

## *Appendix 1-A*

*BC Input-Output Model Report: Harper Creek*

HARPER CREEK PROJECT

**Application for an Environmental Assessment Certificate /  
Environmental Impact Statement**

# BC Input-Output Model Report: Harper Creek

## BACKGROUND

This report summarizes the results of an input-output analysis that assesses the economic impact of the construction and annual operations of the Harper Creek Project, an open-pit copper mine. The project is located north of Kamloops, in the North Thompson Valley.

The British Columbia Input-Output Model (BCIOM) was used to generate the estimates. A description of the BCIOM, and the assumptions underlying input-output analysis, is included in the Appendix.

## ABOUT INPUT-OUTPUT ANALYSES

Input-output analyses highlight the relationships among producers and consumers (businesses as well as individuals) of goods and services. An input-output analysis is based on first identifying a basket of goods and services used by a specific project<sup>1</sup> and then tracing through all of the steps involved in producing those goods and services to identify the total extent to which the British Columbia economy will be affected by project expenditures.

## THREE TYPES OF IMPACTS

Three different types of impacts are reported in a typical input-output analysis:

The **direct impact** measures the impact on BC industries supplying goods and services directly used by the project.

The **indirect impact** measures the impact on BC industries that are further back in the supply chain. The indirect impact is cumulative, and includes transactions going all the way back to the beginning of the supply chain.

The **induced impact** measures the effect that spending by workers (those employed by the project, or by direct and indirect supplier industries) has on the economy.

## HOW ARE ECONOMIC IMPACTS MEASURED?

Output, GDP, employment and tax revenues are the key measures used to assess the economic impacts associated with a project. In order to properly interpret the results of a BCIOM analysis, some background information about what these measures represent and how they are calculated may be helpful. A brief explanation of terms and concepts follows.

**Output** is simply a measure of the total value of production associated with a project. In an **industry-based** analysis, output is equal to the value of goods and services produced by the BC industry or industries that are affected by a specific project. In an **expenditure-based** analysis, it can be measured as the total dollar amount of all spending on **goods and services produced in BC**. It should be noted that purchases of goods and services produced outside the province do not directly affect BC businesses, so these expenditures are explicitly excluded from the analysis. This is usually the main reason why the direct impact on BC industries is less than initial project expenditures.

**Gross Domestic Product (GDP)** is a measure of the value added (the unduplicated total value of goods and services) to the BC economy by current productive activities attributable to the project. It includes **household income** (wages, salaries and benefits, as well as income earned by proprietors of unincorporated businesses) from current productive activities as well as profits and other income earned by corporations. Only activities that occur within the province are included in GDP.

<sup>1</sup> Or, in the case of an industry analysis, the total value of production by one or more industries.

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**Employment** estimates generated by the model are derived from estimated wage costs using information on average annual wages in an industry. They are not full-time equivalent (FTE) measures. Instead, they reflect the wages paid and hours spent on the job by a typical worker in an industry. For an industry where most employees work full time, the numbers will be very similar to FTE counts. However, in an industry where part-time work is more common, the job counts will be quite different from FTEs.

**Government tax revenue** estimates generated by the model include income taxes as well as commodity taxes. *Provincial and federal tax revenues* include federal and provincial personal and corporation income taxes. Also included are PST, GST and other *commodity* taxes such as gas taxes, liquor and lottery taxes and profits, air transportation taxes, duties and excise taxes. Property tax revenues are not included in the estimates. *Municipal tax revenues* are primarily related to accommodation taxes.

A more detailed explanation of input-output modelling in general and the BCIOM in particular is included in the Appendix.

Output or GDP: which measure should be used to evaluate economic impacts associated with a project?

Output and GDP are both valid economic measures. However, there are some key differences between them that should be kept in mind when analyzing the results of an input-output analysis.

*Output measures correspond to total spending or production, but may overstate the economic impact of a project because the value of a good or service is counted each time it changes hands.*

If one is only looking at direct effects, output is a meaningful measure since it shows the total dollar value of industry production. However, there is a danger of double-counting when activities in industries further up the supply chain are also included. Output measures may overstate the indirect economic impact associated with a particular project since the activities of every industry that has contributed in some way to the creation of a final

product are counted each time a good or service changes hands.

For example, when a construction company builds a house, the selling price of the house includes:

- the cost of the land on which it is built;
- the cost of inputs (lumber, shingles, cement, carpets, paint, hardware, plumbing fixtures, architectural services and so on) purchased and used by the builder; and
- the value of the work done by the construction company.

An **output-based impact measure** would include the entire selling price of the house (including all these imbedded costs) in the direct output of the construction industry. The value of architectural services included in the cost of the house would also be counted as an indirect output impact on the architectural services industry. The value of the lumber used would be counted as an indirect output impact on the wood industry, and going further back in the supply chain, the value of the logs used by the sawmill would be counted in the indirect output impact on the logging industry. In this example, the value of the logs used to produce the building materials is counted at least three times: once in the direct output impact, and twice in the indirect output impacts on the sawmill and logging industries. In other words, the indirect output impact could be quite high simply because goods (or services) used in production have changed hands many times.

*Indirect output impacts provide useful information about the total amount of money that has changed hands as goods and services are transformed into final products. GDP is a better measures of the economic impact since the value of the work done by each industry is attributed only to the producing industry, and is counted only once.*

GDP is calculated by subtracting the cost of purchased goods, services and energy from the total value of an industry's output. As a result, the value of the work done by a producing industry is only counted once. In the construction example, the direct GDP impact would only include the value of the work done by the

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construction firm. The indirect impact on the sawmill industry would only include the value of the work done to transform the logs into lumber, and the indirect impact on the logging industry would be a measure of the value of the work done by the loggers. There is no double counting in GDP measures.

It should be noted that the relationship between GDP and output is a useful analytical measure since it shows the extent to which industries rely on labour and capital as opposed to material and service inputs in

production. The analysis of economic impacts relies on this relationship, since output is more easily and directly measured than GDP. In fact, the starting point for most input-output analyses is a measure of the direct output associated with a project. From this, known relationships between output and other indicators such as GDP and employment can be used to estimate the economic impact associated with a specific project.



## SUMMARY OF RESULTS, HARPER CREEK (UPDATED)

### SOURCES OF DATA

The results presented in this report are derived from information provided by clients. The data inputs used for this study were provided to BC Stats by Yellowhead Mining Inc.

The data inputs were coded to BCIOM categories by BC Stats, and used to perform a customized run through the British Columbia Input-Output Model.

### KEY ASSUMPTIONS

The wage component of the labour cost estimate is assumed to include pre-tax wages, salaries and supplementary income (e.g., the employer’s share of contributions to EI or CPP). The model’s estimates of income tax revenues are calculated by estimating income taxes associated with a given wage. For the calculation of induced effects, it is assumed that 80% of workers’ earnings will be used to purchase goods and services in the province (the remaining 20% goes to taxes, other payroll deductions, and savings).

It is assumed that a social safety net is in place, and that workers hired to work on the project previously had some income from EI or other safety net programs (note: the social safety net assumption only affects the estimate of worker spending, which is the induced effect associated with the project).

All of the tax revenue impacts have been calculated based on the current tax structure, which assumes a PST of 7% is applied to items subject to the tax.

Employment estimates are generated by the model based on the wage bill and average earnings in each affected industry. They should not be confused with FTE counts. The model estimates represent average jobs in an industry. In some industries, most workers are employed full time, but in others (e.g., accommodation and food services) the typical work week is usually shorter.

### SUMMARY OF RESULTS: CONSTRUCTION PHASE

The input data used in the analysis of the economic impact of the construction phase of the project are summarized in the following table.

<b>Harper Creek Mine Construction Costs (\$million)</b>	
Labour	122.0
Materials	92.9
Equipment	401.2
Subcontractors	120.2
Other Costs	271.5
<b>Total</b>	<b>1,007.9</b>

For the construction phase, total expenditures on goods and services are expected to be \$1 billion, including a contingency allowance (reported in other costs in the table above) which was allocated proportionally across all expenditure items. It should be noted that the labour and other costs in the BCIOM report tables reflect this reallocation of the contingency amount.

Of the \$1 billion spent on mine construction, an estimated \$411 million is expected to be used to purchase commodities imported from other countries, from other provinces, or withdrawn from inventories. Total spending on goods and services produced in British Columbia (including labour) is estimated at \$597 million.

Wages, benefits and operating surplus comprise an estimated \$148 million of this total, while taxes on products net of subsidies are estimated at \$40 million. Thus, the direct BC supply (the change in BC supplier industry output associated with spending on construction) is estimated at \$409 million. This is the amount that was used to shock the model in order to determine the indirect and induced impacts associated with construction expenditures.

Total tax revenues directly generated by construction spending are estimated at \$60 million, including the \$40.1 million of commodity tax revenues mentioned previously, as well as an estimated \$18.2 million on

# BCIOM Report: Harper Creek (Updated)—continued...

personal income taxes, and \$1.9 million in corporate income taxes.

Direct purchases from BC supplier industries are estimated at \$409 million, with another \$211 million of output generated in industries further back in the supply chain. Spending by workers is expected to result in an additional \$124 million of output in the province.

The GDP originating in direct supplier industries is estimated at \$188 million, with another \$98 million in industries further back in the supply chain. Spending by workers is expected to contribute an additional \$77 million to the province's total GDP.

Direct employment during construction is estimated at 1,756 (total for the two-year construction period). Another 3,336 jobs are anticipated in supplier industries, including those employed by sub-contractors hired to work on the construction project, as well as those working in the industries supplying goods and services used directly by the project. Employment attributed to spending by workers is estimated at 876.

Indirect GDP and employment estimates associated with the construction project reflect the expected expenditures, which include a significant portion of spending going to sub-contractors and equipment purchases.

Total tax revenues associated with the project include the \$60 million directly generated by construction spending, plus another \$46 million in taxes originating in the activities of direct and indirect supplier industries, together with \$10 million resulting from spending by workers.

Project direct spending is expected to contribute \$16 million to federal government coffers, \$44 million to provincial governments, and a marginal amount going to local governments. It should be noted that the allocation of taxes on products and production by level of government is based on provincial averages, and may not reflect the actual allocation of these taxes in the local area.

Supplier industry activities are expected to generate \$27 million in federal government revenues, \$22 million in provincial revenues and nearly \$8 million in revenues to local governments.

Local area employment includes the 878 direct jobs (annual average) on the project, plus another 2,106 indirect and induced jobs. Of this total, it is estimated that 317 jobs will be filled by local area residents (those located in Thompson-Nicola areas A, B, P and O), while most (1,789) of the jobs will be in other parts of the province.

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## Harper Creek Mine Construction (2 years)

<b>Total impact, including Construction (2 years), supplier industry &amp; induced effects</b>					
	<b>Direct</b>	<b>Other suppliers</b>	<b>Total Indirect*</b>	<b>Induced**</b>	<b>Total impact</b>
Total project expenditures, Construction (2 years) (\$M)	<b>1,008</b>				
Supplier industry & induced impacts (\$M)	409	211	<b>620</b>	124	<b>744</b>
GDP at basic prices (\$M)					<b>512</b>
Construction (2 years)***	<b>148</b>				148
Supplier industry & induced impacts	188	98	<b>286</b>	77	364
Employment (#)****					<b>5,968</b>
Construction (2 years) (Model Estimate)	<b>1,756</b>				1,756
Supplier industry & induced impacts	2,137	1,199	<b>3,336</b>	876	4,212
Employment (FTES)					<b>5,312</b>
Construction (2 years) (Model Estimate)	<b>1,716</b>				<b>1,716</b>
Supplier industry & induced impacts	1,913	1,016	<b>2,928</b>	668	3,596
Household income (\$M)					<b>378</b>
Construction (2 years)	<b>134</b>				134
Supplier industry & induced impacts	132	67	<b>199</b>	44	244
Average annual wage (\$ per employee)					
Construction (2 years)	<b>76,355</b>				
Supplier industry & induced impacts	61,680	56,160	<b>59,695</b>	50,675	<b>57,820</b>
Tax revenue (\$M)					<b>117</b>
Construction (2 years)	<b>60</b>				60
Supplier industry & induced impacts	31	15	<b>46</b>	10	56

\* The total indirect impact is the sum of the effect on direct suppliers and other supplier industries

\*\* Assumes a social safety net is in place. Includes effects generated by project spending and activities of supplier industries

\*\*\* Project expenditure data provided by clients may not include all components of GDP (e.g., operating surplus)

\*\*\*\* Employment estimates are based on average annual wages in 2011. Includes total employment over the life of the project

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<b>Allocation of Project Expenditures Construction (2 years)</b>					
<b>Total construction (2 years) expenditures (\$M)</b>					<b>1,007.9</b>
<i>minus leakages:</i>					
<i>imports from other countries</i>					137.8
<i>imports from other provinces</i>					267.9
<i>other leakages (e.g. withdrawals from inventory)</i>					5.3
<i>Equals:</i>					
<b>Expenditures on goods &amp; services (including labour and profits) produced in BC (\$M)</b>					<b>597.0</b>
<i>Of which:</i>					
<i>Wages, benefits, unincorporated business income and operating surplus (\$M)</i>					148.1
<i>Taxes on products net of subsidies (\$M)</i>					40.1
<i>Taxes on factors of production net of subsidies (\$M)</i>					0.0
<b>Direct BC supply (\$M)</b>					<b>409</b>
<i>( the change in BC supplier industry output associated with construction (2 years))</i>					
Project employment during construction (2 years) (#)					1,756
Household income included in construction (2 years) (\$M)					<b>134.1</b>
<b>Tax revenue derived from direct project expenditures Construction (2 years)</b>					
	Federal	Provincial	Local	Total	
<b>Total, all sources</b>	<b>16.023</b>	<b>44.195</b>	<b>0.016</b>	<b>60.234</b>	
Taxes on products (\$M)*	1.537	38.584	0.000	40.121	
Taxes on factors of production (\$M)	0.000	0.008	0.016	0.024	
Personal income taxes (\$M)	13.158	5.016		18.174	
Corporate income taxes (\$M)	1.328	0.586		1.914	
<i>(income taxes paid on worker's wages and returns to capital reported in project expenditure)</i>					

\*Small differences between this figure and the value for taxes on products net of subsidies reported in the allocation of project expenditure are due to rounding and/or the inclusion of net taxes paid on some goods purchased by subcontractors which are not reflected in the indirect & induced impacts given below.

<b>Indirect &amp; Induced Impacts resulting from Construction (2 years) expenditures</b>					
	Direct suppliers	Other suppliers	Total indirect impact (all suppliers)	Induced Impact**	Total indirect & induced impacts
Output (\$M)	409	211	620	124	744
GDP at basic prices* (\$M)	188	98	286	77	364
Employment (#)*	2,137	1,199	3,336	876	4,212
FTEs (#)	1,913	1,016	2,928	668	3,596
Household income (\$M)	132	67	199	44	244
<b>Total tax revenue (\$M)</b>	<b>31.225</b>	<b>14.929</b>	<b>46.154</b>	<b>10.176</b>	<b>56.330</b>
Federal (\$M)	16.211	7.296	23.507	3.264	26.770
<i>Personal income tax</i>	11.118	5.373	16.491	2.474	18.965
<i>Corporation income tax</i>	4.504	1.976	6.480	1.318	7.797
<i>Net taxes on products</i>	0.588	-0.053	0.536	-0.528	0.007
Provincial (\$M)	12.468	5.624	18.092	3.899	21.991
<i>Personal income tax</i>	4.204	2.047	6.251	0.950	7.201
<i>Corporation income tax</i>	2.019	0.891	2.910	0.586	3.497
<i>Net taxes on products</i>	6.245	2.686	8.931	2.362	11.293
Local (\$M)	2.546	2.008	4.555	3.014	7.569

\* Includes wages, benefits, unincorporated business income, operating surplus and net taxes on factors of production

\*\* Assumes a social safety net is in place. Includes effects generated by project spending and activities of supplier industries

# BCIOM Report: Harper Creek (Updated)—continued...

## SUMMARY OF RESULTS: MINE OPERATION

The data inputs used in the analysis of the economic impact of the mine operation are summarized in the following table. It should be noted that these values represent the total impact over the 28-year life of the mine.

Harper Creek Mine Operating Costs, 28 year total (\$million)		
General & Administration	Labour	50.1
	Direct	237.4
	Subtotal	287.9
Site Services	Labour	91.3
	Direct	157.2
	Subtotal	248.5
Mining	Labour	682.4
	Power	786.2
	Consumables	1,212.3
	Subtotal	2,681.0
Processing	Labour	294.0
	Consumables	1,576.4
	Power	741.9
	Residual	0.0
	Subtotal	2,612.3
<b>TOTAL</b>		<b>5,829.7</b>

Of the \$5.8 billion that the mine is expected to spend on goods and services during its operation, an estimated \$1.5 billion is expected to be used to purchase goods and services that have either been imported, or withdrawn from inventories held by producers.

Total spending on goods and services produced in BC, including labour and returns to capital, is estimated at \$4.3 billion. Of this total, an estimated \$1.1 billion is expected to be labour costs, which are reported as the direct GDP associated with the project. It should be noted that the data inputs supplied by the client did not include any estimated return on capital, so the project's direct GDP (and tax revenue impacts) does not include corporate profits or corporate income tax.

Taxes on products net of subsidies are estimated at \$274.1 million over the 28-year life of the mine, with another \$34.6 million generated from taxes on factors of production. Personal income tax revenues are estimated at \$126.7 million over the 28 year period. These estimates are based on current tax rates and incidence.

The direct BC supply—the change in BC supplier industry output associated with the mine's operation—is estimated at \$2.9 billion. Another \$931 million is expected to be generated in industries further back in the supply chain, while industries benefitting from spending by workers are expected to see their output increase by \$661 million.

GDP in direct supplier industries is estimated at \$1.6 billion, with another \$456 million in indirect supplier industries. The induced GDP impact is estimated at \$412 million.

In addition to the 11,248 jobs at the mine (total employment over the 28-year period), direct and indirect supplier industry employment is estimated at 13,197, with another 4,657 jobs in industries benefitting from spending by workers.

Tax revenues generated by indirect and induced spending are estimate at \$408 million, including \$184 million in revenues to the federal government, \$146 million in revenues to provincial governments and \$77 million in local government revenues.

It is anticipated that most of the supplier industry jobs will be outside the local area (Thompson-Nicola areas A, B, O and P). In addition to the 402 (average annual) jobs at the mine, it is expected that there will be 24 jobs in local supplier industries, with the remaining 613 jobs located outside the local area.

# BCIOM Report: Harper Creek (Updated)—continued...

## Harper Creek Mine Operation (28-year total)

Total impact, including Operation (28-year total), supplier industry & induced effects					
	Direct	Other suppliers	Total Indirect*	Induced**	Total impact
Total project expenditures, Operation (28-year total) (\$M)	<b>5,830</b>				
Supplier industry & induced impacts (\$M)	2,893	931	<b>3,824</b>	661	<b>4,484</b>
GDP at basic prices (\$M)					<b>3,618</b>
Operation (28-year total)***	<b>1,152</b>				1,152
Supplier industry & induced impacts	1,597	456	<b>2,053</b>	412	2,465
Employment (#)****					<b>29,103</b>
Operation (28-year total) (FTE Estimated by Client)	<b>11,248</b>				11,248
Supplier industry & induced impacts	8,027	5,171	<b>13,197</b>	4,657	17,855
Employment (FTES)					<b>26,263</b>
Operation (28-year total) (Estimated by Client)	<b>11,248</b>				<b>11,248</b>
Supplier industry & induced impacts	7,127	4,338	<b>11,465</b>	3,550	15,015
Household income (\$M)					<b>2,227</b>
Operation (28-year total)	<b>1,118</b>				1,118
Supplier industry & induced impacts	593	280	<b>873</b>	236	1,109
Average annual wage (\$ per employee)					
Operation (28-year total)	<b>99,383</b>				
Supplier industry & induced impacts	73,885	54,180	<b>66,165</b>	50,675	<b>62,125</b>
Tax revenue (\$M)					<b>843</b>
Operation (28-year total)	<b>435</b>				435
Supplier industry & induced impacts	283	70	<b>353</b>	54	408

\* The total indirect impact is the sum of the effect on direct suppliers and other supplier industries

\*\* Assumes a social safety net is in place. Includes effects generated by project spending and activities of supplier industries

\*\*\* Project expenditure data provided by clients may not include all components of GDP (e.g., operating surplus)

\*\*\*\* Employment estimates are based on average annual wages in 2011. Includes total employment over the life of the project

# BCIOM Report: Harper Creek (Updated)—continued...

<b>Allocation of Project Expenditures Operation (28-year total)</b>	
<b>Total operation (28-year total) expenditures (\$M)</b>	<b>5,829.7</b>
<i>minus leakages:</i>	
<i>imports from other countries</i>	779.0
<i>imports from other provinces</i>	710.6
<i>other leakages (e.g. withdrawals from inventory)</i>	20.7
<i>Equals:</i>	
<b>Expenditures on goods &amp; services (including labour and profits) produced in BC (\$M)</b>	<b>4,319.4</b>
<i>Of which:</i>	
<i>Wages, benefits, unincorporated business income and operating surplus (\$M)</i>	1,117.9
<i>Taxes on products net of subsidies (\$M)</i>	274.1
<i>Taxes on factors of production net of subsidies (\$M)</i>	34.6
<b>Direct BC supply (\$M)</b>	<b>2,893</b>
<i>( the change in BC supplier industry output associated with operation (28-year total))</i>	
Project employment during operation (28-year total) (#)	11,248
Household income included in operation (28-year total) (\$M)	<b>1,117.9</b>
<b>Tax revenue derived from direct project expenditures Operation (28-year total)</b>	
	Federal      Provincial      Local      Total
<b>Total, all sources</b>	<b>131.424      281.358      22.573      435.355</b>
Taxes on products (\$M)*	39.641      234.469      0.000      274.110
Taxes on factors of production (\$M)	0.250      11.764      22.573      34.587
Personal income taxes (\$M)	91.533      35.125           126.658
Corporate income taxes (\$M)	0.000      0.000           0.000
<i>(income taxes paid on worker's wages and returns to capital reported in project expenditure)</i>	

\*Small differences between this figure and the value for taxes on products net of subsidies reported in the allocation of project expenditure are due to rounding and/or the inclusion of net taxes paid on some goods purchased by subcontractors which are not reflected in the indirect & induced impacts given below.

<b>Indirect &amp; Induced Impacts resulting from Operation (28-year total) expenditures</b>					
	Direct suppliers	Other suppliers	Total indirect impact (all suppliers)	Induced Impact**	Total indirect & induced impacts
Output (\$M)	2,893	931	3,824	661	4,484
GDP at basic prices* (\$M)	1,597	456	2,053	412	2,465
Employment (#)*	8,027	5,171	13,197	4,657	17,855
FTEs (#)	7,127	4,338	11,465	3,550	15,015
Household income (\$M)	593	280	873	236	1,109
<b>Total tax revenue (\$M)</b>	<b>283.064</b>	<b>70.385</b>	<b>353.449</b>	<b>54.108</b>	<b>407.557</b>
Federal (\$M)	132.917	33.541	166.458	17.354	183.812
<i>Personal income tax</i>	47.716	22.001	69.717	13.156	82.873
<i>Corporation income tax</i>	84.784	10.938	95.722	7.006	102.728
<i>Net taxes on products</i>	0.417	0.603	1.020	-2.808	-1.789
Provincial (\$M)	97.549	27.989	125.538	20.729	146.267
<i>Personal income tax</i>	18.218	8.392	26.610	5.052	31.662
<i>Corporation income tax</i>	35.677	5.015	40.692	3.118	43.810
<i>Net taxes on products</i>	43.654	14.582	58.236	12.559	70.795
Local (\$M)	52.597	8.855	61.453	16.026	77.478

\* Includes wages, benefits, unincorporated business income, operating surplus and net taxes on factors of production

\*\* Assumes a social safety net is in place. Includes effects generated by project spending and activities of supplier industries

## INTERPRETING THE BCIOM RESULTS

BCIOM model results are summarized in the tables attached to this report. This section defines some of the terms and concepts used in the report tables and explains how they are calculated.

*Variables that are calculated directly from information supplied by clients*

**Total project expenditure** is usually provided by the client, and includes all direct expenditures associated with the project.

There are no jobs, GDP or output associated with the production of goods and services that are imported into the province. Therefore an estimate of the value of imported goods and services is deducted from project direct spending to determine the value of **project expenditure in BC**.

Estimates of wages, salaries and other components of GDP provided by the client are reported in **project direct GDP at basic prices**.

*About Project Direct GDP Estimates*

*It should be noted that project direct GDP figures are derived from information provided by clients. These figures are usually project-specific, but they are not always based on complete information. For example, it is often possible to get good data on wages and salaries associated with a project or activity. Labour costs are the biggest component of GDP, but other variables which ought to be included in the estimate (such as investment income, operating surplus, or depreciation) are not always known. When the GDP figures generated by the BCIOM are based on partial information, they may understate the project's direct contribution to GDP.*

**Project direct employment** is derived based on the project's wage bill and estimates of average annual wages in the industry.

**Household income** is calculated based on project direct wages, benefits and mixed income.

Variables that are estimated using model information

**Commodity taxes less subsidies** is calculated using information on average sales and other tax rates associated with each good or service purchased by the project.

Project expenditure in BC is traced back to the producing industries in order to determine the **direct BC supply**. Because industries do not “produce” taxes, wages or other components of GDP, the direct BC supply only includes the value of goods and services produced by BC industries. Direct project spending on wages, salaries, operating surplus and taxes are excluded from this measure.

An estimate of **corporate and personal income taxes** associated with these project direct expenditures is calculated using information on average tax rates from the model.

# BCIOM Report: Harper Creek (Updated)—continued...

## *BCIOM impact estimates*

The model is shocked using the direct BC supply calculated from the information provided by the client. This is used to determine the total economic impact of the project on the BC economy, which is reported in terms of direct, indirect and induced impacts.

The **direct impact** measures the change in economic activity required to satisfy the initial change in demand. The **direct output impact** is equal to the direct BC supply—the change in the economic activity of the industries producing the goods and services purchased by the project.

The **direct GDP impact** is the GDP generated as a result of the activities of the industries that produce the goods and services used by the project.

The **direct employment impact** shows total employment in these industries, and the **direct household income impact** is a measure of the wages, salaries, benefits and other income earned by these workers.

The **direct tax revenue impact** includes personal, corporation, sales and other taxes generated as a result of the activities of the industries that supply the goods and services used by the project.

The allocation of tax revenues to federal, provincial and local governments is based on model averages.

## *Induced effects*

The induced effect, which measures the impact associated with expenditures by workers, includes purchases of a variety of goods and services, including housing.

*More detailed information about the impacts is available in the report tables included in this document.*

## APPENDIX

### SOME BACKGROUND ON INPUT-OUTPUT MODELS AND ANALYSIS

Input-output analysis is based on statistical information about the flow of goods and services among various sectors of the economy. This information, presented in the form of tables, provides a comprehensive and detailed representation of the economy for a given year. An input-output model is essentially a database showing the relationship between commodity usage and industry output. It consists of three components:

- a table showing which commodities—both goods and services—are consumed by each industry in the process of production (the input matrix)
- a table showing which commodities are produced by each industry (the output matrix)
- a table showing which commodities are available for consumption by final users (the final demand matrix).

These data are combined into a single model of the economy which can be solved to determine how much additional production is generated by a change in the demand for one or more commodities or by a change in the output of an industry. Changing the usage or production of a commodity or group of commodities is often referred to as shocking the model. The known relationship between goods and services in the economy is used to generate an estimate of the economic impact of such a change.

If a change in demand is met by increasing or decreasing imports from other jurisdictions, there is no net effect on domestic production. All of the benefits or costs associated with employment generation or loss, and other economic effects, will occur outside the region. Therefore, it is important to identify whether or not a change in the demand for a good or service is met inside or outside a region.

### ASSUMPTIONS AND CAVEATS

From an IO perspective, commodities made in BC have a much bigger impact than those imported into the province. The analysis presented here is based on using default import ratios for most commodities: i.e., assuming they are purchased locally, but allowing for the fact that they may have been manufactured elsewhere.

All tax data were generated using the model structure, and are based on averages for an industry or commodity.

Economic modelling is an imprecise science, and the precision of the figures in the tables should not be taken as an indication of their accuracy.

### THE BRITISH COLUMBIA INPUT-OUTPUT MODEL

The BCIOM can be viewed as a snapshot of the BC economy. It is derived from inter-provincial input-output tables developed by Statistics Canada and includes details on 727 commodities, 300 industries, 170 “final demand” categories, and a set of computer algorithms to do the calculations required for the solution of the model. It can be used to predict how an increase or a decrease in demand for the products of one industry will have an impact on other industries and therefore on the entire economy.

### LIMITATIONS AND CAVEATS ASSOCIATED WITH INPUT-OUTPUT ANALYSIS

Input-output analysis is based on various assumptions about the economy and the inter-relationships between industries. These assumptions are listed below:

Input-output models are linear. They assume that a given change in the demand for a commodity or for the outputs of a given industry will translate into a proportional change in production.

Input-output models do not take into account the amount of time required for changes to happen.

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# BCIOM Report: Harper Creek (Updated)—continued...

Economic adjustments resulting from a change in demand are assumed to happen immediately.

It is assumed that there are no capacity constraints and that an increase in the demand for labour will result in an increase in employment (rather than simply re-deploying workers).

It is assumed that consumers spend an average of 80% of their personal income on goods and services. The remaining 20% of personal income is consumed by taxes, or goes into savings.

The BCIOM is based on a “snapshot” of the BC economy in 2008. It is assumed that relationships between industries are relatively stable over time, so that the 2008 structure of the economy continues to be applicable today. However, it should be noted that employment estimates have been adjusted to reflect wage levels for the year of the expenditures in each case.

The BCIOM does not distinguish between regional effects. It will not, for example, differentiate between the economic impact of a plant located in one region of the province and a similar plant elsewhere in BC.

