Ministry of Transportation
Valley Link Update

Project No.: 011025-20

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EXECUTIVE SUMMARY

In 1991 the Ministry of Transportation and Highways commissioned a study of the economic viability of constructing road links between Port Renfrew, Lake Cowichan, Port Alberni, and Cumberland / Courtenay. This study called the Vancouver Island Valley Link Study was conducted jointly by T.J.Ward Consulting Group Inc. and Novacorp Consulting Inc., and was completed in 1993.

Focus Corporation was commissioned to update this study. Focus has teamed up with Trillium to provide the economic component of this update study.

The purpose of this study is to bring the previous study results up to date so that the new results will be sufficiently relevant for determining whether there is justification for further study. As an updating exercise, this study is not intended to be a complete repeat of the old study using new data. Because the emphasis is to provide guidance for future direction, only the most promising options are considered relevant.

This update study is comprised of two phases.

Phase 1 – Option Reduction is a high level assessment of the alignments, intended to reduce the options from the previous study (12 in total, illustrated in Exhibits 1,2, and 3) down to 3, one for each of Links A, B, and C. This phase yielded minor changes to the alignments of Links B and C to take advantage of existing infrastructure and to promote economic development. The resulting Links A, B, and C are illustrated in Exhibits 7,8, and 9.

Phase 2 – Updating Analysis is a detailed investigation of each selected link alignment using updated data and analysis methodology. This phase investigates essentially the benefits (e.i. travel time savings, link utility, economic development, etc.), costs (i.e. capital cost, maintenance cost, rehabilitation cost, etc.) and the business case to justify the links (i.e. benefit/cost ratio, net present value) using current input parameters.

The investigation indicates that none of the three investment options generate positive net benefits and yield positive benefit-cost ratios. Link A generates the highest travel time savings, and Link B generates the highest economic benefits. However, the economic benefits include transfers from other regions. Link B generates the greatest overall benefits. All three links yield benefit-cost ratios in the range of 0.3, with Link C having the highest benefit-cost ratio.

The findings for Link A are similar to that of the original report. The findings for Links B and C differ significantly from that of the original report. This is due in large part to two key findings of this report. First, anticipated volumes for Links B and C are lower than in the original report. Second, the travel time savings on Link C is greatly diminished (compared to the original report) because of the improvements brought about by the new Inland Island Highway.

Readers should note that accident cost and vehicle operating cost savings were not developed for this study. There are currently no accident statistics available on the number and severity of accidents on industrial logging roads. There are no estimates of savings in vehicle operating costs applicable for industrial road upgrades. Quantification of savings could result in greater net present values and higher benefit-cost ratios for all three Valley Links.

Capital costs did not account for forestry compensation costs and property costs for right of way. Quantification of these values could result in lower net present values and benefit-cost ratios.

Capital costs can be greatly affected by geotechnical conditions. This update study did not address geotechnical conditions. The original study relied on 1:50,000 scale terrain mapping. A greater degree of study of the geotechnical conditions will be required to confirm feasibility and costs.

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1.0 BACKGROUND

In 1991 the Ministry of Transportation and Highways commissioned a study of the economic viability of constructing road links between Port Renfrew, Lake Cowichan, Port Alberni, and Cumberland / Courtenay. This study called the Vancouver Island Valley Link Study was conducted jointly by T.J.Ward Consulting Group Inc. and Novacorp Consulting Inc., and was completed in 1993.

Focus Corporation was commissioned to update this study. Focus has teamed up with Trillium to provide the economic component of this update study.

2.0 PURPOSE

The purpose is to bring the previous study results up to date so that the new results will be sufficiently relevant for determining whether there is justification for further study.

3.0 APPROACH

As an updating exercise, this study is not intended to be a complete repeat of the old study using new data. Because the emphasis is to provide guidance for future direction, lower ranked options become less relevant. The following approach is adopted to streamline the process and most efficiently concentrate the investigation efforts.

This update study is comprised of two phases. ***Phase 1 – Option Reduction*** is a high level assessment of the alignments, intended to reduce the options from the previous study (12 in total) down to 3, one for each of Links A, B, and C.

Phase 2 – Updating Analysis is a detailed investigation of each selected link alignment using updated data and analysis methodology which has since been accepted by MoT. Also new factors not previously covered, such as First Nations issues, are discussed.

4.0 PHASE 1 - OPTION REDUCTION

The original Valley Link Study by Ward considered three (3) alignments for Link A, four (4) for Link B, and five (5) for Link C. These alignments are shown in Exhibits 1, 2, and 3 excerpted from the original report. In general, the same route options from the original study are investigated for this update study. There are a few minor exceptions to this, as will be discussed later in a subsequent section (MoT Workshop and Recommended Alignments).

The following process is used to reduce the alignment options from 12 to 3, one for each link. First, the original study results are reviewed to confirm that we agree with the conclusions and recommendations, given the data of the day. In essence, this step is to determine whether the original results are robust, or sensitive to philosophical changes in decision making.

Second, key factors of the original study are re-evaluated to determine if the rankings between alignment options would change. In essence, this step is to determine whether the recommended alignment options of the original study remain the best ones today, when updated with new data.

Third, a workshop was held March 5, 2004 with MoT staff to review the study recommendations of alignment options at this preliminary stage. This provided a forum to collect valuable input from MoT that was focused, yet early enough to steer the study direction in terms of choosing the best options to pursue.

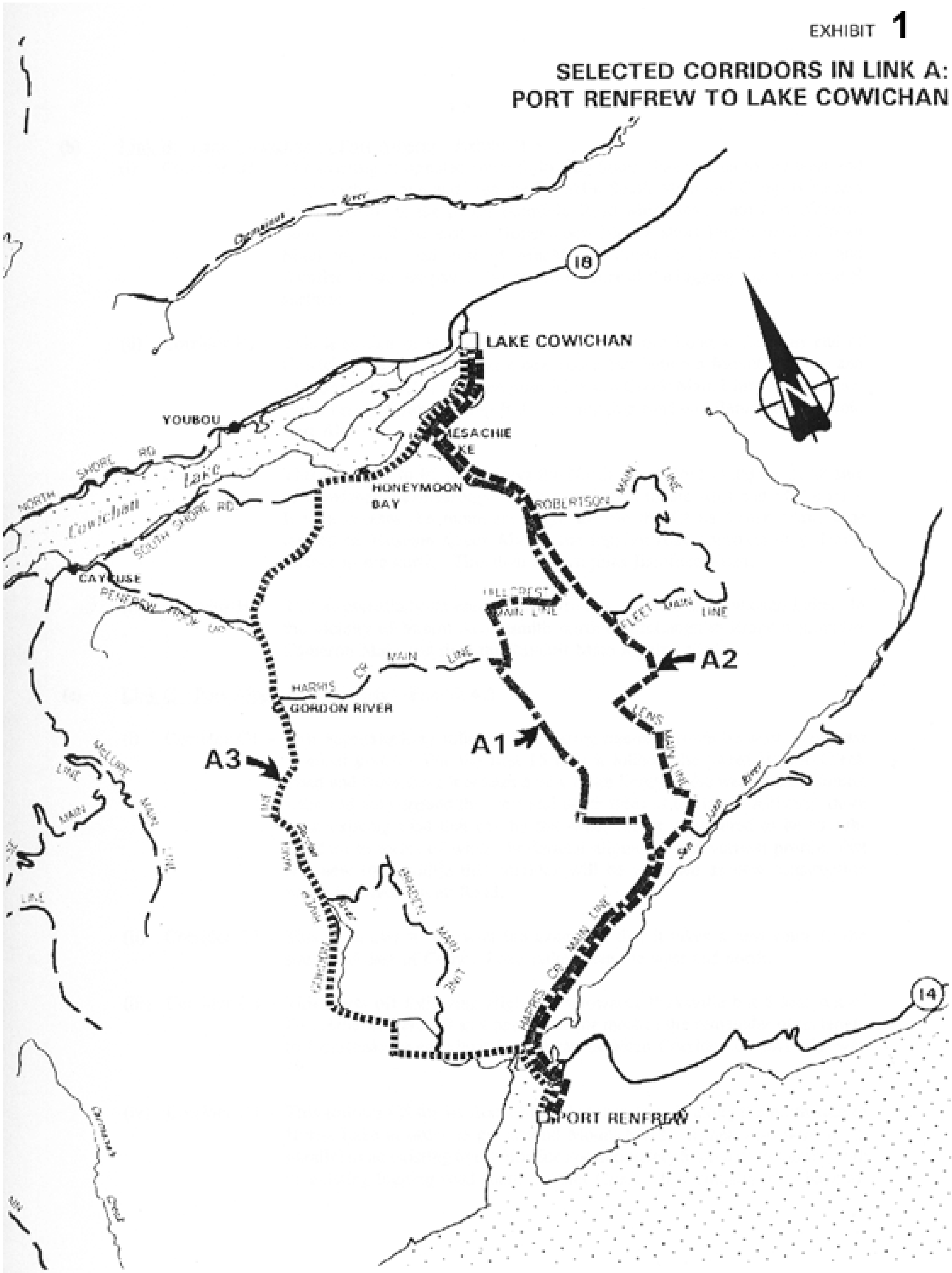


EXHIBIT 1
SELECTED CORRIDORS IN LINK A:
PORT RENFREW TO LAKE COWICHAN
18
LAKE COWICHAN
YOUBOU
MESACHIE LAKE
HONEYMOON BAY
NORTH SHORE RD
Cowichan Lake
SOUTH SHORE RD
CAYCUSE
ROBERTSON MAIN LINE
FLEET MAIN LINE
HARRIS CR MAIN LINE
GORDON RIVER
A1
A2
A3
LENS MAIN LINE
San Juan River
HARRIS CR MAIN LINE
14
PORT RENFREW

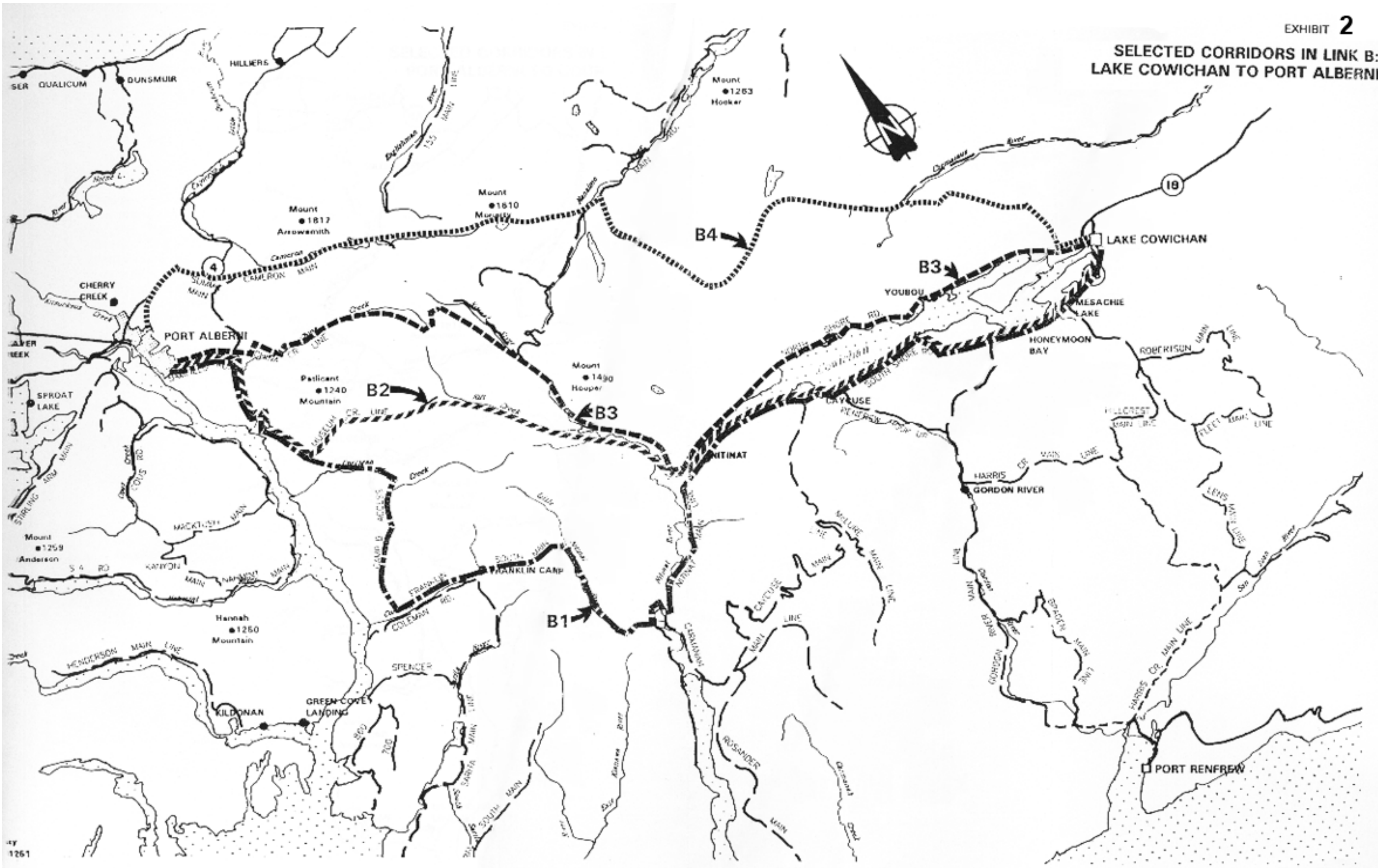


EXHIBIT 2
SELECTED CORRIDORS IN LINK B:
LAKE COWICHAN TO PORT ALBERNI
B1
B2
B3
B4
PORT ALBERNI
LAKE COWICHAN
YOUBOU
MESACHIE LAKE
HONEYMOON BAY
NITINAT
GORDON RIVER
PORT RENFREW
FRANKLIN CAMP
KILDONAN
GREEN COVE LANDING
CHERRY CREEK
SPROAT LAKE
QUALICUM
DUNSMUIR
HILLIERS

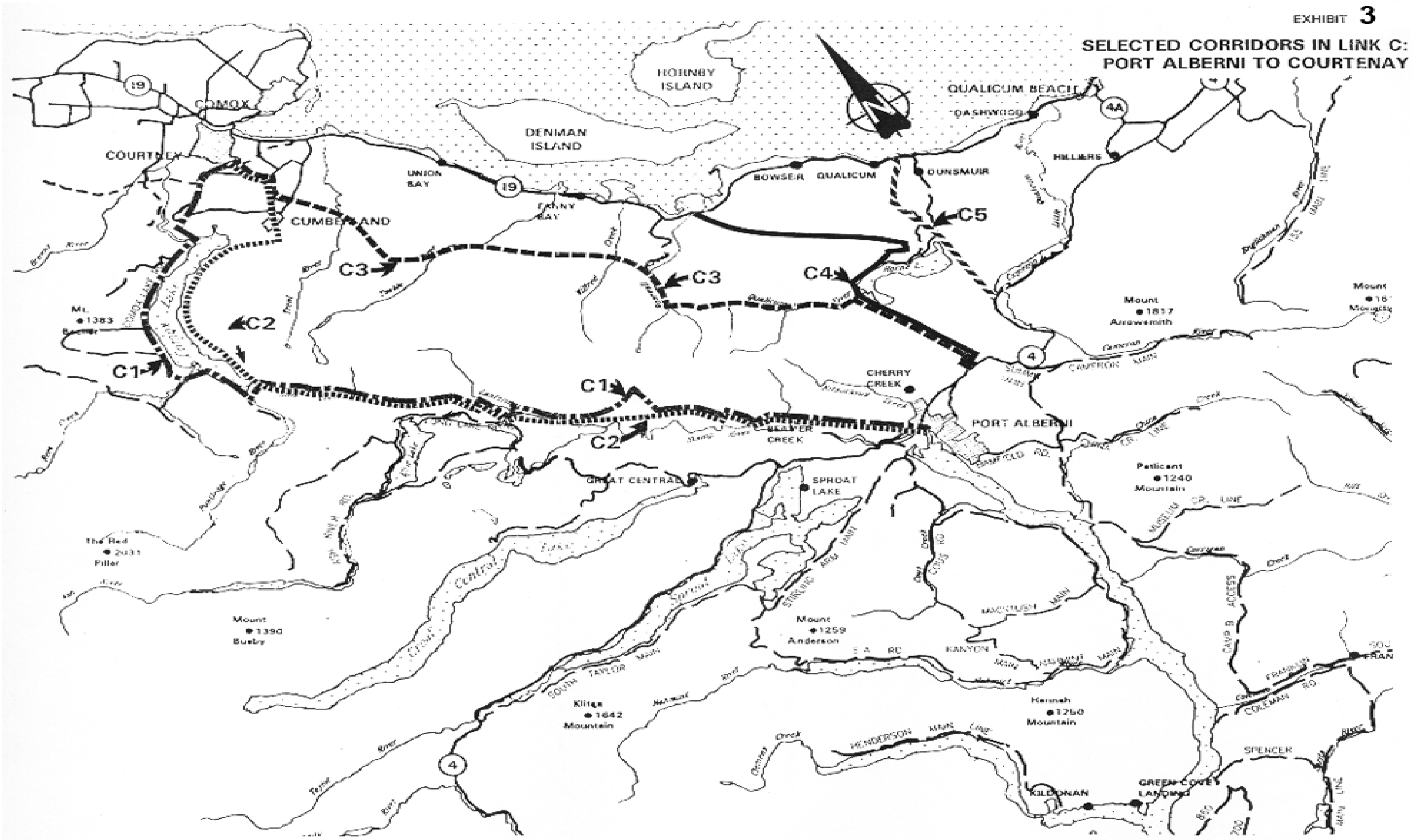


EXHIBIT 3
SELECTED CORRIDORS IN LINK C:
PORT ALBERNI TO COURTENAY
HORNBY ISLAND
DENMAN ISLAND
COMOX
COURTENAY
CUMBERLAND
UNION BAY
FANNY BAY
BOWSER
QUALICUM
QUALICUM BEACH
DASHWOOD
DUNSMUIR
HILLIERS
C1
C2
C3
C4
C5
CHERRY CREEK
PORT ALBERNI
BEAVER CREEK
GREAT CENTRAL
SPROAT LAKE
Mount 1817 Arrowsmith
Patlicant 1240 Mountain
The Red 2031 Pillar
Mount 1390 Busby
Mount 1259 Anderson
Klitsa 1642 Mountain
Hannah 1250 Mountain
KILDONAN
GREEN COVE LANDING
SPENCER

4.1 Review of Original Study Results

While it is tempting to simply adopt the original recommended alignment options for further detailed analysis in Phase 2, it is more instructive and informative to review the analysis results of the fundamental criteria commonly used for decision making.

Because the original study considered so many factors, both quantitative and qualitative, the end recommendation was a weighted blend of all factors reflecting the preferences of the original steering committee. These preferences may or may not be consistent with MoT's current philosophy.

Therefore it is imperative to have a transparent discussion of how a present day reader would consider the previous results. The factors reviewed in this section include link distance (surrogate measure for travel time), anticipated traffic volume, benefit cost ratio for key industry sectors, and agency costs. Other factors also go into the selection of optimal alignment, but the discussion of rationale is abbreviated for the sake of clarity.

Understanding of the previous alignment choices, and confirmation that we still agree with those choices, are the objectives of this section.

Link A

Based on the results of the original study, it was clear that of the Link A options, alignment A1 was optimal. Previous results indicate all three Link A alignments were of similar length, traffic volumes are low and similar, but A1 is less costly due mainly to the availability of existing logging roads that can be utilized.

Exhibit 4 is an excerpt of Table 4.1 from the original study. It lists the length of each alignment option and the length of new road construction required for each option. All Link A options are approximately 60km long, therefore generating similar time savings. Alignments A2 and A3 require new road construction for approximately 25% of their length.

Exhibit 4

4-10

Table 4.1
Length of Alternative Corridors
New Construction vs. Upgraded Roads
(In Kms)

Link/ Corridor		New Road	Existing Public	Upgraded Public Gravel	Upgraded Public Paved	Upgraded Logging Gravel	Upgraded Logging Paved	Total Length
Link A	A1	0	10	0	0	34	16	60
	A2	15	10	0	0	18	13	56
	A3	13	17	0	0	27	4	61
Link B	B1	0	14	2	0	90	12	118
	B2	15	14	2	0	62	0	93
	B3	22	14	2	0	53	0	91
	B4	44	15	0	0	35	0	94
Link C	C1	40	16	0	0	12	8	76
	C2	40	24	0	0	8	0	72
	C3	33	5	0	0	28	0	66
	C4	21	38	0	0	5	0	64
	C5	8	68	0	0	5	0	81
Link D								
D1 (A1-B2-C4)		36	56	2	0	101	16	211
D2 (A2-B1-C1)		55	34	2	0	120	33	244
D3 (A1-B2-C1)		55	34	2	0	108	24	223

Note that the lengths of the Link D corridors are slightly shorter than the sum of the individual corridors since there is a common length of 6 kms between A1/A2 and B1/B2.

Exhibit 5 is an excerpt of Table 4.18 from the original study. It lists the projected volume anticipated to utilize the various link options. Traffic volumes are similar and low for all three alignment options (in the order of 100 to 200 AADT) and therefore generating similar and limited utility.

Exhibit 5

4-42

Table 4.18
Projected 2001 Daily Traffic Volumes

	1991	2001 Existing	Gravel @ 60 km/h				Paved @ 80 km/h			
	Existing	Network	Normal	Diverted	Generated	Total	Normal	Diverted	Generated	Total
Link A: Port Renfrew - Lake Cowichan										
A1	80	100	120	0	0	120	160	0	60	220
A2	0	0	120	0	0	120	160	0	60	220
A3	0	0	120	0	0	120	160	0	60	220
Link B: Lake Cowichan - Port Alberni										
B1	300	400	440	0	0	440	440	600	220	1260
B2		no road	40	0	160	200	40	1490	440	1970
B3		no road	40	0	160	200	40	1560	440	2040
B4		no road	40	0	160	200	40	1530	440	2010
Link C: Port Alberni - Courtenay										
C1		no road	0	80	110	190	0	520	350	870
C2		no road	0	80	110	190	0	580	350	930
C3		no road	0	80	80	160	0	850	240	1090
C4		no road	0	250	0	250	0	1530	150	1680
C5		no road	0	180	0	180	0	1370	150	1520

Exhibit 6 is an excerpt of Table 6.11 from the original study. It lists agency costs and economic impacts for the options for key industry sectors of agriculture, mining, tourism, and property development. While A2 has a higher benefit cost ratio than A1, the difference of 0.1 is small.

Exhibit 6

Table 6.11
Summary Comparison of Direct Economic Impacts and Agency Costs
(Present Values in 1991 $ x 1 million)

		Direct Economic Impact			Direct Economic Impact: Cost Ratio	
		Local	Island	Agency Costs	Local	Island
(a)	Link A					
	A1	$31	$20	$20.0	1.55	1.00
	A2	$36	$25	$22.8	1.58	1.10
	A3	$30	$19	$23.9	1.26	0.79
(b)	Link B					
	B1	$86	$59	$46.9	1.83	1.26
	B2	$93	$63	$42.1	2.21	1.50
	B3	$91	$59	$48.7	1.87	1.21
	B4	$78	$47	$68.9	1.13	0.68
(c)	Link C					
	C1	$98	$66	$42.6	2.30	1.55
	C2	$89	$57	$32.3	2.76	1.76
	C3	$89	$56	$45.5	1.96	1.23
	C4	$31	$15	$26.4	1.17	0.57
	C5	$27	$13	$13.0	2.08	1.00

Updating the analysis of all the Link A options is not expected to significantly change the ranking between A1, A2, and A3. The authors of the current study do not see any development or tourism advantage in favour of any one alignment. Therefore alignment A1 was chosen as the option for further detailed analysis (update). This choice is also consistent with the recommendations of the original report.

Link B

Based on the results of the original study, Link B alignment options B2 and B3 both appear to be good candidates.

Referring to Exhibit 4, B1 is 25% longer than the other three options which are all about 95km. However, B1 has no new road construction and takes advantage of 12km of paved logging road which the other options do not.

Referring to Exhibit 5, Link B1 has significantly less traffic draw compared to the other three, some 700vpd or 60% less.

Referring to Exhibit 6, Link B4 is significantly low on benefit / cost ratio largely due to its high cost and B2 is the clear winner.

Therefore alignment B2 was chosen as the option for further detailed analysis (update). This choice is also consistent with the recommendations of the original report.

Updating the analysis of all the Link B options is not expected to significantly change the ranking between B1, B2, B3, and B4.

Link C

Based on the results of the original study, a variety of link options are good choices, depending on which account is considered.

On the road length account (Exhibit 4), C3 is the shortest at 66 km and C5 is the longest at 81km. However, C5 has the shortest length of new road construction (8km). And although C5 is the longest, it takes fullest advantage of the higher speed and excellent road standards of the Inland Island Highway (Highway 19).

On the traffic volume account (Exhibit 5), C4 and C5 are a good 50% higher than the other three options.

On the benefit /cost account (Exhibit 6), C2 is the clear winner with a ratio of 1.76. C4 is the clear loser with a ratio of 0.57 and C5 just managing to justify itself with a ratio of 1.0. With the improvements to Highway 19 since the original report, C4 and C5 will likely have improved benefits as their travel times improve even more. In addition, C5 is the most economical at $13million agency cost compared to $32million for C2 and $45million for C3.

C5 is cautiously recommended for further evaluation in the next section, Re-evaluation of Key Factors, to determine the impact of the Inland Island Highway. C5 is also consistent with the recommendations of the original report.

Link D

The original study also investigated different combinations of alignment options for Links A, B, and C. The combinations were:

- D1 = A1+B2+C4
- D2 = A2+B1+C1
- D3 = A1+B2+C1

Since there is no obvious rationale for the combinations, Link D options are not pursued any further in this study. The best combination will simply be the combination of best individual alignment options for each of Links A, B, and C.

4.2 Re-Evaluation of Key Factors

The original study analyzed a multitude of factors to determine the optimal link alignments including (but not limited to):

- travel time savings
- capital cost
- maintenance cost
- geotechnical feasibility
- driving experience / scenic enjoyment
- development potential
- tourism potential

To analyze all of the factors again at this stage would defeat the purpose of the option reduction exercise. Therefore we selectively determine which factors should be considered in the reduction of alignment options. Consider how each of the factors has changed for each alignment in the past decade. These changes can be categorized in three groups.

- no significant changes e.g. geotechnical
- changes affecting all options similarly e.g. inflation
- changes affecting some options disproportionately

The last group is the only one that would affect the relative ranking between options. Only travel time savings appears to fit this category.

With the Vancouver Island Highway (VIH) and the Inland Island Highway (IIH) being constructed after the original study, travel speeds and distances may have changed and potentially affect the relative comparison of alignment options. For this reason, a re-evaluation of the travel time for each alignment is in order.

To keep the re-evaluation as simple as possible, it is desirable to maintain consistency with the original study as much as possible. However, reproducing the original values proved to be challenging because assumptions surrounding the upgrading of the VIH and IIH were never fully defined. Though the IIH and VIH were discussed as future upgrades (Sections 4.10 and 4.13 of previous study), it was never clear whether Options C4 and C5, and the base case took advantage of these upgrades in arriving at the previous study's conclusions and recommendations. Furthermore, precise travel times were never presented.

For the purposes of this study, we assume that Highways 1 and 19 were not upgraded in the calculations of the previous study. We will also assume that all alignments of the current study will take full advantage of the VIH and IIH. That is, the new study's base cases, C4, and C5 will utilize the VIH and IIH instead of Highway 1A and 19A (old alignments).

The resulting travel time comparison is presented in Table 1 below. Link alignment option lengths and the proportion of paved / unpaved road used in the calculations are based on the original report (excerpt provided in Exhibit 4 of this report). Operating speeds on gravel and paved roads (excluding numbered highways) are assumed to be 60km/h and 80km/h respectively. The design speeds are adopted directly from the original study and are assumed reasonable because the authors of the previous study had driven the route options of that study. The operating speed on numbered highways and their associated road lengths used in the calculations are listed in Appendix A.

Table 1: Comparison of Travel Time Between New and Old Highway Conditions

			Travel Time				
			current hwy. conditions with VIH and IIH		old hwy. conditions along Highway 1A and 19		change
	option	length	gravel (hours)	paved (hours)	gravel (hours)	paved (hours)	paved (minutes)
Link A	A1	60	0.89	0.75	same as current hwy. conditions		nil
	A2	56	0.84	0.70			
	A3	61	0.93	0.76			
base case A	Hwy. 14/1/18	176		2.40		2.58	11
Link B	B1	118	1.86	1.48	same as current hwy. conditions		nil
	B2	93	1.49	1.16			
	B3	91	1.46	1.14			
	B4	94	1.50	1.18			
base case B	Hwy. 18/1/19/4	162		1.83		2.42	35
Link C	C1	76	1.17	0.95	same as current hwy. conditions		nil
	C2	72	1.10	0.90			
	C3	66	1.08	0.83			
	C4 (via IIH)	64	0.82	0.71	0.91	0.80	5
	C5 (via IIH)	81	0.92	0.87	1.07	1.01	8
base case C	Hwy. 4/4A/19	108		1.12		1.64	31

It stands to reason that Table 1 indicates a change in time savings for the route alignments which utilize the numbered highway system. That is, the base cases, and alignments C4 and C5 show a decrease in travel time when the VIH and IIH were utilized instead of the old highways during the time of the original report. The greatest changes (half an hour) occurred for the base cases B and C because they took greatest advantage of the upgraded highway.

The rankings between Link C options, in terms of travel time, have changed. Under the old highway conditions, the ranking was C4, C3, C2, C1, C5 for paved options. Under the new highway conditions, the ranking is C4, C3, C5, C2, C1 for paved options. That is, the C5 rank moved up.

Referring to Section 4.1 of this study, changes brought by the improved VIH and IIH has bolstered the recommendation of the C5 alignment.

Note the travel time of C5 now has only a 15 minute advantage over the base case, compared to 38 minute advantage that the original C5 had over the original base case. The impacts of this will be considered in Section 5.1.4 Local and Diverted Traffic Volume and the consequences in Section 5.2.2 User Benefits.

4.3 MoT Workshop and Recommended Alignments

As the final step toward selecting an alignment for each of Links A, B, and C for further study and updating, a workshop was held involving Focus, Trillium[1], and MoT[2] on March 5, 2004. This provided a forum to discuss other possible issues which may not be apparent from review of the technical materials.

Link A

There was no new consideration in favour of, or against any of the Link A alignments, so the recommendation from Section 4.1 for A1 alignment was adopted. This alignment is illustrated in Exhibit 7.

Link B

A combination of B3 and B2 alignments was chosen for further study and updating. This alignment is illustrated on Exhibit 8. The following factors and considerations contributed to this choice of alignment.

- B2 recommended from the previous report and Section 4.1 of this report.
- Development potential is maximized if the road alignment follows along the north shore of Cowichan Lake (B3 alignment).
- There is desire by the land owners for MoT to take ownership of the existing road along the north shore of Cowichan Lake (B3 alignment).

Alignment B1 was considered briefly because MoT is currently protecting for sections of this alignment and cost sharing with forestry companies, for access purposes, and not necessarily part of the Valley Link or circle route project. For reasons outlined in Section 4.1, B1 is not the recommended alignment for this Valley Link Updating Study.

[1] Doug Hibbins represented Trillium. Trillium is a subcontractor to Focus Corporation for the economic analysis portion of this study.

[2] MoT staff included Dave Edgar (Transportation Planning Engineer, Nanaimo Office), Bob Webb (District Technician, Saanich Office), Dan Saari (Area Manager, Roads, Saanich Office).

Link C[3]

Local interest in C5 is high because of a growing desire for an alternate to Highway 4/4A. This desire stems from:

- Perceived increasing truck traffic due to the end of rail service to Port Alberni by E&N Rail in early 2002. This is perception only because the data suggests otherwise. Total traffic volumes increased 14% from 1997 to 2002, while heavy truck volume increased 1.2% in the same period.
- Wanting a high speed connector to the IIH that would match the same standards as the IIH.
- Low geometric standards on some sections of the current Highway 4/4A.
- Limited passing opportunity on the current Highway 4/4A.
- Wanting network redundancy. Because Highway 4/4A is the only paved road between Port Alberni and Highway 19 (IIH), major incidents can shut down the highway and stop the flow in and out of the city.

A combination of C4 and C5 alignments was chosen for further study and updating. This alignment is illustrated in Exhibit 9. The following factors and considerations contributed to this choice of alignment.

- C5 recommended from the previous report and from Sections 4.1 and 4.2 of this report.
- The location of the C5 connection to IIH is closest to Highway 4/4A, and most closely fulfills the role of an alternative to Highway 4/4A.
- C4 offers some advantage in sharing less of the Highway 4 alignment, creating a longer alternative section.
- Development potential is maximized if the road alignment follows along the north shore of Horne Lake (C4 alignment). This is a conscious choice, recognizing that the northwest slopes of Horne Lake have been known to be unstable.

[3] Discussions on Link C were deferred to Sean O'Sullivan, Transportation Engineer, Vancouver Island District, who was not in attendance and was contacted after the workshop for input.

5.0 PHASE 2 – UPDATING ANALYSIS

The alignment options recommended from Phase 1 of this study (illustrated in Exhibits 7, 8, and 9) are investigated in Phase 2 to update their analyses. Since the completion of the original study in 1993, many of the input parameters that went into the original study have changed. Consequently, the benefits and other downstream calculations have also changed.

The following input parameters and analyses are re-investigated because they may have changed significantly since the original study, or are considered so fundamental to project justification as to warrant confirmation.

- travel time savings
- traffic volumes
- user benefits
- generated demand
- capital cost
- forestry issues
- First Nations issues

Subsequent discussions of the parameters and their analyses are generally categorized into engineering and economic. It is inevitable that there be some cross over between the categories and cross references between the sections will occur.

5.1 Engineering Assessment Update

5.1.1 Alignment Review

Two link alignments recommended in Phase 1 are hybrids of the original alignments. For this reason, and because the alignment is fundamental to all the updating work that follows, the three recommended link alignments were reviewed on 1:50,000 scale mapping. A single set of the mapping is provided to MOT for reference.

All three alignments appear reasonable with the assumption that the design speeds of 80km/h for paved road and 60km/h for gravel road can be compromised at spot locations, using advisory speed signs. The design speeds are adopted directly from the original study and it is assumed reasonable because the authors of the previous study had driven the route options of that study. The scope of this study excludes site visits that would allow confirmation of adequacy of the recommended alignments for the chosen design speeds, or whether realignment is required, and the degree of realignment required.

Note Link C is aligned along the northwest slopes of Horne Lake where it is known to be unstable[4]. This is a deliberate choice to maximize on the development potential which lies along the north shore of the lake. Again, the limited scope of this study precluded geotechnical investigations. It is assumed that the original study addressed this topic adequately and the passage of time does not affect those findings. The original study assessed the geotechnical conditions using 1:50,000 scale terrain and landform maps.

As a consequence of the hybrid alignments developed in Section 4.3 and carried forward for updating, the length of each link has changed. These are provided in Table 2. The length of each link extend into town with the transition to the next link occurring somewhere in the middle of town. The length within town is included so that travel time on multiple (consecutive) links can be easily calculated.

Table 2: Lengths of New Link Alignments

	un-numbered roads		new construction	numbered highways	total
	paved	gravel			
Link A	30.5	31.5	0	0	62
Link B	41	51.5	7	0	100
Link C	0	13	10	58	81

[4] Sean O'Sullivan, MoT, Nanaimo Office

5.1.2 Capital Costs

Construction cost is estimated for each link and summarized in Table 3. The estimates are based on the road lengths taken from 1:50,000 scale mapping, as discussed in Section 5.1.1 Alignment Review. The capital cost estimates were developed by E.Wolski Consulting Ltd.

Table 3: Capital Costs

	Utilize existing logging road alignment		**Realign and repave existing logging road sections**	
	paved	unpaved	paved	unpaved
Link A	**$43.8M**	$35.9M	$62.8M	$54.8M
Link B	**$81.5M**	$64.4M	$92.5M	$75.4M
Link C	**$37.3M**	$31.5M	$37.3M	$31.5M
Total	**$162.6M**	$131.8M	$192.6M	$161.7M

Estimates are based on a 2 lane rural road design with 3.6m lanes and 1.5m shoulders on both sides, with localized exceptions permitted to 1.0m shoulders at pinch points. Design speeds are 80km/h paved and 60km/h unpaved, consistent with Section 5.1.1 Alignment Review.

Some of the sections of Links A and B are currently paved 2 lane logging roads. Because these are forestry roads, not MoT roads, these sections may not meet the MoT standards for an 80km/h design speed. The scope of this study excluded site visits that would allow confirmation of the adequacy of the alignment and pavement condition.

Therefore two costs are provided; one if the alignment is adequate, and a second if realignment and repaving is required in these sections of the existing paved logging roads (and assuming speed advisory signs are insufficient for addressing alignment problems).

The first scenario (existing alignment, paved road) is used for the remainder of this study (economic analysis).

Unpaved road costs are calculated as the paved road cost, without the pavement component. This assumes the alignment and structure of unpaved roads would be upgraded to the point where only the pavement is not in place. In reality, if an unpaved standard is chosen, perhaps a lower standard may be acceptable. In the context of this upgrading study, the assumption is considered adequate.

A detailed listing of the level of upgrading assumed for each section of logging road is provided in Appendix B.

The cost estimates do not account for property and forestry compensation costs. Both are calculations requiring detailed accounting of land ownership and potential impacts, and are beyond the scope of this study.

5.1.3 Travel Time Savings

Travel times were calculated in Phase 1 of this study to help select the optimal alignment within each link. Travel time savings is calculated here in Phase 2 as an indicator of user benefits for each link, and will serve as a key input to the economic evaluation later.

Phase 1 calculations are based on the speeds of the old highway (Highway 1A and 19A), whereas Phase 2 calculations are based on the new VIH and IIH speeds. Phase 1 calculations were based on route lengths of paved / unpaved road from the original report, whereas Phase 2 calculations are based on scaled lengths from 1:50,000 scale mapping used in Section 5.1.1 Alignment Review.

Table 4: Travel Time Savings Estimate (minutes)

Link	Option	Construction Standard		Difference
		gravel	paved	
A	A1	55	47	8
	Hwy.14/1/18		144	
	Difference		98	
B	B3/B2	89	74	15
	Hwy.18/1/19/4		110	
	Difference		36	
C	C4/C5 (via IIH)	56	51	5
	Hwy.4/4A/19		67	
	Difference		16	
A+B	A1+ B3/B2	143	121	22
	Hwy.14/1/19/4		214	
	Difference		93	
B+C	B3/B2+ C4/C5 (via IIH)	137	116	21
	Hwy.18/1/19		119	
	Difference		3	
A+B+C	A1+ B3/B2 +C4/C5 (via IIH)	191	163	28
	Hwy.14/1/19		224	
	Difference		61	

Time savings for Links A and B (over the numbered highway alternative) are significant at 1.5 hours and 0.5 hours, respectively. Time savings for Link C are low, in the order of 15 minutes.

Travel time for the route combination Link B+C have no significant advantage over the numbered highway alternative (Highway 18/1/19) because of the high standards (high speeds) of the recently upgraded Highway 1/19.

The calculations are based on the following assumptions:

- Average 80km/h on all link paved roads. This is not strictly true because the lengths of road through towns (terminal points of the links) are pre-existing paved roads which do not permit travel at 80km/h. However, since this "travel time advantage" was applied equally to all links, it would even out between links and not create any artificial differences, only a consistent absolute decrease in travel time for all links.
- Average 60km/h on all link gravel roads.
- The operating speed of the existing numbered highways and their associated road lengths used in Table 4 calculations are listed in Appendix A.
- For the gravel road option, the sections of the route which are currently paved will continue to be paved and service an average speed of 80km/h while the gravel sections will be upgraded to service an average speed of 60km/h. In other words, the "gravel" option will have some components of paved roads assumed to be performing at higher standards (80km/h). This is not strictly accurate because if a gravel road standard is chosen, the currently paved sections are not likely to be upgraded to a full 80km/h design except for minor maintenance such as filling in potholes. This approximation is considered reasonable for the level of detail involved in this study.

5.1.4 Local and Diverted Traffic Volumes

Traffic volumes were estimated in the original study by using a gravity model. While such models are commonly used in transportation studies for metropolitan regions and their outlying suburbs, the gravity model is not usually used in large rural areas such as this case. The original study recognized this and used the gravity model for lack of a better approach.

For reasons above and because the project scope does not afford development of a new model, whether gravity of otherwise, this update study uses the original study's volumes as a base for comparison with existing data to check for reasonableness. Adjustments are made where justified and rationalized in paragraphs to follow. The resultant volumes developed for this update study are listed in Table 5.

Table 5: Local and Diverted Traffic Volumes

Links	Road Surface	Local AADT	Diverted AADT	Total AADT
Link A Port Renfrew to Lake Cowichan	Paved	120	40	160
Link B Lake Cowichan to Port Alberni	Paved	40	200	240
Link C Port Alberni to Comox	Paved	0	200	200
Link A+B Port Renfrew to Port Alberni	Paved		10	10
Link B+C Lake Cowichan to Comox	Paved		0	0
Link A+B+C Port Renfrew to Comox	Paved		10	10

In comparison, Exhibit 5 illustrates Table 4.18 excerpted from the original study. The "normal" and "diverted" components (using the terminology of the original study) represent existing road users in the network. These components are addressed in this section. The "normal" component is the same as the "local AADT" in Table 5.

Generated traffic volume is the traffic induced as a consequence of the new link and will be addressed as an economic impact in following sections.

Using MoT's short count data from 2001 summarized on Exhibit 10, and using population data from Stats BC summarized in Table 6, one can infer several logical conclusions.

Table 6: BC Stats Population Data

Municipality	Estimated Population (2003)
Lake Cowichan	2,958
Port Renfrew	275
Port Alberni	18,235
Nanaimo	76,736
Parksville	10,932
Qualicum Beach	7,294
Comox / Little River	11,937
Courtenay / Royston	20,340

For Link B:

- The Link B diverted volume cannot exceed 3000 AADT = volume on Highway 18.
- The proportion of north-south traffic at the junction of Highway 18 and 1 is 48% north. Therefore the Link B diverted volume cannot exceed 1440 AADT = 3000 x 48%.
- The 1440 AADT is destined to a variety of locations north of the Highway 18/1 junction. This includes Nanaimo, Parksville, Qualicum Beach, Courtenay, Comox, and Port Alberni. Borrowing from the gravity model theory, Port Alberni which comprises 13% of the combined population of these cities and towns, should draw approximately 200 AADT (≈ 181 = 13% x 1440).

For Link C:

- The Link C diverted volume cannot exceed 8400 AADT = volume on Highway 4.
- The Highway 4/4A volume destined north along Highway 19 is 10%[5]. Therefore the Link C diverted volume cannot exceed 840 AADT = 8400 x 10%.
- Based on the work in Section 5.1.3 Travel Time Savings, Link C saves only 16 minutes over the numbered highway alternative (base case), which would take 67 minutes for the entire trip. Travel via the base case requires minimal

[5] Based on MoT origin-destination studies.

additional time and offers greater driver comfort (less driver effort) with the high standards of the IIH (Highway 19). Therefore it is reasonable that only a portion of the volume traveling between Port Alberni and Comox will use Link C. The Link C diverted component is estimated at 200 AADT (≈ 201 = 840 x 16 ÷ 67).

For Link A, the volumes from the original study are adopted because no adjustment, such as the ones above, is apparent. However, judging by the ratio of "total AADT"/highway volume for Links B and C, the total AADT estimated for Link A may be high.

For Link Combination A+B:

- The diverted volume cannot exceed 400 AADT = volume on Highway 14.
- The proportion of north-south traffic at the junction of Highway 14 and 1 is estimated to be 25% north, largely due to the strong draw to the south toward Victoria. Therefore the diverted volume cannot exceed 100 AADT = 400 x 25%.
- Using the similar rationale as for Link B, the diverted volume is estimated to be 10 AADT (= 100 x 10% share for Port Alberni).

For Link Combination B+C, the time savings advantage over the numbered highway alternative (base case) is only 3 minutes. Travel via the base case requires an insignificant amount of additional time and offers greater driver comfort. Therefore this link combination is anticipated to divert no traffic.

For Link Combination A+B+C, the same rationale is used as for Link Combination A+B above. Again, the diverted traffic is estimated to be 10 AADT (= 100 x 10% share for Comox).

5.2 Economic Assessment Update

This section explores the costs and benefits that could accrue from capital improvements to Valley Link highway infrastructure outlined in previous sections.

5.2.1 Methodology

The objective of this engagement was to update the costs and benefits of the components of the Valley Link project at a high level. Since the proposed Valley

Link Project will generate economic benefits as well as provide user benefits, the Study Team included economic benefits in the assessment. In contrast, the assessment of highway improvement projects is typically limited to capital costs, operating costs, and social benefits to users. The inclusion of economic benefits is appropriate when evaluating a transportation project that has a regional economic development purpose.

Economic benefits include direct, indirect and induced benefits resulting from the expenditures of travelers which would not otherwise be made in this region. These expenditures would likely be a combination of transfers from other regions of British Columbia as well as actual net increases to the provincial economy.

Therefore, this study focused on the demand for new infrastructure, the travel time savings that would be enjoyed by users, and the economic impacts along the corridors.

While costs can take the form of capital, rehabilitation and maintenance, benefits will take on many forms and will accrue over time.

To existing users, benefits will take the form of reduced travel times, lower operating costs, improved levels of comfort and reduced accident costs.

To communities in the corridors, short term benefits will accrue from increased traffic that stimulates business and labour activity. Over the medium to longer term, other benefits may accrue as improved infrastructure facilitates access to resources, and impacts the rate of demographic growth and investment activity.

In estimating benefits, we explore:

- Impacts on existing users
- Impacts on users in other corridors
- Impacts of increased traffic flow on forest, retail, food, accommodation and recreation industries
- Impacts on First Nations
- Impacts on future land use and investment activity

We estimate costs and benefits over a thirty year time period and report their present value in 2004 dollars using a discount rate of 6%. The discount rate is a reflection of the opportunity cost of scarce resources in their next best alternative.

Wherever possible, costs and benefits have been quantified. However, in cases where no monetary values could be attached, qualitative assessments are applied. In addition, we estimate the impact of increased expenditures on regional employment and income. All costs and benefits are presented in a multiple account format for ease of interpretation.

Readers are cautioned that this is not a comprehensive assessment of all the costs and benefits that could accrue if investments take place. A more comprehensive assessment may be necessary to fully identify financial, social, and economic benefits.

5.2.2 User Benefits

This section estimates benefits that will accrue to highway users.

Table 7, copied from Section 5.1.4 for convenience, shows estimates of AADT for each link assuming construction occurs and links are operational. Local AADT is an estimate of trips generated by local and regional traffic and is a measure of domestic demand. An estimate for traffic diverted from alternative routes is also provided. In this analysis, we refer to diverted traffic as derived demand.

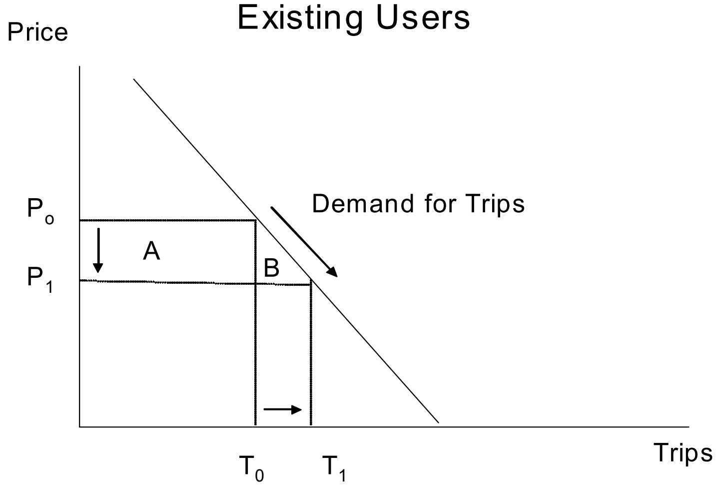
Table 7: Estimated Average Daily Traffic in Year 1

Links	Road Surface	Local AADT	Diverted AADT	Total AADT
Link A Port Renfrew to Lake Cowichan	Paved	120	40	160
Link B Lake Cowichan to Port Alberni	Paved	40	200	240
Link C Port Alberni to Comox	Paved	0	200	200
Link A+B Port Renfrew to Port Alberni	Paved		10	10
Link B+C Lake Cowichan to Comox	Paved		0	0
Link A+B+C Port Renfrew to Comox	Paved		10	10

A. Domestic Demand

We use a model of consumer theory to explore impacts on domestic demand by consumers in local and regional markets. Consumer theory is premised on the assumption that consumers maximize welfare subject to a budget constraint. Given fixed incomes, the rational consumer purchases the bundle of goods which generates the highest level of satisfaction possible, maximizing welfare subject to their budget constraint. To the consumer, if benefits from improved Valley Link infrastructure take the form of reduced travel times and operating cost savings, they save income. To the consumer, the cost of transportation falls. A reduction in the cost of transportation means the consumer can purchase more trips for a lower price or have more resources available for other purposes.

Exhibit 11
Shifts in Demand for Highway Infrastructure
Existing Users



In the short term, a reduction in the price of transportation increases demand by consumers in the region. Users increase the number of trips demanded from T_0 to T_1. Benefits that accrue to users (consumer surplus) is equal to area A + B.

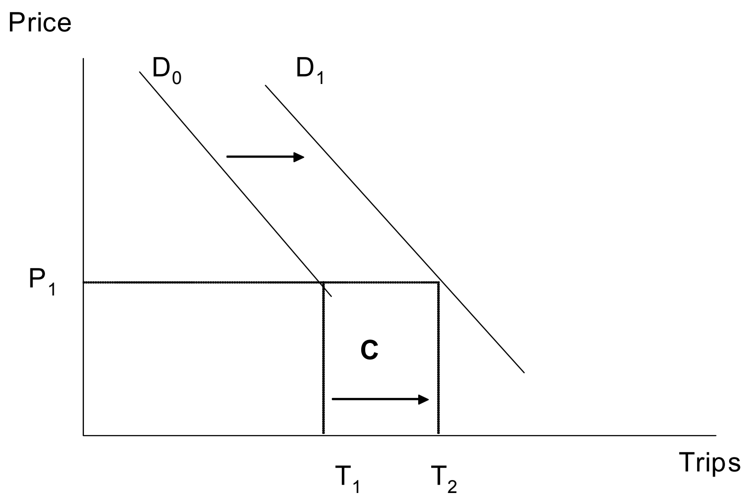
In Exhibit 11, area "A" represents a measure of gains in consumer welfare generated by improved infrastructure to existing users. Area "B" is a measure of consumer surplus generated from additional trips that are generated in the region. Area "A+B" represents consumer surplus that will accrue from domestic demand.

B. Derived Demand

Investments in Valley Link infrastructure will impact consumers in other transportation markets on Vancouver Island. The close proximity of improved Valley Link infrastructure to other markets will present a viable alternative to consumers, possibly impacting behavior and increasing the demand for trips in Valley Link corridors.

Additional trips generated by derived demand will cause the demand curve to shift to the right, increasing the number of trips in Valley Link corridors and stimulating business and labour force activity. Increased demand is derived as consumers in other markets substitute Valley Link trips for trips normally made in an alternative corridor (see Exhibit 12).

Exhibit 12
Derived Demand for Highway Infrastructure



The price change in Valley link corridors impacts consumer behaviour in other markets changing the relative price. New users enter the Valley link market, shifting demand to the right and increasing the number of trips from T_1 to T_2. Area "C" Is a measure of incremental expenditures generated by derived demand.

While derived demand will increase the number of trips using improved Valley Link infrastructure, from a cost-benefit perspective the increase in consumer surplus generated by a fall in price in one market at the expense of a loss of consumer surplus in another market represents a transfer of welfare from one market to another and needs to be excluded from the analysis.

However, from an economic development perspective, an increase in regional expenditure generated from traffic diverted from another market has a real and tangible impact on a region's economy. It is customary to account for these benefits when evaluating a proposed regional economic development project.

So we measure benefits that will accrue to domestic demand as increases in consumer welfare generated from travel time savings. We also account for benefits that will accrue regionally from derived demand as increases in consumer welfare generated from travel time savings. We account for benefits that will accrue regionally from induced demand in terms of impacts on employment and income using multipliers obtained from the BC Input-Output Model.

The BC Input Output Model provides information on how much each industry in BC depends on other industries for inputs and outputs required to produce their own output. Take the food industry for example. To produce a meal, the owner first needs to purchase the ingredients to make the meal then combine the ingredients with energy and labour to produce the product. The input-output model uses statistical information on the purchase and sale of goods and services by each industry and estimates the impact that an expenditure in one industrial sector has on the economy in terms of income and employment.

Income is measured from the point of initial sale (direct impact) through subsequent rounds of purchases (indirect and induced impacts). Employment impacts are expressed as person years of employment.

To generate an estimate of incremental expenditures for traffic (derived demand), we developed assumptions based on the 1998 BC Visitor Study, Report on Travel in British Columbia, produced by Tourism British Columbia updated to 2003.

This study reported mean daily expenditures for BC resident day visitors who undertake trips of 80 km or more and have access to a wide range of goods and services.

In this case, the available services will vary by route and will be below the norm. We have assumed that each visitor comprising the induced demand will spend $15 per day on goods and services. Based on an average of two persons per vehicle, each trip is expected to generate expenditures of $30.

C. Growth Rates

Demographic change and shifts in consumer behavior will impact the demand for trips on Valley Link infrastructure over time. For modeling purposes, we assume an annual growth rate of 1.5% applied by Ward Consulting Group in the Vancouver Island Valley Link Study as a fair approximation of future growth in the number of trips generated by domestic demand over the forecast period. While this growth rate does exceed the current rates of population growth in communities in the corridor, it is consistent with our assumption that improved infrastructure will lead to increased use by residents and reflects the average growth of traffic volumes in urban areas in BC. We apply the 1.5% growth rate to *escalate the demand for trips by residents on the three Valley Links.

We vary the growth rate to estimate the increase in trips generated by derived demand. The growth rates applied represent reasonable estimates based on our assessment of demographics, travel demand, and economic activity. For Link A, we assume a 1% growth rate for traffic diverted from other routes, given the region's relatively sparse population. We use a 1.5% growth rate to estimate the growth of traffic diverted from other routes (derived demand) for Link B and for Link C. This growth rate reflects the average rate of growth in BC. It is also consistent with population growth in the Cowichan Valley Regional District.

Some consumers will choose to travel over multiple links. For example, a consumer in Jordan River wishing to travel to Port Alberni could choose the Port Renfrew – Cowichan Lake – Port Alberni alternative to the Vancouver Island Highway.

We use a 2.5% growth rate to escalate demand by users traveling on Link A+B. This high growth rate reflects the average rate of growth in traffic volume destined for the Tofino/Ucluelet region on the west coast of Vancouver Island.

We expect minimal growth to occur for consumers using Link B+C. The Vancouver Island Highway will likely continue to remain the preferred route.

A few consumers could choose to use Valley Link infrastructure to travel between Port Renfrew and Comox. However, in this case, we expect the increase in demand to be more moderate and use the 1.5% growth rate in this corridor.

D. Travel Times

We proxy benefits that may accrue to domestic and derived demand using the travel time savings outlined in Table 8. Table 8 is copied from Section 5.1.3 for convenience.

Table 8: Travel Time Savings (minutes)

Link	Option	Gravel	Paved	Difference
A	A1	55	47	8
	Hwy.14/1/18		144	
	Difference		98	
B	B3/B2	89	74	15
	Hwy.18/1/19/4		110	
	Difference		36	
C	C4/C5 (via IIH)	56	51	5
	Hwy.4/4A/IIH		67	
	Difference		16	
A+B	A1	143	121	22
	Hwy.14/1/18		214	
	Difference		93	
B+C	B3/B2	137	116	21
	Hwy.18/1/19/4		119	
	Difference		3	
A+B+C	C4/C5 (via IIH)	191	163	28
	Hwy.4/4A/IIH		224	
	Difference		61	

In the case of Link A (Port Renfrew to Lake Cowichan), the current network of logging roads is rough and unreliable. Many residents drive from Port Renfrew to Victoria, then to Lake Cowichan. The average travel time to make this trip is 144 minutes. If Link A were constructed to MOT standards, travel time would be reduced to 47 minutes, a savings of 98 minutes each trip.

A network of forestry roads currently links Lake Cowichan to Port Alberni. Improving this network of forest service roads to MoT standards would generate a travel time savings of 36 minutes each trip.

Link C connects Port Alberni to the Vancouver Island Highway near Comox. Improvements in this section involve a combination of upgraded logging roads, new construction and increased utilization of existing infrastructure. Constructing Link C to MoT standards would generate a travel time savings of about 16 minutes a trip.

Users of multiple links will also generate additional travel time savings. Users traveling between Port Renfrew and Port Alberni would save 93 minutes over the current alternative, the Vancouver Island Highway. Users traveling between Port

Renfrew and Comox would save 61 minutes. Travel time savings for users traveling from Cowichan Lake to Comox would save 3 minutes per trip.

5.2.3 Induced Demand

This section expands the analysis to examine possible impacts induced by improvements to Valley Link infrastructure. In this section, we use qualitative measures to identify possible impacts on land development, industrial and investment activity. We use quantitative measures to estimate impacts in the tourism industry.

A. Forestry

Approximately 31 km of Link A traverses provincial forests managed by TimberWest through TFL46. The balance of this link consists of fee simple lands and First Nations lands. A substantial portion of fee simple lands are owned by forest companies.

Approximately 28 km of Link B traverses provincial forests managed by Weyerhaeuser through TFL44. Fee simple lands are owned by TimberWest and several other forest interests.

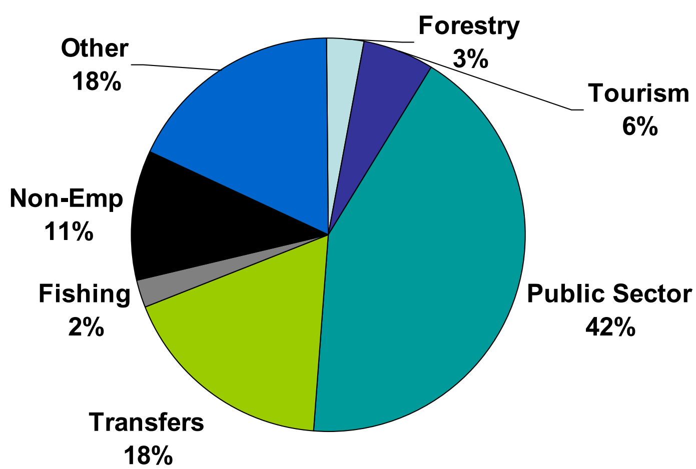
The southern portion of Link C traverses provincial forests managed by Weyerhaeuser through TFL44. The northern portion consists of fee simple lands held by forest companies and private interests. With the exception of a recreational strata development and some park land, the area surrounding Horne Lake consists of large blocks of resource management land.

The impact of Valley Link infrastructure was discussed with Ministry of Forests and industry officials. It appears that Valley Link improvements would have some negative impacts on the forestry sector. Approximately 32 loads of wood are hauled to the China Creek dry land sort along the Bamfield access road each day using off-highway trucks. If highway load limits were to be imposed, the number of loads would increase from 32 to 80. While reduced travel times would provide offsetting benefit, the overall impact is expected to be negative.

B. The Port Renfrew Region

Exhibit 13 shows 2001 income dependencies of residents in Port Renfrew region by major source of income. In 2001, 42% of all income in the Port Renfrew region was generated by the public sector.

Exhibit 13
Port Renfrew
Percent Income Dependencies*



*After tax incomes, 2001

The forest sector does not dominate this region's economy. Instead, residents are more dependent on the public sector and on transfer payments as the primary source of income. Transfer payments include pensions, age security payments and other government transfers. Over the past 10 years, increasing demand for recreational activity in this region has increased income generated from the tourist sector by 50%. Given this fact, it is likely that the tourism sector will continue to expand as the demand by consumers for unique west coast experiences continues to increase.

Port Renfrew is located at the southern terminus of the West Coast Trail and at the western end of the Juan de Fuca Marine Trail linking Botanical Beach Provincial Park near Port Renfrew with China Beach Provincial Park west of Sooke. While improvements to Valley Link infrastructure will not likely impact the number of visitors using the West Coast Trail (the trail is currently at capacity), they will have a positive impact on demand for the Juan de Fuca Marine Trail and for use of provincial parks in this region.

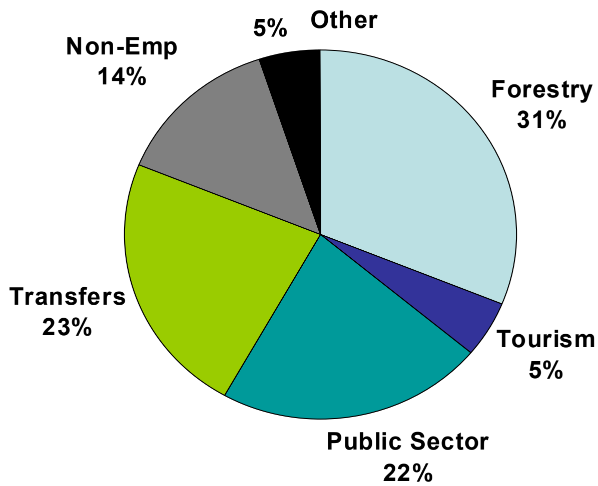
For analytical purposes, we assume the increase in demand for recreation use of trails and parks in the Port Renfrew region will have minimal impacts on industrial and investment activity. Land development opportunities are limited and no impact is expected on investment activity in the forestry and mining sectors.

We account for increased expenditures generated from an increasing number of day visits by non-residents to this region (tourists) using an estimate of tourist traffic expressed in terms of AADT equivalents and an annual growth rate of 2.5%. We assume each AADT equivalent injects $30 into the regional economy and express those benefits in terms of impacts on employment and income.

C. The Lake Cowichan Region

Exhibit 14 shows 2001 income dependencies of Lake Cowichan residents by major source of income. In 2001, the forest sector continued to dominate the regional economy, generating 31% of all income in the region. Income received from transfer payments was the second largest source of income in 2001.

Exhibit 14
Lake Cowichan
Percent Income Dependencies*



*After tax incomes, 2001

While the forest sector continued to dominate the Lake Cowichan economy in 2001, the percentage of income generated by the forest sector has fallen 4% over the past 10 years. Over this same time period, the percentage of income generated by the tourist sector, and by transfer payments grew by 3% and 8% respectively. Transfer payments include pensions, age security payments and other government transfers.

These trends are a good indicator that:

1. there is a growing dependence on the tourism sector for regional income, and
2. this area is experiencing in-migration of people taking advantage of low cost housing.

Both trends suggest Lake Cowichan will continue to develop as a recreational resort for residents of Vancouver Island. As such, the number of vacation cottages, recreational vehicle lots and boats using Lake Cowichan will continue to grow until an upper limit on land development is reached and opportunities for future growth become constrained. improvements to Valley Link infrastructure will present opportunities to accelerate development of private property holdings in this region. However, land development opportunities available to offset project costs are limited. There are no large tracks of Crown Land and the majority of property along both shores of Lake Cowichan is privately owned.

The forest sector around Lake Cowichan is fully committed. There are no mineral deposits that would be impacted by improved Valley Link infrastructure. While there are always opportunities to produce value added products, they are not expected to have a significant impact on employment and income.

The majority of benefits that will accrue from induced demand in this region are expected in the tourism sector.

Lake Cowichan is the eastern gateway to Nitnat Lake and Carmanah Walbran Provincial Park. Both areas are becoming increasingly popular for their highly valued outdoor recreational experiences. Nitnat Lake is the one of the world's premier lakes for wind surfing. The popularity of Nitnat Lake as a world class destination for wind surfers is continuing to grow in international markets. Nitnat

Lake also provides access to the Nitnat Triangle, a series of lakes in Pacific Rim National Park. This area is quickly becoming one of the most popular paddling trips on the west coast and is growing in international stature. The circuit crosses Nitnat, Hobiton and Tsusiat Lakes and takes 4 to 5 days to complete. The Nitnat River hatchery is located at the junction of Nitnat and Little Nitnat rivers and is the largest chum hatchery on the west coast.

The Carmanah Walbran Provincial Park is accessible from Lake Cowichan. While this Park provides excellent opportunities for wilderness camping, hiking and nature study, given current access, demand for park services has been minimal and has resulted in little or no development of trails and recreation facilities. As a result, access to this Park is currently discouraged due to potentially unsafe conditions.

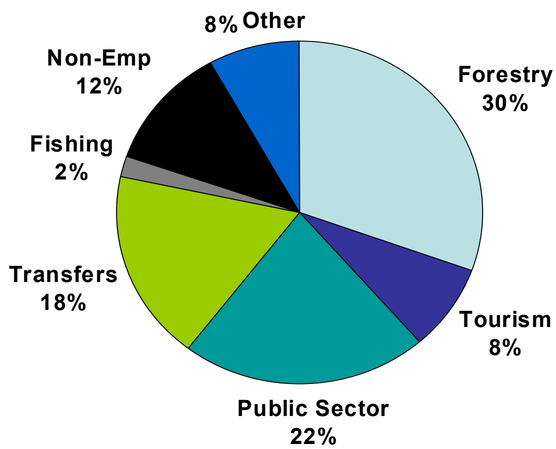
Recreational attributes of Nitnat Lake and the surrounding area are attractive to investors. However, in the past, access issues have restrained the willingness of businesses to invest in this region. Improvements to Valley Link infrastructure would improve access to this region, increasing the number of visitors and increasing demand for food and accommodation services in the region. Over the medium term, improvements to Valley Link infrastructure will have a positive impact on investment activity in this region.

We account for increased demand by tourists to this region using an estimate of incremental day visits expressed in terms of AADT equivalents and apply an annual growth rate of 4%. We assume each AADT equivalent injects $30 into the regional economy and express those benefits in terms of impacts on employment and income.

D. Port Alberni Region

Exhibit 15 shows the percentage income dependencies of residents in the Port Alberni region by major source for 2001.

Exhibit 15
Port Alberni
Percent Income Dependencies*



*After tax incomes, 2001

More than 50% of all income was generated in the forest and public sectors in 2001. Over the past decade, the share of income generated by the forest sector has remained constant while income generated by the tourism sector increased by 100% and income generated by the public sector rose 68%. Transfer payments also increased 77% over the 10 year time period. Transfer payments include pensions, age security payments and other government transfers.

Although the share of income generated by the forest sector has remained constant, the annual allowable cut continues to fall and employment in the industry continues its long term decline. This is a consequence of increased efficiencies in the forest sector. Improvements to Valley Link infrastructure are not expected to have a significant impact on the forest sector. In the mining sector, developing markets for construction aggregates in the US may lead to some investments and employment opportunities. For example, the $115 million dollar Eagle Rock Minerals is expected to employ about 80 people, exporting aggregate to the California market. However, improvements to Valley Link infrastructure are not expected to impact the mining sector. The potential for private sector land development opportunities will improve. However, no large tracks of Crown land exist in this region to help offset project costs.

Expanded fish farming does present significant economic potential for the future. However, there are many regulatory, scientific and social issues that remain outstanding and will take time to work out. Improved Valley Link infrastructure is not expected to have a measurable impact on the commercial fishery in this region.

In the tourist sector, while the significance of the sports fishery continues to decline as many tourists by-pass Port Alberni on their way to west coast destinations, the importance of tourism as a growing source of regional income suggests this sector has potential to continue to expand as a source of income and employment in this region. Improved access to other regions and the creation of circle routes will increase the number of day visits and expenditures in the region. An increase in the number of day visitors could also increase demand at the Mount Arrowsmith Ski Resort and result in additional investment in ski-hill development.

We account for increased demand by tourists to this region by using an estimate of incremental traffic expressed in terms of AADT equivalents and applying an annual growth rate of 1.5%. In addition, we assume each AADT equivalent injects $30 into the regional economy and express those benefits in terms of impacts on employment and income.

E. Comox Region

The Comox region is the most northern region that could benefit from induced activity generated by improved Valley Link infrastructure. The primary area examined for this study is the area in the vicinity of Horne Lake.

Horne Lake is located in the western park of the Nanaimo Regional District. Most of Horne Lake has already been subdivided into lakeshore lots. The predominant land use is a large strata development, which permits a maximum of 400 lots. This development covers much of the shoreline including close to 120 lakeshore lots along the north shoreline of the lake west of the Qualicum River.

Road access to the north of these lots is provided by Horne Lake Caves Road. This is a dedicated road while many of the other roads along Horne Lake are privately owned and maintained by the strata corporation. Lakeshore lots also cover most of the east and south-east lake frontage.

There is strong demand for finite supply of recreational lots on Horne Lake. This has occurred despite limited services and a prohibition on year round occupancy of lakeshore properties.

There is very limited amount of Crown land on Horne Lake, all of which is believed to be committed to park or environmental protection purposes.

There is no indication of provincial Crown land with development potential along the north shoreline of Horne Lake portion where the preferred route between Port Alberni and the Horne Lake intersection with the Island Highway has been identified. Almost all of this land along this route is committed to private strata recreational lots, existing provincial or regional district parks or environmental protection.

A significant portion of the Horne Lake shoreline consists of private forested land. Some of this area along the south-west shoreline may have potential for recreational lot development but this potential is limited by terrain constraints. In addition, environmental considerations and regulatory changes would have to be addressed.

No incremental impacts are expected in the forestry or mining sector in this region.

We account for increasing demand generated by increasing day visits to this region using an estimate of incremental tourist traffic expressed in terms AADT equivalents and applying an annual growth rate of 1.5% to this traffic. We assume each AADT equivalent injects $30 into the regional economy and express those benefits in terms as impacts on employment and income.

F. Summary - Induced Demand

While incremental activity stimulated by improvements to Valley Link infrastructure is expected to have minor impacts on land development, industrial and investment activity over time, moderate benefits are expected to accrue from an expanding tourist sector across all regions. A combination of increasing traffic generated by the existence of circle routes and increasing visits to the region by non-residents will have positive impacts on employment and income.

5.2.4 Other Potential Socio-Economic Benefits

The proposed Valley Link is within the traditional territories of a number of First Nations.

The Lake Cowichan First Nation (LCFN) is located on the north shore of Lake Cowichan. In 2001, there were 15 band members[6]. The LCFN is part of the Hul'qumi'num Treaty Group which is at stage 4 of the treaty process, negotiating an agreement in principle.

The Pacheedaht First Nation (PFN) is located at the mouth of Gordon River near Port Renfrew. In 2001, the Band had 250 members. The PFN is negotiating a treaty settlement at a common treaty table with the Ditidaht Fist Nation.

The Ditidaht First Nation is located at the north end of Nitnat Lake and in 2001 had 629 band members. The Pacheedaht and Ditidaht are now at Stage 4 of the treaty process, negotiating an agreement in principle. The Pacheedaht and Ditidaht are currently implementing interim measures signed in 2001. These agreements address funding for forestry training and business development, resource planning and governance skill development.

The Tseshaht First Nation is located near Port Alberni on the Somass River. In 2001 the band had 861 members. The Tseshaht First Nation is represented by the Nuu-chah-nulth tribal Council (Council) in negotiations with the British Columbia Treaty Commission. The Council is currently implementing four treaty related measures including shellfish aquaculture tenures, a regional wildlife management advisory committee, a regional aquatic resources management board and identification of key cultural sites. The Council is now at Stage 4 in the treaty process, negotiating an agreement in principle.

The Hupacasath First Nation, north of Port Alberni, entered the treaty process independently in November 2000, and is now at Stage 2 of the six-stage process, preparing for negotiations and assessing its readiness to negotiate. In 2001, the

[6] Source: Registered Indian Population by Sex and Residence 2001, DINAC.

Hupacasath tabled interim measures proposals on capacity building, land-use planning and governance. The Hupacasath First Nation is focused on economic development projects in the Alberni Valley, such as canoe tours and a joint venture granite mining operation.

While an assessment of social benefits impacting First Nations is outside the scope of this study, it appears that the potential road improvements could generate significant social benefits for communities along the corridor. First Nations communities in these corridors have limited access to services and few opportunities to develop sustainable economies. While there are resource based activities in the corridor, there are few other activities which generate economic benefits to First Nation communities.

Improved access will generate opportunities that will benefit First Nation Communities. Improved access will generate new employment and business opportunities for First Nations people and will enhance exposure of cultural and artistic wealth imbedded in their communities along the corridor. There is growing global demand for products produced by BC First Nations in regional and global markets. Improved Valley Link infrastructure will assist First Nations to develop more sustainable economies over time.

5.2.5 Costs

Table 9 provides estimates of capital cost (taken from Section 5.1.2), rehabilitation cost, and maintenance costs used in this analysis. All costs are in 2004 dollars.

Table 9: Capital, Rehabilitation and Maintenance Cost Assumptions

Link	Capital	Rehabilitation	Maintenance
Link A	$43.8M	$22.6M	$0.9M/YR
Link B	$81.5M	$40.75M	$1.4M/YR
Link C	$37.3M	$18.7M	$1.2M/YR

Maintenance costs assumed to average $15,000/km per year

Rehabilitation costs are an estimate; assumed to occur in year 18

Table 10 shows the present value of capital, rehabilitation and maintenance costs using a 6% discount rate over a 30 year time period.

Table 10: Present Value of Costs (2005 through 2035)

Link	Capital	Maintenance	Rehabilitation	Total
Link A	$41 M	$11 M	$8 M	$60 M
Link B	$77M	$17 M	$14 M	$108 M
Link C	$35 M	$15 M	$7 M	$57 M

The cost estimates do not account for property and forestry compensation costs. Both are calculations requiring detailed accounting of land ownership and potential impacts, and are beyond the scope of this study.

5.2.6 Benefits

We use MICROBENCOST default values for travel time savings to estimate consumer surplus accruing to residents in the region (domestic demand). We use the assumptions developed in Section 5.2.1 and in Section 5.2.2 to estimate incremental expenditures that will accrue from increasing traffic diverted from other routes (derived demand) and new traffic generated from improved access to recreational resources (induced demand). We use provincial input-output multipliers to estimate the impact of incremental expenditures on employment and income.

Tables 11 - 14 show the benefits that would be generated from travel time savings and injections of revenue (expenditures) generated by induced demand. Impacts of incremental expenditures on employment and income are also provided. These expenditures would likely be a combination of transfers from other regions of British Columbia as well as actual net increases to the provincial economy. These tables also present a qualitative assessment of the impacts of each link on First Nations, land development, forestry, mining and tourism.

Table 11: Assessment of Benefits – Link A (2005 through 2035)

Link A		**Benefits**
Travel Time Savings (PV)		
Domestic Demand	$6.8 M	
Derived Demand	$4.4 M	$11.2 M
Economic Benefits (PV) (includes transfers)		
Increase in GDP (Induced Demand)		$8.0 M
Total Benefits (PV)		$19.2 M
Person-Years of Employment		328 PY
First Nations Impacts		Positive *Improvements will enhance quality of life and promote sustainable economies*
Land Development Opportunities		Limited *No significant public sector development opportunities; development of private sector holdings could be accelerated*
Forestry		Limited *Improvements not expected to impact forest investment activities; some negative impact on operations expected*
Mining		Limited *Improvements not expected to impact mining sector activity or investment*
Tourism		Moderate *Increased day visits and circle tours will generate increased economic activity*

Table 12: Assessment of Benefits – Link B (2005 through 2035)

Link B		Benefits
Travel Time Savings (PV)		
Domestic Demand	$1.7 M	
Derived Demand	$8.5 M	$10.2 M
Economic Benefits (PV) (includes transfers)		
Increase in GDP (Induced Demand)		$19.8 M
Total Benefits (PV)		$30.0 M
Person-Years of Employment		869 PY
First Nations Impacts	Positive *Improvements will enhance quality of life and promote sustainable economies*	
Land Development Opportunities	Moderate *No significant public sector development opportunities; significant private sector development opportunities around Cowichan Lake*	
Forestry	Limited *Improvements not expected to impact forest investment activities; some negative impact on operations expected*	
Mining	Limited *Improvements not expected to impact mining sector activity or investment*	
Tourism	High *Increased day visits and circle tours and exposure to Nitnat Lake will stimulate activity*	

Table 13: Assessment of Benefits – Link C (2005 through 2035)

Link C	Benefits	
Travel Time Savings (PV)		
Domestic Demand	-	
Derived Demand	$3.6 M	$3.6 M
Economic Benefits (PV) (includes transfers)		
Increase in GDP (Induced Demand)		$17.0 M
Total Benefits (PV)		$20.6 M
Person-Years of Employment		670 PY
First Nations Impacts	Positive *Improvements will enhance quality of life and promote sustainable economies*	
Land Development Opportunities	Limited *Development opportunities limited due to land use constraints*	
Forestry	Limited *Improvements not expected to impact forest investment activities; some negative impact on operations expected*	
Mining	Limited *Improvements not expected to impact mining sector activity or investment*	
Tourism	Moderate *Increased day visits and circle tours will generate increased economic activity*	

Table 14: Assessment of Benefits – Combined Links (2005 through 2035)

Links A+B	**Benefits**
Travel Time Savings (PV)	
Derived Demand	$1.3 M
Links B+C	**Benefits**
It has been forecast that there will be no demand for Link B+C combination.	
Links A+B+C	**Benefits**
Travel Time Savings (PV)	
Derived Demand	$1.2 M

Note: See Tables 11 – 13 for Assessment of Other Benefits

Table 15 summarizes the present value of costs, the present value of benefits, the net present value and benefit-cost ratio for each link.

	Present Value Costs	**Present Value Benefits**	**Net Present Value***	**Benefit/Cost Ratio**
Link A	$60 M	$19 M	($41 M)	.32
Link B	$108 M	$30 M	($78 M)	.28
Link C	$57 M	$21 M	($36 M)	.37
Links A+B		$1 M	$1 M	
Links B+C		-	-	
Links A+B+C		$1 M	$1 M	
Total	$225 M	$72 M	($153 M)	.32

* Net present value (NPV) is the present value of benefits minus the present value of costs. NPV is commonly used in the evaluation of projects subject to a budget constraint.

5.2.7 Summary

Capital costs, traffic forecasts and benefit streams described in the previous sections provide the basis for evaluating the effectiveness of Valley Link options.

Our analysis indicates that none of the three investment options generate positive net benefits and yield positive benefit-cost ratios. Link A generates the highest travel time savings, and Link B generates the highest economic benefits. However, the economic benefits include transfers from other regions. Link B generates the greatest overall benefits. All three links yield benefit-cost ratios in the range of .3, with Link C having the highest benefit-cost ratio.

Readers should note that accident cost and vehicle operating cost savings were not developed for this study. There are currently no accident statistics available on the number and severity of accidents on industrial logging roads. There are no estimates of savings in vehicle operating costs applicable for industrial road upgrades. Quantification of savings could result in greater net present values and higher benefit-cost ratios for all three Valley Links.

Capital costs did not account for forestry compensation costs and property costs for right of way. Quantification of these values could result in lower net present values and benefit-cost ratios.

Capital costs can be greatly affected by geotechnical conditions. This update study did not address geotechnical conditions. The original study relied on 1:50,000 scale terrain mapping. A greater degree of study of the geotechnical conditions will be required to confirm feasibility and costs.

Appendix A

Route Lengths and Operating Speed for Travel Time Calculations on Numbered Highways

Highway	**From**	**To**	**Length (km)**	**Current Operating Speed (km/h)**	**Previous Operating Speed (km/h)**
1	Colwood	Hwy.18	55	100	80
1	Hwy.18	Nanaimo south	41	80/90	80
19	Nanaimo south	Nanaimo north	22	80/90	40
19	Nanaimo north	Comox Valley Parkway	63	110	60
14	Port Renfrew	Colwood	87	80	60
Millstream Road	Hwy.14	Hwy.1	4	60	60
18	Hwy.1	Lake Cowichan	30	90	80
4/4A	Hwy.1	Port Alberni	39	80	80
Comox Valley Parkway	Hwy.19	Comox	7	90	60

It is assumed that the difference in length between the new highways (VIH and IIH) and their old highway alignments during the time of the original study (Highways 1A and 19A) has not changed significantly.

Appendix B

Appendix B: Level of Upgrade Assumed for Each Section of Link

	station	existing conditions	requried upgrade	length
link A	0 to 24	existing 2L paved road	none	24
	24 to 55.5	class 1	see notes	31.5
Port Renfrew to Lake Cowichan	55.5 to 62	existing 2L paved road	none	6.5
link B	0 to 16	existing 2L paved road	none	16
	16 to 39	class 1	see notes	23
Lake Cowichan to Port Alberni	39 to 53	existing 2L paved road	none*	14
	53 to 60	no road	new construction	7
	60 to 62	class 3	see notes	2
	62 to 79	class 2	see notes	17
	79 to 88.5	class 1	see notes	9.5
	88.5 to 99.5	existing 2L paved road	none	11
link C	0 to 6	existing 2L paved road	none	6
	6 to 8	no road	new construction	2
Port Alberni to Comox	8 to 9	class 3	see notes	1
	9 to 17	no road	new construction	8
	17 to 24.5	class 2	see notes	7.5
	24.5 to 29	class 1	see notes	4.5

notes:
The existing condition of gravel roads are determined from the Federal Government's topographic maps of 1:50,000.
The classes of road conditions are as follows:
- class 1 - all weather 2L (or more) gravel - requires minor upgrade to road structure plus paving, but no widening
- class 2 - less than 2L gravel - requires widening, minor upgrade to road structure, plus paving
- class 3 - dry weather gravel road - requires widening, extensive upgrade to road structure, plus paving
- class 4 - unclassified road - requires extensive widening, extensive upgrade to road structure, plus paving

* Wolski estimate had assumed alignment changes and paving on this section. The Valley Link Update Report has corrected for this.