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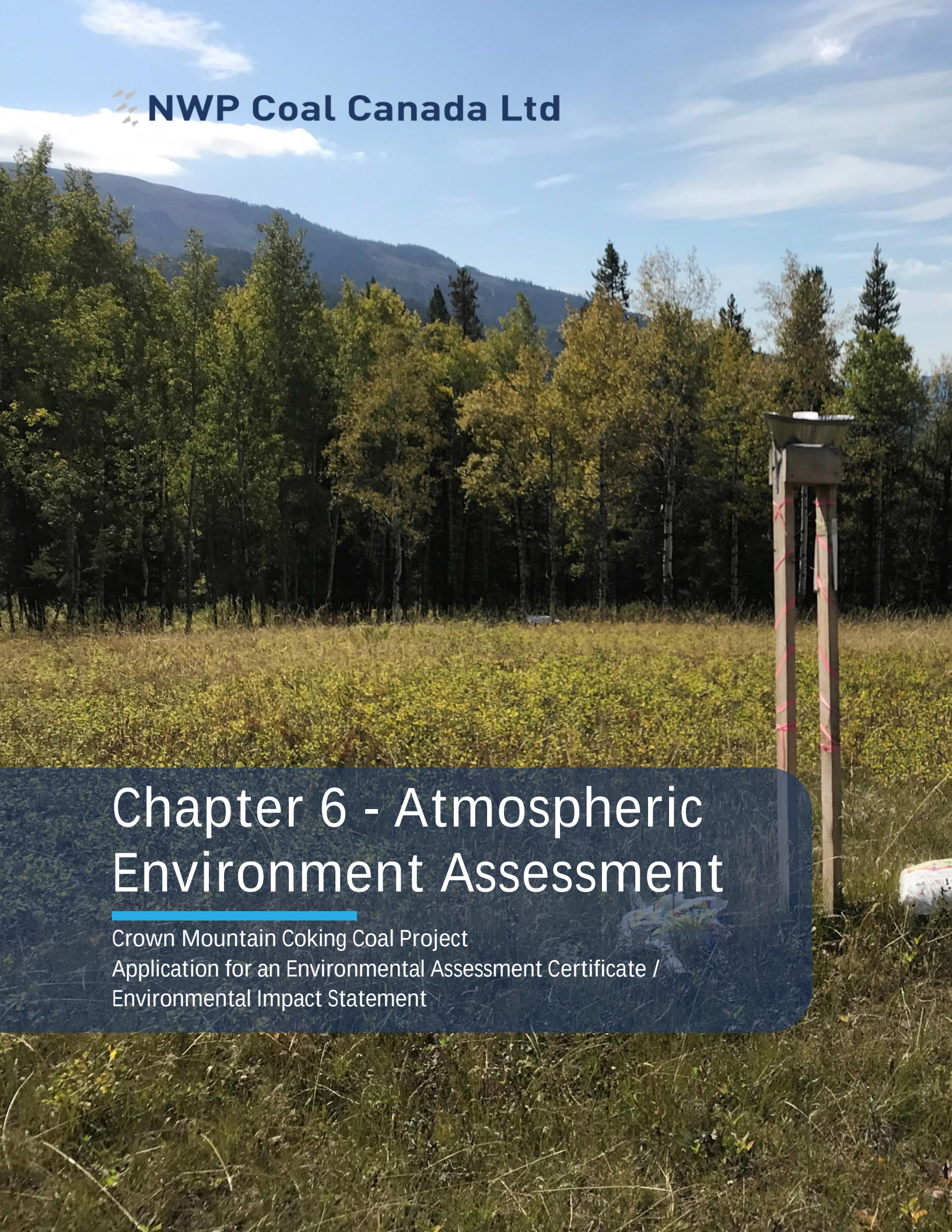

Chapter 6 - Atmospheric Environment Assessment

Crown Mountain Coking Coal Project
Application for an Environmental Assessment Certificate / Environmental Impact Statement

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6. Atmospheric Environment Assessment

6.1 Introduction

The atmospheric environment is defined as the layer of air above the earth's surface to a height of approximately 10 kilometres (km). The atmospheric environment includes climate, air quality, and greenhouse gases (GHGs), which are characterized as follows:

- Climate is characterized by the long-term historical seasonal weather conditions of a region, which can include temperature, humidity, precipitation, sunshine, cloudiness, and winds, among other parameters. Statistical climate data are typically averaged over a period of several decades, and climate "normals" are normally based on historical averages and extremes over a period of 30 years;
- Air quality is characterized by the composition of the ambient air, including the presence and quantity of air contaminants in the atmosphere in comparison to applicable air quality objectives; and
- Project-based releases of GHGs, such as carbon dioxide (CO_2), methane (CH_4), and nitrous oxide (N_2O), are typically used as an indicator of the potential for environmental interactions with climate change. It is understood that GHG releases on a global scale from both natural processes/sources and human activities are increasing global concentrations of GHGs in the atmosphere and they contribute to climate change.

The Crown Mountain Coking Coal Project (the Project) will result in emissions of criteria air contaminants (CACs), dust, and GHGs. CACs are a set of air pollutants that contribute to air pollution problems such as ground level ozone, haze, and acid rain. CACs and dust emissions affect local air quality, which is an important environmental factor for vegetation, wildlife, and human health, and in remaining in compliance with federal and provincial regulations. GHGs are associated with climate change and have specific federal and provincial reporting regulations and reduction targets.

Given the complex relationship between the atmospheric environment and the natural and human environments, air quality as part of the atmospheric environment was identified as an intermediate

valued component (VC) for the Project in the Application Information Requirements (AIR; Environmental Assessment Office [EAO], 2018) and as a component of the physical environment in the Guidelines for the Preparation of an Environmental Impact Statement for the Crown Mountain Coking Coal Project (EIS Guidelines; Canadian Environmental Assessment Agency, 2015), as it constitutes a pathway to receptor VCs such as wildlife, vegetation, and humans. An understanding of air quality within and surrounding the Project area is critical to the Project design, engineering, operations, and assessment and mitigation of potential environmental effects. Potential GHG emissions as part of the atmospheric environment are a receptor VC in the AIR and are assessed as an indicator of potential Project contributions to provincial, national, and global GHG inventories.

Atmospheric environment effects have linkages to several receptor VCs; these effects are primarily assessed in the following chapters:

- Chapter 8: Soil and Terrain Assessment;
- Chapter 11: Surface Water Quality Assessment;
- Chapter 13: Landscapes and Ecosystems Assessment;
- Chapter 14: Vegetation Assessment;
- Chapter 15: Wildlife and Wildlife Habitat Assessment;
- Chapter 18: Socio-Community Assessment;
- Chapter 19: Land Use Assessment;
- Chapter 22: Human and Ecological Health Assessment; and
- Indigenous Communities discussed in Chapters 23 through 31.

6.1.1 Regulatory and Policy Setting

6.1.1.1 Air Quality

Air quality in Canada is managed by federal, provincial, regional, and municipal governments (Table 6.1-1). The Canadian Environmental Protection Act (CEPA, 1999) and related regulations and policy instruments address air quality issues at the national level (including transboundary issues). The federal government has regulations, standards, and guidelines related to air quality for vehicles, engines and fuels, marine vessels, and rail. National Air Quality Objectives (NAAQOs) for various air pollutants were set by the federal government in 1974 and in 2013, the Canadian Council of Ministers of the Environment (CCME) established new Canadian Ambient Air Quality Standards (CAAQS) for fine particulate matter and ozone, followed by sulphur dioxide and nitrogen dioxide in 2020 (Table 6.1-2).

The National Air Quality Management System (AQMS) was established by the CCME in 2012, which is a comprehensive management system being implemented across Canada to protect human health and the environment. In addition to setting the new CAAQS, the system includes the following:

- Implementing air zone management to improve air quality and keep clean areas clean;
- Enhancing coordination where pollution crosses jurisdictional boundaries; and
- Increasing collaboration on actions to reduce transportation emissions (CCME, 2012).

At the provincial level, the British Columbia (B.C.) Environmental Management Act (2003) regulates air contaminant emissions for industrial sources and sets air quality objectives for a number of contaminants that are broadly comparable to the federal objectives. The Province has developed air quality objectives, standards, and guidelines as shown in Table 6.1-1 and Table 6.1-2, including the B.C. Ambient Air Quality

Objectives (B.C. AAQOs) and guidance documents for the siting, monitoring, and modelling of air quality and meteorological data. No air quality bylaws exist for Sparwood, B.C., to which the Project is proximal.

Table 6.1-1: Federal and Provincial Legislation Relevant to Air Quality

Legislation Name	Year	Description
Federal		
Canadian Environmental Protection Act	1999	The Act's goal is to contribute to sustainable development by "preventing pollution and protecting the environment and human health" (CEPA, 1999) by managing toxic substances, other pollution and wastes.
Provincial		
Environmental Management Act	2003	Regulates industrial and municipal waste discharge, pollution, hazardous waste, and contaminated site remediation. Provides the authority for introducing wastes into the environment while protecting public health and the environment (EMA, 2003).

Table 6.1-2: Federal and Provincial Guidelines Relevant to Air Quality

Guideline Name	Year	Description
Federal		
National Ambient Air Quality Objectives (NAAQOs)	1974	Air Quality Objectives were developed under CEPA to provide "a measure of protection to people and the environment from adverse effects due to airborne pollutants" (NAAQOs, 1974)
Canadian Ambient Air Quality Standards (CAAQS)	2020	CAAQS drive air quality management across Canada. CAAQS have been developed for sulphur dioxide, nitrogen dioxide, fine particulate matter, and ozone (CCME, 2020).
Provincial		
British Columbia Ambient Air Quality Objectives (B.C. AAQOs)	2020	Air Quality Objectives are non-statutory limits used to gauge current and historical air quality, guide decisions on environmental assessments and authorizations, guide airshed planning efforts, inform regulatory development, and develop and apply episode management strategies such as air quality advisories (B.C. Ministry of Environment and Climate Change Strategy [ENV], 2020).
Air Monitoring Site Selection and Exposure Criteria	2013	Designed to outline and define the baseline study requirements and information considerations necessary to propose a mineral development project in B.C. (B.C. MOE, 2013).
British Columbia Air Quality Dispersion Modelling Guideline	2015	This guideline helps ensure that "dispersion modelling studies developed for the Ministry are appropriate for the needs of the application, correctly and consistently applied and used to reliably inform air quality management decisions" (B.C. MOE, 2015)
Water and Air Baseline Monitoring Guidance Document for Mine Proponents and Operators	2016	This document provides guidance on the data collection, analysis, interpretation, and submission of requirements for baseline studies associated with mineral development project proposals in B.C. (Carmichael et al., 2016).

Guideline Name	Year	Description
Pollution Control Objectives for the Mining, Smelting, and Related Industries of British Columbia	1979	These criteria, which referred to all discharges to the environment, were rescinded in 2006, but the ambient air quality objectives continue to be used for reference purposes (B.C. MOE, 1979).

6.1.1.2 Greenhouse Gases

Currently there are no specific regulations that limit the release of GHG emissions from a project; however, there are relevant reporting thresholds and carbon reduction legislation set by the federal and provincial governments (Table 6.1-3). At a federal level, Environment and Climate Change Canada (ECCC)'s Greenhouse Gas Reporting Program collects information on GHG emissions from facilities across Canada. It is a mandatory program for facilities that emit 10,000 tonnes or more of GHGs in carbon dioxide equivalent units (CO_2e) per year (ECCC, 2019). At a provincial level, facilities emitting over 10,000 tonnes of CO_2e per year must report to the B.C. Ministry of Environment and Climate Change Strategy (ENV) under the Greenhouse Gas Emission Reporting Regulation.

Table 6.1-3: Federal and Provincial Legislation and Guidelines Relevant to Greenhouse Gases

Legislation/Guideline Name	Year	Description
Federal		
Canadian Environmental Protection Act	1999	Information collected for the federal Greenhouse Gas Reporting Program is legislated under Section 46 of the Canadian Environmental Protection Act (CEPA, 1999).
Incorporating Climate Change Considerations in Environmental Assessment	2003	This document is a result of federal, provincial, and territorial collaboration and provides guidance for incorporating climate change considerations in project Environmental Assessments (Federal-Provincial-Territorial Committee on Climate Change and Environmental Assessment, 2003).
Strategic Assessment of Climate Change (SACC)	2021	The SACC outlines specific requirements for the consideration of climate change in the federal impact assessment process (ECCC, 2021a). The Project is not subject to the SACC since it applies to designated projects under the Impact Assessment Act (2019) and the Project will cease operations prior to 2050; however, certain concepts presented within the SACC may be applicable to the Project.
Provincial		
Environmental Management Act	2003	Regulates industrial and municipal waste discharge, pollution, hazardous waste, and contaminated site remediation. Provides the authority for introducing wastes into the environment while protecting public health and the environment (EMA, 2003).
Greenhouse Gas Industrial Reporting and Control Act	2014	Includes the framework for GHG emission reporting. The Act provides authority for the Greenhouse Gas Emission Reporting Regulation, the Greenhouse Gas Emission Control Regulation, and the Greenhouse Gas Emission Administrative Penalties and Appeals Regulation (Greenhouse Gas Industrial Reporting and Control Act, 2014).

Legislation/Guideline Name	Year	Description
Greenhouse Gas Emission Reporting Regulation	2015	Requires that industrial operations that emit over 10,000 carbon dioxide equivalent tonnes (tCO_2e) per year report their GHG pollution each year (Greenhouse Gas Emission Reporting Regulation, 2015).
Greenhouse Gas Emission Control Regulation	2015	Establishes the infrastructure and requirements for issuing emission offset units and funded units (Greenhouse Gas Emission Control Regulation, 2015).
Greenhouse Gas Emission Administrative Penalties and Appeals Regulation	2015	Establishes when, how much, and under what conditions administrative penalties, including administrative monetary penalties, may be levied for non-compliance (Greenhouse Gas Emission Administrative Penalties and Appeals Regulation, 2015).
Greenhouse Gas Reduction (Emissions Standards) Statutes Amendment Act	2008	Focuses on reducing GHG emissions from certain industrial operations while creating additional opportunities for the bioenergy sector (Greenhouse Gas Reduction (Emissions Standards) Statutes Amendment Act, 2008).
Climate Change Accountability Act	2007	Includes legislated targets for reducing GHGs, a climate change accountability framework, and requirements for the provincial public sector. B.C.'s overall GHG emissions are to be reduced by at least 40% below 2007 levels by 2030, 60% by 2040, and 80% by 2050. GHG emission limits for individual facilities or sectors are not provided, however (Climate Change Accountability Act, 2007).
Carbon Tax Act	2008	Puts a price on GHG emissions to provide an incentive for sustainable choices that produce fewer emissions (Carbon Tax Act, 2008).

6.2 Scope of the Assessment

6.2.1 Valued Components and Measurement Indicators

Project activities during Construction and Pre-Production, Operations, Reclamation and Closure, and Post-Closure may influence affect air quality near the Project footprint, and GHG emissions released during these phases may contribute to global climate change. Changes to the atmospheric environment from mining activities can result in potential effects to receptor VCs, including aquatic health, vegetation, and human and wildlife health. Air quality measured through ground-level concentrations of air contaminants as well as GHG emissions released from the Project were selected as the measurement indicators for effects on the atmospheric environment (Table 6.2-1).

Table 6.2-1: Measurement Indicators and Effects Pathways for the Atmospheric Environment

Valued Component	Measurement Indicator	Effects Pathways
Air Quality	• Criteria air contaminants, including fine particulates (PM_{10} and $PM_{2.5}$), total suspended particulates, sulphur dioxide (SO_2), nitrogen dioxide (NO_2), carbon monoxide (CO), and volatile organic compounds (VOCs);	VCs or VC groups for which air quality is an effects pathway include: • Greenhouse gases; • Soil quality; • Surface water quality; • Fish and fish habitat;

Valued Component	Measurement Indicator	Effects Pathways
	• Metals and polycyclic aromatic hydrocarbons (PAHs in dustfall); and • Meteorology (e.g., wind conditions, barometric pressure, air temperature, relative humidity, precipitation) including climate normals.	• Landscapes and ecosystems; • Vegetation; • Wildlife and wildlife habitat; • Community health and well-being; • Land use; • Human Health; and • Wildlife Health.
Greenhouse Gases	• Greenhouse gas emissions (CO_2, CH_4, and N_2O), reported as CO_2-equivalents	VCs or VC groups identified as effects pathways for greenhouse gases include: • Air quality; • Fish and fish habitat; • Landscapes and ecosystems; • Vegetation; • Wildlife and wildlife habitat; • Community health and well-being; • Land use; • Human Health; and • Wildlife Health.

6.2.2 Indigenous and Stakeholder Consultation

NWP engaged with Indigenous groups (including the Ktunaxa Nation Council [KNC]) and conducted consultation with public stakeholders and regulators. A summary of all consultation activities undertaken to date is presented in Chapter 4. A summary of consultation feedback specific to the atmospheric environment is presented in Table 6.2-2. In addition, in August 2020, the KNC provided the location of sensitive receptors to inform the acoustic, air quality, and human health and ecological risk assessments. Indigenous and stakeholder consultation feedback received was used to inform the baseline dustfall monitoring program, evaluate baseline conditions, and inform the air dispersion modelling.

6.2.3 Assessment Boundaries

6.2.3.1 Spatial Boundaries

Three study areas were considered in the atmospheric environment assessment: the Project footprint, the Atmospheric Local Study Area (LSA), and the Atmospheric Regional Study Area (RSA). As detailed in Chapter 5, Table 5.3-2, the spatial boundaries for the air quality and greenhouse gases VCs have changed from the study areas presented in the AIR. A discussion on the spatial boundaries used in the assessment is provided below.

The Project footprint encompasses the location of temporary and permanent works associated with the Project and covers approximately covering approximately 13 square kilometres (km^2) or 1,283 hectares (ha; Figure 6.2-1). The centre of the Project is positioned approximately 12 km northeast of the District of Sparwood and approximately 5 km west of the provincial boundary between B.C. and Alberta (Figure 6.2-1). The Project footprint is defined as the area of physical disturbance associated with the

Table 6.2-2: Summary of Consultation Feedback on the Atmospheric Environment

Topic	Feedback Received*: IG	G	P/S	O	Consultation Feedback	Feedback Source	Response or Actions Identified
Baseline Air Quality Methodology		✓	X		Dustfall results are poor indicators for effects monitoring because there is no indication of the bioavailability of any metals contained in the samples.	Letter to the British Columbia Environmental Assessment Office (EAO) from ENV dated March 23, 2018 regarding baseline air quality methodology.	Total metals in dustfall were collected in accordance with the AIR (British Columbia Environmental Assessment Office, 2018).
Baseline Air Quality Methodology		✓	X		The proposed approach of using existing data from Teck Coal Limited's regional monitoring stations in the baseline study is reasonable. However, since this data is not currently registered in the B.C. Air Quality (AQ) database, ENV does not endorse its quality, and it is the responsibility of the proponent to assure that the stations adhere to ENV siting criteria and comply with other guidance documents.	Letter to the EAO from ENV dated March 23, 2018 regarding baseline air quality methodology.	Existing data were verified to confirm compliance with siting criteria and other guidance documents.
Dispersion Modelling Plan		✓			ECCC recommends that the results of the air dispersion modelling be presented in the appropriate statistical method for the corresponding B.C. AAQOs and the most stringent current and future CAAQS. This includes CAAQS for SO_2, NO_2 and ozone (O_3) that will come into effect in 2025.	Comments provided by ECCC via email on December 10, 2020.	Air dispersion modelling results were compared to relevant provincial and federal standards, including the 2025 CAAQS for SO_2 and NO_2. Ozone is a secondary pollutant and is not emitted directly. It has thus not been modelled.
Dispersion Modelling Plan		✓			Health Canada suggest that the construction phase of the Project be considered in the quantitative assessment of the worst-case scenario for emission rates, or a rationale provided for its exclusion.	Comments provided by Health Canada via email on December 15, 2020	Construction activities have been assessed, as have emissions for each year of Operations. Emissions are expected to be greatest in the 11th year of mine

Topic	Feedback Received*: IG	G	P/S	O	Consultation Feedback	Feedback Source	Response or Actions Identified
							operation. As such, the dispersion modelling assessment reflects the eleventh year of Operations. Construction impacts are described in the assessment in contrast to maximum emissions.
Dispersion Modelling Plan		✓			Health Canada has determined that diesel exhaust is carcinogenic in humans, which is consistent with the conclusion of the International Agency for Research on Cancer, and that diesel exhaust is associated with significant population health impacts in Canada. Given that heavy equipment will likely be used during the Project, Health Canada suggests the carcinogenic and non-carcinogenic health effects of diesel particulate matter (DPM) be included in the assessment.	Comments provided by Health Canada via email on December 15, 2020	Diesel particulate matter was quantified in the modelling.
Dispersion Modelling Plan		✓			ENV provided comments on the draft dispersion modelling plan prepared by NWP and provided to ENV on November 24, 2020.	Comments provided by ENV via email on December 23, 2020.	NWP reviewed and discussed the comments on the draft dispersion modelling plan with ENV.
Carbon Offsets	✓				Is NWP going to consider purchasing carbon offsets?	Comment received from the Shuswap Indian Band during a Project meeting held on May 25, 2021.	NWP is evaluating a range of options along the entire supply chain and is focusing on emissions reductions rather than offsets; for example, potentially implementing the use of

Topic	Feedback Received*:				Consultation Feedback	Feedback Source	Response or Actions Identified
	IG	G	P/S	O			
							electric haul trucks should the technology become readily available, and working with new manufacturers to evaluate the potential for other options. The assessment is based on traditional equipment, but NWP will implement any further improvements, where possible.

Note:
*IG = Indigenous Group (group specified in column); G = Government (provincial or federal agencies); P/S = Public/Stakeholder (Interest group, local government, tenure and license holders, members of the public); O = Other

Project and consists of the proposed surface extraction areas (three pits - North Pit, East Pit, and South Pit); Mine Rock Storage Facility; mine infrastructure and support facilities, including the plant area (raw coal stockpile area and processing plant); clean coal transportation route; rail loadout facility and rail siding; and ancillary facilities (i.e., water supply, power supply, natural gas supply, water, sewage treatment, fuel storage, and explosives storage).

The Atmospheric LSA (Figure 6.2-1) is thought of as the "zone of influence" of the Project and includes:

- The Project footprint;
- The Western Airshed;
- Nearby unincorporated local communities that may be locally impacted by emissions generated by the Project;
- Towns and other municipalities within approximately 20 km of the centre of the Project including the District of Sparwood, the District of Elkford, the Municipality of Crowsnest Pass (Alberta), and the Municipal District of Ranchland 66 (Alberta);
- Selected receptors identified through consultation and engagement, at which an evaluation of potential changes in air quality was conducted (receptor locations provided in Section 6.5.4 and Section 6.7.2); and
- Operating mines with suitable data near the Project area. After a review of the data's suitability and quality, two stations at Teck Coal Limited (Teck) nearby Elkview Operations were used.

The Atmospheric RSA (Figure 6.2-1) is the area which will be considered for the cumulative effects assessment and includes:

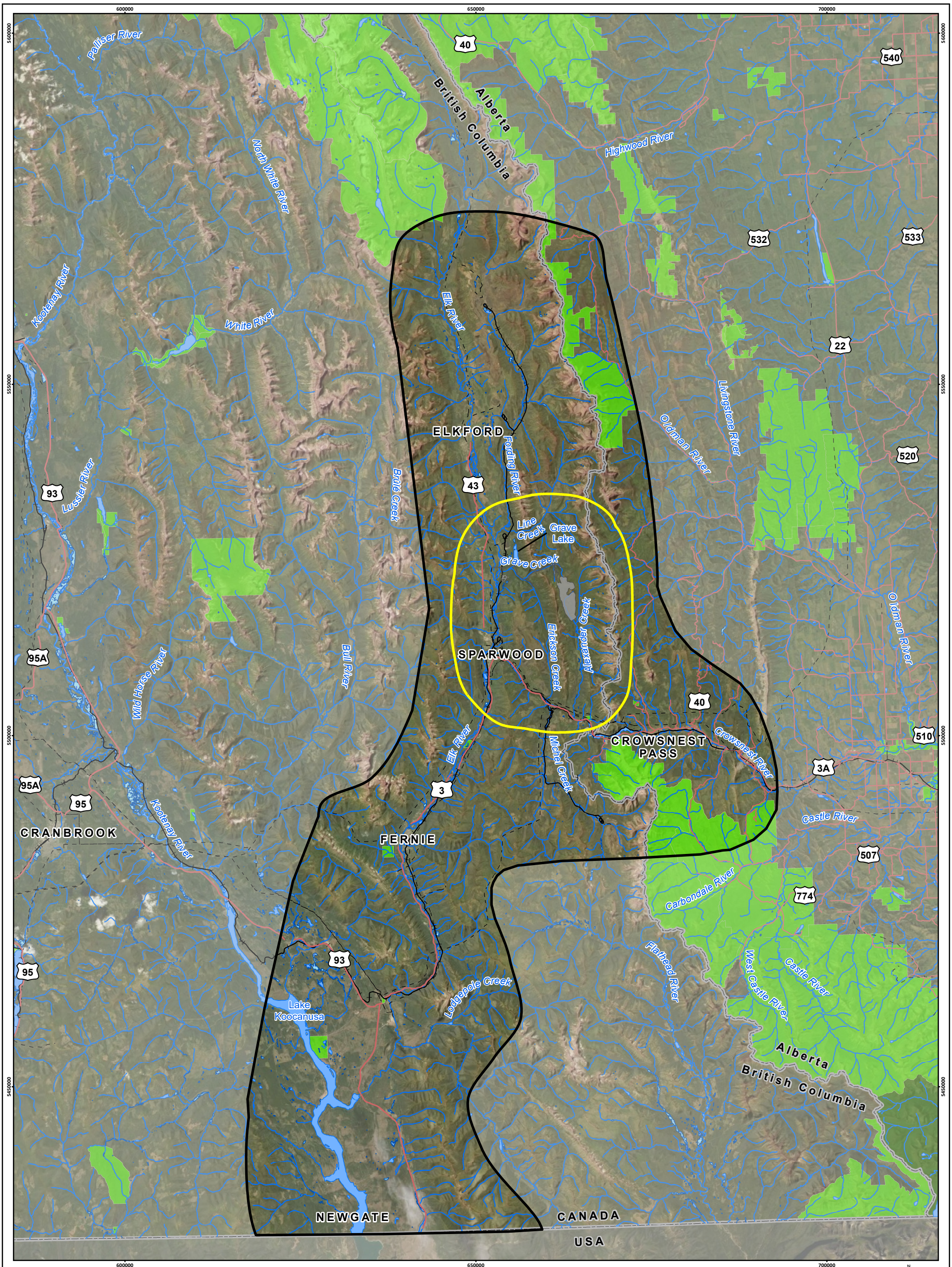
- The Atmospheric LSA;
- The Western Airshed;
- Communities within the Elk Valley that may be regionally affected by changes in air quality as a result of cumulative effects;
- Operating and proposed mines within the Elk Valley and Crowsnest Pass/Oldman Watershed areas that may be considered as part of the cumulative effects assessment; and
- The Elk River Valley to the United States of America (U.S.A.) border.

6.2.3.2 Temporal Boundaries

Temporal boundaries include the time periods during which the Project is anticipated to result in potential effects on VCs (EAO, 2013). The temporal boundaries considered in the assessment include the temporal limits of the Project in terms of its Construction and Pre-Production, Operations, Reclamation and Closure, and Post-Closure phases. The temporal boundaries of the Project used in the effects assessment include the timing of Project phases and activities as outlined in Table 6.2-3. Additional details on the Project phases and activities are provided in Chapter 3.

Table 6.2-3: Temporal Boundaries for the Project Effects Assessment

Phase	Project Year	Length of Phase (Years)
Construction and Pre-Production	1 – 2	2
Operations	3 – 17	15
Reclamation and Closure	18 – 19	2
Post-Closure	20 – 34	15



Crown Mountain Coking Coal Project

Figure 6.2-1
Atmospheric Local and Regional Study Areas

LEGEND

- Atmospheric Regional Study Area
- Atmospheric Local Study Area
- Project Footprint
- Highway
- Railway
- Transmission Line
- Watercourse
- Waterbody
- Wetland
- Provincial Park/Protected Area
- National Park
- British Columbia/Alberta Border

0 10 20
Kilometres

Scale 1:500,000

Map Drawing Information:
Data Provided By NWP Coal Canada Ltd, Dillon Consulting Limited, Province of British Columbia GeoBC Open Data, Government of Alberta Open Data, Natural Resource Canada. Imagery Provided By ESRI.

Map Created By: LMM
Map Checked By: LKD
Map Coordinate System: NAD 1983 UTM Zone 11N

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The temporal boundaries for the atmospheric environment assessment were defined based on the operational mine life of the Project and consideration of the existing and future cumulative effects to which the Project might contribute. Emissions to the atmosphere as a result of the Project were quantified for Construction and Pre-Production, Operations, and Reclamation and Closure. Emissions during Post-Closure will be negligible in comparison to other Project phases and are therefore not considered further in this Application/Environmental Impact Statement (EIS).

The air quality effects from the Construction and Pre-Production and Reclamation and Closure phases are anticipated to be localized, intermittent, limited in duration, and lower in magnitude than those during the Operations phase. Therefore, the greatest effects from these phases of the Project are expected to fall within the bounds of the effects that would occur during the Operations phase (i.e., the emissions from the Construction and Pre-Production and Reclamation and Closure phases are anticipated to have lesser effects than the Operations phase). For this reason, most of the assessment of Project effects and cumulative effects on the atmospheric environment will be focused on the Operations phase, as a conservative approach.

A review of air quality emissions over the entire Project timeframe determined that the eleventh year of mine operation (i.e., Year 13 of the Project) represents the most conservative operating scenario with respect to impacts to air quality from the Project. This operational year represents a worst-case scenario for air quality, with the most air quality related Project activities (e.g., combustion, fugitive road dust generation) and operations in closest proximity to local receptors. A review of GHG emissions over the entire Project timeframe determined that the tenth year of mine operations (i.e., Year 12 of the Project) would capture the most conservative operating scenario with respect to Project GHG impacts. This operational year represents a worst-case scenario for GHG with the most GHG-related Project activities (e.g., combustion equipment). These were the years of the Operations phase that were selected to carry out the effects assessment of the atmospheric environment, and represents a conservative approach to the assessment.

6.2.3.3 Administrative Boundaries

Administrative boundaries represent limitations imposed on the assessment due to political, economic, and social constraints (EAO, 2013).

As discussed in Section 6.1.1, the atmospheric environment assessment considers the B.C. AAQOs and the CAAQS. The most stringent applicable air quality criteria were used in the assessment. Relevant air quality objectives and standards are provided in Table 6.2-4. Both the 2020 and 2025 CAAQS for NO_2 and SO_2 are presented, as suggested by ECCC in Table 6.2-2. The former NAAQOs are also presented for total suspended particulate (TSP), since no other objectives exist for this parameter. Parameters without established guidelines impose a limitation on the assessment due to lack of available policy statements. It is important to note that these air quality objectives do not have any direct legal standing, and, on their own, are not considered to be legal standards.

Table 6.2-4: B.C. Ambient Air Quality Objectives, Pollution Control Objectives, and Canadian Ambient Air Quality Standards

Contaminant	Averaging Period	Air Quality Objective or Standard [µg/m^3]	Reference for Objective or Standard
NO_2	1 h	188	Interim B.C. AAQOs [1]
	1 h	113	2020 CAAQS [2]
	1 h	79	2025 CAAQS [3]
	Annual	60	Interim B.C.AAQOs [1]
	Annual	32	2020 CAAQS [2]
	Annual	23	2025 CAAQS [3]
$PM_{2.5}$	24 h	25	B.C. AAQOs [3]
	24 h	27	2020 CAAQS [2]
	Annual	8	B.C. AAQOs [3]
	Annual	8.8	2020 CAAQS [2]
PM_{10}	24 h	50	B.C. AAQOs [4]
SO_2	1 h	196	Interim B.C. AAQOs [1]
	1 h	183	2020 CAAQS [2]
	1 h	170	2025 CAAQS [3]
	Annual	13	2020 CAAQS [2]
	Annual	10	2025 CAAQS [3]
Total Suspended Particulate (TSP)	24 h	120	NAAQOs [5]
	Annual	60	NAAQOs[5]
CO	1 h	14,300	PCO [6]
	8 h	5,500	PCO [6]

Notes:
Bold - represents most stringent values and those that will be used in assessment
1. Interim B.C. Ambient Air Quality Objectives - NO_2 are currently under review
2. Canadian Council of Ministers of the Environment: 2020 Canadian Ambient Air Quality Standards
3. Canadian Council of Ministers of the Environment: 2025 Canadian Ambient Air Quality Standards
4. B.C. Ambient Air Quality Objectives
5. Canadian Council of Ministers of the Environment: National Ambient Air Quality Objectives
6. Pollution Control Objectives for food-processing, agriculturally orientated, and other misc. industries

6.2.3.4 Technical Boundaries

Technical boundaries represent constraints imposed on the assessment due to limitations in the ability to predict the effects of the Project (EAO, 2013). The development of emissions estimates from the Project relies heavily on empirical correlations developed by various regulatory agencies (e.g., United States Environmental Protection Agency) and estimates of hours of operation and fuel consumption by Project related equipment, which have been developed using a large body of evidence from emission testing campaigns several decades ago, and are generally thought to be very conservative (an over-estimate)

compared to actual emissions from today's modern equipment. Air dispersion modelling is a tool that is used for determining air quality impacts for the Project. The modelling is based on accepted best practices, such as those outlined in the British Columbia Air Quality Dispersion Modelling Guideline (B.C. AQDMG; B.C. MOE, 2015); however, the simplified assumptions made in dispersion models are thought to be an imperfect and simplified representation of what are actually very complex physical phenomena from the fate, transport, and deposition of contaminants in ambient air. Generally, the inherent conservatisms built into the dispersion equations are typically thought to over-represent, rather than under-represent, actual concentrations that might occur in real life.

For the purposes of this assessment, notable levels of conservatism are built into the assessment methodology to minimize the risk of under-prediction, and present a reasonable worst-case scenario. For example, the air quality dispersion modelling was based on Year 13 of the Project, which represents the worst-case year in terms of Project activity, coal extraction, and coal processing over the lifecycle of the Project, and for the purpose of this assessment, those emissions in Year 13 (and the resulting ground-level concentrations of contaminants) are assumed to represent annual emissions and resulting air quality impacts from the Project during its entire life (i.e., from Construction and Pre-Production through to Post-Closure). Emissions during other years of Operations, or during other phases, will be less than during Year 13; this thus represents a conservative approach. Similarly, GHG emissions during Year 12 of Operations represent the year with highest annual GHG emissions, yet these emissions are also assumed to represent annual GHG emissions from the Project during its entire life.

6.3 Regional and Local Overview

The Province of B.C. has been divided into seven air management zones for the AQMS (B.C. MOE, 2014a). Air zones are areas that typically exhibit similar air quality characteristics, issues and trends, and are the basis for monitoring, reporting, and taking action under the AQMS. The Project is located in the Southern Interior Air Zone within the Western Airshed (B.C. MOE, 2014a). The Atmospheric RSA overlaps with a portion of the South Saskatchewan Air Zone along the B.C.-Alberta border.

Within the vicinity of the Project, current land uses include: residential; recreational (e.g., hunting, all-terrain vehicle [ATV] trails, fishing, hiking, etc.); exploration; resource; industrial; rangeland; agriculture, and forestry. Mining in the East Kootenay region has been ongoing for well over a century, with coal being the dominant resource extracted in the area. Additional information on past and present land uses is provide in Chapter 1, Section 1.3.2.

Existing air quality in the Atmospheric LSA and Atmospheric RSA is affected by natural air emissions (e.g., wind-blown dust, forest fires) and anthropogenic air emissions (e.g., existing coal mines, vehicular traffic, construction activities, residential heating, and winter road gritting). Other industrial activities in the Atmospheric RSA that may affect local and regional air quality and GHG emissions include pulp mills, sawmills, and several oil and gas facilities, in addition to prevalent agriculture and forestry practices.

6.4 Existing Conditions

6.4.1 Air Quality

Air emissions resulting from coal mining and processing include fugitive dust, particulate matter, CO, sulphur oxides (SOx), oxides of nitrogen (NOx), VOCs, and GHGs (Province of B.C., 2009; Rout et al., 2014). Emissions of these compounds have the potential to affect human health and aquatic and terrestrial ecosystems. Dustfall is primarily a nuisance issue but may also affect human health, vegetation, water quality, soil quality, and visual aesthetics. GHG emissions as a result of the Project are assessed separately in Section 6.4.2.

The air quality assessment focuses on seven contaminants that are of greatest concern given the nature of the Project, as follows:

- TSP (total suspended particulates < 30 µm [micrometres] in diameter);
- PM_{10} (particulate matter < 10 µm);
- $PM_{2.5}$ (particulate matter < 2.5 µm);
- Nitrogen dioxide (NO_2);
- Sulphur dioxide (SO_2);
- Carbon monoxide (CO); and
- Total dustfall.

The assessment draws upon local and regional publicly-available data and results from detailed dispersion modelling used to predict the potential impact of emissions from the Project. Details on existing and predicted air quality are summarized in this section and further details are provided in Appendices 6-A: Air Quality Baseline Report (Dillon Consulting Limited [Dillon], 2020a) and Appendix 6-B: Meteorology Baseline Report (Dillon, 2020b).

Meteorological conditions must be considered during the assessment of air quality since factors such as temperature, pressure, precipitation, relative humidity, wind speed, and wind direction influence the dispersal of emissions following release (Golder Associates Ltd., 2010; Pearce et al., 2011). Meteorological data are therefore a key input for dispersion modelling, as well as for the assessment of surface water quantity and surface water quality through atmospheric deposition of air contaminants (Chapter 10 and Chapter 11). The meteorological baseline program is summarized in this chapter, and the full baseline report is provided in Appendix 6-B.

Baseline monitoring was carried out for air quality and meteorology in order to define existing environmental conditions. Desktop research was carried out to provide sector, provincial, and federal air quality levels. The objectives of the baseline monitoring programs were to:

- Provide an understanding of existing baseline conditions in the Project study areas;
- Provide a benchmark for evaluating the potential future effects of the Project; and
- Support predictive modelling for the effects analysis.

This section describes the existing conditions in the Atmospheric LSA and Atmospheric RSA in sufficient detail to enable potential effects of the Project on air quality to be identified, understood, and assessed.

6.4.1.1 Existing Regional and Local Information

A review of long-term meteorological data available from ECCC (i.e., climate normals for temperature and precipitation from 1981-2010) was conducted for weather stations in the Crown Mountain regional area to compare with past meteorological averages. However, given that the Crown Mountain climate station was situated at a higher elevation on mountainous terrain, recorded climate data at this station may not be directly comparable to long-term local and regional trends at ECCC weather stations near the Project site and the local and/or regional weather stations. Thus, it is important to consider both proximity and elevation of ECCC climate stations relative to the Crown Mountain station. Existing local and regional meteorological data were compiled from three ECCC climate stations: Sparwood (ID: 1157630), Fernie (ID: 1152850), and Fording River Cominco (ID: 1152899; Figure 6.4-1), supplemented by an on-site climate station (discussed below). The climate stations recorded continuous and seasonal climate data related to temperature, precipitation, and snowpack.

Existing local and regional air quality data were compiled by conducting a desktop assessment of background information in the Atmospheric LSA and RSA. Data sources included:

- Available regional data (e.g., air quality monitoring data provided by ENV);
- Federal databases (e.g., National Pollutant Release Inventory);
- Provincial Southern Interior Air Zone Reports;
- Air emissions from existing operations in the Project study areas (e.g., Teck);
- Alberta Ministry of Environment and Parks' Alberta Air Zone Report (Brown, 2019);
- Other environmental assessments (EAs) undertaken near the Project; and
- Federal databases and mapping sites (e.g., Environment Canada).

6.4.1.1.1 Meteorology

The long-term meteorological data available from ECCC (i.e., climate normals for temperature and precipitation from 1981 to 2010) for the Sparwood (ID: 1157630), Fernie (ID: 1152850), and Fording River Cominco (ID: 1152899) stations are summarized in this section. Historical climate trends for the Sparwood station are included within Appendix 6-A. The Sparwood station was selected as the most representative as it is the closest station to the Project site and is the only station considered which has 30 years of available climate data.

Air temperatures in the Atmospheric RSA are variable and influenced by various factors including elevation, latitude, and local topography. Air temperatures were lowest at Fording River Cominco (1,585 metres above mean sea level [m amsl]) and highest at Fernie (1,001 m amsl), respectively. The Crown Mountain climate station air temperature data is most closely aligned with the corresponding data for Fording River Cominco, which is the station that is nearest in elevation. Mean monthly air temperature ranges at each regional station between 1981 and 2010 included the following:

- At Sparwood, mean monthly air temperatures ranged from -7.3°C in December to 15.8°C in July, with an annual average of 4.4°C;
- At Fernie, mean monthly air temperatures ranged from -6.1°C in December to 16.8°C in July, with an annual average of 5.3°C; and
- At Fording River Cominco, mean monthly air temperatures ranged from -11.3°C in December to 12.6°C in July, with an annual average of 0.9°C.

The mean monthly precipitation data indicate that greater amounts of precipitation occur in the late fall and early winter months (predominantly snowfall) and lower amounts of precipitation in summer and early fall months (predominantly rainfall). There is a notable difference in the amount, type, and distribution of precipitation between the further south and lower elevation Fernie climate station compared to the Sparwood and Fording River Cominco climate stations that are further north and at higher elevations (Table 6.4-1). A comparison of the data indicates that the precipitation conditions at the Crown Mountain climate station correlate more closely with the Sparwood climate station, as expected given that this station is closest in proximity to the Project area.

Table 6.4-1: Regional Study Area Mean Monthly and Annual Precipitation (mm)

Summary Statistic	1981-2010 Climate Normals (mm)								
	SPARWOOD **Station 1157630** (1,138 m amsl)			FERNIE **Station 1152850** (1,001 m amsl)			FORDING RIVER COMINCO **Station 1152899** (1,585 m amsl)		
	Rain	Snow	Total	Rain	Snow	Total	Rain	Snow	Total
Annual Total	411.2	264.0	613.5	902.2	325.0	1,226.9	339.8	277.3	617.1
Monthly Minimum	12.4	0.0	34.9	39.0	0.0	51.9	3.1	0.1	33.9
Monthly Average	34.3	22.0	51.1	75.2	27.1	102.2	28.3	23.1	51.4
Monthly Maximum	67.7	54.2	72.1	123.0	83.5	179.1	82.1	44.7	85.7

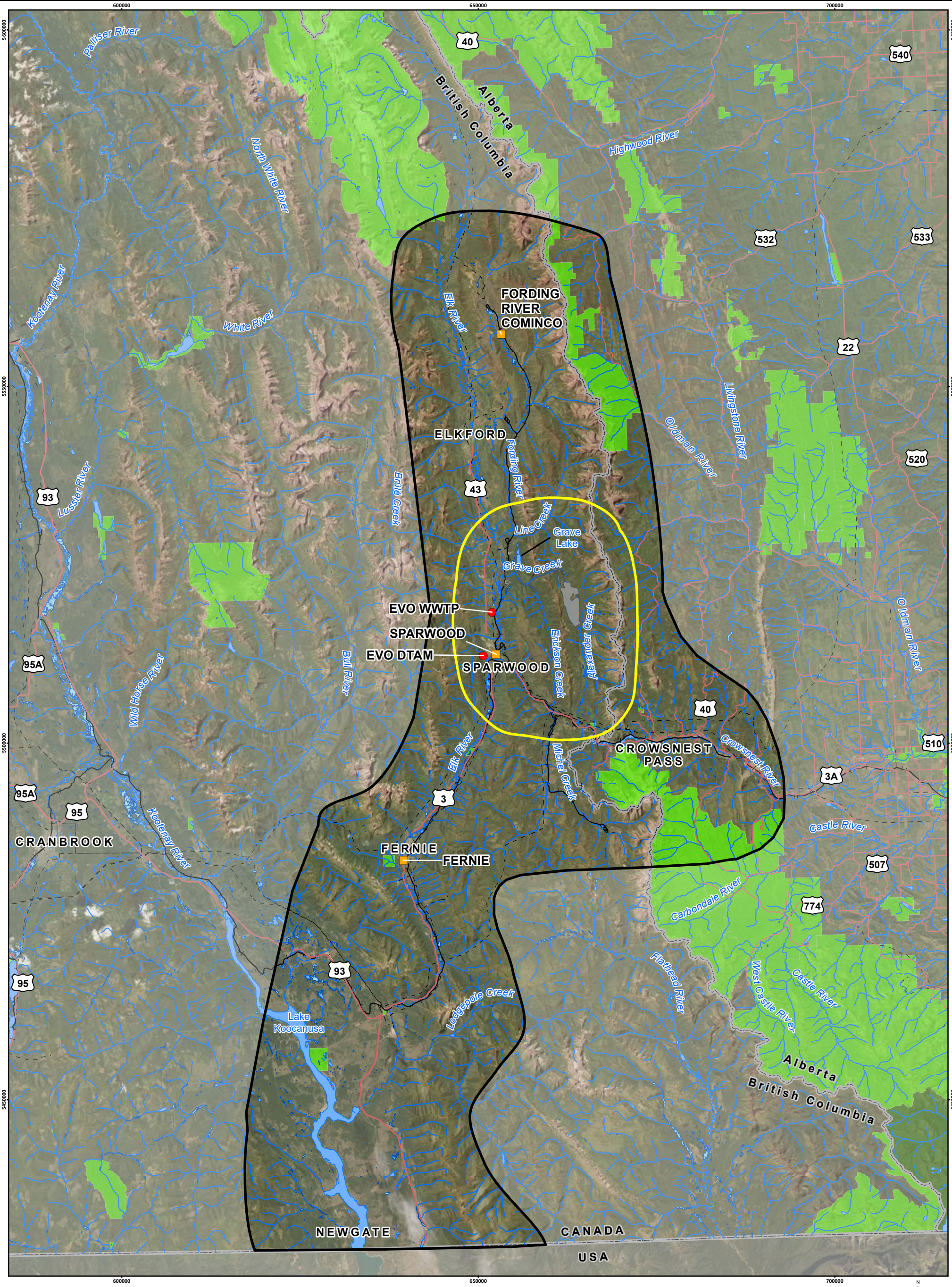
Source: ECCC (2019b)

Mean annual rainfall, snowfall, and total precipitation also appeared to be influenced by elevation and latitude and were the highest at Fernie, the most southerly station at the lowest elevation. Mean annual snowfall and total precipitation were the lowest at Sparwood. Snow depths and snow water equivalents in the Atmospheric RSA are influenced by elevation, with the highest average and maximum values associated with the Morrissey Ridge station (1,860 m amsl) and the lowest values representing the Upper Elk River station (1,340 m amsl).

6.4.1.1.2 Climate Change

An assessment of historical climate trends was carried out for the Columbia River Basin (Preliminary Analysis of Climate Variability and Change in the Canadian Columbia River Basin: Focus on Water Resources [Murdock et al., 2006]). The assessment examined trends over the 90 year period from 1913 to 2002 based on historical data collected at five climate stations. Findings of the assessment include:

- Annual mean temperature rose by 1.4°C, with increases occurring primarily in the winter;
- Annual minimum and maximum temperatures increased by 1.6 and 0.9 °C, respectively;
- Annual precipitation rose by 26%, with annual rainfall increasing by 32% and annual snowfall decreasing by 6%; and
- Snowpack is declining with increasing temperatures, particularly at lower elevations.



Crown Mountain Coking Coal Project

Figure 6.4-1
Regional Climate and Air Quality Monitoring Station Locations

LEGEND

- Climate Station Location
- Air Monitoring Station
- Atmospheric Regional Study Area
- Atmospheric Local Study Area
- Project Footprint
- Highway
- Railway
- Transmission Line
- Watercourse
- Waterbody
- Wetland
- Provincial Park/Protected Area
- National Park
- British Columbia/Alberta Border

0 10 20
Kilometres

Scale 1:500,000

Map Drawing Information:
Data Provided By NWP Coal Canada Ltd, Dillon Consulting Limited, Province of British Columbia GeoBC Open Data, Government of Alberta Open Data, Natural Resource Canada. Imagery Provided By ESRI.

Map Created By: LMM
Map Checked By: LKD
Map Coordinate System: NAD 1983 UTM Zone 11N

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A review of historical data was undertaken for three climate stations in the Atmospheric RSA (i.e., Sparwood, Fernie, and Fording River Cominco) to identify trends in air temperature and precipitation since 1970 at various locations and elevations in the region. The historical data generally indicate that there has been an overall increase in mean annual air temperatures over the assessment period, most notably at lower elevations. An increasing trend for rainfall occurred at the Sparwood and Fernie climate stations, while annual rainfall trended downwards at the Fording River Cominco climate station. Annual snowfall has decreased significantly at the Fernie and Fording River Cominco climate stations and increased at the Sparwood climate station. Overall, the historical climate data demonstrates that air temperatures have increased in the Atmospheric RSA and that there is considerable variability with respect to precipitation conditions.

Future climate projections have been developed for the Columbia River Basin by Pacific Climate Impacts Consortium (PCIC) through detailed modelling using an ensemble of Global Climate Models. The climate projections are for the period of 2041 to 2070, relative to a baseline period of 1971 to 2000. The results of the projections are presented in the Climate Extremes in the Columbia Basin Summary Report (PCIC, 2014) and include the following:

- Annual mean temperature is projected to increase by between 1.8 and 2.7°C, with temperature increases projected for all seasons;
- The frequency of warm days in the summer is projected to increase, while the frequency of cool nights in the winter is projected to decrease;
- The annual total basin-averaged precipitation is projected to increase by between 1 and 9%;
- Most projections show an increase in precipitation in the winter months and decreased precipitation in the summer; and
- Future projections indicate a potential increase in precipitation extremes.

6.4.1.1.3 Air Quality

Regional and Local Environment

Provincial monitoring locations in the Southern Interior Air Zone generally did not exceed the B.C. AAQOs and CAAQS except when influenced by wildfires between 2015 and 2017 (ENV, n.d.). Wildfire smoke is believed to be a factor leading to elevated daily and annual $PM_{2.5}$ concentrations and elevated ozone concentrations. Consequently, the Southern Interior Air Zone was assigned an “orange” management level that focuses on preventing CAAQS exceedances (ENV, n.d.).

A search of the National Pollutant Release Inventory (NPRI; ECCC, 2021b) maps of reporting facilities identified 10 sources within the Atmospheric RSA. The 2019 emissions (the latest year for which data are available) of NO_2, SO_2, CO, TSP, PM_{10}, and $PM_{2.5}$ from each source identified were compiled where applicable to identify existing air emissions from selected sources in the Atmospheric RSA and are presented in Table 6.4-2. The highest emissions for all criteria air contaminants were reported by Teck Fording River Operations.

Table 6.4-2: 2019 National Pollutant Release Inventory Emissions Sources in the Atmospheric RSA (tonnes per year)

Company Name	Facility Name	Sector	Location	Annual Emissions (tonnes/year)					
				NO_2	SO_2	CO	TSP	PM_{10}	$PM_{2.5}$
Teck Coal Limited	Fording River Operations	Mining and Quarrying	Elkford	421	46	1,584	42,752	19,393	1,876
Teck Coal Limited	Greenhills Operations	Mining and Quarrying	Elkford	260	-	652	20,007	7,624	927
Teck Coal Limited	Coal Mountain Operations	Mining and Quarrying	Sparwood	-	-	-	5,889	2,834	411
Teck Coal Limited	Elkview Operations	Mining and Quarrying	Sparwood	290	32	1,073	22,793	9,614	1,215
Teck Coal Limited	Line Creek Operations	Mining and Quarrying	Sparwood	152	-	653	23,323	9,722	1,124
Foothills Pipe Lines Ltd.	Crowsnest	Oil and Gas Pipelines and Storage	Crowsnest	164	-	31	-	0.69	0.69
Foothills Pipe Lines Ltd.	Elko	Oil and Gas Pipelines and Storage	Elko	279	-	70	-	0.51	0.51
Canadian Forest Products Ltd.	Elko Sawmill	Wood Products	Elko	43	-	76	60	21	7.3
Canadian Forest Products Ltd.	Polar Division	Wood Products	Elko	46	-	76	81	50	28
Stella-Jones Inc.	Selkirk Forest Products - Galloway	Wood Products	Galloway	-	-	-	20	5.3	0.54

RWDI Consulting Engineers and Scientists (RWDI) conducted baseline studies in 2015 in the vicinity of Teck's Elkview Operations located approximately 8 km southwest of the proposed Project (RWDI, 2015). Air quality data were collected at nine stations within and surrounding Elkview from January to December 2014 (RWDI, 2015). Air quality results were as follows:

- Dustfall measurements ranged from <0.27 to 2.5 milligrams per square decimetre per day (mg/dm^2/day) and generally met the provincial residential dustfall PCO of 1.7 mg/dm^2/day;
- Daily average $PM_{2.5}$ measurements at all stations exceeded the daily B.C. AAQOs (25 micrograms per cubic metre [µg/m^3]) but annual averages met the B.C. AAQOs of 8 µg/m^3 at all stations;
- Daily average PM_{10} measurements at 6 out of 8 stations exceeded the daily B.C. AAQOs (50 µg/m^3);
- Daily average TSP measurements at 3 of 5 stations exceeded the daily B.C. AAQOs (120 µg/m^3) at three stations, but annual TSP averages met the B.C. AAQOs of 60 µg/m^3 at all stations; and
- Continuous measurements of CO, NO_2 and SO_2 were collected at one station in Sparwood and met the B.C. AAQOs for all parameters for the applicable 1-hour, 8-hour, and daily objectives.

Transboundary Environment

The Project overlaps with a portion of the South Saskatchewan Air Zone along the B.C.-Alberta border. From 2015 to 2017, $PM_{2.5}$ in the South Saskatchewan Air Zone achieved acceptable levels as per the CAAQS, with the exception of exceedances resulting from wildlife smoke contributions (Brown, 2019). The South Saskatchewan Air Zone was assigned a 'yellow" management level for $PM_{2.5}$ that focuses on preventing air quality deterioration (Brown, 2019).

Benga Mining Limited's proposed Grassy Mountain Coal Project is located 7 km north of Blairmore, Alberta and within the Atmospheric RSA. Dustfall measurements collected from May to June of 2016 at the Devon Coleman station closest to the B.C.-Alberta border ranged from 3 to 113 mg/dm^2/30 days during that project's air quality baseline program (Millennium EMS Solutions Ltd., 2016). Three measurements exceeded the residential Alberta Ambient Air Quality Guidelines (AAAQG) of 53 mg/dm^2/30 days, but not the industrial AAAQG of 158 mg/dm^2/30 days. Thirty-day averages for SO_2 and NO_2 were also collected in the same time period; thirty-day SO_2 averages were 0.29 µg/m^3 or less, and thirty-day NO_2 averages ranged from 0.41 to 0.62 µg/m^3.

6.4.1.2 Baseline Programs

6.4.1.2.1 Methods

Meteorology

The meteorological conditions in the Project footprint and Atmospheric LSA were determined by collecting data at the Project-specific Crown Mountain meteorological station located within the coal license area at an elevation of 1,920 m amsl in the headwaters of the Alexander/West Alexander watershed (Figure 6.4-1). This location was selected based on accessibility, suitability for installation and monitoring of meteorological parameters that are representative of local conditions at the Project site, and based on the guidance provided in the Air Monitoring Site Selection and Exposure Criteria (B.C. MOE, 2013). The collection of meteorological data followed guidance set out in the Water and Air Baseline Monitoring Guidance Document for Mine Proponents and Operators (Carmichael et al., 2016) and Meteorological Data and Sensing Requirements (B.C. MOE, 2011).

The Crown Mountain meteorological station (Photo 6.4-1 and Photo 6.4-2) was installed on November 28, 2013 and was first operational on November 29, 2013. The meteorological station was comprised of a standard 10 m Golden Nugget tower equipped with a solar regulator with panel and battery and instrumentation designed to measure the following meteorological parameters:

- Atmospheric temperature;
- Barometric pressure;
- Relative humidity;
- Solar radiation;
- Wind speed;
- Wind direction; and
- Precipitation rate and accumulation.

Photo 6.4-1: Crown Mountain Meteorological Station Installation (November 29, 2013)

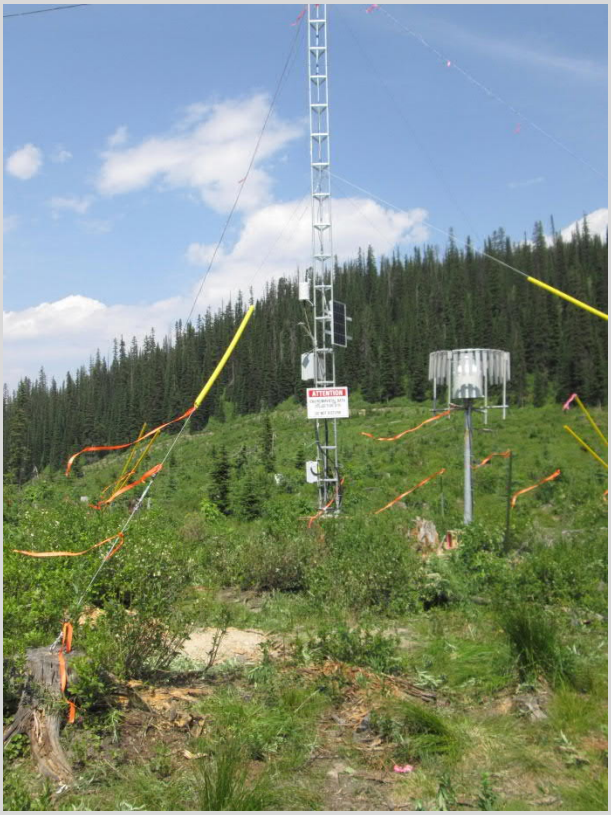


Photo 6.4-2: Crown Mountain Meteorological Station during Maintenance Trip (July 18, 2014)

The meteorological station included a satellite telemetry system (Iridium Satellite Telemetry provided by Data Garrison Satellite Weather Station Portal), which allowed for remote acquisition of data. Measurements for the above-listed parameters were logged at 15 minute intervals, 24 hours a day. Meteorological data were uploaded via satellite connection at a 6 hour interval to a Data Garrison secure web-based portal maintained by Upward Innovations Inc.

Quality Assurance/Quality Control (QA/QC) activities were completed during the meteorology baseline data program, including routine inspection of the meteorological station to confirm that the instrumentation was functioning properly; that station calibration and maintenance undertaken in accordance with the manufacturer's specifications for all components of the meteorological station; and to enable the review and filtering of data of anomalous readings. The baseline analysis of meteorological data focused on data collected between January 1, 2014 and May 13, 2016 based on the results of the QA/QC activities. Further details on the meteorology baseline program are available in Appendix 6-B.

Air Quality

Local ambient air quality monitoring data for CACs, collected from January 2014 to December 2016 at eight pre-existing stations operated by Teck, were obtained from ENV. Based on contaminant data availability, data quality, geographic location, and local influence of station results (i.e., influence from current mining operations), two stations were selected for the baseline analysis: the EVO Downtown

Sparwood Centennial Square (EVO DTAM), and the Whispering Winds Trailer Park (WWTP; Figure 6.4-1). Available data from EVO DTAM included PM_{10}, $PM_{2.5}$, NO_2, CO, and SO_2. Available data from WWTP included PM_{10} and $PM_{2.5}$. It is noted that, for the purpose of the assessment of Project effects, the data from these two regional ambient air quality monitoring stations are assumed to represent the baseline ambient air quality conditions in the entire Atmospheric LSA and Atmospheric RSA, even though they are more generally intended to represent localized air quality rather than regional influences. This is a conservative approach.

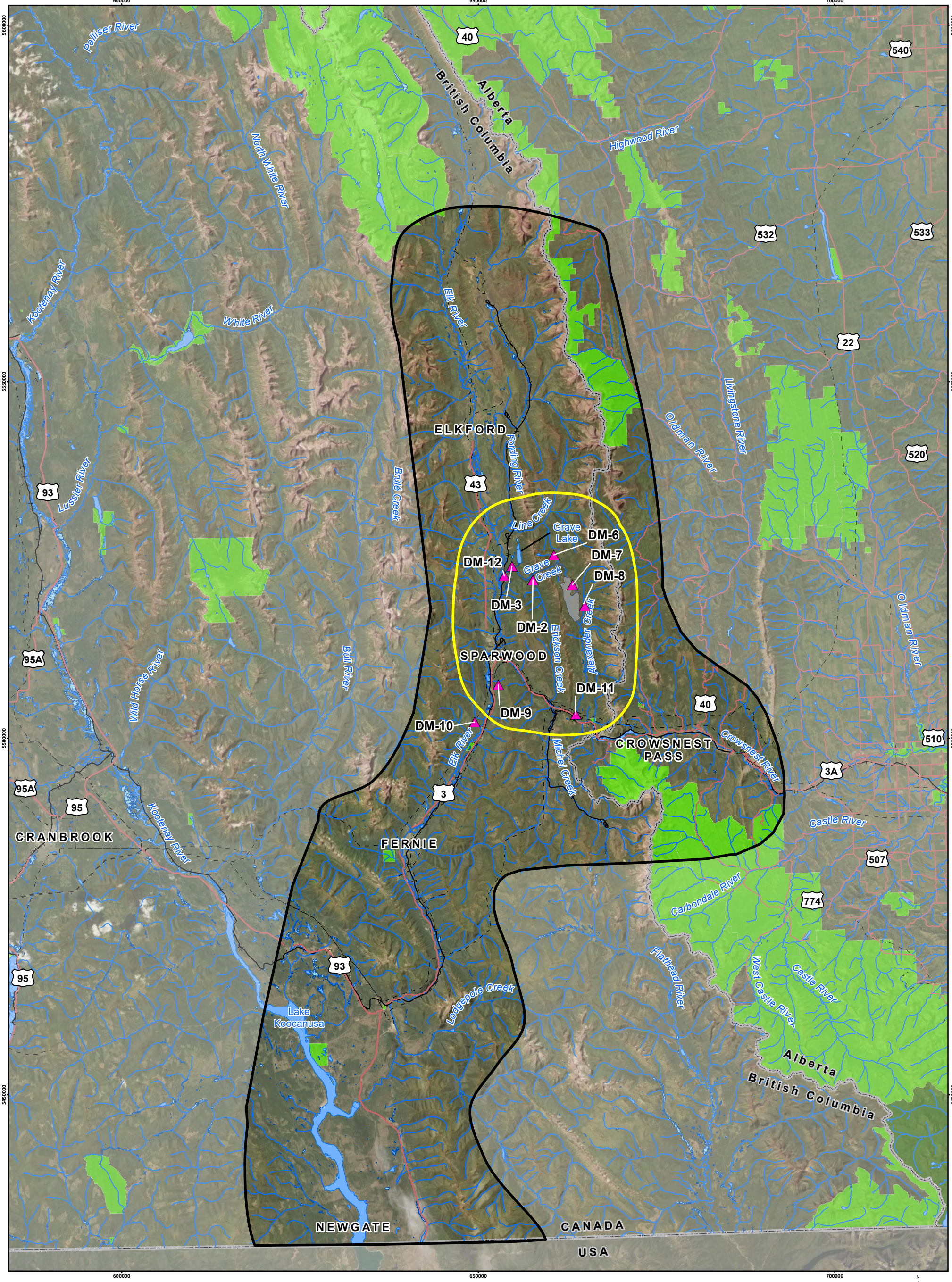
The data were reviewed for completeness and that the station locations adhere to the siting criteria in the Air Monitoring Site Selection and Exposure Criteria (B.C. MOE, 2013). A data gap analysis was completed for each station based on the recommendation of the B.C. AQDMG, which suggests that at least one year of data is available and that a data record that is 75% in each quarter is used. Overall, most quarterly data sets had well over a 90% completeness; however, select quarters did not meet the 75% recommendation. Since the data set for each station spanned over a three year period compared to the recommended one year period, the data sets were deemed to be sufficient for the purposes of the air quality baseline evaluation. VOCs were not included in the baseline assessment due to the lack of available data. Diesel particulate matter was also not included in the baseline assessment, as there are no limits to compare against. As diesel particulate matter is exclusively anthropogenic and the Project is proposed in a relatively undisturbed area, it is likely that baseline concentrations of diesel particulate matter in the immediate Project area are negligible.

The B.C. AQDMG includes guidance for three general levels of assessment: Level 1 (Screening), Level 2 (Detailed), and Level 3 (Comprehensive). Level 3 Assessments are recommended in situations where there is a need to evaluate air quality consequences under a permitting or EA process for large industrial developments that may have considerable social, economic, and environmental consequences. Given the nature of the Project, a Level 3 Assessment was considered the most appropriate methodological process for the air quality assessment. Taking into account the requirements for a Level 3 Assessment, an analysis of the baseline data was completed that included statistical analysis of the CACs in the Atmospheric LSA. Air assessment results were compared to the B.C. AAQOs, provincial Pollution Controls Objectives (PCOs), 2020 CAAQS, and NAAQOs (Table 6.2-4).

Baseline levels for 1-hour cumulative prediction values were determined as follows as per Level 3 Assessment requirements:

- The 99th percentile of daily maximum 1-hour values was used for SO_2;
- The 98th percentile of daily maximum 1-hour values was used for NO_2;
- The 98th percentile from screened hourly datasets was used for all other pollutants; and
- The 98th percentile of the 24-hour (daily) values from the screened data was used as the baseline level for a 24-hour cumulative prediction.

The Project-specific air monitoring baseline program was undertaken between October 2018 and October 2019 and consisted of dustfall monitoring, including analysis of metals in dustfall. Sampling was conducted as per ASTM Method D1739-98: Standard Test Method for Collection and Measurement of Dustfall (Settleable Particulate Matter) (ASTM International, 2017). PAHs were not analyzed due to the volatility of these compounds. Nine dust monitoring stations were constructed and deployed across the Project footprint and surrounding area, including in the nearby community and recreational areas (Figure 6.4-2).



Crown Mountain Coking Coal Project

Figure 6.4-2
Baseline Dustfall Monitoring Locations

LEGEND

- Dustfall Monitoring Location
- Atmospheric Regional Study Area
- Atmospheric Local Study Area
- Project Footprint
- Highway
- Railway
- Transmission Line
- Watercourse
- Waterbody
- Wetland
- Provincial Park/Protected Area
- National Park
- British Columbia/Alberta Border

0 10 20
Kilometres

Scale 1:500,000

Map Drawing Information:
Data Provided By NWP Coal Canada Ltd, Dillon Consulting Limited, Province of British Columbia GeoBC Open Data, Government of Alberta Open Data, Natural Resource Canada. Imagery Provided By ESRI.

Map Created By: LMM
Map Checked By: LKD
Map Coordinate System: NAD 1983 UTM Zone 11N

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Date: 2021-12-02

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6.4.1.2.2 Results

Meteorology

Details on the results of the baseline meteorological data collected at the Crown Mountain climate station for air temperature, barometric pressure, relative humidity, solar radiation, wind speed, wind direction, and precipitation are provided in the Meteorology Baseline Report (Appendix 6-B).

The mean daily average, minimum, and maximum air temperature values for the Atmospheric LSA were derived for January 2014 to May 2016 based on continuous data collected at the Crown Mountain climate station and include the following:

- Mean daily average temperature ranged from a low of -13.4 °C in February 2014 to a maximum of 16.6 °C in June 2015;
- Mean daily minimum air temperature ranged from a low of -16.9 °C in February 2014 to a high of 10.2 °C in July 2015;
- Mean daily maximum air temperature ranged from a low of -9.0 °C in February 2014 to a high of 23.9 °C in July 2014; and
- The extreme minimum temperature at the Crown Mountain climate station was -32.3°C on March 1, 2014 and the extreme maximum temperature was 35.2°C on June 7, 2015.

Barometric pressure measurements ranged from 78.3 to 82.5 kilopascals (kPa). The average daily and monthly barometric pressure were generally higher in the warmer summer months, and lower with greater variability in the colder winter months, which was anticipated as there are typically more active low pressure weather systems in the winter.

Precipitation data were collected at the Crown Mountain climate station between January 2014 and May 2016. However, due to a malfunction of the precipitation gauge caused by high winds, some of the data were deemed to be inaccurate. To characterize the precipitation conditions for Project footprint and Atmospheric LSA, a regression analysis was conducted using data collected at nearby climate stations. Precipitation conditions can vary spatially and temporally and are influenced significantly by altitude, topography, and wind. The Sparwood (11557630) and Natal Harmer Ridge (1155402) climate stations (Figure 6.4-1) were selected for the analysis given their proximity to the Crown Mountain climate station, elevation, and available period of record. For the purpose of the analysis, only the data for the common period of record (1980 to 1990) for the two stations were utilized for the regression analysis of the climate station data.

The results of the regression analysis indicate that the mean summer precipitation at the Crown Mountain climate station (1,920 m amsl) is 14.9 mm higher than at the Sparwood climate station (1,138 m amsl), and the mean winter precipitation is 23.9 millimetres (mm) lower, respectively. The seasonal relationships for mean summer and winter precipitation were applied to derive the monthly precipitation for the Project area. The monthly mean precipitation varied throughout the assessment period, with the lowest values generally corresponding to the summer months (a lowest mean of 35.4 mm in August) and higher precipitation in the early winter months (a highest mean of 89.6 mm in November). The maximum monthly precipitation was 268.6 mm in December and the minimum monthly precipitation was 2.9 mm in February. The total annual precipitation for January 2014 to May 2016 was approximately 760 mm (2014) and 700 mm (2015).

There was substantial variability in the average daily humidity measured at the Crown Mountain climate station. The average monthly relative humidity ranged from 50.1% (August 2015) and 93.1% (January 2016). Average monthly humidity was typically lowest in the summer months and highest in the winter.

The average monthly solar radiation at the Crown Mountain climate station ranged from a minimum of 6.1 watts/square metre (W/m^2) in December 2015 to a maximum of 252.8 W/m^2 in July 2014. Varying solar radiation values during the daytime are generally attributed to cloud cover. Typically, higher average solar radiation levels occurred during the summer months, whereas lower average values occurred during the winter months.

The wind rose (Figure 6.4-3) indicates wind speeds between 2 and 6 kilometres per hour (km/h) were most frequently recorded between January 2014 and May 2016. Wind speeds below 3.6 km/h or 1 m/s (i.e., calm winds) occurred 33.6% of the time, and wind speeds over 21.6 km/h or 6 m/s (i.e., strong winds) occurred 1.4% of the time. The maximum instantaneous wind speed was 58.4 km/h on February 6, 2016. The most frequent wind direction was traveling west-northwesterly (i.e., from the south-east), at approximately 22.9% of the recorded entries.

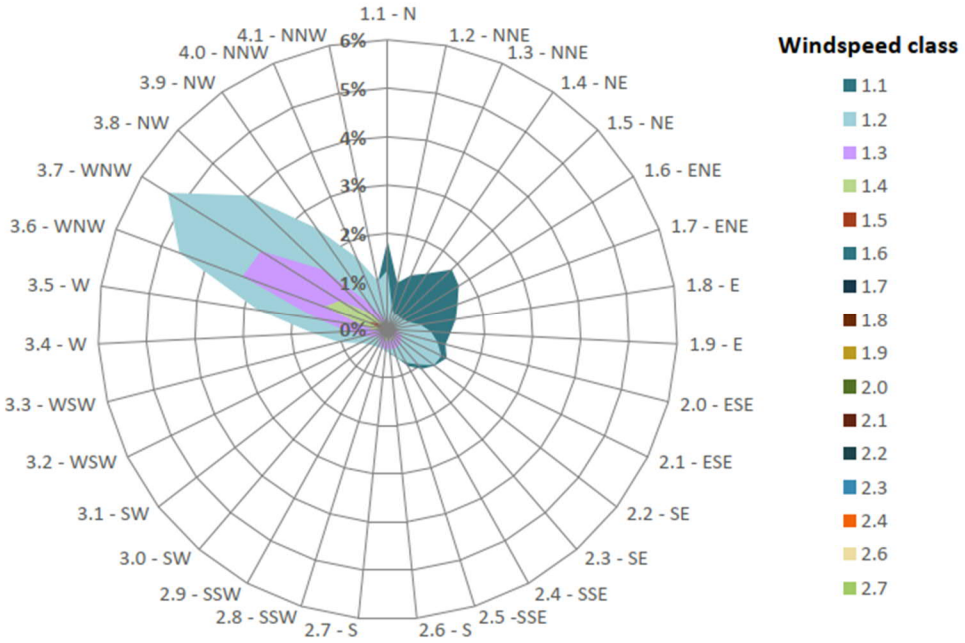


Figure 6.4-3: Crown Mountain Wind Direction Distribution

There are no known snow survey stations located within the Project footprint or Atmospheric LSA. Accordingly, an assessment of snow pack data was not completed for these areas.

Air Quality

The B.C. AQDMG specifies that when multiple monitoring sites are being used to represent local ambient air quality, the arithmetic average of these stations is calculated to represent what the baseline air quality value should be for each contaminant. Table 6.4-3 provides a summary of these data along with each contaminant's percent contribution to B.C. AAQOs. Ambient air concentrations for the selected

contaminants of concern all fell below their corresponding B.C. AAQOs for each of their respective averaging periods.

Table 6.4-3: Baseline Ambient Air Quality Arithmetic Averages from EVO DTAM and WWTP and Percent Contribution to B.C. AAQOs, January 2014 to December 2016

Contaminant	Averaging Period	Baseline Ambient Air Concentration (µg/m^3)	Most Stringent Air Quality Objective from Table 6.2-4 (µg/m^3)	Criteria	Percent Contribution to Objective
NO_2	1 h	29.4[1]	113	2020 CAAQS	26.0%
	Annual	7.4[6]	32	2020 CAAQS	23.0%
SO_2	1 h	2.4[2]	183	2020 CAAQS	1.3%
	Annual	0.8[6]	13	2020 CAAQS	6.1%
CO	1 h	647.6[3]	14,300	PCO	4.5%
	8 h	786.9[4]	5,500	PCO	14.3%
PM_{10}	24 h	28.7[5]	50	B.C. AAQOs	57.3%
$PM_{2.5}$	24 h	19.7[5]	25	B.C. AAQOs	78.8%
	Annual	5.2[6]	8	B.C. AAQOs	64.8%

Notes:
1. NO_2 value is based on 98th percentile of daily maximum 1-hour values
2. SO_2 value is based on 99th percentile of daily maximum 1-hour values
3. CO 1-h value is based on 98th percentile of 1-hour values
4. CO 8-h value is based on 98th percentile of rolling 8-h average
5. $PM_{2.5}$ and PM_{10} are based on the 98th percentile of 24-hour averages
6. Annual averages use the annual mean of 1 hour values over the entire data set

A total of seven one-month dustfall sampling events were conducted between October 2018 and October 2019 at each of the monitoring locations identified in Figure 6.4-2; however, only six were used in the data analysis due to laboratory errors with samples from the discarded sampling event (December 2018). Total dustfall results are presented on a monthly and annual basis in Table 6.4-4. Metal in dustfall results are presented in Appendix 6-A. When analyzing the results from the six sampling events, the following observations were made:

- DM-2 experienced the highest average six month dustfall accumulation when compared to the other stations (1.26 mg/dm^2/day);
- DM-2 experienced the single highest dustfall accumulation in one particular month, that being during the October 2019 sampling event (1.82 mg/dm^2/day);
- DM-9 experienced the lowest average six month dustfall accumulation when compared to the other stations (0.34 mg/dm^2/day);
- The highest average dustfall accumulation across all stations occurred in November 2018 (0.86 mg/dm^2/day), with the second highest being in October 2019 (0.85 mg/dm^2/day); and
- The lowest average dustfall accumulation across all stations occurred in the month of August 2019 (0.28 mg/dm^2/day), with the second lowest being in July 2019 (0.61 mg/dm^2/day).

Table 6.4-4: Total Baseline Dustfall Results, Selected Months between November 2018 to October 2019

Station ID	Units	November 2018	June 2019	July 2019	August 2019	September 2019	October 2019	Average [mg/dm^2/day]	Maximum [mg/dm^2/day]
DM-2	mg/dm^2/day	1.66	0.91	0.8	NA	1.13	1.82	1.26	1.82
DM-3	mg/dm^2/day	1.64	0.78	0.76	0.36	0.79	1.12	0.91	1.64
DM-6	mg/dm^2/day	0.63	0.55	0.61	0.11	0.52	0.72	0.52	0.72
DM-7	mg/dm^2/day	0.66	0.84	0.7	0.77	0.94	0.52	0.74	0.94
DM-8	mg/dm^2/day	0.4	0.86	0.91	0.2	0.92	0.73	0.67	0.92
DM-9	mg/dm^2/day	0.39	0.51	0.32	0.1	0.39	0.34	0.34	0.51
DM-10	mg/dm^2/day	NA	1.12	0.1	0.1	0.41	0.51	0.45	1.12
DM-11	mg/dm^2/day	0.41	0.38	0.45	0.33	0.16	0.96	0.45	0.96
DM-12	mg/dm^2/day	1.11	NA	0.83	0.28	0.62	0.93	0.75	1.11

Notes:
NA - No sample available for analysis

6.4.2 Greenhouse Gases

Greenhouse gas emissions from coal mining operations include CO_2, CH_4, and N_2O (Province of British Columbia [Province of B.C.], 2021a). These contaminants are released from fossil fuel combustion sources associated with the Project. Emissions of these compounds have the potential to affect the global climate through the greenhouse effect. The GHG assessment focuses on three compounds, expressed as CO_2e:

- CH_4;
- CO_2; and
- N_2O.

This section describes the existing conditions in the Atmospheric LSA and Atmospheric RSA in sufficient detail to enable potential effects of the Project on contributions to provincial, national, and global GHG inventories to be identified, understood, and assessed.

6.4.2.1 Existing Regional and Local Information

Data were compiled to establish baseline GHG emissions for local and regional context surrounding the Project. The evaluation of baseline emissions included sources of emissions, sinks, or reservoirs that may be impacted as a result of the Project. GHG production data were compiled from federal and provincial sources, including:

- Federal: Environment and Climate Change Canada: National inventory report 1990-2019: Greenhouse gas sources and sinks in Canada (2021); and
- Provincial: Province of British Columbia: B.C. industrial facility GHG report summary 2020 (2021a) and Provincial greenhouse gas emissions inventory: 1990-2019 (2021b).

To evaluate baseline GHG emissions for the Project area, total GHG emissions from B.C. and sector specific emissions, particularly emissions from the mining sector, were considered. The best available estimate of B.C.'s reported GHG emissions is provided in the 2020 ECCC National Inventory Report (NIR) and 1990-

2019 Provincial Inventory (Province of B.C., 2021b). GHG emissions from all of Canada are also documented below for context. Results are documented in million metric tonnes of CO_2 equivalents (Mt CO_2e).

A review of the 2019 GHG emissions summary from the ECCC NIR shows that:

- GHG emissions from all human-made sources in Canada equated to a national annual total of 730 Mt CO_2e;
- GHG emissions from the mining sector across Canada had an annual total of 9.0 Mt CO_2e;
- GHG emissions from coal production (including stationary combustion, on-site transportation, and fugitive emissions from underground and surface coal mines) in Canada had a national annual total of 3.0 Mt CO_2e;
- GHG emissions from human-made sources in B.C. had a provincial annual total of 65.7 Mt CO_2e;
- GHG emissions from the mining sector in B.C., excluding coal and oil and gas production, had an annual total of 0.5 Mt CO_2e; and
- GHG emissions from coal production in B.C. had an annual total of 2.0 Mt CO_2e.

B.C. requires industrial facilities that emit 10,000 tonnes or more of carbon dioxide equivalent (t CO_2e) per year to report their emissions to government, as per the Greenhouse Gas Emission Reporting Regulation. GHG Emission Summaries for Single Facility Operations in the Atmospheric RSA in 2020 are provided in Table 6.4-5. Teck's Fording River Operations was the highest fossil fuel emitter in the Atmospheric RSA.

Table 6.4-5: GHG Emission Summaries for Single Facility Operations in the Atmospheric RSA, 2020 (t CO_2e/year)

Company Name	Facility Name	Summary, t CO_2e/year 2020 Totals by Gas Type			2020 Total Emissions (t CO_2e/year)
		$CO_{2\ fossil}$	CH_4	N_2O	
Teck Coal Limited	Coal Mountain Operations	1,643	2	56	1,701
Teck Coal Limited	Elkview Operations	240,061	194,034	7,575	441,669
Teck Coal Limited	Fording River Operations	392,339	243,370	14,137	649,846
Teck Coal Limited	Greenhills Operations	222,785	152,742	5,965	381,492
Teck Coal Limited	Line Creek Operations	116,986	99,464	4,108	220,558
	Total	973,814	689,612	31,841	1,695,266

Based on these results, GHG emissions from Single Facility Operations in the East Kootenay region in 2020 accounted for approximately 2.6% of B.C.'s annual emissions, or approximately 0.2% of Canada's total GHG emissions. During the course of the Project, it is expected that both GHG sources and sinks within the Atmospheric LSA and Atmospheric RSA will change, resulting in an effect on local and regional GHG emissions.

6.5 Project Effects Assessment

6.5.1 Thresholds for Determining Significance of Residual Effects

6.5.1.1 Change in Ambient Criteria Air Contaminant Concentrations

A significant adverse residual environmental effect on a change in ambient criteria air contaminant concentrations (as a measure of a change in air quality) is one that causes a widespread degradation of the quality of the ambient air in the Atmospheric LSA and Atmospheric RSA such that the maximum outside modelled property boundary Project-related ground-level concentration plus the conservative background level of the air contaminant being assessed frequently exceeds the respective, most stringent ambient air quality objective for a particular contaminant as presented in Table 6.2-4. "Frequently" is defined as 1% of the time during the modelling period for the 1-hour, 8-hour, and 24-hour objectives. The term "widespread" is intended to convey the notion that a change in ambient criteria air contaminant concentrations would constitute a significant adverse residual environmental effect if concentrations exceed a particular ambient air quality objective broadly at the Atmospheric LSA or Atmospheric RSA scale, and that exceedance at a particular receptor or a series of receptors does not necessarily constitute a significant adverse residual effect. It is important to note that exceeding an air quality objective does not imply that an unacceptable risk exists, but rather that the potential for adverse effects to the environment and human and wildlife health may be increased.

The scope of the air quality effects assessment is restricted to parameters with approved or working provincial, federal or regional guidelines that are protective of the environment and human and wildlife health. Consequently, VOCs and metals in dustfall are not considered in the residual effects assessment on air quality as ambient air quality objectives for these parameters do not yet exist.

6.5.1.2 Change in Greenhouse Gas Emissions

Project operations have the potential to emit GHGs, specifically, CO_2, CH_4, and N_2O. GHG emissions can be generated from Project activities such as use of fossil fuels in mobile equipment and natural gas combustion.

As per guidance from the Federal-Provincial-Territorial Committee on Climate Change and Environmental Assessment, "the environmental assessment process cannot consider the bulk of GHG emitted from already existing developments. In addition, unlike most project-related environmental effects, the contribution of an individual project to climate change cannot be measured" (Federal-Provincial-Territorial Committee on Climate Change and Environmental Assessment, 2003). It is therefore not possible to assess significance related to a measured environmental effect on climate change on a project-specific basis. Project emissions will be measurable and potentially important in the context of local and provincial GHG emissions, but will be very small in a global context.

There are currently no specific regulations that govern a change in GHG emissions from the Project; however, there are relevant reporting thresholds and carbon reduction targets set by the federal and provincial governments. At a federal level, ECCC's Greenhouse Gas Reporting Program collects information on GHG emissions from facilities across Canada. It is a mandatory program for facilities that emit 10,000 tonnes or more of GHGs in CO_2e per year. At a provincial level, facilities emitting over 10,000 tonnes of CO_2e per year must report to ENV under the Greenhouse Gas Emission Reporting Regulation (2015).

The Federal-Provincial-Territorial Committee on Climate Change and Environmental Assessment has guidance for incorporating the impact of the Project on climate change in environmental assessments that recommends a comparison of Project specific GHG emissions with sectoral, provincial, and national emissions[1]. Thus, instead of setting a specific significance criterion for an environmental effect related to GHG emissions, the assessment involves estimating Project-related GHG emissions and considering the magnitude, intensity, and duration of Project emissions as directed by the 2003 Federal-Provincial-Territorial Committee on Climate Change and Environmental Assessment guidance.

Three categories are described in the Federal-Provincial-Territorial Committee on Climate Change and Environmental Assessment guidance: "low", "medium", and "high". In this Application/EIS, these categories are attributed quantitatively based on evaluation of GHG emissions from other industrial facilities and regulatory thresholds (such as reporting thresholds for GHG emissions to provincial and federal programs). For this Application/EIS, the magnitude of the Project-related change in GHG emissions (on a tonnes CO_2e per annum basis) is based on the following criteria:

Less than 10,000 tonnes CO_2e per annum is considered "low", since below this level, reporting to the federal and provincial governments is not required. Between 10,000 and 500,000 tonnes CO_2e per annum is considered "medium"; and Greater than 500,000 tonnes CO_2e per annum is considered "high", generally representing more than approximately 1% of current annual GHG emissions in B.C.

The quantitative levels used to define the low, medium, and high magnitudes of GHG emissions are based on emissions from other mines in Canada and with respect to the federal and provincial reporting program. These revised levels represent a more conservative approach to evaluating the significance of Project GHG emissions on global climate.

As per the 2003 Federal-Provincial-Territorial Committee on Climate Change and Environmental Assessment guidance, where GHG emissions are considered to be either "medium" or "high", a GHG Management Plan must be prepared.

6.5.2 Project Effects

Project activities and components have the potential to result in adverse effects to local and regional air quality and greenhouse gas concentrations. This assessment focuses only on planned activities within the designed scope of the Project. Potential effects related to unplanned events (e.g., spills, equipment malfunctions, accidents) are presented in Chapter 21.

[1] The Federal-Provincial-Territorial Committee on Climate Change and Environmental Assessment. (November 2003). Incorporating Climate Change Considerations in Environmental Assessment: General Guidance for Practitioners. Catalogue No. EN106-50/2003E-PDF. ISBN 0-662-35454-0.

6.5.2.1 Project Interactions

Project activities during the Construction and Pre-Production, Operations, Reclamation and Closure, and Post-Closure phases have the potential to affect air quality and greenhouse gas concentrations. Key Project activities that are expected to interact with air quality and greenhouse gas concentrations, with a potential for adverse effects, are presented in Table 6.5-1. Specific details on Project activities and components are discussed in Chapter 3. A spatial overview of the Project footprint infrastructure is shown in Figure 6.5-1.

In general, the Project has the potential to affect air quality and/or greenhouse gas concentrations through emissions of criteria air contaminants, fugitive dust, and GHGs during Construction and Pre-Production, Operations, and Reclamation and Closure resulting from:

- Vehicle and mobile equipment movements on unpaved roads (fugitive dust, CACs, and GHGs);
- Material handling and processing (fugitive dust and GHGs);
- Logging, clearing, and grubbing of the Project footprint (fugitive dust, CACs, loss of carbon sinks);
- Excavation of the quarry and water management structures (fugitive dust, CACs);
- Road upgrading and construction (fugitive dust, CACs, and GHGs);
- Excavating and pouring of foundations (fugitive dust, curing of concrete releases CO_2);
- transportation, construction, and commissioning of pre-fabricated structures including the Coal Handling Process Plant, workshop, mine dry, explosives factory, and components of the rail loadout (fugitive dust and GHGs);
- Receiving fuel deliveries, dispensing fuel, and transferring fuel to on-site delivery trucks (potential release of VOCs);
- Loading, hauling, and stockpiling of soil, coal, and mine rock (fugitive dust, CACs, and GHGs);
- Drilling and blasting activities (fugitive dust, NOx, CO, SO_2, and GHGs);
- Coal processing and disposal of coal rejects (fugitive dust, VOCs, and GHGs);
- Dismantling of infrastructure and buildings (fugitive dust); and
- Removal of the natural gas line (potential for release of VOCs and GHGs if residual gas remaining in pipeline); and
- Progressive reclamation (fugitive dust, positive effect on GHG concentrations as vegetation replanting will result in the re-establishment of carbon sinks).

Table 6.5-1: Project-Air Quality and Greenhouse Gases Interaction Matrix and Ranking

Project Phase	Project Component	Description of Activities	Change in Air Quality	Change in Greenhouse Gas Emissions
Construction and Pre-Production	Transportation	Use of Highway 43, Line Creek Mine Road, Valley Road, and Grave Creek Road by highway transport trucks, light duty vehicles, and crew busses to transport personnel, materials, and consumable items	II	II
	Logging of Merchantable Timber	Merchantable timber will be logged from the infrastructure and pre-production development footprint	I	II

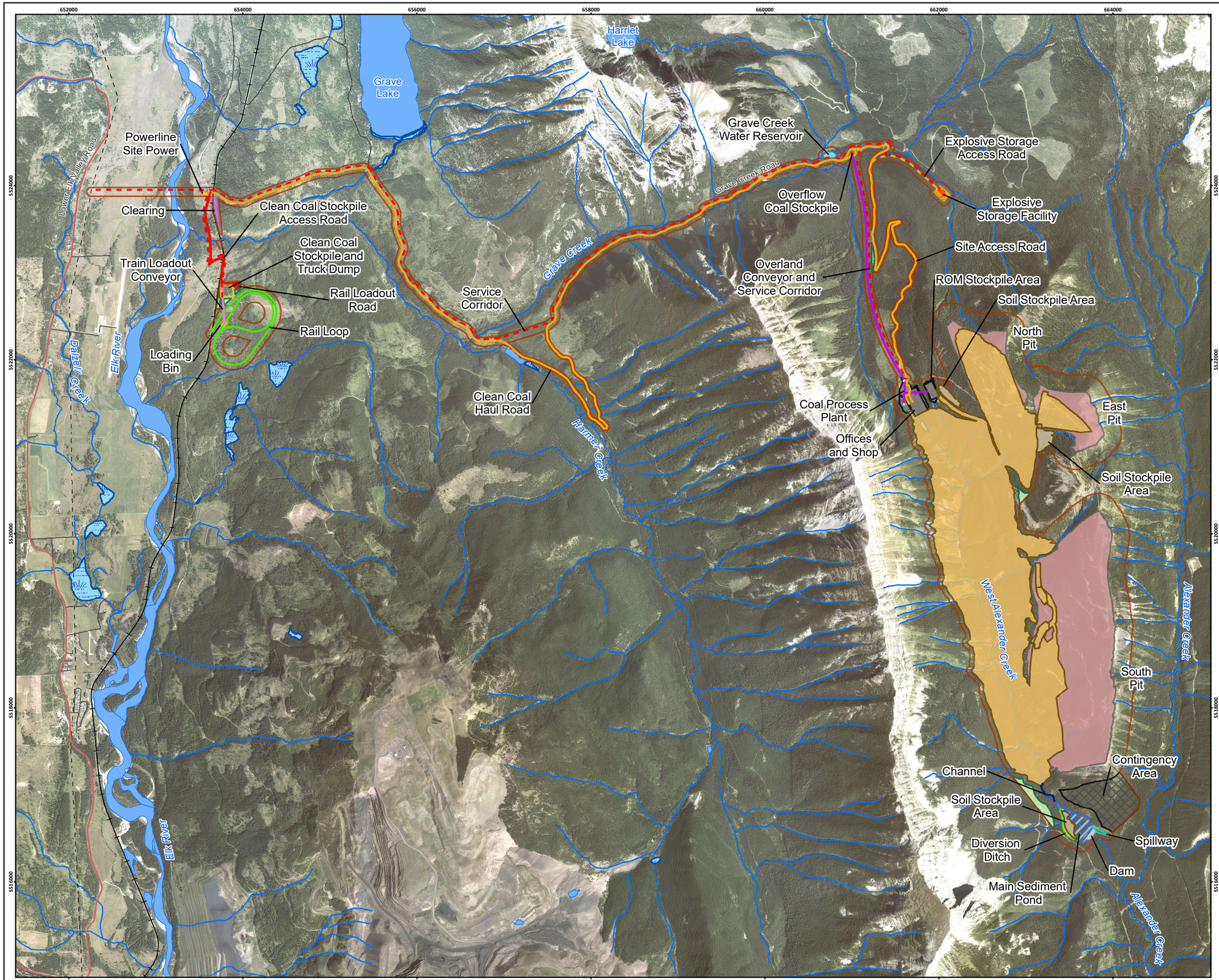
Project Phase	Project Component	Description of Activities	Change in Air Quality	Change in Greenhouse Gas Emissions
	Clearing and Grubbing	After the merchantable timber has been removed, the remaining vegetation will be cleared and grubbed from the infrastructure and pre-production development footprint	II	II
	Stockpiling Wood Waste	Wood waste will be stockpiled on site and used for reclamation as a source of coarse woody debris	I	I
	Quarry for Construction Materials	Excavation of road bed materials from the North Pit footprint for use on Grave Creek Road	II	I
	Water Management or Water Management Structures	Water management structures to support initial construction activities will be built prior to soil being salvaged from the run of mine (ROM) and plant site	II	I
		Interim Sediment Pond will be built prior to the soil removal and stockpiling from the pit access road and initial phase of the North Pit	II	I
		Grave Creek Reservoir will be constructed to act as a back-up source of process water	II	II
	Soil Salvage	Soil will be salvaged from the footprint of the infrastructure	II	I
	Road Upgrading and Construction	Branch C Road will be widened and upgraded to facilitate construction and mine traffic to plant site area	II	II
		Grave Creek Road will be widened to facilitate the clean coal haul	II	II
		A new road will be constructed off the Valley Road to access the rail loadout for construction and operation	II	II
	Linear Infrastructure	Installation of the powerline	I	I
		Installation of the natural gas line	II	II
	Overland Conveyor	Clearing, grubbing, and construction of overland conveyor from the plant site to Grave Creek Road	II	II
	Coal Handling Process Plant Construction	Excavating and pouring of foundation	II	II
		Transportation of materials and personnel to site	II	II
		Constructing of the Coal Handling Process Plant (CHPP)	II	II
		Commissioning of the CHPP	I	I
	Workshop / Mine Dry Construction	Excavating and pouring of foundations	II	II
		Transportation of materials to site	II	II
		Construction of workshop / mine dry	I	I

Project Phase	Project Component	Description of Activities	Change in Air Quality	Change in Greenhouse Gas Emissions
		Equipment wash bay and heavy equipment parking	I	I
		Administration, first aid, and mine dry building	I	I
		Diesel tank farm	I	I
		Warehouse	I	I
		Potable water system	I	I
		Septic system	I	I
		Water supply pipelines from Grave Creek and West Alexander Creek	I	I
		Commissioning of the facilities	I	I
	Explosives Factory Construction	Construction of the explosives factory	II	II
	Rail Loadout Construction	Excavation and preparation of the rail bed	II	II
		Excavation and preparation of foundation stockpiling and coal handling systems	II	II
		Transportation of materials and personnel to site	II	II
		Construction of rail loadout	II	I
		Connection to the CP Fording Sub-line	I	I
		Commissioning of the rail loadout	I	I
	Labour	Hiring of personnel for the mine, CHPP operations, administration, and coal haul	I	I
		Training of personnel	I	I
	Construction Waste Materials	Collection and transfer to a recycling facility or other approved facility	I	I
Operations	Transportation	Use of Highway 43, Line Creek Mine Road, Valley Road, and Grave Creek Road by highway transport trucks, light duty vehicles, and crew busses to transport personnel, materials, and consumable items	III	III
	Explosives Factory	Ammonium nitrate / emulsion storage facilities which have the ability to load explosive agents into delivery trucks	I	I
		Wash facility to decontaminate the bulk explosive delivery trucks	I	I
		Storage of explosives (detonators and boosters)	I	I
	Fuel Storage	Receiving bulk fuel deliveries	II	I
		On-site storage of fuel	I	I
		Dispensing fuel	II	I

Project Phase	Project Component	Description of Activities	Change in Air Quality	Change in Greenhouse Gas Emissions
		Transferring fuel to on-site delivery trucks	II	I
	Mine Roads Development	Building roads from material sourced on-site	II	II
	Mining	Progressive clearing	II	II
		Removal of unconsolidated material	I	I
		Loading, hauling, and stockpiling of soil	II	III
		Drilling and loading of blastholes	II	II
		Detonating the explosives	III	II
		Loading, hauling, and dumping of mine rock	II	III
		Loading, hauling, and stockpiling of coal	II	III
	Site Water Requirements	Using contact water as the primary process make-up water from Interim Sediment Pond (Year 1 to 5)	I	I
		Using contact water as the primary process make-up water from the North Pit (Year 5 to 15)	I	I
		Backup reservoir in Grave Creek as a secondary source of process make-up water	I	I
	Coal Processing	Run of mine coal sizing	II	II
		Washing coal	I	I
		Mechanical and thermal drying of coal	II	II
		Coal reject disposal (part of loading, hauling, and dumping of mine rock activities)	II	II
		Conveying clean coal	II	I
	Sewage Treatment	Sewage will be treated by a septic system constructed at the plant site which will support the administration, mine dry, and CHPP facilities	I	I
	Main Sediment Pond	Construction of Main Sediment Pond in Year 4	II	II
		Management of the Main Sediment Pond discharge	I	I
	Reclamation	Reclaiming available areas as soon as possible to achieve reclamation objectives	II	II
Reclamation and Closure	Transportation	Use of Highway 43, Line Creek Mine Road, Valley Road, and Grave Creek Road by highway transport trucks, light duty vehicles, and crew busses to transport personnel, materials, and consumable items	II	II
		Dismantling of the CHPP, maintenance facilities, administration, and other facilities	II	I

Project Phase	Project Component	Description of Activities	Change in Air Quality	Change in Greenhouse Gas Emissions
	Dismantling Infrastructure and Buildings	Dismantling, salvaging, collecting, and transferring materials to a recycling facility or other approved facility	II	I
	Removal of Linear Infrastructure	Removal of the powerline	I	I
		Removal of the natural gas line	II	II
	Reclamation	Reclaiming available areas as soon as possible to achieve reclamation objectives	II	II
	Monitoring	Reclamation monitoring	I	I
		Geotechnical monitoring	I	I
		Aquatic effects monitoring	I	I
	Water Management	Management of the Main Sediment Pond discharge	I	I
Post-Closure	Water Management	Decommissioning the Main Sediment Pond once water quality objectives have been met	I	I
	Road Use	Branch C Road will remain as a permanent access road for future commercial and recreational use	I	I
	Rail Line	The rail line will remain as a permanent feature	I	I
	Monitoring	Reclamation monitoring	I	I
		Geotechnical monitoring	I	I
		Aquatic effects monitoring	I	I

Notes (after EAO, 2013):
I = No or negligible effect (positive or adverse) is anticipated; not carried forward in the assessment
II = Potential adverse effects requiring additional mitigation or substantive positive effects are expected; carried forward in the assessment
III = Key interaction resulting in potential significant adverse effect or significant concern; carried forward in the assessment



Crown Mountain Coking Coal Project

Figure 6.5-1
Project Footprint Infrastructure

LEGEND

- Project Footprint
- Channel to Ultimate Pond
- Clean Coal Haul Road\Site Access
- Explosive Storage Access\Facility Road
- Rail Loadout Road
- Rail Loop
- Service Corridor
- Coal Process Plant Conveyor
- Coal Process Plant Duct
- Train Loadout Conveyor
- Waste Dump
- Mined Area
- Clean Coal Stockpile and Truck Dump
- Overflow Coal Stockpile
- Soil Stockpile Area
- Explosive Storage Facility\Pad
- Loading Bin
- Plant Site\ROM Stockpile Area
- Powerline-Site Power
- Water Reservoir
- Main Sediment Pond
- Dam
- Spillway
- Diversion Ditch
- Clearing
- Additional Area
- Contingency Area
- Arterial/Collector Road
- Local/Resource Road
- Railway
- Transmission Line
- Watercourse
- Waterbody
- Wetland
- British Columbia/Alberta Border

0 1 2
Kilometers

N W E S

Scale 1:42,000

Map Drawing Information:
Data Provided By NWP Coal Canada Ltd, Dillon Consulting Limited, Province of British Columbia GeoBC Open Data, Government of Alberta Open Data, Natural Resource Canada.
Imagery Provided By GeoBC OrthoImagery (Aug 2016).

Map Created By: RB/LMM
Map Checked By: LKD
Map Coordinate System: NAD 1983 UTM Zone 11N

NWP Coal Canada Ltd

Project: 12-6231
Status: FINAL
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Interactions were not identified for Project activities relating to:

- Any activity during the Post-Closure phase;
- Stockpiling of wood waste for reclamation purposes, as natural wood waste does not have the potential to adversely affect air quality or GHG emissions;
- Installation of the powerline, as minimal ground disturbance or extensive use of mobile equipment will be required;
- Commissioning of the CHPP, work shop/ mine dry; and rail loadout;
- Hiring and training of personnel, as these activities do not have the potential to adversely affect air quality;
- Disposal of construction waste materials, as materials will be stored primarily in C cans or other secure containers prior to transport and disposal offsite;
- Storage of explosives (detonators and boosters), as these will be stored in secure facilities that meet all environmental, health and safety design requirements;
- Domestic sewage produced at the Project site will be treated via a septic system and will not interact with the atmospheric environment;
- Site water use and management of the Main Sediment Pond discharge, as there will be little to no interaction with the atmospheric environment; and
- Reclamation, geotechnical, and aquatic effects monitoring, as these activities do not have the potential to adversely affect air quality or substantially contribute to GHG emissions.

Potential effects on air quality and greenhouse gas concentrations as a result of the Project that are carried forward in the discussion of potential effects are summarized in Table 6.5-2.

Table 6.5-2: Potential Effects on Air Quality and Greenhouse Gases

Potential Effect	Rationale for Selection of Environmental Effect
Change in Ambient Criteria Air Contaminant Concentrations	Project activities such as site clearing; transportation of materials and personal; construction of roads and mine infrastructure; drilling and blasting; loading, hauling, and stockpiling of soil, coal, and mine rock; raw and clean coal processing; and dismantling of infrastructure and buildings generate fugitive dust and other CACs.
Change in Greenhouse Gas Emissions	Project activities such as vehicle and mobile equipment use; clearing of the Project footprint; pouring of foundations; loading, hauling, and stockpiling of soil, coal, and mine rock; and raw and clean coal processing generate GHGs. Progressive reclamation will have a positive effect on GHG emissions as vegetation replanting will result in the re-establishment of carbon sinks within the Project footprint.

6.5.2.2 Discussion of Potential Effects

The potential effects identified in Table 6.5-2 are discussed in the context of each Project phase (Construction and Pre-Production, Operations, Reclamation and Closure, and Post-Closure) in the following subsections.

6.5.2.2.1 Change in Ambient Criteria Air Contaminant Concentrations

Project activities such as the construction of facilities and infrastructure, construction and upgrading of access and haul roads, blasting, transportation of soil, raw coal, mine rock, and coal rejects, use of heavy equipment, and operation of vehicles have the potential to affect air quality due to the generation of fugitive dust and other CACs such as NOx, CO, SO_2 during all phases of the Project.

Other air contaminants that may be generated as a result of the Project include ground level O_3 and VOCs. Ground level ozone is formed in a series of complex secondary atmospheric reactions that involve other air pollutants such as NOx and VOCs. Operation of the natural gas pipeline may result in VOC emissions; however, emissions are expected to be minimal. VOC emissions associated with the combustion of fossil fuels and coal processing are also expected to be minimal. As discussed in Section 6.5.1.1, there are currently no established provincial or federal criteria for ambient VOCs. Due to the minimal emissions, complex chemistry, and the lack of ambient air quality objectives, these contaminants are not considered further in this assessment.

Construction and Pre-Production

During the Construction and Pre-Production phase, CACs are expected to be generated by:

- Transportation of personnel and materials;
- Land clearing activities and soil salvage;
- Road construction and upgrading;
- Excavation of the quarry for construction materials;
- Excavations for foundations;
- Transportation and construction of pre-fabricated structures including, but not limited to, the Coal Handling Process Plant, workshop, mine dry, explosives factory, and components of the rail loadout;
- Construction of the overland conveyor; and
- Construction of water management infrastructure such as the Grave Creek Reservoir and Interim Sediment Pond.

Operations

During site Operations, CACs are expected to be generated by the following activities:

- Transportation of personnel and materials;
- Receiving fuel deliveries, dispensing fuel, and transferring fuel to on-site delivery trucks;
- Progressive clearing and mine road construction;
- Construction of the Main Sediment Pond;
- Drilling and blasting;
- Loading, hauling, and dumping of soil, mine rock, coal, and coal rejects;
- Run of mine coal sizing;
- Mechanical and thermal drying of coal;
- Conveying clean coal; and
- Reclamation activities.

Reclamation and Closure

During Reclamation and Closure, some CACs (particularly fugitive dust) are expected to be generated through transportation of personnel and materials, decommissioning of mine site infrastructure, and reclamation of remaining disturbed areas.

Post-Closure

No changes to ambient air quality are anticipated Post-Closure, as all activities with the potential to generate measurable quantities of CACs will be completed during the Reclamation and Closure phase.

6.5.2.2.2 Change in Greenhouse Gas Emissions

Project activities such as vehicle, mobile, and stationary equipment use, land clearing activities, construction of facilities and infrastructure, and blasting, have the potential to affect greenhouse gas emissions due to the generation of GHGs such as CO_2, CH_4, and N_2O during all phases of the Project.

Construction and Pre-Production

During the Construction and Pre-Production phase, GHGs are expected to be emitted through:

- Transportation of personnel and materials;
- Land clearing activities (combustion of fossil fuels and loss of carbon sinks);
- Road construction and upgrading;
- Pouring of foundations;
- Transportation and construction of pre-fabricated structures including, but not limited to, the Coal Handling Process Plant, workshop, mine dry, explosives factory, and components of the rail loadout; and
- Construction of the overland conveyor.

Operations

During site Operations, GHGs are expected to be emitted through:

- Transportation of personnel and materials;
- Progressive clearing and mine road construction;
- Drilling and blasting;
- Loading, hauling, and dumping of soil, mine rock, coal, and coal rejects;
- Coal processing; and
- Reclamation activities.

Carbon sinks will gradually be re-established within the Project footprint as a result of progressive revegetation during Operations and Reclamation and Closure, resulting in a positive effect on greenhouse gas concentrations.

Reclamation and Closure

During Reclamation and Closure, some GHGs are expected to be emitted through transportation of personnel and materials and decommissioning of mine site infrastructure. Carbon sinks will gradually be re-established within the Project footprint as a result of progressive revegetation during Operations and Reclamation and Closure.

Post-Closure

No measurable changes in greenhouse gas emissions are anticipated Post-Closure, as all activities with the potential to result generate measurable quantities of GHGs will be completed during the Reclamation and Closure phase, and carbon sinks will be re-established within the Project footprint as a result of progressive revegetation.

6.5.2.3 Transboundary Effects

The Project is located approximately 5 km west from the Alberta border along the western side of the Continental Divide and 85 km north from the Montana border in the U.S.A. As discussed in Section 6.4.1.2.2, the most frequent wind direction recorded at the baseline climate station was from the southeast. Consequently, it is anticipated that the majority of air emissions (particularly fugitive dust) will be blown towards the west/northwest of the site. However, the potential for transboundary air quality effects into both Alberta and the U.S.A. have the potential to occur as a result of the Project.

As discussed in Chapter 1, Section 1.3.3, the nearest federal lands to the proposed Project are the ?aq'am First Nation Bummer's Flat 1 Reserve (approximately 69 km southwest), Stoney Nakoda Edan Valley 216 Reserve (approximately 70 km northeast), Tobacco Plains 2 (approximately 80 south), Piikani Nation Peigan Timber Limit 147B (approximately 52 km east in Alberta), and Parcels 73 and 82 of the Dominion Coal Blocks (approximately 20 and 40 km southwest, respectively). Federal land is not required to facilitate the Project and the Project does not overlap with any federal land, though there is potential for transboundary air quality effects to occur on federal lands as a result of the Project.

Project greenhouse gas emissions will be measurable and potentially important in the context of local and provincial GHG emissions, but will be very small in a global context. Despite the relative low quantity of emissions, the Project will contribute to national and international greenhouse gas emissions, thereby contributing to global climate change at the transboundary level.

6.5.3 Mitigation Measures

The mitigation measures proposed for changes in air quality and greenhouse gas emissions are based on available best management practices (BMPs), provincial and federal guidance documents, mitigation measures conducted and accepted for similar projects, and professional judgement. The identification and selection of technically and economically feasible mitigation measures followed the mitigation hierarchy approach outlined by the provincial Environmental Mitigation Policy and related Environmental Mitigation Procedures (B.C. MOE, 2014b and 2014c). Technical and economic constraints dictated the highest level of the mitigation hierarchy that could be achieved for managing each potential effect.

Mitigation measures were identified for each potential effect on air quality and greenhouse gas emissions. For the purposes of this assessment, mitigation measures are defined to include Project design features, procedures, or practices that will reduce or eliminate Project-related effects to air quality and greenhouse gases. Potential Project-related changes to air quality will be reduced through design mitigation, regulatory requirements, BMPS, including management plans, monitoring, and adaptive management. Where mitigation measures are considered to be completely effective, potential Project effects to air quality and greenhouse gases are not identified as residual effects.

The following subsections describe mitigation for the following potential Project effects on the atmospheric environment from:

- Change in ambient criteria air contaminant concentrations; and
- Change in greenhouse gas emissions.

6.5.3.1 Mitigation Measures for Change in Ambient Criteria Air Contaminant Concentrations

The primary measure to mitigate a change in ambient criteria air contaminant concentrations is to reduce the potential for generation of CACs through the implementation of the Air Quality and Greenhouse Gas Management Plan (Chapter 33, Section 33.4.1.1). Specific mitigation measures, as organized by mitigation hierarchy level, may include, but not be limited to:

1. Avoid:
    - Material handling activities throughout the life of mine will be scheduled to limit durations of exposed soils and to avoid dust-generating activities during windy periods, where possible;
    - Dust generation from mining activities and equipment will be contained through the application of standard emission control measures (e.g., fabric covers for the coal stockpiles and conveyors, a dust extraction system on the rail loadout bin) to intercept dust;
    - Clean coal storage at the rail loadout will be enclosed in a covered structure to avoid release of dust and particulate matter; and
    - Regular inspections will be conducted to monitor air quality and dust control measures are effective and functioning properly, which will allow for timely maintenance and adjustments as required.
2. Minimize:
    - The layout of the site has been designed to minimize travel distances between operations (e.g., between the pits and the Coal Handling Process Plant) in order to reduce vehicle travel distances and speeds that would result in additional generation of CAC emissions;
    - Enforcement of low speed limits for vehicular traffic throughout the site;
    - Unpaved roads will be regularly maintained and kept in good repair, including regular compaction and use of coarse aggregate with low silt content, where possible;
    - Paved roads will be cleaned, as required, to minimize dust;
    - Water or dust suppression methods will be used during dry periods from May to November to mitigate dust generation in areas including unpaved roads, work areas, and storage piles;
    - Establish and follow site Soil Management Plan (Chapter 33, Section 33.4.1.9);
    - Soil stockpiles will be placed at appropriate locations, and soil stored and shaped to be stable and reduce moisture content loss;
    - Inspect and maintain all vehicles and combustion equipment per manufacturer recommendations and operate within regulatory requirements;
    - Idling of equipment and vehicles will be minimized as much as possible. If required, cabin heaters may be added to vehicles and equipment to minimize idling of on-site vehicles and equipment during cold weather conditions; and
    - Apply a dustbinder chemical solution to the rail cars after filling to mitigate dust during the mine to port journey.

3. Restore On-Site:
    - Progressive reclamation and revegetation will occur throughout the mine life to minimize wind erosion potential and reduce the Project footprint, minimizing the potential for dust generation.

Monitoring and adaptive management will be used to validate the efficacy of the proposed mitigation measures through the implementation of the Air Quality and Greenhouse Gas Management Plan (Chapter 33, Section 33.4.1.1). However, with these mitigation measures in place, there is still a potential for a residual effect to air quality as a result of changes in ambient criteria air contaminant concentrations.

6.5.3.2 Mitigation Measures for Change in Greenhouse Gas Emissions

The primary measure to mitigate a change in greenhouse gas emissions is to reduce the potential for generation of GHGs through the implementation of the Air Quality and Greenhouse Gas Management Plan (Chapter 33, Section 33.4.1.1). Specific mitigation measures, as organized by mitigation hierarchy level, may include, but not be limited to:

1. Avoid:
    - Plant design utilizing hyperbaric driers to avoid high GHG generation from thermal dryers; and
    - Investigate use of electric vehicles, including for clean coal haul, to avoid some fleet GHG emissions.
2. Minimize:
    - The layout of the site has been designed to minimize travel distances between operations (e.g., between the pits and the Coal Handling Process Plant) in order to reduce vehicle travel distances and speeds that would result in additional generation of GHG emissions;
    - Enforcement of low speed limits for vehicular traffic throughout the site;
    - Use low sulphur gasoline, diesel fuel, and fuel oil in Project-related mobile equipment and other combustion sources;
    - Inspect and maintain all vehicles and combustion equipment per manufacturer recommendations and operate within regulatory requirements; and
    - Limit long-term idling; where possible.
3. Restore On-Site:
    - Progressive reclamation and revegetation will occur throughout the mine life to reduce the Project footprint and minimize the temporary loss of carbon sinks.

Monitoring and adaptive management will be used to validate the efficacy of the proposed mitigation measures through the implementation of the Air Quality and Greenhouse Gas Management Plan. However, with these mitigation measures in place, there is still a potential for a residual effect to the atmospheric environment as a result of changes in greenhouse gas emissions.

6.5.3.3 Summary of Mitigation Measures for Changes in Air Quality and Greenhouse Gas Emissions

The key mitigation measures proposed to mitigate potential effects on the atmospheric environment are summarized in Table 6.5-3. Anticipated residual effects that will be carried forward in the characterization of residual effects, significance, and likelihood and confidence are outlined in Table 6.5-3.

Table 6.5-3: Summary of Proposed Mitigation Measures related to the Atmospheric Environment

Potential Effect	Key Mitigation Measure(s)	Rationale	Applicable Project Phase(s)	Effectiveness	Residual Effect
Change in Ambient Criteria Air Contaminant Concentrations	• The layout of the site has been designed to minimize travel distances in order to reduce vehicle travel distances and speeds that would result in additional generation of CAC emissions • Limit CAC emissions through the application of standard industry practices and emissions control measures • Conduct regular inspections on control measures for effective and proper functioning • Limit the mine disturbance footprint through Project design and progressive reclamation	• Emission control measures (e.g., fabric covers, dust suppression) are standard industry practice and proven to be effective • Regular inspection of emission control measures and vehicles and other combustion equipment allows for timely repairs and adjustments as required • Minimizing the Project footprint, particularly exposed soils, minimizes potential wind erosion and dust generation	• Construction and Pre-Production • Operations • Reclamation and Closure	Moderate	Yes
Change in Greenhouse Gas Emissions	• Use of hyperbaric drying rather than thermal drying • Enforcement of low speed limits for vehicular traffic throughout the site • Inspect and maintain all vehicles and combustion equipment per manufacturer recommendations and operate within regulatory requirements • Limit long-term idling; where possible • Limit the mine disturbance footprint through Project design and progressive reclamation	• GHG emission control measures (e.g., optimizing travel routes and speeds limits, limiting idling) are standard industry practice and proven to be effective • Regular inspection of vehicles and other combustion equipment allows for timely repairs and adjustments as required • Minimizing the Project footprint minimizes the temporary loss of natural carbon sinks	• Construction and Pre-Production • Operations • Reclamation and Closure	Moderate	Yes

Mitigation measures proposed to reduce adverse effects to the atmospheric environment are generally accepted, understood, and proven to effectively reduce adverse effects on the atmospheric environment. Given that changes in air quality and greenhouse gas emissions cannot be completely avoided, the overall effectiveness of the proposed mitigations to address a change in ambient criteria air contaminant concentrations and a change in greenhouse gas emissions are rated as moderate. Where mitigation measures do not or may not mitigate all effects or if there is a low level of confidence in their effectiveness, the effect was carried forward for further analysis of residual effects.

If monitoring indicates that the effectiveness of mitigation measures is lower than predicted, further mitigation may be required as per adaptive management strategies outlined in the Air Quality and Greenhouse Gas Management Plan (Chapter 33, Section 33.4.1.1).

6.5.4 Characterization of Residual Effects, Significance, Likelihood, and Confidence

Based on the evaluation of potential Project effects on the atmospheric environment and related mitigation, potential residual effects that may remain after implementation of proposed mitigation measures include:

- Change in ambient criteria air contaminant concentrations; and
- Change in greenhouse gas emissions.

6.5.4.1 Assessment Methods

6.5.4.1.1 Emissions Estimation Methodology

An emissions inventory was prepared for the Project to quantify air contaminant emissions associated with the Project. As described in Section 6.2.3.4, a review of air quality emissions over the entire Project timeframe determined that the eleventh year of mine operation (Year 13 of the Project) would represent the most conservative operating scenario with respect to Project air quality impact. This operational year represents a worst-case scenario for air quality with the most air quality related Project activities (e.g., combustion, fugitive road dust generation) and operations in closest proximity to local receptors. A review of GHG emissions over the entire Project timeframe determined that the tenth year of mine operations (Year 12 of the Project) would capture the most conservative operating scenario with respect to Project GHG impacts. This operational year represents a worst-case scenario for GHG with the most GHG-related Project activities (e.g., combustion equipment). The mitigation measures have been incorporated in the source emission estimates and therefore the air dispersion modelling assessment represents mitigated results.

Available data from NWP and equipment manufacturers and the most appropriate emission models and factors available to date were used to compile the emissions inventory. Details on the emissions quantification used to predict Project emissions are provided in the Air Quality and Greenhouse Gas Assessment (Dillon, 2021; Appendix 6-C). The emissions inventory includes the following emissions sources:

- Locomotive engine;
- Emergency generators;
- Blasting and explosive detonation;

- Blast hole drilling;
- Conveyor belt system;
- Rail loading;
- Stockpile and screening drop;
- Truck loading;
- Bulldozing – coal;
- Bulldozing – overburden;
- Grading;
- Stockpile wind erosion;
- Rail car spray bar;
- Coal cleaning plant steam boiler;
- Feeder breaker;
- Natural gas-fired comfort heating;
- Unpaved roads; and
- Mobile equipment.

6.5.4.1.2 Air Dispersion Modelling Methodology

Dispersion modelling of Project emissions was completed to align with the B.C. AQDMG (2015). The modelling approach for the assessment was submitted in the Project Dispersion Modelling Plan.

The CALMET/CALPUFF dispersion modelling system was used to predict the expected concentrations of CACs and dustfall due to the Project. CALPUFF model version 7.2.1, level 150618, CALMET model version 6.5.0, level 150223, and CALPOST model version 7.1.0, Level 141010 were used for modelling. Modelling configuration parameters were selected to align with the B.C. AQDMG (2015). The selection of non-default modelling parameters were made in consultation with ENV.

Atmospheric dispersion modelling was conducted using the CALPUFF dispersion model. Local measured meteorological data (described in Section 6.4.1.2.2) as well as ENV recommended prognostic Weather Research and Forecasting (WRF) provincial dataset run by Exponent were used in the assessment. CALMET was configured to predict meteorological conditions for a 3-year period from January 1, 2013 to December 31, 2015. CALMET was configured according to ENV recommended settings. Model results are presented for the maximum predicted concentrations at gridded receptors and at selected sensitive receptors in the Atmospheric LSA and Atmospheric RSA such as residences, campgrounds, and recreation sites.

A 30 km by 40 km subset of the CALMET domain was used for the CALPUFF modelling to encompass the Atmospheric LSA, and an 86.5 km by 146.5 km domain was used to encompass the Atmospheric RSA. The Atmospheric LSA domain uses a grid resolution of 200 m and comprises 150 grid cells in the X direction, 200 cells in the Y direction, and 10 cells in the vertical direction. The Atmospheric RSA domain uses a grid resolution of 500 m and comprises 173 grid cells in the X direction, 293 cells in the Y direction, and 10 cells in the vertical direction.

The domain resolution and other configurations were set according to the B.C. AQDMG or to model defaults. Detailed CALMET/CALPUFF model configurations are presented in the Air Quality and Greenhouse Gas Assessment (Dillon, 2021; Appendix 6-C).

6.5.4.1.3 Receptor Locations

A nested receptor grid encompassing the Atmospheric LSA and Atmospheric RSA was used in accordance with the B.C. AQDMG. The receptor grid includes the municipalities of Sparwood and Elkford and represents the area in which air quality impacts are most likely to occur. Specifically, receptors were included as follows:

- 20 m receptor spacing along the Project boundary;
- 50 m spacing within 500 m of the Project boundary;
- 250 m spacing within 2 km of the Project boundary;
- 500 m spacing within 5 km of the Project boundary; and
- 1,000 m spacing beyond 5 km of the Project boundary.

Receptors within the Project footprint were not considered, as per standard dispersion modelling practice. The gridded receptors for the air modeling assessment is shown on Figure 6.5-2. A total of 17,200 discrete receptors were generated for the Atmospheric LSA, and an additional 4,312 discrete receptors were included in the Atmospheric RSA. Note that the 1,000 m receptor spacing extends to cover the entire Atmospheric RSA but is not shown to preserve figure resolution.

In addition to the gridded receptors discussed above, sensitive receptors were included to represent points of interest within the Atmospheric LSA and Atmospheric RSA. The sensitive receptor IDs, locations, and descriptions are provided in Table 14 of Appendix 6-C. The location of identified sensitive receptors within the Atmospheric LSA are shown in Figure 6.5-3. A total of 405 unique sensitive receptors representing residences, schools, campgrounds, recreational sites, and culturally significant locations were selected for the air quality modeling assessment, including 143 sensitive receptors in the Atmospheric LSA and 262 sensitive receptors in the Atmospheric RSA. Combined with the gridded receptors, the total number of receptors modelled in the Atmospheric LSA was 17,343, and 4,574 within the Atmospheric RSA.

Receptor locations were selected based on a desktop review, site visits, and input from ENV. The maximum contaminant concentrations and dustfall deposition rates were predicted at all selected sensitive receptors based on Project activity, as well as with the inclusion of baseline concentrations. In addition, the frequency of exceedance of any relevant air quality objectives was evaluated for each sensitive receptor.

6.5.4.1.4 Data Analysis

The predicted ambient air quality maximum ground-level concentrations for each CAC was compared against the most stringent applicable air quality criteria (refer to Table 6.2-4). For all contaminants with ambient air quality objectives, the frequency of exceedance of applicable standards are also assessed for each sensitive receptor. The frequency of exceedance is calculated based on the number of exceedances (hours) of each corresponding objective (e.g., $PM_{2.5}$) which occurs at each receptor location for the entire modelling period (2013 to 2015; 26,280 hours).

Post processing was performed on the predicted NOx concentrations to convert to NO_2 using the NO_2/NOx ratio developed from ambient monitoring data, following the ambient ratio method (ARM) approach described in the B.C. AQDMG. The CALPUFF dispersion modelling was conducted separately for the Atmospheric LSA and RSA due to different computational and receptor grids.

Crown Mountain Coking Coal Project

Figure 6.5-2
Air Quality Assessment Receptor Grid

LEGEND

Receptor Grid

- Project Footprint Outline, 20m Spacing
- Buffer 500m, 50m Spacing
- Buffer 2km, 250m Spacing
- Buffer 5km, 500m Spacing
- RSA Extent, 1000m Spacing
- Atmospheric Local Study Area
- Atmospheric Regional Study Area
- Project Footprint
- Highway
- Arterial/Collector Road
- Local/Resource Road
- Railway
- Transmission Line
- Watercourse
- Waterbody
- Wetland
- Provincial Park/Protected Area
- British Columbia/Alberta Border

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Scale 1:135,000

Map Drawing Information:
Data Provided By NWP Coal Canada Ltd, Dillon Consulting Limited, Province of British Columbia GeoBC Open Data, Government of Alberta Open Data, Natural Resource Canada.
Imagery Provided By GeoBC OrthoImagery (Aug 2016).

Map Created By: LMM
Map Checked By: LKD
Map Coordinate System: NAD 1983 UTM Zone 11N

NWP Coal Canada Ltd

Project: 12-6231
Status: FINAL
Date: 2021-12-02

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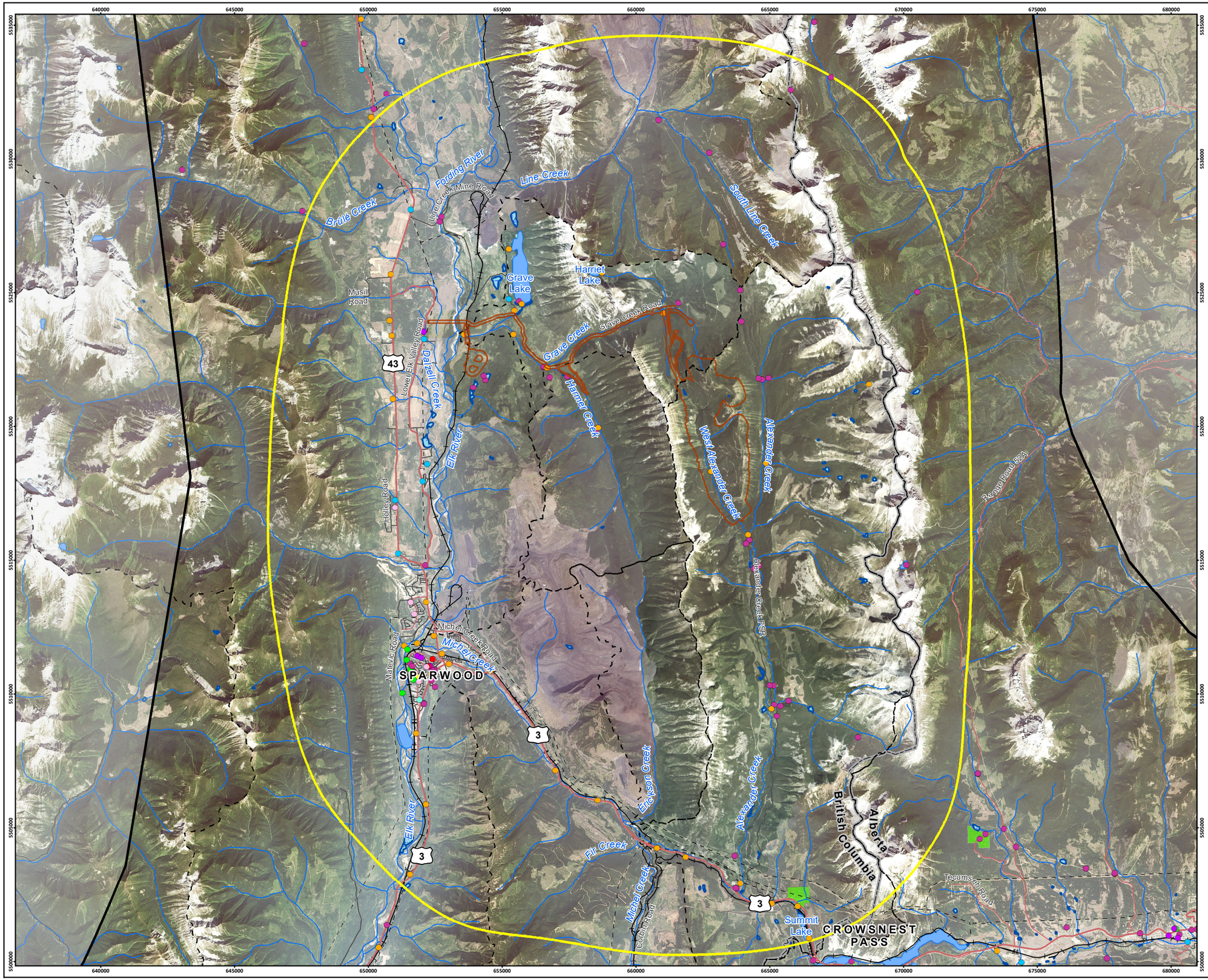

Crown Mountain Coking Coal Project

Figure 6.5-3
Air Quality Assessment Sensitive Receptor Locations

LEGEND

- Day Care
- Hospital
- Park
- Place of Worship
- Recreation
- Residence
- School
- Senior Centre
- Other
- Atomspheric Local Study Area
- Atomspheric Regional Study Area
- Project Footprint
- Highway
- Arterial/Collector Road
- Local/Resource Road
- Railway
- Transmission Line
- Watercourse
- Waterbody
- Wetland
- Provincial Park/Protected Area
- British Columbia/Alberta Border

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Scale 1:135,000

Map Drawing Information:
Data Provided By NWP Coal Canada Ltd, Dillon Consulting Limited, Province of British Columbia GeoBC Open Data, Government of Alberta Open Data, Natural Resource Canada.
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6.5.4.2 Potential Residual Effects Assessment

6.5.4.2.1 Change in Ambient Criteria Air Contaminant Concentrations

Dispersion modelling results are presented for the maximum predicted concentrations at gridded receptors and each selected sensitive receptors in the Atmospheric LSA and Atmospheric RSA such as residences, campgrounds, and recreation sites. Maximum predicted dustfall deposition and concentrations of TSP, PM_{10}, $PM_{2.5}$, CO, NO_2, SO_2, and VOCs, with and without existing baseline contributions, are presented in this section. The model results presented include the implementation of applicable mitigation measures (e.g., fugitive dust control).

Among the 405 sensitive receptors selected for the air quality assessment, the predicted maximum concentrations of PM and CACs at a number of sensitive receptors in the Atmospheric LSA are predicted to be above the applicable air quality objectives, although the majority of receptors within the Atmospheric LSA were within the applicable air quality objectives. The maximum predicted concentrations of all modelled contaminants at the Atmospheric RSA receptors are below the corresponding air quality objectives.

The following subsections characterize the effects of the Project on ambient air quality for each of the CACs. The maximum predicted CAC concentrations in the Atmospheric LSA and Atmospheric RSA are summarized in Table 6.5-4. For brevity, comparisons to the relevant CAAQS are included only for the 2020 CAAQS for NO_2 and SO_2; comparison to the future 2025 CAAQS are included in Appendix 6-C. Full model results and frequencies of exceedances by all sensitive receptors are presented in Appendix D of Appendix 6-C.

NO_2

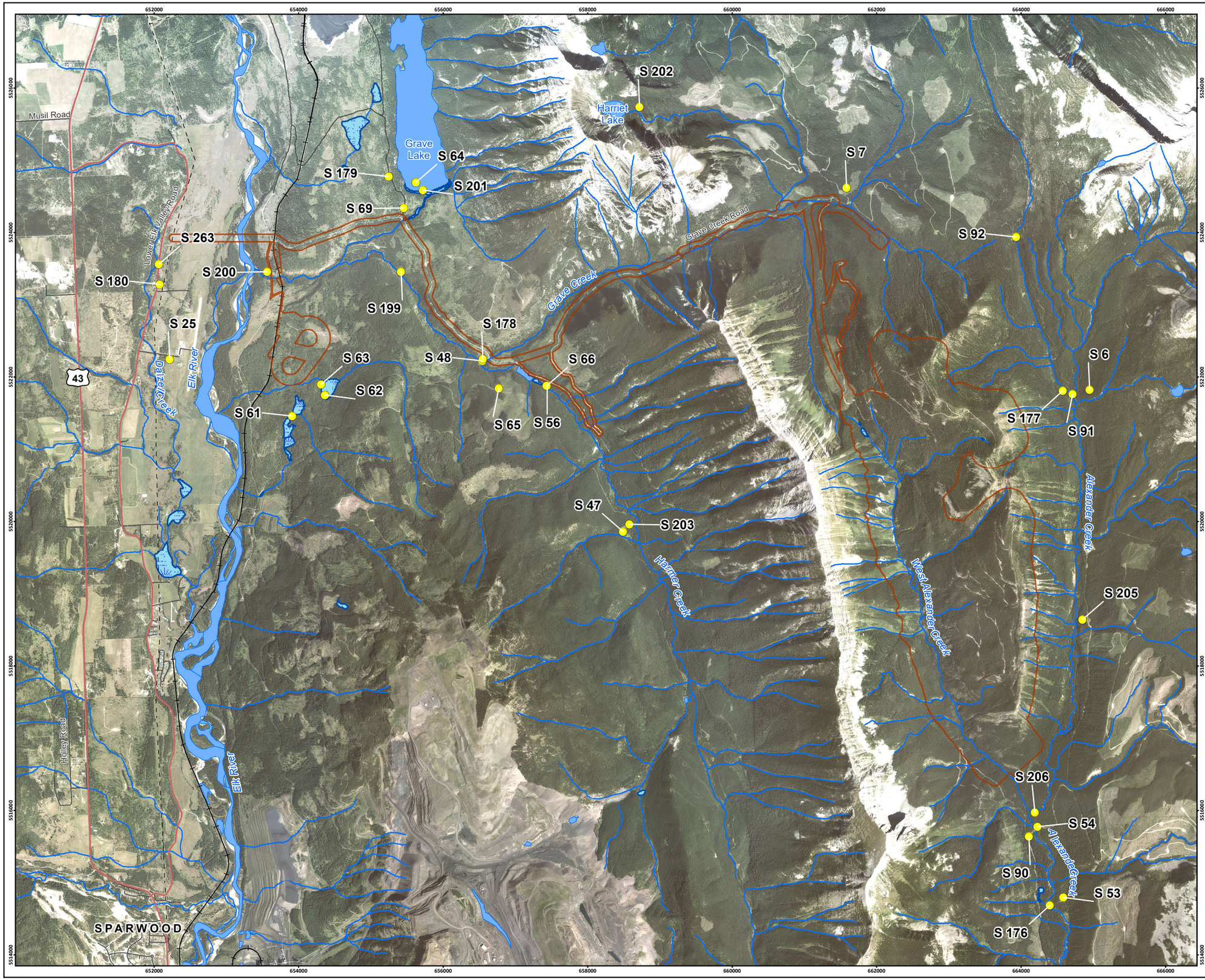
Predicted maximum 1-hour concentrations of NO_2 are below the objectives at 94.3% of the locations modelled (Table 6.5-4). The overall maximum predicted hourly concentration of 285 µg/m^3 exceeds the objective of 113 µg/m^3; however, for receptors with exceedances, the average exceedance frequency accounts for only 1.7% of the modelling period. The predicted maximum NO_2 concentrations with the background contribution exceed the 1-hour objective at 23 receptors in the Atmospheric LSA (Table 6.5-5). Receptors with predicted exceedances of any air quality objectives with greater than a 1% frequency are shown in Figure 6.5-4. Of these receptors, six are predicted to have exceedances of the 1-hour NO_2 objective as presented in Table 6.5-5. Receptor S 200, a sensory and human health receptor located to the northwest of the rail loadout (Figure 6.5-4), was predicted to exceed the 1-hour objective most frequently, with exceedances expected 23.9% of the time. Exceedances at the other five locations with exceedances greater than 1% of the time are predicted to occur less than 5% of the time.

Predicted maximum annual average NO_2 concentrations are below the objective at all locations modelled (Table 6.5-4). The maximum predicted annual concentration of 31.9 µg/m^3, which includes a background of 7.4 µg/m^3, is 99.6% of the annual objective.

Table 6.5-4: Predicted Overall Maximum Air Contaminant Ground-Level Concentrations in the Atmospheric RSA Resulting from Project Activities

Contaminant	Averaging Period	Concentrations (µg/m^3) and Dust Deposition Rate (mg/dm^2/d)				% of Receptors Exceeding Objective		Maximum Frequency of Exceedance (%)		Average Exceedance Frequency for Receptors with Exceedances (%)	
		Most Stringent Objective	Background Concentration	Maximum Predicted Concentration (Project Only)	Maximum Predicted Concentration (Project + Background)	Project	Project +Background	Project	Project + Background	Project	Project + Background
NO_2	1-hour	113	29.4	255	285	2.2	5.7	10	24	1.2	1.7
	Annual	32	7.4	24.5	31.9	0	0	0	0	0	0
SO_2	1-hour	183	2.4	5	7	0	0	0	0	0	0
	Annual	13	0.8	0	1	0	0	0	0	0	0
CO	1-hour	14,300	647.6	920	1,568	0	0	0	0	0	0
	8-hour	5,500	786.9	595	1,382	0	0	0	0	0	0
TSP	24-hour	120	59.9	2,306	2,366	5.9	7.7	100	100	12	16
	Annual	60	15.2	623	638	1.5	1.5	100	100	100	100
PM_{10}	24-hour	50	28.7	813	842	7.2	13.1	100	100	11	14
$PM_{2.5}$	24-hour	25	19.7	96	116	2.2	11.9	45	100	6	10
	Annual	8	5.2	22	27	0.5	1.2	100	100	67	100
Dustfall	30-Day	-	-	10.7	11.7	-	-	-	-	-	-
VOCs	-	-	-	75	-	-	-	-	-	-	-

Notes:
1. Exceedances are highlighted in bold.
2. The frequency of exceedance is calculated based on the number of exceedances (hours) of each corresponding objective that occurs at each receptor location for the entire modelling period (2013 to 2015; 26,280 hours).
3. VOCs are not further assessed due to the lack of AAQOs.
4. Ozone is a secondary pollutant and is not emitted directly. It has thus not been modelled.



Crown Mountain Coking Coal Project

Figure 6.5-4
Sensitive Receptors with Greater than 1% Exceedance Frequencies of Criteria Air Contaminant Objectives

LEGEND

- Sensitive Receptor
- Project Footprint
- Highway
- Arterial/Collector Road
- Local/Resource Road
- Railway
- Transmission Line
- Watercourse
- Waterbody
- Wetland
- British Columbia/Alberta Border

0 1 2
Kilometers

N W E S

Scale 1:50,000

Map Drawing Information:
Data Provided By NWP Coal Canada Ltd, Dillon Consulting Limited, Province of British Columbia GeoBC Open Data, Government of Alberta Open Data, Natural Resource Canada.
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Table 6.5-5: Frequency of 1-hour NO_2 Objective Exceedances at Sensitive Receptors in the Atmospheric LSA

Sensitive Receptor ID	Frequency of 1-hour NO_2 Exceedances	Sensitive Receptor Description
S 25	1.75%	Airport
S 48	2.26%	Unofficial campsite
S 54	0.01%	Trapline
S 56	0.004%	Unofficial campsite
S 61	2.20%	Hunting
S 62	0.12%	Hunting
S 63	0.19%	Hunting
S 64	0.02%	Campground
S 65	0.03%	Unofficial campsite
S 66	0.01%	Unofficial campsite
S 69	4.33%	Crown
S 90	0.01%	Great Divide Trail/Waypoints
S 178	2.81%	Unofficial campsite
S 179	0.02%	Residence
S 180	0.33%	Residence
S 199	0.84%	Sensory and human health
S 200	23.86%	Sensory and human health
S 201	0.10%	Sensory and human health
S 205	0.01%	Sensory and human health
S 206	0.03%	Sensory and human health
S 263	0.23%	School
N 366	0.02%	N/A
N 368	0.01%	N/A

SO_2

Predicted maximum 1-hour and annual average SO_2 concentrations were all well below the objectives at all locations modelled (Table 6.5-4). The maximum predicted hourly concentration of 7 µg/m^3 is 3.8% of the objective and the maximum predicted annual concentration of 1 µg/m^3 is 7.7% of the objective.

CO

Predicted maximum 1-hour and 8-hour average CO concentrations were both well below the objectives at all locations modelled (Table 6.5-4). The maximum predicted hourly concentration of 1,568 µg/m^3, which includes a background of 647.6 µg/m^3, is 11.0% of the objective and the maximum predicted 8-hour concentration of 1,382 µg/m^3, which includes a background of 786.9 µg/m^3, is 25.1% of the objective.

Particulates

A total of 53 receptors in the Atmospheric LSA are predicted to have exceedances for one or more particulate matter objectives (TSP, PM_{10}, and/or $PM_{2.5}$; Table 6.5-6).

TSP

Predicted maximum 24-hour average TSP concentrations are below the objective at 92.3% of the locations modelled (Table 6.5-4). The overall maximum predicted daily concentration of 842 µg/m^3 exceeds the objective of 120 µg/m^3; however, for receptors with exceedances, the average exceedance frequency accounts for only 16% of the modelling period. The predicted maximum TSP concentrations with the background contribution exceed the 24-hour objective at 31 receptors in the Atmospheric LSA (Table 6.5-6). Receptors with predicted exceedances of any air quality objectives with greater than a 1% frequency are shown in Figure 6.5-4. Of these receptors, 25 are predicted to have exceedances of the 24-hour TSP objective as presented in Table 6.5-6 more than 1% of the time. Receptor S 200, a sensory and human health receptor located to the northwest of the rail loadout (Figure 6.5-4), was predicted to exceed the 24-hour objective most frequently, with exceedances expected 100% of the time. Receptor S 200 was identified by the Ktunaxa Nation Council as a representative location of a possible Indigenous seasonal dwelling. There is currently no dwelling at this location, and NWP will remain in communication with Indigenous land-users to better understand their potential use of this location and what, if any, mitigations might be appropriate in the future, should the location become occupied during the Project life.

Predicted maximum annual TSP concentrations are below the objectives at 98.5% of locations modelled (Table 6.5-4). The overall maximum predicted annual concentration is 638 µg/m^3, which exceeds the objective of 60 µg/m^3. For receptors with exceedances, the average exceedance frequency accounts for 100% of the modelling period; however, there are only six receptors that exceed the annual standard for TSP (Appendix D of Appendix 6-C). These receptors are all located within approximately 300 m of the haul road.

PM_{10}

Predicted maximum 24-hour average PM_{10} concentrations are below the objective at 86.9% of the locations modelled (Table 6.5-4). The overall maximum predicted daily concentration of 2,366 µg/m^3 exceeds the objective of 50 µg/m^3; however, for receptors with exceedances, the average exceedance frequency accounts for only 14% of the modelling period. The predicted maximum PM_{10} concentrations with the background contribution exceed the 24-hour objective at 53 receptors in the Atmospheric LSA (Table 6.5-6). Receptors with predicted exceedances of any air quality objectives with greater than a 1% frequency are shown in Figure 6.5-4. Of these receptors, 31 are predicted to have exceedances of the 24-hour PM_{10} objective as presented in Table 6.5-6 more than 1% of the time. Receptor S 200, the sensory and human health receptor located to the northwest of the rail loadout described above (Figure 6.5-4) was predicted to exceed the 24-hour objective most frequently, with exceedances expected 100% of the time.

$PM_{2.5}$

Predicted maximum 24-hour average $PM_{2.5}$ concentrations are below the objective at 88.1% of the locations modelled (Table 6.5-4). The overall maximum predicted daily concentration of 116 µg/m^3 exceeds the objective of 25 µg/m^3; however, for receptors with exceedances, the average exceedance frequency accounts for only 10% of the modelling period. The predicted maximum $PM_{2.5}$ concentrations with the background contribution exceed the 24-hour objective at 48 receptors in the Atmospheric LSA (Table 6.5-6). Receptors with predicted exceedances of any air quality objectives with greater than a 1% frequency are shown in Figure 6.5-4. Of these receptors, 29 are predicted to have exceedances of the 24-

hour $PM_{2.5}$ objective as presented in Table 6.5-6 more than 1% of the time. Receptor S 200, the sensory and human health receptor located to the northwest of the rail loadout described above (Figure 6.5-4) was predicted to exceed the 24-hour objective most frequently, with exceedances expected 100% of the time.

Predicted maximum annual $PM_{2.5}$ concentrations are below the objective at 98.8% of locations modelled (Table 6.5-4). The overall maximum predicted annual concentration is 27 µg/m^3, which exceeds the objective of 8 µg/m^3. For receptors with exceedances, the average exceedance frequency accounts for 100% of the modelling period. There are five receptors that exceed the annual objective for $PM_{2.5}$.

Table 6.5-6: Frequency of 24-hour TSP, PM_{10}, and $PM_{2.5}$ Objective Exceedances at Sensitive Receptors in the Atmospheric LSA

Sensitive Receptor ID	Frequency of 24-hour Exceedances			Sensitive Receptor Description
	TSP	PM_{10}	$PM_{2.5}$	
S 6	0.1%	3.4%	0.5%	Trapline Cabin
S 7	56.7%	79.4%	57.6%	Trapline Cabin
S 10	0.0%	0.1%	0.0%	Trapline Cabin
S 11	0.0%	0.3%	0.2%	Trapline Cabin
S 21	0.0%	0.1%	0.0%	Residence
S 25	18.5%	29.3%	6.4%	Airport
S 47	0.2%	2.2%	1.5%	Recreation
S 48	64.7%	65.7%	49.0%	Unofficial campsite
S 49	0.0%	0.5%	0.2%	Unofficial campsite
S 50	0.0%	0.1%	0.1%	Unofficial campsite
S 53	2.0%	10.3%	7.0%	Unofficial campsite
S 54	5.8%	18.6%	14.6%	Trapline
S 56	13.9%	19.5%	9.3%	Unofficial campsite
S 61	4.6%	12.0%	5.7%	Hunting
S 62	3.1%	8.9%	3.1%	Hunting
S 63	4.0%	10.4%	4.0%	Hunting
S 64	4.6%	8.8%	3.6%	Campground
S 65	20.6%	26.3%	14.5%	Unofficial campsite
S 66	14.2%	20.1%	9.3%	Unofficial campsite
S 69	36.8%	42.2%	14.5%	Crown
S 89	0.0%	0.1%	0.1%	Great Divide Trail/Waypoints
S 90	7.0%	20.1%	18.3%	Great Divide Trail/Waypoints
S 91	0.1%	5.0%	1.0%	Great Divide Trail/Waypoints
S 92	0.1%	2.5%	0.5%	Great Divide Trail/Waypoints
S 93	0.0%	0.7%	0.2%	Great Divide Trail/Waypoints
S 94	0.0%	0.2%	0.0%	Great Divide Trail/Waypoints

Sensitive Receptor ID	Frequency of 24-hour Exceedances			Sensitive Receptor Description
	TSP	PM_{10}	$PM_{2.5}$	
S 115	0.0%	0.1%	0.1%	Great Divide Trail
S 143	0.0%	0.4%	0.2%	Trans Canada Trail
S 153	0.0%	0.3%	0.2%	Trans Canada Trail
S 176	2.2%	11.1%	8.6%	Unofficial campsite
S 177	0.3%	6.9%	1.3%	Unofficial campsite
S 178	70.3%	70.2%	57.4%	Unofficial campsite
S 179	7.7%	15.2%	5.8%	Residence
S 180	6.6%	14.6%	3.5%	Residence
S 181	0.0%	0.4%	0.0%	Residence
S 184	0.0%	0.1%	0.0%	Recreation
S 199	38.9%	42.6%	23.7%	Sensory and human health
S 200	100.0%	100.0%	100.0%	Sensory and human health
S 201	4.6%	8.5%	3.7%	Sensory and human health
S 202	1.9%	4.5%	2.8%	Sensory and human health
S 203	0.1%	2.3%	1.3%	Sensory and human health
S 205	2.6%	21.6%	15.0%	Sensory and human health
S 206	5.8%	19.4%	14.7%	Sensory and human health
S 210	0.0%	0.1%	0.1%	Sensory and human health
S 263	5.3%	12.2%	3.5%	School
S 416	0.0%	0.8%	0.2%	N/A
N 364	0.0%	0.8%	0.2%	N/A
N 365	0.0%	0.2%	0.1%	N/A
N 366	0.0%	0.5%	0.2%	N/A
N 367	0.0%	0.6%	0.2%	N/A
N 368	0.0%	0.2%	0.1%	N/A
N 376	0.0%	0.2%	0.2%	N/A
N 377	0.0%	0.3%	0.2%	N/A

Notes:
1. Receptors S3, S4, S196, N413, N414 are located on the edge of CALPUFF computational domain so their locations have been slightly adjusted.
2. Receptors S198, S208, S347, N415 are located within the Project footprint and thus excluded from reporting.
3. Receptors S60, S73, S136, S241, S267, S268, and S275 are duplicate receptors and thus excluded from reporting.

Spatial Distribution of Sensitive Receptors with >1% Exceedance Frequencies of Criteria Air Contaminants Objectives

Sensitive receptors with greater than 1% of exceedance frequencies of air quality objectives are located close to the Project footprint boundary. Of these, Receptor S 202 is the furthest away from the Project footprint boundary (approximately 2 km; Figure 6.5-4). All other receptors with greater than 1% of exceedance frequency of air quality objectives are located within 2 km of the Project footprint boundary.

Consequently, no measurable transboundary effects on air quality in Alberta, the U.S.A., or on federal lands are anticipated as a result of the Project.

6.5.4.2.2 Change in Greenhouse Gas Emissions

Annual GHG emissions were quantified over the life of the Project, specifically, the CO_2, CH_4, and N_2O emissions generated from on-site activities. The existing conditions in the Project footprint result in 0.001 Mt CO_2e/year of carbon sequestration due to baseline tree cover. Carbon sequestration by forested areas has been taken into account in annual Project emissions. The total GHG emissions from each operational year are provided in Table 6.5-7. Total annual emissions presented in tonnes of carbon dioxide equivalents (CO_2e) were calculated to establish a worst-case emissions year. It was determined that the Project's tenth operational year (Year 12) yielded the highest total GHG emissions, a total of 414,572 tonnes of CO_2e (0.41 Mt CO_2e). As such, Year 12 was used as a comparison year for both Provincial and Federal Sectoral Totals (ECCC, 2021c).

A summary of GHG emissions from Year 12 for each emission source category is provide in Table 6.5-8. Further details are provided in the Air Quality and Greenhouse Gas Assessment (Dillon, 2021; Appendix 6-C). Fugitive emissions from coal production, processing, transmission, and distribution, and post-mining coal storage and handling represented the highest proportion of emissions in Year 12 (140,720 tonnes CO_2e). Mobile equipment combustion emissions from South Pit represent the second highest proportion of emissions in Year 12 (98,223 tonnes CO_2e), followed by mobile equipment combustion emissions from the haul road (68,866 tonnes CO_2e; Table 6.5-8). Forest sequestration represents a carbon sink of -286 tonnes CO_2e in Year 12. The existing conditions at the Project site result in 0.001 Mt CO2e of carbon sequestration due to the baseline tree cover. Carbon sequestration by forested areas has been taken into account in annual Project emissions.

Table 6.5-7: Greenhouse Gas Annual Emissions Summary for Construction and Pre-Production and Operations

Year	GHG Emission Rate (tonnes/year)			
	CO_2	CH_4	N_2O	CO_2e
1	10,595	0.29	0.24	10,675
2	30,478	1.32	0.85	30,762
3	194,658	5,638	9.05	338,311
4	210,565	5,639	9.51	354,377
5	186,617	5,638	8.79	330,182
6	224,428	5,640	9.93	368,380
7	244,622	5,641	10.54	388,782
8	264,722	5,642	11.14	409,090
9	244,147	5,641	10.52	388,300
10	246,862	5,641	10.60	391,042
11	249,450	5,641	10.67	393,658

Year	GHG Emission Rate (tonnes/year)			
	CO_2	CH_4	N_2O	CO_2e
12	270,157	5,642	11.28	414,572
13	267,613	5,642	11.21	412,001
14	267,027	5,642	11.19	411,409
15	204,562	5,639	9.30	348,302
16	258,059	5,642	10.94	402,356
17	157,468	5,636	7.91	300,734
17+	Not defined			

Note:
BOLD values indicate the highest emissions (worst-case operating year)

Table 6.5-8: Summary of Greenhouse Gas Emissions by Source for Year 12 of Operations (Worst-Case Operating Year)

Emissions Source Category	Source Description	GHG	Tonnes Emitted per Year	Total CO_2e Emitted per Year
Locomotive Combustion	Locomotive engine emissions	CO_2	10,304	11,463
		CH_4	0.58	
		N_2O	3.84	
Mobile Equipment (Mining and Plant Site)	Mobile equipment combustion emissions from haul road	CO_2	68,159	68,866
		CH_4	3.55	
		N_2O	2.08	
	Mobile equipment combustion emissions from South Pit	CO_2	97,214	98,223
		CH_4	5.06	
		N_2O	2.96	
	Mobile equipment combustion emissions from Mine Rock Storage Facility (Years 8-12)	CO_2	63,244	63,901
		CH_4	3.29	
		N_2O	1.93	
	Mobile equipment combustion emissions from Rail Load Out	CO_2	2,789	2,818
		CH_4	0.15	
		N_2O	0.09	
	Mobile equipment combustion emissions from plant site	CO_2	4,957	5,008
		CH_4	0.26	
		N_2O	0.15	

Emissions Source Category	Source Description	GHG	Tonnes Emitted per Year	Total CO_2e Emitted per Year
Generator Emissions	Diesel generators for the CHPP, Office, and Shop	CO_2	30.76	30.8
		CH_4	3.20E-04	
		N_2O	9.20E-05	
CHPP Boiler Emissions	CHPP natural gas fired boiler	CO_2	11,612	11,636
		CH_4	0.22	
		N_2O	0.06	
Natural Gas-Fired Comfort Heating Emissions	Unit heats, exhaust fans, and make-up air units in the CHPP, Overland Surge Bin, and Rejects Bin	CO_2	9,346	9,402
		CH_4	0.18	
		N_2O	0.17	
Blasting and Explosive Detonation Emissions	Blasting and explosive detonation in South Pit	CO_2	2,730	2,730
Mobile Equipment (Clearing and Logging)	Mobile equipment combustion emissions from skidders, fellers, log trucks, and loaders	CO_2	57.79	58.73
		CH_4	2.49E-03	
		N_2O	2.91E-03	
Fugitive Emissions	Fugitive emissions from coal production, processing, transmission, and distribution, and post-mining coal storage and handling	CH_4	5,629	140,720
Forest Sequestration	Carbon sequestration by forested areas. Accounts for baseline tree cover, expected deforestation, and projected reforestation	CO_2	-286	-286

The best available estimate of B.C.'s GHG emissions is provided in the ECCC NIR. A review of the 2019 GHG emission summaries from the ECCC NIR show that B.C. and Canada have an annual total GHG emission of 65.7 Mt CO_2e and 730 Mt CO_2e, respectively. The worst-case GHG emission year (Year 12) represents a reasonable estimate of future peak GHGs from the Project and accounts for 0.41 Mt CO_2e based on 2019 levels. This peak would result in 0.63% and 0.06% of B.C.'s and Canada's total emission profiles, respectively.

A review of the 2019 GHG emission summaries from the ECCC NIR show that the B.C. and Canada coal production sectors have an annual total GHG emission of 2.0 Mt CO_2e and 3.0 Mt CO_2e, respectively. The worst-case GHG emission year for the Project would result in 20.7% and 13.8% of B.C.'s and Canada's total coal production emission profiles, respectively. The reported coal production emissions are based on actual production and operations in 2019, while the worst-case GHG emissions year for the Project are based on maximum production and operation capacity. The comparison of maximum production and operation emissions versus actual overestimates the Project's emissions contributions; however, this approach provides a notably conservative GHG emissions scenario.

6.5.4.3 Characterization of Residual Effects

The assessment of residual effects on the atmospheric environment involves the consideration and evaluation of specific effects assessment criteria based on the degree (i.e., 'level') of potential Project effects. Criteria used to characterize residual effects are defined in Chapter 5, Section 5.3.4.5 and include duration, magnitude, geographic extent, frequency, reversibility, and context.

6.5.4.3.1 Change in Ambient Criteria Air Contaminant Concentrations

The residual effect to a change in ambient criteria air contaminant concentrations arising from the Project is characterized as follows:

- Duration: Long-term, criteria air contaminant emissions will be produced at the Project site for the duration of the Construction and Pre-Production, Operations, and Reclamation and Closure phases.
- Magnitude: High, maximum 1-hour concentrations of NO_2, maximum 24-hour concentrations of TSP, PM_{10}, and $PM_{2.5}$, and annual maximum concentrations of TSP and $PM_{2.5}$ exceed the B.C. AAQOs at some sensitive receptor locations, based on Year 13 emissions. However, criteria air contaminant emissions will likely decrease after Year 13, which represents the worst-case scenario for air emissions.
- Geographic Extent: Local, exceedances of air quality objectives will be restricted to within the Project footprint and up to approximately 2 km beyond the Project footprint, but exceedances are not expected to occur at other locations within the Atmospheric LSA.
- Frequency: Regular to continuous, sources of criteria air contaminant emissions will operate on a regular basis, and exceedances of the B.C. AAQOs 1-hour objectives for NO_2 and 24-hour objectives for TSP, PM_{10}, and $PM_{2.5}$ will regularly or continuously occur at some sensitive receptor locations.
- Reversibility: Reversible long-term, criteria air contaminant emissions will be produced at the Project site for the duration of the Construction and Pre-Production, Operations, and Reclamation and Closure phases, but as the site is reclaimed and closed, ambient air quality will gradually return to levels similar to baseline concentrations.
- Context: Neutral, baseline air quality is influenced by other anthropogenic sources and criteria air contaminant emissions will be produced at the Project site for the duration of the Construction and Pre-Production, Operations, and Reclamation and Closure phases, but once mine operations have ceased, ambient air quality is anticipated to gradually return to levels similar to baseline concentrations.

Determination of Significance

The residual effect of a change in ambient criteria air contaminant concentrations from the Project is considered not significant. The dispersion modelling completed for the Project based on the worst-case scenario for air emissions predicted some exceedances of the B.C. AAQOs for maximum 1-hour concentrations of NO_2, maximum 24-hour concentrations of TSP, PM_{10}, and $PM_{2.5}$, and annual maximum concentrations of TSP and $PM_{2.5}$ at up to 53 localized sensitive receptor locations in the Atmospheric LSA, mostly concentrated within 2 km of the Project footprint where no permanent residences exist; while it is possible that people or wildlife could be occasionally exposed to such levels, a continuous exposure would not be expected. Exceedances occurring more frequently than 1% of the modelling period were predicted at up to 31 sensitive receptor locations in the Atmospheric LSA, out of 143 sensitive receptor

locations. The maximum distance from the sensitive receptors with exceedances frequency greater than 1% of the modelling period to the Project footprint is approximately 2 km (i.e., Receptor S 202). All receptors located more than 2 km from the Project footprint are either predicted with exceedances below 1% frequency or below corresponding air quality objectives. Therefore, while exceedances may occur nearby, exceedances are not expected to be widespread in most of the Atmospheric LSA.

The greatest source of fugitive dust in the Project footprint is mobile equipment fugitive emissions from the unpaved haul road (Appendix B of Appendix 6-C). The dispersion modelling assumes the worst-case scenario and does not account for periods of rain or snow, which will alleviate localized dust concentrations. Based on the 1981 to 2010 Canadian Climate Normals station data for Sparwood, there are approximately 39 days with precipitation amounts greater than 5 mm per year (Government of Canada, 2019), or approximately 11% of the year. In addition, monthly snowfall amounts greater than 25 cm and daily average temperatures below freezing occur from November to the end of March in Sparwood, approximately 150 days or approximately 41% of the year. During this period, the haul road is anticipated to be covered in hard packed snow for the majority of the time, thus reducing or eliminating the generation of fugitive dust emissions from the haul road. As such, the frequency of exceedances of objectives at the sensitive receptors is anticipated to be lower than what was predicted by the conservatism built into the model. In addition to the inherent conservatisms in the model itself, the conservative approach built into the emissions estimation and emissions inventory by considering the worst-case year of emissions in the life of the Project (Year 13), combined with the low population density of the area, support the determination of a not significant effect.

Based on these results and the analyses that precede this section, with the proposed mitigation and environmental protection measures, the residual effect to the atmospheric environment from a change in ambient criteria air contaminant concentrations during all phases of the Project is rated not significant Elevated concentrations at some receptors beyond objectives will require further monitoring and follow-up and adaptive management, further details are provided in the Follow-up Strategy in Section 6.7.

Likelihood and Confidence

Effects that are determined to be not significant do not require a characterization of likelihood.

Confidence considers the reliability of data and analytical methods used in the assessment of effects. The confidence in the characterization of the residual effect on the atmospheric environment from a change in ambient criteria air contaminant concentrations from the Project has a low level of confidence, as all air contaminant emissions were estimated using conservative emission factors, assumptions, and activity levels. A follow-up program to monitor ambient air quality and validate emission rates will improve this level of confidence.

6.5.4.3.2 Change in Greenhouse Gas Emissions

The residual effect of a change in greenhouse gas emissions arising from the Project is characterized as follows:

- Duration: Long-term, greenhouse gas emissions will be produced at the Project site for the duration of the Construction and Pre-Production and Operations phases.

- Magnitude: Moderate, Project GHG emissions will range from between 10,000 and 500,000 tonnes CO_2e per annum. Worst-case scenario Project GHG emissions will account for a 0.63% increase in total provincial GHG emissions and a 0.06% increase in total national GHG emissions.
- Geographic Extent: Beyond regional, Project GHG emissions will contribute to global GHG concentrations.
- Frequency: Continuous, GHGs will continuously be emitted from the Project site for the duration of the Construction and Pre-Production and Operations phases.
- Reversibility: Reversible long-term to irreversible, GHGs released into the atmosphere by the Project may be gradually removed by natural sinks.
- Context: Neutral, worst-case scenario Project GHG emissions will account for a 0.63% increase in total provincial GHG emissions and a 0.06% increase in total national GHG emissions. After mixing, there will be no measurable difference to global GHG emissions as a result of the Project.

Determination of Significance

The residual effect of a change in greenhouse gas emissions from the Project is considered not significant. The results of the GHG assessment indicate that the future peak GHG emissions are estimated to be less than 1% of the annual provincial emissions and less than 0.1% compared to the annual federal emissions. Under the Climate Change Accountability Act (2007), the Province of B.C. is committed to reducing GHG emissions by 16% below 2007 levels by 2025, 40% by 2030, 60% by 2040, and 80% by 2050. A review of the 2007 GHG emission summary from the 2007 ECCC NIR (ECCC, 2021c) showed that B.C. had an annual total GHG emission of 63.1 Mt CO_2e. The future peak of potential GHG emissions from the Project result in 0.66% of B.C.'s total emissions from 2007. The Project lifespan is for 15 years and is expected to be fully decommissioned prior to 2050. Therefore, any increases in GHG emissions from the Project will cease prior to the 2050 provincial target. After atmospheric mixing, there will be no measurable difference to global GHG emissions as a result of the Project.

As per the 2003 Federal-Provincial-Territorial Committee on Climate Change and Environmental Assessment guidance, where GHG emissions are considered to be either "medium" or "high", a GHG Management Plan must be prepared. The GHG Management Plan is included in the Air Quality and Greenhouse Gas Management Plan (Chapter 33, Section 33.4.1.1).

Likelihood and Confidence

Effects that are determined to be not significant do not require a characterization of likelihood.

Confidence considers the reliability of data and analytical methods used in the assessment of effects. The confidence in the characterization of the residual effect on the atmospheric environment from a change in greenhouse gas emissions from the Project has a high level of confidence, as all GHG emissions were estimated using conservative emission factors, assumptions, and activity levels.

6.5.4.4 Summary of Residual Effects Assessment

Residual effects and the selected mitigation measures, characterization criteria, likelihood, significance determination, and confidence are summarized in Table 6.5-9. There are no significant residual effects to the atmospheric environment anticipated as a result of the Project.

Table 6.5-9: Summary of Residual Effects on the Atmospheric Environment

Residual Effect	Project Phase(s)	Mitigation Measures	Summary of Residual Effects Characterization	Significance (Significant, Not Significant)	Confidence (High, Moderate, Low)
Change in Ambient Criteria Air Contaminant Concentrations	• Construction and Pre-Production • Operations • Reclamation and Closure	• The layout of the site has been designed to minimize travel distances in order to reduce vehicle travel distances and speeds that would result in additional generation of CAC emissions • Limit CAC emissions through the application of standard industry practices and emissions control measures • Conduct regular inspections on control measures for effective and proper functioning • Limit the mine disturbance footprint through Project design and progressive reclamation	Duration: Long-term Magnitude: Moderate to High Geographic Extent: Local Frequency: Regular to continuous Reversibility: Reversible long-term Context: Neutral	Not Significant	Low
Change in Greenhouse Gas Emissions	• Construction and Pre-Production • Operations	• Utilize hyperbaric drying • Enforcement of low speed limits for vehicular traffic throughout the site • Inspect and maintain all vehicles and combustion equipment per manufacturer recommendations and operate within regulatory requirements • Limit long-term idling; where possible • Limit the mine disturbance footprint through Project design and progressive reclamation	Duration: Long-term Magnitude: Moderate Geographic Extent: Beyond regional Frequency: Continuous Reversibility: Reversible long-term to irreversible Context: Neutral	Not Significant	High

6.6 Cumulative Effects Assessment

Cumulative environmental effects are the result of Project residual environmental effects interacting with the effects of other past, present, and reasonably foreseeable future projects or activities to produce a combined/overlapping effect. The objective of the cumulative effects assessment is to consider overlapping effects for all residual adverse effects, not only those predicted to be significant (EAO, 2013). The assessment of cumulative effects on the air quality and greenhouse gas VCs requires that:

- The Project results in a residual adverse environmental effect on the VC;
- A residual Project effect interacts cumulatively with effects from other projects or activities (i.e., an effect of the Project overlaps spatially and temporally with those of other projects or activities that have been or will be carried out);
- The other projects or activities have been or will be carried out and are not hypothetical; and
- The cumulative effect is likely to occur.

Further information regarding the cumulative effects assessment methodology is provided in Chapter 5, Section 5.3.5.

6.6.1 Overview of Residual Effects

A cumulative effects assessment is required for the air quality and GHG VCs because there is a possibility that the following potential Project residual effects may remain after implementation of proposed mitigation measures:

- Change in ambient criteria air contaminant concentrations; and
- Change in greenhouse gas emissions.

6.6.2 Assessment Boundaries

6.6.2.1 Spatial Boundaries

The assessment of cumulative air quality and GHG effects was conducted at a regional scale and was confined to the Atmospheric RSA described in Section 6.2.3.1.

6.6.2.2 Temporal Boundaries

The temporal boundaries for the cumulative effects assessment are the same as those for Project effects, as defined in Section 6.2.3.2.

6.6.2.2.1 Use of Temporal Cases

The temporal cases used in the assessment of cumulative effects are described as follows:

1. Base Case – Describes the current status of the VC prior to the start of the Project, including all appropriate past and present projects and/or activities. The Base Case for air quality and GHG emissions is presented in the existing conditions (Section 6.4), with explicit reference to the fact that the Base Case generally reflects the contributions of past and present projects and/or activities;

2. Project Case – Describes the status of the air quality and GHG VCs with the Project in place, over and above the Base Case. This is represented by the Project effects assessment presented in Section 6.5; and
3. Future Case – Describes the status of the air quality and GHG VCs as a result of the Project Case in combination with all reasonably foreseeable future projects and/or activities that could be carried out.

6.6.2.3 Administrative Boundaries

No additional administrative boundaries were considered in the cumulative effects assessment beyond those described in Section 6.2.3.3.

6.6.2.4 Technical Boundaries

The technical boundaries for the cumulative effects assessment are associated to constraints imposed on the assessment due to limitations in the ability to predict the effects of the Project (EAO, 2013).

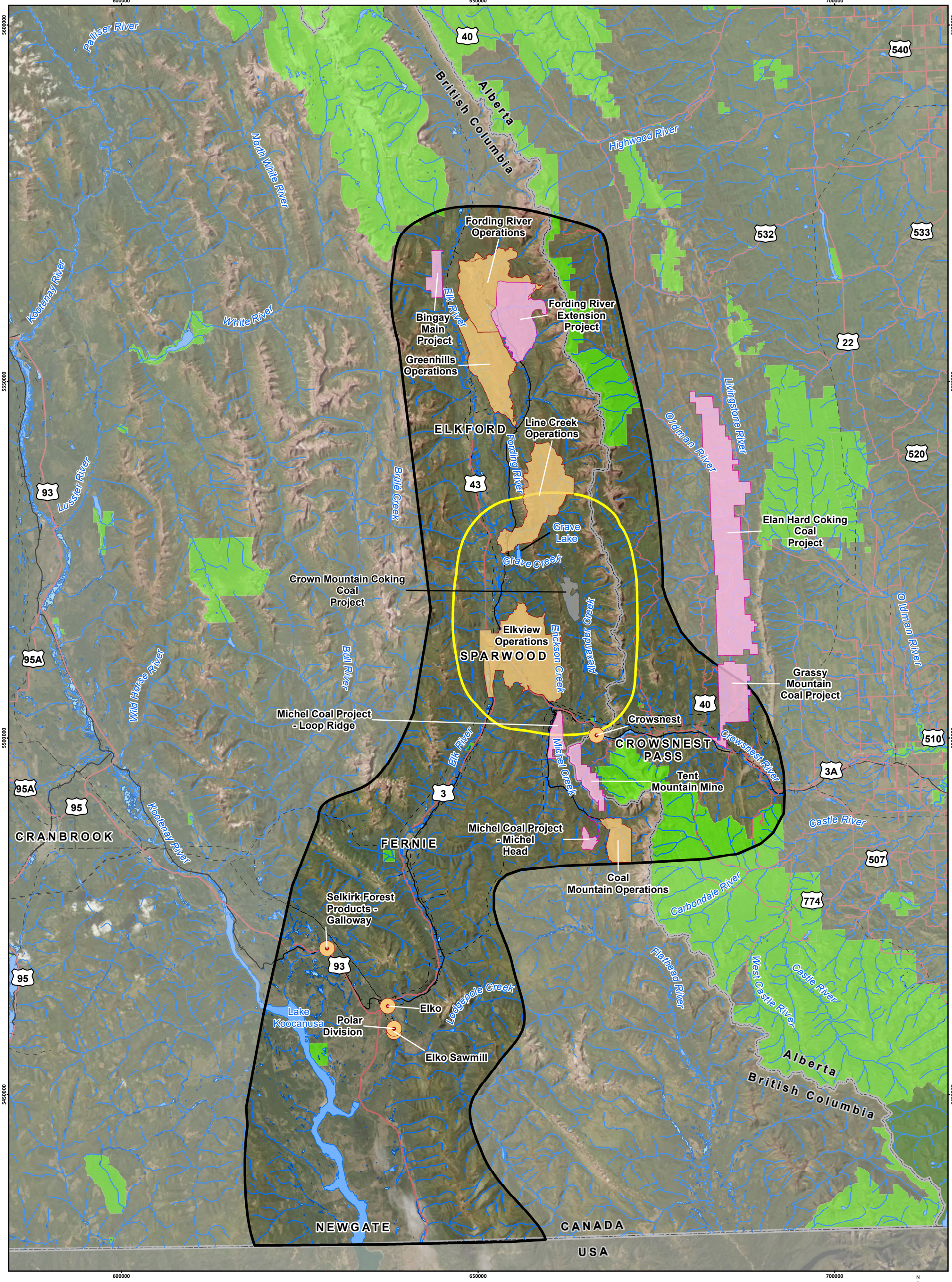
For the purpose of the cumulative effects assessment for air quality, the technical boundaries, in addition to those described in Section 6.2.3.4, relate to constraints with respect to available data for other reasonably foreseeable projects/activities. No information is publicly available on the predicted CAC or GHG emissions for other reasonably foreseeable future projects or activities in the Atmospheric RSA with the exception of the proposed Grassy Mountain Coal Project; therefore, it was not possible to conduct a quantitative Future Case cumulative effects assessment.

6.6.3 Identifying Past, Present, and Reasonably Foreseeable Future Projects and/or Activities

Descriptions of the past, present, and reasonably foreseeable projects and/or activities for consideration in the cumulative effects assessment are provided in Chapter 5, Section 5.3.5.3. A summary of the past, present, and reasonably foreseeable projects or activities that are expected to interact with air quality and/or GHG emissions, with a potential for adverse cumulative effects, is provided Table 6.6-1. Locations of the past, present, and reasonably foreseeable future projects or activities are shown in Figure 6.6-1.

As noted in Chapter 5, Section 5.3.5.3, the following projects were considered as past, present, or reasonably foreseeable future projects and/or activities in the cumulative effects assessment but were not included:

- Coal Mountain Phase 2 as the environmental assessment was placed on hold by Teck Coal Limited in 2016;
- Mount Brussilof (Baymag Mine) by Baymag due to no temporal overlap;
- Barnes Lake Phosphate Exploration Project by Fertoz International Inc. given that the project is in exploration phase and no project has been proposed; and
- Cabin Ridge Coal by Warburton Group is in exploration and no project has been proposed.



Crown Mountain Coking Coal Project

Figure 6.6-1
Present or Reasonably Foreseeable Future Projects or Activities in the Atmospheric Regional Study Area

LEGEND

- Present Projects or Activities Locations
- Present Projects or Activities Footprints
- Reasonably Foreseeable Future Projects and Activities
- Atmospheric Regional Study Area
- Atmospheric Local Study Area
- Crown Mountain Coking Coal Project
- Highway
- Railway
- Transmission Line
- Watercourse
- Waterbody
- Wetland
- Provincial Park/Protected Area
- National Park
- British Columbia/Alberta Border

0 10 20
Kilometres

Scale 1:500,000

Map Drawing Information:
Data Provided By NWP Coal Canada Ltd, Dillon Consulting Limited, Province of British Columbia GeoBC Open Data, Government of Alberta Open Data, Natural Resource Canada. Imagery Provided By ESRI.

Map Created By: LMM
Map Checked By: LKD
Map Coordinate System: NAD 1983 UTM Zone 11N

NWP Coal Canada Ltd

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Document Path: \\42dillon\CAD\GIS\2012 and Prior\126231 Crown Mountain\EA_Report\CumulativeEffects\AirMeteorology\126231_CE_AQM_PresentorRFFuturePorActivitiesintheAtmosphericRSA.mxd

Table 6.6-1: Air Quality and Greenhouse Gas Interactions Matrix for Potential Cumulative Effects

Past, Present, or Reasonably Foreseeable Future Projects or Activities	Ranking of Potential Cumulative Effect		Justification / Rationale
	Change in Ambient Criteria Air Contaminant Concentration	Change in Greenhouse Gas Emissions	
Past or Present Projects and/or Activities that Have Been Carried Out			
Natural Resource Extraction – Mining (past)	I	I	Air quality and GHG emissions from past mining projects are reflected in baseline conditions and are therefore implicitly considered in the assessment of cumulative effects.
Coal Mountain Operations	II	II	Current/ongoing mining operations have a potential for contributing to adverse cumulative effects on ambient criteria air contaminant concentrations and GHG emissions within the Atmospheric RSA through the release of CACs and GHGs. The Coal Mountain Operations is rated lower than the other existing coal mine operations in the Elk Valley because it is no longer operational and has been on care and maintenance since 2019.
Elkview Operations	III	III	
Line Creek Operations	III	III	
Fording River Operations	III	III	
Greenhills Operations	III	III	
Kootenay West Mine	I	I	The Kootenay West Mine Project does not spatially overlap with the Atmospheric RSA.
Elkhorn Quarry West (Windermere Mining Operations)	I	I	The Elkhorn Quarry West Project does not spatially overlap with the Atmospheric RSA.
Energy - Elko Dam	I	I	The Elko Dam is not anticipated to contribute to adverse cumulative effects on ambient criteria air contaminant concentrations and GHG emissions within the Atmospheric RSA because it is a currently non-operational hydroelectric generating station.
Koocanusa Reservoir	I	I	The Koocanusa Reservoir is not anticipated to contribute to adverse cumulative effects on ambient criteria air contaminant concentrations and GHG emissions within the Atmospheric RSA because it is a preexisting anthropogenic reservoir with little potential to directly or directly affect the atmospheric environment.
Marten Phosphate Project	I	I	The Marten Phosphate Project is not expected to substantially contribute to adverse cumulative effects on ambient

Past, Present, or Reasonably Foreseeable Future Projects or Activities	Ranking of Potential Cumulative Effect		Justification / Rationale
	Change in Ambient Criteria Air Contaminant Concentration	Change in Greenhouse Gas Emissions	
			criteria air contaminant concentrations and GHG emissions within the Atmospheric RSA because the footprint is small and current underground extraction is limited to bulk sample removal.
Forestry	I	I	Ongoing forestry activities have the potential to contribute to adverse cumulative effects on GHG emissions within the Atmospheric RSA through the removal of natural carbon sinks (i.e., forests). However, replanting of cutblocks is anticipated to partially offset the impacts of deforestation on GHG emissions.
Energy - Pipelines	II	I	Pipelines operated by Foothills Pipe Lines Ltd. in the Atmospheric RSA report emissions of NO_2, CO, PM_{10}, and $PM_{2.5}$ to the National Pollutant Release Inventory and therefore have the potential to contribute to cumulative effects on ambient criteria air contaminant concentrations. Existing pipelines are not expected to substantially contribute to GHG emissions within the Atmospheric RSA as GHG reporting is not required for these facilities, meaning they emit less than 10,000 tonnes of GHGs in carbon dioxide equivalent units (CO_2e) per year.
Energy - Electrical Transmission	I	I	Past and present electrical transmission projects/activities are not expected to substantially contribute to adverse cumulative effects on ambient criteria air contaminant concentrations and GHG emissions within the Atmospheric RSA because there is minimal interaction of transmission lines the atmospheric environment.
Transportation	I	I	Past and present transportation projects/activities are not expected to substantially contribute to adverse cumulative effects on ambient criteria air contaminant concentrations and GHG emissions within the Atmospheric RSA

Past, Present, or Reasonably Foreseeable Future Projects or Activities	Ranking of Potential Cumulative Effect		Justification / Rationale
	Change in Ambient Criteria Air Contaminant Concentration	Change in Greenhouse Gas Emissions	
			because there are environmental best practices for highway maintenance activities and rail operations that are anticipated to minimize the potential for environmental effects.
Recreation and Tourism	I	I	Past and present projects/activities related to recreation and tourism are not expected to substantially contribute to adverse cumulative effects on ambient criteria air contaminant concentrations and GHG emissions within the Atmospheric RSA because recreational activities are not anticipated to result in measurable quantities of CAC or GHG emissions.
Commercial, Residential, and Industrial Use	II	I	Industrial facilities that produce wood products in the Atmospheric RSA report emissions of NO_2, CO, TSP, PM_{10}, and $PM_{2.5}$ to the National Pollutant Release Inventory and therefore have the potential to contribute to cumulative effects on ambient criteria air contaminant concentration. These existing operations are not expected to substantially contribute to GHG emissions within the Atmospheric RSA as GHG reporting is not required for these facilities, meaning they emit less than 10,000 tonnes of GHGs in carbon dioxide equivalent units (CO_2e) per year.
Parks and Protected Areas	I	I	Past and present projects/activities related to parks and protected areas are not expected to substantially contribute to adverse cumulative effects on ambient criteria air contaminant concentrations and GHG emissions within the Atmospheric RSA because land use within these areas is not anticipated to result in measurable quantities of CAC or GHG emissions. Parks and protected areas may also act as carbon sinks in the Atmospheric RSA.
Agriculture	I	I	Past and present agriculture projects/activities are not expected to substantially contribute to adverse

Past, Present, or Reasonably Foreseeable Future Projects or Activities	Ranking of Potential Cumulative Effect		Justification / Rationale
	Change in Ambient Criteria Air Contaminant Concentration	Change in Greenhouse Gas Emissions	
			cumulative effects on ambient criteria air contaminant concentrations and GHG emissions within the Atmospheric RSA because agricultural land use is not anticipated to result in measurable quantities of CAC or GHG emissions.
Natural Processes or Events	I	I	Past and present natural processes or events are reflected in baseline conditions and are therefore implicitly considered in the assessment of cumulative effects.
Reasonably Foreseeable Future Projects and/or Activities That Will Be Carried Out			
Michel Coal Project	III	III	The proposed Michel Coal Project would contribute to ambient criteria air contaminant concentrations and GHG emissions in the Atmospheric RSA during construction, operation, and decommissioning.
Grassy Mountain Coal Project	III	III	The proposed Grassy Mountain Coal Project would contribute to ambient criteria air contaminant concentrations and GHG emissions in the Atmospheric RSA during construction, operation, and decommissioning.
Tent Mountain Mine	III	III	The proposed Tent Mountain Mine would contribute to ambient criteria air contaminant concentrations and GHG emissions in the Atmospheric RSA during construction, operation, and decommissioning.
Fording River Extension Project	III	III	The proposed Fording River Extension Project would contribute to ambient criteria air contaminant concentrations and GHG emissions in the Atmospheric RSA during construction, operation, and decommissioning.
Bingay Main Project	III	III	The proposed Bingay Main Project would contribute to ambient criteria air contaminant concentrations and GHG emissions in the Atmospheric RSA during construction, operation, and decommissioning.

Past, Present, or Reasonably Foreseeable Future Projects or Activities	Ranking of Potential Cumulative Effect		Justification / Rationale
	Change in Ambient Criteria Air Contaminant Concentration	Change in Greenhouse Gas Emissions	
Elan Hard Coking Coal Project	III	III	The proposed Elan Hard Coking Coal Project would contribute to ambient criteria air contaminant concentrations and GHG emissions in the Atmospheric RSA during construction, operation, and decommissioning.
Climate Change	I	I	Although GHG emissions from the Atmospheric RSA will contribute to global climate change, due to 34 year life of the Crown Mountain Coking Coal Project, climate change events are not anticipated to measurably affect GHG emissions in the Atmospheric RSA.
Natural Processes or Events	I	I	Future natural processes or events such as wildfires have the potential to affect local and regional ambient air quality and GHG concentrations. These impacts are anticipated to persist for short periods of time and to be fully reversible and as such are not considered further in the assessment of cumulative effects.

Notes:
I – Residual Project effects do not act cumulatively with those of other past, present, or reasonably foreseeable future projects and/or activities. Not carried forward in the assessment.
II – Residual Project effects act cumulatively with those of other past, present, or reasonably foreseeable future projects and/or activities, but are unlikely to result in significant cumulative effects; or residual Project effects act cumulatively with existing significant cumulative effects but the Project will not measurably contribute to these cumulative effects on the VC. Carried forward in the assessment.
III – Residual Project effects act cumulatively with those of other past, present, or reasonably foreseeable future projects and/or activities, and may result in significant cumulative effects; or residual Project effects act cumulatively with existing significant cumulative effects and the Project may measurably contribute to adverse changes in the state of the VC. Carried forward in the assessment.

6.6.4 Identification of Cumulative Effects

A review of past, present, and reasonably foreseeable future projects or activities was conducted to identify potential cumulative interactions for ambient criteria air contaminant concentrations and GHG emissions within the Atmospheric RSA. The results of the assessment are summarized as follows:

- Potential effects to ambient criteria air contaminant concentrations and GHG emissions from past mining projects are reflected in baseline conditions; therefore, these effects are implicitly considered in the Base Case for the assessment of cumulative effects;
- Existing and proposed linear infrastructure (i.e., electrical transmission and transportation) are not expected to result in a measurable contribution to adverse cumulative effects on ambient criteria air contaminant concentrations and GHG emissions and are thus not carried forward in the cumulative effects assessment;

- Ongoing forestry activities have the potential to contribute to adverse cumulative effects on GHG emissions within the Atmospheric RSA through the removal of natural carbon sinks (i.e., forests). However, replanting of cutblocks is anticipated to partially offset the impacts of deforestation on GHG emissions;
- Other land uses, including agriculture and recreation and tourism account for a very small proportion of the Atmospheric RSA and are not identified as having the potential to contribute substantially to adverse cumulative effects on ambient criteria air contaminant concentrations and GHG emissions and are thus not carried forward in the cumulative effects assessment; and
- The projects and activities identified as having a potential to interact cumulatively with the predicted residual Project effects primarily include the currently ongoing and proposed mining operations in the Atmospheric RSA. This is a conservative approach as emissions from some existing operations may already be captured in the baseline assessment.

The projects and activities with a potential to adversely contribute to cumulative effects on ambient criteria air contaminant concentrations and GHG emissions are summarized in Table 6.6-2.

Table 6.6-2: List of Projects and Activities with Potential to Adversely Contribute to Cumulative Effects on a Change in Ambient Criteria Air Contaminant Concentrations and Change in Greenhouse Gas Emissions

Project/Activity	Project Life	Proponent
Coal Mountain Operations	Care and Maintenance	Teck Coal Limited
Elkview Operations	Currently operating	Teck Coal Limited
Line Creek Operations	Currently operating	Teck Coal Limited
Fording River Operations	Currently operating	Teck Coal Limited
Greenhills Operations	Currently operating	Teck Coal Limited
Crowsnest	Currently operating	Foothills Pipe Lines Ltd.
Elko	Currently operating	Foothills Pipe Lines Ltd.
Elko Sawmill	Currently operating	Canadian Forest Products Ltd.
Polar Division	Currently operating	Canadian Forest Products Ltd.
Selkirk Forest Products - Galloway	Currently operating	Stella-Jones Inc.
Michel Coal Project	Proposed	North Coal
Fording River Extension Project	Proposed	Teck Coal Limited
Bingay Main Project	Proposed	Centermount Coal Ltd.
Tent Mountain Mine	Proposed	Montem Resources Alberta Operations Ltd.
Grassy Mountain Coal Project	Proposed	Benga Mining Limited
Elan Hard Coking Coal Project	Proposed	Atrum Coal

6.6.5 Mitigation for Cumulative Effects

The mitigation strategy developed for Project effects is also applicable to the cumulative effects on a change in ambient criteria air contaminant concentrations and change in greenhouse gas emissions. As described in Section 6.5.3, the mitigation measures include a combination of Project design features, procedures, and practices aimed at reducing or eliminating Project-related effects on ambient criteria air contaminant concentrations and GHG emissions. Existing and proposed mitigation measures for current coal mining operations and reasonably foreseeable projects in the Elk Valley are also described in this section.

Implementation of the operational practices and procedures that are prescribed in the Air Quality and Greenhouse Gas Management Plan (Chapter 33, Section 33.4.1.1) will be the primary means by which the Project will address adverse effects to ambient criteria air contaminant concentrations and GHG emissions.

Teck's four existing coal mine operations in the Elk Valley (Elkview, Line Creek, Fording River, and Greenhills) are required to maintain Fugitive Dust Management Plans per their site-specific permits (Christensen and Sawycky, 2020). As of March 2020, Teck Coal Mountain Operations maintains an Air Quality and Dust Control Management Plan as a voluntary commitment. In addition, the Environmental Management Act permits to discharge emissions to the air for the existing Teck coal mines in the Elk Valley require a Regional Air Monitoring Program (RAMP) and participation in a Regional Air Working Group to identify continual improvement opportunities for fugitive dust management. The RAMP requires ongoing assessment of the efficacy of monitoring and to provide annual reporting summarizing the state of air quality and meteorology in the Elk Valley. NWP intends to pursue participation in the RAMP and Regional Air Working Group, as a regional initiative.

As of 2020, Teck sites are updating their Fugitive Dust Management plans in consideration of the draft guidance released in joint by the B.C. Ministry of Energy, Mines and Petroleum Resources (EMPR) and ENV for Developing a Fugitive Dust Management Plan for Industrial Projects (2018).

No specific information is available regarding the mitigation measures in place for the existing Foothills Pipe Lines Ltd. Crowsnest and Elko natural gas pipelines, the Canadian Forest Products Ltd. Elko Sawmill or Polar Division, or the Stella-Jones Inc. Selkirk Forest Products – Galloway.

No specific air quality and GHG information has been provided to NWP to assess the contribution of the Michel Coal Project to cumulative effects. Based on information presented in the Revised Project Description (North Coal Limited [North Coal], 2018), North Coal is implementing strategies to reduce adverse impacts to ambient criteria air contaminant concentrations and GHG emissions, included but not limited to:

- All active haul roads will be sprayed with water, or water combined with dust suppression agents, where needed;
- During construction of topsoil/subsoil and rock piles, North Coal will build piles from the bottom up to minimize dust and manage the footprint;
- Dust suppressant sprays will be used throughout the coal production plant as needed;
- Use, where possible, construction equipment that will meet Tier 2 emission standards for non-road diesel engines (at a minimum);

- Implement regularly scheduled maintenance of all fossil fuel burning equipment and monitor fuel consumption;
- Reduce heating by appropriately insulating and operating all relevant facilities;
- Eliminate the use of a thermal dryer to dry coal;
- Investigate the potential to use bio-fuels to replace fossil fuels; and
- Reduce electrical demands via a comprehensive energy conservation program for all onsite buildings.

No specific air quality and GHG information has been provided to NWP to assess the contribution of the Fording River Extension Project to cumulative effects. Limited information is presented in the Initial Project Description in accordance with Schedule 1 of the Impact Assessment Act's Information and Management of Time Limits Regulations (Teck Coal Limited, 2020), but potential mitigation measures may include the implementation of an air quality and dust control plan, efficient operation of the vehicle fleet and equipment/coal dryer to minimize greenhouse gas emissions, and investigation of other options to reduce air emissions/ consideration of alternative technologies (e.g., electric vehicles).

No specific air quality and GHG information has been provided to NWP to assess the contribution of the Bingay Main Project to cumulative effects. Limited information is presented in the Updated Project Description (Centermount Coal Ltd., 2017); however, coal processing will include a breaker station with a dust collection system, and the rail loadout will include a dust control/suppression system.

No specific air quality and GHG information has been provided to NWP to assess the contribution of the Tent Mountain Mine to cumulative effects. Limited information is presented in the Project Description and Project Summary Table (Montem Resources Alberta Operations Ltd., 2021), although the document includes a commitment to adopt newer technologies to provide improvements over the previous operations at the site. In terms of mitigations for GHG emissions, the Tent Mountain Mine will use diesel equipment/vehicles that have low engine emission Levels meeting the U.S. EPA Tier 4 emission standards, resulting in less energy consumption and GHG emissions. In addition, the Processing Plant will not have a dryer, also resulting in less energy consumption and GHG emissions. Considering the Alberta and national emission inventories, the Project is estimated to account for 0.03% and 0.012% of the Alberta and national emission inventories respectively (Montem Resources Alberta Operations Ltd., 2021).
No specific air quality and GHG information has been provided to NWP to assess the contribution of the Grassy Mountain Coal Project to cumulative effects. According to the Environmental Impact Assessment Summary for the project (Benga Mining Limited, 2016), the primary sources of dust emissions will be from haul road activity and material handling. Mitigative measures to reduce emissions will include:

- The mine fleet will meet exhaust emissions from the U.S. EPA Tier 4 standards;
- Water will be systematically applied to haul roads and to the plant access road to minimize dust, and snow cover will be retained on the road as a mitigative measure during the winter months, where possible;
- Gravel or crushed rock will be used on the haul roads, as gravel is observed to produce less dust than clay and sandy surfaces;
- Use of a grader to maintain the active surface of the road;
- The mined areas will be reclaimed promptly and backfilled with overburden and soil from prestrip areas, and then covered by vegetation;

- The two coal processing plant modules 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;
- 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; and
- Benga will also investigate alternative ammonium nitrate/fuel oil (ANFO) formulations that reduce NOx emissions during blasting.

No specific air quality and GHG information has been provided to NWP to assess the contribution of the Elan Hard Coking Coal Project to cumulative effects. No information on mitigation for ambient criteria air contaminant concentrations is publicly available; however, Atrum Coal Limited has committed to reducing their carbon footprint through:

- Incorporating energy use reduction and efficiencies throughout the project life cycle;
- Exploring opportunities for alternative energy sources; and
- Minimizing carbon emissions with integration of financially viable, low carbon technologies (Atrum Coal Limited, 2020).

Ongoing and continued collaboration between project proponents, government, Indigenous groups, and other stakeholders is necessary to confirm that appropriate mitigation measures are adopted such that adverse cumulative effects on ambient criteria air contaminant concentrations and GHG emissions are minimized to a practical extent. Proactive mitigation strategies, monitoring programs, and data sharing are of critical importance that ambient air quality objectives (and potential future applicable GHG objectives) are met in the Elk Valley. In addition, NWP will actively seek out opportunities to collaborate on regional initiatives such as the RAMP, Regional Air Working Group, and similar initiatives aimed at finding collective solutions to local and regional ambient air quality and GHG emission concerns.

To determine whether additional mitigation measures are required to address potential cumulative effects to ambient criteria air contaminant concentrations and GHG emissions, a collaborative long-term air monitoring program will be implemented, subject to that approach being acceptable to other nearby proponents. Further details are provided in Section 6.7.

6.6.6 Characterization of Residual Cumulative Effects

The assessment of residual cumulative effects on a change in ambient criteria air contaminant concentrations and a change in greenhouse gas emissions involves the consideration and evaluation of specific effects assessment criteria based on the degree (i.e., 'level') of potential Project effects. Similar to the Project effects assessment, the criteria used to characterize residual effects include duration, magnitude, geographic extent, frequency, reversibility, and context, as defined in Chapter 5, Section 5.3.4.5. Given the technical boundaries and limitations discussed above, notably the lack of information on emissions and ambient air quality from other operating or proposed mines in the area, the characterization of residual cumulative effects shall be qualitative.

6.6.6.1 Change in Ambient Criteria Air Contaminant Concentrations

6.6.6.1.1 Base Case

The Base Case for ambient criteria air contaminant concentrations was established through an assessment of ambient air quality conditions at multiple locations in the Atmospheric LSA and Atmospheric RSA. The Base Case accounts for all past and present projects/activities, and is intended to serve as the baseline conditions for the assessment of cumulative effects on ambient criteria air contaminant concentrations. The Base Case for ambient criteria air contaminant concentrations is described in Section 6.4.1 and further detailed in the Air Quality Baseline Report (Appendix 6-A; Dillon, 2020a).

6.6.6.1.2 Project Case

The Project Case includes all past and present projects or activities which have the potential for contributing to adverse cumulative effects on ambient criteria air contaminant concentrations in the Atmospheric RSA (via the baseline conditions established for the Base Case) in combination with the effects of the Project. As listed in Table 6.6-2, there are multiple coal mining projects, pipelines, and wood products operations currently operating in the Elk Valley that have the potential to contribute to adverse cumulative effects on ambient criteria air contaminant concentrations.

The existing projects with available annual emissions data that may contribute to cumulative effects on ambient criteria air contaminant concentrations are summarized in Table 6.6-3. Emissions data were obtained from the 2019 National Pollutant Release Inventory (ECCC, 2021b). Annual emissions for the Project are based on the Project worst-case operational year for CAC emissions, Year 13.

Based on available emissions data from existing operations and predicted worst-case annual emissions for the Project, the Project has the potential to contribute up to 37.1% of NO_2, 17.5% of SO_2, 8.2% of CO, 9.7% of TSP, 5.7% PM_{10}, and 6.6% of $PM_{2.5}$ annual emissions in the Atmospheric RSA (Table 6.6-3). It should be noted that this is likely a considerable overestimate of Project Case emissions, as some existing operations are likely already captured in the Base Case scenario. In addition, as discussed in Section 6.5.1, the methodology used in the development of emissions estimates from the Project are generally thought to be very conservative (an overestimate) compared to actual emissions from modern equipment.

Table 6.6-3: Annual Criteria Air Contaminant Emissions from Present Projects in the Atmospheric RSA

Project Name	Sector	2019 Annual Emissions (tonnes/year)					
		NO_2	SO_2	CO	TSP	PM_{10}	$PM_{2.5}$
Fording River Operations	Mining	421	46	1,584	42,752	19,393	1,876
Greenhills Operations	Mining	260	-	652	20,007	7,624	927
Coal Mountain Operations	Mining	-	-	-	5,889	2,834	411
Elkview Operations	Mining	290	32	1,073	22,793	9,614	1,215

Project Name	Sector	2019 Annual Emissions (tonnes/year)					
		NO_2	SO_2	CO	TSP	PM_{10}	$PM_{2.5}$
Line Creek Operations	Mining	152	-	653	23,323	9,722	1,124
Crowsnest	Oil and Gas Pipelines	164	-	31	-	0.69	0.69
Elko	Oil and Gas Pipelines	279	-	70	-	0.51	0.51
Elko Sawmill	Wood Products	43	-	76	60	21	7.3
Polar Division	Wood Products	46	-	76	81	50	28
Selkirk Forest Products - Galloway	Wood Products	-	-	-	20	5.3	0.54
Crown Mountain Coking Coal Project	Mining	978	16.57	377	12,282	2,961	392
Total Project Case Emissions	-	2,633	95	4,592	127,207	52,226	5,982
Percent of Project Case Emissions Attributable to Crown Mountain Coking Coal Project	-	37.1	17.5	8.2	9.7	5.7	6.6

Note: "-"represents data were not available for the specified contaminant

The residual cumulative effects of a change in ambient criteria air contaminant concentrations in combination with the effects of other past and present projects or activities in the Atmospheric RSA (i.e., the Project Case) are characterized as follows:

- Duration: Long-term, emissions with the potential to contribute to adverse cumulative effects on ambient criteria air contaminant concentrations will be produced at the Project site for the duration of the Construction and Pre-Production, Operations, and Reclamation and Closure phases.
- Magnitude: Moderate to high, although estimated Project emissions have the potential to account for up to 37.1% of NO_2 and 17.5% of SO_2 emissions in the Atmospheric RSA, Project emissions of other modelled CACs will account for less than 10% of regional emissions. In addition, criteria air contaminant emissions from the Project will likely decrease after Year 13, which represents the worst-case scenario for air emissions.
- Geographic Extent: Regional, exceedances of air quality objectives will be restricted to within the Project footprint and up to approximately 2 km beyond the Project footprint in the Atmospheric RSA, but criteria air contaminant emissions from the Project have the potential to contribute to adverse cumulative effects on ambient criteria air contaminant concentrations at other locations within the Atmospheric RSA, although to a much lesser extent than near the Project footprint.

- Frequency: Continuous, the potential for adverse cumulative effects on ambient criteria air contaminant concentrations will be ongoing because the Project and current industrial operations in the Elk Valley are anticipated to discharge to the atmosphere continuously for the foreseeable future.
- Reversibility: Reversible long-term, criteria air contaminant emissions will be produced at the Project site for the duration of the Construction and Pre-Production, Operations, and Reclamation and Closure phases, but as the site is reclaimed and closed, ambient air quality will gradually return to levels similar to baseline concentrations.
- Context: Neutral, regional air quality is influenced by other anthropogenic sources and criteria air contaminant emissions will be produced at the Project site for the duration of the Construction and Pre-Production, Operations, and Reclamation and Closure phases, but once mine operations have ceased, ambient air quality is anticipated to gradually return to levels similar to baseline concentrations.

6.6.6.1.3 Future Case

The assessment of cumulative effects for a change in ambient criteria air contaminant concentrations under the Future Case considers the potential for overlapping of the Project effects with those of reasonably foreseeable future projects or activities. As discussed above, there are currently seven coal mining projects proposed in the Atmospheric RSA, including the Crown Mountain Coking Coal Project. Sufficient data are not available to facilitate a quantitative assessment of cumulative effects on ambient criteria air contaminant concentrations in the Atmospheric RSA in the Future Case. However, it is expected that each proposed mine operation will be required to implement appropriate mitigation strategies, including best available current technologies to minimize or eliminate effects on air quality.

As discussed in Section 6.6.5, current coal mining operations in the Elk Valley participate in a RAMP that includes requirements to monitor and assess ambient air quality in the Elk Valley. The monitoring stations included in the RAMP were chosen to provide a representative assessment of air quality and meteorology throughout the Elk Valley (Christensen and Sawycky, 2020). Data collected at the RAMP stations are compared to the B.C. AAQOs and CAAQS. It is anticipated that future projects in the Elk Valley will be required to participate in the RAMP so that ambient criteria air contaminant concentrations generally continue to be met at the monitoring stations.

The RAMP is limited to the Elk Valley, but reasonably foreseeable future projects outside the Elk Valley (i.e., in Alberta) also have the potential to overlap with effects from existing or reasonably foreseeable future projects in the Elk Valley through long-range transport of air pollutants. This assessment assumes that a regional monitoring program will be implemented in Oldman Watershed/Crowsnest Pass area so that relevant provincial and federal objectives are met in Alberta, in addition to the Elk Valley area.

The residual cumulative effects of a change in ambient criteria air contaminant concentrations in combination with the effects of other reasonably foreseeable future projects or activities in the Atmospheric RSA (i.e., the Future Case) are characterized as follows:

- Duration: Long-term, the cumulative change in criteria air contaminant concentrations as a result of the Project is detectable from Operations through Post-Closure, and has the potential to overlap with residual effects to criteria air contaminant concentrations from other reasonably foreseeable future projects or activities.

- Magnitude: Low to moderate, this assessment assumes that through the use of best available current technologies, ambient criteria air contaminant concentrations in the Atmospheric RSA, including at regional monitoring stations in the Elk Valley and the Oldman Watershed/Crowsnest Pass areas, will be required to meet the B.C. AAQOs and CAAQS.
- Geographic Extent: Regional, potential adverse cumulative effects to ambient criteria air contaminant concentrations in combination with the effects of other reasonable foreseeable future projects or activities may occur throughout the Atmospheric RSA.
- Frequency: Continuous, the potential for adverse cumulative effects to ambient criteria air contaminant concentrations will be ongoing, as present and proposed operations in the Atmospheric RSA are anticipated to discharge to the Atmospheric RSA continuously for the foreseeable future.
- Reversibility: Reversible long-term, the cumulative change in ambient criteria air contaminant concentrations resulting from present and future projects in the Atmospheric RSA is anticipated to be potentially reversible once operations are reclaimed.
- Context: Neutral, the atmospheric environment in the Atmospheric RSA is a dynamic system that naturally experiences a wide range of atmospheric and meteorological conditions and is already influenced by existing anthropogenic sources of criteria air contaminants. Once present and reasonably foreseeable future projects in the Atmospheric RSA have ceased operations, ambient air quality is anticipated to gradually return to levels similar to baseline concentrations.

6.6.6.1.4 Determination of Significance of Residual Cumulative Effects

As discussed in Section 6.5.4.3.1, residual Project effects for a change in ambient criteria air contaminant concentrations are not predicted to occur beyond limited areas within the Atmospheric LSA. The residual effects of the Project on ambient criteria air contaminant concentrations were found to vary with respect to magnitude and were generally limited to within 2 km of the Project footprint. The residual effects of the Project on a change in ambient criteria air contaminant concentrations during all phases of the Project were therefore considered not significant.

With respect to the Project Case, estimated Project emissions have the potential to account for up to 37.1% of NO_2 and 17.5% of SO_2 emissions in the Atmospheric RSA, though Project emissions of other modelled CACs will account for less than 10% of regional emissions. In addition, criteria air contaminant emissions from the Project will likely decrease after Year 13, which represents the worst-case scenario for air emissions. The Project Case likely overestimates future emissions of CACs, as some existing operations are likely already captured in the Base Case scenario, and the methodology used in the development of emissions estimates from the Project are generally thought to be very conservative compared to actual emissions from modern equipment.

With respect to the Future Case, a quantitative assessment was not possible due to the unavailability of adequate information related to the reasonably foreseeable future projects in the Atmospheric RSA (i.e., proposed mine site development details, emissions predictions, etc.). However, it is understood that mitigation measures and appropriate operational practices are in place for all of the current coal mines in the Elk Valley, and similarly it is expected that an appropriate mitigation strategy would be developed and implemented for the proposed future coal mining operations in the Atmospheric RSA in order to meet relevant provincial and federal air quality objectives. Additional monitoring and data sharing with other proponents will be necessary to confirm acceptability of air quality in the Atmospheric RSA.

In light of the above, and in consideration of planned mitigation and best practices, the residual cumulative effects of the Project in combination with those of other past, present, or reasonably foreseeable future projects or activities on ambient criteria air contaminant concentrations during all Project phases are considered not significant.

6.6.6.1.5 Likelihood and Confidence

A characterization of likelihood is not required for residual cumulative effects from Project activities that are determined to be not significant.

Confidence considers the availability and reliability of data and analytical methods used in the assessment of effects. The air dispersion modelling results are considered to provide a reasonable prediction of the magnitude of effects on ambient criteria air contaminant concentrations related to past and present projects and activities in the Atmospheric RSA. However, the Project Case is based only on a mass comparison using limited publicly available data for existing operations (i.e., data from the National Pollutant Release Inventory) and does not include a comparison to relevant B.C. AAQOs and CAAQS; therefore, the significance determination for the Project Case is assigned a moderate level of confidence.

The availability of information related to reasonably foreseeable future projects and activities in the Atmospheric RSA is limited, and, thus, a quantitative assessment of cumulative effects on ambient air quality concentrations was not possible. As such, this significance determination was assigned a low level of confidence for the Future Case.

6.6.6.2 Change in Greenhouse Gas Emissions

6.6.6.2.1 Base Case

The Base Case for greenhouse gas emissions was established through an assessment of GHG emission summaries for existing facilities in the Atmospheric RSA. The Base Case accounts for all past and present projects/activities, and is intended to serve as the baseline conditions for the assessment of cumulative effects on greenhouse gas emissions. The Base Case for greenhouse gas emissions is described in Section 6.4.2 and further detailed in the Air Quality and Greenhouse Gas Assessment (Appendix 6-C; Dillon, 2021).

6.6.6.2.2 Project Case

The Project Case includes all past and present projects or activities which have the potential for contributing to adverse cumulative effects on greenhouse gas emissions in the Atmospheric RSA (via the baseline conditions established for the Base Case) in combination with the effects of the Project. As listed in Table 6.6-2, there are multiple coal mining projects and operations currently operating in the Elk Valley that have the potential to contribute to adverse cumulative effects on greenhouse gas emissions.

The existing projects with available annual emissions data that will contribute to cumulative effects on greenhouse gas emissions are summarized in Table 6.6-4. Emissions data for 2020 were obtained from the 2020 B.C. Industrial Facility GHG Report (Province of B.C., 2021a). Annual emissions for the Project are based on the Project worst-case operational year for GHG emissions, namely Year 12.

Based on available emissions data from existing operations and predicted worst-case annual emissions for the Project, the Project has the potential to contribute up to 19.6% of annual GHG emissions in the Atmospheric RSA (Table 6.6-3) based on 2020 data for existing operations. It should be noted that this is likely a considerable overestimate of Project Case emissions as the reported mining industry emissions are based on actual production and operations in 2020, while the worst-case GHG emissions year for the Project are based on maximum production and operation capacity. The comparison of maximum production and operation emissions versus actual will overestimate the emissions; however, this approach provides a very conservative GHG emissions scenario.

Table 6.6-4: 2020 Annual Greenhouse Gas Emissions from Present Projects in the Atmospheric RSA (t CO_2e/year)

Project Name	Sector	2020 Total Emissions (t CO_2e/year)
Coal Mountain Operations	Mining	1,701
Elkview Operations	Mining	441,669
Fording River Operations	Mining	649,846
Greenhills Operations	Mining	381,492
Line Creek Operations	Mining	220,558
Crown Mountain Coking Coal Project	Mining	414,572
Total Project Case Emissions		2,109,838
Percent of Project Case Emissions Attributable to Crown Mountain Coking Coal Project		19.6%

Based on available 2020 GHG emissions data from the Atmospheric RSA presented in Table 6.6-4 and the 2019 provincial and national data presented in Section 6.4.2, the Project Case will account for approximately 3.2% of B.C.'s anthropogenic GHG emissions and 0.29% of Canada's GHG emissions. After mixing, there will be no little to no measurable difference to global GHG emissions as a result of the Project Case.

The residual cumulative effects of a change in greenhouse gas emissions in combination with the effects of other past and present projects or activities in the Atmospheric RSA (i.e., the Project Case) are characterized as follows:

- Duration: Long-term, GHG emissions with the potential to contribute to adverse cumulative effects on GHG concentrations will be produced at the Project site for the duration of the Construction and Pre-Production and Operations phases.
- Magnitude: Moderate, although estimated Project emissions have the potential to account for up to 19.6% of GHG emissions in the Atmospheric RSA, Project GHG emissions will not exceed the high magnitude threshold of 500,000 tonnes CO_2e per annum. In addition, GHG emissions from the Project will likely decrease after Year 12, which represents the worst-case scenario for GHG emissions.

- Geographic Extent: Beyond regional, Project GHG emissions will contribute to global GHG concentrations.
- Frequency: Continuous, the potential for adverse cumulative effects on GHG concentrations will be ongoing because the Project and current industrial operations in the Elk Valley are anticipated emit GHGs continuously.
- Reversibility: Reversible long-term to irreversible, GHGs released into the atmosphere by the Project and other existing operations in the Atmospheric RSA may be gradually removed by natural sinks through atmospheric carbon fixation.
- Context: Neutral, although worst-case scenario Project GHG emissions may account for up to 19.6% of regional reported emissions in the Atmospheric RSA, the Project will result in only a 0.63% increase in total provincial GHG emissions and a 0.06% increase in total national GHG emissions. In combination with the GHG emission from existing projects and activities in the Atmospheric RSA, the Project Case will account for approximately 3.2% of B.C.'s anthropogenic GHG emissions and 0.29% of Canada's GHG emissions. After mixing, there will be little to no measurable difference to global GHG emissions as a result of the Project Case.

6.6.6.2.3 Future Case

The assessment of cumulative effects for a change in greenhouse gas emissions under the Future Case considers the potential for overlapping of the Project effects with those of reasonably foreseeable future projects or activities. As discussed above, there are currently seven coal mining projects proposed in the Atmospheric RSA, including the Crown Mountain Coking Coal Project. Sufficient data are not available to facilitate a quantitative assessment of cumulative effects on greenhouse gas emissions in the Atmospheric RSA in the Future Case. However, it is expected that each proposed mine operation will implement appropriate mitigation strategies, including best available current technologies to minimize or eliminate sources of greenhouse gases.

The residual cumulative effects of a change in greenhouse gas emissions in combination with the effects of other reasonably foreseeable future projects or activities in the Atmospheric RSA (i.e., the Future Case) are characterized as follows:

- Duration: Long-term, the cumulative change in GHG emissions as a result of the Project is detectable from Operations through Post-Closure, and has the potential to overlap with residual effects to GHG emissions from other reasonably foreseeable future projects or activities.
- Magnitude: Moderate, this assessment assumes that through the use of best available current technologies and based on reported emissions from currently operating facilities, GHG emissions from other reasonably foreseeable future projects will range from between 10,000 and 500,000 tonnes CO_2e per annum per facility.
- Geographic Extent: Beyond regional, GHG emissions from reasonably foreseeable future projects will contribute to global GHG concentrations.
- Frequency: Continuous, the potential for adverse cumulative effects on GHG concentrations will be ongoing because the Project and other reasonably foreseeable future projects in the Atmospheric RSA are anticipated to emit GHGs continuously for the foreseeable future.
- Reversibility: Reversible long-term to irreversible, GHGs released into the atmosphere by the Project and other reasonably foreseeable future projects in the Atmospheric RSA may be gradually removed by natural sinks through atmospheric carbon fixation.

- Context: Neutral, although measurable and potentially important in comparison to local and provincial levels, an increase in GHG emissions as a result of the Project and other reasonably foreseeable future projects in the Atmospheric RSA will likely result in little to no measurable differences in global GHG emissions.

6.6.6.2.4 Determination of Significance of Residual Cumulative Effects

As discussed in Section 6.5.4.3.2, residual Project effects for a change in greenhouse gas emissions will account for less than 1% of the annual provincial emissions and less than 0.1% compared to the annual federal emissions. The residual effects of the Project on greenhouse gas emissions will cease with the end of the Operations phase of the Project prior to 2050, when B.C. has committed to reduce provincial emissions by 80% below 2007 levels. After atmospheric mixing, there will be no measurable difference to global GHG emissions as a result of the Project. The residual effects of the Project on a change in greenhouse gas emissions during all phases of the Project were therefore considered not significant.

With respect to the Project Case, estimated Project emissions have the potential to account for up to 19.6% of GHG emissions in the Atmospheric RSA. However, GHG emissions from the Project will likely decrease after Year 12, which represents the worst-case scenario for GHG emissions. The Project Case also likely overestimates future emissions of GHGs, as the assessment was based on conservative emission factors, assumptions, and activity levels.

With respect to the Future Case, a quantitative assessment was not possible due to the unavailability of adequate information related to the reasonably foreseeable future projects in the Atmospheric RSA (i.e., proposed mine site development details, emissions predictions, etc.). However, it is understood that mitigation measures and appropriate operational practices are in place for all of the current coal mines in the Elk Valley, and similarly it is expected that an appropriate mitigation strategy would be developed and implemented for the proposed future coal mining operations in the Atmospheric RSA in order to reduce or eliminate sources of GHG emissions.

In light of the above, and in consideration of planned mitigation and best practices, the residual cumulative effects of the Project in combination with those of other past, present, or reasonably foreseeable future projects or activities on a change in greenhouse gas emissions during all Project phases are considered not significant.

6.6.6.2.5 Likelihood and Confidence

A characterization of likelihood is not required for residual cumulative effects from Project activities that are determined to be not significant.

Confidence considers the availability and reliability of data and analytical methods used in the assessment of effects. GHG emissions for the Project were estimated using conservative emission factors, assumptions, and activity levels. However, the Project Case is based only on a mass comparison using limited publicly available data for existing operations (i.e., data from the national and provincial inventory reporting) and does not account for GHG emissions or sinks from other sources in the Atmospheric RSA; therefore, the significance determination for the Project Case is assigned a moderate level of confidence.

The availability of information related to reasonably foreseeable future projects and activities in the Atmospheric RSA is limited, and, thus, a quantitative assessment of cumulative effects on greenhouse gas emissions was not possible. As such, this significance determination was assigned a low level of confidence for the Future Case.

6.6.7 Summary of Cumulative Effects Assessment

Residual cumulative effects and the selected mitigation measures, characterization criteria, likelihood, significance determination, and confidence are summarized in Table 6.6-5. As indicated, there are no significant residual cumulative effects to the atmospheric environment anticipated as a result of the Project.

Table 6.6-5: Summary of Cumulative Effects on the Atmospheric Environment

Residual Cumulative Effect	Project Phase(s)	Mitigation Measures	Summary of Cumulative Residual Effects Characterization	Significance (Significant, Not Significant)	Confidence (High, Moderate, Low)
Change in Ambient Criteria Air Contaminant Concentrations (Project Case)	• Construction and Pre-Production • Operations • Reclamation and Closure	• The layout of the site has been designed to minimize travel distances in order to reduce vehicle travel distances and speeds that would result in additional generation of CAC emissions • Limit CAC emissions through the application of standard industry practices and emissions control measures • Conduct regular inspections on control measures for effective and proper functioning • Limit the mine disturbance footprint through Project design and progressive reclamation	Duration: Long-term Magnitude: Moderate to high Geographic Extent: Regional Frequency: Continuous Reversibility: Reversible long-term Context: Neutral	Not Significant	Moderate
Change in Ambient Criteria Air Contaminant Concentrations (Future Case)	• Construction and Pre-Production • Operations • Reclamation and Closure	• Working with other proponents, the provincial government, and Indigenous communities to establish a regional monitoring program	Duration: Long-term Magnitude: Low to moderate Geographic Extent: Regional Frequency: Continuous	Not Significant	Low

Residual Cumulative Effect	Project Phase(s)	Mitigation Measures	Summary of Cumulative Residual Effects Characterization	Significance (Significant, Not Significant)	Confidence (High, Moderate, Low)
		• Collaborating with other proponents to meet air quality objectives through a combination of Project-specific and regional mitigation measures	Reversibility: Reversible long-term Context: Neutral		
Change in Greenhouse Gas Emissions (Project Case)	• Construction and Pre-Production • Operations	• Enforcement of low speed limits for vehicular traffic throughout the site • Inspect and maintain all vehicles and combustion equipment per manufacturer recommendations and operate within regulatory requirements • Limit long-term idling; where possible • Limit the mine disturbance footprint through Project design and progressive reclamation	Duration: Long-term Magnitude: Moderate Geographic Extent: Beyond regional Frequency: Continuous Reversibility: Reversible long-term to irreversible Context: Neutral	Not Significant	Moderate
Change in Greenhouse Gas Emissions (Future Case)	• Construction and Pre-Production • Operations	• Working with other proponents, the provincial government, and Indigenous communities to establish regional targets for greenhouse gas emissions • Collaborating with other proponents to meet air quality objectives through a combination of Project-specific and regional mitigation measures	Duration: Long-term Magnitude: Moderate Geographic Extent: Beyond regional Frequency: Continuous Reversibility: Reversible long-term to irreversible Context: Neutral	Not Significant	Low

6.7 Follow-up Strategy

As required by the Canadian Environmental Assessment Act, 2012, a follow-up program is required for "(a) verifying the accuracy of the environmental assessment of a designated project; and (b) determining the effectiveness of any mitigation measures". The proposed follow-up program for the atmospheric environment is described at a high-level below.

6.7.1 Ambient Air Quality Monitoring Program

To assess changes in ambient air quality over the course of the Project, site-specific monitoring will be implemented as part of an Air Quality Monitoring Program (AQMP). The AQMP will detail specific actions to be taken during the Project phases (Construction and Pre-Production, Operations, and Reclamation and Closure) to evaluate the effectiveness of the Air Quality and Greenhouse Gas Management Plan (AQGHGMP; Chapter 33, Section 33.4.1.1) prevention measures, mitigation measures, and management strategies throughout the relevant phases of the Project. Given that there will be no Project activity that would be expected to adversely affect ambient air quality during the Post-Closure phase, the AQMP will cease at the end of the Reclamation and Closure phase. The AQMP is expected to evaluate changes in ambient air quality to confirm that regulatory compliance measures are met, and to allow for the development of adaptive management strategies through continued improvement of mitigation measures.

Monitoring is important to the Project as it provides feedback on the effectiveness of mitigation measures and management strategies. More specifically, monitoring as part of the AQMP will be used to:

- Confirm regulatory compliance for the duration of the Project;
- Set out monitoring protocols such as monitoring station locations, collection procedures, frequency, and triggers for action;
- Assist in evaluating the accuracy and adequacy of predictions made as part of baseline studies and this Application/EIS;
- Assist in evaluating the effectiveness of mitigation measures being implemented for the Project; and
- Provide information to develop appropriate adaptive management strategies in a timely manner to limit or prevent air quality exceedances in the natural environment.

The AQMP will be designed to provide comparable and consistent data for which to assess changes in ambient air quality as a result of the Project. The monitoring program will be reviewed regularly to confirm it is consistent with current legislation and to assess its effectiveness over time.

A high-level description of the conceptual approach to be taken for developing and implementing the AQMP is provided below. The specific details of the AQMP (i.e., frequency, duration, monitoring locations, etc.) will be determined in consultation with B.C.'s Ministry of Environment and Climate Change Strategy (ENV), key stakeholders, and potentially affected Indigenous communities.

6.7.1.1 Air Quality Monitoring

6.7.1.1.1 Air Contaminants of Concern

The criteria air contaminants with the potential to result from Project operations are:

- Total suspended particulate (TSP);
- Particulate matter with an aerodynamic diameter less than 10µm (PM_{10});
- Particulate matter with an aerodynamic diameter less than 2.5µm ($PM_{2.5}$);
- Sulphur dioxide (SO_2);
- Nitrogen dioxide (NO_2); and
- Carbon monoxide (CO).

The AQMP is likely to focus on the above contaminants of concern, with particular emphasis on TSP, PM_{10}, $PM_{2.5}$, and NO_2, for which the dispersion modelling predicted exceedances of ambient air quality objectives. Given that there were no predicted impacts from SO_2 and CO emissions arising from the Project, these parameters are not likely to be monitored, to be determined in consultation with stakeholders.

6.7.1.1.2 Monitoring Duration

Periodic ambient air quality monitoring will be performed to validate the results presented in the Atmospheric Environment Assessment and confirm that compliance with applicable criteria is achieved. Monitoring locations will vary throughout the life of the Project to reflect changes in the pit sizes, locations, and operations.

The number and schedule of monitoring events will be chosen based on the following considerations:

- The proximity of the Project activity to the Project boundary;
- The length and volume of traffic volumes for the on-site haul routes; and
- The predominant wind direction.

6.7.1.1.3 Monitoring Locations

In general, ambient air monitoring stations will be in a location that provides an objective representation of the geographic area of interest. It is not possible for all sources or all receptors to be monitored, and as such, several criteria will be considered in siting the monitors. Representative monitoring locations will be selected with consideration of the following factors:

- Air dispersion modelling predicted location(s) of maximum particulate concentration(s);
- Site/area accessibility, including the provision of electrical power;
- Upwind/downwind data comparisons between multiple monitoring stations, and separation between multiple monitoring stations that is appropriate to the spatial scale;
- Human and environmental receptors in proximity to the monitoring location, and
- Minimal local interferences from surrounding activities (e.g., avoidance of proximity to public roads).

In addition, the monitoring stations will be located along or close to the Project boundary. While there would be a benefit to locating the monitors in close proximity to neighbourhood/residential receptors, other factors must be considered such as access to monitors for set-up and maintenance, equipment

security, and contribution of other air emission sources located between the Project site and the monitors (e.g., roadways, emissions from other industry, etc.). Since the air emission sources (notably dust emission sources) are relatively low to the ground, any plume of air emissions are expected to track along the ground, with concentrations highest at the source and decreasing with increasing distance from the source. There is little potential for the plume to elevate and pass over the Project boundary monitors. For these reasons, Project boundary monitoring locations are preferred to measure the maximum air quality concentrations leaving the site for assessment against relevant criteria.

As the monitoring events are to take place over different development phases during the lifecycle of the Project, the monitoring station locations will be subject to change for each event. There will be three monitoring station locations proposed (two downwind and one upwind) for each monitoring event.

6.7.1.1.4 Monitoring Equipment

The equipment used to perform the air quality monitoring will be selected to accommodate the proposed long-term monitoring events, as well as the electrical power supply constraints. The sampling/monitoring systems may require a connection to an electrical power supply or a DC battery system.

Monitoring may include a combination of continuous measurements and/or consecutive discrete samples. The sampling/monitoring equipment will have valid calibration documents and be field calibrated (where required) before, during, and after each use, as necessary.

6.7.1.1.5 Local and Regional Air Monitoring Stations

Existing monitoring data for the common air contaminants are available from ENV from different Teck Coal Limited monitoring stations. These stations collect data at nearby municipalities (i.e., Fernie, Sparwood, Elkford), and existing mine operations.

A review of these local and regional meteorological and air quality data will be included during the AQMP monitoring events to provide additional context to the results.

6.7.1.1.6 Reporting

Following each air quality monitoring event, a formal report will be completed. The reports will, at a minimum include the following components:

- Monitoring locations;
- Maximum, minimum, and average concentrations as compared to relevant criteria;
- Summary of air quality exceedances including:
  - Date, time, and duration of exceedance;
  - Expected primary cause (internal or external);
  - Mitigation actions taken; and
  - Other relevant information;
- Weather conditions during monitoring events (i.e., wind direction and speed, temperature, cloud conditions, etc.);
- Summary of significant monitoring equipment outages or periods of invalid data; and
- An assessment of the Project's overall dust mitigation effectiveness based on the event's monitoring data.

If monitoring results exceed the relevant criteria at a monitoring location, appropriate NWP personnel will be notified immediately so that appropriate steps can be taken, including an investigation to identify the potential cause(s) of the exceedance. The investigation may include a review of Project operations and atmospheric conditions at the time of the exceedance. Once the cause for the exceedance is identified, mitigation measures for the source(s) will be identified, and should repeat exceedances be observed, those mitigation measures will be implemented as an adaptive management measure. Subsequent monitoring at the location where exceedance was observed will be performed to confirm that the implemented mitigation measures are effective. Records of the exceedance and all subsequent mitigation and monitoring will be kept at the site for future reference and review by regulators as required. Relevant stakeholders (i.e., residents) who could be affected by the observed exceedances will be notified of the exceedance and the corrective measures that NWP has taken or will be taking.

It should be noted that results from the monitoring program may not entirely be attributable to activities from the Project. For example, particulate matter concentrations in the ambient air may increase regionally due to agricultural activity (e.g., harvesting), nearby industrial/mine emissions, dry/windy conditions, forest or agricultural fires, traffic on nearby public gravel roads, and/or other influences outside of the control of the Project. As such, where exceedances are identified, the first step in the data assessment will be to determine the predominant wind direction over the 24-hour period, and compare the upwind and downwind monitoring results to identify the cause(s) and source(s) of the exceedance.

Where both upwind and downwind concentrations are elevated or exceeding standards, there is a high probability of an off-site, regional emission source that is causing the elevated concentrations. In these instances, only the relative contribution (i.e., subtract the upwind concentration from the downwind concentration) from the monitoring site will be assessed against the relevant criteria.

Where the upwind/downwind results do not suggest an external or regional source of air emissions, consideration of Project operating conditions will be made in an attempt to identify potential causes of the exceedance. Where linkages are identified, this will allow NWP personnel to investigate short-term mitigation options that could be implemented, or identify where longer-term investments are needed to improve the control of air emissions from the operations.

There are currently no specific regulations that govern GHG emissions from the Project; however, there are relevant reporting thresholds and carbon reduction targets set by the federal and provincial governments. At a federal level, Environment and Climate Change Canada's (ECCC) Greenhouse Gas Reporting Program collects information on GHG emissions from facilities across Canada. It is a mandatory program for facilities that emit 10,000 tonnes or more of GHGs in carbon dioxide equivalent units (CO_2e) per year. At a provincial level, facilities emitting over 10,000 tonnes of CO_2e per year must report to the B.C. Ministry of Environment and Climate Change Strategy under the Greenhouse Gas Emission Reporting Regulation. B.C. facilities that emit over 25,000 tonnes of CO_2e per year must have their GHG emission reports verified by an accredited third party.

It is anticipated that the Project will exceed 10,000 tonnes of CO_2e during the first year of construction and over 25,000 tonnes of CO_2e during the last year of construction and each year of Operations. Therefore, the Project will be subject to annual reporting requirements to the ECCC and annual reporting and verification to ENV.

A year-over-year comparison will be completed for the Project to determine if any trends in GHG emissions appear and if corrective or mitigative actions may be implemented.

6.7.2 Air Quality Best Management Practices Plan

An air quality best management practices plan (BMPP) will be developed to reduce the potential for air quality exceedances, in particular with an emphasis on dust control. The air quality BMPP will provide a framework of the measures that will be employed to minimize the risk of poor air quality, the response process that will be in place in the event of an air quality exceedance or complaint, and the reporting procedures that will be implemented to identify and manage potential degradation of air quality and air quality exceedances before they occur.

The BMPP will include the following components:

1. Identification of potential sources of air emissions;
2. Identification of nearby receptors that may be impacted by the sources of air emissions;
3. Description of control measures (best management practices) to be undertaken;
4. Site inspections;
5. Other monitoring;
6. Staff training;
7. Continuous improvement; and
8. Complaint response.

The BMPP will be prepared in consultation with ENV, key stakeholders, and potentially affected Indigenous communities.

6.8 Summary and Conclusions

The Crown Mountain Coking Coal Project (the Project) activities and components have the potential to result in adverse effects to the air quality and greenhouse gas VCs in both the local and regional atmospheric environments, and could result in residual effects to the atmospheric environment. The thresholds for determining the significance of residual effects for the atmospheric environment assessment are based on: 1) frequent and widespread exceedances of the most stringent ambient air quality objectives for criteria air contaminants, and 2) quantitative levels used to define low, medium, and high magnitudes of GHG emissions based on emissions from other mines in Canada and with respect to the federal and provincial reporting program.

To characterize the residual Project effects on air quality, an air quality dispersion modelling assessment was developed to evaluate air quality at key locations within the Atmospheric LSA and Atmospheric RSA under existing and proposed (i.e., mine development) scenarios. The model and associated emissions calculations also incorporated proposed design mitigation measures to reduce emissions of criteria air contaminants. To characterize the residual Projects effects on greenhouse gases, a quantitative greenhouse gas assessment was conducted to quantify greenhouse gas emissions resulting from Project activities. As a conservative approach, the residual effects assessment was conducted based on predicted worst-case scenario Project emissions of criteria air contaminants in Year 13 of the Project and worst-case scenario greenhouse gas emissions in Year 12.

Based on the evaluation of potential Project effects on air quality and greenhouse gas VCs, potential residual effects to the air quality and greenhouse gas VCs that may remain after implementation of proposed mitigation measures include:

- Change in ambient criteria air contaminant concentrations; and
- Change in greenhouse gas emissions.

Dispersion model predictions for the Project effects assessment showed localized elevated levels of some ambient criteria air contaminants (i.e., maximum 1-hour concentrations of NO_2, maximum 24-hour concentrations of TSP, PM_{10}, and $PM_{2.5}$, and annual maximum concentrations of TSP and $PM2_{.5}$) at up to 53 sensitive receptor locations in the Atmospheric LSA. The maximum distance from the sensitive receptors with exceedances frequency greater than 1% of the modelling period to the Project footprint is approximately 2 km. All receptors located more than 2 km from the Project footprint are either predicted with exceedances below 1% frequency or below corresponding air quality objectives. Therefore, while exceedances may occur nearby, exceedances are not expected to be widespread in most of the Atmospheric LSA. The majority of exceedances at the sensitive receptor locations are related to fugitive dust from the unpaved haul road. The dispersion modelling assumes the worst-case scenario and does not account for periods of rain or snow, which will alleviate localized dust concentrations. As such, the frequency and of exceedances of objectives at the sensitive receptors is anticipated to be lower than what was predicted by the conservatism built into the model. Based on the results of the assessment, the residual effects of the Project on a change in ambient criteria air contaminant concentrations are considered not significant. The residual effects assessment characterization includes several potential sources of uncertainty and, therefore, this significance determination was assigned a low level of confidence.

The greenhouse gas assessment for the Project effects assessment showed that Project GHG emissions will range from between 10,000 and 500,000 tonnes CO_2e per annum. Worst-case scenario Project GHG emissions will account for a 0.63% increase in total provincial GHG emissions and a 0.06% increase in total national GHG emissions. The future peak of potential GHG emissions from the Project result in 0.66% of B.C.'s total emissions from 2007. The Project lifespan is for 15 years and is expected to be fully decommissioned prior to 2050. Therefore, any increases in GHG emissions from the Project will cease with the end of the Project's Operations phase, prior to the 2050 provincial target under the Climate Change Accountability Act (2007). After atmospheric mixing, there will be no measurable difference to global GHG emissions as a result of the Project. Based on the results of the assessment, the residual effects of the Project on a change in greenhouse gas emissions are considered not significant. The confidence in the characterization of the residual effect on the atmospheric environment from a change in greenhouse gas emissions from the Project has a high level of confidence, as all GHG emissions were estimated using conservative emission factors, assumptions, and activity levels.

A cumulative effects assessment was undertaken for the air quality and greenhouse gas VCs because there is a possibility that potential Project residual effects may remain after the implementation of proposed mitigation measures. The cumulative effects assessment focused on two Project residual effects, a change in ambient criteria air contaminant concentrations; and a change in greenhouse gas emissions. The cumulative effects assessment involved the identification of past, present, and reasonably foreseeable future projects or activities followed by an evaluation to characterize cumulative residual effects on ambient criteria air contaminant concentrations and greenhouse gas emissions in the Atmospheric RSA

under various temporal cases (Base Case, Project Case, and Future Case). The assessment of cumulative effects under the Project Case included all past and present projects/activities which have the potential to contribute to adverse cumulative effects on the air quality and greenhouse gas VCs, while the future case considers the potential for overlapping of Project effects with those of reasonably foreseeable future projects or activities.

The Project Case cumulative effects assessment for a change in ambient criteria air contaminant concentrations was based on available emissions data from existing operations and predicted worst-case annual emissions for the Project. The Project has the potential to contribute up to 37.1% of NO_2, 17.5% of SO_2, 8.2% of CO, 9.7% of TSP, 5.7% PM_{10}, and 6.6% of $PM_{2.5}$ annual emissions in the Atmospheric RSA. However, this is likely a considerable overestimate of Project Case emissions, as some existing operations are likely already captured in the Base Case scenario and the methodology used in the development of emissions estimates from the Project are generally thought to be very conservative compared to actual emissions from modern equipment. With respect to the Future Case, a quantitative assessment was not possible due to the unavailability of adequate information related to the reasonably foreseeable future projects in the Atmospheric RSA (i.e., proposed mine site development details, emissions predictions, etc.). However, it is understood that mitigation measures and appropriate operational practices are in place for all of the current coal mines in the Elk Valley, and similarly it is expected that appropriate mitigation strategies will be developed and implemented for the proposed future coal mining operations.

The residual cumulative effects of the Project on a change in ambient criteria air contaminant concentrations in combination with those of past and present projects or activities during all phases are considered not significant. This significance determination for the Project Case was assigned a moderate level of confidence as it was based only on a mass comparison using limited publicly available data for existing operations and does not include a comparison to relevant B.C. AAQOs and CAAQS. The availability of information related to reasonably foreseeable future projects and activities in the Atmospheric RSA is limited and a quantitative assessment of future cumulative effects on a change in ambient criteria air contaminant concentrations was not possible. As such, this significance determination for the Future Case was assigned a low level of confidence.

The Project Case cumulative effects assessment for a change in greenhouse gas emissions was based on available emissions data from existing operations and predicted worst-case annual emissions for the Project. The Project has the potential to contribute up to 19.6% of annual greenhouse gas emissions in the Atmospheric RSA. In combination with the GHG emission from existing projects and activities in the Atmospheric RSA, the Project Case will account for approximately 3.2% of B.C.'s anthropogenic GHG emissions and 0.29% of Canada's GHG emissions. However, the Project Case likely overestimates future emissions of GHGs, as the assessment was based on conservative emission factors, assumptions, and activity levels. With respect to the Future Case, a quantitative assessment was not possible due to the unavailability of adequate information related to the reasonably foreseeable future projects in the Atmospheric RSA (i.e., proposed mine site development details, emissions predictions, etc.). However, it is understood that mitigation measures and appropriate operational practices are in place for all of the current coal mines in the Elk Valley, and similarly it is expected that appropriate mitigation strategies will be developed and implemented for the proposed future coal mining operations in order to reduce or eliminate sources of GHG emissions.

The residual cumulative effects of the Project on a change greenhouse gas emissions in combination with those of past and present projects or activities during all phases are considered not significant. This significance determination for the Project Case was assigned a moderate level of confidence as it was based only on a mass comparison using limited publicly available data for existing operations and does not account for GHG emissions or sinks from other sources in the Atmospheric RSA. The availability of information related to reasonably foreseeable future projects and activities in the Atmospheric RSA is limited and a quantitative assessment of future cumulative effects on a change in greenhouse gas emissions was not possible. As such, this significance determination for the Future Case was assigned a low level of confidence.

Both a Project-specific follow-up program and regional monitoring program are necessary to verify the effects predictions and the effectiveness of mitigation measures, which will improve the low to moderate levels of confidence assigned to the prediction of residual effects (Project and cumulative) on ambient criteria air contaminant concentrations and greenhouse gas emissions. The follow-up program will include the implementation of an air monitoring program to collect air quality data at strategic locations within the Atmospheric LSA, in addition to a regional monitoring program in the Atmospheric RSA in collaboration with other proponents. The results of the monitoring program will be relied upon to determine whether additional mitigation measures or adaptive management strategies are needed.

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