

**Alaska-Canada Rail Link
Strategic Environmental Assessment
Overview of Economic Impacts**

Prepared for

Alaska-Canada Rail Link (ACRL)

By

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Overview of Economic Impacts

1 Introduction

The ACRL is designed to link together the Alaska Railroad (ARR) system with the Canadian rail systems (CNR and CPR), which are also connected to major U.S. rail systems. Network economies will provide access for people and businesses in Alaska, Yukon, and northern B.C. to rail service connections throughout North America.

The study of the impact of a large construction project like the ACRL can be likened to dropping a rock into a pond. If one looks at the pond in its entirety, the impacts are modest. However, near the entry point of the rock, there are sizeable waves that ripple outward. The task of economic impact analysis is to measure the magnitude, reach, and persistence of those ripples. Estimating the impacts of the ACRL is complicated by the size and shape of the pond, which spans one state (Alaska), one territory (Yukon), one province (British Columbia), and two countries.

Each of these jurisdictions operates in its own economic and fiscal environment, with a unique mix of human and natural resources. These differences will determine how impacts of the project will be felt in different regions. For example, while the relatively modest construction labour demand may be readily absorbed in Alaska during a period of projected decline in construction activity, the much larger demand in Canada will be substantially in excess of available resources in Yukon and northern British Columbia. Without careful planning to mitigate the impacts created by the arrival of large numbers of temporary workers, communities in the region will be subject to the negative impacts of a sharp boom-bust cycle, such as that experienced in Interior Alaska during construction of the Trans-Alaska Pipeline.

2 Rail Link Construction Impacts

The Alaska-Canada Rail Link (ACRL) is a standard-gauge rail line over 1,500 miles in length, with a capital cost of approximately US\$11.8 billion in current dollars. Most of the mileage and the construction costs are in Canada (1,323 miles and approximately US\$10.6 billion). The remaining construction will take place in Alaska (213 miles, US\$1.2 billion).¹

The route for the ACRL determines both the total expenditure and the annual capital outlay. The route chosen for the impact study is the Delta Junction to Ladue (Alaska Segment) to Carmacks to Watson Lake (Yukon Segment) to Hazelton (B.C. Segment) with a spur from Carmacks to Whitehorse to Skagway.

Construction costs average about US\$7.7 million per mile (CD\$9.1 million). In Alaska, construction costs are lower (about US\$5.6 million per mile) while in Canada they

¹ To convert to US dollars multiply Canadian dollar value by 0.85.

average about US\$8.0 per mile (Yukon - US\$8.3 million per mile and BC US\$7.5 million per mile).

Figure 1: ACRL Construction Impacts

	Total Project	Rest of U.S.	Alaska	Yukon	B.C.	Rest of Canada	Canada
Miles of Track	1,536	0	213	791	532	0	1,323
Investment ¹ (Millions, US\$)	\$11,800	-	\$1,200	\$6,600	\$4,000	-	\$10,580
Investment ¹ (Millions, CD\$)	\$13,900	-	\$1,500	\$7,700	\$4,700	-	\$12,400
Total Economic Output/GDP (Millions, US\$)	\$24,930	N/A	\$1,980	\$5,400	\$5,700	\$11,850	\$22,950
Direct Employment	68,500	-	10,500	33,000	25,000	-	58,000
Indirect + Induced Employment	140,200	N/A	6,600	21,800	35,700	76,100	133,600
Total Employment	208,700	N/A	17,100	54,800	60,700	76,100	191,600
Total Labour Income (Millions, US\$)	\$12,610	N/A	\$880	\$2,200	\$3,100	\$6,430	\$11,730

Notes:

¹ Does not include Skagway port projects. Only includes US\$30 million for the Alaska segment of the Skagway–Whitehorse–Carmacks spur line. These impacts are analyzed in Appendix A.

The construction phase of the project will generate about 209,000 person-years of employment, about 17,000 in Alaska and over 190,000 in Canada. Direct construction employment will be 68,500 person-years, with over 10,500 in Alaska and about 58,000 in Canada (33,000 in Yukon and 25,000 in B.C.). The balance of jobs results from *indirect* employment generated by suppliers to the project and the employment *induced* by workers spending their paychecks from construction and supplier firms on goods and services in the broader economy. Many of the indirect and induced jobs will be in other parts of Canada and the U.S.²

3 Rail Link Operations Impacts

The operations phase of the rail link requires resources for maintenance of the right-of-way, equipment maintenance, the transport of goods, and the administration of the operating activities (billing, payroll, etc.). Annual ACRL employment for operations would be about 530 full-time equivalents (FTEs) with about 90 in Alaska, 260 in Yukon, and 180 in B.C.

² The U.S. estimates do not include employment in the Lower 48 states. An approximation would be about 13,000 person-years of employment elsewhere in the U.S.

The real action arises from the induced activity in mining along with the induced employment to supply the indirect needs of the rail and mining sectors in Alaska and Canada and the induced needs arising from the increase in labour income.

The Gross Domestic Product (GDP) for the rail link operations should cover the wage bill, net interest paid, capital consumption allowances, and a regulated rate of return for invested capital. There is an implicit assumption that any revenue shortfalls are covered by the U.S. and Alaska governments, with minor contributions from Canada.

Alternatively, the governments could operate the roadbed/right-of-way with an annual charge tied to the use of the line by railroad companies. Any losses would show up as losses by a Crown corporation. Depending on the method of covering these costs, GDP might be affected.

Figure 2: Annual Operations Impacts

	Total Project	Rest of U.S.	Alaska	Yukon	B.C.	Rest of Canada	Canada
Operation Costs ¹ (Millions, US\$)	\$127	-	\$20	\$64	\$43	-	\$107
Operation Costs ¹ (Millions, CD\$)	\$149	-	\$23	\$75	\$51	-	\$126
Direct Employment ²	530	-	90	260	180	-	440
Indirect + Induced Employment ^{2,3}	8,774	N/A	74	3,200	3,400	2,100	8,700
Total Employment ^{2,3}	9,304	N/A	164	3,460	3,580	2,100	9,140
Labour Income ^{2,3} (Millions, US\$)	\$635	N/A	\$11	\$230	\$238	\$156	\$624
Labour Income ^{2,3} (Millions, CD\$)	\$748	N/A	\$13	\$271	\$280	\$184	\$735
Economic Output/ GDP (Millions, US\$)	\$1,370	N/A	\$52	\$342	\$415	\$561	\$1,318
Economic Output/ GDP (Millions, CD\$)	\$1,611	N/A	\$61	\$402	\$488	\$660	\$1,550

Notes:

¹ Includes operating expenses only (maintenance of way, maintenance of equipment, transportation, general and administration).

² Canadian employment and labour income impacts are based on the Innovations Solutions Phase I cost model, June 8, 2006 version. Alaska operations impacts are based on the Phase 2 financial model, July 5, 2006 version. Alaska operations impacts are based on costs and revenues for Year 7 (2016).

³ Canadian employment and labour income impacts include induced mine construction and operation, and substituted rail for truck transportation. Alaska induced impacts include rail operations only.

4 Other Important Impacts

Presently, most consumer and industrial goods are transported to northern BC and Yukon by truck and to Alaska by truck and barge, including rail-barge units that are rolled off in Alaska and moved to their consumption or redistribution point by rail. This adds a significant cost to all goods consumed in Alaska, Yukon, and northern BC. The ACRL can result in a significant reduction in these transportation costs. In turn, this will reduce consumer prices for transported goods and their domestic competitors.

Wages and Prices

Wages and the pricing of services also reflect the cost-of-living. Reductions in the prices of consumer goods will induce reductions in the price of services as well, leading to further increases in consumers' real incomes. The CPI is expected to be reduced permanently by between 0.3 and 0.4 percent in both Yukon and Alaska.

In Alaska, the average savings resulting from the diversion of up to two million tonnes of highway and marine freight could total over \$100 million per year or about 25 percent of annual resupply transportation costs. We expect that some of this savings would be passed on to Alaska households, businesses and government purchasers. Annual savings on general merchandise entering Alaska would average \$52 per ton or \$162 per capita.

Alaska Highway Gas Pipeline

At some point in the near future, a large-diameter natural gas pipeline will be built, linking the natural gas deposits in Prudhoe Bay, Alaska, with the Alberta node for the North American natural gas transportation network. Transportation costs for materials to the construction sites are a major expense, equivalent to three to four percent of the total project cost, which has been estimated at US\$21 billion (2005). If the ACRL becomes operational before pipeline construction begins, there would be significant savings to the pipeline project from reduced transportation costs for steel pipe, diesel fuel, and other supplies. Trucks will still be necessary for hauling materials to construction spreads from offload points on the rail line. However, this should be a shorter distance by truck when compared to the project operating without rail available.

The ACRL could save the project over US\$37 million on the transportation of pipe and fuel. Heavy equipment (bulldozers, pipe-laying equipment, etc.) can also be moved more efficiently by rail, which on average use one quarter of the diesel fuel trucks consume to move a ton of freight one mile. A rail line would also be beneficial for removal of equipment.

In addition, the ACRL could save the state and North Slope producers US\$250 to US\$300 million in avoided highway maintenance costs. This is around one-third of the US\$800 million that Alaska's Department of Transportation and Public Facilities expects to spend after construction to repair the wear and tear on Alaska highways and bridges due to the extremely heavy loads and high levels of project-related traffic.

Reductions in the logistics costs for the pipeline construction reduce the capital cost of the pipeline, resulting in larger economic rents for the North Slope producers and the State of Alaska. These gains occur regardless of where along the route the savings occur,

because the pipeline itself will be a regulated utility, with a tariff representing its total costs. Savings in transportation costs will result in a lower tariff, higher wellhead price, and increased revenues and royalties. The ACRL could increase the net present value of producer revenues by US\$13 million and increase payments to the State of Alaska by US\$17 million over the life of the project.

The Oil and Gas Industry

The oil and gas industry uses a variety of current inputs of goods for producing oil and gas. Many of these inputs originate in the Lower 48 States or in Canada. A rail line will reduce the transportation costs of these inputs, although trucking from the railhead to Prudhoe Bay will still be required. Movements of line pipe, cement, fuel, and drilling mud could benefit from the existence of a rail line. Similar benefits could accrue in Yukon if oil and gas exploration activities lead to subsequent developments.

Rail cars on a track are a substitute for trucks on a road. Highway maintenance will be reduced on those highways currently used to move goods to B.C., Yukon and Alaska. Loaded trucks are the principal source of highway wear, with damage proportional to the square of axle weight. Savings in Alaska may be on the order of US\$2 million per year; in Yukon and northern B.C., combined savings of US\$4 million per year are likely.

Mineral Development

A rail line serves as a magnet for economic developments along its route. Within 50 to 100 miles on either side of the route, transportation costs are significantly lowered, both for inputs and outputs of a project. Projects with large transportation costs are natural economic development opportunities.

Metal mining and coal mining are two such industries. Fortunately, Alaska, Yukon, and British Columbia are known for their mineral riches. However, transportation and energy costs have been a barrier in the past for many sites. There are three levels or tiers of development expected.

First, existing mine sites currently being planned or already in production will move to rail for transportation if it is cost-effective. This move could be achieved quickly, as soon as loading facilities can be put in place.

Second, mid-term developments will include known mineral sites that would likely become economic with the rail line. Their development will be spread out over a number of years, as developers reassess prospects, raise capital, and begin the process of mine development. Estimates of Tier 1 and Tier 2 mineral development in Yukon and British Columbia have been included in the impact study.

Third, longer-term developments will involve new sites, not yet discovered, that result from increased exploration activity in the transportation corridor. In Alaska, statistical analysis has provided estimates of the tonnage of refined metal and mineral concentrates likely to be produced in the rail corridor over a thirty-year period. Not all of these mineral occurrences will be developed right away. However, it is reasonable to assume that exploration activity will increase and eventually many of sites will come on stream.

It is also possible that some sites that are more than 100 miles from the rail line could also become economic with a rail link. For example, the sheer size of the Crest Mine in Yukon, with its very large iron ore deposits, may warrant the construction of a rail spur to transport iron pellets for international markets. The economic feasibility of such projects will require additional study.

Fiscal Impacts

Positive economic activity undertaken by the private sector invariably improves the fiscal position of governments. This paper reports impacts of the Alaska Canada Rail Link project to expenditures and revenues of local, provincial and federal governments at the national level in Canada. On average all three levels of government combined will have US\$1.3 billion additional revenue from ACRL during the years 2010 to 2025, of which, the federal government will receive 44 percent, provincial government 51 percent, and the rest accrue to local and municipal governments.

On average, about 29 percent of the government revenue comes as induced effects of the project through direct taxes on persons and businesses. GST yields another 26 percent of average total revenue. However, the biggest effect accrues as surpluses accumulate, and interest income increases. (Our operating rule for financial management is that government debt is repaid first until it reaches a threshold level. Then financial assets are accumulated.) Net debt in all levels of Canadian government is reduced by CD\$11.2 billion by the end of 2025 due to the rail link.

On the U.S. side, federal, state and local revenues are modest in comparison to the Canadian effect. The U.S. treasury will receive additional revenues from personal income tax levied on income to ACRL construction and operations workers, corporate income tax levied on Alaska-based corporations whose expenses are reduced, to the extent they do not reduce prices, and royalties from oil and gas revenues derived from leases on U.S. government lands. The displacement of trucking freight will reduce federal fuel taxes by approximately US\$100,000 annually.

The State of Alaska levies a seven percent mining license tax based on net income, plus three percent if the lease is on state land. There are no state payroll or state sales taxes; a corporate income tax of 9.4 percent is levied on net profits. The net increase in tax revenues to the State of Alaska, derived primarily from the mining license tax, is approximately US\$4 million per year. The displacement of trucking freight will reduce state fuel taxes by approximately US\$41,000 annually.

Alaska municipalities levy property taxes or contract for payments in lieu of taxes (PILT) on mining properties of 6 to 20 mills on the value of infrastructure built within municipal boundaries. These revenues can be significant to local governments; for example the Red Dog Mine pays the Northwest Arctic Borough a PILT of US\$6.2 million annually, while the Fort Knox Mine pays the Fairbanks North Star Borough US\$3.5 million in property taxes annually. There are not, however, any existing organized boroughs or municipalities in the ACRL rail corridor, so any net revenues to local government depend upon the creation of governments not now operating.

5 Summary

The Alaska-Canada Rail Link will have positive economic impacts along its route and elsewhere during construction and operations. Rail is a cheaper and more energy efficient method of moving heavy loads over long distances than trucking. This productivity or efficiency gain will be reflected in lower prices and increased options for consumers and businesses. The rail link will spur new economic activity in the region by lowering development and operating costs for new enterprises. Governments will benefit from lower resupply costs and reduced highway maintenance.

The large workforce required during construction and in some mining operations may also create negative social and economic impacts that will need to be mitigated as much as possible through careful planning that includes the participation of impacted communities.

Appendix A - Alaska

1 Introduction

This paper provides an overview of the anticipated economic and fiscal impacts of an Alaska-Canada Rail Link on the Alaska economy. Data developed during the first phase of the ACRL feasibility study forms the basis of the analysis. This overview updates the findings of the earlier Information Insights report, *Alaska-Canada Rail Link Strategic Environmental Assessment: Socio-economic Impact Assessment – Alaska*.

2 Construction and Operations Impact

ACRL construction will provide an estimated 10,500 construction jobs in Alaska over a three-year period, with wages and benefits exceeding US\$600 million. An additional 6,600 indirect and induced jobs will bring the total employment impact in Alaska to over 17,000 jobs. Total labour income from wages, benefits and self-employment income is estimated at US\$880 million. Jobs from ACRL construction would help offset an anticipated downturn in construction employment in Alaska.

Capital costs for the 213 miles of track in Alaska (196 miles of the mainline and 17 miles of the spur line) are expected to total nearly US\$1.2 billion or a little over ten percent of construction costs for the full route. The economic output generated by this spending will total almost two billion dollars in Alaska.

These impacts do not include necessary upgrades to the Port of Skagway and the White Pass and Yukon Railway, which could create an additional 1,450 construction jobs and 1,050 jobs in other economic sectors, with a combined labor income of US\$127 million. New capital investments of US\$110 million in the port and US\$74 million in the Alaska segment of the existing rail line would generate US\$294 million in economic output in the state.³

Haines could be a possible alternative to the Skagway line, assuming the biophysical, cultural and economic impacts could be sufficiently mitigated to make such a line feasible. However, the community does not have a formal position on the concept and potential impacts have not been assessed.

A project of this scale will create significant economic opportunities for residents of communities in the rail corridor. Direct construction jobs will include skilled and semi-skilled positions for diesel mechanics, welders, machine operators, and truck drivers. In addition, jobs in clearing, bridge and tunnel construction, earth moving, gravel mining,

³ The capital cost estimates from Informetrica Limited, which was used as the basis for the ACRL construction impact analysis, included US\$30 million for the Alaska segment of the Skagway spur line. A separate analysis of the impacts of Skagway area port and rail upgrades is based on capital estimates from HDR Engineering, Inc. Upgrades to the narrow-gauge White Pass and Yukon Railway are estimated to cost US\$180 million. We assume work done on the Alaska portion would cost about US\$74 million.

food service and hospitality will need to be filled. A lot of drivers will be needed for both direct and indirect activities.

We assume that some Alaskans will also fill positions in ACRL operations, including train crews and maintenance of way jobs on the Alaska segment of the mainline and jobs in general and administrative capacities in Fairbanks, Delta, the interim border terminal, and Skagway. Operation of the ACRL mainline will add about 90 direct jobs to the economy, with wages and benefits of \$7.1 million dollars per year. No economic impact has been calculated for increased freight operations at the Skagway harbor following construction of the ACRL.

In a scenario in which the rail link is built in time for gas pipeline mobilization, jobs from ACRL construction would help to offset the anticipated downturn in construction employment in Alaska. The Alaska Department of Labor and Workforce Development is projecting construction employment to slow over the next five to ten years with the end of the residential housing boom and the anticipated decline in federal funding to Alaska.

The following series of figures shows the impact of gas pipeline and ACRL construction in reversing the projected decline in construction employment. Figure 3a illustrates the preliminary forecast for the construction sector with peak pipeline employment of 4,200 jobs by 2014. Figure 3b shows the additional impact of ACRL construction if it overlaps with pipeline construction. The purple line represents the *additional impact* of ACRL jobs on construction employment – not total ACRL jobs. In this scenario, the ACRL could not be used to mobilize pipe; labour and materials costs for both projects would be bid up; and the boom and eventual bust effect on the economy from these large construction projects would be exacerbated. Figure 3c shows how early construction of the ACRL would nearly eliminate the projected decline in jobs and smooth and stretch out the pipeline boom. Achieving this synergy would require fast action on funding and permitting of at least key segments of the rail link.

If port and rail upgrades in Skagway were completed before construction starts on the ACRL mainline, construction employment in Alaska could look like the curve in Figure 3d. Early expansion of Skagway port and rail freight infrastructure would maximize the benefit of the ACRL for the gas pipeline project. Adding new jobs in the Skagway area in 2010 further extends the construction boom, which now looks more like a picture of steady growth. Note that only the first two years of pipeline construction are shown. Construction would continue for two more years at near peak levels. The bust following pipeline construction is also not shown. The post-construction decline in employment would be most severe in the scenario represented by Figure 3b, with both railroad and gas pipeline construction jobs ending within a two-year period.

Figure 3: Cumulative impact of gas pipeline and ACRL on construction jobs

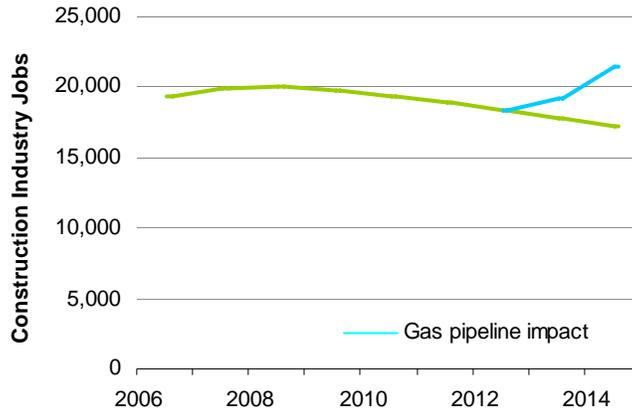


Figure 3a: Without ACRL

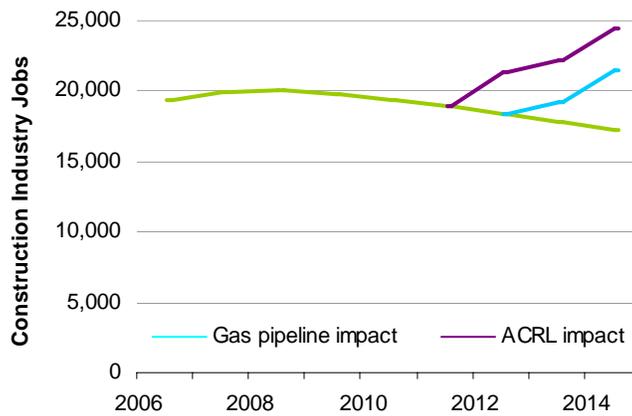


Figure 3b: Overlapping timing

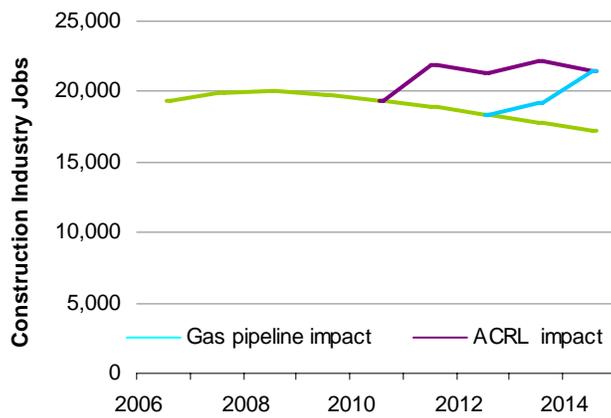


Figure 3c: Sequenced timing

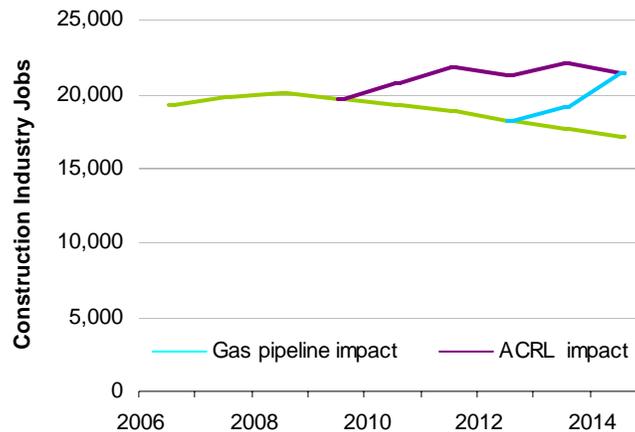


Figure 3d: Sequenced timing with Skagway upgrades in 2010

3 Mining Impacts

New mineral resource development is expected to provide one of the major sources of freight and revenue for the ACRL on the Canadian side of the border and thus one of the key rationales for the project. We anticipate that in the mid- to long-term mineral development in Alaska will play a similar role.

A preliminary assessment of the potential for new Alaska minerals development associated with an ACRL project predicts at least 8.8 billion tonnes of mineral concentrates could be developed in the rail corridor over a 30-year period, with a gross metal value totaling US\$16.9 billion.⁴ New mining activity could provide an estimated 3,000 direct jobs per year on average with an annual payroll of US\$250 million. Total jobs, including indirect and induced effects, would average 5,300 annually. Economic output from new mining activity on this scale would total US\$24.5 billion over 30 years, for an average annual impact of US\$800 million.

These impacts are based on a statistical analysis by University of Alaska Fairbanks researchers of the probability of development of 588 mineral occurrences within 100 kilometers of the proposed rail line over a 30-year period. These numbers are not directly comparable to estimates of mineral development and mining impacts in Canada because the analysts used different data sets, different methodologies and different assumptions.

4 Alaska Resupply Impact

Alaska currently imports about four million tonnes of freight annually for the purpose of community resupply, using a variety of modes of transport – truck, container vessel or

⁴ This is a conservative estimate based on the lowest figure in the range of probability. The high-end of the range is US\$69 billion in gross metal value developed over thirty years.

barge, roll-on/roll-off (RO/RO) barge, and rail barge.⁵ Although labeled community resupply, this freight includes industrial materials such as chemicals, minerals, metals, and petroleum products, as well as general merchandise, construction materials, vehicles, foodstuffs and other consumer goods.

According to the freight traffic and logistics analyses by QGI Consulting, two of the 2.4 million tonnes of freight analyzed could be shipped competitively using the ACRL. Savings on resupply would average US\$107 million or 25.4 percent of the US\$422 million total spent on resupply transport. Annual savings on general merchandise entering Alaska would average US\$51.68 per ton or US\$162 per capita.

According to freight traffic and rate analyses completed as part of Phase I of the ACRL Feasibility Study, the rail link could successfully compete for 85,000 tonnes of freight entering Alaska by truck from Yukon Territory each year and 1.6 million tonnes of container freight arriving at the Port of Anchorage. It could also divert almost half the freight coming into the Port of Whittier each year – the 142,000 tonnes that currently arrives by rail barge from Prince Rupert, B.C.

The competitive advantage of rail over trucking is the strongest. Comparing estimates of truck and direct rail shipping costs from Edmonton, Alberta, and Vancouver, B.C. to Fairbanks and Anchorage, the ACRL would cut freight costs to Alaska by an average of 71 percent.

The diversion of up to two million tonnes of marine freight would have profound impacts on port communities in Southcentral and possibly Southeast Alaska. Although the primary impact would be on the Port of Anchorage, negative impacts could also be possible in Whittier, while Skagway and Haines are most likely to benefit economically from increased freight traffic. In British Columbia, the Port of Prince Rupert would also see a loss in resupply freight destined for Alaska, but could see a significant expansion in outbound mineral shipments.

5 Alaska Highway Gas Pipeline Impact

The timing of an ACRL project is critical if it is to have a positive impact on the economics of an Alaska natural gas project. The rail link would need to be operational one year before the start of construction to maximize the benefit to the pipeline project.

Logistical analysis completed for Phase I found that 1.1 million tonnes of pipeline-related freight destined for Fairbanks, Delta Junction, and Tok could be diverted to rail if an ACRL project is built first. Materials destined for Prudhoe Bay and Dietrich camp would continue to go direct by ship or barge to Prudhoe Bay and from there by truck to Dietrich, so no savings on North Slope segments of the project are expected. Using phase one cost estimates, we calculate that mobilization for Alaska segments of the line could save the project US\$8.9 million, including a savings of US\$4.6 million off the cost of moving

⁵ This includes 1.5 million tonnes of petroleum products and over 100,000 tonnes of bulk cement passing through the Port of Anchorage, which were excluded from analysis due to insufficient data on freight costs and point of origin. According to Port officials, most of the petroleum products actually originate in Alaska.

pipe and US\$4.3 million off fuel delivery to construction camps in Fairbanks, Delta Junction, and Tok. Actual savings will be larger if the ACRL is also used to mobilize heavy equipment and other supplies for the project.

A Phase I analysis of Skagway port and rail projects assumes that all of the 725 miles of pipe (about 1.4 million tonnes) required for construction of Yukon Territory segments of the pipeline would come through the Port of Skagway and be transported by rail to Whitehorse for sorting, double jointing and coating, if port and rail facilities are upgraded in time. If pipe comes from the U.S. and Canadian sources rather than Asia the volume would be reduced to approximately 600 miles of pipe but moving a much greater ACRL distance. The rail link would be slightly less useful for mobilizing pipe for Canadian segments if a northern alignment is chosen since trucking would be required to deliver pipe to Beaver Creek and Haines Junction, which would not be on the rail line.

Overall, we estimate that the use of the ACRL to mobilize pipe and other materials for construction spreads in Alaska and Canada could save the pipeline project over US\$37 million, or 11 percent of total materials transportation costs. An 11 percent savings on transportation costs would increase the net present value of gas pipeline revenues to the State of Alaska by US\$17 million over the 35-year life of the project, while revenues to industry would increase by US\$13 million and federal tax receipts would go up US\$7 million over the same period.⁶

Alaska DOT/PF estimates that the state will need to spend US\$400 million in pre-construction improvements to key roads, bridges and ports. In addition, wear and tear on state highways and other infrastructure during pipeline construction will result in an additional US\$800 million in repair and maintenance costs. If the ACRL is used to mobilize materials for some Alaska segments of the pipeline, between US\$250 to US\$300 million of the post-construction repair costs could be avoided, resulting in significant savings to North Slope oil producers and the State of Alaska. (The producers and the State have not yet developed a Highway Use Agreement to govern how these costs will be shared.)

6 Other Important Impacts

6.1 *CPI impact*

Based on the estimates of freight volumes and prices, an ACRL could directly save US\$105 million on the cost of transporting goods typically included in the Anchorage consumer price index (CPI). This savings would result in a 1.0 percent decrease in the goods portion of the Anchorage CPI, for a net reduction to the Anchorage CPI of 0.38 percent. The total effect on the CPI will depend on what effect the savings in transportation costs has on services provided in Alaska. In theory, lower costs of goods would have a moderating effect on wages, but we do not have a current CPI model to estimate this effect. We can therefore say that the CPI effect would be between 0.38 and 1.0 percent.

⁶ Pipeline revenues are in 2005 US dollars. The net present value is calculated using a five-percent discount rate for government revenue and a ten-percent discount rate for corporate revenue.

6.2 *Other oil and gas industry impacts*

Chemicals and metals account for 185,000 tonnes of rail-barge traffic entering Alaska each year, the great majority of which are used by Alaska's oil and gas industry. Of this total 93,000 tonnes (50 percent) currently shipped from Canada by rail barge could be moved more efficiently by rail transport. Cost savings to the industry would average 8.5 percent on these commodities and could total up to US\$1.5 million annually. It may also be possible that the ACRL will the oil and gas industry with new sourcing options for inputs such as barite that can be produced in western Canada, saving money and lessening lead times on resupply.

6.3 *Military defense and emergency management benefit*

The most important military defense and emergency management benefits to Alaska from the ACRL cannot be quantified. The rail link would provide a critical transportation link that could prove invaluable in the event that a major natural disaster or breach of security shuts down other transportation arteries connecting Alaska to the rest of the world. In particular, the expansion of freight facilities at the Port of Skagway would give Alaska another point of access in the Gulf of Alaska that is less vulnerable to seismic hazards.

As well, the ACRL would provide alternate port/rail access to the Lower 48 states, in the event of US west coast port closure for whatever reason.

The ACRL communications system could improve the state's emergency response capacity by providing a redundant communication link that could be tapped into in the event of an emergency.

The ACRL would benefit the military economically by providing savings on routine procurement. We estimated that the savings on military family resupply would average US\$2.6 million per year, or US\$1.1 million per year when family members are excluded.⁷

6.4 *Tourism*

No studies have been done to estimate ACRL passenger traffic or revenue on the Alaska side of the border. It is assumed that the rail link will draw the most tourists from those currently traveling to Alaska by air (52 percent) and highway (5 percent). We assume there will be a negative impact on Alaska companies currently providing bus packages, a positive impact on the Alaska Railroad and the White Pass & Yukon Route Railroad, and a positive impact on communities in the rail corridor. Passenger rail service would also attract additional tourists to Alaska who are rail enthusiasts.

The impact on Skagway's tourist-based economy could be positive or negative depending on how well expanded freight facilities at the Port of Skagway can be designed around the needs of the cruise ship industry and related businesses. Tourist excursion operations

⁷ Estimates area based on FY 2005 military personnel data and exclude branches whose members are unlikely to live or work on military bases, including the Army and Air National Guard and the Army, Air Force, Navy, and Marine Reserves.

could be enhanced if cruise ship business is linked to a modern passenger rail operation, while the three-rail track prospect for the White Pass & Yukon Route Railroad could become a tourist attraction in itself.

6.5 *Highway maintenance savings*

Reduced heavy truck traffic on the Richardson, Alaska, Haines, and Klondike Highways due to a rail link would save the state an estimated US\$1,144,000 per year in annual maintenance costs, or more than US\$22.9 million over twenty years. An even larger savings could be expected on the Parks, Glenn, and Seward Highways from the diversion of truck traffic associated with 1.6 million tonnes of marine freight that arrives at the Port of Anchorage each year. However, these savings cannot be estimated without data on the ultimate destination of goods shipped to the port. These savings are in addition to the one-time savings of US\$250 million to US\$300 million in post-pipeline construction road and bridge repairs.

6.6 *U.S. impacts outside Alaska*

Construction and operation of the ACRL will have a minimal impact on the U.S. outside Alaska. The most significant impact we anticipate is the reduction in surface transportation in the West and Northwest as marine freight flows to Alaska are diverted to direct rail service on the ACRL. Intermodal freight traveling by highway and rail to Seattle/Tacoma would be diverted to Chicago resulting in a net loss in transportation service within the U.S., a net gain in Canada, and a small negative impact on the U.S. balance of trade with Canada. A positive impact on the U.S. balance of trade could result from new mines or petrochemical plants developed in Alaska due to the ACRL, but there is little Phase I data on which to base an estimate. Further study is needed to assess the impact of lost business on U.S. ports, railways, and trucking services.

Table 1: ACRL capital expenditure for Alaska segments

Capital Expenditures	Alaska Segments (US\$ millions)	Full Route (US\$ millions)
ACRL Mainline (Delta Junction, AK - Ladue Border - Carmacks, YT - Watson Lake, YT - Hazelton, BC)	\$1,215	\$11,190
Skagway Spur (Carmacks, YT - Whitehorse, YT - Skagway, AK)	\$30	\$635
Total Capital Cost	\$1,245	\$11,825

Source: Informetrica Limited (June 2006)

Table 2: Economic impacts of ACRL construction on Alaska

Type of Impact	Direct	Indirect + induced	Total Impact
Employment	10,500	6,600	17,100
Labour Income (US\$ millions)	\$640	\$240	\$880
Economic Output (US\$ millions)	\$1,245	\$735	\$1,980

Source: IMPLAN Group data, 2003. Notes: A job equals one full- or part-time job for one year. Labour income includes employee wages and benefits and self-employed income.

Table 3: ACRL operating costs

US\$ millions	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024
Total	\$96.3	\$139.9	\$143.3	\$143.3	\$143.3	\$143.3	\$138.5	\$138.5	\$137.4	\$135.5
Alaska [*]	\$13.7	\$19.9	\$20.4	\$20.4	\$20.4	\$20.4	\$19.8	\$19.8	\$19.6	\$19.3

Source: Innovations Scheduling Phase 3 Financial Model Base Case (July 5, 2006); *Calculated from full route costs. The wage cost per U.S. employee is roughly 8 percent more than for Canadian employees because of higher fringe benefits. Other costs are allocated based on proportion of Gross Ton Miles in Alaska (13.5 percent). Currency is in 2006 U.S. dollars.

Table 4: ACRL operations impacts on Alaska for 2016 (Year 7)

Type of impact	Employment	Labour Income (US\$ millions)	Economic Output/GDP (US\$ millions)
Direct	90	\$4.8	\$41.2
Indirect + Induced	74	\$2.8	\$10.4
Total	164	\$7.6	\$51.6

Source: Operations impacts were calculated using a model of the Alaska economy developed by the Institute of Social and Economic Research. Innovative Scheduling operating cost estimates were compared with wage and spending data provided by the Alaska Railroad to determine the economic impact of rail operations in Alaska.

Note: Impacts are shown for Year 7 (2016), when traffic, operations and employment are expected to reach stable, long-term levels. Currency is in 2006 U.S. dollars.

Table 5: Economic impact of Skagway port and rail projects

Type of Impact	Direct	Indirect + induced	Total Impact
Employment	1,450	1050	2,500
Labour Income (US\$ millions)	\$88	\$39	\$127
Economic Output (US\$ millions)	\$183	\$110	\$293

Source: IMPLAN Group data, 2003. Note: A job equals one full- or part-time job for one year. Labour income includes employee wages and benefits and self-employed income.

Table 6: Employment impact of new mine development

Type of Impact	30-year life	Annual Impact
Gross Metal Value (US\$ millions)	\$ 16,900	\$ 550
Employment, direct	91,000	3,050
Employment, indirect + induced	67,700	2,250
Labour Income, direct (US\$ millions)	\$ 7,150	\$ 250
Labour Income, indirect + induced (US\$ millions)	\$ 2,700	\$ 100
Total Labour Income (US\$ millions)	\$ 9,850	\$350
Total Employment	158,700	5,300
Total Economic Output (US\$ millions)	\$ 24,500	\$ 800

Source: IMPLAN Group data, 2003. Notes: Monetary figures are in 2003 dollars. A job equals one full- or part-time job for one year. Labour income includes employee wages and benefits and self-employed income.

Table 7: Summary of community resupply savings

Mode	Total Tonnage Analyzed	Divertible Tonnage	Actual Cost 2003-05	Lowest Cost Option	Savings using ACRL	Percent Savings
Truck	81,753	81,753	\$ 40,328,940	\$ 11,651,518	\$ 28,677,423*	71.1%
Container vessel/barge	1,587,719**	1,587,719	\$ 351,378,433	\$ 280,931,000	\$ 76,197,331	21.7%
Rail barge (U.S.)	167,000	2,000	\$ 17,867,669	\$ 17,853,956	\$ 13,713	0.1%
Rail barge (Canada)	142,000	142,000	\$ 12,236,950	\$ 9,901,022	\$ 2,335,928	19.1%
Total	1,978,472	1,813,472	\$ 421,811,992	\$ 320,337,496	\$ 107,224,395	25.4%

Sources: Cost data from QGI Consulting (2006a,b,c); Savings analysis, Information Insights. Notes: *Does not include potential savings on freight trucked from Yukon Territory. **Does not include 360,000 tonnes of containerized freight and trailers shipped to ports other than Anchorage for which comparable cost data was not available.

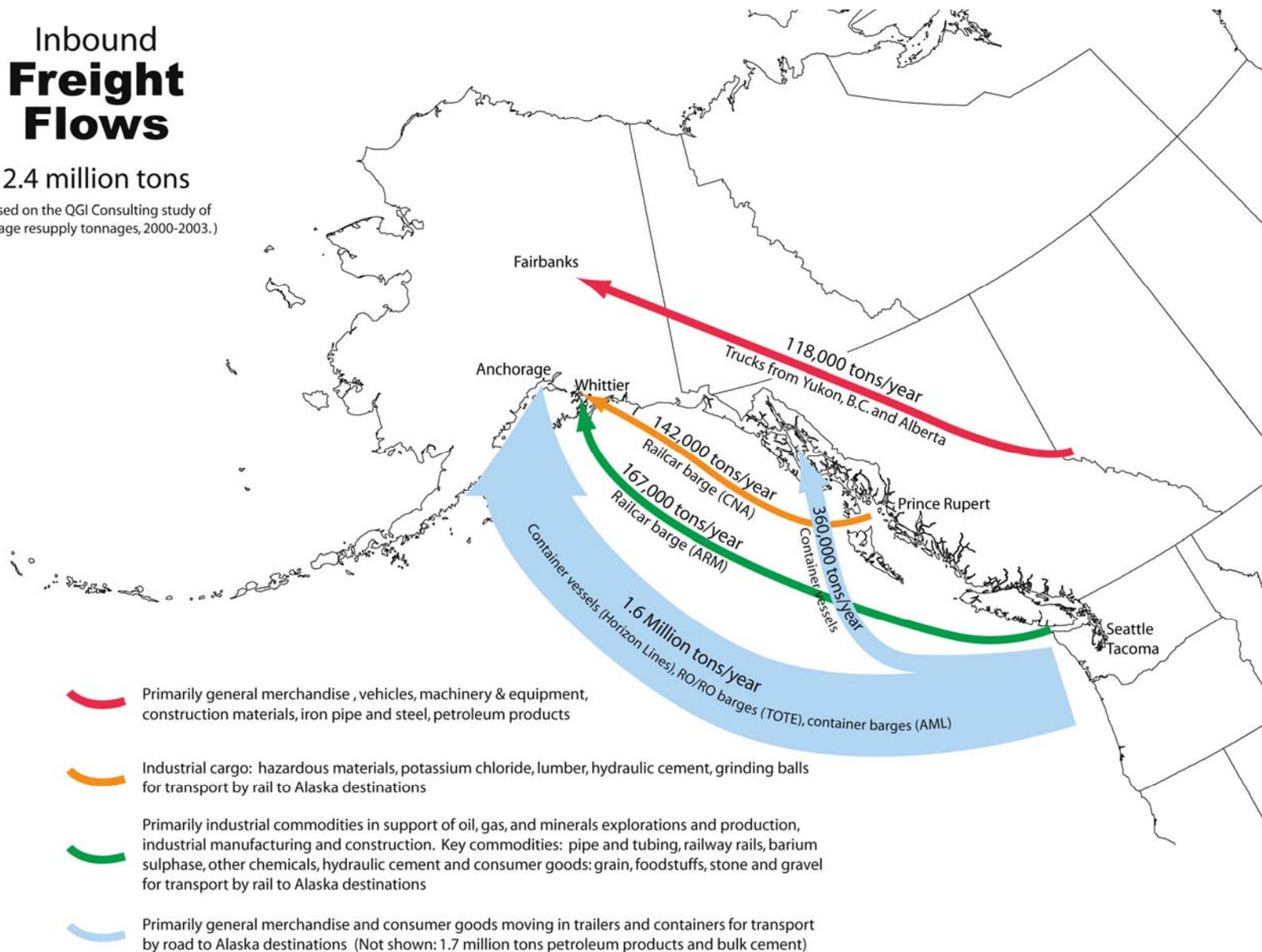
Table 8: Transportation savings on Interior Alaska segments of a gas pipeline

Commodity	Destination	Mode	Ave. cost \$/ton	Tonnage	Base case cost	Cost with ACRL	Savings with ACRL	Percent savings
Pipe	Fairbanks, Delta Junction, and Tok	Mixed (base case)	\$69.99	921,500	\$64,497,080			
		Mixed with ACRL	\$64.90			\$59,802,320	\$4,694,760	7.28%
Fuel	Fairbanks, Delta Junction, and Tok	Barge w/ rail or truck	\$81.11	142,700	\$11,574,030			
		Direct Rail	\$51.14			\$7,297,950	\$4,276,080	36.95%
Equipment	Fairbanks, Delta Junction, and Tok	N/A		58,100	N/A			
		Direct Rail	\$220.17			\$12,791,710	N/A	N/A
Total (w/o equipment)	Fairbanks, Delta Jct., and Tok	Base case	\$71.48	1,064,200	\$76,071,110			
		With ACRL	\$63.05			\$67,100,270	\$8,970,840	11.79%

Source: Dean, 2006

Figure 4: Community resupply traffic flows, 2000-2003

Inbound Freight Flows
2.4 million tons
 (Based on the QGI Consulting study of average resupply tonnages, 2000-2003.)



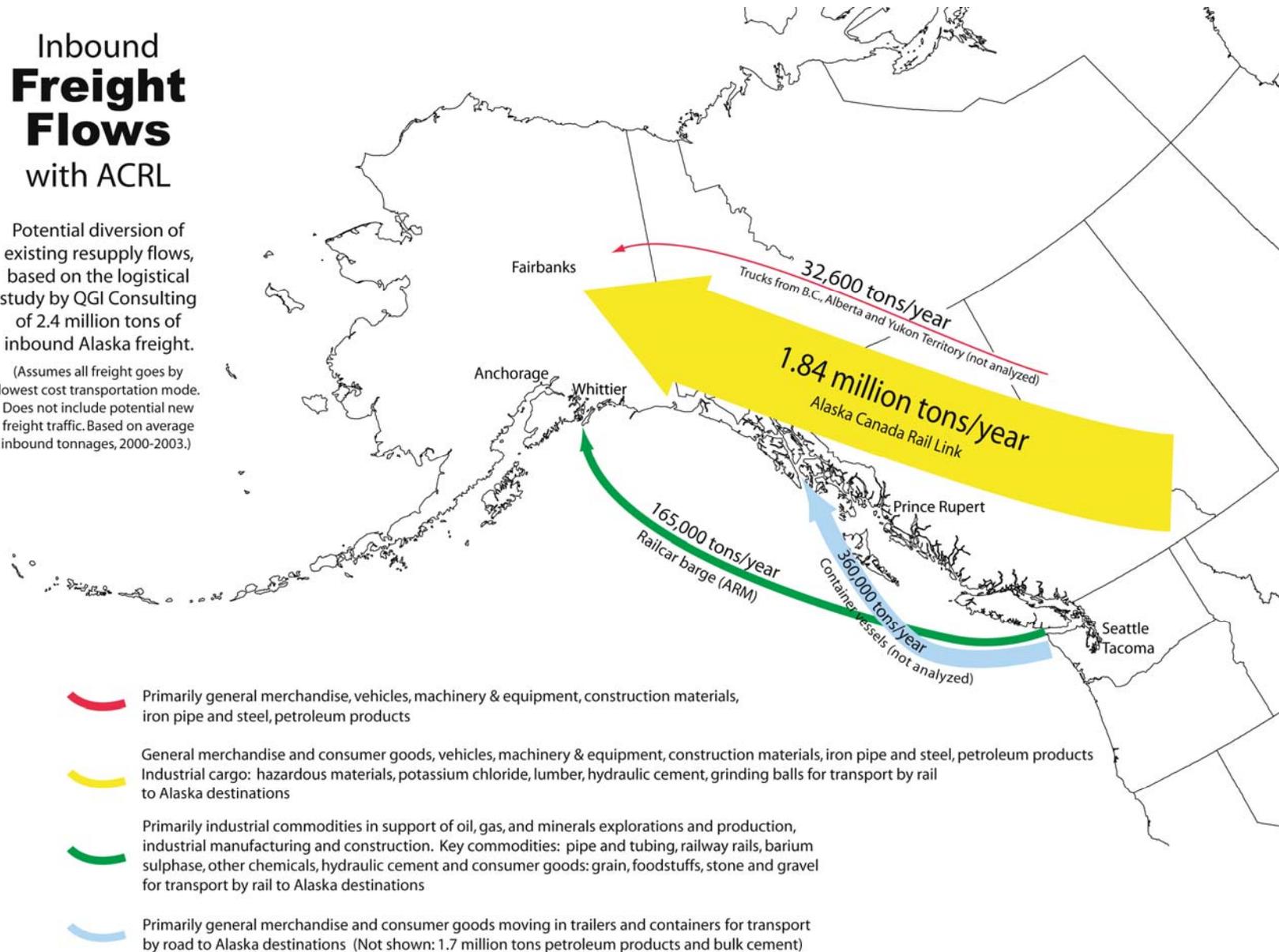
Source: Information Insights, 2006; Based on QGI Consulting data.

Figure 5: Potential community resupply diversions with ACRL

Inbound Freight Flows with ACRL

Potential diversion of existing resupply flows, based on the logistical study by QGI Consulting of 2.4 million tons of inbound Alaska freight.

(Assumes all freight goes by lowest cost transportation mode. Does not include potential new freight traffic. Based on average inbound tonnages, 2000-2003.)



Source: Information Insights, 2006; Based on QGI Consulting data.

Appendix B – Canada

1 Introduction

This paper provides an overview of the anticipated economic and fiscal impacts of an Alaska-Canada Rail Link on the Canadian economy. Data developed during the first phase of the ACRL feasibility study forms the basis of the analysis. A full report of the findings summarized here can be found in *Alaska-Canada Rail Link Strategic Environmental Assessment: Socio-economic Impact Assessment – Canada* by Informetrica Limited.

2 ACRL Construction Impacts

ACRL construction will provide an estimated 58,000 construction jobs in Canada from 2010 to 2014, of which 33,000 will occur in Yukon and 25,000 in British Columbia. Construction labour income will exceed CD\$2.8 billion over the same period.⁸ Indirect and induced employment will provide an additional 134,000 jobs and an estimated CD\$11 billion in labour income, from 2010 to 2020.⁹

The capital costs for the Canadian segment of the ACRL are expected to be CD\$12.4 billion, approximately 90 percent of the entire project. The total economic output generated by this spending will be approximately CD\$27 billion.

3 ACRL Operations Impacts

The operation of the ACRL mainline will generate approximately 440 railway worker jobs, where 180 are in British Columbia and 260 are in the Yukon. The ACRL operations will have a direct impact of CD\$290 million per year on the economic output of the Canadian economy.

The introduction of rail transportation as an option is expected to result in the development of a number of mines in the Yukon and northern BC. The rail line operation and mine activity results in a direct and indirect impact on the economic output of CD\$1.2 billion per year. Total economic output generated specifically by the operation of the rail line and mine activity is approximately CD\$1.6 billion per year.

⁸ To convert to US dollars multiply Canadian dollar value by 0.85.

⁹ Indirect effects (employment and GDP) will occur at the same time as the direct effects, in this case 2010 to 2014. Induced effects can occur over a longer period because of sticky wages and prices, and increased government spending due to an improved debt position. In the case of ACRL, construction induced impacts occur from 2010 to 2020.

4 Other Important Impacts

4.1 *Resupply*

Combining the Alaska Highway truck transportation data of approximately 54,700 tonnes of goods per year and 93,000 tonnes of fuel from the pipeline from Alaska we get approximately 147,000 tonnes of goods per year into the Yukon. Only 23,800 tonnes could be competitively transported by the ACRL from existing truck transportation service. This would result in a re-supply saving of CD\$4.5 million, or a 32 percent reduction in total transportation costs. Other saving measures include CD\$30 per tonne or CD\$150 per capita.

The reduction in demand for truck services will be somewhat offset by the increased demand from other sources, which include new mine development and other short hauls to and from the rail line to nearby locations. Re-supply modal shifts for northern British Columbia would have similar characteristics to the Yukon re-supply picture, but to a lesser extent.

4.2 *CPI impacts*

The drop in transportation costs reduces the CPI by approximately 0.2 to 0.3 percent, in the first four years, followed by a fairly stable average impact of 0.1 percent.

The drop in the CPI has a number of anticipated effects like softening nominal wage rate demands in the early years and spurs both consumer demand for goods and business investment.

The erosion of the CPI comes from the response to increased demand. As demand increases there is also an increase in employment demand, which lowers the unemployment rate. The lower unemployment rate puts upward pressure on wage rate demands and nominal wage income increases with an impact of more than twice that of real demand. Consequently, there is an increase in unit labour costs which puts upward pressure on prices.

Real disposable income is increased on average by 0.4 percent, and peaks in the fourth year with an impact of 0.5 percent. Improvements in the first three years are derived mainly from the CPI drop, while the remaining years are dominated by improved nominal income gains.

4.3 *Alaska Highway gas pipeline impacts*

The construction of the Alaska Highway Pipeline will require the mobilization of significant tonnage of pipe, fuel and equipment over a very short period of time. The use of a rail system for transporting inputs should reduce the costs of construction.

Due to lack of truck transportation rates we have taken the expected ACRL rates and applied a multiplier to simulate truck rates at two, three and four times the ACRL rate (shown in the table below).

Commodity	Tonnes	ACRL Revenue	Truck Revenue		
			2x ACRL Rate	3x ACRL Rate	4x ACRL Rate
Pipe	1,309,700	\$16,516,920	\$33,033,840	\$49,550,760	\$66,067,680
Fuel	161,100	\$2,277,590	\$4,555,180	\$6,832,770	\$9,110,360
Equipment	121,800	\$7,243,860	\$11,340,240	\$15,436,620	\$19,533,000
TOTAL	1,592,600	\$26,038,370	\$48,929,260	\$71,820,150	\$94,711,040
		Saving from ACRL	\$22,890,890	\$45,781,780	\$68,672,670

Notes: Mobilization to Haines Junction has been kept at the base values.

If the switch from truck to rail results in a halving of the freight rate then there is an opportunity for a CD\$22.9 million saving on pipe construction. Larger savings will be available from larger reductions in freight rates.

This saving would lead to a lower pipeline tariff (regulated return based on capital expenditure) and therefore a larger net back for the natural gas producers in Prudhoe Bay.

4.4 *Other oil and gas industry impacts*

Exploration and development of oil and gas activities in the Yukon and northern British Columbia would benefit from reduced transportation costs of material inputs. The magnitude of the savings is uncertain at this point in time.

4.5 *Highway maintenance savings*

The ACRL will reduce re-supply truck traffic along some of the major roads in Yukon, primarily Alaska Highway, Campbell Highway and the Klondike Highway. Average recent spending on these highways is approximately CD\$7.7 million per year, which accounts for approximately 17 percent of total annual spending on highways, and 5 percent of total capital expenditure by the Yukon Government.

There are no estimates of the magnitude of the capital expenditure relief from the reduced truck traffic, but a rough estimate of about CD\$1 million per year for both BC and Yukon would not be unreasonable. Some capital repairs will still be necessary, even if truck volumes are lower.

4.6 *Mining impacts*

The ACRL is expected to aid in the development of mines in the Yukon and northern British Columbia with production in excess of one billion tonnes of metal and coal ore over the first 40 years of operation.

The following 9 mines are expected to come into operation taking advantage of ACRL as the main transportation mode.

- Fyre (copper)
- Kudz Ze Kayah (lead-zinc-copper)
- Grum (lead-zinc)
- Ice (copper)
- Swim (lead-zinc)

- Lost Fox (anthracite coal)
- Hobbit Boatch (anthracite coal)
- Summit (anthracite coal)
- Ground Hog Coalfield (anthracite coal)

Most of these projects are expected to come into operation after 2020, accounting for almost 11.1 million tonnes of concentrate to be railed via ACRL, bringing in around CD\$114 million of average revenue for the railway annually. Almost CD\$339 million worth of capital investment is needed for all of these mines to come into operation.

The total impact of these mines amount to an average of CD\$917 million on national output, of which, CD\$460 million accrue to Yukon and CD\$195 million to British Columbia. The mines also account for an average of 7,800 full-time equivalent jobs annually from 2020 onwards, of which 4,000 will be located in the Yukon and more than 2,000 in British Columbia.

Furthermore, ACRL may induce more exploration activities and result in new mines. Using the expert opinion survey data from the mineral assessment project at Yukon Economic Development, we can say that within a 50 percent confidence interval, 120 new mines are expected to be developed within Yukon as an effect of ACRL. These mines will bring in 0.7 million tonnes of minerals worth CD\$714 million to be transported by ACRL on an average annual basis for 40 years beyond our forecast horizon of 2025. This will directly result in 431 full-time equivalent jobs per year. Essentially, as near-term mines' outputs are reduced, new mines can be expected to fulfill the gap to keep a steady flow of minerals from Yukon. The BC portion of ACRL may also contribute to this effect, bringing in an average of 0.6 million tonnes of minerals worth CD\$592 million annually for 40 years, and directly generating more than 500 full-time equivalent jobs per year.

Finally, if the mammoth Crest iron deposit is developed into a mining project, we may see a US\$750 million milling and processing plant and 4 pellet plants of 7 million metric-tonnes per year capacity worth US\$450 million each. Crest is expected to produce 28 million tonnes of iron pellets per year at full capacity.