Elk Valley Water Quality Plan

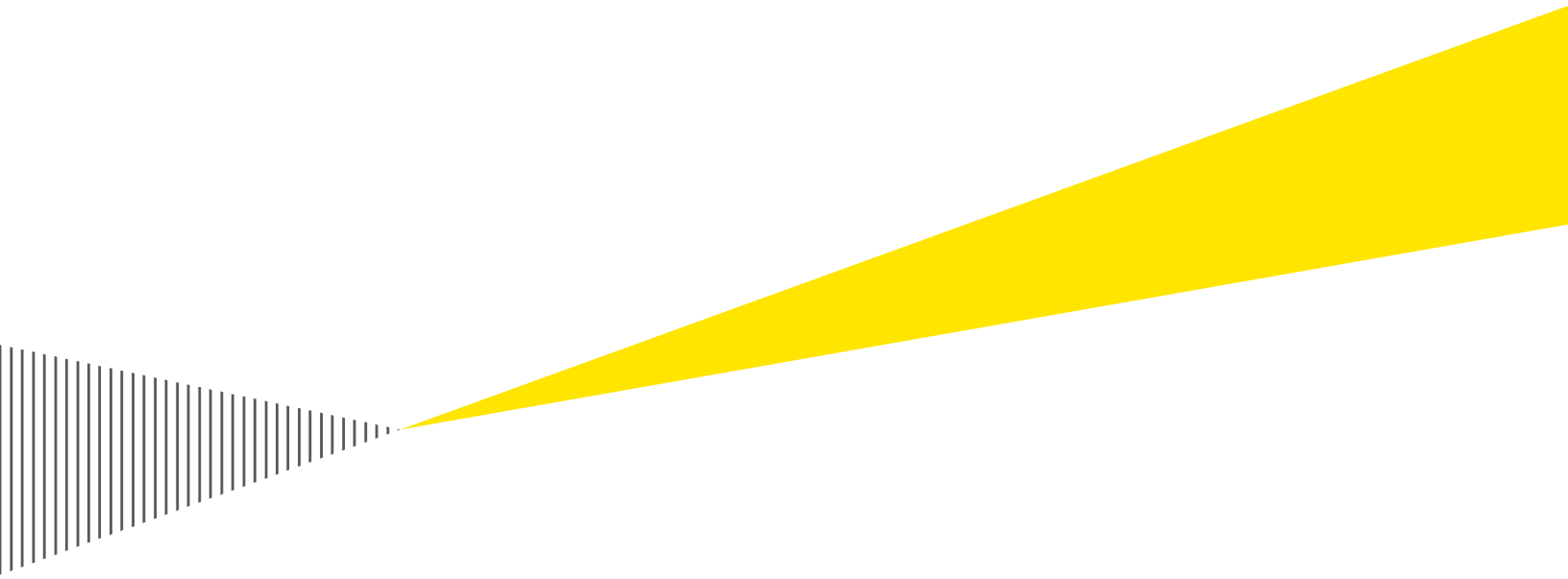
Annex M

Elk Valley Water Quality Plan Socio-Economic Analysis

Teck

Elk Valley Water Quality Plan
Socio-economic Impact Analysis

17 July 2014



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1. Executive Summary

Report purpose

This report presents key findings from a socio-economic impact analysis conducted by Ernst & Young LLP, Canada ("EY") to assist Teck Coal Limited ("Teck") in preparing the Elk Valley Water Quality Plan ("the Plan" or "EVWQP").

Context

The Elk Valley is located in the southeast corner of British Columbia, within the Regional District of East Kootenay. It contains the mainstream Elk River and its tributaries. Teck operates five world-scale coal mines in the Elk Valley: Coal Mountain, Fording River, Line Creek, Elkview and Greenhills.

Scientific monitoring conducted in the Elk Valley has identified that selenium, cadmium, nitrate and sulphate levels in the ecosystem are not expected to adversely affect the overall health of the aquatic ecosystem; however, the monitoring has identified that selenium and nitrate are approaching levels where mitigation will be required. These issues are largely associated with historical and current mining activity.

In this context, in April 2013 the BC Minister of Environment issued Ministerial Order No. M113 ("the Order") requiring Teck to develop an area-based management plan for the Elk Valley, to be known as the Elk Valley Water Quality Plan. The Plan specifies how to remediate water quality effects of past activities and how to guide future development in the Elk Valley. The Plan also required, among other things, that Teck assess the economic and social costs and benefits of addressing risks to the environment through treatment.

Teck engaged EY in August 2013 to conduct an objective economic and social impact analysis of current operations of the Elk Valley mines and operations under potential representative scenarios selected and designed by Teck.

Approach

EY developed and employed a structured process to select social and economic measures for analysis that considered the relevance and importance of potential Plan impacts to communities of interest ("COIs"). The results of COIs input gathered by Teck and its consultants were an important source of information in EY's assessment.

Measures selected were analysed with consideration of the Elk Valley mines' current operations and four plan scenarios prepared by Teck at an early stage of Plan development. This analysis was used by Teck in designing the implementation plan proposed in the EVWQP.

A review of preliminary economic modelling and social impact analysis indicated no material differences in the economic and social impacts among the four scenarios analyzed.

This report presents findings as to the socio-economic impact of "current operations" and one "representative scenario", which is the scenario analysed by EY that was considered most

representative of Teck's proposed implementation plan (for definitions, see "Key Terminology", page 6).

Selection of impacts measured

Based on a structured framework adapted from BC's Environmental Assessment Office Guidelines, components of the social and economic environment valued by the COIs — the valued components ("VCs") were selected.

In our report, the term "impact" describes both the economic and social impacts of current operations and the incremental impact of the representative scenario over current operations. For each VC assessed by EY, indicators were selected to measure the impact of current operations and the representative scenario.

The economic impact of the representative scenario was measured on both an absolute basis and relative to the impact of current operations.

Considering feedback from COIs and current state assessments, it was concluded that social impacts resulting from the representative scenario would be local in nature. As such, social measures were assessed within the boundaries of the East Kootenay region and specifically focused on the Elk Valley communities of Elkford, Fernie and Sparwood.

Social impacts on valued components were measured qualitatively based on the direction, magnitude and likelihood of impacts.

Development of base case data

To put the socio-economic impact analysis into a context, EY developed base case descriptions of the Canadian, British Columbia and East Kootenay economies. In relation to social measures, a current state inventory and assessment of relevant social characteristics, including availability of education, healthcare, emergency services and housing, was developed for the Elk Valley communities.

The economic impact of the Elk Valley mines' current operations in 2014 was modelled using a robust Computational General Equilibrium ("CGE") model licensed by EY. Based on Elk Valley mine life-of-mine ("LOM") and other representative data, the CGE model measured the impact of current operations on GDP, personal income, employment contribution, population, compensation and other indicators. The model measured economic impacts on the Canadian and British Columbia economies. Relying on LOM, CGE and other data, local impact models were developed for the East Kootenay economy.

The LOM, CGE and local models provided quantitative measures of the impact of both current operations and the representative scenario on the population in the East Kootenay, which were key data in EY's social impact analysis.

Population and population changes, which are the most significant factors impacting social VCs, were modelled as part of EY's economic analysis.

Economic impacts

Analysis of current operations indicates the Elk Valley mines are significant contributors to the Canadian, British Columbia and East Kootenay economies. As outlined in the tables contained in this report and as summarized below, Teck's current operations are important to each of those economies. The Elk Valley mines are significant contributors to the tax base at federal, provincial and community levels.

The economic and social impact of the representative scenario relative to the current operations increases for first 10 years, peaking near year 10 before declining for the remainder of the 20-year forecast period. This pattern reflects an initial ramping up of capital expenditures during the construction of the treatment facilities followed by a decline in construction activity.

The impacts on each of the selected economic measures are summarized below.

Gross domestic product

Current operations generate a significant contribution to GDP at provincial and national levels. In 2014, it is expected that current operations will contribute $4.5 billion or 2.0% of British Columbia's $230 billion GDP.

The representative scenario will have a marginally positive impact on GDP at provincial and national levels over the forecast period. Most of the contribution will arise from capital expenditures.

Local business opportunities

Current operations generate approximately $1.4 billion in local procurement spending. Approximately $600 million of that amount remains in the East Kootenay, creating significant opportunities for local business. The remainder flows through to the origin of various items such as tires, diesel and explosives.

Implementation of the representative scenario is expected to marginally increase local procurement spending and opportunities for local businesses.

Investment

Current operations are estimated to contribute $0.5 billion of the $70 billion in investment in British Columbia in 2014. As capital expenditures are a significant element of the implementation plan, investment is the economic indicator most significantly impacted.

The overall increase in total provincial and national investment under the representative scenario will be relatively marginal.

Jobs

Teck is the single largest employer in the larger East Kootenay region, directly or indirectly contributing 6,440 jobs to the East Kootenay economy. Approximately one in five (20%) of the total jobs in the East Kootenay are dependent on current operations. Similarly, if it is assumed

that the households with Teck-supported employment would relocate if no employment was available, approximately 20% of the total East Kootenay population would be impacted.

On a provincial and national scale, considering direct and indirect employment and spinoffs, current operations are projected to support 15,240 jobs in British Columbia and 19,020 jobs in Canada in 2014. Due to the capital intensive nature of the mining industry, for every 1 job created at Teck, another 2.7 jobs are created elsewhere in the provincial economy. Teck's current operations support $1.8 billion in wages and benefits across British Columbia and $2.6 billion Canada-wide, including British Columbia.

Our analysis indicates that the representative scenario will not have a negative impact on existing East Kootenay jobs arising out of Teck's current operations. The construction of treatment facilities would be expected to create a temporary increase in employment through construction jobs.

Personal income generation

Current operations positively contribute to the standard of living in East Kootenay. In 2014, the Elk Valley mines provided $5,100 of additional per capita income and $7,100 in higher average compensation.

Similar to the impact on jobs, the representative scenario is not forecast to negatively impact wages and personal income in the region. The construction of treatment facilities would be expected to generate a temporary increase in personal income.

Tax and resource revenue sharing

Current operations are expected to contribute approximately $1.1 billion in tax liability to federal, provincial, and local governments in 2014.

The implementation of the representative scenario results in a decrease in potential taxes, royalties and revenue-sharing for governments and First Nations. Forecast tax reductions are due to an increase in Teck's operating and capital costs related to the construction and operation of treatment facilities and other mitigation, which will reduce Teck's taxable earnings. Reductions in tax liability are partially offset by increases in economy-wide tax revenues.

Social impacts

The social VC that is measured in this report is the availability of and access to community services. Indicators selected for analysis include: availability of education, medical services, emergency services (police, ambulance and fire) and housing; and Teck's support and spending on training, apprenticeships and community investment. Two other VCs identified in EY's assessment — physical health and use of the aquatic environment — are to be separately evaluated by Teck and its consultants in the EVWQP report.

The social impact analysis considered the population impacts under current operations and the incremental impact of the representative scenario.

The existence of Teck's current operations contributes to the present level of availability and access to community services in the Elk Valley. Based on projected current operations, levels of community services currently available are expected to be sufficient to absorb future population growth, which would support maintenance of funding for existing community services.

It is expected that staged construction of treatment facilities and other mitigation will smooth the impact of a potential influx of temporary residents or increased demand on community services. Considering the expected impact of the representative scenario on local population and current levels of community services, EY concluded that its impact on availability and access to education, medical services, ambulance and emergency services will likely be negligible.

Teck expects the representative scenario will not negatively impact its traditional level of community investment and expects existing levels of skills training and apprenticeships supported through Teck's operations to continue.

The Elk Valley region has a high percentage of recreational or seasonal housing units compared to the rest of the province but, due to rising housing costs and the dropping rental vacancy rate, attainable and affordable housing are key issues in the local communities. The proposed staging for the implementation of the representative scenario would maintain the annual construction labour force at a level similar to that used to build the West Line Creek Active Water Treatment Facility. As there will not be a large influx of workers in a short time period putting pressure on housing availability, the impact of the representative scenario on the availability of housing in the local communities should be minimal.

Conclusion

The Elk Valley mines' current operations are a significant contributor to the selected components of the national, provincial and local social and economic environments valued by the COIs.

In comparison to current operations, the impact of the representative scenario on the economic and social VCs assessed is expected to be marginal.

Key Terminology

Capital Investment	Investment in assets with a useful life of one year or more.
Communities of Interest ("COIs")	A community of people that share a common interest. In the case of the Plan, COIs include but are not limited to government, aboriginal groups, the public, and non-governmental organizations. While Teck and its shareholders are interested parties, they are not included as COIs in this report.
Compensation	Employee compensation equal to total payments to workers, including cash wages and the value of benefits.
Computable General Equilibrium ("CGE") model	An economic model that solves a system of equations to show how an economy moves between equilibria in response to an economic shock.
Current Operations	Teck's current operations in the Elk Valley include operating the five Elk Valley mines, projected over a 20 year time horizon, 100% of mine operations and mine life extensions are included.
Environmental Assessment Office ("EAO") Guidelines	Guidelines issued by BC's Environmental Assessment Office to support parties in meeting the requirements of BC's Environmental Assessment Act in selecting valued components.
Elk Valley Mines	The Coal Mountain, Fording River, Line Creek, Elkview and Greenhills mines, which are located in British Columbia's Elk Valley and operated by Teck.
Employment	The sum of full- and part-time employment. Note that this definition is not synonymous with full-time equivalents.
Gross Domestic Product ("GDP")	Equal to the payments to labour and capital factors of production. This concept is also equal to revenue less payments for intermediate inputs.
Life of Mine ("LOM") model	Models the cash flow of mining operations for a given scenario over a defined time period.
Ministerial Order No. M113 (the "Order")	A ministerial order requiring Teck to develop an area-based management plan for the Elk Valley.
Personal Income	Personal income received from all sources less contributions for government social insurance. Sources of income include compensation, investment income, and government transfers.
Representative Scenario	Of four potential water treatment scenarios considered by EY, the scenario that best represents the base case plan selected by Teck in the EVWQP.

Key Terminology

Tax Liability	For most taxes, the amount collected in additional tax revenue by federal, provincial and local governments during the calendar year. For corporate income tax, this amount is equal to the change in liability before applying net operating losses.
Teck	Teck Coal Limited, a subsidiary of Teck Resources Limited.
The Elk Valley Water Quality Plan (the "Plan" or "EVWQP")	The area-based management plan for the Elk Valley or, specifically, the Elk Valley Water Quality Plan, that Teck is required to create under Ministerial Order No. M113.
Total Economic Impact	The sum of Teck's direct activity plus other changes that occur in the economy in response to Teck's economic activity. Readers familiar with economic impact analyses using an input-output model will recognize these types of activity as indirect (supplier) and induced (consumption) impacts, although the type of economic model used in this analysis simulates a more complex set of economic effects.
Valued Components ("VCs")	A component of the natural and human environments that is considered by COIs to be of importance.

2. Introduction

2.1. Overview

This report presents key findings from a socio-economic analysis conducted by EY to assist Teck in preparing the Elk Valley Water Quality Plan (the "Plan" or "EVWQP"), which is a plan to remediate water quality effects of past activities and to guide future development in the Elk Valley. This analysis was conducted on the current operations of the five Elk Valley mines and for four potential scenarios for the Plan.

This report presents EY's findings as to the socio-economic impact of current operations and the scenario considered most representative of the implementation plan proposed by Teck in the EVWQP (the "representative scenario").

2.2. About Teck in the Elk Valley

The Elk Valley is located in the southeast corner of British Columbia within the Regional District of East Kootenay (Figure 2.1). The significant local communities are the cities of Cranbrook, Kimberley and Fernie and the district municipalities of Sparwood, Invermere and Elkford.

The Elk Valley contains the mainstream Elk River and its tributaries, including the Fording River and Michel Creek. The Elk River flows into Lake Koocanusa, a reservoir that crosses the Canada-U.S. border. Clean water in the Elk Valley is important to the economic and social fabric of the region. In addition to being essential for human health, clean water provides opportunities for local recreation, fishing, tourism and other economic activity.

The economy of the Elk Valley and surrounding area is heavily dependent on coal mining and related activity. Teck is the only company operating mines in the Elk Valley, with five coal mines in the area. Teck owns 100% of the Coal Mountain, Fording River and Line Creek mines, and it has a 95% partnership interest in the Elkview mine and an 80% joint venture interest in the Greenhills mine. The analysis in this report includes 100% of the operations of the five Elk Valley Mines. The locations of these mines are shown in Figure 2.1.

The Elk Valley mines produce approximately 26 million tonnes of steelmaking coal annually, making Teck the second largest supplier of seaborne steelmaking coal in the world. Most of Teck's coal is exported overseas, with approximately 95% transported by rail to the coast of British Columbia and shipped to Asia (mainly to Japan, Korea, Taiwan and China), Europe and South America.

2.3. Context for the Economic and Social Impact Analysis

Scientific monitoring and research conducted to date at the watercourses in the Elk Valley indicate that selenium, cadmium, nitrate and sulphate constituents are at levels that are not expected to adversely affect the overall health of the aquatic ecosystem. Monitoring has also identified, however, that selenium and nitrate levels in the upper Fording River may be approaching levels at which mitigation will be required. These issues are largely associated with historical and current mining activity and, in particular, leaching from waste rock dumps.

To remediate water quality effects of past activities and to guide future development in the Elk Valley, in April 2013 the BC Minister of Environment issued Ministerial Order No. M113 (the "Order"), requiring Teck to develop an area-based management plan for the Elk Valley (the "Plan").

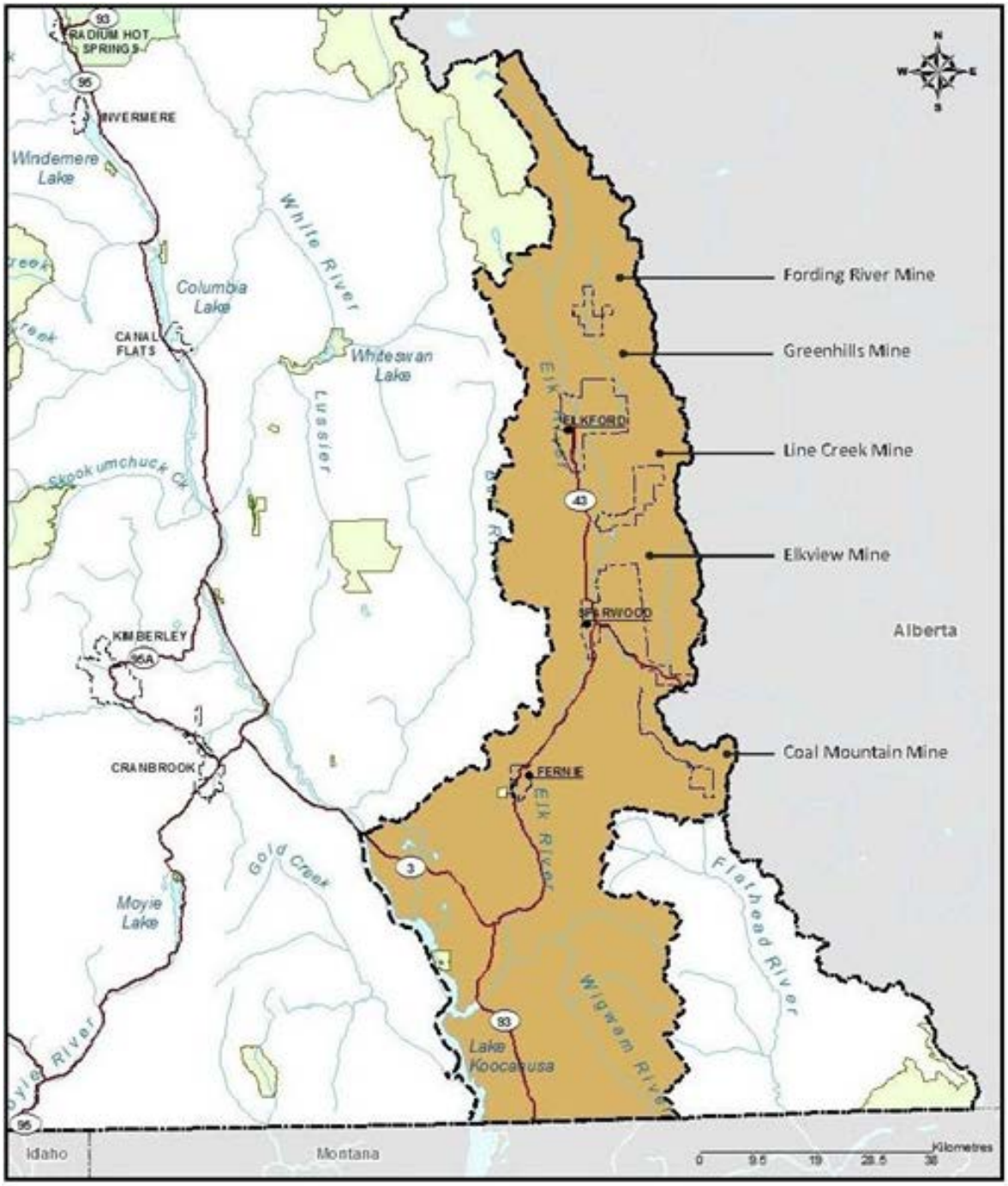
The Order requires Teck to consider a number of factors in developing the Plan, including:

- Current contaminant concentrations
- Current and emerging economically achievable treatment technologies
- Sustainable balancing of environmental, economic and social costs and benefits
- Current and emerging science regarding the fate and effects of contaminants

The Terms of Reference for the Plan, as authored by Teck and approved by the Minister on July 22, 2013, specify the name of the Plan to be the Elk Valley Water Quality Plan ("EVWQP") and require the assessment of the economic and social costs and benefits of addressing risks to the environment through treatment.

Teck engaged EY to conduct an economic and social impact analysis of potential representative scenarios, selected and designed by Teck, to support Teck in preparing the Plan within the broader decision-making framework established in the Order. This report outlines the scope of EY's work and presents its findings.

Figure 2.1: Geographic Boundaries of the Elk Valley as Defined in the Order



2.4. Scenario Presented

In the EVWQP, Teck commits to achieving short-term and long-term water quality targets using adaptive management, which means that the Plan will be updated and adjusted to incorporate additional learning and experience. Therefore, actual implementation may be different than the base case plan contained in the Plan.

Due to this variability and Teck's continuing refinement of the base case implementation plan since EY commenced its work, EY assessed four potential scenarios. The four scenarios focus on active water treatment and clean water diversions. The EVWQP describes why these treatment approaches were selected. After analysis of the four scenarios, including economic modelling and review of social impacts, EY concluded there were no significant differences in the economic and social impacts among the four scenarios. While the implementation plan proposed in the EVWQP will differ from all of the scenarios analysed, it will be materially similar to one of the scenarios analysed. The analysis and findings presented in this report are for that materially similar scenario, which is hereinafter referred to as the "representative scenario".

The representative scenario and the EVWQP implementation plan are similar, with both proposing treatment facilities at:

- Line Creek operation (2 facilities)
- Fording River operation (2 facilities)
- Elkview operation (1 facility)
- Greenhills operation (1 facility)

The construction timing under the implementation plan and the representative scenario are both within one year, and total capital expenditures are within 15%. The plans primarily differ in the order of construction and size of individual plants and in the capital profiles in certain years.

In this report, EY analyses the impact of the representative scenario on the economic and social VCs and assumes that it will not materially differ from the implementation plan that will be presented in the EVWQP.

In our report, the term "impact" describes both the impact of current operations and the incremental impact of the representative scenario over current operations. For each valued component selected and assessed by EY, indicators were selected to measure the impact of the representative scenario on that valued component.

2.5. Application of this Report

In addition to assessing the economic and social impacts that are analysed by EY, the Order requires the Plan to address a number of other issues. This report informs Teck as to the social and economic impact of the representative scenario for the purpose of development and

evaluation of the Plan. It provides no conclusions or recommendations as to these other issues or the Plan option to be selected.

The research and data described in this report are based on publicly available information or information provided to EY by Teck. The conclusions of this impact analysis are EY's professional judgment based upon the scope of work, including the research EY conducted, EY's understanding of the facts and circumstances that may impact decision makers and COIs, and the information provided by Teck. Government authorities may have access to additional information and may use different frameworks when making actual policy and other decisions in relation to the Plan.

This report should be read in the context of the limitations outlined in Section 6.

3. Selection of Measures for Analysis

3.1. Sources Considered in Selecting Measures for Analysis

The following sources were considered in designing the approach to selecting measures:

Table 3.1: Sources of Information Considered

Source	Commentary
BC Environmental Management Act	The Environmental Management Act ("EMA") was brought into force in July 2004. The Act provides for "innovative tools for environmental protection such as area-based planning"[1] and empowers the Minister to issue Terms of Reference for the creation of such plans that may include requiring parties to consider the socio-economic costs and benefits of addressing risks to the environment[2]. In accordance with this power, Ministerial Order No.M113 — issued by the Minister pursuant to the EMA — requires Teck to consider economic and social costs and benefits in determining water quality targets and treatment scenarios in the Elk Valley[3]. No regulations, rules or guidelines have been issued under the EMA as to how to conduct socio-economic analysis when creating an area-based management plan. Since Teck is understood to be the first party to have been directed to create an area-based management plan under the EMA, no precedent is known to exist.
BC Environmental Assessment Act ("EAA")	Guidelines were issued July 26, 2013, by BC's Environmental Assessment Office ("EAO Guidelines") to support parties in meeting the requirements of BC's EAA.[4] The stated objective of the EAO Guidelines is to inform the understanding and application of appropriate, standardized methods for conducting environmental assessments to meet the requirements of the EAA, where the scope of such assessments includes environmental, economic, social, heritage, and health effects. Of most relevance to Teck's current objectives, the EAO Guidelines provide direction on how measures for analysis should be selected.

[1] BC Government, Ministry of Environment website.

[2] *Environmental Management Act*, S.B.C. 2003, Chapter 53, Section 89 (4) (c).

[3] Province of British Columbia, Order of the Minister of Environment, *Ministerial Order No. M113*.

[4] Environmental Assessment Office, "Guideline for the Selection of Valued Components and Assessment of Potential Effects" (September 2013).

Source	Commentary
Other Canadian Guidelines	The most relevant guidelines from other bodies of the BC Government that have been considered are Guidelines for Socio-Economic and Environmental Assessment produced by the Integrated Land Management Bureau ("ILMB Guidelines"), an agency of the Ministry of Agriculture. The ILMB Guidelines provide direction on categories of indicators, analysis techniques and specific indicators. The acts of other jurisdictions, such as the Yukon's Environmental and Socio-economic Assessment Act, were also considered.
Best Practices	Global best practices for measures considered include: ► Warkworth Mine Court Decision in Australia[5] ► Community Indicators Victoria project in Australia ► Newfoundland and Labrador community well-being studies ► UK Department for International Development's Sustainable Livelihoods Framework
Precedents	The environmental assessments underway or concluded for two Teck projects in the Elk Valley have been considered: Line Creek Phase II and Fording River Swift. A number of socio-economic impact assessments conducted under the ILMB Guidelines have also been considered.

While not drafted specifically for the purpose of creating area-based management plans, the framework contained in the EAO Guidelines provides a robust basis for socio-economic analysis. It was applied extensively in designing the approach to identifying and selecting measures for analysis. Other factors considered in that regard include:

- Though the EAO works at arms-length from the Ministry of Environment ("MoE"), it still reports to the ministry. The EAO Guidelines were therefore considered indicative of MoE expectations when considering socio-economic impact in the context of creating an area-based management plan.
- COIs are familiar with the terminology and approach of the EAO Guidelines.

[5] Refers to the decision by the New South Wales Land and Environment Court on April 15, 2013, to overturn the decision of the Planning Assessment Commission to approve the extension of the Mount Thorley Warkworth mine operations in the Hunter Valley. Of particular relevance, the court held that the Input-Output Analysis and the Cost-Benefit Analysis had deficiencies in the data and assumptions that affected the reliability of conclusions.

- Application of the EAO Guidelines afforded the opportunity to align analysis with environmental assessments for Line Creek Phase II and Fording River Swift and to thereby best leverage existing work and avoid potential confusion among COIs.

3.2. Hierarchy of Measures

EAO Guidelines provide a hierarchy of assessment measures that enable measures to be comprehensive, structured, understandable and accessible. This hierarchy has been applied throughout our approach. The hierarchy is outlined in Table 3.2.[6]

Table 3.2: Hierarchy of Measures as Defined by EAO Guidelines

Hierarchy of Measures	Description
1. Pillars	Pillars reflect the highest-level of effects identified in the relevant Act. In the case of the EAA, for example, these effects would be: (1) Environmental, (2) Economic, (3) Social, (4) Heritage and (5) Health
2. Valued components	Valued components are components of the natural and human environment that are considered to be of importance by the proponent, public, aboriginal groups, scientists, other technical specialists, and government agencies involved in the process. Valued components may be divided into subcomponents; for example, for a broadly defined valued component such as wildlife, individual species or groups of species may be used as subcomponents to structure the assessment, e.g., grizzly bear or large carnivores, northern goshawk or avifauna. Valued components vary by project, industry and geographic region to reflect the nature of the potential project effects and the context in which the project is to be undertaken.
3. Indicators	Indicators are metrics used to understand and evaluate the potential impact on a valued component. Indicators are frequently an aspect of the valued components that is important to the integrity of the valued components and can be used to understand and evaluate the potential effect on the component.

[6] Note that in some cases adjustments have been made to the nomenclature of EAO guidelines for internal purposes of consistency and clarity, but in all cases we have endeavored to stay true to the intent of the EAO Guidelines.

3.3. Process for Selecting Measures

In the selection of measures, EY adopted the hierarchy in Table 3.2 in the stepped sequence shown in Figure 3.1

Figure 3.1: Hierarchy of Measures

3.4. Selection of Pillars

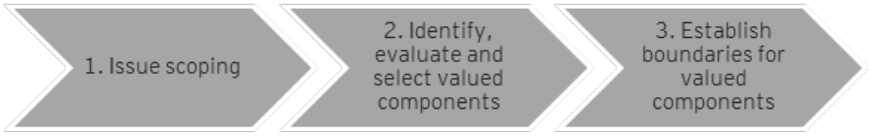
EAO Guidelines suggest that pillars be created with consideration to the highest level of types of effects identified in the applicable legislation.

The primary legislation relevant to the Plan is the *BC Environmental Management Act (*"EMA"*)*, which provides three clear pillars: environmental, economic and social. To conform to the EMA and the Order, these pillars were selected as the highest level categories of measures. The scope of our analysis was limited to the social and economic pillars. EY understands that environmental impacts are separately addressed in the Plan.

3.5. Selection of Valued Components

EAO Guidelines propose the following approach to selecting valued components.

Figure 2.2: Approach to Selecting Valued Components



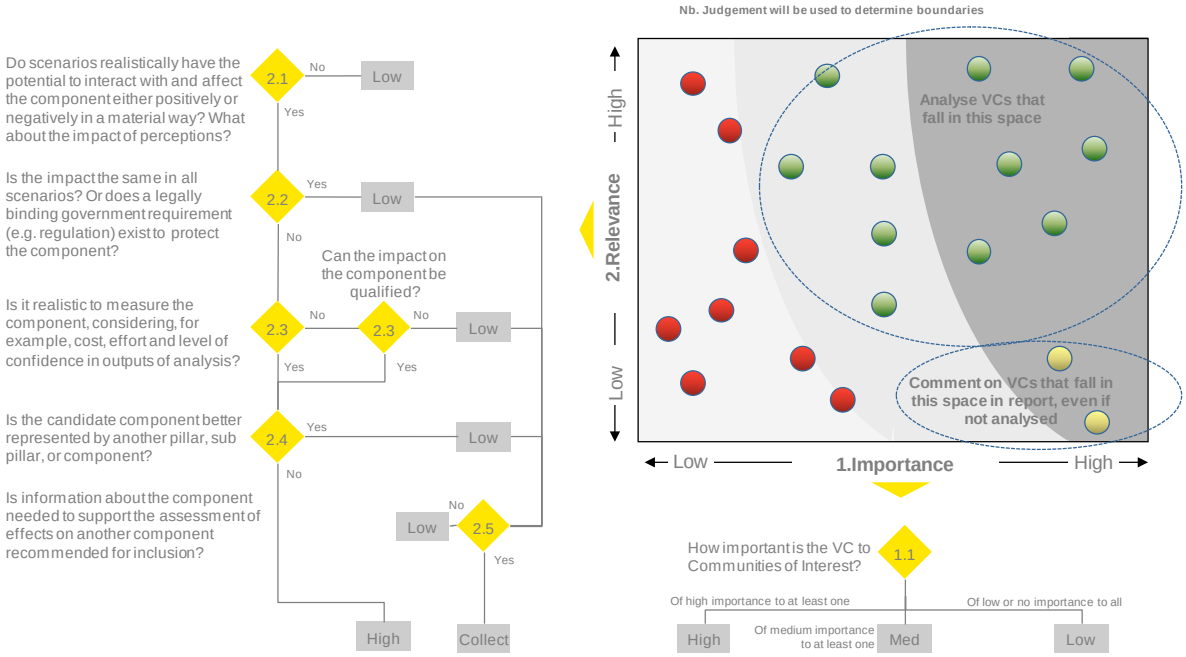
Issue scoping

EAO Guidelines recommend that issues be identified through consultation with key COIs. Considering that Teck had already conducted issue scoping, including consultation with Elk Valley COIs pertaining to water quality issues, EY was able to leverage Teck's existing findings and knowledge base. On the understanding that once valued components had been selected they would be subsequently validated by Teck, with the MoE and other COIs, EY concluded that no additional issue scoping was required prior to the initial identification and selection of valued components.

Identify, evaluate and select valued components

Working with Teck, EY identified approximately 75 potential and wide-ranging valued components through consideration of other global socio-economic assessments, previous environmental assessments in the Elk Valley and Teck's knowledge of potential issues of importance for COIs. In parallel, EY developed an objective framework for evaluating valued components that was consistent with EAO Guidelines. This framework is presented in Figure 3.3.

Figure 3.3: Valued Component Evaluation Frame



The framework included two high-level evaluation criteria: first, the importance of the valued components for COIs, and second, the relevance of the valued components in the context of the Plan scenarios.

For each criterion, an objective set of evaluation guidelines was defined. To apply the evaluation framework to each potential valued component, EY facilitated workshops with specialists from Teck with knowledge of issues of importance to COIs and knowledge of realistic impacts suggested by the scenario.[7]

[7] That is, in the absence of actual scenarios having been defined at the time of evaluation. As scenarios were defined, measures were re-evaluated.

During the workshops, valued components were short-listed for inclusion in the socio-economic analysis. The short list was further refined in accordance with EAO principles, resulting in a set of valued components that was:

- Comprehensive, valued components enabling a full understanding of the important potential effects of Plan options
- Concise, allowing the nature of the project and valued components interaction and the resulting effect pathway to be clearly articulated and understood, and allowing redundant analysis to be avoided

Establish boundaries for valued components

Boundaries were established and articulated separately for each valued components to delineate, for example, areas within and times during which scenarios might be expected to impact the valued components.

In determining the appropriate boundaries, the following issues were considered:

- Extent to which the impact could be meaningful assessed
- Availability of data
- Ministry and COIs expectations
- Cost, where the cost differential was expected to be significant

Table 3.3 outlines the key boundaries considered.

Table 3.3: Categories of Boundaries Based on EAO Guidelines

Category	Description
Spatial	The areas within which the project was anticipated to have potential effects on the valued components, classified as: - Local - Provincial - National
Temporal	The periods during which the project could be expected to have potential effects on the selected valued components.
Administrative	The limitations imposed on an assessment by political, economic, or social constraints. These constraints may include existing datasets that are collected on the basis of regional or provincial boundaries that are not the same as the spatial boundaries of the selected valued components, and which may therefore constrain the assessment of potential effects in some way.

Category	Description
Technical	The constraints imposed on an assessment by limitations in the ability to predict the effects of a project. For example, technical boundaries may include challenges associated with sampling reclusive species, leading to a gap in data.
Conceptual	The extent to which potential successive impacts in a chain of impacts are considered. For example, with respect to economic indicators, this would include direct, indirect and induced impacts (note that conceptual boundaries are not proposed in the EAO Guidelines).

3.6. Selection of Indicators and Boundaries

Indicators were selected that best represented each valued component by considering the rationale for the selection of the valued components, available data, and the complexity of analyzing the impact. EY considered whether each indicator could be quantified in a meaningful manner within the constraints of available time and data. Where indicators could be quantified, the approach to analysis was selected to produce estimates that would reasonably measure the actual changes that would occur under the scenarios being evaluated. Where a quantitative approach was not practical, indicators were analysed qualitatively.

Teck engaged Kirk & Co Consulting Ltd., a company specializing in designing and implementing public and stakeholder consultation and engagement programs. The public consultation results indicated that 89% of the survey respondents agreed with the social and economic impact analysis being conducted, 5% disagreed and 6% were indifferent.

After considering the feedback received, some indicators were grouped and final measures were selected for analysis. Table 3.4 outlines the final list of valued components and indicators selected for analysis.

Table 3.4: Measures Selected for Analysis

Pillar	Valued Components	Indicators
Economic	GDP	GDP
	Local business opportunities	Spend on local suppliers
		GDP impacts by industry
	Investment	Capital investment
	Jobs	Employment
	Personal income generation	Per capita income
		Average compensation
	Tax and resource revenue sharing	Provincial government revenues
		Federal government revenues
		Municipal government revenues
		First Nations revenues from provincial mineral tax sharing
Social	Availability and access to community services	Availability of education / distribution of educational attainment across population / Teck spend on training and apprenticeships

Pillar	Valued Components	Indicators
		Availability of medical services
		Availability of emergency services (police/ambulance/fire)
		Availability of housing
		Teck spend on community investment
	Physical health*	Selenium level impact on consumption of fish
		Selenium levels in municipal drinking water (compared to guidelines)
	Use of aquatic environment*	"Swimmability" of the Elk and Fording rivers and Lake Koocanusa
		"Fishability" of the Elk and Fording rivers and Lake Koocanusa

*"Physical health" and "Use of aquatic environment" valued components are addressed by Teck and their consultants in the EVWQP.

4. Economic Impact Analysis

4.1. Overview

This section provides baseline data and estimates the economic impact of current operations and of the representative scenario for the selected economic measures. Estimates are provided for three geographic regions: Canada, British Columbia, and East Kootenay.

Most economic measures were assessed quantitatively using a CGE model. This approach was selected for its robustness and credibility when modelling certain types of changes in the economy, such as large investments and large changes in the level of industry output.

4.2. Economic Measures

This report estimates the economic impact of current operations and the representative scenario on the economic measures selected, which are outlined in Table 4.1.

Table 4.1: Economic Measures Selected for Analysis

Pillar	Valued Components	Indicators
Economic	GDP	GDP
	Local business opportunities	Spend on local suppliers
		GDP impacts by industry
	Investment	Capital investment
	Jobs	Employment
	Personal income generation	Per capita income
		Average compensation
	Tax and resource revenue sharing	Provincial government revenues
		Federal government revenues
		Municipal government revenues
		First Nations revenues from provincial mineral tax sharing

The economic analysis for British Columbia and Canada includes estimates of the impacts of current operations and the representative scenario for the following indicators:

- GDP
- Capital investment
- Employment
- Personal income
- Average compensation

Detail is also provided by industry and geography. GDP and employment impacts are provided for 14 industries.

Estimates of the local impact on total employment, per capita income, average compensation, and population are provided for East Kootenay.

4.3. Baseline Forecast of the Economies

Baseline: British Columbia and Canada

To provide context for the results of the analysis, the CGE model's baseline projections for British Columbia are presented in Table 4.2. The model was calibrated to 2009 Statistics Canada data, the latest year with all necessary calibration data. This data includes input-output tables, labour compensation statistics by industry, employment statistics by industry, GDP, sources and disposition of personal income, occupation data, and demographic data. GDP is pegged to Statistics Canada actual data through 2012, Department of Finance Canada forecasts from 2013 through 2018, and the forecasted mid-level growth rate from the Organisation for Economic Co-operation and Development ("OECD") from 2019 through 2033.

Table 4.2: Baseline Economic Indicators for British Columbia and Canada, 2014

Indicator	Units	Amount: British Columbia	Amount: Canada
GDP	Billions of dollars	230	1,840
Investment	Billions of dollars	70	410
Employment	Thousands of jobs	2,390	17,880
Per Capita Income	Thousands of dollars	40	41
Average Compensation	Thousands of dollars	57	59

Note: The figures for Canada are inclusive of British Columbia.
Source: Regional Economic Models, Inc. ("REMI") model of British Columbia and Canada.

Although the CGE model does not explicitly compute detailed tax revenue estimates, there is detailed data on the economic activity that serves as the tax base for the various sources of tax revenue. As such, 2009 Statistics Canada data on federal, provincial, territorial, and local government revenue is calibrated to variables within the CGE model to forecast tax revenue by source. For example, personal income tax revenue is forecasted with the growth of personal income and consumption tax revenue pegged to the growth of personal consumption expenditures.

Forecasts of federal government revenues, British Columbia provincial government revenues, and British Columbia local government revenues are presented in Table 4.3. Federal government revenues are not limited to those collected from activity in British Columbia.

Table 4.3: Baseline Tax Revenue for British Columbia and Canada in 2014

Type of Tax Revenue	Tax Revenue (millions of dollars)
Federal Government	**265,000**
Corporate income and royalty taxes	37,000
Personal income taxes	140,000
Contributions to social insurance plans	28,000
Consumption taxes	50,000
Other taxes	11,000
British Columbia Provincial Government	**31,000**
Corporate income and royalty taxes	3,000
Personal income taxes	8,000
Contributions to social insurance plans	1,000
Consumption taxes	11,000
Other taxes	8,000
British Columbia Local Government	**4,900**
Property and related taxes	4,600
Other taxes	300

Note: Figures may not sum due to rounding.
Source: REMI model of British Columbia and Canada, Statistics Canada, and EY analysis.

It should be noted that the British Columbia provincial government revenues and local government revenues do not overlap.

Baseline: East Kootenay

As documented in the methodology description, the CGE model projection of British Columbia can be used to forecast economic indicators in East Kootenay.

As shown in Table 4.4, East Kootenay makes up approximately 1.5% of British Columbia in terms of employment, income, and population. Moreover, per capita income and average compensation are fairly similar to both British Columbia and the overall Canadian economy.

Table 4.4: Baseline Economic Indicators for East Kootenay in 2014

Economic Indicator	Units	Amount
Employment	Number of jobs	33,000
Per capita income	Dollars	42,000
Average compensation	Dollars	57,000
Population	Persons	62,000

Source: REMI model of British Columbia and Canada, Statistics Canada, and EY analysis.

4.4. Sources of Data

In addition to baseline data, economic indicators in the three regions were derived from three sources of data:

- Teck's LOM models projected mine operations for current operations and the representative scenario.
- The outputs of the LOM models were used as inputs to the CGE model, which estimated the ripple effect of the change in Elk Valley mine operations and capital investments throughout British Columbia and the Canadian economy.
- Outputs from the CGE model were used to estimate economic impacts specific to East Kootenay.

Life of mine model

The Teck LOM model is a financial model that projects mine operating characteristics over a 20-year period in real (2013) dollars. The information in the Teck LOM model summarizes major operational and financial data for the Elk Valley mines. The model provides the ability to adjust production, foreign exchange rates, coal prices, and other factors determining revenues, expenditures, employment, and other characteristics.

The LOM model is the starting point for Teck's long-term planning. The projections of economic activity up to 20 years in the future are subject to revision as market and related conditions vary. Over the long-term, actual mine operations should be expected to vary from projections. As such, this data should be viewed as an estimate from currently available information and so subject to change in the future in response to market and other factors.

In addition to other operational data, the LOM models provided expected schedules for replacement of capital equipment, construction projects, and hiring for both current operations and the representative scenario.

Seven categories of information from the Teck LOM model were used as inputs in the economic analysis:

- Coal production
- Revenue
- Mine-site employment
- Cost of labour and benefits
- Capital expenditures for construction and equipment, in total and locally sourced
- Operating expenses, excluding labour and benefits
- Tax payments for major taxes, including corporate income tax and royalties

Each of these characteristics was estimated annually from 2014 through 2033, a period that aligns with the LOM models maintained for each mine. Revenues were calculated using consensus forecasts for coal prices, adjusted for product specifications and location. Additional detail on the regional location of suppliers (i.e., East Kootenay, British Columbia, Canada, or foreign) was provided in this model and in supplemental data detailing the region of production for specific types of capital expenditure materials and intermediate goods and services.

Given the commercially sensitive nature of the information contained in the LOM model, the data disclosed in this report is limited to the 2014 results for current operations and the incremental change and percent change of the representative scenario for the period 2017 through 2033.

CGE model

The economic impacts of current operations and the representative scenario were estimated primarily using a CGE model of the BC provincial and Canadian national economies. Forecasted current operations and projected changes in operations under the representative scenario were used as inputs to a Canadian CGE economic model, developed by Regional Economic Models, Inc. The CGE model incorporates input-output, general equilibrium, econometric, and economic geography methodologies to model impacts on macroeconomic variables and estimate industry-specific results for British Columbia and the overall Canadian economy.

The CGE model contains the standard social accounting matrix data found in typical input-output models and a system of equations that describe the economic identities and behavioral responses required to simulate an economy moving between equilibria in response to economic shocks.

The input-output module of the model takes into account the inter-industry transactions within the Canadian economy, as well as the economy's interaction with buyers and sellers in other countries. This component of the model is similar to a typical input-output model, which is able to estimate the impact on supplier industries due to a change in the level of production of an intermediate goods-demanding industry. The social accounting matrix contained in the CGE

model extends this model of inter-industry dependence to transactions between industries, households, and government. In this way, the CGE model estimates economic impacts that consider the following types of effects estimated by users of an input-output model:

- **Direct effect:** the total number of employees, amount of compensation, and output attributed to the treatment operations.
- **Supplier-related effect:** the supplier-related economic activity that results from the Elk Valley mine's purchases of goods and services. This includes purchases of operating inputs that support employment, compensation, and output in the supplying industries. In turn, these suppliers purchase operating inputs, which support additional rounds of supplier-related economic contributions.
- **Consumption-related effect:** the contribution from employee spending that supports businesses such as retailers, restaurants, and service companies.

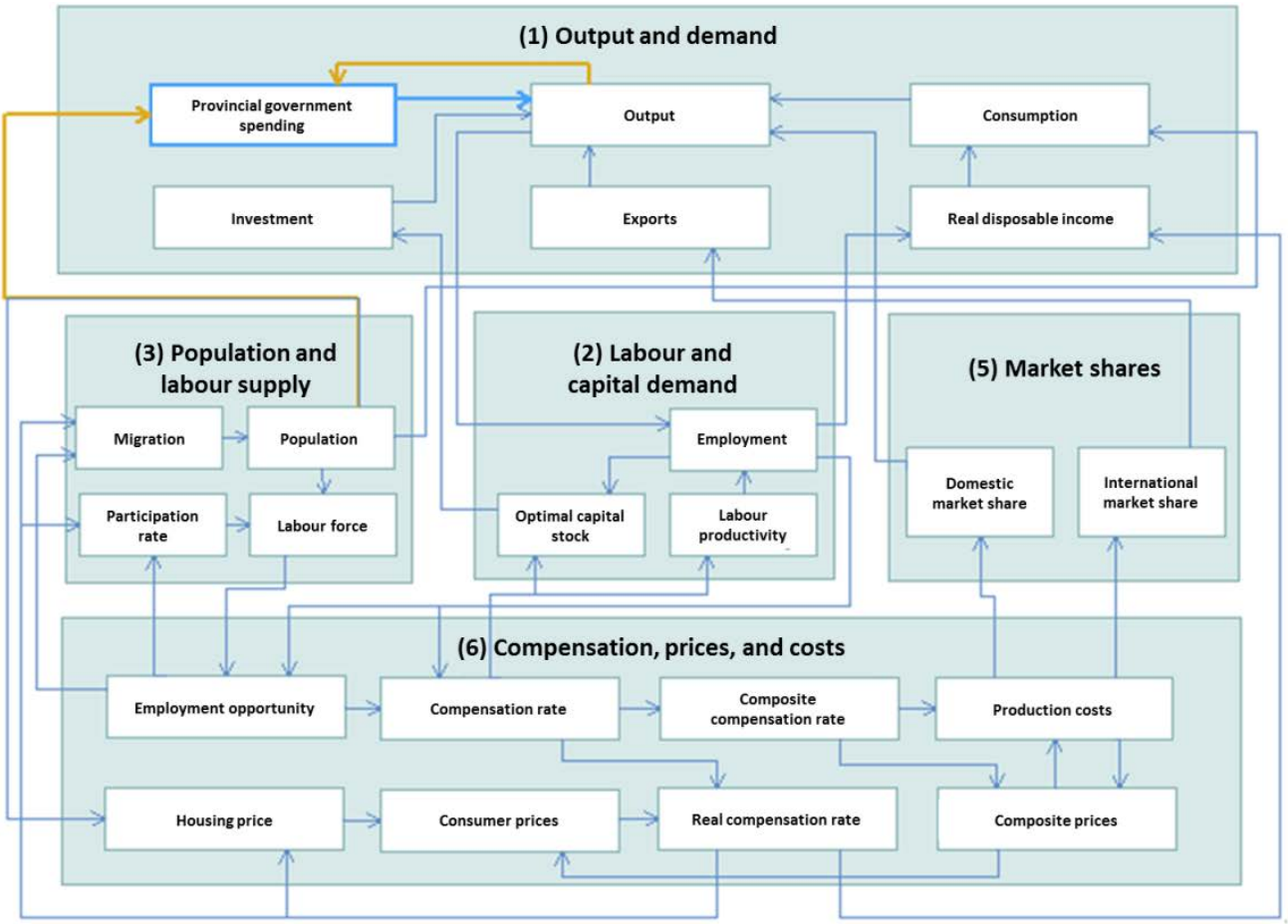
A CGE model was selected because it has significant capabilities beyond those of an input-output model. Advantages of a CGE analysis over a simple input-output analysis considered in the model selection included:

- **Consideration of supply-side constraints:** The most significant limitation of economic impact analysis using an input-output model is the implicit assumption that the economy has no supply-side constraints. That is, it is assumed that extra output can be produced in one area without taking resources away from other activities, thus overstating economic impacts. The actual impact is likely to be dependent on the extent to which the economy is operating at or near capacity. A CGE model accounts for supply-side constraints and offers more credible results for changes in economic activity.
- **Change in prices with variation in supply and demand:** Constraints on the availability of inputs, such as skilled labour, require prices to act as a rationing device. In economic impact analyses using an input-output model, factors of production are assumed to be limitless and, consequently, this rationing response is assumed not to occur. In contrast, a CGE model allows prices to vary and thus captures crowding-out effects that would not be reflected in a simpler input-output framework.
- **Dynamic usage of production inputs:** Economic impact analysis using input-output models implicitly assumes that there is a fixed input structure in each industry and fixed ratios for production. As such, impact analysis using multipliers can be seen to describe average effects, not marginal effects. CGE models allow the composition of industry inputs to change based on changes in relative prices of each input.
- **Change in consumption shares:** Economic impact analysis using an input-output model assumes that households consume goods and services in exact proportions to their initial budget shares. A CGE model allows for the household budget share of goods and services to vary depending on relative prices.
- **Adjustment dynamics of a market economy:** CGE models mimic the economy's adjustment process from one equilibrium to another after an economic shock. As such, the model does

not provide a timeless impact but rather annual changes incorporating the time path of the change in operations and the behavioural changes of businesses and consumers.

The parameters used to define structural relationships in the CGE model are quantified through an econometric methodology. These elasticity estimates allow the behavioural sensitivity of businesses and consumers to changes in the price of goods and services to vary by industry. Examples of econometrically determined response parameters include income and price elasticities of demand for various goods, factor substitution elasticities, and export transformation elasticities. This reflects that consumers, in the example of good-specific price elasticities of demand, will be more responsive to a change in the price of some goods (e.g., luxury goods) than others (e.g., necessities).

Figure 4.1: Summary of CGE Model Dynamics



Source: Regional Economic Models, Inc.

The CGE model developed by REMI was selected based on its recognized credibility for simulating economic impacts. The REMI model was licenced for use by EY. REMI models are widely used by universities, government agencies, and private research organizations. Academic journal articles regarding the model equations and simulation results have been published in the American Economic Review, The Review of Economic Statistics, the Journal of

Regional Science, and the International Regional Science Review. The REMI model provides the abundance of detail necessary for an analysis of the selected economic indicators.

Model variables

The Teck LOM model outputs were input into the CGE model using the following changes to model variables:

- **Local capital investment spending:** Capital investment spending on construction was entered into the economic model as a change in total investment (current operations) or the demand for local construction services (representative scenario). To the extent Teck data showed equipment was to be supplied from within British Columbia or Canada, the equipment was entered as a change in demand for locally-supplied equipment.[8]
- **Operating labour compensation and employment:** The Elk Valley mines' labour compensation and employment were entered into the model simultaneously as an increase in the output of the British Columbia mining industry, calibrated to reflect the correct level of output and employee compensation per worker. This shock to the economic model was specified to eliminate the impact of intermediate input purchases from suppliers, so that those impacts could be isolated in a separate impact. This impact accounted for the estimated 29% of current Teck employees living in and commuting from Alberta: their employment and output was attributed to British Columbia, but their compensation and consumption-related impact was attributed to Alberta.
- **Intermediate input purchases from local suppliers:** The Elk Valley mines' purchases of locally-supplied operating inputs were estimated using supplier payment data from Teck showing the amount and types of purchases made from suppliers in East Kootenay, British Columbia, and Canada. The portion of locally-supplied (British Columbia and Canada) operating inputs was then entered into the model as an increase in locally-supplied demand for several categories of inputs used by Teck.

The approach described above was used to estimate the economic contribution of current operations as well as the impact of the representative scenario:

- The economic contribution of current operations was estimated by first estimating a new model baseline without Teck's capital investments and operations and then adding projected capital investments and operations to that baseline.

[8] Note that Teck's capital expenditures for the current contribution scenario are treated as capital investment in the model because Teck's expenditures on mine construction and operating machinery and equipment are assumed to increase productivity and function similarly to the capital factor in the economic model. However, Teck's investment in water treatment construction and equipment is treated as a demand change without a corresponding increase in capital stock because Teck's investment in water treatment assets reduces an externality not quantified in the model. That is, Teck's water treatment assets produce a good (improved water quality) that does not exist in the economic model.

- The impact of the representative scenario was estimated by translating the incremental operating inputs, employment, and capital investments from Teck's LOM model into shocks to the economic model.

Local economic impact

Local economic impacts are estimated for East Kootenay. This geographic area was selected based on the availability of published economic data.

Although the CGE model does not provide region-specific detail below the British Columbia level, the in-depth detail provided from the CGE model for British Columbia can be used to estimate the economic impact specific to East Kootenay. The baseline against which changes are compared was estimated by apportioning approximately 1.5% of employment, income, and population of the British Columbia baseline in the CGE model to East Kootenay. These figures were estimated through use of the 2006 and 2011 censuses.

The local economic impact encompasses the direct operations of the Elk Valley mines, the portion of the consumption-related impact related to direct employees, and the impact of capital expenditures for current operations that was assumed to occur in East Kootenay. The direct impact reflects the number of jobs, amount of compensation, and output attributed to the activity from current operations. The direct portion of the total consumption-related impact reflects the local spending of these employees (e.g., at retailers and restaurants). A further downward adjustment was made to exclude approximately 20% of goods and services consumed in East Kootenay that would likely contribute to economic activity outside of East Kootenay (e.g., finance and insurance services).

The capital expenditures impact was divided into two parts:

- The impact of the construction workers themselves was attributed fully to East Kootenay.
- The supplier and employee consumption impact was adjusted downwards to exclude the economic activity occurring from suppliers outside of East Kootenay and the employee consumption of those suppliers. A further downward adjustment was made to exclude the consumption of goods and services that would likely contribute to economic activity outside of East Kootenay.

These adjustments reduce the overall economic impact of capital expenditures specific to East Kootenay by approximately one-third.

In modelling the change in population, the ratio of employees to population is held constant. Each new employee was assumed to contribute approximately two people to the East Kootenay population.

4.5. Economic Impact of Current Operations

This section summarizes the economic contribution of current operations in 2014, assuming LOM projections of revenue, employment, and operating and capital expenditures. EY assessed the economic impact from current operations for the period 2014 to 2033. As

discussed above, due to disclosure restrictions of sensitive information, EY has only presented the 2014 results in this report.

Current operations: Canada and British Columbia

The contribution of current operations to the British Columbia and Canadian economies includes contributions to GDP, investment, employment, and labour compensation. These impacts are summarized below for current operations.

- **GDP:** In 2014, current operations are projected to contribute $4.5 billion (2.0%) of British Columbia's $230 billion in GDP. The Canadian nationwide impact in 2014 is estimated to be $5.2 billion, 16% greater than the provincial impact.
- **Capital investment:** current operations are estimated to contribute $0.5 billion of the $70 billion in investment in British Columbia in 2014.
- **Employment:** current operations are projected to support a total of 15,240 jobs in British Columbia and 19,020 jobs in Canada in 2014. This overall impact results from employment at Teck, its suppliers, and businesses that sell to employees, as well as offsetting effects such as higher prices for labour and capital.
- **Compensation:** The overall contribution of current operations to employee compensation is projected to be $2.6 billion nationwide and $1.8 billion in British Columbia in 2014.

The concentration of industry-specific results in British Columbia are similar to those in the overall Canadian economy because a significant portion of the total economic impact occurs in British Columbia: in 2014, $4.5 billion of the $5.2 billion (87%) of current operations GDP impact and 15,240 of the 19,020 (80%) employment impact occurs in British Columbia.

Table 4.5: Economic Contribution of Current Operations to British Columbia and Canada in 2014

Source of Contribution	Units	Amount: British Columbia	Amount: Canada
GDP	Millions of dollars	4,540	5,190
Investment	Millions of dollars	530	590
Employment	Number of jobs	15,240	19,020
Personal Income	Millions of dollars	2,020	2,720
Compensation	Millions of dollars	1,840	2,610

Note: Figures for Canada are inclusive of British Columbia.
Source: REMI model of British Columbia and Canada, and EY analysis.

Current operations: GDP and employment by industry

Industry-specific GDP and employment impacts were estimated in the CGE model. The contribution of current operations to Canada's GDP in 2014, by industry, is summarized in Table 4.6.

Table 4.6: Economic Contribution of Current Operations to GDP and Employment for Canada in 2014

Industry	GDP (millions of dollars)	Employment (number of jobs)
Agriculture, Forestry, Fishing, and Hunting	20	130
Mining, Quarrying, and Oil and Gas Extraction	2,790	4,460
Utilities	40	60
Construction	390	2,240
Manufacturing	280	1,210
Wholesale Trade	80	480
Retail Trade	110	1,420
Transportation and Warehousing	370	2,090
Information	100	330
Finance and Insurance	260	1,420
Real Estate and Rental and Leasing	70	60
Business Services	450	2,820
Non-business Services*	170	1,990
Government	70	310
Total	**5,190**	**19,020**

*Non-business services include heath, education, restaurants, accommodation, recreation, and personal services.
Note: Figures may not sum due to rounding; figures for Canada are inclusive of British Columbia.
Source: REMI model of British Columbia and Canada and EY analysis.

The results for Canada shown in Table 4.6 are inclusive of the result for British Columbia shown in Table 4.7. For example, if employment in manufacturing increases by 100 jobs in Canada and by 20 jobs in British Columbia then 20 of the 100 jobs in Canada result from British Columbia and the remaining 80 jobs occur elsewhere in Canada.

Approximately half of the $5.2 billion of total GDP contributed to the Canadian economy by current operations is in the mining, quarrying, and oil and gas extraction industry ($2.8 billion). This result is primarily due to the direct impact of current operations. Other industries are also affected, with business services ($450 million), construction ($390 million), and transportation and warehousing ($370 million) having the largest effects.

The contribution of current operations to BC's GDP in 2014, by industry, is summarized in Table 4.7.

Table 4.7: Economic Contribution of Current Operations to GDP and Employment for British Columbia in 2014

Industry	GDP (millions of dollars)	Employment (number of jobs)
Agriculture, Forestry, Fishing, and Hunting	20	130
Mining, Quarrying, and Oil and Gas Extraction	2,720	4,240
Utilities	30	40
Construction	330	1,790
Manufacturing	190	980
Wholesale Trade	60	340
Retail Trade	100	1,210
Transportation and Warehousing	310	1,710
Information	80	250
Finance and Insurance	120	590
Real Estate and Rental and Leasing	50	40
Business Services	360	2,170
Non-business Services*	150	1,620
Government	40	140
Total	**4,540**	**15,240**

*Non-business services include heath, education, restaurants, accommodation, recreation, and personal services.
Note: Figures may not sum due to rounding.
Source: REMI model of British Columbia and Canada and EY analysis.

The mining industry is capital intensive and is characterized by relatively a high employment multiplier of 3.7 for British Columbia – meaning that for each direct Teck employee there are 3.7 total jobs, including direct Teck employees, created in British Columbia.

The impacts on employment and GDP are not proportional across industries due to variations in GDP per worker. For example, although approximately half of the GDP impact on the overall Canadian economy of current operations occurs in the mining, quarrying, and oil and gas extraction industry ($2.8 billion of $5.2 billion in 2014), only about one-quarter of the employment impact occurs in the industry (4,460 of 19,020 in Canada in 2014). This is because of the industry's relatively high capital intensity. Of the total Canadian mining, quarrying, and oil and gas extraction industry job impact in 2014 of 4,240, 4,155 are direct Current Operation employment, with the residual related to increased supplier and consumer spending. Other industries are also affected, with the largest job impacts occurring in business services (2,820), construction (2,240), and transportation and warehousing (2,090).

Current operations: East Kootenay

The economic impact of current operations is also estimated for East Kootenay, the census division that contains Elk Valley. Of the 15,240 jobs supported in 2014 by the current operations, approximately 42% (6,440 jobs) are located in East Kootenay. Note that the economic impact in British Columbia includes the economic impact in East Kootenay. For example, if 100 manufacturing jobs were supported in British Columbia and 20 in East Kootenay then this implies 80 manufacturing jobs are supported in British Columbia outside of East Kootenay.

The current operations support a substantial portion of the East Kootenay economy. As shown in Table 4.8, current operations are projected to contribute 6,440 jobs to the East Kootenay economy in 2014. This level of employment is equal to 20% of the 33,000 total jobs in the East Kootenay economy (refer to Table 4.4 for baseline indicators). Similarly, assuming that households with Teck-supported employment would relocate if no employment were available, approximately 20% of the total East Kootenay population would be impacted in 2014.

Current operations also contribute to the standard of living in East Kootenay. In 2014, the East Kootenay is projected to have a per capita income of $42,000 and average compensation of $57,000. As shown in Table 4.8, the analysis estimates that current operations support $5,100 of per capita income and $7,100 of average compensation in 2014 in East Kootenay. In other words, the presence of the Elk Valley mines in the local economy results in $5,100 more per capita income and $7,100 more average compensation than if Teck were not operating in the Elk Valley.

Table 4.8: Economic Contribution of Current Operations to East Kootenay in 2014

Source of Contribution	Units	Amount
Employment	Number of jobs	6,440
Per Capita Income	Dollars	5,100
Average compensation	Dollars	7,100
Population	Persons	12,550

Source: REMI model of British Columbia and Canada, Statistics Canada, and EY analysis.

Current operations: Spending on local suppliers

Incremental supplier purchases create economic activity through non-labour operating expenses and capital expenditures in the following ways:

- Non-labour operating purchases are estimated to originate from the following geographic areas: East Kootenay (19%), British Columbia outside of East Kootenay (31%), elsewhere in the Canadian economy (30%), and internationally (20%).

- The sourcing of capital expenditures is as follows: East Kootenay (33%), British Columbia outside of East Kootenay (7%), elsewhere in the Canadian economy (9%), and internationally (51%).

In 2014, the total procurement going through local, East Kootenay suppliers is projected to be $1.4 billion. Because a significant amount of that procurement generates economic activity outside of the region (i.e., diesel, manufacturing, truck tires, and explosives), the total supplier spend generating East Kootenay economic activity directly from current operations is projected to be $623 million.

Current operations: Government revenues

Economic activity due to current operations contributes to tax liability to the Federal government, the provincial British Columbia government, and the local governments in British Columbia.

Most of the direct economic contributions from current operations to tax liability result from federal and provincial corporate income taxes, the British Columbia carbon tax, and royalty taxes. A much smaller amount is also contributed from the provincial sales and property taxes and the federal fuel excise tax.

In 2014, current operations are estimated to contribute $1.1 billion in tax liability to federal, provincial, and local governments.[9] This tax liability is contributed mostly to the federal government ($530 million) and the provincial government ($480 million); however, $42 million of tax liability is contributed to British Columbia local governments, largely through property taxes.

Tax contributions are summarized in Table 4.9.

[9] Note that Teck's current year tax liability is reduced by the use of tax pools. All corporate tax amounts shown in this report are estimates of Teck's incremental tax liability before credits or reductions resulting from tax pool deductions.

Table 4.9: Total Tax Liability from Current Operations for British Columbia and Canada in 2014

Type of Tax Liability	Tax Liability (millions of dollars)
Federal Government	**530**
Corporate income and royalty taxes	150
Personal income taxes	250
Contributions to social insurance plans	50
Consumption taxes	50
Other taxes	20
British Columbia Provincial Government	**480**
Corporate income and royalty taxes	250
Personal income taxes	80
Contributions to social insurance plans	10
Consumption taxes	80
Other taxes	50
British Columbia Local Government	**42**
Property and related taxes	40
Other taxes	2

Note: Figures may not sum due to rounding.
Source: REMI model of British Columbia and Canada, Statistics Canada, and EY analysis.

A significant portion of the revenue generated for the British Columbia provincial government from Teck's current operations are from the British Columbia Mineral Resource Tax. EY understands that a portion of this revenue is shared with First Nations, pursuant to the government's revenue sharing agreements.[10]

[10] For more information on the First Nations revenue sharing agreement, refer to BC Ministry of Aboriginal Relations and Reconciliation news releases "Province and Ktunaxa reach agreement to share mine revenue dated January 29, 2013.

4.6. Economic Impact of the Representative Scenario

This section summarizes the economic impact of the representative scenario. It is based on LOM projections provided by Teck, which EY understands reasonably represent the base case implementation plan described in the EVWQP.

Comparison of the representative scenario to current operations

The representative scenario is generally consistent with Teck's EVWQP implementation plan in terms of the pattern of increases in employment, operating expenses, labour costs, and capital expenditures.[11]

Key variances between the attributes projected for current operations and the representative scenario were obtained by comparing data contained in the LOM models. Table 4.10 summarizes these variances.

Table 4.10: Incremental Change and Percent Change of the Representative Scenario Compared with Current Operations

Scenario Attributes	Units	Incremental Change and Percent Change per Year					
		2017	2020	2023	2026	2029	2032
Employment	Number of jobs	28	32	70	91	115	118
		1%	1%	1%	2%	2%	2%
Labor costs	Millions of dollars	4	5	12	17	23	25
		1%	1%	2%	2%	3%	3%
Capital expenditures	Millions of dollars	118	127	128	66	28	0
		30%	65%	65%	20%	5%	0%
Operating expenses	Millions of dollars	17	38	81	107	128	142
		1%	1%	3%	3%	3%	4%

Source: Teck and EY analysis.

The most significant variation from current operations is for capital expenditures over the 20-year period. While the impact on capital expenditures is currently the greatest in years 2020 and 2023, this is due to lower than average capital costs at the current operations in those years. Overall capital expenditures, including treatment, remain below the 20-year average of the LOM in those years.

The capital expenditures contribute significantly to the overall economic impact of the representative scenario. In particular, capital expenditures contribute to the direct impact

[11] Teck has already made some capital expenditures for treatment in the Elk Valley; the representative scenario thus includes both incurred capital expenditures to date and the projected outlays under this representative scenario.

through increased demand for local construction services. These expenditures also contribute to the supplier-related impact through intermediate inputs used by local construction services, as well as from those suppliers purchasing operating inputs that, in turn, supports additional rounds of supplier-related economic impacts. Finally, these capital expenditures contribute to the consumption-related impact through the spending of local construction employees and the employees of related suppliers.

Employment, operating expenses, and labour costs would each permanently increase over the 20-year period included in this analysis. Each would increase 1% above projected current operations by 2017 and increase further over time. By 2032 the increase is 2% for employment, 3% for labour costs, and 4% for operating expenses.

Representative scenario: Overview of economic impact

The economic impact of the representative scenario relative to the economic contribution of current operations is presented in Table 4.11. For each measure shown in this table, such as British Columbia GDP, the economic contribution attributable to the representative scenario in a given year is shown as a percentage change in comparison to the economic contribution from current operations in that year. For example, in 2023 the additional economic activity associated with water treatment in the representative scenario results in an increase in British Columbia GDP equivalent to 5% of the contribution to British Columbia GDP from current operations of the Elk Valley mines that year.

To put Table 4.11 into context, percentage changes in impacts should be viewed in conjunction with current operations impacts for 2014. For example, the Elk Valley mines represented a $4.5 billion impact on British Columbia GDP in 2014.

Table 4.11: Economic Impact of the Representative Scenario Compared with Current Operations

	Units	Incremental Change and Percent Change per Year					
		2017	2020	2023	2026	2029	2032
East Kootenay Impact							
Employment	Number of jobs	444	431	375	224	189	176
		6%	7%	6%	3%	2%	2%
Average compensation	Dollars	53	77	155	193	222	234
		1%	1%	2%	3%	3%	3%
British Columbia Impact							
GDP	Millions of dollars	168	193	227	161	110	83
		3%	4%	5%	3%	2%	1%
Investment	Millions of dollars	125	143	158	103	65	33
		19%	24%	28%	14%	6%	4%
Employment	Number of jobs	882	936	937	678	627	581
		5%	6%	6%	4%	3%	3%
Compensation	Millions of dollars	72	91	101	87	84	87
		4%	5%	5%	4%	3%	3%
Canada Impact							
GDP	Millions of dollars	251	283	296	210	169	138
		5%	5%	5%	3%	2%	2%
Investment	Millions of dollars	129	151	174	120	80	44
		17%	23%	27%	15%	7%	4%
Employment	Number of jobs	1,269	1,338	1,344	1,032	959	863
		6%	7%	7%	5%	4%	4%
Compensation	Millions of dollars	106	134	152	137	139	142
		4%	5%	5%	4%	4%	4%

Source: REMI model of British Columbia and Canada, Statistics Canada, and EY analysis.

Corresponding to employment impact, EY's analysis indicates that the representative scenario will result in higher population in the East Kootenay region during the forecast period. Population impact is described in more detail in Section 5 and Table 5.4.

In general, the economic impact of the representative scenario increases through approximately year 10 of the 20-year forecast period and then tapers toward the end of the 20-year period. This is due to the upward trend of labour costs and operating expenses over time combined with the ramping up and decline of capital expenditures. Additionally, the CGE model mimics the market adjustment process, smoothing the response of the increase in economic activity from the representative scenario.

The peak of the response corresponds to the peak of capital expenditures. This is followed by a smooth decline to the economic impact from treatment facility operations. This pattern can be observed in the variances in economic indicators of Table 4.11.

For East Kootenay, the increase above the economic contribution of projected current operations is larger in the years in which capital expenditures are concentrated. Employment increases above current operations by 6% in 2017 before declining in 2026 (3%), and 2029 (2%).

A similar pattern can also be observed in British Columbia and Canada, with increases in investment of 28% and 27% above current operations levels before returning to similar levels as the other indicators with the decline in capital expenditures.

Representative scenario: Government revenue

As outlined above, given the commercially sensitive nature of the information contained in the LOM models, the tax liability impact of the representative scenario is presented as the incremental percentage change of the representative scenario over current operations for the period 2014 through 2033.

The representative scenario results in a net overall decrease of tax liability to the Canadian and British Columbia governments and net increase in tax liability to local governments in British Columbia.

The decrease in liability to the federal and provincial governments is due to the reduction in Teck's taxable earnings associated with the incremental costs of the representative scenario, which include its corporate income tax and provincial royalty tax liabilities. The higher the treatment costs for Teck, the lower its federal and provincial tax liabilities. These declines are mitigated but not offset by increases in the tax liabilities resulting from the increase in overall economic activity due to the representative scenario. This increase includes a positive impact on tax liability for economic activity subject to personal income taxes, contributions to social insurance plans, and consumption taxes.

Table 4.12 summarizes the tax liability implications of the representative scenario for the federal, provincial, and local governments.

Table 4.12: Tax Liability Impact of Representative Scenario as a Percentage Change from Tax Liability Contribution from Current Operations

Type of Tax Liability	Tax Liability Change from Current Operations (percentage)					
	2017	2020	2023	2026	2029	2032
Federal Government Liability	**-1%**	**-3%**	**-3%**	**-4%**	**-3%**	**-2%**
Corporate income and royalty taxes	-12%	-24%	-23%	-24%	-28%	-18%
Personal income taxes	4%	5%	5%	4%	4%	4%
Contributions to social insurance plans	4%	5%	5%	4%	4%	4%
Consumption taxes	5%	6%	6%	5%	4%	4%
Other taxes	4%	5%	5%	4%	4%	4%
British Columbia Provincial Government Liability	**-4%**	**-7%**	**-9%**	**-6%**	**-7%**	**-6%**
Corporate income and royalty taxes	-13%	-18%	-21%	-16%	-20%	-15%
Personal income taxes	4%	5%	5%	4%	3%	3%
Contributions to social insurance plans	3%	5%	5%	4%	3%	3%
Consumption taxes	4%	5%	5%	4%	3%	3%
Other taxes	5%	6%	6%	4%	3%	3%
British Columbia Local Government Liability	**4%**	**5%**	**5%**	**3%**	**3%**	**3%**
Property and related taxes	4%	5%	5%	3%	3%	3%
Other taxes	5%	8%	6%	4%	3%	4%

Source: REMI model of British Columbia and Canada, Statistics Canada, and EY analysis.

The net increase in tax liability for local governments in British Columbia shown in Table 4.12 is mainly a result of the increase in economic activity leading to higher property tax liability. Such impacts are observed throughout many of the sources of tax liability for the federal and British Columbia governments. In particular, tax liability to the federal government from personal income taxes, contributions to social insurance taxes, and consumption taxes increases by 4 to 6% over the projected current operations. Likewise, the tax liability owed to the British Columbia government for these same categories of taxes increases by 3 to 6% over the projected current operations throughout the 20-year period.

The impact of the corporate income tax and royalty tax is significantly larger for the federal government, ranging from 12 to 28% reductions over the 20-year period, and for the British Columbia government, ranging from 13 to 21% reductions over the period.

The reduction in provincial mineral resource tax liability from the representative scenario suggests that First Nations revenue sharing would also decline.

5. Social Impact Analysis

5.1. Overview

This section provides a baseline assessment of the current social inventory in the Elk Valley and assesses the importance of current operations to selected social valued components. Considering that baseline, it assesses the impact of the representative scenario on selected social measures.

5.2. Selected Measures and Boundaries

The social measures selected for analysis in this report are summarized in the Table 5.1. The basis for selection is provided in Section 3.

Table 5.1: Social Measures Selected for Analysis

Pillar	Valued Components	Indicators
Social	Availability and access to community services	Availability of education, distribution of educational attainment across population, and Teck spend on training and apprenticeships
		Availability of medical services
		Availability of emergency services (police, ambulance, and fire)
		Availability of housing
		Teck spend on community investment

Two other valued components identified in our assessment at Table 3.4 — physical health and use of the aquatic environment — are to be separately evaluated by Teck and its consultants in the EVWQP report.

Considering COIs feedback and current state assessments, it was concluded that in terms of spatial, i.e., geographic, boundaries, social impacts resulting from the representative scenario would be local in nature. As such, social measures were assessed within the boundaries of the East Kootenay and specifically focus on the local Elk Valley communities of Elkford, Fernie and Sparwood.

EY's impact analysis is qualitative and considers the magnitude, direction and likelihood of impacts that may occur as a result of changes in economic and demographic conditions under the representative scenario.

5.3. Impact Assessment Criteria

EY's impact assessment takes into account a range of factors, including probability of occurrence, number of people affected, duration of impact, benefits and costs to communities

of interest, extent to which impacts are reversible or can be mitigated, likelihood of impact, and level of importance to the local COIs.

The criteria classifications relied upon were developed with the COIs in mind, particularly consideration of how expected impacts would affect local communities.

Criteria classifications are summarized in Table 5.2.

Table 5.2: Summary of Criteria Classifications

Criteria	Classification	Description
Overall impact		
	Negligible	The impact of the scenario will be negligible and have little or no effect on the social indicator.
	Moderate	The impact of the changes under the scenario will moderately effect the social indicator.
	Significant	The impact of the changes under the scenario will be significant to the social indicator.
Direction		
	Increase	The scenario may increase the availability of the social indicator
	Decrease	The scenario may decrease the availability of the social indicator
	Uncertain	Unknown how the scenario will impact the social indicator
	No effect	
Magnitude		
	Low	The scenario will cause an impact to no or very few stakeholders.
	Medium	The scenario will cause an impact to some stakeholders.
	High	The scenario will cause an impact to many people. There is a high level of reliance from communities and stakeholders.
	N/A	Not applicable
Likelihood		
	Likely	it is likely that impacts will occur as a result of the scenario.
	Possible	it is possible that impacts will occur as a result of the scenario.
	Unlikely	it is unlikely that impacts will occur as a result of the scenario.
	Uncertain	it is unclear if impacts will occur as a result of the scenario.
	N/A	Not applicable

5.4. Current State of Social Indicators

Scale and utilization are key factors considered by government and policy makers in the provision and funding of facilities and services. For this reason, population and population change are key factors in the assessment of availability of community services. Table 5.3 summarizes the current population and age profile of the Elk Valley area.

Table 5.3: Summary of Elk Valley Demographics

	Elkford	Fernie	Sparwood	Rest of Elk Valley area	Total
Total population	2,523	4,448	3,667	1,899	12,537
Median age	38	40	40	41	
Breakdown by age					
0-4	185	250	220	110	765
5-19	470	630	685	295	2,080
20-64	1,690	3,015	2,330	1,280	8,315
65+	170	550	435	210	1,365

Source: BC Stats, census 2011

Based on the British Columbia Stats census, the population of the Elk Valley increased by 3% between 2006 and 2011.

Teck is the single largest employer in East Kootenay, directly or indirectly contributing 6,440 jobs to the East Kootenay economy. Approximately 20% of the total jobs in East Kootenay are dependent on current operations. Similarly, assuming the households with Teck-supported employment would relocate if no employment were available, approximately 20% of the total East Kootenay population would be impacted.

As Teck operations are concentrated in the Elk Valley, the relative population support in Elk Valley communities is substantially higher than for the East Kootenay region as a whole.

EY's economic modelling measured the impact of the representative scenario on the population in East Kootenay. Using the current percentage of Teck-related residents (direct and induced) in the Elk Valley area (87%), EY approximated the expected impact on population in the Elk Valley communities for the representative scenario. Based on this analysis of LOM data, current operations may contribute to growth in local population over the next 20 years.

The assessments below consider the impact on social indicators from current operations based on the projected movements in various economic indicators for the period 2014 to 2032. Given the local population dependency on Teck operations, it is apparent that continued operation of the Elk Valley mines is essential to the maintenance of community services at current levels.

Table 5.4 summarizes the estimated impacts of the representative scenario over the forecast period on Teck's contribution to the Elk Valley population in both absolute and percentage terms.

Table 5.4: Estimated Elk Valley Population Impact from Representative Scenario

	2017	2020	2023	2026	2029	2032
Population impact	733	725	637	375	314	297
	5.1%	5.1%	4.0%	2.1%	1.4%	1.4%

Note: Population change is calculated using 2011 census results and EY's projected population from REMI model

As shown in Table 5.4, the population impact of the representative scenario in the local Elk Valley communities varies from 1.4 to 5.1% during the period 2014 to 2032, with temporary increases up to 5.1% during the years of significant capital expenditures and an increase of 1.4% in the long run. The change in population assumes a direct proportional relationship between employment and population so that new employees to the region will relocate families to the area while holding the average family size constant. If construction workers and other impacted employees didn't relocate families, the expected impact would be reduced.

5.5. Education, Training and Apprenticeships

Overview of education

Elk Valley communities are a part of School District No. 5 ("District 5"). These communities have three elementary schools, three secondary schools, one private school in Fernie and one community college. District 5 serves a student population of approximately 5,300[12] students from the communities of Cranbrook, Jaffray and the three Elk Valley communities of Elkford, Fernie, and Sparwood. This district is challenged by the distances between the students and their schools, declining enrolment, and an economy that is dependent on mining and forestry. The goal of District 5 is to have schools located close to where students live and to maintain educational standards. It is currently looking at options to sustain student success and to attract families to the area. Its current initiatives include ensuring there is sufficient funding to maintain quality education in each local community.[13]

K to 12

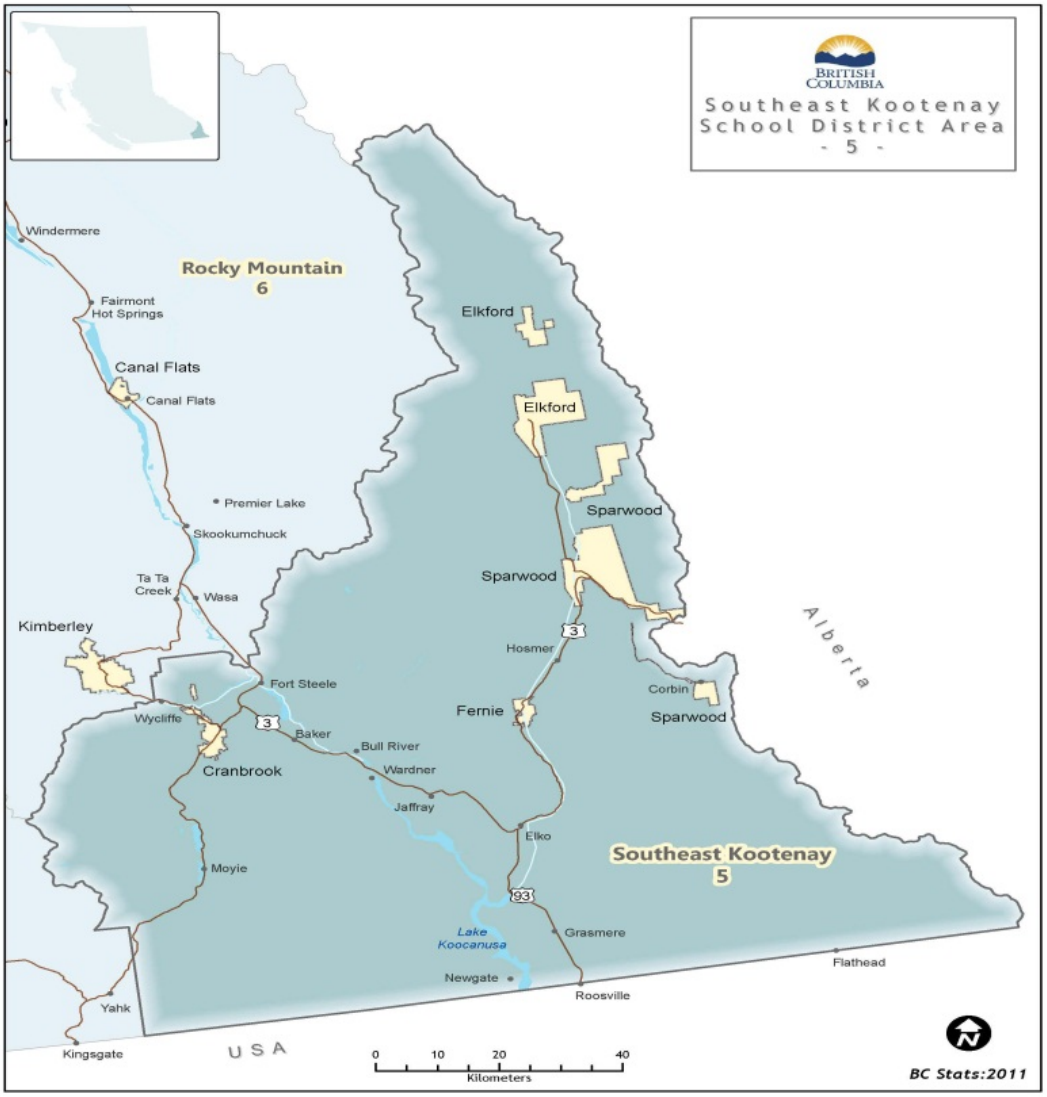
Like most districts in rural British Columbia, District 5 is experiencing declining enrolment and underutilization of facilities. The K-12 population (ages 5 to 18) has decreased by approximately 30% over the past two decades, while the total population of the area has increased by approximately 7%. This means that though the area's population has been increasing, the district's population is getting older, with proportionally fewer children. This shift in demographics has implications for all public service providers, including District 5, which is operating with less available funds due to declining student enrolment. Going forward,

[12] Per Ministry of Education website as at the 2012/13 school year.

[13] Update to SD5 District Facilities Plan.

District 5 is expected to face further declines because of the aging population. This downward trend in enrolment means that funding, capacity, and utilization will remain issues in the future. Figure 5.1 outlines District 5's regional boundaries.

Figure 5.1: School District 5 - Regional Boundaries



District 5 enrolment for the 2012/13 student year was 5,191 students (2,942 elementary, 2,247 secondary, and 2 home-school students[14]). Since 2007, enrolment has declined by 352 students, or 6%. The decrease in enrollment and low operating utilization levels has led to the

[14] Headcount data for the 2012/13 school year per Ministry of Education website. Note that the student enrollment count is lower than the student population base. This may be due to home-schooling, private schools and dropouts.

closure of three elementary schools in the Elk Valley area since 2001. Looking forward, District 5 projects that student enrollment will slightly increase by 1.4% to approximately 5,300 students by 2022.

The decrease in students led to a decrease in funding, increasing pressure on District 5 to respond to the changes. Funding for District 5 is based mainly on the student head count. As enrollment numbers decrease, there is an immediate financial impact. For the 2012/13 school year, the grant was approximately $9,400 per pupil. Assuming no change in the grant amount, for every 1% drop in enrollment the financial impact to District 5 is approximately $0.5 million. This means District 5 would have less money to spend for educational programs and services, supplies, equipment, etc.

Pressure would also increase as capital funding is required to replace schools. District 5's current five-year plan includes capital funding requirements to replace four schools due to their age and condition. Two of the Elk Valley schools to be replaced by new schools will each have a new operating capacity of 400 students, which is an increase from the current operating capacities of 275 and 325 students. Total funding required by District 5 to meet its five year plan to replace schools and buses is $79.6 million. This current plan is based on District 5's best estimate of future enrollment, which is expected to increase slightly over the next 15 years and then stabilize. The best estimate of future enrollment is adjusted for birth rates, migration, and housing factors but not for any significant changes in the economy of the area. The provincial threshold for operating utilization is 100%[15] for elementary schools and 110%[16] for secondary schools before District 5 approves capital projects.

To assess the strength of the educational system, indicators such as high school completion rate within six years, graduation rates, and provincial examination grades were reviewed. District 5's rate for completing high school within the standard six years for the 2012/13 year was 79.4%, while the BC provincial rate was 83.6%. The graduation rate for eligible grade 12 students for District 5 was 97%, which is comparable to the provincial rate of 98%. Figure 5.2 shows the provincial examination results for British Columbia and District 5. Exam grades in District 5 for the 2012/13 school year are slightly below the average provincial results[17]. Based on the results of the indicators, District 5 is performing slightly below the provincial average.

[15] Permanent School Closure Report, School District 71, January 2006.

[16] Permanent School Closure Report, School District 71, January 2006.

[17] BC Ministry of Education.

Figure 5.2: Provincial Examination Results for British Columbia and District 5

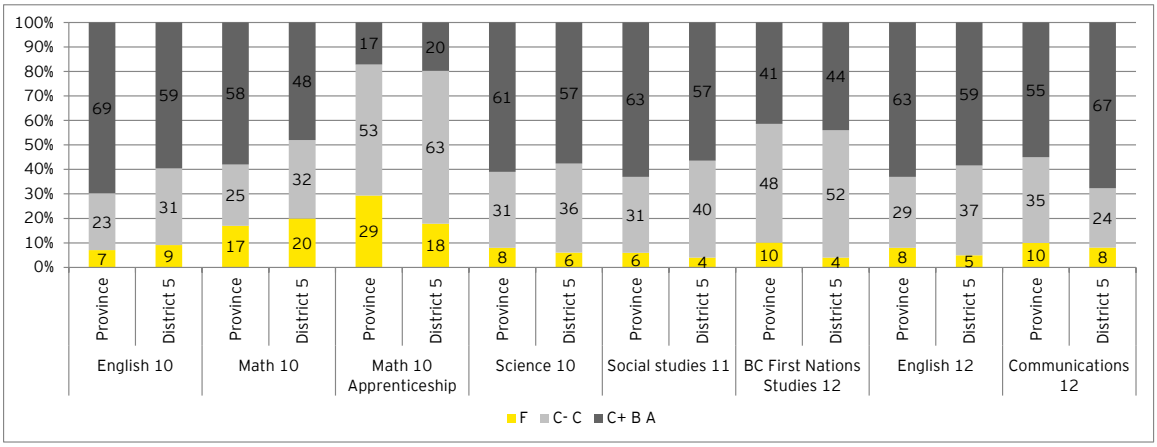


Table 5.5 summarizes the current level of educational attainment in the Elk Valley compared to the province. The percentage of the adult population in the Elk Valley who did not complete high school or are without post-secondary credentials is higher than the provincial average.

Table 5.5: Educational Attainment for the Population Aged 25-54

	Fernie LHA	BC
Without high school completion	13%	11%
Without post-secondary credentials	47%	37%

Elk Valley K-12

Elk Valley communities currently have 2,508 student spaces (1,008 elementary and 1,500 secondary), leaving 566 net surplus student spaces. As summarized in Table 5.6, the district-wide capacity utilization rate for the 2012-2013 school year was 77% (108% at elementary schools and 56% at secondary schools). Historically, BC schools in medium urban districts with capacity factors below 90%[18] have been considered for potential closure and allocation of the student base to nearby facilities. A key consideration for school closures is whether students can be accommodated in other local schools. In an area as disparate as the Elk Valley, this can be a challenge.

[18] Permanent School Closure Report, School District 71, January 2006.

Table 5.6: Summary of Elk Valley Schools K-12

Zone	School	Grade span	Operating capacity	Enrollment 2012/13	Operating utilization in 2013	Projected utilization 2026*
Elkford						
	Rocky Mountain Elementary	K-6	224	221	99%	110%
	Elkford Secondary School	7-12	375	163	43%	54%
Fernie						
	Isabella Dicken Elementary	K-6	292	326	112%	114%
	Fernie Secondary School	7-12	675	338	50%	76%
	Fernie Academy	K-12	300	286	95%	114%
Sparwood						
	Frank J Mitchell Elementary	K-6	292	327	112%	118%
	Sparwood Secondary School	7-12	350	281	80%	88%
Elementary operating utilization			808	874	108%	114%
Secondary operating utilization			1400	782	56%	73%
Total			2508	1942	77%	88%

**Projected utilization based on District 5's enrollment projections.*
Source: BC Ministry of Education and School District 5 website.

Research conducted by BC school districts indicates that the optimal size for an elementary school is around 300 students and for a secondary school around 900 students[19]. These sizes allow for adequate school funding and delivery of programs. If a school is too small, it faces challenges relating to efficiency, diversity, variety of teaching expertise, availability of equipment and the number of program choices.

Post-secondary

The annual outflow of grade 12 graduates to post-secondary institutions has been gradually declining. In 2006 the percentage of grade-12 graduates moving on to post-secondary was 36.7%. This dropped to 28.6% in 2011. District 5's outflow rates to post-secondary institutions are below the BC provincial average of 51% and well below the target of 70%[20].

This condition could be due to several factors, including availability of post-secondary education and the nature of area jobs. Of the graduating students who proceed to post-secondary institutions, approximately 90% attend community college (approximately 81% of the 90% attending community colleges attend the College of the Rockies).[21]

[19] Update to SD5 District Facilities Plan, April 2012.

[20] Ministry of Education, 2012/13 – 2014/15 Service Plan, February 2012.

[21] Per Ministry of Education website as at the 2012/13 school year.

The College of the Rockies main campus is located in Cranbrook, and it has satellite campuses in Creston, Golden, Invermere, Kimberley and Fernie. The College has been in existence since 1975 and has continued to grow, from 543 students at five campuses in 1975 to 2,138 full time equivalent students ("FTEs") in the 2012/13 academic year. The current FTE student population base is comprised of 1,700 Ministry of Advanced Education-funded FTEs, 338 trades apprentice FTEs and 100 foundation trades training FTEs. There are approximately 8,000 part-time continuing education registrants as well, and an international student base of 137 students. The attendance is highly dependent on the local population because only 11% of the colleges students come from outside the area.

The College of the Rockies offers a variety of programs to students including university studies; business; health; fire services training; global studies; kinesiology; office administration; child, youth and family studies; tourism and recreation; information technology; trades; and adult upgrading to complete or upgrade high school.

The College of the Rockies has consistently met or exceeded its annual student FTE targets. The 2012-13 academic year FTE target set by the Ministry of Education was 1,770 students. The actual FTE reported by the college for the academic year was 1,700 students. A change in the economy in the area could have a dramatic impact on the student population base and increase the risk of the college not meeting its targets in the future.

The 2012-13 budget for the College of the Rockies includes a provincial grant of approximately $11,600 per FTE. The annual operating expenses for the year were $35.3 million, and the annual surplus for the year was $0.4 million[22]. If the college FTE population was to drop by 10%, funding would decrease by $2 million based on the current provincial grant per FTE. This could result in significant cuts to programs offered as the college is running close to breakeven at current enrollment rates.

Teck spend on training and apprenticeships

The Elk Valley excels in educational attainment in relation to apprenticeships or trades certification. At 19%,[23] the rate of trades training is nearly double the provincial rate and ranks only slightly behind the overall Kootenay region. The importance of technical skills in the mining sector is mainly responsible for this trend.

Education: Impact of current operations

The maintenance of current levels of availability of education depends on the continued operation of the Elk Valley mines because current operations account for approximately 20% of the population residing in East Kootenay and 67% in the Elk Valley communities. As the region experiences growth in population, there may be increased enrollment at local schools.

[22] College of the Rockies, Annual financial statements for the year ended 31 March 2013.

[23] Statistics Canada National Household Survey, 2011

District 5's current facility plan includes replacement of two elementary schools with larger facilities that would increase operating capacity at each facility from 292 students to 400 students. The secondary facilities are operating below capacity at approximately 56%. Given the available future capacity at the facilities, District 5 would be able to absorb the future increase in enrollments.

The operating utilization target set by the BC Ministry of Education is 90% or higher for schools to be considered fully utilized. Currently, the secondary schools in Fernie and Elkford are operating below this level. To hit optimal utilization an increase in enrollment of 270 secondary school students in Fernie and 175 secondary school students in Elkford would be required (increases of 107% and 80%, respectively).

Per capita income in the East Kootenay area is also expected to increase under current operations. Increases in disposable income may result in more residents choosing to continue with post-secondary education. An increase in enrollment would help the College of the Rockies achieve FTE targets set by the province and contribute to adequate funding going forward.

Elk Valley mine operations spent approximately $26 million in 2013 on training programs in the East Kootenay, including training of employees at Elk Valley Operations and leadership training that brings together individuals from all Teck operations in the region. Current operations are substantially responsible for local educational attainment in relation to apprenticeships and trades certification.

Education: Impact of the representative scenario

EY's assessment of the impact of the representative scenario on availability of education considers the changes in population and economic indicators relative to current operations. As discussed in the economic section of this report, the changes in economic indicators under the representative scenario it will increase through approximately year 10 of the 20-year forecast period before declining for the remaining 20-year period.

As shown in Table 5.4 above, the population impact of the representative scenario in the local Elk Valley communities varies from 1.4 to 5.1% during the period 2014 to 2032, with temporary increases up to 5.1% during middle of the period and an impact of 1.4% in the long run.

With higher population, the number of students enrolled at the local schools to should increase resulting in higher operating utilization. The available capacity at the District 5 facilities should be sufficient to absorb the impact of higher enrollments.

The population impacts of the representative scenario may increase enrollment numbers at the College of the Rockies, but the change would not expected to be significant in relation to the availability of programs.

Given a staged implementation plan, communities will have more time to strengthen education and training by delivering strategic local trades training and apprenticeship opportunities to

meet industry requirements. The timeframe will allow for communities to respond and train local workforces.

Teck has indicated that it expects existing levels of skills training and apprenticeships supported through the Elk Valley mine operations to continue under the representative scenario.

The staged development of water treatment facilities under the representative scenario could create additional demand for skilled workers for the specialized construction and operation of the treatment facilities, which could lead to an increase in the number and type of skills training or apprenticeships offered in the region.

The conclusion of EY's assessment is that the overall impact on the availability of education of the representative scenario will be negligible. Population increase is likely, but the magnitude of the impact is low given the expected base case percentage growth in population and the capacity of the existing facilities to absorb increased enrollment.

Table 5.7: Impact of the Representative Scenario on Availability of Education

Overall Projected Impact	**Negligible**		
	Direction	**Magnitude**	**Likelihood**
Availability of education	Increase	Low	Likely

5.6. Availability of Medical Services

Overview of medical services

Medical services in the Elk Valley are as follows:

- The Elk Valley communities have one community hospital in Fernie, one regional hospital in Cranbrook, and four medical clinics employing a total of sixteen physicians.
- The current health status of residents is similar to British Columbia as a whole.
- The communities are experiencing the impacts of an aging population, shortages of qualified health personnel and funding cuts.
- Projections for the area forecast that the shift in demographics toward an older population will continue because the existing population is aging in the context of a drop in birth rates and migration out of the region. The senior population is forecast to grow by 43.5% between 2012 and 2017, as compared to population growth of only 3.8%.

The Elk Valley area falls under the East Kootenay Health Service Area ("East Kootenay HSA") and the Fernie Local Health Area ("Fernie LHA"). The Fernie LHA services the communities of Fernie, Sparwood and Elkford.

General health

The general health status of the East Kootenay HSA and the Fernie LHA is summarized in Table 5.8. Local health quality compares favourably with the rest of the province.

Table 5.8: General Health Indicators 2007-2011

	Fernie LHA	East Kootenay HSA	BC
Life Expectancy	80.8	81.0	82.0
Average age of the population	40.8	41.9	40.8
Infant mortality rate (per 1000 births)	3.9	4.2	3.7
Low birth weight rate (per 1000 births)	35.3	56.4	55.6
Potential years of life lost (per 1000 population)			
Natural causes	25.5	29.7	29.7
Accidental causes	17.1	12.0	7.0

Source: BC Vital Stats

The infant mortality rate[24] in the Fernie LHA has been decreasing for the past two decades and has stabilized. Birth weight is recognized as a primary indicator of newborn health and an important predictor of subsequent health and well-being. The low birth weight rate for Fernie LHA is well below the BC average. Over the past decade, the low birth weight rate in the area has steadily declined, which is a general indicator of an increasingly healthy environment. The potential years of life lost is an estimate of the average years a person would have lived if they did not die prematurely. The results in Table 5.9 indicate that a greater number of accidental deaths occur in younger people in the Fernie LHA compared to the province.

Another factor used to assess the health status of an area is the standardized mortality rate ("SMR"). The SMR compares the actual number of deaths in the area with the number that would be expected if the area had the same age-specific death rates as the whole province. Table 5.9 summarizes the SMR for various causes of deaths for the Fernie LHA and East Kootenay HSA. Deaths from external factors such as motor vehicle accidents, falls, suicide, and homicide in the Fernie LHA are almost double the provincial average, which leads to greater demands on local health care services than would be expected if the results were closer to the provincial average. However, the numbers of deaths in the Elk Valley area overall are in line with expectations based on provincial results.

[24] Infant mortality rates indicate the number of infants who died before their first birthday per 1,000 live births.

The rate of deaths due to medically treatable diseases is also a key indicator of the strength of the medical system. These are situations where the cause of death could potentially have been avoided through appropriate and timely medical intervention and treatment. There were no such deaths in the period from 2007 to 2011 for the Fernie LHA. [25]

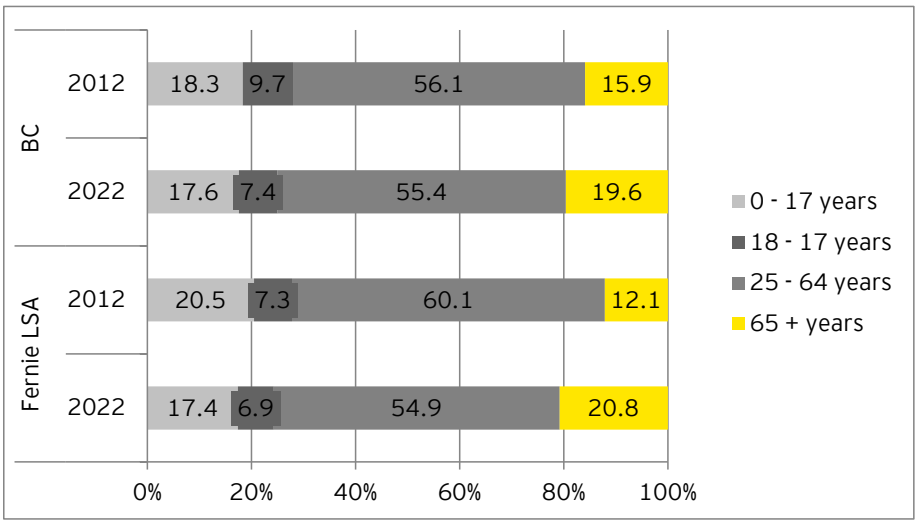
Table 5.9: Average Standard Mortality Ration ("SMR") 2007-2011

	Fernie LHA	East Kootenay HSA	BC
All causes of deaths	1.10	1.06	1.00
Motor vehicle accidents	2.01	2.01	1.00
Accidental falls	2.21	1.77	1.00
External causes (ASMR - per 10,000)	7.93	4.62	3.07
Deaths due to medically treatable diseases	0.00	1.27	1.00

Source: BC Vital Statistics 2011

Aging of the local population is an important factor in the assessment of future health services resourcing. Figure 5.3 depicts the shift in age distribution for the population in BC and for the Fernie LHA from 2012 to 2022.

Figure 5.3: Shift in Age Distribution for the Population in BC and Fernie LHA, 2012 – 2022



[25] BC Vital Stats, 2007-2011.

An aging local population will place an increasing burden on existing health care resources. As shown in Figure 5.3, local growth in seniors is forecasted to be 43.5% from 2012 to 2017 despite a growth in population of only 3.8%.[26]

There are key differences that distinguish medical health systems in rural areas from those in urban centres:

- Patients that could be treated as outpatients in urban centres may have to be admitted because access and long travel times are an issue.
- The predominant economic activities in the Fernie LHA are mining and forestry. These are inherently riskier than service-based industries seen in the urban health regions.
- High participation in relatively high-risk outdoor recreational activities, including snowmobiling, climbing and hang gliding, has been cited as contributing to the high rate of unintentional injuries.

These factors can lead to a greater need for medical services, putting pressure on available resources.

East Kootenay is physically large and sparsely populated, and it contains a number of geographic barriers. For these reasons, access to medical facilities in a reasonable time frame is an issue for residents living in the Elk Valley. There are a number of related community concerns with respect to health care in the area, such as shortages in qualified personnel and funding.

Health care resources

The availability of adequate medical resources, such as human resources and technology, is a basic requirement for a properly functioning healthcare system. The inability to attract and retain healthcare professionals in the region has been cited as an area of concern. The Interior Health Authority[27] has been focused on addressing this issue, and in the past five years the East Kootenay HSA has experienced growth in the number of physicians and specialists.

[26] Source: BC Stats, Fernie Local Health Area, Population Profile October 2012.

[27] Responsible for health services to residents in the interior region of BC.

Table 5.10: Summary of Human Resource Availability

	East Kootenay HSA	BC
Family medicine physicians		
Per 100,000 population - 2012	159	122
Percentage growth 2008-2012	9.4%	13.7%
Specialists per 100,000 population		
Per 100,000 population - 2012	45	99
Percentage growth 2008-2012	56.5%	12.5%
All regulated nurses		
Per 100,000 population - 2011	651	758
Percentage growth 2007-2011	n/a	7.8%

Source: Canadian Institute for Health Information

Table 5.10 summarizes the availability of human resources in the East Kootenay HSA, which is catching up to the province but still experiencing shortages, particularly for specialists and nurses. In the East Kootenay HSA, 85% of residents have a regular medical doctor, which is comparable to the provincial rate of 86%.[28]

The Elk Valley area has four medical clinics: one in Fernie, one in Sparwood, and two in Elkford, with 16 physicians working at these clinics. Doctors in Sparwood and Elkford are concerned about the shortage of physicians. They have expressed concern about the strain this puts on them and on residents.[29] The Sparwood emergency department hours of operation are normally seven days a week from 8 am to 7 pm, but regular hours are often shortened due to lack of doctors as two physicians typically manage the demand. In Elkford, a doctor is available for after-hours, life-threatening emergency services on an on-call basis three nights a week, with nurses available during four-hour shifts on the weekend.

Hospitals

Hospitals are generally considered to be the locus of rural healthcare systems. Not only are important health services based at hospitals, but many of a community's health care personnel

[28] Interior Health, Fernie Local Health Area Profile, October 2012.

[29] Shortage of Physicians in the Elk Valley, Elk Valley Herald, January 31, 2012.

are either directly employed by, or supported by, the local hospital. As such, the closure of a hospital can have a significant impact on a rural community.

There are two hospitals serving the area: the Elk Valley Hospital located in Fernie and the East Kootenay Regional Hospital in Cranbrook. Key operating statistics for local hospitals are compiled in Table 5.11.

Table 5.11: Utilization Statistics for East Kootenay HSA Hospitals

	East Kootenay Regional Hospital	Elk Valley Hospital
Total beds	69	20
Average occupancy rate 2011/12	99.7%	66.2%
Total inpatient days	24,867	4,835
Inpatient utilization by Fernie LHA	10.5%	92.3%
Inpatient days by age group 65+	58.0%	65.0%
Surgical day care utilization by Fernie LHA	9.0%	83.0%
Number of emergency room visits	22,140	10,508

Source: BC Stats, information as at fiscal year 2011-12

The Elk Valley Hospital is a full-service facility offering services that include inpatient care, obstetrics and emergency care. East Kootenay Regional is a larger facility that provides core physician specialties, surgical specialties, emergency and trauma services, laboratory, and acute and obstetrical care. The emergency departments at both hospitals are open 24 hours a day, 7 days a week. Elderly patients already account for the highest volume of inpatient days, and an aging population will increase the strain on the facilities. The target occupancy rate set by the Interior Health Authority is 95%.[30] The Interior Health Authority plans to add 15[31] new beds at East Kootenay Regional Hospital as part of its ten-year capital plan to accommodate future demand based on population projections. The current occupancy rate at Elk Valley Hospital is 66%,[32] which is well below the target rate.

Funding

The health ministry considers the following factors when assessing the need for healthcare services in a specific area:[33]

[30] Interior Health Capital Strategy 2013-2023, March 19, 2013.

[31] Interior Health Capital Strategy 2013-2023, March 19, 2013.

[32] Interior Health, Fernie Local Health Area Profile, October 2012.

[33] Health Funding Explained, Auditor General of British Columbia, 9 January 2013.

- **Population demographics**: The size and demographic composition of regional populations by age, gender and socio-economic status.
- **Utilization**: The use of health care services by the provincial population varies significantly by age, gender and socio-economic status.
- **Inter-regional flows:** Because residents can receive services in other health authority regions than the one they reside in, the model allocates funds to the health authorities providing the services.
- **Regional costs:** Adjustments are made for differences in the cost of delivering health care in different regions due to remoteness or to the higher costs inherent in large, specialized acute care facilities.

Before it would consider closing a medical facility, the Interior Health Authority would consider converting some smaller hospitals to acute-care facilities with no in-patient beds. Another consideration would be to convert 24-hour emergency departments to 18-hour emergency rooms with on-call doctors.

Medical services: Impact of current operations

Population relating to current operations contributes significantly to the existing availability of medical services in the Elk Valley. In the absence of current operations, it would be difficult to maintain medical services at current levels.

Under current operations, projected population growth may increase the number of patients and utilization of the health local facilities. The Elk Valley Hospital's current occupancy rate is 66%, well below the 95% target rate. Operating at occupancy rates below target levels increases the risk of service cuts and closures. Given available capacity, current facilities would be able to absorb future increases in use; improved occupancy rates will bring facilities closer to target use levels.

Over 80% of the population growth that results from current operations is in the 0-64 age category. Because the financial burden on health care is primarily driven by the over-65 age category, current operations positively contribute to the state of health care in the community.

Expected population growth under current operations should assist in the maintenance of funding levels, while not adding proportionally to the strain on resources that are required to provide necessary services.

Medical services: Impact of the representative scenario

The impact assessment of the representative scenario considers the incremental changes in economic indicators over and above current operations.

As discussed in the economic impact section of the report and in relation to education, the changes in economic indicator will increase through approximately year 10 of the 20-year forecast period before declining for the remaining 20-year period. Population increases in the local Elk Valley communities ranging from 1.4 to 5.1% and stabilizing at 1.4% in the long run.

The long-term population base increase will increase the utilization of medical facilities and resources. Given available capacities, current facilities should be able to absorb the incremental increase in use resulting from the representative scenario. The increase in utilization may contribute to current funding levels being maintained and current services continuing to be provided.

Based on this assessment, EY concluded that the overall impact of the representative scenario on the availability of medical services indicator will be negligible. The population increase is likely, but the magnitude is low, given that the long-term expected growth in population as a result of the representative scenario is 1.4% over baseline growth, once stabilized.

Table 5.12: Impact of the Representative Scenario on Availability of Medical Services

Overall Projected Impact	Negligible		
	Direction	**Magnitude**	**Likelihood**
Availability of medical services	Increase	Low	Likely

5.7. Availability of Emergency Services

Overview of emergency services

Police, ambulance and fire services in the Elk Valley are as follows:

- Policing in the area is provided by the 18 officers of the Elk Valley RCMP detachment.
- Each of the three Elk Valley communities has one ambulance station and one ambulance, providing services 24 hours a day, seven days a week.
- Fire services are provided through a combination of volunteer and paid fire brigades. Each community has a fire department and a reasonable level of fire equipment to support its needs in the current state.

Police services

The Elk Valley communities are served by the RCMP provincial force, which provides detachment policing to municipalities with populations under 5,000. The Elk Valley RCMP Detachment includes three provincial policing jurisdictions: Fernie, Sparwood, and Elkford. The total authorized strength (maximum number of positions the detachment is authorized to fill) for the Elk Valley detachment is 18, which includes one general investigation member assigned to the detachment as a whole.

For communities with populations below 5,000, the cost of the RCMP provincial force is shared between the federal and provincial governments, covering 30% and 70% of the policing costs, respectively. Municipalities share the provincial cost, with the proportion not exceeding 50%. The local communities collect a police tax as part of the annual property taxes.

The crime rates in Table 5.13 represent the number of Criminal Code of Canada ("CCC") offenses per 1,000 people. The Elk Valley Detachment's crime rate is 62 per 1,000 people,

which is comparable to the average crime rate for all provincial detachments of 69 per 1,000, and significantly below the total RCMP municipal forces total of 86 per 1,000[34]. The population per officer rate of 840:1 for the Elk Valley detachment is comparable to the total RCMP forces for the province, but higher than the population per officer rate of 547:1 for independent municipal police departments. The number of serious crimes per officer is significantly lower than the provincial average. The RCMP, in conjunction with the provincial government, monitors and reviews existing resources so that resources are strategically deployed to prevent and reduce crime in the communities.

Table 5.13: Summary of Elk Valley RCMP Detachment

	Fernie	Sparwood	Elkford	Total	BC
Population	6,891	4,548	2,839	14,278	2,608,874
Officers	9	5	3	17	3,463
Population per officer	766	910	946	840	753
CCC offences	476	275	129	880	223,377
Crime rate	69	60	45	62	86
# serious crimes per officer (2009-2011)				2.7	7.0

Source: Police Resources in British Columbia 2012

The populations of Fernie and Sparwood are each close to exceeding 5,000.[35] Once a community exceeds a population of 5,000, it falls under a municipal policing structure and will be responsible for 70% of the policing costs with the remaining 30% paid by the federal government.

Ambulance services

The BC Ambulance Service ("BCAS") falls under the umbrella of the Public Health Services Authority of BC. BCAS has been struggling to recruit and retain paramedics to serve rural parts of BC [36]. The communities of Fernie, Sparwood and Elkford each have one station and one ambulance providing services 24 hours a day, seven days a week.

The Elk Valley stations are staffed similar to volunteer fire departments where paramedics are called to respond by pager. When on-call, paramedics receive a stipend (sometimes $2 per hour) to be available and their full hourly rate for four hours when responding to a call. This staffing structure is not used in urban areas and makes working in rural regions less attractive.

Currently, each community in the Elk Valley has its own station and ambulance vehicle available. Table 5.14 summarizes the 2013 annual call volume for each community on

[34] Ministry of Justice – Police Resources in British Columbia, 2012

[35] Based on census population results

[36] Ambulance Paramedics Community Solutions in Rural Communities, UBCM 2013.

average. On average, there is less than one call per day, and such low emergency call volumes do not justify the expense of full-time paramedic staffing. With an aging population, there will be greater need in the future for a more active and reliable ambulance service. BCAS reports that call volumes in other parts of BC have risen every year and doubled since 2005 for the province. In contrast the results for call volumes in the Elk Valley communities have been fairly stable for the past three years.

Table 5.14: Summary of Annual Call Volume

	2011	2012	2013
Fernie	337	330	329
Sparwood	260	285	271
Elkford	118	126	111

In response to staffing shortages, several programs have been launched to help promote working in rural parts of BC to paramedic students. The Ministry of Advanced Education set up an emergency medical assistant education fund in 2007 that supports the training and development of paramedic students in rural communities. Also, starting in early 2014, a new Primary Care Paramedics program will provide training for a total of 30 students, organized as two intakes of 15 students in two rural communities each year. The first communities to benefit from the training will be Prince George and Cranbrook.

Fire services

As with other public service areas, recruiting and retaining qualified firefighters remains a key concern for Elk Valley. There is no mandatory legislative requirement in BC for a community to have a fire department, and essentially all decisions related to the fire and rescue service are made at the community level. Currently, each Elk Valley community has its own regional district fire department. Typically, they share resources as needed. Regional district fire departments are funded through municipal tax funding or donations.

There are three basic types of fire departments: paid, composite, and volunteer. In a paid fire department, all members are salaried; in a composite department, members are a mix of full-time firefighters and volunteers who are paid stipends when called in; and in a volunteer department, all members are paid only a stipend for work. Sparwood has a paid department, and Elkford and Fernie have composite fire departments.

Table 5.15: Summary of Fire Services in Elk Valley

	Fernie	Sparwood	Elkford
# of fire halls	1	2	1
# of firefighters:			
Fire chief	1	1	1
Full time firefighters	6	34	-
Volunteer	17	-	27

At current resource levels, Elk Valley fire statistics are comparable to provincial results. Table 5.16 summarizes the number of incidents in 2012. There were no injuries in the area, but the number of fires in Elkford was higher than provincial average, although the number was manageable with the support of neighboring communities.

Table 5.16: Summary of Fire Statistics

	Fernie	Sparwood	Elkford	BC
Population	4,502	3,835	2,698	44,596,743
# of fires	3	1	8	6,780
Injuries	-	-	-	266
Fatalities	-	-	-	35
Per capita loss	4	2	39	87
Fire per 1,000 persons	1	0	3	1.5

Source: BC Annual Statistical Fire Report 2012

Emergency services: Impact of current operations

As with other community services, population related to current operations contributes significantly to the existing availability of emergency services in the Elk Valley. In the absence of current operations, it would be difficult to maintain services at current levels.

Projected population growth under current operations will contribute to the maintenance of existing levels of emergency services in the Elk Valley communities. It may also contribute to the maintenance of funding levels. The current level of services available should be sufficient to absorb future population growth under current operations.

Emergency services: Impact of the representative scenario

The primary impact of the representative scenario on emergency services is the projected increase in local population. As discussed in relation to education and healthcare services, the changes in economic indicators will increase through approximately year 10 of the 20-year forecast period before declining for the remaining 20-year period. Population increases in the local Elk Valley communities ranging from 1.4 to 5.1% and stabilizing at 1.4% in the long run.

While a population increase is likely, the magnitude is low. Long-term population increases under the representative scenario are expected to contribute to the maintenance of existing levels of emergency services in the Elk Valley communities without any substantial strain on resources. They may also contribute to the maintenance of funding levels.

Temporary Increases in population during the middle years of the projection period, during which local resources are unlikely to be augmented, may strain the availability of policing and ambulance services. Given the proposed staging for the implementation of the representative scenario, the strain on the availability of services is expected to be relatively small and manageable.

Based on this assessment, EY concluded that the overall impact of the representative scenario on the availability of emergency services will be negligible.

Table 5.17: Impact of the Representative Scenario on Availability of Emergency Services

Overall Projected Impact	Negligible		
	Direction	**Magnitude**	**Likelihood**
Availability of emergency services	Mixed	Low	Likely

5.8. Availability of Housing

The mining and tourism industries have attracted new residents to the Elk Valley as temporary and long-term residents. Growing numbers of retiring employees are choosing to stay in the area rather than leaving and making properties available for new employees. These factors have caused availability and affordable housing to be key issues in the Elk Valley.[37]

Occupancy and vacancy rates

The Elk Valley region has a high percentage of recreational or seasonal housing units compared to the rest of the province. The provincial average is around 9% for total housing units not occupied by usual residents (meaning they are empty or occupied on a temporary basis). The proportion for the Elk Valley is 30%.[38]

The percentage of residents living in rental accommodations in the Elk Valley is 20%, with average rental payments of $610, which is lower than the provincial average rent of $828. There is currently a shortage of rental accommodations in Elkford and Sparwood to serve the area's permanent population, contract workers and consultants, or those working in the mines

[37] Kootenay Business, Upper Elk Valley sees affordable housing solution, February 2011.

[38] BC Stats, Census 2011.

on a 4-day-on and 4-days-off rotation.[39]The average vacancy rate for Sparwood was approximately 5% in January 2014, a drop from a peak vacancy rate of 15% in 2011.[40]

Historical housing prices

Elk Valley housing costs are similar to neighbouring regions, with average single family homes having an assessed value of $385,000 for Fernie, $226,000 for Elkford, and $215,000 for Sparwood.[41] However, the Elk Valley area does lack lower-cost housing relative to some of the other smaller communities.[42] Residents have experienced increasing housing prices for the last 10 years. In 2014, property assessment values for the Elk Valley area rose by approximately 3% from 2013.[43]

Residential building permits issued

The level of development activity in the Elk Valley has generally followed the ups and downs of the provincial economy, with record highs achieved in 2007, declines in 2008 to 2009, and a recovery in 2012. Table 5.18 summarizes the number of building permits issued in the Elk Valley communities for each of the last five years. On average, the communities have added 70 new housing units annually, an increase of approximately 1% each year in total private dwellings.

Table 5.18: Summary of Residential Building Permits

	2009	2010	2011	2012	2013
Fernie	58	21	21	25	21
Sparwood	6	76	15	28	9
Elkford	10	7	19	28	7
Total	74	104	55	81	37
% change	(43%)	41%	(47%)	47%	(54%)

Source: BC Stats

Availability of housing: Impact of current operations

The existence of current operations has contributed to the level of availability of housing in the Elk Valley. Based on the projected population growth rates under current operations, the

[39] The Districts of Elkford & Sparwood Housing Need and Demand Assessments, 2012.

[40] Sparwood staff report to council, Vacancy Rates, January 2014.

[41] Elk Valley Regional Economic Opportunity Analysis & Growth Sector Identification, Final Report, June 2013.

[42] Elk Valley Regional Economic Opportunity Analysis & Growth Sector Identification, Final Report, June 2013.

[43] Elk Valley Regional Economic Opportunity Analysis & Growth Sector Identification, Final Report, June 2013.

availability of housing is expected to keep pace with the future population increase without significant impact on housing prices.

The population growth from current operations and the expected stability of the Elk Valley mine operations over the forecast period will help to maintain housing prices and mitigate dramatic changes in property values over the period.

Availability of housing: Impact of the representative scenario

As discussed above, the changes in economic indicators will follow the shape of an inverted-U and stabilize in the twenty-year projection period. While increases in population resulting from the representative scenario would tend to reduce housing availability, the resulting overall increase in required housing is expected to be relatively minor and to have a low impact on the availability of housing.

While not expected under the representative scenario, a large inflow of workers in a short period of time could have a disruptive impact on the availability of housing. As shown in Table 5.4, population growth in the local Elk Valley communities as a result of the representative scenario will range from1.4 to 5.1% during the period 2014 to 2032. A staged implementation approach alleviates the pressure on housing demand by maintaining construction employment around current levels for an extended period of time, rather than spiking and dropping off.

EY understands that the proposed staging of the base case implementation plan under the Plan will maintain the annual construction labour force at a level similar to what was used to build the West Line Creek AWTF.

Based on this assessment, EY concluded the representative scenario will have a negligible impact on the availability of housing in the Elk Valley.

Table 5.19: Impact of the Representative Scenario on Availability of Housing

Overall Projected Impact	**Negligible**		
	Direction	**Magnitude**	**Likelihood**
Availability of housing	Decrease	Low	Likely

5.9. Teck Spending on Community Investment

As a part of its sustainability strategy, Teck collaborates with communities so they benefit in a self-defined and sustainable manner from its activities and products. One way that Teck collaborates with Elk Valley communities is by making annual contributions to education, environment, health and various social initiatives. On average, Teck has contributed approximately $1 to 2.5 million annually within the Elk Valley communities to initiatives such as:

- Fernie Women's Shelter
- Automated External Defibrillators in local schools and recreation centres
- Local Food Banks
- Bike trails

Under the modelling assumptions used for this assessment, Teck has informed us that the representative scenario is not expected to impact community contributions.

6. Limitations

This report is confidential. It has been prepared by EY solely for Teck for the purpose stated, and it should not be used for any other purpose. It is subject to the terms and restrictions outlined in the engagement agreement between EY and Teck.

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Readers should be aware of the following limitations of the economic analyses contained in this report:

- **The economic analysis does not consider externalities.** The economic analysis only captures market transactions and does not consider the potential positive externality of improvements in water quality. For example, an improvement in water quality may reduce future remediation expenditures, health, or other outcomes that are not reflected in the economic model or the estimated economic impacts.
- **The economic analysis is not a full cost-benefit analysis and does not assess the opportunity cost of the investment in the representative scenario.** The economic analysis presents the estimated economic contribution of current operations and the estimated incremental impact of the representative scenario. However, no analysis of the potential alternate uses of the funds is included. The analysis does not consider the potential change in public sector costs that could occur as a result of the incremental economic activity.
- **The economic analysis does not include a public-sector balanced-budget constraint.** A change in the level of economic activity and tax collections may result in government spending changes. For example, if tax collections increase due to a stronger economy, the additional revenue could be used to fund a reduction in tax rates, higher government spending, or a reduction in public debt. Similarly, if government tax collections decline, this reduction in revenue would be offset by a reduction in government spending, a reduction in taxes, or an increase in public debt. While it is assumed in the social impact analysis that

changes in tax collections affect changes in government spending, the economic analysis does not estimate the impact of changes in tax revenue.

- **The economic analysis relies on Teck's current supplier location information to project the location of suppliers to the representative scenario.** Information provided by Teck describes the location of its current suppliers for various types of operating inputs and capital expenditure items. It is assumed in the economic analysis that the portion of incremental operating inputs and capital goods supplied locally as part of the representative scenario will be similar to the portion that Teck currently obtains locally.
- **Border effects are considered outside the CGE model.** The CGE model is a two-region model containing British Columbia and rest of Canada regions. The model's economic geography module considers flows between the two regions using average distance between each region, but does not allow for an explicit assumption about the proximity of the mine to the border of the region. Therefore, off-model adjustments were needed to allow for a greater portion of the economic impacts related to employee spending to leak out of the British Columbia provincial economy to Alberta.

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