BRITISH COLUMBIA-YUKON-ALASKA
HIGHWAY COMMISSION

PRELIMINARY REPORT

ON

PROPOSED HIGHWAY THROUGH BRITISH COLUMBIA AND THE YUKON TERRITORY TO ALASKA

April, 1940 Ottawa, Ontario

VOLUME 2 - APPENDIX

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A P P E N D I X

APPENDIX

(continued)

1

STATISTICS OF PRINCE GEORGE ROUTE

Filed by G.H.T.Perry on behalf of Prince George Board of Trade

MILEAGE ADVANTAGES:

1. Prince George to Alaska boundary

Hazelton Route "A"	1,442 miles
Summit Lake - Finlay, Route "B"	1,223 "
"B" saves	209 miles

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2. Vancouver to Alaska

"A"	1,968 miles
"B"	1,759 "
"B" saves	209 miles

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3. Manson Creek Road via Finlay, as Alternative to Summit Lake

Prince George to Alaska boundary	1,361 miles
Summit Lake	1,233 "
Summit "B" saves	128 miles

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4. New Construction Required in British Columbia

"A" 610 miles, via Hazelton
"B" 562 miles from Summit Lake - Prince George
48 miles less new construction

ELEVATION ADVANTAGES OF SUMMIT ROUTE "B"

5. Pass Elevations:

Hazelton "A"	"B" Summit-Finlay		Manson	
4,230 feet	Summit Lake	2,500 feet	Manson	4,900 ft
5,176 "	Sifton	3,000 "	Gaffney	3,500 "
5,405 "	Liard	1,650 "		
5,000 to 6,000 feet	Arctic-Bering	3,150		

Summary - Highest - Hazelton, 5,000 to 6,000 feet
Manson 4,900 "
Gaffney 3,500 (this is cut off from Manson)

Lowest - Summit Lake 3,150 feet

6. Lower Costs

Shorter mileages - Lower passes ensure lower cost of construction and maintenance

7. More Resources

Minerals - coal, chiefly at Hazelton; precious metals on "B" route (which is in Pre-Cambrian range)
More agricultural lands
More timber

8. Alberta Connection

Another connection to Alberta is afforded at Finlay Forks, Route "B".

9. Better Air Route

Thereby affording more business along Highway "B".

Finally:

1. We submit that there are only two routes that can fill the purposes of an Alaska highway, if we exclude defence as a reason for the highway in so far as we are arguing.

2. That as between the Hazelton route "A" and the Prince George - Summit Lake - Finlay route "B", we submit the latter has the following distinct advantages:

   First: A shorter mileage, 209 miles, appealing therefore to tourist traffic to Alaska.

   Second: Lower elevations - less snowfall it is said.

   Third: Lower costs per mile in construction and in total mileage. Lower maintenance costs.

   Fourth: Greater resources available in precious minerals, agricultural lands and timber.

   Fifth: An extra route is afforded, Alberta to Alaska, at Finlay.

   Sixth: It is the Air Lane route, permitting more business to be done this way.

MILEAGES:

Prince George to Sinclair Mills	62 miles
Prince George to Longworth	74 "
Prince George to Penny	83 "
Prince George to McBride	160 "
McBrude ti Tête Jaune	43 "
Tête Jaune to Alberta boundary (through Park)	51 "
McBride to Valemount	60 "
Valemount to Albreda (or British Columbia boundary)	18 "
Albreda to Blue River (approximately)	40.8 "
Prince George to Alberta boundary	254 Miles

DESCRIPTION OF ROUTE THROUGH BRITISH COLUMBIA TO ALASKA VIA HAZELTON AND KITWANGA

By P.M.Monckton

Submitted by E.T.Kenney, M.L.A. on behalf of Hazelton District Chamber of Commerce

We have to-day a highway running north as far as Hazelton and Kitwanga, both on the banks of the Skeena river. For the most part this road is in very good condition, and its ultimate objective will be Prince Rupert.

Mr Monckton has covered all of the intervening space between Kitwanga and Hazelton to Whitehorse on the Yukon River, following the valley immediately to the east of the coast range, and states that "the most logical place for the junction for the Alaska road would be at Kitwanga about twenty-five miles west of Hazelton.

Leaving the Skeena at Kitwanga, the road would ascend the valley of the Kitwancool as far as the village of Kitwancool and a short distance further on skirt the shores of Kitwancool lake; just beyond the lake an imperceptible divide is crossed and we are in the headwaters of the Cranberry river. Here we pass through easy burnt-off country, and directly ahead while the mountains look forbidding, across the Nass river a fairly easy pass will allow a branch road to connect up with Alice Arm.

At 51 Mile Post from Kitwanga, another branch road south for about twenty miles would connect with Aiyansh, the centre of the fertile Nass valley.

Leaving the Cranberry at the 51 Mile post and bearing north westerly through a region of level gravelly benches lightly timbered with jack pine and birch, follow the Nass river for fifty miles, crossing where it is constricted in a canyon with an island in the centre, and necessitating the use of two short bridge spans both under 100 feet long.

After crossing the Nass, a change in the character of the country is noted; we find heavier timber, mostly balsam and considerable growth of underbrush. This denotes greater precipitation and deep snow, which continues as far north as Iskut Cabin. However, the construction is easy and seven miles beyond the Nass

Crossing, brings the route to the Hanna River. Just across the Hanna river is the foot of an outlying spur of the coast range. At this point another branch road would turn immediately west and after passing Meziadin lake cross the coast range through the Bear Pass, and give access to Stewart forty-five miles from Hanna river; Bear Pass is the most remarkable pass to be found on the coast range, the highest elevation at this particular section being not over 2000 feet above sea level. Stewart is about 150 miles from Kitwanga, and two miles beyond Stewart the international boundary would be crossed and Alaska entered at Hyder. Fifteen miles beyond Hyder is the Premier Mine.

Continuing north with the main highway from the point of diversion to enter Stewart, the road would follow the slow-flowing Hanna river to the summit at an elevation of about 1750 feet, and cross Surveyors Creek and continuing on for a few miles would cross Bowser river, a wide sluggish river with its outlet in Bowser lake. Leaving Bowser lake and travelling along about twenty miles of undulating country to the crossing of a large stream known as Treaty creek. Treaty Creek can be crossed by a twenty-foot span at a narrow canyon and one mile further on brings the road across a timbered flat to the bank of the Bell Irving or the west fork of the Nass.

The next ten miles will probably be the most expensive of the whole route as the country is somewhat mountainous; from this point the route would come to the slow-flowing Teigen creek and passing through about two miles of beaver meadows, it would contact the Yukon Telegraph Line, where it crosses Snowbank Creek, which would be followed to its summit.

At the contact with the Telegraph Line, the distance would be about 160 miles from Kitwanga, and at no time would there be an elevation to cross over 1900 feet, above sea level, whereas the Telegraph Line has come 248 miles from Hazelton, crossed several summits, some of which are 5000 feet elevation.

From this point the route would follow the Yukon Telegraph Line through a nearly level pass of about ten miles and an elevation of about 2050 feet.

Crossing the divide and leaving the watershed of the Nass, we enter the shed of the Stikine, parallelling the Ningunsaw and down a gentle grade to the flat

country where it joins the Iskut river. The pass just travelled is an easy one with very little rock work but somewhat swampy.

Leaving the Ningunsaw and turning due north to ascend the valley of the Iskut, the main valley of this river between its mountain walls is ten miles wide. A branch down the Iskut for thirty-five miles would reach the head of navigation and a ferry connection to the town of Wrangell, Alaska, be made.

The route now (main route) enters a country of different character as it bends slightly to the eastward further up the Iskut. Here we are leaving the Coast range and coming into a drier climate and lighter snowfall. The valleys open out and there is choice of several routes for a highway. An easy pass through the next range of mountains follows the Little Iskut, while another route somewhat longer but more beautiful, follows the forty mile chain of Lakes, Kinaskan, Tatogga, Eddontenajon and Kluachon. These two routes meet on the Klastline or the second fork of the Stikine.

A decision will now have to be made as to whether to follow open bunchgrass country up the Morchua creek and cross the Stikine above the great canyon, or to follow down the valley of the Klastline and cross the plateau at Buckley lake, and after a sharp descent of 2000 feet cross the Stikine at the town of Telegraph Creek.

North of the Stikine the country is of a much easier nature, and the choice of several routes is available; either the Tahltan or the Tuya may be ascended where a summit of about 3000 feet would be crossed in either route. Once over this divide the route would be on the waters of the Taku and another branch road would give access to Juneau, Alaska's capital, by using twenty-five miles of a ferry from the head of Taku Inlet.

Approximately 180 miles from Telegraph Creek, an existing road would be joined, and keeping near the eastern shore of Atlin Lake, the largest lake in British Columbia, the town of Atlin will be reached. A branch road from across Atlin lake, along the old Fantail Trail, could be built to the coast at Skagway.

Leaving Atlin and travelling along the margin of the lake another thirty miles would bring the route to the 60th parallel of latitude, which is the

northern boundary of British Columbia and the southern boundary of the Yukon Territory. Sixty miles of very easy construction past Little Atlin lake and Marsh lake, and the road would be at Miles Canyon where the Yukon is compressed into a narrow rocky cleft, which makes bridging very easy. Two miles further on the town of Whitehorse lies at the head of navigation for the steamers plying the river Yukon to Dawson. The proposed road would then head westward for Kluane lane and Alaska.

The cost of construction would vary over the portion above outlined from Hazelton-Kitwanga to Whitehorse from $3000 per mile in the easier parts to $20,000 per mile for a few miles along the Bell Irving river; it might average $5000 per mile from Kitwanga to Whitehorse, or an approximate cost of $300,000; to this must be added the cost of bridges which would approximate $1,500,000, or a total of $5,000,000 exclusive of the branch roads mentioned.

From Kitwanga to Iskut the road passes a somewhat wet and snowy climate, while north of Iskut the climate is exceedingly dry and game is very abundant.

Such a road would also give access to a great and almost unknown mineral belt lying along the eastern contact of the coast batholith which is so expensive to penetrate that it is impossible for the average prospector. The wealth of one new mine along the proposed route, such as the Premier, would repay more than the cost of construction of the whole road. This can best be verified by the fact that the Premier Mine, which is in the same formation, has paid the estimated cost of such a road several times over. The gas tax from the tourist traffic alone should take care of maintenance and up-keep of such a highway.

OUTLINE OF FACTUAL DATA PERTAINING TO THE

FEASIBILITY OF THE WESTERN ROUTE NORTH FROM HAZELTON

Submitted on behalf of the Hazelton District Chamber of Commerce.

A prime difficulty in drafting an advocative brief such as this lies in the choice between length with great detail and brevity with a risk of omissions. However, it is felt that an accurate and explanatory map used in conjunction with information already available and reference to certain records, such as the Report of the Commission to Study the proposed Highway to Alaska (1933), allows us to be brief with a minimum loss of detail.

Therefore we trust that generous use will be made of such maps and records which will disprove adverse statements recently made through the press: (e.g. see Vancouver Daily Sun, issue Friday, June 23rd,1939,page 5, column 4, in part "On the Commission's maps the Hazelton proposal is marked the "A" route, and the Finlay Forks the "B" route. Which route - it will be the Commission's most delicate task to recommend as between the two routes. The "A" route through Hazelton is nearer the coast but runs up through some river-cut country and over a 6000 feet high level".) We have gone into this matter in considerable detail and believe the Vancouver Daily Sun or its informants are grossly mistaken, as we have no knowledge of any 6000 feet level to be crossed on our proposed route.

Quoting Col.J.M.Rolston, page 53, Appendix B. extract from his Report to the Commission to study proposed Highway to Alaska (1933) - "That portion of the Telegraph Trail from Kispiox to Cabin No.9, I could find no maps covering, and it was therefore necessary to go over this portion and get data for grades, cost, etc."

Six years later the same condition exists, for no topographical survey has ever been made of the section Col.Rolston mentions. Nevertheless from reliable sources of information we have been able to locate on the available

maps of northern British Columbia, a route for such a highway which is entirely feasible physically, as proved by pack-train traverse, and of greatest desirability economically.

On page 57 of the 1933 Report, Col.Rolston further states:

"Skeena River - From the junction of the Kilankis and Skeena Rivers any route to Hazelton would of necessity be forced to follow down the Skeena River through a deep narrow valley for approximately 50 miles. The Skeena valley will be expensive construction, as the river is in canyons a great deal of the time, and a route would have grades up the side hills over these canyons."

This we know to be an unintentional mis-statement of fact as apparently Col.Rolston was never apprised of the fact that a very good route over a low divide is available by following the Kispiox river thence to the East fork of the Nass river, the existence of which route the attached map will show. As this route practically parallels the Skeena route, it naturally can be used to reach Hazelton. This criticism,therefore, does not apply to the route herein outlined.

Our map will show the most favourable route lies up the valley of the Kispiox river to the low-lying table-land on which streams flowing in opposite directions have their source in a group of small lakes. North from this point no survey, or other published reports being available, we referred for our information to game guides, native trappers, etc., named in the appendix hereto, and are informed of two alternative routes. One of these continues north over the table-land, crossing the Nass river at or near the junction of Vile Creek, thence north crossing the West Fork of the Nass at a point about eight miles below (south) No 7 Cabin on the old Yukon Telegraph trail. The other route follows the Nass river from Vile Creek to Sixth Cabin, thence north along the Telegraph trail to the point eight miles below No 7 Cabin where it meets the first described route.

Leaving the Telegraph Trail at this point the route follows the Nass river - Anthony Creek valley through a low pass to Beirnes creek which it

crosses and proceeds to the upper Skeena valley at a point near the junction of Caribou Creek.

At this point we are again able to refer to Col.Rolston on page 58 (1933 Report), where he states that further consideration should be given to a route which coincides with the route herein recommended from this point. We quote,

"Route No.3. .... following the main Skeena river past Courier Creek and Beirnes creek to the summit between the Skeena and the Spatsizi, thence north to either the Klappan Valley, via the Little Klappan, or more northeasterly via the Spatsizi river to Cold Fish Lake and into the Klappan over a low divide." Referring to this route on page 58, and of route 2, Col.Rolston states, "I consider that the following route should be given further consideration and be thoroughly explored before any definite route is accepted." Again on page 59, Col.Rolston states in part, "the upper Skeena appears to be more or less open bench country with jack pine and open meadows."

Leaving the Spatsizi River valley about halfway between Buckinghorse creek and Mink creek, the route turns westward via an unnamed valley to the Eaglenest Creek valley which it follows to the Klappan river, and down the Klappan valley to a point in line with Ealue lake, thence westward again into the Klastline valley. This watercourse is then taken to its junction with the Stikine which is followed and crossed at a point just above the confluence of the Tahltan river and joins here the present road between Telegraph Creek and Dease lake.

Alternatively from Ealue lake lower altitudes may be found on a route paralleling the west shore of this lake and the east shore of Eddontenajon lake, rejoining the first outlined route at Kluachon lake.

A further alteration in the route as outlined might prove advantageous in many ways, which only a reconnaissance survey will show. In any case, its length can be reduced some twenty-five miles by leaving the Spatsizi at Indian creek,which is followed across a low divide to the Little Klappan river, which valley is taken to the confluence of Eaglenest creek on the

first described route. This cut-off has the whole-hearted endorsement of our previously mentioned guides and trappers, and of it, Col.Rolston (page 56,1933 Report) says:

"I found this valley a first-class route. The cost of construction would be comparatively light, as the valley consists of jack-pine benches or many open meadows, very similar in character to the Chilcotin country. It is interesting to note that all horses used by the big pack-trains pulling out of Telegraph Creek are wintered in the Spatsizi river, as the Spatsizi and Klappan areas produce bunch grass which the horses winter on very well.... The general elevation of the Klappan Valley runs from 2,600 feet at its junction with the Stikine to 4500 feet at the summit, a rise of about 2000 feet in some 80 miles. In fact the river is navigable for canoes for about 40 miles above the crossing." And refer again to his statement on page 58, already quoted herein.

Also, on page 59, Col.Rolston states: "Big game parties, leaving Hazelton and proceeding by pack-trail, invariably go into the area which would be touched by this route, i.e., the head of the Skeena and Groundhog Mountains. This is a marvellous big game-hunter's paradise."

On page 61, Col.Rolston again states: "The Klappan Valley,however, is about one mile wide and consists of gravel benches and rocky side-hill slopes. It is much drier than the Nass valley and of a much more open nature. Jack-pine replaces the spruce of the upper Nass valley and the side hills are in many cases open ground covered with bunch grass."

Also, on page 61, quote, "From mile 248 to the end of the section, mile 283, the route follows jackpine ridges, affording very cheap construction. This last section represents the cheapest portion of the route to construct, as the Klappan valley widens to about two miles and falls gradually to the Stikine river at elevation of 2600 feet."

The above quotations refer to that portion of the entire route we have outlined, extending from Beirnes Creek to Eddontenajon lake, from which point our route solves some difficulties which Col.Rolston mentions in connection with the Stikine river canyon, by avoiding same until it is crossed near the

Tahltan confluence at 800 feet.

The physical advantages of this route are many. Among them are features which make for economical construction and maintenance; the route lies along valleys which afford low altitudes and easy grades, providing at the same time an abundance of materials for construction, such as timber and gravel. Climatically, the route lies sufficiently far east to be in a region of light precipitation and yet by virtue of its westerly location introduces many advantages of an economic nature.

Many economic reasons justifying construction of such a highway are to be found in Chapter VI, page 23 of the 1933 Report, and while these cover more specifically advantages to Alaska and the United States, parallels may be drawn with regard to benefits to Canada. In fact, because nine-tenths of the road lies in Canada, the advantages would be even greater.

Enlarging upon the specific advantages of the western route, considerable worth lies in the fact that construction could proceed from at least five points at once, by taking advantage of approaches to the route (at water freight rates) on the southern end (Hazelton), 176 miles from tide-water; Telegraph Creek (construction two directions), also 176 miles from tide-water; and Whitehorse (construction two ways), 110 miles from the coast at Skagway. The advantages of such a feature are self-evident, with regard both to construction of the primary road and feeders to the British Columbia coast and Alaskan coast line, of which at least five could be built economically to serve the coast communities. This allows for rapid construction of the main highway by permitting economical importation of materials and supplies other than those located on the route, while allowing employment of five times as much labour, with a proportionate reduction in the time required for completion as compared to any other route having only one starting point.

In addition to the economies effected by this mode of construction, are those resulting from the fact that this route requires less new construction by a matter of 300 miles than any other route.

Briefly some economic advantages to be derived only from the western route include:

(1) Service to that part of British Columbia north of the Canadian National Railway most densely settled, resulting in greater traffic volume and subsequent tourist expenditures.

(2) Use of the greatest possible amount of already-existing highway, serving a present permanent population through a region of known and developed agricultural value.

(3) Provision of transportation facilities for development of a country known to be rich in mineral and timber values, as well as the famous Groundhog anthracite coal area, to which only this route would allow easy access, and unlimited water power.

(4) A tourist highway unexcelled anywhere for scenic attraction, hunting and fishing, is afforded by this route, and we are again able to quote Col. Rolston's 1933 Report, page 69, in part: The scenery is unsurpassed - the open mountains of the Upper Skeena, Klappan, etc. provide a wonderful area for big game. Moose, caribou, mountain sheep and goat, are very plentiful in this area and attract a large number of hunters from all over the world. A thirty-day hunting trip costs about $3,000, which gives some idea of the pay-roll provided by the big-game hunters."

Topography and Geography in General

Because no survey has ever been made in the neighbourhood of this route, including the alternatives mentioned, no official records are available of altitudes, etc. Our authorities, however, among whom we must include air pilots, are unanimous that at no point must elevations exceeding 4000 feet be coped with, and where such altitudes are met, they are gradually approached on water courses. This fact combined with the sufficiently easterly location of the entire route, beyond the region of heavy precipitation, precludes any possibility of difficult construction or maintenance due to said precipitation, regardless of the season.

By providing such alternative routes over short distances as are shown, we believe that a survey will prove the absolute feasibility of this route insofar as topography and climatic conditions are concerned, which, with such economic and geographic advantages as we can point out, will prove beyond question the superiority of this over any other route which might be proposed. The route is as far west as will allow of minimum precipitation, and as far east as it can possibly be to serve the primary purposes of any highway which might be projected to Alaska; service to British Columbia and Alaskan coast; development of northern interior of British Columbia; opening of vast mineral, coal areas and pulpwood stands; rapid movement of military function in circumstances requiring coast defence by communication with coast on navigable rivers; and as previously mentioned, connection up of developed communities between Fairbanks and Vancouver, of which only a few exist north of 55° east of this route to the Alberta - British Columbia boundary.

Telegraph Creek - Atlin

Our resume to this point covers only the first 300 miles north of Hazelton, taking us to Telegraph Creek, because we have first-hand knowledge of this section of the route and are positive with regard to its feasibility. Of the section north to Atlin and Whitehorse, we have some authentic information, but feel that more specific and valuable data on this section can and will be presented by the local proponents in that district.

Nevertheless, our presentation cannot be considered complete until Atlin is reached. Therefore we refer here to our available sources and believe no reasonable objections can be proved against either on a basis provided by a survey.

Quoting Mr George B.Ball of Telegraph Creek:

"Following up the Tahltan river 28 miles to head Salmon creek, following Sheslay river to Macdonald party, 15 miles below Sheslay (Egnell) Station, via east side Heart Mountain to Nahlin, continuing to Atlin, via west side

Spruce Mountain and right limit of Little Nakina river, or to Teslin Lake, via east side of Spruce Mountain. Highest point under 3000 feet, sufficiently light snowfall."

The 1933 Report again serves to corroborate this route. Mr J.H.Gray, in Appendix C, page 72, says in part: "Only by a line up the Tahltan and Little Tahltan rivers from a Stikine river crossing near Tahltan mouth (800 feet above sea level), via Klastline river, or some such route, from Klappan Valley, would consideration be given to a route via this portion of Telegraph Trail."

"The Little Tahltan river, 10 miles from the flats, turns abruptly northerly into the mountains. The summit or divide between this stream and Salmon or Hackett river is scarcely noticeable, the maximum height booked being 2,240 feet.

"At Camp 3 on Hackett or Salmon river, 15 miles from Tahltan Flats, elevation 1,980 feet, the first kodaks were taken. Views 1 and 2 show, respectively, the stamp and class of country passed through on the flats for 15 miles between Tahltan Flats and three miles back of Egnell (Sheslay). View 2 also shows the nature of side hill, from a point at extreme right of view and some three miles east of Egnell, that must be utilized along Egnell Creek (faintly shown on extreme left of view) in order to reach the plateau level some 2,100 feet above Egnell.

"Stream crossings and drainage generally would be light over this stretch, in fact more favourable conditions could not be expected. The snowfall is from 2 to 2½ feet (Indian report).

"At Egnell, 1890 feet above sea level, I took a day for the examination of Sheslay river and Egnell Creek.

"Sheslay river, 1890 feet at this point and poorly shown in view 3, bearing N.53° W., could be easily descended for about 15 miles, whence a mountain pass bearing northeasterly could be utilized back to the Telegraph Creek (probably meant 'Trail') country about Dudidontu river, some 22 miles north of Egnell.

"The examination of Egnell Creek was satisfactory. A 150-foot span in canyon would cross at an elevation of 2,900 feet, followed by fair side hill for another three and a half miles to plateau level. The work on this six and a half miles would be heavy, but in my opinion more favourable than on the Sheslay river detour."

From these two reports, there seems to be no doubt as to the feasibility and ease of construction of the proposed highway to Atlin. Altitudes and precipitation are covered in these quotations, and the scenery which is world-renowned, is mentioned by Col.Rolston on page 70. We quote: "The northern portion of this area consisting of Teslin, Surprise and Atlin Lakes, offers wonderful scenery. Atlin has taken advantage of this and provided first-class tourist hotel with every convenience, including guides, motor launches, etc."

To attempt to outline the route beyond Atlin would be to allow our statements to degenerate from fact to hearsay, which is of no value, and we are convinced therefore that our presentation should properly be concluded at this point. That this route can be continued northward with similar economy and advantage, we are sure, and feel that the most suitable location will be thoroughly outlined by those more favourably situated to do so.

Authorities for this Route

George B.Ball, Telegraph Creek, B.C.

Charles Barrett, Barrett Lake, B.C.

George M.Beirnes, Hazelton, B.C.

F.M.Dockrill, Telkwa, B.C.

All these men have been in the country since 1898, in the various capacities of prespector, surveyor, game guide, pack-train operator and winter mail carrier, and all have travelled the route herein described at all seasons of the year.

Stan. McMillan, Canadian Airway Limited pilot, stated on more than one occasion that the lowest passes north to Telegraph Creek lie on the route outlined.

Mileages - Hazelton to Telegraph Creek

Hazelton to First Cabin	40
First Cabin to Vile Creek	66
Vile Creek to Nass Crossing	20
Nass Crossing to Beirnes Creek	20
Beirnes Creek to Caribou Creek	9
Caribou Creek to Indian Creek	23
Indian Creek to Eaglenest Creek	46
Eaglenest Creek to McEwan Creek	12
McEwan Creek to Klastline River	24
Klastline River to Stikine	24
	284

Notes: The map referred to in thie Brief is filed with the records of the British Columbia - Yukon - Alaska Highway Commission.

The "1933 Report" referred to above is the Report of the Commission to Study the Proposed Highway to Alaska, The Department of State, Conference Series No 14, U.S. Government Printing Office, Washington: 1933.

NOTES RE BRITISH COLUMBIA - ALASKA HIGHWAY

By Noel Humphrys, Vancouver

There are, in my opinion, which opinion is based upon personal knowledge generally of the country through which such a highway would pass, gained during some thirty years' experience in surveying, exploring, etc. in British Columbia, two reasonable and feasible routes for the proposed Alaska-British Columbia highway. Both of these routes would naturally centre on Prince George, from which point southward to the boundary line a generally good gravelled and partly surfaced highway is already in existence. From Prince George northerly there are two alternative routes generally speaking; each of which have minor alternatives here and there. Both alternatives should in my opinion, as well as leaving Prince George, have for their next common objective Dease Lake, for reasons that will be explained later.

The distance from Prince George to Dease Lake (which section I am considering first) over either route is much the same, though the westerly route which I will call the Hazelton route as marked on the accompanying map of British Columbia in green and numbered (1) is the shortest. The matter of distance, though of importance, is however only one of the things we have to consider, and in the case of a through highway such as this, as in the matter of a railway, there are a number of other considerations of equal or greater importance to consider:

(1) Distance from one given point to the next.

(2) Character of country traversed from the construction viewpoint - whether mountainous or rocky, obstacles such as mountain lakes (the usual type of British Columbia lake), streams and rivers to cross, etc.

(3) The commercial side of the question, resources which the road would tap and open up, the chief of which are doubtless in order of importance in northern British Columbia, Yukon and Alaska, mining, lode and placer; agricultural, timber resources, and scenic value in connection with the tourist trade.

(4) And of very great importance from the maintenance standpoint possibility of continuous year round use, climatic conditions, particularly with regard to snow in winter as well as rainfall in summer months.

I will now refer again to what I consider are the only two (from all standpoints) feasible and reasonable routes:

The westerly or Hazelton route (with variations) number (1) on map, coloured green, with variations marked (1A) and green (1B) and the Telegraph Creek route marked dark purple, and (1C) marked blue, a variation on route (1B). The other alternative I term the Fort St James - Omineca route and this is marked (2) and coloured red with variations brown and marked (2A).

I append herewith an approximate table of distances of existing road and road to be built, together with totals, Osoyoos on the United States boundary to Dease Lake being the first section considered here:

(1B) Prince George - Hazelton - Dease Lake, via Telegraph Creek:

Prince George to Hazelton (existing road)	302.0 miles
Hazelton to Dease Lake (approximately)	420.0 "
Built - Telegraph Creek to Dease Lake (rough road), about	(70) "
Existing highway, Prince George - Osoyoos	553 "
	1,275 miles

(1C) Prince George - Hazelton - Dease Lake via Kinaskan Lake (avoiding Telegraph Creek)

Prince George - Hazelton, existing road	302.0 miles
Hazelton - Dease Lake via Kinaskan Lake, to build	400.0 "
Existing highway, Prince George - Osoyoos	553.0 "
Total to Dease Lake	1,255 miles

(1) Prince George - Hazelton - Dease Lake via Klappan River

This route recommended

Prince George - Hazelton, existing road	302.0 miles
Hazelton - Dease Lake via Klappan river	310.0 "
Prince George - Osoyoos, existing highway	553.0 "
(the shortest route) and	1,165.0 miles

(1A) a diversion of above for possible lower grade and lower maximum elevation via Skeena River would be about 40 miles longer or a total of 1,205 miles.

(2) The Fort St James - Omineca Route

This route would be over existing highway from Prince George to Fort St James at easterly end of Stuart Lake, approximate distance 115 miles

Fort St James - Manson Creek, partly built, approximately	120 "
To Dease Lake via Omineca river, approximately	390 "
Total, Prince George - Dease Lake	625 miles
Prince George - Osoyoos, existing highway	553 "
Total - United States boundary - Dease Lake	1,178 miles

(2A) Fort St James - Omineca - Findlay River - Fort Graham - McConnell Creek - Stikine River - Dease Lake (marked light brown on map and termed (2A)

Prince George to Fort St James	115 miles
Fort St James to Manson Creek	120 "
Manson Creek - Omineca River - Findlay River - Fort Graham, McConnell Creek - Dease Lake, approximately	480 "
Total this route, Prince George - Dease Lake	715 miles
Plus United States boundary to Prince George	553 miles
	1,268 miles.

There have been some suggestions that the highway in question should go via Finlay river to its headwaters at Sifton Pass, thence down the Kechika river on the Liard watershed and presumably to the junction of the Kechika with the Turnagain river, and then westerly via Deadwood Lake and McDame Creek, Hudson's Bay post on the Dease river, and so up the Dease to the north

end of Dease lake. This route is in my opinion not to be recommended. It is a good deal longer, it is too far east and being along the Finlay to Sifton Pass in the "Rocky Mountain Trough" will encounter deep winter snow, extreme cold and later spring, as well as high elevations, and will have no advantages in the way of tapping resources over the other routes, and is in fact I think not so useful in this regard.

I consider that in connection with the necessary preliminary investigation to be followed by reconnaissance surveys it is not necessary nor desirable to pay any attention to any other than the two routes with their variations as outlined above. From the standpoint of resources, both have much to recommend them.

Following is a summary of conditions as applied to each route above, being the points referred to in the first part of this statement and numbered (1) to (4).

Climatic Conditions

Before citing that which I think it advisable to consider generally, the well known fact that, regarding climatic and meteorological conditions the Coastal trough, that is the depression immediately behind the Coastal mountains and which may be said to extend parallel to the Pacific Coast line more or less continuously from the Mexican border to the Alaskan, is the dryest and most arid area of the Pacific.

The reason for this is well known to meteorologists, that is, that the moisture-laden movements which originate generally in the north Pacific and bring practically all our precipitation here, meet the Coastal mountains and precipitate most of their moisture, then pass easterly high up over the Coastal trough, causing the dry belt of British Columbia. Compare the annual precipitation in the Okanagan Valley at Kamloops, Ashcroft, Lillooet and so on with the precipitation at similar latitudes in the Cascade and Rocky Mountain trough, for instance, the latter of which is the wettest and has by far the heaviest snowfall. I give the following examples:

Dry Belt (Coastal trough). Ashcroft, average annual precipitation about 7 inches, Vernon, 15.24, Kelowna, 12.74, Penticton, 10.64; Oliver, 7.94, and with practically, as far as highways are concerned, no snowfall; and further north Lillooet, 13 inches with average of only 19.5 inches snow, Quesnel, 18 inches, of which 44.3 inches is snow; Prince George, 19.23 with snow, 61.5; Hazelton, 18.49, and snow, 42.1. (Please observe greater proportion of snow the further easterly you go); Atlin, 11.16 with 54.7 inches of snow; Mayo, 10.98 with 43 inches snow; and Dawson, Yukon Territory, 12.60 with 51.7 of it in snow.

Middle Belt,(being Selkirk or Rocky Mountain trough) Revelstoke, 43 inches with 141.4 snow; Nelson, 45 and snow, 80; Blue River (North Thompson), 36.54 with snow, 159 inches; Parkerville, east of Quesnel, 46 inches with snow, 184; McBride, 23 with 76 inches snow, etc.

Above being so it appears obvious if other conditions on easterly route are similar,that the Coastal trough is the right one to follow.

I will now consider the routes as outlined above separately, in view of the conditions (1) to (4) set out in the first part of this statement.

Route 1 Prince George, Dease Lake via Hazelton and Klappan river. This route (1) is the shortest and a fair highway already exists from the boundary line to Hazelton and up the Kispiox valley 25 or so miles. (2) It is an admitted fact that road construction along the dry belt is not only easier and cheaper by nature of the large gravelly and sandy plateaus and open valleys found there, but maintenance cost to keep roads open the year around by reason of lower precipitation, is less. Also I think anyone who knows the country will admit that the winters are neither so severe or so long in the Coastal trough as farther east. (3) Resources. The proposed route (1) follows roughly from Hazelton northwesterly the eastern contact of the Coast Batholith which is known to be one of the most fertile if not the most fertile area from a mining standpoint. Such a road will pass close to the fairly well-known anthracite

coal field of Groundhog mountain area, and will traverse a country which is known to be rich in placer possibilities. This route also traverses a generally fertile country from the agricultural viewpoint,and will follow many beautiful valleys with good soil and good grazing areas, such as for instance the Kispiox valley to mention but one.

From the standpoint of timber, there are many large areas of quite well timbered country along this route. It is a veritable paradise for the hunter and fisherman, which condition applies equally to either of the two routes or their alternatives.

There are no high summits to cross on thie route and remarkably little rock work. No great difficulties regarding river crossings (Stikine river excepted) which any route must cross, and no rock and mountain surrounded lakes to encounter.

Route 1B A variation of the Hazelton route going to Telegraph Creek and using the existing road, Telegraph Creek to Dease Lake. This route is longer than (1) and I do not recommend following the present highway along the northerly side of Stikine from Telegraph Creek to Dease Lake, as it is steep and climbs high above the Stikine Canyon.

Also following, as it more or less would, the route of the old Yukon Telegraph trail, it crosses minor summits which are avoided on route (1). It would cross Raspberry Pass, elevation 4,800 feet, whereas there appears no reason why route (1) should rise much higher than 3,000 feet with easy grades throughout.

From the resources viewpoint, 1B is equally good with (1). Conditions, therefore, to compare are:

No.1. Distance. Route 1B is some 110 miles longer.

No 2. Character of Country. 1B will cross higher summits and will I think encounter probably more rock work though this is not excessive.

No 3. Resources. Mining. Both routes will traverse a country with great potential lode and placer mining possibilities, both tap a country with good areas in places, of agricultural and grazing lands and they are about

equal as far as timber resources are concerned, as also from a scenic and tourist and sportsman's viewpoint.

Route 1A is a minor variation from Route 1,designed to follow the Skeena valley in order to avoid elevation,and is equally good as 1 but some 40 miles longer.

Route 1C is a variation of 1B to avoid Telegraph Creek and higher elevation along Telegraph Trail, and designed to go via Kinaskan Lake. It is longer than Route 1 but should be investigated. Comparing with (1):

1. Distance. About 40 miles longer. (2) Character of Country.Compares favourably with (1) and on survey may prove the better, but there are no undue obstacles, heavy rock work, bad summits, etc. to encounter, and climatically compares very favourably with route 1. (3) Resources. Route 1C will tap a country equally rich in mining and agricultural wealth in my opinion, and one which compares favourably and equally with others from the sportsman's or tourist's angle.

All of the above,however, before any decision as to route is made, should be covered at least by a reconnaissance survey.

Route 2. Fort St James - Omineca. Following existing highway westerly to Vanderhoof thence northerly via present highway to Fort St James at end of Stuart lake, thence northerly to Manson Creek along the present partly built roadway. As far as this or at least as Stuart Lake, this route has much to recommend it. It traverses a good country, the precipitation is light (average 15.52 inches with average snowfall 53 inches at Fort St James). From thence northwesterly I think anyone who is acquainted with the Liard river area will agree that this is to be avoided, and that the route via Fort St James and Omineca should also, as the others, head more or less for the Dease Lake country. Our highway then, via Manson Creek and Germansen should follow up the Omineca more or less to its headwaters, along part of the Sustut river to Dease lake. This route would traverse country comparatively

easy from a construction standpoint, though, I submit the precipitation and snowfall will be found heavier than farther west. It will tap a country known to be rich in placer fields and with good possibilities for mining generally. From the scenic, tourist and sportsman's viewpoint its resources are doubtless unsurpassed. So, to compare as before from our four viewpoints:

(1) Distance. This is one of the shortest routes. Approximately 1178 miles from United States boundary to Dease Lake, practically the same as route (1).

(2) Character of Country from construction angle. The country is generally gravelly bench and plateau or open valley. But little rock work should, or need, be encountered and there should be no expensive or difficult bridging problems.

(3) Commercial and Resources. From the mining viewpoint, this route traverses probably one of the most important potential gold placer areas in British Columbia. From the lode mining angle, I do not think this route will be as useful as the westerly route via Hazelton. It is farther away from the Eastern Contact of the Coast Batholith.

Agriculturally, there are many areas of good agricultural lands, but I think it will be found that along this route the seasons are shorter, the country more subject to summer frosts, and therefore not so suitable for crops, though there are many good areas of grazing lands where stock will thrive. There will be found a good many areas of quite good timber, though I do not think as good as the westerly route, while from the scenic and sporting viewpoint it is, I am sure, unexcelled.

(4) Maintenance. Climate. As already stated it will, I think, be found that the average elevation of this route is higher than the more westerly ones, the precipitation will average more, and snowfall considerably so, while the winters are longer farther east and spring breakup later. Compare, for instance, further south, Barkerville with Quesnel.

Route 2A. Alternative via Fort St James - Manson Creek. As has been frequently suggested, to go down, not up, the Omineca to the Finlay River

valley, leaving the Finlay valley at the Ingenica, up the Ingenica to McConnell creek to headwaters Stikine river and across to joint route 1 south of Stikine and thence along Route 1 to Dease lake. To compare:

(1) Distance. This route is approximately 100 miles longer than either route 1 or 2.

(2) Character of Country. From construction viewpoint, it compares I think favourably with the others. No heavy rock work or grades appear necessary, nor bridging problems.

(3) Commercial. This route also will traverse a country rich in placer mining possibilities. Will tap a well-known interesting lode mining area along the Ingenica and farther. Provides also access to some excellent agricultural lands on the Finlay, Ingenica, while from the tourist and sportsman's angle it also is doubtless unexcelled. There is a certain amount of good timber also, although the good stand of timber along the Findlay has been badly injured and much destroyed by fire.

(4) Climatic Conditions. This route will encounter much heavier average precipitation than the westerly route with in many places, very heavy winter snows. It has also a shorter summer and longer winter season also.

The other route so much spoken of via Sifton Pass (headwaters of Finlay river) is not in my opinion to be even considered. It follows the Rocky Mountain trough with its very heavy snow. Has high elevations. Trends too far easterly and leads to the Liard river via its branch, the Kechika river. The whole route will be too far east. The country in the vicinity of Liard more rocky and mountainous, making for very expensive construction, while the heavy snowfall and long winters will make maintenance for any length of time almost prohibitive.

I do believe, however, that before any final decision is made, or any actual ground surveys commenced, that an aerial and photographic survey of all possible routes with ground control parties for each aerial should be made, with particularly attention to obtain all possible detail on routes (1) and (2) and their variations. This work whether finally along the route

adopted for the highway or not is well worth while, since the information obtained will be of great value both from a mining and general resource survey standpoint. This work could, at comparatively small cost, be readily completed this year with proper organization, giving opportunity during the winter to make a detailed study and general decision as to the best route; which would facilitate an actual start of detailed location and construction early in 1940.

In closing this memorandum I think I should call attention to one quite important consideration in connection with the construction and maintenance of the proposed highway, that is, convenience at the present time to transportation for supplies, machinery, etc. required. The Hazelton or westerly route undoubtedly is superior here: Access at its (unconstructed) southerly end by both rail and highway at Hazelton. Again in summer months by boat by way of Stikine River to Telegraph Creek - Dease Lake, and again farther north via White Pass and Yukon Railway to the Yukon at Lake Bennet and the Atlin Lake country. It must be admitted that these three points of attack will prove a real factor in cutting construction cost; also, after construction, access to the northwesterly-southeasterly Mexico to Alaska trunk road (of which the Alaska highway is an important link) from coastal cities, ports and points is much to be desired.

The easterly route is too far away for this, at least for many years. The last point is of the very greatest importance from the commercial viewpoint as anyone must readily see and admit, and should therefore be given careful consideration before deciding on the adoption of any route farther easterly than necessary.

I therefore maintain that the westerly or Hazelton route No (1) is:

(1) The only one practical to serve coastal connection either in British Columbia, Yukon or Alaska.

(2) It will traverse a country which is the best settled and needs such a road most urgently and with best reason.

(3) It provides all-Canadian communication just behind the Coast range and

and would avoid the necessity of crossing the Alaskan Panhandle.

(4) Access to coast readily provided, in addition to existing access at Prince Rupert, at Stewart, B.C., and Hyder, Alaska, at Wrangell, Juneau and Skagway.

(5) Follows more existing highway which only requires improving.

(6) Obvious advantages of ready coast communications in wartime, having the dual advantage of protection from the coast by the Coast range and at the same time, ready communication to coastal points.

(7) Can on account of more favourable climate, be kept open in spring.

(8) For visitors and tourists, as well as business men who want access to the northern interior or to interior Yukon or Alaska, access at different coastal points would avoid the long drive to Prince George or Hazelton.

This memorandum is respectfully submitted with the wish, in which I am sure most people who know the country concur, that unless some very much more cogent reason than heretofore set out is given for adopting the easterly route or routes, that the proposed highway will follow the westerly route, which has all the advantages of the easterly and none of its disadvantages, and will without doubt be the cheapest and quickest to construct, as well as providing the lowest maintenance cost.

Respectfully submitted

(Signed) NOEL HUMPHRYS

Vancouver, British Columbia,

May 3rd, 1939.

Note: The map referred to in the above memorandum is filed with the records of the British Columbia - Yukon - Alaska Highway Commission.

Yukon Section of Highway

In the first part of my memorandum re the proposed British Columbia - Alaska highway, I have confined my remarks to the section from the international boundary to Dease Lake, British Columbia. There is not, I think, much argument nor controversy as to the balance of the route to connect with existing United States road system in Alaska interior.

There is no difficulty from Dease Lake on to Atlin Lake, the country generally being fairly open with rolling hills and quite wide valleys, with good terrain for road construction and no obstacles which cannot be readily avoided. This section of the highway as is quite well known will traverse a country rich in gold placer potentialities as well as lode mining. It appears evident that probably the shortest and most useful route will be from Dease Lake to Teslin Lake and thence westerly to Atlin Lake, with a considerable local choice of good routes. From the Atlin Lake district the road would continue on northerly to Carcross, to Whitehorse and to Dawson and from there northwesterly to join the Fairbanks road south from Fairbanks. The distance from Dease Lake to Fairbanks will be upwards of 1000 miles. It would be shorter not to cross westerly from Teslin to Atlin Lake, but to follow up the Hootalinqua (Teslin) river. The other route via Atlin, however, would traverse the Whitehorse-Dawson road and some construction cost would be saved here.

In any event the Yukon section of the highway presents no difficulties and will, generally speaking, be cheaper construction than will the British Columbia section though maintenance costs will be just as great or greater on account of course of the longer winters in the north.

I think that it would be advisable to follow the Teslin Lake and Teslin river route to Carmacks as this will serve a more useful purpose, and the Atlin Lake route is already served to some extent by the existing road, to which the other would be connected in any event.

Total Length of Highway, International Boundary to Fairbanks, Alaska, via Hazelton, Dease Lake, Teslin Lake and River, etc.

(Approximate distances)

Section	Existing Road	To Build	Total
United States boundary to Dease Lake, British Columbia	855	310	1,165
Dease Lake to Fairbanks, via Teslin Lake and River	150 (approximate)	870	1,020
Totals	1,005	1,180	2,155 miles

Bearing in mind of course that a very great part of the existing highway requires regrading and surfacing, in many places complete revision might be advisable.

Respectfully submitted.

(Signed) NOEL HUMPHRYS

Vancouver, British Columbia

May 16th, 1939.

MEMORANDUM ON ROUTE "B"

By F.C.Green,
Surveyor-General of British Columbia

The following notes are offered as a contribution toward future discussions of this project, and they deal only with suggested Route "B" - the Rocky Mountain trench route.

The distance following river valleys from Finlay Forks to Pelly Crossing is about 827 miles, and is about equally divided between British Columbia and Yukon.

We have contour maps from Summit Lake to Finlay Forks, secured during the Pacific Great Eastern Railway Resources survey of 1929, and from these maps and from other information, it can be said with certainty that the route via Crooked, Pack and Parsnip rivers to Finlay Forks is feasible and of light construction, and has a maximum altitude of 2,500 feet at Summit Lake.

On the suggested route to Finlay Forks, via Fort St James, Gaffney Creek and Manson Creek, information is less complete, but it is no doubt feasible,and has a maximum elevation of about 3,800 feet at the head of Gaffney Creek.

From Finlay Forks northerly along Finlay river valley, the Surveys Branch (British Columbia) has a triangulation net to a point north of the mouth of the Ingenica river, but has only sketch topography, while from Ingenica northward through Sifton Pass, down the Kechika river, up the Liard river and its tributaries and down the Pelly river, no surveys have been made and we are dependent for information on sketch maps by Swannell to Whitewater, Inspector Moodie (waggon road to Klondike,1898), Hart and Dr Dawson, these together covering the entire route but only in a very general manner.

Aerial photography and the topographical mapping of a strip would seem to offer the most speedy, certain and cheapest way to guard against costly

errors in location, and would greatly reduce the cost to the Public Works Department of the final location survey. The Surveys Branch of the Department of Lands is best equipped to carry on triangulation and topographic mapping, and the engineers of the Public Works Department to make the actual location.

Aerial photography without triangulation and topographic control loses most of its value, as in itself it offers no satisfactory way of getting elevations or the true scale of the photographs, and for best results the topographers should have air photos with them. The aerial photography and main triangulation should preferably be carried out one season in advance of topography.

Along the valleys of the Finlay, Fox and Kechika rivers it would be advisable to photograph a strip ten miles wide, taking in five miles on each side of the river channels, and on approaching the main Liard river, a wider area south of the river might be necessary. The 412 miles between Finlay Forks and the point where the Liard crosses the 60th parallel would, according to the above, require about 5,000 square miles of aerial photography. Photography from altitude 15,000 feet with six inch cone would, for the average valley altitude of 2,500 feet, give photographs at the scale 1/25,000, this being about 2,100 feet, or 32 chains to the inch. Photographs would require a sixty per cent overlap fore and aft, and a twenty per cent lateral overlap, for use in the stereoscope. Photography such as the above, covering 5,000 square miles, could be contracted for at about $16,000, whereas by day work it might cost much less or more, depending on the frequency of perfectly cloudless and smokeless days.

The Surveys Branch (British Columbia) has no appropriation to cover aerial photography, but if air photographs could be secured, two triangulation and six photo-topographical survey parties could, in two seasons, produce a map on a scale of one-half mile to the inch, showing

one hundred foot contours, and covering a ten mile strip following the rivers from Finlay Forks to the 60th parallel. To accomplish this it would be necessary to add $20,000 per annum to the present surveys vote, or a total increase of $40,000 for the two years. The resulting topographic map would be of high quality and of permanent value for general purposes.

(Signed) F.C.Green

Surveyor General

Victoria,

British Columbia,

April 26,1939

MEMORANDUM RE FOREST CONDITIONS ON ROUTE OF ALASKA HIGHWAY

By W.E.D.Halliday
Dominion Forest Service
Department of Mines and Resources
Ottawa

Proposed routes for the British Columbia to Alaska highway pass through portions of three forest regions. The general forest conditions of areas tributary to the two proposed routes are as follows:

Route "A" Hazelton to Dawson City via Kispiox, Skeena and Stikine rivers, Teslin and Atlin lake areas, and Lewes river.

British Columbia

1. Hazelton-Kispiox-Skeena rivers. This division falls within the western portion of the transition section of the Montane forest region. The forests consist mainly of Engelmann spruce, with intrusion of two coast forest species, western hemlock and western red cedar. The former species occurs on specialized sites, usually about 2000 feet elevation, and the latter on the upper benches of the rivers in small quantities suitable for poles.

Alpine fir increases in abundance towards timber line and black cottonwood is noticeable along the flood plains of the rivers. As the result of heavy burns there are some areas of lodgepole pine, and poplar mixed with spruce; and white spruce has been reported from the district.

The Kispiox valley is of rather an open nature, with large meadow areas, and is of fair agricultural value.

2. Upper Skeena river The forests of this valley come within the sub-Alpine forest region. Engelmann spruce and alpine fir are the principel species, with the fir increasing in abundance at higher elevations. Lodgepole pine follows burn, and there is some black cottonwood along the river banks.

In the northern parts of the valley timber conditions deteriorate and stands become patchy. About seventy-four per cent of the area is made up of non-

productive barrens or alpine scrub.

3. Stikine-Tuya rivers North of the divide the Stikine plateau section of the Boreal forest region is encountered, and which is characterized by a dry climate.

This plateau is sparsely forested, with a cover of white spruce, lodgepole pine, aspen, and white birch. The trees are often of a stunted nature. In addition, black cottonwood is found along the banks of the rivers.

There has been considerable burning of the forest with a consequent second growth of willow, aspen, lodgepole pine, and scattered spruce. Alpine fir occurs more especially towards the headwaters of the rivers, and around the timber-line.

The upper slopes of the valleys and the plateau in general show grassy alpine conditions, and it is estimated that over 80 per cent of the area is above the line of merchantable timber.

British Columbia - Yukon Territory

4. Atlin - Teslin lake areas - Lewes river - Pelly Crossing - Dawson

This portion of the route comes within the Yukon section of the Boreal forest region. The climate is dry and cool.

The southern parts are rather flat in nature, with a scattered growth of white and black spruce, the latter mostly on swampy ground. The trees are generally scrubby in size but individuals may reach fair proportions. Patches of lodgepole pine occur and there is some scrubby black cottonwood along the rivers.

The northern parts are more irregular in nature, but with much the same growth of timber. Grassy areas are common for the whole area and are reported to be characteristic of south and west facing slopes. North and east facing slopes, however, are usually well timbered. Alpine fir appears to be scarce in or absent from the country contiguous to the route.

Estimates

Recent estimates for merchantable timber are available only for a small portion of the route. There are none for the Yukon Territory, and those for the Stikine drainage basin include portions of the Coast forest region in the lower reaches of this basin and which could not properly be considered tributary to the route. Species found here are western hemlock and Sitka spruce. It must be clearly understood that estimates given are of a very general nature.

British Columbia

Drainage Basin	Merchantable acreage	Western hemlock	Thousand Board Feet Spruce	Fir	Lodgepole Pine	Total
Upper Skeena and Kispiox [1]	474,200	1,630,200	1,145,100	1,566,100	254,300	4,595,700
Stikine-Unuk [2]	707,840	1,189,440	1,038,720	284,640	99,840	2,612,640
Atlin [2]	96,000	-	134,400	19,200	38,400	192,000
	1,278,040	2,819,640	2,318,220	1,869,940	392,540	7,400,340

Notes: 1. The Forest Resources of British Columbia. F.D.Mulholland,1937.

2. Forests of British Columbia, H.N.Whitford and R.D.Craig. Commission of Conservation (Ottawa),1918.

Route "B" Prince George to Dawson City via Salmon, Parsnip, Finlay, Kachika, Liard, Frances and Pelly rivers

British Columbia

1. Prince George - Salmon river. This country comes within the Transition Section of the Montane forest region.

The principal forest type is a mixture of spruce and alpine fir with, at lower elevations, Douglas fir. The latter special appears to have been more abundant at one time, and small areas in a nearly pure state may be found. The spruce has usually been considered to be Engelmann spruce, but recent investigation indicates that in the lower altitude forests a large proportion may be white spruce.

As the result of fire, large areas are occupied by lodgepole pine. On patches of heavier soil this species is replaced by poplar.

2. Parsnip river This well-timbered drainage basin is usually considered as part of the sub-Alpine forest region, but more detailed information may show portions to belong more properly to either the Montane transition section above, or to the Boreal forest region.

Engelmann spruce and alpine fir form the principal forest type, with the fir increasing in abundance toward timber-line. Fires have replaced considerable areas of this type by one of lodgepole pine. There is a small quantity of Douglas fir on very warm sites, mixed with the spruce, or in small pure stands. Investigation may also show white spruce to be of some importance in the river valleys.

Of the total area, thirty-nine per cent is considered to be non-productive. This figure covers barrens, scrub, swamp and water.

3. Finlay river. Like the last unit, this basin has been considered as within the sub-Alpine forest region, but recent information indicates that at least the northern half is properly within the Boreal forest region.

Over half the area is classed as above merchantable timber-line, and eighty-four per cent of the total area is considered as unproductive.

Much of the forest has been burnt so that lodgepole pine now covers considerable ground. Engelmann spruce and alpine fir types are present the latter species forming the main sub-Alpine type at higher elevations. Over a great deal of the valley, however, the Boreal white spruce is the characteristic tree, together with aspen, balsam poplar and black spruce.

4. Kachika - Liard rivers This division comes within the Boreal forest proper and constitutes the Upper Liard section.

Like the preceding unit, over half the area is above merchantable timber-line.

The dominant species is white spruce, mixed with alpine fir more especially as the tree-line is reached. Lodgepole pine follows burning, and tamarack and black spruce occur on swamp lands. Aspen, balsam poplar, and white birch, are present, often in some quantity but reported to be of poor quality, and there is said to be a large amount of "fire made" prairie.

Yukon Territory

5. Frances river This unit also comes within the Upper Liard section of the Boreal forest region. The main valley is reported to be well wooded though much burnt.

White spruce is the characteristic species and reaches diameters of 24 inches. Alpine fir mixes with it in places and becomes prominent towards timber-line. White birch and balsam poplar are both present, black spruce and tamarack grow on swampy ground, and lodgepole pine follows burn.

6. Pelly river - Dawson The route now comes within the Yukon section of the Boreal forest region, where climatic conditions are drier than in the previous units. The river valleys are wide and, although forested, there is usually considerable difference in character between the south and south-west facing slopes and those opposite them. On the former, tree cover is sparse and grassy areas general; on the latter, forests are relatively well developed.

White spruce and black spruce are the most abundant trees. The former may reach to 24 inches in diameter but with reduced height growth. On the

average the timber is small. Aspen, balsam poplar and white birch mix with the white spruce and form small groves; lodgepole pine occurs on gravelly terraces, and black spruce in swampy areas. Tamarack has a scattered representation but is mostly found in the upper Pelly drainage, while alpine fir becomes dominant towards tree-line but does not seem to occur much farther west than the junction of the Pelly and Macmillan rivers.

Estimates

Recent merchantable timber estimates are available for territory adjacent to the route in British Columbia. No estimates are obtainable for the Yukon Territory. In respect to the Finlay Forks - Hudson Hope drainage basin, over half this area can not be considered as tributary to the route.

Drainage Basin	Merchantable acreage	Douglas Fir	Spruce	Fir	Lodgepole Pine	Total
		(Thousand Board feet - British Columbia log scale)				
Salmon river	116,600	35,800	396,800	55,400	208,300	696,300
Parsnip river	587,100	108,200	2,874,000	941,400	399,900	4,323,500
Finlay Forks - Hudson Hope	321,700	-	1,713,400	474,900	321,400	2,509,700
Omenica river	42,400	-	95,500	69,600	43,000	218,100
Finlay river	176,500	-	831,200	191,800	66,200	1,089,200
	1,244,300	144,000	5,910,900	1,733,100	1,038,800	8,826,800

(Signed) W.E.D.Halliday

November 14th,1939

Note:

A map accompanying Mr Halliday's Memorandum is filed with the records of the British Columbia - Yukon - Alaska Highway Commission.

FOREST LAND CLASSIFICATION (IN SQUARE MILES)

Area	D B No.	Drainage	Capable of Producing Commercial Timber: Merchantable	Immature	Not Satisfactorily Stocked	Total Productive	Per Cent of Total Area	Incapable of Producing Commercial Timber	Per Cent of Total Area	Total Area
A	1.	Upper Skeena River	741	103	310	1,154	18	5,086	82	6,240
	2.	Upper Stikine River	239	1,557		1,796	15	10,178	85	11,974
	3.	Atlin Region	150	431		581	6	8,752	94	9,333
		Total	1,130	2,401		3,531	13	24,016	87	27,547

Estimates for drainage basins 2 and 3 taken from Commission of Conservation Report - Dated 1917.

Forest Surveys Division. 5/2/38.

FOREST ECONOMICS
DIVISION
"F.S.McK."

MERCHANTABLE TIMBER (IN THOUSAND BOARD FEET)

D B Area	No.	Drainage	Merchantable Acres	Species				Total
				Hemlock	Spruce	Balsam	Lodgepole Pine	
A	1.	Upper Skeena River	474,000	1,630,000	1,145,000	1,566,000	255,000	4,596,000
	2.	Upper Stikine River	153,000	--	383,000	230,000	152,000	765,000
	3.	Atlin Region	96,000	--	135,000	19,000	38,000	192,000
		Total	723,000	1,630,000	1,663,000	1,815,000	445,000	5,553,000

Note: Cedar suitable for poles has not been quoted in the above estimates. Small volumes of this species occurs on the Upper Skeena Drainage in the vicinity of Hazelton.
Large black Cottonwood are found along all main water courses.

Estimates for drainage basins 2 and 3 taken from Commission of Conservation Report - dated 1917.

Forest Surveys Division 5/2/38

FOREST ECONOMICS
DIVISION
"F.S.McK."

FOREST LAND CLASSIFICATION (IN SQUARE MILES)

Area	D B No.	Drainage	Capable of Producing Commercial Timber: Merchantable	Immature	Not Satisfactorily Stocked	Total Productive	Per Cent of Total Area	Incapable of Producing Commercial Timber	Per Cent of Total Area	Total Area
B	1.	Parsnip River	988	2,046	1,967	5,001	51	4,716	49	9,717
	2.	Omineca River	66	453	303	822	20	3,344	80	4,166
	3.	Finlay River	277	611	776	1,664	14	10,195	86	11,859
	4.	Dease, Kachika River	46	4,294		4,340	24	13,654	76	17,994
		TOTAL	1,377	10,450		11,827	27	31,909	73	43,736

Estimates for drainage basin 4 taken from Commission of Conservation Report-dated 1917.

Forest Surveys Division. 5/2/38.

FOREST ECONOMICS
DIVISION
"F.S.McK."

MERCHANTABLE TIMBER (IN THOUSAND BOARD FEET)

Area	D B No.	Drainage	Merchantable Acres	Species				Total
				Fir	Spruce	Balsam	Lodgepole Pine	
B	1.	Parsnip River	633,000	108,000	3,079,000	990,000	429,000	4,606,000
	2.	Omineca River	42,000	--	95,000	70,000	43,000	208,000
	3.	Finlay River	177,000	--	831,000	192,000	66,000	1,089,000
	4.	Dease, Kachika River	29,000	--	58,000	15,000	72,000	145,000
		TOTAL	881,000	108,000	4,063,000	1,267,000	610,000	6,048,000

Note: In addition to the above estimates, there is reported to be 144,000 M.B.M. of black cottonwood on the Parsnip and Finlay River drainages. The estimate for this species, which occurs along the main water courses, should be considered low.

Estimates for drainage basin 4 taken from Commission of Conservation Report-dated 1917

Forest Surveys Division. 5/2/38

FOREST ECONOMICS
DIVISION
"F.S.McK."

8

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THE UNITED STATES - ALASKA HIGHWAY

A Suggested alternative for the Section between Hazelton and the Yukon Telegraph Trail

By Marius Barbeau

At the request of the Secretary of the British Columbia - Yukon - Alaska Highway Commission, I have prepared the following statement as to the possibility of building a section of the United States - Alaska highway via Hazelton, on the Skeena river, the Kispiox river, a tributary of the Skeena, northwards to the upper Nass river, following the upper Nass river to the Yukon Telegraph Trail, joining it at a point between the Ninth Cabin and Telegraph Creek.

I find in my notes on the Indian hunting grounds of the Nass and Skeena river tribes, that the Kispiox and the adjacent Nass river territories were all occupied as hunting grounds and trap lines, and that the Indians passed from one river to the other, following a trail.

As the maps for this area are stated by the Indians to be incomplete and incorrect, they give only an approximate idea of the country. I am not sure whether the trail passes from the Kispiox river to the Nass river tributary flowing down from Brown Bear lake, or whether there is only a trail connecting the Kispiox river with the Cranberry river, an important tributary of the Nass. The Kispiox river trail to the Nass, such as it is, was not considered a difficult one by the Indians, except for a log bridge crossing the headwaters of the Kispiox at one point. One of the Indians, whose hunting grounds were at the headwaters of the Kispiox, stated that this was a flat country. There is a waggon road now reaching up, I believe, to the First Cabin.

More precise information was obtained from John Brown, an old Kispiox Indian. Beaver Lake, which is Harey's hunting ground, has an outlet into the Nass. It is not connected with the Kispiox river, but the headwaters of the Kispiox come close to it. It is all level ground there. Harey's hunting grounds are about fifteen miles square.

Some time late this autumn, I had an opportunity to revisit Hazelton and to have long conversations with Mr R.S.Sargent, the Hazelton merchant, who is an old timer. He came there for the Hudson's Bay Company in 1891 and is a man whose opinions I consider dependable. When I told him that one of the officials investigating the matter last summer was inclined to consider the opinion of Mr Beirnes as too partial to his own plan, he came out emphatically with his own views, which seem to me to be correct.

The point is that it has been known for many years in the country that the path followed by the Yukon Telegraph trail over to the headwaters of the Skeena had not been wisely selected in the first place, and that there have been many suggestions since that it should be changed to that of the Kispiox Trail to the Nass. The well-known fault of the Telegraph Trail and Kispiox over Poison Mountain and the Skeena is that it goes over mountains 5,000 feet high and through a country where the snow is deep in the winter and the climate very cold.

The advantage of the Nass river trail is that it keeps to the lower grounds, that there is no more snow there than, say, at Hazelton, that the climate is no more severe, and that it travels into easier country. From my own sources with the Indians and many accounts and tales of big game hunters and Indians, I am inclined to think that this view should carry weight. Besides, the highway would go through a territory which might be developed after it was made accessible - the upper Nass, Lake Medziaden, which is now the best sockeye spawning lake in the district.

As I spent the winter of 1921 at Hazelton, I had an opportunity to realize that the climate is much milder than ours here (Ottawa); and at no time was there more than about twelve inches of snow. The road from Hazelton to Kispiox was easy to travel, as there were no noticeable snowdrifts.

Last autumn I had an opportunity to travel in a motor car with two friends from Hazelton to Prince George, down the Fraser through Ashcroft, down the canyons of the Thompson and Fraser rivers to Vancouver. I may

say that the road we followed has been improved tremendously since 1926, when it was travelled in a motor car by Mr Sargent and some others. Now there is a very decent highway which we travelled at fifty to sixty miles an hour. The only difficulty was that some sections of it near Burns Lake were of gumbo. There had been rain and one had to be careful. Below Prince George, and particularly Quesnel, the road is heavily travelled, and many large dray-waggons are often encountered. While the road along the canyons of the Thompson and the Fraser is spectacular, it is perched so high on the face of the cliffs, and so long (nearly sixty miles), that it is bound to remain rather difficult and narrow, and it cannot easily be widened in places. A more important road would be down from Ashcroft, through the Okanagan, to the United States.

When travelling along the Cariboo road I heard Mr Lanning, a commercial traveller for a Vancouver biscuit company, say that he is in the habit of travelling in a motor car in the winter along the Cariboo road, as many others do; that there is not much snow there and that the road is kept open. The only inconvenience in case of accident, is that it is cold and one may have to travel on foot a good long way before getting relief.

Note: A map accompanying Mr Barbeau's Memorandum is filed with the records of the British Columbia - Yukon - Alaska Highway Commission.

Meteorological Data

The official data, hereunder, on precipitation and temperatures for various points on possible routes of the British Columbia - Yukon - Alaska Highway have been supplied the Commission by the Office of the Dominion Meteorological Service at Toronto. The latter Service, at the request of the Commission, further supplied special information regarding dates of first snowfalls in any one year and maximum depth of snow on the ground at any one time.

The meteorological information included in this Report has considerable value in the consideration of advantages or disadvantages of different routes.

Note: The meteorological data referred to above, and comprising pages 155-182 of the Appendix to the Report of the British Columbia - Yukon - Alaska Highway Commission, is on file with the records of the Commission in Ottawa.

REPORT TO THE PUBLIC WORKS DEPARTMENT OF BRITISH COLUMBIA ON RECONNAISSANCE SURVEY OF NORTHERN PART OF ROUTE "B" - BRITISH COLUMBIA - YUKON - ALASKA HIGHWAY BETWEEN LIARD RIVER AND SIFTON PASS.

By E.Lamarque

General Statement

This report contains an account of a reconnaissance carried out during the summer of 1939 in the region lying between the British Columbia - Yukon boundary, where the Liard river crosses it a few miles above the confluence of the Dease, and Sifton Pass, somewhat less than two hundred miles to the south-east. The expedition was undertaken to determine the suitability or otherwise of this little known region as a route for a motor highway.

In order to carry out this work, I left Vancouver on the evening of the 3rd of June with three assistants, E.Cushing, K.Ford and C.King. Travelling by the Canadian Pacific Railway Company's steamship Princess Louise, we reached Wrangell,Alaska, at 2 a.m. on the 6th, and left there on the afternoon of the same day by the motor vessel Hazel B of the Barrington Transport Company for Telegraph Creek, 140 miles up the Stikine river. We reached Telegraph Creek on the evening of the 8th and, after outfitting there, left on the 11th with two Indian packers, Loudecker and Harry Karlick, and 14 horses, for Dease Lake where we arrived on the 15th. On the 17th after obtaining information about various routes, E.Cushing and K.Ford with two packers and 14 horses - ten pack and four saddle - left for the Lower Post, half a mile above the confluence of the Dease river with the Liard, via the upper Turnagain river, Mosquitoe and Sand creeks, with instructions to form a cache of supplies at the confluence of the Turnagain with the Kachika ere proceeding, as lightly loaded as possible, to their destination.

In the meantime, C.King and myself, after an unavoidable delay of some days at Dease lake, left by one of Hope and Marion's scows for the Lower Post

on the morning of the 22nd, via Dease lake and river. We stopped for the night at McDames and reached the Lower Post the next evening, where we were busy in the general locality till the 7th of July, when E.Cushing and K.Ford with the packers and horses arrived from the south-east. On the 9th, after replenishing our supplies for the remainder of the season, we commenced our reconnaissance towards Sifton Pass which we reached on the 5th of September, and the Finlay river at Fort Ware on the 8th. On the 9th, K.Ford and C.King left for Prince George by boat via the Finlay and Parsnip rivers. They reached their destination on the 16th and Vancouver on the 20th.

On the 10th E.Cushing, the two Indian packers and fourteen horses left for Telegraph Creek via Two Brothers Lake and Hylands Post. Delayed by stormy, inclement weather, and having to abandon one horse en route, they reached Telegraph Creek on the 2nd of October, where the Indians were paid off and the outfit, other than that brought out by Mr Cushing or Mr Ford, stored with the Government Agent there. Delayed by lack of transportation on the Stikine, Mr Cushing did not leave Telegraph Creek till the 9th. He arrived at Vancouver on the 14th.

On the 10th of September, I left Fort Ware by mail plane for Prince George, arriving there in two and a half hours flying time. Leaving there on the 12th, I reached Vancouver, via Quesnel and Squamish, on the 13th. The plane journey from Fort Ware enabled me to appreciate the value of low flying for reconnaissance purposes to an observer accustomed to making rapid notes.

Acknowledgments

The successful completion of this reconnaissance is principally due to the hearty cooperation of all the members of the party and especially to the energy and ability shown by E.Cushing and K.Ford. We received considerable assistance, also, from officers of the Hudson's Bay Company and residents of the district at Dease Lake, McDames and the Lower Post, and are particularly indebted to D.B.Carter of the Forestry Branch and the British Columbia Police, who not only took our radio messages but transmitted them to their destination.

Methods of Survey

A rapid chain-compass traverse was made of our route from the confluence of the Dease river with the Liard to that of the Gataga with the Kachika, about 130 miles, where we tied into signals established by H.Pattinson of the Department of Lands who was triangulating north of Sifton Pass. From the Gataga to Sifton Pass, our distances were estimated on a time basis and controlled by Mr Pattinson's survey. At the Lower Post, we tied on to the base line established by Mr Moncton prior to the commencement of his triangulation southward; our distances from the Post northward to the provincial boundary being estimated by time.

Excursions on either side of our route were made where necessary and several hills and mountain slopes ascended for the purpose of general reconnaissance. Observations for latitude were taken at several points between the Dease and Gataga rivers and, in order to determine the magnetic variation, occasionally for azimuth. On the chained traverse blazed trees mark the miles.

The party was well equipped in every way, and the radio, which weighed with batteries complete, in a strong case suitable for a side-pack on a horse, only seventy pounds, was of great value. A recent model, built for the Forestry Department of the Province, it proved remarkably efficient, and from the middle of July we were in frequent communication with Colonel Rolston's party on the southerly end of route "B", initially contacting them when quite three hundred air miles distant and, latterly, the Forestry Station at Prince George when over four hundred air miles therefrom.

Except on the Liard and Dease rivers in the vicinity of the Lower Post, the party depended on pack animals for transport within the area of reconnaissance. These were available in the numbers and with the required equipment either at Telegraph Creek or points so far to the south that their safe return there in the fall would have been problematical. They were hired, therefore, as already noted, at Telegraph Creek.

History

The country was first explored by the fur-traders of the Hudson's Bay Company who entered it from the north-east by way of the Liard. Mr J.McLeod ascended the Liard and the Dease rivers in 1834 and Robert Campbell wintered at Dease Lake in 1838-39, and in the forties the Liard was used by the Company to supply their posts on Frances Lake, on the Pelly, and at the confluence of the Pelly with the Lewes. In 1849 Fort Pelly Banks at the northerly end of the portage from Finlayson lake, was burned and abandoned; in 1851 Fort Frances was also abandoned, and in 1852, Fort Selkirk at the mouth of the Pelly, was raided by coast Indians, and though Robert Campbell made every effort to have the post reestablished, it too was abandoned. After this, the upper Liard was probably entirely deserted by white men till, in 1872, two prospectors, Henry Thibert, a French-Canadian, and McCullock, a Scotchman, found their laborious way to Dease lake from the Red river (Manitoba), via the Athabasca, Mackenzie and Liard rivers. With no John Company to back them, the courage and hardihood of these two adventurers can only be contemplated with admiration. Their persevering efforts were rightly crowned with success for the next year, in '73, they discovered gold on Thibert creek, a stream that enters Dease lake from the west near its lower end, and thus mining in this part of the Cassiar was started and carried on, more or less successfully, to the present. In '74 the placers of McDames creek were found and it is said that a million dollars was taken from the district that year, and that the total value recovered to 1887 was about five millions.

Population

The population of the district, even to-day, is very limited. The Indians living within or in the country contiguous to our line of reconnaissance would hardly exceed twenty-five families, possibly a hundred all told. They belong to the Athapascan linguistic group and are of the Tahltan, Sickanni or Beaver tribes. They usually trade at the Lower Post, McDames or at Fort Ware, occasionally going as far as Fort Nelson, on the Fort Nelson river to the east,

and south to Dease lake and even to Telegraph Creek. In 1935 the Hudson's Bay Company reestablished a post at Frances lake, abandoned for eighty-four years, bringing in their supplies from Whitehorse by air, but it is doubtful if any Indians from British Columbia trade there.

Besides the natives, there are a few white trappers. Nearly a dozen of these make their headquarters during the summer at the Lower Post and most of them trap in Yukon Territory. Two, Messrs Fosberg and Ludwig Smaaslet, fly to their headquarters cabin on Rabbit Lake, a lake expansion of Rabbit river, some miles to the east of the Kachika. The white trappers who make Fort Ware their headquarters during the summer, trap to the west and south of that post, and, with one or two exceptions, do not enter the area under discussion. Except for surveyors of the Department of Lands working to the north of Sifton Pass, and for two Indians who caught up to us with mail when we were south of the Turnagain, we did not see a soul between the Lower Post and the Pass, or excepting old camping sites of the natives, any sign of human habitation between the Dease and the Turnagain. At the confluence of the latter stream, however, with the Kachika, there are about half a dozen old cabins, relics of the days when R.Sylvester had a trading post there, established about sixty years ago and afterwards taken over by the Hudson's Bay Company. This post was supplied by pack-trail from McDames, a trail that is reported to be well located and easy to follow. It is, in fact, part of the main trail from Fort Nelson and is used by hunting parties and others who may enter this northern wilderness from the east. Colonel Moodie, in charge of a detachment of the North West Mounted Police, came north through Sifton Pass in 1898 down the valley of the Kachika, and, entering this trail at the westerly limit of the valley about five miles from Chee House, as this old-time establishment of Sylvester's is called, followed it to McDames. The Colonel wrote a remarkably good report of his northland journey and his notes and plan of this area proved valuable to us. South of the Turnagain there are half a dozen or more cabins in the valley, the majority within a few miles of the Pass. They were all unoccupied when we passed by.

Climate

The climate in the region of our reconnaissance appears to be one of generally low precipitation and varying winds. It is reported that strong winds are frequent along the Kachika in winter and that the depth of snow in the lower valley rarely equals, and seldom exceeds, eighteen inches. Above the Gataga the snowfall is greater and the snow is probably quite four feet deep at Sifton Pass toward the end of the winter. For many miles north of the Turnagain, as far or slightly to the north of Red river, the snowfall is probably about the same as that along the Kachika below the Gataga. The small sage, Artemisis Frigida, is abundant on many of the open hillsides and signs of wind erosion, usually associated with dry or semi-arid regions, are not lacking. North of the Red river, the precipitation evidently increases, and a depth of about three feet of snow is reported at the Lower Post, and for thirty miles or more to the south-east. The summer of 1939 was, we were informed, wetter than usual. There were thirteen showery days in July when we were between the Lower Post and the Turnagain, and fourteen in August, in the valley between the Turnagain and Sifton Pass. Never during these two months, unless at some time during the night, was the sky completely clear.

At midnight, on the 14th of July, at an elevation of about 3,000 feet, the temperature fell to 27 F., and at dawn on the 18th of August, at an elevation of about 2,500 feet, the temperature was 24. The highest recorded in July was 82, at noon on the 17th; the highest in August, 85 at noon on the 9th. Temperatures of between 50 and 60 below zero F. have been recorded in the winter time at the Lower Post. Winter prevails from the beginning of November to the end of March. As elsewhere, the seasons vary, but it is probable that there is but little snow left in the lower valleys by the end of April, and that it rarely falls to stay before mid-October. Dease lake is usually free of ice during the last week in May or the first in June, and the Dease, Liard and Kachika rivers early in May.

Fauna

The principal mammals found in this region are members of the bear and deer families. We saw only two or three black bears during the summer and no

grizzlies. The latter are probably fairly numerous in the mountains where one of their principal foods is the hoary marmot or whistler. Neither moose or deer are plentiful, owing, it is said, to the numerous wolves, which are reported to hunt in packs of a dozen or more individuals during the winter and to be a menace to the horses of the natives or others wintering in the region of the Kachika.

A species of woodland caribou has a wide range throughout this part of the Province. These animals are frequently found in small herds on the broader, plateau-like hills between the forested lowlands and the higher mountains. Mountain sheep (Ovis Stonei) and mountain goats are generally well distributed in the mountains on either side of the valley of the Kachika, though only a few were seen by the party during the summer. Most of the common fur-bearing animals are trapped in the district, but it is doubtful if they are abundant. They include lynx, marten, mink, fisher, foxes, wolverine, wolves, musquash and beavers. Signs of the last-named were quite numerous. Trout are fairly abundant in the streams and lakes.

Flora

The forest - nowhere of importance for export - consists of spruce, tamarack, pine, poplar, cottonwood, many varieties of willows and some birch. Down in the bottoms, on heavier soils, cottonwood of between thirty and forty inches in diameter are found. Spruce sometimes reach a diameter of two feet; pine rarely more than a foot or eighteen inches. At higher elevations, balsam firs are abundant, extending to timber-line, here at an altitude of about 5,000 feet. Tamaracks a foot in diameter are rare; eight to ten inches is their average size. In the vicinity of the Red river, it appears to take about sixty years for poplars to attain a diameter of six inches; cotton, seven inches; pine, nine inches; and spruce, eight inches. Their height then would average fifty feet. Prof. Davidson of the University of British Columbia, has kindly given the names of some of the species of plant life found along our route between the Lower Post and Sifton Pass. The list will be found at the end of this report.

Potatoes and other vegetables of the hardier variety are grown at the Lower Post and at Fort Ware, and no doubt could be grown in the valley of the Kachika below the Gataga. The agricultural possibilities, however, are so exceedingly limited as to be practically negligible. Horses can easily winter out on the lower Kachika and to the east of the Dease river, in the valley some distance above the confluence of the Blue, where the snowfall is light.

Transportation

The upper Liard river in British Columbia is usually reached by way of the Stikine river to Telegraph Creek, the motor road from there to Dease lake and by the Dease river. The Barrington Transport Company operate boats on the Stikine river, usually about three times a month from the middle of May to the middle of October. The motor road between Telegraph Creek and Dease lake, 72 miles long, is, for a frontier region, reasonably good, and the journey, either by truck or car, takes from six to eight hours. The voyage from Dease lake to the Liard, usually takes two days; the return journey, up-stream, three or four.

Air transportation is now frequently used both for passengers and freight. There is a small air field on the plateau above the Stikine at Telegraph Creek and in the winter time the mail is brought there by air from Atlin, two hundred miles to the north. Dease lake affords an excellent landing for planes, and the Dease river at McDames, and the Liard at the Lower Post are frequently used though the main landing for the Liard is at Watson lake, about twenty-five miles to the north-west of the Lower Post. This lake, situated about three miles north of the Liard river and reached by pack-trail from the Lower Post, is used by the Yukon-Southern Company's planes on their passenger and mail route between Edmonton and Whitehorse. They have a radio station there. Between the Lower Post and Sifton Pass planes can land at Fishing Lake, fifty miles from the Post; at Birch Lake, ten miles further to the south-east, and on a lake about eighty miles from the Post, and a hundred north of Fox lake, a good landing some forty miles from Fort Ware on the Finlay river, and about ten miles south of Sifton Pass. The Kachika, below the Gataga, might also be used

in case of emergency. The Finlay river at Fort Ware is the regular landing place for the plane carrying the mail twice a month to this place during the summer time, somewhat more than two hours' flight from Prince George on the Canadian National Railway.

Practically all freight and passengers for Fort Ware, the most northerly trading post on the Finlay river, are brought in by open boats from Summit lake via the Crooked, Parsnip and Finlay rivers; the only real obstacles to navigation being the shallows on the Crooked river and the rapids of Deserters Cañon on the Finlay about one hundred miles below Fort Ware. At low or medium stage of water, this cañon is easily navigated by the motored boats used on the river to-day. At very high water, however, freight may have to be taken across the half-mile portage, or transport delayed till the water drops. A motor road, thirty miles long, connects Prince George with Summit Lake.

The Liard river is used by trappers and prospectors between the Lower Post and the confluence of the Kachika, at medium or low stages of water. Navigation of this river, however, is in this section obstructed by the rapids of the Little Cañon, some thirty-five miles below the Lower Post, by whirlpools some four miles below this cañon, and by the Cranberry rapids where a mile and a half of rough water is reported some distance above the confluence of the Kachika. The Kachila itself is said to be free of rapids from where it enters its main valley,about five miles north of Sifton Pass and the Liard river. Boats have been built near the pass and the river successfully navigated, at a good stage of water, from there to the Liard. Above the Gataga river, which comes in from the east about sixty miles north of the Pass, it is full of driftwood and is locally called Driftpile river. This drift makes navigation somewhat hazardous,and fallen trees or sweepers, which may extend completely across the stream in its narrower parts, add to the difficulties. The Liard and Kachika rivers, therefore, afford doubtful means of transport to the central and upper part of the area between the Lower Post and Sifton Pass. It is one, nevertheless, that should be more fully investigated.

Little is known about possible navigation on the Turnagain which enters the Kachika about a hundred miles above the Liard. A tractor road has been

built from the southerly end of Dease lake to the headwaters of this stream where there are many lake expansions. Below these expansions, some of them suitable for plane landings, the streams falls about 1,200 feet on its way through tho Cassiar range to the Kachika, a distance of about one hundred miles. It is reported to be frequently c-nyoned, and it may be expected that navigation would be difficult.

Besides waterways and airways, there are various pack trails in the region. These trails are at present only suited for pack animals but they are usually well located and might, in some instances, be fairly rapidly and economically transformed into rough roads over which tractors could pass. Of these, the Davey Trail, which extends from the Lower Post to the Kachika river some five miles below the junction of the Turnagain is, as the plan shows, remarkably straight and a credit to its locator, Davey, who died at Fort Ware early in September at the great age of ninety or over. It is said that he was born in the Province of Quebec, and that he had lived in this part of the north for over seventy years. In winter dog teams are usually used for all transport. Very little freighting is done but planes can be and have been used and tractors were used last winter to haul machinery and heavy material to the mining camp at Boulder Creek on the Turnagain over the tractor road from Dease lake noted above.

General Description of the Country

This part of northern British Columbia is more or less of a mountainous character, the chief ranges being those of the Cassiar and Rocky Mountains where some of the higher peaks may attain an elevation of 9000 feet. The central portions of the Cassiar range contain belts of intrusive rocks, but their eastern flanks, probably consist almost entirely of sedimentary formations of argilites, quartzites, and particuarly limestones, abundant. The Turnagain and many of the small streams south of it coming from this range contain a great deal of lime, and small sloughs and ponds often have beds of calcareous mud two or more feet in depth above limestone boulders and

rubble. It seems probable, also, that similar formations are mainly present in the Rocky Mountains in this region and intrusive rocks almost, if not entirely, absent.

In the vicinity of the Liard and the lower Dease and Kachika rivers, the higher mountains are distant, and the country has the appearance of an undulating, densely wooded plateau, broken here and there by low, forested ranges or isolated hills. It is essentially a wilderness of which little is known and where people are few.

The drainage is to the western Arctic by way of the Liard and Mackenzie rivers. The Liard is a big river with its headwaters in the mountains in Yukon Territory. It averages seven or eight hundred feet in width from the Yukon boundary to the Dease, almost immediately below which it expands, is often half a mile or more wide, and generally full of islands to where it makes a big bend to the north about twenty miles below the Dease. At this bend it is apparently deflected by a low plateau of massive clay formation which rises precipitously for from two to three hundred feet above the water. The river here turns almost a right angle and a fair-sized stream, known as Twenty Mile creek, enters from the south through a wide gap in this low plateau. Hyland river, a large stream about the same size as the Dease, enters from the north about seven miles above the bend. At medium stage, the Liard may carry about twenty-five thousand feet a second above the Dease, and its current is about five miles an hour.

The Dease river has a northerly course from Dease Lake and for several miles is quite narrow and very crooked, many of the bends being remarkably sharp. The river, from many small tributaries, soon becomes larger, but the numerous bars, driftpiles and shoals are troublesome to the navigator. Further down are several rapids, all of which require care in navigating though none are particularly dangerous.

About ten miles below McDames Post, a trading centre on the left bank of the stream, and fifty or more below the lake, the river, which has so far followed a north-easterly course, turns abruptly to slightly west of north,

a direction it pursues for some thirty miles till, just to the east of the Cassiar range, it resumes its former course to reach the Liard thereby some thirty miles below. The stream, at an average stage of water, may carry from ten to fifteen thousand cubic feet a second.

The Kachika or Big Muddy river heads in the mountains far to the south of its confluence with the Liard. It is a big, dirty river with an average flow of perhaps twenty thousand feet a second. Its main tributaries are the Turnagain and Frog from the west, the Gataga from the east. The Gataga is a big, muddy stream and probably the principal cause of the sediment in the Kachika. The Turnagain heads in a high plateau country about fifty miles east of the southerly end of Dease lake, and flowing for a hundred miles or more north-easterly through the Cassiar range, joins the Kachika about a hundred miles above the Liard.

The Frog is much smaller, and rises in the high mountains of the continental divide far to the south-west of its confluence with the Kachika.

Description of the Route

The country in the general vicinity of the Lower Post is of an undulating, densely forested nature of somewhat low relief, the hills for many miles on either side of the Liard, not exceeding a few hundred feet above the river which, at the confluence of the Dease, is about 2000 feet or more above sea level.

From a high ridge to the south of the river, about a mile and a half from the Post, the Cassiar range is visible far to the south, and lower, isolated peaks and ranges far to the east and north. From another and higher ridge, some eight hundred feet above and just to the north of the river, very close to the boundary between British Columbia and the Yukon, high hills and low mountain ranges are visible to the west and north-west, where the country presents a similar, though somewhat rougher appearance, to that to the south-east. It was noticeable,moreover, when descending the Dease river, that the country for many miles above its confluence with

the Liard has, in general, the same characteristics as those already described and that the terrain through which the Blue river, some twenty-five miles above the Liard finds its way to the Dease from the north-west, appears to be low and probably favourable for economical highway construction.

Throughout this wooded, undulating country there are many small ponds, lakes, swamps and streams. The swamps on either side of the Davey Trail which, as already mentioned, pursues a remarkably straight course from the Lower Post to near the confluence of the Turnagain river with the Kachika, are rarely of any great extent and so situated in relation to gravel ridges and benches that they could be either entirely avoided or narrowly crossed by a highway located in the general vicinity of this trail. The swamps through which the trail passes usually have a firm bottom of gravel or small boulders about a foot below the surface and in only one instance did their crossing present any difficulty to our pack animals.

About thirty miles south-east of the Dease river, from a low ridge over which the trail passes, both the Cassiar and Rocky Mountain ranges are visible, ranges that become more evident as the traveller proceeds to the south-east till, near the Turnagain, the intervening valley may be said to form the northerly end of that celebrated physiographical feature, known as the Rocky Mountain trench, one that persists from this locality for nearly a thousand miles to the south-east, to within United States territory in Montana.

For many miles south-east of the Lower Post, as far as the Red river, 47 miles distant, the drainage is to the north-east and throughout this section the general character of the terrain hardly varies. It is more hilly to the west than to the east of the Davey Trail, and it is quite evident that a highway would be in the general vicinity of this trail which forms, therefore, an admirable base for a preliminary survey, which our rough traverse thereof should considerably facilitate.

About twenty miles from the Lower Post, the trail follows for over two miles what appears to be an old river channel which, where observed, has an

average width of about 1000 feet, and a general elevation of some 600 or 700 feet above the Liard river at the Lower Post. This old channel, where the trail follows it, has a direction somewhat south of east but turns to the north-east where the trail leaves it and it is probable that the small, five foot stream which meanders through it drains into Twenty Mile Creek, a stream that enters the Liard where that river turns abruptly to the north some twenty miles below the Lower Post.

It seems probable, also, that all the small creeks the trail crosses in this part of the plateau drain to Twenty Mile Creek, and as their distance thereto can hardly exceed ten or fifteen miles and they are here several hundred feet above the Liard, their fall, north of the trail, must be quite precipitous, indicating a very broken, gulch-ridden terrain in that direction. Twenty Mile creek itself, about forty feet wide at its mouth, enters the Liard through a deep gulch whose width is out of proportion to the size of the stream and it is just possible that the old channel, to which I have referred, may bear some relation to this condition.

It seems probable, also, that should the Blue river route be adopted, the location thereto would leave the Davey Trail in its vicinity.

If a definite limit can be set for the northerly end of the Rocky Mountain trench, a point where the valley ceases to be well defined, it might be placed where the Davey Trail crosses the Red river, about twenty miles north of the Turnagain, where the Red river itself turns somewhat abruptly to the north-east along the northerly limit of a high, wooded ridge which, up to that point, may be said to form the easterly side of the valley north the Kachika. At or near the Red river, too, the towering bulk of the Cassiar range swings to the west just as, twenty miles south of the Turnagain, the Rocky Mountains turn eastward.

The Red river itself is the only stream between the Dease and the Turnagain that could be called a river. It rises far to the west, in the ranges not far from the Dease river and pursues a very sinuous course in a wide valley, is swift and has above the trail an average width of about 100

feet. Near the trail it spreads out through many channels in a flood plain and it is reported to enter the Kachika about twenty-five miles below the Turnagain.

South of the Red river, the trail follows the easterly side of the valley, that is here about five miles wide, and the character of the terrain all the way to the Turnagain is very similar to that north of the river. In this section the valley contains two, low, wooded central ridges. The more northerly commences at the Red and parallels the valley for five or six miles, Fishing lake lying between it and the easterly side. This lake, over three miles long, half a mile wide and containing many small islands near its southerly end, appears to drain to the Red river, from which it is about three miles distant, by a small winding stream that perhaps reaches the river subterraneously for the confluence was not seen.

The trail hugs the easterly side of this lake for about two miles to follow across undulating side hills on this side of the valley and reach the Kachika, sixty-six miles from the Lower Post, with Davey creek which flows to the river through a narrow, precipitous defile at the north-easterly termination of the southerly of the two ridges noted above. This ridge is in the form of an ellipse with its long axis a diagonal to the valley; its southerly slopes fall to the Turnagain, its easterly to the Kachika. Its maximum elevation above the valley is about 400 feet, and on its westerly side, between it and the Cassiar range, is a string of lakes, the largest and most northerly of which we have called Birch lake. The lakes, which are remarkable for their rainbow colouring and beautiful situation, evidently drain into a tributary of Davey Creek.

From the Red river to the Kachika, the location of the highway would, in all probability, be very close to the pack-trail, swinging easily down on light grades round the north-easterly side of the southerly ridge to the low jackpine benches along the Kachika, which it would follow to the Turnagain.

The Turnagain, which is a large stream of the same order as the Dease, can be conveniently and economically crossed about two hundred yards above

its confluence with the Kachika. It is there about 250 feet wide. The Kachika is a much larger stream and between the Turnagain and the Davey Trail, five miles below, it is from 500 to 700 feet in width.

The Davey Trail ends at the Kachika,and the natives cross the river there to the well-used trail on its easterly side which extends to Sifton Pass and the Finlay river at Fort Ware, the trails on the westerly side of the river being but little used and more or less obliterated by windfalls and forest debris.

On account of the formidable crossing of the Kachika, however, we examined the westerly side of the valley to above the confluence of the Frog with the Kachika, for about six miles from the Turnagain and found the terrain on the whole more favourable than that to the north, and, in general, very similar.

About twenty miles south of the Turnagain, the Rocky Mountains sweep westward to within three miles of the Cassiar range, which is the general width of the intervening valley to above the Frog where it becomes much narrower, averaging hardly more than half a mile in width and sometimes not much more than a quarter its approximate size at Sifton Pass.

The scenery along this section of the route is bold and beautiful and should be a great source of attraction to motorists. Moreover the topography of the valley is such as to allow long tangents, easy grades and easy curves, conditions unusual when travelling through mountains and the more, therefore, enjoyable.

The route we blazed through this section of the valley is never far from the probable location of a highway and usually in its approximate position. On the whole the country is more open than that to the north and the clearing would be lighter.

Only two large streams enter the Kachika from the west between the Turnagain and the Frog. The first, which we called Moody Creek, is about twenty miles south of the Turnagain. It would be crossed just above where it commences to spread out in the lower part of the valley.

The second stream enters the valley about twelve miles below the Frog and its crossing is a more difficult matter than the first. After passing through the range, it is deflected sharply to the north by a rocky ridge parallel to the valley from which it frees itself by another sharp turn to the east to run, in seasons of flood, riotously across the valley to the Kachika. The estimated cost of this crossing is $25,000.00, and by careful location it should be sufficient.

It seems probable that it will be more economical to cross the Frog and Kachika rivers separately than the combined stream below the former, as the Kachika is there broken into many channels and no suitable bridge site was observed. Before this is decided,however, a careful survey will have to be made of this area and, if not suitable, it is probable that the Kachika (here called the Driftpile) can be economically bridged at a low rock canyon about three miles above the Frog. The location of this crossing, also, will depend on a further examination of both sides of the Kachika to a point about fifteen miles above the Frog, above which point the easterly side of the river is undoubtedly the better for on the west the country is often rocky and the topography considerably rougher.

The westerly side was examined for about twenty-five miles and a reasonably good location could be obtained for about fifteen, though a wide and rather deep ravine, showing evidence of ice pressure in winter - a succession of frozen overflows from its creek - might be expensive to negotiate. Apart from this and one big creek crossing, the terrain is generally favourable.

The distance between the Gataga and Frog, where they enter the Kachika, is about four miles, and the valley of the Gataga - diagonally across it where it joins the Trench - is fully seven. The Gataga itself hugs the northerly side of its valley, and the Kachika, here of a very winding character, is deflected to the west about three miles above the Frog, near the upper limit of the Gataga valley. The terrain on the easterly side of the Kachika, within the valley of the Gataga, consists of a series of gravel benches which

present little difficulty to highway construction.

Immediately above this valley on this, the east side of the river, the Trench narrows and the ground becomes broken and comparatively difficult, with many low ridges between which the drainage is frequently poor and there is some swamp and occasionally ponds or small lakes. The pack trail is here three or four hundred feet above the river, to which the ground falls in a series of benches.

Above, where the location will definitely be on this side of the river, the terrain is generally quite good. Three large creeks enter the valley on this side. They will have to be crossed where they leave the hillsides to debouch across the valley floor in wide, shallow, gravel-strewn beds.

The Kachika will be crossed again where it enters the Trench from the Rocky Mountains. From this crossing to and beyond Sifton Pass, five miles distant, the location will be about in the centre of the valley where, with the exception of half a mile or so of heavy sidehill work, construction should not be expensive.

As this report is accompanied by statements relating to bridges, culverts and probable quantities for approximately every mile from the Dease river to the Pass, it is not here necessary to discuss these details. It may be added, however, that gravel appears to be abundant along the entire route from the 60th parallel to Sifton Pass, and that the haul of this material for surfacing purposes will probably never exceed half a mile. Gravelly soils, indeed, predominate; the heavier clay soils, except in the lower areas, along creeks or river bottoms, are less in evidence. Barely a hundred stations of rockwork may be expected.

Summary and Conclusion

The reconnaissance shows that a good, generally economical route for a motor highway exists from the crossing of the Liard river at the lower cañon on the northerly boundary of British Columbia to Sifton Pass along, or very close to our line of traverse, a distance of very approximately 180 miles.

Two possible bridge sites were measured on the Liard, and two on the Dease. It is evidently more economical to cross the Dease and the Liard than to cross the Liard below the Dease where the length of span required would considerably exceed the combined crossings.

In order to avoid crossing the Kachika river below the Turnagain - a major crossing of about 600 feet - the location should hold to the west of the stream, anyway to above the confluence of the Gataga. The country on the easterly side of the Kachika is probably as favourable, or even more so, than on the west, but it would hardly make up for the extra cost necessitated by bridging it below the Turnagain, and the crossing of the Gataga - at least 175 feet - would about balance the crossing of the Frog and the Kachika above it.

It is more sunny on the easterly side of the valley, but as the location on the west side of the river will be more in mid-valley than close to the slopes of the Cassiar range, the difference in this respect should not be great. In any case, this section will get more sunshine and less snow than that above, towards Sifton Pass, where the valley is narrower and the snowfall greater.

Regarding the Liard river, it must be pointed out that it may not be advisable to cross this at the Lower Cañon at the 60th parallel; it may prove economical to keep on the southerly side of the stream far into Yukon Territory, but as the southerly boundary of that Territory was the northerly limit of our reconnaissance, we have no observed data on this question.

There is the question also of the Blue river route, which, as already noted, could conveniently leave the line of our traverse about twenty miles south of the Dease river and - assuming favourable terrain - reach the valley of the Liard about twenty-five miles above the Frances, to follow northerly along its valley and those of North river and Big Campbell creek to the confluence of the latter with the Pelly. Such a route might save twenty miles in distance over any other to this point, and perhaps bridging costs would be less.

In conclusion, then, there is little ambiguity regarding the location of a highway from Sifton Pass to a point some twenty miles from the Dease river, but from there north the location depends on the Blue river terrain within the Province of British Columbia and on that adjacent to it and the Liard in Yukon Territory.

ALASKA HIGHWAY

Liard River (Yukon Boundary) to Sifton Pass

(1)	Liard River	250' steel deck span - concrete abutments on solid rock -		
		Span	$ 97,000.00	
		Abutments	12,000.00	$109,000.00
(2)	Dease River	3, 110' H.T.spans on pile piers and 6 spans of trestle approaches -		
		3 spans at $9,000.00 each	27,000.00	
		102' trestles at $30.00	4,400.00	
		2 pile piers at $2,200.00	4,400.00	
		2 " " " 1,400.00	2,800.00	
			38,600.00	38,600.00
(3)	Red River	1, 110' H.T.span at $9,000.00	9,000.00	
		38' trestle at $30.00	1,140.00	
		1 concrete abutment	3,000.00	
		1 pile pier	1,200.00	
			14,340.00	14,400.00
(4)	Davey Creek	1, 50' King span	2,200.00	
		38' trestles at $30.00	1,140.00	
		2 pile piers at $800.00	1,600.00	
			4,940.00	5,000.00
(5)	Turnagain River	2, 120' H.T.spans at $11,000.00	22,000.00	
		51' trestle at $30.00	1,530.00	
		1 concrete abutment	4,000.00	
		1 pile pier	1,800.00	
		1 " "	1,600.00	
			30,930.00	31,000.00
(6)	Moody Creek	1, 110' H.T.span	9,000.00	
		170' trestles at $30.00	5,100.00	
		2 pile piers at $1,200.00	2,400.00	
			16,500.00	16,500.00

(7)	Denatiah Creek	1 120' H.T.span	$ 11,000.00	
		442' trestle at $30.00	13,360.00	
		2 pile piers at $1,200.00	2,400.00	
			26,760.00	$27,000.00
(8)	Hayes Creek	1 60' King span	2,500.00	
		68' Trestle at $30.00	2,040.00	
		2 pile piers, $800.00	1,600.00	
			6,140.00	6,200.00
(9)	Frog River	1, 125' H.T.span	11,000.00	
		68' trestle at $30.00	2,040.00	
		2 pile piers at $1,600.00	3,200.00	
			16,240.00	16,300.00
(10)	Kachika River	1, 120' H.T.span	11,000.00	
		2 concrete abutments	6,000.00	
			17,000.00	17,000.00
(11)	Two O'Clock Creek	1,60' King span	2,500.00	
		68' trestle at $30.00	2,040.00	
		2 pile piers at $800.00	1,600.00	
			6,140.00	6,200.00
(12)	Canary Creek	1,60' King span	2,500.00	
		68' trestle at $30.00	2,040.00	
		2 pile piers at $800.00	1,600.00	
			6,140.00	6,200.00
(13)	Wade Creek	1, 70' King Truss	3,000.00	
		102' trestle at $30.00	3,060.00	
		2, pile piers at $1,200.00	2,400.00	
			8,460.00	8,500.00
(14)	12' Creek	1, 60' King span	2,500.00	
		68' trestle at $30.00	2,040.00	
		2 pile piers at $800.00	1,600.00	
			6,140.00	6,200.00
(15)	Feathers Creek	1, 60' King span	2,500.00	
		68' trestle at $30.00	2,040.00	
		2 pile piers	1,600.00	
			6,140.00	6,200.00
(16)	Drift Pile Creek	1, 70' King span	3,000.00	
		102' Trestle at $30.00	3,060.00	
		2 pile piers at $1,200.00	2,400.00	
			8,460.00	8,500.00
Secondary Bridges		7 - 20' spans	3,000.00	
		1 - 25' spans	500.00	
		3 - 30' spans	2,000.00	
			5,500.00	5,500.00
		Portable Mill - delivered and assembled		11,000.00
				339,300.00
		Contingencies, 11 per cent		42,693.00
				381,993.00
		Practically -		$382,000.00

ALASKA - BRITISH COLUMBIA HIGHWAY RECONNAISSANCE, 1939

Memorandum on Secondary Structures and Culverts

Miles No	Bridges Common			Corrugated Iron Pipe						Wooden Box Culverts			
	20'	25'	30'	12"	18"	24"	30"	36"	48"				
1 - 5				5	5	1				1			
5 -10	1			14	10		1	1				1	
10-15	1			7	4								
15-20	1			11	6	1				1			
20-25				9	5		2				2		
25-30				6	3								
30-35				12	5						2		
35-40	1			6	1								1
40-45				8	2								
45-50				6	4		3						
50-55				9	5	1					1		
55-60				8	1					1			
60-65				10	2								
65-70				10									
70-75				10	1								
75-80				15	2	2							
80-85	1			6	4	1				1			
85-90				10	1	2				1	1		
90-95				4	4	1							
95-100	1			6	2					1			
100-105				10	1	3				1			
105-110			2	8	3	2					1		
110-115			1	6		4					1		
115-120	1	1		4	1	4		1					
120-125				8	1								
125-130				10	1	3							
130-135				13	3	1					1		
135-140				13	3	1							
140-145				13	3	1							
145-150				10	3	1	1			1			
150-155				12	2	1	1				1		
155-160				13	2	1	2				1		
160-165				12	4	2	2						
165-170				11	2	2		1			1		
170-175				10	2								
175 -				10	3	4	3				2		
				325	102	39	15	3		8	16	1	1

Total Lineal feet culverts required	Corrugated Iron Pipe			Cost per 30 lin.ft		Estimated Cost	
	12"	"	$11,750	12"	$60	12"	24,000.00
	18"	"	4,080	18"	90	18"	13,000.00
	24"	"	1,640	24"	120	24"	7,000.00
	30"	"	750	30"	140	30"	4,000.00
	36"	"	150	36"	170	36"	1,000.00

Wooden Box Culverts
Total lineal feet 200, 800, 50 and 50
Estimated cost of same $1000 and $5000

Total estimated cost : $55,000.00

Note: Figures compiled by K.Ford based on data collected by him recently on Columbia River Big Bend Highway construction.

Mile	Distance	Quantities	Clearing Grubbing	& Surfacing	T o t a l
1 - 63	63	655,000 at 62½	1,500.00	2,000.00	629,875.00
64	1	15,000 at $1.25	"	"	22,250.00
65 - 145	81	868,000 at 62½	"	"	826,000.00
146-147	2	30,000 at $1.25	"	"	44,500.00
148-151	4	40,000 at 62½	"	"	39,000.00
152	1	15,000 at $1.25	"	"	22,250.00
153-179	27	325,000 at 62½	"	"	297,625.00
					1,881,500.00
					$1,881,500
Less 7 miles 70,000 at 62½ plus Clearing, grubbing and surfacing					68,250.00
					1,813,250.00
					$1,813,250

Plus for Dease River to Lower Canyon on Liard, total 8 miles:

2 miles	40,000 yards at 62½ plus clearing, g and surfacing		32,000.00	
5 "	40,000 " " " "		42,500.00	
1 "	15,000 " " $1.25 "		22,250.00	96,750.00
				$1,910,000

Note: 62½ cents a yard is estimated for ordinary excavation; $1.25 a yard where 40 per cent is rock. (The rock appears to be generally of a schistose nature, comparatively easy to break)

Clearing is estimated for a 66 foot right-of-way; grubbing, 33 feet.

Excavation, clearing, Grubbing and surfacing	$1,910,000.00	
Bridges from previous page (as amended by A.L. Carruthers)	382,000.00	
Bridges and culverts, Liard and Dease Rivers	3,000.00	
Culverts	55,000.00	
		$2,350.000

This for 180 miles - $13,056.00

Note: The earthwork is based on a 30-foot, overall, roadway and a maximum grade of 6 per cent, estimated from two or more typical sections (half a mile in length) en route. It is considered that the above is a fair estimate of probable costs.
Some spruce in isolated patches is available and would be satisfactory for local lumber - camp purpos es, small structural timbers and piling. Such timber is found near Mile 42, near the confluence of the Kachika and Turnagain rivers, in the vicinity of Denatiah Creek and Frog River and other localities in the Trench. No amount for engineering services is included in the above figures. $100,000 for such services would bring the above total to say $2,450.000

Memorandum of Freight Rates

Telegraph Creek to Dease Lake (road)	3½ cents per pound
Dease Lake to Lower Post	6 " "
Prince George to Fort Ware	7 " " "

Passengers

Wrangell to Telegraph Creek - $30 up stream; $15 down stream

Telegraph Creek to Dease Lake $5

Dease Lake to Lower Post (up or down stream) $20

Pack and saddle horses at Telegraph Creek, $1.25 per day, fully equipped, usually with apparajos for pack animals.

Pack and saddle horses at Hudson Hope, Peace River or Stuart Lake, 75 cents to $1.00 per day; usually with pack saddles for pack animals.

Comparison of Prices at Telegraph Creek, Lower Post and Fort Ware

Commodity	Telegraph Creek	Lower Post	Fort Ware
Bacon per pound	.50	.80	.65
Beans "	.13	.23	.20
Butter "	.55	.65	.60
Coffee "	.55	.70	
Dried Fruit "	.30	.40	.35
Flour "	.07	.16	
Rice "	.10	.20	.17½
Salt "	.08	.20	.18½
Sugar "	.11	.20	
Tea "	.70	.90	
Gasoline, per gallon		1.50	

WEATHER REPORT - 1939

Date	Location	General Conditions	Wind	Temperature
June 15	Dease Lake	Fine, frost at night	S.W.	30 at 6 a.m.
" 16	"	Fine, warm		25 at 4 a.m.
" 17	"	Rain in p.m.		60 at 8 a.m.
" 18	"	Cloudy, showery, cool		54 at 7 a.m.
" 19	"	Clearing	North	55 at noon
" 20	"	Cloudy, cool		50 at noon
" 21	"	Rain	S.E.	60 at noon
" 22	Dease River	Fine, partly cloudy, cool		52 at noon
" 23	"	Rain. Cloudy to fine		60 at noon
" 24	Lower Post	Fine		45 at 7 a.m.
" 25	"	Showery		52 in a.m. and p.m.
" 26	"	Fine, warm, showery		52 in " "
" 27	"	Showery		60 at noon
" 28	"	Fine. High wind	E.	65 at noon
" 29	"	Fine. High wind	E.	72 at noon
" 30	"	Rain		52 at 8 a.m.
July 1	Lower Post	High wind. Rain	W.	40 at 8 a.m.
" 2	"	Fine. High wind	W.	50 "
" 3	"	Rain		50 "
" 4	"	Fine		52 "
" 5	"	Fine		52 "
" 6	"	Showery		52 "
" 7	"	Fine to rain		50 "
" 8	"	Fog. Heavy dew		45 "
" 9	"	Fine		55 "
" 10	12 Miles S.E.	Fine. Cloudy		56 "
" 11	"	Showery		58 at noon
" 12	"	Showery, windy	S.E.	58 at noon

Date	Location	General Conditions	Wind	Temperature
July 13	29 Miles S.E.	Rain to Fine		33 at 10 p.m.
" 14	"	Cloudy to fine		27 at midnight
" 15	37 " S.E.	Showery		47 at 6 a.m.
" 16	Red River	Fine. One shower		48 at 6 a.m.
" 17	"	Fine		82 at noon
" 18	"	Cloudy to fine		
" 19	54 Miles S.E.	Fine. One shower		50 at 6 a.m.
" 20	"	Fine. Cloudy		86 at 2 p.m.
" 21	"	Fine	E.	52 at 7 a.m.
" 22	"	Fine. Sultry		54 at 8 p.m.
" 23	"	Cloudy. Windy. Fine	S.W.	65 at noon
" 24	Kachika River	Cloudy. Showery	W.	52 at 8 p.m.
" 25	Chee House	Fine		54 at 7 a.m.
" 26	"	Fine		44 "
" 27	"	Fine		48 "
" 28	"	Fine to cloudy		45 "
" 29	"	Cloudy, one shower		50 "
" 30	"	Showery		60 at noon
" 31	"	Cloudy		45 at 7 a.m.
August 1	Chee House	Cloudy. Windy	W.	45 at 7 a.m.
" 2	"	Cloudy, fine		52 "
" 3	"	Partly Cloudy		44 "
" 4	6 miles south	Fine, windy		38 "
" 5	"	Cloudy, one shower		42 "
" 6	"	Fine, partly cloudy		60 at noon
" 7	12 "	Partly clear,fine and warm		38 at 6 a.m.
" 8	20 "	Fine		45 at 6 a.m.
" 9	"	Fine, warm		85 at noon
" 10	"	Fine, warm		80 at noon
" 11	25 "	Cooler.Thunder.Rain at night		47 at 6 a.m.

Date		Location	General Conditions	Wind	Temperature
August	12	25 miles south	Cold. Rain		42 at 6 a.m.
"	13	"	Rain to clear. Cool		42 at 6 a.m.
"	14	35 "	Showery and cool		37 at 6 a.m.
"	15	"	Showery, cool	S.E.	37 at 6 a.m.
"	16	40 "	Showery, windy, cool		42 at 6 a.m.
"	17	"	Showery and cool		60 at noon
"	18	"	Showery to fine		24 at 4 a.m.
"	19	"	Showery, windy		52 at 6 a.m.
"	20	"	Fine; one shower		
"	21	"	Fine		48 at 6 a.m.
"	22	48 "	Fine. Cool		48 "
"	23	60 "	Fine. Cool		
"	24	"	Showery, cool.		42 at 6 a.m.
"	25	Frog River	Showery, cold		54 at noon
"	26	"	Fine		34 at 6 a.m.
"	27	"	Fine		25 at 6 a.m.
"	28	"	Fine		32 at 6 a.m.
"	29	13 miles south	Cloudy, calm		38 at 6 a.m.
"	30	26 " "	Cloudy, rain at night		42 at 6 a.m.
"	31	" "	Cloudy, fine		36 at 6 a.m.
Sept.	1	36 miles south	Cloudy; rain in p.m.		30 at 6 a.m.
"	2	48 " "	Cloudy, showery		45 "
"	3	Sifton Pass	Cloudy, showery	S.E.	30 "
"	4	" "	Cloudy, showery		34 at 6 a.m.
"	5	Fox Lake	Cloudy to fine		28 at 6 a.m.
"	6	Fox Pass	Showery, cold		25 at 6 a.m.
"	7	37 miles south of Sifton Pass	Fine, windy	S.W.	36 at 6 a.m.
"	8	Fort Ware, Finlay River	Fine, partly cloudy		25 at 6 a.m.

Notes on Bird Life

Many varieties of birds were observed during the summer. Of the wild-fowl, loons (the Great Northern Diver), snipe, plover, Canada geese, many kinds of ducks and a few herring gulls and terns were seen. A few geese evidently nest in the region.

Owls do not appear to be plentiful and we seldom heard and rarely saw them, but there are some Golden Eagles, many sparrow hawks, some marsh hawks and a few falcons - probably the peregrine. We saw, I think, one osprey. American crows and ravens are fairly numerous.

Willow grouse and spruce partridge are common, though not particularly plentiful, and ptarmigan are found on the higher levels.

Of the smaller birds, we saw robins, red-winged blackbirds, cow birds, woodpeckers, flickers, varied and olive-backed thrushes, northern wrens, juncos, American water-ouzels, sparrows, western tanagers, yellow warblers, night-hawks and two or more flocks of cedar waxwings, one flock near the Lower Post early in July. Canada jays (whiskey jacks) of course are numerous, and so were the bank swallows which were busy nesting under the eaves of buildings at McDames and the Lower Post.

List of Plants from Liard Basin, 58-60 N.Lat; 127-130 W.Long.

Lower Post - Liard River to Sifton Pass

Achillea Millefolium	Galium Sp., Boreale	Pyrole Chlorantha
Allium Schoenoprasum	Gentiana Propinqua	Rosa. Sp.?
Anemone Multifida	Larix Americana	Rubus Arcticus
Aquilegia Brevistyla	Ledum Groenlandicum	Saxifraga Tricuspidata
Arnica Sp.?	Linnaea Borealis	Senica. Sp.?
Artemisis Frigida	Lonicera.? Lupinus	Solidago Elongata
Astragalus Sp.?	Lupinus	Tofieldia Intermedia
Campanula Rotundifolia var.	Mertensia	Vaccinium Oreophyllum
Delphinium Sp.?	Oxytropis Monticola	Vaccinium Vitis-idaea?
Erigeron Compositus	Polemomium Coeruleum	Viburnum Pauciflorum
Eriophorum	Potentilla Fruiticosa	Zygadenus Elegans.

Note: The names of the above plants were kindly given by Prof. J.Davidson, Associate Professor of Botany, University of British Columbia.

List of Plans Accompanying Reconnaissance Report by E.Lamarque

1. Plan - Northerly end of "B" Route - scale 16 miles to 1 inch

2. Plan of Upper Liard River and adjacent territory - scale 16 miles to 1 inch

3. Plan of Lower Post and vicinity - scale 2,000 feet to 1 inch

4. Map of reconnaissance survey, "B" Route, Liard river to Sifton Pass - four miles to 1 inch

5. Plan of Fort Ware to Caribou Hide - scale 4 miles to 1 inch

6. Sample topography and location near Mile 12

6a. Sample cross sections for above

7. Sample topography and location near Sifton Pass

7a. Sample cross sections for above

8. Trail traverse, Lower Post to Sifton Pass - 1,000 feet to 1 inch.

Note. Some fifty photographs also accompanying the Report are filed with the records of the British Columbia - Yukon - Alaska Highway Commission.

REPORT TO THE PUBLIC WORKS DEPARTMENT OF BRITISH COLUMBIA ON RECONNAISSANCE SURVEY ON PORTION OF BRITISH COLUMBIA - YUKON - ALASKA HIGHWAY BETWEEN MANSON RIVER, NEAR FINLAY FORKS AND SIFTON PASS, B.C.

By J.M.Rolston

Finlay Forks, B.C.

Situated at the intersection of the 124th meridian with the 56° parallel of latitude, at an elevation of 1920 feet above sea level, the Finlay river flowing south-easterly meets the Parsnip river flowing north-westerly, together forming the Peace river. The Manson river from the west also joins at this point.

The valleys of these three rivers form a basin drained by the Peace river which breaks through the Rocky mountains at this point to the east.

The valleys of the Parsnip and Finlay rivers occupy the Rocky Mountain trench.

Finlay river

The Finlay river, rising in the Coast Range, flows easterly and enters the Rocky mountain trench at Fort Ware, where it joins the White river from the east. From Fort Ware to Finlay Forks, a distance of 130 miles, the Finlay river occupies, with its bends and high water channels a strip about one mile wide - bordered on each side by benches gradually sloping upward to the base of the mountains forming the Rocky mountain trench.

The tributary streams (with the exception of the Inginika) joining the Finlay river in this section, are all glacial streams subject to violent freshets. In consequence the junction of these streams with the Finlay river are spread out into various channels choked by log jams. In fact, the channels of Finlay river and all its tributaries are subject to change at each high water; the silty banks caving in and causing the timber to form fresh jams. Bridging will therefore be one of the principal items of the estimate of cost.

Alternative Routes

The Rocky Mountain trench between Finlay Forks and Fort Ware is about six miles wide, with the Finlay river and its channels occupying the centre of the valley. It was at once apparent that both sides had to be closely examined to determine which side would form the better location for a road.

Method of Reconnaissance

In order to report on both sides of the valley, and obtain as far as possible quick and reliable information to be used as a cost basis, cross sections from known points on the Finlay River were taken about every three miles from the river to the higher benches. Objective points such as river crossings were determined and tied in by observation or measurements. This method was carried out between Finlay Forks and Fort Ware.

Fox River

From Fort Ware northerly the Rocky Mountain trench is occupied by the Fox river, rising in Sifton Pass, and joining the Finlay river at Fort Ware. Through this section, some forty miles in length, the valley is narrower, and the location could more easily be determined by running a traverse of the existing pack trail, tied in to known points, determined by triangulation.

Projected Location

From the information obtained a plan, one mile to the inch is attached, showing the position of what I consider the best location for a road on both the east and west sides of the Finlay river to Sifton Pass. Mileage is shown every five miles.

Commencement of Survey

The zero of the projected locations is near mile 46 north of the 55° parallel on the surveyed 124th meridian, on the northerly bank of the Manson river. From this point it is about twenty miles westerly up the Manson river to the constructed road to Fort St James. At mile 12 on the projected location, the routes to the east and west sides of Finlay river diverge. A description and estimate of cost of each route is as follows:

East Side Finlay River

Mile 0 - 12 High gravel ridges, covered with jackpines and spruce.

Mile 12 - 20 Gravel ridges sloping towards Manson river, which is crossed at mile 20. Heavy clearing in river bottom lands.

Mile 20 - 27 Follows gravel ridge bordering south side of Manson river, Finlay river crossing at mile 27. This point of crossing is the only one available, where the Finlay is in one channel. The width of river at this point, 1000 feet. Considerable protection work to banks will be necessary.

Peace River

Road Junction After crossing Finlay river to the north side, a proposed route along the north bank of the Peace river leads to the road system of Peace river.

Mile 27 - 44 The higher benches should be followed which afford light construction for several miles. At mile 44 the Ospika river (from the east) would be crossed. This river is a very swift glacial stream with innumerable channels near its junction with the Finlay. The bridge site is some three miles up-stream. Considerable protection work will be required to the banks to avoid undermining at high water.

Mile 44 - 56 Through spruce and jackpine flats mostly clay loam. In all spruce flats on the Finlay river considerable soft ground is met with, which will require corduroy foundation. Spruce flats generally border muskegs which will have to be avoided in location. Deadman's river is crossed at mile 56.

Mile 56 - 80 Dry gravel flats, mostly jackpines with occasional small creek crossings. Bridges will be required at Collins, Deer, Davis, and Shovel Creeks, but will not be expensive construction.

Fort Grahame At mile 80 Fort Grahame is reached. This Hudson's Bay Company post was established in 1890 as an outpost to Fort

St James. The post supplies and trades with about fifty Indians and a few white trappers. Trails from Fort Connolly on Bear Lake to Fort Nelson cross the Finlay at Fort Grahame. The trail of 1898 also joins the Finlay Valley here. At present Fort Grahame is a regular point of call for the air mail from Prince George.

Mile 80-107 In this five-mile section the Finlay river follows at the base of the mountain slopes on the east bank. At mile 110 Deserter's Canyon is half a mile long, and the Finlay river goes through a narrow gorge about 150 feet wide, with one hundred foot rock walls. The fall is about 18 feet and a run through the canyon in our fast river boats is an experience well worth having. This point would form one of the principal attractions for tourists on the route.

The location should follow close to the Finlay river, Mile 107 to 109, then grade up to get above the Canyon walls on a rocky bench. This section will have considerable rock work.

Mile 112-120 North of Deserter's Canyon the east side of the valley widens out again, and construction costs to the Akie river would be very slightly higher than those below the canyon. The location would follow the rim of a high bench which borders a big muskeg. At mile 113 Wedge Creek is crossed, requiring a hundred foot bridge and approaches. At mile 119 the Akie river is a formidable obstacle. Surveys were made here, and the only suitable crossing point found some distance up stream. This is a very swift glacial stream covering a large area with its various high water channels. Considerable approach and protection work will be required.

Mile 120-143 From the Akie river to Paul Creek at mile 143, good jack-pine flats and spruce flats can be obtained. No serious bridges are required. Some corduroy will be required across spruce

flats. At mile 143 Paul Creek is crossed close to its junction with the Finlay river. A 50-foot bridge will be required.

Mile 143-157½ The nature of the valley changes again at Paul Creek, and from this point to White river the Finlay river is at the base of high rocky side hills. The cost in this twelve miles will be heavy, to allow for considerable rock and corduroying work. At mile 155 the White river can be crossed in a canyon. A 300-foot bridge and approaches required. At mile 157½ the east route joins the west route at Fort Ware.

Fort Ware Fort Ware, like Finlay Forks, is situated at the junction of the Fox river and White river with the Finlay river. This is a Hudson's Bay Company outpost supplying and trading with about one hundred Indians and a few white trappers. The Finlay river enters the Rocky Mountain trench at this point while the White river, one of the largest tributaries of the Finlay, flows from the east. The Rocky Mountain trench with its wide valley carries on northwesterly over Sifton Pass, but is occupied by the Fox river from Fort Ware to Sifton Pass. A pack trail leads from Fort Ware to Telegraph Creek.

Estimate of Cost:

As a means of getting a comparative estimate of cost of the two routes, the following specifications were used.

Specifications:

Roadbed cuts	24' wide	Culverts	- pipe
" fills	22' wide		
" surface	20' wide	Surface	- gravel
Clearing	66' wide	Bridges	- steel and concrete
Grubbing	20' wide	Bridges (small)	- pile and frame.

Estimates of Cost:

Using specifications as shown, and quantities obtained from sample miles at various points, costs have been classified as follows:

Light construction, $10,000 per mile

Medium " $15,000 " "

Heavy " $25,000 " "

The above estimates do not include bridges of 50' and over, but include all small bridges and culverts.

Classification
Grading Surfacing Bridging
Manson River Mile 0 - to Mile 157.5 Fort Ware

Mile	Grading, Surfacing and culverts (miles)			Concrete and Steel Bridges Length of opening (feet)						Remarks
	Light	Medium	Heavy	50	100	150	200	300	400 1000	
0 - 12		12								
12 - 20		7	1			1				Bridge over Manson river
20 - 27		7								
27 - 28			1						1	Bridge, Finlay river
28 - 30	2									
30 - 33		3								
33 - 36		2	1	1						
36 - 40	3	1								
40 - 45	2	2	1					1		Bridge over Ospika river
45 - 50		5								
50 - 55	2	3		1	1					
55 - 60	2	3			1					
60 - 66	6									
66 - 70	2	1	1	1						
70 - 71			1		1					
71 - 76	4	1								
76 - 85		7	2	2	1					
85 - 90		4	1	2						
90 -100	6	3	1	2						
100-107	5	1	1	1						
107-114	2	1	4		2					
114-120	3	2	1					1		Bridge over Akie river
120-130	7	1	2	3						
130-145	10	2	3		1					
145-157½	2.5	2	8					1		Bridge over White river
Totals:	58.5	70	29	13	7	1		3	1	

58.5 miles of light construction at	$10,000 per mile	$ 585,000
70 " " medium "	" 15,000 " "	1,050,000
29 " " heavy "	" 25,000 " "	725,000
13 Bridges 50 feet long	" 10,000	130,000
7 " 100 " "	" 30,000	210,000
1 " 150 " "	" 50,000	50,000
3 " 300 " "	" 100,000	300,000
1 " 1000 " "	" 500,000	500,000
Cost East side on 157.5 miles - Manson River to Fort Ware, $3,550,000.		3,550,000

Route on West side of Finlay River

Manson River to Fort Ware

Mile 0 - 30 The route selected follows close to the surveyed line of the 124th meridian. There are several long moraines which can be used, giving an excellent location at about 2300 feet. Omineca river can only be crossed cheaply at Black Canyon, about three miles above its junction with the Finlay river. Below the canyon the Omineca breaks up into many high water channels. A 150 foot bridge would be required.

Mile 30-42 On high gravel and clay ridges which extend to the crossing of Cache Creek. The clearing would be heavy in places, and considerable corduroy would be required. There is a belt of good spruce available in this section. Cache Creek is a sluggish beaver stream which parallels the Finlay for about ten miles.

Mile 42-60 The location should follow gravel ridges and flats which are cut across by small ravines and creeks. Muskegs occur, which must be avoided. The clearing is fairly heavy through spruce.

Mile 60-75 The gravel flats give place to side hills on this section and the construction costs will be higher. Some rock work will be unavoidable.

Mile 75-80 Fort Grahame is at mile 75 on this route, and is described in the east route. Opposite Fort Grahame at mile 77, Ross Creek flows through a wide valley, and from mile 75 to mile 77 the construction will be heavy side hill work, grading down to the valley of the Finlay at Ross Creek. From mile 77 to mile 80 the work will be light.

Mile 80-92 From Ross Creek to the crossing of the Inginika river at mile 92, advantage can be taken of good gravel flats. At mile 90 an old waggon road leads up the Inginika valley to Inginika mines. These mines have been partially developed, but at present are shut down, only a watchman being at the mine. The Inginika river, which rises in large lakes, is a clear water stream, swift, but having good banks. A good crossing was found near the junction with the Finlay river. A 300-foot bridge will be required, with some protection work.

Mile 92-107 From the Inginika river north, the country flattens out into good gravel flats extending for 15 miles. The heavy work encountered on the east side route at Deserter's Canyon is completely avoided on the west side by using the high level benches.

Mile 107-120 From mile 107 to 120, the benches are more cut up by ravines and gulches. The best location would be to keep the grade above the level of the high cut banks on the Finlay river, which are characteristic of this section. Some of these cut banks are 300 feet high, of blue clay, and continuously being weathered and falling in. Good flats occur behind them, which can be utilized.

Mile 120-130 Rough benches and muskegs occur in this section, with considerable clay soil, which may require corduroy. Russell Creek is crossed at mile 130. The pack trail from Fort Grahame to Fort Ware crosses to the west side of the Finlay at Russell Creek.

Mile 130-151 A flat country with many lakes and large swamps and muskegs, which can be avoided by following the gravel ridges. Clearing

Mile 130-151 (continued) will be heavy, also corduroy and culverts. The Finlay river is reached at mile 149 (Fort Ware) and requires a three hundred foot bridge. Fort Ware has been described in the eastern route. Mile 151 of the western route corresponds to mile 157½ on the easterly route, being 6½ miles shorter.

Classification
Grading Surfacing Bridging
West Side of Finlay River
Manson River Mile 0 to Mile 151 Fort Ware

Mile	Grading, Surfacing, Culverts (miles)			Concrete and Steel Bridges Length of opening (feet)						Remarks
	Light	Medium	Heavy	50	100	150	200	300	400	
0 - 30		30		1						
30 - 31			1			1				Bridge over Omineca river
31 - 50	10	7	2	3						
50 - 60	4	6		2						
60 - 70	3	3	4	4						
70 - 80	2	3	5	3						
80 - 92	5	5	2	2				1		Bridge over Inginika river
92 - 100	8			1						
100- 110	8	2								
110- 120	2	2	2		1					
120- 130	2	6	2	2	1					
130- 140	3	3	4	2						
140- 151	6	4	1	1				1		Bridge over Finlay river
Totals	53	75	23	21	2	1		2		

Estimate of Cost:

53 miles of light construction at	$10,000 per mile	$ 530,000
75 " " medium " "	$15,000 " "	1,125,000
23 " " heavy " "	$25,000 " "	575,000
21 bridges 50 feet long	$10,000	210,000
2 " 100 " "	$30,000	60,000
1 " 150 " "	$50,000	50,000
2 " 300 " "	$100,000	200,000
Cost on West side, 151 miles, Manson river to Fort Ware, $2,750,000.		$2,750,000

Fort Ware to Sifton Pass

Mile 151 to Mile 191

Mile 151-160 The first seven miles is across a flat gravel plateau lightly timbered with jackpine on the east side of the Fox river. At mile 160 it is proposed to cross the Fox river to the west bank to avoid some heavy side hill work on the east side. A bridge of 150 feet would be required.

Mile 160-167 The benches on the west side are followed but at mile 167 the Fox is again crossed above the junction with the east fork. It is to be noted that the East Fork is really the principal stream; above its junction the Fox river is only a small stream. The Fox is navigable by river boats up to the East Fork at anytime except low water.

Mile 167-173 Between the two branches of the Fox there is a good gravel ridge which should be followed to mile 173 to avoid large muskegs. At mile 173 is a large Indian encampment. The east fork swings east out of the Rocky Mountain trench.

Mile 173-191 The valley gradually narrows towards the height of land at mile 191, and some side hill work and a good deal of corduroy will be necessary. Sifton Pass is a swamp half a mile in width. Just north of the summit the branches of the Kachika river rise and flow northwards.

At Sifton Pass my work and report joins that of Mr E.C.Lamarque.

Classification
Grading Surfacing Bridging
Fort Ware to Sifton Pass
Mile 151 to Mile 191

Mile	Grading, Surfacing, Culverts (miles)			Concrete Steel Bridges (feet)			Remarks
	Light	Medium	Heavy	50	100	150	
151-157	6						
157-160		2	1	2		1	Bridge over Fox river
160-167	2	4	1	2			
167-175	2	4	2	1			
175-180	3	2					
180-191		10	1	3	1		Bridge over Fox river
Totals	13	22	5	8	1	1	

Estimate of Cost:

13 miles of light construction at	$10,000 per mile	$130,000
22 " " medium "	15,000 " "	330,000
5 " " heavy "	25,000 " "	125,000
8 bridges 50 feet long	10,000	80,000
1 " 100 " "	30,000	30,000
1 " 150 " "	50,000	50,000
		$745,000

Cost, Fort Ware to Sifton Pass,

forty miles, $745,000.

Estimate of Cost:

Manson River Mile 0 to Sifton Pass Mile 191
Via Finlay Forks and East Side of Finlay River

Manson River Mile 0 to Fort Ware Mile 157.5	$3,550.000
Fort Ware Mile 151-157.5 to Sifton Pass Mile 191	745,000
Add for engineering and contingencies	500,000
Total cost, 197.5 miles	$4,795,000

Manson River Mile 0 to Sifton Pass Mile 191
Via West side of Finlay River

Manson River mile 0 to Fort Ware Mile 151	$2,750,000
Fort Ware Mile 151 to Sifton Pass Mile 191	745,000
Add for engineering and contingencies	440,000
Total cost, 191 miles	$3,935,000

Comparison of Routes:

Cost via east side of Finlay river, 197.5 miles	$4,795,000
Cost via west side of Finlay river, 191 miles	3,935,000
Difference in favour of west side	$ 860,000

The west side of the Finlay river as shown on the map is therefore considered the better route to locate, as in addition to being shorter and cheaper, I consider that the rivers crossed on the west side of the Finlay are more easily bridged and are not subject to extreme freshets. The east side rivers, including the Finlay at Finlay Forks, will require a great deal of protection work at bridge sites as they are all glacial streams and very swift. The Omineca river, which is the worst on the west side, has a good bridge over Black Canyon.

It must be pointed out, however, that Mile 0 to Mile 27 of the easterly route would form a part of a road to the Peace river. The estimated cost of this 27 miles in these estimates is $750,000.[1] It would appear therefore, that this amount would be a saving to the Government of British Columbia if the Peace river road is considered.

Note. 1. $965,000. Arthur Dixon.

Insofar as the British Columbia - Yukon highway is concerned, the better side of the Finlay river is the west side.

Natural Resources

Agriculture

At present very little farming has been attempted in the Finlay valley. At Finlay Forks there are good gardens, and also at Fort Grahame. Potatoes are grown successfully at Paul Creek. There are quite large areas of very good bottom land, covered with poplar and small willow, growing good summer feed for stock, occurring between Fort Grahame and Paul Creek, while Indian garden patches were noticed all the way up the Finlay.

It is quite possible that experiment would prove that a considerable area of good agricultural land was suitable for mixed farming. Pack horses are wintered successfully all through the valley.

Minerals

Silver lead properties have been held by location for a number of years in the lower Omineca river. A mica deposit has been worked at Fort Grahame.

A few miles up the Inginika river, the Inginika mines spent a large amount on development work, but at present are closed down.

On Wedge river a very large ledge of copper is reported, with considerable work done on it.

Cost of freight in and out of the Finlay has been the main handicap to development. More extensive prospecting might uncover some good properties. Freight rate at present on supplies from Prince George are five cents per pound at Finlay Forks, rising on a general scale to eight cents a pound at Fort Ware. This high cost of freight prohibits the average prospector from exploring the mountains bordering the Finlay river.

Timber

Spruce up to 12 and 15 inches in diameter is plentiful, but is of inferior quality. Large cottonwoods up to 24 inch diameter are found in the river flats. There is a small sawmill working at Finlay Forks, cutting only sufficient for local requirements.

Game

Although moose are very plentiful in the Crooked and Parsnip river valleys, they are scarce in the Finlay valley, due to the large number of wolves. Cariboo are very scarce, only one being seen during the season.

Fur of all descriptions seems to be plentiful, there being about twenty trappers in the Finlay who make about $500,00 each during the season.

Weather

The weather during the three months spent in the Finlay river valley was very wet. Forty-five days' rain were noted, which is phenomenal for that area. Rivers continued high during July and August.

Snowfall

From information received from game officers and trappers, snowfall in the Finlay valley is not heavy; about three feet of snow on the ground is the usual amount during an average winter. During the winter of 1939, snowfall was particularly heavy, having seven feet at Summit Lake and about the same in Sifton Pass.

Engineering Work done on the Finlay River Reconnaissance - 1939

Compass chain	75 miles	Cross section
" page	80 "	" "
Transit sladia	21 "	River crossing

Total mileage covered by report - 350 miles.

Party Employed:

W.E.Warburton, Assistant Engineer
H.C.Kinghorn " "
2 rodmen
2 boatmen
1 cook

Equipment

2 river boats, 38 feet long
2 24 h.p. P.Kickers
1 sending and receiving radio
1 transit
1 camera
Survey equipment

Time in field work - three months.

Note: The panoramic views referred to in this Report are filed with the records of the British Columbia - Yukon - Alaska Highway Commission.

Before closing this report, I would like to record the good work done by my assistants and men. Field work was arduous at all times, due to wet weather and to heavy undergrowth which had to be gone through, but in spite of this, a very large area was covered in the short time at our disposal.

Photographs

Photographs shown in this report of panoramic views taken from high points in the mountains, were obtained through the courtesy of Mr Norman Stewart and Mr Jackson of the Photo Topographic Survey, who were working in the Finlay Valley.

SUPPLEMENTARY ESTIMATE

Mile 0 - Mile 191 - British Columbia - Yukon Highway
Manson River to Sifton Pass

Increase in cost of roadbed construction due to widening from 24 to 28 feet in cuts	
On 66 miles of light construction at $10,000 per mile Add 10 per cent, or $1,000 per mile	$ 66,000.00
On 97 miles of medium construction at $15,000 per mile Add 15 per cent, or $2,250.00 per mile	218,250.00
On 28 miles of heavy construction at $25,000.00 per mile Add 20 per cent or $5,000.00 per mile	140,000.00
Gravel	
Extra cost of 24-foot wide gravel instead of 20' wide - $370.00 per mile on 191 miles	70,670.00
Hard Surfacing	
Based on estimate of $6,000 per mile at Prince George Add to above, freight $2,000.00 per mile - Total surfacing cost, Manson river to Sifton Pass - 191 miles at $8,000.00	1,528,000.00
T o t a l	2,022.920.00

(Signed) J.M.ROLSTON

Note re Surfacing by Arthur Dixon: I consider the estimate for surfacing to be inadequate. The Surfacing Engineer has gone into the question in detail and is assured that the cost will not be less than that shown in his report.

Atlin Electoral District 13

British Columbia - Yukon - Alaska Highway Reconnaissance - August to November, 1939.
by T. E. Clarke.

ROUTE NUMBER 1.

Datum - sea level. Elevations taken by Aneroid readings checked from base station, or average of two days' readings. Costs estimated at Southern British Columbia costs plus 50% for a twenty-four foot road, sixty-six foot clearing, and gravel surfacing, where necessary.

From Atlin, at an elevation of 2,240 feet, Mile 0 for 26.5 Miles south-easterly on the existing O'Donnell River Road to an elevation at Mile 26 of 3200 feet. Material: - earth, gravel and scattered solid rock points. Present width twelve feet, could be widened to twenty-four feet, grades and alignment improved for $10,000.00 per mile.

Mile 26.5 approximately along the existing trail crossing the O'Donnell River with a 60 ft. span to Dixie Lake, Bell, Thysen (locally called Paddy's) Lakes, and the telegraph line to above Nakina crossing, Mile 59 at an elevation of 3,300 feet; Bell, Thysen Lakes and above Nakina Crossing being the highest points at an elevation of 3300 feet. Material: earth gravel, boulders, and 25% black muck and gravel, and swamps. There is good drainage throughout the whole section. The timber is spruce and jack pine, mostly small and scattered. Estimated cost --- $15,000 per mile.

Mile 59 - On the northeast side of the Nakina River for ten miles, benches and sidehill, averages slop fifteen degrees to forks of Nakina and Little Nakina, Mile 69, at an elevation of 2550 feet at the Forks and crossing the Nakina with a sixty foot span. Materials: sand, gravel and short solid rock points; timber - spruce, jack pine and balsam, six to eight inches in diameter. Estimated cost ..... $20,000 per mile.
One half-mile of rock work on north-west side of Little Nakina at Forks.
Estimated cost .....$30,000 per mile.
Mile 69.5 - Up Little Nakina on northeast side for 19.5 to headwaters lake on telegraph line, Mile 89; at an elevation of 3,100 feet, the summit between the Nakina and Nihlin Rivers. Three miles sand, gravel and scattered rock points. Estimated cost.....$15,000 per mile
and 16.5 miles on sand and gravel benches.....est. cost $ 7,000 per mile.
One forty foot span.

The valley is one half to one mile wide, good grass, and scattered clumps of Jack Pine and Poplar.

Mile 89 - Approximately following telegraph line, down North Fork of Nihlin to elevation of 2200 feet and up Nihlin River to bench above Nihlin telegraph station, Mile 121, at an elevation of 3000 ft. Material: earth, gravel, short solid rock points and swamps; benches and side hill. Spruce, Jack Pine and Poplar; in river bottom scattered Spruce up to thirty inches. Estimated cost -------$15,000 per mile, and one forty foot span.

Mile 121 - Up Nihlin and northwest Fork of Nihlin to Nihlin - Trail Creek (Tuya River drainage). Summit, Mile 157.5 at an elevation of 3,900 feet. The highest summit on this route between Atlin and the Stikine River. Material: sand gravel and short swamps; benches and side hill. Spruce, Jack Pine and Poplar. Estimated cost $12,000 per mile.

Mile 157.5 - Crossing Trail Creek, and down on benches on southwest side of Tuya River, down Tuya on benches on west side, one half to two miles back from river, to top of bank on north side of Mansfield (locally called Coal) Creek at Mile 193, at an elevation of 2,500 feet. Material: earth, gravel and 15% of black muck and swamps. Spruce and scattered Jack Pine. Estimated cost ----------$15,000 per mile.

Mile 193 - To top of bank on south side of Mansfield Creek, Mile 195, at an elevation of 2,500 feet. Water level of Creek 2,000 ft. This Creek is 500 ft./below the benches on either side, this depth does not change much in the next eight to ten miles up. Sides of valley: earth, clay and gravel; some short slides. Average slope is 20 degrees. Spruce and poplar. Estimated cost ----------$18,000 per mile. one forty foot span.

Mile 195 - South to Clasey (locally called Grassy) Creek, Mile 201, two miles south of S.W.Corner Lot 5472, I.R.; crossing Creek at an elevation of 2,200 feet. Material: earth and gravel benches, burnt over. Estimated cost ----------$ 9,000 per mile.

Mile 201 - Down Classy Creek and on benches above Tuya River

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to existing Telegraph Creek-Dease Lake Road at Mile 18 from Telegraph Creek. Mile 211.5 at an elevation of 1,900 feet. Material: earth, gravel and short swamps, benches and side hill. Spruce, Jack Pine and Poplar. Estimated cost ----------$12,000 per mile.

Mile 211.5 - On existing road to twelve miles from Telegraph Creek and at the mouth of the Tahltan River. Mile 217.5 at an elevation of 1,000 feet. Material: earth and gravel benches and side hill. Jack Pine and Poplar. Estimated cost to improve grades and alignment ----$ 9,000 per mile.

Mile 217.5 to 218 - On existing road on lava beds and approach to proposed bridge. Material: Solid rock. Estimated cost-----$15,000 per mile.

Mile 218 - Crossing of Stikine River. Material: solid rock (lava shattered on north side, solid on south side). Present water level - 700' high water - 730'.

Elevation of deck	900'
Width at deck level	550'
" " H.W. "	250'
" " present " (Nov.20)	155'

Estimated cost ---------- $300,000.

On South side of Stikine River.

Mile 218 - Southerly up draw to Mile 220. Material: earth, gravel and scattered solid rock points; side hill average slope 30°. Estimated cost ---------- $20,000 per mile.

Mile 220 - South-easterly above river to Mile 222 at an elevation of 2,210 feet. Material: earth and gravel side hill, average slope 30°. Estimated cost ---------- $16,000 per mile.

Mile 222 - 225.5 - Days Lake at an elevation of 1,960 feet. Material: earth and gravel bench. Light Poplar. Estimated cost---- $ 8,000 per mile.

Mile 225.5 - 231 Southeasterly on bench on west side of Klastline River at an elevation of 1,780 feet. Material: earth and gravel bench. Light Poplar. Estimated cost ----------$ 8,000 per mile.

Mile 231 - 279 - Klappan River where trail crosses river south-east of Klappan Summit. (Distance scaled from map, covered by former reconnaissance).

The snowfall as given by trappers and settlers who have been there for some years, and checked, where possible, by information from two or

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three, is as follows:

Mile 0 -	Mile 49	Average Maximum	2 - 3 feet 5 feet,
Mile 49 -	MILE 190	Average Maximum	2.5 feet 3.5 feet
Mile 190 -	Mile 231	Average Maximum	15 inches, 2.5 feet

Light, dry snow.

Average year first snow to stay.....1st-15th November,

Heavier falls over by.....1st February

Snow mostly gone by.....15th April.

These records are of the snow as it is on the ground the latter part of February, and early in March.

The timber is scattered, and of no commercial value, except where near settlements for local use or for mining purposes.

Mile to Mile		Distance Miles	Estimated cost per mile		Cost.
0	26.5	26.5	$10,000		285,000.00
26.5	59	32.5	15,000		487,500.00
				One 60' span	4,600.00
59	69	10	20,000		200,000.00
				One 60' span	4,600.00
69	69.5	0.5	30,000		15,000.00
69.5	89	3	15,000		45,000.00
		16.5	7,000		115,500.00
				One 40' span	3,500.00
89	121	32	15,000		480,000.00
				One 40' span	3,500.00
121	157.5	36.5	12,000		438,000.00
157.5	193	35.5	15,000		532,500.00
193	195	2	18,000		36,000.00
				One 40' span	3,500.00
195	201	6	9,000		54,000.00
201	211.5	10.5	12,000		126,000.00
211.5	217.5	6	9,000		54,000.00
217.5	218	0.5	15,000		7,500.00
218				Stikine River Bridge	300,000.00
218	220	2	20,000		40,000.00
220	222	2	16,000		32,000.00
222	225.5	3.5	8,000		28,000.00
225.5	231	5.5	8,000		44,000.00
231	279	48	Covered by former reconnaissance		
					$3,319,700.00
			Minus Stikine River Bridge		300,000.00
					3,019,700.00

Average cost per mile (bridges included except Stikine River) - $13,072.00

ROUTE NO. 2.

Atlin Southeasterly to Dease Lake.

Datum and costs estimated as for Route No. 1.

Route No. 1, Mile 0 to Mile 183 equals Route No.2 to Mile 183.

From Route No. 1, Mile 183, on bench on west side of Tuya River at an elevation of 2,900 feet to top of bank on west side of Tuya River two miles north of West Fork of Tuya River, Mile 190, at an elevation of 2,800 feet. Material: earth, gravel and 15% black muck and gravel and swamp. Estimated cost ----------$12,000 per mile.

Mile 190 to bench at east side of Tuya River, Mile 193, at an elevation of 2,800 feet; crossing the Tuya with three sixty-foot spans at an elevation of 2,400 feet. Material: earth, gravel and clay, short slides and soft spots, side hill average slope 20 degrees.

River crossing - Tuya River:

Highwater to high water	180 feet,
Width at present water level (Oct.27)	100 feet.

River bottom and to above high water large boulders and gravel. Good approach on both sides. Bridge on existing road lower down has centre pier of rock-filled crib, which appears to have been there for years.

Timber - Spruce and Balsam. Estimated cost ---------$18,000 per mile.
Bridge ---------- 14,300.00.

Mile 193 - Easterly five miles to a point on the existing Telegraph Creek-Dease Lake Road, thirty-nine miles easterly from Telegraph Creek, - Mile 198, at an elevation of 2,400 feet. Material: earth, both gravel and clay. Timber - Spruce, scattered Jack Pine and Poplar. Estimated cost ----------$12,000 per mile.

Mile 198 - On existing road easterly for 31 miles to a point 70 miles easterly from Telegraph Creek and 3 miles west of Dease Lake - Mile 229, at an elevation of 2,500 feet. Material: earth, gravel, clay, short stretches of black muck and swamps. Timber: Spruce, scattered Jack Pine and Poplar. Estimated cost to improve existing road - $9,000 a mile.

Mile 229 - Up Tanzilla River and Gnat Creek, down Ptarmigan Creek, crossing Stikine River and up Klappan River to where trail crosses river southeast of Klappan Summit.

Route No.2, Mile 281 equals Route No.1, Mile 279. (Distance Mile 229-Mile 281 scaled on map. This has been covered by former reconnaissance.)

The snowfall as given by trappers and settlers who have been there for some years, and checked, where possible, by information from two or three sources, is as follows:

Mile 0 - Mile 49	Average	2 - 3 feet
	Maximum	5 feet
Mile 49 - Mile 198	Average	2.5 feet
	Maximum	3.5 feet
Mile 198 - Mile 229	Average	2.5 feet
	Maximum	3.5 feet

of light, dry snow. Average year first snow to stay - 1st to 14th November; Snow mostly gone by the 15th April. These records are of the snow as it is on the ground the latter part of February and early in March.

Mile	to Mile	DISTANCE MILES	Estimated Cost per mile		
0	183	183		Route No.1	$2,444,700.00
185	190	7	$12,000		84,000.00
190	193	3	18,000		54,000.00
				3 sixty ft.spans	-14,300.00
193	198	5	12,000		60,000.00
198	229	31	9,000		279,000.00
229	281		Covered by former reconnaissance.		
					$2,936,000.00

Average cost per mile (bridges included) to Mile 229 equals $12,821.00

There will be a difference in the cost of crossing the Stikine River; also Route No.2 has not the long grades in and out of Mansfield Creek and the Stikine River lower down that Route No. 1 has.

LINE " A ".

Down the White Swan Valley and through a low pass to the Little Nakina River.

From the south end of Gun Lake at an elevation of 3,100 feet, and three miles from Route No. 1, Mile 121 at Nihlin Station; for thirty-four miles to the North end of Lake Chismania at an elevation of 2,800 feet, and the beginning of pass to the Little Nakina with a summit of 3,000 feet. Thence ten miles southwesterly to the Little Nakina and Route No.1 at Mile 81.5.

A total distance of forty-seven miles against 39.5 miles by Route No.1.

The White Swan and Summit Valleys are from six to eight miles wide and full of lakes and low hills; the road would follow the side hill on the west side, at an estimated cost of $12,000 to $18,000.

I consider Route No.1 via Nakina and Nihlin Rivers a better and cheaper route.

LINE "B"

Leaves Route.No.1 at Mile 186, twentyfive miles southeasterly from Nihlin Station; thence fifty-eight miles southeasterly to the Telegraph Creek-Dease Lake Road, 18 miles from Dease Lake.

From Route No.1, Mile 186, at an elevation of 3,300 feet, seven miles easterly up a good valley to Summit Lake at an elevation of 3,500 feet, and the Nihlin-Tuya River summit. Estimated cost - $10,000 per mile.

Thence twenty miles easterly through a country of lakes, swamps and hills 200-400 feet high of earth, gravel and solid rock. Estimated cost $15,000 per mile. Thence down the bench on the east side of the Tuya for twelve to fifteen miles at an elevation of 3,600 to 3,300 feet. The Tuya River is 250 to 300 feet below this bench, which is mostly wet and swampy, with numerous creeks in deep valleys flowing into the River. The banks of the creeks and the Tuya are of scattered rock points and glacial mud, with numerous slides from top to bottom.

As I did not consider this a suitable country for highway construction if anything else could be found, and the travelling being very bad on these benches, we left them and travelled southeasterly over the mountains to the Telegraph Creek-Dease Lake Road.

T. E. CLARKE,
Reconnaissance Engineer.

REPORT ON A RECONNAISSANCE BETWEEN MOUTH OF GAFFNEY CREEK AND FINLAY FORKS - A DISTANCE OF 40 MILES - October, 1939. 14

by L. Keith.

This reconnaissance was undertaken in order to report on the country and indicate the choice of route for a road from Gaffney Creek, continuing the McKenzie Highway from that point to Finlay Forks.

It was apparent that this route of necessity must follow the Manson River for the first fifteen miles at least, follow very closely the course of the river itself. After examining both banks, the northerly and westerly bank was chosen, as on the whole affording more economical construction.

From there on two possible routes opened up -- the one approximately as I have indicated on the accompanying sketch, the other crossing the Manson River, say at a point near the intersection of the River and the 124th Meridian, thence following the course of the river to the east and approaching the Forks on the Ridge between the Manson and Parsnip Rivers. This entails a crossing of the Manson, and of necessity a crossing of the Finlay on river bottom land near the confluence of all the streams, thus being in danger of flood destruction during exceptionally high water conditions.

For these reasons I favour the route I have indicated. Also from near the crossing of Deep Creek, this location lends itself to a continuation in the future, north and westerly to the Black Canyon, on the Omineca and so north up the Finlay River.

Leaving the highway at Gaffney, the proposed location proceeds for some two and one-half miles on level gravel benches with light Jack Pine growth, then between the first and second creeks shown on sketch some fairly steep hillside is encountered, with a small proportion of loose rock. Between the second and third creeks crossed, some solid rock is encountered; it is impossible to avoid this rock, as to extent there are two stretches of say one quarter of a mile in length, mostly loose rock and some solid. From this point, that is the third creek crossing, for a distance of three miles to the creek crossing immediately south of Wilton Creek, the ground is mostly level and good material -- Jack Pine growth. From this last mentioned point, which is approximately

nine miles from Gaffney for a further distance of five miles the benches are broken, and about fifty per cent of the grading will be heavy side hill work, perhaps a small percentage of loose rock, also clearing and grubbing will be heavy. This takes us to the fourteen mile point. The next three miles to the crossing of Crescent Creek is high and dry bench, excellent material and light clearing, mostly Jack Pine.

Crescent Creek Crossing is, say, Mile 17, from this point to the Crossing of the Finlay River -- a distance of, say, 23 miles -- the greatest portion of the ground is perfectly flat, and follows the same bench to Deep Creek. The clearing is, on the whole, very light, though some very heavy windfall is encountered. The material is mostly white clay with gravel in places. It will be necessary to haul gravel some three or four miles in spots. The creek crossings are not difficult, say 5 - 50 ft. bridges being needed, other creeks and drainage being taken care of by small trestles and culverts.

I consider a point three miles west of the Meridian line on Deep Creek a control point, as nearer the Manson, clay is more in evidence and the creeks cut very deep.

The crossing as indicated at the Finlay I estimated as 970 feet, and a suitable location for either a bridge or a ferry, both banks being sound and above high water, a moderate current prevailing.

Over the entire distance, there is no grade problem, and a good general alignment should be procured easily.

L. KEITH.

ESTIMATE OF COST.

30 Miles - 1500 cubic y rds earth per mile	- 45,000 cu.yds @ 50¢	- $22,500.00
10 Miles - 3000 " " " "	- 30,000 cu.yds @ 50¢	15,000.00
1500 " " loose rock	1,500 cu.yds @ 75¢	1,125.00
400 " " solid rock	400 cu.yds @ $3.00	1,200.00
40 Miles clearing 54 ft. wide @ $400. per mile		16,000.00
40 Miles grubbing $300. per mile		12,000.00
Bridges - say 5 - 50 ft. Bridges @ $2,000.		10,000.00
say 15 small trestle spans and culverts @ $500.		7,500.00
Foundation excavation and Bridge fill - 3000 cu.yds.@ 75¢		2,250.00
Gravel - free haul 10,400 cu. yds. @ 40¢		4,080.00
overhaul - average 2 miles 10,400 cu.yds. @ 80¢		8,160.00
Engineering - Location		4,000.00
Supervision		3,000.00
	Total.....	$106,815.00

Total per mile $2,670

Estimate made from observations made during reconnaissance and consideration given to the necessarily high cost of transportation.

RECONNAISSANCE AIR SURVEY, PRINCE GEORGE TO DAWSON VIA PARSNIP AND FINLAY, SIFTON PASS, LIARD AND PELLY RIVERS

by

-J. H. Mitchell.-

Complying with your request contained in your wire of the 5th instant re my views and approximate cost of construction of the proposed Alaska Highway along the easterly route from Prince George to Dawson via the Parsnip, Finlay Rivers, Sifton Pass, Liard and Pelly Rivers, I beg to submit herewith a summary of my observations over this route traversed July 9th to 13th, 1939.

On one of the sketch maps being mailed you in connection with the westerly route from Hazelton, I have indicated with a blue dot-dash line the approximate route the alignment would traverse from a point below Finlay Forks to a point north of the British Columbia-Yukon Boundary on the Liard and Frances Rivers.

Not having traversed the section of the Parsnip River between Prince George and Finlay Forks, but from a study of the map, the country would appear to be the same as that section of the valley seen from a point where we crossed from Fort St. James to the Manson River and that part of the Parsnip below Blackwater Creek. If such is the case, I would consider the route from Prince George to Finlay Forks would be good road construction, the summit of the pass being low and the valley bottoms wide flat bench land. The location from Summit Lake would, I think, follow along the eastern side of the Parsnip to a suitable crossing of this river below the mouth of the Nation River. The reason for crossing to the west bank of the Parsnip will be dependent on whether a suitable crossing of the Peace or Finlay Rivers is available below or above Finlay Forks, as I consider that in following the Finlay the road location should follow the east bank of this river to Fort Grahame and Whitewater, to avoid crossing such large streams as the Omineca and the Ingenika, also to be on the east side of the Finlay so as to make suitable connection with any road system from Hudson Hope on the Peace.

The terrain along the east bank of the Finlay is generally fair road construction. Prints 3 to 12 indicate that, although the river flows more along the east side of the valley, there is considerable bench land

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along the valley bottom for favourable road construction, swampy sections being easily avoided. On the west side of the valley the bottom is wide and flat to Fort Grahame. Here it narrows down somewhat until Deserters Canyon is passed, opening up again slightly until the Paul River is crossed. From this point to Whitewater, and thence up the Fox River to Sifton Pass, the valley bottom is more confined and of a U shape showing numerous benches along the sides suitable for road construction.

From Sifton Pass, which is crossed at an estimated altitude of 3,000 ft., the route would follow down the east side of the Kechika River to a suitable crossing just above the mouth of the Gataga River, thence along the west bank to a suitable crossing of the Turnagain River a short distance above its junction with the Kechika. After crossing the Turnagain the line would follow across a flat plateau to a point near Lower Post on the Liard River, where it would follow the south bank of the Liard until the Dease River is crossed, a suitable crossing of which may be available two to five miles above its confluence with the Liard. Having crossed the Dease an early crossing should be made of the Liard to the north-east bank. This may be possible at the point called "Canyon" about ten miles above Lower Post. From this point north along the east bank of the Liard and Frances Rivers to a point near the outlet of Frances Lake suitable road material will be met with in following the flat bench land above the river flats. If possible a crossing should be made of the outlet of the east arm of Frances Lake and the north-east shore of the west arm followed to the head of the lake at the mouth of the Finlayson River. The north bank of the Finlayson would then be followed to the head of Finlayson Lake and the Bering Divide crossed at about 3,200 ft.altitude.

The terrain from the point of crossing the Turnagain River to the mouth of the Frances River is flat rolling plateau country, with numerous lakes and large streams all flowing into the Liard River. High mountain ranges are seen thirty miles to the southwest, lower ranges of hills to the northeast. From the confluence of the Frances and the Liard to the Bering Divide, the Frances and Finlayson valleys are more confined with low-lying hills about ten miles distant, and higher mountain ranges to the south.

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After leaving the Bering Divide, the road would follow the side of Campbell Creek Valley, crossing the Big Campbell some distance above its junction with the Pelly River, from which point the road would probably follow the south bank of the Pelly to a point twenty miles below Ross River Settlement.(1) Here it might be feasible to leave the valley of the Pelly and pass over a low divide to the headwaters of the Magundy River, which flows westerly to Little Salmon Lake. From here it may be possible to get through the country south of Glenlyon Mts. via Drury and Tatlmain Lakes to Pelly Crossing, where it would join the present existing Yukon road system to Dawson. This diversion would probably eliminate some heavy construction around the big loops of the Pelly seen in prints 55 and 56 and also the confined area below the mouth of the McMillan River at Granite Canyon.

Generally the country traversed down the Pelly may be considered fairly good road construction material, more confined than along the Liard and Frances Rivers. Good bench land is seen on the south side of the river, but the north slope runs down in many places close to the river bed, leaving less bench land suitable for road construction; further two large streams would be crossed if the north bank of the Pelly were followed, in the Ross and McMillan Rivers. However, a ground reconnaissance would have to determine the most suitable bank to follow.

Summarizing the foregoing, I may say I have no hesitation in stating that the route via the Parsnip, Finlay Rivers, Sifton Pass, Frances Lake and the Pelly River to Dawson would be the most economical of construction and maintenance. As the country traversed is mostly open, flat bush country there would be less precipitation than along the westerly route via the Skeena, Nass and Klappan Rivers to Atlin, and thence to Whitehorse and Dawson. A considerable distance of the westerly route follows narrow confined valleys between high mountain ranges where considerable sidehill work must be expected, and, from the timber growth in some sections, considerable heavy snowfall is indicated during the winter months, resulting in late spring run-off.

(1) See R. M. Martin's report on Pelly River route.

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The total distance of the easterly route between Summit Lake and Dawson is about 1,132 miles. The estimated cost for a 24 ft. gravelled highway through this country, which is less confined and more easy of access to bases of supplies, as many of the rivers followed are navigable for light draft freight boats for many miles, would run about $14,000.00 per mile, including bridges. This would make the estimated cost from Prince George to Dawson at around $16,000,000.00.

In conclusion I would suggest that careful consideration be given to both westerly and easterly routes outlined by the reports I have submitted. In the matter of costs it would be evident to the ordinary layman, who may have the privilege of reviewing the photographs taken over both routes, that the westerly route would be the more costly construction. This, at the same time, is not a matter only of present costs, but rather will the easterly or westerly route be the more suitable for a main trunk road that will be fed by an extension of other road systems from the east, northeast and west, which will eventually result from opening up country which for years has been the home of the prospector and trapper.

Jasper, Alberta,
October 11,1939.

RECONNAISSANCE AIR SURVEY, ATLIN TO FORT ST JAMES VIA WESTERN ROUTE

by 16

J. H. Mitchell

Complying with your request dated August 21st, 1939, I am returning herewith the 25 - 7 x 9 aerial photographs which were taken during the reconnaissance along the Western route of the proposed Alaska Highway between Atlin and Fort St. James. These prints have been checked over with my records of location, etc., and corrections made where any errors were evident. The information placed by the Canadian Airways was supplied at Fort St. James by me, and conforms very closely with the list mailed you August 8th. The following errors or omissions are given herewith:-

No. 1 - Above Pike and O'Donnell Rivers.
No. 9 - Junction Stikine, Tahlatan and Tuya Rivers.
No. 20 - Junction of Sustut and Skeena Rivers.
No. 21 - Over north end of Bear Lake, looking N.W. to Sustut River Valley, Bear River in foreground.

I also attach the two maps of the northwestern section of British Columbia on which I have indicated by a green dash line the route flown on the 15th, 16th and 17th of July, commencing at the south end of Bennett Lake, from which point I took off on the afternoon of the 15th, arriving at Atlin the same day. Due to weather conditions on the morning of the 16th the flight was postponed until the afternoon, when I continued the journey from Atlin, via the Pike and O'Donnell Rivers, Bell Lake, Nakina River headwaters, Prairie Lake to Dease Lake for the night, resuming the flight on the morning of the 17th from this point to Fort St. James. Aerial photographs were only taken at such points en route between Atlin and Fort St. James. Approximate photographic stations are indicated on the maps by a green triangle and arrow pointing in the direction of the landscape photographed.

I have also indicated on the maps in a blue dash dot line the most feasible route for a western location of the proposed highway from Tagish River outlet from Tagish Lake, the nearest point to present road system to the town of Atlin on Atlin Lake, and from this point to a junction with the Fort St. James - Manson Creek Road near Chuchi Lake and the Nation River.

Also I have indicated by a blue dash 2 dot line, where possible, alternative routes that might be given consideration when ground reconnaissance is contemplated. The first of these is shown to be from a point on the present tote road between Telegraph Creek and Dease Lake, near the Junction of the Tuya and Stikine Rivers, following the Klastline River, Eddontenajon Lake to a point on the Klappan River. The second of these alternative routes is from a point on the Kilankis River, following a route from the Skeena to Hazelton. The country that would be traversed on the Klastline section in the vicinity of its junction with the Stikine is quite rough, the rivers having cut deep canyons in the bottom of the valley, which is shown in prints 8 & 9. If these two prints are placed together where I have marked a cross, and No. 8 is held approximately 4 inches apart, a panorama view of the country northwest of the Stikine River is made taking in the Tahltan, Tuya and Tanzilla Rivers, with the Stikine flowing from right to left in the foreground. It is evident considerable heavy construction would be met with at this point.

Following the route of the Klastline about twelve miles above its junction with the Stikine the valley bottom flattens out and no great heavy construction is evident above the junction of Kakiddi Creek, shown in print 10. Typical country traversed from this point to the Klappan River is shown in prints 11, 12 and 13.

The country crossed by the alternative route between the Kilankis River, via the Skeena River, to Hazelton is clearly defined in print no.18, which indicates that the Skeena Valley is more of a V shape for some distance below the junction of the Kilankis. The timber growth is heavy spruce and pine. The ground slope would indicate that considerable side hill construction would be met with for at least thirty miles. The valley no doubt opens up from its confined traverse through the mountain ranges above the junction of the Babine River and the district north of Hazelton.

Resuming my aerial traverse from Tagish along Little Atlin Lake and the east shore of Atlin Lake to Atlin, no serious engineering difficulties would be met with. Heavy outcrops may be avoided when a ground

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reconnaissance is made. Leaving Atlin and following the O'Donnell River road to Dixie Lake, and thence via BellLake, Ruth Lake to the Nakina River, near the Nakina Cabin, print 2, taken about ten miles below Nakina Cabin, is typical of the terrain one will encounter when leaving headwater courses of streams flowing into the Pacific Ocean. In view of this, in making the aerial reconnaissance of 16th July, I left the proposed route at Nakina Cabin and followed the upper headwaters of the Hayes River, which flows northeasterly to the White Swan River and Teslin Lake. Print No. 3 shows this divide to the left of the view taken. Unfortunately visibility was not too clear at times due to rain squalls and detail is lacking in this print.

From Atlin Lake to Gun or Prairie Lake, and thence to a point on the Dease Lake-Telegraph Creek trail, is practically the same route as covered by Mr. J. C. Brady, District Engineer for the Province of British Columbia. Generally I agree with Mr. Brady that the route as indicated on the sketch maps is favourable for road construction, and swampy sections may be avoided by traversing the bench lands of the wide plateau between the headwaters of the Nakina and the crossing of the Tuya River. A low flat divide would be crossed between the headwaters of the White Swan River and a west branch of the Tuya. This divide is seen on the left of print 4, and may possibly be around 3,500 ft. elevation.

Continuing the traverse after linking up with the trail to Dease Lake the sketch map shows three possible routes to the Klappan River, besides the alternative via the Klastline previously referred to. Field reconnaissance would have to be made here to determine the most feasible. On print No. 5, in the lower right corner, may be seen a section of the Dease Lake telegraph trail, and about three miles above it are the tents of a road construction crew who, I understand, were grading a road to Hluey Lakes, or up the Gnat Creek, for the Public Works Department, who no doubt have location surveys and ground information of the section available.

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Prints Nos. 13 to 18 show the valleys of the Klappan, Nass, Kilankis Rivers and that section of the Skeena River below the junction of the Kilankis. They indicate that these rivers flow through flat U valleys with increasing timber growth as the Skeena is reached, evidence that increased precipitation may be met along the Skeena towards Hazelton on the alternative route south. Along this whole section from the Klappan to the Skeena construction would be generally fair, with no engineering difficulties. The summits crossed between the headwaters of the Klappan and Nass Rivers lie in a continuous trough, as do the Damdochax and the Kilankis. The elevation of these summits will probably be around 3,500 ft.

Following the route up the Skeena from the mouth of the Kilankis to the Sustut River and Bear Lake, then down the Driftwood to Takla Lake and via the Nation Lakes to a point on the Manson Creek Road, prints 19 to 23 indicate that the mountains flatten out and the valley bottoms are wide flat U shape to the head of Takla Lake. From this point along the shores of Takla Lake and Nation Lakes to the junction with the Manson Creek Road the terrain is hummocky, with numerous small lakes and rock ridges, with flat, probably swampy basins, between ridges. Generally the well defined water courses to the head of Takla Lake would be easy road location and construction. However, between the head of Takla Lake and the Nation Lakes construction would be more difficult and only a ground reconnaissance could determine the best route to close this link of the suggested location between the junction of the Kilankis and Skeena Rivers and a point on the Fort St. James-Manson Creek Road.

Summarizing the foregoing, I consider a feasible westerly route is possible from a point on the Carcross-Tagish trail to Atlin and thence south along the east shore of Atlin Lake following the O'Donnell-Dixie Lake trail to Bell Lake and the headwaters of the Nakina River, then up the White Swan Valley to the saddle between this river and the west branch of the Tuya to a point on the Dease Lake telegraph trail. Between this point and the Klappan River four possible routes are available, and only a ground reconnaissance could decide the most economical and suitable way to breach the rough country between the Tuya and the valley of the Klappan River. The Big

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Klappan and the Nass should be followed as the proposed route by Eaglenest Creek or the Little Klappan to the headwaters of the Skeena did not look favourable from the air. This is also the reason why I suggest the route via the White Swan River after leaving Nakina Cabin on the Nakina River, where the proposed location was to follow the telegraph line to the Nahlin Cabin and then south to the Tahltan and the mouth of this stream on the Stikine River.

At the junction of the Kilankis and the Skeena two ways are feasible -- one to Hazelton and the other to Manson Creek and on to Fort St. James. The latter would be much longer, but would possibly be the more suitable to link up with an extension of a road system extending west from Hudson Hope on the Peace River, via Findlay Forks and Manson Creek or the Omineca to Takla Landing. The distance between Tagish and Hazelton is approximately 640 miles, while the distance between Tagish and Manson Creek is about 680 miles. The estimated cost for a 24 ft. gravelled highway through mountainous country as traversed by the westerly route would run around $16,000.00 per mile, including bridges. Therefore, the estimated cost would not be less than ten or ten and one-half millions respectively.

From Tagish to Dawson the distance is approximately 435 miles and, at a cost of $16,000 per mile would make the estimated total figure from Hazelton to Dawson at about $17,000,000.00. A ground reconnaissance and location surveys would be the only means of determining cost factors. However, in view of the great distance of much of the proposed route from bases of supplies, construction costs might be somewhat higher than work we have undertaken in recent years where the section was only 18 ft. and construction workings not more than 70 to 80 miles from railhead.

In conclusion, I would suggest that further careful ground and aerial reconnaissance be made over the routes outlined on the sketch map before any location or construction work is projected, as these would provide more detail of ground conditions than one can observe from only one flight over unfamiliar territory.

Jasper, Alberta,
October 10, 1939.

REPORT ON SURVEY - WHITEHORSE TO WHITE RIVER.

By R.M.Martin 17

I beg to submit the following report on the reconnaissance survey I made between Whitehorse and the White River for the proposed British Columbia-Yukon-Alaska Highway.

I drove from Whitehorse to Kluane Lake by truck on August 11 and 12, following the surveyed trail marked on the map of the Yukon Territory 1936, and passing through Chambers' Ranch at Champagne and the F. Sketch Trading Post at Kloo Lake. The Jacquot Bros. Motor boat met me at Kluane Lake and took me to their ranch at Burwash Landing. The inspection of the west side of the lake was done on my return trip. I left Burwash Landing with a pack outfit and Tom Dickson as guide and followed the trail marked on the above mentioned map to a point four miles up Wolverine Creek on the west side of the Donjek River. Becoming discouraged with the country traversed since crossing Duke River, I returned to the Donjek and followed the river bars down to "Donjek Canyon" ten miles below the mouth of the Wolverine. This point is the most suitable crossing on the Donjek River and is on the north side of a valley which runs from Kluane Lake to the Lower Canyon on the White River. I could see through to the White River so I returned by following the edge of the valley in an easterly direction to "Kluane Canyon" on the Kluane River in order to avoid swamps, then going south 50 degrees East, to a point on the Duke River a mile below the trail. From there I followed the trail to Burwash Landing and arrived back at Whitehorse on August 23rd.

From the information I gathered on this reconnaissance trip, and from two previous years' experience in the Yukon, I have found that the following conditions should be considered in locating and constructing a highway:-

(1) Altitudes. Timber line in the Yukon is approximately 4,000 feet above sea level. High altitudes should be avoided. Snow comes a month earlier in the Fall and stays a month later in the Spring 1,000 feet above the valley. The

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snowfall is also heavier and is more inclined to drift.

(2) Perpetual Frost. Avoid heavy hillside work on frozen ground as they continually slide after the surface is stripped. Make fills over low frozen ground without disturbing the present insulation. The poplar tree grows only on thawed ground and is usually found on the lower slopes of the valley. The region of perpetual frost lies west of Kloo Lake.

(3) Seasons. Snow melts in the valleys between April 1st and 15th and road work could commence the 1st and 10th of May. The freeze-up comes between October 5th and 20th.

(4) Snowfall. The snowfall between Whitehorse and the White River does not exceed 2½ feet and is usually 1 to 1½ feet west of Kluane Lake. The Jacquot Bros. have 75 horses wintering on the range all winter. On the present trail above Bear Creek at an elevation of 3,200 the snow becomes 4 feet deep. The road would be open from December 1st to April 1st.

The route traversed from Duke River over to the head of Wade Creek and over the Donjek River to Tepee Lake by the pack trail is not suitable for a highway for the following reasons:-

(a) The trail climbs 1,100 feet in the first two miles, and the side hill is frozen gravel covered with moss and 6" spruce;

(b) in going over to the head of Wade Creek it is necessary to climb to an elevation of 4,400 feet above sea level;

(c) the country between Duke River and Wade Creek is frozen glacier gravel covered with grass and 'niggerheads';

(d) their is a drop of 1,200 feet in two miles to get to the mouth of Wade Creek;

(e) the Donjek River bed spreads out over a width of two miles from Wolf Creek (8 miles above the Wade) down to Wolverine Creek. The channels are changing every year. At the island just above Arch Creek at the present time the water is in small streams spread over 1,600 feet on each side of the island;

(f) the elevation between Wolverine Creek and Tepee Lake is approximately 3,300 feet above sea level.

I have made a projection on the accompanying map, which is herein described.

Commencing at Whitehorse with an elevation of 2,080 feet above sea level follow within a few hundred feet of the present trail to Canyon on the Aishihik River a distance of 84 miles. Thence N 80° W to the present bridge over Jarvis River. Thence follow within a few hundred feet of the present trail to Silver Bay on Kluane Lake. Thence follow edge of Kluane Lake on west side to Burwash Landing and on to Duke River to a point a mile below the trail crossing. Thence N 80 degrees west a distance of approximately 17 miles to Kluane Canyon. Then N 80 degrees W. to Donjek Canyon a distance of approximately 14 miles. Thence follow the same general direction to the Lower Canyon on the White River a distance of approximately 33 miles. The total distance being approximately 240 miles.

MILE 0 - MILE 20 Follows terraces on the Yukon and Takhini Rivers, maximum elevation is 2,300 feet above sea level. Elevation of Takhini crossing is 2,100 feet. Rock bluffs are avoided, soil is glacier sandy clay and gravel ridges; clearing would be light, with the exception of a few bluffs of 4" spruce it consists of scrub poplar; there is no swampy ground; maximum haul on gravel for the first 15 miles would be 2 miles; there is no gravel between mile 15 and mile 20; the Takhini River carries silty sand with no gravel; the work can be done with bulldozer and grader; there is a ferry at the present time on the Takhini River; the width of the river is 300 feet, and runs about 2 miles per hour; the water is 6 feet deep at the present time, and flood level would be 5 feet above the present level.

MILE 20 - MILE 33 Clearing consists of scattered scrub poplar with many open places. The soil is sandy clay with gravel showing on creeks; maximum haul on gravel would be 3 miles; the grading can be done with bulldozer and grader; there is no rock work, swampy ground or frost conditions; excavation would be about 4,000 c.y. per mile.

MILE 33 - MILE 45 Clearing consists of 4" to 6" spruce and poplar; the present trail has been cut out fairly straight, and can be taken advantage of. The ground is level, and most of grade work would be done with a grader and bulldozer to level up small sags. The soil is chiefly clay. Gravel can be found at Mile 33, Mile 37, Miles 40 and 42.

The excavation would be approximately 3,000 c.y.per mile.

MILE 45 - MILE 60 Clearing consists of scrub poplar and bluffs of 3" spruce. The ground is level, most of the work can be done with a grader. The soil is sandy clay, and gravel can be obtained at Miles 50 and 54, also along the foot of hills lying two miles to the north. Excavation would be approximately 3,000 c.y. per mile.

MILE 60 - MILE 64 Chambers' Ranch at Champagne is at Mile 62. This is fairly open country with a few bluffs of scrub poplar. The soil is very sandy, and is covered with 2" of loam and turf. The country is rolling, and is on the divide between the Takhini and Dezadeash Rivers. The elevation is 2,300 feet above sea level. The work can be done with a grader and bulldozer. Gravel can be found along the foot of the hills two miles to the north; maximum haul on gravel is three miles; excavation work is about 3,000 c.y. per mile.

MILE 64 - MILE 90 The road follows the plateau above the Dezadeash River. The clearing consists of scattered bluffs of 3" poplar and spruce; the soil is sandy silt with gravel showing on small streams crossing the trail; maximum haul on gravel would be three miles. The work can be done with a bulldozer and grader; excavation work about 3,000 c.y. per mile.

MILE 90 - MILE 114 The present trail on this section follows a lower route to Bear Creek, which is level, has gravel near the surface most of the way, and is covered with scattered bluffs of scrub poplar. It then climbs over the side of Mt. Decoell to an elevation of 3,200 feet above sea level. This section has glacier gravel all the way, and is covered with 4" to 10" spruce. The total distance is 30 miles.

I have made the projection on a plateau which runs through from Mile 90 to the Jarvis River.

The clearing would be 3" poplar and spruce. The soil is glacier gravel and sands. The work can be done with bulldozer and grader. Excavation work is 3,000 c.y. per mile on this section. The elevation at Jarvis River is 2,720.

MILE 114 - MILE 133 This section lies between Jarvis River and Kluane Lake at Silver Bay, and crosses the divide between the Alsek River and the White River Basin at an elevation of 2,800 feet above sea level. The trail follows a ridge between Silver Creek and Christmas Creek covered with scrub poplar with scattered 4" spruce. There is gravel the entire distance covered by 4" of Volcanic ash and turf. There is no rock work, no swampy ground and no frost to be encountered. The grade work can be done with a bulldozer and grader and would be approximately 3,000 c.y. per mile.

MILE 133 - MILE 143 The road should follow the edge of the lake on the gravel bench 10 feet above the water level as far as Slims Creek at Mile 138. A delta has been built up at the mouth of the creek. Some work would have to be done here building road above water level. Between Mile 141 and Mile 143 the mountain comes down to the lake, and there is a solid rock bluff with a small bench on it 40 feet above the lake. The excavation work would be 6,000 c.y. per mile with 2,000 c.y. of solid rock and the balance slide rock on these two miles. This is the only section of the road that is not "prairie work". The clearing would be negligible and the work can be done with a bulldozer and grader with powder work on the rock.

MILE 143 - MILE 177 From Mile 143 there is a level bench 40 feet above the lake to Burwash Landing. The soil is sandy clay and gravel covered with scrub poplar and bluffs 5" spruce. There is also some deadfall. The section between Burwash Landing and Duke River is level gravel bars covered with scattered scrub poplar. The grading can be done with a bulldozer and grader. The excavation work would be 3,000 c. y. per mile.

MILE 177 - MILE 194 The road would cross Duke River at an elevation of 2,650. The creek jumps out of its channel near the point where the trail crosses and spreads out over a half mile, making new channels. Approximately ten days' work with the bulldozer would be required to overcome this. At the present time Duke River is 100 feet wide and 3 feet deep in the old channel at the Canyon. From Duke River to Burwash Creek the road follows gravel bars covered with bluffs of poplar and spruce. From Burwash Creek to Kluane Canyon the road would cross gravel ridges with low wet stretches in between.

The wet ground is frozen. The clearing would be 4" poplar and spruce in scattered bluffs. The work would be done with bulldozer, dump wagons with tractor and grader. The excavation would be 4,000 c.y. per mile.

MILE 194 - MILE 208 At Mile 194 the road would climb 100 feet on to a bench and follow the hillside for 4 miles where it would cross a wet and frozen flat for a distance of a mile. It would then climb 100 feet to another bench and follow the hillside at an elevation of approximately 2,700 feet above sea level, and gradually drop down to Donjek Canyon to an elevation of 2,155. The country has been burnt over in recent years. There are bluffs of 3" spruce and poplar with deadfall. The soil is sandy silt and gravel. The excavation work would be 3,000 c.y. a mile.

MILE 208 - MILE 240 I have reason to believe this section is similar to the section Mile 194 to Mile 208. There is very little difference in the physical features of the country between Whitehorse and the White River by the route outlined, and can be summed up as follows:-

(1) Clearing and Grubbing. Scrub poplar 3" to 4" poplar and spruce and a few bluffs of 6" to 8" spruce. The number of stumps to be blasted is negligible.

(2) Grading. Except for two miles at Kluane Lake the balance is "prairie work". A grader can do the most of the work with a bulldozer to grub and level off. Frost conditions would not interfere with the work, as no cuts would be made below thawed ground. There is no swampy ground between Whitehorse and Burwash Creek. There is approximately two miles of wet ground to be filled between Burwash Creek and the Donjek River. One foot of gravel is all that is necessary on these wet places.

(3) SURFACING. The maximum haul on gravel on the first 90 miles would be about three miles. From Mile 90 to the Donjek River at Mile 208 there is gravel on every mile.

(4) Culverts. There is not sufficient timber along the route for native wood culverts. This fact, together with the high cost of labour, would justify the use of corrugated iron pipe. For bridge culverts and for bridges over creeks where there is no run of ice, pile-bent trestles could be used. The The piling could be obtained locally. Thawing for piling west of Kloo Lake can be done with steam points, and is cheaper than hand labour for crib excavations.

(5) Bridges. There are 2 major bridges required, one at Takhini River with two 150 ft. spans, and one on Donjek which requires a 1,000 ft. opening but pile trestle could be used on half of this distance. Also 60 ft. spans are required for Little, Aishihik, Jarvis and Duke Rivers. The remaining creeks can be crossed with trestles with pile-bents spaced 18 ft. centres. All bridges are enumerated with cost in the cost estimate. A detailed

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(5) cont'd.

list of bridges required on this route is given herewith, the type of bridge being shown. Estimates of cost are also given for each bridge based on two widths between wheel guards, namely, 20 feet and 24 feet. Estimated costs of the two larger bridges where steel spans are required are not included in the list, but are given separately.

Whitehorse, Y.T.,
October 10,1939.

REPORT ON RECONNAISSANCE SURVEY
ALONG THE PELLY RIVER VALLEY. 18

by R.M.Martin.

I beg to submit the following report on a reconnaissance survey for the proposed British Columbia-Yukon-Alaska Highway along the Pelly River Valley.

I covered the route by going to Ross River by plane, and drifting down stream in a row-boat. While at Ross River I walked six miles up stream and could see the valley for another six miles. In going down stream I made camp every second day and examined the soil and investigated the creek crossings. I also made three side trips; one to investigate a valley twenty miles above the mouth of McMillan River going over to that river, the second in the region of Diamain Lake to connect with the present trail to Mayo, and the third along the old Dawson trail going northwest from Pelly Farm which is three miles above the mouth of the Pelly River.

Attached to this report is a map of the Yukon Territory 1936 on which I have sketched a proposed route following the north side of the river. The road would be on a river terrace 100 to 300 feet above the river from Ross River to Bradens Canyon with exception of dropping down to river flats at a few valleys coming into the Pelly River. From Bradens Canyon the road would be about thirty feet above the river. There would be no sharp curves in the alignment and the road would be within a few hundred feet of the river at all large bends which swing to the north; the valley being comparatively straight.

For the purpose of describing the physical features of this route, I have numbered the miles from Ross River to Pelly Farm; also the snapshots accompanying this report.

From information I got from Mr. Etzel, who is in charge of thetrading post at Ross River for Taylor and Drury, I deduce that there would be no difficulty in making a road from Ross River to Pelly Banks at the mouth of the Campbell River.

A river crossing on Ross River was chosen 1000 feet up stream from the mouth and is shown in snapshot F1. The width of the river is 300 feet. The

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water was running two feet deep; the bed of the river is gravel. Ice conditions in the Spring would require a bridge to be 20 feet above the present water level. The elevation of the Pelly River at the mouth of Ross River is 2390 feet above sea level.

Going south-east from the River crossing the road would follow a creek valley for two miles and come out on the Pelly River on a bench 300 feet above the river 3 miles up stream from the mouth of the Ross River. (See snapshot F2).

MILE 0 - MILE 10:

Commencing at the Ross River Crossing the road would go in a general direction of North 65 degrees West, climbing on to a terrace 150 feet above the river in order to avoid bluffs which run into the river at miles 3, 8 and 9 (see snapshots F3,F4). The terrace on this section is covered with scrub poplar with bluffs of 4" spruce and poplar. The soil is 2" loam 4" Volcanic ash, 18" gravel on shale. Gulches at miles 3,5,6 and 9 would cause road to be diverted into them with trestles of 2 and 3 bents for culverts. Earthworks would average 5,000 c.y. per mile, with maximum haul on gravel of one mile.

MILE 10 - MILE 25:

At mile 10 the road would drop to the edge of the flats at the foot of the terrace, making easy side hill work and shortening the distance at mile 18 where there is a large gulch. After crossing this gulch the road would climb 200 feet and ride over a rock bluff where there would be a possible 1000 c.y. of rock work. The road would then follow side hill into the Orchay Creek valley without losing elevation in order to ride through a saddle 300 feet above the river at a high bluff at mile 25. The clearing is thin 2" to 4" spruce and poplar. The soil is shale and gravel. Earthworks 6000 c.y. per mile, maximum haul on gravel one mile.

MILE 25 - MILE 35.

Dropping down on to a terrace 150 feet above the river the road goes to mile 30, where it crosses a creek valley by dropping down a 100 feet and climbing again to the terrace. The clearing is thin 2" and 4" poplar

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and spruce. The soil is gravel and clay. Earthworks is 5000 c.y. per mile, mostly level with side hill crossing the creek valley. Maximum haul on gravel two miles.

MILE 35 - MILE 40:

At Mile 35 a creek is crossed by diverting road into the gulch a quarter of a mile. (See photos G2 and G3). The road follows the terrace as in G3 for three miles when it drops on to the river flats of Blind River. The Blind River at Mile 40 is crossed with a 60 foot wooden truss. Clearing is 3" poplar and spruce with some 6" spruce on flats. Soil sandy clay, sand and gravel. Earthworks 4,000 c.y. per mile. Maximum haul on gravel one mile.

MILE 40 - MILE 50:

From mile 40 to 45 the road would follow a level terrace when it drops on to gradual sloping ground in a valley two miles wide. A terrace 150 ft. above the river is again followed to a creek at mile 50, which can be crossed with a 20 foot opening. Clearing is 3" to 4" poplar and spruce with bluffs of dense 3" spruce. The soil is sandy clay and silt. There is gravel in the creeks. Earthworks 5000 c.y. per mile. Maximum haul on gravel two miles.

MILE 50 - MILE 60:

A range of mountains parallel the river on both sides. The road would follow a bench a 100 feet above the river to mile 53, where it goes on to flats 30 feet above the river to mile 55. At mile 55 a narrow bench 200 ft. above the river is followed to mile 60. Small creeks are crossed at miles 53, 54, 55 and 56. There are four small gulches on mile 58. Two bent trestle culverts could be used on all these water courses. The clearing is scrub poplar with bluffs of 4" poplar and spruce, and small windfall. The soil is sandy clay and gravel. Earthworks would be 5000 c.y. per mile. Maximum haul on gravel would be two miles.

MILE 60 - MILE 70:

At mile 61 a small creek is crossed and the road would follow a bench to mile 64. The bench at this point is narrow and is cut with small gulches, but no serious obstruction. At mile 64 the river swings to the opposite

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side of the valley and comes back just above mile 70. The river flats are high and dry covered with spruce. All river flats above this point are flooded from year to year. The sharp bends in the river at mile 70 are known as "The Fish Hooks". The Iron River comes in at mile 65. From mile 65 to Mile 70 the road would be on gradual sloping ground covered with 4" poplar and spruce. The soil is sandy silt and gravel. Earthworks 4000 c.y. per mile with maximum haul on gravel two miles.

MILE 70 - MILE 80:

The mountains recede from the north side of the river. The road would follow a terrace 150 feet above the river to the Tay River at mile 75 which had a flow of 50 cu. feet per second. The terrace is wide to mile 80 where another valley is crossed. The clearing is scrub poplar and scattered 3" spruce. Earthworks 5000 c.y. per mile. Maximum haul on gravel one mile.

MILE 80 - MILE 90:

From mile 40 to mile 87 the general course was N.55 degrees W. From mile 80 to mile 87 the road would follow a wide terrace 200 feet above the river. (See photos K3 and K4). The clearing is scattered 3" poplar with bluffs of 4" poplar and spruce. Earthworks 4000 c.y. per mile. Maximum haul on gravel two miles. At mile 87 the road would follow at the foot of a rock butte and meet the bend in the river at mile 90. (See Photos L1, L2 and L5). Rock between mile 87 and 90 can be avoided.

MILE 90 - MILE 100:

The road follows a plateau 150 feet above the river. At mile 97 the road would be a half mile from the river to avoid a slough on the river flats and a bluff running into the river just below it. The Earn River is crossed at mile 98. This can be done with a low crossing with a 60 foot truss a hundred feet below the plateau or with a level crossing using an arch bridge 200 feet long over a canyon 60 feet deep. (See sketch Photo M1).

MILE 100 - MILE 110:

From the Earn River the road would go N. 85 degrees W. following a level bench covered with scrub poplar to mile 104, where it would go S 80 W and follow the south side of a ridge to mile 110. At mile 108 there is a rock

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bluff with a narrow bench, with a possible 500 c.y. of rockwork. The clearing is scattered 3" poplar and spruce. Earthworks 4000 c.y. per mile. Maximum haul on gravel is one mile.

MILE 110-MILE 120:

At mile 110 the road would drop on to river flats 25 feet above the river and follow foot of bench at mile 112 and climb up on a 100 foot bench on crossing a small creek at mile 115. At mile 120 the road would drop off the bench and cross a small creek. The clearing is 3" poplar with bluffs of 4" spruce. Earthworks 4000 c.y. per mile, soil silt and gravel. Maximum haul on gravel one mile.

MILE 120 - MILE 130:

A wide valley runs toward the McMillan River at mile 125. At mile 120 the road would follow the edge of the wet river flats along the foot of the slope of the side hill. A small creek is crossed at mile 126. At mile 128 a rock ridge comes close to the river and the road would climb on to a narrow bench. (See photo M5). At mile 130 the bench widens out. Earthworks 4000 c.y. per mile, soil mostly gravel. Maximum haul on gravel one mile.

MILE 130 - MILE 140:

The road would follow a wide level bench covered with scrub poplar. Five small gulches are crossed between miles 132 and 136. The soil is silty sand and gravel. Earthworks 4000 c.y. per mile. Maximum haul on gravel one mile.

MILE 140 - MILE 150:

Between miles 140 and 142 a rock ridge is very close to the river. Small benches are in evidence, but a few rock points would make 2000 c.y. of solid rock. From mile 142 to mile 144 the road would follow a gravel terrace and drop off it to the river crossing on the McMillan River. (See photos M6 and N1). The clearing between miles 142 and 150 is 4" poplar and spruce. Soil is silt, gravel and some rock. Earthworks 6000 c.y.per mile. Maximum haul on gravel two miles. (See sketch of McMillan River Crossing).

MILE 150 - MILE 160:

The road follows benches 200 feet above the river to foot of high ridge at mile 155 and then goes on to bend in river at mile 157. (See

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photos N2 and N4). From this point the road would go S 45W following top of gravel terrace. The clearing is then 4" poplar and spruce. The soil is mostly gravel. Earthworks 5000 c.y.per mile. Maximum haul on gravel one mile.

If it is desirable to follow the present trail to Dawson by the Mayo route, the road should leave the Pelly River at mile 158 and go along the north side of Diamain Lake. (See photos N2 and N5). The geological map attached shows the projection from mile 158 north of Diamain Lake and also to Pelly Farm near Selkirk.

Diamain Lake is 400 feet above the Pelly River, and is 2100 feet above sea level. The summit between the Pelly and the Stewart is approximately 2300.

MILE 160 - MILE 170:

From Mile 160 the road would continue S 45 W to mile 165, where it would go west to Pelly Crossing. Diamain Creek is crossed at mile 161 at the top of a canyon at an old cache a half mile from the mouth of the Creek. A 36 ft. trestle is all that is necessary. The clearing is 3" poplar and the soil is mostly gravel. Photos 02, 03 and 04 show type of country between mile 156 and Pelly Crossing at Mile 172. The grading would be mostly level work. Earthworks 4000 c.y. per mile. Gravel on every mile. The granite at Diamain Creek is crossed on a narrow bench of gravel.

MILE 170 - MILE 180:

The road would run N. 80 W., dropping off the terrace at Willow Creek and following river flats 25 feet above the river. Photos P1, P2 and P3 show the gravel terrace. Photo P5 shows a rock bluff which is crossed on a narrow bench. At Grayling Creek the road would cross over a bench to the bend at mile 180. The clearing is scrub poplar and scattered 4" spruce. Earthworks would be mostly level work 4000 c.y.per mile. Maximum haul on gravel one mile. There is a possible 500 c.y. of rock work at mile 175.

MILE 180 - MILE 190:

At mile 180 the road would swing in and out of a gulch gaining altitude to get on a plateau. The plateau 200 feet above the river is followed to mile 185, where the road would drop on to the river flats 25 feet above the

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river. The road would go through a saddle in a rock bluff at mile 186 and cross Crossby Creek at mile 187 on the river flats. On crossing the Creek the road would go on to a low bench on a rock bluff. (See photos Q1, Q3 and Q4). The clearing is scrub poplar except for a bluff of 4" poplar and spruce on mile 187. There is a 1000 c.y. of rock work on mile 188. The soil is silt, gravel and some rock. Earthworks 6000 c.y.per mile. Maximum haul on gravel one mile.

MILE 190 - MILE 198 (Pelly Farm):

From mile 190 the road would follow river flats to mile 192, where a rock bluff comes down to the river, leaving a narrow bench. (See photo Q5). There is a possible 1000 c.y. of solid rock at this place. The road would follow the river flats to Pelly Farm. There is a V shaped gravel bench 80 ft. high protruding into the valley and running in to the river at mile 194. This would make the heaviest piece of work on the entire road there being approximately 6000 c.y. in this cut. The clearing is very light being scattered poplar and spruce. Soil is sandy silt and gravel. Earthworks 6000 c.y. per mile. Maximum haul on gravel is two miles.

PELLY FARM TO STEWART RIVER (via Scroggie Creek):

The old Dawson trail went north-west from Pelly Farm following a creek for three miles with maximum grade of six per cent. The west banks of the creek are covered with moss and is frozen ground but a road could be built on the east bank on thawed ground. The work would be side hill in slide rock and gravel which is easily moved. From the third mile the ground rises gradually there being meadows with glacial gravel ridges. The old trail followed the level ground to avoid work in levelling. Photos R1, R2 and R3 show the nature of the country fairly well. The clearing would be scrub poplar with bluffs of 4" poplar and spruce. The first three miles would have about 10,000 c.y. per mile of earthworks and going over the plateau to the Stewart would run 5,000 c.y. per mile. Gravel would be plentiful for surfacing. The cost per mile would run the same as the average on the Pelly River. The elevation going to the Stewart River would not exceed 2,200 feet above sea level. The elevation of Pelly Farm is 1,600 feet above sea level.

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From previous experience in the Dawson and Indian River areas I know a road could be built from the Stewart River up Blackhills Creek, up the Indian and up either Dominion or Sulphur Creeks. There is a road on these two creeks at the present time. A road could be made from Blackhills down Rosebute to Ogilvie, crossing the Yukon at this point and go up Sixtymile River.

Perpetual frost conditions exist north of Selkirk. Following hillsides on the sunny side especially where the poplar tree grows there is no frost within 20 feet of the surface. The wet 'pups' at intervals along the valleys are usually covered with moss and spruce trees with 'niggerheads' on the lower slopes. It is necessary to keep the frost in the ground on these places. This can be done by making embankment without breaking the insulation of moss. This can be done on a wide road by hauling material with trucks or wagons and bulldozing it ahead. The present practice of using brush is because the natural insulation becomes cut up doing construction.

The cost of construction of roads north of the Stewart River would be only slightly higher than along the Pelly River due to the haul on material, over about 15% of the road, usually in short stretches. The best locations are along the sunny slopes of valleys 50 feet above the bottom.

From the foregoing description it will be seen that the Pelly River route is ideal from a construction point of view. In general the road would follow a terrace 100 to 300 feet above the river. The terrace above the McMillan River is mostly shale with gravel and sandy clay on the surface, and below the McMillan River is mostly gravel. The clearing is light, being scrub poplar, 3" to 4" poplar and spruce with light windfall. There are a few scattered bluffs of timber suitable for piling on the river flats, but there is not sufficient timber on the route for native timber culverts. The alignment would be fairly straight as the bends in the river are on low river flats and the terrace continue through in the general direction of the Valley. The most of the road would be on level ground with side hill work at creeks coming into the Pelly River and in climbing over bluffs which run into the river in a few places. Six rock bluffs would make a possible 6,000 c.y. of rock

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work. Gravel for surfacing is plentiful.

From the trips I made to Diamain Lake, and along the old trail going north-west from Pelly Farm, and from the information I got from parties familiar with the country, I gathered that it is feasible to use either of these routes in going to the Stewart River. The road work would be a different type to that of the Pelly River in both cases. The sides of glacial gravel ridges would be followed where possible and embankments made over low-lying meadows and swamps, which are frozen. The trail from Pelly Crossing to Minto follows a similar country with a maximum elevation of 2000 ft. above sea level. The present trail from Whitehorse to Carmacks and Yukon Crossing is being used by cars and trucks and offers no difficulties to road construction. The snowfall along the Pelly River during the winter amounts to 1½ to 2 feet. This is practically the same as that in the Dawson area, which I have seen myself three winters. The road would be open from April 1st to December 1st without the use of snow-ploughs. If the road were ploughed off two or three times during the winter it would be kept open. The freeze-up comes between October 5th and October 15th, and roadwork could commence between May 1st and May 10th. Mr. Etzel at Ross River claims he plants his garden between April 18th and April 24th. It is a well-known fact that it is the water from the Pelly River that takes the ice out of the upper Yukon. There was a foot and a half of snow on the coast range of mountains above Skagway when I came out on October 14th this year. (I am sending with this report photos showing the scenic value of the route.)

A potential mining field would be opened up by the proposed road. Placer gold having been found in the Campbell, Ketza and Lapie Rivers, and rock formations between the Blind and Earn Rivers show mineralization. The Pelly not being a navigable river for steamers has discouraged prospecting in this area. The game in the country consists of mountain sheep, cariboo and moose. There are salmon and whitefish in the Pelly River and grayling and trout in the creeks. Transportation problems during construction could be best met by construction of tote trail on the right of way. A plane with pontoons could be used hauling supplies out of Selkirk. Machinery and fuel oil supplies could be hauled up the Pelly River on the ice by tractor trains.

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C O S T E S T I M A T E S.

Assuming the distance from Ross River to Pelly Farm near Selkirk to be 198 miles, that the right-of-way be cleared to a width of 66 feet, and that the road be graded to a width of 24 feet shoulder to shoulder with a surface of gravel 6" deep.

Engineering .....$600.00 per mile

Transportation and Camp Establishment ..... 300.00 per mile

Clearing and Grubbing ..... 800.00 per mile.

GRADING:

Bulldozer, operators, fuel, oil, repairs 9 days @ $120 a day.....	$1,080	
Tractor, grader, operators, fuel, oil and repairs 9 days @ $100 a day..	900	
1 Foreman 9 days @ $10 per day	90	
1 Mechanic 9 days @ $9 per day	81	
1 Blacksmith 9 days @ $9 per day.....	81	
12 Labourers @ $7 per day each (9 days)	756	
Total.....	$2988	Say.....$3000.00per mile

SURFACING:

1 3/8 yard gas shovel, operator, gas, oil, cable and repairs 10 days @ $60 per day.....	600	
5 dump trucks, drivers, gas, oil and repairs, 10 days @ $30 per day each..	1,500	
8 labourers 10 days @ $7 " "	560	
Total.....	$2,660	Say.....$2700.00 per mile

CULVERTS:

Allowing 2--18" C.G.I.P.per mile
2--24" C.G.I.P.per mile
2--30" C.G.I.P.per mile
In place.....$1000.00 per mile

Maintenance for three years at $200 per year..... 600.00 per mile
Total..... 9000.00 per mile
Saall tools and exigencies 10%..... 900.00 per mile
Grand total per mile exclusive of bridges..... 9900.00 per mile
Average cost of 190 miles say..... 10000.00 per mile
Average cost of 8 miles say..... 11000.00 per mile

Total Cost - Ross River to Pelly Farm:

190 miles at $10,000 per mile	$1,900,000.00	
8 miles at $11,000 per mile	88,000.00	
Cost of small bridges & bridge culverts.....	108,600.00	(page 11)
Cost of Ross River bridge (p.12)	87,000.00	
Cost of McMillan River bridge (p.12).....	130,000.00	
Grand Total.....	$2,313,600.00	

COST OF SMALL TRESTLES AND BRIDGES - ROSS RIVER TO SELKIRK.

Assuming trestles are used to cross small streams and spring freshettes. Pile bents being placed 14 feet centres and deck designed to carry a uniform load of 5,000 lbs. per lineal foot. Dressed fir timber and native red spruce piling to be used and painted with coal tar.

A single panel requires 5,000 F.B.M. costing.....$ 150.00 per M in place
with 12 piles costing..... 20.00 each in place
making a total cost for the structure of say.....$1,000.00
2 panels would cost.....$1,800.00
3 panels would cost.....$2,600.00
A 60 ft. wooden truss on piling would cost in place. 100.00 per lineal ft.
The freight rate on lumber to Selkirk is..... 70.00 per M.

PLACE	TYPE	LENGTH IN FEET	COST.
Ross River (see page 12)			
Mile 3	2 bent trestle	15	$1,000.00
Mile 3.5	2 " "	15	1,000.00
Mile 5	2 " "	15	1,000.00
Mile 6	2 " "	15	1,000.00
Mile 8	2 " "	15	1,000.00
Mile 8.2	2 " "	15	1,000.00
Mile 19	3 " "	29	1,800.00
Mile 25 Orchay R.	4 " "	43	2,600.00
Mile 30	3 " "	29	1,800.00
Mile 35 Water	2 " "	15	1,000.00
Mile 36	2 " "	15	1,000.00
Mile 37	2 " "	15	1,000.00
Mile 39 Blind R.	60 foot truss	60	6,000.00
Mile 48 Water	3 bent trestle	29	1,800.00
Mile 51 "	4 " "	43	2,600.00
Mile 53	2 " "	15	1,000.00
Mile 54	2 " "	15	1,000.00
Mile 55	2 " "	15	1,000.00
Mile 56	2 " "	15	1,000.00
Mile 57	2 " "	15	1,000.00
Mile 58	2 " "	15	1,000.00
Mile 61 Water	3 " "	29	1,800.00
Mile 64	2 " "	15	1,000.00
Mile 65	2 " "	15	1,000.00
Mile 69 Iron R.	60 foot truss	60	6,000.00
Mile 70 Little H.R.	2 bent trestle	15	1,000.00
Mile 71 Water	2 " "	15	1,000.00
Mile 75 Tay R.	60 foot truss	60	6,000.00
Mile 77	2 bent trestle	15	1,000.00
Mile 79	4 " "	43	2,600.00
Mile 82	2 " "	15	1,000.00
Mile 91	2 " "	15	1,000.00
Mile 98 Earn R.	60 foot truss concrete piers	60	10,000.00
Mile 100	2 bent trestle	15	1,000.00
Mile 115 Water	3 " "	29	1,800.00
Mile 119	2 " "	15	1,000.00
Mile 120	2 " "	15	1,000.00
Mile 125 Water	3 " "	29	1,800.00
Mile 127 Water	3 " "	29	1,800.00
Mile 132	2 " "	15	1,000.00
Mile 133	2 " "	15	1,000.00
Mile 134	3 " "	29	1,800.00
Mile 135	4 " "	43	2,600.00
Mile 136	4 " "	43	2,600.00
Mile 142	4 " "	43	2,600.00
Mile 144 McMillan R. (see page 12)			
Mile 146	3 bent trestle	29	1,800.00
Mile 147 Water	4 " "	43	2,600.00
Mile 156	3 " "	29	1,800.00
			91,200.00 .....

Continued.....

TRESTLES AND SMALL BRIDGES (Continued):

Place.	Type.	Length in ft.	Cost.
	Brought forward....		$91,200.00
Mile 161 Diamain Creek	3 bent trestle	29	$1,800.00
Mile 165	3 " "	29	1,800.00
Mile 167	2 " "	15	1,000.00
Mile 168	2 " "	15	1,000.00
Mile 173 Willow Creek	4 " "	43	2,600.00
Mile 179 Grayling Creek	3 " "	29	1,800.00
Mile 181	2 " "	15	1,000.00
Mile 186	2 " "	15	1,000.00
Mile 187 Crossby Creek	3 " "	29	1,800.00
Mile 192	2 " "	15	1,000.00
Mile 198	4 " "	43	2,600.00
Total cost of trestles and trusses			$108,600.00

ROSS RIVER BRIDGE:

Length of bridge -- 300 feet
Width of water -- 300 feet
Depth Aug. 26, 1939 2 feet, velocity 4 miles per hour
Flood level -- 6 feet above this level
Elevation above sea-level 2,400 feet.

Required - two abutments 48'X6'X30'- 8640 cu. ft. - 320 cu. yds. each		
one centre pier 24'X8'X30'-5760 cu ft. 213 cu. yds. each		
total concrete 853 cu. yds @ $28		$23,880.00
#excavation - 800 cu. yds @ $4.....		3,200.00
Total (say).....		$27,000.00
two steel 150 foot trusses @ $200 per lineal foot....		60,000.00
Total cost of Ross River Bridge.		$87,000.00

McMILLAN RIVER BRIDGE:

Length of bridge -- 500 feet
Width of water -- 500 feet
(Max. depth water
(Sept 21,1939 -- 8 feet, velocity 3 miles per hour
Flood level -- 5 feet above this level.

Required - two abutments 48'X6'X30'- 8640 cu. ft. - 320 cu. yds. each		
2 river piers 24'X8'X30'- 5730 cu. ft. - 213 cu. yds. each		
total concrete - 1066 cu.yds @ $25.		$26,650.00
#excavation - 100 cu.yds. @ $4		4,000.00
Total (say)....		30,400.00
three steel 166 ft. Howe trusses @ $200 per lineal ft.		99,600.00
Total cost McMillan River bridge		$130,000.00

Depth of excavation for piers taken as 15 feet.

LOCATION SURVEYS:

A location party of ten men could complete a mile of road location per day including preliminary lines. A motor-boat is obtainable at Pelly Farm or from Mr. Edwards at Pelly Crossing. Mr. Dan Van Bibber, (a mile above Pelly Crossing) knows the country well, and can give useful information. The High Bank Indians (three miles above Pelly Crossing) also have a motor-boat. An Indian trapper (65 miles below Ross River) is the only other one on the Pelly River below Ross River. Taylor and Drury have trading posts at Selkirk, Ross River and Pelly Banks at the mouth of the Campbell River. There is a portage at Houle Canyon 16 miles above Ross River.

A survey of the country south of Pelly Banks could be best made by going to Finlayson Lake by plane, taking collapsible boats. The short distance from there to Pelly Banks could be done on foot. A reconnaissance survey of this country could be made in the winter by going out from Pelly Banks with a dog team.

TRANSPORTATION DURING CONSTRUCTION:

If it were decided to construct a road on the Pelly River route, Selkirk would be the nearest transportation centre; steamboats are operated by the White Pass and Yukon route. While Taylor and Drury have taken a small steamboat up to Ross River they experienced a great deal of trouble. I understand that rocks are to be blasted out of Granite Canyon, and if this is done, boats could run to the mouth of the McMillan River without difficulty. In any case, boats can be run to Pelly Farm or Pelly Crossing using either of these points for supply bases. A regular service is run by the White Pass and Yukon route on the Stewart River. This service would be a great help in constructing a road from the Pelly River to Dawson.

The following freight rates are in force between Vancouver and Whitehorse on material:-

Lumber.....	$61. per M
Structural Steel.....	55. per ton
Culvert Pipe.....	55. per ton (nested)
Cement	56. per ton

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CONSTRUCTION:

Construction units consisting of one bulldozer, one Letourneau scraper, one tractor and grader, one 3/8 yard shovel and five dump trucks would build 15 miles of road in one season. The cost of above equipment would be approximately $50,000.00 delivered, and, if written off in three years, would amount to $1100.00 per mile for equipment. Allowing $4,000 per mile for labour, $500. per mile for gas, oil and repairs and $100. per mile for small tools, etc., the total cost of grading and surfacing would be approximately $5,700.00 per mile.

A clearing gang of 8 men working with above unit would keep ahead of the grading.

A cluvert gang of 4 men would also work with above unit.

One bridge gang of 8 men and pile driver would form a unit to do all trestle bridges and be nucleus of gang for larger structures.

The McMillan River would require a ferry and Earn River would require a bridge to facilitate movement of equipment and supplies during construction. All other streams below Ross River are easily crossed with native pole bridges for trucks or by driving through the streams.

If I can supply you with any further information, I would be glad to do so.

Vancouver, B. C.,
November 18, 1939.