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TRANSPORT REQUIREMENTS FOR THE GROWTH OF NORTHWEST NORTH AMERICA

LETTER FROM THE CHAIRMAN, ALASKA INTERNATIONAL RAIL AND HIGHWAY COMMISSION, TRANSMITTING THE FINAL REPORT OF THE ALASKA INTERNATIONAL RAIL AND HIGHWAY COMMISSION, PURSUANT TO PUBLIC LAW 884, 84TH CONGRESS

VOLUME 3

Supplement 1 to Battelle Memorial Institute's Report
Brown & Root, Inc.

MAY 25, 1961.—Referred to the Committee on Interior and Insular Affairs and ordered to be printed with illustrations

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BROWN & ROOT, INC. *Engineers · Constructors*

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October 27, 1960

Battelle Memorial Institute
505 King Avenue
Columbus 4, Ohio

Gentlemen:

In accordance with the terms of our agreement of April 1960, we respectfully submit herewith our report covering preliminary route surveys and economic investigations of several possible highways for the northern part of British Columbia, the extreme southern part of the Yukon Territory, and parts of Alaska.

Our evaluation has been, as was requested, primarily limited to highway construction and cost estimates, route feasibility investigations, and maintenance cost studies.

The five major categories which are covered herein are as follows:

(1) A shorter highway connection between the Pacific-Northwest states and the new state of Alaska. Eight feasible routes were evaluated and have been discussed.

(2) Branch roads which would connect the towns of Haines, Petersburg, Wrangell and Juneau to the main Alaska Highway System.

(3) Certain roads in Alaska which have been advocated as essential to the economic development of that state.

(4) Cost estimate for paving the Alaska Highway between Dawson Creek and the Yukon-Alaska boundary.

(5) Comparative estimate of the cost differential between maintaining gravel and black topped highways.

The results of our studies and investigations pertaining to the Alaska Highway and the Interstate connecting highways, as set forth in this report, are briefly summarized below:

(a) Of the eight possible shorter connecting routes studied, there are two which would definitely be preferable to the others when considering construction costs and travel distances alone. These routings have been designated as Routings No's. 5 and 6 and are shown on Plates III-6 and III-7 respectively.

(b) As a "stop-gap" measure a 99-mile section of road between Hazelton and the Stewart-Cassiar Road could be constructed at a cost of approximately $7 million. This would provide a route between Seattle and Fairbanks which is 173 miles shorter than the present route.

(c) The cost of paving the existing Alaska Highway would exceed by approximately $30 million the cost of constructing and paving either Route No. 5 or No. 6.

(d) The selection of Route No. 5 would make practicable the construction of a highway at some later date, which would connect Juneau with the remainder of Alaska.

(e) It is difficult to visualize any appreciable difference in the cost of maintaining a highway with a gravel surface or a hard wearing surface. Consequently, any decision relative to paving must be based on indirect benefits rather than any monetary savings derived from maintenance operations.

(f) If new routes are constructed, it probably will be necessary to continue maintenance of the present roads; and, the overall maintenance costs will thereby be increased.

The section of this report devoted to the Alaskan Intrastate Highway System attempts only to present a cost comparison of two possible routes between Fairbanks and Nome, and a cost estimate of a loop highway through a potentially favorable mineral region near Fairbanks.

We appreciate having had the privilege of preparing this report and extend our sincere thanks for the wholehearted and valuable cooperation of the members of Battelle Memorial Institute with whom we have been associated on this project.

Very truly yours,

BROWN & ROOT, INC.

J. H. Burch

SUPPLEMENT I

TO

BATTELLE MEMORIAL INSTITUTE'S

REPORT TO

THE ALASKA INTERNATIONAL RAIL AND HIGHWAY COMMISSION

Prepared by

BROWN & ROOT, INC.
Engineers-Constructors

Houston, Texas
September 1960

INDEX

INDEX (cont'd.)

SECTION I

SCOPE OF REPORT

1. Scope: This report, prepared by Brown & Root, Inc. for the BATTELLE MEMORIAL INSTITUTE in behalf of the Alaska International Rail and Highway Commission, is based on the findings of a cursory survey of the northern part of British Columbia, the extreme southern part of the Yukon Territory, and parts of Alaska. The basic purpose of the survey was to try and develop reasonably realistic estimates of cost for the construction of: 1) a shorter highway connection between the Pacific-Northwest states and the new State of Alaska; and, 2) certain roads in Alaska which have been advocated as being essential to the economic development of the state. In addition to preparing estimates of cost for constructing gravel surfaced roads, estimates covering the cost of paving both the new and the existing routes have been prepared. The report also covers a route which would connect Petersburg, Alaska with the authorized Stewart-Cassiar Road in British Columbia. Estimates are also presented to show the cost of upgrading the existing "Haines Cut-off" road to a standard that would warrant keeping the route open to traffic the year around. Paving cost estimates were likewise prepared for this route. Cost estimates covering the routes in western Alaska are for a lower type of road. This type of road is frequently referred to as "Pioneer" or "Development" roads.

An attempt has also been made to present realistic estimates of annual costs for maintaining paved highways versus those for maintaining gravel surfaced roads. The absence of basic cost data upon which to base estimates leaves these figures open to debate.

2. Authority and Contract Provisions: During April 1960, a Subcontract was entered into by and between Battelle Memorial Institute and Brown & Root, Inc. for the purpose of developing cost estimates for several highway routes in British Columbia, the Yukon Territory, and Alaska.

3. General: In addition to the usual problems which confront builders of roads and highways, the northwest part of the North American continent imposes added difficulties in the nature of prolonged periods of extremely low temperatures; heavy snowfalls, particularly in the coastal regions; severe icing conditions; numerous and extensive muskegs; extremely rugged terrain; and an excessive amount of road to be built to connect traffic generating centers.

As is the case everywhere, the funds available for road building purposes have been inadequate to the point of being scanty. Those charged with the responsibility of building roads have tried to stretch the dollars over as many miles of road as was humanly possible in an effort to span the great distances. In accomplishing this end, many maintenance problems have been built into the highways. That is, many sections of the roads were constructed on locations where construction costs were less without proper consideration given to subsequent maintenance. Side ditches were constructed with minimum cross-sectional area and back slopes cut at steep angles. Likewise, side slopes on fill sections were steep with narrow shoulders. These practices, coupled with the practice of establishing profile grade lines which closely approximated the natural ground line, resulted in considerable savings in excavated quantities which permitted the construction of more miles of roads. Also in order to conserve funds, the minimum of culverts were installed and the provision of facilities for diverting seepage water from the roadbed were,

for the most part, neglected. These are sound practices in the construction of gravel surface roads; however, in order to conform to sound engineering practices these defects and omissions must be rectified before a high cost paved surface is applied For this reason, the estimates for paving include an average per mile cost for this reconditioning and preparatory work on those sections of existing gravel roads which are considered as a part of a through paved highway.

It is to be noted that all agencies in the Northwest Region charged with the responsibility of highway and road construction are, on all new locations, adhering to the sound policy of carefully picking routes over the more stable areas and establishing horizontal and vertical alignments which will permit of the thoroughfare being subsequently raised to higher standards without the necessity of relocating and reconstructing large portions of the highway.

All the agencies now have laboratory facilities and experienced soil technicians so that the soils characteristics can be determined before the route is definitely established. Better control of embankment, subgrade and base materials used in the construction of the roads is also assured through these practices.

4. Acknowledgements: Space does not permit the naming of all of the individuals who furnished the data and technical assistance required for compiling this report. We do however wish to acknowledge and thank the following organizations for their assistance: The Royal Canadian Engineer Unit called the Northwest Highway Maintenance Establishment; the British Columbia Department of Highways; the Alaska State Highway Department; the Bureau of Public Roads,

Juneau, Alaska; and the Geological Department of the University of Alaska. We also wish to especially acknowledge the splendid cooperation of the members of the Battelle Memorial Institute who were related with this project.

SECTION II

EXISTING HIGHWAY CONNECTIONS

1. The Alaska Highway: Alaska presently has a land connection with the other states via the "Alaska Highway". As is well known, this thoroughfare is the result of a war emergency "crash" program. Factors other than the selection of the shorter or more logical location for a highway to serve peacetime needs influenced the routing of the present highway. For this reason, this report gives careful consideration to the possibilities, both physical and economic, of constructing a new connecting highway that would be more beneficial as a civil facility.

During the years following the cessation of hostilities, an improvement program has been in effect. This consists of the replacement of temporary drainage structures, both bridges and culverts; vertical and horizontal alignment changes; sections of the highway being reconstructed on new and better locations; and stabilization of slide areas in those places where changing the position of the roadway is not deemed practical or economical.

However, due to the many miles involved, much work of this nature remains to be done. Estimates of cost covering these operations are summarized in Table II-A, and a more detailed cost analysis is shown in Table II-B. Table II-C is a recapitulation of data pertaining to the existing bridges and culverts and has been included to show the present status of the temporary bridge replacement program.

To facilitate the comparisons of travel distances and costs, the existing Alaska Highway has been divided into units. This division was necessary since

the various proposed alternate routings did not all embrace the same portions of the existing road. Then, too, existing physical conditions prompted the designation of some of the units; for example, the section between Haines Junction and the Alaska-Yukon boundary was split at M.P. 1100 as this is the approximate beginning of the permafrost region on the upper reach of the highway and a surface treatment only is proposed for the permafrost portion. The sections of road between Seattle and Dawson Creek, and the Alaska Boundary and Fairbanks were not given a unit designation since these portions have been paved. These sections are included, however, for mileage comparison purposes.

Thus, the routing over the present highway is: Seattle to Prince George; Prince George to Dawson Creek; Dawson Creek to Charlie Lake; Charlie Lake to M.P. 649; M.P. 649 to M.P. 760; M.P. 760 to Jake's Corner (M.P. 872); Jake's Corner to Haines Junction (M.P. 1016); Haines Junction to M.P. 1100 (approximate southern limits of permafrost); M.P. 1100 to the Alaska-Yukon boundary, thence over the existing paved or surface treated highway to Fairbanks.

The travel distance over this route is 2,367 miles. This distance is of necessity approximate, since no attempt has been made to maintain corrected mileages occasioned by line changes which are being made each year under the annual maintenance betterment program. However, the discrepancy is slight and would not seriously alter the comparative merits of the routes under study.

COST ANALYSIS - ALASKA HIGHWAY

Unit No. 1 - Dawson Creek to Charlie Lake

Bridge Replacements		
$900,000	x 1.10 =	$990,000

Unit No. 2 - Charlie Lake to M.P. 649

Bridge Replacements		
$8,555,000	x 1.10 =	$ 9,410,500
Relocations and Line Improvements		
94 mi. @ $70,000 = $6,580,000	x 1.10 =	7,238,000
Roadway Preparation		
503 mi. @ $35,000 = $17,605,000	x 1.10 =	19,365,500
Total		$36,014,000
Crushed Gravel Base Course (Av. 18")		
597 mi. @ $40,000 = $23,880,000	x 1.10 =	$26,268,000
2" Hot-Mix Asphaltic Conc. Pavement		
597 mi. @ $25,000 = $14,925,000	x 1.10 =	16,417,500
Total		$42,685,500
Crushed Gravel Base Course (Av. 9")		
597 mi. @ $20,000 = $11,940,000	x 1.10 =	$13,134,000
Asphalt Surface Treatment		
597 mi. @ $6,000 = $3,582,000	x 1.10 =	3,940,200
Total		$17,074,200

TABLE II-B

COST ANALYSIS - ALASKA HIGHWAY (cont'd.)

Unit No. 3 - M.P. 649 to M.P. 760

Bridge Replacements		
$520,000	x 1.10 =	$ 572,000
Relocations and Line Improvements		
21 mi. @ $70,000 = $1,470,000	x 1.10 =	1,617,000
Roadway Preparation		
90 mi. @ $35,000 = $3,150,000	x 1.10 =	3,465,000
Total		$5,654,000
Crushed Gravel Base Course (Av. 18")		
111 mi. @ $40,000 = $4,440,000	x 1.10 =	$4,884,000
2" Hot-Mix Asphaltic Conc. Pavement		
111 mi. @ $25,000 = $2,775,000	x 1.10 =	3,052,500
Total		$7,936,500
Crushed Gravel Base Course (Av. 9")		
111 mi. @ $20,000 = $2,220,000	x 1.10 =	$2,442,000
Asphalt Surface Treatment		
111 mi. @ $6,000 = $666,000	x 1.10 =	732,600
Total		$3,174,600

Unit No. 4 - M.P. 760 to Jake's Corner (M.P. 872)

Bridge Replacements		
$3,050,000	x 1.10 =	$3,355,000
Relocations and Line Improvements		
17 mi. @ $70,000 = $1,190,000	x 1.10 =	1,309,000
Roadway Preparation		
95 mi. @ $35,000 = $3,325,000	x 1.10 =	3,657,500
Total		$8,321,500
Crushed Gravel Base Course (Av. 18")		
112 mi. @ $40,000 = $4,480,000	x 1.10 =	$4,928,000
2" Hot-Mix Asphaltic Conc. Pavement		
112 mi. @ $25,000 = $2,800,000	x 1.10 =	3,080,000
Total		$8,008,000
Crushed Gravel Base Course (Av. 9")		
112 mi. @ $20,000 = $2,240,000	x 1.10 =	$2,464,000
Asphalt Surface Treatment		
112 mi. @ $6,000 = $672,000	x 1.10 =	739,200
Total		$3,203,200

TABLE II-B

COST ANALYSIS - ALASKA HIGHWAY (cont'd.)

Unit No. 5 - Jake's Corner (M.P. 872) to Haines Junction (M.P. 1016)

Bridge Replacements		
$940,000	x 1.10 =	$1,034,000
Relocations and Line Improvements		
15 mi. @ $70,000 = $1,050,000	x 1.10 =	1,155,000
Roadway Preparation		
129 mi. @ $35,000 = $4,515,000	x 1.10 =	4,966,500
Total		$7,155,500
Crushed Gravel Base Course (Av. 18")		
144 mi. @ $40,000 = $5,760,000	x 1.10 =	$ 6,336,000
2" Hot-Mix Asphaltic Conc. Pavement		
144 mi. @ $25,000 = $3,600,000	x 1.10 =	3,960,000
Total		$10,296,000
Crushed Gravel Base Course (Av. 9")		
144 mi. @ $20,000 = $2,880,000	x 1.10 =	$3,168,000
Asphalt Surface Treatment		
144 mi. @ $6,000 = $864,000	x 1.10 =	950,400
Total		$4,118,400

COST ANALYSIS - ALASKA HIGHWAY (cont'd.)

Unit No. 6 - Haines Junction (M.P. 1016) to M.P. 1100

Bridge Replacements		
$110,000	x 1.10 =	$ 121,000
Relocations and Line Improvements		
9 mi. @ $70,000 = $630,000	x 1.10 =	693,000
Roadway Preparation		
75 mi. @ $35,000 = $2,625,000	x 1.10 =	2,887,500
Total		$3,701,500
Crushed Gravel Base Course (Av. 18")		
84 mi. @ $40,000 = $3,360,000	x 1.10 =	$3,696,000
2" Hot-Mix Asphaltic Conc. Pavement		
84 mi. @ $25,000 = $2,100,000	x 1.10 =	2,310,000
Total		$6,006,000
Crushed Gravel Base Course (Av. 9")		
84 mi. @ $20,000 = $1,680,000	x 1.10 =	$1,848,000
Asphalt Surface Treatment		
84 mi. @ $6,000 = $504,000	x 1.10 =	554,400
Total		$2,402,400

TABLE II-B

COST ANALYSIS - ALASKA HIGHWAY (cont'd.)

Unit No. 7 - M.P. 1100 to Alaska-Yukon Border (M.P. 1221)

Structure Replacements		
$1,320,000	x 1.10 =	$1,452,000
Relocations and Line Improvements		
24 mi. @ $70,000 = $1,680,000	x 1.10 =	1,848,000
Roadway Preparation		
97 mi. @ $35,000 = $3,395,000	x 1.10 =	3,734,500
Total		$7,034,500
Crushed Gravel Base Course (Av. 18")		
121 mi. @ $40,000 = $4,840,000	x 1.10 =	$5,324,000
2" Hot-Mix Asphaltic Conc. Pavement		
121 mi. @ $25,000 = $3,025,000	x 1.10 =	3,327,500
Total		$8,641,500
Crushed Gravel Base Course (Av. 9")		
121 mi. @ $20,000 = $2,420,000	x 1.10 =	$2,662,000
Asphalt Surface Treatment		
121 mi. @ $6,000 = $726,000	x 1.10 =	798,600
Total		$3,460,600

SECTION III

POSSIBLE NEW CONNECTION ALONG "A" ROUTE

1. General: One of the primary purposes of this study has been to determine cost estimates for the construction of a shorter highway connection between Alaska and the Pacific-Northwest states, utilizing routes which are either existing or under construction, or have been scheduled for construction. Plate III-1 shows these existing routes for northwest British Columbia and the southwest coastal area of Alaska.

2. Possible New Connection Over "A" Route: There are several feasible locations for a highway connection between Hazelton, B.C. passing through the vicinity of Telegraph Creek, B.C. and Atlin, B.C., and the existing Alaska Highway at Jake's Corner in the Yukon Territory. Also, an alternate route suggested by the British Columbia Highway Department is one which would connect the Stewart-Cassiar Road north of Dease Lake with the Alaska Highway east of Teslin. This location has been designated as Alternate Line "H", and it is covered in this report along with the possible "A" route. Consequently, there are eight possible routings between Points A (Hazelton) and K (Jake's Corner).

To simplify comparisons, since certain sections are common to two or more routings, individual Plates have been prepared for each route and they precede the corresponding cost estimate sheet. The particular route under consideration is shown in red on the applicable Plate. It will be noted that junction points and certain other focal points have been given letter designations. This was done to facilitate tracing the various routings between Hazelton and Jake's Corner.

70243 O - 61 - VOL. 3 - 3

Distances and estimates of cost were computed and compiled by sections corresponding to the letter designations. That is, for example, the section between Hazelton and the junction with the Stewart-Cassiar Road is shown in the various tabulations as A - B. Due to changes in topography the various sections were, in many instances, divided into units for costing purposes. A detailed cost breakdown covering grading, drainage structures, pit-run gravel surfacing, and engineering is included in the unit cost breakdown shown by Table III-K. In general, for costing purposes, the gravel road was taken to be equal to the Stewart-Cassiar Road which is presently being constructed by the Canadian Government in northern British Columbia. Although primarily a "Development Road", it is being constructed to standards which will permit it to be readily upgraded to primary highway classification. Careful attention is being given to principal location factors such as horizontal and vertical alignment and sight distances. Also careful consideration is given to the soils which will form the foundation of the roadway. The roadway, with minor exceptions in solid rock cuts, is being constructed to a crown width of 28 feet and plated with approximately six inches of pit-run gravel with all cobbles larger than three inches screened out before the material is placed on the roadway.

Reference the Cost Estimate Sheets covering Routings Nos. 1 to 8:

Column (1) - Lists the entire route by sections.

Column (2) - Shows the actual or estimated mileage of each section, also the total travel distance.

Column (3) - Shows the estimated cost by sections, and the total overall cost for constructing a gravel surfaced road comparable to the Stewart-Cassiar Road.

Column (4) - Shows estimated cost of upgrading portions of existing substandard roads to the standards of the Stewart-Cassiar Road.

Column (5) - Total of Columns 3 and 4.

Column (6) - Shows estimated cost of resectioning and reconditioning preparatory to adding flexible base and paving or asphalt surface treatment.

Column (7) - Shows estimated cost of flexible base (in most instances crushed gravel) and flexible type pavement. (In this instance, two inches of hot-mix asphaltic concrete.)

Column (8) - Shows totals of Columns 3, 4, 6 and 7. This column reflects the overall cost for constructing paved highways of primary classification, i.e., 24-foot riding surface and a minimum 2-foot shoulder on each side. Base material quantities were computed on the basis of 18-inch average depth throughout. Theoretically this should cover the range between a 6-inch minimum requirement on stable subgrades to 24-inch thickness on less stable grades.

Column (9) - Shows estimated cost of Base and Asphalt Surface Treatment. Base material quantities were computed on the basis of 9-inch average depth throughout. Theoretically this should cover the range between a 6-inch minimum requirement on stable subgrade to 12-inch thickness on less stable subgrades. In this instance, Asphalt Surface Treatment refers to a base prime of

cut-back (liquid) asphalt and a "heavy" single or "light" double surface treatment, i.e., the application of liquid asphalt (or bitumen) covered with graded stone chips.

Column (10) - Totals for Columns 3, 4, 6 and 9. This column reflects the overall estimated cost for constructing all weather highways of secondary classification - for highways carrying light (as distinguished from dense) traffic.

The entire routing between Seattle, Washington and Fairbanks, Alaska has been shown for each individual route. This method permits of the easy comparison of travel distance over the various routes as well as the overall estimates of cost.

3. Routing No. 1: This is the route generally thought of as the old "A" Route since it closely follows the old telegraph line. From Seattle through Prince George to Hazelton this routing is over existing paved highways in the State of Washington, U.S.A., and the Province of British Columbia, Canada. From Point A (Hazelton) to Point B - a connection with the authorized Stewart-Cassiar Road - the route traverses the broad glaciated valleys of the Kiapiox and Ness Rivers. This routing would follow an existing road to approximately 35 miles north of Hazelton. The remainder would be new construction. Construction on this section would be relatively easy. The word "relatively" is underscored to emphasize the fact that no highway construction is easy in the northwest country.

Portions of the Stewart-Cassiar Road would be used between Points B - C and C - D. That part of Section D - E between D and Mowdade Lake offers fairly

easy going with a good crossing of the Iskut River. Between Mowdade Lake and Quash Creek the terrain is composed of glaciated solid rock terraces with little overburden and heavy spruce timber. Relatively easy going between Quash Creek and Dagaichess Creek. Rough going between Dagaichess Creek and the Stikine River across solid rock ridges covered by heavy spruce growth with some wet areas.

A tough problem is encountered in crossing the Stikine River. The canyon at this point, although not as rough as the "Grand Canyon" portion, is still quite a gorge.

Section E - F presents a difficult problem in grading out of the Stikine canyon. Prohibitive grades would be encountered in trying to follow Telegraph Creek. The junction of the Tahltan River with the Stikine is in a very deep and steep walled canyon and it would be difficult to cross here to Buckley Lake. Were it feasible to cross the Stikine at this point, the alignment would be vastly improved and the distance shortened. However, it doesn't look very promising.

Section F - G, along the Tahltan River between Point F and the Little Tahltan, is high bench country with deep gulleys and some solid rock side hill cuts. Up the Little Tahltan and Hackett Rivers, across the divide and down the Shealey River to the Senotua River is fair going through glaciated valleys. Down the Shealey River to the Inklin River the valley gets rougher. The Inklin River valley from this point to its junction with the Taku is unglaciated and presents some very rough going.

Section G - H, following the Taku River valley, which is glaciated, to the

Nakina River is fairly rough. The Nakina valley is unglaciated and rough and rocky.

Section H - I follows the Silver Salmon River over rough broken glaciated rocky benches with little overburden.

Section I - J crosses the O'Donnell River valley to connect with the existing dirt road south of Atlin. This section offers fairly good going.

The existing road would be used, with some upgrading, between Points J and K (Jake's Corner on the Alaska Highway).

From Jake's Corner the route follows the Alaska Highway to Whitehorse, Haines Junction, and across the Alaska-Yukon border to Tek Junction and Fairbanks.

The travel distance over this route is 2,106 miles, or 261 miles shorter than the present route.

4. Routing No. 2: The routing is the same as No. 1 to Point D. Section D - M is a portion of the Stewart-Cassiar Road. Sections M - O and O - P utilize the existing Telegraph Creek Road. These sections would have to be upgraded.

The new location leaves the Telegraph Road at Point P just east of Thirty Mile Lake and follows the Tuys River to Point Q. The going along this section is fair. The line then stays on the plateau to the Taslin River valley with relatively easy going.

In order to reach Atlin the line crosses a low divide to the Nakina River valley. This crossover presents no particular problems. The remaining portion

of the section to Point R follows the Nakina River over fair ground.

Following the Nakina between Points R and H, you encounter some exceptionally rough going. The river between these points is in a rough and rocky unglaciated canyon.

The routing from H through K to Fairbanks was described in Routing No. 1.

5. Routing No. 3: This routing coincides with No. 2 except that the rough Sections R - H and H - I are bypassed by the relatively easy Section R - I through a broad glaciated valley.

6. Routing No. 4: This route coincides with No. 2 except that the alignment is improved and the travel distance shortened by going directly between Points O and Q across a plateau.

7. Routing No. 5: This routing bypasses the rough Sections R - H and H - I and follows the preferred routing between Points M and Q. It is shown on Plate III-6. The travel distance over this route is 2,081 miles or 286 miles shorter than the present Alaska Highway Route and 25 miles shorter than Routing No. 1 through Telegraph Creek.

8. Routing No. 6: This routing, designated as Alternate Line "H", was suggested by the British Columbia Highway Department as offering a shorter route to Alaska at much less cost than a route through the Telegraph Creek area.

The routing of this line between Hazelton and Jake's Corner is as follows: From Point A (Hazelton) to Point B, new construction. From Point B through C, D, M and S the Stewart-Cassiar Road is used. From Point S, through T to U,

would be new construction over relatively easy terrain. At Point U a connection would be made with the existing Alaska Highway in the vicinity of M.P. 760. The present highway would be used between Point U and Jake's Corner.

The travel distance over this route would be 2,096 miles or 271 miles shorter than the present route.

9. Routing No. 7: This routing, which is an alternate to Routing No. 6, using the route S to U to T instead of going directly from S to T, adds approximately 32 miles to the overall distance without a comparable savings in cost.

10. Routing No. 8: This routing, suggested as purely a "stop-gap" measure, consists of the construction of Line "B" between Hazelton and the connection with the Stewart-Cassiar Road. Between Points B and W the Stewart-Cassiar Road would be utilized and from Point W to Fairbanks the route would be over the existing Alaska Highway.

The travel distance over this routing would be 2,194 miles, or a saving of 173 miles over the present route.

Were the construction of the section between Points A and B scheduled for completion at the time of opening of the Stewart-Cassiar Road, then a more direct route, over a gravelled surfaced road, would be available to through traffic until such time as one of the shorter routes was completed.

11. Comparison of Routes: To facilitate comparison of the several routes studied and covered by this report, a SUMMARY SHEET (Table III-J) was prepared as a part of this report and is arranged in the following manner:

Column (1) - Lists the route.

Column (2) - Shows the travel distance between Seattle and Fairbanks.

Column (3) - Gives the estimated cost for constructing gravel surfaced roads comparable to the Stewart-Cassiar Road.

Column (4) - Gives estimated costs for upgrading existing substandard roads to the standards of the Stewart-Cassiar Road.

Column (5) - Shows totals of Columns 3 and 4.

Column (6) - Gives estimates of cost for resectioning and reconditioning roadway preparatory to adding base and paving or base and surface treatment.

Column (7) - Shows estimated cost for base and flexible pavement. In this instance an average of 18 inches of base material and 2 inches hot-mix asphaltic concrete pavement.

Column (8) - Shows totals of Columns 3, 4, 6 and 7, or the total estimated cost for providing a paved through route between Seattle and Fairbanks.

Column (9) - Gives cost estimates for applying an average 9-inch base course with asphalt surface treatment.

Column (10) - Shows the totals of Columns 3, 4, 6 and 9, which is the total estimated cost of constructing an all-weather highway of secondary classification between Seattle and Fairbanks.

Before making an overall comparison of the present Alaska Highway and a feasible new route, we will first eliminate those locations which were inves-

tigated and found to offer but little to warrant their further consideration.

Routings Nos. 1, 2, 3, 4 and 5 are the lines which follow essentially the so-called "A" Route. Column (2) of the Summary Sheet above shows Routing No. 5 to have the shortest travel distance - 2,081 miles. Column (5) shows No. 5 to have the lowest estimate of cost for a gravel highway. Column (8) shows No. 5 to have the lowest cost for a paved highway; therefore, we will drop Routings Nos. 1, 2, 3 and 4, and use No. 5 in the final comparison.

The effects of choosing Routing No. 5 with regards to the cost of a link connecting Juneau will be discussed in SECTION IV of this report.

Comparing Routings Nos. 6 and 7, we find No. 7 to be 32 miles longer with no appreciable savings in cost; therefore, No. 7 has been discarded.

Routing No. 8, as previously mentioned, is presented as a "stop-gap" measure. Under this proposal, Line "B" (Points A to B) would be constructed to the standards of the Stewart-Cassiar Road with a completion date corresponding to the opening of the Stewart-Cassiar Road. This would provide, at a cost of approximately $7 million dollars, a route between Seattle and Fairbanks which is 173 miles shorter than the present route. Nothing would be lost in doing this as this section is common to all the routes studied.

The following table is presented as a cost comparison between Routing No. 5, Routing No. 6, and the existing Alaska Highway. The figures shown for the Alaska Highway were taken from Table II-A of SECTION II.

Routing	Mileage	Gravel Road	Paved Highway	All-Weather Highway
No. 5	2,081	$23,485,600	$121,418,800	$ 88,128,800
No. 6	2,096	17,785,400	121,378,600	87,445,100
Alaska Hwy.	2,367	31,828,500*	152,454,500	102,304,400

*Covers cost of relocations, realignments and bridge replacements.

Routing No. 5 and Routing No. 6 have travel distance advantages over the existing Alaska Highway by 286 and 271 miles respectively. Routing No. 6 has a cost advantage over No. 5 if built as a gravel road; however, when paving is considered neither has a cost advantage over the other, but both are well below the $152 million estimated for paving the present highway.

The Canadian Government might favor Routing No. 6, even as a paved highway, as it would provide improved haul facilities nearer the Cassiar mineral region. However, construction of Routing No. 5 would open up additional territory to possible development. The West Coast states and Alaska will naturally favor the No. 5 Route, and rightfully so. For regardless of whether Juneau continues to be the seat of government of the State, the desire for an overland transportation route will remain alive in the residents of Juneau and the location of Route No. 5 makes possible the consummation of this desire at some future date.

When making a long-range evaluation of the overall scene, this thought should be considered - that should a new and shorter route be constructed, the probabilities are that it would be necessary to maintain the present highway as an alternate route, in which case the annual maintenance appropriation would have to be increased by an amount sufficient to care for the mileage added by construction of the new route.

SECTION IV

ALASKAN INTERSTATE HIGHWAY CONNECTIONS

1. General: There is a recognized need for a highway connection between one or more points in Southwestern Alaska and the mainland lying to the east and south. Consequently, three routes have been evaluated and cost estimates for these routes are included in this section.

2. Haines Road: This section of road - sometimes called the "Haines Cut-off" connects the seaport towns of Haines and Port Chilcoat, Alaska with the Alaska Highway at Haines Junction - M.P. 1016. The distance between Haines and Haines Junction is 159 miles, 42 miles of which are in Alaska, approximately 53 miles in British Columbia, and the remaining 64 miles in Yukon Territory.

The entire Alaska portion of the highway is paved. However, the section between the Chilkat River and the British Columbia boundary is not of the quality of the section between Haines and the Chilkat River. The Coastal Range of the Rocky Mountains is crossed in the B.C. part of the route. This section of the road was built to very low standards on very poor vertical and horizontal alignments. Snowfall is heavy - 58 feet last winter at the pipeline booster station six miles north of the Alaska border and probably more in the mountain passes. Much of this portion of the roadway was built in the trough of the canyons, making snow removal very difficult due to the lack of suitable disposal areas. The Canadian Government has been reluctant to attempt keeping the road open in winter for this reason.

The Yukon portion is built on fairly good alignment, but is of low standard and considerable upgrading would be required on this section even for winter

maintenance as a gravel road.

Several studies have been made and reports prepared on new locations across the mountains. Of the routes studied, the "high" Kelsall River location, even though it would necessitate abandonment of the already paved portion between the Chilkat River and the B.C. border, seems to be most favored both from a construction cost and winter maintenance standpoint. Also, the spectacular scenery along this route whould make the drive very attractive to tourists.

The main disadvantage in choosing this location is that the U.S. Armed Services Oil Products pipeline follows the existing highway route, and servicing the previously mentioned pipeline booster station would make it necessary to keep this portion of the existing road open all year. It is reported that in the winter of 1958-59 it cost approximately $10,000 for snow removal on the six-mile portion in B.C.

This routing is illustrated by Plate IV-1 and a cost estimate is shown by Table IV-A. Table IV-B is a recapitulation of the bridge renewal schedule.

3. Petersburg Connection: The purpose of this highway is to provide a mainland connection for the towns of Petersburg and Wrangell. Three routings for this highway have been advocated. One would follow the Stikine River to the vicinity of Telegraph Creek for a connection with the "A" Route Highway, when built. The other two routes would both follow the Stikine River to the Iskut and then follow the Iskut valley to a connection with the Stewart-Cassiar Highway. The difference between these two routes is that one would follow on the north banks of the rivers and the other would follow the south banks. The Iskut River valley, however, offers much easier going than does the Stikine.

Then too, a route up the Iskut would connect with the already authorized Stewart-Cassiar Road while the route through the Telegraph Creek area is indeterminate and costs would be materially increased were one of the routings other than No. 1 ultimately chosen. Consequently, the attached cost estimate (Tables IV-C and IV-D) was prepared only for the Stikine-Iskut route, and this estimate is based on the north bank route only, as further delineation between the north and south routings would require detailed engineering studies.

That portion of the highway between Petersburg and Popof Creek, which flows into the Stikine River just east of Enskwan Point is included in the State of Alaska's five-year program, hence was not included in the Cost Estimate.

4. Juneau Road: The purpose of this highway would be to provide a direct land connection between Alaska's capital, Juneau, and a highway to the east. Therefore, for the purposes of this portion of the study, it has been assumed that an "A" route will eventually be chosen and that the Juneau highway would connect to it. If this were to be the case, the Juneau highway, as shown by Plate IV-3, would connect into the "A" route at one of the points G, H or I, depending on which "A" route was chosen. For comparison purposes then, the cost of a gravel highway from each of these points to Juneau is shown in Table IV-E. Also, as regards which "A" route would provide the greatest savings, cost estimates comparing Routes No's. 1 and 4, and 1 and 5 were prepared and are shown on Tables IV-F and IV-G respectively.

In both instances substantial savings would be effected - $15 to $18 million - by construction of the through highway on either Route No. 5 or

No. 4, and adding the intervening gap (Sections G-H and H-I) to the Juneau portion of the road. In both instances the travel distance between Juneau and Fairbanks would not be changed. Route No. 4 would increase the travel distance from Juneau to Seattle by 26 miles while No. 5 would effect an increase of 47 miles.

SECTION V

ALASKAN INTRASTATE ROADS

1. General: A very limited study of possible routes and estimates of cost for constructing "Pioneer" or "Development" roads in the area west of Fairbanks was made.

Two general routings were considered, the first being a loop route which would proceed from Rex through Mc-Grath-Ophir-Poorman-Ruby-Tanana and Eureka; and the second being a route between Eureka and Nome.

2. Rex-McGrath-Ophir-Poorman-Ruby-Tanana-Eureka: This routing would provide a loop out of Fairbanks through a potentially favorable mineral region. The short section between Fairbanks and the Tanana River has recently been constructed and the section between the Tanana River and Rex has been programmed. Likewise the road between Fairbanks and the town of Tanana has been either built or programmed.

There are existing dirt roads between McGrath and Ophir, and between Poorman and Ruby. The 58-mile section between Poorman and Ruby is of fairly low quality, consequently cost figures have been included for new construction along this route. Table V-A contains a cost summary for this route and a more detailed cost breakdown is shown by Table V-B.

3. Eureka and Nome: Two possible routes have been considered between Eureka and Nome and for purposes of designation they have been referred to as the southern and the northern routes.

The southern route would proceed from Eureka to Tanana, Ruby-Haycock-

70243 O - 61 - VOL. 3 - 4

Council, and Nome. The route from Eureka to Tanana has been programmed. The section Tanana to Ruby would be along the north bank of the Yukon River, thence across the wet valleys of the Yukon and Keyukuk Rivers. After crossing the Keyukuk River the route would be through an unglaciated mountain region passing through the village of Haycock to Council. There is an existing road between Council and Nome.

An alternate or "northern" route was also considered. This route would proceed in a northwesterly direction from Tanana to Hughes, thence westward to a point at the head of the Ingruksukruk Creek near the base of Purcell Mountain and then southwestward to join with the "southern" route and then on to Haycock, Council and Nome. This route, although longer, would be closer to the Kobuk mineral region and an 86-mile spur road could connect Shungnak and Kobuk with the northern route.

Since the harbor at Golovnin is better than at Nome, a cost estimate for a connection to Golovnin has been prepared and is presented in Table V-F.

Table V-C presents a cost comparison of the routes between Eureka and Nome with additional data given for routes between Eureka and Golovnin. Table V-D is a detailed cost breakdown of the southern route and Tables V-E and V-F are the cost summaries and cost breakdowns, respectively, for the northern route.

SECTION VI

TYPES OF HIGHWAYS BEST SUITED TO THE AREA

1. Road Types: There are those who feel that gravel surfaced roads are best suited for the area. This thinking is shared mainly by those whose prime interest is in the hauling of heavy loads. They stress the fact that for a grater part of the year, due to its frozen condition, they are operating over a hard surfaced road during the winter season. Proponents of this theory tend to shrug off the presence of dust and added tire wear as being inconsequential and generally wind up by admitting that they are afraid that more stringent load restrictions will be imposed once a highway is paved, particularly during the Spring thaw. Too rigid restrictions they claim, and rightfully, would materially increase the per ton transportation cost of cargoes hauled over the highways. The solution to this problem is beyond the scope of this report, but the problem is one that should be given careful consideration by those charged with formulating a long-range highway construction or improvement program, inasmuch as the transportation of mineral ores and concentrates over the highways must play a major role in the economic development of the region.

On the other hand, if full advantage is to be derived from "tourism", it is imperative that highways having dust- and rock-free surfaces be provided in order to reap the tourist dollar harvest, since those who would consider making the trip by auto have long since become accustomed to hard surfaced highways.

2. Paving Types: Due to climatic conditions, hot-mix asphaltic concrete pavement has been the predominant type of paving material used in the area. This

is readily understandable since in this particular type of mixture the ingredients are artificially heated before mixing, the mixture is applied to the roadway and compacted to the required density while hot. The process is completed when the mixture cools to atmospheric temperature, hence the weather problem is, to a great extent, circumvented by the use of this type of paving mixture. Any desired thickness upward from three-quarter inch can be laid; however, a two-inch thickness has generally been employed in the area, hence a like thickness was used in preparing the cost estimates.

A peculiarity of asphalt is that the kneading action of vehicle tires passing over the surfacing is necessary for the asphalt to retain its resilience. With no traffic, or insufficient traffic to keep the asphalt "alive", it begins to harden and becomes brittle, myriad hair cracks appear on the surface, water enters these cracks and the destructive process of complete disintegration is in full swing. Frost action helps to accelerate the action.

This disintegrating process can be retarded and the life of the pavement prolonged by the periodic application of a "seal coat". This consists of an application of heated liquid asphalt over the surface of the pavement and stone chips spread on the asphalt to provide traction. When the asphalt in the seal coat loses its "life" and begins to crack, resealing becomes necessary.

In recent years in Alaska, penetration type surfacings have been used on highways having low traffic densities and also on those lying within the permafrost zone. The sections so treated have not been in service long enough for a full evaluation of its merits. This economical method of providing

smooth, dust-free, riding surfaces deserves much more attention and study than it has apparently received. The potential savings in capital investment are large enough to warrant careful study and testing of this type of surface treatment.

The Bureau of Public Roads in Alaska adopted the policy of using this less costly type of surfacing in the permafrost areas. This also is recommended by the Northwest Highway Maintenance Establishment in the Yukon. This thinking is predicated on the knowledge that, regardless of the type of surfacing or pavement used, the riding surface will become so distorted in a few years, due to changing thermal conditions underneath, that it is necessary to reconstruct and shape the surface. Therefore, huge savings are made possible through using the lighter, less costly type of pavement.

Penetration type "surface treatments" are subject to the same aging processes as asphalt pavements and likewise can be periodically rejuvenated and their usefulness prolonged by seal coating. Alternate cost figures for this lighter type of construction have been included in the Cost Estimates.

Hence, with initial capital costs much lower and maintenance cost comparable, consideration should be given the use of "surface treatments" on those parts of the highways having low density traffic. When traffic density increased to a point that would justify the expenditure of funds for the higher type and costlier pavements, they could be applied on the same base.

SECTION VII

HIGHWAY MAINTENANCE IN NORTHWEST NORTH AMERICA

1. The Alaska Highway: To acquaint the reader with the nature of, and the problems encountered on the Canadian portion of this highway which traverses the northwest region between Dawson Creek, B.C., and Fairbanks, Alaska, excerpts from a paper prepared by the Royal Canadian Engineers of the Northwest Highway Maintenance Establishment are listed below:

The Northwest Highway System

The system of roads known as the Northwest Highway System (NWHS) includes the Alaska Highway from Dawson Creek, B.C. at mile 1 to the Yukon/Alaska border at mile 1221 and includes the Haines Road (117 miles from Haines Junction to mile 42 at the border) and access roads to the airfield at Fort Nelson, Smith River, Watson, Aishhihik and Snag which total some 131 miles. The main highway is open all year, the Haines Road only from May to the end of October and the access roads all year, although on a second priority basis to the main highway.

The country traversed commences with 340 miles of terrain typical of the northern prairies, predominately covered in bush, flat to hilly. The rivers have cut deep valleys and as clay soils are prevalent, frequently interspersed with silt and sand lenses, it is unstable in many areas. Here the main river systems are the Peace, and the Sikanni Chief, Prophet and Muskwa Rivers which converge to form the Fort Nelson River at Fort Nelson. Then follows a crossing of the Rocky Mountains through country typical of Banff and Jasper until the Liard River Valley is reached at mile 496. Gravels and rock predominate in this region and the rivers are typical of mountain country which are raging torrents in flood and peaceful braided streams at other times.

From mile 496 you follow the Liard River to Watson Lake in the Yukon and then traverse the Yukon Plateau to Whitehorse. Hills are predominant in this region and silts and gravels are typical of the material encountered. At mile 722 you unnoticeably cross the watershed which separates drainage to the Arctic via the McKenzie system and to the Bering Sea via the Yukon and its tributaries.

The plateau extends north to Haines Junction, north of which the highway follows a series of wide valleys which skirt to the north of the high St. Elias Mountain System. Silts and gravels pre-

dominate to about the Donjek River at mile 1133. Beyond this, however, the country is more rocky, boulder strewn and permafrost is common. Muskegs which are found in most regions of the highway now become more prevalent and extensive.

The remainder of the NWHS is comprised of units carrying out special supporting functions such as a Works Coy RCE for building utilities; an Ordinance Coy for supplies of Quartermaster Stores, vehicles, equipments and spare parts; a RCEME Coy for mechanical repairs; a Service Corps Coy supplying food, administrative tpt, fuel, gas, diesel and lubricants; and a hospital. There are also Pay, Provost, Signals and a Civ Personnel Officer, the latter having an important task on the highway system because of the high percentage of civilians employed on establishment.

The road system is divided into three areas, in each of which the WHME has a Superintendent. Each area is in turn divided into Sections responsible for 60-90 miles of highway. Each Section has a maintenance foreman and 3-6 maintenance men, operators of equipment, who live in maintenance camps. The year-round maintenance task is carried out by these camps and includes care of the ditches, culverts and offtakes, right-of-way brush control, flood control, slide correction and surface blading. Winter tasks include snow clearance, sanding and ice control.

In the summer additional day labour is hired as required and major bridge repairs or replacements are carried out. It is during the summer also that major work is undertaken on protective works in streams, on slide control, gravel crushing and stockpiling, and the replacing of the crushed running surface. On an average this resurfacing must be done once every four to five years.

The highway is gravel surfaced throughout except for the southern 52 miles from Dawson Creek to Charlie Lake, which is currently being paved by contract. The renewing of the crushed surface course is carried out on about 1/5 or some 260 miles of highway each year and consumes some 300,000-360,000 cubic yards of crushed gravel, pit run and binder. This will indicate both the size of the annual truck haul and gravel crushing task for purely maintenance purposes.

It is the length of the highway, 1221 miles, spread out in a long ribbon through varying topography in undeveloped country, which complicates the problem. The time element of moving equipment or inspecting the job is an important one. The Maintenance Camps are thus remote localities, some all alone, others associated with a cafe and probably a Canadian National Telegraph Camp. The foreman is thus like a "Mayor" of his community. He and the Camp mechanic must deal with the operation of utilities, as will later be shown, in addition to his road tasks, in some camps, schools under Provincial or Territorial auspices are operated in Army huts. Each Camp has a recreation hut for shows and entertainment and a

curling ring, which are great assets to the social life.

Because of the remoteness of the work, the Army provides the maintenance personnel with single or married quarters at very nominal rents. In addition employees are paid a "northern allowance" intended to compensate for the cost of living resulting from the distance from large retail centres.

Engineering Aspects of Maintaining the Alaska Highway

As can be surmised from the general description of the country through which the highway passes, there is a great variety of soil types encountered and these are found in the differing conditions of moisture and frost which are prevalent. From a construction standpoint, the local materials are not always ideal and in some cases have characteristics which are of interest. For example, the clays of the Peace River Region are formed by the "rebound" of shales compressed many eons ago. The relief of pressure, as vast quantities of overburden were removed by ice and water action, has resulted in a return from the shale to the clay state, although shales are still present at depth. These shales also break down under exposure to weather or water and lose their strength. Sand and silt lenses permit the ingress of water to accelerate this breakdown and slides occur, the most recent and publicized of which is the one resulting in the failure of the Peace River Suspension Bridge. Other bridge foundations have presented less dramatic but equally serious problems of a similar nature.

Slopes of 4:1 or flatter are frequently necessary to stabilize sliding hillsides. Stream action sometimes removes the toes of old slides causing renewed slide action. This must be checked if any stability is to be reached and streams have been diverted away from slides to achieve this end. Most important, of course, is to remove the source of underground water by ditching, stripping and draining of muskegs, or by controlled drainage in the form of horizontal pipes, French drains and the like. All methods are used. The Highway Maintenance Establishment has an officer specially trained in Soil Mechanics to advise on such methods in addition to his task of finding and testing of gravels for construction and maintenance purposes.

In the control of frost boils and other road foundation problems, the normal techniques of removing deleterious material and of improving ditching and offtakes to lower the water table are used. The chemical, Lignisol, has also been employed with effect for frost boil control by injecting it into the road bed. In permafrost areas standard drainage methods are not always effective and experience has shown that in stretches of generally level road through muskeg regions overlaying permafrost, it is advisable to build up the road rather

than deepen the ditch. The latter method permits heat to penetrate the frost layer, lower the frost table and the road may sink into the ground.

In resurfacing, the economics of haul distance necessitate the development of gravel pits approximately every 20 miles. It is the exception to find the ideal gravel pit, which when crushed, provides a material of correct gradation to form a tight, dust-free surface course when compacted with water. Either the binders, silts and clays, are too prevalent or too lean. Material that stands up best in very dry weather will likely pothole and be muddy in very wet weather. Material of sufficient binder will washboard and be dusty in dry weather but form a better wet weather surface. The Soils Engineer endeavors through testing to obtain the most suitable materials he can find, and sometimes binder from a pit is mixed with crush from another to achieve this end. As will happen in any gravel road, however, dry weather brings dust. Dust is a nuisance to drivers and a headache to engineers who see in it their surface binder blown into the right-of-way. It is not the Department's policy to use oil or salts as dust palliative on the highway as a whole; however, in certain cases where heavy traffic or soil conditions result in the dust being a hazard, road oils have been used to this end.

Activity on the highway is limited by the short construction season, as, on an average, winter conditions prevail from November until April or May. Winter also brings a restrictively short daylight period in contrast to the summer, when in the Yukon it really never gets dark. Thus, as an example, during the summer crushers operate on a double shift to enable production to be reached. Winter conditions seriously limit economical construction work in the general sense, especially where concreting is involved. On the other hand the Donjek, Slims, and Duke River bridges were constructed to a large extent in winter. Winter construction of bridges has the advantage of a low water stage when use can be made of the ice and gravel bars to eliminate false work and facilitate truck hauls over frozen ground which may be impassable in summer, although heating of concrete is of course necessary, as is likely the steam jetting of piles.

A particular problem of winter is the ice which forms in places over the highway, caused by side hill seepage below the frost line. This water is under pressure and can seep all winter out of high cut banks or, where it meets the deep frost penetration under the travelled surface, can be forced up in the ditches. On exposure it of course freezes and, as the flow continues, gradually builds up an ever increasing mound of ice which "flows" over the road. This problem is attained primarily on a drainage basis; that is, an attempt is made to divert the flow by ditching, or direct it in straight narrow ditches into and away from the culverts. Other methods are to strip the bush cover some distance from the road or build dykes so as to induce the icing away from the road. Burlap fencing is

also used to build up the ice wall away from the road. Steam generators are employed where other means prove inadequate, to clear frozen culverts and permit the water to pass freely under the ice.

To carry out this maintenance task summer and winter, the Highway Maintenance Establishment has a large amount of equipment. For example, there are some 65 graders, 50 bulldozers, 105 dump trucks, and 25 crane/shovels employed. These and the other vehicles of HME and the supporting units present a major repair problem complicated by the remoteness of the highway from the source of supply of spare parts. The workshops operated by RCEME at Whitehorse and MUSKWA carry out this task and are completely equipped. While the replacement of many long timber trestle bridges has reduced the commitment of bridge repair, the ever increasing volume of traffic has made surface maintenance a more difficult task. Traffic volumes have on an average increased threefold in ten years, and range from 800-1,000 vehicles per day in the South to a peak of 200-300 in the extreme North. Oil and construction activity in the South have generated frequent heavy loads. Some 30% of traffic is trucks and many of these are heavily loaded semi-trailers.

The above excerpts convey a general idea of the problems encountered and the methods employed by the NWHME in coping with them. In addition to all year maintenance of the highway, the Army Engineers also do maintenance betterment work and handle new construction projects. Maintenance betterment covers those phases of work which tend to minimize future maintenance costs, such as culvert replacement, ditch and slope dressing; widening, deepening and straightening outfall channels; seepage control and the stripping and drainage of muskegs. New construction consists of work such as rebuilding sections of the highway on new and better locations, and the horizontal and vertical realignment of portions of the existing road to flatten curves and grades and improve sight distances. This category also embraces building new bridges to replace temporary structures, and to replace or upgrade substandard structures.

The system of accounts used by NWHME is such that the cost of maintaining the Alaska Highway in its present condition cannot readily be separated from

the overall costs of maintaining the highway and keeping it open to traffic throughout the year, providing and maintaining headquarters establishments, performing maintenance betterment and new construction work, and the many other duties performed and services rendered which are required due to the remoteness and isolation of the region, which under normal conditions would be handled by other agencies.

Lacking specific cost figures for maintaining the Alaska Highway under existing conditions, certain assumptions must be made when formulating a comparative estimate of cost for maintaining the highway if hard surfaced throughout.

Hence, assuming that all necessary reconstruction, realignment and resectioning had been done and the highway paved, the operations required for maintaining the paved road relative to those for maintaining the same road with open type gravel surfacing would be briefly as follows:

a. Plant - The existing plant which consists of the administrative headquarters at Whitehorse, section maintenance camps, warehouses, utilities, equipment repair shops, equipment storage facilities, and employees housing and recreational facilities, is designed primarily for highway maintenance functions. It is doubtful that curtailment of operations under the classification of "new construction" would alter the requirements for these basic facilities. Nor is there reason to suppose that any reduction in the basic plant requirements could be effected by paving the highway.

b. Administrative and Supervision - The curtailment of construction

activities should permit of a reduction in personnel in this category. However, a similar staff would be required for maintenance whether the highway was, or was not paved.

c. Equipment - The maintenance operation subject to the greatest change occasioned by paving the highway would be the gravel plating operation. This continuing replating task is due to the loss of the gravel surfacing material. The finer particles are dissipated as dust or washed off the roadway by rain water. The exposed coarser particles become loosened and are whipped off the road by moving vehicles. Crushing plants, loading cranes, dump trucks, maintainers and compacting equipment are required for this operation. Similar material, although in lesser quantities, for base repairs and shoulder maintenance will still be required. Due to the cost of moving heavy equipment over long distances, it is not anticipated that any appreciable reduction can be effected, except perhaps in dump truck capacity.

Although paving would eliminate the necessity for continuing blading of the travel portion of the roadway to provide a smooth riding surface, the maintainers, or blade graders, relieved of this function would still be needed for shoulder maintenance and slope and ditch dressing during the summer months. During the winter months this equipment is used for snow removal. Hence, little if any reduction in this type of equipment.

Equipment required for snow removal and icing control would be the same whether the highway were paved or gravel surfaced.

The equipment that would have to be added for the repair and main-

tenance of asphalt pavement, or surfacing, would tend to offset any savings effected by the curtailed gravel resurfacing operation.

d. Labor - The repair and maintenance of asphalt pavements or surfacings involve a lot of hand labor, particularly the damage due to frost action. The labor thus added would tend to offset any savings effected through the curtailment of the gravel plating operation. With labor requirement comparable for the other maintenance functions, for either a paved or unpaved highway, there is little opportunity for any appreciable savings in labor to be realized from paving the highway.

Normal roadway maintenance activities virtually cease during winter months when the ground is frozen solid. The functions of the maintenance forces during this 6-7 months period is snow removal, ice control and rendering assistance to distressed motorists. These operations are necessary to keep the highway open to traffic.

When frozen, the gravel road in reality becomes a paved road, the worst feature of which is the texture of the surface. For the most part the texture can be improved by close blading; that is, by letting the blade cut into the gravel surface sufficiently to remove the ice film and leave the gravel exposed. On paved surfaces this method would damage the pavement, hence the blade is set to skim over the surface leaving more of an ice film than is the case with a gravel surface. To prevent skidding and wheel slippage on the steeper grades and sharper curves, sanding has to be resorted to. Sanding is the spreading of a thin layer of granular material over the surface to provide wheel traction. This is a costly operation since it is largely hand work. It

is the consensus of opinion of the NWHME that sanding costs will be greatly increased if the highway is paved.

During the summer months the ravages of winter and the spring thaw (break-up) must be repaired. Repairs to drainage structures are presently high, owing to the large number of temporary structures remaining on the highway. Expenditures should be greatly decreased when the replacement program is completed. Drainage structure repair and maintenance costs are not affected by paving.

Roadside ditch and offtake, or outfall, channel care is another item receiving attention during the summer months. It is to be expected that roadway ditch sections and gradients would be enlarged and improved to minimize seepage before the highway was paved. It is then necessary to keep the ditches clean and well dressed so they function properly and get the water away from the roadway as quickly as possible. More attention to ditch upkeep is required to adequately protect a paved highway than for a gravel surface.

Right-of-way brush control and spring flood control expenditures would be the same in either case, while major slide control is an indeterminate quantity.

2. Maintenance on Other Northwest Highways: In most instances per annum highway maintenance costs are the quotient of the available funds divided by the miles of road maintained. Rarely, if ever, are the allotted funds sufficient to achieve the optimum maintenance required to properly safeguard the capital investment. Since cost data does not necessarily reflect the true overall cost of proper maintenance, it was necessary to determine the degree of maintenance which was achieved with the expenditure of known sums in order to project real-

istic estimates of cost for highway maintenance in the northwest. Analyses of local conditions and available cost data indicate an average annual expenditure of $2,500 per mile as a minimum figure to use for the maintenance of paved highways in the region. The same figure would be applicable to a gravelled surfaced road comparable to the existing Alaska highway.

3. Summation: It must be borne in mind that maintaining the highway and keeping traffic moving over it during the winter months and spring break-up determines the basic minimum requirements for plant, equipment and personnel below the administrative level. This period covers six to seven months of the year, hence approximately half of the annual maintenance budget would rightfully be chargeable to snow removal, or winter maintenance. The remaining budgetary funds are expended during the summer months for what would be termed as normal roadway maintenance, such as culvert and bridge repairs, much of which is occasioned by the breaking up of the ice and the attendant flooding during the spring thaw; bridge painting; roadway ditch and offtake channel cleaning and dressing; slope dressing and slide control; the repair and replacement of roadside markers and warning signs; and in the case of a gravel surfaced highway, repairing frost boil damage, blading the travel portion of the roadway to provide a reasonably smooth riding surface and the periodic replacement of the gravel surfacing material which is lost through the erosive action of wind and water.

In the case of a paved or hard surfaced highway, operations on the travel portion would consist of repairing frost boil damage, shoulder maintenance, repairing breaks in the surface due to frost action or other causes, the periodic resealing of the asphalt surface by "Seal Coating" (that is, the

application of a light film of liquid asphalt covered with stone chips), and the application and maintenance of roadway center and warning stripes.

The travel portion of a highway constitutes a minor part of the overall maintenance functions, and it is difficult, in the absence of bona fide cost data, to visualize any appreciable difference in maintaining this highway with a gravel surface or with a hard wearing surface. Therefore, any decision relative to paving, or not paving the Alaska highway, must perforce be based on indirect benefits rather than on any monetary savings derived from maintenance operations.

70243 O - 61 - VOL. 3 - 5

APPENDIX

GLOSSARY OF HIGHWAY NOMENCLATURE

1. General Definitions:

HIGHWAY NOMENCLATURE. Webster defines a HIGHWAY as: A main road or thoroughfare; hence, a road or way open to the use of the public.

The nomenclature applied to highways and roads varies widely with changes in locale. However, the adjectives employed are descriptive and generally convey the intended meaning - such as "Primary Road" denoting a thoroughfare of the first order. In other locales these roads may be referred to as trunk, main, arterial, through or cardinal highways or roads.

Confusion occurs in that a thoroughfare which can justifiably be classed as "Primary" in one locale, may be constructed to the standards of highways of "Secondary" or "Tertiary" classification in a different locality. This is the case in the subject area. Even there a marked variation occurs in that the Primary Highways in Alaska are paved, or surfaced, while the Alaska Highway through northern B.C. and the Yukon, with only a gravel surface, can rightly be classified as "Primary" as it is of the highest order of roads in the area traversed.

It is necessary to know the order of magnitude of the Primary classification in order to evaluate the Secondary classification.

The following definitions, where applicable, are specific to the subject area, otherwise they are based on general usage.

PRIMARY - FIRST CLASS - MAIN - TRUNK - CARDINAL HIGHWAY, ROAD OR ROUTE. Thoroughfares of the first order. These terms do not necessarily designate the standard of quality to which a highway is constructed, but rather the relationship of a particular highway to other highways and roads in a locale.

ARTERIAL OR THROUGH HIGHWAYS. General terms denoting a highway primarily for through traffic, usually on a continuous route.

SECONDARY, OR SECOND CLASS HIGHWAY. Denotes highways of the second magnitude. Standards of quality of the first order must be known in order to evaluate the second order.

TERTIARY, OR THIRD CLASS HIGHWAY OR ROAD. Thoroughfares of the third order of magnitude. Generally constructed to low standards.

PRINCIPAL SECONDARY ROUTES. In some areas Tertiary and Quatenary classifications are not used. In these instances, as is the practice in Alaska, the Secondary classification is divided into subgroups. Thus a Principal Secondary Route would apply to the highest type of secondary road.

LOW CLASS, UNIMPROVED, LOCAL, AND DIRT ROADS. Appropriate terms in general use to denote a very low order of throughfare which can be negotiated by horse-drawn vehicles or motor vehicles under favorable weather conditions.

GRADED ROADS. This term applies to dirt roads which have been shaped to a section with power equipment.

IMPROVED ROADS. This is a general term embracing all stages of improvement between a Dirt road and a Paved road.

ACCESS ROAD - SPUR HIGHWAY. A feeder road from an industrial area, mine, quarry, residential section, or other traffic generating area to a highway of higher classification. Anything from a graded dirt road to a multiple-lane paved highway can come under this classification.

PAVED ROAD - HARD SURFACED ROAD. As generally used, this term denotes a thoroughfare having a hard wearing surface of either asphalt or concrete. In professional terminology there is a distinction between a pavement and a surfacing.

GRAVEL ROAD. A thoroughfare on which the wearing surface (contact between wheel and roadway) is composed of either pit-run or processed gravel.

ALL-WEATHER ROAD. A general term applicable to a thoroughfare which has been improved to an extent that it is passable under all normal weather conditions.

PIONEER ROADS. Roads, generally of low standard, constructed for the purpose of creating new traffic generating areas, rather than providing service to existing centers.

DEVELOPMENT ROADS. Roads of varying standards, constructed primarily for the development of areas having known potentials for traffic development.

ROADS TO RESOURCES. Promotional phraseology.

JEEP ROAD. Roads which can be traversed by jeep type vehicles but not by conventional automobiles and pick-ups.

MOTOR ROAD. Thoroughfares which can be negotiated by motor powered vehicles.

CAT TRAIL. Thoroughfares of such low standard as to be negotiable only by track laying vehicles.

WINTER TRACTOR ROADS. Routes across wet areas which can be traversed by track laying vehicles only when frozen.

WINTER TRAIL. As used in northwest region denotes routes negotiable by dog sled or man on foot over frozen ground or water areas.

SUMMER TRAILS. These trails, used as foot and bridle paths, tend to seek higher ground to avoid the wet areas.

TOTE ROAD. Low standard thoroughfare, oftimes of a temporary nature.

BUSH ROAD. Roads of variable standards built through the forest, or bush, generally to serve a specific need.

FOREST HIGHWAY. Arterial routes through National Forest areas, generally of the standards of the connecting State Highway Systems of Primary and Secondary classifications.

FOREST SERVICE ROADS. Thoroughfares constructed by the Forestry Department within the National Forests for patrol, logging and recreational use.

LOGGING ROADS. Roads constructed for the primary purpose of transporting logs to the mill or market.

2. Highway Types:

INTERSTATE. A National System of Interstate and Defense Highways, authorized by the Federal-Aid Highway Act of 1956, with additions by Congress. A

system which connects principal metropolitan areas, state capitols, cities and industrial centers to serve the national defense and to connect at suitable border points with routes of continental importance.

U. S. HIGHWAY. An arterial highway designated by the A.A.S.H.O. as a part of the National System of U. S. Highways, usually through routes between population centers.

FEDERAL AID PRIMARY. All highways on the approved designated system of connecting Federal Highways eligible for Federal Primary Funds through routes between population centers.

FEDERAL AID SECONDARY. All highways on the approved designated system of Federal Secondary Highways eligible for Federal Secondary Funds, usually rural feeders to the Primary and Interstate Systems.

FEDERAL AID URBAN HIGHWAYS. Urban highways consist of those portions of the Primary and Secondary Highways situated within urban areas and urban places of 5,000 or more population with certain approved connections.

STATE HIGHWAYS. A system of roads in a state. This system is designated by the State Highway Commission. These highways are financed by either all state funds or by Federal Aid Primary or Secondary Funds as explained above under Federal Aid Primary and Secondary Highways.

FARM TO MARKET ROADS. A system of secondary roads that connect the rural farming areas with their principal market areas and also serve as rural mail and school bus routes.

RANCH TO MARKET ROADS. A system of secondary roads that connect the rural ranching areas with their principal market areas and also serve as rural mail and school bus routes.

NATIONAL FOREST HIGHWAYS. A system of approved designated forest roads of primary importance to the counties or communities within, adjoining or adjacent to National Forests.

PARK ROADS. A system of secondary roads that connects the various state and national parks with the highway system.

LOOP HIGHWAYS. A system of primary or secondary highways that provides a connection or loop around or through the urban area of a city or town.

SPUR HIGHWAYS. A feeder highway from an industrial area, residential section or other traffic generating area to a highway.

HIGHWAY, STREET OR ROAD. A general term denoting a public way for purposes of vehicular travel, including the entire area within the right-of-way. Recommended usage in urban areas - highway or street; in rural areas - highway or road.

ARTERIAL HIGHWAY. A general term denoting a highway primarily for through traffic, usually on a continuous route.

EXPRESSWAY. A divided arterial highway for through traffic with full or partial control of access and generally with grade separations at intersections.

FREEWAY. An expressway with full control of access.

PARKWAY. An arterial highway for non-commercial traffic, with full or partial control of access, and usually located within a park or ribbon of parklike development.

CONTROLLED ACCESS HIGHWAY. Any designated State Highway within or outside the limits of any incorporated city, town or village, to or from which access is denied or controlled, in whole or in part, from or to abutting land or intersecting streets, roads, highways, alleys or other public or private ways.

COLLECTOR-DISTRIBUTOR ROAD. An auxiliary roadway separated laterally from, but generally parallel to, the through roadway, which serves to collect and distribute traffic from several access connections between selected points of ingress and egress from the through traffic lanes.

MAJOR STREET OR MAJOR HIGHWAY. An arterial highway with intersections at grade and direct access to abutting property and on which geometric design and traffic control measures are used to expedite the safe movement of through traffic.

THROUGH STREET OR THROUGH HIGHWAY. Every highway or portion thereof at the entrance to which vehicular traffic from intersecting highways is required by law to stop before entering or crossing the same when stop signs are erected.

LOCAL STREET OR LOCAL ROAD. A street or road used primarily for access to residence, business or other abutting property.

DIVIDED HIGHWAY. A highway with separate roadways for traffic in opposite directions.

LOOP OR BYPASS. An arterial highway for carrying traffic partially or entirely around an urban area or portion thereof. (Also called Belt Highway or Circumferential Highway.)

RADIAL HIGHWAY. An arterial highway leading to or from an urban center.

FRONTAGE STREET OR FRONTAGE ROAD. A local street or road auxiliary to and located along an arterial highway for service to abutting property and adjacent areas and for control of access. (Sometimes known as a Service Road, Access Road or Insulator Road.)

TOLL ROAD, BRIDGE OR TUNNEL. A highway, bridge or tunnel open to traffic only upon payment of a direct toll or fee.

CUL-DE-SAC STREET. A local street open at one end only with a special provision for turning around.

DEAD END STREET. A local street open at one end only without special provision for turning around.

ONE-WAY STREET OR ROAD. A street or road on which traffic is allowed to move only in one direction.

HIGHWAY-BUSINESS ROUTE. Usually a highway through the business section of a town, city, village or community, where the through highway by-passes the business section.

DETOUR. A temporary route for a highway which directs highway traffic around construction work. The detour route is always marked with the proper

marker and additional signs to indicate it is a detour route.

CROSS ROAD OR CROSS STREET. Any road or street that crosses the subject highway.

3. Pavement and Base Structure Definitions:

PAVED ROAD - HARD SURFACED ROAD. As generally used, this term denotes a thoroughfare having a hard wearing surface of either asphalt or concrete.

BLACK TOP PAVING. Any wearing surface compounded of bituminous materials having a black, or dark color, as distinguished from the lighter textured Portland cement concrete pavement.

BITUMINOUS PAVEMENT. Same as Black Top.

ASPHALTIC CONCRETE PAVEMENT. A homogeneous mixture of well-graded aggregates cemented together with asphalt to form a semi-solid concrete. Pavements of this type are classified as "Flexible Pavements" since they will withstand considerable distortion before rupturing. "Hot Mixed" and "Cold Mixed" are terms used to designate different types of asphaltic concrete pavement. In the hot mixed type the aggregates and bitumen are preheated and mixed, and laid under careful temperature control. The cold mixed type is mixed and laid at atmospheric temperature.

ASPHALT SURFACE TREATMENT. A wearing surface composed of one or more applications of asphaltic material covered with aggregate (stone chips) and constructed on a primed base.

GRAVEL SURFACE. A wearing surface composed of unprotected gravel. The

gravel may be "pit run" or "processed".

Pit Run Gravel. Gravel in its natural state without benefit of processing.

Processed Gravel. Gravel which has undergone mechanical processing to control maximum gradation on the one hand, or complete gradation control on the other hand.

PAVEMENT STRUCTURE. The base-pavement, sub-base and subgrade treatment.

PAVEMENT STRUCTURE DESIGN. The arrangement of material in depth to achieve a multiple layered system in which the stresses induced from the applied traffic load in each successive layer will be within the allowable working limits of the material.

SUBGRADE TREATMENT. The top layer of embankment or natural ground that has received a specified compactive effort at or near optimum moisture, or has been treated with a stabilizing agent, then compacted.

SUB-BASE. One or more courses of material of planned thickness and controlled quality placed immediately under the base-pavement. (Under certain conditions the sub-base thickness may be zero.)

SUB-BASE GRADE. The final elevation or grade line over which the base-pavement is placed.

BASE-PAVEMENT. A layer of one or more courses of selected, processed or treated aggregate material and/or a top course designed to provide structural values and surface resistance to both traffic abrasion and the disintegrating effects of the elements.

FLEXIBLE BASE. A base composed of natural and/or mechanically processed materials with a cohesiometer value less than 100.

SEMI-FLEXIBLE BASE. A base composed of a stabilized material with a cohesiometer value greater than 100 and a flexural strength less than about 200 psi. A semi-flexible base may have a modulus of elasticity of about 1,000,000 psi.

SUBGRADE. The top of the usual grading operation, including the subgrade treatment, upon which the sub-base or base-pavement is placed.

WEARING SURFACE. The top course of a pavement structure designed to provide surface resistance to traffic abrasion and to weatherproof the underlying layers without necessarily imparting any structural values to the pavement structure.

LEVELING COURSE. A layer of material constructed directly on the existing base-pavement or wearing surface for the purpose of removing irregularities.

RESURFACING. A supplemental surface placed on an existing base-pavement or wearing surface to improve its riding surface or increase its strength.

TACK COAT. The initial application of asphaltic material to an existing surface to insure bond between the superimposed construction and the old surface.

PRIME COAT. The initial application of a low viscosity, liquid asphaltic material to an absorbent surface, preparatory to any subsequent treatment, for the purpose of hardening or toughening the surface and promoting adhesion between it and the superimposed construction.

SEAL COAT. An asphaltic coating, with or without aggregate, applied to the surface of a pavement structure for the purpose of waterproofing and preserving the surface, rejuvenating a previous asphaltic surface treatment, improving the surface texture of the wearing surface, changing the surface color, or providing resistance to traffic abrasion.

EMBANKMENT. A raised structure of soil, soil aggregate, or rock.

EMBANKMENT FOUNDATION. The material on which an embankment is placed.

NATURAL GROUND OR EMBANKMENT. The material in excavations, embankments and embankment foundations immediately below the first layer of the pavement structure.

ROUTE : Alaska Highway - (Existing)

ROUTING : Seattle - Prince George - Dawson Creek - Fort St. John - Fort Nelson - Watson Creek - Jakes Cor. - Whitehorse, Haines Jct. - Tok Jct. - Fairbanks

Column No : (1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)	(14)
SECTION	UNIT	MILEAGE	BRIDGE REPLACEMENTS LUMP SUM	RELOCATIONS AND LINE IMPROVEMENTS $ 70,000/Mi	PREPARING ROADWAY FOR PAVING OR SURFACING $ 35,000/Mi	TOTALS COL'S 4,5 & 6	CRUSHED GRAVEL BASE COURSE (AV. 18" THICK.) $ 40,000/Mi	4" HOT-MIX ASPHALTIC CONCRETE PAVEMENT $ 25,000/Mi	TOTALS COL'S 8 & 9	CRUSHED GRAVEL BASE COURSE (AV. 9" THICK) $ 20,000/Mi	ASPHALT SURFACE TREATMENT $ 6,000/Mi	TOTALS COL'S 11 & 12	REMARKS
Seattle - Prince George	-	582	$	$	$	$	$	$	$	$	$	$	Existing Paved Highway
Prince George - Dawson Cr.	-	259											" " "
Dawson Cr. - Charlie Lake	1	52	990,000	-0-	-0-	990,000	-0-	-0-	-0-	-0-	-0-	-0-	Roadway Paved - 2 Semi-Permanent Bridges
Charlie Lake - M.P. 649	2	597	9,410,500	7,238,000	19,365,500	36,014,000	26,268,000	16,417,500	42,685,500	13,134,000	3,940,200	17,074,200	Existing Gravel Road
M.P. 649 - M.P. 760	3	111	572,000	1,617,000	3,465,000	5,654,000	4,884,000	3,052,500	7,936,500	2,442,000	732,600	3,174,600	" " "
M.P. 760 - Jakes Cor.	4	112	3,355,000	1,309,000	3,657,500	8,321,500	4,928,000	3,080,000	8,008,000	2,464,000	739,200	3,203,200	" " "
Jakes Cor. - Haines Jct.	5	144	1,034,000	1,155,000	4,966,500	7,155,500	6,336,000	3,960,000	10,296,000	3,168,000	950,400	4,118,400	" " "
Haines Jct. - M.P. 1100	6	84	121,000	693,000	2,887,500	3,701,500	3,696,000	2,310,000	6,006,000	1,848,000	554,400	2,402,400	" " "
M.P. 1100 - Alaska Bdy.	7	121	1,452,000	1,848,000	3,734,500	7,034,500	5,324,000	3,327,500	8,641,500	2,662,000	798,600	3,460,600	" " "
Alaska Bdy. - Fairbanks	-	305	-0-	-0-	-0-	-0-	-0-	-0-	-0-	-0-	-0-	-0-	Pavement or Asphalt Surface Treatment over Entire Route.
Totals		2367	$ 16,934,500	$ 13,860,000	$ 38,076,500	$ 68,871,000	$ 51,436,000	$ 32,147,500	$ 83,583,500	$ 25,718,000	$ 7,715,400	$ 33,433,400	

Summation:

Schedule 1 - Asphaltic Concrete Pavement

Columns 4 - 5 & 6	$ 68,871,000
Columns 8 & 9	83,583,500
Total Est. Cost	$152,454,500

Schedule 2 - Asphalt Surface Treatment

Columns 4 - 5 & 6	$ 68,871,000
Columns 11 & 12	33,433,400
Total Est. Cost	$102,304,400

Note: 10% for Engineering & Contingencies has been added.

RECAPITULATION OF N. W. H. S. BRIDGES
PROJECTED TO DEC. 1959

No.	ALASKA HIGHWAY: BRIDGE OR BRIDGE CULVERT	MILEAGE	TOTAL LENGTH IN FEET	ORIGINAL STRUCTURE WHERE REPLACED SINCE 1946: TYPE	ORIGINAL STRUCTURE WHERE REPLACED SINCE 1946: LENGTH	PERMANENT BRIDGES BOTH SUB & SUPERSTRUCTURE: LOAD CLASS AS OF 1946	PERMANENT BRIDGES: REPLACED SINCE 1946: LOAD CLASS	PERMANENT BRIDGES: REPLACED SINCE 1946: YEAR CONST	PERMANENT BRIDGES: REPLACED SINCE 1946 BY CULVERT (YEAR)	PERMANENT BRIDGES: ELIMINATED SINCE 1946 (X)	REMAINING BRIDGES: TYPE	REMAINING BRIDGES: LOAD CLASS	REMAINING BRIDGES: YEAR CONST. IF BUILT SINCE 1946	REMAINING BRIDGES: TO BE MADE PERMANENT BY NEW BRIDGE (B) OR REPLACED BY CULVERT (C) IN CONSTRUCTION SEASON: 60/61	61/62	62/63	63/64	64/65	65/66	REMARKS (SP SEMI PERMANENT #; T TEMPORARY; D NEW DECK; # PERMANENT SUBSTRUCTURE OR TREATED TIMBER PILES)	ESTIMATED COST OF REPLACING TEMPORARY DRAINAGE STRUCTURES
1	Kiskatinaw River	20.3	533								SP	H 15									$ 800,000
2	Pingel Creek	34.8	116								SP	H 15									100,000
3	Beatton River	147	111			H15-S12															110,000
4	Sikanni Chief River	161.8	600								SP	H 15									600,000
5	Buckinghorse River	175.2	198			H15-S12															190,000
6	Beaver River	206.7	163			H15-S12															160,000
7	Bougie Creek	229	145	T	106		H20-S16	1955													
8	Adsett Creek	233.7	85			H15-S12															50,000
9	Martin Creek	242.6	114	T	142.9		H20-S16	1959													
10	Parker Creek	246.9	70								SP	H 15									50,000
11	Little Beaver Creek	252.3	Culv.	T	151				1958												
12	Big Beaver Creek	264.3	105.3	T	91		H20-S16	1954													
13	Jackfish Creek	278.2	136								T	H 15		B						Temporary Bridge being installed 1960	120,000
14	Muskwa River	296.6	1046			H15															1,000,000
15	Raspberry Creek	324.6	101			H15-S12															80,000
16	Kledo River	335.1	2 84.8			H15-S12															270,000
17	Steamboat Creek	340.2	186			H15-S12															180,000
18	Gardner Creek	358.5	Culv.	T	115				1954												
19	Mill Creek	363.1	164.2			H15-S12															150,000
20	Bridge Culvert	378.6	20	T	30		H20-S16	1959													
21	Tetsa River	383.3	540			H15-S12															520,000
22	Tetsa River	384.9	208			H15-S12															200,000
23	N. Fork Tetsa No 1	390.1	106								T	H 15							B		90,000
24	N. Fork Tetsa No 2	391.9	91								T	H 15							B		85,000
25	105 Creek	395.2	91								T	H 15						C			85,000

70243 O-61-VOL. -3 (Face p. II-B, Sheet 6) No. 1

RECAPITULATION OF N. W. H. S. BRIDGES
PROJECTED TO DEC. 1959

No.	ALASKA HIGHWAY					PERMANENT BRIDGES BOTH SUB & SUPERSTRUCTURE					REMAINING BRIDGES											ESTIMATED COST OF REPLACING TEMPORARY DRAINAGE STRUCTURES
	BRIDGE OR BRIDGE CULVERT	MILEAGE	TOTAL LENGTH IN FEET	ORIGINAL STRUCTURE WHERE REPLACED SINCE 1946		LOAD CLASS AS OF 1946	REPLACED SINCE 1946		REPLACED SINCE 1946 BY CULVERT (YEAR)	ELIMINATED SINCE 1946 (X)	TYPE	LOAD CLASS	YEAR CONST. IF BUILT SINCE 1946	TO BE MADE PERMANENT BY NEW BRIDGE (B) OR REPLACED BY CULVERT (C) IN CONSTRUCTION SEASON						SP SEMI PERMANENT * T TEMPORARY D NEW DECK * PERMANENT SUBSTRUCTURE OR TREATED TIMBER PILES REMARKS	
				TYPE	LENGTH		LOAD CLASS	YEAR CONST						60/61	61/62	62/63	63/64	64/65	65/66		
26	107 Creek	396.8	Culv.	T	76				1957													
27	110 Creek	398.4	91								T	H 15							C			$ 60,000
28	113 Creek	401.9	76								T	H 15							B			60,000
29	115 Creek No 1	403.5	91								T	H 15							B			60,000
30	115 Creek No 2	403.6	76								T	H 15										60,000
31	MacDonald Creek	410.3	318			H15-S12																250,000
32	Racing River	418.7	525			H15-S12																500,000
33	Wood Creek	424.4	151								T	H 15				B						140,000
34	141 Creek	425.1	76								T	H 15				C						60,000
35	417 Creek	417	28	T	31		H20-S16	1959	*													
36	150 Creek	433.6	61								T	H 15							B			40,000
37	151 Creek	434.9	76								T	H 15							B			60,000
38	Toad River	437.6	247.3			H15-S12																
39	Peterson Creek No 1	441.8	76								T	H 15							B			60,000
40	Peterson Creek No 2	443.8	99								T	H 15										80,000
41	Peterson Creek No 3	444.8	97								T	H 15										80,000
42	Peterson Creek No 4	445	70								T	H 15										60,000
43	Bridge Culvert	445.4	30								T	H 15										
44	Bridge Culvert	448.8	30								T	H 15										
45	Bridge Culvert	449.9	30								T	H 15										
46	Bridge Culvert	450.7	30								T	H 15										
47	Bridge Culvert	452.8	30								T	H 15										325,000
48	Bridge Culvert	454.1	30								T	H 15										No.43 Through
49	Bridge Culvert	455.9	30								T	H 15										No. 54
50	Bridge Culvert	456.5	24								T	H 15										

70243 O - 61 - VOL. 3 (Face p. II-B, Sheet 6) No. 2

RECAPITULATION OF N. W. H. S. BRIDGES
PROJECTED TO DEC. 1959

No.	ALASKA HIGHWAY: Bridge or Bridge Culvert	Mileage	Total Length in Feet	Original Structure Where Replaced Since 1946: Type	Original Structure Where Replaced Since 1946: Length	Permanent Bridges (Both Sub & Superstructure): Load Class as of 1946	Replaced Since 1946: Load Class	Replaced Since 1946: Year Const	Replaced Since 1946 by Culvert (Year)	Eliminated Since 1946 (X)	Remaining Bridges: Type	Load Class	Year Const. if Built Since 1946	To be made permanent by new bridge (B) or replaced by culvert (C) in construction season: 60/61	61/62	62/63	63/64	64/65	65/66	Remarks	Estimated Cost of Replacing Temporary Drainage Structures
51	Bridge Culvert	457.1	30								T	H 15									
52	Bridge Culvert	457.7	30								T	H 15									
53	Bridge Culvert	459.9	30								T	H 15									
54	Bridge Culvert	460.3	30								T	H 15									
55	Bridge Culvert	462.8	Culv	T	30				1959	*											
56	Bridge Culvert	463.8	30								T	H 15									
57	Bridge Culvert	465.0	30								T	H 15									
58	Bridge Culvert	466.2	30								T	H 15									
59	Bridge Culvert	469.3	30								T	H 15									210,000
60	Bridge Culvert	471.2	30								T	H 15									No. 56 Through No. 62
61	Bridge Culvert	474.1	30								T	H 15									
62	Bridge Culvert	477.9	30								T	H 15				C					
63	Trout River	476.3	257			H15-S12															200,000
64	Prochniak Creek	479.3	62	T	76		H20-S16	1954													
65	Washout Creek	491.6	126(a)	Culv							T	H 15	47								50,000
66	Lower Liard	495.8	1113.4			H15-S12															1,000,000
67	Teeter Creek	501.7	61								T	H 15							B		40,000
68	Smith River	513.9	246.3			H15-S12															220,000
69	Coal River	533.2	454			H15-S12															430,000
70	Army Bridge	547.2	99	T	71		H20-S16	1953													
71	Contact Creek	588.1	147	T	140		H20-S16	1957													
72	Irons Creek	594.3	96								T	H 15			B					Being Replaced 1961	80,000
73	Hyland River	605.9	609			H15-S12															550,000
74	Mayfield Creek	618.7	Culv	T	45				1959	*											
75	Upper Liard River	642.6	645			H20															

SP SEMI PERMANENT #
T TEMPORARY
D NEW DECK
* PERMANENT SUBSTRUCTURE OR TREATED TIMBER PILES

RECAPITULATION OF N. W. H. S. BRIDGES
PROJECTED TO DEC. 1959

No.	ALASKA HIGHWAY					PERMANENT BRIDGES BOTH SUB & SUPERSTRUCTURE					REMAINING BRIDGES											ESTIMATED COST OF REPLACING TEMPORARY DRAINAGE STRUCTURES
	BRIDGE OR BRIDGE CULVERT	MILEAGE	TOTAL LENGTH IN FEET	ORIGINAL STRUCTURE WHERE REPLACED SINCE 1946 TYPE	ORIGINAL STRUCTURE WHERE REPLACED SINCE 1946 LENGTH	LOAD CLASS AS OF 1946	REPLACED SINCE 1946 LOAD CLASS	REPLACED SINCE 1946 YEAR CONST	REPLACED SINCE 1946 BY CULVERT (YEAR)	ELIMINATED SINCE 1946 (X)	TYPE	LOAD CLASS	YEAR CONST IF BUILT SINCE 1946	TO BE MADE PERMANENT BY NEW BRIDGE (B) OR REPLACED BY CULVERT (C) IN CONSTRUCTION SEASON 60/61	61/62	62/63	63/64	64/65	65/66	REMARKS	
76	Albert Creek	643.5	64(b)			H20																
77	Little Rancheria	670.2	234	T	126		H 20	47														
78	Big Creek	674.0	165	T	85		H 20	47														
79	Lower Rancheria	687.1	314	T	229		H20-S16	54														
80	Spencer Creek	694.9	39	T	21						T	H 15	49						B			$ 300,000
81	Georges Gorge	701.6	26	C	--						T	H 15	52									
82	Canyon Creak	712	26								T	H 15					B					20,000
83	Young Creek	715.5	26	C	--						T	H 15	52									
84	Upper Rancheria	721.6	223	T	144		H20-S16	54														
85	Swift River	725.1	147								SP	H 15										200,000
86	Seagull Creek	733	64			H20																
87	Partridge Creek	735.9	64			H20																
88	Screw Creek	741.8	64			H20																
89	Logjam Creek	751.1	63			H20																
90	Smart River	759.1	138	T	127		H20-S16	59*														
91	Smart River Overflow	759.4	26	C							T	H 15	48	C								
92	Upper Hazel Creek	767.6	Culv	T	64				1958													
93	Lower Hazel Creek	768.7	Culv	T	64				1958													
94	Andy Creek (Br Culv)	773.2	10	C	--						T	H 15	54									
95	Morley River	777.0	165								SP	H 15										150,000
96	Strawberry Creek	787.0	26	C	--						T	H 15	55		C							15,000
97	Nisutlin Bay	803.4	1916	T	2326		H20-S16	54														
98	Ten Mile Creek	813.1	22								T	H 15							C			15,000
99	Lone Tree Creek	816.8	20								T	H 15							C			15,000
100	Deadman Creek	822.3	64				H20															

SP SEMI PERMANENT *
T TEMPORARY
D NEW DECK
* PERMANENT SUBSTRUCTURE OR TREATED TIMBER PILES

70243 O - 61 - VOL. 3 (Face p. II-B, Sheet 6) No. 4

RECAPITULATION OF N. W. H. S. BRIDGES

PROJECTED TO DEC. 1959

No.	ALASKA HIGHWAY					PERMANENT BRIDGES BOTH SUB & SUPERSTRUCTURE					REMAINING BRIDGES										ESTIMATED COST OF REPLACING TEMPORARY DRAINAGE STRUCTURES
	BRIDGE OR BRIDGE CULVERT	MILEAGE	TOTAL LENGTH IN FEET	ORIGINAL STRUCTURE WHERE REPLACED SINCE 1946 TYPE	ORIGINAL STRUCTURE WHERE REPLACED SINCE 1946 LENGTH	LOAD CLASS AS OF 1946	REPLACED SINCE 1946 LOAD CLASS	REPLACED SINCE 1946 YEAR CONST	REPLACED SINCE 1946 BY CULVERT (YEAR)	ELIMINATED SINCE 1946 (X)	TYPE	LOAD CLASS	YEAR CONST IF BUILT SINCE 1946	TO BE MADE PERMANENT BY NEW BRIDGE (B) OR REPLACED BY CULVERT (C) IN CONSTRUCTION SEASON 60/61	61/62	62/63	63/64	64/65	65/66	SP SEMI PERMANENT * T TEMPORARY D NEW DECK * PERMANENT SUBSTRUCTURE OR TREATED TIMBER PILES REMARKS	
101	Robertson Creek	825.0	Culv	T	22				1959*												
102	Teslin River	836.3	1466			H20															
103	Seaforth Creek	849.0	58								T	H 15				B					$ 50,000
															Jake's	Corners		Mile 862		Sub Total	$10,280,000
104	Judas Creek	872.2	77								T	H 15									60,000
105	Glacier No 1	888.5	--	T	22					X											
106	Glacier Creek No 2	888.6	Culv	T	22				1948												
107	McLintock River	890.3	316								T	H 15						B			300,000
108	Glacier Creek No 3	893.4	26	T	21						T	H 15	53				C				
109	Yukon River	897.5	512	T	526		H20-S16	55													
110	Wolfe Creek	907	26	C	- -						T	H 15	48				C			Being Replaced 1960	
111	McIntyre Creek	912.2	Culv	T	24				1954												
112	Takhini River	946.3	329								SP	H 15									300,000
113	Stoney Creek	956.0	43								T	H 15		B						Being Replaced 1960	
114	Mendenhall Creek	960.0	77								T	H 15			B						60,000
115	Cracker Creek	987.8	85(c)								T	H 15			B						80,000
116	Aishihik River	996.3	107								SP	H 15									100,000
117	Marshall Creek	1005.6	107								SP	H 15									100,000
118	Pine Creek	1018.9	84	T	85		H20-S16	54													
119	Bear Creek	1022.3	Culv	T	26				1955												
120	Jarvis Creek	1034.3	122	T	124		H20-S16	54													
121	Christmas Creek	1047.9	Culv	T	58				1954												
122	Silver Creek	1053.6	21	C							T	H 15	48								
123	Slims River	1059.8	408	T	1217		H20-S16	56													
124	Williscroft Creek	1066.5	39	T	20						T	H 15	53				C				30,000

70243 O - 61 - VOL. 3 (Face p. II-B, Sheet 6) No. 5

RECAPITULATION OF N. W. H. S. BRIDGES
PROJECTED TO DEC. 1959

No.	ALASKA HIGHWAY: BRIDGE OR BRIDGE CULVERT	MILEAGE	TOTAL LENGTH IN FEET	ORIGINAL STRUCTURE WHERE REPLACED SINCE 1946: TYPE	ORIGINAL STRUCTURE WHERE REPLACED SINCE 1946: LENGTH	PERMANENT BRIDGES BOTH SUB & SUPERSTRUCTURE: LOAD CLASS AS OF 1946	REPLACED SINCE 1946: LOAD CLASS	REPLACED SINCE 1946: YEAR CONST	REPLACED SINCE 1946 BY CULVERT (YEAR)	ELIMINATED SINCE 1946 (X)	REMAINING BRIDGES: TYPE	LOAD CLASS	YEAR CONST IF BUILT SINCE 1946	TO BE MADE PERMANENT BY NEW BRIDGE (B) OR REPLACED BY CULVERT (C) IN CONSTRUCTION SEASON: 60/61	61/62	62/63	63/64	64/65	65/66	REMARKS (SP SEMI PERMANENT *; T TEMPORARY; D NEW DECK; * PERMANENT SUBSTRUCTURE OR TREATED TIMBER PILES)	ESTIMATED COST OF REPLACING TEMPORARY DRAINAGE STRUCTURES
125	Congdon Creek	1071.6	51	T	24.5						T	H 15	53								$ 40,000
126	Nines Creek	1078.2	62								T	H 15				B					40,000
127	Mines Creek	1078.8	25	C	--						T	H 15	51								
128	Bock's Brook	1080.3	26	C	--						T	H 15	51								
129	Lewis Creek	1087.0	51	C	--						T	H 15	53								
130	Halfbreed Creek	1089.1	26	C							T	H 15	51								
131	Duke River	1098.4	406	T	1426		H20-S16	55													
132	Burwash Creek	1103.9	190								T	H 15		B						Being Replaced 1960	
133	Quill Creek	1111.6	64								T	H 15		B						" " 1960	
134	Glacier Creek	1113.6	Culv	T	43				1958												
135	Swede Johnson Creek	1119.2	18								T	H 15		C							
136	Donjek Overflow	1132.5	39								T	H 15	52		X						
137	Donjek River	1132.8	1617	T	1811		H20	52 (1)													
138	Lake Creek	1146.2	64								T	H 15							C		40,000
139	Edith Creek	1146.6	106	(Reduced 54) T	169						T	H 15							B		100,000
140	Koidern No 1	1151.5	163	T	148						T	H 15				B				Rebuilt 54/57	100,000
141	Longs Creek	1156.0	106								T	H 15									90,000
142	Koidern No 2	1164.0	169								T	H 15						B			150,000
143	Two Lakes	1164.1		T	43					X											
144	White River Overflow	1165.1	Culv	T	77				1956												
145	White River	1169.2	583			H 15(d)					T	H 15		B						(25' only) (N.End Only)	560,000
146	Sand Pete Creek	1178.0	64								T	H 15			C						30,000
147	Little Sandpete Creek	1178.4	17								T	H 15							C		
148	Dry Creek No 1	1181.0	106	(Reduced 50) T	127						T	H 15				B					80,000
149	Dry Creek No 2	1184.0	106								T	H 15				B					80,000

70243 O - 61 - VOL. 3 (Face p. II-B, Sheet6) No. 6

RECAPITULATION OF N. W. H. S. BRIDGES
PROJECTED TO DEC. 1959

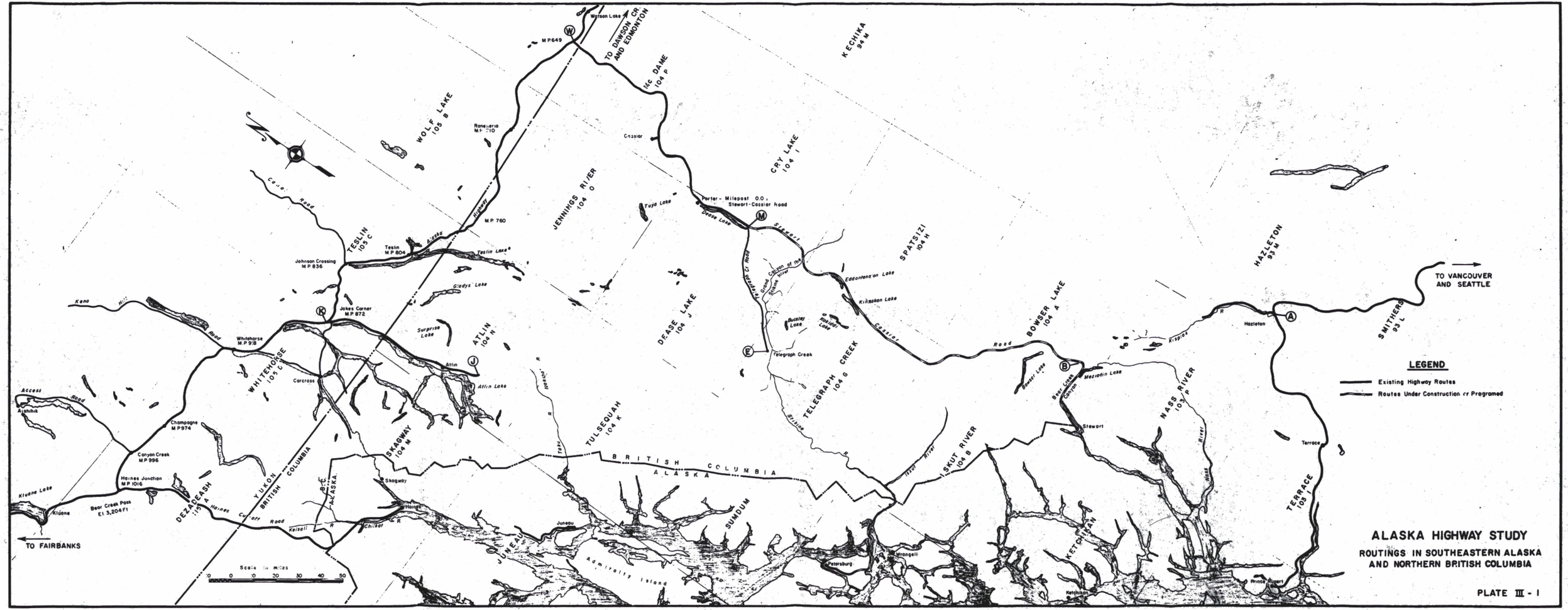
No.	ALASKA HIGHWAY: BRIDGE OR BRIDGE CULVERT	MILEAGE	TOTAL LENGTH IN FEET	ORIGINAL STRUCTURE WHERE REPLACED SINCE 1946: TYPE	ORIGINAL STRUCTURE WHERE REPLACED SINCE 1946: LENGTH	PERMANENT BRIDGES BOTH SUB & SUPERSTRUCTURE: LOAD CLASS AS OF 1946	REPLACED SINCE 1946: LOAD CLASS	REPLACED SINCE 1946: YEAR CONST	REPLACED SINCE 1946 BY CULVERT (YEAR)	ELIMINATED SINCE 1946 (X)	REMAINING BRIDGES: TYPE	LOAD CLASS	YEAR CONST. IF BUILT SINCE 1946	TO BE MADE PERMANENT BY NEW BRIDGE (B) OR REPLACED BY CULVERT (C) IN CONSTRUCTION SEASON: 60/61	61/62	62/63	63/64	64/65	65/66	REMARKS	ESTIMATED COST OF REPLACING TEMPORARY DRAINAGE STRUCTURES
150	Niggerhead Creek	1195.8	85								T	H 15					B				$ 70,000
151	Beaver Creek No 1	1200.5		T	101					X											
152	Beaver Creek No 2	1200.7	205.3			H20 H15 Deck											D				
153	Snag Creek	1208.0	105			H20 H15 Deck											D				
154	Mirror Creek	1208.9	20	C	--						T	H 15	48								
155	Little Scottie Creek	1217.8	26	T	26						T	H 15	54						C		20,000
156	Dixon Creek	1220.3	Culv	T	22				1955												

SP SEMI PERMANENT
T TEMPORARY
D NEW DECK
* PERMANENT SUBSTRUCTURE OR TREATED TIMBER PILES

Footnotes: (1) Donjek River Br. Relocated 3 Miles Downstr. Reference Item No. 137

* Projected for Construction in 1959 " " " 9, 20, 35, 55, 74, 90, 101
(a) Reduced from 139' in '58 " " " 65
(b) Reduced from 91' in '56 " " " 78
(c) 1-21' Span added '48 " " " 115
(d) Conc. Substructure and Steel - H 20 " " " 145

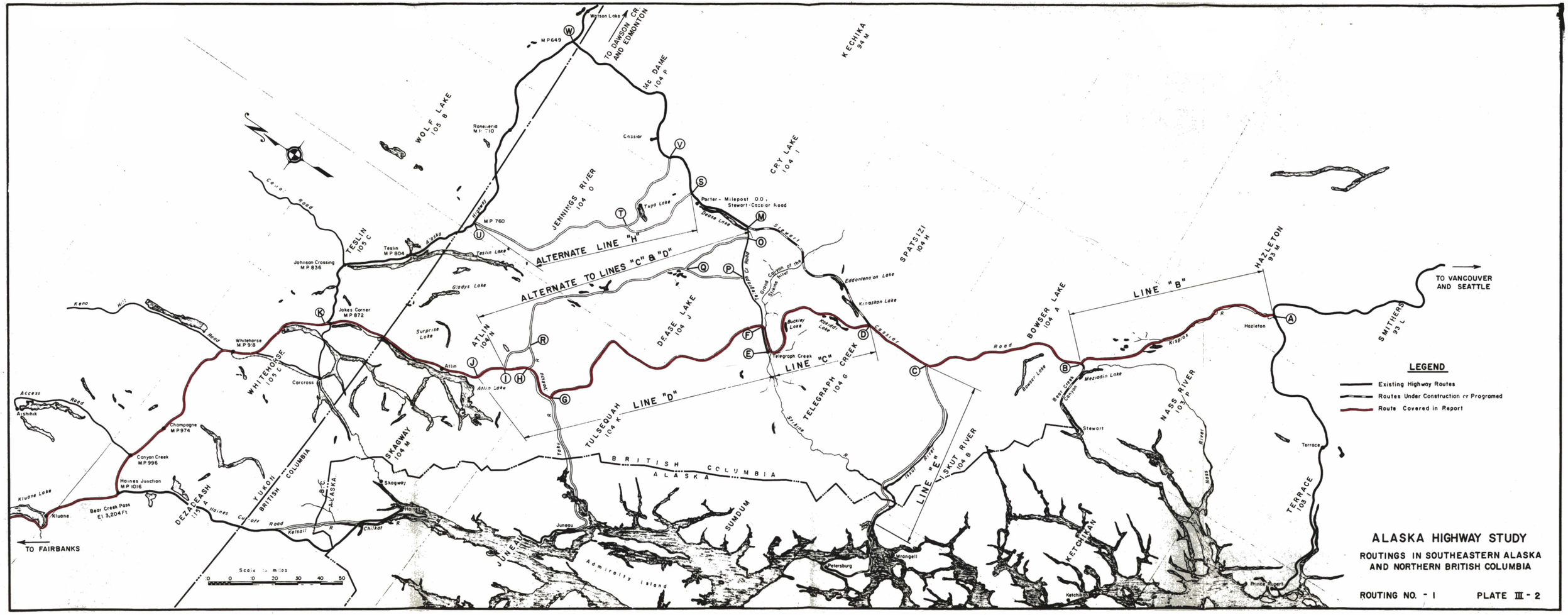
70243 O - 61 - VOL. 3 (Face p. II-B, Sheet 6) No. 7



ROUTE : Seattle to Fairbanks

ROUTING : No. 1-(See Plate III-2);Seattle - Prince George - A(Hazleton) - B - C - D - E(Telegraph Cr.) - F - G - H - I - J -Atlin - K(Jake's Cor.) - Whitehorse - Fairbanks.

Column No.: (1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)
SECTION	MILEAGE	EST. COST GRADING, DRAINAGE STRUCTURES, AND GRAVEL SURF.	RECONDITIONING EXISTING SUB-STANDARD ROADS	TOTAL ESTIMATED COST; COL'S 3 & 4	RECONDITIONING PREPARATORY TO PAVING OR SURFACING	ESTIMATED COST; BASE AND FLEXIBLE PAVEMENT	TOTAL ESTIMATED COST COL'S 5,6, & 7	ESTIMATED COST; BASE AND SURFACE TREATMENT	TOTAL ESTIMATED COST; COL'S 5,6, & 9	REMARKS
Seattle - Prince George	582	$ -0-	$ -0-	$ -0-	$ -0-	$ -0-	$ -0-	$ -0-	$ -0-	Existing Paved Hwy.
Prince George - Hazleton	297	-0-	-0-	-0-	-0-	-0-	-0-	-0-	-0-	" " "
A(Hazleton - B	99	6,901,900		6,901,900	3,811,500	7,078,500	17,791,900	2,831,400	13,544,800	New Construction (Line "B")
B - C	80	-0-		-0-	3,080,000	5,720,000	8,800,000	2,288,000	5,368,000	Stewart-Cassiar Rd.-Auth. or Under Const.
C - D	33	-0-		-0-	1,270,500	2,359,500	3,630,000	943,800	2,214,300	" " " " " " "
D - E(Telegraph Cr.)	75	6,796,500		6,796,500	2,887,500	5,362,500	15,046,500	2,145,000	11,829,000	New Construction - (Line "C")
E - F	14	1,658,300		1,658,300	539,000	1,001,000	3,198,300	400,400	2,597,700	New Const. Coming out of Canyon.
F - G	142	22,658,500		22,658,500	5,467,000	10,153,000	38,278,500	4,061,200	32,186,700	New Const. - (Line "D")
G - H	20	4,278,000		4,278,000	770,000	1,430,000	6,478,000	572,000	5,620,000	New Const. - Nakina River Canyon
H - I	16	3,864,000		3,864,000	616,000	1,144,000	5,624,000	457,600	4,937,600	" " " " "
I - J	13	1,428,300		1,428,300	500,500	929,500	2,858,300	371,800	2,300,600	New Construction
J - K(Jake's Corner)	81	-0-	2,697,000	2,697,000	3,118,500	5,791,500	11,607,000	2,316,600	8,132,100	Atlin Road - Existing - Sub-standard -
Jake's Corner - Haines Jct.	144	-0-	-0-	-0-	7,155,500	10,296,000	17,451,500	4,118,400	11,273,900	Alaska Hwy. - Gravel Surf.
Haines Junction - M.P. 1100	84	-0-		-0-	3,701,500	6,006,000	9,707,500	2,402,400	6,103,900	" " " "
M.P. 1100 - Alaska Boundary	121	-0-		-0-	7,034,500	3,460,600	10,495,100	3,460,600	10,495,100	" " " "
Alaska Bndy. - Fairbanks	305	-0-	-0-	-0-	-0-	-0-	-0-	-0-	-0-	Pavement or Asphalt Surface Treatment over Entire Route.
Totals	2106	$ 47,585,500	$ 2,697,000	$ 50,282,500	$ 39,952,000	$ 60,732,100	$ 150,966,600	$ 26,369,200	$ 116,603,700	

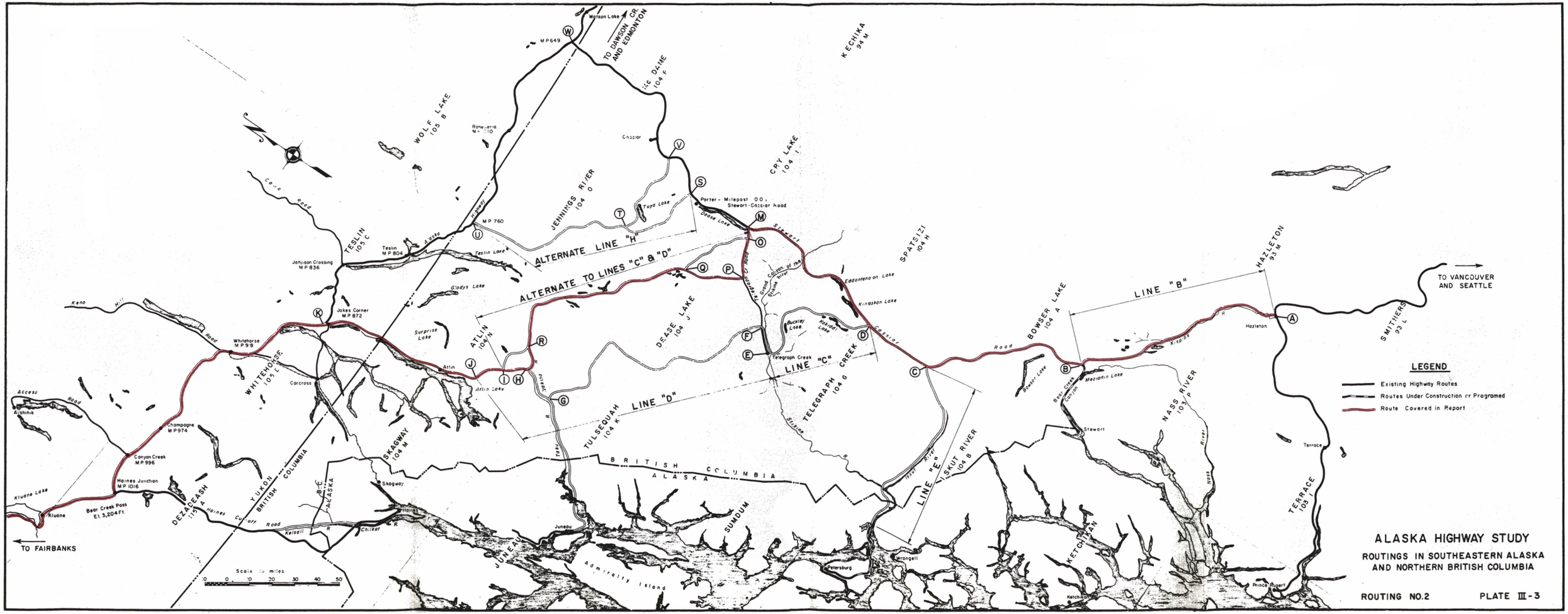


ROUTE : Seattle to Fairbanks

ROUTING : No. 2-(See Plate III-3): Seattle - Prince George - A(Hazleton) - B - C - D - M - O - P - Q - R - H - I - J -Atlin - K(Jake's Cor.) - Whitehorse - Fairbanks

Column No.: (1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)
SECTION	MILEAGE	EST. COST GRADING, DRAINAGE STRUCTURES, AND GRAVEL SURF.	RECONDITIONING EXISTING SUB-STANDARD ROADS	TOTAL ESTIMATED COST; COL'S 3 & 4	RECONDITIONING PREPARATORY TO PAVING OR SURFACING	ESTIMATED COST; BASE AND FLEXIBLE PAVEMENT	TOTAL ESTIMATED COST COL'S 5,6, & 7	ESTIMATED COST; BASE AND SURFACE TREATMENT	TOTAL ESTIMATED COST; COL'S 5,6, & 9	REMARKS
Seattle - Prince George	582	$ -0-	$ -0-	$ -0-	$ -0-	$ -0-	$ -0-	$ -0-	$ -0-	Existing Paved Highway
Prince George - Hazleton	297	-0-	-0-	-0-	-0-	-0-	-0-	-0-	-0-	" " "
A(Hazleton) - B	99	6,901,900		6,901,900	3,811,500	7,078,500	17,791,900	2,831,400	13,544,800	New Construction, (Line "B")
B - C	80	-0-		-0-	3,080,000	5,720,000	8,800,000	2,288,000	5,368,000	Stewart-Cassiar Rd. Auth. or Under Constr
C - D	33	-0-		-0-	1,270,500	1,359,000	2,629,500	943,800	2,214,300	" " " " " " "
D - M	81	-0-		-0-	3,118,500	5,791,500	8,910,000	2,316,600	5,435,100	" " " " " " "
M - O	7	-0-	231,000	231,000	269,500	500,500	1,001,000	200,200	700,700	Telegraph Cr.Rd. Existing Sub-standard
O - P	22	-0-	1,016,400	1,016,400	847,000	1,573,000	3,436,400	629,200	2,792,600	" " " " " "
P - Q	37	3,859,400		3,859,400	1,424,500	2,645,500	7,929,400	1,058,200	6,342,100	New Const.
Q - R	103	7,369,200		7,369,200	3,965,500	7,364,500	18,699,200	2,945,800	14,280,500	New Const.
R - H	13	4,111,300		4,111,300	500,500	929,500	5,541,300	371,800	4,983,600	New Const. Nakina River - Canyon
H - I	16	3,864,000		3,864,000	616,000	1,144,000	5,624,000	457,600	4,937,600	New Const. Nakina River - Canyon
I - J	13	1,428,300		1,428,300	500,500	929,500	2,858,300	371,800	2,300,600	New Const.
J - K(Jake's Corner)	81	-0-	2,697,000	2,697,000	3,118,500	5,791,500	11,607,000	2,316,600	7,732,100	Atlin Road - Existing - Sub-standard
Jake's Cor. - Haines Jct.	144	-0-	-0-	-0-	7,155,500	10,296,000	17,451,500	4,118,400	11,273,900	Alaska Hwy. - Gravel Surface
Haines Jct. - M.P. 1100	84	-0-		-0-	3,701,500	6,006,000	9,707,500	2,402,400	6,103,900	" " " "
M.P. 1100 - Alaska Boundary	121	-0-		-0-	7,034,500	3,460,600	10,495,100	3,460,600	10,495,100	" " " "
Alaska Bndy. - Fairbanks	305	-0-		-0-	-0-	-0-	-0-	-0-	-0-	Pavement or Asphalt Surface Treatment over Entire Route.
Totals	2118	$ 27,534,100	$ 3,944,400	$ 31,478,500	$ 40,414,000	$ 60,589,600	$ 132,482,100	$ 26,712,400	$ 98,504,900	

70243 O - 61 - VOL. 3 (Face blank p. III-12) No. 4



ROUTE : Seattle to Fairbanks

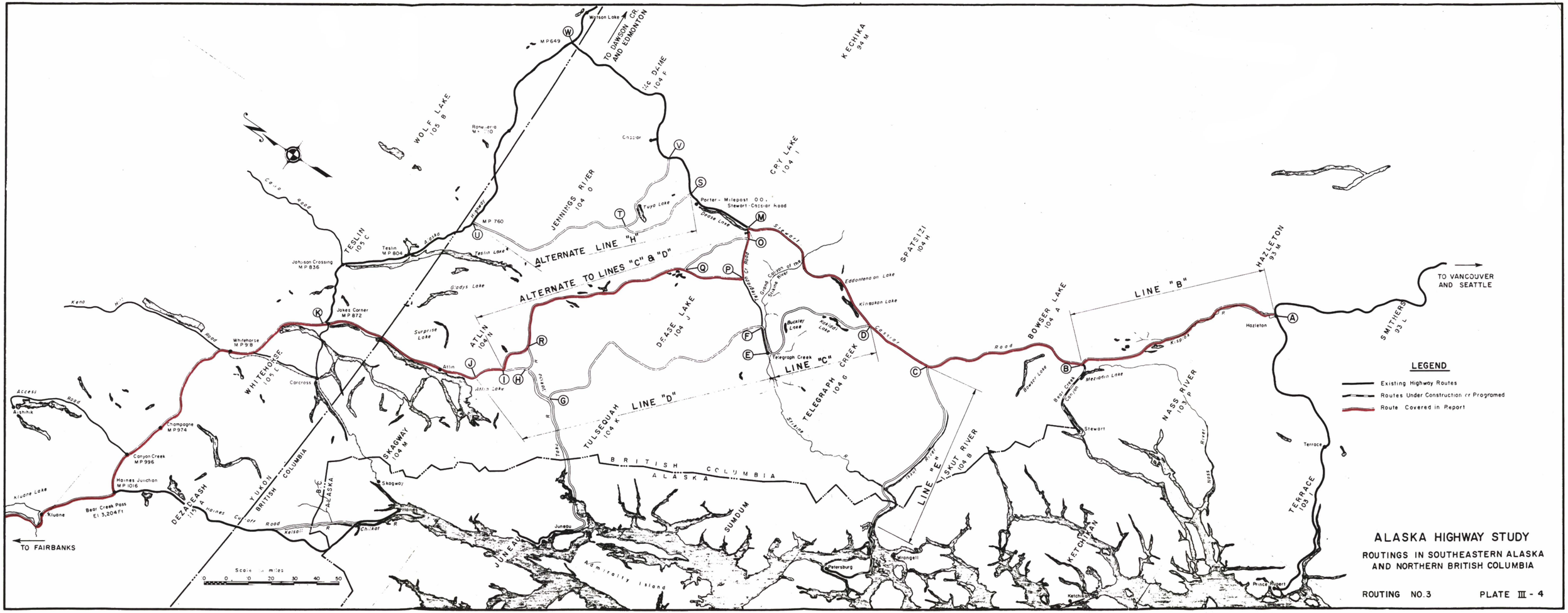
ROUTING : No. 3-(See Plate III-4); Seattle - Prince George - A(Hazleton) - B - C - D - N - O - P - Q - R - I - J -Atlin -K(Jake's Cor.) - Whitehorse - Fairbanks

Column No.: (1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)
SECTION	MILEAGE	EST. COST GRADING, DRAINAGE STRUCTURES, AND GRAVEL SURF.	RECONDITIONING EXISTING SUB-STANDARD ROADS	TOTAL ESTIMATED COST; COL'S 3 & 4	RECONDITIONING PREPARATORY TO PAVING OR SURFACING	ESTIMATED COST; BASE AND FLEXIBLE PAVEMENT	TOTAL ESTIMATED COST COL'S 5,6, & 7	ESTIMATED COST; BASE AND SURFACE TREATMENT	TOTAL ESTIMATED COST; COL'S 5,6, & 9	REMARKS
Seattle to Prince George	582	$ -0-	$ -0-	$ -0-	$ -0-	$ -0-	$ -0-	$ -0-	$ -0-	Existing Paved Highway
Prince George - Hazleton	297	-0-	-0-	-0-	-0-	-0-	-0-	-0-	-0-	" " "
A(Hazleton) - B	99	6,901,900	-0-	6,901,900	3,811,500	7,078,500	17,791,900	2,831,400	13,544,800	New Const. (Line "B")
B - C	80	-0-	-0-	-0-	3,080,000	5,720,000	8,800,000	2,288,000	5,368,000	Stewart-Cassiar Rd.Auth. or Under Const.
C - D	33	-0-	-0-	-0-	1,270,500	2,359,500	3,630,000	943,800	2,214,300	" " " " " " "
D - M	81	-0-	-0-	-0-	3,118,500	5,791,500	8,910,000	2,316,600	5,435,100	" " " " " " "
M - O	7	-0-	231,000	231,000	269,500	500,500	1,001,000	200,200	700,700	Telegraph Cr.-Existing Rd.Sub-Standard
O - P	22	-0-	1,016,400	1,016,400	847,000	1,573,000	3,436,400	629,200	2,492,600	" " " " " "
P - Q	37	3,859,400		3,859,400	1,424,500	2,645,500	7,929,400	1,058,200	6,342,100	New Const.
Q - R	103	7,369,200		7,369,200	3,965,500	7,364,500	18,699,200	2,945,800	14,280,500	" "
R - I	18	1,821,000		1,821,000	693,000	1,287,000	3,801,000	514,800	3,028,800	" "
I - J	13	1,428,300		1,428,300	500,500	929,500	2,858,300	371,800	2,300,600	" "
J - K(Jake's Corner)	81	-0-	2,697,000	2,697,000	3,118,500	5,791,500	11,607,000	2,316,600	8,132,100	Atlin Rd.-Existing - Sub-Standard
Jake's Cor. - Haines Jct.	144	-0-	-0-	-0-	7,155,500	10,296,000	17,451,500	4,118,400	11,273,900	Alaska Highway - Gravel Surface
Haines Jct. - M.P. 1100	84	-0-	-0-	-0-	3,701,500	6,006,000	9,707,500	2,402,400	6,103,900	" " " "
M.P. 1100 - Alaska Boundary	121	-0-	-0-	-0-	7,034,500	3,460,600	10,495,100	3,460,600	10,495,100	" " " "
Alaska Bndy. - Fairbanks	305	-0-	-0-	-0-	-0-	-0-	-0-	-0-	-0-	Paved or Asphalt Surface treatment over Entire Route.
Totals	2107	$ 21,379,800	$ 3,944,400	$ 25,324,200	$ 39,990,500	$ 60,803,600	$ 126,118,300	$ 26,397,800	$ 91,712,500	

ROUTE : Seattle to Fairbanks

ROUTING : No. 3-(See Plate III-4); Seattle - Prince George - A(Hazleton) - B - C - D - N - O - P - Q - R - I - J -Atlin -K(Jake's Cor.) - Whitehorse - Fairbanks

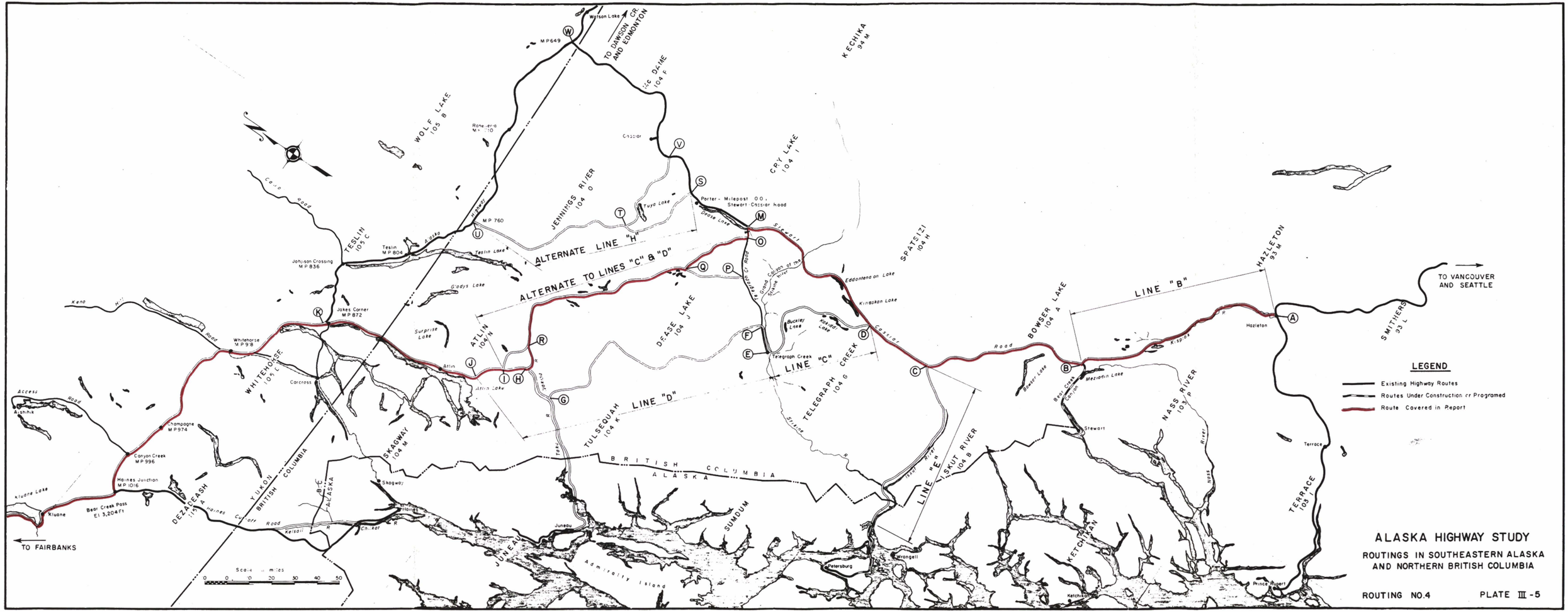
Column No.: (1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)
SECTION	MILEAGE	EST. COST GRADING, DRAINAGE STRUCTURES, AND GRAVEL SURF.	RECONDITIONING EXISTING SUB-STANDARD ROADS	TOTAL ESTIMATED COST; COL'S 3 & 4	RECONDITIONING PREPARATORY TO PAVING OR SURFACING	ESTIMATED COST; BASE AND FLEXIBLE PAVEMENT	TOTAL ESTIMATED COST COL'S 5,6, & 7	ESTIMATED COST; BASE AND SURFACE TREATMENT	TOTAL ESTIMATED COST; COL'S 5,6, & 9	REMARKS
Seattle to Prince George	582	$ -0-	$ -0-	$ -0-	$ -0-	$ -0-	$ -0-	$ -0-	$ -0-	Existing Paved Highway
Prince George - Hazleton	297	-0-	-0-	-0-	-0-	-0-	-0-	-0-	-0-	" " "
A(Hazleton) - B	99	6,901,900	-0-	6,901,900	3,811,500	7,078,500	17,791,900	2,831,400	13,544,800	New Const. (Line "B")
B - C	80	-0-	-0-	-0-	3,080,000	5,720,000	8,800,000	2,288,000	5,368,000	Stewart-Cassiar Rd.Auth. or Under Const.
C - D	33	-0-	-0-	-0-	1,270,500	2,359,500	3,630,000	943,800	2,214,300	" " " " " " "
D - M	81	-0-	-0-	-0-	3,118,500	5,791,500	8,910,000	2,316,600	5,435,100	" " " " " " "
M - O	7	-0-	231,000	231,000	269,500	500,500	1,001,000	200,200	700,700	Telegraph Cr.-Existing Rd.Sub-Standard
O - P	22	-0-	1,016,400	1,016,400	847,000	1,573,000	3,436,400	629,200	2,492,600	" " " " " "
P - Q	37	3,859,400		3,859,400	1,424,500	2,645,500	7,929,400	1,058,200	6,342,100	New Const.
Q - R	103	7,369,200		7,369,200	3,965,500	7,364,500	18,699,200	2,945,800	14,280,500	" "
R - I	18	1,821,000		1,821,000	693,000	1,287,000	3,801,000	514,800	3,028,800	" "
I - J	13	1,428,300		1,428,300	500,500	929,500	2,858,300	371,800	2,300,600	" "
J - K(Jake's Corner)	81	-0-	2,697,000	2,697,000	3,118,500	5,791,500	11,607,000	2,316,600	8,132,100	Atlin Rd.-Existing - Sub-Standard
Jake's Cor. - Haines Jct.	144	-0-	-0-	-0-	7,155,500	10,296,000	17,451,500	4,118,400	11,273,900	Alaska Highway - Gravel Surface
Haines Jct. - M.P. 1100	84	-0-	-0-	-0-	3,701,500	6,006,000	9,707,500	2,402,400	6,103,900	" " " "
M.P. 1100 - Alaska Boundary	121	-0-	-0-	-0-	7,034,500	3,460,600	10,495,100	3,460,600	10,495,100	" " " "
Alaska Bndy. - Fairbanks	305	-0-	-0-	-0-	-0-	-0-	-0-	-0-	-0-	Paved or Asphalt Surface treatment over Entire Route.
Totals	2107	$ 21,379,800	$ 3,944,400	$ 25,324,200	$ 39,990,500	$ 60,803,600	$ 126,118,300	$ 26,397,800	$ 91,712,500	



ROUTE : Seattle to Fairbanks

ROUTING : No. 4-(See Plate III-5); Seattle - Prince George - A(Hazleton) - B - C - D - M - O - Q - R - H - I - J -Atlin - K(Jake's Cor.) - Whitehorse - Fairbanks

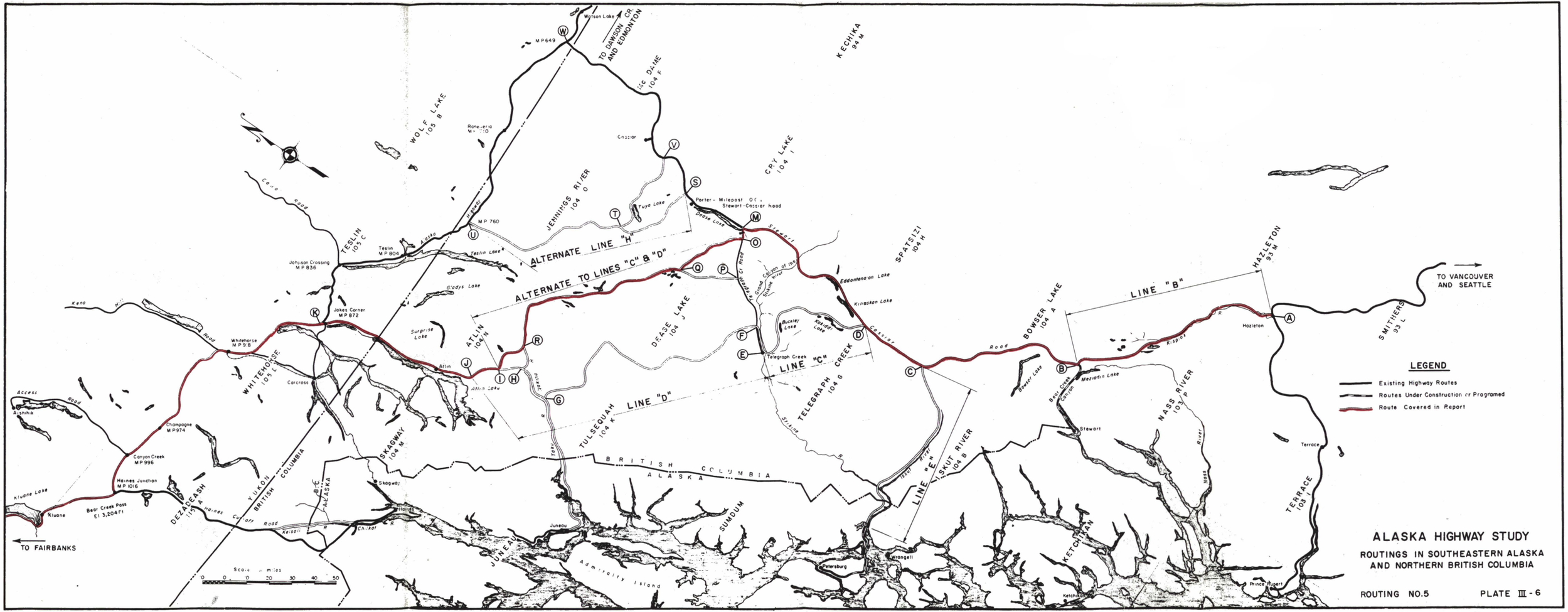
Column No.: (1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)
SECTION	MILEAGE	EST. COST GRADING, DRAINAGE STRUCTURES, AND GRAVEL SURF.	RECONDITIONING EXISTING SUB-STANDARD ROADS	TOTAL ESTIMATED COST; COL'S 3 & 4	RECONDITIONING PREPARATORY TO PAVING OR SURFACING	ESTIMATED COST; BASE AND FLEXIBLE PAVEMENT	TOTAL ESTIMATED COST COL'S 5,6, & 7	ESTIMATED COST; BASE AND SURFACE TREATMENT	TOTAL ESTIMATED COST; COL'S 5,6, & 9	REMARKS
Seattle - Prince George	582	$ -0-	$ -0-	$ -0-	$ -0-	$ -0-	$ -0-	$ -0-	$ -0-	Existing Paved Highway
Prince George - Hazleton	297	-0-	-0-	-0-	-0-	-0-	-0-	-0-	-0-	" " "
A(Hazleton) - B	99	6,901,900	-0-	6,901,900	3,811,500	7,078,500	17,791,900	2,831,400	13,544,800	New Const. (Line "B")
B - C	80	-0-	-0-	-0-	3,080,000	5,720,000	8,800,000	2,288,000	5,368,000	Stewart-Cassiar Rd.Auth. or Under Const.
C - D	33	-0-	-0-	-0-	1,270,500	2,359,500	3,630,000	943,800	2,214,300	" " " " " " "
D - M	81	-0-	-0-	-0-	3,118,500	5,791,500	8,910,000	2,316,600	5,435,100	" " " " " " "
M - O	7	-0-	231,000	231,000	269,500	500,500	1,001,000	200,200	700,700	Telegraph Cr. Rd.-Existing - Sub-Standard
O - Q	33	3,037,200	-0-	3,037,200	1,270,500	2,359,500	6,667,200	943,800	5,251,500	New Const.
Q - R	103	7,369,200	-0-	7,369,200	3,965,500	7,364,500	18,699,200	2,945,800	14,280,500	" "
R - H	13	4,111,300	-0-	4,111,300	500,500	929,500	5,541,300	371,800	4,983,600	New Const. Nakina River Canyon
H - I	16	3,864,000	-0-	3,864,000	616,000	1,144,000	5,624,000	457,600	4,937,600	" " " " "
I - J	13	1,428,300	-0-	1,428,300	500,500	929,500	2,858,300	371,800	2,300,600	New Const.
J - K(Jake's Corner)	81	-0-	2,697,000	2,697,000	3,118,500	5,791,500	11,607,000	2,316,600	8,132,100	Atlin Rd.-Existing - Sub-Standard
Jake's Co . - Haines Jct.	144	-0-	-0-	-0-	7,155,500	10,296,000	17,451,500	4,118,400	11,273,900	Alaska Highway - Gravel Surface
Haines Jct. - M.P. 1100	84	-0-	-0-	-0-	3,701,500	6,006,000	9,707,500	2,402,400	6,103,900	" " " "
M.P. 1100 - Alaska Boundary	121	-0-	-0-	-0-	7,034,500	3,460,600	10,495,100	3,460,600	10,495,100	" " " "
Alaska Bndy. - Fairbanks	305	-0-	-0-	-0-	-0-	-0-	-0-	-0-	-0-	Pavement or Asphalt Surface Treatment over Entire Route.
Totals	2092	$ 26,711,900	$ 2,928,000	$ 29,639,900	$ 39,413,000	$ 59,731,100	$ 128,784,000	$ 25,968,800	$ 95,021,700	



ROUTE : Seattle to Fairbanks

ROUTING : No. 5-(See Plate III-6); Seattle - Prince George - A(Hazleton - B - C - D - M - O - P - Q - R - I - J -Atlin - K(Jake's Cor.) - Whitehorse - Fairbanks

Column No.: (1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)
SECTION	MILEAGE	EST. COST GRADING, DRAINAGE STRUCTURES, AND GRAVEL SURF.	RECONDITIONING EXISTING SUB-STANDARD ROADS	TOTAL ESTIMATED COST; COL'S 3 & 4	RECONDITIONING PREPARATORY TO PAVING OR SURFACING	ESTIMATED COST; BASE AND FLEXIBLE PAVEMENT	TOTAL ESTIMATED COST COL'S 5,6, & 7	ESTIMATED COST; BASE AND SURFACE TREATMENT	TOTAL ESTIMATED COST; COL'S 6,6, & 9	REMARKS
Seattle - Prince George	582	$ -0-	$ -0-	$ -0-	$ -0-	$ -0-	$ -0-	$ -0-	$ -0-	Existing Paved Highway
Prince George - Hazleton	297	-0-	-0-	-0-	-0-	-0-	-0-	-0-	-0-	" " "
A(Hazleton) - B	99	6,901,900	-0-	6,901,900	3,811,500	7,078,500	17,791,500	2,831,400	13,544,800	New Const. (Line "B")
B - C	80	-0-	-0-	-0-	3,080,000	5,720,000	8,800,000	2,288,000	5,368,000	Stewart-Cassiar Rd.-Auth. or Under Const.
C - D	33	-0-	-0-	-0-	1,270,000	2,359,500	3,629,500	943,800	2,213,800	" " " " " " "
D - M	81	-0-	-0-	-0-	3,118,500	5,791,500	8,910,000	2,316,600	5,435,100	" " " " " " "
M - O	7	-0-	231,000	231,000	269,500	500,500	1,001,000	200,200	700,700	Telegraph Cr.Rd-Existing - Sub-Standard
O - Q	33	3,037,200	-0-	3,037,200	1,270,500	2,359,500	6,667,200	943,800	5,251,500	New Const.
Q - R	103	7,369,200	-0-	7,369,200	3,965,500	7,364,500	18,699,200	2,945,800	14,280,500	" "
R - I	18	1,821,000	-0-	1,821,000	693,000	1,287,000	3,801,000	514,800	3,028,800	" "
I - J	13	1,428,300	-0-	1,428,300	500,500	929,500	2,858,300	371,800	2,300,600	" "
J - K(Jake's Corner)	81	-0-	2,697,000	2,697,000	3,118,500	5,791,500	11,607,000	2,316,600	8,132,100	Atlin Rd.-Existing - Sub-Standard
Jake's Cor. - Haines Jct.	144	-0-	-0-	-0-	7,155,500	10,296,000	17,451,500	4,118,400	11,273,900	Alaska Highway - Gravel Surface
Haines Jct. - M.P. 1100	84	-0-	-0-	-0-	3,701,500	6,006,000	9,707,500	2,402,400	6,103,900	" " " "
M.P. 1100 - Alaska Bndy.	121	-0-	-0-	-0-	7,034,500	3,460,600	10,495,100	3,460,600	10,495,100	" " " "
Alaska Bndy. - Fairbanks	305	-0-	-0-	-0-	-0-	-0-	-0-	-0-	-0-	Pavement or Asphalt Surface Treatment Over Entire Route.
Totals	2081	$ 20,557,600	$ 2,928,000	$ 23,485,600	$ 38,989,000	$ 58,944,600	$ 121,418,800	$ 25,654,200	$ 88,128,800	

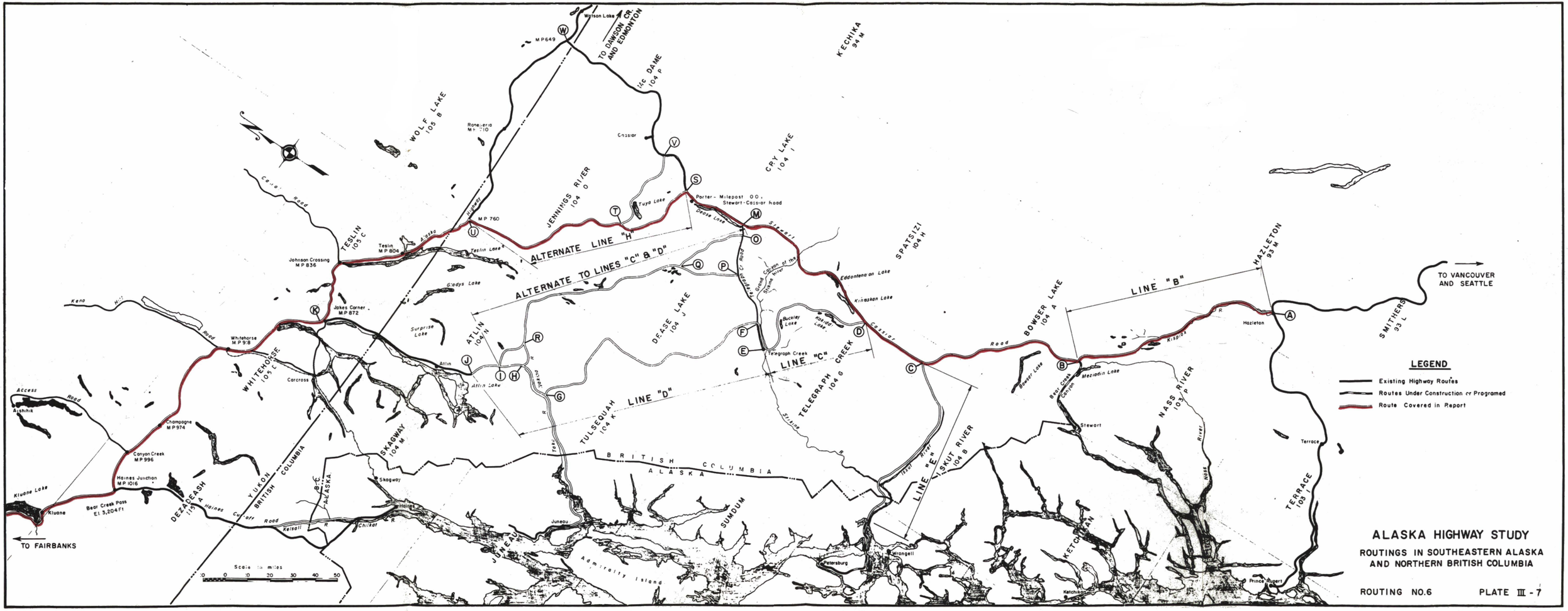


ROUTE : Seattle to Fairbanks

ROUTING : No. 6(See Plate III-7): Seattle - Prince George - A(Hazleton - B - C - D - M - S - T - U - K(Jake's Corner) - Whitehorse - Fairbanks

Column No.: (1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)
SECTION	MILEAGE	EST. COST GRADING, DRAINAGE STRUCTURES, AND GRAVEL SURF.	RECONDITIONING EXISTING SUB-STANDARD ROADS	TOTAL ESTIMATED COST; COL'S 3 & 4	RECONDITIONING PREPARATORY TO PAVING OR SURFACING	ESTIMATED COST; BASE AND FLEXIBLE PAVEMENT	TOTAL ESTIMATED COST COL'S 5,6, & 7	ESTIMATED COST; BASE AND SURFACE TREATMENT	TOTAL ESTIMATED COST; COL'S 5,6, & 9	REMARKS
Seattle - Prince George	582	$ -0-	$ -0-	$ -0-	$ -0-	$ -0-	$ -0-	$ -0-	$ -0-	Existing Paved Highway
Prince George - Hazleton	297	-0-	-0-	-0-	-0-	-0-	-0-	-0-	-0-	" " "
A(Hazleton) - B	99	6,901,900	-0-	6,901,900	3,811,500	7,078,500	17,791,500	2,831,400	13,544,800	New Const. (Line "B")
B - C	80	-0-	-0-	-0-	3,080,000	5,720,000	8,800,000	2,288,000	5,368,000	Stewart-Cassiar Rd.-Auth. or Under Const.
C - D	33	-0-	-0-	-0-	1,270,500	2,359,500	3,630,000	943,800	2,214,300	" " " " " " "
D - M	81	-0-	-0-	-0-	3,118,500	5,791,500	8,910,000	2,316,600	5,435,100	" " " " " " "
M - S	30	-0-	-0-	-0-	1,155,000	2,145,000	3,300,000	858,000	2,013,000	" " " " " " "
S - T	42	4,294,000	-0-	4,294,000	1,617,000	3,003,000	8,914,000	1,201,200	7,112,200	New Const.
T - U	86	6,589,500	-0-	6,589,500	3,311,000	6,149,000	16,049,500	2,459,600	12,360,100	" "
U - K(Jake's Corner)	112	-0-	-0-	-0-	8,321,500	8,008,000	16,329,500	3,203,200	11,524,700	Alaska Highway - Gravel Surface
Jake's Cor. - Haines Jct.	144	-0-	-0-	-0-	7,155,500	10,296,000	17,451,500	4,118,400	11,273,900	" " " "
Haines Jct. - M.P. 1100	84	-0-	-0-	-0-	3,701,500	6,006,000	9,707,500	2,402,400	6,103,900	" " " "
M.P. 1100 - Alaska Bndy.	121	-0-	-0-	-0-	7,034,500	3,460,600	10,495,100	3,460,600	10,495,100	" " " "
Alaska Bndy. - Fairbanks	305	-0-	-0-	-0-	-0-	-0-	-0-	-0-	-0-	Pavement or Asphalt Surface Treatment over Entire Route.
Totals	2096	$ 17,785,400	$ -0-	$ 17,785,400	$ 43,576,500	$ 60,017,100	$ 121,378,600	$ 26,083,200	$ 87,445,100	

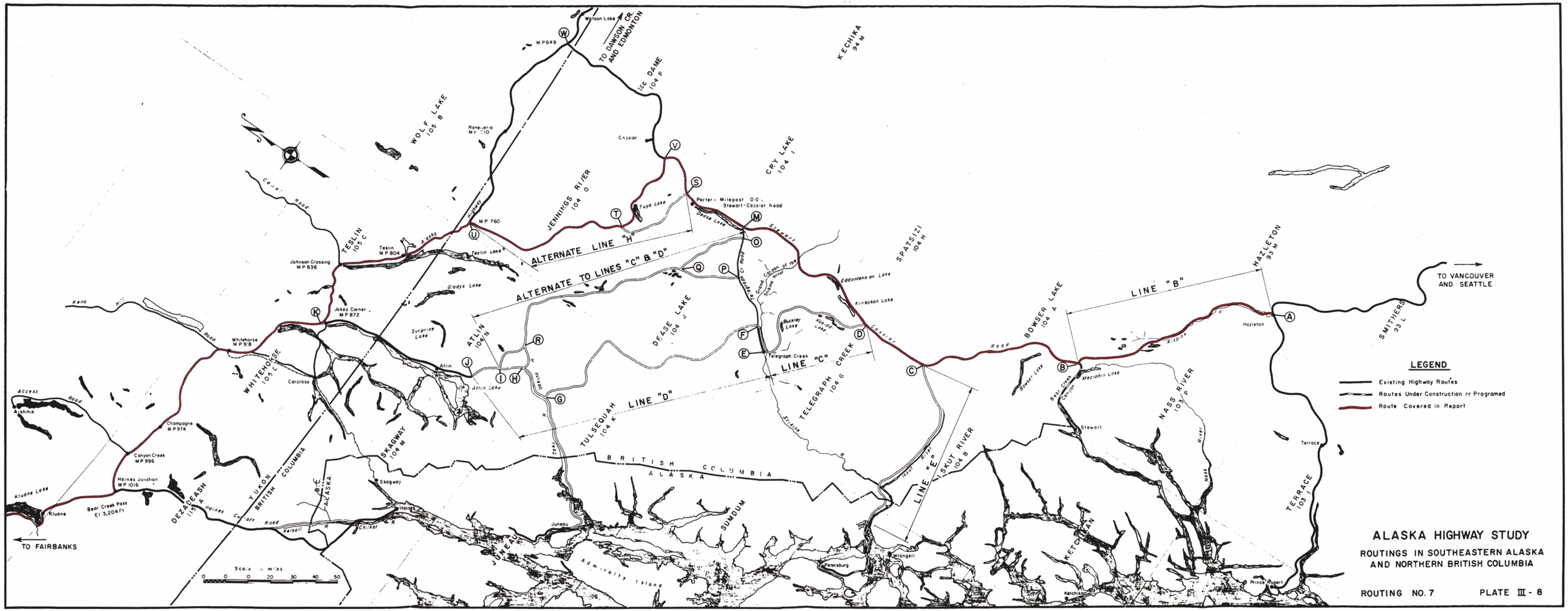
70243 O-61 - VOL. 3 (Face blank p. III-12) No. 12



ROUTE : Seattle to Fairbanks

ROUTING : No. 7(See Plate III-8); Seattle - Prince George - A(Hazleton - B - C - D - M - S - V - T - U - K(Jake's Corner) - Whitehorse - Fairbanks

Column No.: (1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)
SECTION	MILEAGE	EST. COST GRADING, DRAINAGE STRUCTURES, AND GRAVEL SURF.	RECONDITIONING EXISTING SUB-STANDARD ROADS	TOTAL ESTIMATED COST; COL'S 3 & 4	RECONDITIONING PREPARATORY TO PAVING OR SURFACING	ESTIMATED COST; BASE AND FLEXIBLE PAVEMENT	TOTAL ESTIMATED COST COL'S 5,6, & 7	ESTIMATED COST; BASE AND SURFACE TREATMENT	TOTAL ESTIMATED COST; COL'S 5,6, & 9	REMARKS
Seattle - Prince George	582	$ -0-	$ -0-	$ -0-	$ -0-	$ -0-	$ -0-	$ -0-	$ -0-	Existing Paved Highway
Prince George - Hazleton	297	-0-	-0-	-0-	-0-	-0-	-0-	-0-	-0-	" " "
A(Hazleton) - B	99	6,901,900	-0-	6,901,900	3,811,500	7,078,500	17,791,900	2,831,400	13,544,800	New Const. (Line "B")
B - C	80	-0-	-0-	-0-	3,080,000	5,720,000	8,800,000	2,288,000	5,368,000	Stewart-Cassiar Rd.-Auth. or Under Const.
C - D	33	-0-	-0-	-0-	1,270,500	2,359,500	3,630,000	943,800	2,214,300	" " " " " " "
D - M	81	-0-	-0-	-0-	3,118,500	5,791,500	8,910,000	2,316,600	5,435,100	" " " " " " "
M - S	30	-0-	-0-	-0-	1,155,000	2,145,000	3,300,000	858,000	2,013,000	" " " " " " "
S - V	25	-0-	-0-	-0-	962,500	1,787,500	2,750,000	715,000	1,677,500	Existing Paved Highway
V - T	49	3,956,000	-0-	3,956,000	1,886,500	3,503,500	9,346,000	1,401,400	7,243,900	New Const.
T - U	86	6,589,500	-0-	6,589,500	3,311,000	6,149,000	16,049,500	2,459,600	12,360,100	" "
U - K(Jake's Corner)	112	-0-	-0-	-0-	8,321,500	8,008,000	16,329,500	3,203,200	11,524,700	Alaska Highway - Gravel Surface
Jake's Cor. - Haines Jct.	144	-0-	-0-	-0-	7,155,500	10,296,000	17,451,500	4,118,400	11,273,900	" " " "
Haines Jct. - M.P. 1100	84	-0-	-0-	-0-	3,701,500	6,006,000	9,707,500	2,402,400	6,103,900	" " " "
M.P. 1100 - Alaska Bndy.	121	-0-	-0-	-0-	7,034,500	3,460,600	10,495,100	3,460,600	10,495,100	" " " "
Alaska Bndy. - Fairbanks	305	-0-	-0-	-0-	-0-	-0-	-0-	-0-	-0-	Pavement or Asphalt Surface Treatment over Entire Route.
Totals	2128	$ 17,447,400	$ -0-	$ 17,447,400	$ 44,808,500	$ 62,305,100	$ 124,561,000	$ 26,998,400	$ 89,254,300	

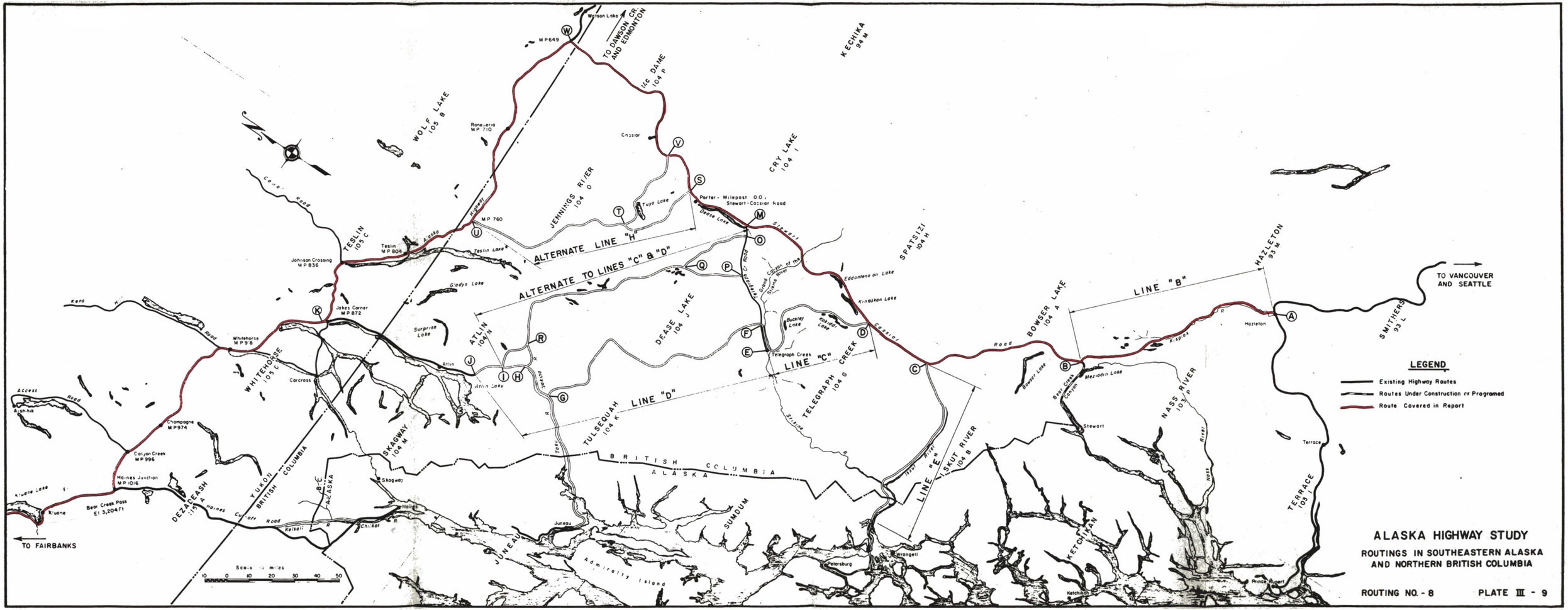


ROUTE : Seattle to Fairbanks - (Temporary Routing over Stewart-Cassiar Road)

ROUTING : No. 8(See Plate III-9); Seattle - Prince George - A(Hazleton) - B - C - D - M - S - V - W(M.P. 649 Alaska Hwy.) - U - K(Jake's Cor.) - Whitehorse - Fairbanks

Column No.: (1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)
SECTION	MILEAGE	EST. COST GRADING, DRAINAGE STRUCTURES, AND GRAVEL SURF.	RECONDITIONING EXISTING SUB-STANDARD ROADS	TOTAL ESTIMATED COST; COL'S 3 & 4	RECONDITIONING PREPARATORY TO PAVING OR SURFACING	ESTIMATED COST; BASE AND FLEXIBLE PAVEMENT	TOTAL ESTIMATED COST COL'S 5,6, & 7	ESTIMATED COST; BASE AND SURFACE TREATMENT	TOTAL ESTIMATED COST; COL'S 5,6, & 9	REMARKS
Seattle - Prince George	582	$ - 0-	$ -0-	$ -0-						Existing Paved Highway
Prince George - Hazleton	297	- 0-	-0-	-0-						" " "
A(Hazleton) - B	99	6,901,900	-0-	6,901,900						New Const. (Line "B")
B - C	80	-0-		-0-						Stewart-Cassiar Road
C - D	33	-0-		-0-						" " "
D - M	81	-0-		-0-						" " "
M - S	30	-0-		-0-						" " "
S - V	25	-0-		-0-						" " "
V. - W(Alaska Hwy.)	90	-0-		-0-						" " "
W - U	111	-0-		-0-						Alaska Highway - Gravel Surface
U - K(Jake's Corner)	112	-0-		-0-						" " " "
Jake's Cor. Haines Jct.	144	-0-		-0-						" " " "
Haines Jct. - Alaska Bndy.	205	-0-		-0-						" " " "
Alaska Bndy. - Fairbanks	305	-0-		-0-						Pavement or Asphalt Surface Treatment over Entire Route.
Totals	2194	$ 6,901,900	$ -0-	$ 6,901,900						

70243 O-61 - VOL. 3 (Face blank p. III-12) No. 16



70243 O - 61 - VOL. 3 (Face blank p. III-42) No. 17

ROUTE : Comparrison of Feasible Locations Along "A" Route With Existing Alaska Highway

ROUTING :

Column No.: (1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)
SECTION	MILEAGE	EST. COST GRADING, DRAINAGE STRUCTURES, AND GRAVEL SURF.	RECONDITIONING EXISTING SUB-STANDARD ROADS	TOTAL ESTIMATED COST; COL'S 3 & 4	RECONDITIONING PREPARATORY TO PAVING OR SURFACING	ESTIMATED COST; BASE AND FLEXIBLE PAVEMENT	TOTAL ESTIMATED COST COL'S 5, 6, & 7	ESTIMATED COST; BASE AND SURFACE TREATMENT	TOTAL ESTIMATED COST; COL'S 5, 6, & 9	REMARKS
Routing No. 1	2106	$47,585,500	$ 2,697,000	$ 50,282,500	$ 39,952,000	$ 60,732,100	$ 150,966,300	$ 26,369,200	$ 114,502,700	
Routing No. 2	2118	27,534,100	3,944,400	31,478,500	40,414,000	60,589,600	132,482,100	26,712,400	98,504,900	
Routing No. 3	2107	21,379,800	3,944,400	25,324,200	39,990,500	60,803,600	126,118,300	26,397,800	91,712,500	
Routing No. 4	2092	26,711,900	2,928,000	29,639,900	39,413,000	59,731,100	128,784,000	25,968,800	95,021,700	
Routing No. 5	2081	20,557,600	2,928,000	23,485,600	38,989,000	58,944,600	121,418,800	25,654,200	88,128,800	
Routing No. 6	2096	17,785,400	-0-	17,785,400	43,576,500	60,017,100	121,378,600	26,083,200	87,445,100	
Routing No. 7	2128	17,447,400	-0-	17,447,400	44,808,500	62,305,100	124,561,000	26,998,400	89,254,300	
Routing No. 8	2194	6,901,900	-0-	6,901,900						
Alaska Hwy. (Existing.)	2367			31,828,500*	38,076,500	83,583,500	152,454,500	33,433,400	102,304,400	

*Relocations, Line Changes & Bridges included in these figures

70243 O - 61 - VOL. 3 (Face blank p. III-12) No. 18

UNIT COST BREAKDOWN - "A" ROUTE

Column No. (1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	
SECTION	* UNIT	MILEAGE	GRADING AND SMALL DRAINAGE STRUCTURES COST PER MILE	** MATERIALS COST PER MILE	TOTAL COL'S 4 & 5 COST PER MILE	TOTAL COST WITHOUT MAJOR STRUCTURES	MAJOR STRUCTURES LUMP SUM	TOTAL COST COL'S 7 & 8	*** ENGINEERING AND CONTINGENCIES	TOTAL ESTIMATED COST	AVERAGE COST PER MILE	REMARKS
A - B	1	33	$ 30,000	$ 3,000	$ 33,000	$ 1,089,000	-0-	$ 1,089,000	$ 108,900	$ 1,197,900	$ 36,300	Reconditioning Existing Road
	2	66	55,000	5,000	60,000	3,960,000	$ 1,000,000	4,960,000	744,000	5,704,000	86,400	New Construction
Totals		99				$ 5,049,000	$ 1,000,000	$ 6,049,000	$ 852,900	$ 6,901,900	$ 69,700	
B - C												Portions of Stewart-Cassiar Road.
C - D												Portions of Stewart-Cassiar Road
D - E	1	12	$ 60,000	$ 3,000	$ 63,000	$ 756,000	$ -0-	$ 756,000	$ 113,400	$ 869,400	$ 72,450	New Construction
	2	23	80,000	8,000	88,000	2,024,000	-0-	2,024,000	303,600	2,327,600	101,200	" "
	3	30	60,000	6,000	66,000	1,980,000	100,000	2,080,000	312,000	2,392,000	79,730	" "
	4	10	100,000	5,000	105,000	1,050,000	-0-	1,050,000	157,500	1,207,500	120,750	" "
Totals		75				$ 4,810,000	$ 100,000	$ 5,910,000	$ 886,500	$ 6,796,500	$ 90,620	
D - M												Portions of Stewart-Cassiar Road.
E - F	1	14	$ 100,000	$ 3,000	$ 103,000	$ 1,442,000	$ -0-	$ 1,442,000	$ 216,300	$ 1,658,300	$ 118,450	Portion of Telegraph Creek
Totals		14				$ 1,442,000	$ -0-	$ 1,442,000	$ 216,300	$ 1,658,300	$ 118,450	Road.
F - G	1	21	$ 100,000	$ 10,000	$ 110,000	$ 2,310,000	$ 200,000	$ 2,510,000	$ 376,500	$ 2,886,500	$ 137,450	New Construction
	2	35	80,000	8,000	88,000	3,080,000	100,000	3,180,000	477,000	3,657,000	104,490	" "
	3	31	85,000	8,000	93,000	2,883,000	150,000	3,033,000	454,950	3,487,950	112,510	" "
	4	26	150,000	15,000	165,000	4,290,000	-0-	4,290,000	643,500	4,933,500	189,750	" "
	5	29	200,000	10,000	210,000	6,090,000	600,000	6,690,000	1,003,500	7,693,500	265,290	" "
Totals		142				$ 18,653,000	$ 1,050,000	$ 19,703,000	$ 2,955,450	$ 22,658,450	$ 159,570	
G - H	1	9	$ 100,000	$ 5,000	$ 105,000	$ 945,000	-0-	$ 945,000	$ 141,750	$ 1,086,750	$ 120,750	New Construction
	2	11	220,000	5,000	225,000	2,475,000	300,000	2,775,000	416,250	3,191,250	290,110	" "
Totals		20				$ 3,420,000	$ 300,000	$ 3,720,000	$ 558,000	$ 4,278,000	$ 213,900	
H - I	1	16	$ 200,000	$ 10,000	$ 210,000	$ 3,360,000	$ -0-	$ 3,360,000	$ 504,000	$ 3,864,000	$ 241,500	New Construction
Totals		16				$ 3,360,000	$ -0-	$ 3,360,000	$ 504,000	$ 3,864,000	$ 241,500	
I - J	1	13	$ 80,000	$ 4,000	$ 84,000	$ 1,092,000	$ 150,000	$ 1,242,000	$ 186,300	$ 1,428,000	$ 109,870	New Construction
Totals		13				$ 1,092,000	$ 150,000	$ 1,242,000	$ 186,300	$ 1,428,000	$ 109,870	
J - K	1	22	$ 30,000	$ 1,000	$ 31,000	$ 682,000	$ -0-	$ 682,000	$ 68,200	$ 750,200	$ 34,100	Rehabilitation of Atlin Road
	2	59	30,000	-0-	30,000	1,770,000	-0-	1,770,000	177,000	1,947,000	33,000	" " " "
Totals		81				$ 2,452,000	$ -0-	$ 2,452,000	$ 245,200	$ 2,697,200	$ 33,300	
M - O	1	7	$ 30,000	$ -0-	$ 30,000	$ 210,000	$ -0-	$ 210,000	$ 21,000	$ 231,000	$ 33,000	Portion of Telegraph Creek
Totals		7				$ 210,000	$ -0-	$ 210,000	$ 21,000	$ 231,000	$ 33,000	Road
M - S												Portions of Stewart-Cassiar Road

NOTES
* UNIT NUMBERING IS FROM SOUTH TO NORTH
** CULVERT PIPE AND BRIDGE MATERIALS ARE FURNISHED BY GOVERNMENT
*** COL. NO. 10 INCLUDES COST OF LOCATION AND SOILS SURVEYS, DESIGN AND CONSTRUCTION SUPERVISION

TABLE III - K
SHEET 1 OF 2

70243 O - 61 - VOL. 3 (Face blank p. III-12) No. 19

UNIT COST BREAKDOWN - "A" ROUTE

Column No. (1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	
SECTION	* UNIT	MILEAGE	GRADING AND SMALL DRAINAGE STRUCTURES COST PER MILE	** MATERIALS COST PER MILE	TOTAL COL'S 4 & 5 COST PER MILE	TOTAL COST WITHOUT MAJOR STRUCTURES	MAJOR STRUCTURES LUMP SUM	TOTAL COST COL'S 7 & 8	*** ENGINEERING AND CONTINGENCIES	TOTAL ESTIMATED COST	AVERAGE COST PER MILE	REMARKS
O - P	1	22	$ 40,000	$ 2,000	$ 42,000	$ 924,000	$ -0-	$ 924,000	$ 92,400	$ 1,016,400	$ 46,200	Portion of Telegraph Creek
Totals		22				$ 924,000	$ -0-	$ 924,000	$ 92,400	$ 1,016,400	$ 46,200	Road
O - Q	1	33	$ 70,000	$ 7,000	$ 77,000	$ 2,541,000	$ 100,000	$ 2,641,000	$ 396,150	$ 3,037,150	$ 92,030	New Construction
Totals		33				$ 2,541,000	$ 100,000	$ 2,641,000	$ 396,150	$ 3,037,150	$ 92,030	
P - Q	1	37	$ 80,000	$ 8,000	$ 88,000	$ 3,256,000	$ 100,000	$ 3,356,000	$ 503,400	$ 3,859,400	$ 104,310	New Construction
Totals		37				$ 3,256,000	$ 100,000	$ 3,356,000	$ 503,400	$ 3,859,400	$ 104,310	
Q - R	1	82	$ 50,000	$ 5,000	$ 55,000	$ 4,510,000	$ -0-	$ 4,510,000	$ 676,500	$ 5,186,500	$ 63,250	New Construction
	2	21	80,000	8,000	88,000	1,848,000	50,000	1,898,000	284,700	2,182,700	103,940	" "
Totals		103				$ 6,358,000	$ 50,000	$ 6,408,000	$ 961,200	$ 7,369,200	$ 71,550	
R - H	1	13	$ 250,000	$ 25,000	$ 275,000	$ 3,575,000	$ -0-	$ 3,575,000	$ 536,250	$ 4,111,250	$ 316,250	New Construction
Totals		13				$ 3,575,000	$ -0-	$ 3,575,000	$ 536,250	$ 4,111,250	$ 316,250	
R - I	1	18	$ 80,000	$ 8,000	$ 88,000	$ 1,584,000	$ -0-	$ 1,584,000	$ 237,600	$ 1,821,600	$ 101,200	New Construction
Totals		18				$ 1,584,000	$ -0-	$ 1,584,000	$ 237,600	$ 1,821,600	$ 101,200	
S - T	1	42	$ 70,000	$ 7,000	$ 77,000	$ 3,234,000	$ 500,000	$ 3,734,000	$ 560,100	$ 4,294,100	$ 102,240	New Construction
Totals		42				$ 3,234,000	$ 500,000	$ 3,734,000	$ 560,100	$ 4,294,100	$ 102,240	
S - V												Portions of Stewart-Cassiar Road
T - U	1	86	$ 50,000	$ 5,000	$ 55,000	$ 4,730,000	$ 1,000,000	$ 5,730,000	$ 859,500	$ 6,589,500	$ 76,620	New Construction
Totals		86				$ 4,730,000	$ 1,000,000	$ 5,730,000	$ 859,500	$ 6,589,500	$ 76,620	
U - K												Portion of Alaska Highway
V - T	1	49	$ 55,000	$ 5,000	$ 60,000	$ 2,940,000	$ 500,000	$ 3,440,000	$ 516,000	$ 3,956,000	$ 80,730	New Construction
Totals		49				$ 2,940,000	$ 500,000	$ 3,440,000	$ 516,000	$ 3,956,000	$ 80,730	
V - W												Portions of Stewart-Cassiar Road
W - U												Portion of Alaska Highway

NOTES
* UNIT NUMBERING IS FROM SOUTH TO NORTH
** CULVERT PIPE AND BRIDGE MATERIALS ARE FURNISHED BY GOVERNMENT
*** COL. NO. 10 INCLUDES COST OF LOCATION AND SOILS SURVEYS, DESIGN AND CONSTRUCTION SUPERVISION

TABLE III - K
SHEET 2 OF 2

70243 O - 61 - VOL. 3 (Face blank p. III-12) No. 20

ROUTE : Haines "Cut-off" Road - Haines, Alaska to Haines Junction on Alaska Highway.

ROUTING :

Column No.: (1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)
SECTION	MILEAGE	EST. COST GRADING, DRAINAGE STRUCTURES, AND GRAVEL SURF.	RECONDITIONING EXISTING SUB-STANDARD ROADS	TOTAL ESTIMATED COST; COL'S 3 & 4	RECONDITIONING PREPARATORY TO PAVING OR SURFACING	ESTIMATED COST; BASE AND FLEXIBLE PAVEMENT	TOTAL ESTIMATED COST COL'S 5,6, & 7	ESTIMATED COST; BASE AND SURFACE TREATMENT	TOTAL ESTIMATED COST; COL'S 8,6, & 9	REMARKS
Haines to M.P. 23.3	23.3	$ -0-	$ -0-	$ -0-	$ -0-	$ -0-	$ -0-	$ -0-	$ -0-	Existing Paved Highway
M.P. 23.3 to Goat Creek	40.5	5,940,500	-0-	5,940,500	-0-	1,336,500	7,277,000	891,000	6,831,500	Relocation - New Construction
Goat Creek - M.P. 89.5	10.0	-0-	1,200,000	1,200,000		330,000	1,530,000	220,000	1,420,000	Reconditioning Existing Road
M.P. 89.5 - Haines Junction	69.5	-0-	3,025,000	3,025,000	1,737,500	4,969,300	9,731,800	3,475,000	8,237,500	" " "
Totals (Haines Cut-off)	143.3	$ 5,940,500	$ 4,225,000	$ 9,715,500	$ 1,737,500	$ 6,635,800	$ 18,538,800	$ 4,586,000	$ 16,489,000	
Haines Jct. - M.P. 1100	84				$ 3,701,500	$ 6,006,000	$ 9,707,500	$ 2,402,400	$ 6,103,500	Alaska Highway
M.P. 1100 - Alaska Bndy.	121				7,034,500	3,460,600	10,495,100	3,460,600	10,495,100	" "
Alaska Bndy. - Fairbanks	305	-0-	-0 -	-0-	-0-	-0-	-0-	-0-	-0-	
Totals (Alaska Highway)	510				$ 10,736,000	$ 9,466,600	$ 20,202,600	$ 5,863,000	$ 16,598,600	
Totals (Haines to Fairbanks)	653	$ 5,940,500	$ 4,225,000	$ 9,715,500	$ 12,473,500	$ 16,102,400	$ 38,741,000	$ 10,449,000	$ 33,088,000	

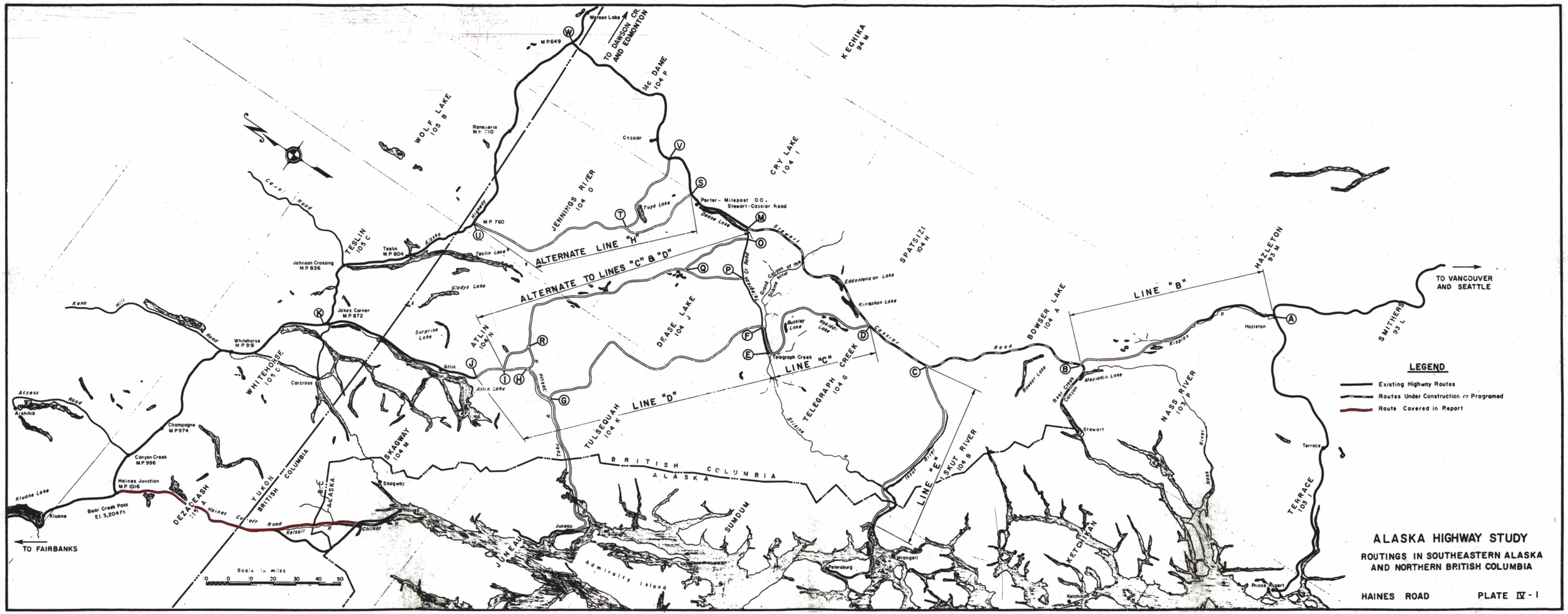
RECAPITULATION OF N. W. H. S. BRIDGES
PROJECTED TO DEC. 1959

No.	HAINES ROAD: BRIDGE OR BRIDGE CULVERT	MILEAGE	TOTAL LENGTH (IN FEET)	ORIGINAL STRUCTURE WHERE REPLACED SINCE 1946: TYPE	ORIGINAL STRUCTURE WHERE REPLACED SINCE 1946: LENGTH	PERMANENT BRIDGES BOTH SUB & SUPERSTRUCTURE: LOAD CLASS AS OF 1946	REPLACED SINCE 1946: LOAD CLASS	REPLACED SINCE 1946: YEAR CONST.	REPLACED SINCE 1946 BY CULVERT (YEAR)	ELIMINATED SINCE 1946 (X)	REMAINING BRIDGES: TYPE	LOAD CLASS	YEAR CONST. IF BUILT SINCE 1946	TO BE MADE PERMANENT BY NEW BRIDGE (B) OR REPLACED BY CULVERT (C) IN CONSTRUCTION SEASON: 60/61	61/62	62/63	63/64	64/65	65/66	REMARKS	ESTIMATED COST OF REPLACING TEMPORARY DRAINAGE STRUCTURES
																				SP SEMI PERMANENT T TEMPORARY D NEW DECK * PERMANENT SUBSTRUCTURE OR TREATED TIMBER PILES	
1	Granite Creek	45.5	Culv	T	54				1957												
2	Five Mile Creek	46.6	45	T	19		H20-S16	57													
3	Seltat Creek	48.8	51								T	H 15					B				$ 40,000
4	Stonehouse Creek	61.0	42	T	44						SP	H 15	57								
5	Clear Creek	61.3	102								T	H 15									90,000
6	Dick Creek	61.5	Culv	T	31				1956												
7	Clayton Creek	63.2	73								T	H 15								Being Replaced 1961	40,000
8	Chuck Creek	68.2	37								T	H 15									25,000
9	Nadahini River	69.8	109								T	H 15									90,000
10	Mule Creek	74.6	64	T	61		H20-S16	57													
11	Datlasaka No 1	75.9	73								T	H 15									50,000
12	Datlasaka No 2	76.3	37								T	H 15									30,000
13	Datlasaka No 3	76.7	55								T	H 15									50,000
14	Goat Creek	79.5	55								T	H 15									60,000
15	Holum Creek	81.5	55								T	H 15									60,000
16	Stanley Creek	87.7	70	Widened 1953							T	H 15									70,000
17	Blanchard River	79.5	137								T	H 15									100,000
18	Takhanne River	81.5	160	Shortened 1958	213						T	H 15									140,000
19	Motheral Creek	87.7	22	T	18						T	H 15	50								20,000
																				Sub Total	$ 450,000
20	Vand Creek	93.0	21	C							T	H 15	46				C				
21	Klukshu Creek	102.7	22	T	18						T	H 15	49								15,000
22	Gribbles Gulch	111.0	89	T	50						T	H 15	50								75,000
23	Small Creek	113.1	Culv	T	18				1956												
24	Trout Creek	117.6	Culv	T	18				1954												

RECAPITULATION OF N. W. H. S. BRIDGES
PROJECTED TO DEC. 1959

No.	HAINES ROAD					PERMANENT BRIDGES BOTH SUB & SUPERSTRUCTURE					REMAINING BRIDGES											ESTIMATED COST OF REPLACING TEMPORARY DRAINAGE STRUCTURES
	BRIDGE OR BRIDGE CULVERT	MILEAGE	TOTAL LENGTH (IN FEET)	ORIGINAL STRUCTURE WHERE REPLACED SINCE 1946		LOAD CLASS AS OF 1946	REPLACED SINCE 1946		REPLACED SINCE 1946 BY CULVERT (YEAR)	ELIMINATED SINCE 1946 (X)	TYPE	LOAD CLASS	YEAR CONST. IF BUILT SINCE 1946	TO BE MADE PERMANENT BY NEW BRIDGE (B) OR REPLACED BY CULVERT (C) IN CONSTRUCTION SEASON						SP SEMI PERMANENT T TEMPORARY D NEW DECK * PERMANENT SUBSTRUCTURE OR TREATED TIMBER PILES REMARKS	
				TYPE	LENGTH		LOAD CLASS	YEAR CONST.						60/61	61/62	62/63	63/64	64/65	65/66		
25	Kathleen River	142.9	134								T	H 15					B				$ 130,000
26	Quill Creek	150.3	76	T	162						T	H 15	57								70,000
27	Dezadeash of #2	158.4	39								T	H 15						B			30,000
28	Dezadeash of #1	158.6	94								T	H 15								Rebuilt 1957	80,000
29	Dezadeash River	158.7	182	Shortened 1957	222						T	H 15									175,000

70243 O - 61 - VOL. 3 (Face p. IV-4) No. 3



70243 O - 61 - VOL. 3 (Face p. IV-4) No. 4

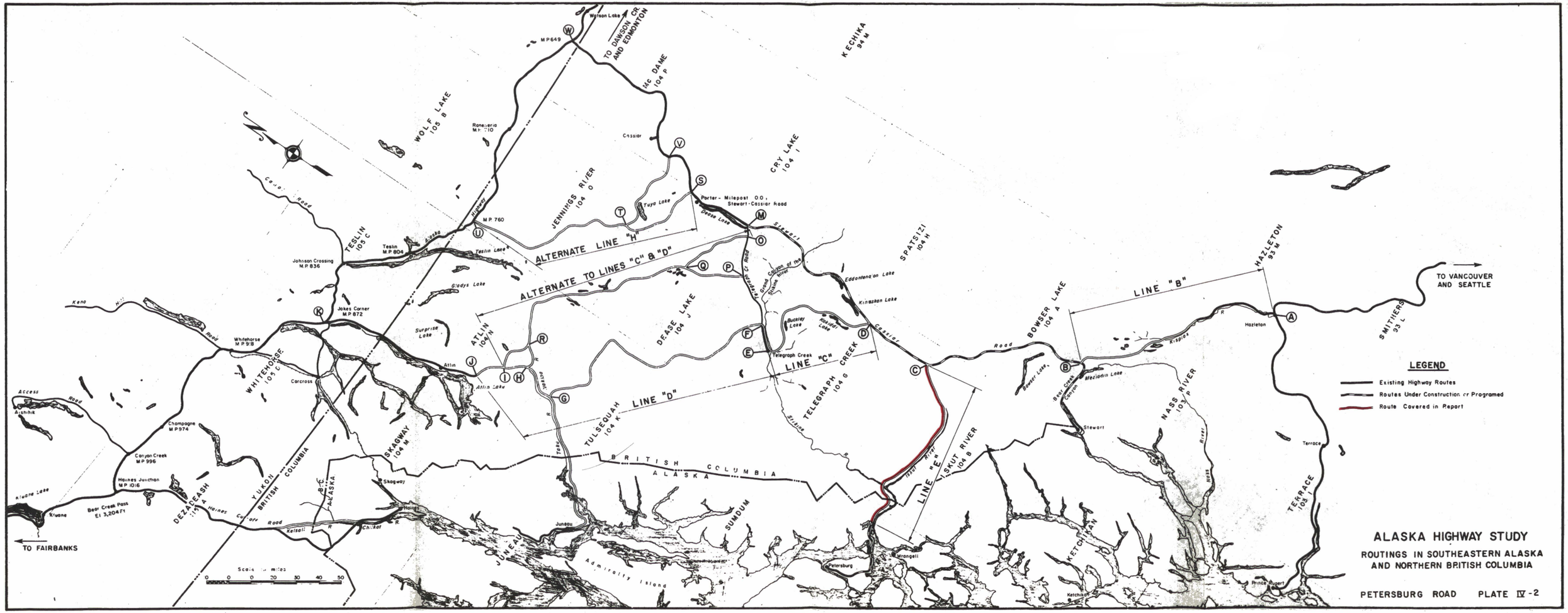
ROUTE : Petersburg to Stewart-Cassiar Road

ROUTING :

Column No.: (1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)
SECTION	MILEAGE	EST. COST GRADING, DRAINAGE STRUCTURES, AND GRAVEL SURF.	RECONDITIONING EXISTING SUB-STANDARD ROADS	TOTAL ESTIMATED COST; COL'S 3 & 4	RECONDITIONING PREPARATORY TO PAVING OR SURFACING	ESTIMATED COST; BASE AND FLEXIBLE PAVEMENT	TOTAL ESTIMATED COST COL'S 5,6, & 7	ESTIMATED COST; BASE AND SURFACE TREATMENT	TOTAL ESTIMATED COST; COL'S 5,6, & 9	REMARKS
Petersburg to Popof Creek	50	$ -0-	$ -0-	$ -0-	$ -0-	$ -0-	$ -0-	$ -0-	$ -0-	Existing or Planned
Popof Creek to										
Alaska - B.C. Border	15	2,706,000	-0-	2,706,000	525,000	1,072,500	4,303,500	456,000	3,687,000	
Alaska - B. C. Border to										
Stewart-Cassiar Rd.	81	14,800,500	-0-	14,800,500	2,835,000	5,791,500	23,427,000	2,462,400	20,097,900	
Total	146	$ 17,506,500	$ -0-	$ 17,506,500	$ 3,360,000	$ 6,864,000	$ 27,730,500	$ 2,918,400	$ 23,784,900	

Cost Analysis for Gravel Highway - Petersburg to Stewart-Cassiar Road

Column No.: (1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)
SECTION	MILES	GRADING AND SMALL STRUCTURES	TOTAL	MAJOR STRUCTURES	TOTAL	10 % ENGR.	TOTAL	AVERAGE COST PER MILE		REMARKS
Petersburg to Popof	50	$ -0-	$ -0-	$ -0-	$ -0-	$ -0-	$ -0-	$ -0-		Existing or Planned
(Popof) Creek to										
Elbow Mtn.	12	80,000	960,000	600,000	1,560,000	156,000	1,716,000	143,000		
Elbow Mtn. to										
Alaska - B.C. Border	3	300,000	900,000	-0-	900,000	90,000	990,000	330,000		
	15		$ 1,860,000	$ 600,000	$ 2,460,000	$ 246,000	$ 2,706,000	$ 180,400		Sub Total Alaska
Alaska - B. C. Border to						(15% Engr.)				
Stickine River	7	$ 150,000/0	$ 1,050,000	$ -0-	$ 1,050,000	$ 157,500	$ 1,207,500	$ 172,500		
Stickine River Crossing	2	200,000/0	400,000	1,000,000	1,400,000	210,000	1,610,000	805,000		
Stickine River to										
Stewart-Cassiar Rd.	72	100,000/10,000	7,920,000	2,500,000	10,420,000	1,563,000	11,983,000	166,400		
	81		$ 9,370,000	$ 3,500,000	$ 12,870,000	$ 1,930,500	$ 14,800,500	$ 182,700		Sub Total in Canada
Total	96		$ 11,230,000	$ 4,100,000	$ 15,330,000	$ 2,176,500	$ 17,506,500	$ 182,360		Grand Total



70243 O-61 - VOL. 3 (Face p. IV-4) No. 7

Cost Analysis for Gravel Highway - Juneau to "A" Route Connection.

Column No.: (1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)
SECTION	MILES	GRADING AND SMALL DR. STRUCT. COST/MILE	MATERIALS COST/MILE	TOTAL COL'S 4 & 5	TOTAL COST WITHOUT MAJOR STRUCTURES	MAJOR STRUCTURES LUMP SUM	TOTAL COST COL'S 7 & 8	ENGINEERING AND CONTINGENCIES	SUB TOTAL ESTIMATED COST	TOTAL ESTIMATED COST	REMARKS
Juneau to Alaska-B.C.Border	52	$ -0-	$ -0-	$ -0-	$ -0-	$ -0-	$ -0-	$ -0-	$ 20,000,000		From Previous Study (1)
Alaska-B.C. Border to											
Point G	35	80,000	8,000	88,000	3,080,000	800,000	3,880,000	582,000	4,462,000		
Total - Juneau to Point G	87									$ 24,462,000	
Section G - H	20								4,278,000		
Total - Juneau to Point H	97									28,740,000	
Section H - I	16								3,864,000		
Total - Juneau to Point I	113									32,604,000	

(1) Downing, Rechard A., Transportation, Presented to International Development Commission Conference, Victoria, B.C., July 19, 1960

ROUTE : Comparison of Routings No. 1 & 5 as regards Juneau Connection (at Point "G")

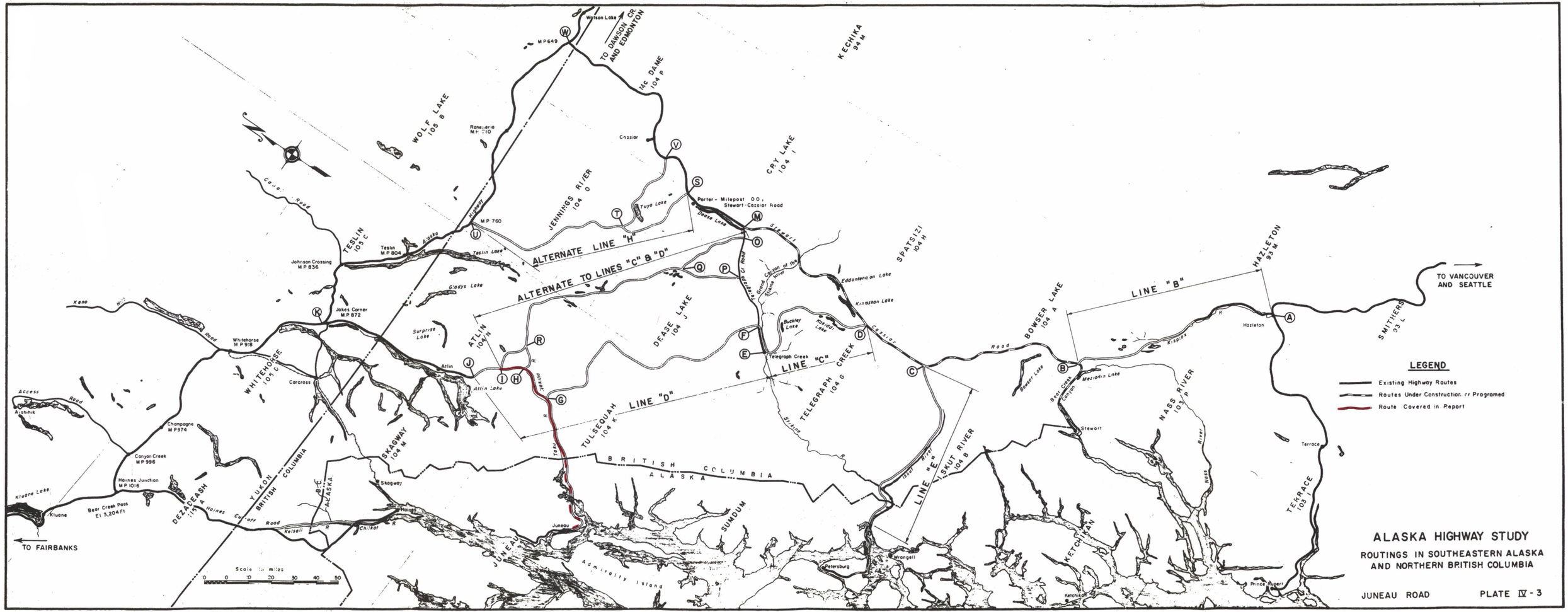
ROUTING :

Column No.: (1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)
SECTION	MILEAGE	EST. COST GRADING, DRAINAGE STRUCTURES, AND GRAVEL SURF.	RECONDITIONING EXISTING SUB-STANDARD ROADS	TOTAL ESTIMATED COST; COL'S 3 & 4	RECONDITIONING PREPARATORY TO PAVING OR SURFACING	ESTIMATED COST; BASE AND FLEXIBLE PAVEMENT	TOTAL ESTIMATED COST COL'S 5,6, & 7	ESTIMATED COST; BASE AND SURFACE TREATMENT	TOTAL ESTIMATED COST; COL'S 5,6, & 9	REMARKS
Routing No. 1										
D - E	75	$ 6,796,500	$ - 0-	$ 6,796,500	$ 2,887,500	$ 5,362,500	$ 15,046,500	$ 2,145,000	$ 11,829,000	Note: Routing No. 1 passes through Point
E - F	14	1,658,300	-0-	1,658,300	539,000	1,001,000	3,198,300	400,400	2,597,700	"G" Which would be the connecting point
F - G	142	22,658,500	-0-	22,658,500	5,467,000	10,153,000	38,278,500	4,061,200	32,186,700	for Juneau Highway.
G - H	-	4,278,000	-0-	4,278,000	770,000	1,430,000	6,478,000	572,000	5,620,000	
H - I	-	3,864,000	-0-	3,864,000	616,000	1,144,000	5,624,000	457,600	4,937,600	
Totals	231	$ 39,255,300	$ -0-	$ 39,255,300	$ 10,279,500	$ 19,090,500	$68,625,300	$ 7,636,200	$ 57,171,000	
Routing No. 4										
D - M	81	$ -0-	$ - 0 -	$ -0-	$ 3,118,500	$ 5,791,500	$ 8,910,000	$ 2,316,600	$ 5,435,100	Note: Routing No. 4 Misses Point "G"
M - O	7	-0-	231,000	231,000	269,500	500,500	1,001,000	200,200	700,700	by 20 miles (G to H)
O - Q	33	3,037,200	-0-	3,037,200	1,270,500	2,359,500	6,667,200	943,800	5,251,500	
Q - R	103	7,369,200	-0-	7,369,200	3,965,500	7,364,500	18,699,200	2,945,800	14,280,500	
R - H	13	4,111,300	-0-	4,111,300	500,500	929,500	5,541,300	371,800	4,983,600	
H - I	-	3,864,000	-0-	3,864,000	616,000	1,144,000	5,624,000	457,600	4,937,600	
Totals	237	$ 18,378,700	$ 231,000	$ 18,612,700	$ 9,740,500	$ 18,089,500	$ 46, 442,700	$ 7,235,800	$ 35,589,000	
Cost Differentials										
Routings No.s 1 & 4		$ 20,976,600		$ 20,642,600			$ 22,182,600		$ 21,582,000	
Cost of G - H	20	4,278,000		4,278,000			6,478,000		5,620,000	
Net Savings	257	$ 16,698,600		$16,364,600			$ 15,704,600		$ 15,962,000	
Travel distance from Juneau to	Fairbanks -	Not affected								
" " " Juneau to	Seattle -	Increased by 26 miles.								

ROUTE : Comparison of Routings No. 1 & 5 as regards Juneau Connection (at Point "G")

ROUTING :

Column No.: (1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)
SECTION	MILEAGE	EST. COST GRADING, DRAINAGE STRUCTURES, AND GRAVEL SURF.	RECONDITIONING EXISTING SUB-STANDARD ROADS	TOTAL ESTIMATED COST; COL'S 3 & 4	RECONDITIONING PREPARATORY TO PAVING OR SURFACING	ESTIMATED COST; BASE AND FLEXIBLE PAVEMENT	TOTAL ESTIMATED COST COL'S 5,6, & 7	ESTIMATED COST; BASE AND SURFACE TREATMENT	TOTAL ESTIMATED COST; COL'S 5,6, & 9	REMARKS
Total Costs -										
Routing No. 1	231	$ 39,255,300	$ -0-	$ 39,255,300	$ 10,279,500	$ 19,090,500	$ 68,625,300	$ 7,636,200	$ 57,171,000	
Routing No. 5										
D - M	81	-0-	-0-	-0-	3,118,500	5,791,500	8,910,000	2,316,600	5,435,100	Note: Routing No. 5 misses Point "G"
M - O	7	-0-	231,000	231,000	269,500	500,500	1,001,000	200,200	700,700	by 36 miles
O - Q	33	3,037,200	-0-	3,037,200	1,270,500	2,359,500	6,667,200	943,800	5,251,500	
Q - R	103	7,369,200	-0-	7,369,200	3,965,500	7,364,500	18, 699,200	2,945,800	14,280,500	
R - I	18	1,821,000	-0-	1,821,000	693,000	1,287,000	3,801,000	514,800	3,028,800	
Totals	242	$ 12,227,400	$ 231,000	$ 12,458,400	$ 9,317,000	$ 17,303,000	$ 39,078,400	$ 6,921,200	$ 28,696,600	
Cost Differentials										
Routings No. 1 & 5		$ 27,027,900	$ -	$ 26,796,900			$ 29,546,900		$ 28,474,400	
Cost of G - H	20	4,278,000	-0-	4,278,000	770,000	1,430,000	6,478,000	572,000	5,620,000	
" " H - I	16	3,864,000	-0-	3,864,000	616,000	1,144,000	5,624,000	457,600	4,937,600	
Totals	278	$ 8,142,000		$ 8,142,000			$ 12,102,000		$ 10,557,600	
Net Savings		$ 18,885,900		$ 18,654,900			$ 17,444,900		$ 17,916,800	
Travel distance from Juneau to Fairbanks		- Not affected.								
" " " Juneau to Seattle		- Increased by 47 miles.								



COST SUMMARY

ROUTING: Rex - McGrath - Ruby - Eureka

COLUMN No.: (1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
SECTION	MILEAGE	GRADING AND DR. STRUCTURES TOTAL ESTIMATED COST	BRIDGES	TOTAL ESTIMATED COST (5) + (6)	ENGINEERING AND CONTINGENCIES	TOTAL ESTIMATED COST (7) + (8)	AVERAGE COST PER MILE	REMARKS
Rex - McGrath	281	$ 15,625,000	$ 1,400,000	$ 17,025,000	$ 2,568,800	$ 19,593,800	$ 69,700	
McGrath - Poorman	119	6,401,000	100,000	6,501,000	975,200	7,476,200	62,800	
Poorman - Ruby	58	-0-	-0-	-0-	-0-	-0-	-0-	Existing Road
Totals	458	$ 22,026,000	$ 1,500,000	$ 23,526,000	$ 3,544,000	$ 27,070,000	$ 59,100	
Poorman - Ruby	58	$ 4,060,000	$ 100,000	$ 4,160,000	$ 624,000	$ 4,784,000	$ 82,500	New Construction
Totals	458	$ 26,086,000	$ 1,600,000	$ 27,686,000	$ 4,168,000	$ 31,854,000	$ 69,600	
Ruby - Bootlegger Slough	5	$ 150,000	- Ferry -	$ 150,000	$ 22,500	$ 172,500	$ 34,500	Connect w/Nome - Eureka Rd.
Bootlegger Slough - Tanana	109	6,835,000	-0-	6,835,000	1,025,300	7,060,300	64,800	Portion of Nome - Eureka Rd.
Tanana - Eureka	58	-0-	-0-	-0-	-0-	-0-	-0-	Under Construction or Programmed
Totals	630	$ 33,071,000	$ 1,600,000	$ 34,671,000	$ 5,215,800	$ 39,086,800	$ 68,330	

COST ANALYSIS

ROUTING: Rex - McGrath - Ruby - Eureka

Column No.: (1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)
SECTION	UNIT	MILEAGE	GRADING AND DR. STRUCTURES COST PER MILE	TOTAL COST	BRIDGES	TOTAL COST (5) + (6)	ENGINEERING AND CONTINGENCIES	TOTAL COST (7) + (8)	AVERAGE COST PER MILE	REMARKS
Rex to McGrath										
	1	27	$ 55,000	$ 1,485,000	$ -0-	$ 1,485,000	$ 222,750	$ 1,707,750	$ 63,250	
	2	20	57,500	1,150,000	200,000	1,350,000	202,500	1,552,500	77,625	
	3	66	55,000	3,660,000	400,000	4,060,000	609,000	4,669,000	70,740	
	4	53	60,000	3,180,000	350,000	3,530,000	529,500	4,059,500	76,590	
	5	80	55,000	4,400,000	450,000	4,850,000	742,500	5,592,500	69,900	
	6	35	50,000	1,750,000	- Ferry -	1,750,000	262,500	2,012,500	57,500	
Totals		281		$ 15,625,000	$1,400,000	$ 17,025,000	$ 2,568,750	$ 19,593,750	$ 69,730	
McGrath to Poorman	1	18	$ 53,000	$ 954,000	$ 100,000	$ 1,054,000	$ 158,100	$ 1,212,100	$ 67,340	
	2	19	-0-	-0-	-0-	-0-	-0-	-0-	-0-	Existing Road - Takotna River to Ophir
	3	35	65,000	2,275,000	-0-	2,275,000	341,250	2,616,250	74,750	
	4	47	67,500	3,172,000	-0-	3,172,000	475,800	3,647,800	77,610	
Totals		119		$ 6,401,000	$ 100,000	$ 6,501,000	$ 975,150	$ 7,476,150	$ 62,820	
Poorman to Ruby		58	$ 70,000	$ 4,060,000	$ 100,000	$ 4,160,000	$ 624,000	$ 4,784,000	$ 82,480	New Construction - (Alternative)
		58		$ 4,060,000	$ 100,000	$ 4,160,000	$ 624,000	$ 4,784,000	$ 82,480	
Ruby to Tanana										
	1	5	$ 30,000	$ 150,000	- Ferry -	$ 150,000	$ 22,500	$ 172,500	$ 34,500	Connect w/Nome Rd. at Bootlegger Slough
	2	109	62,706	6,835,000	-0-	6,835,000	1,025,250	7,860,250	72,110	Portion of Nome - Eureka Road
Totals		114		$ 6,985,000	$ -0-	$ 6,985,000	$ 1,047,750	$ 8,032,750	$ 70,460	
Tanana to Eureka		58	$ -0-	$ -0-	$ -0-	$ -0-	$ -0-	$ -0-	$ -0-	Under Construction or Programmed

70243 O - 61 - VOL. 3 (Face p. V-2) No. 2

Comparison of Routes - Eureka to Nome and Golovnin

Column No.: (1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
ROUTE	MILEAGE	GRADING AND DRAINAGE STRUCTURES TOTAL ESTIMATED COST	BRIDGES	TOTAL ESTIMATED COST COLS. 3 + 4	ENGINEERING AND CONTINGENCIES	TOTAL ESTIMATED COST COLS. 5 + 6	AVERAGE COST PER MILE *	REMARKS
Eureka - Tanana - Hughes - Council - Nome (Northern Route)								
	688	$ 33,605,000	$ 1,350,000	$ 34,955,000	$ 5,243,250	$ 40,198,250	$ 74,715	
Eureka - Tanana - Hughes - Golovnin (Northern Route)								
	586	32,955,000	1,150,000	34,105,000	5,115,750	39,220,750	74,280	
Eureka - Tanana - Bootlegger Slough - Haycock - Council - Nome (Southern Route)								
	565	27,395,000	900,000	28,295,000	4,244,250	32,539,250	78,405	
Eureka - Tanana - Bootlegger Slough - Haycock - Golovnin (Southern Route)								
	463	26,745,000	700,000	27,445,000	4,116,750	31,561,750	77,930	

*Exclusive of Existing and Programmed Portions.

Cost Analysis

Routing: Eureka to Nome (Southern Route)

Column No. (1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
SECTION	MILEAGE	GRADING & SMALL DRAINAGE STRUCT. COST/MILE	TOTAL COST	BRIDGES	TOTAL COST (4) + (5)	ENGINEERING AND CONTINGENCIES	TOTAL COST (6) + (7)	AVERAGE COST PER MILE	REMARKS
Eureka to Tanana	58	$ -0-	$ -0-	$ -0-	$ -0-	$ -0-	$ -0-	$ -0-	1963-64 Program
Tanana to Grant Creek	25	55,000	1,375,000	-0-	1,375,000	206,250	1,581,250	63,250	
Grant Creek to Bootlegger Sl.	84	65,000	5,460,000	-0-	5,460,000	819,000	6,279,000	74,750	
Bootlegger Sl. to Sta. 50	50	45,000	2,250,000	-0-	2,250,000	337,500	2,587,500	51,750	
Sta. 50 to Koyukuk River	32	50,000	1,600,000	- Ferry -	1,600,000	240,000	1,840,000	57,500	
Koyukuk River to Haycock	128	80,000	10,240,000	400,000	10,640,000	1,596,000	12,236,000	95,600	
Haycock to Tubutulik River	46	70,000	3,220,000	300,000	3,520,000	528,000	4,048,000	88,000	
(1) Tubutulik River to Point "A"	14	65,000	910,000	-0-	910,000	136,500	1,046,500	74,750	
(1) Total - Eureka to Point "A"	437		$25,055,000	$ 700,000	$ 25,755,000	$ 3,863,250	$29,618,250	$ 78,148*	
(1) Point "A" to Council	36	65,000	2,340,000	200,000	2,540,000	381,000	2,921,000	81,140	
Council to Nome	92	-0-	-0-	-0-	-0-	-0-	-0-	-0-	Existing Road
Total - Eureka to Nome	565		$27,395,000	$ 900,000	$ 28,295,000	$ 4,244,250	$32,539,250	$ 78,405*	
(1) Point "A" to Golovnin	26	$ 65,000	$ 1,690,000	-0-	$ 1,690,000	$ 253,500	$ 1,943,500	$ 74,750	
Total - Eureka to Golovnin	463		$26,745,000	$ 700,000	$ 27,445,000	$ 4,116,750	$31,561,750	$ 77,930*	*Exclusive of Existing and Programmed Portions.

(1) Point "A" is located at Darby Mtn. Pass, 26 Miles Northeast of Golovnin

COST SUMMARY -

Eureka to Nome and Golovnin via Northern Route

Column No.: (1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
SECTION	MILEAGE	GRADING AND DRAINAGE STRUCTURES TOTAL ESTIMATED COST	BRIDGES	TOTAL ESTIMATED COST COL'S 3 + 4	ENGINEERING AND CONTINGENCIES	TOTAL ESTIMATED COST COL'S 5 + 6	AVERAGE COST PER MILE	REMARKS
Eureka to Tanana	58	$ -0-	$ -0-	$ -0-	$ -0-	$ -0-	$ -0-	Included in 1963 - 64 Program
Tanana to Hughes	125	7,182,500	100,000	7,282,500	1,092,375	8,374,875	67,000	
Hughes to Point "A" (1)	377	24,082,500	1,050,000	25,132,500	3,769,875	28,902,375	76,660	
Point "A" to Council (1)	36	2,340,000	200,000	2,540,000	381,000	2,921,000	81,140	
Council to Nome	92	-0-	-0-	-0-	-0-	-0-	-0-	Existing Road
Total Eureka to Nome	688	$ 33,605,000	$ 1,350,000	$ 34,955,000	$ 5,243,250	$ 40,198,250	$ 74,715*	
Point "A" to Golovnin (1)	26	1,690,000	-0-	1,690,000	253,500	1,943,500	74,750	
Total Eureka to Golovnin	586	$ 32,955,000	$ 1,150,000	$ 34,105,000	$ 5,115,750	$ 39,220,750	$ 74,280*	

(1) Point "A" is located at Darby Mtn. Pass, 26 Miles Northeast of Golovnin

*Exclusive of Existing and Programmed Portions.

Detailed Cost Breakdown: Eureka to Nome Via Northern Route

Column No.: (1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)
SECTION	UNIT	MILEAGE	GRADING AND SMALL DRAINAGE STRUCTURES COST PER MILE	TOTAL COST	BRIDGES	TOTAL COST COL'S 5 + 6	ENGINEERING AND CONTINGENCIES	TOTAL ESTIMATED COST COL'S 7 + 8	AVERAGE COST PER MILE	REMARKS
Eureka to Tanana	1	58	$ -0-	$ -0-	$ -0-	$ -0-	$ -0-	$ -0-	$ -0-	Included in 1963-64 Program
		58								
Tanana to Hughes	1	52	55,000	2,860,000	100,000	2,960,000	444,000	3,404,000	65,460	
	2	23	57,500	1,322,500	-0-	1,322,500	198,375	1,520,875	66,125	
	3	50	60,000	3,000,000	-0-	3,000,000	450,000	3,450,000	69,000	
		125		$ 7,182,500	$ 100,000	$ 7,282,500	$ 1,092,375	$ 8,374,875	$ 67,000	
Hughes to Point "A"*	1	40	62,500	2,500,000	500,000	3,000,000	450,000	3,450,000	86,250	
(To Point "B")**	2	97	57,500	5,577,500	250,000	5,827,500	874,125	6,701,625	69,090	
	3	57	70,000	3,990,000	-0-	3,990,000	598,500	4,588,500	80,675	
	4	55	65,000	3,575,000	-0-	3,575,000	536,250	4,111,250	74,750	
(To Haycock)	5	68	65,000	4,420,000	-0-	4,420,000	663,000	5,083,000	74,750	
	6	24	70,000	1,680,000	300,000	1,980,000	297,000	2,277,000	94,875	
	7	36	65,000	2,340,000	-0-	2,340,000	351,000	2,691,000	74,750	
		377		$ 24,082,500	$ 1,050,000	$ 25,132,500	$ 3,769,875	$ 28,902,375	$ 76,660	
Point "A" to Council*		36	65,000	2,340,000	200,000	2,540,000	381,000	2,921,000	81,140	
		36		$ 2,340,000	$ 200,000	$ 2,540,000	$ 381,000	$ 2,921,000	$ 81,140	
Council to Nome		92		-0-	-0-	-0-	-0-	-0-	-0-	Existing Road
		92								
Point "A" to Golovnin*		26	$ 65,000	$1,690,000	-0-	$ 1,690,000	$ 253,500	$ 1,943,500	$ 74,750	
		26		$1,690,000		$ 1,690,000	$ 253,500	$ 1,943,500	$ 74,750	
			*Point "A" is located at Darby Mtn. Pass, 26 Miles Northeast of Golovnin **Point "B" is located at the head of Ingruksukruk Creek Near Purcell Mtn.							