

Tulsequah Chief Mine ACB Transportation System

Wildlife Management Plan



Prepared for
Redfern Resources

Submitted by
Gartner Lee Limited

February 2008

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Table of Contents

	Page
1. Introduction.....	1
1.1 Objectives	1
1.2 Adaptive Management Approach.....	2
2. Wildlife Mitigation	4
2.1 General Procedures and Best Management Practices	4
2.2 Procedures and Practices for the ACB Transportation System	7
2.3 Procedures and Practices for Project Roads	8
2.4 Procedures and Practices for Camps, Landings and Other Infrastructure Areas.....	10
3. Wildlife Monitoring Program.....	11
3.1 Wildlife Incidents and Observations	11
3.2 Effects of the ACB Operation	12
3.3 Effects of the Project Roads.....	14
3.4 Grizzly Bear Monitoring	15
3.5 Ungulate Monitoring	16
3.6 Effects on Trumpeter Swan Nesting	17
3.7 Effects on Bald Eagle Nesting.....	17
3.8 Effects on Amphibian Breeding.....	18
3.9 Reporting.....	19
3.10 Review and Revision.....	19
4. Literature Cited	20

List of Figures

Figure 1. Tulsequah Chief Mine Wildlife Management Plan Area	3
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Appendices

- A. Wildlife Log and Wildlife Incident Report Form
- B. Operational Procedure Sheets

1. Introduction

The Tulsequah Chief Mine Project is located on the Tulsequah River in northwestern British Columbia, approximately 10 km north of its confluence with the Taku River. Currently the Mine has a valid Project Approval Certificate, issued under the British Columbia Environmental Assessment Act in 1998 and subsequently re-issued in 2002. It has also received a positive screening pursuant to the Canadian Environmental Assessment Act, and a Special Use Permit from the Province of British Columbia for the construction and operation of a limited access, all-season road from Atlin B.C. to the Tulsequah Chief Minesite. Recently, Redfern Resources Limited (Redfern) identified that year-round use of Air Cushion Barges (ACBs) on the Taku River represents a technically, financially and environmentally preferable option for shipment of mine supplies and mineral concentrate to and from the Tulsequah Chief Mine.

In August 2007, an assessment of the potential environmental effects associated with the ACB transportation option was presented in the document *Tulsequah Chief Mine ACB Transportation System Volume 2: Supporting Information for the BC Project Approval Certificate Amendment and The Alaska Coastal Zone Consistency Review* (GLL 2007a). This assessment reviewed the potential environmental effects related to year-round use of the ACB transportation system, which includes the ACB and the associated tug and amphitrac towing vessels; the ACB access road, which extends from the end of the previously reviewed road (the limestone quarry south of the Tulsequah Chief Mine) to the ACB landing site; and the ACB landing site. Additional detailed assessments of the potential effects of the proposed ACB transportation system on wildlife and wildlife habitat have also been completed (GLL 2008).

An outline of a Wildlife Management Plan (WMP) for the protection of wildlife and wildlife habitat values was developed by AXYS Environmental Consulting Ltd. (AXYS 2004) that focused in a large part on the access road and its effects. This Plan builds upon that document, providing more detailed prescriptions, guidelines and strategies to deal with construction and operations of the Tulsequah Chief Mine and associated infrastructure.

1.1 Objectives

The purpose of the Wildlife Management Plan (WMP) is to outline practices and procedures aimed at preventing, minimizing or mitigating potential adverse effects of the proposed ACB transportation system (the Project) on wildlife and wildlife habitats. It also outlines components that need to be considered when developing potential monitoring programs designed to monitor effects of the Project on key wildlife species and habitats throughout the life of the mine. The WMP includes a review process that employs adaptive management triggers to provide an early warning in the event that Project effects exceed predictions and will identify unanticipated Project-related impacts on wildlife and wildlife habitats.

1.2 Adaptive Management Approach

The WMP is based on the principles of adaptive management. Management strategies and guidelines will be closely monitored and, if the management strategies are found through monitoring to be less effective than predicted, improvement of those strategies will be employed to ensure that Project effects are minimized. Monitoring regimes will attempt to both determine any project effects on wildlife throughout the project life, as well as reduce current uncertainties surrounding wildlife populations. The wildlife management plan, therefore is not a static design but will continually evolve based on the results of future data collection as well as input from government, First Nations and members of the public.

The WMP and associated monitoring programs will be reviewed regularly in consultation with the BC Ministry of Environment (MOE), Canadian Wildlife Service (CWS), Alaska Department of Fish and Game (ADF&G), US Department of Fish and Wildlife (USFW) and Taku River Tlingit First Nation (TRTFN) to determine the effectiveness of the wildlife management strategies. Any wildlife incidents and/or mortalities will be examined at this time and if necessary, adjustments will be made to the WMP.

1.2.1 Study Area

The study area for the wildlife management plan is based on the study area used for the Tulsequah Chief Mine ACB Transportation System, which includes the lower Tulsequah and Taku Rivers and Taku Inlet (see Figure 1). It includes the roads, materials laydown areas, ACB landing site and ACB route. During the assessment of effects of the ACB transportation system, the direct and indirect effects were not expected to extend beyond the height of land. The resulting area encompasses approximately ~40,000 ha in BC and ~86,000 ha in Alaska.

The study area is located in the Coast Mountains Ecoprovince and the Boundary Ranges Ecoregion (Demarchi 1995). Based on information obtained through the various terrestrial ecosystem mapping projects conducted in the area, three BEC subzones occur in the study area: Coastal Western Hemlock wet maritime (CWHwm), the Mountain Hemlock moist maritime leeward variant (MHmm2) and Alpine Tundra (AT) (Banner *et al.* 1993). The terrain of the property can generally be described as large floodplain within steep, rugged mountains. Based on TRIM data, elevation ranges from approximately 0 to 1500 meters above sea level.

1.2.2 Species and Habitats

The Wildlife Management Plan, while covering the broad range of species that occur within the study area, focuses on species of interest that were identified during the environmental assessment process. Species of interest which specific mitigation measures have been developed for their habitat or protection include moose, black and grizzly bear, harbour seal, wolf, fisher, bald eagle, trumpeter swan and western toad. Other species and species groups such as wolverine, river otter, marine mammals, forest birds, waterfowl, shorebirds, raptors and amphibians are considered using generalized mitigation measures. Woodland caribou and mountain sheep, although present along the previously proposed road to Atlin, are not present in the current study area and are therefore not included as species of interest.

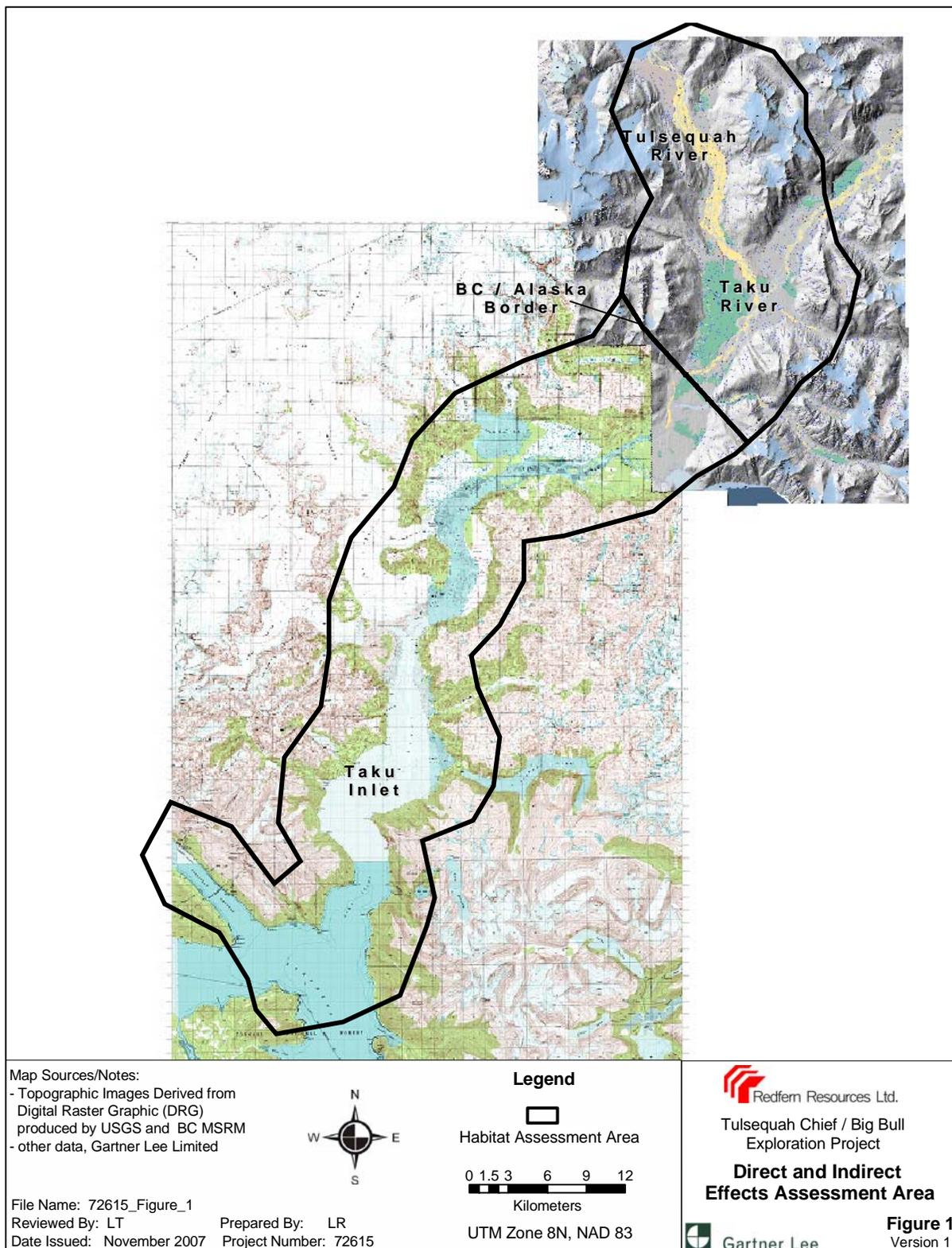


Figure 1. Tulsequah Chief Mine Wildlife Management Plan Area.

2. Wildlife Mitigation

The BC Environmental Assessment Office defines mitigation as “measures implemented to control, reduce or eliminate a potential adverse impact of a project, including restorative measures” (BC EAO 2003). During the environmental assessment process, Redfern has committed to several mitigation measures in relation to the protection of wildlife habitat, the prevention of wildlife incidents and wildlife mortalities, and the maintenance of wildlife movement and distribution. These mitigation measures were developed through consultation with government, wildlife experts, resource agencies and TRTFN in response to the findings of the baseline studies.

2.1 General Procedures and Best Management Practices

A number of general mitigation measures have been proposed to limit the effects of the project on wildlife; these policies and practices will apply year-round to project activities throughout the construction, operations and reclamation phases of the Tulsequah Chief project. General mitigation measures include the following:

- Employee education and awareness of the WMP policies, guidelines and programs.
- Implementation of wildlife-human interaction procedures, which will include Bear Aware training, safe working distances from wildlife and designation of on-site personnel to respond to and follow-up on wildlife incidents.
- Implementation of No Firearms and No Hunting/Fishing Policies for employees.
- Implementation of a Waste Management Plan (a separate document) that minimizes and disposes of attractants to wildlife.
- Implementation of a Sediment Control Plan and Water Management Plan (separate documents) that minimizes impacts to plants and ecosystems, wildlife health and wildlife habitat.
- Policies related to the operation and construction of project roads, landing areas, camps and other infrastructure areas.
- Guidelines on the operation of the ACB and related tugs and amphitracs.

These policies and procedures are discussed in greater detail in following sections.

2.1.1 Employee Education and Awareness

The following will be incorporated into an employee education and awareness program:

- To ensure that the wildlife management plan is carried out, all Redfern employees and subcontractors will be educated on the policies and practices contained within the Plan.
- All employees will be provided with Bear Aware Training and training in wildlife awareness.

2.1.2 Wildlife-Human Conflict Management Program

A key concern in all aspects of the Tulsequah Chief project is the protection of humans and wildlife. The Wildlife-Human Conflict Management Program is aimed at minimizing or preventing wildlife problems through the management of food and garbage, training of employees, treatment of problem animals, and the establishment of procedures and policies on wildlife management.

General wildlife-human interaction policies include the following:

- Any dogs on-site must be controlled to avoid harassment of wildlife. Uncontrolled dogs found harassing wildlife will be removed from the Project site.
- Workers must refrain from all interactions with wildlife unless crew safety is at risk.
- Birds, nests and eggs must be left intact. If an active nest is directly near or in the path of the construction work, a no-work zone will be established and crews will work in another area until birds have vacated the nest.
- Employees will not feed or harass wildlife and will be discouraged from watching and photographing wildlife unless minimum safe distances are maintained.
- All human/wildlife conflicts and incidents will be reported and documented (see section on Wildlife Incidents and Observations under the Wildlife Monitoring Program).
- All significant wildlife features, such as nests and dens will be documented and reported to a designated employee responsible for wildlife incidences (see section on Wildlife Incidents and Observations under the Wildlife Monitoring Program).
- If windows, power lines, or other infrastructure components are found to result in the deaths of birds, measures such as placement of streamers on wires and raptor silhouettes in windows may be taken.
- When working away from camp, employees will maintain a minimum distance of 50-200 m from animals that may pose a risk to the employee (e.g. bears, wolves, moose) and from wildlife sensitive to disturbance (e.g. nesting waterfowl, nesting raptors, marine mammals).

2.1.2.1 Employee Safety, Training and Behaviour

- All field crew members should complete an instruction course in Bear Aware (videos and training are available through <http://www.bearaware.bc.ca>).
- Personal bear deterrents, such as air horns, bear spray and/or bear bangers should be available to all staff. Staff working in remote areas should be carrying personal bear deterrents and two-way radios. (Note that pilots must be informed when transporting personal bear deterrents by aircraft.) Noise devices should not be used unnecessarily, to avoid unwarranted disturbance to other wildlife.
- When working outside, personnel should be aware of any visual or auditory barriers that may contribute to surprising bears and other wildlife (e.g. noise of river).
- While working outdoors, if an employee encounters an animal exhibiting signs of aggression or if the employee feels that the animal represents a legitimate threat to their health and safety, employees will immediately vacate the area and report the incident to the a Redfern employee designated to handle wildlife incidents.

- If a wildlife threat is identified in an area (e.g. a problem bear), warnings will be posted at various sites to inform employees of the potential risk.

2.1.2.2 *Prevention and Treatment of Problem Animals*

- Only trained staff will respond to a situation with a problem animal.
- Several on-site employees will be designated and trained in methods of deterring and moving animals away from hazardous areas, such as roads, camps and other mine infrastructure. At least one trained employee and preferably two employees will be on-site at all times.
- Only designated on-site personnel will be authorized to carry firearms, which may be employed if human life is at risk; however non-lethal bear management techniques aimed at avoid the destruction of wildlife will be employed wherever possible.
- Personnel responsible for firearms at the work site must be trained in proper operation, transportation and storage, and must have all necessary permits and certification. Approved firearms training programs will consist of a Rifle Qualification Course or a Shotgun Qualification Course. Re-certification is required on an annual basis. Courses are available through the Ministry of Attorney General, Police Services Branch, the Justice Institute of BC, or through private training contractors or agencies.
- All dead animals in close proximity to the Project footprint will be reported immediately and a Wildlife Incident Report filled out. Carcasses will be removed to a minimum of 1 km from mine facilities, or incinerated.
- The designated employees will be trained in the use of wildlife incident and observations forms. All wildlife incidents will be documented and tracked (see section on Wildlife Incidents and Observations under the Wildlife Monitoring Program).
- Bear use of habitats near mining infrastructure (e.g. spring foraging by bears in road right-of-ways and other disturbed areas, late summer and fall feeding on spawning salmon near project infrastructure) will be monitored and documented (see section on Wildlife Incidents and Observations under the Wildlife Monitoring Program). Additional monitoring and mitigation measures may be developed in response to this information.
- The Ministry of Environment must be informed of any incidents with bears or other wildlife.

2.1.2.3 *Camp and Infrastructure Organization*

- Electric fencing will be used around camps to discourage bears and other wildlife from entering camp areas. Electric fencing may be used around other infrastructure, if required. Spare parts should be on hand to prevent lengthy breakdowns.
- All buildings and stairs should be skirted to discourage their use by wildlife.
- Blind spots around buildings should be eliminated, where possible.
- All building exits should have windows to prevent surprising wildlife.
- Vegetation, including trees and berry-producing shrubs, should be cleared along walking routes near project infrastructure.

2.1.2.4 Waste Handling and Disposal

The Waste Management Plan will minimize and dispose of attractants such as garbage, food wastes and other edible and aromatic substances. The following guidelines are incorporated into the plan:

- Attractants will be incinerated with a minimum time allotted for storage.
- All food and stored garbage should be kept in bear-proof areas or bear-proof containers.
- Any grease, oils, fuels or antifreeze stored on-site must be stored in bear-proof areas or containers.
- Incinerator spare parts will be stored on-site to prevent lengthy breakdowns and subsequent extended waste storage.

2.1.2.5 Firearms, Hunting, Fishing and Vehicle use Policy

All Project-related employees will abide by the following concerning firearms, hunting fishing and vehicle use while on-site or traveling to and from the site using company-provided vehicles:

- Firearms will be used on-site by authorized personnel only.
- No hunting or fishing by Project-related staff (i.e. Redfern employees or contractors) will be permitted.
- No hunting will be permitted by anyone within 500 m of the Project footprint for safety reasons, as well as for wildlife protection.
- No private vehicles, including ATVs and snowmobiles will be permitted on-site unless prior permission is obtained from Redfern.
- Signage will be posted at the barge landing site and other potential access points along the Tulsequah River informing the public of these policies.
- Redfern will implement an Observe, Record and Report policy, encouraging employees to report any suspicious activity related to wildlife. An on-site employee will be designated to be responsible for obtaining this information and passing the information on to the appropriate responsible agency (e.g. MOE, ADF&G).

2.2 Procedures and Practices for the ACB Transportation System

The ACB will be towed by a conventional shallow draft tug operating during the open-water season, and by an amphibious vessel called an amphitrac when the river is frozen during the winter. This system will operate year-round on the Taku River from its confluence with the Tulsequah River to the Taku Inlet. From there, a conventional ocean going tug will transport the ACB to the port of Juneau.

All reasonable efforts will be made to minimize disturbance and injury to wildlife resulting from barge operations, although crew safety will take precedence. Crews will keep daily logs of wildlife sightings that will document species, locations and other pertinent information.

Policies and guidelines pertaining to ACB operations during construction and operations include the following:

- During the open water season, to the greatest extent possible, the barge route will follow the middle of the main channel to avoid disturbance to wildlife on the riverbanks.
- Throughout the year, when wildlife are encountered swimming in open water, or walking exposed gravel bars, or on river ice during the winter, or using shoreline habitats, the barge will maintain a 200 m distance, if possible.
- Wildlife sightings and locations of significant wildlife features will be recorded and mapped to provide crews with information that could be used to avoid these areas (see section on Wildlife Incidents and Observations under the Wildlife Monitoring Program)
- The barge will strive to maintain a 200 m buffer distance from significant wildlife features and habitats, such as active dens and nests, seal haul-outs and wildlife congregations (e.g. rafting birds).
- In conjunction with the no hunting/no fishing policy, the ACB will not transport trapping, fishing or hunting equipment (the exception being firearms required by the employee designated to handle wildlife incidents). Additionally, the transport of wildlife carcasses on the ACB is prohibited.

2.2.1 Seasonal Procedures and Practices

Specific seasonal guidelines to reduce wildlife disturbance from the operation of the air cushion barge include the following measures:

- During freeze-up and break-up, where shelf ice thickness is less than three inches, barge operations will keep to the middle, open water to avoid breaking ice and maintaining open water longer than would normally occur.
- During freeze-up and break-up, where shelf ice thickness is three inches or greater, barge operations will keep to shelf ice areas, avoiding open leads in the mainstem as much as possible to minimize breaking ice and maintaining open water longer than would normally occur.
- During breeding season (May 1 to July 31), surveys will be performed to identify the locations of active eagle and other raptor nests. Maps will be prepared to outline known active nests and provided to the ACB crews. Crews will maintain a minimum distance of 200 m from active nests, when possible.

2.3 Procedures and Practices for Project Roads

General, year-round policies and procedures related to project roads include the following:

- Where feasible and where they will not impede visibility along the road for drivers, vegetation screens adjacent to roads will be retained and maintained to provide visual and sound barriers.

- During construction, culverts and/or tunnels will be installed near high-use wildlife areas such as wetlands to allow safe road crossing by amphibians and small mammals. Where necessary, amphibian drift fences will be installed to direct these species to the culverts.
- Retain shrub cover in riparian areas and maintain hydrology flows and aquatic connections.
- Brush and timber from road clearing will be widely distributed or piled and burned so as not to create barriers to wildlife movement.

2.3.1 Seasonal Procedures and Practices

Seasonal policies related to the construction and operation of project roads include the following:

- Efforts will be made to schedule road construction clearing outside of the breeding period for migratory birds, including raptors (May 1 to July 31). If vegetation removal and road right-of-way construction is required during this period, nest surveys will be performed by qualified personnel to identify active nests, which will then be protected by a 50 m buffer zone until juveniles have fledged.
- Spring and summer amphibian migration in the vicinity of roads and other infrastructure will be monitored and documented. Crossing culverts and low amphibian fencing will be installed in high-use areas to reduce amphibian mortalities. Such mortalities will be documented and, if found to be excessive, additional mitigation steps will be taken.
- During the winter, snow will be pushed to lower slopes as much as possible (not banked). Snow banks will be contoured to be 1 m or less, and as low and narrow as possible near high value areas such as wetlands.
- If necessary, gaps will be created in the snow banks to allow wildlife to cross the road; it is recommended that there be crossing opportunities at least every 400 m.
- No salt-based agents will be used for ice melting in high-use winter wildlife areas or as dust-reducing agents in the summer.

2.3.2 Road Use and Traffic Management

The following will guide road use and traffic management:

- A maximum traffic speed of 40 km/hr will be posted and enforced on all roads. Lower maximum speeds may be posted in the vicinity of sensitive wildlife areas, such as wetlands or known crossing areas.
- A temporary (movable) signage system will be employed to inform vehicle operators of temporary vehicle/wildlife conflict areas.
- Vehicle operators will yield right-of-way to wildlife and will take all reasonable measures to avoid vehicle-wildlife incidents.
- All vehicles will be equipped with two-way radios and drivers will immediately inform the designated employee of any wildlife incidents, conflicts or potential conflicts.

- To reduce noise along project roads, the use of “Jake” brake engine retarders will be avoided.
- Whenever possible, use of the roads will be minimized during dusk and dawn periods when many animal species may be most active and when visibility is low.

2.3.3 Road Usage Restrictions

The following road usage restrictions will be in effect:

- Unauthorized road traffic, including ATVs and snowmobiles will be restricted from using the road at the barge access landing.
- Signage will be posted at the barge access informing the public of the private status of road and the prohibition of unauthorized use.
- Any use the site by unauthorized persons will be reported and designated personnel will immediately investigate.

2.3.4 Road Maintenance

The following guidelines will be incorporated into a road maintenance policy:

- Roadside reclamation and vegetation management strategies will minimize wildlife attraction to the road. An approved seed mixture using native, non-forage species will be used for re-vegetation of disturbed areas.
- Herbicides will not be used for vegetation control in the vicinity of wetlands and other sensitive wildlife habitat.

2.4 Procedures and Practices for Camps, Landings and Other Infrastructure Areas

General, year-round policies and procedures for landing areas, camp facilities and other infrastructure areas related to the Tulsequah Chief Mine are outlined below. Note that policies and practices outlined for other project components but which also apply to activities occurring within the camp or mine areas may also apply. For example: vehicle operation within landing and camp areas is expected to comply with the policies outlined under Project Roads.

Policies include the following:

- Where possible, re-vegetation of disturbed areas will include the planting of approved native seed mixtures.

2.4.1 Seasonal Procedures and Practices

Specific seasonal guidelines to reduce the effect of construction activities relating to preparation of the ACB landing site and nearby storage and marshalling area on wildlife include the following measures:

- Efforts will be made to schedule infrastructure construction clearing outside of the breeding period for migratory birds, including raptors (May 1 to July 31). If vegetation removal and road right-of-way construction is required during this period, nest surveys will be performed by qualified personnel to identify active nests, which will then be protected by a 50 m buffer zone until juveniles have fledged.

3. Wildlife Monitoring Program

The determination of project effects and the impact that those effects will have on the surrounding environment is a difficult and imperfect process (BC EAO 2003). As a result, it is important to set up effective monitoring programs to ensure that project effects do not exceed the predicted impacts. Through the implementation of monitoring programs and an adaptive management approach to wildlife mitigation, Redfern will ensure that mitigation practices are effectively managing project effects and impacts to local wildlife are minimized.

The following sections summarize potential options for monitoring the effects of the current project on wildlife and wildlife habitats. They are intended only as **suggestions** to guide the development of a relevant monitoring program. Exactly which monitoring programs will be required for the development and operation of the Tulsequah Chief Mine and the ACB transportation systems and what those programs will entail will be determined in consultation between Redfern, government regulators, the TRTFN and potentially, concerned members of the public.

Due to the potential cost of some of these programs, the possibility of additional funding from outside sources will be investigated. As well, some of the monitoring programs may be conducted in conjunction with the TRTFN, various government agencies and/or other interested parties.

3.1 Wildlife Incidents and Observations

To monitor local wildlife populations and assist in identifying potential problems areas, it is recommended that Redfern develop a reporting and tracking process for wildlife incidences and wildlife observations. These records should be reviewed periodically and, if necessary, additional measures should be taken to prevent further incidences. The potential monitoring program may look something like the following.

Measurable Indicators

- Number of wildlife incidents (interactions between an animal and a human or human property where either (1) the animal is harmed, (2) the person is harmed, (3) the person is threatened, or (4) significant property damage occurs).
- Number of wildlife observations – can be analyzed by species, area, time of year, etc.

Monitoring Study Design Considerations

- Designation of an employee to record wildlife incidents and pass to responsible agencies when required (i.e. when wildlife or person is injured).
- Mandatory reporting of all wildlife incidents.
- Reporting and tracking of wildlife observations to assist in monitoring local wildlife populations.
- Provide incident forms and/or wildlife log to staff. Could provide incentives for employees to report observations (i.e. a monthly draw for prizes).
- Periodic review of wildlife incident and wildlife observation records and generation of summary reports. Analyze reports for issues or potential problems such as seasonal concentration areas or sections of road along which there is a high incidence of collisions or near miss.

Potential Thresholds

- Set maximum standards for wildlife incidents based on areas – i.e. camp, mine site, sections of road; or based on species – i.e. bear incidents per year.
- Implement measures to combat potential problems, i.e. increase signage and/or post lower speed limits along potentially problematic sections of road; post site-specific warnings, provide staff bulletins.

3.2 Effects of the ACB Operation

To answer questions about the effects that the operation of the ACB and tug will have on local wildlife, various monitoring programs could be developed. Several of the potential programs are described in the following sections.

3.2.1.1 Effects on Winter Movement of Wildlife

This program would look at the effect of the ACB system on the winter movement of animals across and along the frozen Taku River. The monitoring might focus on particular species of management concern such as moose and wolves.

Measurable Indicators

- Number of successful crossings and the number of deflections (animals turned back) along the ACB track.
- Number of tracks following the ACB track (using the ACB track as a travel corridor).

Monitoring Study Design Considerations

- Data should be compared to baseline information on current wildlife crossings of, and movements along the Taku River in the winter.

- May also want to consider the number and location of snowmobile tracks along the river.
- Would likely involve periodic ground-based sign transects along the Taku River, may be able to conduct aerial transects of the transportation corridor.

Potential Thresholds

- Significant decrease in the number of successful river crossings.
- Significant increase in the movement of animals, particularly predators such as wolves, up and down the river (using the ACB track).

3.2.1.2 Reaction of Wildlife to ACB Movements

This program would look at the effect of the ACB movements on the behaviour of animals along the transportation corridor. Monitoring would likely include a wide variety of species ranging from waterfowl swimming in the Taku River and Inlet to moose or bears foraging along the riverbanks, from seals on the river ice, to mountain goats on the cliffs above the river.

Measurable Indicators

- The level of disturbance exhibited by wildlife during the passage of the ACB.
- Distance of ACB to wildlife and level of reaction

Monitoring Study Design Considerations

- This could involve having observers on the ACB, situated along the barge route or positioned at a vantage spot overlooking a portion of the barge route.
- Observers might record data such as distance between the ACB and the wildlife species, the number and species observed, wildlife behaviour and habitat use prior to, during, and after ACB passage, and level of disturbance exhibited by wildlife during ACB passage including distance retreated if animals moved away from the ACB.
- May also involve periodic aerial surveys along the ACB transportation corridor to document habitat use and population levels.

Potential Thresholds

- A significant level of disturbance exhibited by specific species or species groups during ACB passage.
- Distance that disturbance was observed and level of disturbance exhibited.

3.2.1.3 Effects on Harbour Seal Use of River Ice

This program would look at the effect of the ACB transportation system on the use of river ice by harbour seals. Due to the limited information available during the approval phase of the project, surveys would initially be conducted to delineate the temporal and spatial extent of the use of river ice by seals, determine the number of seals using the habitat and determine the activities for which the ice is used, in

particular, whether pupping is occurring on the river ice. Monitoring would then look at the impact that ACB movements had on these activities and habitats.

Measurable Indicators

- Number of seals using the river ice.
- The timing and spatial extent of the use of river ice by seals.

Monitoring Study Design Considerations

- Periodic aerial surveys may be conducted to determine population size and the temporal and spatial extent of habitat use.
- Ground-based observations may be used to determine seal behaviour on river ice.
- May be done in conjunction with the monitoring program looking at the Reaction of Animals to Barge Movements (see above section).

Potential Thresholds

- Significant decrease in the number of seals using the river ice.
- Significant change in the temporal or spatial extent of the use of river ice by seals.

3.3 Effects of the Project Roads

To minimize project effects as a result of the 12 km haul road to the ACB landing site, it is recommended that a monitoring program focussed on wildlife movements around this section of road be initiated. Ideally, this program would identify high movement areas along the road and may result in decreased speed limits and increased signage in certain areas. The monitoring program for all roads related to the project, including the 12 km haul road to the landing site, would include the following elements:

Measurable Indicators

- Wildlife mortalities along roads.
- Wildlife road crossings.
- Wildlife habitat use along roads.

Monitoring Study Design Considerations

- Should be done in conjunction with the Wildlife Incidents and Observations program.
- Ground-based habitat use studies along project roads, including sign transects and plots, to monitor seasonal habitat use and identify high use areas and movement corridors.
- May include species-specific surveys such as monitoring culverts for fisher use and if necessary, modifying access during the winter so that fisher can continue to enter and exit culverts.

- May include seasonal components looking at differing effects in various seasons, for example the effect of snow banks along project roads in winter.

Potential Thresholds

- Significant number of wildlife mortalities along roads.
- Significant decrease in number of wildlife crossings.
- Significant decrease in wildlife use of habitats along project roads as compared to baseline levels.

3.4 Grizzly Bear Monitoring

To ensure that project effects on grizzly bear are minimized and to monitor the long-term project effect on grizzly bears, it is recommended that Redfern develop a grizzly bear monitoring program. This program would be developed and based on work previously conducted in the area. Depending on the level of detail required, this monitoring program might include evaluations of project-related changes in bear abundance, mortality, movements and seasonal habitat use throughout the life of the project.

Measurable Indicators

- Grizzly population levels and population trends within a designated study area.
- Seasonal habitat use by grizzly bears within a designated study area.
- Movement patterns by grizzly bears within a designated study area.

Monitoring Study Design Considerations

- Sign transects and/or plots in seasonal habitats to monitor habitat use.
- Track surveys to monitor movements and/or population trends
- Radio or GPS collaring of grizzly bears in the study area to monitor their movements and habitat use patterns.
- Mark-recapture surveys to monitor population trends and possibly seasonal habitat use. This could involve DNA analysis of hair samples collected from snare stations. If radio collaring of bears is conducted, mark-recapture surveys to also be conducted via aerial-based counts, ground-based counts or camera capture using the radio-collared animals as the marked portion of a mark/recapture population.

Potential Thresholds

- Significant decrease in population size.
- Significant change in habitat use.

3.5 Ungulate Monitoring

To ensure that project effects on ungulates are minimized, it is recommended that monitoring of the local mountain goat and moose populations be conducted. This monitoring may include evaluation of project-related changes to abundance, mortality and seasonal habitat use and may be conducted over a large study area (e.g. moose winter use) or be restricted to areas of possible conflict with the project (e.g. mountain goat use of the cliffs along the Taku River near the Taku Lodge during ACB passage). The ungulate monitoring program may look at the project effect on moose movements, particularly in the winter when ACB travel along the Taku River may create barriers to moose movements. In relation to ungulate mortality, the monitoring program may also track wolf movements and moose kill locations in relation to the ACB route and project roads.

Measurable Indicators

- Ungulate population levels and population trends within a designated study area.
- Seasonal habitat use by ungulates within a designated study area.
- Movement patterns by ungulates, particularly moose, within a designated study area.
- Movement patterns by wolves within a designated study area.
- Number and location of moose kill sties.

Monitoring Study Design Considerations

- Aerial-based counts at the regional scale to look at population levels and seasonal habitat use.
- Ground-based habitat use studies, including sign transects and plots to monitor seasonal habitat use.
- Observational studies to determine habitat use and behaviour patterns related to project activities, particularly ACB passage (see the section on Reaction of Animals to Barge Movements).
- Radio or GPS collaring of moose using habitats within the Taku River floodplain to monitor their movements and habitat use patterns.
- Reporting and tracking of moose kills by wolves; this may be done as a component of the Wildlife Incidents and Observations monitoring program.

Potential Thresholds

- Significant decrease in ungulate population size.
- Significant increase in mortality due to wolves.
- Significant change in ungulate habitat use.
- Significant changes in ungulate movement, particularly decreases in movement along the ACB transportation corridor.

3.6 Effects on Trumpeter Swan Nesting

Based on concerns expressed by the US Fish and Wildlife Service and the TRTFN, it is recommended that Redfern monitor swan nesting near the ACB transportation system area to ensure that project activities do not have a detrimental effect on swan reproduction. This monitoring would likely include periodic nest counts, and possibly an evaluation of nesting success.

Measurable Indicators

- Number of breeding pairs nesting within a designated study area.
- Habitats used by breeding pairs.
- Trumpeter Swan productivity within a designated study area including number of eggs, number hatched, and number fledged.

Monitoring Study Design Considerations

- Breeding and/or productivity surveys conducted periodically within suitable habitats within a designated study area. These should be conducted as per Resource Inventory Committee (RIC) standards and may include aerial surveys, ground-based surveys and/or observation stations.
- Should decreasing productivity be observed, where possible monitoring may include determination of the causes and whether they may be related to project effects. For example examining the cause of nestling deaths.

Potential Thresholds

- Significant decrease in number of breeding pairs nesting within a designated study area.
- Significant decrease in productivity of nesting swans.
- Significant change in habitats used by breeding swans.

3.7 Effects on Bald Eagle Nesting

In order to ensure that project effects on bald eagles within ACB transportation route area are minimised, it is recommended that Redfern monitor bald eagle nesting within ACB transportation route area. This monitoring would likely include periodic nest counts, occupancy surveys and possibly an evaluation of nesting success.

Measurable Indicators

- Number of breeding pairs nesting within the ACB transportation route, could include number of nests, and nest occupancy.
- Location of nests used by breeding pairs.

- Bald eagle productivity within the ACB transportation route possibly including number of eggs, number hatched, and number fledged.

Monitoring Study Design Considerations

- Breeding and/or productivity surveys conducted periodically within suitable habitats within the study area. These should be conducted as per Resource Inventory Committee (RIC) standards and may include aerial surveys, ground-based surveys river-based surveys and/or observation stations.

Potential Thresholds

- Significant decrease in number of breeding pairs nesting within the ACB transportation route.
- Significant decrease in productivity of nesting bald eagles.
- Significant change in habitats used by nesting bald eagles, particularly abandonment of nests in close proximity to the ACB transportation route.

3.8 Effects on Amphibian Breeding

An amphibian monitoring program is recommended that would monitor the project effects on breeding amphibians, particularly Western Toad which are a species of Special Concern under COSEWIC (BC CDC 2008). This program may focus on specific areas where project components are expected to have the most effect on breeding amphibians, for example, along the 12 km ACB access road. Due to the limited information available on amphibian breeding sites during the approval phase of the project, the monitoring project would need to confirm the location of suspected breeding areas prior to commencement.

Measurable Indicators

- Species breeding near the ACB access road and ACB landing site.
- Number, location and extent of breeding areas.
- Relative abundance of breeding individuals.
- Movement of amphibians to and from breeding ponds.

Monitoring Study Design Considerations

- A variety of survey methods may be used to achieve the program goals. These may include auditory surveys, time-constrained searches or systematic surveys of potential or known breeding habitats, dip netting or larval surveys, live trapping using gee-traps, pitfall or funnel traps, and mark-recapture surveys.

Potential Thresholds

- Significant decrease in number of breeding individuals of each species breeding near the ACB access road and landing site.
- Significant change in use of breeding areas.
- Significant mortality in amphibians accessing breeding areas.

3.9 Reporting

Reporting on the results of wildlife monitoring is a necessary component of the adaptive management process. The various monitoring programs may require different levels of reporting including employee reporting and periodic reporting of monitoring results.

3.9.1 Employee Reporting

- A component of any monitoring program requiring employee participation – for example the proposed Wildlife Incidents and Observations Program will involve the creation of one or more forms which will be made available to employees
- May want to provide incentives to encourage employee participation – for example a yearly draw for prizes based on number of observations reported
- For the Wildlife Incidents and Observations Program, required forms include: a wildlife log (for observations) and a wildlife incident report form (for wildlife incidents or 'near miss' situations)

3.9.2 Reporting Monitoring Results

- Periodic reporting on the results of the wildlife monitors – may be annual, semi-annual, etc
- Involves a detailed report of the monitoring activities which occurred during the monitoring period, the results of the monitoring activities and an analysis of these results, including, where applicable, a comparison of the monitoring results to pre-mine conditions.
- Reports will be used to assess the effectiveness of the mitigation procedures and practices.

3.10 Review and Revision

As a final step in the adaptive management process, monitoring results will need to be periodically reviewed and assessed to determine whether mitigation policies are having the expected result and minimizing project effects. If review determines that project effects are exceeding expected impacts, revision of mitigation processes may be required. Revision of monitoring programs may also be required

if mitigation processes are changed or if the review process finds that the current monitoring activities are insufficient in determining project effects. This process will include:

- Establishment of thresholds within the various monitoring programs, which, if crossed, will trigger a review and revision in mitigation measures
- Periodic review of monitoring reports by biologists, government regulators and Redfern representatives which will look at the individual and collective results of the monitoring programs to determine whether any thresholds have been crossed or whether monitoring results indicate a problem
- Additionally, if those involved in the monitoring process notice that monitoring results demonstrate that a threshold has been crossed, they should immediately bring it to the attention of the appropriate persons
- If thresholds are crossed or if monitoring programs detect a significant impact to a particular species or group of species, mitigation measures relating to the species and project activities involved will be reviewed and revised to correct the problem and minimize the project effect.

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Appendix A

Wildlife Log Form

Wildlife Risk/Incident Report Form

Wildlife Incident/Risk Report

If a staff member has an incident, "near miss" incident, or identifies a situation that may pose or could have posed a risk to wildlife, they must complete this report immediately and bring it to the attention of the Supervisor, Project Manager.

Observer(s): _____
Supervisor / Manager: _____
Date / Time: _____

Incident Type (circle one): vehicle collision, near collision, (vehicle Type: barge, boat, truck, helicopter, all terrain)
other: _____

Incident Results (circle one): death, injury, defensive behaviour, no injury, other: _____

Describe Results: _____

Exact Location: _____

Habitat Description: _____

Species: _____ **Number:** _____

Sex: _____ **Age Class:** _____

Wildlife Activity: _____

Description of Incident: _____

Corrective Action Suggested: _____

Corrective Action Completed By: _____

Signature: _____

Date: _____

Copies of this report to: Resource Agency Supervisor/Manager Employee

Appendix B

Operational Procedure Sheets

These sheets are yet to be developed, but would be single page employee-level sheets outlining the polices and guidelines suitable for posting on and around the project site.