ALASKA – CANADA RAIL LINK STUDY

PHASED MULTIMODAL INTEGRATION
WORK PACKAGE B3(f)
UNIT COST OF SERVICE ESTIMATION

AUGUST 2006

Prepared for:

Alaska Canada Rail Link Project: Feasibility Study ALCAN RaiLink

and

Yukon Engineering Services

Prepared by:

Banjar Management Inc

in association with

CH2M HILL Canada Limited

This report forms part of The Alaska Canada Rail Link (ALCAN Rail Link) Feasibility Study Project. This document, work package B3(f), is the third component of a series of reports produced to estimate the unit costs of service for a series of port-rail scenarios developed to serve projected traffic through the region. Under separate cover, work package B3(b) Life-Cycle Capital Cost Estimation and work package B3(d) Life-Cycle Operating Expense Estimation provide estimates of life-cycle capital costs and life-cycle operating expenses for each scenario. Results from these work packages are inputs to the analysis enclosed.

One of the primary functions of a proposed rail link through Northern British Columbia, the Yukon and Alaska (**Figure 1**) would be to lower transportation costs throughout the region. As the economies of this region are largely resource based, rail traffic projections are largely composed of outbound resources traveling to market and re-supply materials for consumption by the domestic and resource economies.

The development of the region's rich natural resources is dependent on the ability to move resources, in a cost effective way, from their origins to market. These markets, in some cases, will be within North America and can be transported to the larger North American rail network via the ALCAN Rail Link. Many other markets, however, are located off-shore and resources moving to these destinations will travel via deep sea ship.

To facilitate these project transport demands, a series of rail-port scenarios were developed. All rail-port scenarios include the ALCAN Rail Link mainline, spurs to access ports or resources and a destination port facility. Rail-port scenarios are consistent between work packages B3(b/d/f). A map of all rail network and port facilities considered is provided below in **Figure 2**.

Traffic projections from the project team were used to estimate rail traffic volumes throughout the entire rail network and traffic bound for the destination port. Port facility concepts were then developed to reflect the volume of projected traffic. In some scenarios rail traffic from the Crest Iron Ore Mine was included, owing to the large volume of traffic generated by this development, it has a significant impact on the facilities proposed. A detailed description of the projected traffic is provided in Section 2.0 of the report "Life-Cycle Capital Cost Estimation", from work package B3(b). A summary of scenarios considered in this analysis is provided below.

The following ten rail – port scenarios were analyzed in the suite of B3(b/d/f) work packages.

- Scenario 1 Skagway (without Crest)
- Scenario 2 Port Mackenzie – Anchorage via Beaver Creek (with Crest)
- Scenario 2a Port Mackenzie – Anchorage via Beaver Creek (without Crest)
- Scenario 3 Port Mackenzie – Anchorage via Ladue River (with Crest)
- Scenario 3a Port Mackenzie – Anchorage via Ladue River (without Crest)
- Scenario 4 Haines (with Crest)
- Scenario 4a Haines (without Crest)
- Scenario 5 Hyder-Stewart (without Crest)
- Scenario 6 Prince Rupert (with Crest)
- Scenario 6a Prince Rupert (without Crest)

A description of the above scenarios appears in Section 3.0 of the report "Life-Cycle Capital Cost Estimation", from work package B3(b).

This document reports the unit costs of service estimated for the above rail-port scenarios developed to serve these ocean based trips at U$ 2006 price level over a 50 year analysis period. Inputs from work package B3(b) Life-Cycle Capital Cost Estimation and work package B3(d) Life-Cycle Operating Expense Estimation are used to derive the unit costs of service for each scenario. As reported in these earlier volumes the data used to estimate the capital costs, and operating expenses were provided by the ALCAN Rail Link Project Team.

The analysis contained within this report has been conducted at a pre-feasibility level with support from the ALCAN Rail Link Project Team. Results from this report should be used to help identify scenarios that are not likely feasible such that more refined analysis can be undertaken on the remaining, potentially feasible, scenarios. The relative comparison of options presented can not purport the feasibility of any one scenario but rather reports the relative attractiveness of the options based on the analysis methodology.

Figure 1 - Study Area

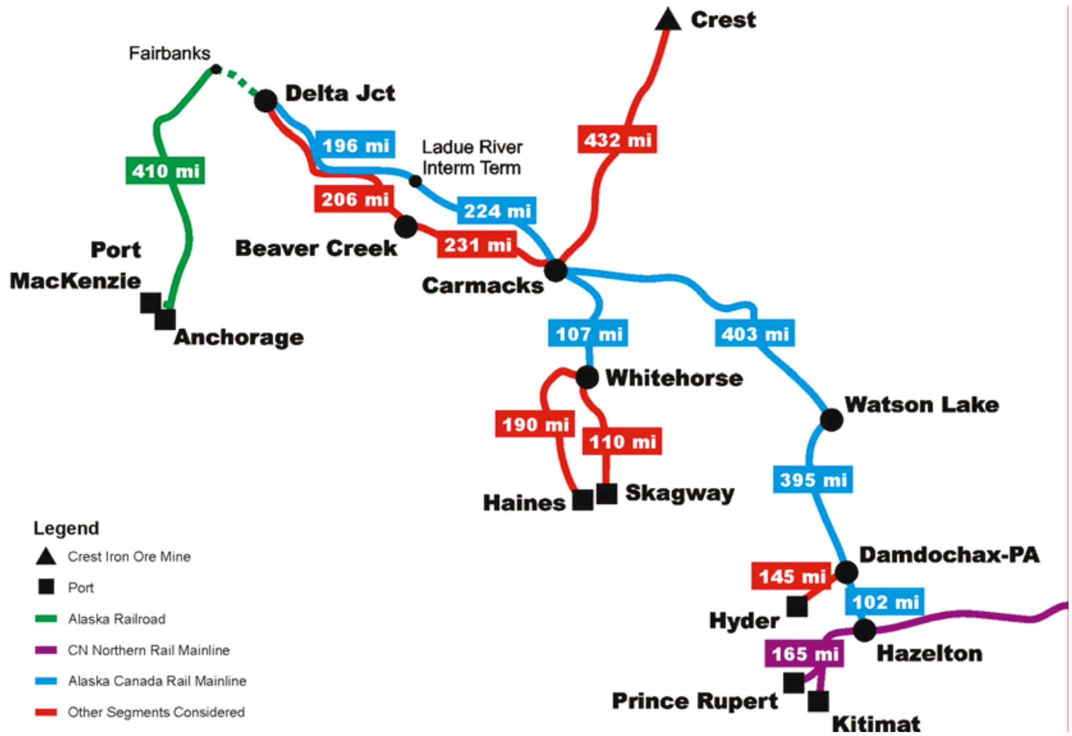

Figure 2 – Rail and Port Network Segments Analyzed

Traffic projections developed by the ALCAN Rail Link Team were used in work packages B3(b) and B3(d) to estimate capital costs and operating expenses. In this work package traffic forecasts were used as an input to the calculation of a rail and port unit cost of service on a per ton basis for each of the assessed scenarios. Since not all traffic present on the rail network makes use of the destination port two traffic forecasts were used in calculation of the unit cost of service. First, for the rail network, the total network wide traffic volume was used, including with and without the Crest Iron Ore traffic. Then, for ports, only traffic that was projected to pass through the port was used, again, with and without the Crest Iron Ore traffic. **Figures 3 to 6** provide a year by year summary of these traffic forecasts.

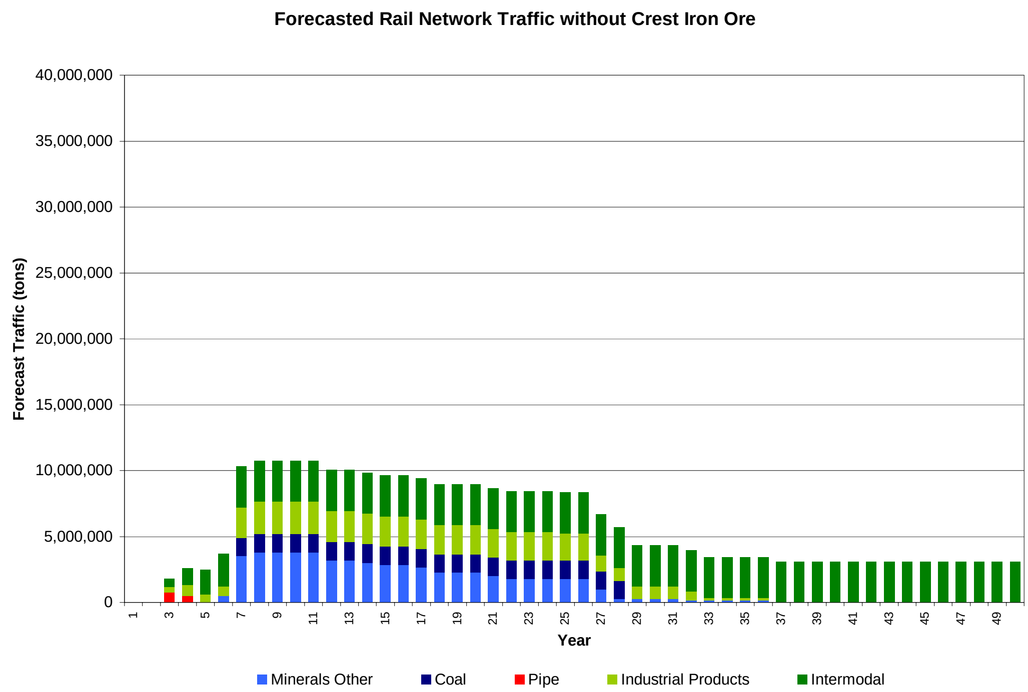

Figure 3 - Forecasted Rail Network Traffic without Crest Iron Ore

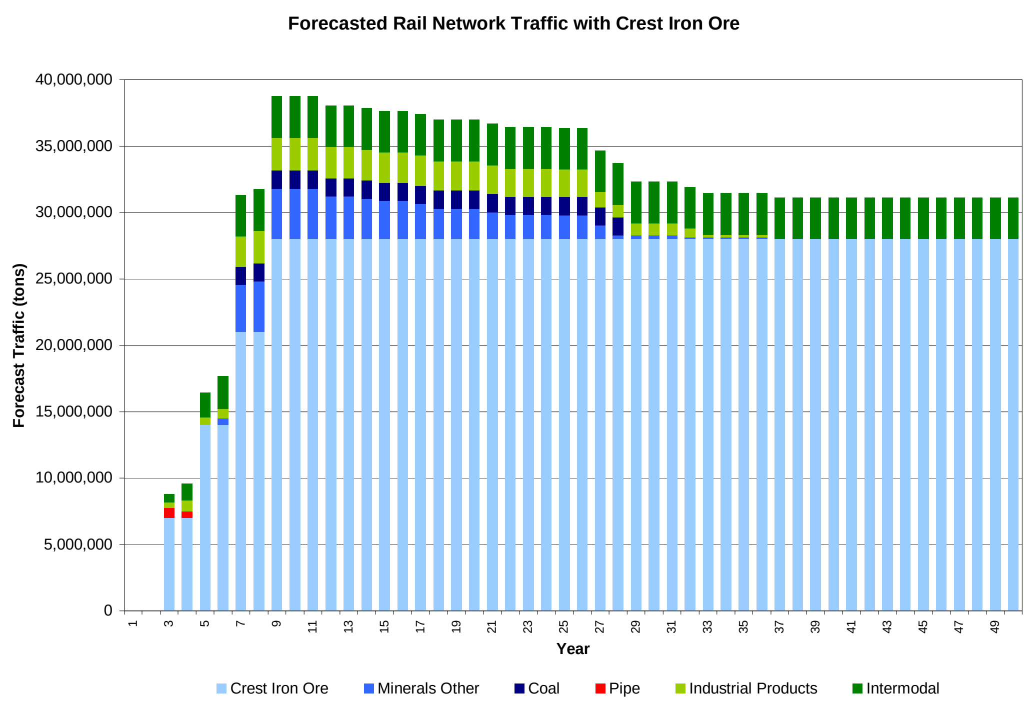

Figure 4 - Forecasted Rail Network Traffic with Crest Iron Ore

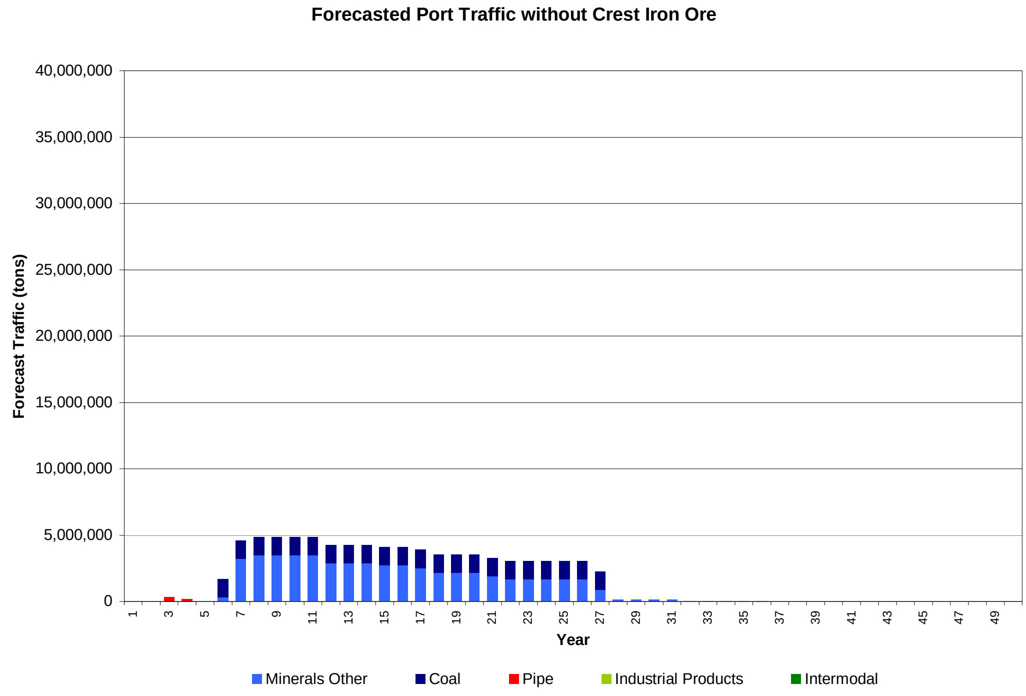

Figure 5 - Forecasted Port Access Traffic without Crest Iron Ore

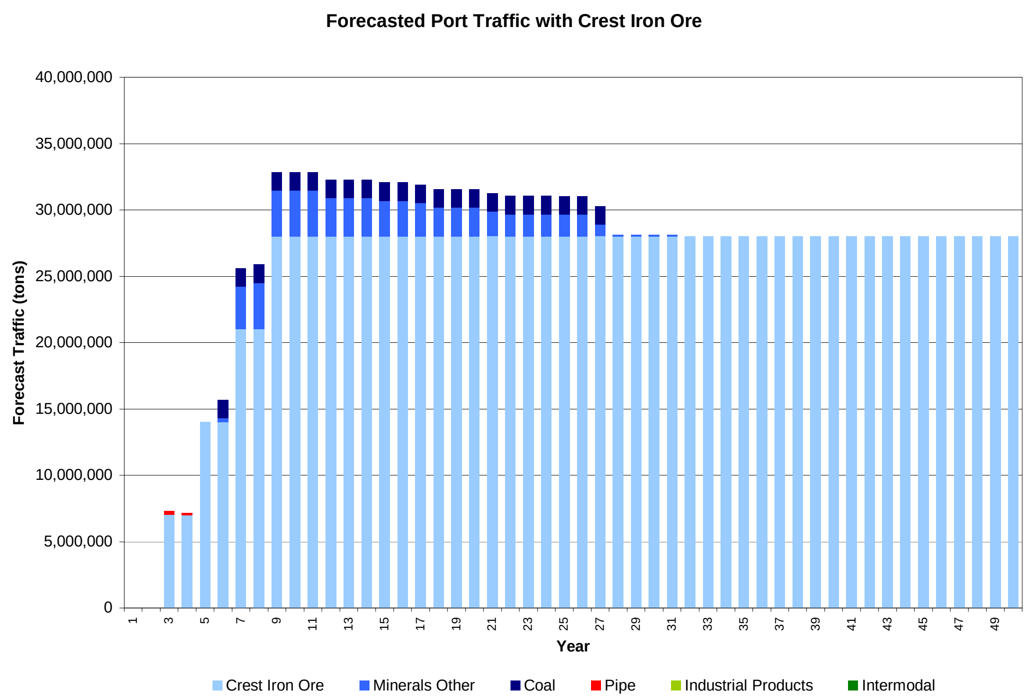

Figure 6 - Forecasted Port Access Traffic with Crest Iron Ore

Calculation of the unit cost of service requires the discounting of the traffic volumes presented above.

Discounting is undertaken to reflect the higher value of benefits, costs or traffic that occurs closer to the present, versus farther in the future. As an example, if two projects have the same total value of benefits over 20 years, but 80% of Project A's benefits occur within the first five years, while 80% of Project B's benefits occur in the last five years, Project A would be preferred. This preference reflects the time value of money/resources, and demonstrates the need for discounting to assess the relative preference of scenarios when benefits/costs are spread over an extended period of time.

To evaluate the equivalent present value of future values from each year, the future values are discounted according to the discounting equation shown below. The discounting equation, used to calculate the present value, PV, requires several inputs including; the discount rate, i, the number of years beyond the present in which the value occurs, j, the duration of the analysis period, n, and the stream of future values, FV_j. As benefits/costs/traffic occur farther into the future, the present value of these benefits are reduced geometrically. To determine the value of all future values combined, the future values are discounted to present values and summed.

$$PV = \sum_{j=1}^{j=n} \frac{FV_j}{(1+i)^j}$$

The cumulative present value of traffic at a discount rate of 5% over the 50 year analysis period is presented below in **Table 1**.

Table 1 - Cumulative Discounted Projected Traffic Volumes

Discounted Projected Traffic Volumes	With Crest Iron Ore (million tons)	Without Crest Iron Ore (million tons)
Rail Network Traffic	507	114
Port Access Traffic	433	40

Methodology

For each rail – port route scenario this analysis combines the life – cycle capital costs estimated in work package B3(b), with the corresponding estimates of life-cycle operating expenses reported in work package B3(d) to generate the overall unit cost of service. This data is then integrated with the rail network and port access traffic forecasts to calculate the unit cost of service values.

Tables 2 through **5** below present both undiscounted and discounted values for capital costs and operating expenses for each of the ten rail-port scenarios considered. In the case of rail operating expenses a range of values is provided to reflect different management strategy[1] assumptions within the rail cost model. Consistent with other analysis in this work package, discounted values were calculated using a real discount rate of 5% over a 50 year analysis period.

[1] As described in Innovative Scheduling report "Alaska Canada Rail Link Feasibility Study Cost Analysis Report" produced as part of work packages B3(c/e)

Table 2 - Estimated Undiscounted Life-Cycle Capital Costs (B3b)

Estimated Undiscounted Life-Cycle Capital Costs		Port Improvements (U$ millions)	Rail Improvements (U$ millions)	Total Improvements (U$ millions)
Scenario 1	Skagway (without Crest) *	$200	$11,600	$11,800
Scenario 2	**Port Mackenzie via Beaver Creek (with Crest)**	**$1,400**	**$17,700**	**$19,100**
Scenario 2a	Port Mackenzie via Beaver Creek (without Crest)	$300	$12,400	$12,700
Scenario 3	**Port Mackenzie via Ladue River (with Crest)**	**$1,400**	**$17,000**	**$18,400**
Scenario 3a	Port Mackenzie via Ladue River (without Crest)	$300	$11,500	$11,800
Scenario 4	**Haines (with Crest)**	**$2,200**	**$18,600**	**$20,900**
Scenario 4a	Haines (without Crest)	$500	$13,500	$13,900
Scenario 5	Hyder-Stewart (without Crest)	$500	$13,100	$13,600
Scenario 6	**Prince Rupert (with Crest)**	**$1,700**	**$18,000**	**$19,700**
Scenario 6a	Prince Rupert (without Crest)	$400	$11,500	$11,900

* Due to constrained port expansion capacity direct comparison not possible. High range reported.

Table 3 - Estimated Discounted Life-Cycle Capital Costs

Estimated Discounted Life-Cycle Capital Costs		Port Improvements (U$ millions)	Rail Improvements (U$ millions)	Total Improvements (U$ millions)
Scenario 1	Skagway (without Crest) *	$200	$11,500	$11,700
Scenario 2	**Port Mackenzie via Beaver Creek (with Crest)**	**$1,000**	**$15,500**	**$16,500**
Scenario 2a	Port Mackenzie via Beaver Creek (without Crest)	$200	$11,300	$11,500
Scenario 3	**Port Mackenzie via Ladue River (with Crest)**	**$1,000**	**$15,700**	**$16,700**
Scenario 3a	Port Mackenzie via Ladue River (without Crest)	$200	$11,300	$11,500
Scenario 4	**Haines (with Crest)**	**$1,500**	**$17,300**	**$18,800**
Scenario 4a	Haines (without Crest)	$400	$13,200	$13,600
Scenario 5	Hyder-Stewart (without Crest)	$400	$12,900	$13,300
Scenario 6	**Prince Rupert (with Crest)**	**$1,100**	**$16,100**	**$17,200**
Scenario 6a	Prince Rupert (without Crest)	$300	$11,400	$11,700

* Due to constrained port expansion capacity direct comparison not possible. High range reported.

Table 4 - Estimated Undiscounted Life-Cycle Operating Expenses (B3d)

Undiscounted Operating Expenses Summary		Estimated Undiscounted Life-Cycle Operating Expenses		
		Port Operations (U$ millions)	Rail Operations (U$ millions)	Total Operations (U$ millions)
Scenario 1	Skagway (without Crest)*	$500	$5,000 - $7,000	$6,000 - $7,000
Scenario 2	**Port Mackenzie via Beaver Creek (with Crest)**	**$5,700**	**$19,000 - $28,000**	**$25,000 - $34,000**
Scenario 2a	Port Mackenzie via Beaver Creek (without Crest)	$1,100	$6,000 - $8,000	$7,000 - $9,000
Scenario 3	**Port Mackenzie via Ladue River (with Crest)**	**$5,700**	**$19,000 - $27,000**	**$25,000 - $33,000**
Scenario 3a	Port Mackenzie via Ladue River (without Crest)	$1,100	$6,000 - $8,000	$7,000 - $9,000
Scenario 4	**Haines (with Crest)**	**$7,500**	**$13,000 - $19,000**	**$20,000 - $26,000**
Scenario 4a	Haines (without Crest)	$1,600	$5,000 - $7,000	$7,000 - $9,000
Scenario 5	Hyder-Stewart (without Crest)	$1,500	$5,000 - $7,000	$6,000 - $8,000
Scenario 6	**Prince Rupert (with Crest)**	**$5,600**	**$24,000 - $34,000**	**$30,000 - $40,000**
Scenario 6a	Prince Rupert (without Crest)	$1,300	$6,000 - $8,000	$7,000 - $9,000

* Due to constrained port expansion capacity direct comparison not possible.

Table 5 - Estimated Discounted Life-Cycle Operating Expenses

Discounted Operating Expenses Summary		Estimated Discounted Life-Cycle Operating Expenses		
		Port Operations (U$ millions)	Rail Operations (U$ millions)	Total Operations (U$ millions)
Scenario 1	Skagway (without Crest)*	$250	$2,000 - $3,000	$2,000 - $3,000
Scenario 2	**Port Mackenzie via Beaver Creek (with Crest)**	**$2,000**	**$6,000 - $9,000**	**$8,000 - $11,000**
Scenario 2a	Port Mackenzie via Beaver Creek (without Crest)	$500	$2,000 - $3,000	$3,000 - $3,000
Scenario 3	**Port Mackenzie via Ladue River (with Crest)**	**$2,000**	**$6,000 - $9,000**	**$8,000 - $11,000**
Scenario 3a	Port Mackenzie via Ladue River (without Crest)	$500	$2,000 - $3,000	$2,000 - $3,000
Scenario 4	**Haines (with Crest)**	**$3,200**	**$4,000 - $6,000**	**$7,000 - $9,000**
Scenario 4a	Haines (without Crest)	$1,100	$2,000 - $3,000	$3,000 - $4,000
Scenario 5	Hyder-Stewart (without Crest)	$700	$2,000 - $3,000	$3,000 - $3,000
Scenario 6	**Prince Rupert (with Crest)**	**$2,300**	**$7,000 - $11,000**	**$10,000 - $13,000**
Scenario 6a	Prince Rupert (without Crest)	$700	$2,000 - $3,000	$3,000 - $3,000

* Due to constrained port expansion capacity direct comparison not possible.

The method used to calculate the unit cost of service employs the present value equation to discount life cycle costs and corresponding life cycle traffic to equivalent present values.

The form of the unit cost of service equation is:

$$Rail\_Unit\_Cost\_of\_Service = \frac{Present\_Value(Rail\_Capital\_Costs + Rail\_Operating\_Expenses)}{Present\_Value\_of\_Rail\_Network\_Traffic}$$

$$Port\_Unit\_Cost\_of\_Service = \frac{Present\_Value(Port\_Capital\_Costs + Port\_Operating\_Expenses)}{Present\_Value\_of\_Port\_Network\_Traffic}$$

$$Total\_Unit\_Cost\_of\_Service = Rail\_Unit\_Cost\_of\_Service + Port\_Unit\_Cost\_of\_Service$$

Table 6 presents a summary of the rail and port components of the total unit unit cost of service for each rail – port route scenario. For the rail component, unit cost of service has been presented for each of the three management strategies[2] used in the work package B3(c/e) rail cost model.

For the port component the unit cost of service has been calculated two ways, a blended rate for combined port traffic to provide a relative comparison between scenarios and; a disaggregated rate by terminal to reflect the potential unit cost of service by commodity group. Finally, total unit cost of service values are presented both by terminal and blended as well as over the range of management strategies.

[2] As described in Innovative Scheduling report "Alaska Canada Rail Link Feasibility Study Cost Analysis Report" produced as part of work packages B3(c/e)

Table 6 - Estimated Unit Unit cost of service

	Traffic				Cost of Service ($U/ton)						
					Rail			Port		Total	
	Coal	Iron Ore	Minerals	Pipe	Management Strategy 1	Management Strategy 2	Management Strategy 3	By Terminal	Blended	By Terminal	Blended
Scenario 1 - Skagway (without Crest)											
Skagway (partial Mineral Con/Coal/Pipe)	■		■	■	$108.80	112.22	114.25				
Scenario 2 - Port Mackenzie - Anchorage via Beaver Creek (with Crest)											
Port Mackenzie (Iron Ore/Coal)	■	■						$6.11		$48.61 - $54.18	
Port Mackenzie (Mineral Con)			■		$42.50	$45.69	$48.07	$23.95	$6.84	$66.45 - $72.02	$49.34 - $54.91
Port of Anchorage				■				$15.00		$57.5 - $63.07	
Scenario 2a - Port Mackenzie - Anchorage via Beaver Creek (without Crest)											
Port Mackenzie (Mineral Concentrates/Coal)	■		■		$116.17	$119.58	$122.33	$19.06	$19.02	$135.23 - $141.39	$135.19 - $141.35
Port of Anchorage				■				$15.00		$131.17 - $137.33	
Scenario 3 - Port Mackenzie - Anchorage via Ladue River (with Crest)											
Port Mackenzie (Iron Ore/Coal)	■	■						$6.11		$46.49 - $52.16	
Port Mackenzie (Mineral Con)			■		$40.38	$43.69	$46.05	$23.95	$6.84	$64.33 - $70	$47.22 - $52.89
Port of Anchorage				■				$15.00		$55.38 - $61.05	
Scenario 3a - Port Mackenzie - Anchorage via Ladue River (without Crest)											
Port Mackenzie (Mineral Concentrates/Coal)	■		■		$108.17	$111.68	$114.41	$19.06	$19.02	$127.23 - $133.47	$127.19 - $133.43
Port of Anchorage				■				$15.00		$123.17 - $129.41	
Scenario 4 - Haines (with Crest)											
Tanani Point (Iron Ore/Coal)	■	■			$40.39	$42.44	$44.24	$7.81	$9.36	$48.2 - $52.05	$49.75 - $53.6
Lutak Inlet (Mineral Con/Pipe)			■					$33.49		$73.88 - $77.73	
Scenario 4a - Haines (without Crest)											
Tanani Point (Coal/Mineral Concentrates/Pipe)	■		■		$123.56	$126.80	$129.49	$28.39	$28.39	$151.95 - $157.88	$151.95 - $157.88
Scenario 5 - Hyder (without Crest)											
Hyder (Coal/Mineral Concentrates)	■		■		$121.12	$124.50	$127.09	$26.83	$26.76	$147.95 - $153.92	$147.88 - $153.85
Arrow Barge Terminal (Pipe)				■				$15.00		$136.12 - $142.09	
Scenario 6 - Prince Rupert (with Crest)											
Ridley (Iron Ore/Coal)	■	■						$5.32		$49.85 - $56.5	
South Kaien (Mineral Con)			■		$44.53	$48.32	$51.18	$34.20	$7.05	$78.73 - $85.38	$51.58 - $58.23
Kitimat (Pipe)				■				$15.00		$59.53 - $66.18	
Scenario 6a - Prince Rupert (without Crest)											
Ridley (Coal)	■							$5.32		$113.77 - $120.16	
South Kaien (Mineral Con)			■		$108.45	$112.06	$114.84	$34.20	$23.85	$142.65 - $149.04	$132.3 - $138.69
Kitimat (Pipe)				■				$15.00		$123.45 - $129.84	

Figure 7 below presents a graphic view of the comparative total unit cost of service for each rail-port scenario based on the blended unit cost of service at each port.

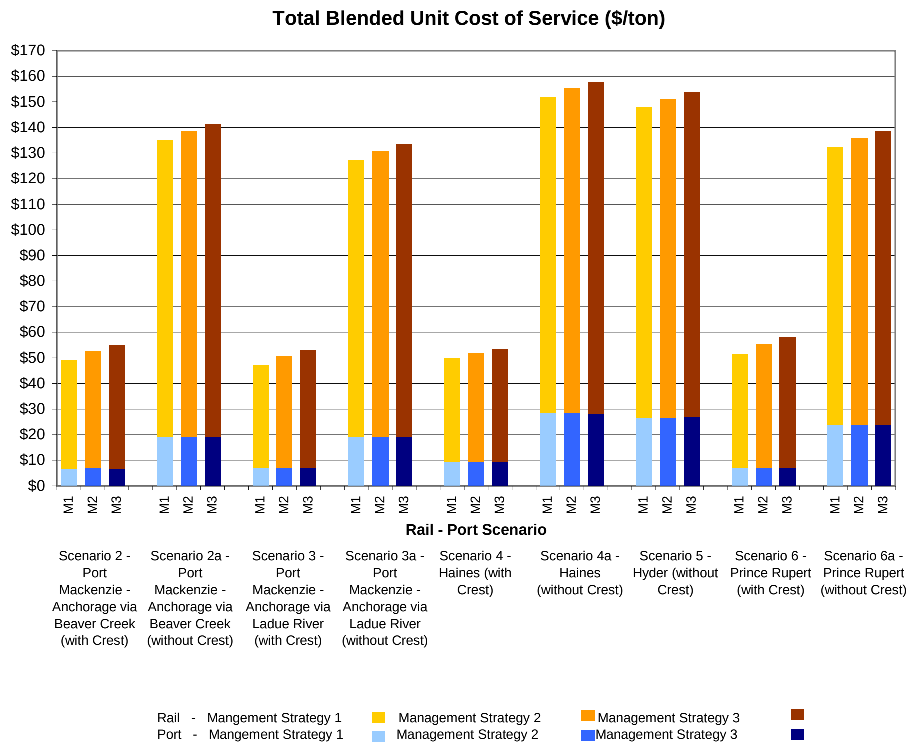

Figure 7 – Total Blended Unit Unit cost of service

SUMMARY

The unit cost of service results in Table 6 and Figure 7 present the estimated blended unit cost of service for each scenario evaluated broken down by both port and rail components, plus by management strategy. As can been seen in Figure 7 there is a large difference in unit cost of service between scenarios that include Crest Iron Ore Mine traffic and those that do not. This difference is largely due to changes in operating expenses associated with additional rail traffic generated by the mine and large changes in the projected traffic volumes, which influences the unit cost of service calculation.

In general it can be seen that the overall unit cost of service is larger for management strategy 3 versus management strategy 1. However, this does not mean that management strategy 1 is the most desirable, as performance metrics other than cost such as schedule reliability or travel times may not follow a similar pattern.

The projected unit cost of service for each rail-port route scenario is in the range of U$50 to U$60 per ton for with-Crest and from $135 to $165 per ton without-Crest. Operating expenses made up 30-40% of the total unit cost of service in with-Crest scenarios, falling to approximately 20% for non-Crest scenarios.

These values represent the combined output for the rail cost model and port cost models for each of the scenarios assessed. The results are best used for comparative evaluation of the scenarios for the purpose of targeting additional investigation and refinement of scenarios. In addition, these estimates are based on blended unit cost of service values at each port, unit cost of service rates for commodity groups are estimated in Table 6, by which comparison of unit cost of service rates at other operations could be undertaken.

Scrutiny of the data in Table 6 provides the following insights into the comparative unit costs of service for rail – port route integration:

- The presence of the Crest Iron Ore Mine and its associated large volumes of iron ore traffic have a very large influence over the projected unit cost of service through both the rail and port components of each scenario.
- The massive volumes of material being moved in the with Crest scenarios versus non-Crest scenarios (3-4 times by weight) drives down the unit cost of service for all users by increasing traffic volumes by a greater magnitude than capital costs and operating expenses grow to support the new traffic.
- However, it should be noted that inclusion of Crest traffic onto the network does result in substantial increases in capital costs and operating expenses.

Relative breakdown of unit cost of service between port terminal infrastructure and rail infrastructure shows that rail costs and expenses dominate the port costs and expenses by a large margin. Variation in port costs in many cases are small or insignificant in comparison to variations in rail costs. Having said this, the ability to develop a port at some locations assessed is a significant risk in the feasibility of that scenario.

In general locations with existing port facilities of similar magnitude will minimize this risk as conditions at these locations and their impact on deep sea shipping operations are better understood. It should be recognized that some sites could present significant challenges to port development of certain scales.

The port integration scenarios presented carry a common trade-off of costs associated with longer travel distances versus port development risks. Ports located far from the crest iron ore mine (Prince Rupert / Port Mackenzie) are have lower port development costs due to more favorable terrain and port infrastructure. However, the longer distance to access these ports have offsetting impacts on the overall unit cost of service. Other closer ports include less attractive port sites, with associated risks and costs of development at a new port site, but as they are closer, can reduce long haul costs versus the other scenarios. These trends are borne out in the results in terms of higher operating expenses and lower capital costs for ports such as Prince Rupert and

Port Mackenzie while ports such as Haines incur additional capital costs but have lower rail-port route operating expenses.

Although this report looks at the unit cost of service by unit of weight, in this case tons, it should be noted that different commodity groups have different value by weight, and thus different sensitivity to unit cost of service. Iron ore and coal are low value commodities and require low unit cost of service rates to be economically viable. Coal and iron ore tend to be shipped in very large quantities to spread the capital cost of infrastructure over a large volume of traffic. In the case of the scenarios analyzed it was noted that the coal volumes projected are small and without the ability to share facilities with other bulk traffic such as at Prince Rupert's existing coal terminal or in conjunction with infrastructure built for Crest Iron Ore, the unit cost of service for coal would remain very high. In contrast, mineral concentrates and pipe, which in this analysis had a higher unit cost of service, may be able to accommodate these costs as their overall value of cargo is much higher on a per ton basis.

OTHER CONSIDERATIONS

The unit unit cost of service estimates provided encompass the land transport costs, (rail and port). They do not include the comparative ocean freight rates that will be incurred to ship the resource – oriented products to market. These costs, which are beyond the scope of this study, should be taken into consideration. Based on experience in other studies the ocean freight charges to access ports on the north coast will be reasonably comparable but will differ in one important aspect. This is the cost of pilots to navigate in confined waters and the possible cost of tug assistance. In consideration of these factors ocean freight rates can be expected to be lowest at Prince Rupert, (directly sailing in through Dixon Entrance) and highest at either Haines or Hyder, (navigation of the Lynn and Portland Canals). Port Mackenzie would likely be mid range with pilot assistance required from Homer to navigate Cook Inlet and Knick Arm.

The comparisons of port access contained in this analysis are based on pre – feasibility estimates of the capital costs (and related operating expenses) of large scale port infrastructure. The status of infrastructure at the ports ranges greatly from a well established rail served international port (Prince Rupert) to a developing port complex (Port Mackenzie with its south central Alaska location and proximity to Anchorage and the Alaska Railroad), to the two undeveloped port sites in southeast Alaska at Haines, (Tanani Point and Lutak Inlet) and Hyder which are presently served by road transport only. The developed port locations at Prince Rupert and Port Mackenzie are considered to be comparatively mature and available for expansion subject to the existing socio – economic and environmental approval processes. However proposals to develop major port infrastructure at either Haines or Hyder would be more challenging and require a longer time frame to implement.

NEXT STEPS

The scenarios presented above compared different configurations of the ALCAN Rail Link and include in all cases the mainline from Delta Junction to Hazelton plus spur connections to access ports or resources along the route. A more independent assessment of the feasibility of the Crest Iron Ore Mine may be possible by developing scenarios that only include components required to support the mine traffic itself. This would include reducing the scope of the rail network as well as port facilities. This, in turn, would result in different unit cost of service rates, particularly on the rail component as the current rate is averaged over the entire network and all traffic.

Although none of the current scenarios analyzed looked specifically at such a configuration some information is available from the existing results. First, traffic associated with the Crest Iron Ore Mine makes up approximately 70-90% of rail traffic on the proposed network, see Figure 4. Second, in Scenario 4 (Haines with Crest) rail network components that would be required by mine traffic make up only 42% of the total track capital cost of the rail network. Operational expenses would likely be more closely linked to rolling stock, and thus most operational expenses will be attributed to segments of track used by Crest traffic.

Based on these results, it appears likely that a reduced rail scope scenario serving Crest only could continue to serve 70-90% of network traffic while substantially reducing capital costs and maintaining similar operating expenses. Such a network would likely be able to deliver iron ore to tidewater at a lower rate versus a similar network with the ALCAN mainline included. Analysis consistent with the scenarios analyzed in this report would provide a more direct comparison with other options presented.

The current analysis indicates that the unit cost of service between Haines, Prince Rupert and Port Mackenzie varies by about $5.00 per ton, with the most expensive being Prince Rupert at ($51.58 to $58.23 per ton) followed by Haines and Port Mackenzie at ($47.22 to $52.89 per ton), both with Crest. Although the transfer to a deep sea ship at port marks the end of the land component of total transportation cost, ocean rates will vary to these ports. The costs associated with pilotage and tugs between these ports costs could be in the range of $3.00 to $5.00 per ton. Variation in these costs could further reduce the spread of these ports, with Prince Rupert likely having the cheapest ocean freight, followed by Port Mackenzie and then Haines.

Finally, the level of detail and data to support the estimates included in this analysis are at the pre-feasibility level and are based on very limited amount of hard engineering data. Largely derived from engineering judgment and experience the unit cost of service provided in this report should be used as a relative comparison tool between scenarios to help refine the options being considered and to provide direction to further more detailed analysis.