APPENDIX 2.7.2.7-A INVASIVE PLANT MANAGEMENT PLAN

The Invasive Plant Management Plan (IPMP) has been updated from the 2009 Prosperity Project. Key changes include the Incorporation of updated invasive plant lists.

The key aspects of the IPMP that remain the same are that Taseko Mines will follow and adapt, as necessary, the Invasive Plant Management Plan in order to identify, prevent, treat, and monitor invasive plants throughout the Project (mine site, access road and transmission line) during construction, operation and decommissioning stages of the New Prosperity Gold-Copper Project. No new baseline data has been collected; data from 2006 is therefore presented.

The IPMP is important to apply to all aspects of the Project. The concern of invasive weeds and the proposed transmission line was raised during the 2009/2010 environmental assessment review of the Prosperity Project. In recent years, the issue of invasive plants and their management has caught the attention of land managers as they are confronted with the task of and costs associated with their control, the mitigation of their detrimental effects and, optimally, the prevention of their spread. Non-native plants have the potential to spread and to replace or overwhelm natural vegetation assemblages, change ecosystem properties such that ecosystem function is reduced or altered, and have economic implications with respect to agriculture, forestry and rangeland (Myers and Bazely, 2003; Klinkenberg 2004).

1.1 INVASIVE PLANT DEFINITION

Invasive plants are plants that spread extensively and rapidly and, by virtue of some unique attribute, are undesirable (e.g. noxious to cattle) and very difficult to control. Invasive plants are sometimes referred to as ‘weeds’, ‘introduced’ or ‘exotics’ as they are typically non-native species which have been introduced either accidentally or intentionally, to a new ecosystem thereby escaping their usual control agents. As such, these new plant populations are not subjected to natural checks and balances like insect pests or plant pathogens that control the populations of other species in their native habitats (BC MoF 2005a).

Invasive plants can permeate any terrestrial habitat, but they tend to invade disturbed areas, such as sites with barren soil, post-fire disturbance and drought or following herbicide application, logging or landscape-scale changes such as tree die-offs as observed with the mountain pine beetle infestation (Davis et. al, 2000).

1.2 INVASIVE PLANT LEGISLATION

British Columbia is host to many invasive plant species, both in terrestrial and aquatic ecosystems (e.g., Meidinger et al. 2004). Some of these plants have been listed on a Provincial Noxious Weed list which is regulated under the *Weed Control Act.* In British Columbia the *Weed Control Act* imposes a duty on all land-occupiers to control designated noxious plants. An inspector may issue a notice requiring control of noxious weeds and it is an offence to fail to comply.

Two other provincial pieces of legislation having provisions for invasive plant management are the *Forest and Range Practices Act* (FRPA) and the *Ministry of Forest Act.* These acts provide legislation for forestry and range-related projects but can also provide guidance to other activities occurring on crown lands.

The Province is divided into three forest regions; the proposed Prosperity project falls within the Southern Interior Forest Region. An Invasive Alien Plant Pest Management Plan has been created for this region which details the framework for prioritizing sites for weed control and uses a decision making matrix based on the invasiveness of the species and the susceptibility and potential for control of a site (B.C. MoF, 2007).

B.C. is further divided into Regional Districts, the Project being within the bounds of the Cariboo Regional District (CRD). The CRD has also initiated a noxious weed control program to control the spread of noxious weeds throughout the range lands and grasslands of the Cariboo-Chilcotin. In addition to the CRD, the Coast Cariboo-Chilcotin Invasive Plant Committee (CCCIPC) coordinates and facilitates invasive plant-related activities for the region which includes the area surrounding the proposed Prosperity Mine site.

1.3 PURPOSE

The overall purpose of the Invasive Plant Management Plan is to control the spread of existing invasive plant infestations and prevent new infestations from establishing in the Project area while managing Project activities so as to eliminate the risk of spreading invasive plants to other sites in the Cariboo-Chilcotin region.

The approach will consist of:

- prevention
- proper identification and knowledge of species
- inventories, mapping and monitoring
- educated control decisions based on knowledge of potential damage, cost of control method and environmental impact of the invasive plant and control decision
- combining invasive plant management methods
- evaluation of the effectiveness of the strategies used and adjusting if required.

2 – BASELINE

2.1 INVASIVE SPECIES IN BC

The first step in conducting an invasive plant survey is to review available literature in order to understand which invasive plants may occur in the Project. Several sources were reviewed prior to conducting the fieldwork component including examining invasive plant publications from the Ministry of Forests and Range, Ministry of Agriculture and Lands, the British Columbia *Weed Control Act,* Fraser Basin Council, the Invasive Plant Council of British Columbia, the Cariboo Regional District and the Grasslands Conservation Council of BC. These sources were used to assess the susceptibility of sites to invasive plant incursion, review potential prevention and mitigation techniques, and to generate a list of potential invasive plants in the Cariboo-Chilcotin region.

The Provincial and Regional Noxious Weed list details plants which are required, under the Weed Control Act, to be controlled by the landowner. Table 2.1 lists the invasive plants which are designated as provincial or regional noxious weeds and are legislated for control in BC; plants that are considered to be invasive throughout the Cariboo Region by the CCCIPC; and the Forests and Range Practices Act (FRPA) list that deals with plants that affect forested and range lands. The CCCIPC's 30 priority invasive plant species for the CRD have the greatest potential to impact ecological or economic values in the region. Of these plants, knapweed is of special concern because of its ability to rapidly spread and infest grasslands and rangelands, which compose a vast majority of the Cariboo area (CRD 2006). Knapweed invasion of rangelands in the Cariboo region has caused extreme economic loss to rangelands, and environmental degradation to grassland ecosystems (CRD 2006).

Interior grassland ecosystems are particularly sensitive to invasive plants, due to their sparse ground cover and lack of canopy which allows pioneer species to proliferate with ease. As native bunchgrasses are replaced by knapweed and other invasive plants, there is an increase in surface water runoff, a loss of soil, and a consequential sedimentation of watercourses. In addition, displacement of native grassland plant species affects wildlife foraging and lack of palatable range forage for domestic cattle (Fraser Basin Council 2003).

Table 2.1 Invasive Plants of Concern in the Project Area

Common Name	Latin Name	Provincial /Regional Noxious	*Forest and Range Practices Act*	*CCCIPC*
anchusa	*Anchusa officinalis*		✓	✓
annual sowthistle	*Sonchus oleraceus*	✓		
baby's breath	*Gypsophila paniculata*		✓	
black henbane	*Hyoscyamus niger*			✓
black knapweed	*Centaurea nigra*		✓	
Blueweed	*Echium vulgare*	✓	✓	✓
bohemian knotweed	*Fallopia x bohemica*	✓		
brown knapweed	*Centaurea jacea*		✓	
bull thistle	*Cirsium vulgare*		✓	
bur chervil	*Anthriscus caucalis*	✓		
Burdock	*Arctium* spp.	✓		✓
Canada thistle	*Cirsium arvense*	✓	✓	✓
common burdock	*Arctium minus*		✓	
common reed	*Phragmites australis ssp. australis*	✓		
common tansy	*Tanacetum vulgare*		✓	✓
crupina	*Crupina vulgaris*	✓		
dalmatian toadflax	*Linaria dalmatica*	✓	✓	✓
dense-flowered cordgrass	*Spartina densiflora*	✓		
diffuse knapweed	*Centaurea diffusa*	✓	✓	✓
dodder	*Cuscuta spp.*	✓		
English cordgrass	*Spartina anglica*	✓		
field scabious	*Knautia arvensis*		✓	✓
flowering rush	*Butomus umbellatus*	✓		
garlic mustard	*Alliaria petiolata*	✓		
giant hogweed	*Heraclueum mantegazzianum*	✓		
giant knotweed	*Fallopia sachalinensis /Polygonum sachalinense*	✓	✓	✓
giant mannagrass/ reed sweetgrasss	*Glyceria maxima*	✓		
goat's beard	*Tragopogon dubius*			
gorse	*Ulex europaeus*	✓	✓	
Himalayan balsam	*Impatiens glanulifera*			✓
Himalayan knotweed	*Polygonum polystachyum*	✓		
hoary alyssum	*Berteroa incana*		✓	✓
hoary cress	*Cardaria draba*		✓	✓
hounds-tongue	*Cynoglossum officinale*	✓	✓	✓
Japanese knotweed	*Fallopia japonica /Polygonum cuspidatum*	✓	✓	✓
jointed goatgrass	*Aegilops cylindrica*	✓		
leafy spurge	*Euphorbia esula*	✓	✓	✓
marsh thistle	*Cirsium palustre*		✓	✓
meadow hawkweed	*Hieracium pilosella*		✓	
meadow knapweed	*Centaurea pratensis*		✓	✓
milk thistle	*Silybum marianum*	✓		

Common Name	Latin Name	Provincial /Regional Noxious	*Forest and Range Practices Act*	*CCCIPC*
mullein	*Verbascum thapsis*			
nodding thistle	*Carduus nutans*		✓	✓
North Africa grass	*Ventenata dubia*	✓		
orange Hawkweed	*Hieracium aurantiacum*	✓	✓	✓
oxeye daisy	*Chrysanthemum leucanthemum*	✓	✓	✓
perennial pepperweed	*Lepidium latifolium*		✓	✓
perennial sowthistle	*Sonchus arvensis*	✓		
plumeless thistle	*Carduus acanthoides*		✓	✓
puncture vine	*Tribulus terrestris*		✓	
purple loosetrife	*Lythrum salicaria*	✓	✓	✓
purple nutsedge	*Cyperus rotundus*	✓		
rush skeletonweed	*Chondrilla juncea*	✓	✓	
Russian knapweed	*Acroptilon repens*		✓	✓
saltmeadow cordgrass	*Spartina patens*	✓		
scentless chamomile	*Matricaria maritima*	✓	✓	✓
Scotch broom	*Cytisus scoparius*		✓	
Scotch thistle	*Onopordum acanthium*		✓	
smooth cordgrass	*Spartina alterniflora*	✓		
spotted knapweed	*Centaurea maculosa*	✓	✓	✓
St. John's wort	*Hypericum perforatum*		✓	✓
sulphur cinquefoil	*Potentilla recta*		✓	✓
tansy ragwort	*Senecio jacobaea*	✓	✓	
teasel	*Dipsacus fullonum*		✓	
velvetleaf	*Abutilon theophrasti*	✓		
wild oats	*Avena fatua*	✓		
yellow flag iris	*Iris pseudacorus*	✓	✓	✓
yellow hawkweeds (invasive)	*Hieracium piloselloides, H. caespitosum, H. praealtum, H. flagellare*			✓
yellow nutsedge	*Cyperus esculentus*	✓		
yellow starthistle	*Centaurea solstitialis*	✓	✓	
Yellow toadflax	*Linaria vulgaris*	✓	✓	

Notes:

1. PI= Priority Invaders
2. SI- Secondary Invaders

2.2 2006 FIELD SURVEY

2.2.1 Methods

The scope of the invasive plant survey was focused along the transmission corridor, mine site and access road and was conducted in conjunction with TEM and rare plant surveys. During these surveys, vegetation ecologists looked for incidental invasive plants, especially within disturbed areas such as roadways, cattle holdings, forestry landings, and old mining settlements. At each plot, vegetation, site characteristics and location were recorded, along with the species name and degree of spread of any identified invasive plants.

2.2.2 Results

Two invasive, noxious plant species, both legislated under the BC *Weed Control Act,* were observed within the RSA during the 2006 field season. Canada thistle (*Cirsium arvense*), which is legislated as noxious within all regions of BC, was found in small numbers and isolated locations within the transmission corridor, mine site, and access road. Orange hawkweed (*Hieracium aurantiacum*), which is legislated as noxious within the Cariboo Regional District, was found along the access road. Refer to Appendix E Prosperity Project Vascular and Non-vascular Plant Species List.

One invasive plant, legislated under the BC Forest and Range Practices Act was observed within the RSA during the 2006 field season. Bull thistle (*Cirsium vulgare*) was found within the transmission corridor, mine site, and access road.

3 – IMPLEMENTATION

Of the three areas surveyed, the access road has the lowest potential for invasive plant species since the road has already mostly been established and it will therefore be subjected to less soil disturbance. Currently, orange hawkweed (*Hieracium aurantiacum)* bull thistle (*Cirsium vulgare*) and Canada thistle (*Cirsium arvense*) have already been surveyed in 2006.

The mine site has a higher potential for invasive plants due to the exploration and logging roads in the north and small mining settlements in the south. Within the mine site, Canada thistle (*Cirsium arvens*) and bull thistle (*Cirsium vulgare*) have been observed.

The potential for invasive plant spread is highest along the length of the transmission corridor due to abundant cattle grazing and human access. Canada thistle (*Cirsium arvens*) and bull thistle (*Cirsium vulgare)* were observed within the transmission corridor.

In order to effectively implement the Invasive Management Plan, five objectives will be applied to all aspects of the Project:

1. **Inventory** - develop and maintain a comprehensive invasive plant inventory in the Project Area.
2. **Prevention -** prevent the introduction and/or establishment of invasive plants that are not currently in the project area and surrounding region. Prevent or minimize the spread of invasive plants present in the project area and surrounding region.
3. **Control and Management** - of invasive plant populations using the principles of Integrated Vegetation Management.
4. **Monitoring** - the spread of existing invasive plant populations and success of treatments employed to control or manage infestations.

3.1 INVENTORY PROGRAM

Detecting invasive plants early and accurately recording the details of each occurrence (including mapped locations) is the most important phase in directing efforts to prevent establishment (Cranston *et al*. 2002).

Tasks include:

1. Provide population estimates (spatial extent and number of plants) and locations of invasive plant species as a basis for establishing the prevention, treatment, and monitoring programs and allocating resources to priority areas.
2. Invasive plant inventories will be conducted annually on all disturbed mine and transmission corridor land that has been seeded or left to recover naturally. These surveys are best performed in the late spring or early summer so that treatment measures can be applied prior to seed dispersal in accordance with the B.C. Ministry of Forests Invasive Alien Plant Program (IAPP1) methods. Inventories will be recorded on Site and Invasive Plant Inventory Record forms (available from the IAPP website).
3. Update lists for identifying invasive plants online at applicable websites. Current examples to verify weed lists are the Ministry of Agriculture and Lands CRD website3 and the CCCIPC website
4. Document invasive plant outbreak locations (as necessary) and report them to provincial regulators as required. Prevention Program

3.2 PREVENTION PROGRAM

The most common means by which invasive plants can gain access to a site are

- As seeds or plant parts in new fill and on vehicles
- As weed seeds in impure seed mixes
- From intentional plantings
- By less-controllable natural vectors such as animals, wind and waterways.

Some of the most likely areas of potential invasive plant problems in the Project area are recently disturbed soil along roads, mine staging areas, and cleared grassland areas. Knowing if machinery is frequenting these areas and whether this equipment is potentially moving unwanted seed to other areas is crucial to preventing the spread of invasive plants.

Taseko Mines is committed to preventing the spread or establishment of invasive plants during construction, operations, and reclamation, by:

1. Reducing seed dispersion
2. Minimizing unnecessary soil disturbance
3. Re-vegetating as promptly as possible following soil disturbance
4. Reducing seed dispersion will require cleaning of site vehicles. Dispersal of invasive plant seed by wind, water, and animal transport, will be reduced by removing known weed populations before flowering and covering or burning designated areas at appropriate times. Relevant information to communicate to mine site personnel, including contractors can be found in the Field Guide to Noxious and Other Selected Weeds of British Columbia, a hard-copy of which is included with this management plan as well as on the BC Ministry of Agriculture and Lands web site[1]. Key protocols include:
    - Using wash stations for machinery
    - Routinely cleaning work clothes
    - Using uncontaminated gravel and crushed rock
    - Informing personnel of the species of concern and prevention measures.
5. All unnecessary soil disturbances should be avoided to prevent soils from susceptibility to invasive plant establishment. Any soil disturbance that results from construction or mining activity will be promptly re-seeded with a quick-establishing grass and legume seed mix for invasive plant control.
6. Re-vegetating as promptly as possible following soil disturbance. Areas requiring immediate seeding include soil stockpiles, bare soil, water management features such as ditches and sediment pond berms, gravel pits, cleared grassland areas, and road edges. High quality grade seed mixes is specified in the reclamation plan. The seed included in the mix will be invasive-plant free.

[1] Ministry of Agriculture and Lands "Field Guide to Noxious and Other Selected Weeds of British Columbia" http://www.al.gov.bc.ca/cropprot/weedguid/weedguid.htm

3.3 TREATMENT PROGRAM

Treatment measures are required when, despite the prevention programs initiated by Taseko Mines, invasive plants become established or were established at baseline and require treatment. The three treatment options are:

Mechanical - For small populations prior to flowering, mechanical treatment measures such as hand pulling, burying, or burning can be used to eradicate invasive plants. Mechanical treatment of Canada thistle (*Cirsium arvense*) and orange hawkweed (*Hieracium aurantiacum*) may prevent and destroy these weeds; however, monitoring and further treatment will likely be necessary.

Chemical - Treatment measures include applying herbicides at specific growth stages. Any herbicide application will be in compliance with the Integrated Pest Management Act. To minimize any risks related to an herbicide application program, Taseko will follow product specified guidance and industry standard practices, use personnel/contractors that are licensed herbicide applicators that are knowledgeable in spraying operations and have the appropriate equipment; and, utilize effective herbicides that have the lowest persistence in the environment possible.

Biological - Regional programs[2] to manage certain invasive species using biological methods will be supported by Taseko Mines. If biological control measures are used, a stringent protocol for releasing beneficial insects must be followed in order to measure the effectiveness of the program.

3.4 MONITORING PROGRAM

Monitoring will be conducted as required to assess treatment success, to gauge the efficacy of prevention plans, and track the spread of invasive plants.

Taseko Mines will monitor their operations to prevent the introduction or spread of invasive plant populations. Monitoring for invasive plants will be integrated into the environmental monitoring programs with procedures that identify corrective actions as necessary.

[2] Cariboo Regional District, Fraser Basin Council, and Grasslands Conservation Council of BC

4 – NEXT STEPS

Once approval for mine development has been granted, the Invasive Plant Management Plan will be implemented. Immediate actions will include:

- Identify invasive plant locations in the Project footprint and monitor yearly (i.e. disturbed soil, roads, landings, staging areas)
- Identify any outbreaks of noxious weeds listed under the *Weed Control Act* and report these to the onsite Environmental Monitor
- Create a database of invasive plants and noxious weed locations for the annual monitoring program using the IAPP database for information storage
- Establish measures for inclusion in the Construction and Vegetation and Wildlife Environmental Management Plans to avoid introduction of invasive plant seeds or material (e.g., contract specifications, establishment of vehicle and equipment cleaning stations, limiting driving across open grasslands)
- Include invasive plant monitoring in the environmental monitoring programs
- Educate employees, contractors, and clients about managing invasive plants
- Establish treatment and prevention programs specific for Canada thistle (*Cirsium arvense*) and orange hawkweed (*Hieracium aurantiacum*), known to be in the Project area, to avoid further spread, as per the *Weed Control Act*.
- Engage with the CCCIPC (currently, a Taseko employee is a member of this committee).
- Engage First Nations, local landowners, regulatory agencies, range tenure holders and other stakeholders to communicate Taseko's weed management strategies, obtain input, and as required, modify the plan as required by changes in regulations or the environment.

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