Columbia (2012) recommends woody loads do not exceed 99 tonnes/ha (~175 m^3/ha). An exemption may be allowed for larger volumes from the local fire centre under Section 25 or 26 of the Wildfire Regulation. ▪ Vinge and Pyper recommend applying between 60 to 100 m^3/ha of woody material to reclaimed sites to mimic the natural range of variability for woody material in the forest ▪ Implement at sites left for natural recovery when woody material is available as well as sites that are planted with seedlings	▪ The length of a treated segment is dependent on sufficient quantities of woody material available. Longer segments are a more effective treatment at controlling human access since ATV riders will be less inclined to attempt to travel through the woody material or traverse around it in adjacent forest stands if the woody material continues for an extended distance. There are no guidelines or research to suggest the optimal distance for woody debris placement for wildlife and human access control purposes. ▪ Woody material can also conserve soil moisture, moderate soil temperatures, provide nutrients after it decomposes, prevent soil erosion, provide a source of seed for natural revegetation, provide microsites for seed germination and protection for introduced tree seedlings, and protect seedlings from wildlife trampling and browsing ▪ Spreading of woody material is effective as an access control immediately following implementation	▪ Potential for fuel loading is a concern. The BC MFLNRO specifies acceptable levels of woody material while considering fire management objectives. Consultation with the local fire centre is recommended prior to treatment (stay under 99 tonnes/ha) ▪ Storage and use of woody materials may be compromised if bark beetle is a concern in the area and would be discussed with the local forest officer ▪ Storage of woody material for extended periods without increasing fire hazard can be challenging and should be discussed with district fire managers as part of the planning process when using woody materials	▪ Winter (frozen-ground conditions)	▪ CRRP 2007 ▪ Enbridge 2010 ▪ Osko and Glasgow 2010 ▪ Golder 2010, 2011 ▪ Government of Alberta 2013 ▪ OSLI 2012a,2012b ▪ BC MFLNRO 2012 ▪ Pyper and Vinge 2012 ▪ Vinge and Pyper 2012

Table 1 Habitat Restoration Prescription Types (Restoration Techniques) for Seismic Lines

Type of Mitigation Prescription	Objective(s)	Specifications	Positive Experiences with this Technique	Considerations to take into account	Ideal Timing for Treatment	References
			▪ Woody material can be brought to a site from another location that has identical tree species			
Tree-felling/ Tree Bending	▪ access control ▪ reduce line-of-sight ▪ reduce shade effect	▪ Bend (hinge) mature trees partially across the line with an excavator while treating the features for mounding purposes or spreading woody material ▪ Fell mature trees across the line on upland and transitional sites (e.g., white spruce, pine, aspen, and black spruce) – An excavator is preferred for felling trees by pushing them over, if site conditions are suitable for excavator access – Trees can be felled with a chain saw if site access is suitable to address safety concerns ▪ Trees are to be felled perpendicular to the line. Trees are not to be felled parallel to the line to reduce a fire hazard ▪ Treatment locations to occur approximately every 20 m on lowland and upland sites ▪ At each treatment location, 2 or more trees to be felled, from opposite sides of the line, to create an access control and line of sight break – Treatment locations should occur where sufficient sized timber is present. Before using merchantable timber, consultation between the province of BC's MFLNRO and the local forestry company would need to occur to decide approval process and tracking method for species and number cut – Treatment locations should be as frequent as possible to discourage wildlife use, understanding that locations will be variable depending on forest stand adjacent to line – More trees to be felled near access points and intersections to restrict access and predator movement. Additional trees can be felled along identified lines where the adjacent trees are of suitable height (depends on width of line, need to cover across entire corridor)	▪ Tree-felling and tree bending across the line is mimicking natural processes that occur in the forest. ▪ Tree-felling from the adjacent eco-site can reduce the shade effect on the corridor, leading to more sunlight and warmer soils, creating an enhanced environment for plant growth	▪ Tree-felling will result in tree mortality. Tree bending may keep trees alive with longer term needle cover ▪ Potential for fuel loading is a concern. The BC MFLNRO specifies acceptable levels of woody material while considering fire management objectives. Consultation with the local fire centre is recommended prior to treatment. ▪ Felling and bending is difficult to implement using hand fallers due to difficulties with access, and safety considerations. Mechanical equipment and site safety supervision should be considered ▪ A permit from FLNRO will be required to fall trees	▪ Winter (frozen-ground conditions)	▪ Cody 2013 ▪ Cenovus 2013 ▪ CRRP 2007 ▪ Neufeld 2006 ▪ MEG 2014 ▪ Keim et al. 2014

3.0 ZONE 1 TREATMENT AREA

Zone 1 was chosen as a priority focus area for implementation under the Program Plan for a number of reasons including:

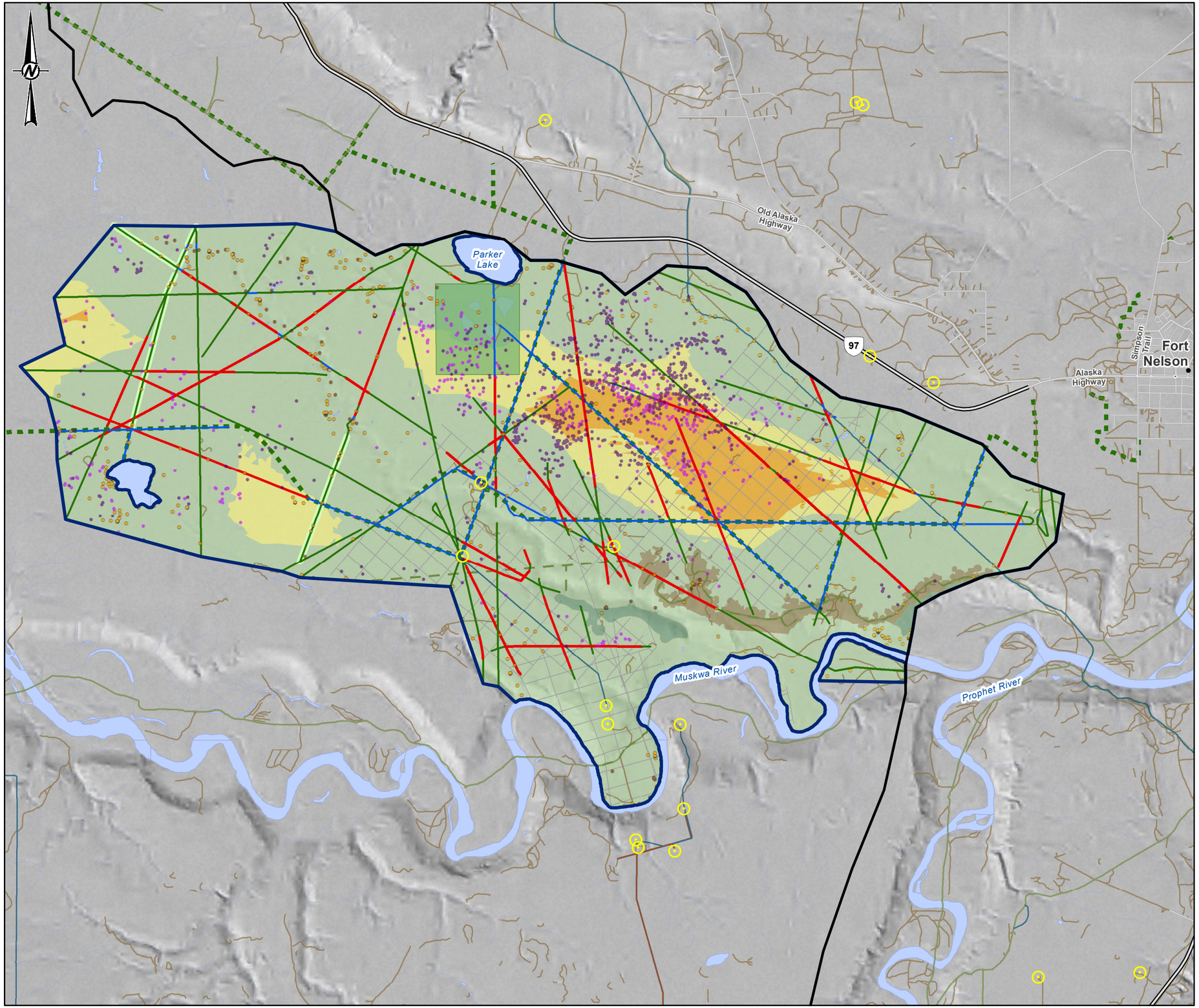
- restoring corridors in an area that has documented high caribou use;
- restoring corridors in an area that has relatively high predicted caribou calving habitat;
- restoring corridors in an area that has known wolf use;
- controlling human access on linear disturbances within the caribou range where human use is known to occur due to the proximity to Fort Nelsen;
- there is a high density of treatment sites, resulting in logistical and cost efficiencies;
- reducing the impact planning or field related logistical constraints will have by reducing the variables for the first year of field implementation by:
    - requiring less winter access than other zones;
    - eliminating any requirements for establishing a camp (proximity to Fort Nelson);
    - reducing the number of road use and pipeline crossing agreements; and,
    - no major watercourse crossings are required.

Within the Zone 1 treatment area, all linear disturbances have been mapped and interpreted for the following variables for each segment along the linear footprints:

- site type;
- dominant tree species;
- vegetation height;
- vegetation cover;
- line width; and,
- presence or absence of a game trail.

Treatment sites were chosen for treatment based on the results of an inventory of the linear disturbances within Zone 1 (Figure 2) and a ground-truthing field visit completed September 2-5, 2015. Candidate sites from the linear inventory were reviewed during the ground-truthing field visit by a combination of completing ground plots and a low level helicopter fly-over, to confirm the results of the desk top exercise and the treatment prescription. Site type, vegetation height and percent cover were recorded at ground plots and compared to the results of the aerial imagery classification at the same location to determine the accuracy of the desktop assessments. The majority of the sites were categorized properly for site type, vegetation height and percent cover, with only a few sites categorized incorrectly that would lead to changing the treatment recommendation. The low level fly-over had similar findings, with few changes in treatment recommendations. The data gathered during the ground truthing field visit is incorporated in Section 3.1.

The Program Plan prepared for the Parker Range Habitat Restoration Pilot contains more detail on the inventory and data collection process used to determine candidate treatment sites (Golder 2015a).



LEGEND

- PARKER CARIBOU RANGE
- TACTICAL PLAN TREATMENT ZONE 1

PRELIMINARY RESTORATION RECOMMENDATION

- TREATMENT SITE
- NO TREATMENT - LEAVE FOR NATURAL REGENERATION
- NO TREATMENT - NON TREATABLE
- POTENTIAL FUTURE TREATMENT CANDIDATE SITE (WOLF USAGE) : GROUND TRUTH 2016 SUMMER

RADIO-COLLAR DATA

- CARIBOU GPS RADIO-COLLAR LOCATION (2011 - 2012) [1]
- CARIBOU GPS RADIO-COLLAR LOCATION (2013 - 2015) [2]
- WOLF GPS RADIO-COLLAR LOCATION (2012 - 2013) [1]
- WOLF GPS RADIO-COLLAR LOCATION (2013 - 2014) [3]

PREDICTED CARIBOU CALVING HABITAT

- LOW
- LOW - MODERATE
- MODERATE

CANFOR DETAILED FOREST MANAGEMENT PLAN

- CUTBLOCK
- PROPOSED CUTBLOCK

OTHER

- PARKER LAKE ECOLOGICAL RESERVE
- WATERBODY
- WATERCOURSE
- EXCLUDED LINEAR DISTURBANCE (LOW IMPACT SEISMIC)
- SURFACE WELL (INACTIVE)
- TOWN

TRANSPORTATION

- HIGHWAY
- MAJOR ROAD
- LOCAL ROAD
- RESOURCE ROAD
- UNCLASSIFIED ROAD
- BC OGC PETROLEUM ACCESS ROAD
- BC OGC PETROLEUM DEVELOPMENT ROAD
- FORESTRY SERVICE ROAD / ROAD PERMIT
- PROPOSED CANFOR FORESTRY ROAD
- RECREATIONAL TRAIL

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REFERENCES

1. CARIBOU (2011-2012) AND WOLF (2012-2013) GPS RADIO-COLLAR LOCATIONS OBTAINED FROM C.DEMARS, UNIVERSITY OF ALBERTA (2015).
2. CARIBOU (2013-2015) GPS RADIO-COLLAR LOCATIONS OBTAINED FROM BC OGRIS REMB BOREAL CARIBOU RADIO-COLLARING PROGRAM. AVAILABLE ONLINE AT HTTP://WWW.BCOGRIS.CA/BOREAL-CARIBOU/PROJECTS/ACTIVE (13 OCTOBER 2015)
3. WOLF (2013-2014) PGS RADIO-COLLAR LOCATIONS OBTAINED FROM FROM B.C. MINISTRY OF FORESTS, LANDS AND NATURAL RESOURCE OPERATIONS.
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7. PARKER AND MUSKWA CARIBOU RANGE, RECREATIONAL TRAIL, ECOLOGICAL RESERVE AND HILLSHADE OBTAINED FROM B.C. GOV. CONTAINS INFORMATION LICENCED UNDER THE OPEN GOVERNMENT LICENCE - BRITISH COLUMBIA.
7. CANFOR FORESTRY CUTBLOCKS AND ROADS OBTAINED FROM CANFOR CORPORATION.
COORDINATE SYSTEM: NAD 1983 UTM ZONE 10N

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PROJECT
PARKER CARIBOU RANGE
ZONE 1 IMPLEMENTATION PLAN

TITLE
TACTICAL PLAN TREATMENT ZONE 1 OVERVIEW
CARIBOU HABITAT RESTORATION TREATMENT SITES

CONSULTANT
Golder Associates

YYYY-MM-DD	2015-12-30
DESIGNED	BC
PREPARED	RH
REVIEWED	BC
APPROVED	PB

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Based on the results of the mapping and ground-truthing exercises, each linear disturbance segment received a final classification as either:

- **No-treatment (38 km):** These disturbances constitute any linear disturbance that may have an active disposition or protective notation, such as a pipeline, lease road, designated recreational trail, or ecological reserve.
- **Leave for Natural (90 km)**: Recommended when percent cover and height classification of vegetation along a linear disturbance are above the threshold for recommending vegetation introduction or access control, and there is no game trail.
- **Restoration Treatment Site (52 km)**: Recommended when percent cover and height classification of vegetation along a linear disturbance are below the thresholds recommending vegetation introduction or access control.

Treatment sites include all sites that are vegetated up to 3 m in height, but still have a well-defined game trail.

The decision support flow chart located in Appendix B illustrates in more detail the process used to determine the treatment type for each line segment. Treatment type was further refined following ground-truthing.

3.1 2016/2017 WORK PLAN

The restoration treatment prescriptions identified for Zone 1 are summarized in Table 2. Treatment sites are all located on crown land with no active dispositions. Treatment prescriptions fall into one of six treatment types based on the site specific treatment segments.

Table 2: Treatment Type and Total Sites

Treatment Type	Number of Sites
Tree Felling	35
Mounding / Seedling Planting	25
Mounding / Tree Felling / Seedling Planting	16
Tree Felling / Seeding	1
Mounding / Seeding	4
Mounding / Tree Felling / Seeding	6
Grand Total	87

There is a relatively small and inconsistent amount of woody debris along some seismic lines, making it difficult to prescribe line segments solely for a coarse-woody debris treatment. Any woody debris present along the edge of a seismic line will be placed over the line at the time of treatment implementation, as required.

Upland sites scheduled for mounding will have the surfaced ripped / scraped to create micro-sites for seed or seedling planting except at intersections with well used access corridors. Access corridor intersections will be mounded. Mounding for access control will generally be for approximately 100 m treatment lengths.

There are a total of approximately 52 km of linear features that are scheduled for treatment, encompassing an area of approximately 33.4 ha, spread out over 87 treatment segments (Table 2).

Treatment sites will be planted with a total of 22,193 black spruce (Sb) and 1,589 white spruce / Engelmann spruce cross (Sx) seedlings. All upland spruce in this seedlot zone, and subsequent seed collection, are considered cross species between white spruce and Engelmann spruce. Upland sites more suitable for lodgepole pine will be seeded to pine as required.

Table 3 includes the Figure number (see Appendix C Mapbook), legal location, restoration recommendation, treatment segment length and width, and recommended seedlings (species, number) required to plant the site (if required).

Table 3: Restoration Treatment Locations and Recommendations

Figure Number[1]	Site ID	Start Coordinate		End Coordinate		BEC Subzone (Dominant Restoration Unit)[2]	Dominant Species in Adjacent Stand	Site Type	Game and/or ATV Trail	Restoration Recommendation[3,4]	Corridor Width (m)	Corridor Length (m)	Treatable Corridor Length (m)	Treatable Area (m^2)	Vegetation treatment: Seedlings Required[5,6,7]			Comments
		Easting	Northing	Easting	Northing										Sb	Sx	Total	
A-5	1	514652	6515979	514599	6515856	BWBSmk[(8)]	Sb	Wetland - Organic	Game / ATV trail	Tree Felling	6	134	134	802	N/A	N/A	-	
A-1, A-5	2	514599	6515856	514285	6515139	BWBSmk	Sb	Wetland - Organic	Game / ATV trail	Tree Felling	6	782	732	4,394	N/A	N/A	-	
A-5	3	513573	6516228	513982	6516145	BWBSmk	Sb	Wetland - Organic	Game trail	Mounding / Seedling Planting	5	408	383	1,915	230	N/A	230	One monitoring plot will be established at this site.
A-5	4	513271	6516290	513431	6516257	BWBSmk	Sb	Wetland - Organic	Game trail	Tree Felling	7	163	163	1,138	N/A	N/A	-	
A-5	5	512809	6516403	512884	6516375	BWBSmk	Aw	Upland	Game trail	Tree Felling	3	80	80	241	N/A	N/A	-	
A-5	6	512704	6516441	512809	6516403	BWBSmk	Sb	Wetland - Organic	Game trail	Tree Felling	5	111	111	557	N/A	N/A	-	
A-5	7	512598	6516479	512704	6516441	BWBSmk	Aw	Upland	No trail	Tree Felling	3	113	88	264	N/A	N/A	-	One monitoring plot will be established at this site.
A-5, A-6	8	512025	6516687	512598	6516479	BWBSmk	Sb	Wetland - Organic	Game trail	Tree Felling	5	602	577	2,885	N/A	N/A	-	One monitoring plot will be established at this site.
A-6	9	511918	6516726	512025	6516687	BWBSmk	Sb	Wetland - Organic	Game trail	Mounding / Seedling Planting	5	105	105	526	63	N/A	63	
A-6	10	511787	6516773	511918	6516726	BWBSmk	Sb	Wetland - Organic	Game trail	Mounding / Seedling Planting	5	131	131	655	79	N/A	79	
A-6	11	511722	6516797	511776	6516777	BWBSmk	Sb	Wetland - Organic	Game trail	Mounding / Seedling Planting	5	58	58	289	35	N/A	35	
A-6	12	511582	6516848	511722	6516797	BWBSmk	Sb	Wetland - Organic	Game trail	Tree Felling	5	141	141	705	N/A	N/A	-	
A-6	13	511465	6516890	511582	6516848	BWBSmk	Aw	Upland	No trail	Tree Felling	6	118	93	559	N/A	N/A	-	One monitoring plot will be established at this site.
A-6	14	511345	6516933	511465	6516890	BWBSmk	Sb	Wetland - Organic	No trail	Tree Felling	6	128	128	768	N/A	N/A	-	
A-6	15	512082	6516050	511705	6516960	BWBSmk	Sb	Wetland - Organic	Game trail	Tree Felling	6	946	921	5,525	N/A	N/A	-	One monitoring plot will be established at this site.
A-6	16	511453	6517564	511358	6517788	BWBSmk	Sb	Wetland - Organic	Game trail	Tree Felling	6	230	205	1,228	N/A	N/A	-	One monitoring plot will be established at this site.
A-6, A-11	17	511321	6517875	511105	6518382	BWBSmk	Sb	Wetland - Organic	Game trail	Tree Felling	7	544	519	3,630	N/A	N/A	-	One monitoring plot will be established at this site.
A-1, A-2, A-6	18	512782	6514719	510549	6516713	BWBSmk	Sb	Wetland - Organic	Game trail	Tree Felling	7	2,933	2,783	19,482	N/A	N/A	-	Six monitoring plots will be established at this site.
A-6, A-7	19	510417	6516830	509245	6517874	BWBSmk	Sb	Wetland - Organic	Game trail	Tree Felling	6	1,538	1,488	8,926	N/A	N/A	-	Two monitoring plots will be established at this site.
A-7	20	509005	6517782	509400	6517641	BWBSmk	Sb	Wetland - Organic	Game trail	Tree Felling	5	411	386	1,931	N/A	N/A	-	One monitoring plot will be established at this site.
A-7	21	508915	6517815	509005	6517782	BWBSmk	Sb	Wetland - Organic	No trail	Tree Felling	5	96	96	482	N/A	N/A	-	
A-7	22	508590	6517932	508915	6517815	BWBSmk	Sb	Wetland - Organic	Game trail	Tree Felling	6	345	320	1,918	N/A	N/A	-	One monitoring plot will be established at this site.
A-2, A-6, A-7	23	509996	6514755	508849	6517636	BWBSmk	Sb	Wetland - Organic	Game trail	Tree Felling	8	2,985	2,860	22,882	N/A	N/A	-	Five monitoring plots will be established at this site.
A-7	24	508370	6516882	508725	6515982	BWBSmk	Sb	Wetland - Organic	Game trail	Tree Felling	6	936	886	5,316	N/A	N/A	-	Two monitoring plots will be established at this site.

Table 3: Restoration Treatment Locations and Recommendations

Figure Number[1]	Site ID	Start Coordinate		End Coordinate		BEC Subzone (Dominant Restoration Unit)[2]	Dominant Species in Adjacent Stand	Site Type	Game and/or ATV Trail	Restoration Recommendation[3,4]	Corridor Width (m)	Corridor Length (m)	Treatable Corridor Length (m)	Treatable Area (m^2)	Vegetation treatment: Seedlings Required[5,6,7]			Comments
		Easting	Northing	Easting	Northing										Sb	Sx	Total	
A-2, A-3	25	509516	6514449	508879	6514789	BWBSmk	Aw	Upland	Game trail	Tree Felling / Seeding	6	710	660	3,958	N/A	N/A	-	CanFor Road: Further Consultation Required. Tree felling, spreading coarse woody debris when present, and seeding acceptable. No mounding. Lodgepole pine seed will be applied to the site. Two monitoring plots will be established at this site.
A-3	26	508879	6514789	507881	6515319	BWBSmk	Sb	Wetland - Organic	Game trail	Tree Felling	8	1,111	1,086	8,685	N/A	N/A	-	CanFor Road: Further Consultation Required. Tree felling, spreading coarse woody debris when present, and seeding acceptable. No mounding. One monitoring plot will be established at this site.
A-3	27	508053	6514893	507721	6515655	BWBSmk	Sb	Wetland - Organic	Game trail	Mounding / Tree Felling / Seedling Planting	10	799	774	7,744	929	N/A	929	One monitoring plot will be established at this site.
A-3	28	507865	6515048	507925	6514974	BWBSmk	Sb	Wetland - Organic	Game trail	Mounding / Seedling Planting	6	95	95	572	69	N/A	69	
A-3	29	507617	6515556	507712	6514862	BWBSmk	Sb	Wetland - Organic	Game trail	Mounding / Tree Felling / Seedling Planting	6	673	648	3,889	467	N/A	467	One monitoring plot will be established at this site.
A-3	30	507498	6515489	507648	6515309	BWBSmk	Sb	Wetland - Organic	Game trail	Tree Felling	6	226	226	1,358	N/A	N/A	-	
A-3	31	507655	6515300	507680	6515270	BWBSmk	Sb	Wetland - Organic	Game trail	Tree Felling	6	39	39	234	N/A	N/A	-	
A-7, A-12	32	506966	6520264	507491	6516474	BWBSmk	Sb	Wetland - Organic	Game trail	Mounding / Seedling Planting	6	3,780	3,605	21,627	2,595	N/A	2,595	Seven monitoring plots will be established at this site.
A-7	33	506801	6516328	506998	6515802	BWBSmk	Sb	Wetland - Organic	Game trail	Mounding / Seedling Planting	7	545	520	3,637	436	N/A	436	One monitoring plot will be established at this site.
A-7	34	506702	6516594	506796	6516341	BWBSmk	Sb	Wetland - Organic	Game trail	Mounding / Seedling Planting	7	270	270	1,889	227	N/A	227	
A-7, A-8	35	506398	6516819	507143	6515919	BWBSmk	Sb	Wetland - Organic	Game trail	Mounding / Seedling Planting	6	1,138	1,113	6,676	801	N/A	801	One monitoring plot will be established at this site.
A-8	36	505908	6517410	506391	6516827	BWBSmk	Sb	Wetland - Organic	Game trail	Mounding / Tree Felling / Seedling Planting	6	744	719	4,311	517	N/A	517	One monitoring plot will be established at this site.
A-3	37	508282	6513797	507433	6513805	BWBSmk	Sb	Wetland - Organic	Game trail	Mounding / Seedling Planting	7	810	760	5,319	638	N/A	638	Two monitoring plots will be established at this site.
A-3	38	507413	6513805	506937	6513803	BWBSmk	Sb	Wetland - Organic	Game trail	Mounding / Seedling Planting	7	448	448	3,136	376	N/A	376	
A-3, A-4	39	506923	6513803	505994	6513794	BWBSmk	Sb	Wetland - Organic	Game trail	Mounding / Tree Felling / Seedling Planting	7	897	897	6,282	754	N/A	754	
A-3, A-4	40	506655	6514552	507075	6513427	BWBSmk	Sb	Wetland - Organic	Game trail	Tree Felling	6	1,150	1,100	6,599	N/A	N/A	-	Two monitoring plots will be established at this site.
A-4	41	506625	6514643	506655	6514552	BWBSmk	Aw	Upland	No trail	Tree Felling	6	96	71	424	N/A	N/A	-	One monitoring plot will be established at this site.
A-4	42	505599	6513583	505573	6513805	BWBSmk	Aw	Upland	No trail	Mounding / Tree Felling / Seeding	7	223	198	1,389	N/A	N/A	-	Lodgepole pine seed will be applied to the site. One monitoring plot will be established at this site.
A-4	43	505573	6513805	505532	6513991	BWBSmk	Sb	Wetland - Organic	Game trail	Mounding / Tree Felling / Seedling Planting	6.5	183	183	1,189	143	N/A	143	
A-4	44	505531	6514718	506230	6513327	BWBSmk	Sb	Wetland - Organic	Game trail	Mounding / Seedling Planting	7	1,488	1,438	10,064	1,208	N/A	1,208	Two monitoring plots will be established at this site.
A-4	45	505459	6514864	505531	6514718	BWBSmk	Sw	Upland	Game trail	Mounding / Seedling Planting	7	164	139	970	N/A	116	116	One monitoring plot will be established at this site.

Table 3: Restoration Treatment Locations and Recommendations

Figure Number[1]	Site ID	Start Coordinate		End Coordinate		BEC Subzone (Dominant Restoration Unit)[2]	Dominant Species in Adjacent Stand	Site Type	Game and/or ATV Trail	Restoration Recommendation[3,4]	Corridor Width (m)	Corridor Length (m)	Treatable Corridor Length (m)	Treatable Area (m^2)	Vegetation treatment: Seedlings Required[5,6,7]			Comments
		Easting	Northing	Easting	Northing										Sb	Sx	Total	
A-4	46	505321	6515141	505459	6514864	BWBSmk	Sb	Wetland - Organic	Game trail	Mounding / Seedling Planting	7	301	301	2,104	252	N/A	252	
A-4	47	505216	6515294	506380	6515067	BWBSmk	Aw/Sb	Upland	Game trail	Mounding / Tree Felling / Seedling Planting	6	1,275	1,275	7,652	N/A	918	918	
A-4	48	506392	6515173	506300	6515418	BWBSmk	Aw/Pl	Upland	No trail	Tree Felling	6	262	262	1,570	N/A	N/A	-	
A-4	49	506304	6514969	506335	6514952	BWBSmk	Aw/Pl	Upland	No trail	Mounding / Tree Felling / Seeding	6	35	35	210	N/A	N/A	-	Lodgepole pine seed will be applied to the site.
A-4	50	506060	6515106	506293	6514975	BWBSmk	Pl	Upland	No trail	Mounding / Tree Felling / Seeding	6	268	243	1,456	N/A	N/A	-	Lodgepole pine seed will be applied to the site. One monitoring plot will be established at this site.
A-4	51	505517	6515413	506060	6515106	BWBSmk	Sb	Wetland - Organic	Game trail	Mounding / Tree Felling / Seedling Planting	6	608	583	3,497	420	N/A	420	One monitoring plot will be established at this site.
A-4	52	505249	6515565	505517	6515413	BWBSmk	Aw	Upland	Game trail	Mounding / Tree Felling / Seeding	6	288	263	1,579	N/A	N/A	-	Lodgepole pine seed will be applied to the site. One monitoring plot will be established at this site.
A-8	53	505817	6516461	505816	6516654	BWBSmk	Aw/Pl	Upland	Game trail	Mounding / Tree Felling / Seeding	6	193	168	1,007	N/A	N/A	-	Lodgepole pine seed will be applied to the site. One monitoring plot will be established at this site.
A-8	54	505812	6517056	505807	6517489	BWBSmk	Sb	Wetland - Organic	Game trail	Tree Felling	7	434	434	3,036	N/A	N/A	-	
A-8	55	505804	6517267	505695	6517190	BWBSmk	Sb	Wetland - Mineral	Game trail	Tree Felling	7	134	134	938	N/A	N/A	-	
A-8	56	505900	6517335	505815	6517275	BWBSmk	Sb	Wetland - Mineral	Game trail	Tree Felling	7	104	79	551	N/A	N/A	-	One monitoring plot will be established at this site.
A-8	57	505286	6516817	505418	6516704	BWBSmk	Sb	Wetland - Organic	Game trail	Mounding / Tree Felling / Seedling Planting	8	174	174	1,391	167	N/A	167	
A-8	58	504989	6517066	505286	6516817	BWBSmk	Sw	Upland	Game trail	Mounding / Tree Felling / Seedling Planting	8	380	355	2,840	N/A	341	341	One monitoring plot will be established at this site.
A-8, A-13	59	505805	6517701	505798	6518378	BWBSmk	Sb	Wetland - Organic	Game trail	Mounding / Seedling Planting	7	677	652	4,564	548	N/A	548	One monitoring plot will be established at this site.
A-13	60	505200	6519981	505110	6520038	BWBSmk	Sb	Wetland - Organic	Game trail	Mounding / Seedling Planting	7	107	107	748	90	N/A	90	
A-13	61	504347	6520096	504428	6520317	BWBSmk	Sb	Wetland - Organic	Game trail	Mounding / Seedling Planting	6	236	211	1,265	152	N/A	152	One monitoring plot will be established at this site.
A-13, A-14	62	503575	6518045	504113	6519473	BWBSmk	Sb	Wetland - Organic	Game trail	Mounding / Seedling Planting	6	1,525	1,475	8,851	1,062	N/A	1,062	Two monitoring plots will be established at this site.
A-9, A-14	63	503513	6517879	503575	6518045	BWBSmk	Pl	Upland	Game trail	Mounding / Seeding	7	178	153	1,071	N/A	N/A	-	Lodgepole pine seed will be applied to the site. One monitoring plot will be established at this site.
A-9	64	503444	6517695	503472	6517770	BWBSmk	Aw	Upland	No trail	Mounding / Seeding	7	80	80	562	N/A	N/A	-	Lodgepole pine seed will be applied to the site.
A-14	65	503673	6518064	503606	6518108	BWBSmk	Sb	Wetland - Organic	Game trail	Mounding / Tree Felling / Seedling Planting	7	80	80	562	67	N/A	67	
A-14	66	503595	6518116	503287	6518318	BWBSmk	Sb	Wetland - Organic	Game trail	Mounding / Tree Felling / Seedling Planting	7	368	368	2,575	309	N/A	309	
A-14	67	502820	6518627	502473	6518855	BWBSmk	Sb	Wetland - Organic	Game trail	Mounding / Tree Felling / Seedling Planting	6	415	390	2,339	281	N/A	281	One monitoring plot will be established at this site.
A-14	68	503596	6520018	502857	6519473	BWBSmk	Sb	Wetland - Organic	Game trail	Mounding / Seedling Planting	7	918	868	6,076	729	N/A	729	Two monitoring plots will be established at this site.
A-14	69	502857	6519473	502471	6519192	BWBSmk	Aw	Upland	Game trail	Mounding / Seeding	7	477	452	3,166	N/A	N/A	-	Lodgepole pine seed will be applied to the site. One monitoring plot will be established at this site.

Table 3: Restoration Treatment Locations and Recommendations

Figure Number[1]	Site ID	Start Coordinate		End Coordinate		BEC Subzone (Dominant Restoration Unit)[2]	Dominant Species in Adjacent Stand	Site Type	Game and/or ATV Trail	Restoration Recommendation[3,4]	Corridor Width (m)	Corridor Length (m)	Treatable Corridor Length (m)	Treatable Area (m^2)	Vegetation treatment: Seedlings Required[5,6,7]			Comments
		Easting	Northing	Easting	Northing										Sb	Sx	Total	
A-14	70	502122	6519087	501967	6519190	BWBSmk	Sb	Wetland - Organic	Game trail	Mounding / Seedling Planting	6	186	186	1,119	134	N/A	134	
A-14	71	501967	6519190	501698	6519368	BWBSmk	Sw	Upland	Game trail	Mounding / Tree Felling / Seedling Planting	6	322	297	1,781	N/A	214	214	One monitoring plot will be established at this site.
A-14	72	501698	6519368	501351	6519594	BWBSmk	Sb	Wetland - Organic	Game trail	Mounding / Seedling Planting	6	415	415	2,490	299	N/A	299	
A-14, A-15	73	501138	6519733	500533	6520130	BWBSmk	Sb	Wetland - Organic	Game trail	Mounding / Seedling Planting	6	724	674	4,043	485	N/A	485	Two monitoring plots will be established at this site.
A-14	74	502171	6518985	501813	6518782	BWBSmk	Aw/Pl	Upland	Game trail	Mounding / Seeding	7	412	387	2,709	N/A	N/A	-	Lodgepole pine seed will be applied to the site. One monitoring plot will be established at this site.
A-14	75	501813	6518782	501166	6518430	BWBSmk	Sb	Wetland - Organic	Game trail	Mounding / Seedling Planting	7	736	736	5,155	619	N/A	619	
A-10, A-14, A-15	76	501148	6518419	498669	6517849	BWBSmk	Sb	Wetland - Organic	Game trail	Mounding / Tree Felling / Seedling Planting	7	2,762	2,712	18,987	2,278	N/A	2,278	Two monitoring plots will be established at this site.
A-14, A-15	77	499914	6518438	501413	6518422	BWBSmk	Sb	Wetland - Organic	Game / ATV trail	Mounding / Seedling Planting	10	1,499	1,424	14,238	1,709	N/A	1,709	Three monitoring plots will be established at this site.
A-15	78	499890	6518274	500423	6518031	BWBSmk	Sb	Wetland - Organic	Game trail	Tree Felling	6	587	587	3,520	N/A	N/A	-	
A-15	79	499727	6518347	499872	6518282	BWBSmk	Sb	Wetland - Organic	Game trail	Tree Felling	6	158	158	950	N/A	N/A	-	
A-15	80	499941	6519020	499681	6518439	BWBSmk	Sb	Wetland - Organic	Game trail	Mounding / Seedling Planting	8	637	612	4,896	587	N/A	587	One monitoring plot will be established at this site.
A-10, A-15	81	499609	6518276	499398	6517804	BWBSmk	Sb	Wetland - Organic	Game trail	Tree Felling	8	518	518	4,141	N/A	N/A	-	
A-10	82	499398	6517804	499361	6517720	BWBSmk	Aw	Upland	No trail	Tree Felling	5	91	66	332	N/A	N/A	-	One monitoring plot will be established at this site.
A-10	83	499361	6517720	499312	6517611	BWBSmk	Sb	Wetland - Organic	Game trail	Tree Felling	8	120	120	957	N/A	N/A	-	
A-10	84	499305	6517596	499265	6517506	BWBSmk	Aw	Upland	No trail	Tree Felling	8	99	99	791	N/A	N/A	-	
A-10	85	499135	6517330	499668	6517464	BWBSmk	Sb	Wetland - Organic	Game trail	Mounding / Tree Felling / Seedling Planting	5	576	576	2,879	345	N/A	345	
A-10	86	499668	6517464	499816	6517406	BWBSmk	Aw	Upland	Game trail	Mounding / Tree Felling / Seeding	5	149	124	621	N/A	N/A	-	Lodgepole pine seed will be applied to the site. One monitoring plot will be established at this site.
A-9, A-10	87	499816	6517406	502640	6516303	BWBSmk	Sb	Wetland - Organic	Game trail	Mounding / Tree Felling / Seedling Planting	6	3,032	2,907	17,440	2,093	N/A	2,093	Five monitoring plots will be established at this site.
											Total	**52,200 m**	**51,100 m**	**33.4 ha**	**22,193**	**1,589**	**23,782**	

1 Figures are located in Appendix C.

2 The Treatment Matrix for BWBSmk is located in Appendix A.

3 See the Treatment Flowchart in Appendix B for an illustration of how treatment recommendations were determined.

4 Upland sites with mounding recommendation will be scrapped up to create micro-sites.

5 Seedlings will be 412 stock (4 cm in diameter and 12 cm in length) 1 + 0 (1 year in nursery containers, 0 years in beds).

6 All sites will be planted to 1200 seedlings/hectare.

7 Sb = black spruce; Sx = white spruce / Engelmann spruce cross.

8 Moist Cool Boreal White and Black Spruce.

Site type, treatment type, and seedlings required for Zone 1 are summarized in Table 4.

Table 4: Summary of the treatment type, and seedlings required, based on site type

Site Type	Treatment Type	Sb Seedlings	Sx Seedlings	Total Seedlings
Lowland / Wetland (Mineral and Organic)	Tree Felling	0	0	0
	Mounding / Seedling Planting	13,422		13,422
	Mounding / Tree Felling / Seedling Planting	8,770	0	8,770
Upland	Tree Felling	0	0	0
	Mounding / Seedling Planting	0	116	116
	Mounding / Tree Felling / Seedling Planting	0	1,473	1,473
	Tree Felling / Seeding	0	0	0
	Mounding / Seeding	0	0	0
	Mounding / Tree Felling / Seeding	0	0	0

The species selected for planting at each site was determined by comparing the site type and dominant species in the adjacent site to the Treatment Matrix for BWBSmk sites (Appendix A). All sites are considered low disturbance with the exception of Site 25 and 26, which has been used as a block road during forestry harvesting operations. For wetland site types, only black spruce is available for planting (larch is currently not available). Wetland areas require mounding prior to seedling planting. For upland site types, hybrid spruce cross seedlings will be planted. Black spruce is not a preferred species for upland site types on seismic lines, regardless of whether it's growing in the adjacent vegetation site series, based on recent research indicating poor growth because of nutrient and moisture deficiencies on linear corridors in uplands (Golder 2015c). Drier site series dominated by lodgepole pine and trembling aspen will be seeded with lodgepole pine seed, as required (Appendix A).

All of the treated sites will have signs placed at the intersection with the recreational trails and resource roads advising users of the trails that treatments have occurred on the seismic line. The sign will contain wording outlining the following:

- lines designated as a habitat restoration site;
- the type of treatment(s) that may have been implemented on the line; and
- asks users to not use the site in either winter or summer.

The sign will be bolted to a heavy duty steel post and will be 16" by 24" in size. An example of a sign to be used is located in Appendix D. It is estimated there will be approximately 43 signs and posts required. Signs will be maintained as part of the monitoring program to be implemented as part of the Zone 1 Implementation Plan.

4.0 MONITORING DESIGN

Monitoring plots will be established at the time of treatment implementation to confirm that vegetation (both natural ingress of species plus any planting treatments) on disturbances is growing and moving towards being considered functional habitat for boreal caribou herds in the long term. The monitoring design for restoration treatment monitoring in the Parker Range follows the guidance provided for Program-level monitoring in the REMB Boreal Caribou Habitat Restoration Monitoring Framework (Golder 2015d).

Based on a monitoring design power analysis completed for a similar habitat restoration monitoring program in west-central Alberta (Golder 2015c), it is recommended to establish paired reference and treatment plots. These paired plots should be placed at least 500 m apart from each other on a minimum of 45 linear disturbance sites throughout a program's monitoring area for each distinct treatment type (i.e., 45 pairs per treatment). Ideally, the monitored portion of the Program's area should be evenly distributed over the entire treatment area and in all restoration unit types (upland, lowland, transitional) so that monitoring results are representative of the disturbance features in the project. For the Parker Program Plan monitoring design, a focus is to shift more monitoring plots to Zones 1 and 2 for ease of access, earlier timeline for monitoring results over the multi-year program and cost efficiencies of the monitoring program. Monitoring plot numbers will be increased with each additional restoration treatment type.

The paired reference and treatment plots will be established side by side, on the same linear disturbance feature, with a minimum of 25 m of the reference plot left untreated (Figure 3, Golder 2015d).

The Program Plan monitoring program is designed around four primary treatment types of:

- tree-felling;
- mounding / seedling planting;
- mounding / tree felling / seedling planting; and
- mounding / tree felling / seeding.

Based on four primary treatment types, a minimum of 180 paired monitoring plots are recommended for the entire Program Plan area. For Zone 1, a maximum of 17 monitoring plots within upland treatment sites could be established within the 22 upland treatment sites, and a maximum of 65 monitoring plots within lowland treatment sites could be established within the 65 lowland treatment sites while maintaining a minimum distance of 500 m between monitoring plots (Table 5). In total, 82 monitoring plots will occur within Zone 1, as illustrated in Figure 4. Monitoring plots were established to represent the four primary treatment types.

Table 5: Monitoring Plot Numbers and Locations Based on Site Type and Treatment Type

Site Type	Number of Monitoring Plots by Site Type	Treatment Type	Number of Monitoring Plots by Site and Treatment Type
Lowland / Wetland (Mineral and Organic)	65	Tree Felling	27
		Mounding / Seedling Planting	26
		Mounding / Tree Felling / Seedling Planting	12
Upland	17	Tree Felling and Tree Felling / Seeding	6
		Mounding / Seedling Planting and Mounding / Seeding	4
		Mounding / Tree Felling / Seedling Planting	2
		Mounding / Tree Felling / Seeding	5

The majority of the monitoring plot locations are located adjacent to a relatively easily navigable summer access route for ground access.

Monitoring plot design, data collection, data storage, and other methods will follow the procedures laid out in the Boreal Caribou Habitat Restoration Monitoring Framework (Golder 2015d). Recommended monitoring frequency will follow the first, fifth, tenth and 15th growing season after restoration treatments are implemented.

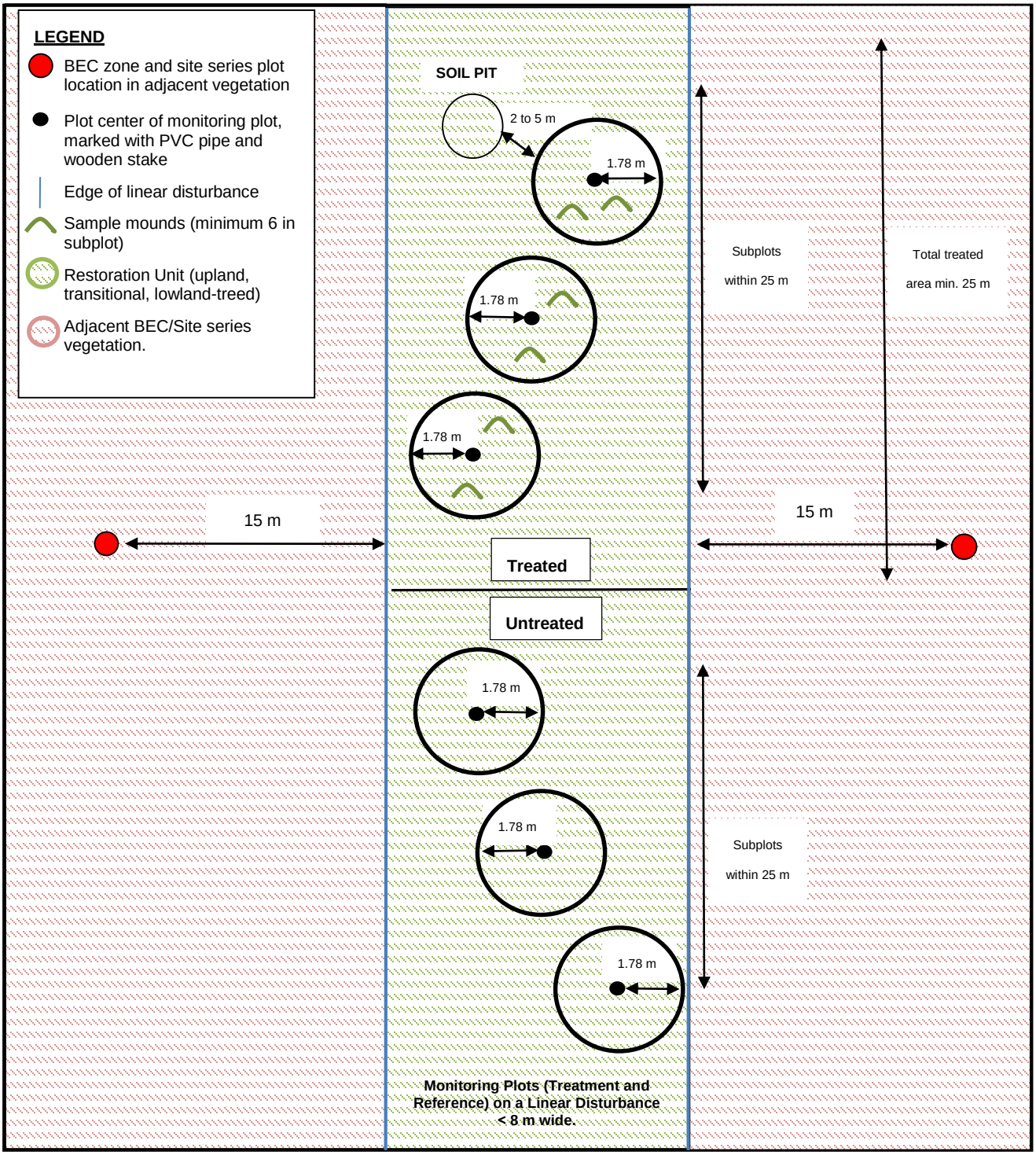
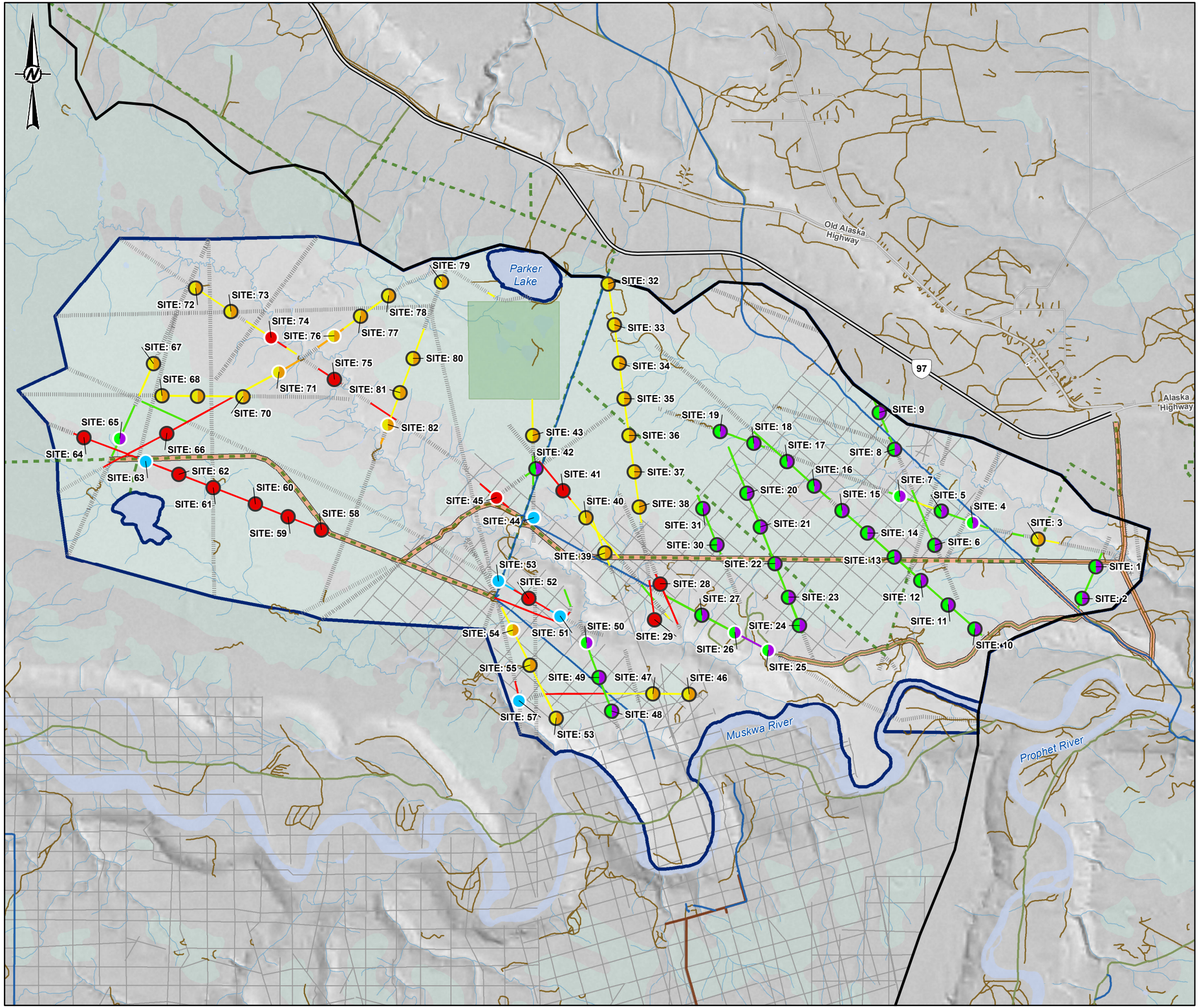


Figure 3. Paired treatment and reference plot layout on the same linear disturbance, < 8 m wide. Subplots are 1.78 m fixed radius subplots. Minimum of 6 mounds should be sampled within the group of subplots, in an area of 25m width maximum. .



LEGEND

- PARKER CARIBOU RANGE
- TACTICAL PLAN TREATMENT ZONE 1

PROPOSED MONITORING PLOT LOCATION AND SITE TREATMENT TYPE

- TREE FELLING AND TREE FELLING / SEEDING
- MOUNDING / SEEDLING PLANTING AND MOUNDING / SEEDING
- MOUNDING / TREE FELLING / SEEDLING PLANTING
- MOUNDING / TREE FELLING / SEEDING

PROPOSED MONITORING PLOT SITE TYPE

- UPLAND
- LOWLAND

TREATMENT TYPE

- TREE FELLING
- MOUNDING / SEEDLING PLANTING
- MOUNDING / TREE FELLING / SEEDLING PLANTING
- TREE FELLING / SEEDING
- MOUNDING / SEEDING
- MOUNDING / TREE FELLING / SEEDING

OTHER

- LINEAR DISTURBANCE - LEAVE FOR NATURAL RESTORATION
- PARKER LAKE ECOLOGICAL RESERVE
- WATERBODY
- WETLANDS
- WATERCOURSE
- HIGHWAY
- MAJOR ROAD

WINTER ACCESS

- PROPOSED PRIMARY WINTER ACCESS

SECONDARY WINTER ACCESS OPTIONS

- EXCLUDED LINEAR DISTURBANCE (LOW IMPACT SEISMIC)
- LOCAL ROAD
- RESOURCE ROAD
- UNCLASSIFIED ROAD
- BC OGC PETROLEUM ACCESS ROAD
- BC OGC PETROLEUM DEVELOPMENT ROAD
- FORESTRY SERVICE ROAD / ROAD PERMIT
- RECREATIONAL TRAIL

0 1,000 2,000 3,000

1:60,000 METRES

REFERENCES

1. 2D SEISMIC CUTLINES, WATERCOURSE, WATERBODY, POPULATED AREA, ROADS, WETLAND, TOWN AND PROVINCIAL BOUNDARY OBTAINED FROM FROM CANVEC © DEPARTMENT OF NATURAL RESOURCES CANADA. ALL RIGHTS RESERVED.
2. 2D SEISMIC AND LIS CUTLINES AND BC OGC PETROLEUM ACCESS ROAD OBTAINED FROM BC OIL AND GAS COMMISSION.
3. ROAD/ACCESS OBTAINED FROM DIGITAL ROAD ATLAS.
4. BC OGC PETROLEUM ACCESS AND DEVELOPMENT ROAD AND SURFACE WELL POINTS OBTAINED FROM THE BC OIL AND GAS COMMISSION.
5. PARKER CARIBOU RANGE, RECREATIONAL TRAIL, ECOLOGICAL RESERVE AND HILLSHADE OBTAINED FROM B.C. GOV. CONTAINS INFORMATION LICENCED UNDER THE OPEN GOVERNMENT LICENCE - BRITISH COLUMBIA.

COORDINATE SYSTEM: NAD 1983 UTM ZONE 10N

CLIENT

BC OIL AND GAS RESEARCH AND INNOVATION SOCIETY

PROJECT

PARKER CARIBOU RANGE
ZONE 1 IMPLEMENTATION PLAN

TITLE

PROPOSED MONITORING PLOTS FOR RESTORATION SITES

CONSULTANT

Golder Associates

YYYY-MM-DD	2015-12-31
DESIGNED	BC
PREPARED	RH
REVIEWED	BC
APPROVED	PB

PROJECT NO.	CONTROL	REV.	FIGURE
1529978	8000	0	4

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IF THIS MEASUREMENT DOES NOT MATCH WHAT IS SHOWN, THE SHEET SIZE HAS BEEN MODIFIED FROM: ANSI B

0 25mm

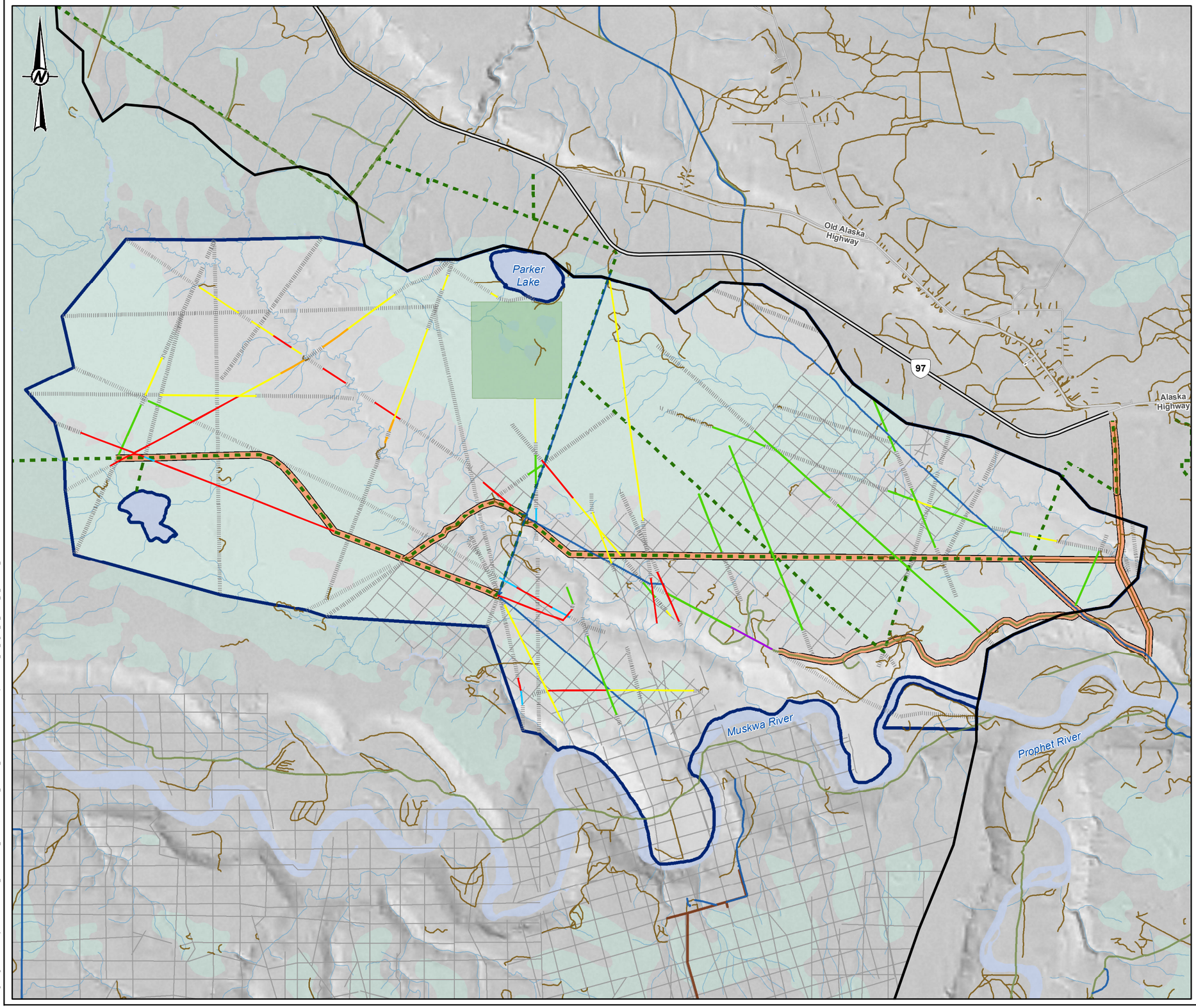
5.0 ACCESS MANAGEMENT PLAN

A winter access route will be established in the treatment area to transport the heavy machinery required to complete the treatments. Preference for the route was given by focusing on using recreational trails and resource roads within the area, and where possible minimizing watercourse crossings, drainages, mineral wetland crossings, and avoiding well-vegetated seismic lines. The total kilometers of winter access route that will likely need frozen-in to access the treatment sites by both truck and heavy machinery is estimated to be 17 kilometers. There are a number of watercourses, mineral wetlands, and well-vegetated areas that should be noted during the treatment implementation; these sites are highlighted on the treatment implementation figures in Appendix C. Figure 5 illustrates the preliminary winter access route.

The winter access route will be subject to stakeholder consultation and a field survey will occur as soon as ground conditions are frozen prior to the planned treatment implementation start-up.

The area highlighted will be frozen-in, where required, beginning at least two weeks prior to the planned treatment implementation start-up. The access routes for the heavy machinery that don't require truck access will not be frozen-in with the exception of watercourse, drainage, and mineral wetland crossings that are reviewed in the field and considered potential hazards. These access routes for the heavy machinery only, will usually be the lines to be treated. Other access routes for the heavy machinery only, may include resource access roads and 3-D seismic lines.

Modifications may occur to the planned heavy machinery access routes during the treatment implementation, as required, based on site conditions and weather.



LEGEND

- PARKER CARIBOU RANGE
- TACTICAL PLAN TREATMENT ZONE 1

TREATMENT TYPE

- TREE FELLING
- MOUNDING / SEEDLING PLANTING
- MOUNDING / TREE FELLING / SEEDLING PLANTING
- TREE FELLING / SEEDING
- MOUNDING / SEEDING
- MOUNDING / TREE FELLING / SEEDING

OTHER

- LINEAR DISTURBANCE - LEAVE FOR NATURAL RESTORATION
- PARKER LAKE ECOLOGICAL RESERVE
- WATERBODY
- WETLAND
- WATERCOURSE
- HIGHWAY
- MAJOR ROAD

WINTER ACCESS

- PROPOSED PRIMARY WINTER ACCESS

SECONDARY WINTER ACCESS OPTIONS

- EXCLUDED LINEAR DISTURBANCE (LOW IMPACT SEISMIC)
- LOCAL ROAD
- RESOURCE ROAD
- UNCLASSIFIED ROAD
- BC OGC PETROLEUM ACCESS ROAD
- BC OGC PETROLEUM DEVELOPMENT ROAD
- FORESTRY SERVICE ROAD / ROAD PERMIT
- RECREATIONAL TRAIL

0 1,000 2,000 3,000

1:60,000 METRES

REFERENCES

1. 2D SEISMIC CUTLINES, WATERCOURSE, WATERBODY, ROADS, WETLAND AND OBTAINED FROM FROM CANVEC © DEPARTMENT OF NATURAL RESOURCES CANADA. ALL RIGHTS RESERVED.
2. 2D SEISMIC AND LIS CUTLINES AND BC OGC PETROLEUM ACCESS ROAD OBTAINED FROM BC OIL AND GAS COMMISSION.
3. ROAD/ACCESS OBTAINED FROM DIGITAL ROAD ATLAS.
4. BC OGC PETROLEUM ACCESS AND DEVELOPMENT ROAD AND SURFACE WELL POINTS OBTAINED FROM THE BC OIL AND GAS COMMISSION.
5. PARKER CARIBOU RANGE, RECREATIONAL TRAIL, ECOLOGICAL RESERVE AND HILLSHADE OBTAINED FROM B.C. GOV. CONTAINS INFORMATION LICENCED UNDER THE OPEN GOVERNMENT LICENCE - BRITISH COLUMBIA.

COORDINATE SYSTEM: NAD 1983 UTM ZONE 10N

CLIENT

BC OIL AND GAS RESEARCH AND INNOVATION SOCIETY

PROJECT

PARKER CARIBOU RANGE
ZONE 1 IMPLEMENTATION PLAN

TITLE

PROPOSED WINTER ACCESS TO TREATMENT SITES

CONSULTANT

Golder Associates

YYYY-MM-DD	2015-12-30
DESIGNED	BC
PREPARED	RH
REVIEWED	BC
APPROVED	PB

PROJECT NO.	CONTROL	REV.	FIGURE
1529978	8000	0	5

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6.0 2016 WORK PLAN ACTIVITIES AND SCHEDULE

6.1 Regulatory Authorization Process

Land Use Permitting

Since no existing OGC oil and gas permits requiring restoration occur within Zone 1, clarity is required from applicable regulatory agencies regarding what authorizations are required prior to conducting restoration activities on the legacy linear disturbance footprints occurring within Zone 1.

Through a review of legislation, as well as through discussions with staff from the OGC and the Ministry of Environment and the Ministry of Forest and Natural Resource Operations (MFLNRO), restoration treatments on legacy disturbance footprint within the Parker Range not under an existing permit of another Ministry or the OGC will require authorization by the MFLNRO under the *Forest and Range Practices Act* (M. Viszlai-Beale, pers. comm., September 11 and November 19, 2015). The restoration treatments, and associated obligation to the treatment activities, will be identified and tracked by MFLNRO as a silvicultural opening. Identification of a 'licensee' who will be carrying out the on the ground activities must be provided. For the Zone 1 Implementation Plan, Golder Associates will be the identified licensee. It is expected that authorization will be on a yearly basis during the multi-year Program Plan, specific to the area of restoration treatment.

To assist with the MFLNRO authorization under the *Forest and Range Practices Act*, Ms. Mary Vislai-Beale has agreed to work with the Program Plan steering team during the development of the Zone 1 Implementation Plan. Authorization application projected submission date of the Zone 1 Implementation Plan is January 30, 2016. Authorization timeline will allow for First Nations consultation led by FLNRO. The First Nations consultation and referral process will be led by FLNRO and completed according to the respective consultation process agreements (e.g., Crown Land Management Agreement, Treaty 8 Economic Benefits Agreement, etc.) (J. Hudson, pers. comm. November 16, 2015). Feedback received during the consultation phase and from the MFLNRO will be incorporated into future implementation plans developed as part of this multi-year Program Plan. Authorization is not required under the *Land Act* to conduct the restoration treatment work, however, if there is a desire to place a level of protection on the restored footprints, then the REMB could pursue a Special Use Permit under the *Land Act* through MFLNRO once the work is completed (L. D'Aloia, pers. comm., August 12, 2015).

To meet the anticipated requirements of the application for authorization under the *Forest and Range Practices Act*, this Zone 1 Implementation Plan includes the following (M. Viszlai-Beale, pers. comm., September 11 and November 19, 2015):

- identification of a land base (Figure 1);
- identification of an area (Figure 2);
- boundary for activities on the ground, and details of those activities (Table 3, Appendix C);
- identifying who the 'licensee' is that will be carrying out the activities (Golder Associates Ltd.); and,
- providing both hard copy documents and shapefiles for area and activity identification for MFLNRO tracking (refer to Appendix C: Mapbook).

Authorization will be needed for any cutting of Crown timber for the use of tree-felling treatments (will need to report number and location).

Regulatory applications for land use are anticipated to be submitted to the MFLNRO by February 15, 2016.

Watercourse Crossings

During the implementation of the restoration treatments, access will be required into the Parker Range during the winter in areas without high grade roads or bridges. A main access route described in Section 5.0 will need to be frozen-in prior to bringing heavy machinery into the area. For the main access routes, when watercourses are present, crossings will need to be established in the form of either temporary bridges or ice bridges/snow fills. Once machinery has been transported into a treatment zone, watercourse crossings may need to be established where heavy machinery needs to cross a watercourse to access treatment areas, again in the form of either temporary bridges or ice bridges/snow fills. The necessity for a crossing structure will depend on, but is not limited to, the presence/absence of water, frost levels, and snow depths. The type of crossing structure that may be required will depend on the size of the watercourse and presence/absence of flowing water.

Potential winter access routes have been assessed using the Vieworx 360 Imagery to determine the presence and number of potential watercourse crossings, and are illustrated on each treatment map sheet (Appendix C). There are a potential total of 21 watercourses/waterbodies and 134 mineral wetlands that may be crossed during the treatment implementation in Zone 1. The potential watercourses/waterbodies crossings locations are outlined in Table 6. They are also highlighted on the treatment implementation figures in Appendix C.

These locations will be visited in late summer or fall 2016 to confirm the watercourse crossing methods and any watercourses identified in the field that were not identified during the review of the Vieworx 360 Imagery will be added to the watercourse crossing list as part of a watercourse crossing plan.

The watercourse crossing plan will form the basis for a notification package that must be sent to FrontCounterBC at least 45 days prior to the establishment of any required crossing structures, as required under the BC *Water Act*. Field watercourse crossing assessments are not anticipated to be required prior to establishing a crossing structure if there will be no disturbance to the watercourse or the riparian area. Due to the nature of establishing crossing structures in the winter using temporary bridges or ice bridges/snow-fills, it is not anticipated there will be disturbance to any of the watercourses or riparian areas.

Archeological Overview Assessment

Golder is currently working towards completion of the Archaeological Overview Assessment (AOA) for the Zone 1 treatment area. Notification of AOA was provided to the Fort Nelson First Nation, Prophet River First Nation, Dene Tha, Doig River and West Moberly First Nations on December 16. Upon completion of the AOA an application will be submitted to the BC Archaeological Branch (MFLNRO) for a Heritage Inspection Permit pursuant to Section 14 of the *Heritage Conservation Act* and it is expected to be received and in place by March 31, 2016.

Future archaeological activities will be determined by the results of the AOA. However, annual AOAs are anticipated to be completed for each subsequent treatment zone.

Aboriginal Engagement Plan

Golder has prepared a referral package that will be distributed by MFLNRO to the appropriate First Nation groups as identified by MFLNRO. Each package contains specific details regarding the Program Plan, and key contact information. As of December 16, 2015, referral packages had not yet been distributed by MFLNRO. Following the distribution of the referral packages, Golder will extend an invitation for face-to-face meetings with both the Fort Nelson First Nation and the Prophet River First Nation. It is anticipated the meetings will occur in January or February 2016. Notifications of the project will also be sent to West Moberly, Dene Tha, and Doig River, but meetings with these groups are not anticipated. Following the meetings, procurement and employment opportunities are anticipated to be issued to the Fort Nelson and Prophet River First Nations.

We anticipate that a draft Aboriginal Inclusion Plan will be completed by the end of March 2016 to be distributed to the REMB, however the date of this deliverable may shift as it is contingent on the outcome of meetings with the First Nations.

Stakeholder Consultation

Stakeholder consultation will occur with affected parties during Q1 of 2016 for the Zone 1 Implementation Plan area. Identified stakeholders include aboriginal communities identified in the previous section, trapline holders (Program Plan area overlaps with 3 traplines; 749T004, 749T005 and 749T007), and the local snowmobile club. Engagement is expected with the snowmobile club since there may be plans to expand recreational trails in the area which may overlap with treatment locations.

Consultation with stakeholders will be led by MFLNRO. Ads will be placed in local newspapers seeking input from the public regarding the Implementation Plan.

Road Use Agreements

Road use agreements will be required for any use of the Forest Service Roads held under disposition by CanFor. There are not any roads under disposition to any oil and gas companies, nor are there any pipelines to cross in Zone 1 that would require a pipeline crossing agreement.

Table 6: Water Feature Types and Potential Issues in Zone 1

Unique ID Number	Water Feature Type	Figure Number	Crossing Potential (Y/N)	Water Flow (Y/N/ Potential)	Banks (Y/N)	Affected Corridor Length [m][(a)]	Comments
1	creek	A-14	Y	N	N	89.2	beaver has created dams in this area
2	creek	Outside of figure display	N	Y	N	121.1	the creek is 11 m wide
3	open body	A-15	Y	N	N	166.1	on edge of open body
4	wetland	A-10	Y	Y	N	255.3	creek (15 m wide) to north and the rest is a wetland to south
5	creek	Outside of figure display	N	Y	N	134.1	none
6	wetland	A-15	Y	N	N	119.7	some open water
7	wetland	A-10	Y	N	N	708.8	ranges from saturated ground to some open water
8	water body	A-8	N	N	N	86.2	large beaver dam right at the crossing area
9	river	A-8	Y	N	N	44.3	beaver damns along what appears to be a river/stream
10	wetland	A-12	N	N	N	195.2	open bodies of water within this area
11	wetland	A-12	Y	N	N	95.4	can go to the north of the wetland and go around the open body of water
12	wetland	A-7	Y	N	N	125.2	may be able to go north to go around
13	open body	A-6	Y	N	N	180.1	it appears that seismic went through but this is very wet
14	open body	A-5	N	N	N	173.8	may be able to make an ice road at edge of water to the south.
15	wetland	A-13	N	N	N	118.2	large mineral wetland - has some birch tree breaks
16	wetland	A-13	N	N	N	146.4	large mineral wetland - birch trees and open water
17	creek	A-8	Y	N	N	125.7	follows in middle of trail
18	wetland	A-13	N	N	N	145.9	open body of water within wetland
19	wetland	Outside of figure display	N	N	N	270.5	huge open body of water
20	river	A-2	N	Y	Y	229.6	major river
21	lake	A-10	N	Y	Y	101.9	lake

(a) The affected corridor length is the length of area that is affected by the water feature and is considered a sensitive area.

6.2 Seedling Requirements

There are a total of 23,782 seedlings required, as outlined in Table 2, including 22,193 black spruce and 1,589 white / Engelmann spruce cross. The seed to grow the seedlings has been sourced from local collectors and will be grown for winter planting scheduled for January 2017. The seedlings will be individually wrapped for ease of planting in winter conditions and put in cold storage in early winter 2016. Once obtained from cold storage, the seedlings will be kept frozen on site either in a cooler or in a snow cache until the time of planting, which will occur during treatment implementation right after the excavator has made the mounds or scarified the site.

All of the seedlings are 412 1+0 stock: 4 cm in diameter and 12 cm in length with 1 growing season in nursery containers, and 0 growing seasons in beds.

6.3 Schedule

Table 7 provides a list of activities that require completion and the dates they should be completed by. A detailed schedule for Zone 1 is also provided in Appendix E.

Table 7: Zone 1 Implementation Plan Activities and Schedule

Activity	Responsible	To Be Completed By
Reserve Seedlings for January 2017 Planting	Golder	December 2015
Regulatory Applications for Land Use	Golder	March 30, 2016
Heritage Inspection Permit Obtained	Golder	March 30, 2016
Aboriginal Inclusion Plan Completed	Golder	May 30, 2016
Confirm Watercourse Crossings (field)	Golder	September 1, 2016
Submit Watercourse Crossing Plan	Golder	September 15, 2016
Secure Contractors for January to March 2017 Field Work	Golder	September 30, 2016
Road Use Agreements	Golder	October 30, 2016
Scout Winter Access in the Field	-	December 15, 2016
Complete Line Locates (if necessary)	Golder	January 4, 2017
Treatment Implementation	-	January 4 to late-March 2017
Monitoring Plot Establishment	-	January 4 to late-March 2017
Install Signs on Completed Sites	-	January 4 to late-March 2017, September 15, 2017 as required
Monitoring Plot Field Survey: 1 Growing Season	-	September 15 2017

7.0 CLOSURE

We trust that the Zone 1 Implementation Plan as described meets the REMB's requirements to guide the 2017 field implementation component of the Parker Caribou Range Boreal Caribou Restoration Pilot Program Plan.

Please contact Brian Coupal at (403) 532-5715 or Paula Bentham at (780) 930-8661 with any questions or comments.

GOLDER ASSOCIATES LTD.

Brian Coupal, B.A., B.Sc., P. Ag.
Senior Restoration Specialist

Paula Bentham, M.Sc., P.Biol.
Principal, Senior Wildlife Ecologist, Project Director

BC/PB/kn

CC: Steve Wilson, Gary Sargent, Mary Viszlai-Beale, Shawn Williams, Megan Watters, Lisa Helmer, Ben Rauscher

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APPENDIX A

Treatment Matrix Table: Site BWBSmk

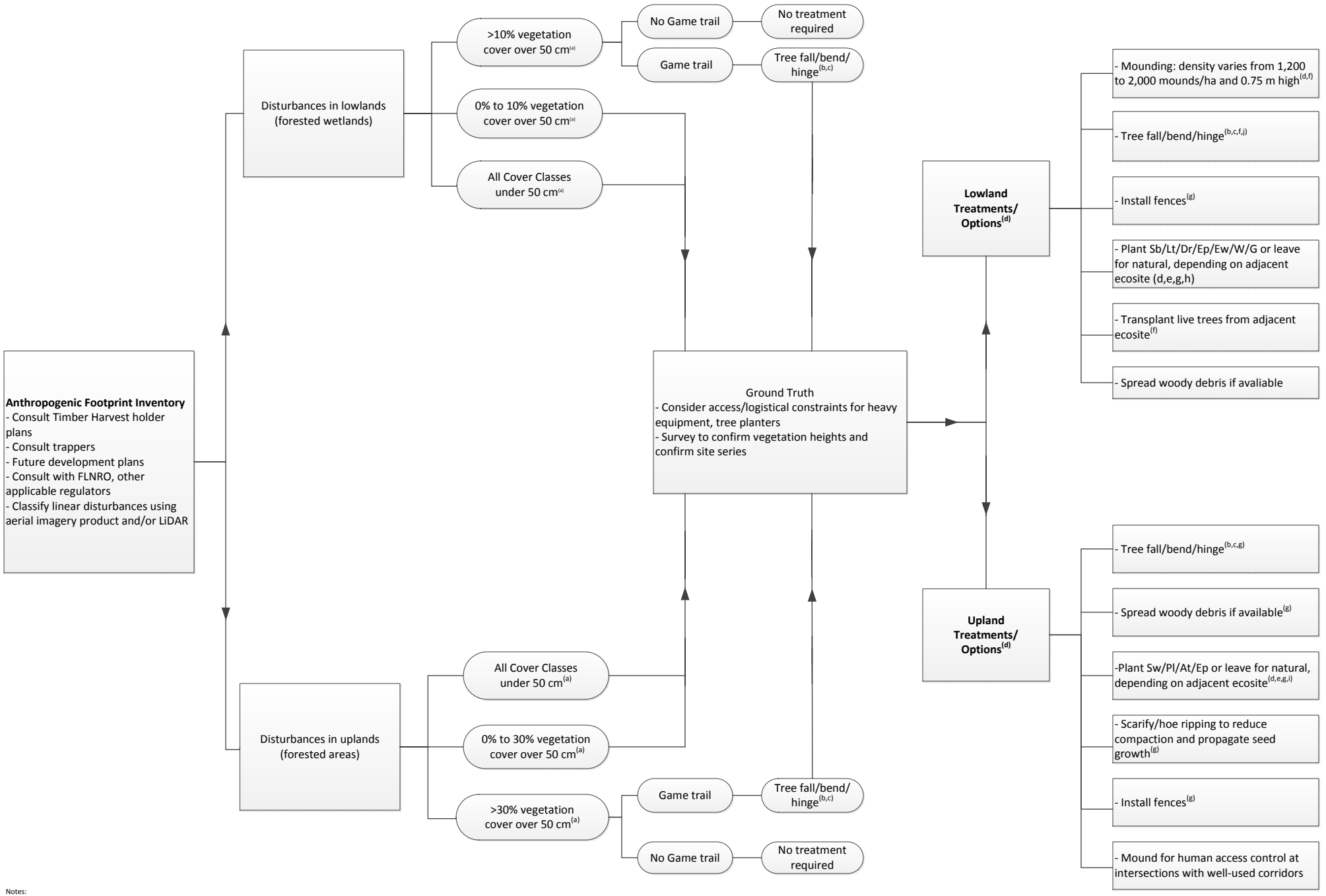
Treatment Matrix for Linear Restoration - MOIST COOL BOREAL WHITE AND BLACK SPRUCE

Site Type	BWBSmk Site Series [(a)]	Site Series name [(a)]	Moisture Regime [(a)]	Nutrient Regime [(a)]	Limiting Factors [(a)]	Disturbance Level	CWD Level	Siteprep	Mound density/ha	Planting Density	Final Minimum Stem Density	Stocksize	Vegetation Treatment	Target Species	Vegetation Coverage	Number of Species
Moderately Dry	102	Pl – Kinnikinnick – Lingonberry	xeric to subxeric	very poor to medium	Productivity limited by growing season drought; removal of LFH will further limit productivity	High - No LFH	75 to 100 m^3/ha	none	none	none	2000	none	natural or applied seed	Lodgepole pine	25% woody or herbaceous	Combined 3 species
Moderately Dry	102	Pl – Kinnikinnick – Lingonberry	xeric to subxeric	very poor to medium		Low - LFH present	75 to 100 m^3/ha	light surface	none	none	2000	none	natural or applied seed	Lodgepole pine	25% woody or herbaceous	Combined 3 species
Slightly Dry	103	SwPl – Soopolallie – Wildrye	submesic to mesic	medium to rich	Drought may limit productivity during dry growing seasons	High - No LFH	75 to 100 m^3/ha	none	none	none	2000	none	natural or applied seed	Lodgepole pine or White spruce	25% woody or herbaceous	Combined 3 species
Slightly Dry	103	SwPl – Soopolallie – Wildrye	submesic to mesic	medium to rich		Low - LFH present	75 to 100 m^3/ha	light surface	none	none	2000	none	natural or applied seed	Lodgepole pine or White spruce	25% woody or herbaceous	Combined 3 species
Slightly Dry to Fresh	104a	Sb – Labrador tea – Step moss, freely drained phase	submesic to mesic	very poor to poor	Lack of soil nutrients	High - No LFH	150 m^3/ha	mound	500	none	2000	none	natural or applied seed	Black spruce or Lodgepole pine	25% woody or herbaceous	Combined 3 species
Slightly Dry to Fresh	104a	Sb – Labrador tea – Step moss, freely drained phase	submesic to mesic	very poor to poor	Lack of soil nutrients; cold soil temperatures where thick insulating moss layers exist	Low - LFH present	75 to 100 m^3/ha	mound	1200	Sb 800 SPH Pl 400 SPH	1000	small	plant/ natural seed	Black spruce or Lodgepole pine	25% woody or herbaceous	Combined 5 species
Slightly Dry to Fresh	101	Sw – Lingonberry – Step moss	submesic to mesic	medium to rich	Few limiting factors; fine textured soils may limit soil aeration and rooting depth	High - No LFH	150 m^3/ha	mound	500	none	1000	none	natural or applied seed	White spruce	25% woody or herbaceous	combined 5 species
Slightly Dry to Fresh	101	Sw – Lingonberry – Step moss	submesic to mesic	medium to rich		Low - LFH present	75 m^3/ha	mound	1200	Sw 1200 SPH	1000	large	plant/ natural seed	White spruce	25% woody or herbaceous	combined 5 species
Moist to Very Moist	104b	Sb – Labrador tea – Step moss, imperfectly/poorly drained phase	subhygric to hygric	very poor to poor	Lack of soil nutrients; high water tables limit soil aeration and thus root development	High - No LFH	150 m^3/ha	mound	500	none	2000	none	natural or applied seed	Black spruce	25% woody or herbaceous	Combined 3 species
Moist to Very Moist	104b	Sb – Labrador tea – Step moss, imperfectly/poorly drained phase	subhygric to hygric	very poor to poor	Lack of soil nutrients; cold soil temperatures where thick insulating moss layers exist; high water tables limit soil aeration and thus root development	Low - LFH present	75 to 100 m^3/ha	mound	1200	Sb 1200 SPH	1000	small	plant/ natural seed	Black spruce	25% woody or herbaceous	Combined 5 species
Moist to Very Moist	110	Sw – Currant – Horsetail	subhygric to hygric	medium to rich	Water table may rise with removal of trees, reducing suitable planting microsites.	High - No LFH	150 m^3/ha	mound	500	none	1000	none	natural or applied seed	White spruce	25% woody or herbaceous	combined 5 species
Moist to Very Moist	110	Sw – Currant – Horsetail	subhygric to hygric	medium to rich	Water table may rise with removal of trees, reducing suitable planting microsites. Sites with deep LFH (> 10 cm) have reduced rooting availability in mineral soil; increases windthrow hazard and limits productivity	Low - LFH present	75 m^3/ha	mound	1200	Sw 1200 SPH	1000	large	plant/ natural seed	White spruce	25% woody or herbaceous	combined 5 species
Moist to Very Moist	111	Sw – Mountain alder – Horsetail	subhygric to hygric	rich to very rich	Water table may rise with removal of trees, reducing suitable planting microsites.	High - No LFH	150 m^3/ha	mound	500	none	1000	none	natural or applied seed	White spruce	25% woody or herbaceous	combined 5 species
Moist to Very Moist	111	Sw – Mountain alder – Horsetail	subhygric to hygric	rich to very rich	Water table may rise with removal of trees, reducing suitable planting microsites. Sites with deep LFH (> 10 cm) have reduced rooting availability in mineral soil; increases windthrow hazard and limits productivity	Low - LFH present	75 m^3/ha	mound	1200	Sw 1200 SPH	1000	large	plant/ natural seed	White spruce	25% woody or herbaceous	combined 5 species
Moist to Very Moist	112 (Fm02)	AcbSw – Mountain alder – Dogwood	subhygric to hygric	rich to very rich	Periodic flooding and very high vegetation competition may limit Sw establishment.	High - No LFH	150 m^3/ha	mound	500	none	1000	none	natural or applied seed	Balsam poplar or White spruce	25% woody or herbaceous	combined 5 species
Moist to Very Moist	112 (Fm02)	AcbSw – Mountain alder – Dogwood	subhygric to hygric	rich to very rich		Low - LFH present	75 m^3/ha	mound	1200	Acb 1200 SPH or Sw 1200 SPH	1000	large	plant/ natural seed	Balsam poplar or White spruce	25% woody or herbaceous	combined 5 species
Wetland	Wb	Wetland bog	hygric to subhydric	very poor to poor	Soil temperature, drainage and nutrients	Same Low/High	10 to 50 m^3/ha	mound	1200	Sb 1200 SPH	1000	medium	plant/ natural seed	Black spruce	25% woody or herbaceous	Combined 3 species
Wetland	Wf	Wetland fen	subhydric	poor to rich	Soil temperature and drainage	Same Low/High	10 to 50 m^3/ha	mound	1200	Sb 1200 SPH or Lt 1200 SPH	1000	medium	plant/ natural seed	Black spruce or Tamarack	25% woody or herbaceous	Combined 3 species

(a) DeLong, C., A. Banner, W. H. MacKenzie, B. J. Rogers, and B. Kaytor. 2011. A field guide to ecosystem identification for the Boreal White and Black Spruce Zone of British Columbia. B.C. Min. For. Range, For. Sci. Prog., Victoria, B.C. Land Manag. Handb. No. 65. www.for.gov.bc.ca/hfd/pubs/Docs/Lmh/Lmh65.htm

APPENDIX B

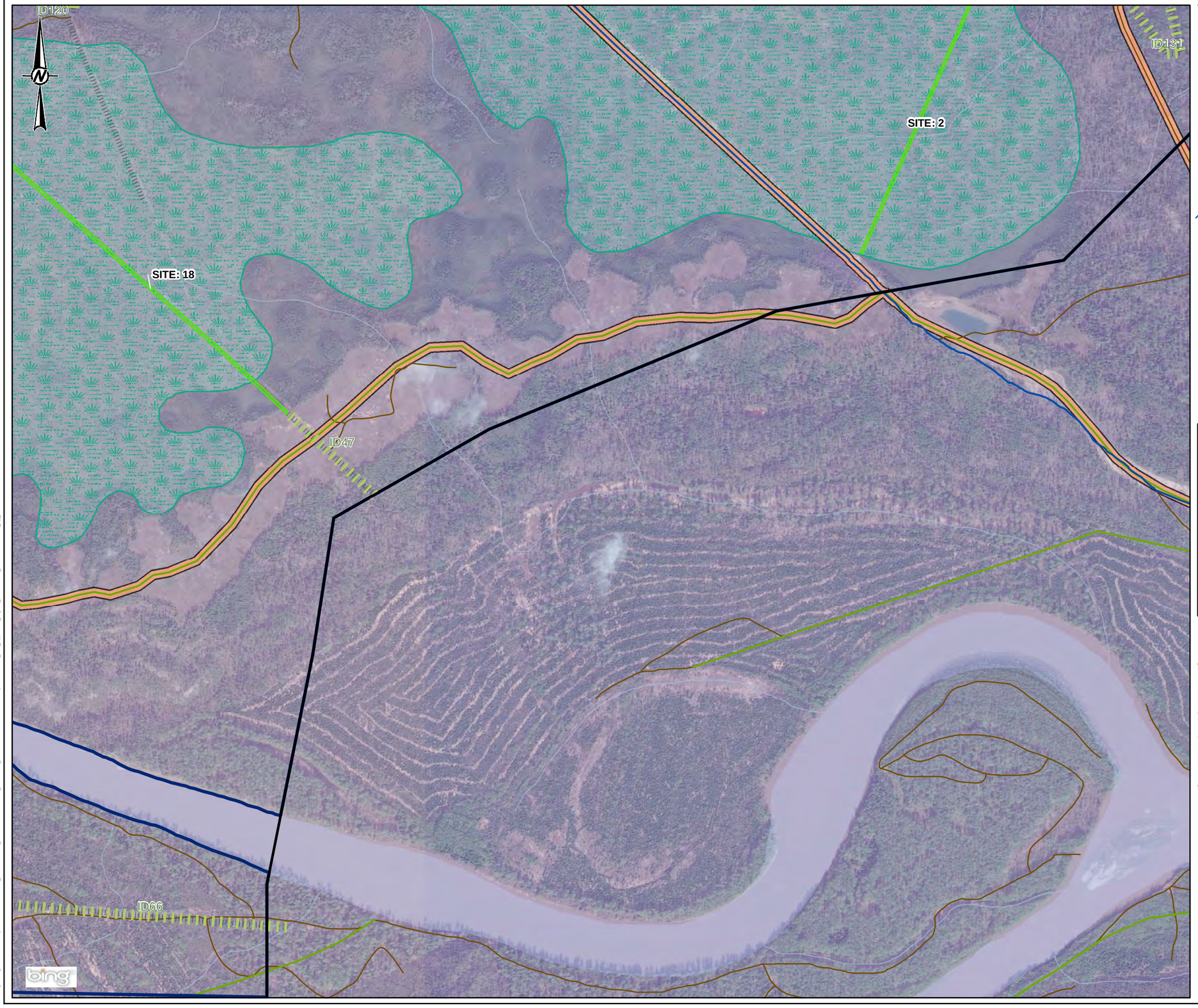
Flowchart: Treatment Recommendation Flow Chart



Notes:
(a) 50 cm is used as a cut-off since it is difficult to accurately determine vegetation heights to a smaller variance. If a site has consistent vegetation over 50 cm it won't require additional vegetation treatment. If a site has less than 50 cm cover it should be ground-truthed for greater accuracy.
(b) For sites with less than 3 m vegetation heights use an excavator. For sites over 3 m vegetation heights use a hand faller.
(c) Tree felling/bending/hinging is only successful if trees used are sufficient size to alter line of sight or prevent access control
(d) Refer to Treatment matrix from Boreal Caribou Habitat Restoration Operational Toolkit for British Columbia (Golder 2015b) regarding treatment type and planting recommendations.
(e) Planting densities will vary depending on species present in adjacent ecosite. Refer to the Boreal Caribou Habitat Restoration Operational Toolkit for British Columbia (Golder 2015b) regarding treatment type and planting recommendations
(f) Winter operation
(g) Summer or winter operation
(h) Sb = black spruce; Lt = tamarack, Dr = red alder; Ep = paper birch; Ew = water birch; W = willow; G = dogwood
(i) Sb = black spruce; Sw = white spruce; Pl = lodge pole; At = trembling aspen; Ep = paper birch
(j) Will require a permit from FLNRO

APPENDIX C

Mapbook: Site Restoration Recommendations



LEGEND

- PARKER CARIBOU RANGE
- TACTICAL PLAN TREATMENT ZONE 1

TREATMENT TYPE

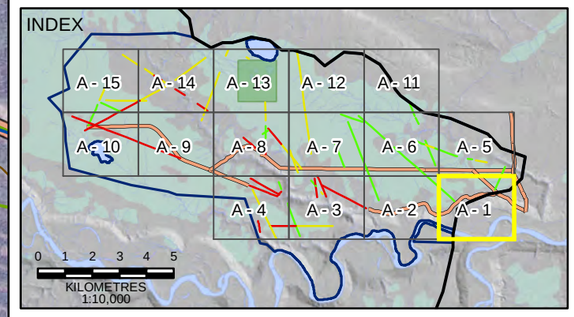
- TREE FELLING
- MOUNDING / SEEDLING PLANTING
- MOUNDING / TREE FELLING / SEEDLING PLANTING
- TREE FELLING / SEEDING
- MOUNDING / SEEDING
- MOUNDING / TREE FELLING / SEEDING

OTHER

- LINEAR DISTURBANCE - LEAVE FOR NATURAL RESTORATION
- NATURAL REVEGETATION >3m : NO ACCESS
- POTENTIAL WATER OBSTACLE
- PARKER LAKE ECOLOGICAL RESERVE
- WATERBODY
- WETLAND
- WATERCOURSE

WINTER ACCESS

- PROPOSED PRIMARY WINTER ACCESS
- EXCLUDED LINEAR DISTURBANCE (LOW IMPACT SEISMIC)
- RESOURCE ROAD
- UNCLASSIFIED ROAD
- FORESTRY SERVICE ROAD / ROAD PERMIT



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REFERENCES

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ZONE 1 IMPLEMENTATION PLAN

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CONSULTANT
Golder Associates

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REVIEWED	BC
APPROVED	PB

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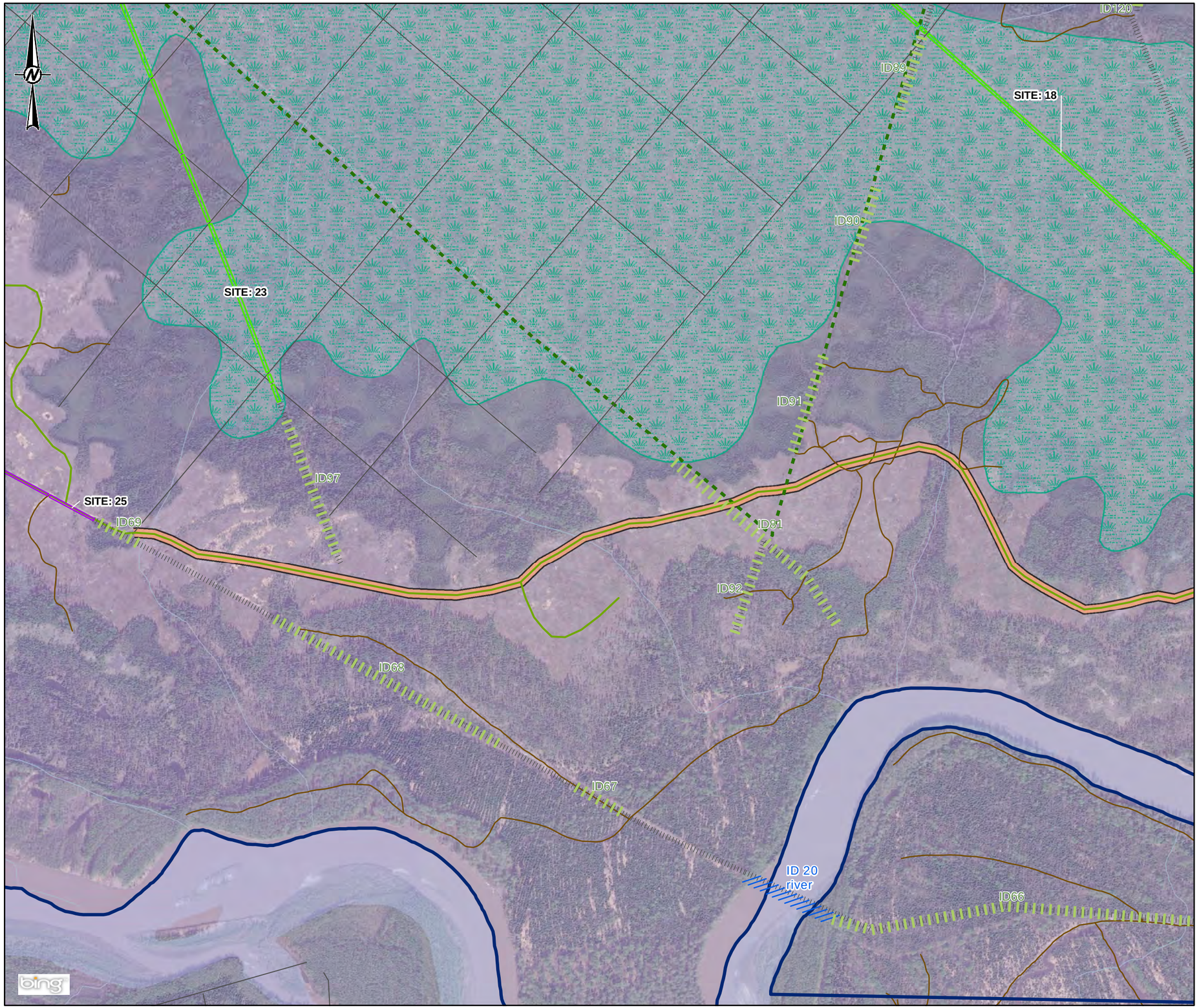

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- TACTICAL PLAN TREATMENT ZONE 1

TREATMENT TYPE

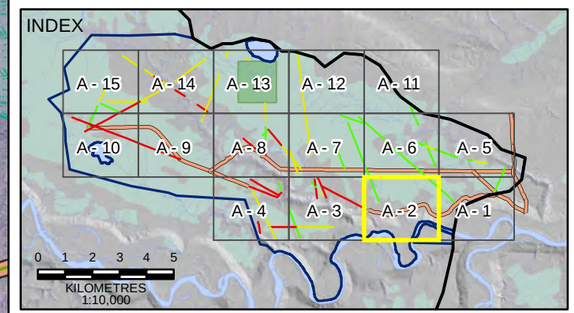
- TREE FELLING
- MOUNDING / SEEDLING PLANTING
- MOUNDING / TREE FELLING / SEEDLING PLANTING
- TREE FELLING / SEEDING
- MOUNDING / SEEDING
- MOUNDING / TREE FELLING / SEEDING

OTHER

- LINEAR DISTURBANCE - LEAVE FOR NATURAL RESTORATION
- NATURAL REVEGETATION >3m : NO ACCESS
- POTENTIAL WATER OBSTACLE
- PARKER LAKE ECOLOGICAL RESERVE
- WATERBODY
- WETLAND
- WATERCOURSE

WINTER ACCESS

- PROPOSED PRIMARY WINTER ACCESS
- EXCLUDED LINEAR DISTURBANCE (LOW IMPACT SEISMIC)
- UNCLASSIFIED ROAD
- FORESTRY SERVICE ROAD / ROAD PERMIT
- RECREATIONAL TRAIL



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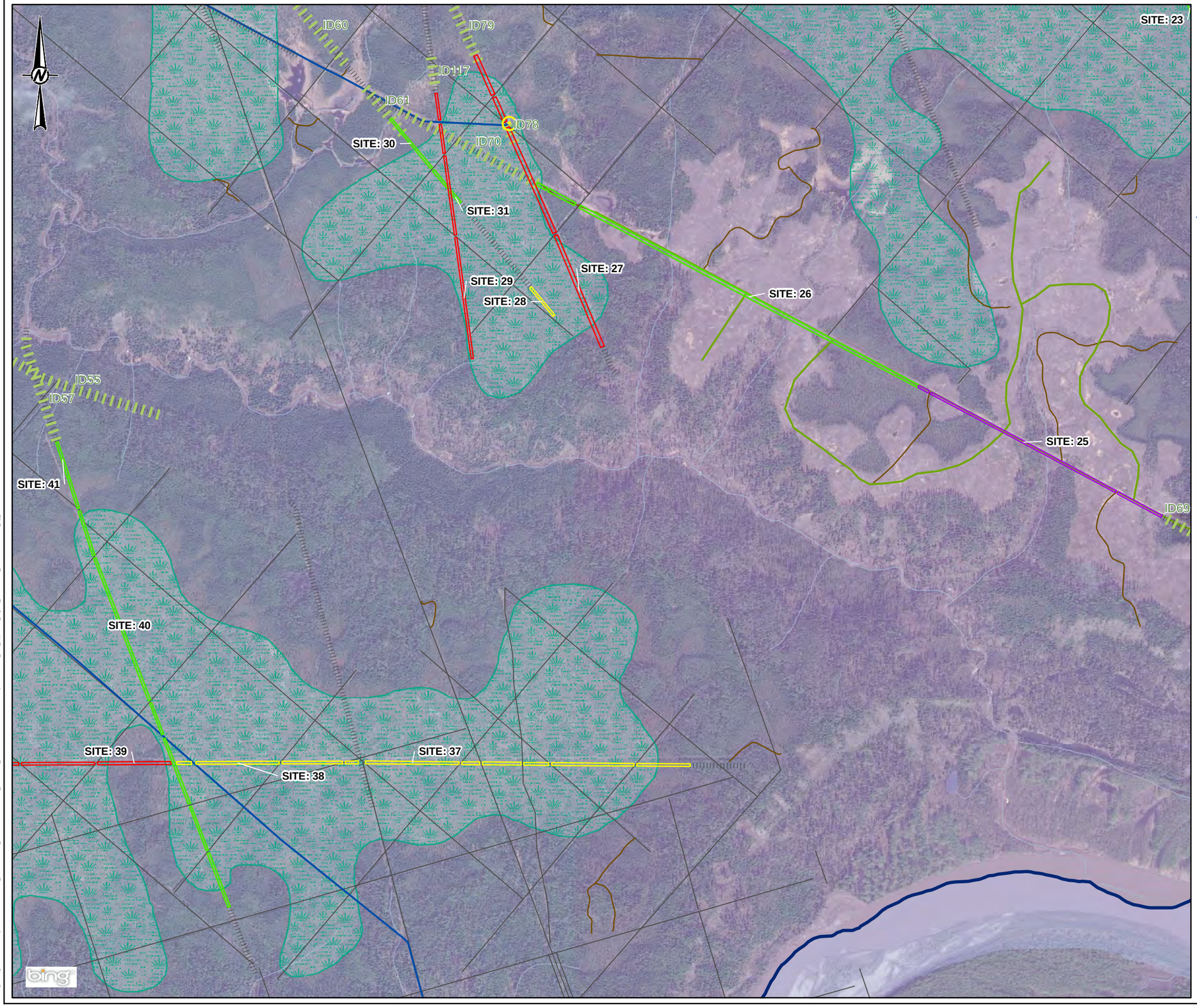

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- PARKER CARIBOU RANGE
- TACTICAL PLAN TREATMENT ZONE 1

TREATMENT TYPE

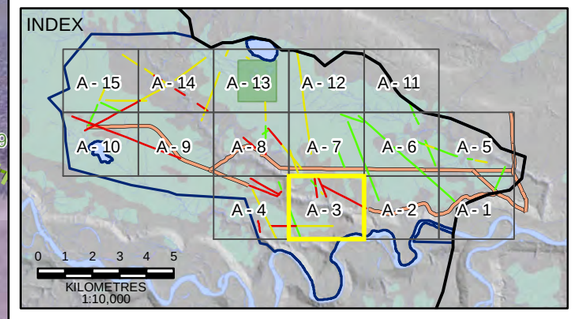
- TREE FELLING
- MOUNDING / SEEDLING PLANTING
- MOUNDING / TREE FELLING / SEEDLING PLANTING
- TREE FELLING / SEEDING
- MOUNDING / SEEDING
- MOUNDING / TREE FELLING / SEEDING

OTHER

- LINEAR DISTURBANCE - LEAVE FOR NATURAL RESTORATION
- NATURAL REVEGETATION >3m : NO ACCESS
- POTENTIAL WATER OBSTACLE
- PARKER LAKE ECOLOGICAL RESERVE
- WATERBODY
- WETLAND
- WATERCOURSE
- SURFACE WELL (INACTIVE)

WINTER ACCESS

- PROPOSED PRIMARY WINTER ACCESS
- EXCLUDED LINEAR DISTURBANCE (LOW IMPACT SEISMIC)
- RESOURCE ROAD
- UNCLASSIFIED ROAD
- FORESTRY SERVICE ROAD / ROAD PERMIT



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Golder Associates

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REVIEWED	BC
APPROVED	PB

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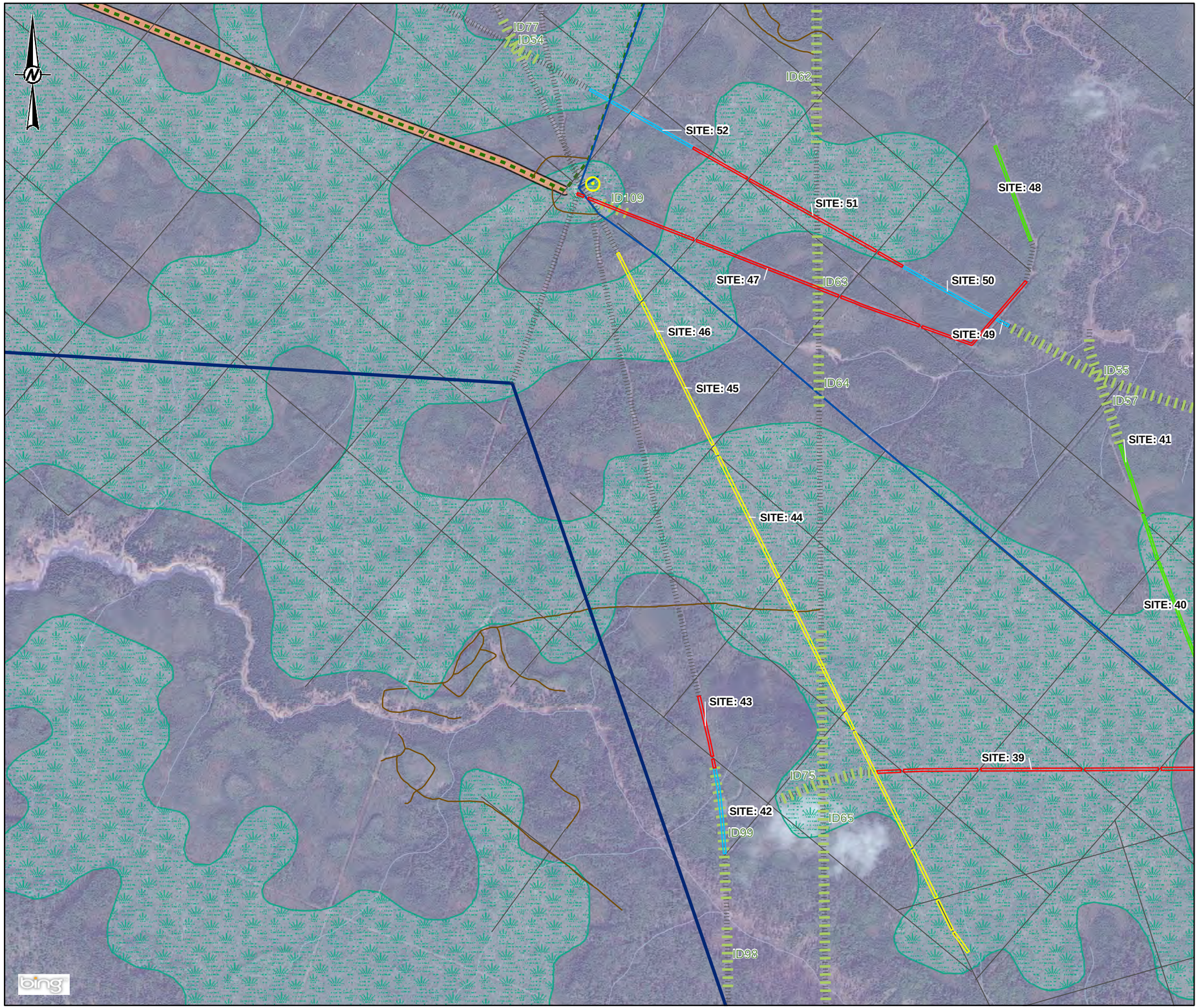

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- PARKER CARIBOU RANGE
- TACTICAL PLAN TREATMENT ZONE 1

TREATMENT TYPE

- TREE FELLING
- MOUNDING / SEEDLING PLANTING
- MOUNDING / TREE FELLING / SEEDLING PLANTING
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OTHER

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- NATURAL REVEGETATION >3m : NO ACCESS
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- PARKER LAKE ECOLOGICAL RESERVE
- WATERBODY
- WETLAND
- WATERCOURSE
- SURFACE WELL (INACTIVE)

WINTER ACCESS

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- EXCLUDED LINEAR DISTURBANCE (LOW IMPACT SEISMIC)
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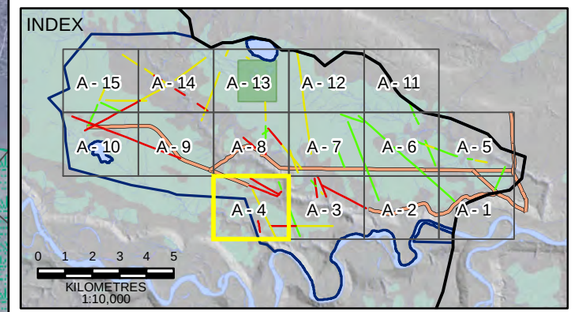
- RECREATIONAL TRAIL



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APPROVED	PB

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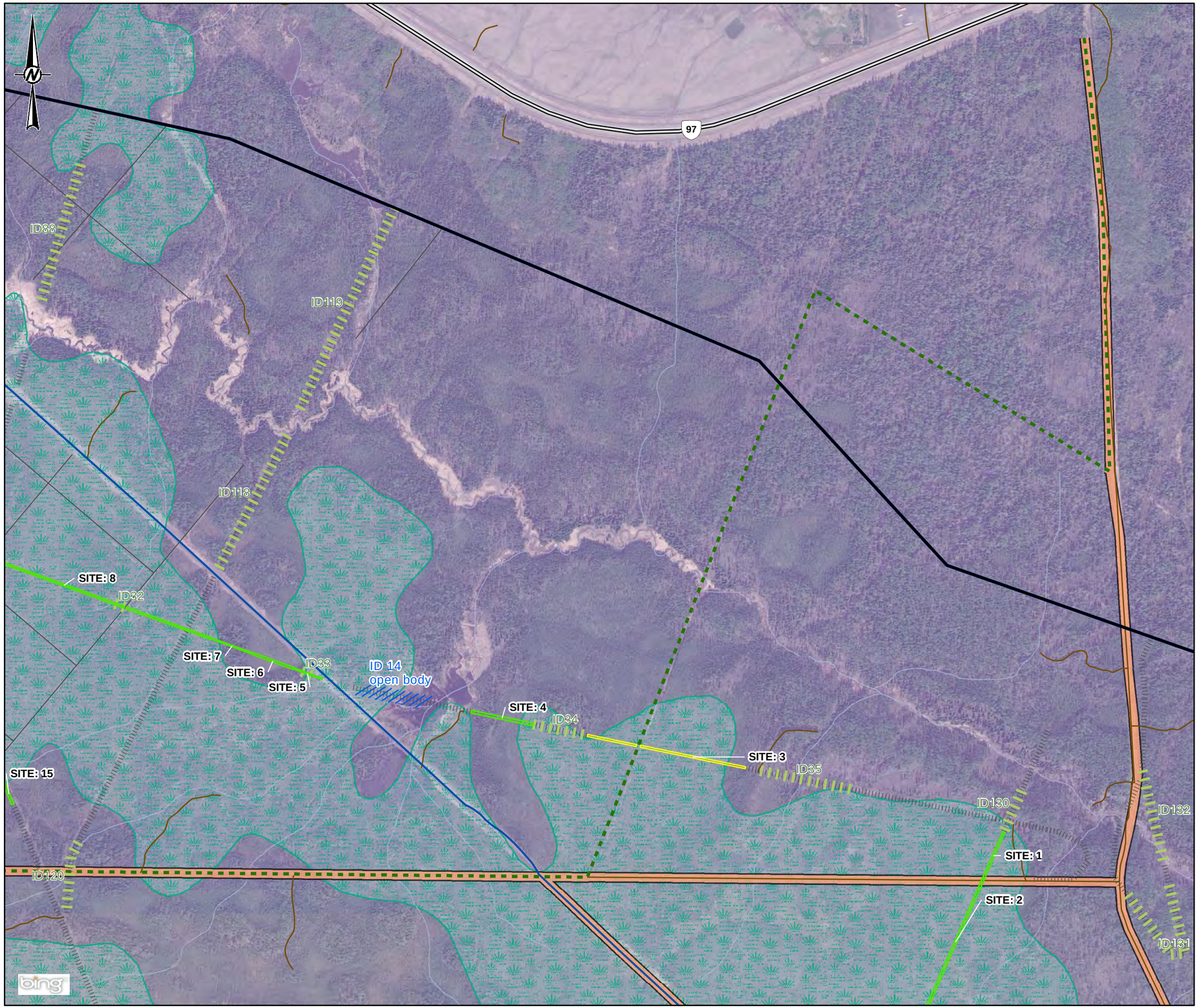

LEGEND

- PARKER CARIBOU RANGE
- TACTICAL PLAN TREATMENT ZONE 1

TREATMENT TYPE

- TREE FELLING
- MOUNDING / SEEDLING PLANTING
- MOUNDING / TREE FELLING / SEEDLING PLANTING
- TREE FELLING / SEEDING
- MOUNDING / SEEDING
- MOUNDING / TREE FELLING / SEEDING

OTHER

- LINEAR DISTURBANCE - LEAVE FOR NATURAL RESTORATION
- NATURAL REVEGETATION >3m : NO ACCESS
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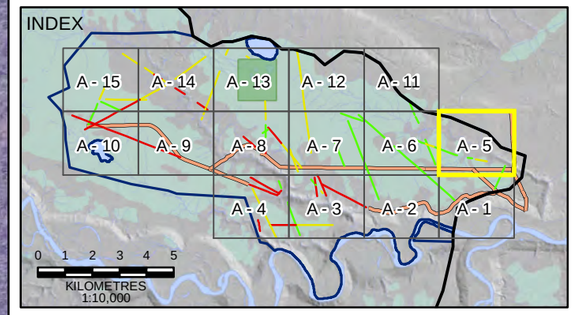
- PARKER LAKE ECOLOGICAL RESERVE
- WATERBODY
- WETLAND
- WATERCOURSE

WINTER ACCESS

- PROPOSED PRIMARY WINTER ACCESS
- EXCLUDED LINEAR DISTURBANCE (LOW IMPACT SEISMIC)
- HIGHWAY
- RESOURCE ROAD
- UNCLASSIFIED ROAD
- RECREATIONAL TRAIL



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Golder Associates

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APPROVED	PB

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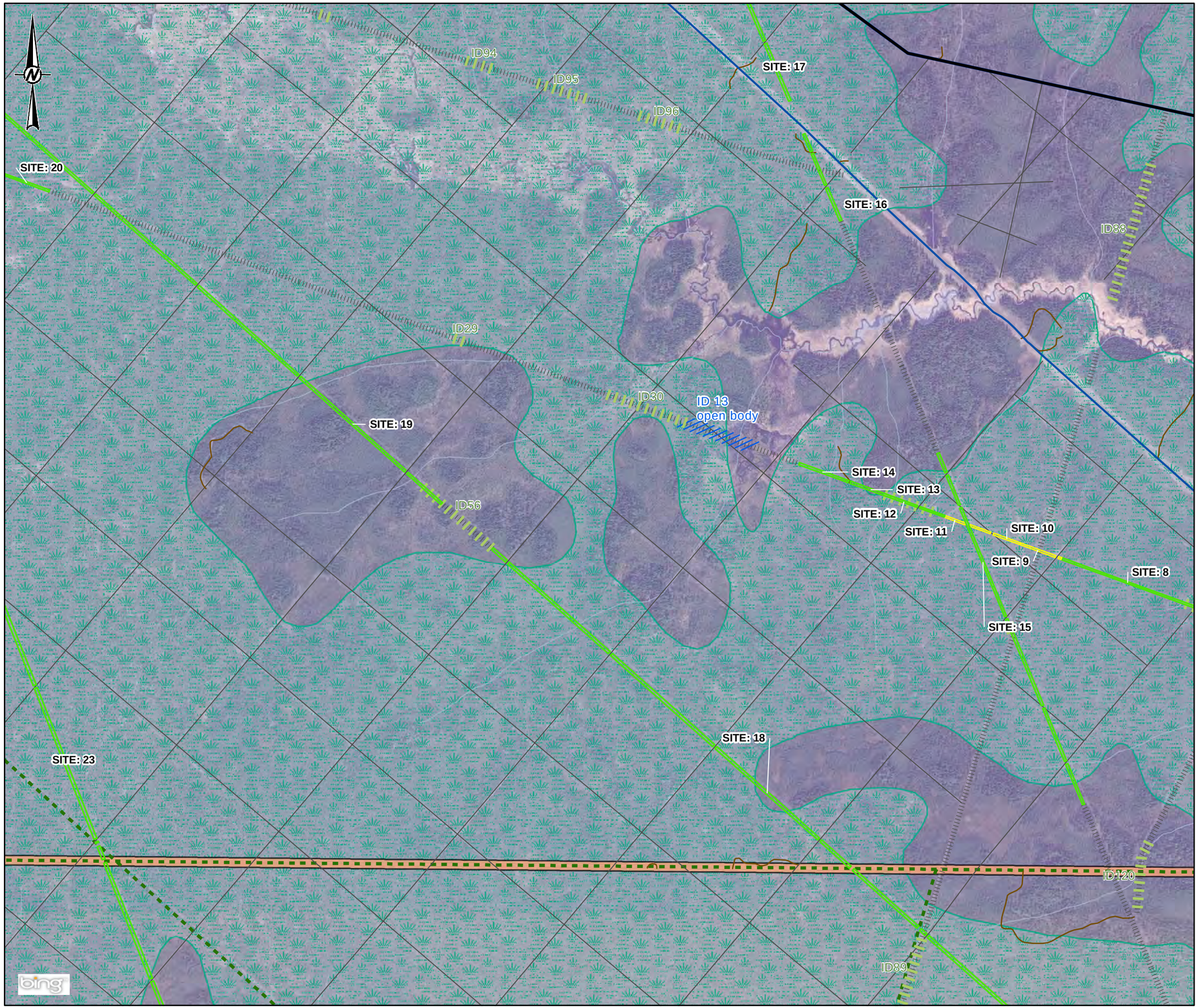

LEGEND

- PARKER CARIBOU RANGE
- TACTICAL PLAN TREATMENT ZONE 1

TREATMENT TYPE

- TREE FELLING
- MOUNDING / SEEDLING PLANTING
- MOUNDING / TREE FELLING / SEEDLING PLANTING
- TREE FELLING / SEEDING
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- MOUNDING / TREE FELLING / SEEDING

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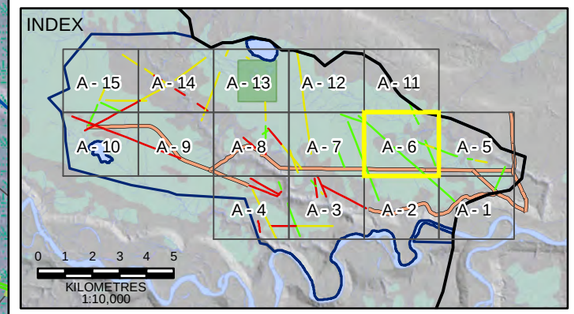
- EXCLUDED LINEAR DISTURBANCE (LOW IMPACT SEISMIC)
- RESOURCE ROAD
- UNCLASSIFIED ROAD
- RECREATIONAL TRAIL



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REFERENCES

1. 2D SEISMIC CUTLINES, WATERCOURSE, WATERBODY, POPULATED AREA, WETLAND, ROADS, TOWN AND PROVINCIAL BOUNDARY OBTAINED FROM FROM CANVEC © DEPARTMENT OF NATURAL RESOURCES CANADA. ALL RIGHTS RESERVED.
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COORDINATE SYSTEM: NAD 1983 UTM ZONE 10N

CLIENT
BC OIL AND GAS RESEARCH AND INNOVATION SOCIETY

PROJECT
PARKER CARIBOU RANGE
ZONE 1 IMPLEMENTATION PLAN

TITLE
RESTORATION TREATMENT SITES

CONSULTANT
Golder Associates

YYYY-MM-DD	2015-12-30
DESIGNED	BC
PREPARED	RH
REVIEWED	BC
APPROVED	PB

PROJECT NO.	CONTROL	REV.	FIGURE
1529978	8000	0	A - 6

IF THIS MEASUREMENT DOES NOT MATCH WHAT IS SHOWN, THE SHEET SIZE HAS BEEN MODIFIED FROM: ANSI B

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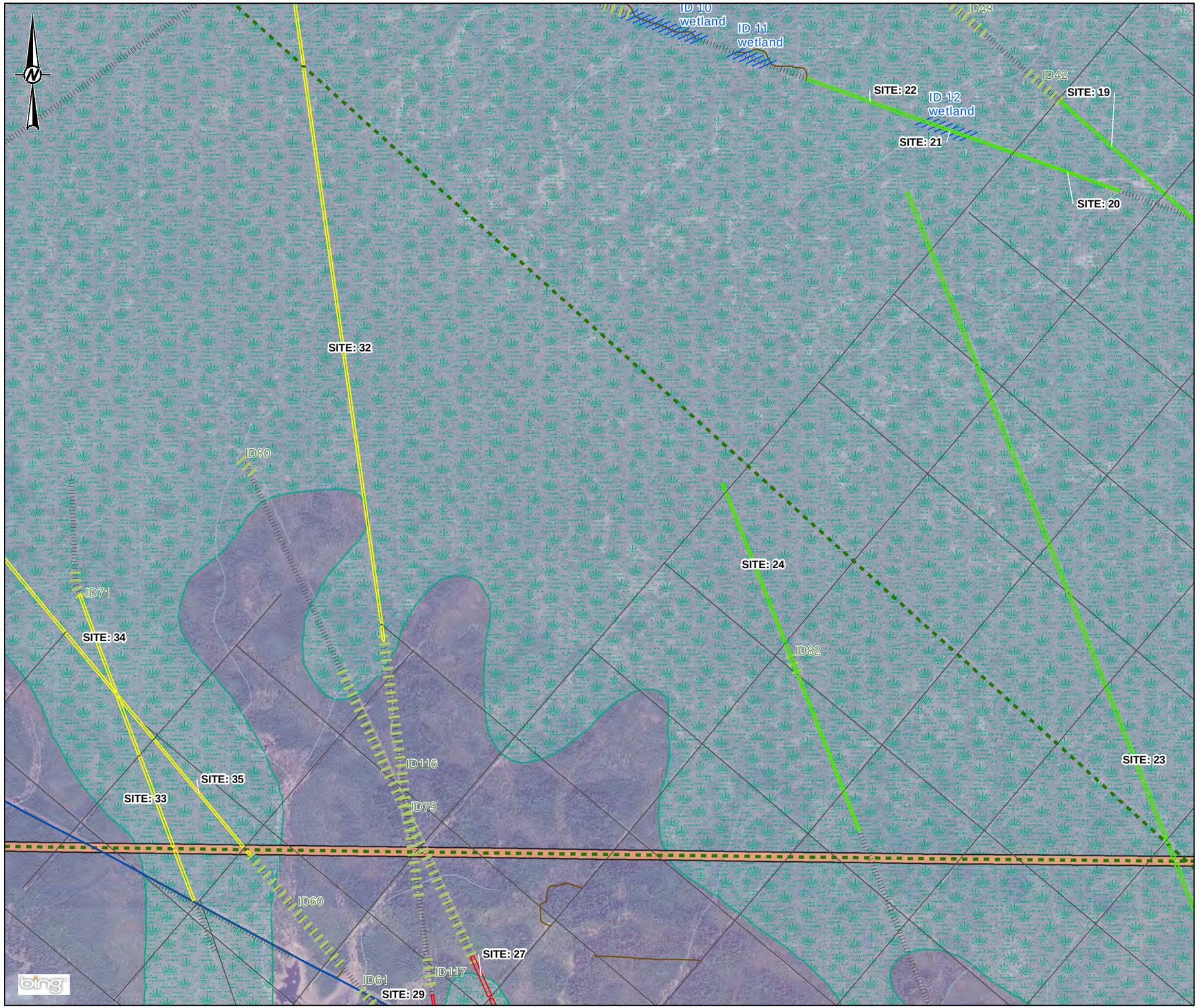


LEGEND

- PARKER CARIBOU RANGE
- TACTICAL PLAN TREATMENT ZONE 1

TREATMENT TYPE

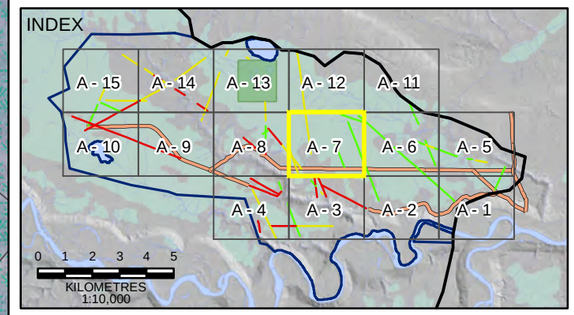
- TREE FELLING
- MOUNDING / SEEDLING PLANTING
- MOUNDING / TREE FELLING / SEEDLING PLANTING
- TREE FELLING / SEEDING
- MOUNDING / SEEDING
- MOUNDING / TREE FELLING / SEEDING

OTHER

- LINEAR DISTURBANCE - LEAVE FOR NATURAL RESTORATION
- NATURAL REVEGETATION >3m : NO ACCESS
- POTENTIAL WATER OBSTACLE
- PARKER LAKE ECOLOGICAL RESERVE
- WATERBODY
- WETLAND
- WATERCOURSE

WINTER ACCESS

- PROPOSED PRIMARY WINTER ACCESS
- EXCLUDED LINEAR DISTURBANCE (LOW IMPACT SEISMIC)
- RESOURCE ROAD
- UNCLASSIFIED ROAD
- RECREATIONAL TRAIL



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REFERENCES

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CLIENT

BC OIL AND GAS RESEARCH AND INNOVATION SOCIETY

PROJECT

PARKER CARIBOU RANGE
ZONE 1 IMPLEMENTATION PLAN

TITLE

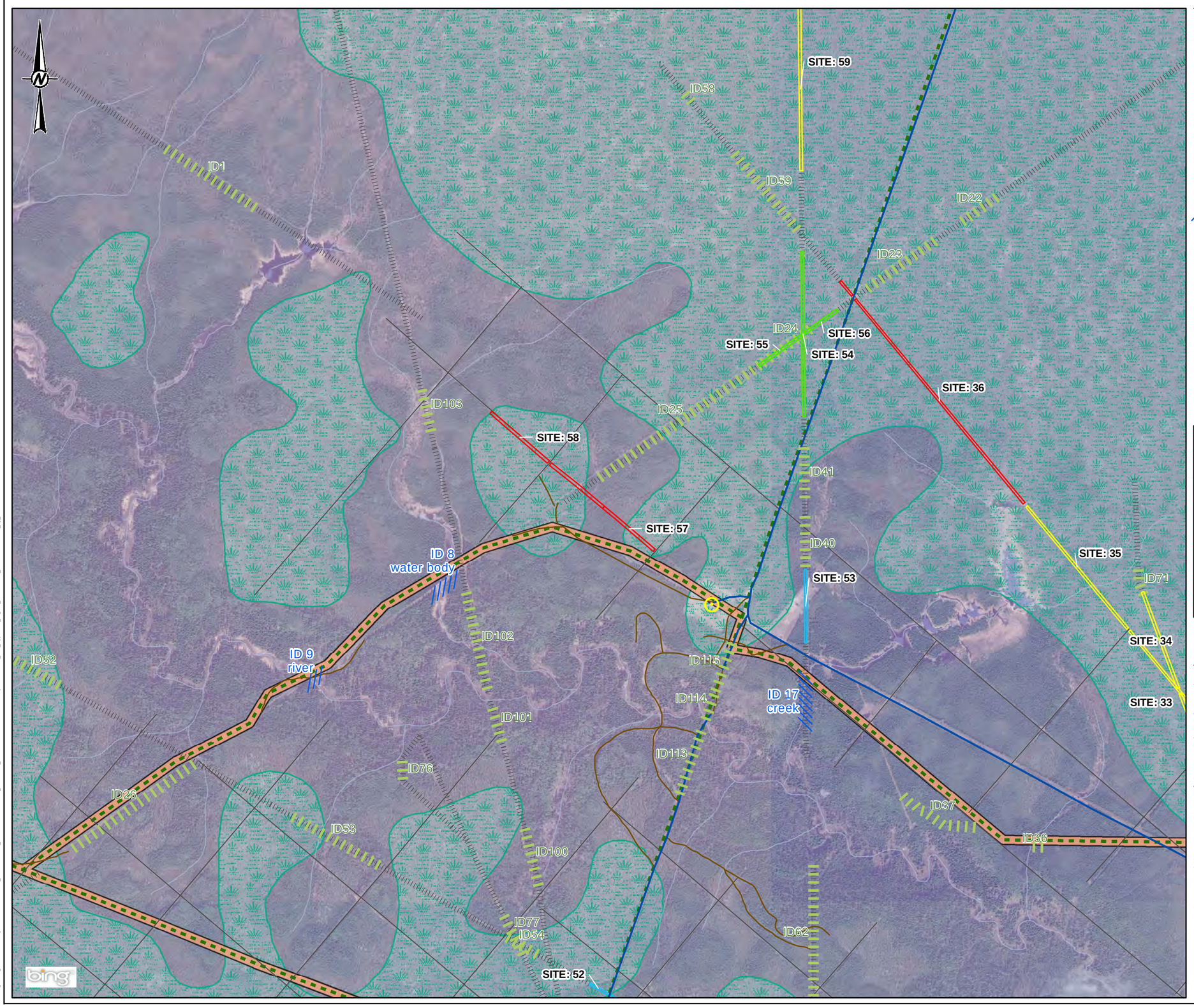
RESTORATION TREATMENT SITES

CONSULTANT

Golder Associates

YYYY-MM-DD	2015-12-30
DESIGNED	BC
PREPARED	RH
REVIEWED	BC
APPROVED	PB

PROJECT NO.	CONTROL	REV.	FIGURE
1529978	8000	0	A - 7



LEGEND

- PARKER CARIBOU RANGE
- TACTICAL PLAN TREATMENT ZONE 1

TREATMENT TYPE

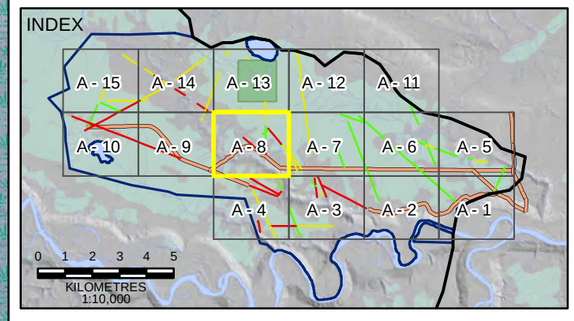
- TREE FELLING
- MOUNDING / SEEDLING PLANTING
- MOUNDING / TREE FELLING / SEEDLING PLANTING
- TREE FELLING / SEEDING
- MOUNDING / SEEDING
- MOUNDING / TREE FELLING / SEEDING

OTHER

- LINEAR DISTURBANCE - LEAVE FOR NATURAL RESTORATION
- NATURAL REVEGETATION >3m : NO ACCESS
- POTENTIAL WATER OBSTACLE
- PARKER LAKE ECOLOGICAL RESERVE
- WATERBODY
- WETLAND
- WATERCOURSE
- SURFACE WELL (INACTIVE)

WINTER ACCESS

- PROPOSED PRIMARY WINTER ACCESS
- EXCLUDED LINEAR DISTURBANCE (LOW IMPACT SEISMIC)
- RESOURCE ROAD
- UNCLASSIFIED ROAD
- RECREATIONAL TRAIL



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COORDINATE SYSTEM: NAD 1983 UTM ZONE 10N

CLIENT

BC OIL AND GAS RESEARCH AND INNOVATION SOCIETY

PROJECT

PARKER CARIBOU RANGE
ZONE 1 IMPLEMENTATION PLAN

TITLE

RESTORATION TREATMENT SITES

CONSULTANT

Golder Associates

YYYY-MM-DD	2015-12-30
DESIGNED	BC
PREPARED	RH
REVIEWED	BC
APPROVED	PB

PROJECT NO.	CONTROL	REV.	FIGURE
1529978	8000	0	**A - 8**

IF THIS MEASUREMENT DOES NOT MATCH WHAT IS SHOWN, THE SHEET SIZE HAS BEEN MODIFIED FROM ANSI B

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LEGEND

- PARKER CARIBOU RANGE
- TACTICAL PLAN TREATMENT ZONE 1

TREATMENT TYPE

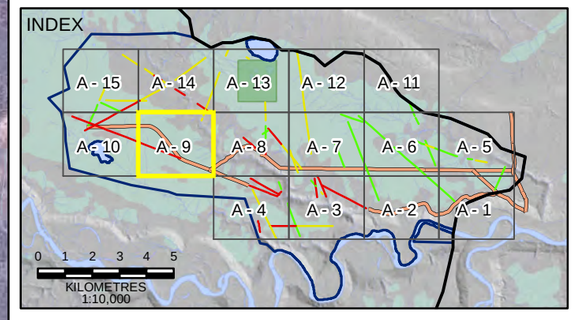
- TREE FELLING
- MOUNDING / SEEDLING PLANTING
- MOUNDING / TREE FELLING / SEEDLING PLANTING
- TREE FELLING / SEEDING
- MOUNDING / SEEDING
- MOUNDING / TREE FELLING / SEEDING

OTHER

- LINEAR DISTURBANCE - LEAVE FOR NATURAL RESTORATION
- NATURAL REVEGETATION >3m : NO ACCESS
- POTENTIAL WATER OBSTACLE
- PARKER LAKE ECOLOGICAL RESERVE
- WATERBODY
- WETLAND
- WATERCOURSE

WINTER ACCESS

- PROPOSED PRIMARY WINTER ACCESS
- EXCLUDED LINEAR DISTURBANCE (LOW IMPACT SEISMIC)
- UNCLASSIFIED ROAD
- RECREATIONAL TRAIL



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COORDINATE SYSTEM: NAD 1983 UTM ZONE 10N

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BC OIL AND GAS RESEARCH AND INNOVATION SOCIETY

PROJECT

PARKER CARIBOU RANGE
ZONE 1 IMPLEMENTATION PLAN

TITLE

RESTORATION TREATMENT SITES

CONSULTANT

Golder Associates

YYYY-MM-DD	2015-12-30
DESIGNED	BC
PREPARED	RH
REVIEWED	BC
APPROVED	PB

PROJECT NO.	CONTROL	REV.	FIGURE
1529978	8000	0	**A - 9**

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IF THIS MEASUREMENT DOES NOT MATCH WHAT IS SHOWN, THE SHEET SIZE HAS BEEN MODIFIED FROM: ANSI B

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ID50
ID12
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ID84
ID83
SITE: 85
SITE: 86
ID14
SITE: 87
ID 4
wetland
ID 21
lake
ID15
ID16
ID 7
wetland
bing

LEGEND

- PARKER CARIBOU RANGE
- TACTICAL PLAN TREATMENT ZONE 1

TREATMENT TYPE

- TREE FELLING
- MOUNDING / SEEDLING PLANTING
- MOUNDING / TREE FELLING / SEEDLING PLANTING
- TREE FELLING / SEEDING
- MOUNDING / SEEDING
- MOUNDING / TREE FELLING / SEEDING

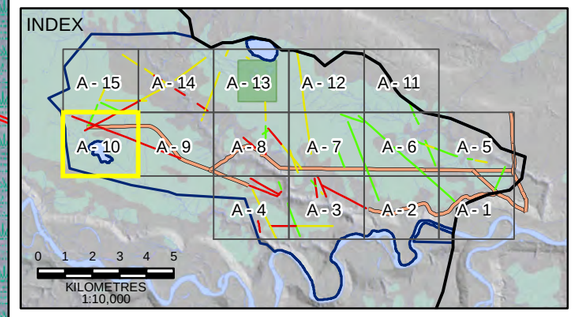
OTHER

- LINEAR DISTURBANCE - LEAVE FOR NATURAL RESTORATION
- NATURAL REVEGETATION >3m : NO ACCESS
- POTENTIAL WATER OBSTACLE
- PARKER LAKE ECOLOGICAL RESERVE
- WATERBODY
- WETLAND
- WATERCOURSE

WINTER ACCESS

- PROPOSED PRIMARY WINTER ACCESS
- EXCLUDED LINEAR DISTURBANCE (LOW IMPACT SEISMIC)
- UNCLASSIFIED ROAD
- RECREATIONAL TRAIL

INDEX



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REFERENCES

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CLIENT
BC OIL AND GAS RESEARCH AND INNOVATION SOCIETY

PROJECT
PARKER CARIBOU RANGE
ZONE 1 IMPLEMENTATION PLAN

TITLE
RESTORATION TREATMENT SITES

CONSULTANT
Golder Associates

YYYY-MM-DD	2015-12-30
DESIGNED	BC
PREPARED	RH
REVIEWED	BC
APPROVED	PB

PROJECT NO.	CONTROL	REV.	FIGURE
1529978	8000	0	A - 10

IF THIS MEASUREMENT DOES NOT MATCH WHAT IS SHOWN, THE SHEET SIZE HAS BEEN MODIFIED FROM: ANSI B

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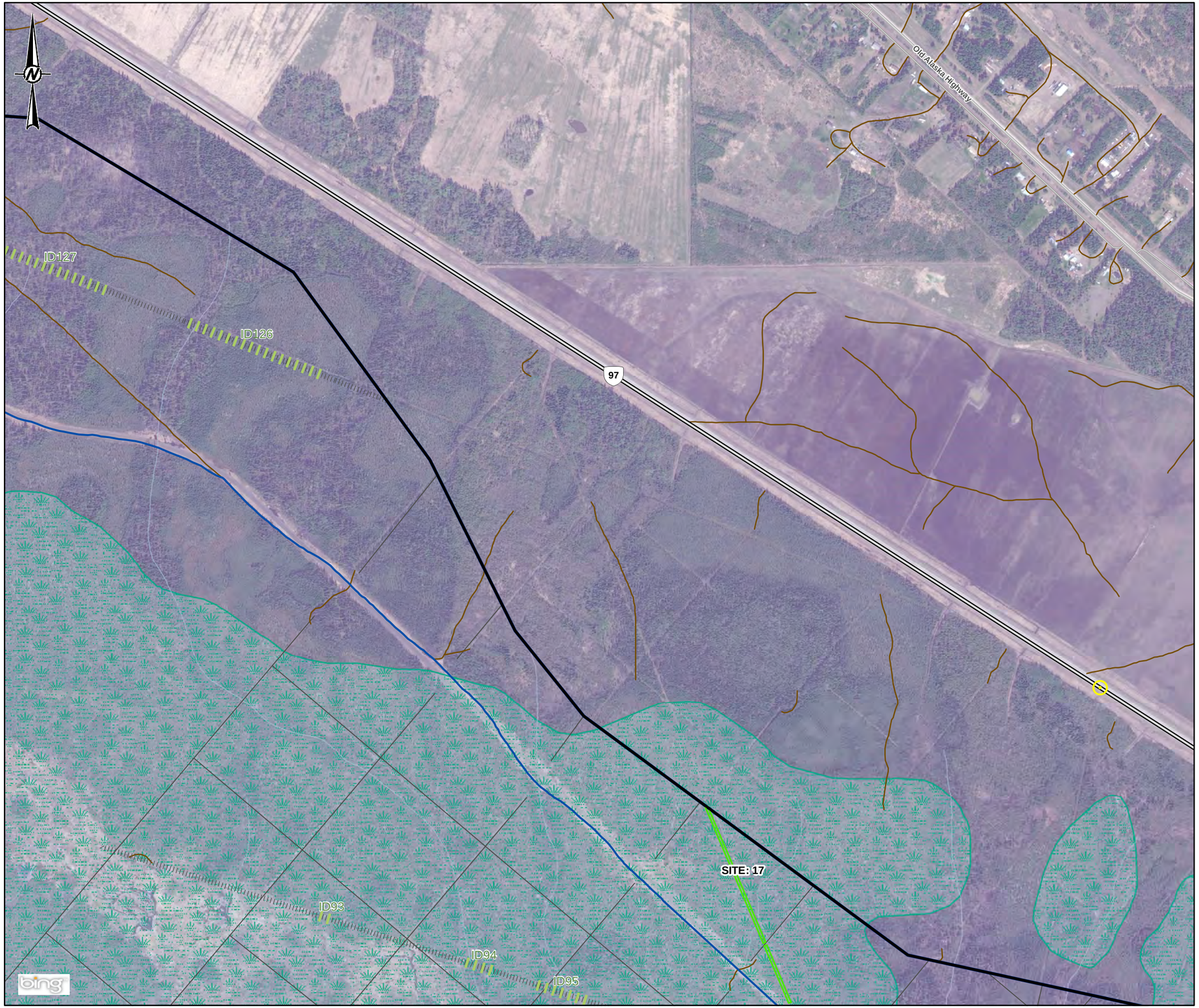


LEGEND

- PARKER CARIBOU RANGE
- TACTICAL PLAN TREATMENT ZONE 1

TREATMENT TYPE

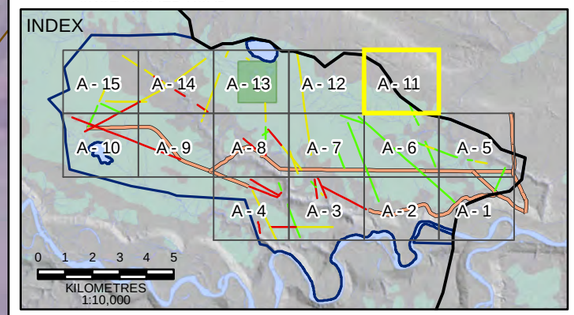
- TREE FELLING
- MOUNDING / SEEDLING PLANTING
- MOUNDING / TREE FELLING / SEEDLING PLANTING
- TREE FELLING / SEEDING
- MOUNDING / SEEDING
- MOUNDING / TREE FELLING / SEEDING

OTHER

- LINEAR DISTURBANCE - LEAVE FOR NATURAL RESTORATION
- NATURAL REVEGETATION >3m : NO ACCESS
- POTENTIAL WATER OBSTACLE
- PARKER LAKE ECOLOGICAL RESERVE
- WATERBODY
- WETLAND
- WATERCOURSE
- SURFACE WELL (INACTIVE)

WINTER ACCESS

- PROPOSED PRIMARY WINTER ACCESS
- EXCLUDED LINEAR DISTURBANCE (LOW IMPACT SEISMIC)
- HIGHWAY
- MAJOR ROAD
- LOCAL ROAD
- RESOURCE ROAD
- UNCLASSIFIED ROAD



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CLIENT
BC OIL AND GAS RESEARCH AND INNOVATION SOCIETY

PROJECT
PARKER CARIBOU RANGE
ZONE 1 IMPLEMENTATION PLAN

TITLE
RESTORATION TREATMENT SITES

CONSULTANT
Golder Associates

YYYY-MM-DD	2015-12-30
DESIGNED	BC
PREPARED	RH
REVIEWED	BC
APPROVED	PB

PROJECT NO.	CONTROL	REV.	FIGURE
1529978	8000	0	A - 11

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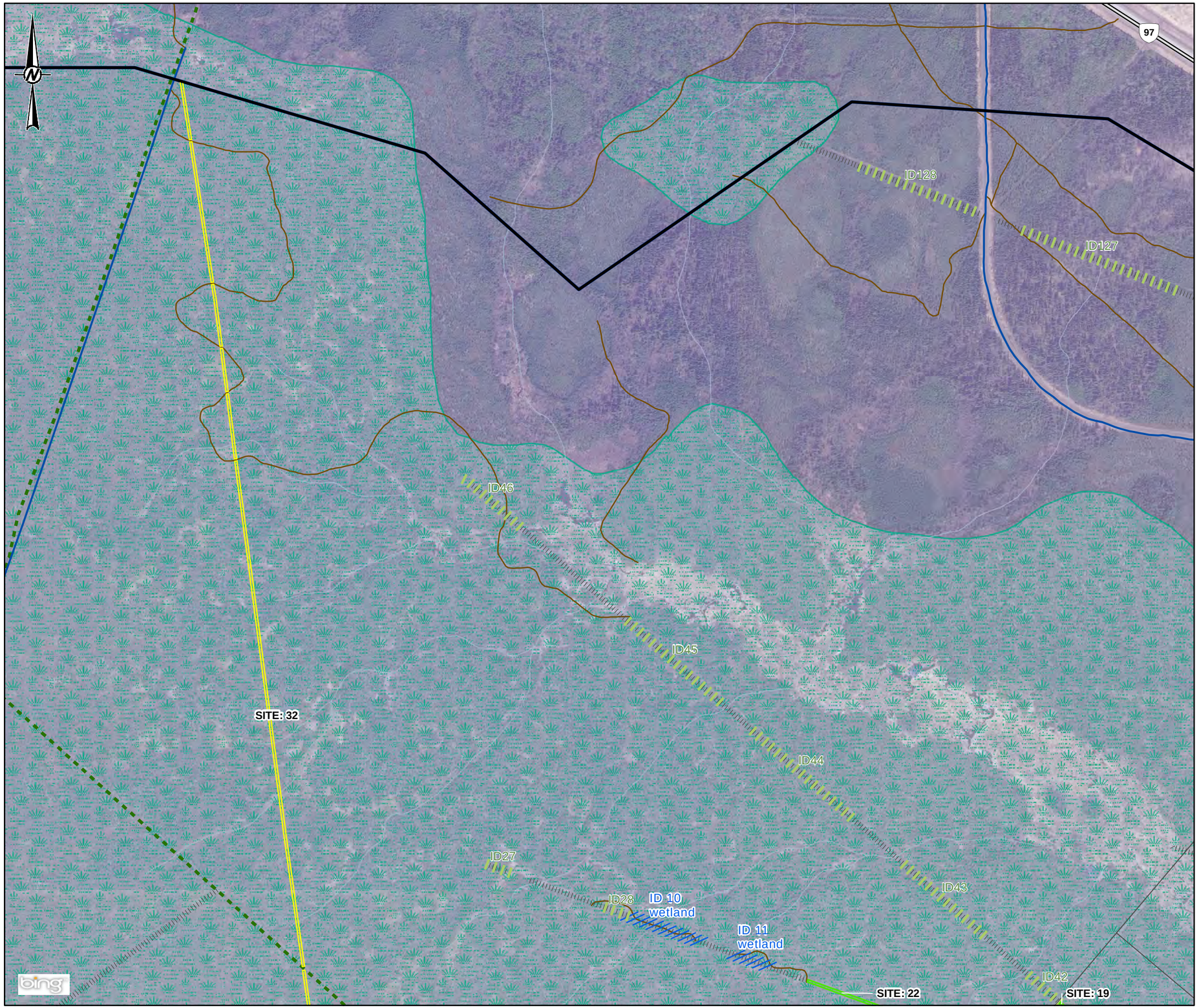


LEGEND

- PARKER CARIBOU RANGE
- TACTICAL PLAN TREATMENT ZONE 1

TREATMENT TYPE

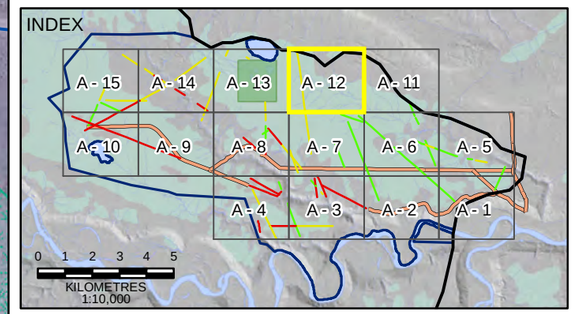
- TREE FELLING
- MOUNDING / SEEDLING PLANTING
- MOUNDING / TREE FELLING / SEEDLING PLANTING
- TREE FELLING / SEEDING
- MOUNDING / SEEDING
- MOUNDING / TREE FELLING / SEEDING

OTHER

- LINEAR DISTURBANCE - LEAVE FOR NATURAL RESTORATION
- NATURAL REVEGETATION >3m : NO ACCESS
- POTENTIAL WATER OBSTACLE
- PARKER LAKE ECOLOGICAL RESERVE
- WATERBODY
- WETLAND
- WATERCOURSE

WINTER ACCESS

- PROPOSED PRIMARY WINTER ACCESS
- EXCLUDED LINEAR DISTURBANCE (LOW IMPACT SEISMIC)
- HIGHWAY
- RESOURCE ROAD
- UNCLASSIFIED ROAD
- RECREATIONAL TRAIL



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REFERENCES

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CLIENT
BC OIL AND GAS RESEARCH AND INNOVATION SOCIETY

PROJECT
PARKER CARIBOU RANGE
ZONE 1 IMPLEMENTATION PLAN

TITLE
RESTORATION TREATMENT SITES

CONSULTANT
Golder Associates

YYYY-MM-DD	2015-12-30
DESIGNED	BC
PREPARED	RH
REVIEWED	BC
APPROVED	PB

PROJECT NO.	CONTROL	REV.	FIGURE
1529978	8000	0	A - 12

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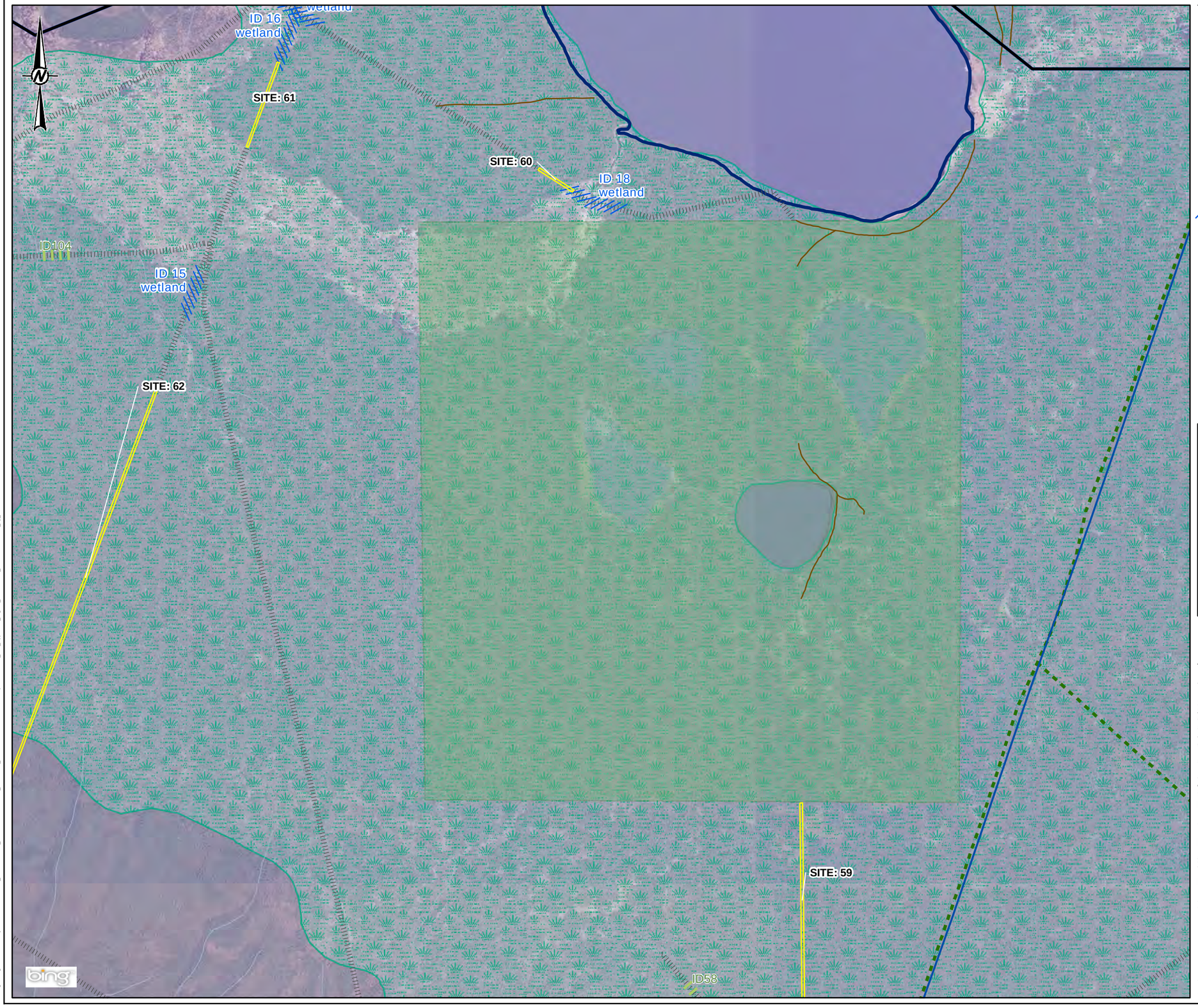


LEGEND

- PARKER CARIBOU RANGE
- TACTICAL PLAN TREATMENT ZONE 1

TREATMENT TYPE

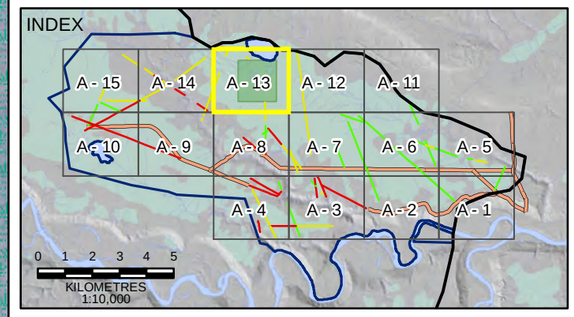
- TREE FELLING
- MOUNDING / SEEDLING PLANTING
- MOUNDING / TREE FELLING / SEEDLING PLANTING
- TREE FELLING / SEEDING
- MOUNDING / SEEDING
- MOUNDING / TREE FELLING / SEEDING

OTHER

- LINEAR DISTURBANCE - LEAVE FOR NATURAL RESTORATION
- NATURAL REVEGETATION >3m : NO ACCESS
- POTENTIAL WATER OBSTACLE
- PARKER LAKE ECOLOGICAL RESERVE
- WATERBODY
- WETLAND
- WATERCOURSE

WINTER ACCESS

- PROPOSED PRIMARY WINTER ACCESS
- EXCLUDED LINEAR DISTURBANCE (LOW IMPACT SEISMIC)
- RESOURCE ROAD
- UNCLASSIFIED ROAD
- RECREATIONAL TRAIL



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BC OIL AND GAS RESEARCH AND INNOVATION SOCIETY

PROJECT

PARKER CARIBOU RANGE
ZONE 1 IMPLEMENTATION PLAN

TITLE

RESTORATION TREATMENT SITES

CONSULTANT

Golder Associates

YYYY-MM-DD	2015-12-30
DESIGNED	BC
PREPARED	RH
REVIEWED	BC
APPROVED	PB

PROJECT NO.	CONTROL	REV.	FIGURE
1529978	8000	0	A - 13

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LEGEND

- PARKER CARIBOU RANGE
- TACTICAL PLAN TREATMENT ZONE 1

TREATMENT TYPE

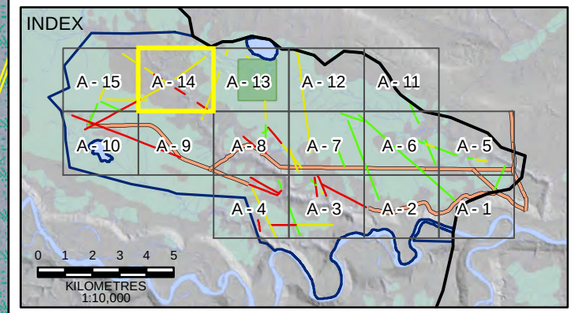
- TREE FELLING
- MOUNDING / SEEDLING PLANTING
- MOUNDING / TREE FELLING / SEEDLING PLANTING
- TREE FELLING / SEEDING
- MOUNDING / SEEDING
- MOUNDING / TREE FELLING / SEEDING

OTHER

- LINEAR DISTURBANCE - LEAVE FOR NATURAL RESTORATION
- NATURAL REVEGETATION >3m : NO ACCESS
- POTENTIAL WATER OBSTACLE
- PARKER LAKE ECOLOGICAL RESERVE
- WATERBODY
- WETLAND
- WATERCOURSE

WINTER ACCESS

- PROPOSED PRIMARY WINTER ACCESS
- EXCLUDED LINEAR DISTURBANCE (LOW IMPACT SEISMIC)
- UNCLASSIFIED ROAD



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REFERENCES

1. 2D SEISMIC CUTLINES, WATERCOURSE, WATERBODY, POPULATED AREA, WETLAND, ROADS, TOWN AND PROVINCIAL BOUNDARY OBTAINED FROM FROM CANVEC © DEPARTMENT OF NATURAL RESOURCES CANADA. ALL RIGHTS RESERVED.
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4. PARKER CARIBOU RANGE, RECREATIONAL TRAIL, ECOLOGICAL RESERVE AND HILLSHADE OBTAINED FROM B.C. GOV. CONTAINS INFORMATION LICENCED UNDER THE OPEN GOVERNMENT LICENCE - BRITISH COLUMBIA.
5. IMAGERY OBTAINED FROM BING MAPS FOR ARCGIS PUBLISHED BY MICROSOFT CORPORATION, REDMOND, WA, MAY 2009. DATE: MAY 2011.

COORDINATE SYSTEM: NAD 1983 UTM ZONE 10N

CLIENT

BC OIL AND GAS RESEARCH AND INNOVATION SOCIETY

PROJECT

PARKER CARIBOU RANGE
ZONE 1 IMPLEMENTATION PLAN

TITLE

RESTORATION TREATMENT SITES

CONSULTANT

Golder Associates

YYYY-MM-DD	2015-12-30
DESIGNED	BC
PREPARED	RH
REVIEWED	BC
APPROVED	PB

PROJECT NO.	CONTROL	REV.	FIGURE
1529978	8000	0	A - 14

IF THIS MEASUREMENT DOES NOT MATCH WHAT IS SHOWN, THE SHEET SIZE HAS BEEN MODIFIED FROM: ANSI B

25mm

0

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LEGEND

- PARKER CARIBOU RANGE
- TACTICAL PLAN TREATMENT ZONE 1

TREATMENT TYPE

- TREE FELLING
- MOUNDING / SEEDLING PLANTING
- MOUNDING / TREE FELLING / SEEDLING PLANTING
- TREE FELLING / SEEDING
- MOUNDING / SEEDING
- MOUNDING / TREE FELLING / SEEDING

OTHER

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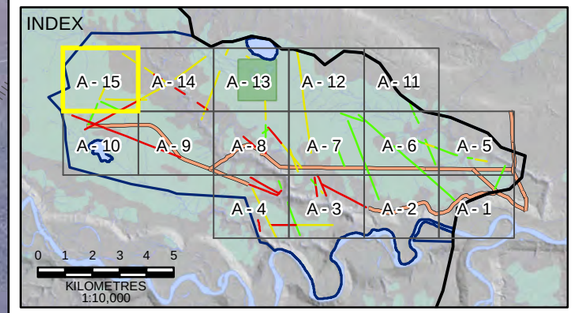

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APPROVED	PB

PROJECT NO.	CONTROL	REV.	FIGURE
1529978	8000	0	**A - 15**

APPENDIX D

Sample Habitat Restoration Sign

HABITAT ENHANCEMENT SITE

THIS SITE WAS TREATED WITH ONE OR MORE OF THE FOLLOWING METHODS:

*** EXCAVATOR MOUNDING ***

*** SLASH ROLLBACK ***

*** SEEDLING PLANTING ***

*** TREE-FELLING / BENDING ***

DO NOT DISTURB IN EITHER SUMMER OR WINTER

BRITISH COLUMBIA

Ministry of Forests, Lands and Natural Resource Operations

Contact FrontCounter BC in Fort Nelson at 1-877-855-3222 for more information.

APPENDIX E

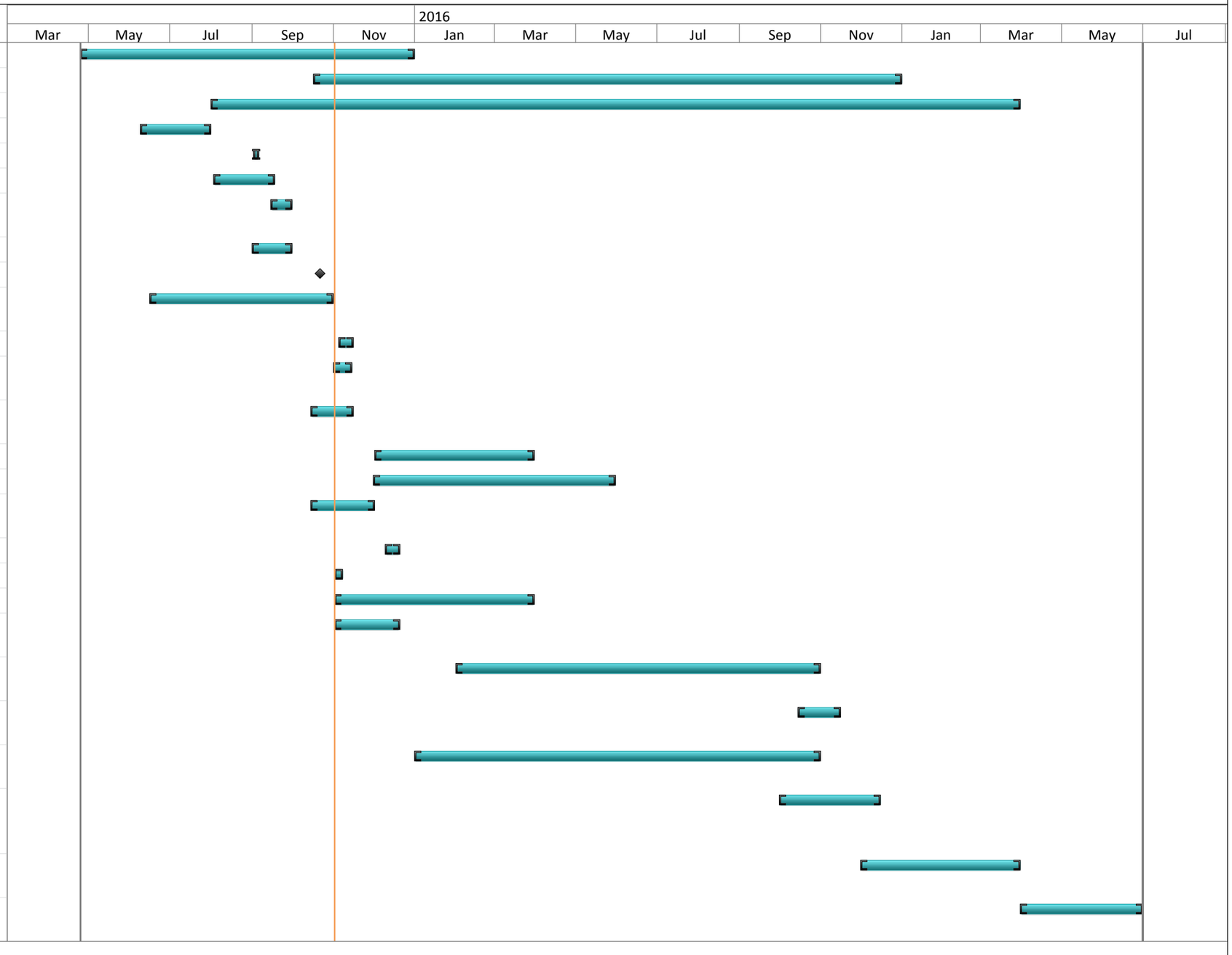
Parker Range Restoration Program Plan: 2015-2017 Schedule

Golder Associates

Parker Range Restoration Program Plan
2015-2017 Schedule

Last Updated: November 2, 2015
Project Number: 1529978

ID	Task Name	Start	Finish
1	BCIP-2016-04 Scope	Apr 25 '15	Dec 31 '15
2	BCIP-2016-16 Scope	Oct 17 '15	Dec 31 '16
3	Data Management (Orientis)	Aug 1 '15	Mar 30 '17
4	360 Vieworx & Data Acquisition	Jun 9 '15	Jul 31 '15
5	Field Reconnaissance	Sep 2 '15	Sep 5 '15
6	Linear Inventory Mapping Desktop	Aug 3 '15	Sep 17 '15
7	Linear Disturbance Inventory Mapping Finalization & Initial Reporting Results	Sep 15 '15	Sep 30 '15
8	Archaeological Desktop	Sep 1 '15	Sep 30 '15
9	Project Team Update Meeting	Oct 22 '15	
10	Development of Draft Habitat Restoration Pilot Program Plan Report	Jun 16 '15	Oct 31 '15
11	Project Team Update Meeting	Nov 5 '15	Nov 15 '15
12	Finalize Habitat Restoration Pilot Program Plan Final Report	Nov 1 '15	Nov 14 '15
13	Year 1: Seed, Seedling & Encapsuled Seed Puck Sourcing	Oct 15 '15	Nov 15 '15
14	FLNRO Authorization	Dec 2 '15	Mar 30 '16
15	Aboriginal Inclusion Plan	Dec 1 '15	May 30 '16
16	Development of Draft Year 1 Implementation Plan	Oct 15 '15	Dec 1 '15
17	Finalize Year 1 Implementation Plan	Dec 10 '15	Dec 20 '15
18	Nofity First Nations	Nov 2 '15	Nov 7 '15
19	Archaeological Overview Assessment	Nov 2 '15	Mar 30 '16
20	Preparation of Heritage Inspection Permit Application	Nov 2 '15	Dec 20 '15
21	Watercourse Crossing Assessments & Road/Pipeline Crossing Agreements	Feb 1 '16	Oct 31 '16
22	Year 2: Seed, Seedling & Encapsuled Seed Puck Sourcing	Oct 15 '16	Nov 15 '16
23	Development of Year 2 Implementation Plan & Securement of 2017 Authorizations	Jan 1 '16	Oct 31 '16
24	Year 1 Field Program Mobilization (Secure Constractors, Field Logistics, HSE Documents, etc)	Oct 1 '16	Dec 15 '16
25	Year 1 Field Program Implementation & Demobilization	Dec 1 '16	Mar 30 '17
26	Year 1 Field Implementation Workplan Reporting	Mar 31 '17	Jun 30 '17



Proposed Task Proposed Milestone

As a global, employee-owned organisation with over 50 years of experience, Golder Associates is driven by our purpose to engineer earth's development while preserving earth's integrity. We deliver solutions that help our clients achieve their sustainable development goals by providing a wide range of independent consulting, design and construction services in our specialist areas of earth, environment and energy.

For more information, visit golder.com

Africa	+ 27 11 254 4800
Asia	+ 86 21 6258 5522
Australasia	+ 61 3 8862 3500
Europe	+ 44 1628 851851
North America	+ 1 800 275 3281
South America	+ 56 2 2616 2000

solutions@golder.com
www.golder.com

Golder Associates Ltd.
10628 Peck Lane
Mail to: Site 18, Comp 26, SS 2 Stn.Main
Fort St. John, British Columbia, V1J 4M7
Canada
T: +1 (250) 785 9281

Golder Associates