



Section A

Project Introduction

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A. PROJECT INTRODUCTION

A.1 BACKGROUND

Benga Mining Limited (Benga), a wholly owned subsidiary of Riversdale Resources Limited (Riversdale), is proposing to develop a nominal 4.5 million clean tonnes per year steelmaking coal mine, referred to as the Grassy Mountain Coal Project (the Project). The Project is located in southwest Alberta, approximately 150 km southwest of Calgary ([Figure A.1.0-1](#)), in the Crowsnest Pass, and will cover areas within Townships 08 and 09 and Ranges 03 and 04, West of the 5th Meridian. The proposed steelmaking coal processing facility is planned to be located approximately 7 km north of the community of Blairmore.

The Project will involve a surface steelmaking coal mine, a coal handling and preparation plant (CHPP) with associated infrastructure, an overland conveyor system, which will parallel an existing high grade access corridor and connect to a rail load-out facility, and a new section of rail track ([Figure A.1.0-2](#)). The Project components have also been shown with an aerial photograph on [Figure A.1.0-3](#). The topography in the vicinity of the Project is steep and varies from 1,350 m in the south near the proposed rail load-out facility to 2,025 m in the north ([Figure A.1.0-4](#)). Land ownership in the vicinity of the Project is a combination of crown and private land ([Figure A.1.0-5](#)). There is also an incidental activity associated with the Project as the part of the local golf course will be impacted by the rail load-out and will need to be relocated. The relocation is shown on [Figure A.1.0-6](#).

The intention of the Project is to re-establish a historical coal mine on Grassy Mountain, to ship high quality steelmaking coal to overseas steel producers. To do this the projected labour requirements will involve approximately 700 person-years of construction labour and 400 full time positions during operation. The Project is expected to provide significant economic stimulus to the Municipality of Crowsnest Pass and the Municipality of Ranchlands, as well as to the neighbouring communities to the west (*e.g.*, Sparwood, Elkford, and Fernie).

Benga is applying for a provincial coal mine permit, associated mine and disposal area licenses and a steelmaking coal processing plant approval as per the Alberta Coal Conservation Act which is administered by the Alberta Energy Regulator (AER). Benga is also applying for a *Canadian Environmental Assessment Act* approval which is administered by the Canadian Environmental Assessment Agency (CEAA). Also included are the applications with respect to the *Alberta Water Act*, *Alberta Public Lands Act* and the *Alberta Environmental Protection and Enhancement Act* (EPEA).

These applications are being supported and accompanied by an Environmental Impact Assessment (EIA) report, which is being provided to both the AER and the CEAA. This assessment follows the

Terms of Reference (ToR) established for the Project issued by the AER on March 19, 2015 ([Appendix 1](#)) and the *Guidelines for the Preparation of an Environmental Impact Statement* issued by CEAA on May 14, 2015 ([Appendix 2](#)). In addition to these guidance documents, the *Guide to Preparing Environmental Impact Assessment Reports in Alberta* (Government of Alberta 2013a) and the *Draft Technical Guidance for Assessing Cumulative Environmental Effects* under the *Canadian Environmental Assessment Act, 2012* (CEAA 2014) were also referred to. Information requirements for both agencies are provided in the application, with agency specific concordance tables provided in [Appendix 1](#) and [Appendix 2](#).

A.2 PROJECT COAL TYPE OVERVIEW AND PROJECT NEED

Benga has the opportunity to develop a world class steelmaking coal mine supplying global, seaborne markets and further enhancing Canada's reputation as a supplier of high quality steelmaking coal to the world's largest steel makers who continue to be key players in global growth and industrialization. At full production, Grassy Mountain will be one of the largest single site sources of steelmaking coal to have been developed in the past few decades using the most modern mining technology. The development will have a substantial long term positive effect on the local Crowsnest Pass economy in addition to providing a number of benefits to the province of Alberta, including diversifying the resource revenue base and providing significant economic stimulus in southern Alberta.

A.2.1 Coal Classification

Coal is formed from ancient swamps and bogs become buried in sediment. Over time the increasing sediment layer increases the temperature and pressure exerted on the coal. The process of converting an organic substance into coal is called carbonization. Mountain building processes also contribute to the carbonization and in opportune locations bring the coal beds closer to the surface.

There are four basic types of coal ([Figure A.2.1-1](#)). In order of increasing maturity they include:

1. Lignite
2. Sub-bituminous
3. Bituminous
4. Anthracite

Coal can be classified from a geological perspective by its rank, which is a measure of the age and conditions under which the coal was originally formed. Coal rank, also referred to as reflectance, can be measured using petrography, where samples of coals are tested for the amount of light they reflect. Low rank coals (lignite and sub-bituminous coals) have low reflectance and, due to being younger with higher moisture content and lower carbon content. High rank coals (bituminous and anthracite

coals) conversely have higher reflectance, are typically older (with some exceptions), and have lower moisture and higher carbon contents. The coal quality testing program, which included historical sampling data and recently completed core hole sampling/testing has indicated that the coal at Grassy Mountain is a high ranking coal. Please refer to [Section B.4.2](#) for further details on the coal quality testing program.

A.2.2 Steelmaking Coal versus Thermal Coal

Coal can also be broadly classified according to its utilisation as either a thermal (energy) coal or as a metallurgical (steelmaking) coal ([Figure A.2.1-1](#)). Thermal coals (also known as steam coals) are suitable for commercial use in industries such as power generation, heating, and cement manufacture. Metallurgical coals (also known as coking coals) are primarily used in steel production and include coking coals and pulverized coal injection (PCI) coals. Anthracitic coals, including semi-anthracite and anthracite, can also be used in steel making as a PCI fuel and in specialized industries. The coal at Grassy Mountain is steelmaking coal.

A.2.3 Coal Occurrence

Coal occurs widely throughout the world in basins deposited millions of years ago. The youngest coals (lignite) were deposited during the Miocene Era from 20 million years ago, and the oldest coals were laid down during the Carboniferous Era up to 390 million years ago. Coal age does not necessarily reflect the thermal or metallurgical properties. These properties are a function of the burial depth and geothermal gradient, which is how quickly the coal is transformed from the original formation in peat swamps to the current rank.

The Grassy Mountain deposit was formed during the late Jurassic to Early Cretaceous Periods, approximately 150 million years ago.

A.2.4 Steelmaking Coal

Thermal coal is relatively widespread throughout the world; however, steelmaking coal (or metallurgical coking coal) is less widespread. The correct conditions required for coking coal to form, including the original plant matter and geothermal gradient, are limited to certain regions and basins. The unique property that determines if a coal is coking coal is its ability, when heated, to soften and become plastic and then, on further heating, to re-solidify into a coke. The typical temperature range for plasticity is around 425°C to 500°C.

Within the steelmaking (coking) coal classification there are a number of sub-types based on the hardness of the coke that can be produced. This ranges from weak or semi-soft coking, semi hard, and hard coking coal (HCC). Only a limited number of basins and areas within those basins contain HCC. The majority of seaborne-traded HCC is produced in Australia, Canada, USA, and Russia.

China produces as much HCC as the rest of the world, but virtually all of it is consumed within the country. While the price of thermal coal is usually dictated by its calorific value, the price of coking coal is determined by the hardness of the coke that can be produced from the coal. HCC receives the highest prices. The index developed to compare the coke strength of various coking coals is known as the coke strength after reaction (CSR), which is defined by:

- hard coking coal – >60 CSR;
- semi-hard coking coal – 35-60 CSR; and
- weak/semi-soft coking coal – <35 CSR.

The steelmaking coal found in Grassy Mountain is a hard coking coal.

A.2.5 Testing of Steelmaking Coal

There are a large number of specialized tests that help classify and therefore determine the marketability of steelmaking coal. While not intended to be a complete list, the main tests include:

- CSR – This is a laboratory test done on the coke to simulate the conditions in a blast furnace; the higher the number the harder the coke. The highest cokes typically have a CSR of 72-74. The Grassy Mountain steelmaking coal CSR has been tested to be in the mid-60s.
- CSN (Crucible Swelling Number) – This is a simple test in which a measured sample of powdered coal is heated until it forms a “button” of coke and compared against an empirical scale of 0-9. HCC is usually >6. The Grassy Mountain steelmaking coal CSN is >6.5.
- Residual ash and impurities including ash, sulphur and phosphorous – The lower the levels, the harder the coke. The Grassy Mountain steelmaking coal has low sulphur and phosphorous contents and has a product ash content that is competitive in global seaborne markets.
- Carbon and Volatile Matter Content – HCC can range from low volatility to high volatility. The Grassy Mountain steelmaking coal has medium volatility (~23%).
- Ash Chemistry (the makeup of minerals in the residual coke ash) – This is usually summarised as the Basicity Index (BI, the ratio of basic minerals to acidic minerals). A low BI is conducive to making a HCC. The Grassy Mountain steelmaking coal has a low BI.
- Vitrinite Content (the measure of bright particles or macerals in the coal) – Vitrinite assists the plasticity and fusibility of the coal during the coking process. However, to make a good, hard coke there needs to be a combination of bright and inert particles to collectively bind together (similar to cement and aggregate needed to make concrete). The Grassy Mountain steelmaking coal’s vitrinite content is at the lower end; however, it will blend well with coals with higher vitrinite content.

A.2.6 Steel Making Process

Steel making is typically carried out using the blast furnace/basic oxygen furnace or the electric arc furnace using recycled scrap steel. The purpose of the blast furnace is to convert iron ore into pig iron. The basic oxygen furnace then converts, with the addition of alloys, the pig iron into steel.

Iron ore and coke are alternatively introduced into the top of the blast furnace in layers in conjunction with a limestone flux. Coke, produced from steelmaking (coking) coal has four main roles in the blast furnace:

- fuel (thermal) - about 80% of heat from burning coke;
- chemical (reductant) – converts iron oxides into liquid iron called “hot metal”;
- mechanical (supports burden) - mechanically strong enough (hence HCC) to support mass of burden and resist abrasion during decent into furnace; and
- porosity (free draining) - hot metal and combustion gas can flow through it with minimal resistance

No other material can replace all four roles of coke in a furnace. Additional information on the steel making process and its dependence on coking coal can be found here:

- <http://www.steel.org/making-steel/how-its-made/processes/processes-info/coke-production-for-blast-furnace-ironmaking.aspx>; and
- <http://www.worldcoal.org/coal/uses-coal/how-steel-produced>.

Modern integrated steel-making facilities will typically consist of stockpiles of coking coal, PCI coal, fine and lump iron ores, coke batteries, sintering plants (to consolidate iron ore fines), PCI grinding mills, blast furnaces, and basic oxygen furnaces (Figure A.2.1-1).

A.2.7 Project Need

Benga completed an Engineering Feasibility Study on the Project in October 2015 and is committed to bringing the Project into the production phase. The Project has been designed to ensure it is economically sustainable such that employees and other stakeholders, including the local community and nearby Aboriginal Groups, can be confident it will continue to operate throughout its 20+ year life and hence make key decisions accordingly. The Project is located on a disturbed site from past mining activities that have not been rehabilitated appropriate to modern day standards. As a result, throughout the engineering design, Benga has been conscious of ensuring the Project is environmentally responsible and sustainable, not only throughout its operating life but also to ensure it capable of appropriate rehabilitation at the conclusion of its life. A unique opportunity exists in this case to have the site rehabilitated to a better state at the conclusion of mining that it currently presents

today. Environment and local stakeholder safety has been a key component of the design and has resulted in new technologies being included in the design that are yet to be utilized in the Canadian coal industry. Examples of some of these new technologies are discussed further in [Section C \(Project Description\)](#), [Section C.2.4.6.2](#) (hyperbaric disk filter technology – resulting in no dryer requirement) and [C.2.4.6.3](#) (reject dewatering – resulting in no tailings pond).

Benga has already secured key contracts in respect of the export port on the west coast of Canada for the product and is in discussions with a number of off-take parties in North Asia (*e.g.*, Japan, South Korea) and South America who are considered to be the key customers for the high quality Grassy Mountain product. Other markets that will likely purchase some of the product include Europe, China, and India although these are not the core markets for Grassy Mountain.

While seaborne steelmaking coal markets are currently depressed due to subdued demand and recent capacity expansions at a number of mines, Benga is confident that Grassy Mountain product will be well received into the market based on numerous discussions with potential off-takers to date. The steelmaking (hard coking) coal product from Grassy Mountain is low in impurities and would be considered an attractive steelmaking coal for many of the largest steel makers to include in their coke oven operations to produce good quality steel for their domestic and international customers. In looking ahead, the seaborne steelmaking coal market is expected to be in balance in 2019 with new high quality supply required after that to assist the developing nations to continue on their strong growth and to maintain appropriate growth in the developed nations. The strong growth is expected to be led by India and China although other Asian, South American and African nations are also expected to be increasingly important contributors to global growth over the coming decade. As the steel intensity per capita of these countries increase, with greater demand for infrastructure, automobiles, machinery, buildings and other steel consuming industries, the ability to source high quality coking coal from countries that can provide reliable supply such as Canada is vital. Canada is also strategically located in respect to a number of these countries from a freight point of view compared to other major seaborne steelmaking coal suppliers.

If there are delays in the overall Project schedule the key impacts will be economical as Benga has signed contracts with Westshore Terminals for reserved port space, and will be charged these costs at the time the contract commences. A delay in getting coal to the port would result in considerable port charges being incurred without any revenue generation. Another impact that might occur with delays to the Project could be with the potential customers who may have a contractual relationship to purchase coal from Benga. There are often penalties associated with non-delivery and sometimes the contracts can be cancelled.

The Project will create economic benefits for a significant portion of the local and regional population. In concert with its environmental responsibilities, Benga, through the development of the Project, will

drive major economic development, employment and community benefits for the local region and neighboring Aboriginal Group communities.

Development of the Project will provide the following benefits:

- receipt of revenue in the form of production royalties, licence fees and taxes by municipal, provincial and federal governments;
- a material diversification of revenue for both the municipal and provincial governments given the limited metallurgical coal developments in the Crowsnest Pass and Alberta;
- material economic development in southwest Alberta, an area that is trailing the remainder of Province economically;
- use of goods and services provided by local, regional and provincial contractors and retailers;
- opportunities for Alberta and Canadian (with a focus on the local public and Aboriginal Groups) engineering firms, contractors, manufacturers and suppliers to compete in the supply of goods and services;
- employment which includes skilled, well paid, full time positions; and
- development of the Project in an environmentally responsible manner and one that allows the full rehabilitation of the Grassy Mountain area at the conclusion of the project in a fashion that is much more sustainable long term than prior mining in the area has currently left it.

A.3 PROJECT PROPONENT

A.3.1 Proponent Overview

Riversdale is an Australian based coal exploration and development company that is focused on hard coking coal projects with the potential to be developed into mines supplying coking coal into the seaborne market. Riversdale is a privately held company whose corporate structure and management team is comprised of a Board of Directors and individuals with decades of experience in all aspects of coal mining in Canada (where it operates as Benga), Africa, and Australia.

Benga acquired the Grassy Mountain, Bellevue, Adanac, and Lynx properties from Devon Canada and CONSOL of Canada (50/50 Joint Venture) in 2013 ([Figure A.3.1-1](#)). Post-acquisition, Benga have focussed their interest on the Grassy Mountain property, which comprises approximately 2,800 ha of the total Crowsnest Pass acquisition. Development efforts to date have included the pre-feasibility study work, a re-evaluation of the historical coal quality data, and the development of a detailed engineering feasibility study. Using the Feasibility Study as the base, a subsequent Optimization Study was completed which has resulted in a positive impact on the Project's economics and resource recovery. The Optimization Study provided the basis of the Project description ([Section C](#)) and subsequent assessment of potential environmental impacts.

Benga has an office located in the town of Blairmore in the Crowsnest Pass and have 10 full time employees and dozens of consultants working on the Project. Benga's goal is to become a significant participant in the seaborne steelmaking coal market through the development of high quality coking coal projects located in North America. The Company's main assets are:

- Crowsnest Pass Complex: the Grassy Mountain Coal Project, and other coal lease and exploration leases associated with the Adanac, Lynx, and Bellevue leases; and
- Chickaloon Project: a coking coal exploration/development project located in Alaska, United States.

A.3.2 Proponent Contact Information

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A.4 PROJECT LOCATION

The Project is located north of the town of Blairmore in the Crowsnest Pass region of Alberta ([Figure A.1.0-1](#) and [A.4.0-1](#)). The proposed Project footprint includes:

- the open pit coal mine
 - UTM Zone 11, NAD 83 686155 E, 5507278 N
 - Latitude: 49.68924, Longitude: -114.41896

- North, central and south rock disposal areas (NRDA, CRDA, SRDA):
 - NRDA:
 - UTM Zone 11, NAD 83 685110 E, 5509268 N; and
 - Latitude 49.70744, Longitude -114.43249.
 - SRDA:
 - UTM Zone 11, NAD 83 686278 E, 5503500 N; and
 - Latitude 49.65525, Longitude -114.41905.
 - CRDA:
 - UTM Zone 11, NAD 83 685929 E, 5505994 N; and
 - Latitude 49.67776, Longitude -114.42270.
- a CHPP with associated infrastructure:
 - UTM Zone 11, NAD 83, 685063 E, 5504029 N; and
 - Latitude 49.66038 Longitude -114.435620.
- a coal load-out facility and rail loop:
 - UTM Zone 11, NAD 83 684211 E, 5499119 N; and
 - Latitude 49.61652 Longitude -114.44972.

The components of the Project are listed in [Table A.4.0-1](#) and are shown on [Figure A.4.0-1](#).

Table A.4.0-1 Summary and Spatial Extent of Project Components		
Project Component	Component Area (ha)	Percentage of Development (%)
Coal Handling Processing Plant and Infrastructure	94.1	6.2
Coal Load-Out and Railway Loop	33.1	2.2
Construction Camp	1.9	0.1
Haul Road	0.3	<0.1
Ponds and Ditches	74.6	4.9
Powerline, Access and Conveyor RoW	15.2	1.0
Proposed Pipeline/Service Road Right of Way	1.5	0.1
Reclamation Material Storage	37.9	2.5
Ultimate Pit Extent	632.4	41.6
Ultimate Rock Disposal Extent	589.9	38.8

Project Component	Component Area (ha)	Percentage of Development (%)
Proposed Replacement Golf Course Area ¹	38.1	2.5
Proposed Helipad Access ¹	1.6	0.1
Total Mining Activities Reclamation Area	1,481.0	97.4
Total Non-Mining (Recreational) Area ¹	39.7	2.6
TOTALS²	1,520.7	100

¹ Benga Reclamation Responsibility include “incidental physical activities” identified by CEAA (Canadian Environmental Assessment Agency 2015).

² Due to rounding of values, totals may not equal the sum of the individual values presented in the table.

The topography of Grassy Mountain consists of rounded hills at lower elevations with moderate to steep grade slopes at higher elevations. The regional area is characterized by relatively high relief, with numerous valleys where watercourses are present (Figure A.1.0-4). Major ridgelines and valleys are generally oriented north-south, causing precipitation run-off and local groundwater to flow generally east-west downslope, away from topographic highs towards watercourses. Blairmore Creek and Gold Creek flow in a north to south direction along the western and eastern margin of the proposed Mine Permit Boundary, respectively, before discharging into the Crowsnest River. Their headwaters are generally located at high elevations (2,100 m asl), and their discharge point is at 1,390 m asl.

The Project is located in the Rocky Mountain Natural Region, which is characterized by highly variable topography, geology, and vegetation. The north to south and east to west variation in bedrocks across this Natural Region result in the highly variable physiographic nature of this region and the characteristic vegetation distributions. The vegetation is indicative of the Montane and Subalpine Natural Subregions, which are characterized as follows:

- Montane Natural Subregion – characterized by a pattern of open forests and grasslands, with modal sites having forested stands of Douglas fir, lodgepole pine, white spruce, aspen, or mixtures of all. The Montane Subregion occurs at lower elevations than the Subalpine Subregion and has warmer and drier climatic conditions as a result. Limber pine may be present, but is commonly restricted to dry, exposed ridge tops. Abrupt changes in vegetation can occur over very short distances due to high variability in microclimates from differing aspects, slope positions, and wind exposure (Natural Regions Committee 2006).

- Subalpine Natural Subregion – occurs at high elevations on strongly rolling ridges and lower slopes of mountains, often with bedrock near the surface (Archibald *et al.* 1996). A broad range of vegetation species are characteristic of on mesic sites due to significant variations in elevation. Vegetation communities at lower elevations are characterized by closed canopy forests of lodgepole pine, Engelmann spruce, and subalpine fir. Whitebark pine is found at higher elevations where the forest canopy is generally more open (Archibald *et al.* 1996).

Within this region, Benga is submitting an integrated application package for a Coal Mine Permit and for an open pit mine licence and three rock disposal area licences, which will allow mining operations to occur. The proposed Mine Permit Boundary covers 3,701.4 ha and described in [Table A.4.0-2](#) and shown on [Figure A.4.0-1](#).

Table A.4.0-2 Grassy Mountain Coal Project - Proposed Mine Permit Boundary		
Twp.-Rge.-Meridian	Section	Quarter Section / LSD
08-03-W5M	18	LSD 05,06,11,12,13,14
	19	SW, NW
	30	LSD 03,04,05,06,10,11,12,13,14,15
	31	LSD 03,04,05,06,11,12,13,14,15
09-03-W5M	06	LSD 02,03,04,05,06,11,12,13,14
	07	LSD 03,04
08-04-W5M	02	LSD P03,P04,05,06,11,12,13
	03	LSD P07,P08,09,P10,P11,P13,P14,15
	09	LSD P01
	11	LSD 04,05,12,13
	13	LSD 05,06,07,08,09,10,11,12,13,14,15,16
	14	LSD 03,04,05,06,07,08,09,10,11,12,13,14,15,16
	23	All
	24	All
	25	All
	26	All
	35	All
36	All	

Twp.-Rge.-Meridian	Section	Quarter Section / LSD
09-04-W5M	01	All
	02	All
	11	LSD 01,02,03,04,07,08
	12	LSD 01,02,03,04,05,06

In regards to the rock disposal areas; as part of Benga’s Mine Optimization Study, it was decided to split the SRDA into two parts to avoid relocating an existing high voltage power line. A 150 m wide corridor centred on the powerline will divide the two parts. The SRDA licence is the portion located to the south of the existing powerline. The CRDA licence contains the ex-pit rock dumped on the north side of the powerline along with the in-pit portion of the rock disposal area, as the two eventually become contiguous. The NRDA licence includes the ex-pit portion of the rock disposal located to the northwest of the grassy mountain open pit. These boundaries are shown on [Figure A.4.0-1](#) and are described in [Tables A.4.0-3](#) through [A.4.0-6](#).

Twp-Rge-Meridian	Section	LSD
08-03-W5M	30	4,5,12,13
	31	4,5,12,13
08-04-W5M	23	1,8,9,16
	24	3,4,5,6,11,12,13,14
	25	All
	26	1,8,9,16
	35	1,8,9,16
	36	All
09-03-W5M	6	4, 5, 12, 13
09-04-W5M	1	1,2,3,4,6,7,8,9,10,11,15,16
	2	1

Table A.4.0-4 South Rock Disposal Licence Boundary		
Twp-Rge-Meridian	Section	LSD
08-04-W5M	13	5,6,7,8,9,10,11,12,13,14,15,16
	24	1,2,3,4,5,6,7,8,9,10,11,12

Table A.4.0-5 Central Rock Disposal Mine Licence Boundary		
Twp-Rge-Meridian	Section	LSD
08-03-W5M	30	4,5,12,13
	31	4,5,12,13
08-04-W5M	23	1,2,7,8,9,10,15,16
	24	All
	25	All
	26	1,2,7,8,9,10,15,16
	35	1,2,7,8,9,10,15,16
	36	All

Table A.4.0-6 North Rock Disposal Mine Licence Boundary		
Twp-Rge-Meridian	Section	LSD
08-04-W5M	35	14,15,16
	36	13,14
09-04-W5M	1	3,4,5,6,11,12,13,14
	2	1,2,3,6,7,8,9,10,11,14,15,16
	11	1,2,7,8
	12	3,4,5,6

No federal lands exist within the Mine Permit Boundary (A.4.0-2). The nearest federal land to the Project includes the Piikani Reserve (approximately 45 km east) and the Peigan Timber Limit 147B

(approximately 30 km east). Also, the townsite of Coleman, which borders the Project on the southwest, is listed as a National Historic Site of Canada.

Several National Parks and National Historic sites exist within southwest Alberta and southwest BC. The National Parks (NPs) in the area include (Figure A.4.0-2):

- Waterton Lakes NP (55 km south from the Project);
- Banff NP (100 km northwest from the Project);
- Kootenay NP (145 km northwest from the Project); and
- Yoho NP (225 km northwest from the Project).

Nearby National Historic Sites in the vicinity of the Project include:

- Coleman (immediately southwest of the Project);
- Head-Smashed in Buffalo Jump (56 km east from the Project);
- Territorial Courthouse (73 km east from the Project);
- Fort McLeod (73 km east from the Project);
- First Oil Well in Western Canada (75 km southeast from the Project);
- Prince of Wales Hotel (79 km southeast from the Project);
- Bar U Ranch (82 km north from the Project);
- Fort Steele Heritage Town (87 km west from the Project);
- Old Woman's Buffalo Jump (100 km from the Project);
- Turner Valley Gas Plant (110 km north from the Project); and
- Turner Valley Oilfield (110 km north from the Project).

Some land parcels within the Mine Permit Boundary are located on Provincial Crown Land. The Land Use Consultant Report ([CR10, Section 4.9](#)) details surface land ownership associated with the parcels of land on which the Project will be located. Alberta Provincial Parks (Chinook Provincial Park), Provincial Recreation Areas (PRA) (Coleman PRA, Crowsnest Lake PRA, Island Lake PRA, and Lundbreck Falls PRA), Wildland Provincial Parks (WPP) (Livingstone Range WPP, Castle WPP, and High Rock WPP), and a BC Provincial Park (Crowsnest Provincial Park) occur in the vicinity of the Project (*i.e.*, within 20 km from the Project centre) ([Figure A.4.0-3](#)). These areas are all considered Provincial Crown Land.

A.5 REGULATORY FRAMEWORK

In Alberta, the Project is regulated by the AER under the EPEA and the *Coal Conservation Act (CCA)*. As the Project proposes to produce 4.5 million clean metric tonnes (CMT) of metallurgical coal per year, it is a mandatory activity that requires the preparation and submission of an EIA report as per Schedule 1 of the Environmental Assessment (Mandatory and Exempted Activities) Regulation.

In Canada, the Project is regulated by the CEAA under the *Canadian Environmental Assessment Act*. Section 16(d) of the *Regulations Designating Physical Activities* states the Project triggers CEAA 2012 and it has been determined that an environmental assessment will be required for the Project. CEAA has confirmed the Project will be subject to a “panel review”. CEAA has requested that the AER participate in a joint panel review and the AER has not confirmed their participation. Additional details of the regulatory framework are provided in the following sections of this report.

A.5.1 Provincial Legislation

A.5.1.1 Environmental Protection and Enhancement Act – EIA Report

This application and EIA report has been prepared as required under Section 44(1) (a) of the EPEA. Section 44(1)(a) of EPEA “Where a proponent or a proposed activity is referred to the Director under section 41, where the Director gives a notice under section 43 or where a proponent on the proponent’s own initiative consults with the Director in respect of the application of this Division to a proposed activity, the Director shall, (a) if the proposed activity is a mandatory activity, direct the proponent by order in writing to prepare and submit an environmental impact assessment report in accordance with this Division.”

Schedule 1, Sections (g) and (h) under EPEA states “(g) a surface coal mine producing more than 45,000 tonnes per year; (h) a coal processing plant within the meaning of the *Coal Conservation Act*.”; consequently, as the proposed production of the Project is 4.5 million CMT per year, an EIA is mandatory.

The following outlines the key steps (and associated dates) that the Project has been through in the AER process:

- Project Description was submitted on September 29, 2014;
- AER informed Benga that an EIA was required on November 21, 2014;
- Benga submitted the proposed terms of reference (PToR) for the Project on November 17, 2014;
- the public advertising period for the PToR ran from December 08, 2014 to January 08, 2015; and
- the AER approved the Project final terms of reference (FToR) on March 19, 2015.

This application and EIA report have been prepared in accordance with the FToR issued by the AER. A concordance table of the requirements listed in the ToR and where they have been addressed in this document is included in [Appendix 1A](#).

A.5.1.2 *Environmental Protection and Enhancement Act* – EPEA Operating Approval

Information has been included in this Application that supports the requirements of the EPEA Operating Approval that is required for the Project. A concordance table has been prepared that identifies the requirements under EPEA for an Operating Approval that identifies where the information have been provided in this Application ([Appendix 1B](#)).

A.5.1.3 *Coal Conservation Act* Applications for AER

Benga is applying for approval for a Mine Permit under the CCA (Part D Development, Operation and Abandonment of Mines, Section 10(1) (b)) that will allow Benga to prepare applications for approval to mine coal at the Project. This technical application has been prepared to provide the AER with the information to approve the mine activities and issue a Mine Permit Approval as required under Section 10(1)(b) which states *“No person shall develop a mine site or mine, without first applying for, and obtaining, a permit from the Board.”*

Benga is also applying for approval for a new coal processing plant under Section 23(1)(a) which states *“No person shall (a) construct or begin operations at a new coal processing plant, without applying for, and obtaining, an approval from the Board. “* This technical application provides the information required to approve the new coal processing plant.

Benga will also require authorization under the CCA (Section 11) to develop, operate and reclaim the surface mine, associated rock disposal areas and Project infrastructure. Section 11 states *“11 No person shall (a) begin mining operations at a site at which mining operations have not previously been undertaken, (b) begin mining operations at an abandoned mine, or (c) resume mining operations at a mine at which normal working has been suspended for a period of more than 12 months, without first applying for, and obtaining, a licence from the Board.”* Benga is applying for approvals for the following CCA licences:

- Pit Licence;
- North Rock Disposal Area Licence (NRDA);
- Central Rock Disposal Area Licence (CRDA); and
- South Rock Disposal Area Licence (SRDA).

A concordance table has been prepared that identifies the requirements under the CCA for the Licences that identifies where the information have been provided in this Application ([Appendix 1C](#)).

A.5.1.4 *Water Act* – Fence-line Approval

Benga will require approvals to capture, collect, treat and manage surface runoff and groundwater as part of the water management program including development of an end pit lake. Information has been provided in support of this application regarding the activities and need for these approvals.

A concordance table has been prepared that identifies the requirements under the *Water Act* for the Fence-line Approval that identifies where the information have been provided in this Application ([Appendix 1D](#)).

A.5.1.5 *Water Act* – Licence(s) to Divert

Benga will require approvals for surface and groundwater diversion licences and approvals under the *Water Act*. Information has been provided in this application regarding the activities and need for these approvals, in support of the EIA report ([Appendix 1E](#)). This information is only partially completed as the South Saskatchewan River Basin is closed to the issuance of additional surface water allocations, so Benga must acquire licences from current users. It takes considerable time and financial resources to purchase existing licences and also adds considerable risk to the Project to complete these types of transactions at this stage. Benga understands that complete documentation is required prior to transfers occurring or licences being issued to Benga.

A.5.1.6 *Public Lands Act*

The Project will involve both privately owned lands and lands owned by the crown. Benga will obtain agreements from the private lands to use them for different components of the Project. All activities proposed for crown lands will require public lands dispositions to be obtained to allow surface development to occur. It is likely this will require the issuance of a mineral surface lease (MSL) accommodate surface development. Benga is applying for these dispositions at this time and the supporting information is provided in [Appendix 1F](#).

A.5.1.7 Concordance Tables

As part of the requirements to address all the provincial legislative requirements for this Project, a number of concordance tables have been prepared to help the reviewers and stakeholders to find the appropriate information in this Application. These concordance tables include:

- [Appendix 1A](#) – EIA Final Terms of Reference;
- [Appendix 1B](#) – EPEA Operating Approval Application;
- [Appendix 1C](#) – *Coal Conservation Act* Licence Applications;
- [Appendix 1D](#) – *Water Act* – Fence-line Approval;
- [Appendix 1E](#) – *Water Act* – Transfers and Diversion Licences; and

- [Appendix 1F](#) – Public Lands Application.

A.5.2 Federal Legislation

A.5.2.1 *Canadian Environmental Assessment Act, 2012*

The Project falls within the *Canadian Environmental Assessment Act 2012, Regulations Designating Physical Activities*, Section 16(d), which identified that the designated Project involves “*The construction, operation, decommissioning and abandonment of a new coal mine with a coal production capacity of 3,000 t/d or more.*” The Project proposes to produce approximately 11,000 tonnes per day (t/d) of metallurgical coal and is therefore subject to an environmental assessment (EA). The following are key dates that occurred in the CEAA process:

- Project Description was filed with CEAA on March 26, 2015;
- the 45 advertising period for the review of the Project Description began on March 30, 2015 to make the determination if an environmental assessment was required (as per Section 10, *Canadian Environmental Assessment Act 2012*);
- it was determined that an EA was required on May 14, 2015 which was the date of the EA commencement (as per Section 14, *Canadian Environmental Assessment Act 2012*);
- the CEAA Draft Guidelines for the Project were prepared and posted for comment on May 14, 2015;
- the CEAA Guidelines for the Project were finalized on June 13, 2015;
- the Project was referred to the Federal Minister of Environment for a determination of the review process that CEAA would be engaged in; and
- the Federal Minister of Environment provided CEAA with a decision that the Project would go to a Review Panel on July 16, 2015.

This application and EIA report (EIS under federal terminology) has been prepared in concordance with Section 19, *Canadian Environmental Assessment Act 2012* and the Guidelines for the Preparation of an Environmental Impact Statement pursuant to the *Canadian Environmental Assessment Act, 2012 – Grassy Mountain Coal Project*. A concordance table of the requirements provided in the guideline document and where they have been addressed in this document is included in [Appendix 2A](#). Benga is seeking an approval under *Canadian Environmental Assessment Act 2012* from the Federal Minister of Environment.

As part of the requirements to address all the federal legislative requirements for this Project, a number of concordance tables have been prepared to help the reviewers and stakeholders to find the appropriate information in this Application. These concordance tables include:

- [Appendix 2A](#) – CEAA Guidelines Concordance;
- [Appendix 2B](#) – Impact Ratings for CEAA Valued Components;
- [Appendix 2C](#) – Impact Ratings for Other Valued Components; and
- [Appendix 2D](#) – Mitigations and Commitments.

A.5.2.2 *Fisheries Act*

Benga will be seeking approvals under Section 35(2) of the federal *Fisheries Act*, as a result of the assessment and predicted impacts to some of the tributaries to Gold Creek and Blairmore Creek. Benga is NOT seeking approvals at this time, but information in this application supports the assessment and ultimate approval for these activities. Additional field work and data analysis is planned over the next few months and Benga plans to file the Section 35(2) application in Q1, 2017.

A.5.2.3 *Species at Risk Act*

Benga will comply with the *Species at Risk Act* (SARA). There is one known SARA listed fish species present in Gold Creek (westslope cutthroat trout – *Oncorhynchus clarkii lewisi*) and one terrestrial vegetation species found within the proposed development area (whitebark pine – *Pinus albicaulis*). Recovery plans exist for both of these species, which Benga is aware of and will implement.

In addition to these SARA listed species, the following SARA listed wildlife species are reported to occur near the Project location: olive-sided flycatcher, common nighthawk, short-eared owl, and little brown myotis. Critical habitat has not yet been identified for these species by Environment Canada.

A.5.2.4 *Migratory Birds Convention Act*

Benga will comply with the *Migratory Birds Convention Act*.

A.5.3 Other Legislation Approvals/Authorizations Required

Benga intends to file both concurrent and separate applications for those parts of the Project that are legislated under various other statutes. Application and approval requirements applicable to the Project that are intended to be submitted under separate cover are:

- site surface disturbance clearance pursuant to the *Historical Resources Act* and regulations;
- development permits pursuant to Municipal District of Ranchland and Municipality of Crowsnest Pass Land Use Bylaws and the *Municipal Government Act* and regulations;
- electrical power interconnections issued pursuant to the *Electrical Utilities Act* and regulations;
- and

- pre-construction approvals to construct the access road and undertake site clearing and preliminary site preparation for the plant site to facilitate an efficient construction schedule to meet a second half of 2018 production start-up.

A.5.4 Application Guide and Description

This application to the AER and the CEAA has been integrated in accordance with AER FTOR and CEAA Guidelines to facilitate an efficient review by both the regulatory review agencies and the public. The Project application is presented in multiple volumes that consist of the following components:

Application and EIA Sections

- [Section A](#) – Project Introduction;
- [Section B](#) – Geology and Geotechnical;
- [Section C](#) – Project Description;
- [Section D](#) – Assessment Methodology;
- [Section E](#) – Environmental Impact Assessment;
- [Section F](#) – Conservation and Reclamation Plan;
- [Section G](#) – Stakeholder Engagement; and
- [Section H](#) – Aboriginal Consultation.

Supporting Appendices

- [Appendix 1](#) – AER Terms of Reference and Concordance Table:
 - [Appendix 1A](#) - EIA Final Terms of Reference;
 - [Appendix 1B](#) – EPEA Operating Approval Application;
 - [Appendix 1C](#) – Coal Conservation Act Licence Applications;
 - [Appendix 1D](#) – Water Act – Fence-line Approval;
 - [Appendix 1E](#) – Water Act – Transfers and Diversion Licences;
 - [Appendix 1F](#) – Public Lands Application;
- [Appendix 2](#) – CEAA Guidelines and Concordance Table:
 - [Appendix 2A](#) - CEAA Guidelines Concordance;
 - [Appendix 2B](#) – Impact Ratings for CEAA Valued Components;
 - [Appendix 2C](#) – Impact Ratings for Other Valued Components; and
 - [Appendix 2D](#) – Mitigations and Commitments.

- [Appendix 3](#) – Project Team;
- [Appendix 4](#) – Glossary and Acronyms;
- [Appendix 5](#) – References;
- [Appendix 6](#) – Public Engagement Records:
 - [Appendix 6A](#): Public Consultation Report;
 - [Appendix 6B](#): Media Examples;
 - [Appendix 6C](#): Public Notices; and
 - [Appendix 6D](#): Public Forum and Open House Material.
- [Appendix 7](#) – Aboriginal Consultation Records and TEK Reports:
 - [Appendix 7A](#): Treaty 7 First Nations Consultation Plan;
 - [Appendix 7B](#): Aboriginal Consultation Records:
 - [Appendix 7B\(i\)](#): Piikani;
 - [Appendix 7B\(ii\)](#): Kainai;
 - [Appendix 7B\(iii\)](#): Siksika;
 - [Appendix 7B\(iv\)](#): Stoney Nakoda;
 - [Appendix 7B\(v\)](#): Tsuut’ina;
 - [Appendix 7B\(vi\)](#): Samson Cree;
 - [Appendix 7B\(vii\)](#): Ktunaxa;
 - [Appendix 7B\(viii\)](#): Foothills Ojibway;
 - [Appendix 7B\(ix\)](#): Shuswap Band;
 - [Appendix 7B\(x\)](#): Metis Nation of Alberta; and
 - [Appendix 7B\(xi\)](#): Metis Nation of BC.
 - [Appendix 7C](#): First Nations Traditional Use Reports:
 - [Appendix 7C\(i\)](#): Kainai;
 - [Appendix 7C\(ii\)](#): Piikani;
 - [Appendix 7C\(iii\)](#): Siksika;
 - [Appendix 7C\(iv\)](#): Stoney Nakoda;
 - [Appendix 7C\(v\)](#): Tsuut’ina;
 - [Appendix 7C\(vi\)](#): Metis Nation Alberta; and
 - [Appendix 7C\(vii\)](#): Metis Nation British Columbia.
- [Appendix 7D](#): Management Frameworks:
 - [Appendix 7D\(i\)](#): Aboriginal Access Management Plan; and

- [Appendix 7D\(ii\)](#): Cultural Site Discovery Contingency Plan.
- [Appendix 8](#) – Traffic Impact Assessment;
- [Appendix 9](#) – Technical Reports:
 - [Appendix 9A](#): Golder - Grassy Mountain Project Waste Dump and Infrastructure – Supplemental (2015) Geotechnical Program. April 2016;
 - [Appendix 9B](#): Golder - Grassy Mountain Preliminary Pit Slope Stability Assessment. April 2015;
 - [Appendix 9C](#): Golder – Grassy Mountain Mini Pit Geotechnical Investigation and Pit Slope Stability Assessment. July 2016; and
 - [Appendix 9D](#): Terracon – Geotechnical Site Investigation of Waste Storage Dumps and Water Impoundment Structures at Grassy Mountain Coal Project. July 2016.
- [Appendix 10](#) – Geochemistry Reports:
 - [Appendix 10A](#): SRK – Grassy Mountain Geochemistry Characterization Report. July 2016;
 - [Appendix 10B](#): SRK - Grassy Mountain Water and Load Balance Report. July 2016; and
 - [Appendix 10C](#): SKR – Grassy Mountain Water Quality Management. August 2016.

Supporting Consultant Reports

- [Consultant Report #1a](#) – Air Quality Assessment Grassy Mountain Coal Project;
- [Consultant Report #1b](#) – Air Quality Assessment of Loadout Emissions;
- [Consultant Report #2a](#) – Noise Impact Assessment Grassy Mountain Coal Project;
- [Consultant Report #2b](#) – Noise Summary Rail Siding and Loadout Components;
- [Consultant Report #3](#) – Hydrogeology;
- [Consultant Report #4](#) – Hydrology;
- [Consultant Report #5](#) – Surface Water Quality;
- [Consultant Report #6](#) – Aquatic Resources;
- [Consultant Report #7](#) – Terrain and Soils;
- [Consultant Report #8](#) – Vegetation and Wetlands;
- [Consultant Report #9](#) – Wildlife;
- [Consultant Report #10](#) – Land and Resource Use;
- [Consultant Report #11](#) – Socio-Economic Impact Assessment; and
- [Consultant Report #12](#) – Human Health Risk Assessment.

A.6 DEVELOPMENT PLAN

A.6.1 Mine

The proposed mine plan involves ramping up clean coal production to an annual level of 4.5 million CMT per year over the first four years of the mine life. The mine has been scheduled to produce 4.5 million CMT/year for the first two thirds of the mine and then reducing to just under 4 million CMT/year for the remainder. The Project and will produce a single hard coking coal product from a blend of three seams.

The proposed mine is a truck/shovel operation where the rock overlying the coal seams will be drilled, blasted and excavated by mining shovels. The overburden rock will be loaded into haul trucks and then transported to designated disposal areas. The uncovered coal is then placed into trucks and hauled to the coal preparation plant for cleaning. This method is very similar to the numerous mines operated by Teck Coal, located to the west in British Columbia's Elk Valley.

Prior to mining, any merchantable timber is harvested and any available soil is salvaged and either placed into stockpiles for future reclamation or else direct placed onto newly reclaim land. When an area is no longer active, all rock disposal areas will be re-sloped to 23 degrees and then re-soiled as part of the on-going reclamation of the site.

The site has a history of coal mining with the presence of both legacy surface and underground mines. The legacy surface mine is currently inside the footprint of the new proposed open pit ([Figure A.3.1-1](#)). The legacy Greenhills underground mine is located just to the south and the Bear Valley and Bellevue underground mines are located to the east of the Grassy Mountain property ([Figure A.3.1-1](#)).

Over the 23-year active mine life, a total of 167.6 million raw metric tonnes of coal will be produced at an average in-situ stripping ratio of 5.1 bank cubic metres (bcm). The average yield or recovery in the coal preparation plant is expected to be 55%, making the total recoverable coal volume for the Project to be 92.6 million CMT. Additional mining details are provided in [Section C.1](#) of the Application.

A.6.2 Processing

The CHPP facilities are required to wash the coal in order to make it saleable. The location is shown on [Figure A.1.0-2](#). Coal often contains materials such as sandstone, mudstone, carbonaceous shale and clay material which need to be cleaned out of the raw coal to make it a saleable product. The coal will be cleaned using a modern and state of the art CHPP that includes dense media cyclones, reflux classifiers and froth flotation processing circuits. The cleaned coal is then de-watered to produce a saleable product that has 10% moisture content and an air-dried product ash between 9% and 10%.

The CHPP facility will be built in a single phase capable of producing a nominal 4.5 million CMT per year.

The coarse and fine coal reject material will be dewatered using mechanical dewatering equipment that includes filter presses to enable the solid material to be co-disposed with the rock in the waste rock disposal areas. This 18% to 20% moisture material will be hauled away from the CHPP in trucks. This is a different and more efficient process, compared to most other operating coal mines which use large holding ponds to dewater the fine coal material.

Clean coal will be transported to the train loadout facility located 5 km to the south next to Highway 3 *via* a 5 km long overland conveyor. Additional processing details are provided in [Section C.2](#) of the Application.

A.6.3 Access and Loadout

Access to the mine will start at Highway 3 and will be constructed in the same corridor as the overland coal conveyor ([Figure A.1.0-2](#)). This two lane road will be approximately 7 m wide and designed to accommodate highway trucks up to the CHPP. It will follow a similar alignment to the current access road/trail and will require considerable upgrades.

The train loadout will be located just north of Highway 3 ([Figure A.1.0-6](#)). The infrastructure required for the loadout includes a connection to the Canadian Pacific Railway (CPR), a length of loading track loop and associated rail, highway, and infrastructure. The loadout is sized to accommodate a unit train at 152 cars allowing the Project's coal product to be transported to the west coast ports as economically as possible.

The loadout facility is being proposed on the existing golf course and the new rail spur line will require a highway crossing (an underpass below the highway grade is proposed), a rail line that runs north of and parallel to the highway, and a rail loadout with sufficient length to allow the processing of trains with 152 cars (approximately 2.5 km in length). Options considered for this component of the Project are described in [Section A.7.3](#). To minimize the overall disturbance of the railroad construction, a loop was proposed which would reduce the overall linear length of the new railroad siding which would need to be approximately 6 km to a loop that is considerably smaller.

The location of the loadout and railroad extension were the subject of numerous public forums and debate, with the "golf course" option being selected as the first choice which has been presented and assessed in this application. Additional infrastructure details are provided in [Section C.3](#) of the Application.

A.6.4 Surface Water Management

All water from the pit dewatering program and from surface runoff will be captured on the mine site. Five ponds will be created to capture water for treatment/removal of total suspended solids (TSS) and release to Gold Creek and Blairmore Creek. An additional three ponds will be created to capture water that is likely to contain selenium enriched water, which will require on-site management and no release (Figure A.6.4-1).

Based on the characterization of the waste rock found inside the proposed Grassy Mountain open pit, the leaching of selenium out of the rock disposal areas is a possibility. Experience with selenium levels in the Elk Valley has shown a direct correlation between cumulative waste rock volumes and increases in selenium concentrations found in the local rivers and streams. The rock testing results show the Grassy Mountain geology contains about half the selenium concentrations that are found in the Elk Valley mines.

The overall selenium management strategy, which has been built into the overall sequencing of the mine plan, includes the following:

- capture seepage from the north and south external rock disposal areas, which is water that is likely enriched with selenium;
- use the captured water for use in the coal wash plant and other components of the Project;
- development of passive treatment for selenium attenuation by creating back-filled pits that can become saturated and by directing water containing selenium to these attenuation zones where the selenium will drop out of solution due to microbial action in a non-oxygenic environment. There will be three saturated zones created and used during and after the life of the Project; and
- as a backup to this plan, a water quality treatment plant could be constructed but is not planned at this time

Additional details of the surface water management strategy (Section C.5) and geochemistry (Section C.8) are included in the Application.

A.6.5 Shared Infrastructure

A.6.5.1 Existing Infrastructure

Benga plans to use Highway 3 as the primary access into the Crowsnest Pass region to get workers and supplies to the Project. The existing CPR railroad mainline will also be used to transport coal to the Westshore Terminal near Vancouver. There is currently an access road that traverses from Highway 3 to the proposed CHPP at the mine site. This access road will be upgraded to facilitate the

construction of the conveyor and powerline. This access is currently used and will continue to be shared by the local Crowsnest Pass Golf and Country Club.

All existing trails and access points through the proposed Project will eventually be closed. Alternate access will be available as required.

AltaLink has an existing powerline that is located on the proposed Mine Permit but will not be impacted by the mining development. There is some existing oil and gas infrastructure that Benga is in the process of negotiating agreements to allow mining development to occur.

A.6.5.2 New Infrastructure

The access road to the CHPP will be upgraded and will contain the access road, coal transport conveyor and the powerline which a portion will be available for use by the general public. A rail siding and spur line will need to be constructed so that coal trains can be safely loaded away from the CPR mainline. Once trains are loaded they will proceed onto the mainline to transport the coal to Westshore Terminals.

A rail spur line will need to be constructed and will encompass a portion of the current golf course. The impacted portions of the golf course will be relocated to the northwest to minimize this impact. As part of the rail spur development, an access road will be relocated so that full time access can be maintained to the forestry helipad (located north of Hwy 3) and an alternate access to the golf course ([Figure A.1.0-6](#)).

A.6.6 Mine Schedule

Pending regulatory approval the project is scheduled to begin site construction in mid-2017. Prior to that detailed engineering/design and procurement activities will commence. These activities include:

- detailed engineering and design with respect to both the mine and CHPP begin upon filing of the Grassy Mountain EIA;
- mine equipment procurement and tendering;
- mine construction/development contracts;
- initial site access from Highway 3 developed;
- vehicle access roads developed to main infrastructure sites and camp accommodation;
- installing power and water (raw and fire) to support construction and commissioning;
- installation of the construction camp;
- construct bulk earthwork platforms for CHPP laydown and construction;
- concrete work during the summer of 2017;

- begin installation of pre-assembled plant modules;
- development of site water management infrastructure ahead of mining such as sediment ponds and interceptor ditches;
- harvest any merchantable timber;
- soil salvage activities;
- begin pre-stripping activities;
- production commences: December 2018; Ramp-up: 33% December 2018, 66% January 2019; 100% February 2019.

[Table A.6.6-1](#) provides a breakdown of the Project timelines.

The mine life is approximately 23 years. Final reclamation activities are expected to take an additional four years. Managing the site is expected to be required beyond completion of mining to ensure that the selenium levels are within discharge limits so water reporting to both Blairmore Creek and Gold Creek is acceptable both in terms of quality and quantity. Details with respect to final closure are discussed within the Conservation and Reclamation Plan ([Section F](#)).

Table A.6.6-1 Project Timelines																															
Activity	2015				2016				2017				2018				2019				2020				2021				2022 - 2041	2042-2045	2055
	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4			
EIA	█				█																										
Feasibility Study	█																														
Optimization Study			█	█	★																										
File EIA, Permit/License, Water Act, PLA, EPEA Applications																															
Detailed Engineering and Construction Designs		█	█	█	█	█	█	█																							
Mine Equipment Procurement & Tendering							█	█																							
CHPP Detailed Designs							█	█	█	█																					
Mine Construction /Development Contracts Secured							█	█																							
CHPP/Infrastructure Construction										█	█	█	█	█	█	█															
Mobile Equipment Delivery/Commissioning									★	█	█	█	█	█	█	█	█	█	█	█											
EA Decision/Permit & Licence Granted																															
Mine Development / Logging										█	█																				
Pre-production Stripping														█	█	★															

Table A.6.6-1 Project Timelines																															
Activity	2015				2016				2017				2018				2019				2020				2021				2022 - 2041	2042-2045	2055
	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4			
First Coal																															
Mine Production																															
End of Mine																															
Final Reclamation																															
Final Closure																															

A.7 PROJECT ALTERNATIVE MEANS ASSESSMENT

As part of the Project's engineering Feasibility Study, a range of mine plan development assessments were carried out. One of the key approaches to the engineering Feasibility Study was continuous communication and collaboration with Benga, the Aboriginal Consultation team, the general public, municipal stakeholders, and the EIA team to capture key economic, social, and environmental issues. The intention of this approach was, where possible, to develop an engineering and economically feasible mine plan that mitigated these key issues through design.

CEAA defines "Alternative means" as various technically and economically feasible ways under consideration by the proponent that would allow a designated project to be carried out. For the Project, to assist in developing the alternative means assessment, the Operational Policy Statement (OPS): Addressing "Purpose of" and "Alternative Means" under the *Canadian Environmental Assessment Act, 2012* was referenced. The OPS aims to ensure that the CEAA 2012 requirements related to the purpose of a designated project and alternative means of carrying out the designated project are met in all environmental assessments (EAs) for which CEAA is the responsible authority.

All key components of mine planning execution were included in the alternative means analysis:

- mining type;
- mine configuration;
- rail and loadout facility location;
- clean coal transport;
- CHPP fines management (coal dewatering);
- water and selenium management;
- coal lease development;
- rail haul;
- energy source;
- water supply;
- construction camp;
- employee accommodation; and
- non-rail transportation.

Wherever possible, alternative means options were evaluated against the following technical criteria:

- operability and constructability;

- desirable – the mining method lends itself easily to the geologic conditions that are present on the site.
- undesirable – the mining method cannot be implemented to its full potential due to the nature of the geology/geometry of the mine site.
- flexibility:
 - desirable – the method can adapt to unexpected changes in the site geology. Production rate can be modified to react to economic conditions.
 - undesirable – the method relies on an extremely high understanding the local geology in order to be successful. Limited ability to vary the production rate to match economic conditions.
- safety:
 - desirable – have a high probability of operating the site with minimal risk to human safety.
 - undesirable – subjecting the health and safety of workers to unacceptable levels of risk.
- resource recovery:
 - desirable – high recovery of the available coal resources on Benga’s leases.
 - undesirable – low recovery of the available coal resources or sterilization of resources.

Additionally, wherever possible, economic feasibility of alternative means was based on an applicable/relevant subset of the following:

- construction/capital cost:
 - desirable - minimizing costs of earthworks, length of rail tracks, length of access roads, and length of conveyor systems.
 - undesirable - the presence of geographical, social or environmental factors requiring high total construction cost.
- operating cost:
 - desirable - lower running costs including cost of energy and amount of transportation to the load-out, and ease of maintaining infrastructure.
 - undesirable - excessive amounts of infrastructure and/or novel infrastructure requiring high operating and maintenance costs.
- schedule risks:
 - desirable – a location with a high probability of successful permitting, construction and operation.
 - undesirable - potential for delays in obtaining government approvals, areas requiring buy-in from the community, and a high amount of required environmental remediation.

- impact on community:
 - desirable - a location requiring little or no relocation of existing users (residential, commercial, recreational and/or industrial) with a low impact on adjacent properties and low safety/security hazard.
 - undesirable – locations with a high impact on current land use.

For each key component, potential options (alternative means) were rated against each applicable criterion. A quantitative system (ranging from 1 - least desirable to 4 - most desirable) was used for ranking against each criterion:

- 1 = meets many undesirable sub-criteria, with a negative impact so significant as to be excluded from future consideration.
- 2 = meets some or all of the undesirable sub-criteria, and meets only limited desirable sub-criteria;
- 3 = meets some or all of the desirable sub-criteria, and meets only limited undesirable sub-criteria; and
- 4 = fully meets all desirable sub-criteria.

Once the technically and economically feasible alternative means were determined, the environmental effects of each overall feasible option were assessed. Assessments were based on all of, or the applicable subset of, the following Valued Components (VCs):

- air quality;
- noise;
- hydrogeology and groundwater chemistry;
- hydrology;
- surface water quality;
- fisheries and aquatic ecology;
- soils and terrain;
- vegetation and wetlands;
- wildlife;
- traditional land use;
- socio-economics;
- human health;
- historical resources;

- aesthetics;
- public safety; and
- materials handling.

A.7.1 Mining type – Underground vs. Surface Mining

The stratigraphy for Grassy Mountain indicates the three predominant coal seams are aligned as steep dip configurations and have been subject to faulting during the mountain building processes. The geology has been classed as complex (Section B.2). Benga has over 450 exploration holes that were used to evaluate the geology which is reasonably well understood. Benga conducted an analysis to determine whether underground or open pit mining were technically or economically feasible.

A.7.1.1 Technical Feasibility of Underground Mining

Benga considered two separate approaches that are commonly used in underground mining, longwall mining and room and pillar mining. A key reference used in this evaluation was Underground Coal 2015. The technical feasibility for the various mining options has been summarized in Table A.7.1-1.

Longwall Mining: Underground Coal (2015) state that the longwall approach typically involves mining a relatively long mining face (approximately 100 to 300 m) is created by driving a roadway at right angles between two roadways that form the sides of the longwall block, with one rib of this new roadway forming the longwall face. Once the longwall face equipment has been installed, coal can be extracted along the full length of the face in slices of a given width (referred to as a ‘web’ of coal). The modern longwall face is supported by hydraulically powered supports and these supports are progressively moved across to support the newly extracted face as slices are taken, allowing the section where the coal had previously been excavated and supported to collapse (becoming a ‘goaf’). This process is repeated continuously, web by web, thus completely removing a rectangular block of coal.

Longwall underground mines are generally only successful when the geometry of the deposit is either flat or with only a slight dip in alignment and subjected to only minor displacement due to faulting. Longwall mining is not technically feasible at Grassy Mountain due to the following factors:

- shallow depth;
- steep dip; and
- presence of complex faulting.

Room and Pillar Mining: Room and pillar mining involves splitting the pillars or blocks formed by the first workings using minimal (but adequate) short term supports and/or mining a series of short,

unsupported 'lifts' off long 'splits' that are driven with the continuous miner. The length of the lifts are controlled so that the roof remains intact while the continuous miner is extracting the lift and no personnel are required to work under the unsupported roof.

Pillar extraction with continuous miners poses a risk of loss of roof control in the immediate working area or extracted area ('goaf' or 'room') where the continuous miners and even the operators could be buried. The development of mobile roof support has largely ameliorated this risk, but the safe application of such pillar extraction methods is still very heavily dependent on the judgment and experience of individuals employed.

Most of the legacy underground mines in this region, including the Greenhill's mine, which is located adjacent to and partially under Grassy Mountain, used the room and pillar method of extraction. The geology in the area is complex and doesn't favour room and pillar mining methods. While technically feasible to mine coal using this method, other factors like safety and economics, make it non-viable.

A.7.1.2 Technical Feasibility of Surface Mining

Benga has evaluated the potential for surface mining at Grassy Mountain, including surface strip mining (dragline) and open pit (truck/shovel).

Strip Mining (Dragline)

Dragline or strip mining involves removing the rock above a flat lying coal seam and casting it to one side. Strips of coal are exposed and mined out before the dragline returns to mine the next strip. The overburden from this strip is placed into the adjacent mined-out cut. The method is widely used in North America and Australia where the coal is found relatively close to the surface and is generally flat lying. The coal-fired power generating stations in Alberta and Saskatchewan are fed from these types of mining operations. These mines have the benefit of low operating costs and low manpower requirements, and have exemplary safety records. Unfortunately, due to the very steeply dipping nature of the coal seams at Grassy, this method would be limited to only the areas where the coal seams are near the surface. The draglines have a finite digging depth that would quickly be exceeded, resulting in a very low overall resource recovery. This method, like the longwall method, fails technically due the geometry of the coal seams and was therefore not considered for economic analysis.

Open Pit Mining

Truck and shovel mining has been evaluated and was determined to be the most viable mining option for this Project. The current mine plan has been developed and demonstrates the technical and

economic viability of surface mining. Details of the mining and development plan are provided in [Section C.1](#). The technical feasibility for the various mining options has been summarized in [Table A.7.1-1](#).

Option #	Location	Technical					Total Score
		Operability	Flexibility	Safety	Environmental Risk	Resource Recovery	
1	Underground Longwall Mining	1	1	1	3	1	7
2	Underground Room & Pillar Mining	2	2	3	3	1	11
3	Surface Strip Mining (dragline)	1	1	1	3	1	7
4	Surface Mining Open/Pit (truck/shovel)	4	3	3	2	4	16

A.7.1.3 Economic Feasibility of Underground Mining

An economic evaluation was completed for the two technically feasible options – room and pillar mining and open pit mining. The economic evaluation was based on three criteria: capital costs, operating costs, and final closure costs ([Table A.7.1-2](#)). The 4-point desirability scale was used to rank the alternatives.

Longwall Mining: Longwall mining was determined not to be technically viable; an economic evaluation has not been completed.

Room and Pillar Mining: The room and pillar mining method was determined to have marginal technical feasibility. The economic evaluation considered:

- coal recovery – typical coal recoveries for this method of mining range from 40% to 70% which is largely dependent on the ability to extract the pillars. Given the steep dip of the coal and the presence of faulting, coal recoveries would be expected to be on the lower end of the range;
- mining productivity – the steeply dipping coal would greatly impact productivity on a method which is already one of the least productive methods; and

- complex geology – the location of the major faults is believed to be generally well understood. Localized faulting can also be expected to occur which can be handled in an open pit operation but could cause major unexpected production delays in an underground application. The exploration drilling needed to provide the geological certainty required for an underground mine make this method uneconomic.

In this situation, room and pillar mining was determined not to be an economical option for mining of the Grassy Mountain coal reserves.

A.7.1.4 Economic Feasibility of Surface Mining

Surface mining was deemed to be the only technical and economical option for mining the Grassy Mountain coal reserves. This Application has been compiled to fully address the technical, environmental and social components of the proposed Project. The economic feasibility for the various mining options is summarized in [Table A.7.1-2](#).

Option #	Location	Economic				Total Score
		Cost to Construct	Operation and Maintenance	Schedule Risks	Impact on Community	
1	Underground Room & Pillar Mine	1	1	3	3	8
2	Open Pit Truck & Shovel Mine	3	3	3	3	12

The overall ratings for the combined technical and economical evaluations are:

- underground room and pillar mining 19
- open pit truck/shovel mining 28

Truck/shovel surface mining was deemed to be the only technically and economically feasible option for mining the Grassy Mountain coal reserves. The Application was prepared to fully address the technical, environmental, and social components of the proposed Project using this mining method.

The key VCs potentially impacted by the Open Pit mining method were addressed in the EIA Application and include:

- air quality;
- noise;
- hydrogeology;
- hydrology;
- surface water quality;
- aquatic ecology/fisheries;
- soils and terrain;
- vegetation and wetlands;
- wildlife;
- traditional land use;
- socio-economics;
- human health; and
- historical resources.

A.7.1.5 Summary

The only operational underground coal mines in Canada include Quinsam Coal on Vancouver Island, and Grand Cache Coal in Grande Cache, as both locations have coal seams that are fairly flat. Based on this analysis Benga and the engineering feasibility team are proposing an open pit mining approach which is both technically and economically feasible, which are described in more detail in [Sections A.6](#) and [C.1](#) of the Application. The open pit mining concept forms the basis of the entire technical application and environmental impact assessment report.

A.7.2 Mine Configuration

With the decision made to mine the existing metallurgical coal resource using an open pit truck/shovel method, mine planning efforts centered on optimizing the various processes and infrastructure locations. More specifically, an assessment was conducted on potential locations of the waste rock disposal areas. [Figure A.7.2-1](#) shows the locations of the proposed rock disposal areas during initial scoping study investigations and the locations of the currently proposed rock disposal areas. The technical and economic feasibilities for the mine configurations are summarized in [Table A.7.2-1](#) and [A.7.2-2](#).

A.7.2.1 Technical/Economic Feasibility of Disposal Areas

North Rock Disposal Area 1 (NRDA 1): On [Figure A.7.2-1](#), the north rock disposal area was planned to parallel the western pit limit and progress to the north-west. The northern end of the dump was designed to take advantage of two valley bottoms for rock disposal. This disposal area would allow

short rock haul distances and would generally allow for downhill rock haulage (cost effective rock haulage) and would not encroach upon Blairmore Creek. This option is both technically and economically feasible.

North Rock Disposal Area 2 (NRDA 2): [Figure A.7.2-1](#) shows the currently planned north dump configuration. This disposal area was located further east towards the northern limb of the pit to minimize the impact on the Blairmore Creek tributaries. There is much less disposal space available with this option, which required the mine plan to be developed maximizing in-pit rock disposal. The option is both technically and economically feasible but has likely resulted in increased rock haulage costs.

West and East Rock Disposal Areas (WERDA): The west rock disposal area was incremental area that was contemplated to the west of the north rock disposal area ([Figure A.7.2-1](#)). This configuration would have resulted in the crossing and burial of approximately 4 km of Blairmore Creek. A significant rock drain would have been required to allow water to flow through the massive external rock disposal area. A lengthy diversion of Blairmore Creek would have also been required, to provide continuous flow and replace fish habitat that would have been buried.

From a purely mining perspective, the combined north and west disposal option was the most economical of all the waste rock disposal options. The operating costs would have been the cheapest through short haul distances and downhill rock hauls. There would have been considerable additional costs for the rock drain and creek diversions as well.

The east rock disposal option was initially considered to ensure that sufficient disposal space was available for the rock coming out of the pit ([Figure A.7.2-1](#)). The east disposal area would have encroached into the Gold Creek watershed and on to lands that were privately owned, and not by Benga. A decision was made to limit as much development as possible in the Gold Creek drainage to minimize any potential impacts to the aquatic environment, which is home to the westslope cutthroat trout (which is listed as a federal species at risk).

All of these options are technically and economically feasible, but were not chosen for environmental and social reasons.

South Rock Disposal Area (SRDA): In full consideration of protecting the aquatic environments of both Blairmore Creek and Gold Creek, the south rock disposal area was planned ([Figure A.7.2-1](#)). This location allows for relatively short rock hauls and sets the mine up to take advantage of in-pit backfill opportunities as the operation progresses from south to north. The entire pit was re-designed to maximize in-pit backfill which was required with the reduction in ex-pit space that would not be available. This area has a much lower impact on both Blairmore and Gold Creeks.

Option #	Location	Technical					Total Score
		Operability	Flexibility	Safety	Environmental Risk	Resource Recovery	
1	NRDA 1	3	2	3	2	n/a	10
2	NRDA 2	3	2	3	4	n/a	12
3	WERDA	3	3	1	1	n/a	8
4	SRDA	4	4	3	4	n/a	17

Option #	Location	Economic				Total Score
		Cost to Construct	Operation and Maintenance	Schedule Risks	Impact on Community	
1	NRDA 1	2	3	2	2	9
2	NRDA 2	3	3	3	3	12
3	WERDA	1	3	2	2	8
4	SRDA	3	3	3	3	12

The overall ratings for the combined technical and economical evaluations are:

- NRDA 1 19
- NRDA 2 24
- WERDA 16
- SRDA 29

The north and south rock disposal area options are both technically and economically feasible. The south rock disposal area contained a powerline that would require relocation, so it was split in two to avoid the need to move the powerline, thus creating a third rock disposal area which has been called the central rock disposal area (CRDA).

A.7.2.2 Summary

At the commencement of the feasibility study the engineering planning team was directed to develop a mining solution that minimized impacts to the Blairmore Creek and Gold Creek watersheds while still being feasible from a mine operability and economic stand point. Additional geologic information collected post-scoping level assessments, resulted in a more accurate geologic model for the mine. Based on this revised geology model, projected mine operating costs, and coal selling price assumptions, were used to define a new ultimate pit that mined to the current break-even-strip-ratio. With the new ultimate pit defined, the mine engineering planners were tasked to sequence the pit in such a way as to:

- minimize ex-pit disturbance;
- maximize in-pit backfill;
- reduce impacts on Blairmore Creek and Gold Creek; and
- maintain a mine sequence that was achievable both operationally and economically.

All of the external rock disposal area options that have been considered are technically and economically feasible. In the final analysis, environmental and social factors were weighted higher than the economics. The options for north, central, and south rock disposal areas that were chosen are also technically and economically feasible.

The north, central, and south rock disposal options have been included in the details of the technical application and environmental impact assessment report.

A.7.2.3 Environmental Evaluation

Current Options: a full technical and environmental evaluation has been completed for the north, central, and south rock disposal options and is provided in [Section C](#) and [Section E](#).

West and North Rock Disposal (NRDA 1) Areas: From a mining engineering and economics perspective, the west and north waste rock disposal locations would be advantageous as the overburden haul distances would be short and generally downhill of the mining operation. This approach would have resulted in the disposal of waste rock directly on four unnamed tributaries to Blairmore Creek and the covering of 4 km of the main stem of Blairmore Creek. This mine plan would also require a diversion of Blairmore Creek around the waste rock disposal area.

The valued components (VCs) potentially affected by this alternative are primarily aquatic based and include:

- flow within the Blairmore Creek watershed;

- water quality in the Blairmore Creek watershed; and
- aquatic species located within and downstream the Blairmore Creek watershed.

This proposed development would have had considerable more potential for impacts to the Blairmore Creek watershed, which translates to considerably more mitigation and monitoring being required. Choosing the smaller north disposal area option and staying out of the main stream of Blairmore Creek is considered to be positive.

East Rock Disposal Area: From a mining engineering and economics perspective, the east waste rock disposal location would be advantageous as the overburden haul distances would be short and generally downhill of the mining operation. This approach would have resulted in the disposal of waste rock directly on three unnamed tributaries to Gold Creek and created more opportunity for surface run-off and seepage from the waste rock to enter the creek.

The VCs potentially affected by this alternative are primarily aquatic based and include:

- flow within the Gold Creek watershed;
- water quality in the Gold Creek watershed; and
- aquatic species located within and downstream of the Gold Creek watershed.

This proposed development would have had considerable more potential for impacts to the Gold Creek watershed, which translates to considerably more mitigation and monitoring being required. Staying out of the Gold Creek drainage basin by eliminating the east disposal area is considered to be positive.

A.7.3 Rail and Loadout Facility

A rail loading facility is required to transfer the final produced metallurgical coal onto railcars where it can then be transported *via* existing rail-connected ports on the west coast of British Columbia to send to foreign markets.

Potential locations for the Rail Loading Track (RLT) were searched for within a 15 km radius of the CHPP. Criterion for suitable RLT placement included:

- ability to connect the RLT to CPR main line located in the Crowsnest Pass;
- relatively flat terrain to allow the construction of loadout buildings and other necessary infrastructure;
- topography that enabled construction of enough track on either side of the loadout building to accommodate trains of up to 2,550 m in length to allow efficient servicing by CPR. Of note,

this is currently the longest length of train able to be handled by the CPR Crowsnest Subdivision as well as existing port facilities; and

- a location that minimized impact on residents in the community, private land (not owned by Benga), and the surrounding biophysical environment.

In addition to this criterion, CPR's operating requirements for trains up to 152 cars long was also taken into consideration, which included:

- a maximum gradient of 2.2%;
- a maximum curvature of 12 degrees (478 feet radius, 146 metres); and
- grades as close to 0% as possible in the actual loading area.

During an initial desktop scoping assessment multiple sites were identified for analysis as potential RLT locations; however, based on some of the criteria (*e.g.*, topography and impact on landowners) some of the options were immediately dismissed. Five potential sites were selected for more detailed consideration ([Figure A.7.3-1](#)).

- Option 1 – Blairmore Creek Tail Track;
- Option 2 – Golf Course Figure 8 Loop;
- Option 3 – Coleman Siding;
- Option 4 – Frank Industrial Area Loop; and
- Option 5 – Gas Plant Loop.

A.7.3.1 Technical Feasibility of Five Rail and Loadout Options

Each potential RLT location was further evaluated against the following technical criteria, with sub-criteria classified as 'desirable' or 'undesirable'. For the purposes of this evaluation, any required conveyors and/or coal haul road have been included in the evaluation of each potential RLT as they are inherent to the design of the overall coal transportation system. The technical criteria that were used in the evaluation include the following:

a. Rail Grade at Loading:

- Desirable - level track through the entire train loading cycle.
- Undesirable – an increase in grade for all or part of the loading track, as it makes loading harder to control and increases potential for derailments and spills.

b. Distance from CHPP:

- Desirable - locations closer to the CHPP.

- Undesirable - longer distance and variable topography from coal preparation plant, as it adds cost and complexity to transport the coal to the load-out *via* a conveyor or trucks.
- c. Coal Storage at Load-out:**
- Desirable - sufficient volume of coal to be available at the load-out, or supplied directly *via* a conveyor, so that rail loading operations are not at risk once train loading commences.
 - Undesirable - large storage volumes in public areas.
- d. Use of Public Roads by Coal Trucks:**
- Desirable - no road transportation of coal to be used, or to a lesser extent for coal trucks to use shorter private haul roads.
 - Undesirable - large numbers of heavy coal trucks mixing with general traffic on public roads, as they are a hazard to public safety.
- e. Environmental Risk**
- Desirable - low potential impact on surface waterways, locations away from geologically unstable areas and locations further from areas hazardous to human health such as other industrial facilities.
 - Undesirable - operations adjacent to potential environmental hazards.

The technical ratings for the various options are provided in [Table A.7.3-1](#).

Table A.7.3-1 Rail Loading Track Location Technical Analysis							
Option #	Location	Technical					Total Score
		Rail Grade at Loading	Distance from CHPP	Coal Storage	Use of Public Roads	Environmental Risk	
1	Blairmore Creek Tail Track	2	4	4	4	2	16
2	Golf Course Figure 8 Loop	4	3	4	4	3	18
3	Coleman Rail Siding	3	3	4	4	2	16
4	Frank Industrial Area Loop	4	2	2	4	2	14
5	Gas Plant Loop	4	2	2	1	3	12

Blairmore Creek Tail Track #1 – This option connected to the CPR mainline between Blairmore and Coleman, crossed under Highway 3 and proceeded northward up the Blairmore Creek valley at a

grade of 2.2%. The rail and loadout were located immediately adjacent to the CHPP and clean coal stockpile.

The technical rating for this option is tied for second, and is considered technically feasible.

Golf Course Figure 8 Loop #2 – This option connected to the CPR mainline between Blairmore and Coleman, crossed under Highway 3 and proceeded eastward parallel to the highway at a grade of 1.5%. The coal loadout was located on a level figure 8 return loop on the present site of the Crowsnest Pass Golf Club. It was connected to clean coal stockpiles at mine site through a covered conveyor.

The technical rating for this option is ranked number one and is considered technically feasible.

Coleman Siding #3 – This option required new track to be roughly parallel with the CPR mainline between Coleman and Blairmore, with the loadout building on industrial land in Coleman. It was connected to clean coal stockpiles at mine site through a covered conveyor which crossed under Highway 3.

The technical rating for this option is tied for second, and is considered technically feasible.

Frank Industrial Area Loop #4 – This option was a figure 8 loop on land currently occupied by the Frank Industrial Area and would have connected to the CPR mainline near Frank. The conveyor system crossed Highway 3 and connected to a clean coal storage facility at the loadout. All current users of the industrial park would be relocated.

The technical rating for this option is ranked number three, and is considered technically feasible.

Gas Plant Loop #5 – This option connected with the CPR mainline at Sentinel near the former gas plant, crossed Highway 3 and proceeded northward on a grade of 0.6% with a return loop near the Crowsnest Mountain Resort. Coal would have been hauled by truck from mine site with clean coal storage at loadout.

The technical rating for this option is ranked number four, and is considered technically feasible.

A.7.3.2 Economic Feasibility of Five Rail and Loadout Options

Each potential RLT location was further evaluated against the following economic criteria, with sub-criteria classified as desirable or undesirable. For the purposes of this evaluation, any required conveyors and/or coal haul road have been included in the evaluation of each potential RLT as they are inherent to the design of the overall coal transportation system. The economic criteria that were used in the evaluation include the following:

a. Cost to Construct:

- Desirable - minimizing costs of earthworks, length of rail tracks, length of access roads, and length of conveyor systems.
- Undesirable - the presence of geographical, social or environmental factors requiring high total construction cost.

b. Operation and Maintenance:

- Desirable - lower running costs including cost of energy and amount of transportation to the load-out, and ease of maintaining infrastructure.
- Undesirable - excessive amounts of infrastructure and/or novel infrastructure requiring high operating and maintenance costs.

c. Schedule Risks:

- Desirable – a location with a high probability of successful permitting, construction and operation.
- Undesirable - potential for delays in obtaining government approvals, areas requiring buy-in from the community, and a high amount of required environmental remediation.

d. Impact on Community:

- Desirable - a location requiring little or no relocation of existing users (residential, commercial, recreational and/or industrial) with a low impact on adjacent properties and low safety/security hazard.
- Undesirable – locations with a high impact on current land use.

The economical ratings for the various options are provided in [Table A.7.3-2](#).

Table A.7.3-2 Rail Loading Track Location Economical Analysis						
Option #	Location	Economic				Total Score
		Cost to Construct	Operation and Maintenance	Schedule Risks	Impact on Community	
1	Blairmore Creek Tail Track	1	2	3	3	9
2	Golf Course Figure 8 Loop	2	3	3	3	11
3	Coleman Rail Siding	4	3	4	3	14

Option #	Location	Economic				Total Score
		Cost to Construct	Operation and Maintenance	Schedule Risks	Impact on Community	
4	Frank Industrial Loop	2	2	2	1	7
5	Sentinel Gas Plant Loop	2	2	2	1	7

Blairmore Creek Tail Track #1 – The economic rating for this option is ranked number three, and is not considered economically feasible.

Golf Course Figure 8 Loop #2 – The economic rating for this option is ranked number two, and is considered economically feasible.

Coleman Siding #3 – The economic rating for this option is ranked number one, and is considered economically feasible.

Frank Industrial Area Loop #4 – The economic rating for this option is tied for number four, and is not considered economically feasible.

Gas Plant Loop #5 – The economic rating for this option is tied for number four, and is not considered economically feasible.

A.7.3.3 Summary

The overall ratings for the combined technical and economical evaluations capture:

- Blairmore Creek Tail Track 25
- Golf Course Figure 8 Loop 29
- Coleman Rail Siding 30
- Frank Industrial Area Loop 21
- Gas Plant Loop 19

Of the five potential sites evaluated, three were excluded from further consideration based on certain aspects that were deemed to have negative impact of at least one criterion (*i.e.*, a ranking of “1”). The following is a summary of the options that triggered a specific criteria ranking of “1”:

- Blairmore Creek Tail Track – scores “1” for *Cost to Construct* – an alignment roughly parallel to Blairmore Creek would require very extensive and costly earthwork to build to a grade suitable to get to the mine and for the loading of railcars.
- Frank Industrial Area Loop – scores “1” for *Impact on Community* – a loop or figure-8 alignment in this location would displace a significant number of commercial landowners leading to widespread disruption to established economic activity within Crowsnest Pass. The Crowsnest Pass Sewage treatment Plant would also have to be relocated.
- Gas Plant Loop – scores “1” for *Use of Public Roads* – this site would require the use of public roads by coal trucks to haul clean coal to the load-out, which would be a significant safety hazard. It would also require coal storage at the site, which would adversely affect adjacent residential and commercial properties.

The two locations which were considered both technically and economically feasible include the Golf Course Figure 8 Loop and the Coleman Rail Siding. Both were subject to additional environmental evaluation below.

A.7.3.4 Environmental Evaluation

The two potential RLT locations (“Golf Course Figure 8 Loop” and “Coleman Rail Siding”) that were deemed to be the most technically and economically viable options were the subject of considerable discussion within the local community. More detailed designs were developed and presented at a public open house in Crowsnest Pass on April 22, 2015. Comments and input were solicited from attendees including the Municipal Council and members of the general public in order to better evaluate the impact on the VCs.

The key VCs potentially impacted in the Golf Course Loop include the following:

- air quality (*e.g.*, dust);
- noise;
- aesthetics; and
- socio-economic (*e.g.*, proximity to residential, recreational use).

The key VCs potentially impacted by the Coleman Rail Siding Option include the following:

- air quality (*e.g.*, dust);
- noise;
- aesthetics; and
- socio-economic (*e.g.*, proximity to residential, land development).

The Coleman Rail Siding was rated number one and the Golf Course Figure 8 Loop was rated number two of all the options that were considered. Based on feedback received from the open house, the Golf Course Loop was generally received more favourably by the public, with 80% of attendees expressing their preference for this option. Some of the reasons cited for this included the loadout operations being farther away from residential and commercial areas, little impact on existing roads and travel patterns (which were seen as positive impacts to the noise, aesthetics and socio-economic VCs. The Golf Course Figure 8 Loop will encroach on some of the existing golf course holes which presented a challenge. Benga has reached an agreement with the golf course to replace the lost holes and provide some other significant upgrades at no cost to the members and users, which was also seen as a benefit of this option.

The preferred option was the Coleman Rail Siding as it was the most favourable from an economic perspective. Both options were comparable based on the environmental VCs which was largely related to air and dust generation, where the conveyor and loadout facilities were planned to be enclosed limiting dust generation. The other VCs (noise, aesthetics and socio-economic) were primarily social VCs, and factored heavily in the comments from the local stakeholders. Based on public feedback and consultation with key stakeholders, which are summarized in [Section G](#), Benga proceeded with the development of design plans associated with the Golf Course Figure 8 Loop. This option was presented as part of the overall development plan and was included in the full technical application and environmental impact assessment ([Section C.3](#) and [Section E](#)).

A.7.4 Clean Coal Transport – Trucking versus Covered Conveyor

At full production, the Project will produce 4 million CMT per year. All of this coal must be transported from the CHPP to the rail loadout. Benga has considered two main options for clean coal transport which include using a covered conveyor and using trucks to haul it. For truck haulage tractor trailer style trucks with an assumed safe haul capacity of 34 tonnes (with extra axles) were used for the assessment. The overland conveyor will generally parallel the mine access road and will be approximately 5 km long. The technical and economic feasibilities of each of the two options were evaluated against operability/constructability and safety using the 4-point desirability rating system ([Table A.7.4-1](#) and [A.7.4-2](#)).

A.7.4.1 Technical and Economic Feasibility of Transporting Coal to Rail Loadout *via* Trucks

The truck haulage option consisted of the following assumptions:

- 10 trucks (34 tonnes each) would be required to operate full time (24 hours/day, 7 days/week, 365 days/yr);
- eight haul trucks would be moving on the road at any given time;
- the road width may need to be increased;

- run-away lane(s) to accommodate loaded downhill hauls would be required;
- additional equipment would be required for road maintenance and dust control;
- clean coal storage would be required at the RLT;
- a loader would be required at the RLT at the clean coal storage area; and
- a more substantial bridge over the rail track loop would be required.

The trucking option is technically feasible and has some potential concerns:

- extra traffic would increase the risk of wildlife conflicts (vehicle incidents and wildlife mortality);
- increased potential for traffic accidents;
- wider road and run-away lanes would increase the size of the footprint; and
- potential for additional noise and dust along the road.

The economic feasibility of the trucking option considered the following components:

- capital costs are lower than the conveyor;
- upgrading the rail loop crossing bridge (an estimated \$4 to \$5 million cost);
- developing a truck dump and large coal storage in the rail loop might cost an estimated \$24 to \$34 million for closed storage (*e.g.*, large shed or silos); and
- operating costs have been estimated to be \$5.00/tonne.

The trucking option is considered to be economically feasible.

A.7.4.2 Technical and Economic Feasibility of Transporting Coal to Rail Loadout *via* Covered Conveyor

The covered conveyor option consisted of the following assumptions:

- is a widely used method for transporting coal;
- would generally be located along and adjacent to the current site access road;
- can accommodate the required grades;
- can be quite reliable with mechanical availability over 95%;
- capital costs of a conveyor will be higher than trucking;
- operating costs will be lower;
- lower manpower requirements;
- ease of operation;

- safer; and
- reduced emissions.

The covered conveyor option is technically feasible and has some potential concerns:

- transfer points between belts can be a source of dust;
- can be a barrier to wildlife without planned crossings; and
- conveyors are not very aesthetically pleasing.

The economic feasibility of the covered conveyor option considered the following components:

- capital costs are higher than trucking; and
- operating costs have been estimated to be \$0.25 to \$0.50/tonne.

The covered conveyor is considered to be economically feasible.

Table A.7.4-1 Clean Coal Transport Technical Analysis

Option #	Location	Technical					Total Score
		Operability	Flexibility	Safety	Environmental Risk	Resource Recovery	
1	Truck Haulage	3	3	3	3	n/a	12
2	Covered Conveyor	4	3	4	4	n/a	15

Table A.7.4-2 Clean Coal Transport Economic Analysis

Option #	Location	Economic				Total Score
		Cost to Construct	Operation and Maintenance	Schedule Risks	Impact on Community	
1	Truck Haulage	3	2	3	2	10
2	Covered Conveyor	2	4	3	4	13

The overall ratings for the combined technical and economical evaluations are:

- truck haulage 22
- covered conveyor 28

A.7.4.3 Summary

Both coal transport options have been deemed technically and economically feasible. The covered conveyor option has been selected as it will provide safe and reliable coal movement from the CHPP to the loadout. The operational costs will be considerably less than the trucking option which is a key component of this decision. By not selecting the trucking option, there will be less social interaction without eight trucks on the road all the time, and the noise, dust and safety concerns will be improved.

A.7.4.4 Environmental Evaluation

The VCs that were deemed to be potentially impacted by the two options include the following:

- air quality (*e.g.* dust);
- noise;
- wildlife (movement); and
- public safety.

The conveyor option will result in improvements by having less dust generated, less noise, and improved public safety because there will be less vehicles on the road. There will be wildlife crossings that will allow movement of wildlife under the conveyor at key locations along the corridor. Conversely, trucking would increase road dust, might increase coal dust off the trucks, increase in noise levels, increased potential for public safety concerns and more potential collisions with wildlife.

The conveyor option will result in improvements for the selected VCs.

A.7.5 Coal Processing Fines Management – Conventional Tailings Pond versus Mechanical Dewatering

It is typical for western Canadian coal processing plants that are in operation today to direct the fines from their coal cleaning process to a large conventional storage pond. The coal fines are often referred to as coal tailings. Very early in the process the coal processing design team evaluated whether to send the process fines to a conventional pond or to dewater them by mechanical means. This section discusses these two key options for coal cleaning fines management. The technical and economic feasibilities of each of the two options were evaluated against operability/constructability and safety using the 4-point desirability rating system ([Table A.7.5-1](#) and [A.7.5-2](#)).

A.7.5.1 Technical and Economic Feasibility of Conventional Tailings Pond

Conventional tailings ponds are in use at many of western Canada's operating coal processing plants and a pond application for this project is technically feasible. A scoping level estimate of the pond capacity required for this project is approximately 45 million cubic metres. With the limitations of the local topography, a site suitable and large enough to accommodate a pond of this magnitude is challenging. Typically, it is preferred to have a pond located in close proximity to the processing plant. A pond would need to be located along the slope of the hillside west of Blairmore Creek or in the valley adjacent to the creek.

Using a conventional pond to manage the coal fines from the wash plant is challenging in this terrain, but is technically feasible.

Given the natural ground contours it would be extremely costly to build a structure capable of containing the volumes of fines that would require storage. As a result the economic feasibility of a conventional pond does not pass the feasibility test.

A.7.5.2 Technical and Economic Feasibility of Mechanical Dewatering

Mechanical dewatering has been planned to limit the liability of a large fines storage pond and to improve water conservation. The Project is located in a water starved area, so provisions have been taken to improve the recovery and conservation of water by considering mechanical dewatering. Benga has evaluated global technologies that would provide a dry fines product that could be disposed of with the coarse coal rejects by hauling it to the rock disposal areas as a solid product. A combination of technologies has been assembled that can accomplish this objective. The technology exists and is in use at many coal processing plants around the world. It has been deemed to be feasible at this particular site by Benga's process engineering design team.

A benefit of the mechanical dewatering is there is no longer a need for a thermal dryer to dry the coal prior to shipping to market. The mechanical dewatering has been deemed technically feasible.

The capital cost associated with installation of the filter presses has been estimated to be less than the cost to build a fines storage pond. The operations costs will be ongoing through the life of the project, but are likely less than the liability that exists with a large storage pond at the end of the Project life.

Table A.7.5-1 Coal Fines Management Technical Analysis

Option #	Location	Technical					Total Score
		Operability	Flexibility	Safety	Environmental Risk	Resource Recovery	
1	Conventional Tailings Pond	2	2	2	2	n/a	8
2	Mechanical De-watering	3	4	4	3	n/a	14

Table A.7.5-2 Coal Fines Management Economic Analysis

Option #	Location	Economic				Total Score
		Cost to Construct	Operation and Maintenance	Schedule Risks	Impact on Community	
1	Conventional Tailings Pond	1	3	2	2	8
2	Mechanical De-watering	3	3	4	4	14

The overall ratings for the combined technical and economical evaluations are:

- conventional tailings pond 16
- mechanical dewatering 28

A.7.5.3 Summary

Both of the fines management options that were evaluated are technically feasible, but the cost of the conventional pond is not economically feasible, largely due to the rugged terrain in the Project area. Benga has selected the mechanical dewatering as it provides immediate and better water conservation, and limits the liability during the operations and closure that exists with an external pond.

A.7.5.4 Environmental Evaluation

Since the conventional pond option was deemed not economically feasible for the Project, an environmental evaluation of this option has not been completed. The mechanical dewatering was selected and a full evaluation was completed and is provided in [Section C](#) and [Section E](#).

A.7.6 Water and Selenium Management Options

Preliminary geochemical evaluations indicate that selenium is present in the geological formations of Grassy Mountain. The geology is similar to the coal mines in the Elk Valley that also have selenium present in the geology. During the mining process, the rock is broken into pieces by blasting and then is transported to rock disposal areas. When water percolates through the blasted rock, selenium can be released from the rock into the water. A plan to manage the selenium enriched water is required.

The two primary options that have been considered for selenium management for the Project include passive treatment using saturated rock backfill areas and active water treatment. As part of the management plan, all water that is expected to have selenium enrichment will be collected and treated. The technical and economic feasibilities of each of the two options were evaluated against operability/constructability and safety using the 4-point desirability rating system (Table A.7.6-1 and A.7.6-2).

A.7.6.1 Technical and Economic Feasibility of Saturated Backfill Option

Studies have been completed at numerous mines evaluating the removal of selenium using the saturated backfill method. The results indicate that selenium removal occurs in the anaerobic environment of the saturated backfill. Accelerated and enhanced removal can occur with the addition of carbon sources. The mine design has incorporated engineered backfilled pit areas that can be saturated and accommodate carbon injection, and function as a bioreactor used for selenium removal.

Using engineered saturated backfill to treat water for selenium removal is considered technically feasible.

The costs to create saturated backfill areas are incremental to standard mining practices and some additional costs to collect water and then pump to these areas will be incurred. The use of saturated backfill is considered economically feasible.

A.7.6.2 Technical and Economic Feasibility of Water Treatment Plant Option

The removal of selenium from water has been done effectively by using water treatment plants. The use of water treatment plants for selenium removal is considered technically feasible.

Depending on the capacity of the water treatment plant the costs can be considerable (>\$80M). There are also some incremental costs that must be incurred to segregate, capture and store water with selenium enrichment. These costs will be incurred with either of the selenium removal options. There will also be on-going operating costs to run the water treatment plant during operations and also for some time after mine closure. The use of water treatment plants for selenium removal is considered economically feasible.

Table A.7.6-1 Water Treatment Technical Analysis

Option #	Location	Technical					Total Score
		Operability	Flexibility	Safety	Environmental Risk	Resource Recovery	
1	Saturated Backfill Option	4	3	4	3	n/a	14
2	Active Water Treatment	3	3	4	3	n/a	13

Table A.7.6-2 Water Treatment Economic Analysis

Option #	Location	Economic				Total Score
		Cost to Construct	Operation and Maintenance	Schedule Risks	Impact on Community	
1	Saturated Backfill Option	3	4	3	3	13
2	Active Water Treatment	2	2	2	3	9

The overall scoring of the two options based on technical and economic evaluations are:

- passive selenium treatment (saturated backfill) 27
- active selenium treatment (water treatment plant) 22

A.7.6.3 Summary

Both selenium removal options are considered technically and economically feasible. The saturated backfill option has been selected as the total capital costs are considerably less than the water treatment plant, and the ongoing operating costs are also considerably less as well.

A.7.6.4 Environmental Evaluation

The VCs that were deemed to be potentially impacted by the two options include the following:

- water quality; and
- aquatic habitat.

The removal of selenium is likely to be equally effective with both options, so the water quality and aquatic habitat VCs will be similar for either option. The key benefit to selecting the saturated backfill option is the savings on capital and operating costs. The saturated backfill option is described in detail in [Section C.5](#) and [Section C.8](#).

A.7.7 Coal Lease Development Options

Benga purchased the Grassy Mountain coal leases from Devon and CONSOL in 2013. In addition to the Grassy Mountain Leases, three additional coal lease areas were also purchased. These areas included the Adanac, Lynx and Bellevue properties ([Figure A.3.1-1](#)). All four coal properties were evaluated to determine which one had the best coal reserves to consider mining. The technical and economic feasibilities of each of the two options were evaluated against operability/constructability and safety using the 4-point desirability rating system ([Table A.7.7-1](#) and [A.7.7-2](#)).

A.7.7.1 Technical and Economic Feasibility

During the initial evaluation of the four coal properties, Grassy Mountain was immediately deemed the most economically viable. Grassy Mountain had considerable geological drilling completed which made for an easy evaluation of the coal reserves that were present and appeared to be a mineable reserve. The other properties had little drilling which would need to be completed prior to completing that evaluation. Grassy Mountain also had existing infrastructure into and around the Project, including considerable lands that were also owned by Benga. During the feasibility study it was determined that surface mining of Grassy Mountain area was technically feasible. The feasibility study also indicated that it was economically feasible to mine the Grassy Mountain area as well.

The other three properties will be evaluated over time to determine if mining is technically and economically feasible for each of them. At this time, that decision cannot be made. The Lynx property has been annexed by the Castle Wildland Provincial Park and access for coal mining is not permitted. Only a portion of the Adanac property is located within the Park, so most of it would be accessible.

Table A.7.7-1 Coal Lease Development Options Technical Analysis

Option #	Location	Technical					Total Score
		Operability	Flexibility	Safety	Environmental Risk	Resource Recovery	
1	Grassy	4	3	3	3	3	16
2	Bellevue	2	2	3	2	2	11
3	Adanac	2	2	3	2	2	11
4	Lynx	1	1	1	1	1	5

Table A.7.7-2 Coal Lease Development Options Economic Analysis

Option #	Location	Economic				Total Score
		Cost to Construct	Operation and Maintenance	Schedule Risks	Impact on Community	
1	Grassy	3	3	3	3	12
2	Bellevue	2	2	1	3	8
3	Adanac	2	2	1	3	8
4	Lynx	1	1	1	1	5

The overall scoring of the two options based on technical and economic evaluations are:

- Grassy – zoned favourably and geology known 28
- Bellevue – zoned favourably and geology unknown 19
- Adanac - zoned favourably and geology unknown 19
- Lynx – zoned unfavourably, now within park, not developable 10

A.7.7.2 Summary

The Grassy Mountain area was selected as the most favourable property to begin mining on and was the basis for the preparation of the technical application and EIA were prepared. The other leases will be evaluated over time to determine their potential. At this point, none of the options would be deemed technically or economically viable.

A.7.7.3 Environmental Evaluation

Since the Adanac, Lynx and Bellevue coal properties were deemed not technically or economically viable, an environmental comparison of these options has not been completed.

A.7.8 Rail Haul Options – Westshore vs Ridley

There are three main locations where coal mined in western Canada can be loaded on marine vessels and shipped to markets. There are two in the greater Vancouver area (*e.g.* Westshore Terminals and Neptune Terminal). There is another port in the Prince Rupert area (*e.g.* Ridley Terminal). Neptune was at capacity and was not an option. Ridley was full but was undergoing an expansion and was considered an option. Westshore Terminal had some available capacity and was the first choice for Benga as it was closer to the Project than Ridley. The technical and economic feasibilities of each of the two options were evaluated against operability/constructability and safety using the 4-point desirability rating system ([Table A.7.8-1](#) and [A.7.8-2](#)).

A.7.8.1 Technical and Economic Feasibility Westshore Terminals

The CPR mainline runs through Crowsnest Pass and has plenty of capacity to transport the 4 million CMT of coal to the west coast. Benga plans to convey the coal from the Project and construct a loadout and rail siding to load the coal and haul it to market. The use of the CPR to transport the coal to Westshore is technically feasible.

Benga has finalized a deal with Westshore and has reserved sufficient port space to accommodate the coal from Grassy Mountain. The Westshore option is also economically feasible.

A.7.8.2 Technical and Economic Feasibility of Ridley Terminal

Ridley is located on the CNR mainline to Prince Rupert. It is considerably farther to get the coal to the Ridley port, and while the coal would start on the CPR rail system, it would need to get transferred to the CNR system which adds cost and complexity. While this is technically feasible, it was not the preferred option.

With the additional haul cost and the transfer from one rail system to another, this option was deemed not economically feasible.

Table A.7.8-1 Rail Haul Options – Westshore vs Ridley Technical Analysis

Option #	Location	Technical					Total Score
		Operability	Flexibility	Safety	Environmental Risk	Resource Recovery	
1	Westshore	4	4	4	3	n/a	15
2	Ridley	2	1	4	3	n/a	10

Table A.7.8-2 Rail Haul Options – Westshore vs Ridley Economical Analysis

Option #	Location	Economic				Total Score
		Cost to Construct	Operation and Maintenance	Schedule Risks	Impact on Community	
1	Westshore	4	4	3	3	14
2	Ridley	3	1	2	3	9

The overall scoring of the two options based on technical and economic evaluations are:

- Westshore Terminal 29
- Ridley Terminal 19

A.7.8.3 Summary

Using the existing CPR mainline to transport coal to the Westshore Terminals was determined to be the best coal transport option and destination. And having port space secured for the Project is beneficial as finding available capacity at a port is often a limiting factor for projects like this.

A.7.8.4 Environmental Evaluation

Since Ridley option was deemed not economically viable, an environmental comparison of these options has not been completed.

A.7.9 Energy Sources to Power the Project

The Project has two major types of equipment that needs power. There is the fixed plant type equipment and the mobile mining fleet type equipment. Typically the fixed plant and the larger mobile equipment such as shovels, drills and draglines are all powered with electricity. The mobile

mining fleet such as haul trucks, dozers, backhoes and loaders are all powered with diesel engines. Benga has considered both options for the Project and has made a modification to the typical mining choices.

Benga plans to tie into the power grid and run all the fixed plant facilities, including the conveyor, with electricity from the grid, and plans to have the entire mining fleet powered with diesel engines. The technical and economic feasibilities of each of the two options were evaluated against operability/constructability and safety using the 4-point desirability rating system (Table A.7.9-1 and A.7.9-2).

A.7.9.1 Technical and Economic Feasibility of Using Electricity

Benga plans to work with Fortis Alberta to tie into the grid near Blairmore and construct a 25 kV powerline up to the CHPP along the access road and conveyor corridor. This is a considerably smaller capacity line than would be required if the major mining equipment was planned to operate on electricity. Using electricity is both technically and economically feasible for the Grassy Project.

A.7.9.2 Technical and Economic Feasibility of Using Diesel Engines

Using diesel powered mining equipment is common for projects that have very complex geology and mine scheduling. They are more mobile and allow rapid response to changes in the operating plan. Using diesel engines is both technically and economically feasible for the Grassy Project.

Table A.7.9-1 Energy sources – Electricity vs. Diesel Engines Technical Analysis

Option #	Location	Technical					Total Score
		Operability	Flexibility	Safety	Environmental Risk	Resource Recovery	
1	Electricity	4	2	4	3	n/a	13
2	Diesel Engines	4	4	4	3	n/a	15

moratorium on issuing surface water licences. If surface water is to be used, then a transfer from an existing licence holder to Benga will be required. Groundwater allocations are still being issued in this region. Based on this, considerable effort looking for groundwater sources in the area was undertaken.

A site wide water balance was completed for the Project and it was determined that all surface runoff from the Project would need to be managed. It was also determined that much of the water could be treated and released to the environment and some would have to be collected and managed for selenium removal. The volume of water that required additional management was equivalent to the Projects water needs. Using the collected water for the CHPP wash plant was the decision that was made. Since this is surface water a transfer of water rights will be required. The technical and economic feasibilities of each of the two options were evaluated against operability/constructability and safety using the 4-point desirability rating system (Table A.7.10-1 and A.7.10-2).

A.7.10.1 Technical and Economic Feasibility of Using Groundwater

Benga investigated multiple sources of groundwater in the area including existing water wells, groundwater within the legacy underground mine workings, artesian wells and from new sources. Water supply could be obtained from a combination of these various sources and would be deemed both technically and economically feasible.

A.7.10.2 Technical and Economic Feasibility of Using Surface Water

When it was determined that considerable volumes of selenium enriched water would require further management, Benga developed the plan to use this water for the Project’s operational needs. Benga is looking to secure surface licences to transfer the rights to this water to the Project. Using the surface water for the Project is deemed necessary and both technically and economically feasible.

Option #	Location	Technical					Total Score
		Operability	Flexibility	Safety	Environmental Risk	Resource Recovery	
1	Groundwater	3	3	4	3	n/a	13
2	Surface Water	4	4	4	3	n/a	15

Option #	Location	Economic				Total Score
		Cost to Construct	Operation and Maintenance	Schedule Risks	Impact on Community	
1	Groundwater	3	3	3	3	12
2	Surface Water	3	3	4	3	13

The overall scoring of the two options based on technical and economic evaluations are:

- groundwater 25
- surface Water 28

A.7.10.3 Summary

While the use of surface water for the Project was not the preferred option, largely due to licencing restrictions, the need to manage considerable volumes for the selenium management program was key to making this decision.

A.7.10.4 Environmental Evaluation

The VCs that were deemed to be potentially impacted by the two options include the following:

- water quality;
- water quantity; and
- aquatic habitat.

There is potential to adversely affect the surface water quality and aquatic habitat in the region if the Project does not use the selenium enriched water for the process. By using this water, there will be no direct release and the water quality and aquatic habitat will be maintained. If groundwater was used by the Project, there would be less potential impact to the flows in the local creeks compared to using surface water.

An evaluation of the surface and groundwater regimes in the area has been completed and is provided in [Section E](#).

A.7.11 Construction Camp Options – On-site vs. Off-site

As part of the Grassy Mountain feasibility study a project execution plan was developed. In the plan, three options were considered for the construction workforce accommodation:

- offsite accommodation using the local townships;
- onsite construction camp; and
- a combination of onsite and offsite accommodation.

The technical and economic feasibilities of each of the two options were evaluated against operability/constructability and safety using the 4-point desirability rating system ([Table A.7.11-1](#) and [A.7.11-2](#)).

A.7.11.1 Technical and Economic Feasibility of using Accommodation in Local Towns

This was determined to be not viable because the quantity of accommodation in the local area was not available. This is not technically or economically feasible.

A.7.11.2 Technical and Economic Feasibility of an On-site Construction Camp

This is technically feasible, but the cost to construct for the peak demand made this a less desirable option from an economic point of view.

A.7.11.3 Technical and Economic Feasibility of an using a Combination of Both

This is the most desirable because it allows the peak demand to be shaved off by using the locally available accommodation. A semi-permanent base camp of 228 people will be assembled, which can be expanded during peak periods. Available hotels/motels in Blairmore, Coleman, and Bellevue will also be utilized for short term ramp-ups in construction activity.

Table A.7.11-1 Construction Camp Options Technical Analysis

Option #	Location	Technical					Total Score
		Operability	Flexibility	Safety	Environmental Risk	Resource Recovery	
1	Accommodation in local towns	1	1	1	1	n/a	4
2	Onsite construction camp	3	3	4	3	n/a	13
3	Combination of onsite/offsite	4	4	3	3	n/a	14

Table A.7.11-1 Construction Camp Options Economic Analysis

Option #	Location	Economic				Total Score
		Cost to Construct	Operation and Maintenance	Schedule Risks	Impact on Community	
1	Accommodation in local towns	1	1	1	1	4
2	Onsite construction camp	2	4	4	4	14
3	Combination of onsite/offsite	3	4	3	3	13

The overall scoring of the two options based on technical and economic evaluations are:

- accommodation in local towns 8
- onsite construction camp 27
- combination of onsite/offsite 27

A.7.11.4 Summary

Benga has determined that Option 3 (use of an on-site construction camp plus the use of off-site accommodations) is the best option for the Project.

A.7.11.5 Environmental Evaluation

The VCs that were deemed to be potentially impacted by Options 2 and 3 include:

- air quality (e.g. dust);
- soil;
- vegetation;
- noise;
- wildlife (movement);
- socio-economic; and
- public safety.

Both Options 2 and 3 will lead to increased Project disturbance that results in impacts to soil and vegetation within the camp footprint area. Option 3 will result in a slightly smaller Project footprint relative to Option 2. Option 3 has a greater likelihood of increased road dust emissions and wildlife interactions relative to Option 2 as there will be an increased volume of traffic with some of the construction workforce coming from accommodation in the local towns.

A.7.12 Employee Accommodation Options

As discussed in the Socio-Economic Impact Assessment (CR#11), Benga assumed the majority of operations workers will migrate to the region and become permanent residents. The populations of the nearby centers (M.D. of Ranchland, Crowsnest Pass, and Sparwood) are expected to rise based on application case projections of 19% to 22% increases in baseline case 2021 population sizes (CR#11, Table 5.2). Once the mine has ramped up to full production in 2022, the anticipated need for housing is an additional 277 units. The town of Sparwood has indicated they have 119 serviced lots that are currently being developed and have capacity for 900 people. The Municipality of Crowsnest Pass has also indicated they have lots available.

Teck Coal announced in November 2015 that it will be shutting down operations at its Coal Mountain Operation in the fourth quarter of 2017. Coal Mountain is believed to support a workforce of about 340 employees. Should not all of these employees find employment at the neighbouring Elk Valley mines, the workers and their associated local accommodation will be available to lower the projected housing requirements.

The Project's application case assumed that private individuals will develop the additional accommodations required to meet the demand. Options to this plan are:

- construction of apartments by Benga and renting out accommodation to workers; or
- housing the additional workers in camps.

Benga is committed to working with local governments to facilitate the timely development of residential land and dwellings by means of ongoing discussions regarding Project timelines and

execution strategies. Both proposed options are less desirable from a project economics perspective versus non-Benga funded accommodations.

A.7.13 Non-Rail Transportation Options

In the Application, Benga included only rail transport of coal to the west coast, and did not assess alternative means of transportation. Transportation of large tonnages of coal and other bulk products is generally moved by rail in this country. The Canadian Pacific Railway mainline passes just south of the Grassy Mountain Project. The construction of a rail loop located at the golf course makes transportation by rail technically feasible. Benga, as part of its internal feasibility study, accounted for the cost of coal transportation by rail in its overall assessment of project economics and determined that the Project is economically viable.

The only other potentially feasible option is the use of long haul trucking. Extending the overland conveyor 1,000 km to the port in Vancouver is not deemed a reasonable alternative. At full production, the Project will produce 4.5 million CMT per year. If the coal is to ultimately end up in tractor-trailer style units for trucking, it would be reasonable to also remove the overland conveyor from the transport chain. Coal would be loaded into the trucks from the coal handling plant and trucked to the port directly.

The truck haulage option consisted of the following assumptions:

- each truck would have a capacity of 34 tonnes each;
- the trucks would haul the coal 1,000 km to the port in Vancouver;
- a return trip would take a minimum of 24 hours; and
- the truck fleet would operate 24 hrs/day, 365 days/year.

To displace the overland conveyor, the following assumptions have been made:

- the road width from the coal handling plant to the highway may need to be increased;
- run-away lane(s) to accommodate loaded downhill hauls would be required;
- additional equipment would be required for road maintenance and dust control; and
- a loader or other truck-loading infrastructure would be required at the clean coal stockpile area.

The above assumptions combined with the planned production rate of up to 4.5 million CMT per year results in the following requirements:

- 117,647 trips per year, which equates to 322 trips/day;

- a fleet size of 322 trucks given a 24 hour cycle time; and
- an average of 13.4 trucks leaving the mine site every hour, or one truck every 4.5 minutes.

This number of trucks pushes the limits of logistics and operability, but was, nevertheless, evaluated on its economic merits.

According to the Railway Association of Canada, freight rail revenue in 2014 was reported to be just under \$0.03 per tonne-km. Applying a 1,000 km haul distance (Grassy Mountain to Vancouver) results in a rail cost of \$30/tonne. Trucking over this distance is estimated to have a minimum cost of \$90/tonne, which is not considered economically viable.

As the trucking option is likely not feasible from a technical perspective and is not economically viable, no environmental evaluation was conducted for this option.

A.8 PUBLIC ENGAGEMENT SUMMARY

For many large projects, public engagement is an important part of the EIA process, as it promotes ongoing dialogue and information sharing with key stakeholders that may be affected by the proposed projects activities. As such, Benga initiated a public engagement program for the Project in early 2013. Information collected to date from this program is presented in the Grassy Mountain Community Engagement Report in [Appendix 6a](#), which also provides a description of the approach used by Benga for the public engagement process.

Benga's primary public engagement program objectives, form the basis for the public consultation activities summarized in [Section G](#). Benga has engaged public stakeholders early, often, and constructively to provide them with opportunities to meaningfully participate in the Project design and environmental assessment. Benga's Public Consultation Objectives contain the following elements:

- early notification and invitation to dialogue to determine the nature of interests by potentially affected stakeholders;
- accessible information to facilitate meaningful consultation with the public;
- sharing information in an open, respectful and timely manner;
- understanding community values, concerns and viewpoints;
- providing sufficient time to evaluate project information and provide input;
- using an adaptive process to align needs of the Project with needs of the public; and
- transparent results to reflect how input from the public is included through the EA process

The public will continue to be provided with multiple opportunities and methods to express their views on the ongoing development, operation and reclamation of the Project.

To date, public engagement activities have included distribution of written material, in-person information meetings, PowerPoint presentations, individual and group meetings, walk-in and telephone access to the local office, information posted on Benga's website, and media notifications. Benga has hosted three Public Forums and three Open Houses in Crowsnest Pass to inform the public about the Project, and both receive and respond to their comments and questions. In addition to the Public Forums and Open Houses, Benga attended a local Trade Show in Blairmore, frequently attends and supports local events, and held numerous meetings with the municipalities in the region, particularly the specialized Municipality of Crowsnest Pass and the Municipal District of Ranchland. A detailed chronology of consultation activities with each stakeholder group is provided in the Community Engagement Plan ([Appendix 6a](#)).

Benga maintains an "open door" during business hours at the local office in Crowsnest Pass whereby individuals can stop by at their convenience to discuss or ask questions about the Project. Benga will continue to operate its community office and employ a Community Relations representative. This will ensure local stakeholders can easily access Project staff and information.

A.9 ABORIGINAL CONSULTATION SUMMARY

Benga has been consulting with Aboriginal groups that may be affected by the Project since June 2013. The First Nations Consultation Plan ([Appendix 7A](#)) describes consultation activities for the EIA process. Consultation activities such as sharing project information, site tours, field work, Traditional Knowledge and Traditional Use studies, workshops, and open houses are reported in [Section H](#) and [Appendix 7B](#) and are ongoing and will continue through the EIA process.

Aboriginal groups that are potentially affected by the Project are defined in the *Terms of Reference for Environmental Impact Assessment Report* ([Appendix 1](#)) and the *Guidelines for the Preparation of the Environmental Impact Statement* ([Appendix 2](#)). TEK reports have been completed by these Aboriginal groups and have been included in [Appendix 7C](#). Project consultation and engagement with Aboriginal groups has included:

- Piikani Nation – [Appendix 7C\(i\)](#);
- Blood Tribe (Kainai Nation) – [Appendix 7C\(ii\)](#);
- Siksika Nation – [Appendix 7C\(iii\)](#);
- Stoney Nakoda Nation (Bears paw, Chiniki, Wesley) – [Appendix 7C\(iv\)](#); and
- Tsuut'ina Nation – [Appendix 7C\(v\)](#).

Benga Mining is also engaging with Aboriginal groups included in the EA process that are expected to be less affected by the Project. Views and information provided by these Aboriginal groups are incorporated into the assessment. These Aboriginal groups identified in the *Guidelines for the Preparation of the Environmental Impact Statement* ([Appendix 2](#)) are:

- Ktunaxa Nation (St. Mary's Indian Band, Lower Kootenay Indian Band, Tobacco Plains Indian Band, Akisq'nuk First Nation);
- Samson Cree Nation;
- Shuswap Indian Band;
- Foothills Ojibway First Nation;
- Métis Nation of Alberta; and
- Métis Nation of British Columbia.

A.9.1 Consultation Objectives

Consultation activities conducted by Benga with Aboriginal groups are guided by key objectives that satisfy regulatory requirements and help develop relationships with Aboriginal groups who may be affected by the Project. Benga is committed to the following key consultation objectives:

- respectful and meaningful consultation with Aboriginal groups including meeting in the early stages of Project planning;
- sharing important and relevant information about the Project and facilitating site-specific discussions with Aboriginal groups in a timely manner regarding Project updates, baseline information, and assessment results;
- working collaboratively with Aboriginal groups to develop work plans and to include Aboriginal groups in field work opportunities;
- including feedback and important information from Aboriginal groups by conducting TK studies, seeking input on potential effects, and including recommendations on ways to mitigate potential effects; and
- Ongoing and open communication with Aboriginal groups through the life of the Project to address issues and concerns.

Effective consultation with Aboriginal groups is an important part of the Project as collaboration with Aboriginal groups can enhance the quality of an Environmental Impact Assessment (EIA) in terms of confidence in results, avoiding potential impacts to Aboriginal groups, and incorporating knowledge of the local environment.

A.9.2 Results

Aboriginal groups provided feedback on the Project through the pre-panel phase including identifying issues and concerns. Issues and concerns identified to date have been around several themes including but not limited to: reclamation and decommissioning process; employment opportunities; opportunities to participate in monitoring programs; maintaining access to traditional use areas; community investments; emergency preparedness; and aquatics. These concerns have been documented, incorporated and responded to in [Section H](#). Benga's commitments to mitigating potential Project effects on Aboriginal groups are summarized in [Appendix 2D](#).

Traditional knowledge and use studies (TK/TU Studies) were funded by Benga and conducted with Kainai Nation, Piikani Nation, Siksika Nation, Tsuut'ina Nation, and Stoney Nakoda Nation. With respect to the Project, the purpose of the TK/TU Studies is to record traditional knowledge and land uses, to identify potential effects of the proposed Project, and to provide knowledge holders an opportunity to share ideas for mitigation of potential effects. TK/TU studies that were approved for use by Aboriginal groups were used to inform the EIA such as in the assessment of potential impacts to vegetation, wildlife, health, socio-economics, and historical resources. TK/TU Studies are available in [Appendix 7C](#).

A.9.3 Continuing Consultation

The Aboriginal consultation program will continue throughout the EIA process and through the life of the Project. During the Panel review phase of the Project, Benga expects to complete the following actions:

- provide notice to all Aboriginal groups of upcoming EIA milestones throughout the Application phases;
- provide project information/updates, technical reports, the EIA and related regulatory documents to all Aboriginal groups throughout the EIA process;
- organize and participate in community information sessions with Treaty 7 First Nations to provide an opportunity for community members to speak with Benga representatives about results of the EIA;
- work with Aboriginal groups, especially non-Treaty 7 First Nations, to determine the most appropriate ongoing processes for consultation activities, schedules, and project timelines, including regulatory process timeframes for comment; and
- facilitate ongoing consultation with Aboriginal groups who are affected by the Project on commitments made in the EIA. In particular, during the pre-construction phase Benga will work with applicable Aboriginal groups to review key management plans and mitigation measures.

A.10 ENVIRONMENTAL ASSESSMENT SUMMARY

The Project EIA and Cumulative Effects Assessment (CEA) have been prepared to comply with all applicable provincial and federal legislation. The EIA methodology and approach were developed to satisfy both provincial and federal requirements within the spirit of the Canada - Alberta Agreement on Environmental Assessment Cooperation.

This section of the application provides an executive style summary of the more detailed information contained in [Section E](#), and in the [Consultant Reports \(\[CR\] #1 to #12\)](#). To assist in the review of this application, a common numbering scheme exists for each discipline between the sections of the report (e.g., Air Quality & Climate is discussed in [Sections A.10.1, E.1, and CR #1](#); Vegetation is discussed in [Sections A.10.8, E.8 and CR #8](#)). Only a summary of the Historical Resources is provided in [Section A.13 and E.13](#), as the full detailed report will be submitted to Alberta Culture under a separate cover. Traditional Use (TU) and Traditional Ecological Knowledge (TEK) are incorporated within each pertinent discipline; however, the majority of the related information can be found in the Aboriginal Consultation sections of the Application ([A.9, Section H, and Appendix 7](#)).

Valued Components

The rigorous review of the Project identified a number of environmental aspects that were specific to the proposed development. A list of VCs was developed for each discipline. The VCs were identified by Benga, the public, Aboriginal Groups, government agencies, and professional community. VCs consider both biophysical (*i.e.*, ecosystem) and socio-economic attributes because of the broad-based definition of environmental effect.

The EIA was focused on the potential impacts that the Project would have on the identified VCs, in combination with other activities in the region, over the projected life of the Project. Application of the selected methodology provided the scope for the EIA. VCs were assessed using three scenarios:

- Baseline Case –which includes existing environmental conditions and existing projects or “approved” activities;
- Application Case – starts with the baseline case and adds only the Project; and
- Planned Development Case (PDC) – which for federal review purposes is concomitant with the CEA, includes past studies, existing and anticipated future environmental conditions, existing projects or activities, plus other “planned” projects or activities.

VCs have been identified within each of the following disciplines:

- air quality & climate;
- noise;

- hydrogeology;
- hydrology
- surface water quality
- aquatic resources;
- hydrology;
- soils and terrain;
- vegetation;
- wildlife;
- land and resource use;
- socio-economic;
- human health;
- historical resources; and
- traditional land use.

Study Areas

The proposed Project mine permit boundary is approximately 3,701.4 ha in size. Within this permit area, the “footprint” of the Project is approximately 1,520.7 ha ([Figure A.1.0-2](#)). The Local Study Areas (LSA) and Regional Study Areas (RSAs) varied in geographic extent according to the needs of the different disciplines. For the PDC/CEA for this Project considered all the existing, approved and reasonably foreseeable projects within the Vegetation RSA. The various discipline specific study spatial and temporal boundaries, along with the projects considered in the PDC/CEA are discussed further in [Section D](#).

Based on the input received during the public engagement program, advice from regulatory agencies and the professionals working on the Project, Benga is confident that the approach used for the EIA (and PDC/CEA) for the Project is comprehensive and accurately reflects the potential effects of the Project.

A summary of the EIA is provided in this section. The full EIA information is provided in [Section E](#) and the associated Consultants’ Reports, which are listed in each sub-section below.

A.10.1 Air Quality

The potential effects of the Project on Air Quality are discussed in [Section E.1](#) and [CR #1a](#).

From an Air Quality VC perspective, the Project was assessed for potential impacts from the release of emissions to the atmosphere from fossil fuel combustion sources, fugitive emissions from processing

equipment, soil and overburden handling, coal movement and wheel entrainment. The objectives of the air quality assessment were to address the Project provincial and federal terms of reference and guidelines, and to compare predicted air quality to provincial and federal air quality objectives.

Four assessment cases were considered in the air quality assessment:

- Baseline Case– including all existing emissions from Highway 3 and four communities, and a measured background concentration. No active industrial facilities were located within RSA;
- Project-Only Case in Year 19 – including Project-only emissions from mining and waste stripping, north and south disposal areas, haul road emissions, coal processing facility emissions and transportation emissions;
- Application Case for Year 19 – including Baseline Case and Project-only emissions as defined above; and
- Planned Development Case – identical to the Application Case, as no planned industrial developments were identified, and community and Highway 3 traffic emissions were assumed to be approximately unchanged.

A review of project emissions identified the following chemicals of potential concern for the Project: sulphur dioxide (SO₂), nitrogen oxides (NO_x), carbon monoxide (CO), ozone (O₃), Volatile Organic Carbons (VOC), Polycyclic Aromatic Hydrocarbons (PAH), particulate matter with a mean aerodynamic diameter of 2.5 µm or smaller (PM_{2.5}), with a mean aerodynamic diameter of 10 µm or smaller (PM₁₀), particulate with a mean aerodynamic diameter of about 30 µm or smaller (TSP), and greenhouse gases (GHGs).

The Air Quality RSA was 30 km x 35 km and encompassed all project sources and the nearest communities. All identified, regional sources within the RSA were included in the assessment. The LSA was defined as the region immediately surrounding the Project development and was 12 km x 15 km. Air quality predictions were made throughout the RSA at grid points and at additional select locations.

Project emissions were based on the expected operations during a worst case year of production (Year 19) based on material handling and hauling. All project activities were considered in detail, from blasting, handling, hauling, and loading on rail cars. Emissions from all activities were based on published engineering estimates. The effects of mitigation, such as dust suppression, were identified and included.

The methods used in the air quality assessment met provincial air quality modelling guidelines. The CALPUFF and CALMET models were applied to five years of meteorological data. Air concentrations during various averaging periods and deposition to the surface were addressed.

Air quality predictions were as follows.

Blasting resulted in large relative increases in predicted maximum 1-hour concentrations of combustion emissions (SO₂, NO₂, CO) on the eastern pit boundary. For longer averaging periods, the actual and relative increases due to the Project were negligible. The Alberta objectives were met for all averaging periods for SO₂, NO₂ and CO at all locations in the Baseline, Project-only, and Application cases.

The 24-hour PM_{2.5} Alberta and Canadian objectives were not exceeded at or beyond the Mine Permit Boundary for any assessment case. PM₁₀ daily predictions exceeded the BC objectives for all assessment cases, including the Baseline case, as a result of community and highway emissions. TSP predicted concentrations were above the Alberta objectives in all assessment cases. Exceedances for daily TSP were also predicted at a number of special receptors in Application and Baseline cases, but the Project contribution was not significant. For the Application case, locations of maximums shifted to the eastern bit boundary, as a result of fugitive dust emissions from the haul road which is located very close to the boundary of the pit.

Odours from NO₂ were predicted to be detectable in communities in the Baseline case, up to 44% of the time. The Project did not change those frequencies in the community but added a new location with detectable odour on the Mine Permit Boundary in the Application case, likely the result of blasting.

A.10.2 Noise

Benga conducted a Noise Impact Assessment (NIA) for the proposed Project. The potential effects of the Project on Noise are discussed in [Section E.2](#) and [CR #2a](#).

The NIA LSA consisted of the proposed Mine Permit Boundary, with the RSA defined as a 1,500 m buffer around the NIA LSA.

The noise modelling results indicate that the Project noise levels during the night-time and day-time, with the addition of the Ambient Sound Levels (ASLs), will be below the PSLs for all residential and theoretical 1,500 m receptors. The results also indicate that the C-weighted (dBC) sound levels will be less than 20 dB above the dBA sound levels for approximately half of the receptors. As specified in the AER Directive 038, if the dBC - dBA sound levels are less than 20 dB, the noise is not considered to have a low frequency tonal component. For the other half of the receptors, the dBC - dBA sound levels are greater than 20 dB. This elevated low frequency noise is associated with the locomotives operating at the rail loadout, at the southern portion of the Project.

The modelling results indicate the possibility of a low frequency tonal noise. Assessment of any actual low frequency tonal noise would require noise monitoring to be conducted during normal operations of the Project. If, upon start-up of the Project, a low frequency noise complaint is received, Benga will conduct a comprehensive sound level (CSL) survey in accordance with the requirements of the AER *Directive 038*.

Anticipated increases in noise arising from the operating rail alignment and associated loadout components are expected to fall within the range of +5.0 dBA, which is the accepted maximum tolerable increase for residential receptors.

A.10.3 Hydrogeology

The potential effects of the Project on groundwater resources are discussed in [Section E.3](#) and [CR #3](#).

The LSA was selected as one section around the Mine Permit Boundary. The RSA was defined based on natural features and extended to include Gold Creek, Blairmore Creek and the headwaters of Daisy Creek.

The VCs selected for this assessment include bedrock aquifers, water wells and the groundwater discharge to surface water bodies including Blairmore, Gold and Daisy creeks. It was identified that the groundwater quality of these VCs could be impacted by operations of surface facilities and mine spoil and that the groundwater quantity could be impacted due to effects of pit dewatering.

The methodology for the evaluation of potential environmental impacts from the proposed mine development was to analyze the existing available information from publicly available resources, collect baseline hydrogeological information (water levels, hydraulic conductivity and water chemistry) from the proposed mine area, develop a numerical groundwater model and synthesize all this information into an appropriate assessment.

Surficial deposits in the LSA are limited and mostly consist of alluvial deposits. The uppermost bedrock of interest for this assessment consists of the Mist Mountain Formation of the Upper Jurassic to Lower Cretaceous age. The formation comprises the economical coal for the Project, interbedded with siltstone and claystone. Beneath the Project, bedrock is folded, faulted and fractured.

Hydraulic conductivity of units belonging to the Kootenay Group, including coal, range from less than 1×10^{-10} to 5×10^{-6} m/s. The higher conductivities in the 10^{-6} m/s range are not common indicating that no significant aquifers are present within or beneath the mine pit.

Groundwater recharge occurs on topographic highs, where precipitation is the most abundant. Groundwater hydraulic heads generally indicate a downward hydraulic gradient at elevation and

depth. Beneath topographic highs, groundwater primarily flows downward to great depth. As the slope becomes more gradual and the elevation decreases towards the topographic lows and the river valleys, groundwater primarily flows upward and discharges into local surface water features, including Blairmore Creek and Gold Creek. Groundwater divides are correlated and match the main surface water divides separating the watersheds.

The groundwater flow path indicates that two systems coexist, with a deep system driving groundwater recharge to depth and a shorter pathway driving groundwater discharge to the river valleys within a relatively short timeframe. Groundwater is expected to reside in the system for period of time greater than 50 years.

There are 177 groundwater wells within the RSA, 47 of which are located within the LSA. The closest confirmed domestic well is located 3.1 km southwest of the proposed CHPP location and 3.7 km southwest of the mine pit boundary. There are 11 licenced groundwater diversions identified within the RSA; however all the water licences are interpreted to be extracting groundwater from surficial aquifers near the Crowsnest River and not from bedrock aquifers.

During mining operations, surface runoff and groundwater that enters the pit will be collected and pumped to the water management system. Dewatering of the pit will cause the hydraulic head in the bedrock units to decrease forming a drawdown cone that will expand laterally. Changes to the groundwater system will be permanent as part of the natural system will be physically removed during mining; however, changes will be limited in extent. Model predictions indicate that measurable drawdown will be mostly located within 400 m of the pit boundary and contained within the proposed Mine Permit Boundary.

There are no water well licences or wells within the proposed Mine Permit Boundary. The nearest domestic well is located 3.7 km southwest of the pit boundary and no impacts from pit dewatering are predicted to any water wells.

Potential impacts to groundwater quality relate to the placement of mine waste rock materials. Information shows that no notable effect to groundwater quality has been observed related to historical mining activities at the Project. The low concentration of nitrates observed in groundwater and toe springs supports a decrease in nitrate concentration with time. The geochemical characterization shows that selenium is the key substance with the potential to have an effect on groundwater quality during the active mining operations and closure. A management plan for selenium, acidity, nitrate, and metals will be implemented and as a result, bedrock aquifers and domestic and municipal water wells are predicted to have low to no groundwater quality impacts associated with mine waste rock and mine activities.

Hydrocarbon fuels and other chemicals will be used or stored at the Plant Site. As a result of the best management practices for material handling methods, there should be a low possibility of potential effects to shallow groundwater quality, except through upset conditions, *i.e.*, accidental spills or leak. In the event of a spill or leak, the spill response plan will be executed to control and minimize the extent of any impact.

Residual impacts of the Project on groundwater quantity and quality are predicted to be insignificant. Cumulative effects are not expected due to the localized extent of potential impacts and lack of other activities that will interact cumulatively with them; subsequently, a cumulative effects assessment was not required.

A.10.4 Hydrology

The potential effects of the Project on hydrology are discussed in [Section E.4](#) and [CR #4](#).

The hydrology LSA is congruent with the surface water quality and aquatic resources LSA and encompasses areas where Project activities have the potential to impact aquatic habitat or fish populations and communities. The LSA is comprised of the Blairmore Creek and Gold Creek watersheds, as the Project footprint is located entirely within these two watersheds, which have areas of 5,121 ha and 6,209 ha, respectively. The Blairmore Creek watershed is relatively steep, with an average slope of 22% and elevations ranging between 2,300 and 1,300 m asl. Gold Creek has similar geomorphological characteristics with an average slope of 19% and elevations ranging from 2,500 to 1,300 m asl in the region

The RSA for aquatic ecology, water quality, and hydrology are also congruent. Project effects have the potential to interact with other projects within the Crowsnest River watershed and therefore the RSA is comprised of the entire Crowsnest River watershed.

The assessed VCs included water flows and water quality (sediment concentrations) for Blairmore Creek, Gold Creek, and their associated tributaries that may be impacted by the Project. Specifically, the VCs are:

- high, mean, and low flows on Blairmore Creek during the operations phase and after closure;
- high, mean, and low flows on Gold Creek during the operations phase and after closure; and
- sediment concentration in Blairmore Creek and Gold Creek during the operations phase and after closure.

The only true loss of water from the Project area is the moisture associated with the clean coal that is shipped off site to market; however, within the Project area there are changes to surface water flows as water is collected, diverted, treated, and discharged, and changes to the inventory of water stored

in various reservoirs such as ponds, saturated zones, and groundwater. Changes to surface characteristics of the developed mine areas are expected to result in higher runoff, which is a net gain in terms of the water balance. In the long-term, the annual discharge volume is expected to be greater than baseline conditions by approximately 600,000 m³/year in years with annual average precipitation. The increase is caused by the higher runoff coefficient associated with the legacy highwalls.

The proposed open pit intersects portions of the upper reaches of the western catchments for Gold Creek. Water intercepted by those areas may be routed to saturated zones and from there, if required based on operational water quality monitoring results, to a water treatment plant. The potential water treatment step may require the discharge from the saturated zones to be treated for removal of metals. In this instance, the treatment plant would discharge to Blairmore Creek; therefore, a net loss of flow may occur in the lower reaches of Gold Creek. The majority of the potential flow changes in Gold Creek are estimated to be around or less than 5%; however, there will be a stretch that may have a change in flow at approximately 10%. If deemed necessary by results of the Project's instream flow needs (IFN) study (to be released in Q1 2017), flow augmentation mitigations can be implemented. At Closure, there will be a continuous increase in base flow estimates in the upper reaches of Gold Creek based on contribution of flows from the final pit lake, which will be designed to be self-sustaining system and will overflow at a specific elevation into Gold Creek.

Under average conditions, flows in Blairmore Creek are expected to increase compared to baseline conditions predominantly because of the estimated increase in runoff caused by changes to the hydrological characteristics of the developed mine areas. For most of the year, the maximum change to flow is expected to be less than 15% for all stations. The water balance model assumes that the discharge from the saturated zones or water treatment plant will be controlled based on the rate of accumulation of water in the saturated zone and the stream flow conditions in Blairmore Creek.

Changes to flows during dry and wet conditions are estimated to be similar to those under average conditions.

The potential effects to flows in Blairmore Creek and Gold Creek were assessed as changes to monthly flows. The monthly flows estimated by the water balance model, both during baseline conditions (in 2017) and through the life of the mine (2018 to post-closure), were assumed to be mitigated by the operational water management. Mitigation consists of interception, diversion, treatment, and release of treated water. Impacts to flows were assessed to be not significant). The rating was based primarily on the low magnitude rating for the reduced flow in Gold Creek and the low to moderate rating for estimated increases to flow in Blairmore Creek. Overall, the estimated changes are well within the range of variability that would naturally occur between wet and dry

years. Any follow-on effects occurring downstream in the Crowsnest River would also be not significant.

Potential effects related to sediment concentrations in Blairmore Creek and Gold Creek were also deemed to be not significant. This rating is primarily based on the assumption that engineering controls and a sediment and erosion control and prevention plan will be implemented for the Project.

A.10.5 Surface Water Quality

The potential effects of the Project on surface water quality are presented in [Section E.5](#) and [CR #5](#).

The surface water quality assessment was based on quantitative and qualitative approaches including baseline studies, water quality modeling, other EIA components, scientific literature, and professional judgment. Seasonal water quality data were collected in 2013, 2014, and 2015 from Blairmore Creek and Gold Creek and their tributaries (LSA) and from the Crowsnest River (RSA). Water samples were analyzed for water quality variables, including field and conventional variables, major ions, nutrients, trace metals, and organics. Water quality data were evaluated by comparing concentrations of individual substances or variables with Alberta Environment and Parks' (AEP) *Surface Water Quality Guidelines for the Protection of Aquatic Life*.

Surface waters in the LSA and RSA were generally clear, characterized by low colour (often below analytical detection limit), low suspended solids, and low total organic carbon concentrations. All watercourses were well-oxygenated, with dissolved oxygen concentrations higher than the minimum requirement of the water quality guideline for the protection of aquatic life. pH was mostly in alkaline range. Total hardness and alkalinity levels characterized all sampled watercourses as hard water creeks/river with low sensitivity to acid depositions. With the exception of a few sulphide concentrations, concentrations of ions were generally low and dominated by calcium and bicarbonate. Surface waters in the LSA and RSA were classified as having low nutrient concentrations with total ammonia, nitrite, and nitrate concentrations often being below the detection limits. Concentrations of total phosphorus suggested the surface waters in the LSA and RSA were within the "oligotrophic" (low) range of aquatic productivity.

Of the 25 metals (both dissolved and particulate forms) measured in the study areas, approximately half were below the analytical detection limits. Concentrations of detected metals were within water quality guidelines, with the exception of total mercury, total selenium, and dissolved aluminum, which occasionally exceeded water quality guidelines for the protection of aquatic life. Total mercury exceeded the guideline in 20% of the samples at Blairmore Creek and 25% of the samples at Gold Creek during summer. Total selenium and dissolved aluminum exceeded the guidelines at Gold Creek. Total selenium exceeded the site-specific objective in 25% of the samples during summer and

in 20% of the samples during winter. Dissolved aluminum exceeded the guideline in 11% of the samples during summer and in 25% of the samples during winter.

No guideline exceedances for metals were noted in the Crowsnest River in the baseline data. However, historical data collected in the Crowsnest River indicate that concentrations of total copper, total chromium, total cobalt, total lead, total silver, total mercury, and total zinc were higher than the water quality guidelines in at least one season. Concentrations of organic compounds were usually below the detection limits at all watercourses and all seasons. The water quality of pit lakes was similar to creeks and within the water quality guidelines.

Specific activities that may influence surface water quality include:

- Construction: development of the mine (haul roads); soil stripping and vegetation clearing; development of water management drainage ditches, sedimentation ponds, and surge ponds; and construction of the rail loop alignment (and associated crossing of Blairmore Creek);
- Operations: pit dewatering, surface water runoff, leaching (*via* groundwater seepage) of overburden rock, accidental leaks and spills, domestic wastewater, and use of explosives; and
- Reclamation: abandonment of open pit workings, surface and rock disposal area recontouring, and abandonment of roads and water management systems.
- In addition, there is the potential for acidification effects associated with the release of air emissions from the Project and other regional developments.

Each of these activities has the potential to influence the natural drainage, infiltration, runoff, and soil erosion of the existing pre-disturbed Project area, which can influence surface water quality; therefore, water management is a key design feature for all phases of the Project. The main objective of the water management plan is to control surface water runoff (to minimize loading of total suspended solids into nearby watercourses) and to ensure other constituents of water quality (*e.g.*, selenium and other metals) are treated before release to natural watercourses.

Based on the associated project activities and mine plan, the following potential water quality issues were identified:

- release of process-related water that does not meet surface water quality guidelines to the natural watercourses;
- use of nitrogen-based explosives;
- accidental leaks and spills of hydrocarbons, chemicals and waste products used and stored within the Project footprint;
- generation of domestic wastewater from camp operations; and

- acidifying/air emission effects.

Based on the anticipated management of runoff and controlled release rates from sedimentation ponds during construction, effects of released process water on water quality are not significant. During operation, all process water with elevated selenium, nitrogen species, and other constituents will be diverted to surge ponds, from where water will be passed through the sequential saturated zones with sufficient water residence time to reduce selenium and nutrient concentrations. Selenium and nitrate/nitrite will be removed through microbial activities that will be enhanced by labile carbon sources. The outflow from the saturation zones will be directed to a water treatment plant to reduce other elevated metal concentrations.

To minimize the nitrogen species derived from blasting residues, packaged explosives will be kept on-site; all runoff from the ammonium nitrate storage areas, mine pits, and mine rock piles will be contained within the water management system. Effects of these explosives on water quality are assessed to be not significant.

As a result of a Spill Response Plan and trucking away domestic wastewater, the effects of accidental leaks/spills and domestic wastewater on water quality are not significant. The average acid deposition due to Project air emissions is lower than the monitoring level for moderately sensitive ecosystems; therefore, acidification effects from aerial emissions of the Project are not expected to occur.

Cumulative impacts were assessed to be the same as the residual impacts – all not significant.

A.10.6 Aquatic Resources

The fish and aquatic resources assessment is discussed in [Section E.6](#) and Consultant Report #6 ([CR#6](#)).

A fish and aquatic resources baseline assessment program for the Project was conducted between 2014 and 2015 and has continued into 2016 to collect additional baseline data on fish population status and detailed habitat information for an Instream Flow Needs (IFN) study. This additional information was deemed critical components to understanding the potential impacts of the Project on fish and aquatic resources. Due to seasonal timing requirements for this information, the finalized assessment was not completed at the time of the Project's EIA report and EPEA application submission. In various discussions with the AER and CEAA, it was agreed that once the entire 2016 fish and aquatic resources field program is completed, a final impact assessment will be provided as an addendum to the EIA. This addendum will provide the complete baseline data set and impact assessment for fish and aquatic resources associated with the Project. The current Consultant Report

(CR#6) (as well as the future addendum, which will be issued to the AER and CEAA Q1 2017) was prepared by Hatfield Consultants Partnership.

The information provided in Section E.6 and CR#6 provides an overview summary of the overall fish and aquatic resources assessment approach, objectives, and methodologies for the additional supporting fish and aquatics field work required for the fish population assessment and IFN was still being executed.

The LSA for fish and aquatic resources encompasses areas where Project activities have the potential to impact aquatic habitat or fish populations and communities. The LSA is comprised of Blairmore Creek and Gold Creek watersheds, as the Project footprint is located entirely within these two watersheds (CR #6, Figure 2.1).

The RSA is comprised of the entire Crowsnest River watershed (CR #6, Figure 2.2) in order to evaluate potential cumulative effects at the regional level. Taken together, the Blairmore Creek and the Gold Creek watersheds represent approximately 11% of the watershed area of the Crowsnest River.

The existing Baseline Case for the fish and aquatic resources assessment was developed from information contained in the provincial Fish and Wildlife Management Information System (FWMIS), information contained in the recovery plans prepared for the westslope cutthroat trout, published reports from the Alberta Conservation Association and available scientific literature, information gathered during traditional knowledge and traditional land use surveys with members of the Treaty 7 First Nations, and a set of field programs conducted from August 2014 to August 2015. The 2014 and 2015 baseline studies consisted of aquatic habitat assessments, fish inventories on Blairmore Creek, and benthic invertebrate community and periphyton surveys. A summary of the results are provided in CR#6, Section 3.2. This Baseline Case will further supported by the 2016 fish population and IFN-based field programs; data collected to date and full methodologies are provided in CR#6, Section 3.3.

Based on the criteria above, the Fish/Aquatic Resource VCs selected include westslope cutthroat trout (WSCT; *Oncorhynchus clarkii lewisi*) and, more broadly, Aquatic Health, which is represented by brook trout (BKTR; *Salvelinus fontinalis*) and lower trophic level organisms (periphyton and benthic macroinvertebrates). WSCT was selected as the primary fish VC based on their provincial and federal status in the Aquatic Ecology local study area (LSA). They are also the only native fish species within the LSA to be potentially affected through potential habitat loss and/or alteration (*i.e.* changes in flow). The Aquatic Health VC was included to consider potential water quality-related effects throughout the life of the mine and includes multiple fish species and lower trophic organisms. Non-native BKTR are used as a surrogate to evaluate potential water quality-related effects to all fish in the LSA given the conservation sensitivities surrounding WSCT. Evaluation of potential effects on the

Aquatic Health VC is addressed primarily through the Surface Water Quality Environmental Effects Assessment Consultant Report ([CR#5](#)).

The core components of the aquatic effects assessment will focus on the potential direct habitat losses to select watercourses as a result of the project footprint, alterations to stream flow in select tributaries and mainstem watercourses, effluent discharge (*i.e.*, potential changes in water quality) and how these project activities interact with the select VCs. At this time, a complete impact assessment cannot be completed for these core components as all the required data that comprises the 2016 field program has not yet been collected. Once this data is collected, fully analyzed (*via* laboratory analysis, project footprint verification, and IFN model simulations), a final impact assessment and significance evaluation will be provided in the Aquatic Resources addendum (to be issued in Q1 2017). [Section 4.1](#) of [CR#6](#) provides an overview of the overall potential impacts of the Project on fish and aquatic resources, as well as a summary of the design features of the mine to mitigate the potential impacts.

On conclusion of the 2016 population assessment and IFN study, the results will guide Benga and resources managers with a robust and scientifically sound data set to fully understand the potential impacts to the fish with Blairmore Creek and Gold Creek, which will help in the determination of a comprehensive and functional habitat offset plan for any residual effects, if deemed by regulators to be necessary.

A.10.7 Terrain and Soils

The potential effects of the Project on terrain and soil are discussed in [Section E.7](#) and [CR #7](#).

The LSA for the terrain and soil baseline study includes lands within proposed mine development areas that are expected to be disturbed during the life of the Project (1,520.7 ha). The RSA corresponds to the Project area (existing and proposed mine permit areas). The area selected as the RSA (4,549.8 ha) is deemed sufficient to evaluate cumulative effects as relating to direct disturbance of soil and terrain from other industries/operations within this selected area.

VCs related to terrain and soils include:

- soil quality (includes impacts related to soil disturbance, erosion, soil burial, and accidental releases);
- soil biodiversity and ecological integrity;
- terrain; and
- landscape capability (impact to potential capability of reclaimed soil and landscapes in comparison to baseline conditions).

The soil survey intensity achieved within the LSA was one inspection per 6.6 ha of land (230 sites over 1,520.7 ha). The survey intensity achieved within the RSA was one inspection per 11.1 ha of land (407 site inspections over 4,528.4 ha). Soils were classified to the soil subgroup level (SCWG, 1998) and to soil series level based on the AGRASID 4.0 name file (ASIC, 2013; Bock *et al.*, 2006).

Baseline soil data were used to determine the potential Project effects on soil resources in the proposed development and study areas, and to assist in preparation of a conceptual Conservation and Reclamation (C&R) Plan with appropriate site mitigation and monitoring activities designed to achieve reclamation success.

Activities that may impact the soil resource and associated terrain as a result of the Project include:

- soil salvage and handling;
- soil stockpiling;
- development of Project infrastructure;
- mining process;
- operational activities; and
- progressive reclamation.

The analysis of soil quality considers changes that may occur in soil physical, chemical and biological properties and soil quantity due to soil profile disturbance (salvage activities, handling, and replacement), erosion, soil compaction, accidental releases, and stockpiling. The C&R Plan has been developed to minimize these potential effects on soil quality.

The potential effect to soil biodiversity and resulting ecological integrity of vegetation communities will be discussed in terms of the effects of the Project on the spatial distribution of soil patterns and potential changes in soil diversity and ecological integrity post disturbance. No changes in soil diversity or ecological integrity with respect to soil types and landscape patterns are expected from a regional perspective.

Various terrain types will be disturbed or removed as a result of Project development. It is expected that the creation of a range of terrain types during contouring and reclamation will provide a reclaimed terrain that will tie into adjacent undisturbed lands, and provide suitable landscapes for the development of a range of reclaimed soil types and functioning vegetation communities. The Project's effects on terrain are expected to be not significant.

Proper soil conservation, soil replacement, mine backfilling and re-contouring, soil placement, and revegetation are all key to ensuring that the reclaimed landscape provides equivalent land capability. The analysis of equivalent capability is assessed by evaluation of soil and overburden materials

comprising the root zone, loss of various land capabilities due to disturbance, and delay in achieving equivalent land capability post reclamation. An overburden assessment program coupled with proper soil salvage and prescriptive soil replacement plan will allow for suitable reclaimed soil profiles to be replaced after mining. Reclamation goals, end land use objectives, and measures of reclamation success will dictate the length of time that the reclaimed landscape requires to reach equivalent land capability. Over time, Benga expects that the reclaimed landscape and vegetation communities will provide equivalent capability to allow for commercial forestry, wildlife habitat, and recreational uses.

With effective soil salvage and handling, reclamation, and mitigation and monitoring the cumulative impacts to the RSA as a result of development of the Project and existing current and future developments are expected to be not significant.

A.10.8 Vegetation

The potential effects of the Project on Vegetation and Wetland Resources are discussed in [Section E.8](#) and ([CR #8](#)).

The LSA (4,797.6 ha) captures the entire Project footprint (1,520.7 ha), including those components that extend close to the proposed Mine Permit Boundary. The RSA (284,024.8 ha) is the LSA plus a 25 km buffer.

The assessment focused on ten vegetation and wetland VCs, which represent vegetation and wetland resources that may be affected by the proposed Project. Their selection was based on the following:

- important contributor to biodiversity at the local, landscape, or regional level;
- considered to be a threatened or endangered species at the provincial or federal level, or is known to be declining in the region;
- valued by traditional users (including Treaty 7 First Nations); and
- unique habitat type that is limited in area and will be affected by Project development.

The following VCs were selected: vegetation communities, rare plants, rangeland resources, forest resources, old growth forests, traditionally used species (TEK vegetation), wetlands, biodiversity and habitat fragmentation, potential acid deposition and nitrogen input, and invasive and noxious species.

Four hundred and eighty (480) plant species were identified in the LSA during field surveys – 298 vascular plants, 77 mosses and liverworts, and 105 lichens species. Of these, 41 species are listed as tracked or watched in Alberta (ACIMS 2014), 9 species are classified as noxious or prohibited

noxious weeds in Alberta, and 20 species are considered invasive in Alberta. Twenty-seven rare vascular and non-vascular plants were identified in the Project footprint.

Within the LSA, vegetation was mapped to the ecosite phase level (or other classifications if an ecosite phase classification was not appropriate, such as disturbed areas). Approximately 78% of the LSA is upland forest; 1% is naturally non-vegetated land, and 20% is disturbed land. This disturbed land includes previous un-reclaimed mined areas (185.2 ha), roads, and oil and gas developments within the Project Footprint. The un-reclaimed mined areas have only partially revegetated naturally. Nine ecosite phases, including wetlands, occupy less than 1% of the LSA and are therefore of a limited distribution. These include mostly Montane upland ecosite phases, along with one Montane lowland and two Subalpine upland ecosite phases.

Approximately 49% of the RSA is forested, 16% is naturally non-vegetated land, 27% is disturbed land, 7% is barren land, and less than 1% is wetland.

Two species identified in the LSA and footprint are federally listed by Committee on the Status of Endangered Wildlife in Canada (COSEWIC) (COSEWIC 2015): *Pinus albicaulis* (whitebark pine) and *Pinus flexilis* (limber pine). Whitebark pine is listed as “Endangered” in Alberta and British Columbia and under SARA Schedule 1. Limber pine was designated as “Endangered” throughout its range in Alberta and British Columbia by COSEWIC in November 2014. All but three provincially rare/watched species found in the LSA (two liverworts and one lichen) are on the *Alberta Wild Species General Status Listing - 2010*. The majority have a status of “Sensitive” or “May be at Risk.” However, whitebark pine and limber pine are ranked as “At Risk” and are ranked as “Endangered” under Alberta’s *Wildlife Act*. Mitigation measures, including some species-specific plans, have been developed to minimize Project effects on species at risk.

Approximately 50% of the native grasslands, including Foothills rough fescue, within the LSA will be removed. Project development will result in the removal of 74% of the total timber volume, 16% of old growth forest, and 29% of area that supports TEK vegetation potential from the LSA. With implementation of mitigation and the C&R Plan, these Project impacts are anticipated to be not significant.

The Project will remove 57% of wetland area from the LSA. The reclamation plan proposes to increase the total wetland area available by closure.

The Project’s impacts on habitat availability and fragmentation will result in reduced biodiversity in the LSA, which is expected to be reversed in the long-term through reclamation.

With mitigation and monitoring, overall Project impacts are characterised as being not significant for all VCs. Cumulative impacts, using the PDC, were assessed for terrestrial vegetation, wetlands, and

biodiversity and fragmentation. With mitigation, cumulative impacts to all three VCs were assessed as being not significant.

A.10.9 Wildlife

The potential effects of the Project on wildlife are discussed in [Section E.9](#) and [CR #9](#).

The wildlife LSA (WLSA) covers an area of 5,646 ha and was established to account for potential disturbance effects of Project development on wildlife that may extend beyond the Mine Permit Boundary. The wildlife RSA (WRSA) was defined as the area within 10 km of the WLSA boundary (73,547 ha). In addition, the Grizzly Bear RSA (GBRSA) was defined as the area within 25 km of the WLSA boundary (284,025 ha). The WRSA reflected the approximate average size of two elk winter home ranges, while the GBRSA represented the average area of an adult female grizzly bear home range.

The wildlife assessment addressed Project effects on wildlife and wildlife habitat, including habitat loss, habitat fragmentation and connectivity, wildlife mortality and health, and wildlife diversity. Wildlife VCs included olive-sided flycatcher, great gray owl, little brown myotis, western toad, Columbia spotted frog, American marten, Canada lynx, grizzly bear, elk and moose. An additional set of eight wildlife species were selected as special status species for high level assessment – barn swallow, common nighthawk, short-eared owl, bald eagle, golden eagle, wolverine, mountain goat, and bighorn sheep.

Field surveys were conducted for amphibians, songbirds, raptors, and mammals. Results from field surveys and reviews of available literature indicated 219 wildlife species (10 herptiles, 156 birds, and 53 mammals) could potentially occur in the WLSA. Field observations confirmed the presence of 87 bird species, five amphibian species, and 28 mammal species in the WLSA.

Of the confirmed species, four are SARA-listed (olive-sided flycatcher, common nighthawk, short-eared owl, and little brown myotis), five are COSEWIC-listed (western toad, barn swallow, grizzly bear, American badger, and wolverine), a total of 67 species are protected under the *Migratory Birds Convention Act*, and several are provincially rated as Sensitive.

The construction and operation of the Project will result in habitat loss, increased habitat fragmentation, and changes in wildlife movement, mortality risk, and abundance for the VCs, special status species, and migratory birds. With progressive reclamation and the implementation of extensive mitigation plans, it is expected that long-term Project effects on habitat availability, wildlife movement, mortality risk, wildlife abundance, and wildlife diversity will be not significant. Cumulative effects in the WRSA and GBRSA are expected to be not significant as Benga is committed

to mitigate Project effects throughout the construction, operation, and reclamation phases of the Project.

A.10.10 Land & Resource Use

The potential effects of the Project on land and resource use are discussed in [Section E.10](#) and [CR #10](#).

The LSA included the land contained within the proposed Mine Permit Boundary as this is the area where there will likely be surface development, and the RSA included the area within approximately 1.6 km of the LSA. These study areas were selected based on the area of potential for direct impact due to development of the Project.

The objectives of the Land and Resource Use Assessment were to identify land and resource uses that occur in the area proposed to be developed, identify how development of the proposed mine may impact those uses, and recommend mitigation measures to reduce impacts to either existing or potential land and resource uses.

The Project is located within the Municipal District of Rangelands No. 66 and within the Municipality of Crowsnest Pass. The closest communities to the Project are Blairmore and Coleman. Provincial Highway 3 and a main line of the Canadian Pacific Railroad are located along the southern edge of the proposed Mine Permit Boundary. The southern portion of the Mine Permit Area is accessible by a secondary access road off of Highway 3, while the northern portion of the Mine Permit Area is accessed by an access road *via* secondary Highway 40 (Forestry Trunk Road).

The proposed Project is situated on both Crown and freehold land. A significant portion of the freehold land is owned by Benga Mining, with access to the remainder of the freehold land currently being discussed with the owners. The area within the Mine Permit Boundary contains seven properties that have existing dwellings, in the form of cabins. The Historic Town of Lille and two additional dwellings are located just east of the proposed Mine Permit Boundary. Benga mining is in consultation with potentially impacted land owners and it is anticipated that all outstanding issues can be resolved.

There are several land and resource use policies and regional planning initiatives applicable to the area covered by the proposed Mine Permit Boundary including:

- the Coal Development Policy for Alberta;
- the Livingstone- Porcupine Hills Sub-Integrated Resource Plan;
- the Crowsnest Corridor Local Sub-Regional Integrated Resource Plan;
- the South Saskatchewan Regional Plan;

- the Approved Water Management Plan for the South Saskatchewan River Basin;
- Environmentally Significant Areas; and
- Wildlife and Biodiversity Zones.

Through a review of regional policies and initiatives environmental issues and concerns have been identified and appropriate mitigation measures included in the design, construction, operation and reclamation plans for the Project. Therefore, development of the Project does not conflict with the intent of these policies and initiatives

Resource development activities that could potentially occur in the area include coal, oil and gas, forestry and agriculture (*i.e.* grazing). There are various surface and subsurface dispositions in place to support development of these resources. It is predicted that the impacts to other resource developers in the area will be not significant. Benga currently has access to all of the coal rights within the proposed mining area and there is no known subsurface resource development occurring in the area other than coal. If the holders of the other leases in the area decide to progress with development of these subsurface resources, Benga will work with the lease holders to develop plans to coordinate activities. The impact to forestry and agricultural resources is also predicted to be not significant. Once mining areas are no longer required they will be reclaimed to a land use equivalent to what existed prior to development of the Project. This includes areas for both timber production and grazing.

Three trapping area dispositions are located within the northern portion of the study area. It is predicted that the impact of the Project on the access to hunting and trapping areas will be not significant as a majority of the land to be developed is privately owned. The lands will be reclaimed to an equivalent capability and Benga will continue to consult with holders of the trapping areas in order to identify further mitigation measures.

Provincial Highway 3 and a main line of the Canadian Pacific Railroad are located along the southern edge of the proposed Mine Permit Boundary. Highway 3 and secondary Highway 40 provide access to the mine. Surface dispositions associated with various public utilities are found within the LSA and RSA. These include pipeline lease agreements, easements for power lines and dispositions for associated access requirements. An underpass on Highway 3 will need to be developed in order to transport coal from the loadout to the existing rail line. The impact on access and utilities in the area due to development of the Project will be not significant. The project will encroach upon an existing power line, but Benga has worked with AltaLink to develop a strategy to ensure operation of this line is not disrupted. This strategy could include realignment of the line. Benga has also been consulting with stakeholders on the construction of the rail loadout and associated underpass on Highway 3 in

order to ensure that the final location and design takes into consideration issues raised by stakeholders therefore minimizing potential impacts.

The Crowsnest Pass is well known for its opportunities for tourism and outdoor recreational activities. There are several provincial parks and recreation areas found within 20 km of the project. Some recreational activities and facilities within the immediate vicinity include a golf course, hiking trails, campgrounds and cabins, a ski resort and mountain biking trails. It is predicted that the direct impact to tourism and outdoor recreation due to development of the Project will be not significant. A majority of the land to be developed is owned by Benga. Benga has been consulting with private landholders since 2013 to access additional privately owned lands.

Development of the Project has the potential to impact the historic Greenhill Mine area. The historic Town of Lille, Frank Slide, Bellevue Mine and the Green Creek Wintering site are all located outside of the proposed Project footprint and therefore will not be impacted by development of the Project. Impact to those historical resources identified within or adjacent to the Project footprint will be mitigated by undertaking additional study, where required, and obtaining clearance in accordance with the *Historical Resources Act* prior to development of the Project.

With the implementation of mitigation measures and monitoring, it is expected that the Project will not have a significant impact on land and resource uses within the area.

A.10.11 Socio-Economic

The potential effects of the Project on socio-economics are discussed in [Section E.11](#) and [CR #11](#).

The Project is fully located within the province of Alberta in the M.D. of Ranchland and the S.M. of Crowsnest Pass; however, the Town of Sparwood, located 40 km to the west of the Project in the province of BC, acts as a service centre to several mines in southeastern BC and will likely also serve the Project. The RSA therefore consists of two unique parts:

- the Alberta portion which includes Ranchland and Crowsnest Pass; and
- the B.C. portion which includes only the Town of Sparwood and the portion of Highway 3 connecting the Project to the Town.

The boundaries of the RSA have been defined based on the following considerations:

- the existing trade patterns and traffic flows in the region;
- the existing distribution of service providers and infrastructure in the region;
- Benga's hiring and materials procurement plan for the construction of the Project;
- the experience of other industrial projects in the region;

- land use concerns related to lands nearby the Project; and
- the availability of statistical data to adequately measure the impacts of the Project.

The socio-economic assessment focused on the Project's impact to the services in the communities of Crowsnest Pass due to its proximity to the Project, and Sparwood, which is the nearest service centre for the mining industry. The socio-economic effects of the Project will not be uniformly distributed across the RSA and the effects assessment for each VC is focused on different communities as appropriate.

The key socio-economic value components assessed fall into the following categories:

- employment;
- personal and business income;
- government tax and royalty income;
- population;
- regional infrastructure and services, including:
 - housing, including worker housing;
 - social infrastructure (*e.g.*, health, education, policing, emergency, recreation, and social services);
 - municipal infrastructure and services;
 - transportation effects;
- traditional land use.

The Project will create positive economic and fiscal effects on the socio-economic RSA. The Project is estimated to create:

- 90 person years of engineering employment prior to and during construction;
- 910 person years of on- and off-site employment related to the construction of the plant, facilities and infrastructure for the mine between 2018 and 2019; and
- 385 long-term operations positions to be hired by 2020.

Once fully operational, the Project will add an estimated \$1.5 million annually in property taxes to Ranchland and Crowsnest Pass, which over the life of the Project has a net present value (NPV) of approximately \$11.2 million (NPV 2015) assuming no change in mill rates. An estimated 67% of these taxes will be paid to Ranchland and the balance will be paid to Crowsnest Pass. The Ranchland council has acknowledged that much of the impacts of the Project will accrue to Crowsnest Pass and has indicated they would be open to negotiating a revenue-sharing agreement once the Project

commences (RL 2013). The Project will also contribute an estimated \$140 million (NPV 2015) and \$210 million (NPV 2015) to provincial and federal corporate income taxes respectively as well as approximately \$195 million (NPV 2015) in provincial royalties over the 23-year operating life of the project, assuming a \$140/tonne average real price of coal.

The jobs created by the Project are expected to be filled primarily by in-migrants to the region, thereby increasing the permanent population in the RSA. Within Alberta, the population impact of the Project is expected to fall primarily on the S.M. of Crowsnest Pass, particularly the communities of Blairmore and Coleman as they are closest to the Project.

In addition to the impact in Alberta, the Project is expected to result in population growth in the nearby Town of Sparwood in BC. By the year 2021, an estimated 1,100 people are expected to have re-located to the region, with approximately 430 going to Sparwood, 660 to Crowsnest Pass, and the balance (10) to Ranchland. The effects on regional services and infrastructure will largely be in line with population effects, falling primarily on Crowsnest Pass and Sparwood.

A number of service providers have indicated that they are well positioned to plan for and address future growth forecasted under both Base and Application Case assumptions, particularly in Sparwood. In Crowsnest Pass, concerns were raised about the ability of the municipality to provide sewage and water services to a larger population.

While service providers will likely face challenges in meeting the increased demand, future growth can also help generate opportunities to address this increased demand by increasing revenues to government, increasing the labour and volunteer base, and growing the number of businesses that can support local programs and infrastructure. Growth in a community can also help increase or revitalize the breadth and nature of infrastructure and services available to local residents (*e.g.* specialized health services, broader educational offerings).

Effects on traditional land use are discussed in [Section H](#).

A.10.12 Human Health

The potential effects of the Project on human and wildlife health are discussed in [Section E.12](#) and [CR #12](#).

The LSA, which is a 10 km by 15 km area centred on the proposed facility, was selected to include key local receptors and to exclude most regional emissions sources in order to differentiate Project impacts from the effects of regional projects. The RSA is a 30 km by 35 km area, centred near the northern boundary of the LSA, selected to include local communities such as Coleman, Blairmore, and Frank, as well as any other emissions in the area.

The Human Health Risk Assessment (HHRA) describes the nature and significance of potential health risks to the local human population, associated with exposure to chemicals that could be released to the environment from the proposed Project. The HHRA also assessed the potential health risks associated with existing conditions, prior to development of the Project, as well as future conditions related to the Project in combination with other planned developments in the region. A screening level wildlife health risk assessment was also conducted, using the same models and air concentrations as the health risk assessment.

Chemicals of potential concern (COPCs) were identified through an inventory of expected Project air emissions, as described in the Air Quality Assessment (CR #1a). As the Project will not release any chemicals into potential domestic use aquifers or surface water under normal operating conditions, the COPCs were based on air emissions only.

The COPCs identified for the Project included:

- SO₂, NO₂, CO, fine particulate matter with diameters of 2.5 and 10 microns (PM_{2.5} and PM₁₀);
- metals;
- polycyclic hydrocarbons (PAHs); and
- volatile organic compounds (VOCs).

The HHRA evaluated both acute and chronic inhalation health risks for all of the identified COPCs for which adequate toxicological data was available. Direct inhalation of air was assumed to be the primary exposure pathway; however, several secondary pathways were also identified as follows:

- COPCs in air can be deposited onto soil in the surrounding area. Receptors may then be exposed by direct contact with soil, inadvertent ingestion of soil, and inhalation of dust;
- COPCs could accumulate in local vegetation, through direct deposition from air or uptake from affected soils. Receptors may then be exposed by ingestion of local vegetation; and
- COPCs in soil, plants, and water can be ingested by local wildlife. Receptors may then be exposed by ingestion of local wild game.

The Project is not expected to have any effect on water quality; however, exposure through ingestion of surface water, contact with surface water while swimming, and ingestion of fish were considered in order to properly evaluate total exposure.

The chemical emissions from the Project are not expected to result in adverse health effects in the region. The key findings of the HHRA are below.

Acute inhalation risks were evaluated by comparing maximum predicted short-term concentrations in air to appropriate toxicity limits. The majority of the hazard quotient (HQ) results for the acute inhalation assessment were below 1.0 at all the receptor locations assessed. HQs above 1.0 were predicted for PM₁₀ at the Coleman and Blairmore North receptors, but these high values were primarily due to baseline conditions and not the Project. The results of the acute inhalation assessment demonstrate that the Project emissions do not pose a risk of adverse health effects from short-term inhalation exposure at the receptor locations assessed outside the Mine Project Boundary for all COPC assessed. Within the Mine Permit Boundary, HQs were above 1.0 in the locales with maximum predicted levels, which are in close proximity to proposed mining activities, and at one receptor; public access to these locations will be restricted during construction and operations.

Chronic inhalation risks were evaluated by comparing maximum predicted annual average concentrations in air to toxicity limits. For the majority of the COPCs assessed, the HQs for the chronic inhalation assessment, based on exposure at multiple locations, were below 1.0 and therefore do not pose a risk of adverse human health effects. Although some exceedances were predicted for NO₂, PM_{2.5} and PM₁₀ on the edge of the pit boundary, due to close proximity to proposed mining activities, it is overly conservative to assume that a person will be living at that location for long periods of time and Project emissions were not predicted to pose a risk of adverse health effects.

Chronic risks from secondary exposure through oral and dermal pathways were evaluated using maximum predicted annual average concentrations in air and a multimedia exposure model. The multimedia HQs and incremental lifetime cancer risk (ILCR) quotients were less than 1.0 for all COPCs except for arsenic at the worst-case receptor, where the ILCR quotient was equal to 1.0. The arsenic ILCR quotient of 1.0 is not considered indicative of potential risk of adverse health effects due to its occurrence only at the worst-case scenario location and the conservative assumptions applied in the assessment of exposure to carcinogens.

The results of the human health risk assessment indicate that isolated concentrations of NO₂, PM_{2.5}, and PM₁₀ slightly exceeded target HQs for inhalation, and that the predicted arsenic oral and dermal exposure at the worst-case scenario receptor was equal to the target ILCR. Due to the isolated nature of these exceedances, their marginal nature when compared to the conservativeness of the modelling assumptions, and the influence of background concentrations, the result do not suggest a need for further mitigation of emissions based on potential human health risks.

The results of the screening-level wildlife risk assessment indicates no potential risk of adverse effects associated with Project emissions on the health of wildlife in the study areas.

A.10.13 Historic Resources

The potential effects of the Project on historic resources are discussed in [Section E.13](#).

Historical Resources in Alberta are regulated under the Alberta Historical Resources Act, and that legislation and its regulations and guidelines are administered by Alberta Culture and Tourism. The complete Historical Resources Assessment will be provided within a separate standalone report, which was submitted directly to Alberta Culture and Tourism.

In addition to the AER and CEEA requirements, the Project has been assessed under a *Historical Resources Act* Requirement issued by Alberta Culture and Tourism, which called for a HRIA of archaeological and palaeontological resources, including the assessment of historic structures and remains. The LSA contains the area within the Mine Permit Boundary and the RSA is coincident with the Alberta portion of the Crowsnest Pass.

A total of 32 archaeological or historic era sites were identified and recorded in the LSA, with 10 being located within or in close proximity to the Project footprint. The nature of actual impacts to each site will vary depending upon the nature of the coal project element that will occur in the area.

There are four important palaeontological locales within the LSA. Portions of the Project footprint, in particular areas of pit extension and the South Rock Disposal Area, are located within the boundaries of two of the palaeontological locales. The potential to encounter significant fossil resources in these areas during mining operations is quite high.

Mitigations were designed to reduce or eliminate the potential impact from the proposed Project's construction and operation activities. The most effective mitigations are those that are designed to be site-specific.

Based on the assumptions that there will be no further spatial expansion of the current mine plan, and that no other proponent will be able to access and develop undisturbed land within the LSA (excluding the Project footprint), there should be no negative Assessment Case effects or cumulative effects associated with the Project on historical resources. It is concluded that where a project has delineated a large spatial area with a focused project footprint, it generally ensures protection of historical resources in undisturbed areas by preventing future developments from other sources or proponents.

After considering proximal direct and indirect impacts from the proposed Project developments, cumulative effects to historical resources are deemed to be not significant.

A.11 MITIGATIONS AND MONITORING SUMMARY

This section provides a complete summary of the mitigation and monitoring that have been proposed by Benga to neutralize or eliminate the environmental effects of the Project.

The appropriate records will be kept for all samples and monitoring for the Project, and will be used for the Project's reporting requirements. The following information in respect to any sampling conducted or analyses performed will be recorded and retained:

- the place, date and time of sampling;
- the dates the analyses were performed;
- the analytical techniques, methods or procedures used in the analyses;
- the names of the persons who collected and analyzed each sample; and
- the results of the analyses.

Records will be kept for a period of 10 years.

Benga expects specific reporting conditions to be included in approval conditions. Based on relevant conditions provided in the recent EPEA Approval issued to a similar mountain/foothills coal mine, the following reporting procedures could be expected:

- annual Air Summary and Evaluation Report;
- annual Mine Wastewater Report;
- annual Waste Management Report;
- annual Domestic Wastewater Report;
- annual Conservation and Reclamation Report;
- annual Groundwater Monitoring Report; and
- special reports/management plans.

Based on industry standards, these annual reports would be required to be submitted to the Director prior to March 31st of each year. Other reporting requirements with varying frequency may also be necessary related to wastewater monitoring.

A.11.1 Air Quality

A.11.1.1 Air Quality Mitigation

The primary sources of PM_{2.5}, PM₁₀ and TSP emissions are dust from haul road activity and material handling. Benga has introduced mitigative measures to reduce particulate emissions along their private haul roads and pit activities. The following key mitigation measures were incorporated into emission estimation and dispersion modelling:

- the mine fleet is regularly upgraded and by Year 19, equipment will be newer and more efficient than assumed in emission estimation. Exhaust emissions from the U.S. EPA Tier 4

(2010) standards were used in Project emission estimates and it is likely that off-road standards will be more stringent by Year 19;

- water is systematically applied to haul roads and to the plant access road to minimize dust using a water truck dedicated to this purpose. An emission control efficiency of 80% during the summer months is expected from this measure;
- snow cover is retained on the road as a mitigative measure during the winter months, unless the cover would compromise the safety of vehicle operations. Winter ground is frozen and, since the soil and overburden have elevated moisture contents, there is a reduction of dust emissions at that time;
- gravel or crushed rock is used on the haul roads. Gravel is observed to produce less dust than clay and sandy surfaces;
- use of a grader to maintain the active surface of the road. This procedure is expected to reduce the effective silt content of the portion of the road where the wheels of the haul trucks travel. The grader blade would tend to move the silt particles to the inactive portion (side) of the road;
- the mined areas are reclaimed promptly and backfilled with overburden and soil from pre-strip areas and then covered by vegetation, which reduces windblown fugitive dust emissions from the barren land;
- trees and bushes will be preserved around mines and plant, effectively trapping dust emissions from mining activities and reducing dust concentrations further from mining activities;
- the coal processing plant will be contained within an enclosed area and all coal material handling will be *via* covered conveyors;
- dust generation from transferring coal from the conveyor to the stock pile will be minimized by the use of luffing stackers (those that can lower and raise their boom) which will minimize the drop height and drop time of the coal; and
- fugitive dust generation will be minimized at the rail load-out, with full cladding on the sides of the load-out structure to create a wind shelter, and with the movable discharge chute of the bin located as close as practical to the coal within the rail cars.

A.11.1.2 Air Quality Monitoring Program

Benga established a monitoring program in spring 2016, comprised of passive monitoring of SO₂, NO_x and O₃ near the proposed plant site. A network of six dustfall monitoring stations was also implemented, one at the plant site and five in other locations in the communities. Initial monitoring results are provided in [CR #1, Appendix C](#).

Benga proposes to establish an ambient air quality monitoring program designed to document the potential, localized, fugitive dust impacts due to Project operation. The measurement program is designed to measure dustfall. Details of the required monitoring are a function of the operational configuration at any time. As such, the monitoring program will need to be developed when the mine plan is established and operations begin, and then modified as mining progresses.

Benga commits to developing a more detailed monitoring program when the mine plan is more advanced than it is now, and commits to reviewing its adequacy periodically in future. Benga will provide the draft monitoring plan to AER six months before planned start-up and to implement the program three months or more prior to the beginning of construction.

A.11.1.3 Determining Effectiveness of Mitigation, Follow-up and Monitoring

CEAA and the AER define follow-up programs as programs designed to verify the predictions made in the environmental assessment related to Air Quality and determine the effectiveness of any mitigation measures. The following components are to be addressed as they form part of the CEAA Guidelines for follow-up:

- *objectives of the follow-up program and the VCs targeted by the program;*
 - the follow-up program will target the VCs related to dust generation, which include TSP, PM₁₀ and PM_{2.5} from mining areas, haul roads and coal loading facilities.
- *list of elements requiring follow-up;*
 - TSP, PM₁₀ and PM_{2.5} are elements that will require follow-up.
- *number of follow-up studies planned as well as their main characteristics (list of the parameters to be measured, planned implementation timetable, etc.);*
 - TSP, PM₁₀ and PM_{2.5} will be studied to determine if the predictions and effectiveness of the mitigation measures are correct. A detailed plan with schedule will be developed prior to construction and according to conditions of the required EPEA approval.
- *intervention mechanism used in the event that an unexpected deterioration of the environment is observed;*
 - the intervention mechanism would begin with the use of a more effective dust suppression product than water.
- *mechanism to disseminate follow-up results among the concerned populations;*
 - local dusting has been raised as a concern of local residents. Monthly reports will be prepared and submitted to the AER, and posted on the AER website. Other data sharing mechanisms could be employed such as posting results to the company website. Benga has established a community liaison group where information could also be distributed.

- *accessibility and sharing of data for the general population;*
 - monthly reports will be prepared and submitted to the AER, and posted on the AER website. Other data sharing mechanisms could be employed such as posting results to the company website. Benga has established a community liaison group where information could also be distributed.
- *opportunity for the proponent to take advantage of the participation of Aboriginal groups and stakeholders on the affected territory, during the implementation of the program; and*
 - the potential to utilize Aboriginal and public assistance in air quality follow-up monitoring will be addressed as opportunities and needs arise.
- *involvement of local and regional organizations in the design, implementation, and evaluation of the follow-up results as well as any updates, including a communication mechanism between these organizations and the proponent.*
 - Benga has established a community liaison group where information could also be distributed. A local stewardship group will also be established which is another means of information distribution.

The following components are to be addressed as they form part of the CEEA Guidelines for monitoring:

- *identification of the interventions that pose risks to one or more of the components and the measures and means planned to protect the environment;*
 - water is the preferred dust suppressant and the most benign on the environment, if alternate products are required, consideration must be given if possible environmental effects may occur. No other interventions are anticipated to pose a risk to the environment.
- *description of the characteristics of the monitoring program where foreseeable (e.g., location of interventions, planned protocols, list of measured parameters, analytical methods employed, schedule, human and financial resources required);*
 - measuring dust generated by the Project is relatively easy and inexpensive to complete, and can be done with local labour employed by Benga. Dust canisters can be used to measure TSP and high volume air samplers can be used to measure PM₁₀ and PM_{2.5}. Locations of monitoring would be in key areas of dust generation in the vicinity of the haul roads, and coal loading.
- *description of the proponent's intervention mechanisms in the event of the observation of non-compliance with the legal and environmental requirements or with the obligations imposed on contractors by the environmental provisions of their contracts; and*

- finding an alternative dust suppression product is the key intervention and would be done by the mine personnel. If dusting at the coal loading facility is an issue it may require additional cladding or protection from the wind.
- *guidelines for preparing monitoring reports (number, content, frequency, format) that will be sent to the authorities concerned.*
- monthly reports will be prepared and submitted electronically to the AER.

A.11.2 Noise

A.11.2.1 Noise Mitigation

Rock Disposal Area Sequencing: At approximately Mining Year 02, there will be increased equipment operating in the south disposal area (CR #2, Figure 1). As the Mining years progress, the elevation of the south disposal area will increase and the activity will move closer to the two residential receptor locations to the east of the Mine Permit Boundary. For these two receptors, the dominant Project noise sources will be the haul trucks accessing the south disposal area as well as the dozers operating on the disposal area. In order to achieve noise levels below the PSLs for these two residential receptor locations, there are two specific operational noise mitigation measures that Benga will undertake. These include:

- route the haul trucks (conveying waste rock and coal) along the western slope of the south disposal area such that the south disposal area itself provides noise shielding between the operating equipment and the residential receptors to the east; and,
- install and maintain a 15 m tall earthen berm along the eastern edge of the south disposal area. The earthen berm will be constructed and maintained during the day-time (when required) and the 15 m earthen berm will increase in overall elevation as the height of the south disposal area increases.

Blasting Noise and Vibration: A portion of the mining operations will involve use of explosive charges to loosen the raw materials. The noise and vibration levels associated with blasting can have a potential impact on nearby residents and can cause sensory disturbance to wildlife. There are no specific noise or vibration level limits for blasting in the *AER Directive 038*, nor are there any specific other provincial or federal criteria.

Despite the lack of specific criteria or guidelines, the following blasting procedures will be adhered to in order to minimize potential noise and vibration impacts associated with blasting:

- blasting to occur only on weekdays during typical day-time hours;
- minimal blasting during cloud cover; and

- blasting to be limited to smaller more localized blasts, which reduces the amount of explosives used at any one time.

Low Frequency Noise Mitigation: The equipment used for the mining operations is comprised essentially of internal combustion engine driven machinery. Similarly, the noise from the rail loadout activity will be largely comprised of diesel locomotives. The frequency content generally contains a relatively high level of low frequency engine noise with typical peaks near 63 -125 Hz. The measurement data obtained for each of the different types of operational equipment did not indicate a specific low frequency tonal component as defined in the *AER Directive 038*.

Light Duty Vehicle Back-up Alarms: Common sources of industrial noise for local residents are safety back-up alarms used on industrial equipment. As with the low frequency noise, the relative impact of the back-up alarms is difficult to predict since the orientation of the trucks and surrounding topography, both of which are constantly changing, will have a considerable influence on the noise levels. If, during active operations at the mine, concerns are raised by local residents, specific noise mitigation measures can be put in place. For example, the alarm noise can be replaced during night-time activities with a flashing light, which provides the necessary safety warning while eliminating the noise. During the day-time there are directional back-up alarms available that focus the noise to areas directly behind the vehicle and minimize the omni-directional noise radiation or back-up alarms with varying tones which provide the necessary safety warnings while minimizing the impact on receptors further away.

Equipment Mechanical Condition Mitigation: The operational sound level measurements conducted for equipment similar to the Project involved equipment which was in good working condition and good mechanical repair. In general, as equipment is used and general 'wear and tear' occurs, the noise levels tend to increase. There will be on-site maintenance shops to ensure that equipment is kept in good repair. When new equipment is purchased, it is also important to consider the noise levels of the equipment during the procurement process and to consider manufacturers options which result in lower noise levels.

A.11.2.2 Noise Monitoring Program

The NIA modelling results indicate the possibility of a low frequency tonal noise. Assessment of any actual low frequency tonal noise would require noise monitoring to be conducted during normal operations of the Project. Based on this, should, upon start-up of the Project, a low frequency noise complaint is received, Benga will conduct a comprehensive sound level (CSL) survey in accordance with the requirements of the *AER Directive 038*.

A.11.2.3 Determining Effectiveness of Mitigation, Follow-up and Monitoring

CEAA and the AER define follow-up programs as programs designed to verify the predictions made in the environmental assessment related to Noise and determine the effectiveness of any mitigation measures. The following components are to be addressed as they form part of the CEAA Guidelines for follow-up:

- *objectives of the follow-up program and the VCs targeted by the program;*
 - the follow-up program will target ambient noise levels.
- *list of elements requiring follow-up;*
 - day time and night time ambient noise levels within 1,500 m of the Mine Permit Boundary will require follow-up.
- *number of follow-up studies planned as well as their main characteristics (list of the parameters to be measured, planned implementation timetable, etc.);*
 - ambient noise will be studied to determine if the predictions and effectiveness of the mitigation measures are correct. All follow-up activities will be in accordance with the AER's Directive 038, as determined by the AER, and may include complaint investigations, noise monitoring, comprehensive noise survey, or noise management plan.
- *intervention mechanism used in the event that an unexpected deterioration of the environment is observed;*
 - the intervention mechanism would begin with the development and use of more effective noise mitigations, specific to the nature, source, and location of noise issues and nature of noise complaints.
- *mechanism to disseminate follow-up results among the concerned populations;*
 - any noise compliance monitoring and mitigation changes will be reported to the AER and posted on the AER website. Other data sharing mechanisms could be employed such as posting results to the company website. Benga has established a community liaison group where information could also be distributed.
- *accessibility and sharing of data for the general population;*
 - all reports prepared and submitted to the AER to ensure compliance with AER Directive 038 will be posted on the AER website. Other data sharing mechanisms could be employed such as posting results to the company website. Benga has established a community liaison group where information could also be distributed.
- *opportunity for the proponent to take advantage of the participation of Aboriginal groups and stakeholders on the affected territory, during the implementation of the program; and*

- the potential to utilize Aboriginal assistance in noise compliance monitoring will be addressed as opportunities and needs arise.
- *involvement of local and regional organizations in the design, implementation, and evaluation of the follow-up results as well as any updates, including a communication mechanism between these organizations and the proponent.*
- Benga has established a community liaison group where information could also be distributed. A local stewardship group will also be established which is another means of information distribution.

The following components are to be addressed as they form part of the CEEA Guidelines for monitoring:

- *identification of the interventions that pose risks to one or more of the components and the measures and means planned to protect the environment;*
 - no noise interventions are anticipated to pose risks to the environment.
- *description of the characteristics of the monitoring program where foreseeable (e.g., location of interventions, planned protocols, list of measured parameters, analytical methods employed, schedule, human and financial resources required);*
 - any prescribed noise monitoring program would be done in accordance with AER's Directive 038 and would occur at locations relevant to potential and actual noise concerns or complaints. Ambient noise monitoring would be completed by a noise specialist with certified noise measuring/monitoring equipment and would most likely occur at receptors located in the Town of Blairmore.
- *description of the proponent's intervention mechanisms in the event of the observation of non-compliance with the legal and environmental requirements or with the obligations imposed on contractors by the environmental provisions of their contracts; and*
 - additional noise mitigation measures would be implemented by Benga in consultation with a noise specialist and/or the AER.
- *guidelines for preparing monitoring reports (number, content, frequency, format) that will be sent to the authorities concerned.*
 - reporting will be determined by the AER, in response to any noise complaints or as indicated in any Noise Management Plan prescribed by the AER.

A.11.3 Hydrogeology

A.11.3.1 Hydrogeology Mitigations

Mitigation requirements for the three key potential impacts of the Project to groundwater are discussed below.

- Pit dewatering is necessary for the mine operations; therefore, drawdown of groundwater in the bedrock units will occur during the Project. Effects to bedrock aquifers are predicted to be localized such that no mitigation measures are required. No impacts are predicted at the water wells, therefore no mitigation is proposed. Specific to watercourses' base flow reduction, effect assessment and mitigation options are discussed in the Hydrology ([Section E.5](#)), Surface Water Quality ([Section E.6](#)) and Aquatics ([Section E.7](#)).
- Mitigation measures on the effect of mine spoil on groundwater quality will include the development of a management plan as described in [Section C](#) and [Consultant Report 5](#). Mitigation measures for minimizing or preventing adverse impacts on shallow groundwater quality include industry-standard operating practices, preparedness for upset conditions and the appropriate management of upset conditions.

A.11.3.2 Monitoring

Monitoring of water levels in bedrock aquifers near the open pit and up-gradient of any receptors will be undertaken as part of the monitoring program. Monitoring will provide verification of the magnitude and extent of predicted impacts to hydraulic head. Monitoring of domestic water wells is not proposed at this time.

A groundwater monitoring program will be implemented to detect any impacts on shallow groundwater quality resulting from mine spoil and mining operations. Monitoring will focus primarily on areas in the vicinity of the ex-situ rock disposal areas and sedimentation ponds that store captured water from mine spoil run-off.

A groundwater monitoring program will be implemented to detect any impacts on the shallow groundwater quality resulting from surface operations at the CHPP and selected storage areas. In the event that an impact on groundwater quality is detected, the groundwater response plan will be implemented. The response plan would include determining the magnitude of the impact and could include risk management or remediation. The response plan will serve to mitigate impacts to groundwater quality. All monitoring wells will be sampled bi-annually to evaluate water quality.

A.11.3.3 Determining Effectiveness of Mitigation, Follow-up and Monitoring

CEAA and the AER define follow-up programs as programs designed to verify the predictions made in the environmental assessment related to Hydrogeology and determine the effectiveness of any mitigation measures. The following components are to be addressed as they form part of the CEAA Guidelines for follow-up:

- *objectives of the follow-up program and the VCs targeted by the program;*
 - the follow-up program will target VCs related to changes in shallow groundwater quantity and quality, which are bedrock aquifers, water wells, and discharge to surface waterbodies).
- *list of elements requiring follow-up;*
 - hydraulic head (groundwater quantity) and groundwater chemistry (quality) will require follow-up.
- *number of follow-up studies planned as well as their main characteristics (list of the parameters to be measured, planned implementation timetable, etc.);*
 - to establish baseline conditions prior to mining, water level monitoring may be monthly during an initial period when water levels are stabilizing. Once drawdowns become more predictable, monitoring frequency may be decreased. The water quality sampling frequency is expected to be either bi-annual or annual.
- *intervention mechanism used in the event that an unexpected deterioration of the environment is observed;*
 - the intervention mechanism for reductions in hydraulic head that could result in a decrease of groundwater discharge to surface water would be flow augmentation. In the unlikely event of a decrease in hydraulic head in privately-owned water wells that impedes use of this water supply, intervention could include drilling a new well or connecting the affected user(s) to the municipal water network. Changes to the water/selenium management plan would be used to intervene changes to water quality. A Groundwater Response Plan will be in place.
- *mechanism to disseminate follow-up results among the concerned populations;*
 - groundwater monitoring results will be reported to the AER and posted on the AER website. Other data sharing mechanisms could be employed such as posting results to the company website. Benga has established a community liaison group where information could also be distributed.
- *accessibility and sharing of data for the general population;*
 - All reports prepared and submitted to the AER to ensure compliance with all approvals will be posted on the AER website. Other data sharing mechanisms could be employed

such as posting results to the company website. Benga has established a community liaison group where information could also be distributed.

- *opportunity for the proponent to take advantage of the participation of Aboriginal groups and stakeholders on the affected territory, during the implementation of the program; and*
 - The potential to utilize Aboriginal assistance in shallow groundwater monitoring will be addressed as opportunities and needs arise.
- *involvement of local and regional organizations in the design, implementation, and evaluation of the follow-up results as well as any updates, including a communication mechanism between these organizations and the proponent.*
 - Benga has established a community liaison group where information could also be distributed. A local stewardship group will also be established which is another means of information distribution.

The following components are to be addressed as they form part of the CEEA Guidelines for monitoring:

- *identification of the interventions that pose risks to one or more of the components and the measures and means planned to protect the environment;*
 - no interventions are anticipated to pose risks to the environment .
- *description of the characteristics of the monitoring program where foreseeable (e.g., location of interventions, planned protocols, list of measured parameters, analytical methods employed, schedule, human and financial resources required);*
 - any prescribed shallow groundwater monitoring program would be done in accordance with the AER's approval conditions. The monitoring program will be tailored to mine activities and selected indicator parameters. Hydraulic head monitoring will be implemented around and downgradient from the pit. Chemistry monitoring will occur near facilities that handle a variety of chemicals and fuels and around the waste rock disposal areas and sedimentation ponds. Hydraulic head monitoring may be monthly during an initial period when water levels are stabilizing, and decrease once drawdowns become more predictable. Chemistry sampling frequency is expected to be either bi-annual or annual.
- *description of the proponent's intervention mechanisms in the event of the observation of non-compliance with the legal and environmental requirements or with the obligations imposed on contractors by the environmental provisions of their contracts; and*
 - a change in groundwater quality near the pit and the selenium control ponds will be addressed as part of the management of the treatment cells. Change in chemistry near the facility will be investigated for spills or upset conditions resulting in a discharge of

chemicals to the surface and seepage to the shallow groundwater. Response measures could include spill investigation, source removal, remediation, risk assessment and/or risk management.

- *guidelines for preparing monitoring reports (number, content, frequency, format) that will be sent to the authorities concerned.*
- reporting requirements will be prescribed by the AER. Reports will be submitted electronically to the AER after each monitoring session.

A.11.4 Hydrology

A.11.4.1 Hydrology Mitigations

In order to reduce the impacts of the Project on surface hydrology, Benga will:

- implement a water management plan to address selenium management and augmentation of potentially impacted tributaries for the Project;
- ensure the coal handling and processing plant facilities will be aligned in such a way to minimize drainage diversions and runoff interception (*e.g.*, maintain natural vegetated buffers between active mine areas and undisturbed streams);
- direct runoff from active mining areas, roads, and topsoil stockpiles to the water management sedimentation ponds for removal of suspended solids;
- direct runoff from the north and south waste rock disposal areas to the surge ponds for selenium treatment;
- design settling ponds according to the latest sizing methodology (1:10 year storm event and safely convey up to the 1:100 year flood event);
- maintain a 100 m minimum setback from the main stems of Blairmore Creek and Gold Creek, and a 30 m setback from associated headwater tributaries;
- design and construct any potential watercourse crossings to meet or exceed the regulatory requirements for approval under the provincial *Water Act*;
- construct clear span crossings over all watercourses identified as potential fish bearing streams;
- use appropriately sized culverts, as required, to maintain drainage along non-fish bearing headwater tributaries and/or ephemeral drainage draws;
- install haul road berms to contain road runoff and direct it to designated runoff control works;
- incorporate flow and erosion control measures, such as ditch check structures, natural depressions or low areas to trap sediment, silt fences or exfiltration ditches in small, low gradient areas adjacent to soil and stockpiles areas;

- train personnel to minimize disturbances and use and maintain drainage and sediment controls; and
- utilize saturated backfill to remove selenium from enriched waters.

A.11.4.2 Hydrology Monitoring

- conduct flow and TSS monitoring at all settling ponds;
- conduct water quality monitoring of discharges from the saturated backfill areas that discharge;
- conduct regular inspections of all drainage works and upstream and downstream water quality sampling; and
- conduct continuous monitoring of flow on Blairmore Creek, Gold Creek, and all potentially impacted tributaries.

A.11.4.3 Determining Effectiveness of Mitigation, Follow-up and Monitoring

CEAA and the AER define follow-up programs as programs designed to verify the predictions made in the environmental assessment related to Hydrology and determine the effectiveness of any mitigation measures. The following components are to be addressed as they form part of the CEAA Guidelines for follow-up:

- *objectives of the follow-up program and the VCs targeted by the program:*
 - The follow-up program will target VCs related to surface water flow.
- *list of elements requiring follow-up:*
 - Streamflow in Blairmore Creek and Gold Creek will require follow-up.
- *number of follow-up studies planned as well as their main characteristics (list of the parameters to be measured, planned implementation timetable, etc.):*
 - Seasonal streamflow monitoring is expected to be an approval condition and will be conducted in accordance with all conditions.
- *intervention mechanism used in the event that an unexpected deterioration of the environment is observed:*
 - The intervention mechanism for altered streamflow would be to change the rate of discharge to Blairmore Creek or Gold Creek.
- *mechanism to disseminate follow-up results among the concerned populations:*
 - Monitoring results will be reported to the AER and posted on the AER website. Other data sharing mechanisms could be employed such as posting results to the company

website. Benga has established a community liaison group where information could also be distributed.

- *accessibility and sharing of data for the general population:*
 - All reports prepared and submitted to the AER to ensure compliance with all approvals will be posted on the AER website. Other data sharing mechanisms could be employed such as posting results to the company website. Benga has established a community liaison group where information could also be distributed.
- *opportunity for the proponent to take advantage of the participation of Aboriginal groups and stakeholders on the affected territory, during the implementation of the program:*
 - The potential to utilize Aboriginal assistance in surface water flow monitoring will be addressed as opportunities and needs arise.
- *involvement of local and regional organizations in the design, implementation, and evaluation of the follow-up results as well as any updates, including a communication mechanism between these organizations and the proponent:*
 - Benga has established a community liaison group where information could also be distributed. A local stewardship group will also be established which is another means of information distribution.

The following components are to be addressed as they form part of the CEEA Guidelines for monitoring:

- *identification of the interventions that pose risks to one or more of the components and the measures and means planned to protect the environment:*
 - No interventions are anticipated to pose risks to the environment.
- *description of the characteristics of the monitoring program where foreseeable (e.g., location of interventions, planned protocols, list of measured parameters, analytical methods employed, schedule, human and financial resources required):*
 - Any surface water flow monitoring program would be done in accordance with the AER's approval conditions.
- *description of the proponent's intervention mechanisms in the event of the observation of non-compliance with the legal and environmental requirements or with the obligations imposed on contractors by the environmental provisions of their contracts:*
 - A change in surface water flow will be addressed as part of the water management plan.
- *guidelines for preparing monitoring reports (number, content, frequency, format) that will be sent to the authorities concerned:*

- Reporting requirements will be prescribed by the AER. Reports will be submitted electronically to the AER after each monitoring session.
- *monitoring and management practices and procedures to be applied during all phases of the Project in relation to selenium releases and cumulative selenium loading. This may also include a description of how these monitoring and management practices may be integrated into and influence any local or regional water quality plans:*
 - A water management plan is provided in [Section C.5](#).

A.11.5 Water Quality

A.11.5.1 Water Quality Mitigations

The Project will implement several proven mitigation measures to effectively prevent Project effects on water quality constituents or reduce them to acceptable levels ([Section C.5](#) and [Appendix 10C](#)).

These measures include:

- A series of collection ditches, sumps, pumps and settling ponds will be established to manage all surface water on the mine site. A total of five settling ponds are proposed to treat total suspended solids and associated constituents in the water before release of water to the environment. Surface water runoff from mining areas, haul roads, overburden disposal areas and any other disturbed areas as well as groundwater runoff from the pit will be collected and directed to settling ponds for treatment and or will be pumped to the raw water pond for storage and use in the coal cleaning process. Once suspended solids are settled, water will be released to Blairmore Creek and Gold Creek;
- Slope grading and stabilization techniques will be adopted. Slopes will be contoured to produce moderate slope angles to reduce erosion risk. Other stabilization techniques used to control erosion include: ditching above the cutslope to channel surface runoff away from the cutslope, leaving buffer (vegetation) strips between the construction site and a watercourse, and placing large rock rip rap to stabilize slopes;
- Temporary measures to control erosion before a vegetation cover is re-established, including: diversion ditches, drainage control, check dams, sediment ponds, sumps, and mulches;
- Progressive reclamation to reduce the amount of disturbed area at any given time. During reclamation, permanent plant cover and revegetation will be established. Soil erosion will be reduced by minimizing the time that reclaimed surfaces are left bare;
- Whenever possible, construction activities in close proximity to watercourses will be carried out during periods of lowest potential impact, typically during the winter months. A 100 m undisturbed buffer zone, maintaining existing vegetation, strip will be left between development activities and Blairmore Creek to the west and Gold Creek to the east;

- The design and construction of all stream crossings will be done in compliance with the Alberta Code of Practice for Watercourse Crossings and associated guidelines. This means that all stream crossings constructed by the Project will meet regulatory requirements for protection of fish resources and aquatic habitat, which also will effectively mitigate against effects on surface water quality;
- Construction techniques will be employed that protect the integrity of the streams as well as the quality of water;
- Where necessary, interim erosion/sediment control measures will be utilized until long-term protection can be effectively implemented;
- Benga will implement specific mitigation measures to attenuate selenium and nitrite and nitrate concentrations in process water before release to the receiving environment (discussed further in [CR #5](#));
- The Project will incorporate design features, management practices and mitigation plans to minimize the potential for spills that might adversely affect surface water quality. Appropriate design features (*e.g.*, berms and containment areas around potential sources), best management practices and emergency spill response plan will be followed;
- Spills of produced water or other potentially hazardous substances will be cleaned up according to emergency response procedures and regulations ([Section C.7](#)). Leaks and spills will be reported to AER and AEP as required and cleaned up in a timely manner; and
- Domestic wastewater will be collected in storage tanks and transferred to the wastewater treatment facility. Treated effluent will be tested to ensure that its quality meets or exceeds the limits for treated wastewater discharge as be specified in the EPEA approval.

A.11.5.2 Water Quality Monitoring

Water quality compliance monitoring will be an integral component of the Project operations, and Benga expects certain ambient aquatic monitoring conditions to be contained in the EPEA Approval with respect to water quality sampling. Settling/release ponds will be tested before release to the surrounding environment to verify acceptability of release waters for variables to be defined under the approval(s) for the Project. A water quality monitoring program will be implemented in natural watercourses both upstream and downstream of the Project.

A.11.5.3 Determining Effectiveness of Mitigation, Follow-up and Monitoring

CEAA and the AER define follow-up programs as programs designed to verify the predictions made in the environmental assessment related to Hydrology and determine the effectiveness of any mitigation measures. The following components are to be addressed as they form part of the CEAA Guidelines for follow-up:

- *objectives of the follow-up program and the VCs targeted by the program:*
 - The follow-up program will target surface water quality.
- *list of elements requiring follow-up:*
 - TSS, turbidity (NTU), pH, floating solids, nitrate-nitrogen, visible foam, acute lethality test using rainbow trout (for any ponds within the system using approved flocc agents), and oil and grease;
 - inorganic parameters listed in the Canadian Water Quality Guidelines for the Protection of Aquatic Life, 2003, CCME as amended; and
 - flow, ammonia, BOD, BTEX, colour, phenols, total phosphorous, sulphate, TDS, temperature, total sulphide, selenium, and hardness.
- *number of follow-up studies planned as well as their main characteristics (list of the parameters to be measured, planned implementation timetable, etc.):*
 - Surface waterbody sampling of the above-listed elements/parameters is expected to be an approval condition, with sampling taking place quarterly.
 - Surface water sampling downstream of the release point will also be completed to maintain quality assurance and quality control. In addition to the downstream sampling other QA/QC measures will be taken including trip blanks, field blanks and field duplicates. All water samples will be collected, preserved and shipped according to protocols specified by analytical laboratories. Samples collected for analysis of most dissolved fractions will be delivered unfiltered and unpreserved to the analytical laboratory within 24 hours of sample collection, following laboratory direction. Other quality assurances include field staff training, standardized field sampling procedures, and the use of accredited laboratories.
- *intervention mechanism used in the event that an unexpected deterioration of the environment is observed:*
 - Of it is determined that water parameters are exceeding approved guidelines, the mine will withhold any releases to the receiving environment in order to further treat the water with additional settling time or flocculant dosing.
- *mechanism to disseminate follow-up results among the concerned populations:*
 - Monitoring results will be reported to the AER and posted on the AER website. Other data sharing mechanisms could be employed such as posting results to the company website. Benga has established a community liaison group where information could also be distributed.

- *accessibility and sharing of data for the general population:*
 - All reports prepared and submitted to the AER to ensure compliance with all approvals will be posted on the AER website. Other data sharing mechanisms could be employed such as posting results to the company website. Benga has established a community liaison group where information could also be distributed.
- *opportunity for the proponent to take advantage of the participation of Aboriginal groups and stakeholders on the affected territory, during the implementation of the program:*
 - The potential to utilize Aboriginal assistance in water quality monitoring will be addressed as opportunities and needs arise.
- *involvement of local and regional organizations in the design, implementation, and evaluation of the follow-up results as well as any updates, including a communication mechanism between these organizations and the proponent:*
 - Benga has established a community liaison group where information could also be distributed. A local stewardship group will also be established which is another means of information distribution.

The following components are to be addressed as they form part of the CEEA Guidelines for monitoring:

- *identification of the interventions that pose risks to one or more of the components and the measures and means planned to protect the environment:*
 - No interventions are anticipated to pose risks to the environment.
- *description of the characteristics of the monitoring program where foreseeable (e.g., location of interventions, planned protocols, list of measured parameters, analytical methods employed, schedule, human and financial resources required):*
 - The surface water quality monitoring program would be done in accordance with the AER's approval conditions. A detailed plan will be prepared following Project approval and receipt of conditions.
- *description of the proponent's intervention mechanisms in the event of the observation of non-compliance with the legal and environmental requirements or with the obligations imposed on contractors by the environmental provisions of their contracts:*
 - If it is determined that water parameters are exceeding approved guidelines, the mine will withhold any releases to the receiving environment in order to further treat the water with additional settling time or flocculant dosing.
- *guidelines for preparing monitoring reports (number, content, frequency, format) that will be sent to the authorities concerned:*

- Reporting requirements will be prescribed by the AER.
- *monitoring and management practices and procedures to be applied during all phases of the Project in relation to selenium releases and cumulative selenium loading. This may also include a description of how these monitoring and management practices may be integrated into and influence any local or regional water quality plans:*
 - A selenium management plan is included in [Section C.8.3.1](#)

A.11.6 Aquatic Resources

A.11.6.1 Aquatic Resources Mitigations

Key Project mine design features are provided [CR #6, Section 4.1.1](#)).

A.11.6.2 Aquatic Resources Monitoring

An Aquatics Monitoring Program will be implemented to ensure that any Project effects on aquatic ecology from mining, watercourse crossings, blasting and use of explosives, improved fishing opportunities will be not significant. A final mitigation plan will be provided as part of the fish and aquatic resources addendum; however, the framework for a monitoring plan is provided in [CR #6, Section 6.0](#).

A.11.6.3 Determining Effectiveness of Mitigation, Follow-up and Monitoring

CEAA and the AER define follow-up programs as programs designed to verify the predictions made in the environmental assessment related to fish and aquatic resources and determine the effectiveness of any mitigation measures. The components to address the CEAA Guidelines pertaining to follow-up and monitoring, as outlined in other discipline sections, will be addressed once the results of the fish population assessment and IFN study are finalized. The results presented in the future fish and aquatic resources addendum will guide the final development of the fish and aquatic monitoring program. Benga will develop the final monitoring program in consultation with the appropriate AER, AEP, and DFO fish biologists.

A.11.7 Terrain and Soils

A.11.7.1 Terrain and Soils Mitigations

Mitigation and monitoring processes provided will minimize impacts to the soil resource throughout the life of the Project. Recommendations are generalized with more detailed information related to soil conservation and reclamation procedures being provided in the C&R Plan for the Project ([Section F](#)).

- Upland surface soil and sufficient subsoil and suitable overburden materials (coversoil) will be salvaged using best management practices. Supervision of salvage operations, stockpiling, and placement of materials during reclamation (including direct placement) by qualified individuals is recommended.
- Soil handling activities should be suspended under wet or windy conditions when the degradation of soil quality is a potential.
- Organic soil material will be salvaged for later use in reclamation.
- Placement of coversoil material will require that it is stored in a manner to minimize material loss or degradation of quality and located in areas that are accessible and retrievable.
- Varying thicknesses of coversoil will be replaced, with a target of 20 cm average thickness, to assist in creating diversity in the reclaimed landscapes.
- Decomposition of the replaced materials will be done to reduce potential compaction as a result of soil replacement.
- All reclaimed lands will be initially vegetated using a cover crop upon completion of soil placement to minimize soil loss *via* erosion (wind and water); target vegetation establishment will occur through natural regeneration and through seeding or planting of desired understory and tree species.
- Soil erosion control measures will be implemented to minimize loss of soil materials *via* wind or water erosion during activities associated with coversoil salvage, storage and reclamation. General mitigation activities to reduce wind or water erosion potential include the following:
 - when stockpiling coversoil material, piles will be placed in strategic locations, to minimize exposure to wind or water;
 - stockpiles will be seeded with a non-invasive and weed free seed mix that establishes quickly;
 - erosion control materials (mats, netting, mulches, straw) will be used to reduce soil surface exposure, as required; and
 - reclaimed landscapes will be reseeded with a quick establishing; non-invasive cover crop to minimize the length of time bare soil is exposed to potential wind and water erosion. In addition, reclaimed landscapes that have a moderate to high water erosion risk (*i.e.*, steep side slopes) will have soil stabilizers or other measures implemented (where necessary) to minimize the potential of erosion (*i.e.*, rough mounding, check bales, silt fences, tackifiers, and/or mulch).
- Implementation of appropriate soil salvage activities will ensure sufficient volumes of coversoil materials are salvaged for placement. Sufficient suitable overburden material will be available for placement over unsuitable overburden. Upon backfilling and re-contouring of

mine blocks unsuitable overburden will be identified to ensure that sufficient reclamation material is replaced to meet regulatory requirements over all reclaimed lands.

A.11.7.2 Terrain and Soils Monitoring

It is typical to produce a soil monitoring program once Project approval is received. Benga will provide a rigorous soil monitoring program as per applicable approval conditions, and will follow standard sampling protocols. Success will be measured by comparing parameters to applicable reclamation criteria and the requirements set by regulatory approvals. Monitoring activities will include the following:

- direct supervision of salvage and replacement activities by a qualified individual;
- erosion of stockpiled or recently replaced soil material as well as effectiveness of erosion control activities;
- ensure coversoil replacement coverage and depths meet required standards;
- quality of overburden material through a sampling program in order to determine material replacement requirements;
- assessment of vegetation communities to determine if the seral communities established are appropriate for the target local common forest ecosystems and desired end land uses;
- monitoring of stockpiled soils and reclaimed areas to ensure erosion is minimized;
- develop and implement an erosion control plan as required;
- based on monitoring results of reclaimed landscapes, adaptive management will be incorporated by Benga in order to allow for continual improvement of erosion control processes;
- quality of overburden after mine backfilling and contouring to determine if overburden material located at surface is suitable or unsuitable as root zone medium;
- quantity of suitable overburden material placed over unsuitable overburden; and
- reclaimed areas for coversoil quality and quantity (depths) and suitability of overburden materials.

A.11.7.3 Determining Effectiveness of Mitigation, Follow-up and Monitoring

CEAA and the AER define follow-up programs as programs designed to verify the predictions made in the environmental assessment related to Terrain and Soils and determine the effectiveness of any mitigation measures. The following components are to be addressed as they form part of the CEAA Guidelines for follow-up:

- *objectives of the follow-up program and the VCs targeted by the program:*

- The follow-up program will target four VCs related to disturbance of soils and reclamation – soil quality and erosion, soil biodiversity, alteration of terrain, and landscape capability.
- *list of elements requiring follow-up:*
 - Soil salvage practices, erosion potential and control, and reclamation will require follow-up.
- *number of follow-up studies planned as well as their main characteristics (list of the parameters to be measured, planned implementation timetable, etc.):*
 - Parameters will include material placement quality, coverage, and depth; effectiveness of erosion control measures; and site contouring. These parameters will be included in the Reclamation Research and Monitoring Program ([Section F.3.9](#)).
- *intervention mechanism used in the event that an unexpected deterioration of the environment is observed:*
 - When the follow-up monitoring program identifies issues requiring mitigation, Benga will undertake maintenance activities such as erosion control and in-fill planting of areas with selected species to enhance the reclamation process. An adaptive management program will allow for specialized responses to specific issues that may arise.
- *mechanism to disseminate follow-up results among the concerned populations:*
 - Soils and related reclamation follow-up results will be reported to the AER and posted on the AER website. Other data sharing mechanisms could be employed such as posting results to the company website. Benga has established a community liaison group where information could also be distributed.
- *accessibility and sharing of data for the general population:*
 - All reports prepared and submitted to the AER to ensure compliance with all approvals will be posted on the AER website. Other data sharing mechanisms could be employed such as posting results to the company website. Benga has established a community liaison group where information could also be distributed.
- *opportunity for the proponent to take advantage of the participation of Aboriginal groups and stakeholders on the affected territory, during the implementation of the program:*
 - The potential to utilize Aboriginal and public assistance in soils and reclamation monitoring will be addressed as opportunities and needs arise.
- *involvement of local and regional organizations in the design, implementation, and evaluation of the follow-up results as well as any updates, including a communication mechanism between these organizations and the proponent:*

- Benga has established a community liaison group where information could also be distributed. A local stewardship group will also be established which is another means of information distribution.

The following components are to be addressed as they form part of the CEEA Guidelines for monitoring:

- *identification of the interventions that pose risks to one or more of the components and the measures and means planned to protect the environment:*
 - No interventions are anticipated to pose risks to the environment .
- *description of the characteristics of the monitoring program where foreseeable (e.g., location of interventions, planned protocols, list of measured parameters, analytical methods employed, schedule, human and financial resources required):*
 - Soil and erosion monitoring will occur at disturbed areas, soil stockpiles, and areas being re-contoured and reclaimed. Monitoring will be conducted according to provincial/federal regulations and standards and all approval conditions. Parameters will include material placement quality, coverage, and depth; effectiveness of erosion control measures; and site contouring.
- *description of the proponent's intervention mechanisms in the event of the observation of non-compliance with the legal and environmental requirements or with the obligations imposed on contractors by the environmental provisions of their contracts:*
 - Benga will determine alternative erosion control measures.
- *guidelines for preparing monitoring reports (number, content, frequency, format) that will be sent to the authorities concerned:*
 - Reporting requirements will be prescribed by the AER. Reports will be submitted electronically to the AER as prescribed.

A.11.8 Vegetation

A.11.8.1 Vegetation Mitigations

Progressive reclamation of the Project Footprint to equivalent land capability provides the primary measure required to mitigate the impacts on vegetation and wetland VCs. Project mitigation will aim to reclaim not only the new disturbances from the Project but also areas previously disturbed from historic mining operations and from roads and oil and gas developments. The reclamation of the 185.2 ha of the Project Footprint left un-reclaimed from previous mining operations is a positive outcome of the Project, especially as the previous mining operations are over 55 years old and have

only partially revegetated by natural processes. Mitigation measures will include, but are not limited to, the following (further details in [CR #8, Section 5.2](#)):

- a re-vegetation program which aims to establish diverse native vegetation communities (closed conifer forests, moderate mixed forests, natural upland herbaceous grasslands, and treed wetlands) with equivalent pre-disturbance capability;
- a C&R Plan which aims to establish communities that are locally and regionally limited in distribution where conditions allow;
- preservation of adjacent vegetation communities by minimizing the area required for construction and operation of the Project;
- provision of appropriate soil substrate where re-vegetated areas can establish;
- seeding of stockpiled topsoil with suitable vegetation species mix to ensure long term stability of the soil piles, which reduces erosion and the potential for weed establishment;
- use of coarse woody debris and direct soil placement techniques to augment mycorrhizal and microbial inoculums;
- use direct placement of soil for provision of propagules to enhance opportunity for re-establishment of native species composition and enhanced species richness; and
- planting of multiple layers of native vegetation (*e.g.*, trees, shrubs and graminoids) to provide initial structure for wildlife habitat and to enhance biodiversity;
- implement seed collection, propagation, and/or relocation plan for rare species; and
- establish disease-resistant whitebark pine.

In addition to the strategies noted above, the preferred primary mitigation strategy for native rough fescue grasslands is avoidance. Until disturbance is unavoidable, the following mitigation strategies will be implemented to preserve the resource:

- construct, or undertake assessments and surveys, during the dormant period for rough fescue (August to March); and
- avoid soil disturbance (Desserud 2006; AESRD 2010) by:
 - minimizing topsoil stripping and grading;
 - utilizing existing trails; and
 - using geotextiles to minimize the amount of topsoil stripping during construction where grading is required.

Where disturbance is unavoidable, where feasible, mitigation strategies will include direct placement of reclamation material (including potential transplantation of rare plants or of foothills rough fescue

sod), collection of native seed from areas with foothills rough fescue and rare plants that will be disturbed, seeding of wild harvest seed, as part of a certified, weed-free native seed mixes in re-vegetation plan, and the potential seeding and growing of plugs grown in a greenhouse to be transplanted onto the site.

For old growth forests, additional mitigation measures should include reclamation with tree species capable of achieving of old growth conditions. As a rare tree species with a specific conservation plan, whitebark pine mitigation will focus on the goals of introducing white pine blister rust resistant strains and conserving genetic diversity during reclamation. To preserve genetic diversity, clusters of whitebark pine will be investigated for suitability for cone/seed collection prior to disturbance and seed collection would include selection of trees showing evidence of white pine blister rust resistance. Conditions and strategies for establishing whitebark pine during reclamation include:

- identification of high light, low competition sites;
- planting in pure stands or patches to avoid competition from other trees;
- avoiding planting in swales and frost pockets;
- creation of microsites for seedling establishment (rocks, stumps or other coarse woody debris);
- use of recommended spacing to avoid interspecies competition; and
- planting seedlings in the fall to avoid hot dry summer conditions.

Given that wetlands are not common in the Project Footprint and in the region, added mitigation measures for the existing wetland types will include the following:

- use of best practices to maintain the hydrologic regime of mineral soil wetlands;
- creation of transition areas between re-vegetated ELCs as outlined in the reclamation plan to the treed swamps, where it is possible and/or appropriate to do so; and
- placement of culverts within wetlands that will be divided by roads to ensure that water flow between wetlands will not be affected.

Supplementary mitigation measures for TEK vegetation impacts include the following:

- consult with and involve First Nations in designing mitigation measures for sustainable management of TEK vegetation;
- implement a re-vegetation program that aims to re-establish vegetation communities that are common to the pre-disturbed landscape and that will support TEK vegetation; and
- where practicable, utilize locally collected seed to preserve the legacy of species and of place.

A.11.8.2 Vegetation Monitoring

Re-vegetation monitoring will include but not be limited to the following:

- periodic assessment of the composition, structure, ecological succession and biodiversity of reclaimed vegetation; and
- survival, growth and health assessments of re-vegetated areas to monitor the effectiveness of reclamation efforts relative to re-vegetation targets (including noxious and invasive species and effectiveness of control methods).

Wetland monitoring will include but not be limited to the following:

- monitoring and maintenance of drainage control structures should be conducted regularly to ensure water flow and flow patterns are maintained in wetlands adjacent to the Project Footprint;
- monitoring road removal at Project closure to ensure restoration of the hydrologic regime;
- continue monitoring for a minimum of ten years to ensure composition, structure, and key wetland functions are consistent with those prior to the Project disturbance; and
- include the use of sub-emergent vegetation species as indicators of wetland health and integrity in the monitoring program.

A.11.8.3 Determining Effectiveness of Mitigation, Follow-up and Monitoring

CEAA and the AER define follow-up programs as programs designed to verify the predictions made in the environmental assessment related to Vegetation and determine the effectiveness of any mitigation measures. The following components are to be addressed as they form part of the CEAA Guidelines for follow-up:

- *objectives of the follow-up program and the VCs targeted by the program:*
 - The follow-up program will target VCs related to landscape disturbance, re-vegetation, and reclaimed landscapes – vegetation community structure and biodiversity, traditional use species, species at risk, and weeds.
- *list of elements requiring follow-up:*
 - Composition, structure, ecological succession, and biodiversity of reclaimed vegetation will require follow-up, as well as health and integrity of reclaimed wetlands and effectiveness of weed control.
- *number of follow-up studies planned as well as their main characteristics (list of the parameters to be measured, planned implementation timetable, etc.):*

- Parameters will include presence and distribution of species and target communities and wetland delineation and characterisation. These parameters will be included in the Reclamation Research and Monitoring Program ([Section F.3.9](#)).
- *intervention mechanism used in the event that an unexpected deterioration of the environment is observed:*
 - When the follow-up monitoring program identifies issues requiring mitigation, Benga will undertake maintenance activities such as erosion control and in-fill planting of areas with selected species to enhance the reclamation process. An adaptive management program will allow for specialized responses to specific issues that may arise.
- *mechanism to disseminate follow-up results among the concerned populations:*
 - Vegetation and related reclamation follow-up results will be reported to the AER and posted on the AER website. Other data sharing mechanisms could be employed such as posting results to the company website. Benga has established a community liaison group where information could also be distributed.
- *accessibility and sharing of data for the general population:*
 - All reports prepared and submitted to the AER to ensure compliance with all approvals will be posted on the AER website. Other data sharing mechanisms could be employed such as posting results to the company website. Benga has established a community liaison group where information could also be distributed.
- *opportunity for the proponent to take advantage of the participation of Aboriginal groups and stakeholders on the affected territory, during the implementation of the program:*
 - The potential to utilize Aboriginal assistance in vegetation and reclamation monitoring will be addressed as opportunities and needs arise.
- *involvement of local and regional organizations in the design, implementation, and evaluation of the follow-up results as well as any updates, including a communication mechanism between these organizations and the proponent:*
 - Benga has established a community liaison group where information could also be distributed. A local stewardship group will also be established which is another means of information distribution.

The following components are to be addressed as they form part of the CEEA Guidelines for monitoring:

- *identification of the interventions that pose risks to one or more of the components and the measures and means planned to protect the environment:*
 - No interventions are anticipated to pose risks to the environment.

- *description of the characteristics of the monitoring program where foreseeable (e.g., location of interventions, planned protocols, list of measured parameters, analytical methods employed, schedule, human and financial resources required):*
 - Vegetation monitoring will occur on re-contoured and re-vegetated areas and at reclaimed wetlands. Monitoring will be conducted according to provincial/federal standards and regulations and all approval conditions. Parameters will include presence and distribution of species and target communities and wetland delineation and characterisation.
- *description of the proponent's intervention mechanisms in the event of the observation of non-compliance with the legal and environmental requirements or with the obligations imposed on contractors by the environmental provisions of their contracts:*
 - Benga will determine alternative revegetation and wetland reclamation procedures.
- *guidelines for preparing monitoring reports (number, content, frequency, format) that will be sent to the authorities concerned:*
 - Reporting requirements will be prescribed by the AER. Reports will be submitted electronically to the AER as prescribed.

A.11.9 Wildlife

A.11.9.1 Wildlife Mitigations

The proposed mitigation measures and wildlife monitoring program described in this section were designed to reduce or minimize the effects of the Project on wildlife and to monitor the effects of the Project to allow for effective adaptive management of mitigation measures over time to ensure that the Project-related effects on wildlife are avoided or minimized.

Benga will implement a number of best management practices, Project design features, and other wildlife mitigation measures to avoid or minimize effects on wildlife. These best management practices, design features, and mitigation measures are presented below in relation to each of the expected Project-wildlife interactions that were assessed.

To prevent or minimize Project effects on federally-listed (SARA) species at risk, Benga will work in consultation with Environment Canada to develop species-specific mitigation and monitoring plans for species at risk known to occur in the WLSA. These species include olive-sided flycatcher, common nighthawk, short-eared owl, and little brown myotis. Over the duration of the Project, other species at risk may be found in the WLSA or added to the SARA list of protected species. If this occurs, Benga will contact Environment Canada to determine mitigation requirements for these additional species.

Mitigation measures to prevent or minimize Project effects on migratory birds and their habitats are incorporated into [CR #9 Section 7.1.3](#) (habitat availability), [CR #9 Section 7.1.4](#) (habitat connectivity and movement), and [CR #9 Section 7.1.5](#) (mortality risk). Key measures include planning vegetation clearing outside of the breeding bird period (April 15 to August 31) characteristic of the region, conducting pre-disturbance nest searches, and implementing the C&R Plan ([Section F](#)) that promotes the development of habitats required for migratory birds. Benga also acknowledges that Environment Canada encourages industry to develop Beneficial Management Practices guides to minimize potential Project-specific impacts on migratory birds and their habitat.

Many of the Project effects associated with wildlife habitat loss will be minimized through implementation of the Project's reclamation plan. The summary of the reclamation plan mitigation recommendations for wildlife and wildlife habitat reclamation include:

- minimize the overall disturbance footprint through the mine planning process;
- preserve remnant forest patches within the development areas where feasible to provide habitat, habitat connectivity and hide cover for wildlife species;
- maximize the direct placement of salvaged soil to enhance native plant development;
- retain slash and large woody debris in the salvaged soil to provide microsites for native plant and hide cover for wildlife;
- establish a variety of vegetation species and communities suitable for wildlife, and encourage structural complexity within the forests;
- encourage understory complexity in reclaimed forests by planting native shrubs such as alder and willow;
- ensure that core security areas are provided for wildlife;
- provide water management program that ensures the surface water quality is maintained; and
- limit sight lines by maintaining mature forest stands as buffers between roads and reclamation areas.

To support the reclamation plan mitigation measures, the following will be implemented to mitigate potential direct and indirect Project effects on wildlife habitat availability:

- Incorporate the existing legacy mining disturbances into the development and reclamation plans for the project, and other proposed land use activities to the best extent possible so that habitat loss, habitat fragmentation, linear disturbance features, and cumulative habitat loss are minimized.

- Pre-disturbance surveys will be conducted along the edges of all areas to be cleared during Project development to determine the occurrence of any important wildlife habitat features such as migratory bird nests, mineral licks, dens, bat habitat, and platform/stick nests.
- In areas of suitable wildlife habitat (on the edge of the Project footprint boundary) appropriate setback distances (or buffer zones) will be considered.
- Clearing and equipment use/storage/cleaning in undisturbed areas within and adjacent to the Project footprint will be avoided.
- Vegetation adjacent to high-activity linear corridors (*e.g.*, access roads, coal conveyor) will be retained to reduce the extent of noise and visual sensory disturbances to the extent possible.
- The overland coal conveyor system was designed in such a manner to prevent any deposition of coal product along the route from the CHPP to the rail load-out area ([Section C.3](#)). This includes a cover for the length of the conveyor to reduce dust, and motor specifications to reduce industrial noise levels.
- Where appropriate, vegetated buffer zones (100 m or minimum of 30 m; pending topography constraints) will be maintained between Project infrastructure and wetlands, creeks, and streams to the best extent possible.
- As required by the *Weed Control Act* and Regulations, all identified noxious and invasive weed species populations will be controlled prior to any site disturbance and mine operation to prevent the further spread of weeds. Noxious weed management will occur in compliance with R&R/03-4 *Weeds on Industrial Development Sites* (Alberta Environment 2003b).
- As the presence of artificial lighting can potentially affect bird and bat use of nearby habitats, Benga has developed a visual impact mitigation plan that reduces stray and non-essential artificial lighting to minimize wildlife effects and that will comply with OH&S safety requirements.
- To mitigate the potential effects of sensory disturbance (acoustic and visual) on effective habitat availability in the southeast portion of the Gold Creek valley, Benga will install and maintain a 15-m tall earth berm along the eastern edge of the south disposal area. The earth berm will be constructed/maintained during the day-time when required and will grow in elevation as the height of the disposal area increases.
- Sensory disturbance from the active mine site will be further mitigated through the use of mufflers on all internal combustion engines, utilizing mine pit topography to shield noise generated from haul trucks, and conducting blasting during daylight hours.

The following general wildlife mitigation measures will be implemented to minimize potential disruption to daily and seasonal wildlife movements:

- a minimum of six wildlife crossings (underpasses and overpasses) will be incorporated into the design of the coal conveyor (the conveyor route is approximately 5.4 km in length):
 - these will be strategically placed in locations that will maximize wildlife use (*e.g.*, presence of well used trails, suitable habitats, and terrain features such as valleys and depressions that act as natural crossings);
 - additional pre-disturbance surveys will be conducted to identify important wildlife habitats and trails along the access road and conveyor corridor;
 - natural underpasses using topography are preferred; and
 - above ground crossings may be required when topography isn't favourable, conveyor will likely be raised higher above the ground to allow wildlife movement under it.
- surface water management ponds and ditches located in undisturbed areas of the Project footprint will be designed to allow wildlife to move around or cross safely;
- road plowing and grading will be conducted in a manner that does not restrict wildlife from crossing access roads or accessing wildlife crossings; and
- measures to control dust and other air emissions (*e.g.*, watering of roads and use of dust suppressants, minimizing engine idling, *etc.*) within the Project footprint will be implemented to minimize effects on adjacent wildlife habitats.

Project-specific mitigations targeted to carnivore species have been incorporated into the reclamation planning. Many of these will also support habitat connectivity for migratory birds and species at risk, and include:

- minimizing the overall disturbance footprint through the mine planning process;
- preserving remnant forest patches in the development areas to provide habitat, habitat connectivity, and hiding cover for wildlife species;
- retaining slash and large woody debris in the replaced soil landscape;
- planting native shrubs early in the reclamation process to initiate hiding cover;
- establishing mixed wood forest stands and high density coniferous tree stands;
- providing understory complexity in the reclaimed forests by planting native shrubs such as alder and willow to provide security cover for the carnivores and their prey;
- maximizing the amount of ungulate habitat;
- prioritizing to final reclamation, disrupt linear disturbances and sight lines by mounding surface soils, piling brush; and
- limiting sight lines by maintaining mature forest stands or by planting high density coniferous stands to act as buffers between roads, project disturbance boundaries and the reclaimed mine areas.

Additional mitigations that are specifically targeted to grizzly bears and grizzly bear habitat will also support other carnivores and migratory birds, and include:

- maintaining a 100 m undisturbed forested buffer around Blairmore Creek and other riparian corridors;
- leaving patches of residual forest within and adjacent to the mine footprint; and
- commencing reclamation early on in mine operations by seeding reclaimable areas with plant species favourable to grizzly bear forage, and by planting shrub and tree species that provide suitable cover (*e.g.*, willow, alder, coniferous trees).

For migratory birds, additional relevant mitigations include:

- retaining slash and large woody debris in the salvaged soil to provide microsites for native plant and hide cover and perches for wildlife; and
- ensuring reclaimed areas promote the re-establishment of woody species and are on a trajectory for reforestation.

For raptors, additional relevant mitigations include:

- retaining residual patches of essential habitat and habitat features within and adjacent to the mine footprint (*i.e.*, mature poplar trees, tall conifer trees) to provide perches, nest sites, and hide cover;
- minimizing loss of mature and old-growth forest habitat and avoid complex, multi-story mixedwood forest where possible; and
- maintaining a 100 m buffer of undisturbed forest around Blairmore Creek, Gold Creek and other riparian corridors.

Targeted mitigation measures involving amphibians and amphibian habitat include:

- conducting monitoring to identify other habitable ponds and to identify habitat requirements and constraints;
- constructing trial breeding ponds;
- reclaiming upland habitat adjacent to reconstructed breeding ponds; and
- avoiding habitat destruction and alteration outside of the defined Project footprint to the best extent possible.

Mitigation measures that will be implemented to reduce wildlife mortality risk include:

- All access to the Mine Permit will be controlled; no uncontrolled access will be permitted. Common operational practices will include:
 - prohibiting use of snowmobiles and ATVs;
 - prohibiting hunting, harassment, or feeding of wildlife; and
 - implementing a strictly enforced zero tolerance policy on the use of firearms.
- Timing vegetation site clearing activities are to occur outside the April 15 to August 31 period to avoid disrupting nesting migratory and resident songbirds and raptors.
- In the event that vegetation clearing must occur within the restricted activity period, pre-disturbance nesting surveys will be conducted by experienced avian biologists according to established sensitive species inventory guidelines (Government of Alberta 2013b).
- Confirm the presence/absence of bats in high quality habitats located within the Project footprint prior to the initiation of any clearing activities and develop a mitigation plan if bats are found.
- Conduct pre-disturbance denning (bears, marten, *etc.*) and roosting (bats) surveys prior to vegetation clearing and other high-disturbance activities. Consult with AEP as needed to develop appropriate mitigation and management strategies.
- Conduct pre-disturbance surveys (acoustic surveys and visual searches) to identify wetlands and watercourses used by breeding Columbia spotted frogs and western toads that feed into the protection plans.
- Benga commits to supporting active bear management plans associated with the Project. If a site specific plan is required, it will be developed in consultation with AEP personnel as part of the Wildlife Mitigation and Monitoring Plan. The plan is expected to be a comprehensive document that outlines operational strategies and best practices for addressing concerns related to not only bear-human conflicts but potential risks to ungulates and other wildlife resulting from attraction of bears to the area.
- Develop a Beneficial Management Plan guide to minimize potential Project-specific impacts on migratory birds and their habitat by identifying more site-specific mitigation and monitoring measures following Project approval and in consultation with federal and provincial regulators.
- A detailed Waste Management Plan will be developed and implemented prior to construction and operational activities to minimize the attraction of wildlife. Benga will follow the Best Management Practices for camps, fences, and barriers as described in Bear Smart: Best Management Practices for Camps (ASRD 2011), and ensure all waste is stored in wildlife-proof containers and disposed of properly. Some of the waste management and bear awareness/Bear Smart guidelines that will be implemented include:

- ensuring food waste, refuse, and other attractants are securely contained in enclosed and approved bear-proof containers and/or facilities (*e.g.*, hard-sided buildings, fenced compounds, and bear-proof transfer station) prior to transportation to a disposal facility to prevent access by scavenging bears;
 - providing adequate signage to inform employees of the location and proper use of bear-proof storage containers/facilities;
 - ensuring waste storage containers/facilities are not filled beyond capacity;
 - ensuring regular inspection and maintenance of waste storage containers/facilities is carried out;
 - ensuring measures contained in the bear management plan are diligently followed by all employees and contractors;
 - all on-site staff will receive Bear Awareness Training; and
 - bear warning signs will be installed to advise staff of locations where problem bears have been reported.
- Implement an Emergency Spill Response Plan to limit the effect of accidental spills. Spills will be minimized by restricting fuel storage and filling to designated areas that are at least 100 m from wetlands and watercourses as well as Project drainage ditches, sediment control ponds, and pit lakes.
 - Store all hazardous materials, including those used for blasting, in secure areas that are inaccessible to wildlife (*e.g.*, buildings, storage areas surrounded by wildlife-proof fencing). In addition, proper handling and storage of industrial materials and debris within the Project footprint will be maintained to minimize potential risks to wildlife.
 - Develop procedures to clear blasting areas of large mammals or birds prior to blasting.
 - Design water management ponds and drainage ditches, and pit lakes to minimize potential entrapment of wildlife.
 - Develop a strategy to minimize changes in water quality upstream of the mine in conjunction with a water-quality monitoring program.
 - Enforce speed limits (≤ 50 km/hr) along the main access road and utility corridors, and place signs at identified wildlife crossings to increase driver diligence to minimize wildlife-vehicle collisions. Vehicles will yield to all wildlife crossing the main access road.
 - Bird collisions with buildings will be mitigated by placing visual markers on windows, and collisions with the proposed power line will be mitigated by installing large ‘floats’ or other markers.

Mitigation measures specific to bat species include:

- avoiding direct and indirect impacts to known, primary maternity roosts and hibernacula should any such roosts or hibernacula be located/identified; and
- where possible, tree clearing to be planned to avoid the May to August bat summer season.

A.11.9.2 Wildlife Monitoring

Wildlife monitoring will be used to monitor the effects of the Project on wildlife species at risk or species of management concern during construction and operation of the Project and post-closure. The wildlife monitoring program will serve a number of important functions including:

- verifying impact predictions and monitoring the effectiveness of mitigation measures;
- improving Benga's understanding of the effects of Project construction and operation on wildlife within the WLSA and surrounding area to enable the implementation of adaptive management practices when required; and
- ensuring compliance with the terms and conditions of the Operating Approval and Project environmental standards once the Project has been approved by AER and CEAA.

As part of the wildlife monitoring program for the Project, Benga will engage regulators (both provincial and federal), First Nations, and traditional land users in discussion regarding approaches to further minimize effects on species of special interest. Such approaches might include continued monitoring, habitat management, and participation in regional initiatives (*e.g.*, the ABMI program to assist with monitoring regional cumulative effects on biological resources).

It is important that monitoring efforts are focussed on parameters that are directly related to effects mitigation and that provide opportunities to improve mitigation performance over time. For these reasons, the wildlife monitoring program will initially focus on the following, but will not be limited to:

- continuing with and expanding the use of wildlife camera monitoring as a low-disturbance, passive monitoring approach to quantitatively measure changes in use of preferred habitat types by larger species such as grizzly bear, moose, and elk and elusive species of concern such as marten, lynx, and wolverine in the vicinity of the Project footprint;
- monitoring breeding birds, raptors, waterbirds, bats, and amphibians using sensitive species inventory guidelines (Government of Alberta 2013b) and recommendations from federal recovery strategies as reclamation progresses over the landscape;
- targeted species to include, but not be limited to:

- SARA schedule 1 species known to occur in the WLSA: olive-sided flycatcher, common nighthawk, short-eared owl, and little brown myotis;
 - COSEWIC-listed species known to occur in the WLSA: western toad, barn swallow, American badger, wolverine, grizzly bear, and Baird's sparrow; provincially listed or protected species; and
 - species of traditional use or value.
- implement a wildlife sighting program for Project personnel and contractors to document wildlife occurrences within the Project footprint during the construction and operations ;
 - construction monitoring to ensure timing windows, setbacks, and other mitigation measures are followed;
 - monitoring wildlife use of Project-related linear features (*e.g.*, railway loop, transmission line, pipelines, drainage ditches, and ponds) during operation;
 - monitoring wildlife crossings to determine the efficiency of the structures at maintaining wildlife movements;
 - monitoring the effectiveness of any access control measures (*e.g.*, gates) on roads and other linear features;
 - monitoring and documenting all human-wildlife interactions that occur within the Project footprint; and,
 - post-closure wildlife monitoring linked with the reclamation monitoring program and any other related environmental monitoring programs, continuing until all permit conditions are satisfied and the AER releases the Project site.

This initial wildlife monitoring approach will enable Benga to evaluate the effectiveness of their wildlife protection, mitigation, and reclamation procedures and to ensure that the Project does not adversely affect wildlife in the region. A detailed wildlife mitigation and monitoring plan based on Approval Conditions will be developed following Project approval.

A.11.9.3 Determining Effectiveness of Mitigation, Follow-up and Monitoring

CEAA and the AER define follow-up programs as programs designed to verify the predictions made in the environmental assessment related to Wildlife and determine the effectiveness of any mitigation measures. The following components are to be addressed as they form part of the CEAA Guidelines for follow-up:

- *objectives of the follow-up program and the VCs targeted by the program:*

- The follow-up program will target VCs related to disturbance of wildlife and wildlife habitat – presence, relative abundance, and distribution of targeted wildlife species (VCs and special status species assessed in [CR #9](#)) and communities (e.g., migratory birds).
- *list of elements requiring follow-up:*
 - Suitability of reclaimed landscapes for wildlife in general and targeted wildlife species/communities along with identification of amphibians, mammals, and birds using reclaimed landscapes will require follow-up.
- *number of follow-up studies planned as well as their main characteristics (list of the parameters to be measured, planned implementation timetable, etc.):*
 - Parameters will include habitat classification and presence, relative abundance, distribution, and habitat use of targeted species and communities. These parameters will be included in the Reclamation Research and Monitoring Program ([Section F.3.9](#)).
- *intervention mechanism used in the event that an unexpected deterioration of the environment is observed:*
 - When the follow-up monitoring program identifies issues requiring mitigation, Benga will undertake maintenance activities such as erosion control and in-fill planting of areas with selected species to enhance the reclamation process and the movement of wildlife into the area. An adaptive management program will allow for specialized responses to specific issues that may arise.
- *mechanism to disseminate follow-up results among the concerned populations:*
 - Wildlife and related reclamation follow-up results will be reported to the AER and posted on the AER website. Other data sharing mechanisms could be employed such as posting results to the company website. Benga has established a community liaison group where information could also be distributed.
- *accessibility and sharing of data for the general population:*
 - All reports prepared and submitted to the AER to ensure compliance with all approvals will be posted on the AER website. Other data sharing mechanisms could be employed such as posting results to the company website. Benga has established a community liaison group where information could also be distributed.
- *opportunity for the proponent to take advantage of the participation of Aboriginal groups and stakeholders on the affected territory, during the implementation of the program:*
 - The potential to utilize Aboriginal assistance in wildlife and reclamation monitoring will be addressed as opportunities and needs arise.

- *involvement of local and regional organizations in the design, implementation, and evaluation of the follow-up results as well as any updates, including a communication mechanism between these organizations and the proponent:*
 - Benga has established a community liaison group where information could also be distributed. A local stewardship group will also be established which is another means of information distribution.

The following components are to be addressed as they form part of the CEEA Guidelines for monitoring:

- *identification of the interventions that pose risks to one or more of the components and the measures and means planned to protect the environment:*
 - No interventions are anticipated to pose risks to the environment.
- *description of the characteristics of the monitoring program where foreseeable (e.g., location of interventions, planned protocols, list of measured parameters, analytical methods employed, schedule, human and financial resources required):*
 - Wildlife monitoring will occur on re-vegetated areas and at reclaimed wetlands. Monitoring will be conducted according to provincial/federal standards and regulations and all approval conditions. Parameters will include presence, relative abundance, distribution, and habitat use of targeted species and communities.
- *description of the proponent's intervention mechanisms in the event of the observation of non-compliance with the legal and environmental requirements or with the obligations imposed on contractors by the environmental provisions of their contracts:*
 - Benga will determine alternative re-vegetation and wetland reclamation procedures to encourage habitat use by native wildlife species.
- *guidelines for preparing monitoring reports (number, content, frequency, format) that will be sent to the authorities concerned:*
 - Reporting requirements will be prescribed by the AER. Reports will be submitted electronically to the AER as prescribed.

A.11.10 Land Use

To minimize the potential direct impacts of the proposed Project development on other land and resource users in the area, Benga will undertake the following:

- continue to consult with local stakeholders, through the life of the Project, in order to identify concerns and proactively address issues when they arise;

- undertake progressive reclamation, and reclaim the area to a landscape that includes provisions for a variety of land uses, including forestry, wildlife habitat, grazing, recreational use *etc.*
- monitor changes in land use policies and initiatives and, through adaptive management, incorporate new requirements into the ongoing development, operation, and reclamation plans.

A.11.10.1 Determining Effectiveness of Mitigation, Follow-up and Monitoring

CEAA and the AER define follow-up programs as programs designed to verify the predictions made in the environmental assessment related to Land and Resource Use and determine the effectiveness of any mitigation measures. The following components are to be addressed as they form part of the CEAA Guidelines for follow-up:

- *objectives of the follow-up program and the VCs targeted by the program:*
 - The follow-up program will target VCs related to disturbance to existing land and resource use activities by stakeholders – hunting/trapping, access, tourism and outdoor recreation, unique sites and special features, and municipal, provincial, and federal reservations.
- *list of elements requiring follow-up:*
 - Land and resource use concerns of local stakeholders and suitability of reclaimed lands for targeted end land and resource uses will require follow-up.
- *number of follow-up studies planned as well as their main characteristics (list of the parameters to be measured, planned implementation timetable, etc.):*
 - Reclamation parameters will include suitability of re-contoured and re-vegetated areas for targeted end land and resource uses. These parameters will be included in the Reclamation Research and Monitoring Program ([Section F.3.9](#)). In addition, stakeholder consultation will continue to gather information on land and resource use concerns ([Section G.6.0](#)), which may alter long-term land use planning.
- *intervention mechanism used in the event that an unexpected deterioration of the environment is observed:*
 - When the follow-up monitoring program identifies issues requiring mitigation, Benga will undertake maintenance activities such as erosion control and in-fill planting of areas with selected species to enhance the reclamation process and the suitability of landscapes for targeted end land and resource uses. An adaptive management program will allow for specialized responses to specific issues that may arise.
- *mechanism to disseminate follow-up results among the concerned populations:*

- Land and resource use and related reclamation follow-up results will be reported to the AER and posted on the AER website. Other data sharing mechanisms could be employed such as posting results to the company website. Benga has established a community liaison group where information could also be distributed.
- *accessibility and sharing of data for the general population:*
 - All reports prepared and submitted to the AER to ensure compliance with all approvals will be posted on the AER website. Other data sharing mechanisms could be employed such as posting results to the company website. Benga has established a community liaison group where information could also be distributed.
- *opportunity for the proponent to take advantage of the participation of Aboriginal groups and stakeholders on the affected territory, during the implementation of the program:*
 - The potential to utilize Aboriginal assistance in land and resource use and reclamation monitoring will be addressed as opportunities and needs arise.
- *involvement of local and regional organizations in the design, implementation, and evaluation of the follow-up results as well as any updates, including a communication mechanism between these organizations and the proponent:*
 - Benga has established a community liaison group where information could also be distributed. A local stewardship group will also be established which is another means of information distribution.

The following components are to be addressed as they form part of the CEEA Guidelines for monitoring:

- *identification of the interventions that pose risks to one or more of the components and the measures and means planned to protect the environment:*
 - No interventions are anticipated to pose risks to the environment.
- *description of the characteristics of the monitoring program where foreseeable (e.g., location of interventions, planned protocols, list of measured parameters, analytical methods employed, schedule, human and financial resources required):*
 - Information gathered in follow-up programs for hydrology, aquatic resources, terrain and soils, vegetation, and wildlife will be used to determine suitability of reclaimed landscapes for targeted end land and resource uses. Monitoring will be conducted according to provincial/federal standards and regulations and all approval conditions. Parameters considered will include those indicated in [A.11.4.3](#), [A.11.6.3](#), [A.11.7.3](#), [A.1.8.3](#), and [A.11.9.3](#).

- *description of the proponent's intervention mechanisms in the event of the observation of non-compliance with the legal and environmental requirements or with the obligations imposed on contractors by the environmental provisions of their contracts:*
 - Benga will determine alternative re-contouring and re-vegetation procedures to encourage a landscape diversity suitable for targeted end land and resource uses.
- *guidelines for preparing monitoring reports (number, content, frequency, format) that will be sent to the authorities concerned:*
 - Reporting requirements will be prescribed by the AER. Reports will be submitted electronically to the AER as prescribed.

A.11.11 Socio-Economics

Since it acquired the Grassy Mountain leases in 2013, Benga has been communicating regularly with local communities – such as Crowsnest Pass, Sparwood and Ranchland – to keep them informed about the Project, identify issues, and explore mitigation options. In addition, Benga has offered to support the hiring of a municipal planner for Crowsnest Pass to assist with community planning.

Additional measures that Benga is prepared to take in order to mitigate the population effects of its Project on social infrastructure in the region are:

- support in the hiring of a municipal planner for Crowsnest Pass to assist with community planning;
- support local municipalities in discussions with the province to acquire additional funding for services and infrastructure;
- work with local governments to facilitate the timely development of residential land and dwellings;
- house construction workers in a temporary camp, which has the ancillary effect of reducing the resident population effect of the Project and the anticipated demand for housing.
- develop and implement specific policies regarding employee health and safety and emergency response;
- maintain explicit and enforced workplace policies with regards to alcohol and drug use, and illegal activities;
- provide employees with access to the company's confidential employee assistance plan, which provides support for families and individuals who may experience difficulty dealing with personal, family, or work-life issues that can affect one's health and well-being;
- continue to support local programs and initiatives through both financial and in-kind contributions, where appropriate;

- cooperate with service providers (*e.g.*, health, social, education), government, and other industrial operators in the region to assist in addressing effects of its project and resource development;
- continuous monitoring of project effects and associated mitigation measures *via* Benga's engagement with regional and provincial stakeholders.
- working with the municipalities in the region to keep them informed of its development plans and their timing so that the affected municipalities have sufficient time to plan for changes in the demand for services.

Benga recognizes the effects of resource development on traditional land use and culture. The proponent will therefore carry out the following actions to enhance the positive and minimize the adverse effects of its Project:

- undertake progressive reclamation, giving consideration to traditional land use, where possible;
- provide access to traditional users across the lease;
- compensate trappers directly affected by the Project, according to industry standards;
- promote cultural diversity awareness to Benga's employees and contractors regarding respect for traditional resource users;
- support specific community projects, such as elder and youth programs, where appropriate; and
- continue working with Aboriginal communities in the region to ensure that their concerns with respect to traditional land use and culture are continually considered during Project planning and operation.

A.11.11.1 Determining Effectiveness of Mitigation, Follow-up and Monitoring

CEAA and the AER define follow-up programs as programs designed to verify the predictions made in the environmental assessment related to Socio-economics and determine the effectiveness of any mitigation measures. The following components are to be addressed as they form part of the CEAA Guidelines for follow-up:

- *objectives of the follow-up program and the VCs targeted by the program:*
 - The follow-up program will target economic and fiscal, population, regional infrastructure, and traditional land use and culture VCs to prevent deterioration of the socio-economic environment as a result of Project activities.
- *list of elements requiring follow-up:*

- Benga's procurement, employment, housing, transportation, and social and municipal infrastructure strategies and outcomes of the Project will require follow-up.
- *number of follow-up studies planned as well as their main characteristics (list of the parameters to be measured, planned implementation timetable, etc.):*
 - Parameters will include workforce, income, population changes, effects of population changes on service providers and physical infrastructure, effects of increased traffic on the regional road network, effects on traditional land use and culture, municipal taxes, provincial corporate tax and resource royalty income, and federal corporate tax.
- *intervention mechanism used in the event that an unexpected deterioration of the environment is observed:*
 - Benga will work with the municipality to determine alternative procurement, employment, and infrastructure strategies to improve socio-economic conditions related to the Project.
- *mechanism to disseminate follow-up results among the concerned populations:*
 - Socio-economic follow-up results will be reported to the AER and posted on the AER website. Other data sharing mechanisms could be employed such as posting results to the company website. Benga has established a community liaison group where information could also be distributed.
- *accessibility and sharing of data for the general population:*
 - All reports prepared and submitted to the AER to ensure compliance with all approvals will be posted on the AER website. Other data sharing mechanisms could be employed such as posting results to the company website. Benga has established a community liaison group where information could also be distributed.
- *opportunity for the proponent to take advantage of the participation of Aboriginal groups and stakeholders on the affected territory, during the implementation of the program:*
 - The potential to utilize Aboriginal assistance in socio-economic follow-up monitoring will be addressed as opportunities and needs arise.
- *involvement of local and regional organizations in the design, implementation, and evaluation of the follow-up results as well as any updates, including a communication mechanism between these organizations and the proponent:*
 - Benga has established a community liaison group where information could also be distributed. A local stewardship group will also be established which is another means of information distribution.

The following components are to be addressed as they form part of the CEEA Guidelines for monitoring:

- *identification of the interventions that pose risks to one or more of the components and the measures and means planned to protect the environment:*
 - No interventions are anticipated to pose risks to the environment.
- *description of the characteristics of the monitoring program where foreseeable (e.g., location of interventions, planned protocols, list of measured parameters, analytical methods employed, schedule, human and financial resources required):*
 - Socio-economic monitoring will occur in the RSA, which includes M.D. of Ranchland, the S.M. of Crowsnest Pass, Town of Sparwood, and the portion of Highway 3 connecting the Project to Sparwood. Monitoring will be conducted according to provincial/federal standards and regulations and all approval conditions. Parameters will include workforce, income, population changes, effects of population changes on service providers and physical infrastructure, effects of increased traffic on the regional road network, effects on traditional land use and culture, municipal taxes, provincial corporate tax and resource royalty income, and federal corporate tax. Global energy needs, government policies, and technologies may change over the duration of the Project, and will therefore be considered during ongoing monitoring.
- *description of the proponent's intervention mechanisms in the event of the observation of non-compliance with the legal and environmental requirements or with the obligations imposed on contractors by the environmental provisions of their contracts:*
 - Benga will determine alternative procurement, employment, and infrastructure strategies to improve socio-economic conditions related to the Project.
- *guidelines for preparing monitoring reports (number, content, frequency, format) that will be sent to the authorities concerned:*
 - Reporting requirements will be prescribed by the AER. Reports will be submitted electronically to the AER as prescribed.

A.11.12 Human Health

Assuming public access within the Mine Permit Boundary is restricted and the mitigation measures assumed by the other disciplines are implemented ([Section A.11](#)); there is no need for further mitigation of emissions based on the results of the HHRA. Due to the potential for limited acute exposure risk within the project footprint, a monitoring program is recommended to confirm that the emitted concentrations of NO₂, PM_{2.5}, and PM₁₀ in areas accessible to the general public do not exceed the levels predicted by the air dispersion modelling and thus will not pose a risk of adverse health effects. In addition a water quality monitoring program will be implemented to monitor selenium (and other pertinent parameters) in Project-affected watercourses and any end pit lakes.

A.11.12.1 Determining Effectiveness of Mitigation, Follow-up and Monitoring

CEAA and the AER define follow-up programs as programs designed to verify the predictions made in the environmental assessment related to Human Health and determine the effectiveness of any mitigation measures. The following components are to be addressed as they form part of the CEAA Guidelines for follow-up:

- *objectives of the follow-up program and the VCs targeted by the program:*
 - The follow-up program will target air quality VCs related to human health - PM_{2.5}, and PM₁₀.
- *list of elements requiring follow-up:*
 - PM_{2.5}, and PM₁₀ emissions will require follow-up, as per the air quality monitoring program (CR #1a Section 6.5).
- *number of follow-up studies planned as well as their main characteristics (list of the parameters to be measured, planned implementation timetable, etc.):*
 - Targeted VCs will be measured as per approval conditions prescribed by the AER.
- *intervention mechanism used in the event that an unexpected deterioration of the environment is observed:*
 - Intervention mechanisms would begin with the use of a more effective dust suppression product than water.
- *mechanism to disseminate follow-up results among the concerned populations:*
 - Reports will be prepared and submitted as prescribed by the AER, and posted on the AER website. Other data sharing mechanisms could be employed such as posting results to the company website. Benga has established a community liaison group where information could also be distributed.
- *accessibility and sharing of data for the general population:*
 - Reports will be prepared and submitted as prescribed by the AER, and posted on the AER website. Other data sharing mechanisms could be employed such as posting results to the company website. Benga has established a community liaison group where information could also be distributed.
- *opportunity for the proponent to take advantage of the participation of Aboriginal groups and stakeholders on the affected territory, during the implementation of the program:*
 - The potential to utilize Aboriginal and public assistance in air quality follow-up monitoring will be addressed as opportunities and needs arise.

- *involvement of local and regional organizations in the design, implementation, and evaluation of the follow-up results as well as any updates, including a communication mechanism between these organizations and the proponent:*
 - Benga has established a community liaison group where information could also be distributed. A local stewardship group will also be established which is another means of information distribution.

The following components are to be addressed as they form part of the CEEA Guidelines for monitoring:

- *identification of the interventions that pose risks to one or more of the components and the measures and means planned to protect the environment:*
 - Water is the preferred dust suppressant and the most benign on the environment, if alternate products are required, consideration must be given if possible environmental effects may occur. No other interventions are anticipated to pose a risk to the environment.
- *description of the characteristics of the monitoring program where foreseeable (e.g., location of interventions, planned protocols, list of measured parameters, analytical methods employed, schedule, human and financial resources required):*
 - Measuring dust generated by the Project is relatively easy and inexpensive to complete, and can be done with local labour employed by Benga. Dust canisters can be used to measure TSP and high volume air samplers can be used to measure PM₁₀ and PM_{2.5}. Locations of monitoring would be in key areas of dust generation in the vicinity of the haul roads, and coal loading.
- *description of the proponent's intervention mechanisms in the event of the observation of non-compliance with the legal and environmental requirements or with the obligations imposed on contractors by the environmental provisions of their contracts:*
 - Finding an alternative dust suppression product is the key intervention and would be done by the mine personnel. If dusting at the coal loading facility is an issue it may require additional cladding or protection from the wind.
- *guidelines for preparing monitoring reports (number, content, frequency, format) that will be sent to the authorities concerned.*
 - Reporting requirements will be prescribed by the AER. Reports will be submitted electronically to the AER as prescribed.

A.11.13 Historical Resources

A.11.13.1 Historical Resources Mitigations

For those historical resources that lie partially or wholly within the Project footprint, there is the potential that they will or may be impacted. A suite of site-specific mitigative actions that are designed to reduce or eliminate the potential impact on archaeological locales from the proposed Project's construction and operation activities include, but are not limited to:

- To mitigate potential rail yard impacts, pertinent best management practices, as outlined in the *Guidelines for the New Development in Proximity to Railway Operations*, will be adhered to. For public access, structures on the inside of the rail loop will be fenced off and will be accessible to the public *via* request. For structures outside of the rail loop, a roadside interpretive pull off will be developed.
- Disturbance of any further remains located within the proposed rail load out footprint, will be mitigated with controlled excavations to remove the remains.
- A mitigation excavation of approximately 80 m² will occur in the CHPP footprint in advance of Project development to remove all remaining historical resources or representative samples.
- Historic mine remains will be completely documents and recorded.
- Historic mining camp remains will be documented in a 20 m² excavation.
- Additional field surveys and documentation, where required.

A.11.13.2 Historical Resources Monitoring

Monitoring during Project development is recommended at a limited number of sites in the footprint:

- construction monitoring during any excavation activities during the construction of the proposed rail line;
- limited construction monitoring is recommended for the Bluff Mountain locale if significant fossil material is recovered from adjacent South Rock Disposal bordering on the north; and
- monitoring to document and salvage significant fossil material within the South Rock Disposal Area where the Fernie Formation will be exposed. This documentation and salvage procedure should be completed before dumping of waste commences.

The intent of the monitoring is to search for, record, and collect historical and paleontological resources materials that may be exposed by construction/land development that were not discovered during the mitigative excavations. There is a specific requirement for palaeontological monitoring and a regular monitoring program will be established after mining operations are started. A permitted palaeontologist will visit the mine area, particularly the pit area, during operations to

search for any fossils that may be exposed by pit operations. If any are located, excavations and/or collection of those fossils may occur if they are deemed significant. It is anticipated that regular monitoring visits will be made annually during the first three years of mining. In addition, mine-operating personnel familiar with fossil identification will be asked to look for fossils during day-to-day operations

A.11.13.3 Determining Effectiveness of Mitigation, Follow-up and Monitoring

CEAA and the AER define follow-up programs as programs designed to verify the predictions made in the environmental assessment related to Historical Resources and determine the effectiveness of any mitigation measures. The following components are to be addressed as they form part of the CEAA Guidelines for follow-up:

- *objectives of the follow-up program and the VCs targeted by the program:*
 - The follow-up program will target archaeological and paleontological materials that were not discovered during the mitigative excavations.
- *list of elements requiring follow-up:*
 - The known paleontological locale within the South Rock Disposal Area and known historical resources requiring further mitigation will require follow-up. Additionally, excavation activities will require monitoring to determine if new paleontological resources are discovered.
- *number of follow-up studies planned as well as their main characteristics (list of the parameters to be measured, planned implementation timetable, etc.):*
 - Known archaeological locales requiring follow-up will likely require one site visit each. The South Rock Disposal Area will require a monitoring program during the soil-stripping phase, which may expose important paleontological resources. It is anticipated that annual excavation monitoring visits to the pit will be made during the first three years of mining. All identified historical resources will be identified and described as per requirements of Alberta's *Historical Resources Act*.
- *intervention mechanism used in the event that an unexpected deterioration of the environment is observed:*
 - Interventions will be determined by Alberta Culture and Tourism, based on their *Standard Conditions Under the Historical Resources Act*.
- *mechanism to disseminate follow-up results among the concerned populations:*
 - New discoveries will be reported to the Heritage Division of Alberta Culture and Tourism. Benga has established a community liaison group where information about ongoing mitigation/monitoring and new discoveries could be distributed.

- *accessibility and sharing of data for the general population:*
 - Benga has established a community liaison group where information about ongoing mitigation/monitoring and new discoveries could be distributed. Due to the cultural and physical sensitivity of in situ historical resources, locations are not publicly available.
- *opportunity for the proponent to take advantage of the participation of Aboriginal groups and stakeholders on the affected territory, during the implementation of the program:*
 - The potential to utilize Aboriginal and public assistance in historical resources follow-up monitoring will be addressed as opportunities arise.
- *involvement of local and regional organizations in the design, implementation, and evaluation of the follow-up results as well as any updates, including a communication mechanism between these organizations and the proponent:*
 - Benga has established a community liaison group where information could also be distributed. A local stewardship group will also be established which is another means of information distribution.

The following components are to be addressed as they form part of the CEAA Guidelines for monitoring:

- *identification of the interventions that pose risks to one or more of the components and the measures and means planned to protect the environment:*
 - No interventions are anticipated to pose a risk to the environment.
- *description of the characteristics of the monitoring program where foreseeable (e.g., location of interventions, planned protocols, list of measured parameters, analytical methods employed, schedule, human and financial resources required):*
 - Known archaeological locales requiring follow-up will likely require one site visit each. The South Rock Disposal Area will require a monitoring program during the soil-stripping phase. It is anticipated that annual excavation monitoring visits to the pit will be made during the first three years of mining. All identified historical resources will be identified and described as per requirements of Alberta's *Historical Resources Act*.
- *description of the proponent's intervention mechanisms in the event of the observation of non-compliance with the legal and environmental requirements or with the obligations imposed on contractors by the environmental provisions of their contracts:*
 - Interventions will be determined by Alberta Culture and Tourism, based on their *Standard Conditions Under the Historical Resources Act*.
- *guidelines for preparing monitoring reports (number, content, frequency, format) that will be sent to the authorities concerned:*

- Reporting guidelines will be provided by the AER and Alberta Culture and Tourism as part of their approvals conditions.

A.12 CONSERVATION AND RECLAMATION SUMMARY

A.12.1 Introduction

The C&R Plan, which includes the final Closure Plan, for the Project has been prepared to:

- provide information about the planning process for the ongoing reclamation and the ultimate closure of the Project; and,
- provide the goals and endpoints for the development and reclamation of the Project.

The conservation and reclamation planning focuses on the 27 year mining and reclamation plan, and closure planning focuses on the principles and objectives that define the reclamation end points needed to achieve equivalent land capability following mine closure. ..

The primary reclamation goal of the Project is to return the lands to a capability that is equivalent to predevelopment conditions and consistent with end land use objectives. Reclamation will be conducted to construct landscape patterns, provide mine soil substrates, establish surface hydrology, and establish plants to initiate development of a functioning ecosystem. The reclaimed lands will feature regionally compatible landforms and vegetation patterns that are ecologically functional and successional, maintenance-free, and self-sustaining. The landscape will evolve through seral states of initial re-vegetation to self-sustaining ecosystems, consisting of mature vegetation communities typical of the Subalpine or Montane Subregions of the Rocky Mountain Natural Region.

The following goals and principles have been incorporated in the C&R and Closure Plans:

- progressive reclamation will be undertaken within the requirements of the mine plan;
- topsoil/reclamation material will be salvaged during site construction and preserved for reclamation activities;
- where possible, Project construction and operations will minimize impact to established communities;
- direct placement of reclamation materials will be undertaken, whenever practical, to maximize the potential viability of native seed banks and propagules;
- landforms will be geo-technically stable and will be integrated into the surrounding natural landforms;
- a variety of landforms (slopes and aspects) will be in the reclamation landscape;

- surface water drainage systems will be designed to minimize erosion rates and sediment loading;
- reclaimed areas will be developed into self-sustaining ecosystems with an acceptable degree of biodiversity;
- forest capability, including commercial forestry potential, will be equivalent to pre-development conditions;
- natural encroachment of native vegetation will be encouraged in ecologically receptive areas;
- local native seed sources will be used wherever practical to maintain genetic integrity of re-established plant communities;
- creation of habitat features that will benefit or help re-establish wildlife species known or reported to occur in the area;
- creation of features to help support SARA-listed vegetation and wildlife species that occur in the area;
- creation of features to promote traditional use or promote the establishment of valued components for traditional use;
- on-site public health and safety will be protected;
- the end pit lake will be ecologically sustainable; and
- reclamation certification will be achieved to allow transfer of the lands back to landowners and to the Crown.

During the on-going reclamation and closure process Benga will ensure that:

- end land use objectives are developed in consultation with stakeholders, building on the existing consultation process;
- site wide environmental monitoring will be conducted throughout the life of the mine and throughout reclamation to ensure landforms, soil conditions and vegetative communities maintain the appropriate trajectory towards the desired end land uses; and
- adaptive management of the C&R and Closure Plans will be pursued through the incorporation of the results of the site wide environmental monitoring programs.

Land capability objectives, as well as reclamation goals and principles, pre-disturbance vegetation inventories and post-mining monitoring programs, will be used to evaluate reclamation success and identify areas for improvement. Benga has also developed the C&R and Closure Plans in consideration of the environmental impact assessment as well as input from extensive public and Aboriginal engagement.

Regional land use was considered in the determination of end land uses. End land use goals for the Project include:

- reclamation of the landscape to an equivalent land capability, optimizing the value of watershed, timber, grazing, wildlife habitat, fish habitat, recreation or other resources, taking into account threatened species, public input, and Aboriginal Group VCs;
- return of forest productivity to equivalent pre-development levels;
- return of aesthetic qualities of the landscape;
- provision for traditional land use (*e.g.*, gathering, hunting and trapping) as identified through consultation with aboriginal communities; and
- maintain equivalent recreational land use specific to the proposed golf course development.

End land use will vary spatially and temporally across the reclaimed Project area and will be focused on forestry, grazing, watershed protection, riparian, wetland, and wildlife objectives.

The following assumptions were made for end land uses and final certification:

- The target ecosystems and vegetation communities identified in the C&R and Closure Plans will allow multiple uses. For example, areas reclaimed to commercial forest use will also provide for wildlife, recreation, and traditional land uses.
- End land use will be constrained by the type of landforms to be constructed.
- Final end land use decisions will, in part, depend on government, local stakeholder, and aboriginal input.

A.12.2 Information Sources

The plan was developed for the mine by integrating information assessed in the Project EIA ([CR #3](#), [CR #4](#), [CR #5](#), [CR #6](#), [CR #7](#), [CR #8](#), [CR #9](#), [CR #10](#), [Appendix 7c](#)), applying standard and innovative reclamation practices and techniques, and with consideration to stakeholder preferences.

Benga received considerable input on existing land values and expectations for reclaimed lands through extensive public engagement and aboriginal consultation. Examples of identified issues include:

- commercial forest productivity needs to be re-established;
- forest communities need to be established such that all of their functions are returned;
- water quality and quantity is very important;
- fisheries habitat is important to protect and to re-establish;

- reclamation performance in terms of ecological development and sustainability;
- end land uses – balancing the wants and needs of the various stakeholders (*e.g.*, golf course); and
- native plants and wildlife need to be protected and re-established.

A more comprehensive list of issues relating to the development of the Project is included in [Section G](#) (Public Engagement). Issues and concerns identified by Aboriginal groups are responded to individually for each group throughout [Section H](#) (Aboriginal Consultation). Consultation with Aboriginal groups on C&R and closure planning will be ongoing.

A.12.3 Reclamation Plan

The reclamation program designed by Benga will focus on the re-establishment of key species and communities that will promote additional species diversity, community structure, and ecological function in the reclaimed areas of the Project. These communities will emulate the landscape diversity of natural analogues in the area.

Reclamation will begin as soon as practical after mining activities are completed in areas where no additional mining, dumping, or stockpiling is required. Progressive reclamation will be optimized through the mine planning process to take advantage of all opportunities for progressive reclamation. Benga's adaptive management approach will involve establishing end land use; monitoring reclamation, soils, revegetation, and wildlife to allow objectives and end point to be reviewed, and, if necessary, develop modified mitigations and site expectations according to changing conditions.

Included in Benga's C&R Plan is a Reclamation Research and Monitoring Program (RRMP) and the Gold Creek Stewardship Program (GCSP). The RRMP will focus on the soils and vegetation resources that are essential to the attainment of the end land use objectives. Elements of this program include soil management, establishment of local native plants, commercially productive forest, biodiversity, and wildlife response to reclamation. The GCSP will address some of the current issues that relate to the water quality and fisheries in Gold Creek. While the aquatic environment is the first priority of this program, the terrestrial and social components may also be captured. Benga will spearhead this program and foresees involvement from a wide range of stakeholders, environmental groups, aboriginal communities, academia, researchers and regulators. A function of the program would be active engagement in local research and monitoring that would tie directly in to the westslope cutthroat trout recovery plan.

The final reclaimed landscape will consist of 1,462.6 ha of reclaimed lands; 18.4 ha will remain as the end pit lake, and 39.7 ha will convert to recreational land use. The maximum Project spatial disturbance will occur in Year 14 (2032) with no additional spatial disturbance to follow, and the

reclamation closure scenario, where the majority of the reclamation is completed, will occur in Year 27 (2045). At full mine closure, the selenium management surge ponds will be decommissioned and removed from the plan. Reclamation certification will be requested when a block of land has achieved the required vegetation cover, landform stability and overall performance criteria.

A.12.4 Closure Plan

Through a progressive C&R program, Benga will have reclaimed almost two-thirds of the mine footprint by the end of the mine life (Year 24). The remainder of the area will be reclaimed within three years of completion of mining (Year 27) with only the infrastructure required for the selenium management program remaining to be reclaimed at a later date (after monitoring). Following mine closure, the Project footprint will maintain comparable distribution of upland forests, grasslands, and wetlands. A slight reduction in overall slope of the site is expected at closure, which will facilitate a rapid revegetation of the Project footprint.

Reclamation end points will be achieved through:

- development of stable landscapes that are able to support a variety of end land uses;
- a soil/reclamation material management plan that will ensure unsuitable overburden materials will not be present in the rooting zone;
- a revegetation program that includes establishment of erosion-resistant plant cover, provision of a diversity of plant species, and establishment of self-sustaining viable plant communities;
- a groundwater and surface water management plan developed for the local topography, and which will ensure sustainable drainage and post-reclamation groundwater and surface water quality and quantity similar to natural conditions.

A.12.5 Closure Landscape

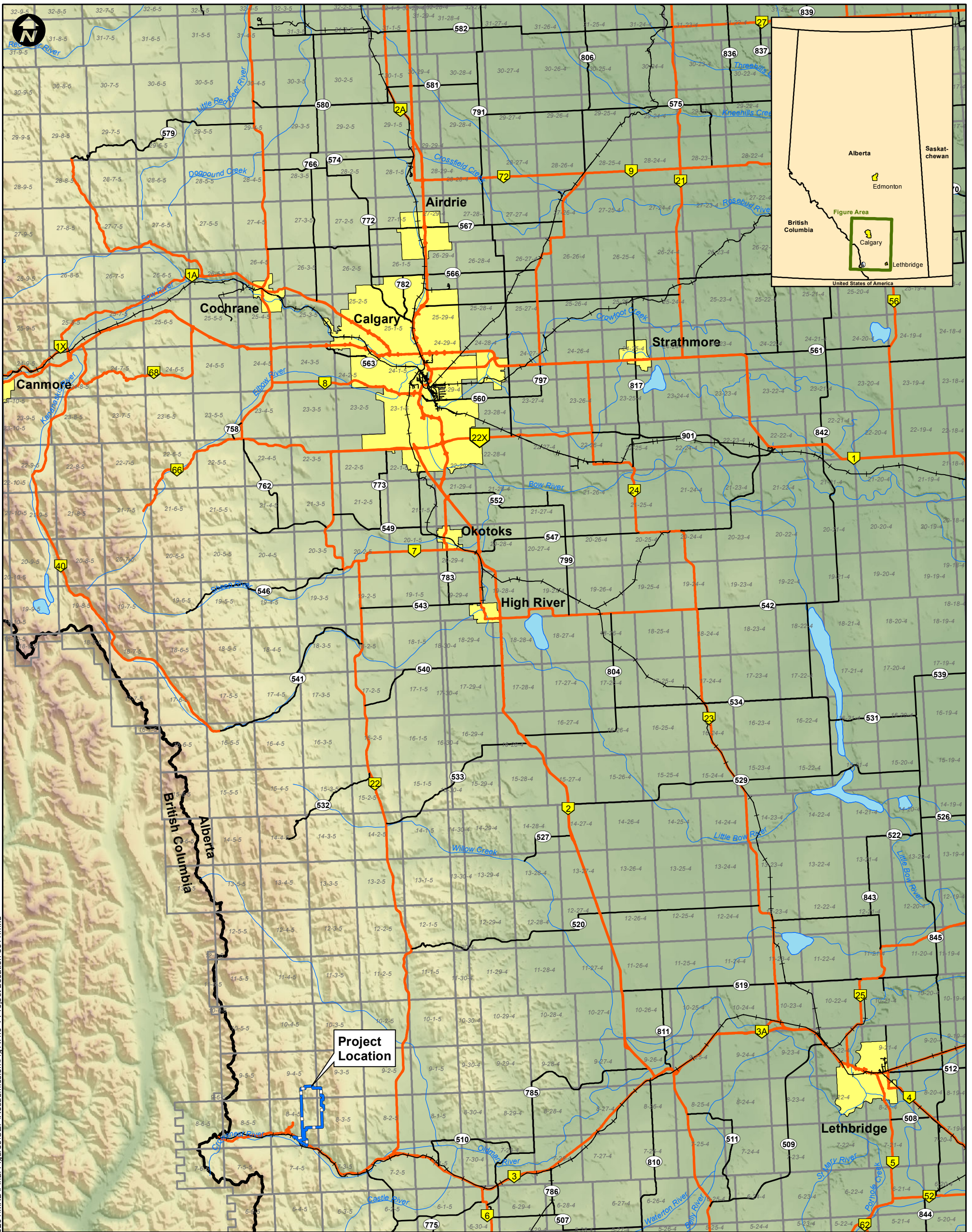
The Project development and reclamation process will establish new landforms. These features are common to coal mine developments and form the landscape of the reclaimed mine. These components include:

- reclaimed powerline, access road and conveyor right of way;
- reclaimed coal handling processing plant and associated infrastructure
- reclaimed temporary construction camp;
- reconstructed sediment ponds, streams and wetlands;
- reclaimed coal load out and railway loop;
- reclaimed pit and rock disposal areas;
- reclaimed end pit lake;

- highwall and escape terrain feature; and
- miscellaneous features such as haul roads, powerlines and other corridors.

In general, the topography will be less steep and have lesser slope angles, with the exception of the highwall feature. All new landforms will have an equivalent land capability as the pre-mining conditions. The closure landforms were designed such that they are integrated with the adjacent undisturbed lands and watershed systems; the location of land uses in areas or on landforms provide physical, biological, social and economic value; and forest productivity of reclaimed landscape will be equal to or greater than pre-development conditions.

Figures



Document Path: K:\Active Projects 2014\AP_14-00201\14-00201\MXD\Final Figures\CEP\Resubmission\Fig A.1.0-1 Project Location 8311.mxd

LEGEND

- Primary Highway
- Secondary Highway
- + Existing Railway
- River
- Proposed Mine Permit Boundary
- Lake
- City/Town
- Provincial Border

PROJECT

RIVERSDALE
RESOURCES
Benga Mining Limited

**GRASSY MOUNTAIN
COAL PROJECT**

MILLENNIUM
EMS Solutions Ltd.

TITLE

REGIONAL PROJECT LOCATION

NOTES

AltaLIS, 2016; NRCAN, 2015; Riversdale, 2016
Datum/Projection: UTM NAD 83 Zone 11

PROJECT: 14-00201-01

DRAWN BY: CP/SL

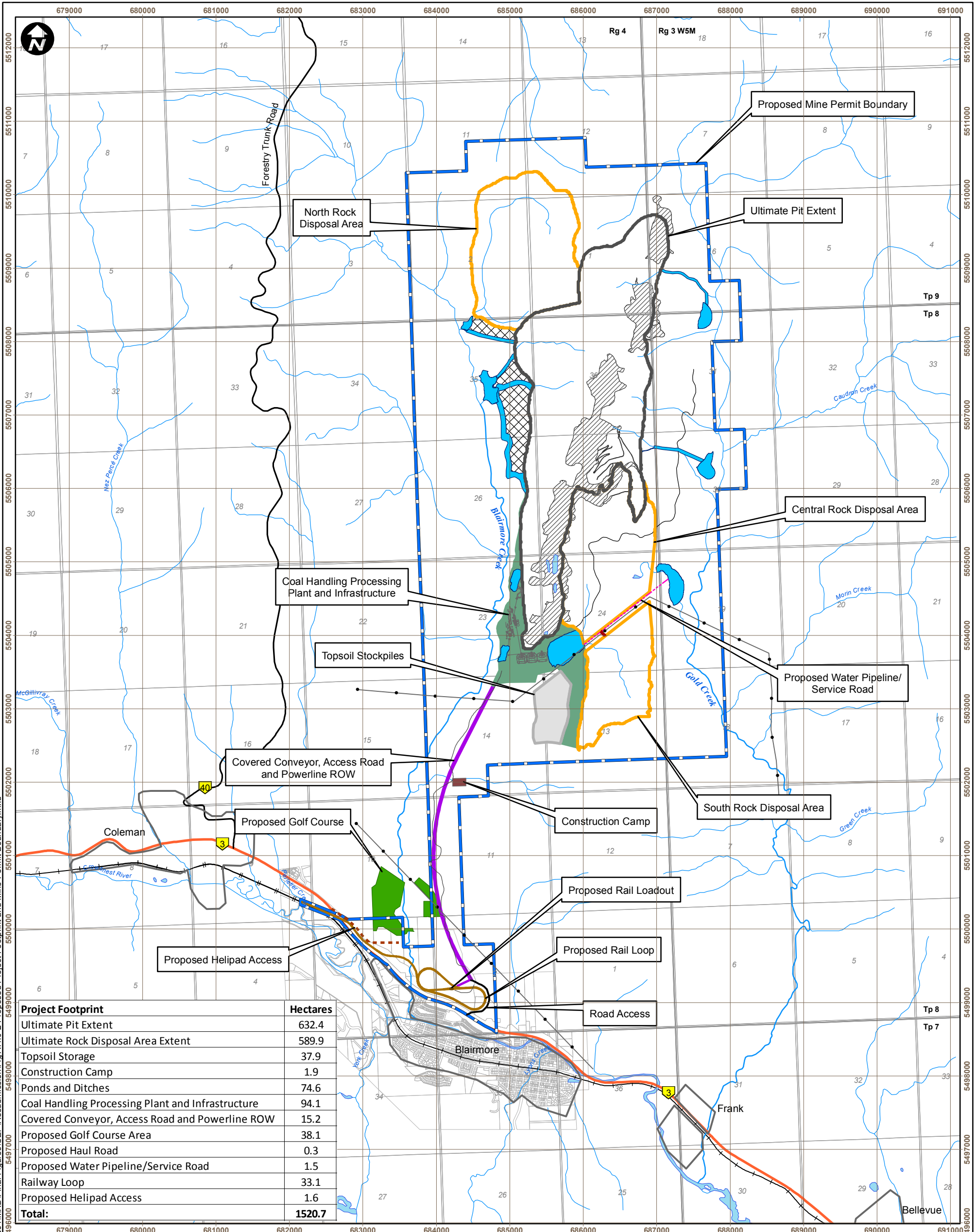
CHECKED BY: DM

DATE: JUNE 13, 2016

FIGURE

A.1.0-1





Project Footprint	Hectares
Ultimate Pit Extent	632.4
Ultimate Rock Disposal Area Extent	589.9
Topsoil Storage	37.9
Construction Camp	1.9
Ponds and Ditches	74.6
Coal Handling Processing Plant and Infrastructure	94.1
Covered Conveyor, Access Road and Powerline ROW	15.2
Proposed Golf Course Area	38.1
Proposed Haul Road	0.3
Proposed Water Pipeline/Service Road	1.5
Railway Loop	33.1
Proposed Helipad Access	1.6
Total:	1520.7

LEGEND

- Primary Highway
- Secondary Highway
- Existing Railway
- Existing Access Road
- Existing Powerline
- CHPP Facilities
- Proposed Water Pipeline/Service Road
- Railway Loop
- - - Proposed Helipad Access
- Proposed Mine Permit Boundary
- Ultimate Pit Extent
- Ultimate Rock Disposal Area Extent
- Topsoil Storage
- Construction Camp
- Ponds and Ditches
- Coal Handling Processing Plant and Infrastructure
- Covered Conveyor, Access Road and Powerline ROW
- Proposed Golf Course Area
- Undisturbed Area
- Legacy Mine Disturbance

RIVERSDALE
RESOURCES

**GRASSY MOUNTAIN
COAL PROJECT**

MILLENNIUM
EMS Solutions Ltd.

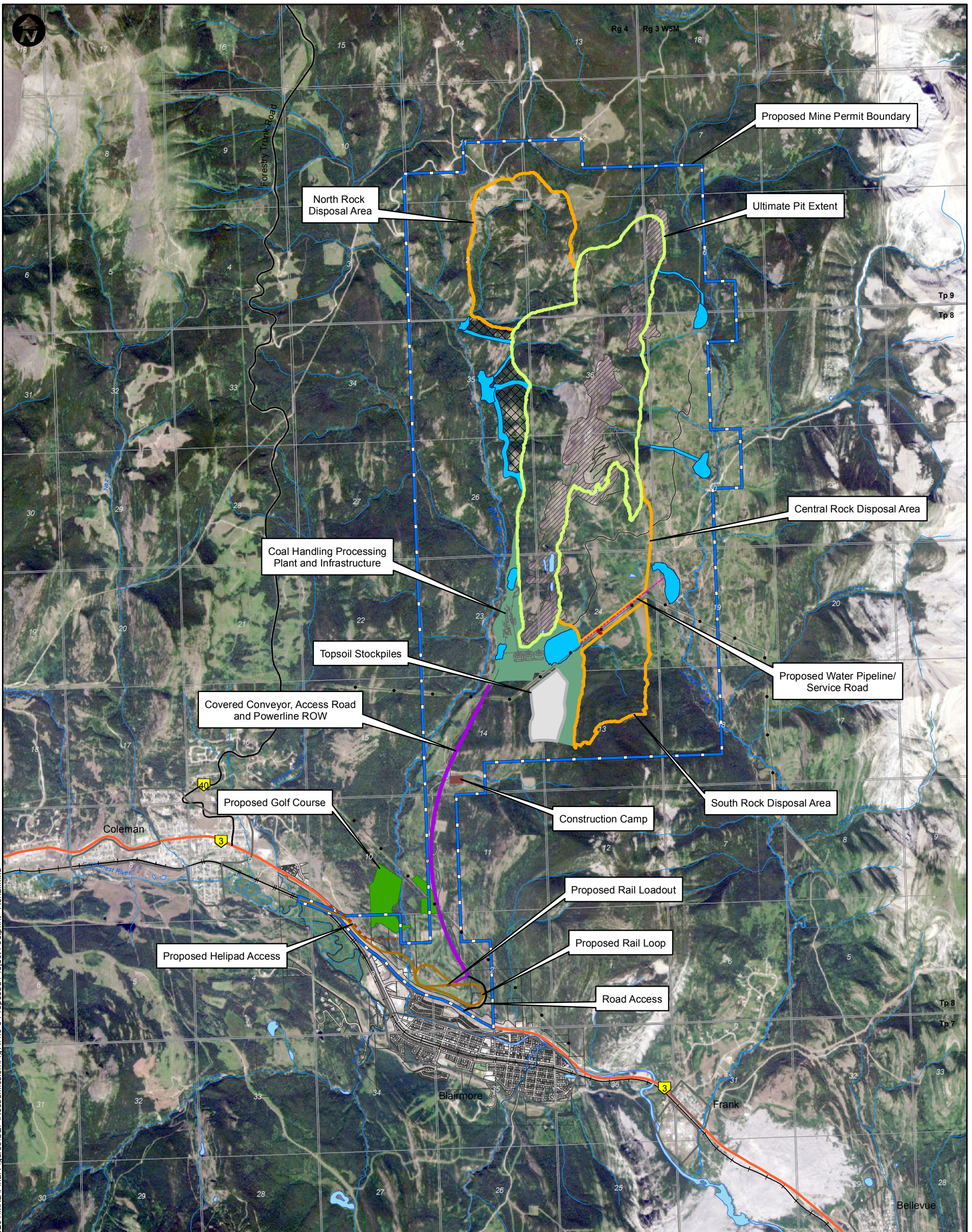
TITLE
**PROPOSED PROJECT FOOTPRINT AND
MINE PERMIT BOUNDARY**

NOTES
AltaLIS, 2016; NRCAN, 2015; Riversdale, 2016
Datum/Projection: UTM NAD 83 Zone 11

0 1 2 4
Kilometres

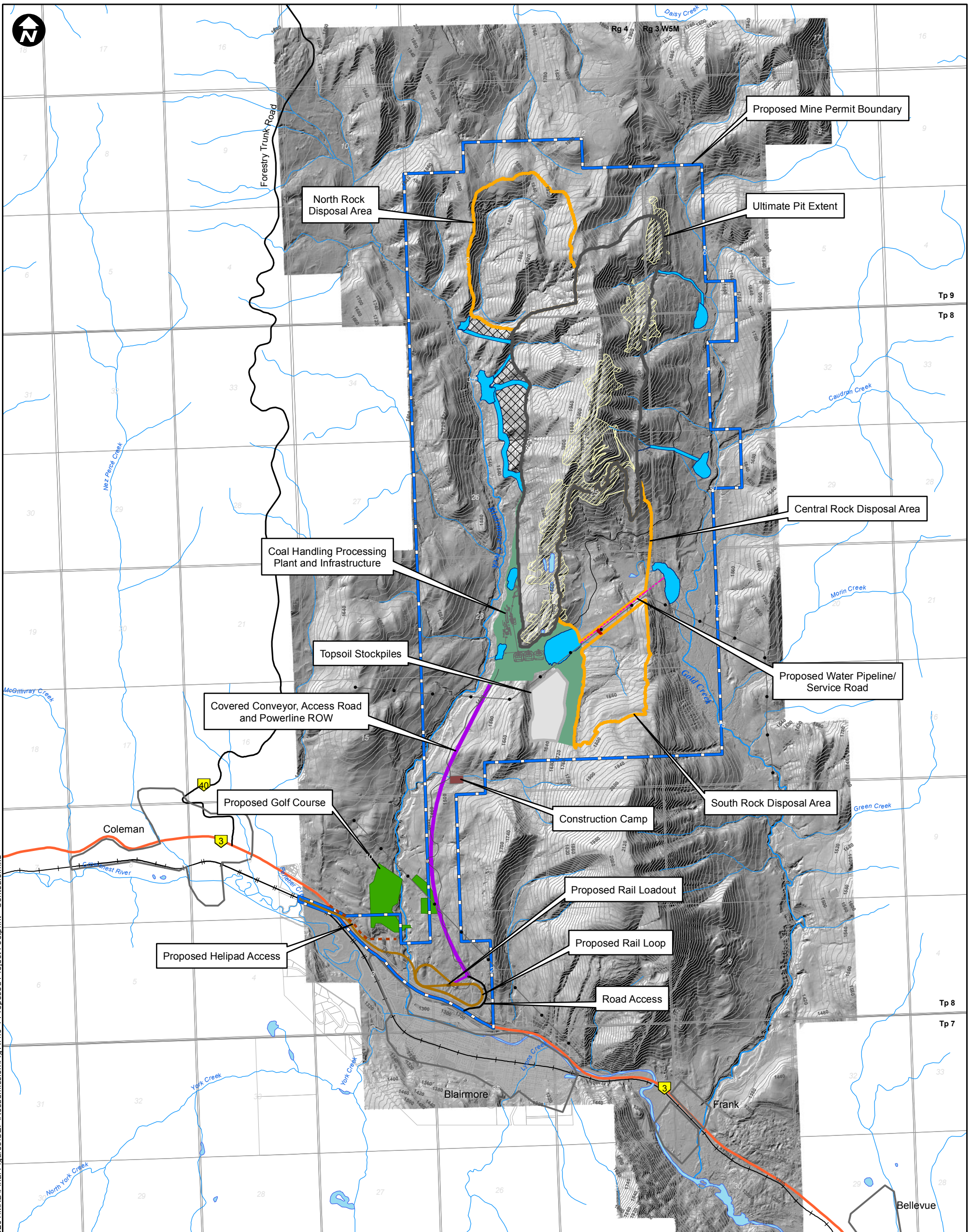
PROJECT: 14-00201-01
DRAWN BY: SL
CHECKED BY: DM
DATE: JULY 25, 2016
FIGURE
A.1.0-2

Document Path: K:\Active Projects\2014\AP_14-00201 to 14-00250\Final Figures\CEP\Resubmission\Fig A.1.0-2 Proposed Project Footprint and Mine Permit Boundary.mxd



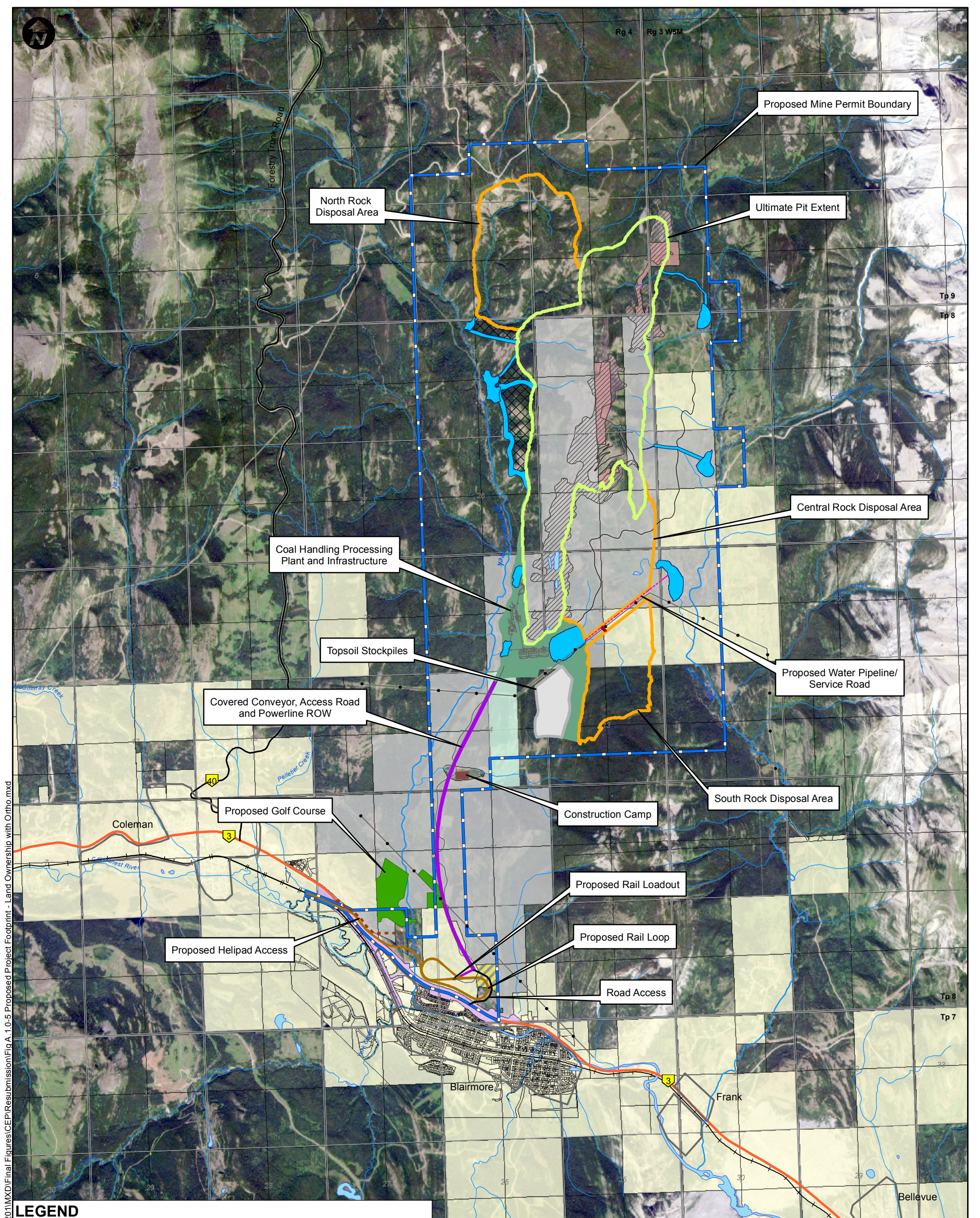
Document Path: K:\Active Projects\2014\AP_14-00201\14-00201\MXD\Final Figures\CEP\Resubmission\Fig A.1.0-3_Proposed Project Footprint - Aerial.mxd

LEGEND		PROJECT	
<ul style="list-style-type: none"> — Primary Highway — Secondary Highway — Existing Railway — Existing Access Road — Existing Powerline — CHPP Facilities — Proposed Water Pipeline/Service Road — Railway Loop - - - Proposed Helipad Access 	<ul style="list-style-type: none"> Proposed Mine Permit Boundary Ultimate Pit Extent Ultimate Rock Disposal Area Extent Topsoil Storage Construction Camp Ponds and Ditches Coal Handling Processing Plant and Infrastructure Covered Conveyor, Access Road and Powerline ROW Proposed Golf Course Area Undisturbed Area Legacy Mine Disturbance 	GRASSY MOUNTAIN COAL PROJECT	
TITLE			
PROPOSED PROJECT FOOTPRINT - AERIAL PHOTOGRAPH			
NOTES		PROJECT: 14-00201-01	
AltaLIS, 2016; NRCAN, 2015; Rapideye 2015 (Image Date: July 26, 2013); Riversdale, 2016 Datum/Projection: UTM NAD 83 Zone 11		DRAWN BY: SL	
		CHECKED BY: DM	
		DATE: JULY 26, 2016	
		FIGURE	
		A.1.0-3	



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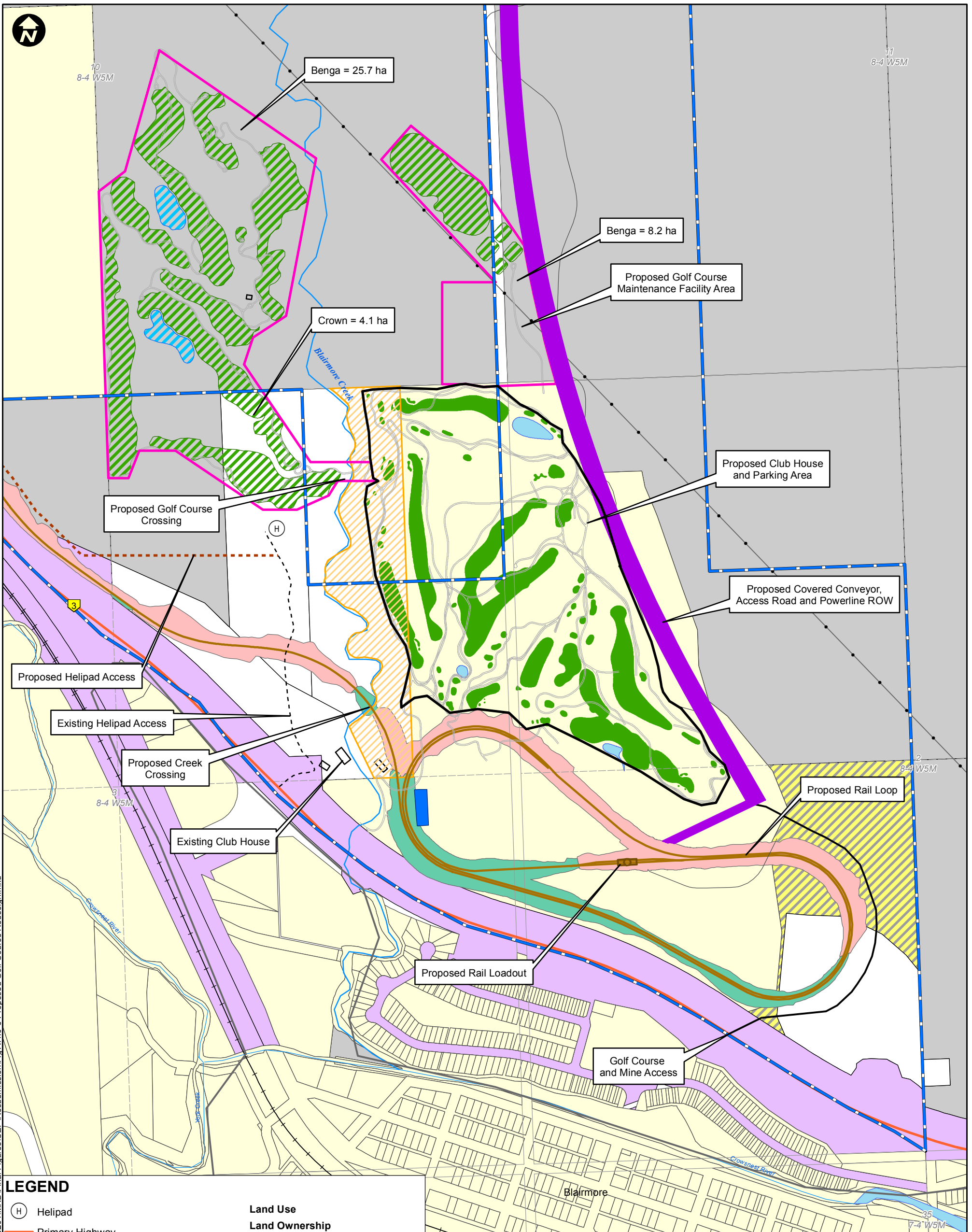
LEGEND		PROJECT	
<ul style="list-style-type: none"> — Primary Highway — Secondary Highway — Existing Railway — Contour (20m Interval) — Existing Access Road — Existing Powerline — CHPP Facilities — Proposed Water Pipeline/Service Road — Railway Loop - - - Proposed Helipad Access 	<ul style="list-style-type: none"> Proposed Mine Permit Boundary Ultimate Pit Extent Ultimate Rock Disposal Area Extent Topsoil Storage Construction Camp Ponds and Ditches Coal Handling Processing Plant and Infrastructure Covered Conveyor, Access Road and Powerline ROW Proposed Golf Course Area Undisturbed Area Legacy Mine Disturbance 	<div style="display: flex; align-items: center;"> <div> <p>RIVERSDALE RESOURCES</p> <p>GRASSY MOUNTAIN COAL PROJECT</p> </div> </div> <div style="text-align: right; margin-top: 10px;"> </div>	
TITLE		NOTES	
PROPOSED PROJECT FOOTPRINT - CONTOURS		AltaLIS, 2016; NRCAN, 2015; Riversdale, 2016 Datum/Projection: UTM NAD 83 Zone 11	
<div style="text-align: center;"> <p>0 1 2 4 Kilometres</p> </div>		PROJECT: 14-00201-01 DRAWN BY: SL CHECKED BY: DM DATE: JULY 14, 2016 FIGURE <h2 style="margin: 0;">A.1.0-4</h2>	



Document Path: K:\Active Projects\2014\AP_14-00201\14-00201\MXD\Final Figures\CEP\Resubmission\Fig A.1.0-5 Proposed Project Footprint - Land Ownership with Ortho.mxd

LEGEND	
	Primary Highway
	Secondary Highway
	Existing Railway
	Existing Access Road
	Existing Powerline
	CHPP Facilities
	Proposed Water Pipeline/Service Road
	Railway Loop
	Proposed Helipad Access
	Proposed Mine Permit Boundary
	Ultimate Pit Extent
	Ultimate Rock Disposal Area Extent
	Topsoil Storage
	Construction Camp
	Ponds and Ditches
	Coal Handling Processing Plant and Infrastructure
	Covered Conveyor, Access Road and Powerline ROW
	Proposed Golf Course Area
	Undisturbed Area
	Legacy Mine Disturbance
Land Ownership	
	Crown
	Crown (ROE Held By Devon)
	Crown (MLL Held By Benga)
	Freehold - Benga
	Freehold - Benga 50%, CNP
	Golf & Country Club 50%
	Freehold - Other
	Registered Roadway

PROJECT RIVERSDALE RESOURCES		GRASSY MOUNTAIN COAL PROJECT		MILLENNIUM EMS Solutions Ltd.	
TITLE PROPOSED PROJECT FOOTPRINT - LAND OWNERSHIP					
NOTES AltaLIS, 2016; NRCAN, 2015; Rapideye 2015 (Image Date: July 26, 2013); Riversdale, 2016 Datum/Projection: UTM NAD 83 Zone 11					
				PROJECT: 14-00201-01 DRAWN BY: SL CHECKED BY: DM DATE: JUNE 13, 2016	
				FIGURE A.1.0-5	



LEGEND

- | | |
|---|---|
| (H) Helipad | Land Use |
| Primary Highway | Land Ownership |
| Existing Railway | White: Crown |
| Existing Access Road | Grey: Freehold - Benga |
| Existing Powerline | Yellow/Green: Freehold - Benga 50%, CNP Golf & Country Club 50% |
| Existing Helipad Access | Yellow: Freehold - Other |
| Proposed Helipad Access | Purple: Registered Roadway |
| Railway Loop | Orange/Yellow: REC910007 - Crowsnest Pass Golf and Country Club |
| Proposed Mine Permit Boundary | Golf Course Features |
| Existing Golf Course Area | Black: Cartpath |
| Proposed Golf Course Area | Green: Existing Fairway |
| Covered Conveyor, Access Road and Powerline ROW | Green/White: Proposed Fairway |
| Stormwater Run-off Pond | Blue: Existing Water |
| Proposed Rail Layout (Proposed Cut Area) | Blue/White: Proposed Water |
| Proposed Rail Layout (Proposed Fill Area) | White: Building |

Note: Accuracy of land ownership is not guaranteed.

PROJECT



GRASSY MOUNTAIN COAL PROJECT



TITLE

PROPOSED GOLF COURSE REDESIGN

NOTES

AltaLIS, 2015; DialecticResearch, 2015; NRCAN, 2015; Riversdale, 2016
Datum/Projection: UTM NAD 83 Zone 11

PROJECT: 14-00201-01

DRAWN BY: SL

CHECKED BY: DM

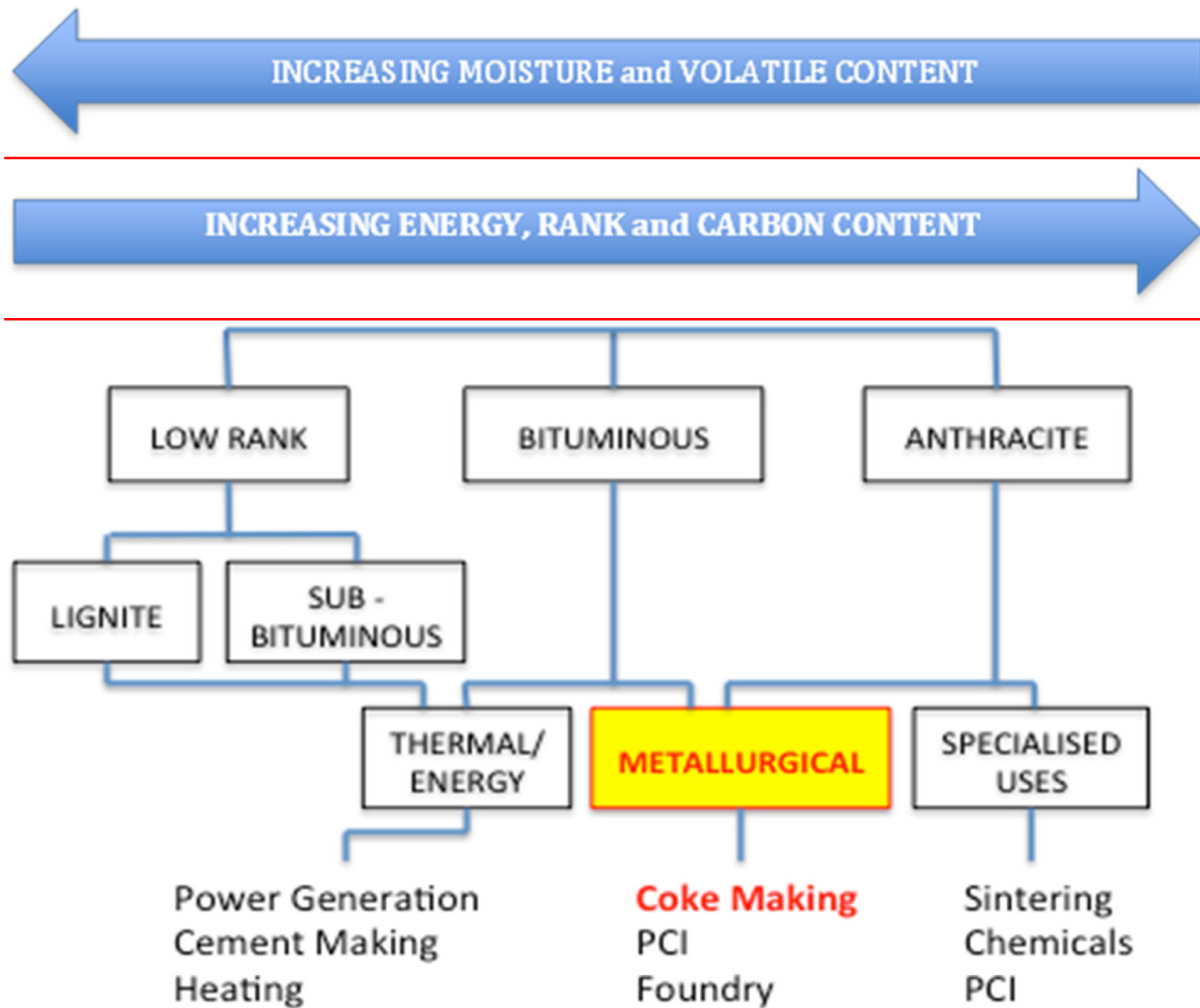
DATE: JULY 14, 2016

FIGURE

A.1.0-6



Document Path: K:\Active Projects\2014\AP_14-00250\14-00201\MXD\Final Figures\CEP\Resubmission\Fig A.1.0-6 Proposed Golf Course Redesign.mxd



LEGEND: N/A

PROJECT



GRASSY MOUNTAIN COAL PROJECT

TITLE

COAL CLASSIFICATION

NOTES

Riversdale, 2016

SCALE: N/A



PROJECT: 14-00201-01

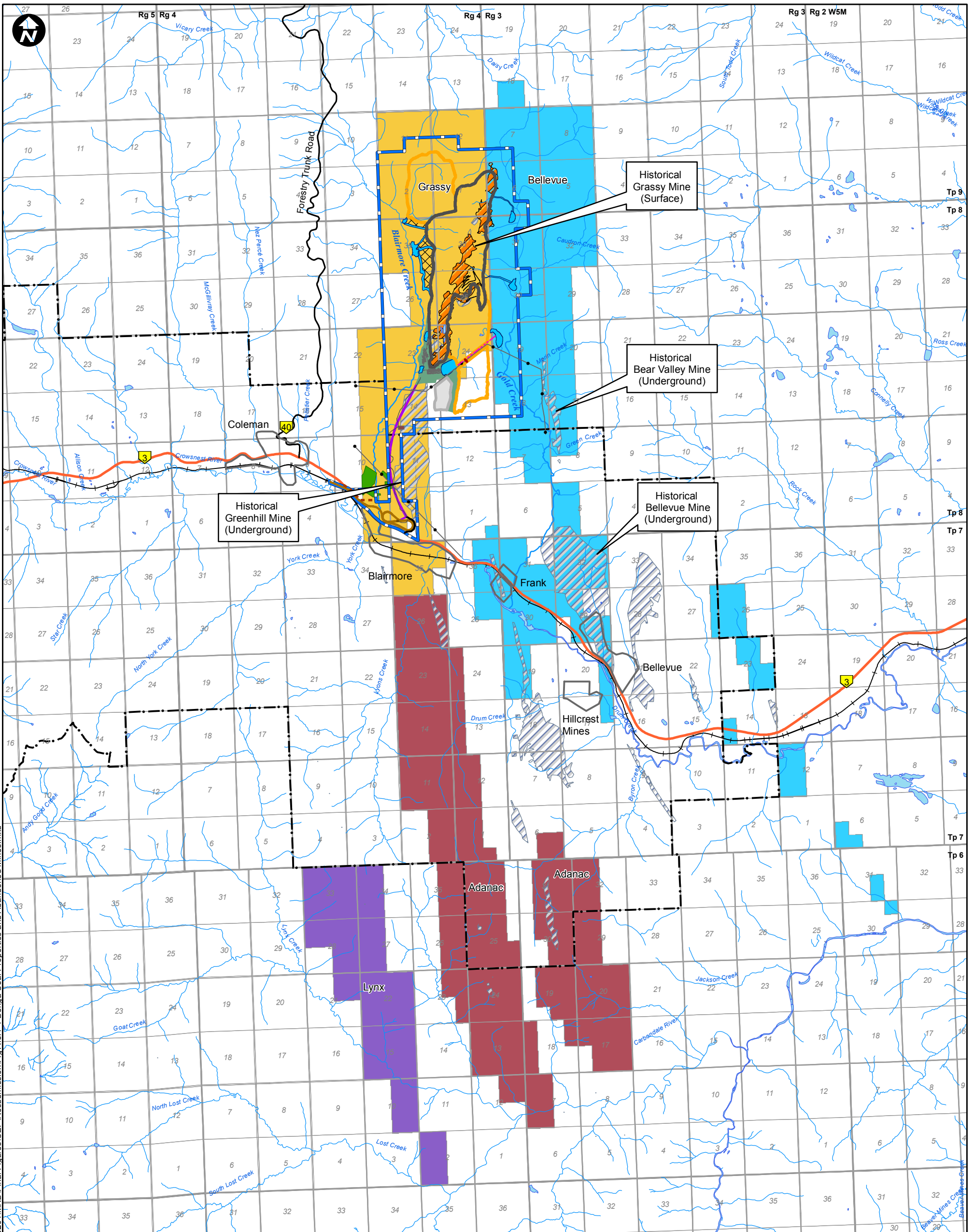
DRAWN BY: SL

CHECKED BY: DM

DATE: JULY 14, 2016

FIGURE

A.2.1-1



Document Path: K:\Active Projects 2014\AP_14-00250\14-00201\MXD\Final Figures\CEP\Resubmission\Fig A.3.1-1 Benga Coal Properties and Abandoned Mines.mxd

LEGEND

- Primary Highway
- Secondary Highway
- Existing Access Road
- Existing Powerline
- CHPP Facilities
- Proposed Water Pipeline/Service Road
- Railway Loop
- - - Proposed Helipad Access
- Municipality of Crowsnest Pass
- Legacy Mine Disturbance
- Underground Mine
- Proposed Mine Permit Boundary
- Ultimate Pit Extent
- Ultimate Rock Disposal Area Extent
- Topsoil Storage
- Construction Camp
- Ponds and Ditches
- Coal Handling Processing Plant and Infrastructure
- Covered Conveyor, Access Road and Powerline ROW
- Proposed Golf Course Area
- Undisturbed Area
- Coal Lease**
- Adanac
- Bellevue
- Grassy
- Lynx

PROJECT

RIVERSDALE RESOURCES **GRASSY MOUNTAIN COAL PROJECT**



TITLE

BENGA COAL PROPERTIES AND ABANDONED MINES

NOTES

AltaLIS, 2016; NRCAN, 2015; Riversdale, 2016
Datum/Projection: UTM NAD 83 Zone 11

PROJECT: 14-00201-01

DRAWN BY: CP/SL

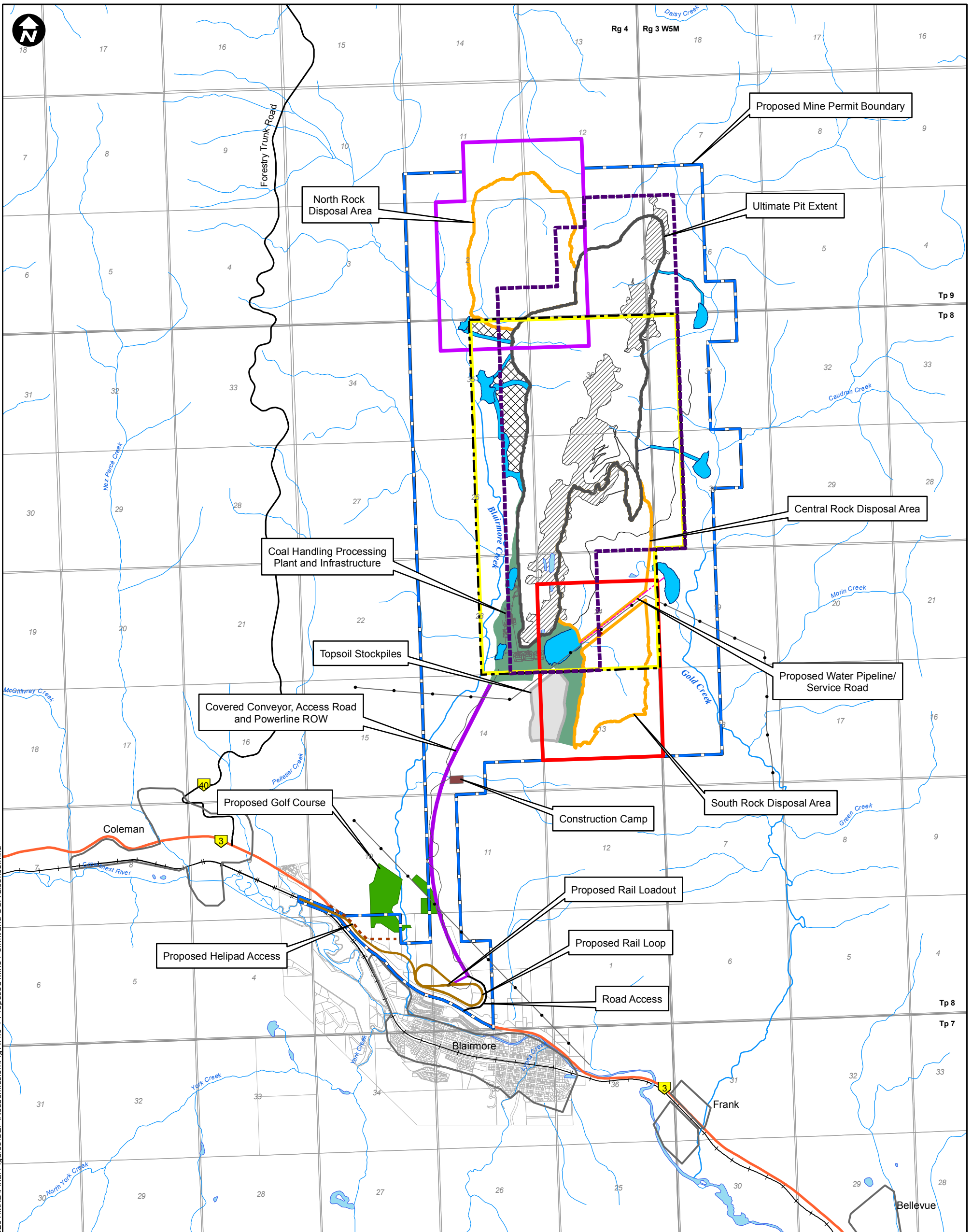
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DATE: JULY 14, 2016

FIGURE

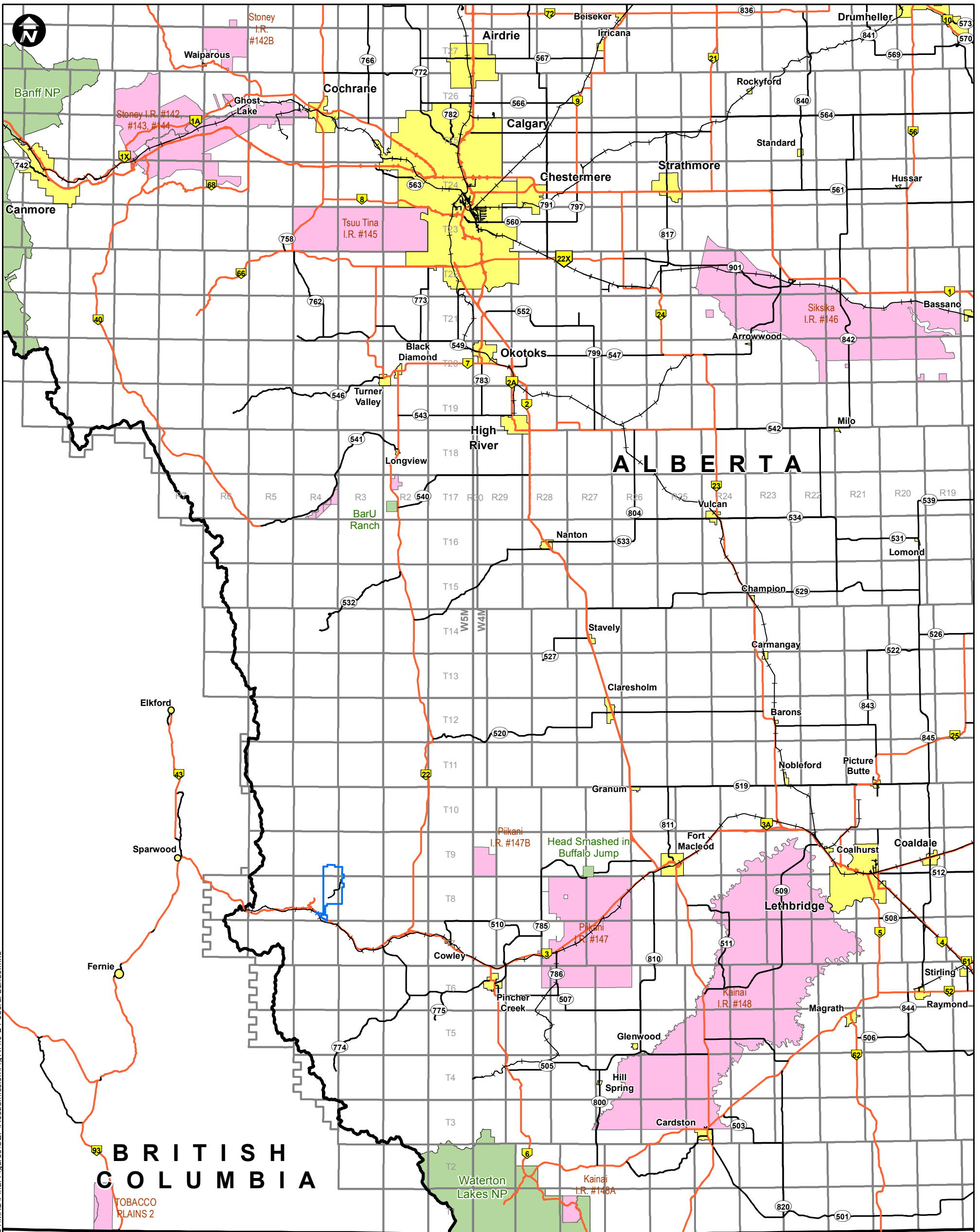
A.3.1-1





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LEGEND <ul style="list-style-type: none"> — Primary Highway — Secondary Highway — Existing Railway — Existing Access Road — Existing Powerline — CHPP Facilities - - - Proposed Water Pipeline/Service Road — Railway Loop - - - Proposed Helipad Access Proposed Mine Permit Boundary Ultimate Pit Extent Ultimate Rock Disposal Area Extent Topsoil Storage Construction Camp Ponds and Ditches Coal Handling Processing Plant and Infrastructure Covered Conveyor, Access Road and Powerline ROW Proposed Golf Course Area Undisturbed Area Legacy Mine Disturbance Pit Licence Central RDA Licence North RDA Licence South RDA Licence 		PROJECT RIVERSDALE RESOURCES		GRASSY MOUNTAIN COAL PROJECT		MILLENNIUM <small>EMS Solutions Ltd.</small>	
TITLE PROPOSED MINE PERMIT BOUNDARY AND CCA LICENCE AREAS							
NOTES AltaLIS, 2016; NRCAN, 2015; Riversdale, 2016 Datum/Projection: UTM NAD 83 Zone 11							
					PROJECT: 14-00201-01 DRAWN BY: SL CHECKED BY: JM DATE: JULY 14, 2016		
FIGURE A.4.0-1							



Document Path: K:\Active Projects 2014\AP_14-00201-14-00201\MXD\Final Figures\CEP\Resubmission\Fig A.4.0-2_Federal Lands.mxd

LEGEND

- Primary Highway
- Secondary Highway
- + Existing Railway
- Proposed Mine Permit Boundary
- National Park/Site
- Indian Reserve/Metis Settlement



PROJECT

RIVERSDALE GRASSY MOUNTAIN
RESOURCES COAL PROJECT

Benga Mining Limited

TITLE

NATIONAL PARKS AND FIRST NATIONS RESERVES

NOTES

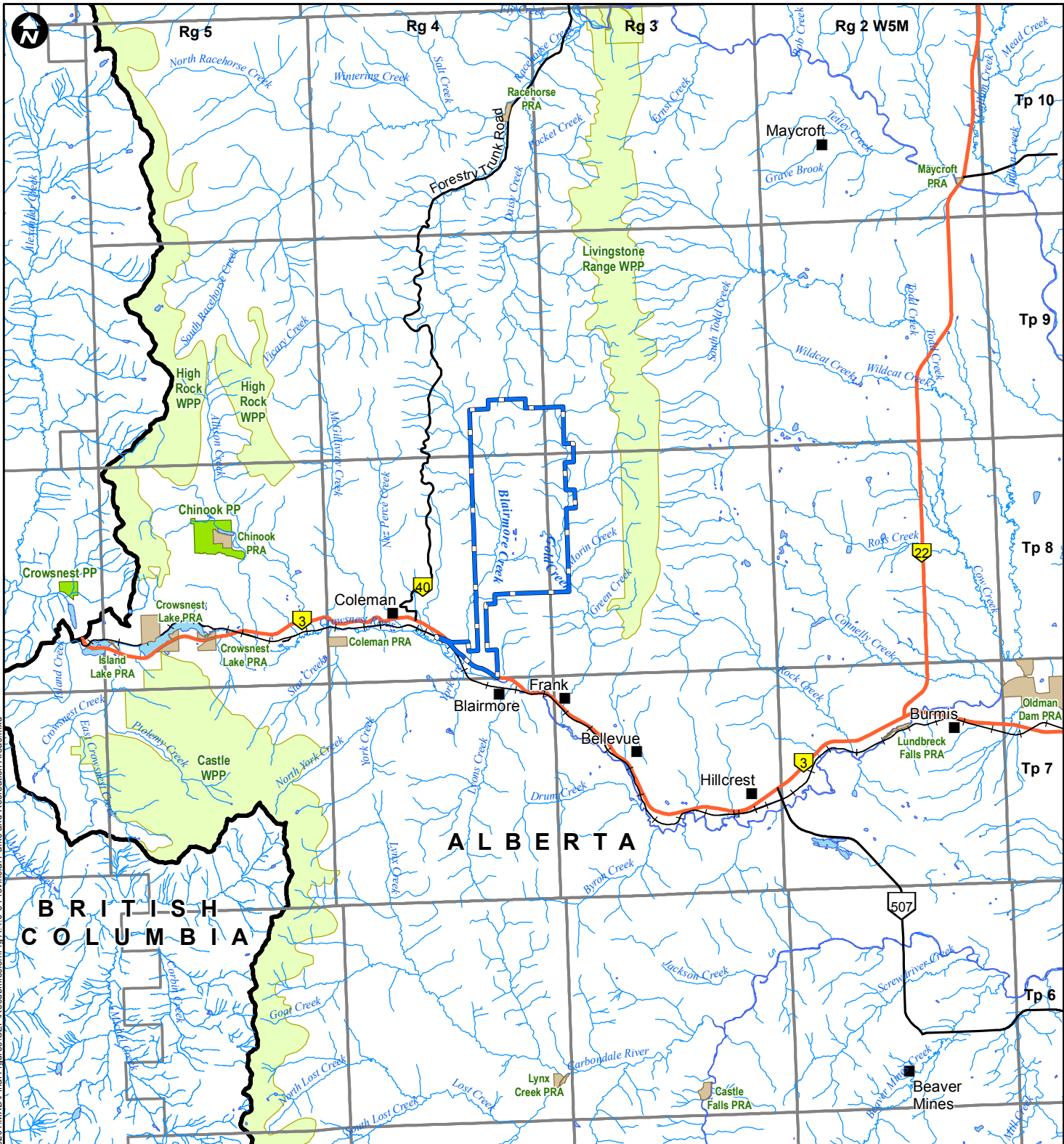
AltaLIS, 2016; NRCAN, 2015; Riversdale, 2016
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PROJECT: 14-00201-01
DRAWN BY: JL/SL
CHECKED BY: MB
DATE: JULY 25, 2016



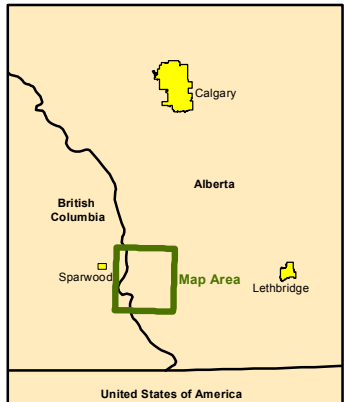
FIGURE

A.4.0-2

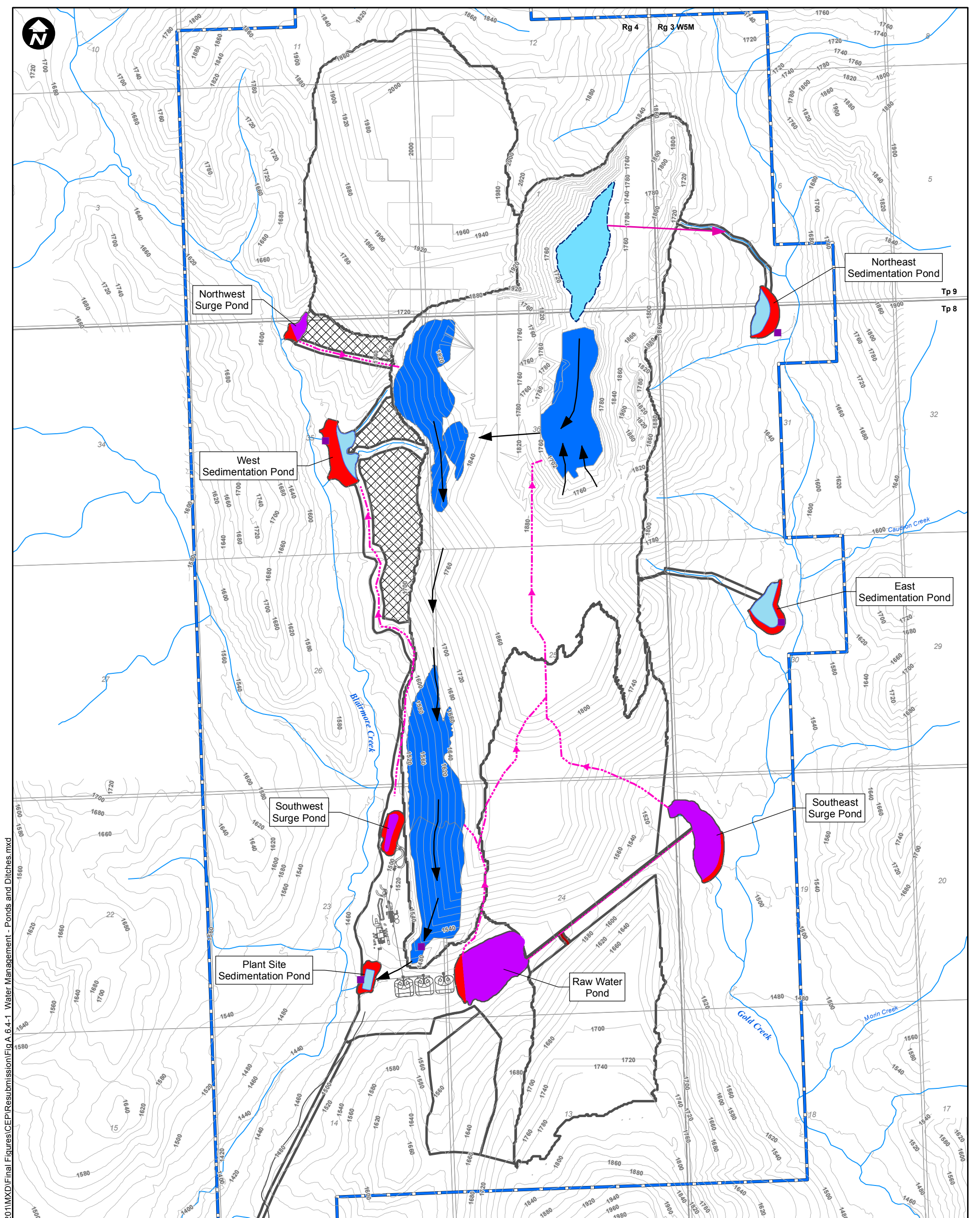


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- LEGEND**
- Primary Highway
 - Secondary Highway
 - Existing Railway
 - Surface Water Drainage
 - Waterbody
 - Proposed Mine Permit Boundary
 - Provincial Park (PP)
 - Provincial Recreation Area (PRA)
 - Wildland Provincial Park (WPP)



<p>PROJECT</p> <p>RIVERSDALE RESOURCES</p>	<p>RIVERSDALE GRASSY MOUNTAIN COAL PROJECT</p>	<p>MILLENNIUM EMS Solutions Ltd.</p>
<p>TITLE</p> <p>PROVINCIAL PARKS AND RECREATION AREAS</p>		
<p>NOTES</p> <p>AB Parks, 2016; AltaLIS, 2016; NRCAN, 2016; Riversdale, 2016 Datum/Projection: UTM NAD 83 Zone 11</p>		
<p>0 3 6 12 Kilometres</p>		<p>PROJECT: 14-00201-01</p> <p>DRAWN BY: SL</p> <p>CHECKED BY: MB</p> <p>DATE: AUGUST 8, 2016</p> <p>FIGURE</p> <p style="font-size: 1.5em;">A.4.0-3</p>



Document Path: K:\Active Projects 2014\AP_14-00201\14-00201\MXD\Final Figures\CEP\Resubmission\Fig A.6.4-1 Water Management - Ponds and Ditches.mxd

LEGEND	
	Release Point
	CHPP Facilities
	Proposed Water Pipeline/ Service Road
	Subsurface Direction of Flow (Selenium Attenuated Water)
	Subsurface Lake Discharge
	Water Transfer Pipeline
	Surface Water Drainage
	Reclaimed Topographic Contour (20m interval)
	Release Pond
	Dam
	Surge Pond (No Release)
	Saturated Fill Zone
	End-Pit Lake
	Proposed Mine Permit Boundary
	Project Footprint
	Undisturbed Area

PROJECT



RIVERSDALE RESOURCES

GRASSY MOUNTAIN COAL PROJECT



MILLENNIUM EMS Solutions Ltd.

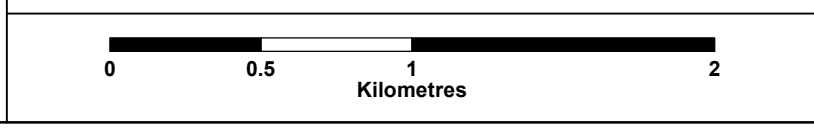
TITLE

WATER MANAGEMENT - PONDS AND DITCHES

NOTES

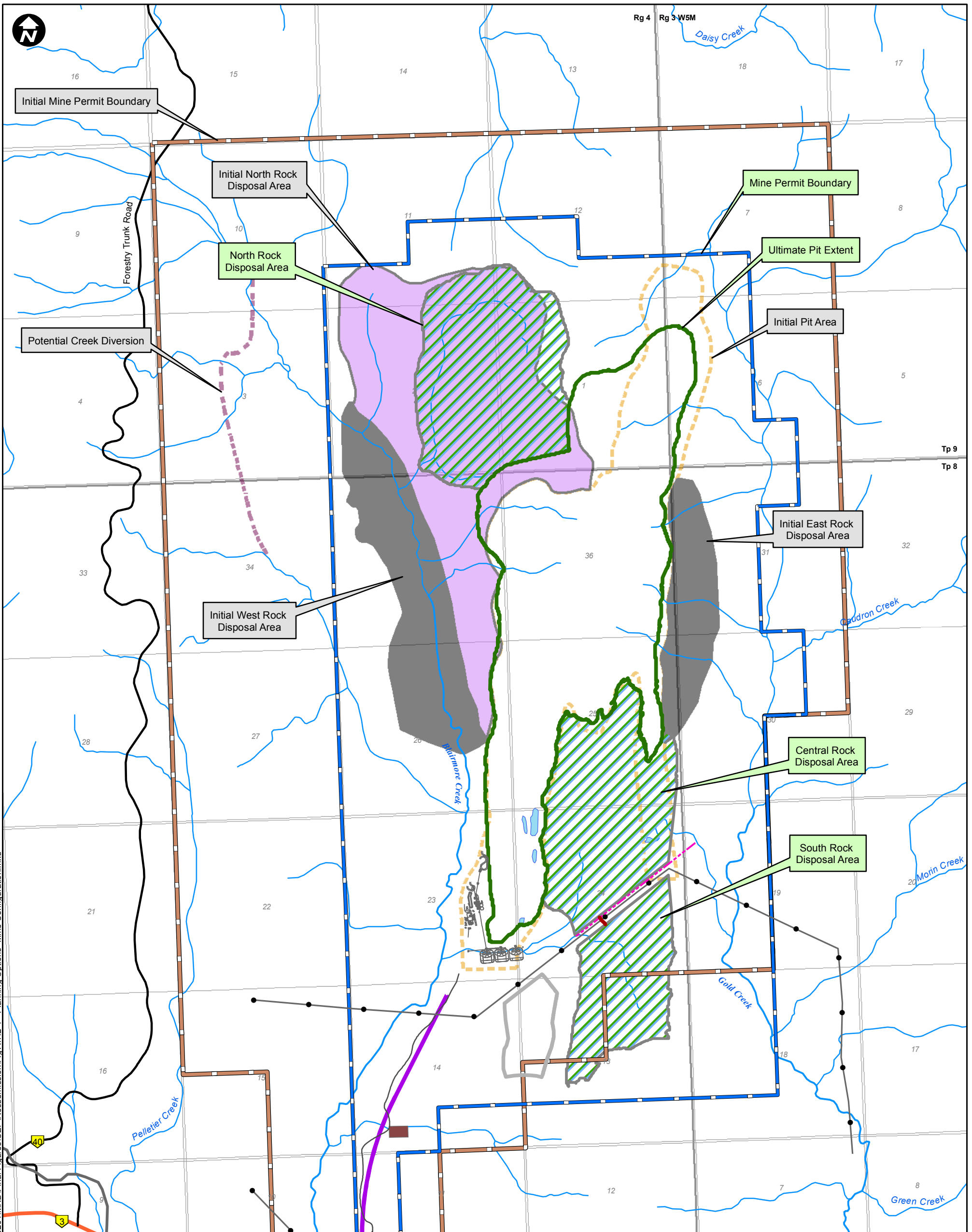
AltaLIS, 2016; Deswik, 2016; Golder 2016; MEMS, 2016; NRCAN, 2015; Riversdale, 2016
 Datum/Projection: UTM NAD 83 Zone 11

PROJECT: 14-00201-01
 DRAWN BY: CP/SL
 CHECKED BY: DM
 DATE: JUNE 15, 2016



FIGURE

A.6.4-1



Document Path: K:\Active Projects 2014\AP_14-00201-14-002501\MXD\Final Figures\CEP\Resubmission\Fig A.7.2-1 - Planning Options - Mine Configuration.mxd

LEGEND

- Primary Highway
- Secondary Highway
- + Existing Railway
- Existing Powerline
- CHPP Facilities
- Proposed Water Pipeline/Service Road
- Proposed Mine Permit Boundary
- Proposed Initial Mine Permit Boundary
- Ultimate Pit Extent
- Initial Pit Area
- External Disposal Area Extent
- Initial North Rock Disposal Area Option
- Initial East & West Rock Disposal Area Option
- Topsoil Storage
- Construction Camp
- Covered Conveyor, Access Road and Powerline ROW
- Potential Creek Diversion

PROJECT

RIVERSDALE RESOURCES **GRASSY MOUNTAIN COAL PROJECT**



TITLE

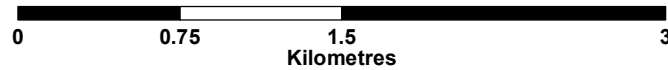
PLANNING OPTIONS - MINE CONFIGURATION

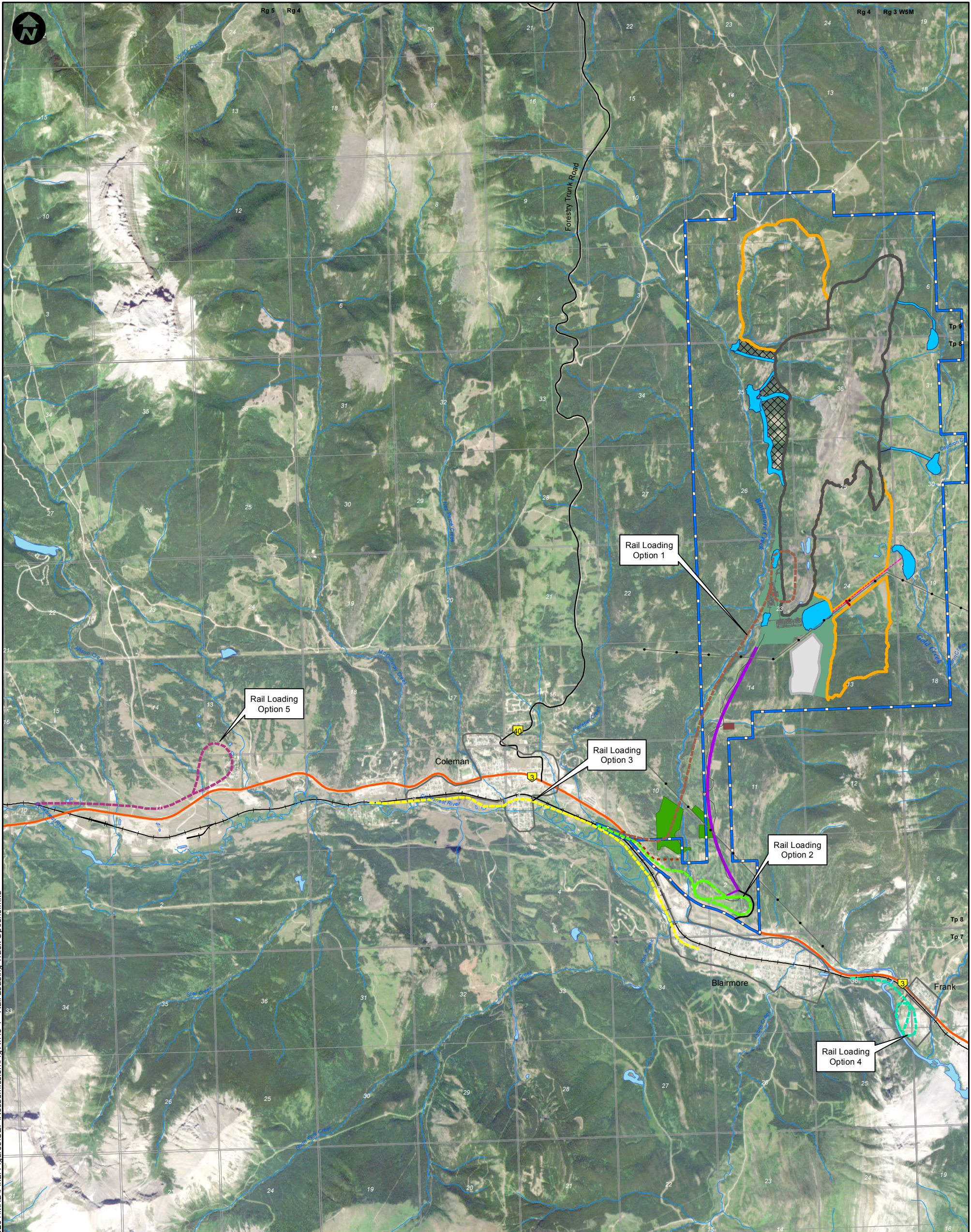
NOTES

AltaLIS, 2016; NRCAN, 2015; Riversdale, 2016
Datum/Projection: UTM NAD 83 Zone 11

PROJECT: 14-00201-01
DRAWN BY: CP/SL
CHECKED BY: JM
DATE: JULY 14, 2016

FIGURE
A.7.2-1





Document Path: K:\Active Projects 2014\AP_14-00201 to 14-00250\14-00201\MXD\Final Figures\CEP\Resubmission\Fig A.7.3-1 - Rail Loading Track Options.mxd

LEGEND

- Rail Loading Options
- Primary Highway
- Secondary Highway
- Existing Railway
- Existing Access Road
- Existing Powerline
- CHPP Facilities
- Proposed Water Pipeline/Service Road
- Proposed Helipad Access
- ▭ Proposed Mine Permit Boundary
- ▭ Ultimate Pit Extent
- ▭ Ultimate Rock Disposal Area Extent
- ▭ Topsoil Storage
- ▭ Construction Camp
- ▭ Ponds and Ditches
- ▭ Coal Handling Processing Plant and Infrastructure
- ▭ Covered Conveyor, Access Road and Powerline ROW
- ▭ Proposed Golf Course Area
- ▭ Undisturbed Area

PROJECT



RIVERSDALE
RESOURCES

**GRASSY MOUNTAIN
COAL PROJECT**



TITLE

RAIL LOADING TRACK OPTIONS

NOTES

AltaLIS, 2016; NRCAN, 2015; Rapideye, 2015
(Image Date July 26, 2013); Riversdale, 2016
Datum/Projection: UTM NAD 83 Zone 11

PROJECT: 14-00201-01
DRAWN BY: CP/JDC
CHECKED BY: JM
DATE: OCTOBER 27, 2015



**FIGURE
A.7.3-1**