ALASKA POWER AUTHORITY

SUSITNA HYDROELECTRIC PROJECT

SUBTASK 8.01 - TRANSMISSION LINE CORRIDOR SCREENING - 1980

DRAFT CLOSEOUT REPORT

JANUARY 1981

TABLE OF CONTENTS

TRANSMISSION CORRIDOR STUDIES

1. GENERAL

The rapid growth of electrical energy consumption in USA and its forecast for the next several years indicates a need for increased electrical power generating facilities and transmission capabilities.

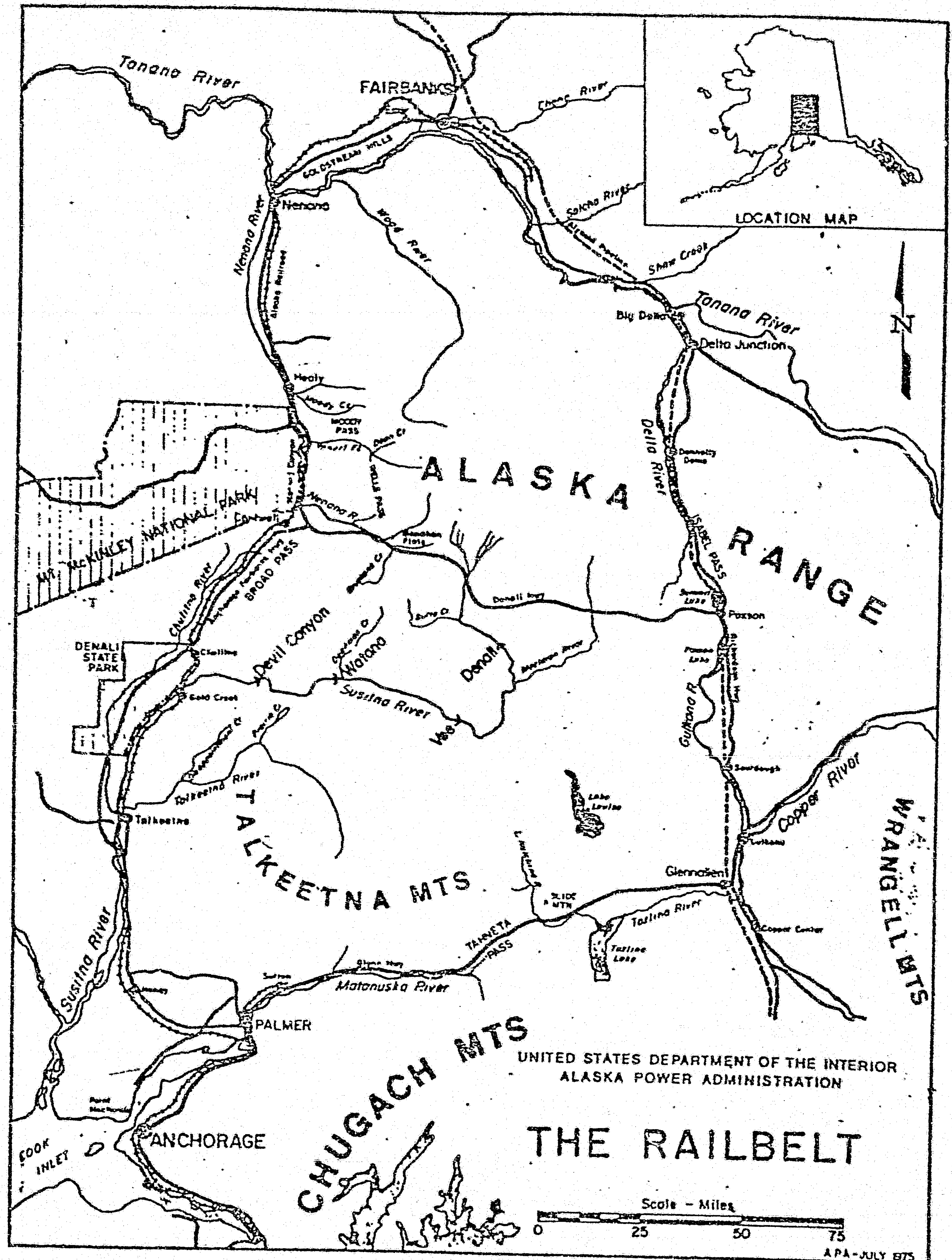
It is anticipated from various estimates that the energy required by the U.S. in the year 2000 will be approximately six times that of the year 1964 (EEI, 1968).

The high voltage transmission line is an efficient means of transporting electrical energy at high voltage from the generating plant to consumers.

This report addresses itself to the satisfactory routing of transmission line and how we reached our selected preliminary route.

2. SELECTION OF CORRIDORS

Let us take a look to the map of the Railbelt (Figure 1). The major mountain ranges of Alaska, Talkeetna and Chugach limit the range of choice of corridors. The higher elevations in these mountains are completely unsuitable for transmission lines, and there are relatively few low elevations passes through these ranges. Away from the mountains, a wide range of locations could be considered.


THE RAILBELT
UNITED STATES DEPARTMENT OF THE INTERIOR
ALASKA POWER ADMINISTRATION
APA-JULY 1975
LOCATION MAP
Scale - Miles
0
25
50
75
FAIRBANKS
Tanana River
Nenana
Nenana River
Healy
ALASKA RANGE
Big Delta
Delta Junction
Delta River
Paxson
ISABEL PASS
BROAD PASS
Cantwell
Nenana R.
MT. McKINLEY NATIONAL PARK
DENALI STATE PARK
Chulitna River
Devil Canyon
Watana
Susitna River
Denali
Gold Creek
Talkeetna River
Talkeetna
TALKEETNA MTS
Gulkana R.
Sourdough
Copper River
WRANGELL MTS
Glennallen
Copper Center
Tazlina River
TAHNETA PASS
Matanuska River
Sutton
PALMER
Susitna River
CHUGACH MTS
ANCHORAGE
COOK INLET

(FIGURE 1)

2.1 How to transport the energy to the different cities?

Figure 2 illustrates on a very broad scale, the alternatives for locating the lines.

2.1.1 From the project site to Anchorage

The heart of Talkeetna mountains can be avoided by:

a. The "Susitna Corridor" which generally follow the Susitna River Valley. or,

b. The "Matanuska Corridor" which pass to the east of the mountains and approaches Anchorage from the Matanuska Valley.

2.1.2 From the project site to the Fairbanks area

The options of crossing the Alaska Range are limited to:

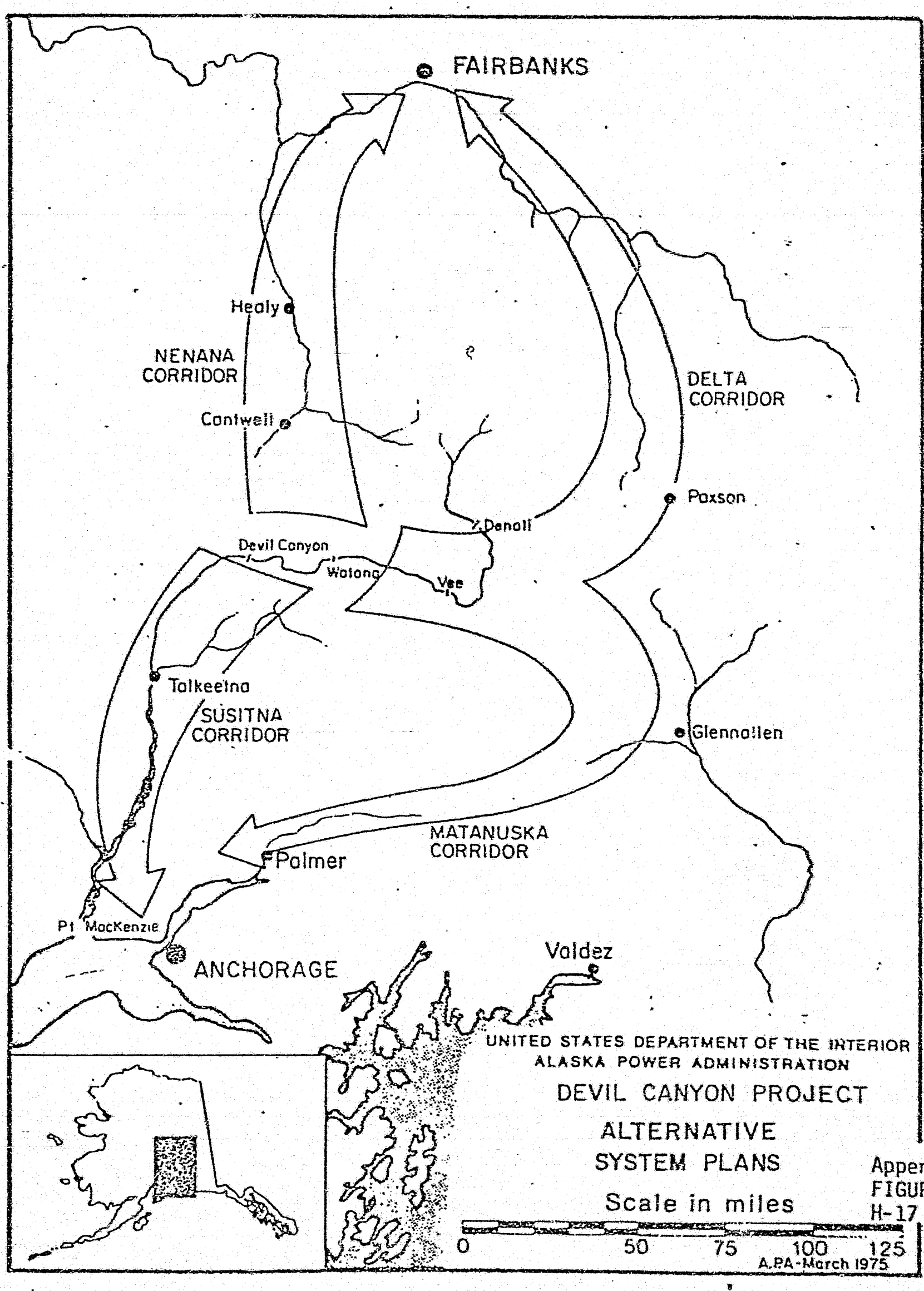
a. The passes in the Nenana River drainage "The Nenana Corridor". or

b. Generally along the Richardson highway to the east "Delta Corridor".

3. METHOD OF EVALUATION

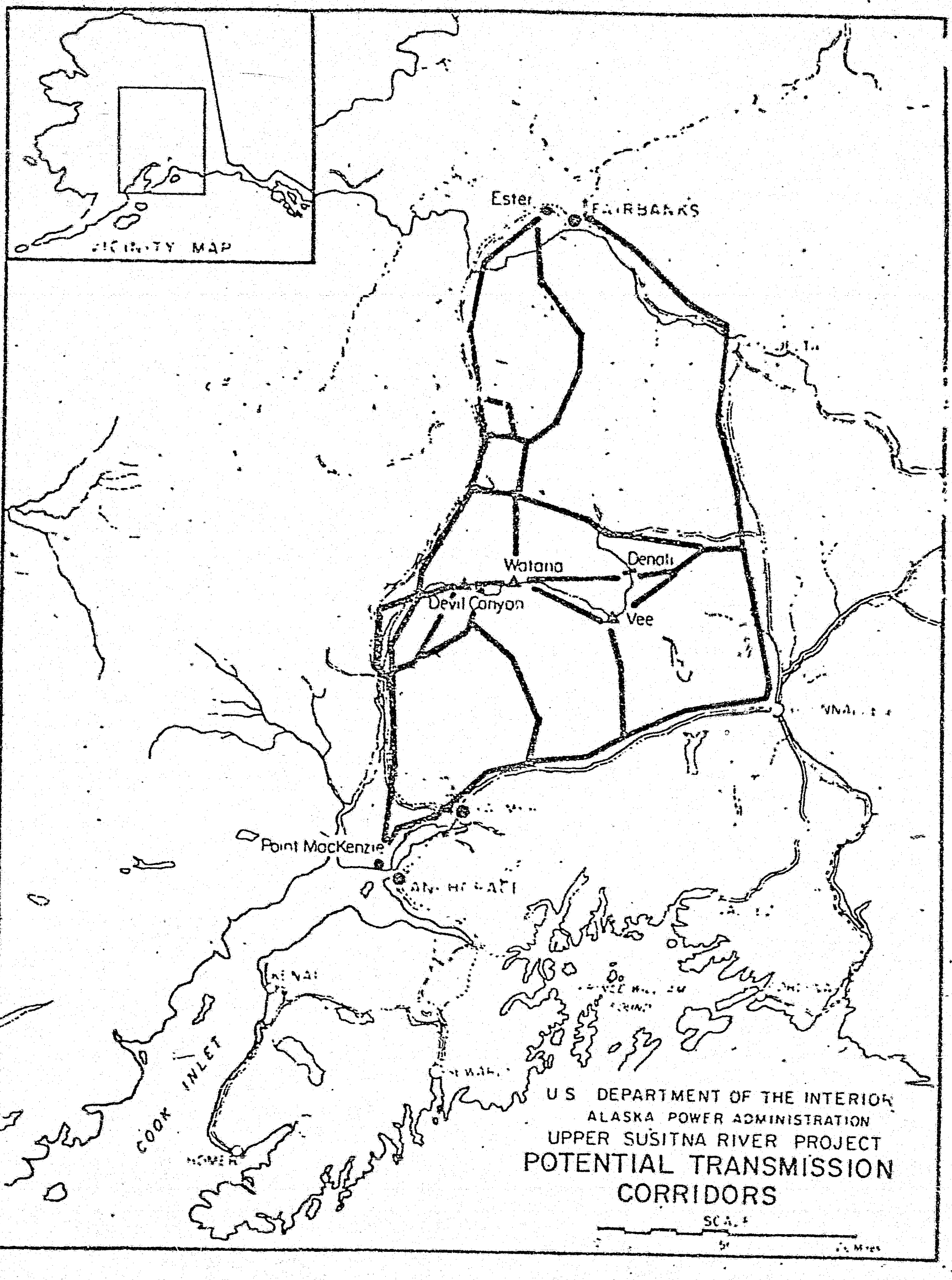
The Corps of Engineers have identified potential corridors utilizing large scale topographic maps and satellite photos. This involved identification of potential feasible passes through the mountains as shown on Figure 3.

Aerial reconnaissance was done to determine which of these corridors were feasable for constructing lines. Several were found to have "fatal flaws" or characteristics that would preclude their use for transmission lines. Reasons for eliminating corridors at this stage included completely unsuitable



(FIGURE 2)

Fig 2


VICINITY MAP
Ester
FAIRBANKS
Watana
Devil Canyon
Denali
Vee
Point MacKenzie
COOK INLET
U S DEPARTMENT OF THE INTERIOR
ALASKA POWER ADMINISTRATION
UPPER SUSITNA RIVER PROJECT
POTENTIAL TRANSMISSION
CORRIDORS
SCALE

(FIGURE 3)

topography, obstruction by major glaciers or excessive elevations.

The remaining potential corridors, indicated on Figure 4 were then analyzed in more detail. The base of the analysis was individual corridor segments indicated on Figure 5. For convenience, the alternative corridors and the individual segments were numbered as shown on maps. Table 1 provides a key to this numbering system. All of these remaining corridors (Figure 5) are considered physically feasible for transmission lines.

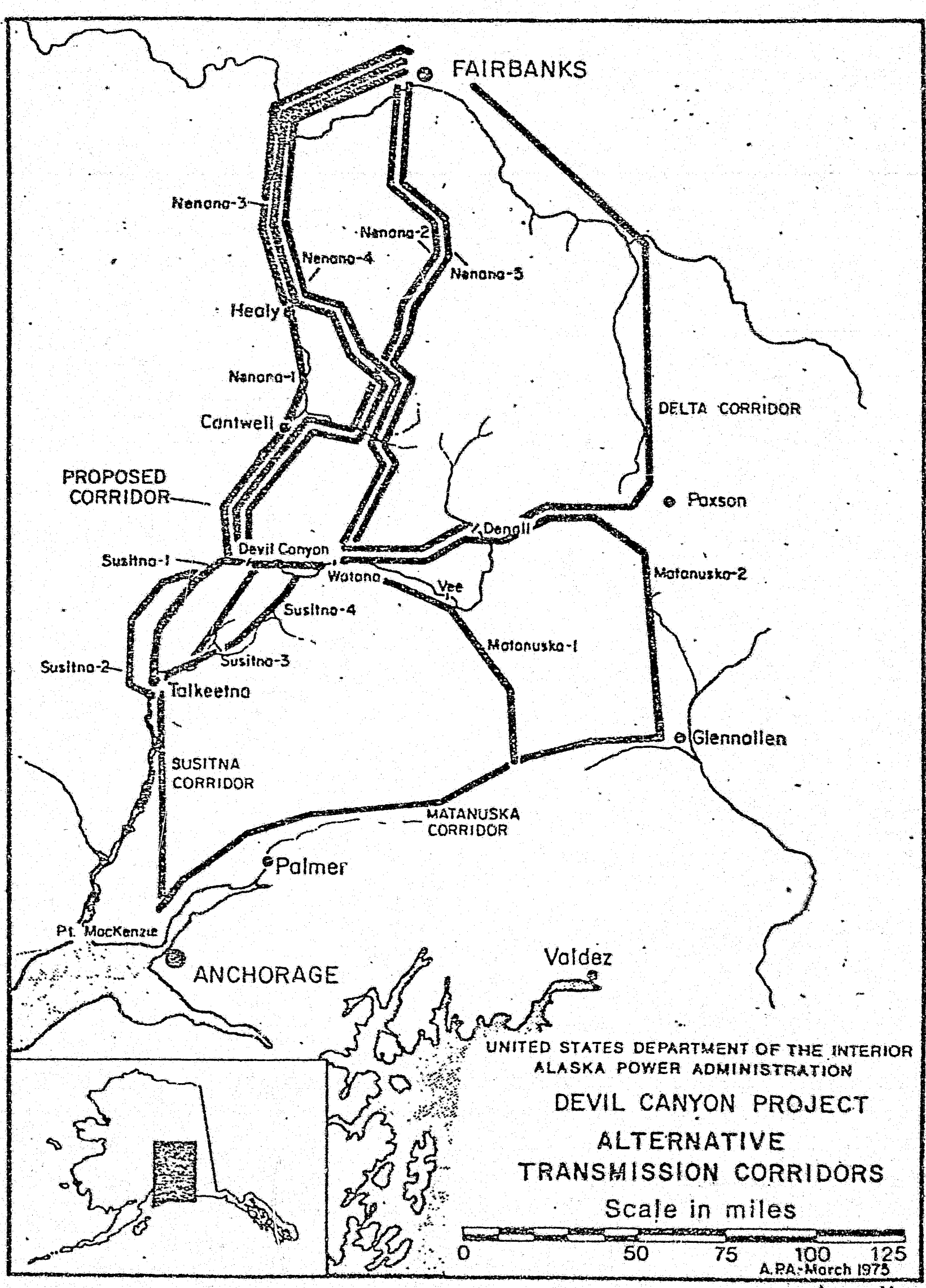
The evaluation is intended to identify the relative advantages or disadvantages of utilizing the alternatives for transmission lines.

3.1 Steps in evaluation

1. Description and inventory by segment of the key resources that would be impacted by a transmission line.
2. Evaluation of probable impacts of locating, building, and operating transmission line for each segment.
3. Determination of relative cost of reliability for his utilizing the alternative corridors.
4. Summarization of advantages or disadvantages from the viewpoint of environment, engineering, costs, and reliability of service.
5. Selection of preferred corridors.

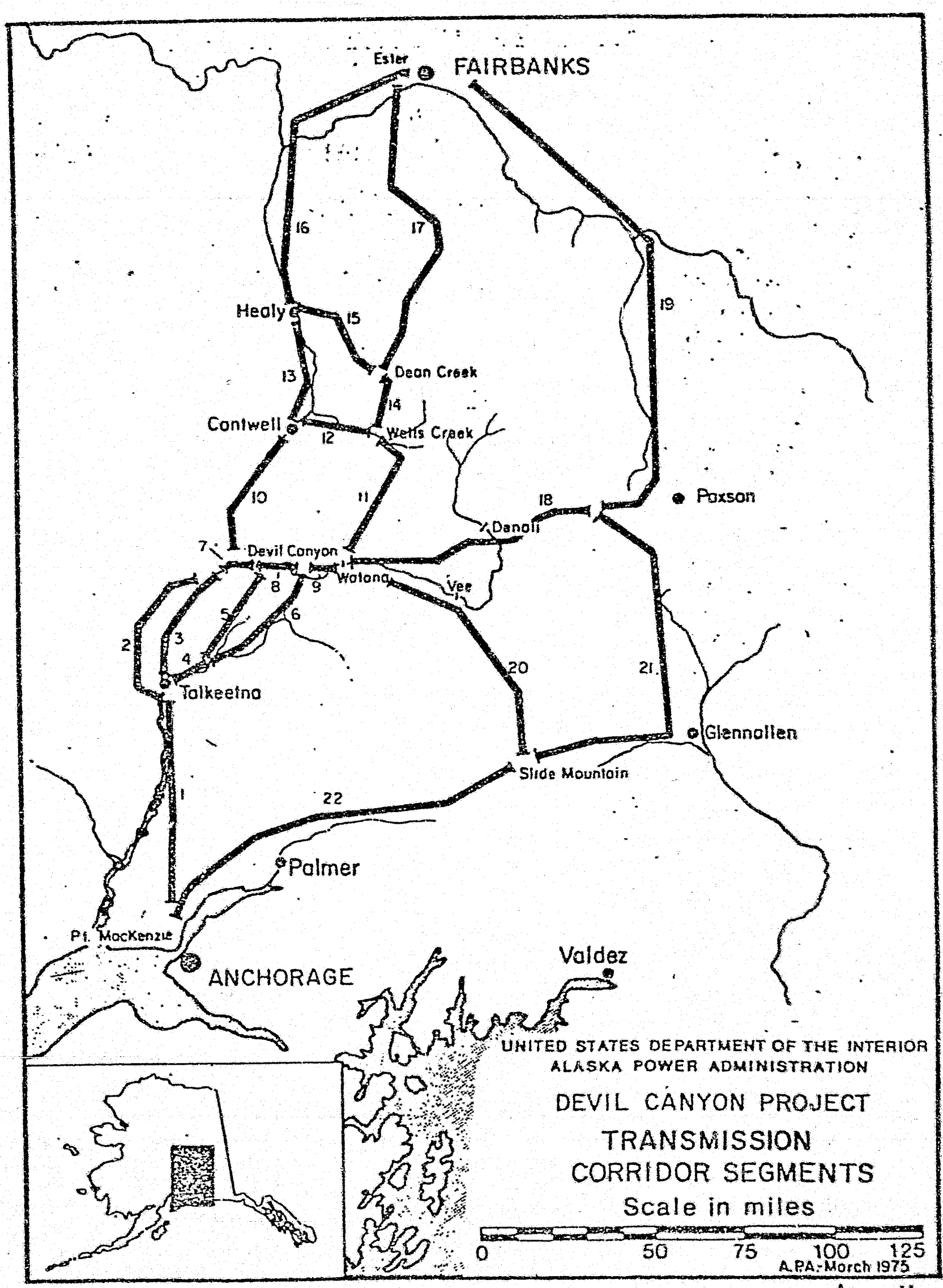
3.2 A.P. Ad. Inventory

(the description and inventory of evaluation of impacts are reported in more detail in the APAd environmental assessment, with only summary information presented in this report. The inventory grouped data under nine broad categories:



(FIGURE 4)

Appendix I
FIGURE I-5
I-11


Ester
FAIRBANKS
16
17
19
Healy
15
Dean Creek
13
14
Cantwell
12
Wells Creek
10
11
18
Paxson
Denali
7
Devil Canyon
8
9
Watana
Vee
5
6
2
3
4
20
21
Talkeetna
Glennallen
Slide Mountain
1
22
Palmer
Pt. MacKenzie
ANCHORAGE
Valdez
UNITED STATES DEPARTMENT OF THE INTERIOR
ALASKA POWER ADMINISTRATION
DEVIL CANYON PROJECT
TRANSMISSION
CORRIDOR SEGMENTS
Scale in miles
0
50
75
100
125
APA-March 1975

(FIGURE 5)

Key to Alternative Corridors and Segments

Corridor	Segments of Corridor	Approximate Total Mileage
	Susitna Corridors	
Susitna #1	1, 3, 7	136
Susitna #2	1, 2, 7	140
Susitna #3	1, 4, 5	129
Susitna #4	1, 4, 6, 8	147
	Matanuska Corridors	
Matanuska #1	8, 9, 20, 22	258
Matanuska #2	8, 9, 18, 21, 22	385
	Nenana Corridors	
Nenana #1	7, 10, 13, 16	198
Nenana #2	7, 10, 12, 14, 17	220
Nenana #3	7, 10, 12, 14, 15, 16	231
Nenana #4	8, 9, 11, 14, 15, 16	223
Nenana #5	8, 9, 11, 14, 17	212
	Delta Corridor	
Delta #1	8, 9, 18, 19	280

(TABLE 1)

1. Topography of Geology
2. Soils
3. Vegetation
4. Wildlife
5. Climate
6. Existing Developments
7. Ownership of Land Status
8. Relation to Existing Rights of Way
9. Scenic Quality of Recreation

The probable impacts are identified and described under five broad categories in the environmental assessment:

1. Soil
2. Vegetation
3. Wildlife
4. Existing Developments
5. Scenic Quality and Recreation

4. LOCATION CONSIDERATIONS

Corridor location objectives are to obtain an optimum combination of reliability and cost with the fewest environmental problems. In many cases these objectives are mutually compatible.

Throughout the corridor evaluation the question arises of whether it is more desirable to place lines relatively close to existing surface transportation facilities or to pioneer new corridors where the line would be seen by few people.

4.1 Major factors considered in the evaluation of alternative corridors:

4.1.1 Climate and Elevation

Winds, icing, snow depth and low temperatures are very important parameters in transmission design, operation and reliability.

Elevations above about 4000 feet in the Alaska Range of Talkeetna mountains are unsuitable for locating major transmission facilities. Significant advantages in reliability and cost are expected if the line is kept well below 3000 feet in elevation.

4.1.2 Topography

Topography plays a great role in corridor location; it affects the following:

a) construction, inspection of maintenance cost

b) visual impacts

c) reliability

Transmission costs rise dramatically in areas of broken or steep terrain.

4.1.3 Soils and Foundation

Soil condits require designs of tower foundations that are compatible with the characteristic behavior of soils.

4.1.4 Vegetation

Heavily forested areas in the valleys would require essentially continuous clearing of the transmission right of way, yet it has

the advantage of shielding the line from view. At higher elevations there would be little impact on vegetation but line visibility is high.

4.1.5 Wildlife

The major consideration for wildlife is the extent to which the transmission lines change the access to land by people. New corridors and new access roads tend to encourage public use and thus increase pressure on fish and wildlife.

4.1.6 Visual Aspects

Existing criteria provide for utilizing natural vegetation and topographic relief as a shield, minimizing crossings over roads and otherwise utilizing route selection and orientation techniques to minimize visibility.

4.1.7 Socio-Economic Aspects

Land status, ownership, use and value are important factors in locating the transmission corridors.

Hunting lodges, tourist accomodations, and facilities with high scenic uses or values such as parks, scenic viewpoints, recreation areas, etc., should be avoided or skirited by transmission corridors.

4.1.8 Distance

Economics dictate that line distances should be kept as short as possible while recognizing other criteria.

5. RELATIVE COST

Rough reconnaissance cost estimates were made for transmission lines in the alternative corridors to illustrate relative costs. The estimates are summarized on Table 2.

The following are considered in the relative cost evaluation:

1. Susitna corridors based on 345 kv. double circuit lines.
2. Nenana and Delta corridors are based on 230 kv. double circuit lines.

Investigating Table 2, it is obvious that corridors S-1 (from dam sites to Anchorage), and N-1 (from dam sites to Fairbanks) are the most economical ones.

6. ENVIRONMENTAL ASSESSMENT

Table 3 shows a relative assessment of the different corridors regarding:

1. Environmental impacts
2. Cost estimates
3. Reliability

Note, lower ranking on the table indicated fewer adverse impacts. It is obvious thus, that corridors S-1 and N-1 are the best ones.

Relative Transmission Construction Cost for Alternative Corridors - Upper Susitna to Anchorage

	Susitna Corridors				Matanuska Corridors	
	S - 1	S - 2	S - 3	S - 4	M - 1	M - 2
Length, miles	166	170	159	164	258	385
Max. elevation, feet	2,100	2,100	3,800	2,200	3,000	4,000
Clearing, miles						
Med. heavy	166	146	132	142	166	228
Light	---	10	10	13	17	157
None	---	14	17	9	75	---
Access Roads, miles						
New roads	0	0	12	32	84	64
4-Wheel drive access	122	126	122	104	138	290
None	44	44	25	28	36	31
Tower Construction, miles						
Heavy steel	44	44	68	62	30	94
Normal	122	126	91	102	228	291
Comparative Cost, $1,000						
Clearing	3,000	3,000	3,000	3,000	600	1,100
Access	8,000	8,200	9,500	10,900	19,900	27,200
Transmission Lines	82,000	84.000	81,300	82,200	132,700	196,200
Total	93,000	95,200	93,800	96,100	153,200	224,500

(TABLE 2)

(continued) Relative Transmission Construction Cost for Alternative Corridors - Upper Susitna to Fairbanks

	Nenana Corridors					Delta Corridor
	N - 1	N - 2	N - 3	N - 4	N - 5	D
Length, miles	228	250	261	223	212	280
Max. elevation, feet	2,400	4,300	4,000	4,000	4,300	4,000
Clearing, miles						
Med. heavy	125	139	127	99	111	114
Light	0	0	0	0	0	21
None	103	111	134	124	101	145
Access Roads, miles						
New roads	0	136	50	96	182	168
4-Wheel drive access	97	22	119	97	0	82
None	131	102	92	30	30	30
Tower Construction, miles						
Heavy steel	155	194	188	121	127	198
Normal	73	56	73	102	85	82
Comparative Cost, $1,000						
Clearing	400	400	400	200	300	400
Access	7,800	21,800	17,400	20,500	24,800	27,300
Transmission lines	77,200	84,900	88,500	75,000	71,400	94,800
Total	85,400	107,100	106,300	95,700	96,500	122,500

(TABLE 2- CONT.)

Appendix H
TABLE H-31

Corridor Analysis - Project Power to Anchorage/Cook Inlet Area

Analysis Factor:	Susitna Corridors				Matanuska Corridors	
	S - 1	S - 2	S - 3	S - 4	M - 1	M - 2
Length, miles	166	170	159	164	258	385
Max. elevation, feet	2,100	2,100	3,800	2,200	3,000	4,000
Ranking	1	1	2	1	3	4
Environmental Impacts						
Soils	1	2	1	1	2	2
Vegetation	2	3	1	3	4	5
Wildlife	1	2	3	3	4	3
Existing developments	3	3	2	1	3	3
Scenic quality/recreation:						
Developed areas	3	3	2	1	3	3
Remote areas	1	2	3	4	4	3
Ranking	1	3	1	3	4	4
Costs						
Construction	1	1	2	1	3	4
Operation and maintenance	1	1	2	1	3	3
Ranking	1	1	2	1	3	4
Reliability						
Exposure to hazards	1	1	2	1	2	3
Ease of repair	1	2	2	2	3	3
Ranking	1	2	3	2	4	4
Summary Ranking	1 (preferred corridor)	2	3	2	4	4

(TABLE 3)

Corridor Analysis - Project Power to Fairbanks/Tanana Area

Analysis Factor:	Nenana Corridors					Delta Corridor
	N - 1	N - 2	N - 3	N - 4	N - 5	D
Length, miles	228	250	261	223	212	280
Max. elevation, feet	2,400	4,300	4,000	4,000	4,300	4,000
Ranking	1	3	3	2	3	3
Environmental Impacts						
Soils	1	3	2	2	3	3
Vegetation	2	2	3	2	1	3
Wildlife	1	3	2	3	3	3
Existing developments	3	2	2	2	1	2
Scenic quality/recreation:						
Developed areas	3	2	2	1	1	3
Remote areas	1	3	2	2	3	2
Ranking	1	3	3	2	1	3
Costs						
Construction	1	4	2	3	5	6
Operation and maintenance	1	4	2	3	5	3
Ranking	1	4	2	3	5	4
Reliability						
Exposure to hazards	1	4	3	2	4	4
Ease of repair	1	4	2	3	4	3
Ranking	1	3	2	2	3	3
Summary Ranking	1 (preferred corridor)	4	2	2	3	4

(TABLE 3 CONT.)

ROUTE SELECTION

The preliminary line routing is shown on Figures 6 and 7. Figure 6 shows the line with respect to the other existing facilities, highways, railroads, etc.

Figure 7 shows only the center line of the preliminary line.

Three corridors were identified on USGS maps of scale 1:250,000.

The three corridors are between:

1 - Anchorage, Willow and Palmer. (Figure 8)

2 - Damsites to the intertie at Healy. (Figure 9)

3 - Healy to Fairbanks. (Figure 10)

The center lines of the preliminary routes were also plotted on the maps. These maps were made available for preliminary biologic and environmental studies.

For detailed study of the route, location center line is plotted on large maps of scale 1:63,360 (one which equals one mile), and under further refinement pending input from other studies. About fourty of such maps are done, as an illustration, see Figure 11.

ROUTE SELECTION CRITERIA

I ENVIRONMENTAL:

1 - SCENIC QUALITY - RECREATION

2 - CULTURAL RESOURCES

3 - WILDLIFE

4 - VEGETATION

5 - SOIL

6 - EXISTING DEVELOPMENT - SOCIAL

II COSTS:

1 - LENGTH

2 - TOPOGRAPHY

3 - ACCESS ROADS

4 - CONSTRUCTION

5 - OPERATION AND MAINTENANCE

6 - LAND OWNERSHIP

III ENGINEERING:

1 - RELIABILITY

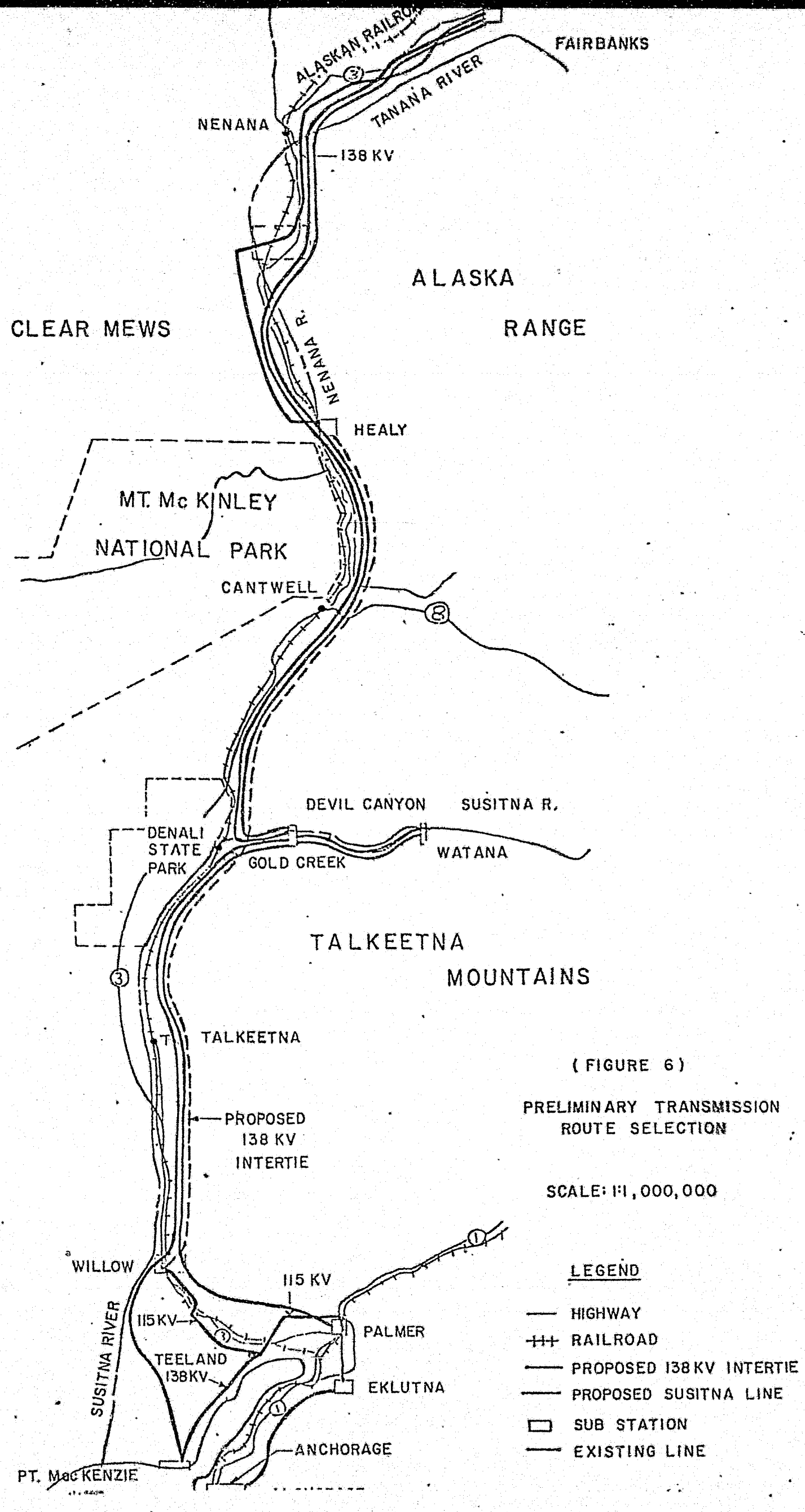
2 - EASE OF REPAIR

3 - TYPE OF TOWERS

4 - FOUNDATION

5 - SEISMIC

6 - LOADING



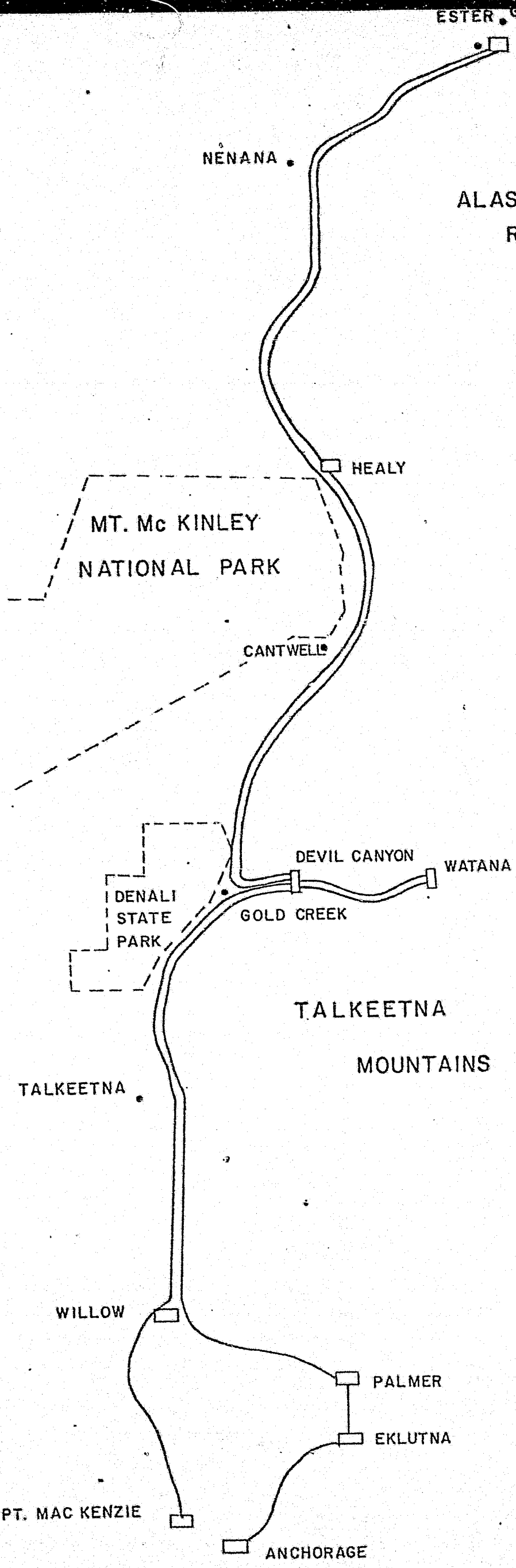
(FIGURE 6)

PRELIMINARY TRANSMISSION
ROUTE SELECTION

SCALE: 1:1,000,000

LEGEND

- HIGHWAY
- RAILROAD
- PROPOSED 138 KV INTERTIE
- PROPOSED SUSITNA LINE
- SUB STATION
- EXISTING LINE



(FIGURE 7)

PRELIMINARY TRANSMISSION
ROUTE SELECTION

SCALE: 1:1,000,000

LEGEND

—— PROPOSED SUSITA LINE

▭ SUB STATION

UNITED STATES
TMENT OF THE INTERIOR
EOLOGICAL SURVEY

PROPOSED CORRIDOR

PROPOSED TRANSMISSION LINE ROUTE

ALTERNATE TRANSMISSION LINE ROUTE

FIG. 8

TALKEETNA

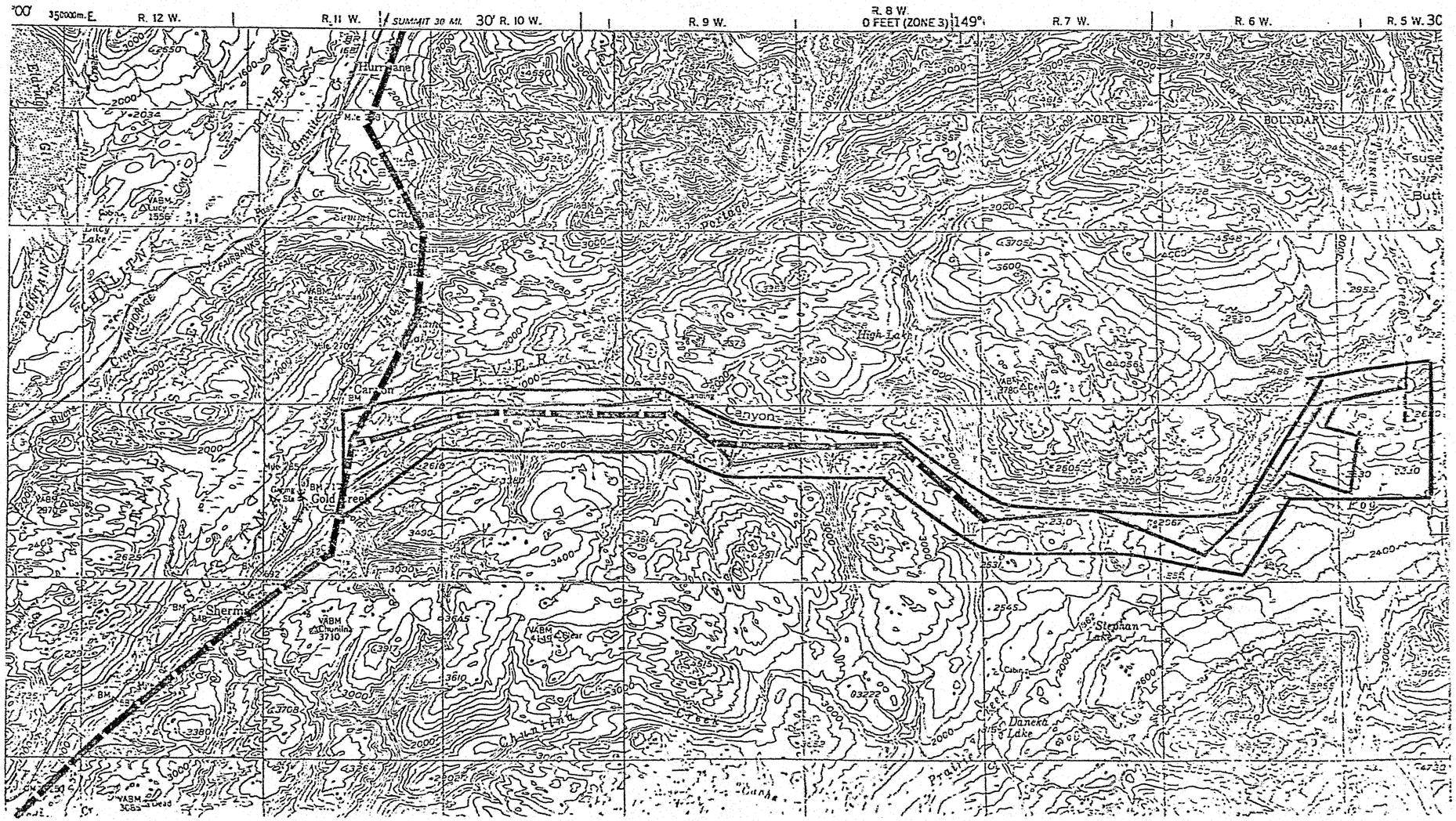
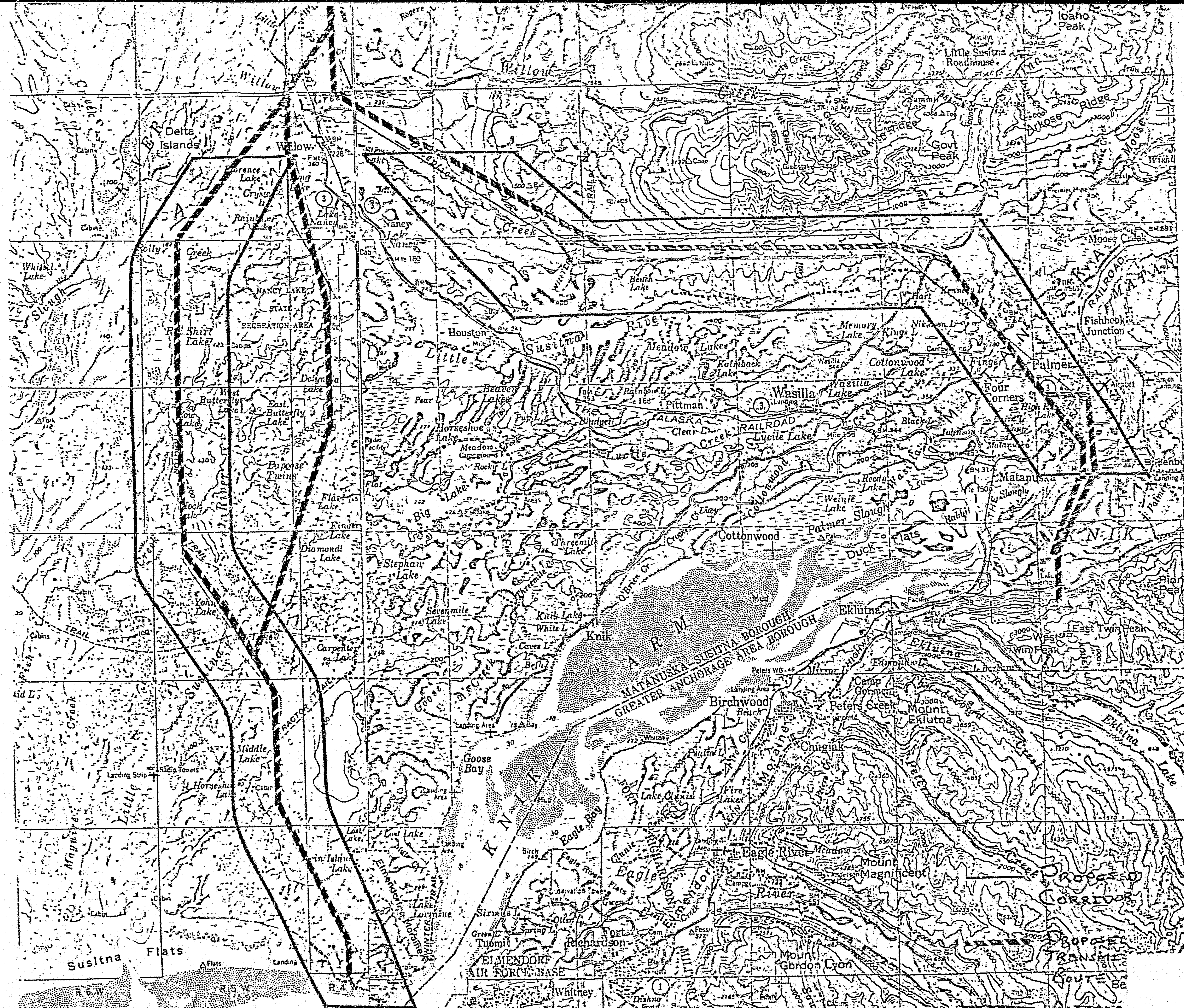


FIGURE 8



Delta Islands
Willow
Nancy Lake
NANCY LAKE STATE RECREATION AREA
Red Shirt Lake
Houston
Susitna River
Little Susitna
Big Lake
Wasilla
Pittman
Palmer
Four Corners
Fishhook Junction
Matanuska
Moose Creek
Little Susitna Roadhouse
Idaho Peak
Govt Peak
Bald Mtn Ridge
Arkose Ridge
Cottonwood
Knik
KNIK ARM
MATANUSKA-SUSITNA BOROUGH
GREATER ANCHORAGE AREA BOROUGH
Eklutna
Birchwood
Peters Creek
Chugiak
Mount Eklutna
Eklutna Lake
East Twin Peak
West Twin Peak
Goose Bay
Eagle River
Mount Magnificent
ELMENDORF AIR FORCE BASE
Fort Richardson
Mount Gordon Lyon
Whitney
Susitna Flats
Middle Lake
Horseshoe Lake
Yohn Lake
Diamond Lake
Finger Lake
Stephan Lake
Sevenmile Lake
Carpenter Lake
Knik Lake
Lake Lorraine
R.6.W.
R.5.W.
R.4.W.
PROPOSED CORRIDOR

FIGURE 9

PLEASE COPY ENTIRE SHEET