SUSITNA TRANSMISSION SYSTEM

STATUS SUMMARY

VOLUME ONE
TECHNICAL, ECONOMIC
AND
ENVIRONMENTAL CONSIDERATIONS

DRAFT

DECEMBER 1983

HARZA-EBASCO
SUSITNA JOINT VENTURE

ALASKA POWER AUTHORITY

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SUMMARY

STATUS

The Susitna Transmission System Status Summary, consisting of three volumes designated Volumes A, B, and C, is an assembly of engineering, technical, economic and environmental data and studies. Although final conclusions are not drawn, it does provide a compendium of information covering the large and complex task performed. Upon direction from the Alaska Power Authority in October, 1983, work on this study was suspended and subsequent efforts focused on documenting the evaluations made to that time. This status summary will be used as a reference document during the Federal Energy Regulatory Commission (FERC) licensing processing.

STUDY DESCRIPTION

The task consisted of reviewing existing studies and assumptions to determine adequacy and to identify preferred transmission line routes and substation locations associated with the Susitna Hydroelectric Project. Additional studies were also done as necessary.

The study area included three separate geographical locations:

1. An area from Willow south to Anchorage, termed the South Study Area.
2. An area from Healy north to Fairbanks, termed the North Study Area.
3. An area from Gold Creek east to the hydroelectric sites at Devil Canyon and Watana, termed the Central Study Area.

The transmission system used for elevation and comparison purposes was as follows:

South Study Area

- o Two single circuit 345 kV transmission lines.
- o Evaluation of both circuits routed in parallel.
- o Evaluation of splitting the two circuits and routing them separately.

Nine alternatives were compared for the South Study Area.

North Study Area

- o Two single circuit 345 or 230 kV transmission lines.
- o Evaluation of routing both circuits to Ester, seven miles west of Fairbanks. Evaluation of routing both circuits to Fort Wainwright, two miles east of Fairbanks.

Five alternatives were compared for the North Study Area.

SUMMARY OF FINDINGS

The findings and conclusions of the Susitna Transmission System Status Summary is covered in Chapter 8. They are briefly summarized as follows:

- o South Study Area

  From a reliability standpoint, two separate and independent Susitna transmission line routes to the Anchorage area are preferred and addressed in the studies. One transmission line would be routed south to the west side of Knik Arm as proposed in the FERC License Application. A second transmission line route would be routed from Willow east around Knik Arm. The development of the

transmission system in Anchorage should be a joint effort between the Power Authority and the Anchorage area utilities.

- North Study Area

  The most suitable transmission line route from Healy to Fairbanks, considering technical, economic, and environmental perspectives collectively, is the one shown in the FERC Application. The development of the transmission system into Fairbanks should be a joint effort between the Power Authority and the Fairbanks area utilities.

- Central Study Area

  The transmission line routes from Gold Creek to the Watana and Devil Canyon hydroelectric sites were the subject of an extensive investigation by Acres and is suitable as shown in the FERC License Application. Therefore, this area was not discussed in this study.

CHAPTER 2

CHAPTER 3

CHAPTER 4

CHAPTER 5

CHAPTER 6

CHAPTER 7

1.0 INTRODUCTION

1.0 INTRODUCTION

1.1 PURPOSE

The purpose of this study was to evaluate and recommend preferred transmission line routes and substation locations associated with the Susitna Hydroelectric Project. The project was considered as presented in the Alaska Power Authority's license application to the Federal Energy Regulatory Commission (FERC).

To meet the above goal, Task 41, entitled "Susitna Transmission System Siting and Licensing", was designed to achieve the following major objectives:

- To review existing studies to establish technical adequacy and identify a preferred transmission line route and substation locations with participation of the serviced utilities;

- To assure that appropriate agencies were contacted in the route selection process;

- To assure that concerns of the general public were considered and documented;

- To evaluate environmental effects of the proposed trans mission line;

- To assure that environmental and technical aspects of the study would enable compliance with statutory and regulatory requirements, and

- To manage the work plan with respect to schedule, budget and staffing and to assure close coordination and integration with the rest of the Susitna Hydroelectric Project Work Tasks.

The approach of the transmission system study team was to utilize, or extend existing feasibility studies to confirm or determine preferred routes. Emphasis was placed on documenting the route selection process and recording agency, public and utility consultation and comments.

General work activities related to each subtask were as follows:

- o Collect data;
- o Review data and determine adequacy;
- o Determine and resolve issues (technical, agencies and utilities);
- o Evaluate routes according to technical requirements and environmental constraints, maintainability, reliability and costs;
- o Develop an evaluation matrix for comparing alternative routes;
- o Obtain Alaska Power Authority comments and approval;
- o Present findings to agencies, utilities and communities, and
- o Prepare report outlining the results.

1.2 BACKGROUND

The initial work effort for Task 41 was to evaluate the transmission line routes and substation locations, as follows:

41.1 Two and three 345 kV transmission lines from Gold Creek to Willow to Knik Arm (West).

41.2 Two 345 kV transmission lines from Gold Creek to Ester (Fairbanks).

41.3 Two 345 kV transmission lines from Watana to Gold Creek and two 345 kV transmission lines from Devil Canyon to Gold Creek.

Studies of each segment were to include evaluation of technical adequacy, economic feasibility, assessment of potential impacts to environmental resources, consultation with utilities and agencies, and public participation.

From discussions with area utilities, the Alaska Power Authority and Harza-Ebasco discussions, new substation terminus locations and additional routes materialized. These included the following:

For the South (Anchorage) Study Area:

1. Identification of an alternative overland route from Willow around Knik Arm into Anchorage.

2. Analysis of establishing substation locations at Fossil Creek and Lorraine.

3. Analysis of alternative substations between Willow and Teeland.

For the North (Fairbanks) Study Area:

1. To review moving the Ester Substation from its present location west of Fairbanks to the east side of Fairbanks at Fort Wainwright.

2. Identification of alternative routes to the new Fairbanks Substation location.

3. Potentially changing the transmission line voltage from Healy to Fairbanks and possibly from Gold Creek to Healy.

As a result of these discussions, a potential new system configuration evolved for the South Study Area. This used the FERC License Application route for one initial transmission line (Watana) from Willow to Anchorage via the west side of Knik Arm, with an underwater crossing into Anchorage. A second route for one transmission line would be routed overland around Knik Arm into Anchorage. The reason for investigating two independent routes into Anchorage was the utilities' concern with a common failure of the submarine cables under Knik Arm. During the course of the study, different power requirement scenarios developed. One of these scenarios is documented in Table B.117 of the FERC License Application Volume 2A, Exhibit B, Chapters 5 and 6, dated July, 1983. In addition, consideration was given to reduced generation from the two Susitna powerplants. As a result, it was necessary to reevaluate the transmission system configuration by means of an electric power system load flow study. The results of this work are discussed in the report entitled "Electric Power System Study, Task 7, Volume One, System Development and Steady State Analysis", dated October, 1983 as well as a supplemental study dated December, 1983 and titled "Electric Power System Study, Task 7, Volume II, Steady State Analysis".

Task 41 supported the efforts of Task 8, Public Participation; Task 40, Need for Power; and Task 3, Review of Prior Studies. Supplemental information was also requested by FERC relating to the transmission system. Specifically, this involved the need to prepare 1993 and 2002 Interconnected System One Line Diagrams, a response to Electrical Environmental Effects and requests for revision to "G" plates in the license application.

In October, 1983, the Alaska Power Authority redirected the efforts on the Susitna Project. The redirection essentially involved limiting all work to that which supported the FERC licensing process. As a result it became necessary to stop and summarize the study portion of the Task 41 work. The Task 41 budget was revised to meet this objective.

1.3 ORGANIZATION OF THE STATUS SUMMARY

The organization of the Susitna Transmission System Status Summary is divided into three volumes as follows.

- Volume One - Technical, Economic and Environmental Considerations
- Volume Two - Appendices covering supporting technical reports
- Volume Three - Resource Maps

Each volume has a complete index. This volume contains eight chapters as well as five appendicies and references all the data contained in both Volume II and Volume III.

- Chapter 1 covers the Introduction which includes the Purpose and Background.

- Chapter 2 covers Engineering Considerations and studies which were undertaken in parallel with the transmission line routing work.

- Chapter 3 covers the transmission line routing Study Approach.

- Chapter 4 graphically shows and describes each of the alternative transmission line routes and the segments comprising the route.

- Chapter 5 covers Technical Considerations.
- Chapter 6 covers Economic Considerations.
- Chapter 7 covers Environmental Considerations.
- Chapter 8 covers Summary and Conclusions as well as relevant issues and Future Study Recommendations

- Appendices M, N, P, R and S covers Agency and Utility Comments, Public Participation, and Environmental Resources Description and Support Data.

1.4 DATA SOURCES AND LIMITATIONS

Data Sources

Data gathering efforts for this study included a review of relevant technical, economic and environmental information obtained from previous studies as well as federal, state, and local agencies, and limited field reconnaissance.

Literature reviewed, primarily focused on appropriate sections of the FERC License Application, Acres support studies and Commonwealth studies related to the Intertie Project. Specifically, these included:

- Susitna Hydroelectric Project, Transmission Line Corridor Screening Closeout Report, Task 8, Final Report, March 1982, by Acres American.
- Susitna Hydroelectric Project, FERC License Application, Exhibit A, B, and E, F and G February 1983 by Acres American.
- Anchorage-Fairbanks Transmission Intertie Route Selection Report, January 1982, by Commonwealth Associates, Inc.

These studies were the primary available reference base related to transmission studies in the project vicinity. A complete listing of documents consulted is presented in the list of References.

Extensive data was obtained from agencies regarding the environmental study effort. Sources included:

Federal

- o Fort Wainwright, Fort Richardson and Elmendorf military bases
- o Corps of Engineers
- o U.S. Fish and Wildlife Service

State

- o Alaska Department of Fish & Game
- o Department of Natural Resources

Local

- o Municipality of Anchorage
- o Matanuska/Susitna Borough
- o Fairbanks/North Star Borough

Much of the data obtained from the above sources were used to develop the resource maps listed in Volume 3 of this summary and as analysis support.

Data Limitations

While detailed information existed in some disciplines for the FERC License Application route, information on the alternative routes essentially did not exist and data had to be collected, mapped and inventoried before analysis could begin. Due to time and budget constraints, the following limitations with respect to the analysis effort are noted:

- o Analysis was based on data obtained from agencies, and literature;

- Detailed field investigations were not conducted;

- Discussion and analysis of access is limited because of the need for current aerial photo coverage and knowledge of the general growth, particularly in the South Study Area;

- Detailed USFWS National Wetlands Inventory data for the North Study Area was not available and therefore, potential wetlands were estimated from DNR vegetation maps; and

- The most recent aerial photos referenced alternatives was 1978 coverage.

2.0 ENGINEERING CONSIDERATIONS

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2.1 ELECTRIC POWER SYSTEM STUDIES

The Electric Power System Study for Susitna Hydrolectric Project was covered under Task 7. A report entitled "Electric Power System Study, Volume One, System Development and Steady State Analysis" was prepared in October, 1983. The purpose of the report was to identify possible refinements to the transmission system described in the FERC license application based upon the load forecast shown in Table B.117 of Volume 2A, Exnibit B, Chapters 5 and 6, dated July, 1983 as well as correspondingly lower electric power generation.

A supplement to the Electric Power System Study, Volume One document was issued in December, 1983. It was designated as Volume Two entitled "Supplemental Study". It covers staging of the Susitna Transmission System from the Table B.117 level to the total Susitna development potential of 1886 MW with the ability to ultimately transmit 85% and 25% of that capacity to Anchorage and Fairbanks, respectively. There was insufficient time for a detailed evaluation of the alternatives presented, therefore the results of the electric power system supplemental study should be considered conceptual for planning purposes.

2.2 REVIEW OF TECHNICAL ADEQUACY OF PREVIOUS WORK

One of the purposes of the Task 41 effort was to establish the technical adequacy of the previous work on the Susitna Transmission System. In order to do so, a series of reports were prepared which are included in Volume Two entitled "Technical and Economic Appendices". Appendix A is entitled "Review of Established Meterological Design Parameters". The recommendations on meterological design parameters are covered under "Conclusions" on pages A-7 and A-8, and cover design criteria for temperature variation, heavy and extra heavy wind loading, ice and

combinations of wind and ice. The results are in agreement with those used on the Intertie Project.

Appendix B is entitled "Review of Established Structure and Foundation Design Parameters". The first section of the report discusses structure loading and structure types with specific reference to design considerations. Section Two covers geologic conditions and foundation materials, slope stability considerations and permafrost. Section Three outlines the requirements for preliminary and detailed soil investigation. Section Four discusses the four types of foundations that may be used for the transmission line structures. These are pile foundations, rock anchors, grillages, and pole foundations. Section Five discusses construction considerations. Appendix D covers 345 kV transmission line environmental effects and performance for the guyed "X" tangent structure utilizing twin 954 Kc mil conductors. Conductor surface gradients are calculated. Radio noise and television interference is evaluated and audible noise is discussed. In Section Five electric and magnetic field effects are calculated and analyzed. The results of this appendix are covered under "Conclusions" on pages D-18 and D-19.

Appendix C, entitled "230 kV Environmental Effects and Performance", was prepared in support of evaluating the potential of using 230 kV instead of 345 kV for the transmission lines from Healy to Fairbanks. The electrical effects and performance data is covered in the same sequence as in Appendix D. The conclusions are covered in Appendix C page C-10.

Appendix E was prepared for two reasons. First, to analyze the possibility of failure of one structure causing failure of an adjacent structure where two separate transmission lines are on the same right-of-way. This is the predominant case for the entire Susitna Transmission System. The conclusions, as indicated on pages E-4 and E-5, are that such a failure is highly unlikely but needs to be recognized

during the design phase of the project, depending upon specific conditions of span length and terrain configuration.

The second purpose for Appendix E was to investigate the required transmission line right-of-way (ROW) widths. During the course of the Task 41 work it was noted that the ROW widths shown in the FERC License Application were not in agreement with those being used on the Intertie Project. The ROW widths recommended for various 230 kV and 345 kV structure types are tabulated on page E-6, as well as the associated acres/mile. This information needs to be incorporated into the FERC License Application "G" Plates and Exhibits.

Appendix H covers the summary of Susitna 345 kV Transmission System costs for the 2002 FERC license application scheme. Also shown are the basic cost estimates used for the transmission system.

Appendix G covers the Land Field Services Reports on Direct and Indirect Land Acquisition Costs for the North and South Study Area. These costs are for 200 feet of right-of-way. Where other right-of-way widths were required a direct ratio was used to obtain the estimated costs.

While reviewing the Susitna Transmission System, potential refinements to the system were identified in both the North and South Study Areas. The cost of these potential refinements are shown in Appendix F.

2.3 POTENTIAL SF6 SWITCHING AT WATANA AND DEVIL CANYON

In parallel with the study of the Susitna Transmission System, studies are in process on the Watana Hydroelectric Plant. As of the time of preparation of this report, a study was in process of incorporating the Watana switchyard into the Watana Hydroelectric Plant by means of a gas insulated (SF6) bus and switching system. If the gas-insulated switching system is incorporated into the plant, the outdoor air-insulated switchyards at Watana and probably Devil Canyon would be deleted.

2.4 POWER SALES AGREEMENT

In April, 1983 the subtask of the Power Sales Agreement was added to Task 41. In subsequent discussion with the Alaska Power Authority, it was agreed that the preparation of the Power Sales Agreement should be a two-step process. The first step was to be the preparation of a Power Sales Agreement - Letter of Intent. This item is included in Appendix I. To establish a clear set of objectives and scope, an Investigation Memorandum was prepared on development of a Power Sales agreement contract between the Alaska Power Authority and the Railbelt utilities for Susitna Power and Related Facilities. This Investigation Memorandum is being utilized as the plan leading to the consummation of a Power Sales Agreement.

3.0 STUDY APPROACH

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3.1 STUDY AREA

The Susitna Transmission System as envisioned for the Susitna Hydroelectric Project is shown in attached Figure 3-1. The transmission line route shown in the FERC License Application runs 34 miles from the Watana damsite to Gold Creek, where the system splits with lines running north 183 miles to Fairbanks and south 134 miles to Anchorage. In general, Harza-Ebasco agrees with the concept of the proposed route from Watana to Gold Creek. In addition, Harza-Ebasco finds the route between Willow and Healy acceptable since the Susitna transmission lines will parallel the Intertie route.

Study efforts focused on the north and south ends of the transmission system. The South Study Area includes the area from Willow to Palmer to accommodate an evaluation of an overland route into Anchorage. The North Study Area is north of the proposed FERC route to accommodate the Department of Natural Resource's request to evaluate an alternative in the Goldstream Valley. It also includes part of the city of Fairbanks in order to evaluate routes to the Fort Wainwright Substation location preferred by the utilities. Boundaries and details of both study areas are referenced in the Exhibits.

3.2 EVALUATION PROCESS

In order to achieve the study objectives, a route selection process consisting of eight steps was developed. These are graphically depicted in attached Figure 3-2.

3.2.1 Determine Study Procedure and Method

The first step of the route selection process was to develop a procedure that would accommodate the needs of the Project. In this respect, the process needed to: 1) allow for input from agencies, utilities and the public; 2) obtain adequate data within given time and budget constraints; 3) provide variables that would be amenable to quantification or comparative measurement of impacts of each alternative to the others; 4) be defensible in its methodology, and 5) be understandable by the public and agencies in the method used and conclusions reached.

Based on defined routing objectives, a network of corridor segments were identified and then evaluated by specific criteria. The objectives emphasized selection of corridor(s) which balance impacts to environmental resources with technical and economic suitability, and also reflect agency, public and utility concerns. The specific criteria for evaluation of alternatives were based on both quantitative measurements and qualitative judgments as determined by various disciplines and through group discussions. Resource map overlays and impact matrices were prepared to help evaluate the relative significance of each consideration.

3.2.2 Define System Needs

The requirements of the transmission system were established early in the process. Voltages, tower designs, and construction and maintenance operations were determined. Substation locations were identified through review of load flow studies and discussions with area utilities. More information on the transmission system needs is presented in the next chapter.

3.2.3 Define Routing Objectives

The next step of the process was to define routing objectives. The objectives identified were based on the Intertie route selection process with which the Alaska Power Authority had developed a high level of confidence:

- o Minimize impacts on land use;
- o Minimize impacts to private ownership;
- o Minimize visual impacts;
- o Minimize impacts on natural systems;
- o Optimize construction and operating costs, and
- o Maximize sharing of existing utility corridors.

These objectives guided the identification and evaluation of alternative corridors. Final recommended corridors are those which best meet these objectives.

3.2.4 Collect Data

Topographic maps, air photos, and data from previous studies were used to identify and screen corridors. These sources, along with field reconnaissance and existing data from agencies, were used to evaluate the corridors on the basis of technical, economic, and environmental factors.

Agency, public and native group contacts were also an important aspect of the data collection effort. Many of the concerns and issues listed in Appendix M were factored into the evaluation.

3.2.5 Identify Corridors

Based on the defined transmission system, established objectives, agency/utility input, and collected data, a regional screening was undertaken to identify potential corridors for further evaluation. General criteria based on physiographic characteristics and existing facilities were used as the screening tool. These criteria focused on: (1) general areas to avoid, and (2) areas generally desirable in which to locate a transmission line.

Avoid	Desired Locations
Residential clusters	Existing transmission lines
Large bodies of water	Existing or proposed utility
Mountainous terrain	corridors

The application of these criteria to the South and North Study Areas identified several potential corridors for further investigation. In addition, certain other corridors were identified through discussions with agencies and utilities. Where alternatives parallel existing transmission lines, the corridor width is well defined; in less well defined locations, the corridor width varied.

These corridors were broken into segments and numbered to aid in the evaluation. The final result was a segment network in which the various segments were combined to form system alternatives. These are described in detail in Chapter 4 of this report.

3.2.6 Evaluate Corridor Alternatives

To reduce the number of corridors to be examined in detail, an inventory of the environmental, technical and economic considerations of each corridor was initiated and comparisons were made. Data consistent with the screening criteria were then tabulated for each

segment to use in quantifying impacts and comparing alternatives. For purposes of evaluation and comparison, corridor centerlines were established and appropriate right-of-way widths referenced. Quantification of potential impacts was done by overlaying a transparency of the alternative segments onto inventoried resource and topographic maps. Each inventoried resource variable that the segment crossed was recorded, lengths and acreages measured, and point occurrences counted. These tabulations are listed in Appendix S.

The criteria used for evaluating and comparing corridor alternatives were divided into the three categories of technical, economic and environmental considerations:

Technical

- Reliability
- Constructability
- Maintainability

Economic

- Construction/Operation
- Materials
- Land Acquisition

Environmental

- Land Use/Ownership
- Fisheries/Wildlife Resources
- Terrestrial Resources
- Cultural/Recreational Resources
- Aesthetic Resources

Details of these evaluation factors are discussed in Chapters 5, 6 and 7 of this report.

3.2.7 Preferred Corridor(s)

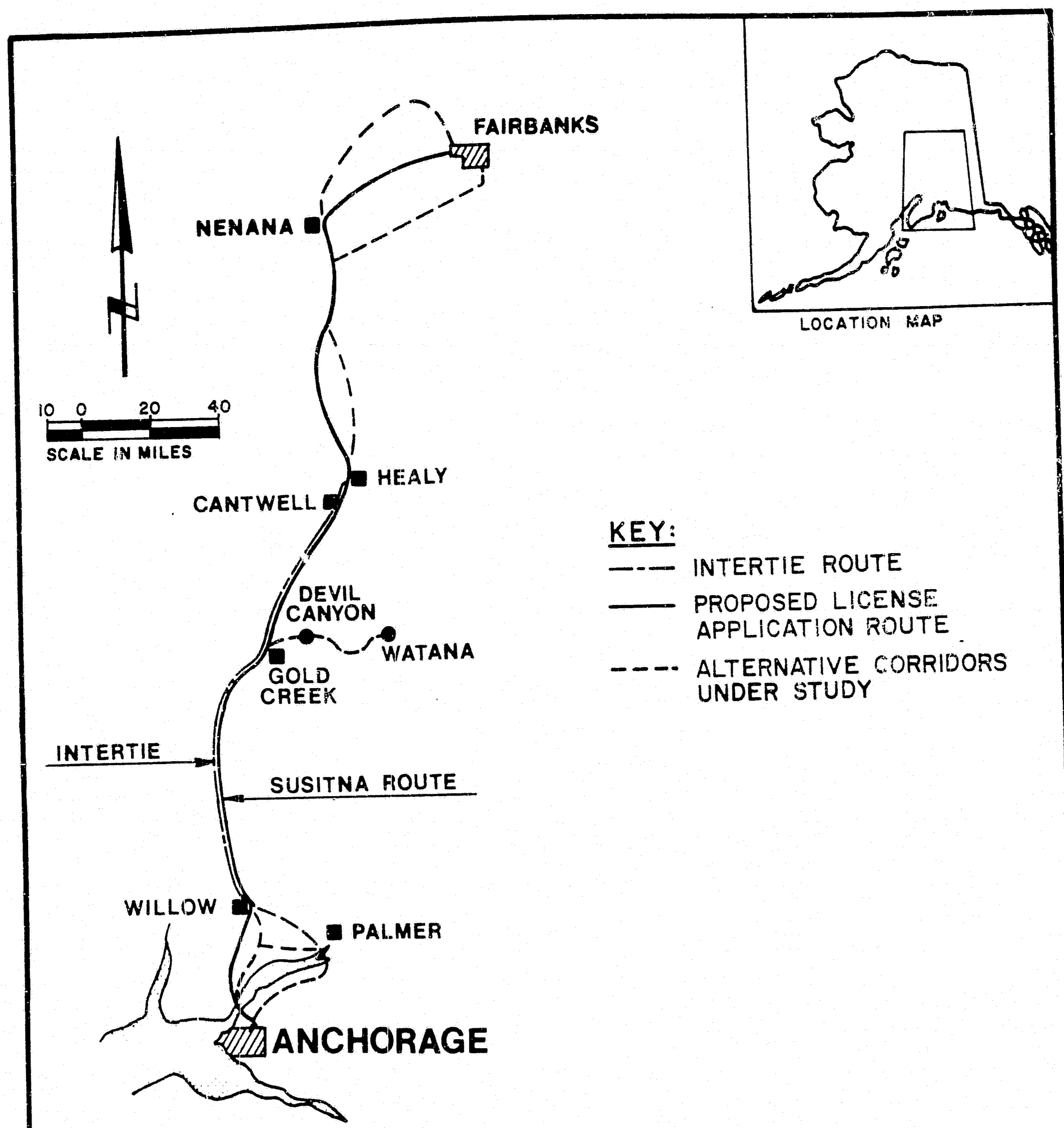
The alternative corridors were compared based on the evaluations of the technical, economic, and environmental categories mentioned previously. Judgements based on intangibles such as cultural values and environmental diversity were considered in the evaluation process, which provided a more satisfactory representation of interest group concerns and qualitative data. It should be noted that due to budget constraints and changes to the project direction, the alternatives study was stopped before completion of the route selection process.

The selection process has compared the alternative corridors based on quantitative and qualitative judgements for each of the 11 evaluation factors listed in data Section 3.2.6. This evaluation resulted in determination of the preferred corridors for each of the factors. The final step of the selection procedure would be to determine the relative importance of each of the factors. This will provide a basis for selecting a preferred corridor. Comments from agencies and groups may require that additional data and evaluation take place before a final recommendation is made. Summaries of technical, environmental, and economic suitability for each alternative were prepared to help focus the discussion of trade-offs to a final selection.

3.2.8 Route Refinement

Tne final step of the route selection process will be to conduct detailed studies on the selected corridor in order to refine the alignment for regulatory, acquisition and construction requirements. Detailed studies would include exploratory borings for foundation suitability, cultural resource investigations, and other field and environmental investigations determined during the selection process and agency correlation period. The route refinement step would culminate in a document detailing the centerline alignment, specific mitigation measures and other aspects to be submitted to various permitting agencies for approval.

FIGURES



ALASKA POWER AUTHORITY

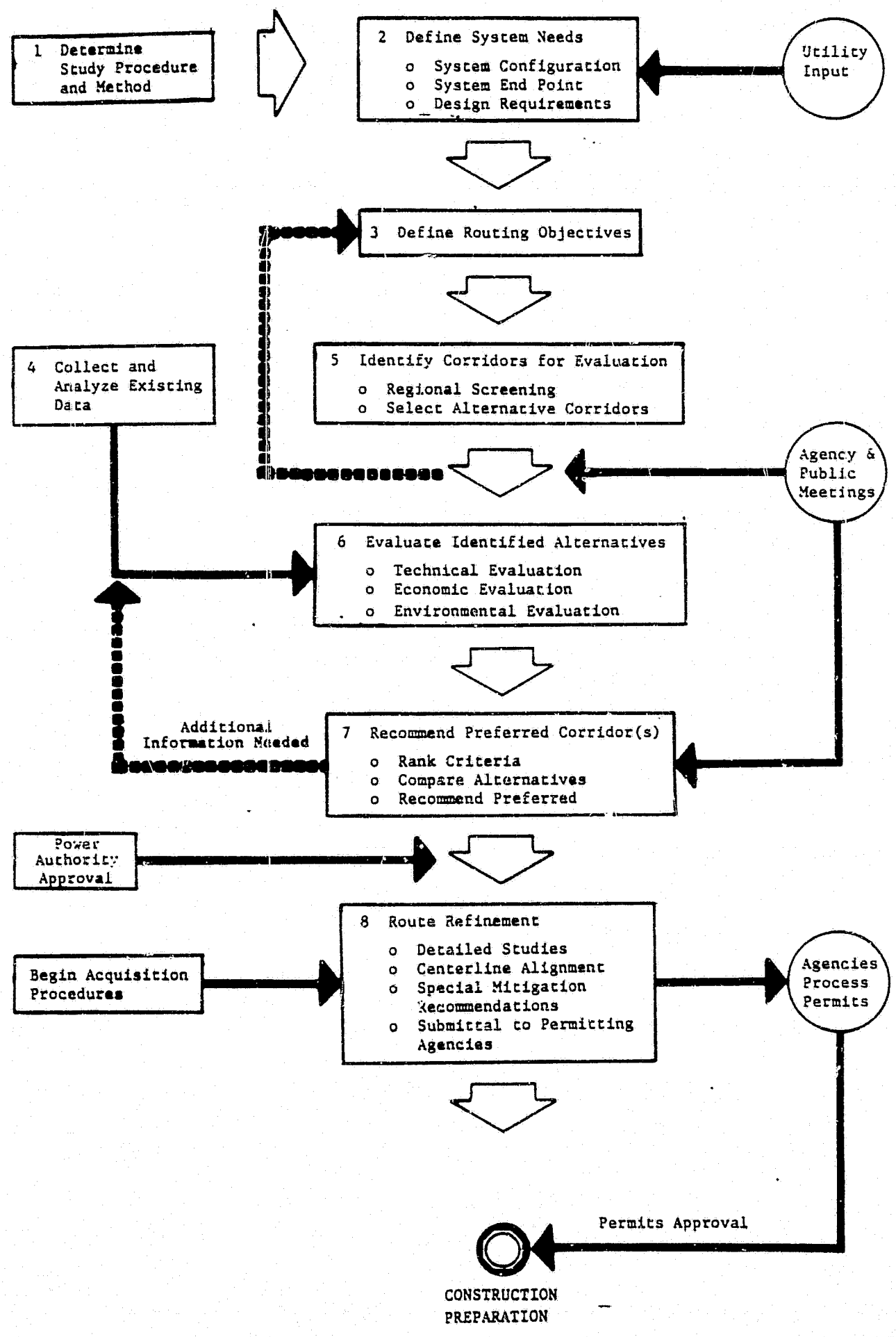
SUSITNA HYDROELECTRIC PROJECT

TRANSMISSION SYSTEM STUDY AREA

HARZA-EBASCO SUSITNA JOINT VENTURE | APPROVED

ANCHORAGE ALASKA | DATE | DRAWING NO. FIGURE 3-1

ROUTE SELECTION PROCESS



ALASKA POWER AUTHORITY

SUSITNA HYDROELECTRIC PROJECT

ROUTE SELECTION PROCESS

HARZA-EBASCO SUSITNA JOINT VENTURE | APPROVED

ANCHORAGE, ALASKA | DATE

Figure 3-2

4.0 ALTERNATIVE ROUTE DESCRIPTIONS

4.0 ALTERNATIVES ROUTE DESCRIPTION

4.1 SOUTH STUDY AREA ALTERNATIVES

For comparison purposes, two 345 kV circuits were evaluated under two system configurations; one routing both cirucits together to the Point MacKenzie area (termed parallel alternatives); and the other routing one line to Point MacKenzie and the other line overland around Knik Arm (termed split alternatives). Two circuits were evaluatd, instead of three as proposed in the License Application, in order to be compatible with the different system configurations evaluated as part of this study. These system configurations, described in more detail in Appendix F, were based on lower generation and forecast demand figures being reviewed at the time.

Based upon the preliminary regional screening efforts and basic system requirements, 19 corridor segments were identified. These segments, defined and diagrammatically shown in Table 4-1, were grouped into different combinations to form 9 alternatives, including the FERC License Application route. Three options were identified for one of the alternatives. These three options were evaluated first so that the preferred option could be analyzed with the other alternatives.

Table 4-2 presents a summary of requirements for each alternative and option. These requirements served as the basis for the comparison.

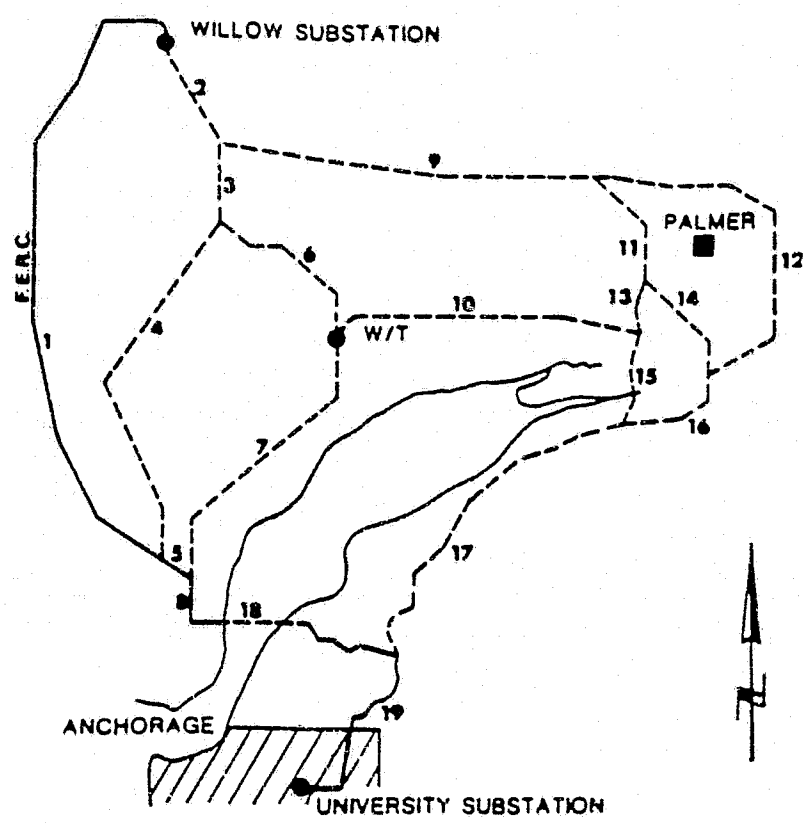
The alternatives are described in terms of the total system instead of by individual corridor segments even though some redundancy occurs. This is done so that a complete picture can be obtained of line lengths, paralleling of existing lines, and various design differences.

Each alternative and option is described below.

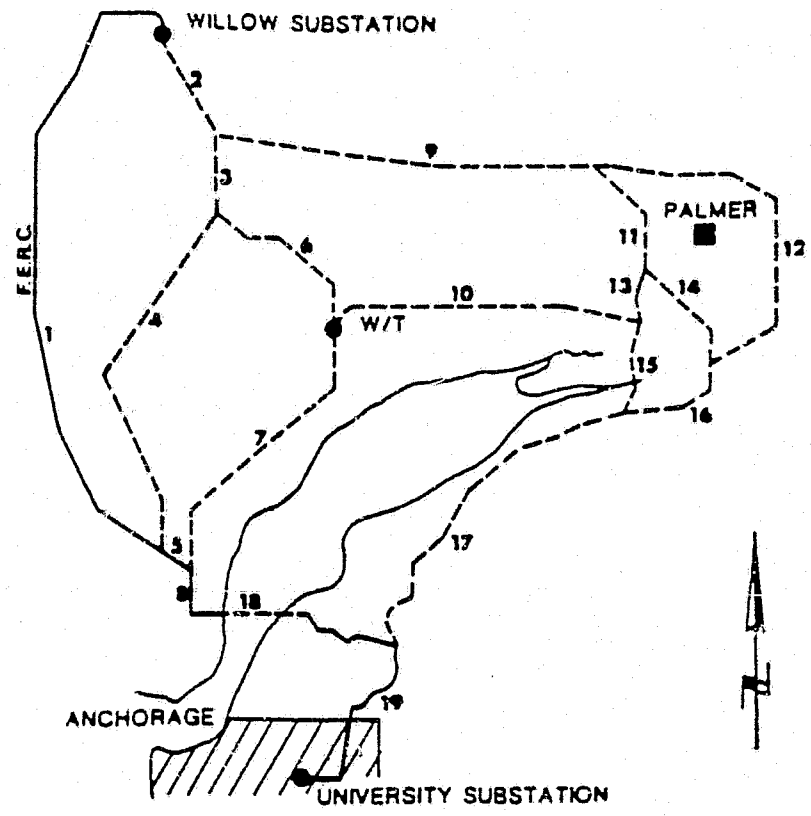
ALTERNATIVE A.

FERC ROUTE

Segments 1, 5, 8, 18, 19



The FERC License Application route envisions two and eventually three 345 kV transmission lines from the Willow substation westward across the Parks Highway for about two miles before turning south. The corridor then transverses relatively flat lowland with limited access before turning southeast where it encounters some agricultural and scattered residential developments. At Segment 8, the corridor crosses the existing Chugach Electric Association (CEA) 138 kV transmission line and parallels it for a short distance and then goes east to the west shore of Knik Arm. The 345 kV transmission lines (Segment 18) would parallel the existing CEA line through the Fort Richardson Military Reservation until it reaches the location shown by Segment 19. At this point, the transmission lines parallel an existing double circuit steel pole transmission line to University substation.

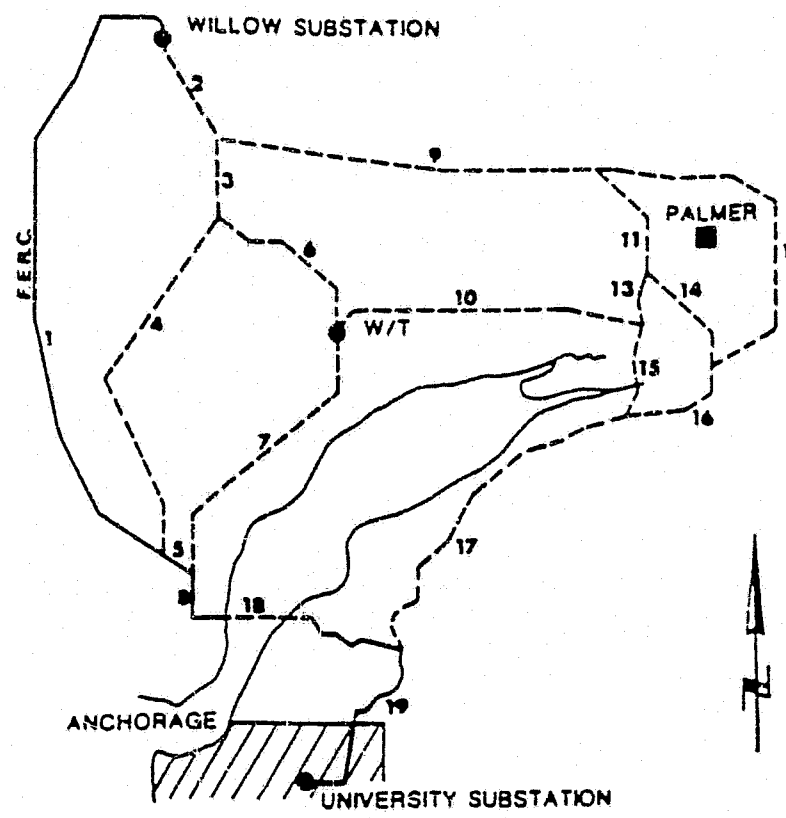


ALTERNATIVE B.

LITTLE SUSITNA - Parallel

Segments 2, 3, 4, 5, 8, 18, 19

The Little Susitna parallel route begins at Willow Substation and runs southeast; parallel to and about one mile east of the Parks Highway and Alaska Railroad. In this section (Segment 2) the right-of-way is shared with existing transmission facilities (MEA 115 kV line). At Segment 3 the corridor turns due south, again following the existing transmission line, crosses the Parks Highway and then turns southwest paralleling the Little Susitna River about one mile distance. The route then turns southeast, then due south along the border of the Goose Bay State Game Refuge. South of the refuge this route joins the FERC route (Alternative A), sharing Segments 5, 8, 18, and 19.



ALTERNATIVE C.

MEA/CEA - Parallel

Segments 2, 3, 6, 7, 8, 18, 19

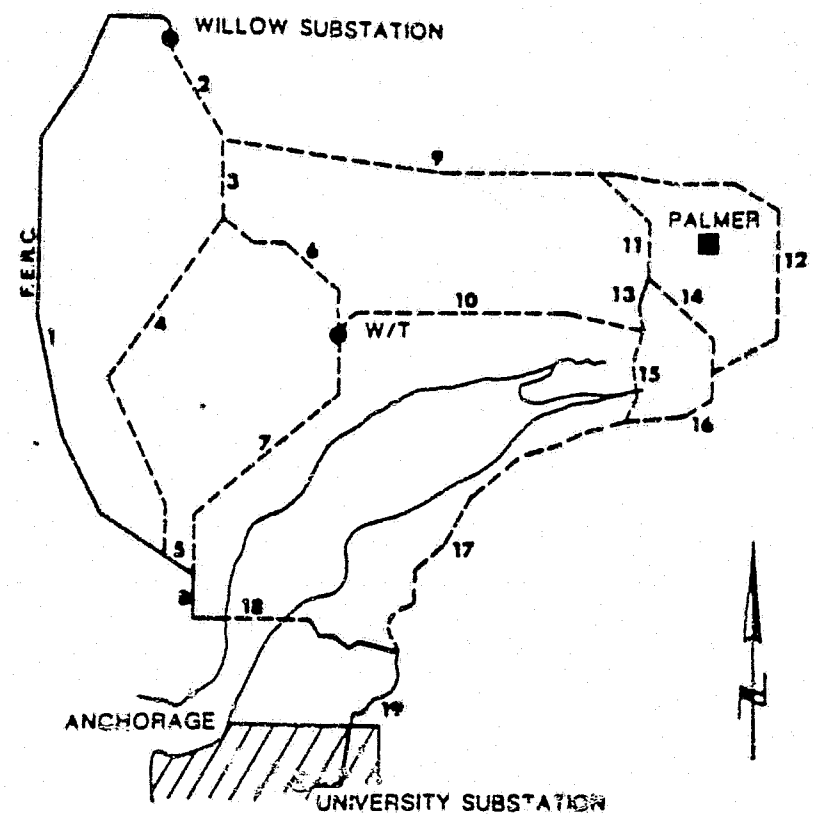
The MEA/CEA Parallel route begins at Willow Substation and shares Segments 2 and 3, described previously for the Little Susitna route (Alternative B). Segment 6 follows the existing MEA transmission line southeastward through an area of flat terrain, wetlands, and lakes. At Willow/Teeland, Segment 7 runs south for 3.5 miles then turns southwest and picks up the existing Chugach transmission line route. It parallels this route across the Goose Bay State Game Refuge. At a point south of the refuge, this route joins Alternatives A and B, sharing Segments 5, 8, 18, and 19.

ALTERNATIVE D.

FERC/NORTH PALMER - Split

Segments 1, 5, 8, 18, 19

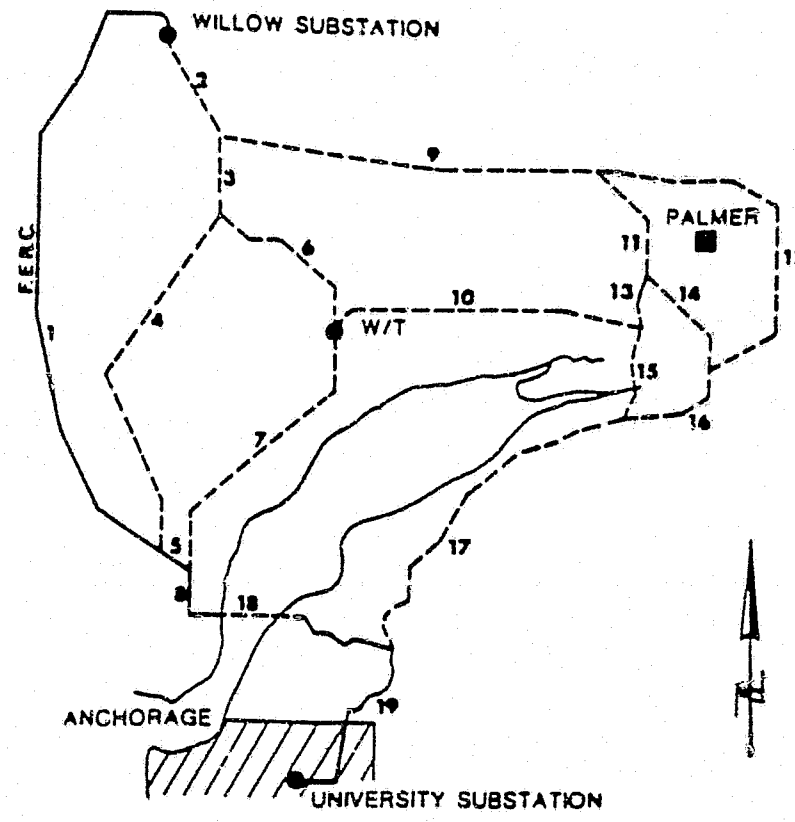
2, 9, option, 17, 19



The FERC/North Palmer Alternative is a split route. One line follows the FERC route described in Alternative A. The second line also begins at Willow Substation but then heads south paralleling the existing MEA transmission line (Segment 2). One mile east of the Parks Highway and Nancy Lakes, Segment 9 turns east toward Palmer. The first 16 miles of Segment 9 are through rolling terrain, while the last four and one-half miles traverse lowlands associated with the Little Susitna River. Segment 9 ends northwest of Palmer, at which point one of the three North Palmer Options described above can be selected to connect Segment 9 to Segment 17 at Eklutna Flats. Segment 17 runs parallel to Glenn Highway and the Alaska Railroad along the eastern side of Knik Arm. It uses the existing ROW of the deactivated MEA 115 kV line except in the vicinity of Birchwood. There the route leaves the MEA right-of-way which runs through Birchwood and runs to the west of the town. The route picks up the MEA right-of-way again south of Birchwood and follows it to the Fossil Creek area (see Existing Features, Map 1). At the Fossil Creek Area, the North Palmer line rejoins the FERC route line and the two parallel the existing Chugach line in Segment 19.

SPLIT ALTERNATIVES

NORTH PALMER OPTIONS



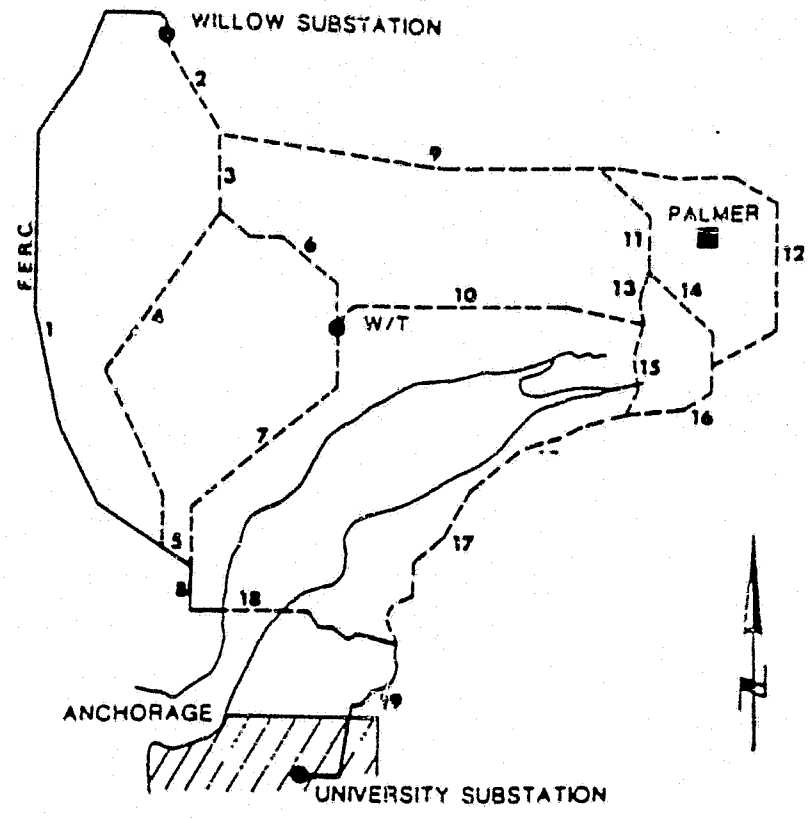
Option 1: East Palmer (Segment 12, 16)

Segment 12 of the East Palmer Option first runs east then south, then southwest through level to rollig terrain. The corridor crosses the Glenn Highway north of Palmer before it drops down in the Matanuska Valley and crosses the Matanuska River and Bodenberg Creek. The corridor parallels the Glenn Highway for five miles near the end of the segment, about three-fourths of a mile from the highway. At Segment 16 the route turns south and then southwest. It runs through wetlands and floodplains the first half and through mountainous terrain the last half, sharing a right-of-way with the existing Alaska Power Administration 115 kV transmission line. This segment also crosses two Knik River channels before joining Segment 17 at the eastern end of Knik Arm.

Option 2: Trunk Road/Kepler Lake (Segments 11, 14, 16)

The Trunk Road/Kepler Lakes Option turns south and parallels part of the Trunk Road to the east before it turns southeast. Here (Segment 4) it traverses wooded, rolling terrain and is routed just to the east of

SPLIT ALTERNATIVES
NORTH PALMER OPTIONS



the currently proposed state recreation area in the Kepler/Bradley Lakes system. Segment 14 continues southeast, crossing the Glenn Highway and railroad before it crosses the Matanuska River. After crossing the river, the route turns south through an area of vegetation, small streams, lakes and floodplain. Segment 14 then joins the Option 1 route and Segment 16.

Option 3: Trunk Road/Glenn Highway (Segments 11, 13, 15)

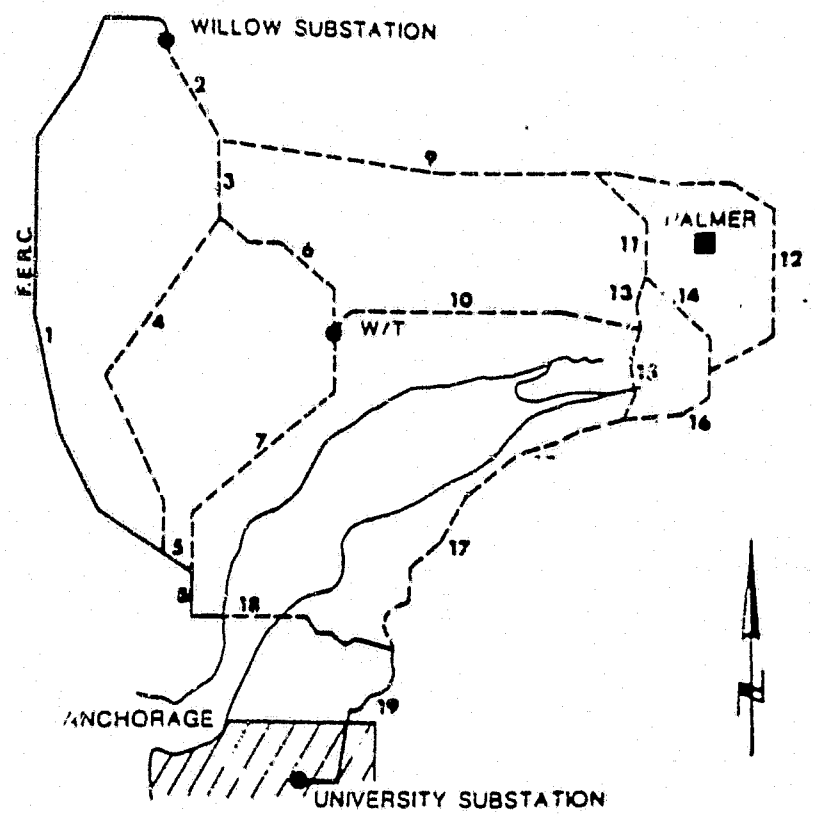
The Trunk Road/Glenn Highway Option shares Segment 11 with Option 2. Segment 13 then runs south, crossing through the Matanuska Valley Experimental Farm before crossing the Glenn Highway near the Glenn and Parks Highway interesection. It then continues south; crossing Spring Creek and the Alaska Railroad within the last one-half mile of the segment. The route continues south through wetlands and floodplains (Segment 15) using the ROW of the deactivated MEA 115 kV line. The entire length of Segment 15 parallels the Alaska Railroad and the Glenn Highway located one-quarter to one-half mile to the west.

Before it connects with Segment 17, Segment 15 crosses the Matanuska and Knik River channels and routes behind a ridge at the intersection of the Old Glenn and Glenn Highways.

ALTERNATIVE E.

FERC/SOUTH WASILLA - Split

Segments 1, 5, 8, 18, 19 &
2, 3, 6, 10, 15, 17, 19

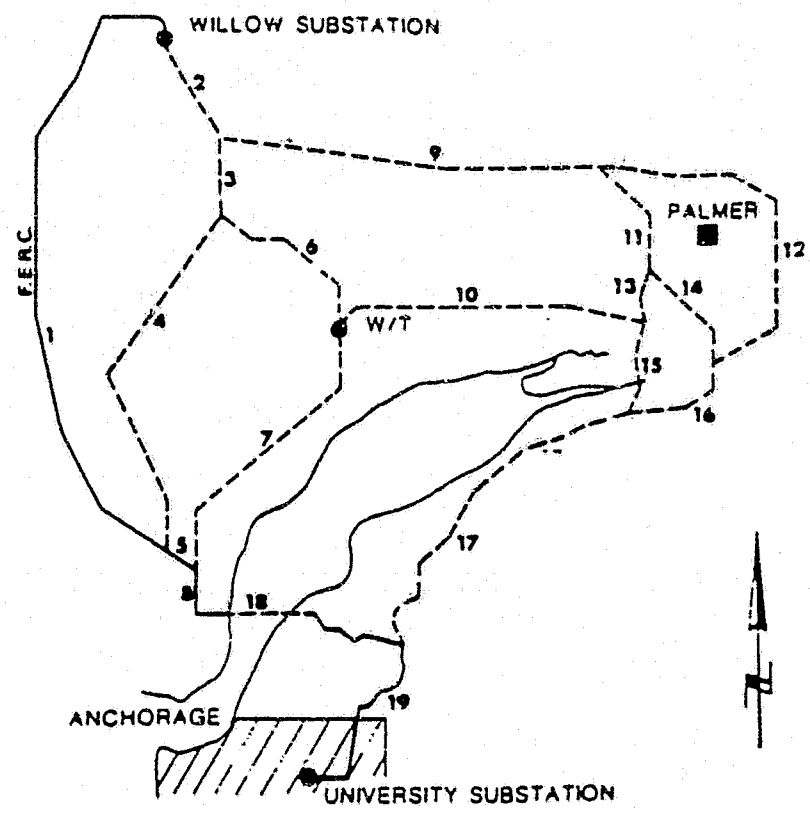


The FERC/South Wasilla Alternative is a split route. One line follows the FERC route (Alternative A). The second transmission line begins at Willow Substation and heads southeast along the existing MEA right-of-way (Segments 2, 3, and 6). From Willow/Teeland the route runs northeast briefly and then east through Lucille Creek Valley. Southwest of Lake Lucille the route leaves Lucille Creek Valley, crosses Knik Goose Bay Road and continues eastward crossing the Glenn Highway and ending at Segment 15 adjacent to the Alaska Railroad. The route then runs south, crossing the Matanuska and Knik Rivers and traversing the Palmer Hay Flats State Game Refuge (Segment 15). The route then heads southwest on the abandoned MEA right-of-way to Fossil Creek (Segment 17). At that point, the second line rejoins the FERC line along Segment 19 to University Substation.

ALTERNATIVE F.

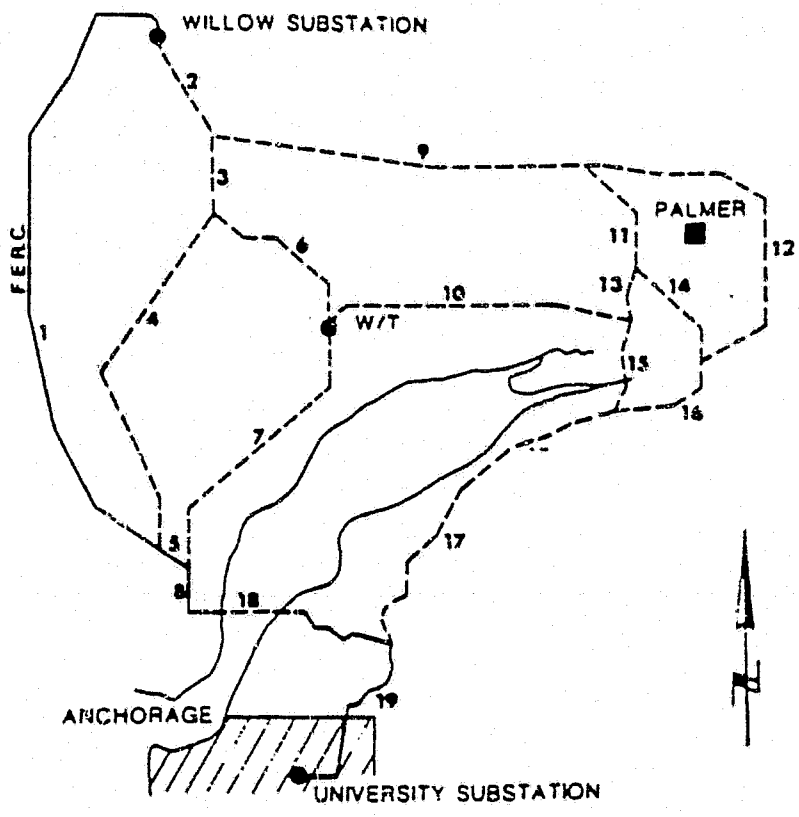
LITTLE SUSITNA/NORTH PALMER

Segments 2, 3, 4, 5, 8, 18, 19 &
2, 9, option, 17, 19



The Little Susitna/North Palmer Alternative is a split route. Both transmission lines run parallel from the Willow Substation along the existing MEA transmission ROW (Segments 2 and 3), then east of Nancy Lake the two lines diverge. One follows the Little Susitna route (Alternative B) southwestward to a point south of the Goose Bay State Game Refuge, then east under Knik Arm, and then south to University Substation (Segment 3, 4, 5, 8, 18 and 19).

The second route runs around Knik Arm along the North Palmer route described under Alternative D. Segment 9 traverses the ridge north of the Little Susitna River. The route then follows one of the North Palmer Options to Eklutna Flats at the eastern end of Knik Arm. At Segment 17 the corridor heads southwest on the abandoned MEA right-of-way to Fossil Creek, at which point the second line rejoins the first along Segment 19 to the University Substation.



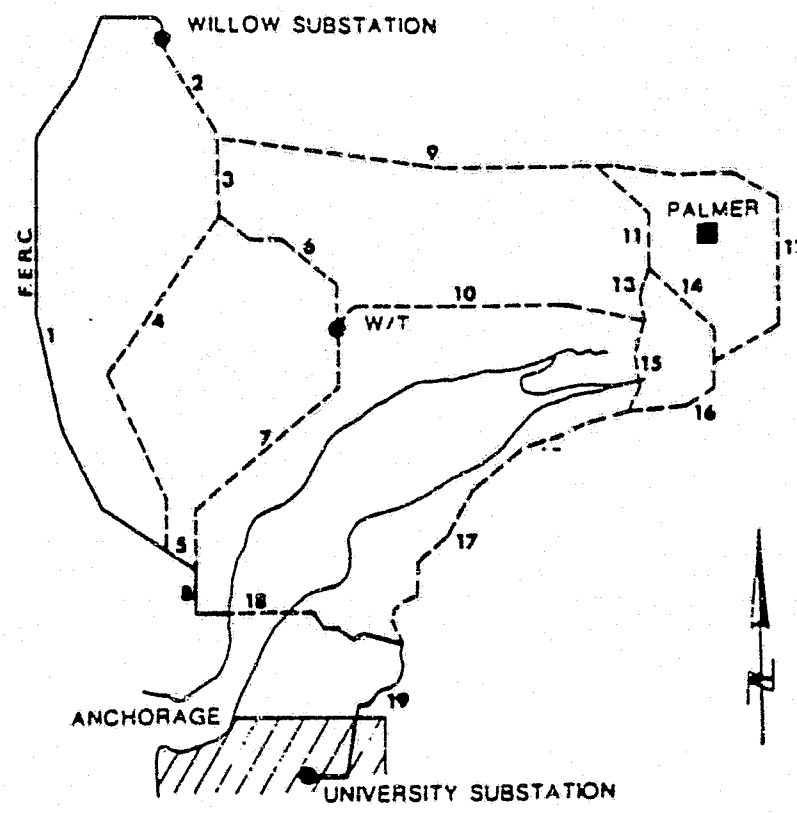
ALTERNATIVE G.

LITTLE SUSITNA/SOUTH WASILLA

Segments 2, 3, 4, 5, 8, 18, 19 &
2, 3, 6, 10, 15, 17, 19

The Little Susitna/South Wasilla Alternative is a split route. Both lines run parallel from Willow Substation along the existing MEA transmission ROW. At the end of Segment 3 one line then follows the Little Susitna route (Alternative B) described previously.

The second transmission line continues to follow the existing MEA right-of-way (Segment 6) to Willow/Teeland. The route then runs east through Lucille Creek Valley as described for Alternative E.



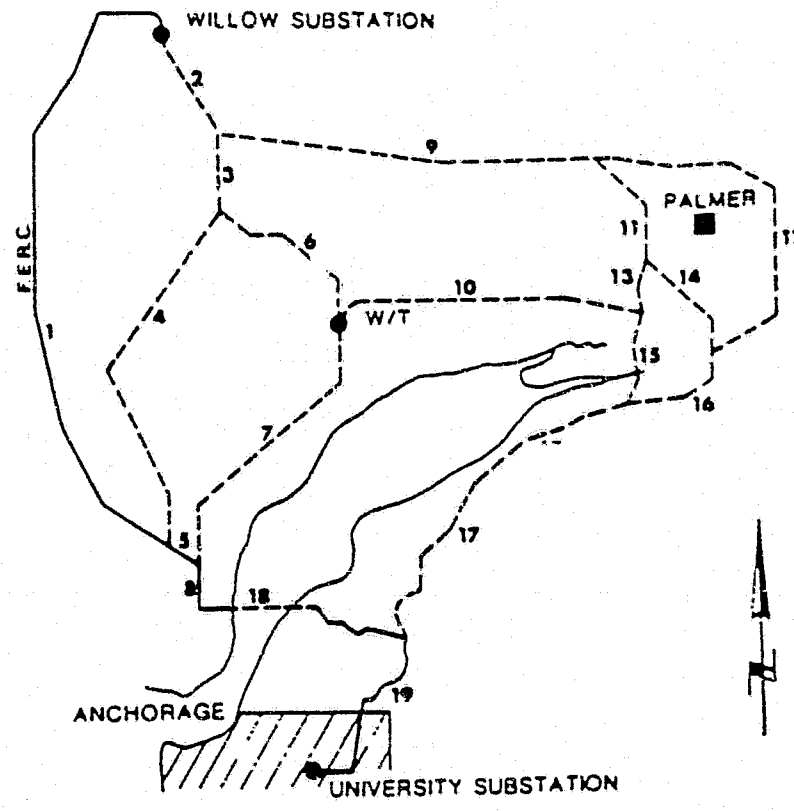
ALTERNATIVE H.

MEA-CEA/NORTH PALMER

Segments 2, 3, 6, 7, 8, 18, 19 &
2, 9, option, 17, 19

The MEA-CEA/North Palmer Alternative is a split alternative combining the Alternative C route with the North Palmer route. Both transmission lines run southeast from Willow Substation along the existing MEA right-of-way (Segment 2). East of Nancy Lake one route heads south (Segment 3), following the route outlined for Alternative C. At Little Susitna it goes southeast to the Wasilla area and along Knik Arm (Segments 6 and 7) before crossing Knik Arm and going into Anchorage (Segments 18 and 19).

The second line runs east along Segment 9 through gently sloped, wooded lands north of the Little Susitna River. At the end of Segment 9, northwest of Palmer, there is a choice of three North Palmer Options for reaching the end point of Segment 17. These were described previously. Segment 17 follows the abandoned MEA transmission ROW southwest to Fossil Creek. At that point the two lines rejoin as a double circuit pole and parallel the existing CEA line to University Substation (Segment 19).



ALTERNATIVE I.

MEA-CEA/SOUTH WASILLA

Segments 2, 3, 6, 7, 8, 18, 19 &
2, 3, 6, 10, 15, 17, 19

The MEA-CEA/South Wasilla Alternative is a split alternative combining the Alternative C route with the South Wasilla route. The distinction of Alternative I is the extent they parallel one another. Both lines in this alternative are parallel through Segments 2, 3 and 6, and adjacent to the existing MEA right-of-way. At Willow/Teeland, the two lines split and follow routes previously described in Alternatives C and E.

4.2 NORTH STUDY AREA ALTERNATIVES

Alternatives identified in the North Study Area between Healy and Fairbanks had one basic routing requirement, which was to connect a substation located at Healy to a substation located at Ester, seven miles west of Fairbanks, or to a substation located at Fort Wainwright, two miles southeast of Fairbanks.

Through review with agencies and utilities, and preliminary screening based on the routing objectives discussed earlier, 28 route segments were identified. These segments are defined and diagrammatically shown in Table 4-3.

As in the South Study Area, some of these segments were combined to form alternatives, essentially two alternatives to Ester Substation and three alternatives to Wainwright Substation.

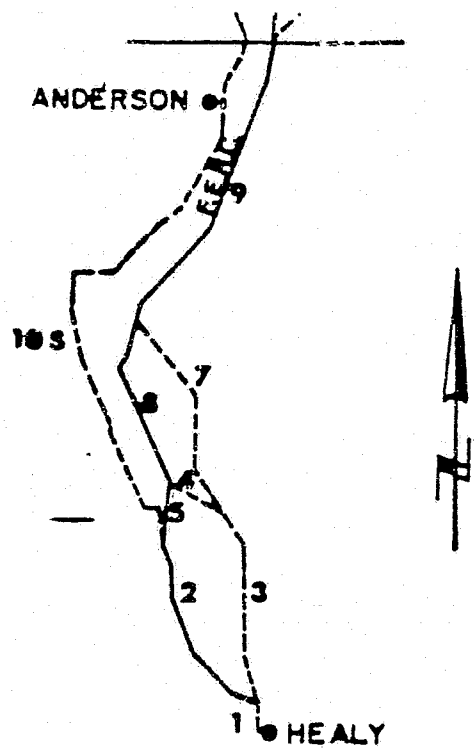
In order to compare potential impacts between segments which share common geographical characteristics or have different existing conditions, the alternatives were broken into four subsections as follows:

- Healy to Anderson
- Anderson to Little Goldstream
- Little Goldstream to Ester
- Anderson to Wainwright

Evaluation of the alternatives by subsections allowed for potential crossovers between segments in the event that impacts of one segment were severe enough to eliminate it from further consideration.

Alternatives within each subsection were compared and the preferred alternative identified. The preferred alternative to each substation location was then compared and a final recommendation made from technical, economic and environmental perspectives. The license application (FERC) route is included as one of the alternatives. One option to the FERC Alternative, termed Healy East, was identified in the Healy to Anderson section. Table 4-4 summarizes the transmission line requirements for the alternatives and option.

As with the South Study Area, these requirements served as the basis for comparisons and are based on preliminary engineering studies to date. Following are brief descriptions of the alternatives.



HEALY TO ANDERSON

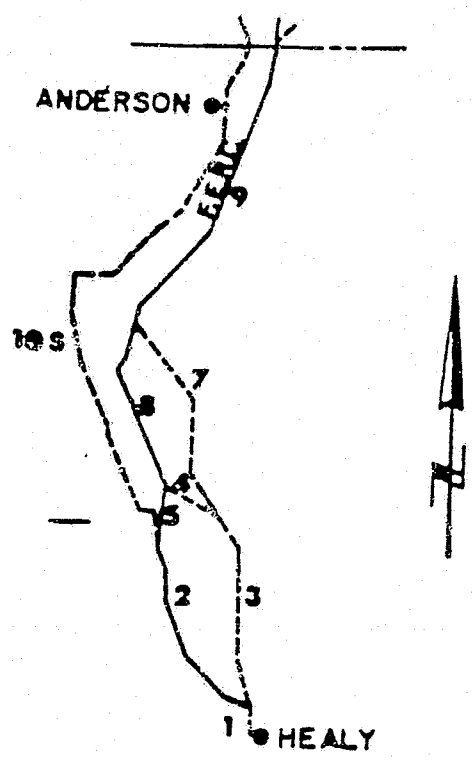
ALTERNATIVES A, B, Option A1

Alternative A: FERC Route (Segments 1, 2, 5, 8, 9)

Alternative A traverses the Healy to Anderson portion of the North Study Area. It begins at Healy then runs one mile north parallel with the Nenana River crossing it and the Alaska Railroad to the west. Proceeding northwest, the route crosses Dry Creek and Panguingue Creek and parallels the GVEA line for most of the Segment 2. It then shifts to a more northerly direction, crossing Little Panguingue Creek and Slate Creek. It parallels the Nenana River, crossing it about one mile north of Ferry (Segment 5). It then crosses the Alaska Railroad and continues northwest in parallel with the Nenana River and the railroad. About Mile 380 on the railroad, the route turns to the northeast and parallels the Parks Highway located one to three miles to the west until it passes the Clear M.E.W.S. facility and approaches the Anderson area.

Option A1: Healy East Option (Segments 1, 3, 7)

The Healy East Option runs due north from Healy, running on a plateau above the Nenana River. The route runs north-northwest for 24 miles, crossing several small streams before it joins Segment 9 about two miles east of the Nenana River and continues to Anderson on the FERC route.



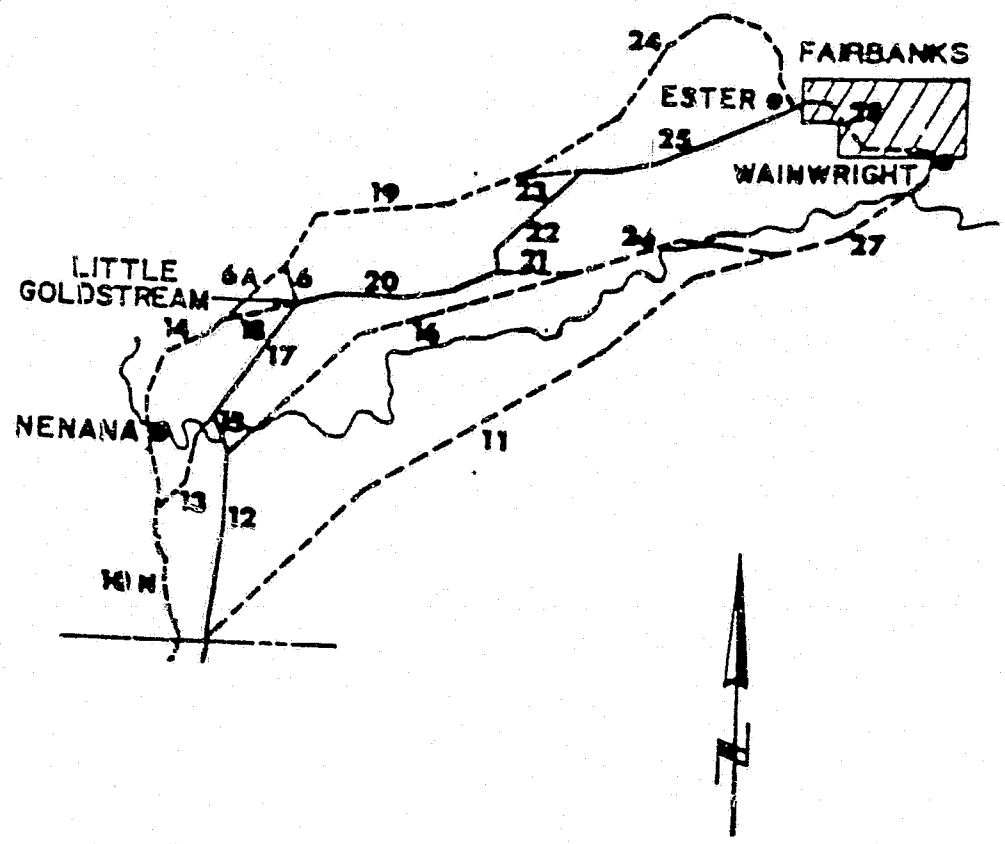
HEALY TO ANDERSON
ALTERNATIVES A, B, Option A1

Alternative B: GVEA Parallel (Segments 1, 2, 10S)

Alternative B follows the FERC route (Alternative A) until it splits off at the end of Segment 2 to parallel the existing GVEA line and the Parks Highway directly for about two miles. It then turns west, crosses Rock Creek and the highway, and proceeds northwest about one-quarter to one-half mile from the Parks Highway, crossing Bear Creek and Birch Creek. About three miles north of Birch Creek it turns due east and crosses the highway again, the Nenana River, and the railroad. It then parallels the highway to the east until just north of the Clear M.E.W.S. boundary, where it crosses the highway a third time and parallels it on the west side until it reaches Anderson.

Alternative B is adjacent to the existing GVEA line and the Parks Highway for almost its entire length.

ANDERSON TO LITTLE GOLDSTREAM
ALTERNATIVES C, D



Alternative C: FERC Route (Segments 12, 15, 17)

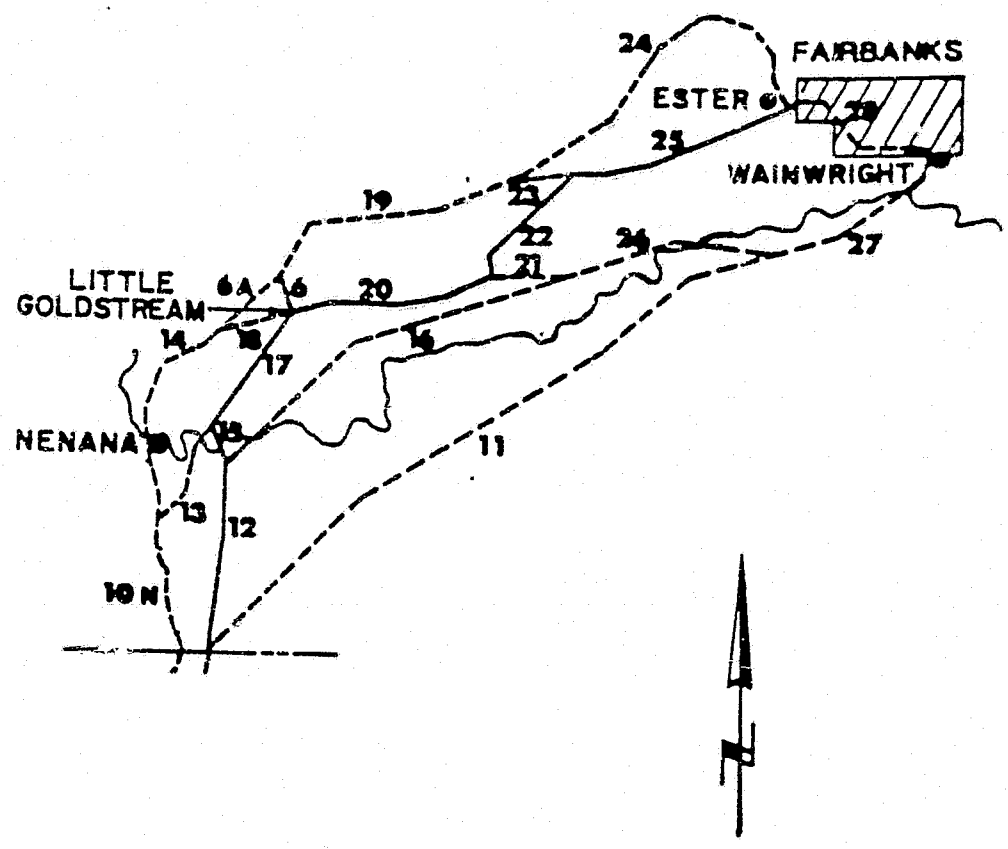
Alternative C is the FERC route transversing the Anderson to Little Goldstream portion, beginning about six miles northeast of Anderson, paralleling the Parks Highway located one and one-half to three and one-half miles west of the route. It routes due north to just south of the Tanana River, which it crosses at a northwest angle. It then proceeds northeast (Segment 17) for about seven miles and terminates near Little Goldstream Creek.

Alternative D: GVEA Parallel (Segments 10N, 14, 18)

Alternative D parallels the GVEA line and the Parks Highway north of Anderson. About six miles north of Anderson, it also parallels the Alaska Railroad and continues through the confluence area of the Tanana and Nenana Rivers. It crosses the Tanana River at Nenana and continues to parallel the highway, railroad, and GVEA line to the northeast to Little Goldstream Creek.

LITTLE GOLDSTREAM TO ESTER

ALTERNATIVES E, F.



Alternative E: FERC Route (Segments 20, 22, 25)

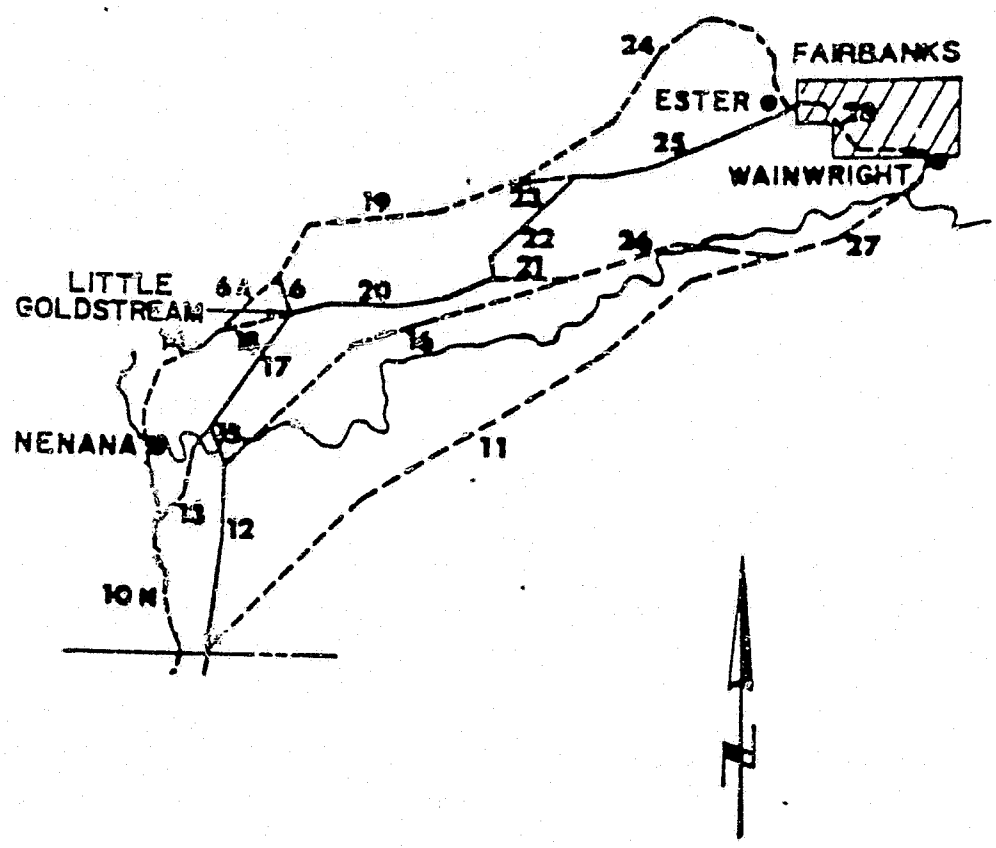
Alternative E begins at the termination of Segment 18 and parallels the GVEA line eastward about 11 miles. The route in this area (Segment 20) traverses the Little Goldstream Creek valley and is parallel to the Parks Highway, which is located on the Tanana Ridge one to one and one-half miles north. One mile west of Bonanza Creek (near Segment 22), the route turns due north for one mile, leaves the GVEA line and crosses the Parks Highway. From there it turns northeast and runs parallel to the highway on the north side of the Ridge. At the beginning of Segment 25 the route turns to the east and runs about three miles before it again parallels the GVEA line on into the Ester Substation. West of the substation, the route crosses the Parks Highway for a second time in this section.

Alternative F: Goldstream Valley (Segments 6, 19, 24)

This route crosses the Parks Highway and traverse the north slope of the Tanana Ridge. At the base of the slope the corridor turns northeast paralleling the base of Tanana Ridge, Goldstream Creek and the railroad. The rail and the corridor are separated by Goldstream

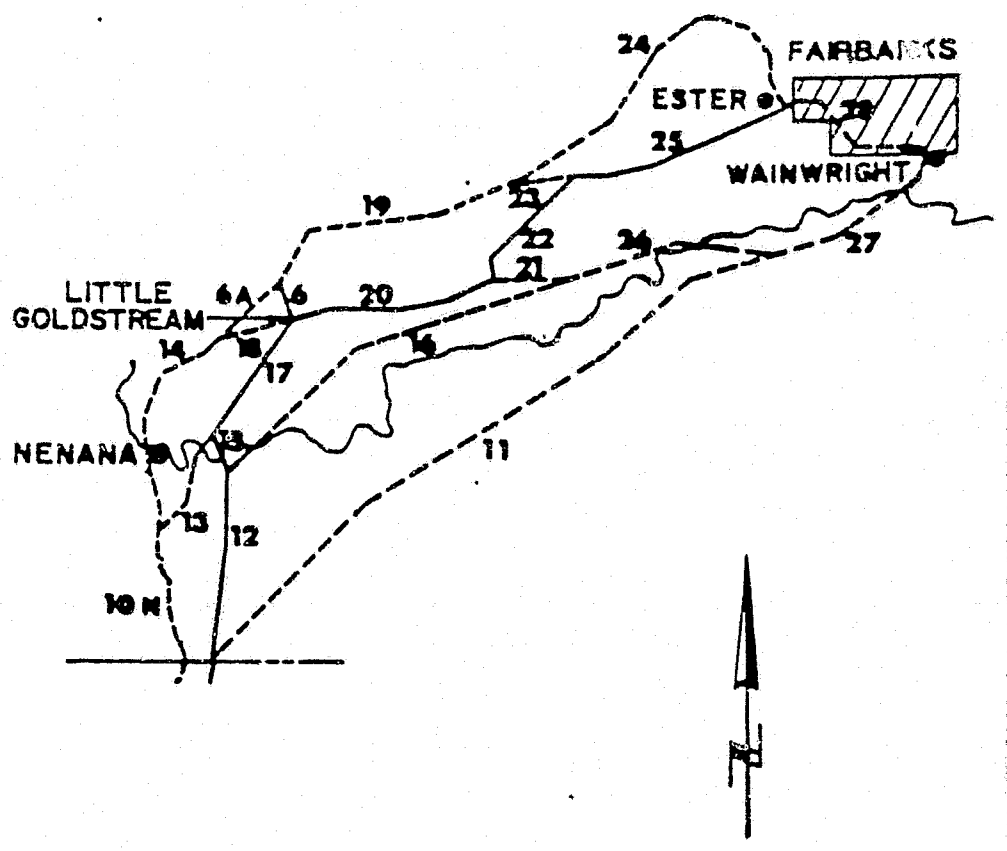
LITTLE GOLDSTREAM TO ESTER

ALTERNATIVES E, F.



Creek. At its northernmost point, the corridor turns east-southeast running along the northern and eastern base of Ester Dome. Along the eastern base of Ester Dome the lines would run south paralleling small distribution lines and cross the Parks Highway into Ester Substation.

ANDERSON TO WAINWRIGHT
ALTERNATIVES G, H, I



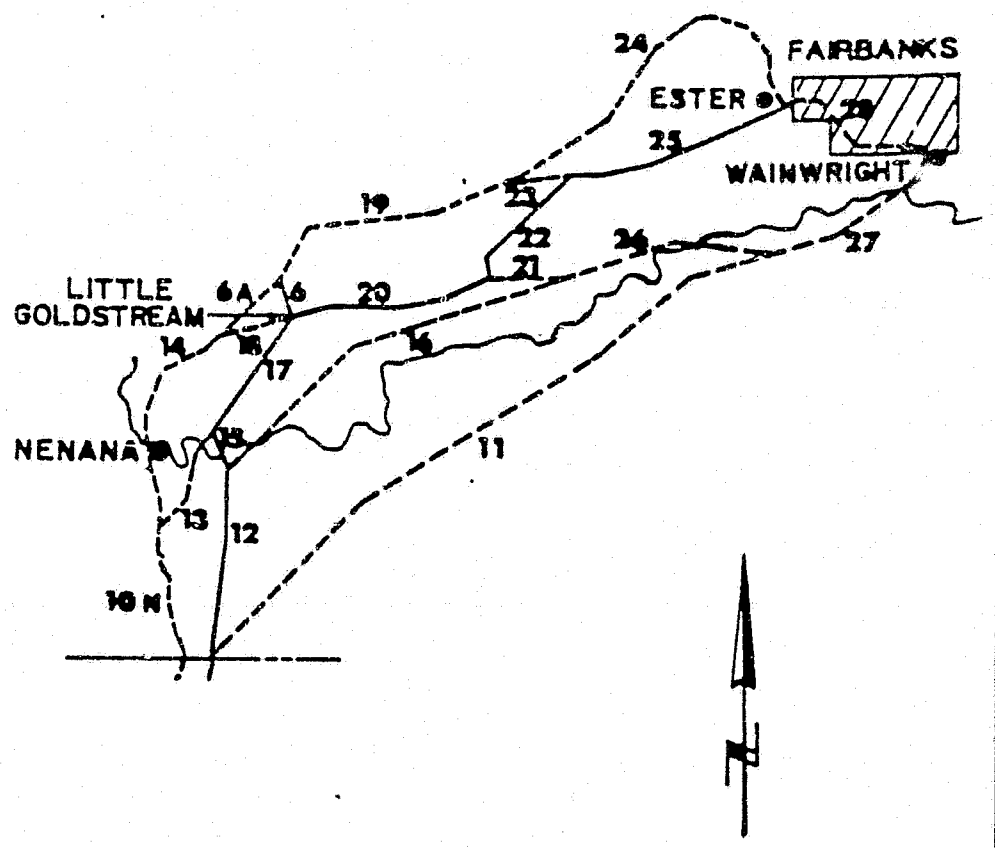
Alternative G: Tanana Ridge (Segments 12, 16, 26, 27)

Alternative G begins as the FERC route (Segment 12) about six miles northeast of Anderson. After crossing the Tanana River it heads northeast, paralleling the river and traversing the base of the south slope of the Tanana Ridge. The line then traverses wet lowland areas, crosses Salchaket Slough and the Tanana River for a third time near Goose Island, before terminating at the substation location.

Alternative H: Tanana Flats (Segments 11, 27)

Alternative H begins at the same point as Alternative G, but runs directly northeast through the Tanana Flats, south of the river. It parallels the Tanana River on the south side, crossing the Totatlanika River, Tattanika Creek, and Wood River (where it enters military land). The line is the same as Alternative G at Segment 27, where it crosses the Salchaket Slough, and Tanana River before reaching the substation site.

ANDERSON TO WAINWRIGHT
ALTERNATIVES G, H, I



Alternative I: Segment 28 (Alternative E or F plus 28)

Alternative I repeats either Alternatives E or F from Anderson to Ester. It adds a segment from the Ester Substation about one and one-half miles east, then runs southeast through southwest Fairbanks for about two miles. The route parallels the recently proposed South Fairbanks Expressway. It would cross the Alaska Railroad, Chena River, and run close to the Fairbanks International Airport. It then runs due east for four miles across south Fairbanks before terminating at the Fort Wainwright Substation.

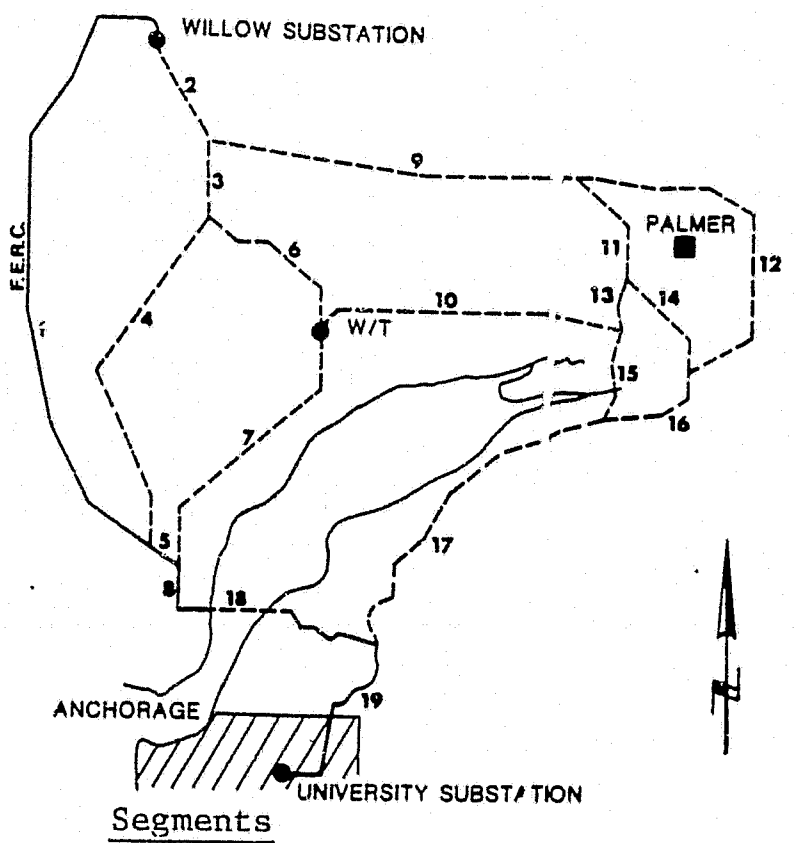
TABLES

TABLE 4-1

SOUTH STUDY AREA

ROUTE SEGMENTS

AND ALTERNATIVES



No.	Alternative	Segments
	Parallel Alternatives	
1.	A : FERC Route	1, 5, 8, 18, 19
2.	B : Little Susitna	2, 3, 4, 5, 8, 18, 19
3.	C : MEA/CEA Parallel	2, 3, 6, 7, 8, 18, 19
	Split Alternatives - North Palmer Option	
	Option 1 : East Palmer	12, 16
	Option 2 : Trunk Road/Kepler Lake	11, 14, 16
	Option 3 : Trunk Road/Glenn Hwy.	11, 13, 15
	Split Alternatives	
4.	D : FERC - North Palmer	1, 5, 8, 19 + 2, 9, Option, 17, 19
5.	E : FERC - South Wasilla	1, 5, 8, 18, 19 + 2, 3, 6, 10, 15, 17, 19
6.	F : Little Susitna - North Palmer	2, 3, 4, 5, 8, 18, 19 + 2, 9, Option, 17, 19
7.	G : Little Susitna - South Wasilla	2, 3, 4, 5, 8, 18, 19 + 2, 3, 6, 10, 15, 17, 19
8.	H : MEA/CEA - North Palmer	2, 3, 6, 7, 8, 18, 19 + 2, 9, Option, 17, 19
9.	I : MEA/CEA - South Wasilla	2, 3, 6, 7, 8, 18, 19 + 2, 3, 6, 10, 15, 17, 19

C/41/7-4

TABLE 4-2
SOUTH STUDY AREA
SUMMARY OF ROUTE REQUIREMENTS

	Route Length[1] (Mi)	Existing Parallel (Mi)	New Route[2] (Mi)	ROW Width (Ft)	ROW (Seg) (Acres)	ROW Total (Acres)	ROW Veg. Cleared (Acres)	Tower Type	No. Ckts	Notes
PARALLEL ALTERNATIVES										
A - FERC	65.3		39.0	275	(1302)			x-frame	(2)	
Segment 8, 18		11.7		255	(362)			x-frame	(2)	Plus 3.5 mile underwater
Segment 19		11.1		130	(175)	1839	1029	pole	(2)	Double circuit
B - Little Susitna	59.6		22.8	275	(761)			x-frame	(2)	
Segment 2, 3, 8, 18		22.2		255	(687)			x-frame	(2)	Plus 3.5 mile underwater
Segment 19		11.1		130	(175)	1623	914	pole	(2)	Double circuit
C - MEA/CEA	63.5		3.5	275	(117)			x-frame	(2)	
Segment 2, 3, 6, 7, 8, 18		45.4		255	(1406)			x-frame	(2)	Plus 3.5 mile underwater and
Segment 19		11.1		130	(175)	1698	113	pole	(2)	3.5 miles Segment 7 no parallel
NORTH PALMER OPTIONS										
Option 1 - E. Palmer	28.8		24.8	170	(512)			x-frame	(2)	
Segment 16		4.0		150	(73)	585		x-frame	(2)	
Option 2 - Kepler Lks.	21.5		17.6	170	(361)			x-frame	(2)	
Segment 16		4.0		150	(73)	434	321			
Option 3 - Glenn Highway	15.5		9.9	170	(204)			x-frame	(2)	
Segment 15		5.6		170	(116)	320	225	x-frame	(2)	MEA ROW
SPLIT ALTERNATIVES										
D - FERC/N. Palmer	112.8[3]		59.6	170	(1230)			x-frame	(1)	
Segments 2, 8, 18		18.1		150	(329)			x-frame	(1)	Plus 3.5 mile underwater
Segment 17		20.5		170	(423)			x-frame	(1)	MEA ROW
Segment 19		11.1		130	(175)	2157[3]	1524[3]	pole	(2)	Double circuit
E - FERC/S. Wasilla	129.2		62.0	170	(1279)					
Segments 2, 3, 6, 8, 18		32.1		150	(584)			x-frame	(1)	Plus 3.5 mile underwater
Segment 17		20.5		170	(423)			x-frame	(1)	MEA ROW
Segment 19		11.1		130	(175)	2461	1601	pole	(2)	Double circuit
F - Little Susitna/N. Palmer	100.7[3]		45.8	170	(895)					
Segment 2		6.4		255	(325)			x-frame	(2)	
Segment 3, 8, 18		15.8		150	(288)			x-frame	(1)	Plus 3.5 mile underwater
Segment 17		20.5		170	(423)			x-frame	(1)	MEA ROW
Segment 19		11.1		130	(175)	1979[3]	1146[3]	pole	(2)	Double circuit
G - Little Susitna/S. Wasilla	113.0		43.4	170	(945)					
Segments 2, 3		10.5		255	(198)			x-frame	(2)	
Segments 6, 8, 18		21.6		150	(393)			x-frame	(1)	Plus 3.5 miles underwater
Segment 17		20.5		170	(423)			x-frame	(1)	MEA ROW
Segment 19		11.1		130	(175)	2261	1515	pole	(2)	Double circuit

FOOTNOTES:

[1] Parallel segments counted only once.
[2] Includes parallel to existing 115 kV lines or above, and assumed use of deactivated MEA 115 kV.
[3] Add option for total length.

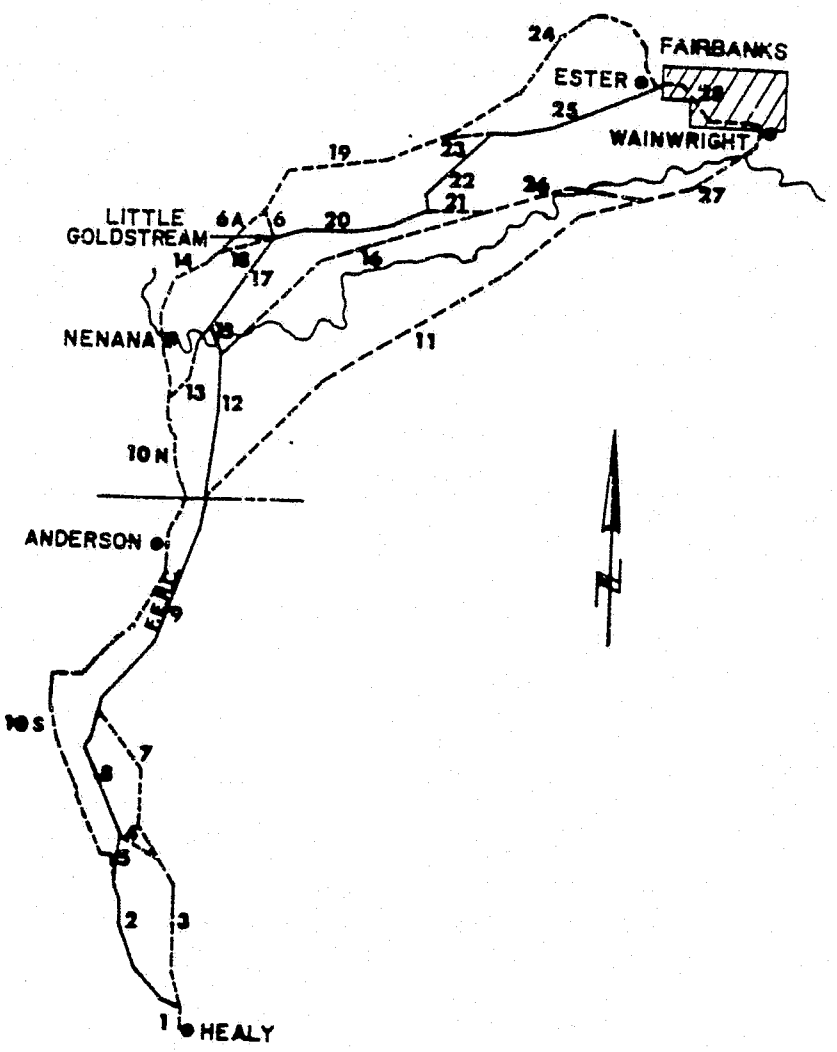
TABLE 4-2
SOUTH STUDY AREA
SUMMARY OF ROUTE REQUIREMENTS

	Route Length[1] (Mi)	Existing Parallel (Mi)	New Route (Mi)[2]	ROW Width (Ft)	ROW (Seg) (Acres)	ROW Total	ROW Veg. cleared (Acres)	Tower Type	No. Ckts	Notes
SPLIT ALTERNATIVES (cont.)										
H - MEA/CEA-N. Palmer	104.6[3]		24.3	170	(501)					
Segment 2		6.4		255	(198)			x-frame	(2)	
Segments 3, 6, 7, 8, 18		38.8		150	(706)			x-frame	(1)	Plus 3.5 miles underwater
Segment 17		20.5		170	(423)			x-frame	(1)	MEA ROW
Segment 19		11.1		130	(175)	2003[3]	1578[3]	pole	(2)	Double circuit
I - MEA/CEA-S. Wasilla	107.0		26.5	170	(547)					
Segments 2, 3, 6		20.4		255	(632)			x-frame	(2)	
Segments 7, 8, 18		25.0		150	(455)			x-frame	(1)	See notes under Alternative C
Segment 19		11.1		130	(175)	2232	1598	pole	(2)	Double circuit

FOOTNOTES:

1/ Parallel segments counted only once.
2/ Includes parallel to existing 115 kV lines or above, and assumed use of deactivated MEA 115 kV.
3/ Add option for total length.

TABLE 4-3
NORTH STUDY AREA
ROUTE SEGMENTS
AND ALTERNATIVES



Alternative	Segments
Healy to Anderson	
A : FERC	1, 2, 5, 8, 9
Healy East Option	1, 3, 7
B : GVEA Parallel	1, 2, 10S
Anderson to Little Goldstream	
C : FERC	12, 15, 17
D : GVEA Parallel	10N, 14, 18
Little Goldstream to Ester	
E : FERC	20, 22, 25
F : Goldstream Valley	6, 19, 24
Anderson to Wainwright	
G : Tanana Ridge	12, 16, 26, 27
H : Tanana Flats	11, 27
I : Segment 28	28

TABLE 4-4
NORTH STUDY AREA
SUMMARY OF ROUTE REQUIREMENTS

ALTERNATIVES (Two 230 KV Circuits)	Route Length[1] (Mi)	Existing Parallel (Mi)	New Route (Mi)[2]	ROW Width (Ft)	ROW (Seg)	ROW Total (Acres)	ROW Veg. cleared (Acres)	Tower Type	No. Ckts	Notes
HEALY TO ANDERSON										
A - FERC	42.6		32.8	210	(836)			x-frame	(2)	
Segment 2		9.8		180	(214)	1050	636	x-frame	(2)	
Healy East Option	41.5		41.5	210		1058	406	x-frame	(2)	
B - GVEA Parallel	45.3		2.4	210	(61)			x-frame	(2)	Segment 1 and 1 mile of
Segments 2, 10S		42.9		180	(937)	998	365	x-frame	(2)	Segment 2 no parallel
ANDERSON TO LITTLE GOLDSTREAM										
C - FERC	20.5		20.5	210		523	418	x-frame	(2)	
D - GVEA Parallel	24.7	24.7		180		539	159	x-frame	(2)	
LITTLE GOLDSTREAM TO ESTER										
E - FERC	31.1		14.1	210	(359)			x-frame	(2)	
Segment 20, 25		17.0		180	(371)	730	682	x-frame	(2)	
F - Goldstream Valley	38.0		38.0	210		969	911	x-frame	(2)	
ANDERSON TO WAINWRIGHT										
G - Tanana Ridge	54.7		54.7	210		1394	1141	x-frame	(2)	
H - Tanana Flats	49.1		49.1	210		1252	908	x-frame	(2)	
I - Segment 28[3]	8.8		8.8	100	(107)		81	pole	(2)	Double circuit

FOOTNOTES:

[1] Parallel segments counted only once.
[2] Existing parallel mileage figures approximate.
[3] Add preferred routes from Anderson to Ester for total mileage.

5.0 TECHNICAL CONSIDERATIONS

5.0 TECHNICAL CONSIDERATIONS

5.1 GENERAL METHOD

From a technical point of view, reliability is the main objective. The technical factors, reviewed from a routing standpoint, were determined based upon their significance in providing a reliable transmission system.

5.2 FACTORS CONSIDERED AND SIGNIFICANCE

The most significant factors which affect reliability are access and topography:

- Lines located in reasonable proximity to transportation corridors will be more quickly accessible and, therefore, more quickly repaired if any failures occur.

- Lines located in areas with gentle relief will be easier to construct and repair.

Although reliability is a technical factor, many of the criteria utilized for economic and environmental reasons also relate to the selection of a corridor within which a line can be operated with minimum interruption of power.

The parameters required for the technical analyses were extracted from the environmental inventory tables, topographic maps, aerial photos and existing published materials. The parameters used in the analysis were: length of the line, accessibility, approximate number of river/creek crossings, approximate number of highway/road crossings, topography, soils, and existing rights-of-way. The main factors contributing to the technical and economic analyses are combined as listed in Tables 5-1 and 5-2.

It should be noted that the parameters are in miles of line length, except towers and crossings. In this analysis, it was determined that 4.5 X-frames and 6.5 pole structures per mile of the line were representative numbers. The number of pole structures were estimated based on the length of narrow ROW. The following technical factors directly determine the complexity of engineering and design, the cost of construction and the ability to operate and maintain the system:

1. Line length - miles

   A shorter line in general will be easier to maintain and will have fewer technical problems due to materials and workmanship than the longer one. For the same environmental conditions, the shorter line is a preferred one.

2. Accessibility - miles

   Accessibility shown in the tables is evaluated based on reasonable proximity of the route to existing major roads or parallel transmission line ROW's. Also, ROW in the perimeter or close vicinity of populated areas were considered as accessible.

3. Parallel right-of-way or right-of-way available - miles

   This parameter is considered as a major factor for accessibility to the route.

4. River and streams crossed - number

   The number of river and streams to be crossed is a contributing factor to reduced accessibility. The larger the number of waterways to cross, the less accessible a particular location is to reach. Where a river or stream is located between a road and the transmission line, this was evaluated on the basis of no access.

5. Wetland, swampy areas - miles

A major factor are the areas of wet and swampy soils. Because all routes studied cross these areas, particularly in the South Study Area, the emphasis was placed on those routes which have the least amount of these conditions. In addition to uncertainties and high cost of foundation construction in swampy areas, the inspection and maintenance are more difficult. The evaluation was based on USGS quad maps and existing reports.

6. Problems and difficult areas - miles

Topography plays a key role since it affects construction, operation and maintenance. Areas of broken or steep terrain add to access difficulties and, therefore, reduce reliability. Also, conditions in which the slope of the terrain exceeds the angle of repose of the soil increases the chances of land, rock, or mud slides. Snow, rock, or mud slides are an additional hazard on steep slopes. Significant advantages of reliability and cost are expected if the lines are routed at low elevations with gentle topography. Highway, powerline, and river crossings should always be minimized where possible. These crossings may require special high structures, and if combined with flat, low surrounding profiles and swampy soil conditions (as along the river banks), create a formidable engineering problem. River crossing structures not properly protected from flooding can directly affect the reliability of the line. Hazards due to steep slopes, floodplains, long span crossings, and ROW congestion have been evaluated and combined in the table under this item.

7. Highways, railroad and power lines crossed - number

The number of crossings were determined, however not all of them are significant.

8. Cable link - miles

Submarine cable links are evaluated as a reliability reduction factor, particularly if all power flow is directed through them.

9. Vegetation and clearing

Heavily forested areas must be cleared prior to construction of the transmission line. This clearing will be minimized as shown in Appendix E, Figures E-2, E-3 and E-4. This factor was not used for evaluation purposes because it can and should be properly managed.

10. Others

Extremely low temperatures, avalanches, snow depth, and severe winds are very important parameters in transmission design, operation and reliability. These climatic factors become more severe in the mountains, where severe winds are expected for both exposed areas and mountain passes. The routes located through narrow valleys and on north slopes are less reliable from this point of view.

5.3 SOUTH STUDY AREA

o Alternative A: FERC Route

- Segment 1 - 37.1 Miles

The line route in this segment passes through flat terrain with extensive wetlands and swampy areas. Because more than one half of this segment crosses wetlands, the major technical problems envisioned will be foundation engineering and construction. A considerable effort of soil exploration will be required. A part of the route is a forested area especially the second half. Two crossings of Willow

Creek, the Alaska Railroad and the Parks Highway occur near Willow and Little Susitna River is crossed at the end of this segment. Some tall structures and probably deep foundations will be necessary for these crossings because of wet soils and flat topography. Some minor changes of alignment will probably be required in the small lake areas. Regular spans of 1100 feet are required for this segment. A longer average span should be investigated for construction and economic reasons. Although the route in some areas is close to a "tractor trail," it is not considered as accessible and construction and maintenance will be difficult from spring to fall. Winter construction should be considered.

The line constructed in this segment should be rated as having a lower reliability due to access for maintenance and a route with better access would be preferable.

- Segment 5 - 1.9 Miles

  This segment is a continuation of Segment 1 and general characteristics previously described apply. Except as noted above, no major technical problems are anticipated.

- Ending at Lorraine - Segment 8 - 2.2 Miles

  Flat topography with elevations up to 150 feet. Wetlands at low elevations with standing water throughout. Small creeks and trails can be crossed with normal span structures. Available winter trails can be developed for construction. Route parallels 138 kV Chugach transmission line therefore this section is accessible for maintenance. Winter construction should be considered.

- Lorraine to Fossil Creek - Segment 18 - 13.0 Miles

  This segment includes Knik Arm crossing by submarine cable. The segment is evaluated as accessible for all of its length. Topography is flat with some areas of extemely wet lands. No major technical problem is anticipated in this segment. Technical evaluation of Knik Arm submarine cable link is excluded from this evaluation.

- Fossil Creek to University Substation - Segment 19 - 11.1 Miles

  The route parallels existing 230 kV pole line ROW, transversing Anchorage metropolitan area. Double circuit pole construction is assumed for this section. The major problems anticipated are congested construction, narrow ROW and closeness to air field.

o Alternative B: Little Susitna - Parallel

- Willow to Nancy Lake - Segment 2 - 6.4 miles

  The topography shows a gentle profile with elevations up to 350 feet. There are some wetlands. The line route crosses the Castle Mountain fault as well as some other faults. Only small streams are crossed which can be done with regular 1000 to 1200 feet spans. The route parallels existing 138 kV MEA transmission line and also runs parallel to the Parks Highway and Alaska Railroad about a mile away. The route is accessible for maintenance. Roads on the route and improved trails can be used for line construction. Conventional construction is visualized. Some wetlands are crossed.

- Nancy Lake to Little Susitna - Segment 3 - 4.1 miles

  Rolling to flat terrain with gentle profiles and elevations around 200 feet with some wetlands. The route crosses the Lake Creek channels, Alaska Railroad and Parks Highway, with steep profile between railroad and highway. The route is parallel to MEA 138 kV transmission line. In general, no major engineering or construction problems are expected however, alignment adjustment will be necessary and crossings will require proper engineering attention. Conventional construction using 1000-1200 feet average spans is expected. The route is close to recreation areas. This segment is considered accessible.

- Little Susitna to Lorraine - Segment 4 - 20.9 miles

  Flat topography with elevations up to 350 feet, with extensive wetlands and standing water. Special foundations may be required for swampy areas and longer spans may be desirable. Little Susitna River, streams, and numerous lakes need to be crossed. Foundation engineering and construction will pose the major problems. Some areas are accessible through existing trails and secondary roads, but particular sites can be inaccessible. Winter and helicopter assisted construction and material deliveries to the sites require careful consideration. For general evaluation purposes this segment is rated as not accessible.

- Segments 5, 8, 18 and 19

  See pages 5-5 and 5-6 for descriptions of these segments.

o **Alternative C: MEA/Chugach Parallel**

- **Segments 2 and 3, total length 10.5 miles**

  The segments are described under Alternative B: Little Susitna - Parallel. The route parallels Matanuska Electric Association (MEA) 138 kV transmission line and is considered accessible for maintenance. Presently, only moderate technical and construction problems are expected.

- **Little Susitna to Wainwright - Segment 6 - 9.9 miles**

  Forested flat terrain, numerous lakes and wetlands. Right-of-way parallels existing MEA 138 kV transmission line for its entire length. The Alaska Railroad and Parks Highway are about one mile away and Big Lake Road is crossed by the route. The area is evaluated as accessible for construction and maintenance. No major technical problems are anticipated.

- **Segment 7 - 16.8 miles**

  Flat topography with gentle profiles and elevations ranging between 100 and 300 feet with wetlands and standing water at lower elevations. Right-of-way parallels CEA/MEA 230/138 kV transmission line for entire length except the first two miles. Goose Bay/Wasilla Road runs parallel to route within a mile or two, providing good access. Difficulties are anticipated with foundation construction limited in the line section crossing Goose Bay tidal marshes. To reduce the number of structures, longer spans than average should be considered. Special deep pile foundations may be required. Winter construction probably will also be required. Although construction

limitations and complicated (difficult) engineering considerations can be expected, accessibility is considered acceptable.

- Segments 8, 18 and 19 - total length 26.3 miles

  The segments are described under Alternative B: Little Susitna - Parallel.

o Option 1

- Segment 12 - 21.1 miles

  In the most part, the topography is level covered by vegetation with floodplains at the Matanuska River crossing. The route crosses Wasilla/Fishhook Road, Glenn Highway, some secondary roads, Matanuska River and Bodenberg Creek, as well as the Matanuska Valley fault. Long spans and high structures probably will be needed for Matanuska River crossing which includes floodplains. Deep pile foundations will probably be necessary. Road crossing can be handled with regular spans. After the river crossing the topography changes to rolling with elevations up to 500 feet with gentle slopes of not more than 10%. The crossing of the Alaska Power Administration (APA) 115 kV line will be necessary and may require somewhat higher structures. Access to route is considered to be satisfactory.

- Segment 16 - 7.7 miles

  The topography is level with wetlands and floodplains around Knik River crossing in the first half of the segment and mountainous terrain in the second half. The major engineering problem is the crossing of two Knik River channels and floodplains. Depending on final route selection, more than one crossing of the Old Glenn

Highway may be required. Sharing a congested ROW with existing Alaska Power Administration (APA) 115 kV transmission line on mountainous terrain will require extra engineering and construction time and cost. Side profiles are estimated up to 20-25 degrees. Meandering Knik River channels and floodplains will require long spans with associated engineering and construction considerations. Single pole structures may be required. Hazards due to mud and rock slides can be anticipated. Accessibility will be difficult.

o Option 2

- Segment 11 - 6.8 miles

  The topography of terrain is gentle with elevation around 400 feet and covered by dense vegetation. Three hard surface secondary roads are crossed. Conventional construction using 1100-1200 feet span structures is anticipated. The area is accessible through highway and secondary roads. No major technical or construction problems are visualized.

- Segment 14 - 7.0 miles

  Topograpy is level around the Matanuska River crossing and rolling with elevations up to 250 feet for the rest of this segment. The route is covered by dense vegetation with numerous lakes and floodplains, and the Matanuska River crossing about one mile wide. The route also crosses the Glenn Highway and Alaska Railroad. Long spans will be required for river crossing, with access to floodplain probably only during winter. River scour needs to be determined and foundations designed accordingly. Also, about seven small streams need to be crossed between the Matanuska River and Knik River. This segment is considered less reliable from a

maintenance point of view, and engineering and construction difficulties are anticipated.

- Segment 16 - 7.7 miles

  The segment is described under Option 1. This is a difficult segment from engineering, construction and maintenance viewpoints.

o Option 3

- Segment 11 - 6.8 miles

  The segment is described under Option 2. No technical or construction problems are anticipated in this segment.

- Segment 13 - 3.1 miles

  The route traverses rolling terrain with dense vegetation and elevation up to 250 feet, with some wetland areas and crossing of the Glenn Highway and Alaska Railroad. Because of flat terrain around the crossings, structures somewhat higher than normal may be required. In general the route is easily accessible for maintenance.

- Segment 15 - 5.6 miles

  This segment is described under Alternative E: South Wasilla - Split. It is a difficult segment from an engineering and construction viewpoint due to river crossings.

- **Alternative D: FERC - North Palmer - Split**

The FERC route is discussed under Alternative A above, and the North Palmer route is discussed below.

- Segment 2 - 6.4 miles

The segment is described under Alternative B: Little Susitna - Parallel. The route parallels existing MEA 138 kV transmission line and is considered accessible for maintenance.

- Segment 9 - 20.6 miles

The route crosses the foothills and south slopes of the Talkeetna Mountains. The first 16 miles of the segment has rolling topography with elevations from 300 to 600 feet and slopes not more than 10%. The rest of the segment is flat with lowlands and some wet soils. The terrain is covered by mixed forest throughout its length. Coal Creek, Little Susitna River and numerous small streams are crossed. Most of the segment has no established access and is far away from major roads. Crossing of the Little Susitna River, which parallels the route and screens it, is necessary to approach the route. Therefore, it may be necessary to rely on helicopters for maintenance or additional access roads need to be constructed. The maintainability of the sector will be more difficult than Alternative C. Engineering aspects are normal and no hazards were found.

- Option 3 - 15.5 miles

Option 3, consisting of Segments 11, 13 and 15 is the preferred route in conjunction with Segment 9. This selection is based on a technical evaluation of the three options.

- Segment 17 - 20.5 miles

The first two miles of route parallels existing Alaska Power Administration (APA) 115 kV line and crosses mountainous terrain with steep side slopes. It can be anticipated that this portion of the route will present technical problems related to alignments, congestion and difficult construction. The rest of the segment has flat to rolling topography covered by mixed forest. Several crossings of the Alaska Railroad and Glenn Highway will be necessary and may require higher than normal structures. Because of numerous developed areas crossed by the route, steel pole line sections may be required. The entire section will require careful attention. Easy access for maintenance makes this section very reliable.

- Segment 19 - 11.1 miles

The segment is described under Alternative A: FERC Route. The route is in the greater Anchorage area.

o Alternative E: FERC - South Wasilla - Split

The FERC route is discussed under Alternative A above, and the South Wasilla route is discussed below.

- Segment 2 and 3 - total length 10.5 miles

The route is described under Alternative B: Little Susitna - Parallel. The route follows MEA 138 kV transmission line ROW and is considered accessible for maintenance, without major technical problems.

- Segment 6 - 9.9 miles

The route is described under Alternative C: MEA/Chugach Parallel. The route follows MEA 138 kV transmission

- Segment 17 - 20.5 miles

The first two miles of route parallels existing Alaska Power Administration (APA) 115 kV line and crosses mountainous terrain with steep side slopes. It can be anticipated that this portion of the route will present technical problems related to alignments, congestion and difficult construction. The rest of the segment has flat to rolling topography covered by mixed forest. Several crossings of the Alaska Railroad and Glenn Highway will be necessary and may require higher than normal structures. Because of numerous developed areas crossed by the route, steel pole line sections may be required. The entire section will require careful attention. Easy access for maintenance makes this section very reliable.

- Segment 19 - 11.1 miles

The segment is described under Alternative A: FERC Route. The route is in the greater Anchorage area.

o Alternative E: FERC - South Wasilla - Split

The FERC route is discussed under Alternative A above, and the South Wasilla route is discussed below.

- Segment 2 and 3 - total length 10.5 miles

The route is described under Alternative B: Little Susitna - Parallel. The route follows MEA 138 kV transmission line ROW and is considered accessible for maintenance, without major technical problems.

- Segment 6 - 9.9 miles

The route is described under Alternative C: MEA/Chugach Parallel. The route follows MEA 138 kV transmission

line route and is considered accessible for maintenance, without major technical problems.

- Segment 10 - 17.4 miles

This segment has flat and rolling topography with elevations up to 400 feet, vegetation and wooded areas. Lucille, Cottonwood, Wasilla Creeks, Big Lake Road, Glenn Highway, Alaska Railroad and secondary roads are crossed. Route runs parallel to the Parks Highway at about a mile distance and mostly through developed areas. Very good access is available. Normal spans can be used in this section. Longer than normal spans up to 1600 feet may be required for crossing Wasilla Creek and adjacent area due to floodplain, wet soils and foundation requirements. Wasilla Creek area, due to anticipated engineering and technical problems, is considered difficult. Based on generally good access, this segment is considered as a reliable line section.

- Segment 15 - 5.6 miles

This segment consists of mostly level wetlands and floodplains. The section is considered to be difficult from engineering and construction viewpoints. Five major crossings will be required. All crossings are associated with floodplains, wet soils and flat terrain. Long spans up to 1600 feet and high structures with difficult foundations will probably be required. Right-of-way parallels the Alaska Railroad and Glenn Highway for full lenth of the segment and crossing of railroad and highway will be necessary. Winter construction has to be considered. The segment is readily accessible by major highway.

- Segment 17 - 20.5 miles

  This segment is described under Alternative D: North Palmer - Split.

- Segment 19 - 11.1 miles

  This segment is described under Alternative B: Little Susitna - Parallel.

o Alternative F: Little Susitna - North Palmer

The Little Susitna route of this split alternative is discussed under B above. The characteristics of this route in the most part (Segments 4, 5, 8, 18, -48 miles) are similar to those of the original FERC route, i.e., wet/swampy areas and limited access. The North Palmer route is described under Alternative D above. For some length along the Talkeetna Foothills (Segment 9-20.6 miles) it also has limited access. The two lines share the same ROW starting at Willow for 6.4 miles (Segment 2) before splitting.

Engineering and line construction aspects will not present special problems. However, five major river/floodplain crossings in Segment 15 of North Palmer route and foundations for quite extensive wet/swampy areas in Little Susitna route will require careful considerations. Winter and helicopter assisted construction is anticipated for some areas.

o Alternative G: Little Susitna - South Wasilla

The Little Susitna route of this split alternative is discussed under Alternative B, and the South Wasilla route is discussed under Alternative E above.

The overall access to the lines is somewhat better than in Alternative F because the South Wasilla route is accessible along its total length. The two lines share the same ROW for 20.4 miles starting at Willow Substation (Segments 2, 3 and 6) before splitting. Engineering and line construction aspects are considered to be quite similar to those of Alternative F above, since Segment 15 with major river crossings is also a part of the South Wasilla route, and the rest of the route is little different from other sections of Alternative F.

o Alternative H: MEA/CEA - North Palmer

One leg of this split alternative, the MEA/CEA route is discussed under Alternative C and the other, the North Palmer route, under Alternative D above. Starting at Willow the two lines share the same ROW for 6.4 miles (Segment 2) before splitting.

The access to MEA/CEA route is considered to be adequate; however, the part of North Palmer route along the Talkeetna Foothills (segment 9-20.6 miles) has limited access.

Engineering and line construction aspects are similar to Alternative F above with the only difference that wet/swampy areas crossed are less extensive than in the Little Susitna Alternative. However, MEA/CEA route crosses Bay Goose tidal marshes with little or no access and winter and helicopter assisted construction is anticipated.

- **Alternative I: MEA/CEA - South Wasilla**

  One leg of this split alternative, the MEA/CEA route is discussed under Alternative C and the South Wasilla route is discussed under Alternative E above. Starting at Willow, the two lines shares the same ROW for a total length of 20.4 miles (Segments 2, 3 and 6).

  The South Wasilla route crosses developed areas and, therefore, has the major advantage of being accessible for all its length through existing roads. The line routes of this alternative, as a whole, are the most accessible, compared to all other alternatives. Easy access for maintenance makes this alternative very reliable.

  Engineering aspects of line construction are similar to Alternative H above.

5.4 NORTH STUDY AREA

HEALY TO ANDERSON

- **Alternative A: FERC Route**

  Segments 1, 2, 5, 8, 9 - Total Length 42.6 Miles

  The beginning of the route, which includes one mile of mountainous terrain and crossing of the Nanana River and Alaska Railroad, will require special attention because tall structures and special foundations will be required. After the river crossing, the route parallels the GVEA 138 kV line. The terrain is rolling to flat topography. Although the route crosses several creeks and streams, no problems are visualized. The route crosses the river and railroad once more as well as 138 kV GVEA line in Section 5 over flat

terrain. This will require the use of tall structures and probably long spans. The following 3 miles, the route is in mountainous terrain with line located on slopes. This section is not considered to be a problem because of the gradual rise in elevation from 1000 to 1500 feet.

Wetlands are crossed in Section 9. Regular spans of 1100-1200 feet and conventional construction is visualized for the entire section from Healy to Anderson. The accessibility for construction is evaluated for 80% of the total route because of the proximity to the Parks Highway, existing ferries for river crossing, and relatively flat terrain for the most part where access roads can easily be develop. Wetland areas crossed by the route are in Segment 8 and mostly 9, and around river crossings. Helicopter assisted construction and material delivery should be considered in these areas.

o Alternative: Healy - East Option

Segments 1, 3, 7, 9 - Total Length 41.5 Miles

The beginning of the route follows the foothill slopes along the Nenana River to Liqunite Creek for about 3 miles. After crossing the creek, the routes continues directly over mountainous terrain approximately 20 miles with elevations from 1200 to 2000 feet. Although this section eliminates two river crossings it introduces less desirable mountain route segments with potential engineering, construction and maintenance problems. Access is poor and the possibility exists for slides and avalanches.

Based upon a study of topographical maps and technical evaluation, 4.5 miles of this route is considered to be difficult. Special structures and foudations may be required. Because Segment 9 is less accessible due to wetlands as discussed

under Alternative A above, and combined with Segments 3 and 7, makes the Healy-Anderson option route much less reliable than the FERC Alternative. Therefore, this alternative designated as the Healy East Option, is less attractive from a technical standpoint.

- Alternative B: GVEA Parallel

  Segments 1, 2, 10S - Total Length 45.3 Miles

  Alternative B differs from the FERC Alternative after Segment 2, and follows the GVEA 138 kV line. Two additional crossings of the Parks Highway are required as well as crossing of the Nenana River and Alaska Railroad, the same as in the FERC route. The topography is generally the same as the FERC Alternative. Regular 1100 foot spans are visualized for this route. Technical problems due to tower spotting in congested areas can be expected. The major advantage of this alternative is complete access to the route due to close proximity to the highway and GVEA 138 kV line. Because the small difference in accessibility compared to the FERC Alternative is counterbalanced by the need for additional highway crossings, the longer line length, and potential tower spotting problems, this alternative is less desirable than Alternative A from a technical standpoint.

ANDERSON TO LITTLE GOLDSTREAM

- Alternative C: FERC Route

  Segments 12, 15, 17 - Total Length 20.5 Miles

  Segment 12 of the route, although it parallels the Parks Highway within distances of one to 3.5 miles, is considered not accessible. This assessment is due to wet soil with standing water and numerous stream crossings. Construction will be a problem due to poor soil and limited access. The

Tanana River crossing is expected to be made by the structures placed on islands. Protection of the structures for flood and ice will be a problem. Winter construction of this section should be considered. Segment 17 is routed through a valley with mountainous terrain and elevations climbing to 800 feet. The profiles are not considered too steep to be a problem. Regular structures of 1000-1200 foot spans appear satisfactory. This segment is considered as not accessible, therefore the reliability is rated as low.

- Alternative D: GVEA Parallel

  Segments 10N, 14, 18 - Total Length 24.7 Miles

  Because the route follows the highway closely, accessibility is good for most of the length. Difficult construc tion is likely to be encountered around Nenana Village and the Tanana River crossing. This is a congested area limited by mountainous terrain on one side and river on the other side. The area is shared by the Parks Highway, railroad, and GVEA line. Crossing of highway, railroad, and GVEA line is anticipated. The route to Goldstream is considered to be fully accessible. Regular construction is envisioned. Depending upon the final line routing, another crossing of GVEA line may be required. Alternative D, the GVEA Parallel route is the most reliable and should be the easiest to construct. This alternative may be preferred if the engineering of the route around Nenana Village can be satisfactorily resolved.

LITTLE GOLDSTREAM TO ESTER

- Alternative E: FERC Route

  Segments 20, 22, 25 - Total Length 31.1 Miles

  The line route parallels the existing GVEA 138 kV line and Fairbanks - Nenana Road 1 to 1.5 miles away and crosses the

road twice. The line route is considered accessible for most of its length. The route crosses mountainous terrain and is located on forested slopes with elevations ranging from 500 to a maximum of 1300 feet. Topography is basically rolling, crossing streams, valleys, and slopes up to 15%. Wetlands are located near the streams. Line construction is expected to be average in this section. Accessibility is evaluated as good. Regular construction using 1000 to 1200 span structures is envisioned. Difficult areas are associated with road, GVEA line and ridge crossings. The line sector is considered to be reliable and moderately difficult to construct with not all sites accessible.

- Alternative F: Goldstream Valley

  Segments 6, 19, 24 - Total Length 38.0 Miles

  The topography of the entire route is mountainous with characteristics which are similar to Alternate E: FERC. Initially, the route crosses the GVEA line and Fairbanks-Nenana Road. The route is located in Goldstream Creek Valley on the northern slopes of the ridge. It parallels the Alaska Railroad but is screened from it by Goldstream Creek. The route, except the portion close to Fairbanks, is considered as not accessible. It may require development of construction roads or utilize helicopter construction. The route crosses elevations from 500 to 900 feet and at lower elevations it crosses wetlands. The line is longer there than Alternative E and the route is considered marginal.

ANDERSON TO WAINWRIGHT

- Alternative G: Tanana Flats

  Segments 11, 27 - Total Length 49.1 Miles

  The areas traversed by Segments 11 and 27 are flat terrain with standing water in many locations. The basic technical

characteristics have severe limitations to off-road traffic in summer because of wet soils and lack of roads. The route is rated as not accessible. Construction and maintenance will be troublesome due to wet soils and numerous rivers and streams. The area is underlined by continuous permafrost and technical difficulties are anticipated with foundation engineering and construction. Extensive soil exploration will be required. Regular spans of about 1100 feet are anticipated, however an economic span length should be determined. Winter and helicopter assisted construction and material delivery is essential and should be expected. Two miles southwest of Fort Wainwright Substation, the route crosses the Tanana River which includes a floodplain and several river channels. This area is characterized by wetlands with standing water. Tall structures, long spans and deep pile foundations will be required. In addition, the structures will be subject to dynamic loads from ice and debris carried by the river. Engineering and construction problems associated with this crossing are rated as difficult. In comparison to other alternatives, this one is considered to be the least desirable and is rated low from the standpoint of reliability.

- Alternative H: Tanana Ridge

  Segments 12, 16, 26, and 27 - Total Length 54.7 miles

  This alternative diverges from the original FERC Alternative at a point south of the Tanana River and before crossing it. After the river crossing, which is approximately 3/4 mile wide, the route runs along the southern slopes of a mountain ridge and eventually crosses it at about 700 foot elevation. The route crosses the Tanana River (consisting of two channels) once more and converges with Segment 27 which is the same as in Alternative G.

part of mountain terrain transversed by the route has rolling topography with slopes no more than 15 percent. No hazaradous area is expected. Three crossings of the Tanana River are required in this alternative to reach Fort Wainwright Substation. All of the crossings are considered to be difficult from both a technical and construction point of view as described under Alternative G. Spans of 800 to 1200 feet depending on terrain are envisioned. The main Tanana River channels are crossed by spans up to 1600 feet.

The route is rated as not readily accessible for its entire length, although in some part it parallels the GVEA line at a distance of 1 to 1-1/2 miles. Three Tanana River crossings are required which makes this alternative not desirable from a reliability viewpoint. This alternative is not recommended.

- Alternative I: Segment 28 - 8.8 Miles

Segment 28 is a connection between Ester Substation and Fort Wainwright Substation. The line is routed in some part through the Fairbanks metropolitan area which is considered to be a difficult area. The routing has not been studied in detail. The route, as indicated, will require special construction around the airport area. A double circuit pole line with an 800 feet average span was assumed for the metropolitan area. Technical and construction problems are evaluated as moderate because of congested ROW and Chena River crossing. The segment is considered to be reliable. This alternative approach to Wainwright Substation is recommended over Alternatives G and H from a technical standpoint.

TABLES

TABLE 5-1
SOUTH STUDY AREA ALTERNATIVES EVALUATION
TECHNICAL AND ECONOMIC SUMMARY

ALTERNATIVES		NORTH PALMER OPTIONS			PARALLEL ALTERNATIVES			SPLIT ALTERNATIVES					
		OPT 1	OPT 2	OPT 3	A FERC	B LITTLE SU	C MEA/CEA	D FERC-NORTH PALMER	E FERC-SOUTH WASILLA	F LITTLE SU/SOUTH PALMER	G LITTLE SU/SOUTH WASILLA	H MEA/CEA NORTH PALMER	I MEA/CEA SOUTH WASILLA
TECHNICAL FACTORS													
Line Length	(Ckt Mi)	28.8	21.5	15.5	65.3x2[1]	59.6x2	63.5x2	139.4	140.3	133.3	134.6	137.6	138.5
Accessibility	(Mi)	25.0	18.5	14.0	24.2	34.6	61.5	77.7	95.4	92.7	110.4	114.7	132.4
Parallel ROW	(Mi)	4.0	4.0	--	24.2	34.6	61.5	30.6	44.2	34.6	44.5	61.5	61.5
River & Stream Xings	(#)	25.0	25.0	17.0	11.0	12.0	18.0	29.0	42.0	31.0	44.0	37.0	40.0
Wetland/Swampy Areas	(Mi)	3.0	3.5	3.0	26.0	17.0	12.0	33.5	37.5	24.5	28.5	19.5	23.5
Problem & Difficult Areas	(Mi)	5.0	5.5	3.0	--	--	--	6.0	6.5	6.0	6.5	6.5	7.0
X-Frame Structures	(#)	140.0	100.0	75.0	480.0	430.0	465.0	540.0	545.0	510.0	520.0	530.0	540.0
Pole Structures	(#)				75.0	75.0	75.0	75.0	75.0	75.0	75.0	75.0	75.0
RR, Hwy & Power Line Xings	(Mi)	5.0	5.0	5.0	1.0	8.0	8.0	18.0	21.0	22.0	23.0	22.0	23.0
Submarine Cable Link	(Mi)	--	--	--	3.5x2	3.5x2	3.5x2	3.5	3.5	3.5	3.5	3.5	3.5
ECONOMIC FACTORS					INSTALLED COST ($x10^6)								
Regular Construction		--	--	--	20.30	23.02	30.33	32.35	30.78	33.79	32.22	37.45	35.88
Wet/Swampy Areas		--	--	--	26.73	17.48	12.34	18.26	20.44	13.35	15.53	10.63	12.81
Problems & Difficult Areas		--	--	--	--	--	--	4.58	4.96	4.58	4.96	4.96	5.34
Pole Segment		--	--	--	10.42	10.42	10.42	10.42	10.42	10.42	10.42	10.42	10.42
Submarine Cable Link		--	--	--	69.10	69.10	69.10	38.60	38.60	38.60	38.60	38.60	38.60
Land Acquisition		--	--	--	2.92	2.92	4.95	9.04	13.40	9.04	13.40	11.60	15.90
TOTAL					129.50	122.90	127.10	113.30	118.60	109.80	115.10	113.70	119.00

FOOTNOTES:

Notes: 1. Double circuit pole structures in Segment 19 (11.1 circuit miles) are common for all alternatives.
2. Alternatives F & H were developed using Option 3.

TABLE 5-2
NORTH STUDY AREA ALTERNATIVES EVALUATION
TECHNICAL AND ECONOMIC SUMMARY

ALTERNATIVES		HEALY TO ANDERSON			ANDERSON TO LITTLE GOLDSTREAM		LITTLE GOLDSTREAM TO ESTER SUB.		ANDERSON TO WAINWRIGHT SUBSTATION		
		A		B	C	D	E	F	G	H	I
		FERC	EAST OPTION	GVEA	FERC	GVEA	FERC	GOLD STREAM	TANANA BRIDGE	TANANA FLATS	SEGMENT 28
TECHNICAL FACTORS											
Line Length	(Mi)	42.6x2	41.5x2	45.3x2	20.5x2	24.7x2	31.1x2	38.0x2	49.1x2	54.7x2	8.8x2
Accessibility	(Mi)	38.0	25.0	45.3	2.0	24.7	22.0	15.0	2.0	2.0	8.8
Parallel ROW	(Mi)	9.5	0	45.3	0	24.7	21.0	3.0	0	0	0
River & Stream Xings	(#)	22.0	21.0	15.0	16.0	8.0	22.0	24.0	25.0	34.0	7.0
Wetland/Swampy Areas	(Mi)	5.5	3.5	4.0	4.0	2.0	0	0	12.5	20.0	0
Problem & Difficult Areas	(Mi)	3.5	4.5	3.5	2.5	4.0	3.0	4.5	8.0	2.0	3.5
Number of Structures	(#)	405.0	395.0	430.0	195.0	235.0	295.0	360.0	470.0	520.0	60.0
RR,Hwy & Power Line Xings	(#)	4.0	3.0	8.0	-	10.0	6.0	-	-	-	
ECONOMIC FACTORS											
		INSTALLED COST ($x10^6)									
Regular Construction		21.10	21.04	23.74	8.79	11.74	17.65	21.04	17.96	20.54	6.90
Wet/Swampy Areas		4.44	2.82	3.23	3.61	1.61	-	-	10.09	16.14	-
Problems & Difficulties		3.85	4.95	3.85	2.75	4.40	3.30	4.95	8.80	2.20	-
Land Acquisition		0.68	0.66	0.73	0.33	0.40	0.50	2.30	0.79	0	0.45
TOTAL		30.10	29.50	31.60	15.50	18.20	21.50	28.30	37.60	38.90	7.40

6.0 ECONOMIC CONSIDERATIONS

6.0 ECONOMIC CONSIDERATIONS

6.1 GENERAL APPROACH

Table H-2 in Appendix H entitled "Transmission Line - Cost per Mile", revised November 30, 1983 is the basis for all cost estimates. The cost data for the x-frame, single circuit overhead transmission lines were arrived at by averaging the bid prices of the three lowest bidders on the Intertie Project. This estimated cost was adjusted for all other overhead transmission line estimates. The cost data for the submarine cable was estimated based upon the actual installed cost of a 230 kV installation under Knik Arm in 1981, at the same location as the proposed Susitna submarine cable crossings.

The costs of land acquisition was obtained from two letter type reports from Land Field Services, one for the South Study Area and one for the North Study Area. The land acquisition cost shown in the Land Field Services reports are included in Appendix G. The direct cost represents the payment to land owners and the indirect cost represents the payment for title work, surveying, application preparation, appraisal and eminent domain procedures. The third item included in each of the Land Field Services report is their recommendations on alternative corridors from a land acquisition perspective. Adjustments had to be made in the land acquisition costs to account for the differences in right-of-way widths used by Land Field Services and those actually required. The right-of-way widths required are shown on page E-6 of Appendix E. The cost of access roads was not evaluated because of insufficient data but should be included in the final evaluation.

Appendix H includes a Summary of Susitna Transmission System Costs for the FERC License Application Scheme. This summary is shown as Table H-1 dated October 29, 1983. A modified version of Table H-1 will have to be prepared to include potential transmission line refinements as discussed in Volume Two, Appendix F. This needs to be incorporated into FERC Exhibit B, Table B-37.

6.2 ECONOMIC CRITERIA

The economic factors are shown at the bottom of Tables 5-1 and 5-2. The basic economic evaluation factor was designated "Regular Construction". Adjustment factors were applied to differentiate between regular construction costs and construction costs for wet/swampy areas as well as problem and difficult areas.

The costs for all alternates were obtained starting from the base costs shown in Appendix H, Table H-2 and then modified to reflect probable variations. The variation factor were basically related to the construction portion of the cost. The total cost of different designs reflects material costs as well. Included under the "Problem & Difficult Areas" heading are river, road, railroad and power line crossings as well as congested ROW's and rough mountain terrain.

6.3 FACTORS CONSIDERED AND SIGNIFICANCE

During the latter part of August, 1983 a potential list of transmission system refinements were identified. To coordinate with other Susitna Project work these potential refinements were designated as Category I and Category II refinements. The Category I refinements were those where sufficient work had been done so that they could be incorporated into the FERC licensing process. There was only one Category I refinement for the transmission system, it was designated as CIT and covered the proposed change in transmission system voltage from 345 kV to 230 kV from Gold Creek to Fairbanks.

In addition to one Category I refinement, five Category II refinements were identified. The definition of Category II refinements were those which required further study before it could be determined whether or not they could be incorporated into the FERC licensing process. These were designated as C2T1, C2T2, C2T3, C2T4 and C2T5. A complete description and cost evaluation of these potential transmission refinements are included in Appendix F.

6.4 SOUTH STUDY AREA

Recognition of the significant cost items in the Susitna Transmission System is an important consideration. As previously indicated, the estimated installed cost for the submarine cables under Knik Arm are in the order of 100 million dollars. This item requires thorough review and analysis from several viewpoints. First, if an alternate route around Knik Arm is obtained and if the Anchorage area load forecast is in the range of the Department of Revenue (DOR) Mean, it may be possible to defer the installation of submarine cables under Knik Arm until the late 1990's. If the proposed Knik Arm bridge were constructd in the late 1990's, it would be advisable to support the Sustina Transmission System cables from the Knik Arm bridge instead of installing them underwater.

If the submarine cables are required with the initial Watana installation, it may be desirable to design them for the maximum capability and plan for an arrangement which allows switching of the spare cable to any of the permanent positions. This may permit installation of 7 cables (2 circuits plus a spare) instead of 3 circuits. In addition, a complete analysis needs to be made of how the cables are to be installed in order to optimize the cost.

6.5 NORTH STUDY AREA

The alternative transmission line routes to Ester Substation presents no significant cost variation from that shown in the FERC license application. However, terminating the transmission lines at Fort Wainwright needs to be evaluated against the cost of routing transmission lines from Ester Substation to Fort Wainwright. Another possibility to be reviewed would be to deliver Susitna Power directly to the Chena Plant in Fairbanks. Because of time and budget restraints these possibilities were not studied to a conclusion.

7.0 ENVIRONMENTAL CONSIDERATIONS

7.0 ENVIRONMENTAL CONSIDERATIONS

7.1 GENERAL APPROACH

Alternative transmission line corridors were identified using the general objectives and screening procedures described in Chapter 3. More detailed environmental evaluations of these alternatives were then carried out as described below.

A set of environmental resource categories, each subdivided into specific suitability criteria, was developed (Table 7-2). Next, data specific to the suitability criteria were then obtained for each of the alternative corridor segments. Data sources consisted primarily of secondary sources and included resurce maps for such parameters as vegetation, habitat, land ownership, land use and topographic maps, supplemented by published and unpublished literature and limited field reconnaissance. Finally, the resultant data were tabulated for each alternative in order to assess relative environmental suitability.

As a part of the selection process, resource categories and criteria were assigned relative importance rankings vis a vis transmission line corridor suitability. However, no formalized, numerical ranking on importance weighing was done at this time. Rather, results of the ranking and general importance weighing are refelected qualitatively in the discussions of alternatives and recommendations.

The objectives of this environmental analysis were: to provide an appropriate level of suitability evaluation for each of the selected alternative corridors; to provide sufficient information on environmental resource trade offs between the selected alternatives; to make environmental recommendations on preferred and/or acceptable alternatives, and to allow this environmental evaluation to be factored into the final process of corridor selection.

7.2 SELECTION OF RESOURCE CATEGORIES AND CRITERIA

7.2.1 Initial Selection

The initial selection of resource categories was based on those categories utilized in previous Susitna transmission line studies (Acres, 1982), FERC licensing regulations (18CFR 4.40; 4:41), consultations with state and federal resource specialists (Appendix S), the previously established general objectives, and selected screening procedures (Chapter 3). This list of categories is presented in Table 7-1.

Following selection of categories, a number were eliminated as unsuitable and/or unnecessary for the present level of detail for this study. Reasons for elimination include:

1. Category or criterion can only be meaningfully applied during design when final alignments of transmission line within a corridor are selected (see Historic/Archaeology, below).

2. Inclusion of category or criterion would result in effectively double counting of a resource (i.e., inclusion of both specific types of habitats and total vegetation lost as criteria).

3. Inclusion of a category or criterion would provide no meaningful discrimination between alternatives (see Socio-economics, below).

7.2.2 Final Selection

A final list of categories and criteria as utilized in this analysis is given in Table 7-2. Section 7.3 discusses these resource categories

and criteria in detail while those eliminated from the study, along with the rationale for their elimination, are briefly described below.

7.2.3 Resource Categories and Criteria Eliminated from the Evaluation Process

- o Geology and Soils

  Geology and soils, as related to the potential for soil erosion and mass movement due to hazards, has limited environmental influence. The reasons are:

  - Tower construction is very localized and the "X"-structure design minimizes ground disturbances;
  - Most construction will occur during winter, minimizing potential for erosion;
  - Maintenance access will be minimal, reducing soil-related impacts, and
  - Most structures and routes can be designed to avoid hazards, (e.g., routing away from steep terrain or spanning avalanche zones).

  Furthermore, both soils and topography were included in the evaluation criteria applied in the technical analysis of the alternatives (Chapter 5), and topography as it pertains to potential for erosion is utilized in fisheries so that inclusion herein would be, in effect, double counting. Thus, the entire category was eliminated.

- o Water Use and Water Quality

  Water use and water quality, aside from that related to fisheries, was not considered to directly affect the route selection. None of the routing decisions would have any significant effect on consumptive or nonsconsumptive water uses

other than fisheries. Therefore, to avoid double counting, this category was eliminated. Water quality as related to fisheries is discussed in a subsequent section of this chapter.

- Socioeconomics

  Socioeconomic parameters include demographic, economic population, services and facilities and fiscal characteristics. The impacts of transmission lines on these factors relate more to construction in general than to the route selection.

  Socioeconomic factors were not therefore, important in the selection of preferred corridors, although general public concerns regarding the transmission line locations are very important. Those concerns are discussed in Appendix A. Again, this entire category has been eliminated.

- Historic and Archaeological Resources

  Historic and archaeological resources tend to be site specific and localize, and routes can generally be refined during design to avoid such sites. This factor, along with lack of a detailed data base on occurrance of such sites make meaningful differentiation between alternatives impractical at present. Although not particularly useful in discriminating between alternatives at this level of detail, historic and archaeological considerations are important, particularly in terms of regulatory compliance.

  Therefore, available data on high and moderate potential for occurrance was inventoried by alternative and presented in Tables 7-3 and 7-4, even though the category, in general, was not fully evaluated.

- Recreational Resources

  Recreational resources were not considered as a separate resource category in this evaluation. Impacts to recreational opportunities which might be associated with the proposed corridors relate specifically to the issue of access and the opportunities for increased use of areas for recreation. Such opportunities will exist in some degree for all the alternatives.

  However, the more significant aspect of this increased access issue is the effect increased use may have on wildlife and fisheries resources. For this reason, recreational resources were not considered as a separate category, but the significant issue is subsumed under land use, terrestrial resources, and fisheries.

7.3 RESOURCE CATEGORIES AND CRITERIA CONSIDERED IN DETAIL

7.3.1 Terrestrial Resources

Potential impacts to botanical and wildlife resources had a primary influence on alternative selection. Botanical resources were considered important primarily because of their interrelationship with other resource categories. Vegetation, a major component of wildlife habitat, also has a primary influence on visual impacts, and affects construction costs and accessibility.

Wildlife resources were considered as very important in transmission line routing. Modification of habitat, disturbance of specific species, avian collision mortality, and access into relatively inaccessible areas were all considered as important routing criteria.
The specific terrestrial evaluation criteria selected for this analysis were:

o Wetlands

Wetlands are biologically productive habitats which are susceptible to damage from vehicles, filling for road or construction pad development, and sedimentation (USFWS, 1979).

Development in wetlands is subject to environmental regulation under Section 404 of the Clean Water Act. In interior Alaska, wetlands are generally underlain by ice-rich permafrost. Disruption of this insulating layer may cause thawing, followed by slumping, ponding, thermal erosion, and severe habitat changes (Pewe', 1982).

Most of the proposed transmission line corridor lies within the zone of discontinuous permafrost. However, it is anticipated that the frequency at which permafrost will be encountered will be greater between Healy and Fairbanks. The occurrence of permafrost and the thaw stability of the ice rich soil is largely dependent on soil type. Of particular concern in the Tanana River lowlands is the presence of ice rich organic silt which generally becomes unstable upon thawing.

For these reasons, avoidance of wetlands is highly desirable in routing of transmission line corridors. Therefore, acres of wetlands within the rights- of-way of each alternative were calculated from vegetation and wetland maps (Appendix S - Environmental Inventory Support Data), and used as a specific criterion against which corridor suitability was judged. No differentiation was made based on the size of individual wetlands or wetland complexes. Future, more detailed assessments of the preferred corridors may require such differentiation, however, as small, scattered wetland parcels can be easily avoided or spanned in final alignment, while extensive wetland complexes are difficult or impossible to avoid.

- Forest Habitat

  Acres of forest habitat within the rights-of-way was used as an evaluation criterion because, in a well-constructed transmission line, the most extensive unavoidable habitat modification impact is removal of forest habitat. As one type of native vegetation replaces another on most of the right-of-way (ROW), loss of total habitat is minimized. However, habitat for forest birds and mammals is lost, while there is a habitat gain for species such as moose which use early successional stages and edge habitats. Routing through areas of earlier successional stages and/or nonforested areas has less severe habitat modification-related impacts because the areas will require little to no cutting of vegetation. In addition, the early successional-adapted animal communities that exist in these areas at present would not be greatly impacted by Row-related habitat modifications.

New Corridor Access

The number of miles of new corridor associated with each alternative was considered as one of the most important terrestrial resources evaluation criteria. New corridors maximize habitat modification and, more importantly, create new access routes into relatively inaccessible areas for four-wheel drive and all-terrain vehicles, as well as snow machines. This increased access may result in higher hunting, poaching, and trapping pressure, (greater potential for damage to wetlands and upland vegetation due to erosion and sedimentation), and a greater level of harassment and general disturbance of wildlife. A major concern of both the Alaska Department of Fish and Game and the U.S. Fish and Wildlife Service is that the Susitna transmission lines be confined as much as possible to existing utility or

transportation corridors (Appendix M). In addition to the length of new corridor associated with each alternative, the existing accessibility of new corridor areas was also considered in a qualitative sense. A new corridor through an area near existing development or existing access would have less impact than one through an area distant from existing developments or points of access.

- Bird Collision Potential

  Bird collisions with transmission lines is a problem that has been studied in many areas outside Alaska (U.S. Fish and Wildlife Service, 1978). The conclusion of these studies generally is that bird collision mortalities occur, but the numbers involved are not biologically significant. However, exceptions do occur and waterfowl, other aquatic birds and raptors are often found to be particularly susceptible.

  Therefore, it was considered desirable to avoid waterbird concentration areas to the extent practical with the transmission line routes.

- Raptor and Swan Nest Sites

  Bald eagle, peregrine falcon, and trumpeter swan nest sites were considered as areas to avoid with transmission line routing. Interference with nest sites along the proposed alternatives can be reduced somewhat by modifying the right-of-way centerline.

  Other factors, such as the presence of moose calving areas, bear denning areas, and high quality furbearer habitat were also considered. However, consideration of acres of wet lands, acres of forest habitat, and miles of new corridor as evaluation criteria accounts for these factors to a large extent.

7.3.2 Fisheries Resources

Fisheries resources in the study area include both the salmonid species (salmon, trout and char) which have significant sport and commercial value, as well as other species such as grayling and burbot.

Both direct and indirect impacts to these resources could occur along any of the alternative corridors. Direct impacts would result from adverse changes in water quality due to erosion, increased turbidity and disturbance of streambeds. Indirect effects could include increased public access and increased fishing.

With proper mitigation fisheries impacts related to transmission line construction would be very limited. Relative comparisons of the alternatives considered the potential for impact and known information on aquatic resources.

Fisheries criteria for evaluation of the alternative corridors were:

- Number of streams or rivers crossed

  The higher the number of crossings the higher the potential for aquatic impacts. Although mitigative measures can prevent or reduce impacts, each stream crossing presents a risk to the aquatic resources in the vicinity of the crossing.

- Potential for access to inaccessible fishing areas

  Increased access by fishermen to otherwise inaccessible fishing areas will impact some fish populations. Less risk

for increased fishing pressure is associated with those alternative routes which have smaller proportions of new corridor length versus those with large proportions of new corridor length.

- o Potential for increased erosion into streams.

  During construction, disturbance of vegetation and other excavation will increase the potential for erosion. The contribution of suspended sediments due to erosion could affect the water quality of streams and, therefore, impact fish habitats. Relatively more disturbance of soils is associated with new corridors than with existing corridors because with new corridors, additional soil disturbance will occur due to the need for access roads. Existing access may be used along existing corridors, thereby minimizing the potential for increased erosion and contribution of suspended sediments in the streams. Therefore, less risk for impact to fish habitat is associated with smaller proportion of new corridor relative to the total corridor length.

- o Type of terrain

  Runoff potential and resulting erosion increases on steeper slopes. Steeper slopes are assumed to present a higher risk for impact than level terrain.

- o Length of stream paralleled

  If a proposed line closely parallels or crosses a stream, there is increased potential for erosion. Therefore, it was assumed that the risk of impact increases as the distance between the corridor and a stream decreases. It was also assumed that the risk increases as the distance parallel to a stream increases.

- Presence of anadromous fish species

  Alternative corridors that cross or parallel streams which are inhabited by adult or juvenile anadromous fish species are considered to be more important than streams which are not inhabited by anadromous fish species, (Resident fish such as rainbow trout and grayling are also very important in many of the streams. However, because little or no information is available on the resident species in many of the streams, it was assumed that all streams have resident fish). Primary emphasis in this evaluation however, is placed on anadromous species because of their high commercial and sport value.

  Three categories of streams were considered, based on the available data. These are those streams known to be inhabitated by anadromous species, those known not to be inhabited by anadromous species, and those for which the presense of anadromous species has not been determined. Alternative corridors which could potentially affect anadromous species were assumed to be less suitable than those which affected streams either not inhabited by anadromous species or the status is currently not known.

7.3.3 Land Ownership

Certain types of ownership, such as native and private, generally present more restrictions and higher acquisition costs than others. In addition, private and native landowners often object to transmission lines on their property because they may limit future development and use. Land use classifications used to evaluate potential land ownership impacts include:

- Private
- Native
- Borough/Municipal
- Federal
- State

The criterion used to evaluate land ownership impacts was:

- o Miles crossed by ownership

  The number of miles of transmission line corridor crossing each land ownership classification was inventoried for each alternative corridor. Proposed or planned land conveyances include state land becoming private, as with state land disposals; federal land transferring to state, as with the railroad; and state or federal land transferring to native ownership (see maps).

7.3.4 Land Use

Land use considerations were of particular importance in the South Study Area because of the extent of existing developments and rapid growth occurring relative to other areas.

The criterion used to evaluate land use impacts was:

- o Miles crossed by land use

  Land uses are important to corridor selection in terms of the compatibility with neighboring uses. Existing and proposed land uses were identified and alternative corridors evaluated for compatibility. Only existing land uses were inventoried, planned or proposed uses were discussed qualitatively in comparing the alternatives.

The land use classifications utilized for this analysis were:

- Residential
- Recreation/Wildlife
- Agricultural
- Commercial/Industrial
- Public
- Vacant

7.3.5 Aesthetic Resources

Aesthetic resources were important in comparing alternative transmission line corridors. The linear nature of the proposed line's design, tower height and right-of-way clearing requirements can result in visual impacts. These areas were noted and the potential for impacts evaluated. Specific criteria used in evaluating the alternatives were scenic quality, visual sensitivity and visual compatability. For additional detail see the Visual Resouce Assessment Report done for this study (Jones and Jones, 1983).

o Visual Quality

Visual quality is a measure of the inherent attractiveness of a given landscape character type. Values generally range as high, moderate or low and are classified based on a number of visual characteristics (see Jones and Jones, October, 1983 and FERC License Application, Exhibit E, Chapter 8). In general, the classification is based on the premise that those landscapes with the most variety or diversity have the greatest potential for high scenic value.

- Visual Sensitivity

Viewer sensitivity is the level of awareness of different viewer groups to the visual environment. Viewer response to visual resource change is a function of viewer exposure to the landscape and viewer sensitivity to its characteristics. Project visibility or viewer exposure results from the number of viewers, their location and distance from the project, the topographic position of the viewpoint, the frequency of view, and speed of viewer travel (Jones and Jones, 1983).

Viewers engaged in activities that require visual amenity, or that are enhanced by it such as recreational pursuits, will be far more sensitive to visual impacts than persons involved in activities that are unrelated to the visual quality of an area.

The principal viewer groups in the project study are residents, recreationists, and highway and railroad travelers. Where possible, the numbers of people within each group was estimated.

The visibility of the transmission line and right-of-way plays a major role in viewer sensitivity. If facility visibility is reduced or blocked due to vegetation and topographic screening, viewer response to the landscape change will be neutral. In addition, viewing distance is a key parameter in determining visual impact. Earlier studies have indicated that transmission facility prominence declines with distance. At a distance beyond three miles, transmission facility visibility is quite low for 345 kV steel towers (Jones and Jones, 1983).

- Visual Compatibility

  The visual compatibility of a proposed transmission facility is the degree to which the facility appears to blend into its landscape setting, independent of the visual quality of that setting. Landform and landcover (water, vegetation, and land use) characteristics affect the ability of a given setting to visually absorb a transmission facility (Jones and Jones, 1983).

  Visual compatibility also depends upon the characteristics of the proposed transmission facility: tower design, color and height, spacing, conductor sag, right-of-way width, and vegetation management within the right-of-way. The visual compatibility of the proposed towers and right-of-way design with combinations of these landscape elements was evaluated. Details on the criteria used for evaluation are described in the Visual Resource Report (Jones and Jones, 1983).

7.4 RANKING OF CATEGORIES AND CRITERIA

To aid in future resolution of conflicts between alternatives with respect to resource categories and criteria, ranking of both resource categories and the criteria within categories has been done by the environmental study team. These rankings were developed based on: the general levels of concern expressed by the public and agencies for the various resource values treated; Alaska Power Authority policies; potential significance of specific impacts; and, presently perceived likelihood of occurrence of impacts. Rankings and the rationale used in establishing them are briefly discussed below.

7.4.1 Ranking by Resource Category

Amoung the resource categories, land ownership and land use were established jointly as the most important factors to be considered in evaluating the alternative corridors. This reflects concerns expressed by the public and by resource agency personnel regarding potential impacts to private landowners, residential property, recreational areas and wildlife refuges. It further reflects Power Authority concerns, particularly in regard to avoiding routes through private and native ownerships and land conveyances due to the complicated and time-consuming procedures involved in acquiring such land.

Terrestrial resources were ranked second in importance due primarily to the relatively high likelihood of occurrence of terrestrial habitat impacts and high potential for significance of impacts when compared to the remaining two categories.

Aesthetic resources were ranked third in importance. Although of relatively high significance, both in terms of public/agency concern and potential for occurrence, aesthetic impacts are generally easier to mitigate and less direct or irreversible than are land ownership and vegetation/wildlife impacts.

Finally, fisheries resources were ranked fourth. Assuming appropriate design and construction practices are followed, in consideration of identified mitigation measured (FERC Susitna License Application, Exhibit E, 1983), impacts to fisheries are considered to be the least potentially significant and to have the relatively lowest likelihood for occurrence.

7.4.2 Rankings Within Categories

As presented below, the criteria within each category are ranked in order of highest importance (least suitable for siting of a transmission line or highest potential for impact) to lowest importance (most suitable or lowest impact potential).

- o Land Ownership

  Criteria, in order of most to least important are as shown below. This ordering is in keeping with Power Authority policy and generally reflects differences in levels of difficulty in procurement of rights-of-way by ownership:

  - Native/Private
  - Borough/Municipal
  - Federal
  - State

- o Land Use

  Criteria rankings reflect differences in suitability/compatibility of transmission lines to existing uses. Thus, heavily populated, developed residential land would be considered least suitable while vacant or industrial lands would be considered most suitable. The selected preliminary ranking is:

  - Residential
  - Recreation/wildlife
  - Public
  - Agricultural
  - Commercial/Industrial
  - Vacant

- Terrestrial Resources

The most important criterion in evaluating the environmental suitability of the various alternatives in terms of terrestrial resources is miles of new corridor/access. In addition to the fact that a completely new corridor development will impact previously undisturbed habitat, the opening up of new areas to access can often result in secondary problems such as increased hunting and poaching, habitat destruction, and disturbance of sensitive wildlife species during critical life cycle periods.

Wetlands, because of their importance to many species of wildlife, fragile nature and special regulatory status are ranked second among the terrestrial resource criteria.

Bird collision potential, and raptor and swan nest sites are ranked equally below the two previously discussed criteria. While either of these two could potentially be serious, opportunities for minimization or avoidance of impacts through careful final selection of alignments within a corridor is high.

Forest habitat is considered fifth most important criterion in this category but close to the latter two in importance. This is due to the previously discussed impacts to these plant communities.

o Fisheries Resources

In considering the suitability of alternative transmission line corridors from the perspective of potential effects to fishery resources, the most important criteria are those with the greatest risk of increased erosion. With this as the main consideration, the proportion of corridor length, the number of streams crossed, the types of terrain traversed, and the length of streams paralleled in proximity to the corridors were given equal and highest consideration.

The potential for increased fishing pressure due to increased access to areas afforded by the corridors was given somewhat less importance than the criteria associated with the potential for increased erosion. This potential effect is associated only with those areas for which new access to the areas is anticipated. This was given somewhat less importance because this criterion is associated with only portions of the alternatives, whereas, the potential for increased erosion is associated with the entire length of all alternative corridors.

o Aesthetic Resources

The most important aesthetic resource criterion is visual sensitivity. This specifically relates to viewer numbers and viewer contact (facility visibility and viewpoints). The magnitude of the visual impact is dependent on the line being visible and on how many people view it. Other factors related to visual sensitivity are the duration of view, viewing position, and the activity people are engaged in.

Visual quality is considered second in importance closely behind visual sensitivity. Trade offs between moderate levels of visual sensitivity and visual quality is often subject to discussion. Generally, the area of lower sensitivity and visual quality is often subject to discussion. However, the area of lower visual sensitivity generally will be preferred.

Visual compatibility defined previously relates to how great the potential for visual change may be. This relates to the degree of significance of impact rather than the impact itself, and can often be mitigated. Therefore, visual compatibility was ranked third among the three criteria.

7.5 SUMMARY OF FINDINGS

The large number of alternative corridor segments and combinations of segments into alternative routes, along with the number of resource categories and criteria against which these alternatives have been evaluated, makes a comprehensive presentation of findings both voluminous and cumbersome to read. Therefore, detailed environmental descriptions of each alternative route are presented as Appendix R to this volume and the following summary describes only the major findings of the environmental evaluation of alternatives. Tables 7-3 and 7-4 present the tabulated results of the suitability criteria analysis as a convenient reference for this summary. The alternatives and sections referred to below have been described in Chapter 4.

7.5.1 South Study Alternatives

Land Ownership Comparison

- **Parallel Alternatives**

  The FERC route (Alternative A) crosses only 2.0 miles of private land, compared to 5.1 miles and 11.5 miles for the Little Susitna (Alternative B) and MEA/CEA routes (Alternative C), respectively. The FERC route does not cross native lands, whereas the Little Susitna route crosses 2.6 miles of native land, and the MEA/CEA route crosses 4.4 miles of native lands. Given these relatively large differences for the most sensitive ownership categories, the preferred parallel alternative from a land ownership perspective is the FERC route (Alternative A).

- **North Palmer Options**

  The East Palmer Option crosses 8.5 more miles of private land than the Trunk Road/Kepler Lakes Option, and 9.6 more miles than the Trunk Road/Glenn Highway Option. It also crosses 4.6 miles of native land, compared to the same figure for Trunk Road/Kepler Lakes and 1.3 miles for Trunk Road/Glenn Highway. The East Palmer Option is clearly the least preferred route from a land ownership perspective based on private/native lands as the least suitable land ownership criteria.

  In comparing land ownership between the other two North Palmer Options, the Kepler Lakes route affects 1.1 miles more of private land, 3.3 miles more of native land, and 3.6 more miles of highly developable borough land than the Glenn Highway route. While some of the state land along the latter

route is within the Palmer Hay Flats State Game Refuge, from a land ownership perspective the Trunk Road/Glenn Highway route is preferred due to the private and native land differential.

- o Split Alternatives

  Summaries of potential land ownership impacts for the six split alternatives are listed in Table 7-3. The North Palmer Option used for all land ownership comparisons was the Trunk Road/Glenn Highway route which was judged to be the preferable option. The FERC/North Palmer route (Alternative D) crosses the least amount of private and native lands and is therefore the preferred split alternative from a land ownership perspective.

- o Parallel/Split Comparison

  Overall, the FERC Parallel route (Alternative A) is most preferable. This alternative crosses 3.1 miles less private land than the Little Susitna route (Alternative B), and 16.5 miles less private land than the FERC North/Palmer route (Alternative D). The FERC Alternative does not cross any native land, whereas the Little Susitna route crosses 2.6 miles of native land. The FERC/North Palmer route crosses 8.9 miles of native lands in total. Therefore, from a land ownership perspective, the development of two parallel circuits along the FERC route is the preferred system alternative for the South Study Area.

Land Use Comparison

o Parallel Alternatives

The FERC Alternative does not cross residential land but does traverse recreational land (the Susitna Flats State Game Refuge and Willow State Recreation Area), and agricultural land (Point MacKenzie Agricultural Project). The MEA/CEA route (Alternative C) traverses some residential land and some recreational land (Goose Bay State Game Refuge). The Little Susitna Alternative also crosses residential and recreational land. These impacts, however, are peripheral effects and are not considered as significant as if they were crossed directly.

Of the three routes, the FERC route minimizes residential effects while crossing the most recreational and agricultural lands. The Little Susitna route presents nearly the reverse situation, with the greatest residential effects, and minimum effect on recreational and agricultural lands. The MEA/CEA route is essentially a compromise involving moderate residential and recreational effects and minimum agricultural effects (see Table 7-3).

In the absence of known agency policy positions, the three routes could be considered nearly equal and uniformly acceptable from a land use perspective. There are existing oil and gas explorations and the Enstar gas pipeline route on Susitna Flats, as well as existing transmission lines across both the Susitna Flats and Goose Bay Refuges. Based on the established ranking for this study, the FERC route should probably be regarded as the preferred Knik Arm alternative because it impacts the least residental land. Some route modifications near Point MacKenzie might be required to reduce agricultural and residental impacts.

- North Palmer Options

  The East Palmer Option crosses 2.3 more miles of residential land than either the Trunk Road/Kepler Lakes Option or the Trunk Road/Glenn Highway Option. For this reason, it was not considered further, even though it crosses less agricultural lands than the other two. The Kepler Lakes and Glenn Highway Options are similar in land use except for the latter's recreation/wildlife lands. The Glenn Highway Option crosses more of these than the Kepler Lakes Option (see Table 7-3). Therefore, from a land use perspective, the Trunk Road/Kepler Lakes Option is preferred.

- Split Alternatives

  The FERC/North Palmer Alternative, with the Kepler Lakes Option, crosses less residential land than the FERC/South Wasilla route, the next lowest with respect to residential impacts. From the inventoried tabulations listed in Table 7-3, the MEA/CEA split alternatives (Alternative H and Alternative I) appear to be the best compromise if land uses were considered equal in importance. However, based on the determination that residential land use is the most important criteria, the FERC/North Palmer Alternative was selected as the preferred split alternative. Future residential development based on the rapid growth occurring in the Teeland and Wasilla areas was also a consideration in selecting the FERC/North Palmer Alternative.

- Parallel/Split Comparison

  Overall, there is little mileage difference within the various parallel alternatives and within the split alternatives making selections difficult. However, there is significant difference between the parallel alternatives and the split alternatives.

  The North Palmer route affects 3.6 more miles of residential land, and a small portion of commercial land and other public land than the FERC route. The FERC route crosses more agricultural and recreational land. While these factors are significant, the mileage of existing and probable future residential development along the North Palmer route in the Wasilla-Palmer area and from Eklutna to Eagle River indicates that this route would have an overall greater impact on land uses.

  Based primarily on the rationale of avoiding residential lands, all three of the parallel alternatives would be preferred over the FERC/North Palmer split alternative.

Terrestrial Resources Comparison

- Parallel Alternatives

  The FERC Alternative includes about 900 acres of wetlands within its ROW. The Little Susitna and MEA/CEA Alternatives, because of their shorter lengths, have about half as much wetland acreage. The acreage of altered forest habitat is similar for the three alternatives.

The FERC Alternative creates 39 miles of new corridor, while the Little Susitna Alternative creates 23 miles, and the MEA/CEA Alternative has only 4 miles. The new corridors within the FERC and Little Susitna Alternatives pass through areas and would increase access to these areas. The MEA/Chugach Alternative creates almost no new access.

All three alternatives traverse good waterfowl and other water bird habitats. Collision potential is somewhat proportional to the length of line that traverses wetlands. Also the net increase in collision potential is higher where a new corridor is established compared with placing a circuit parallel to an existing one. The FERC Alternative includes the greatest number of miles in both categories. However, the MEA/CEA Alternative crosses, and the Little Susitna borders, the Goose Bay Wildlife Refuge which contains seasonal waterbird concentrations; this area is avoided by the FERC alternative.

The MEA/CEA Alternative clearly has the least potential for terrestrial impacts because it crosses the smallest area of wetlands and parallels existing corridors, limiting disturbance and access to less developed areas. Although it crosses the Goose Bay Refuge, it parallels the 138 kV Chugach transmission line in this segment minimizing the incremental collision potential.

- <u>North Palmer Options</u>

  The acreage of wetlands is very similar in all three routes, but the Trunk Road/Glenn Highway Option crosses valuable palustrine emergent, riverine, and estuarine wetlands in the Palmer Hay Flats Wildlife Refuge. Compared to the Trunk Road/Glenn Highway Option, the East Palmer route has twice as much altered forest habitat (466 vs. 225 acres) and total vegetation acreage (593 vs 319) (Table 7-3). The Trunk Road/Kepler Lakes Option is intermediate with 321 acres of altered forest habitat and 443 acres of total vegetation.

The North Palmer Option would create 25 miles of new corridor, the Trunk Road/Kepler Lake Option 18 miles, and the Trunk Road/Glenn Highway Option only 10 miles. Since the areas are developed, none of the options would produce a significant increase in access. The Trunk Road/Glenn Highway Option has a greater potential for bird collisions since it crosses the Palmer Hay Flats Wildlife Refuge, an area of concentrated waterfowl use during migration.

The Trunk Road/Kepler Lakes Option is preferred because it has less wetlands, forest habitat, and new corridor acreage in the ROW than the East Palmer Option, and it avoids the Palmer Hay Flats Wildlife Refuge and the more valuable wetlands crossed by the Truck Road/Glenn Highway Option. This option will be used in comparison with overland Knik Arm alternatives.

- Split Alternatives

The extent of wetlands crossed by the split alternatives is highest for the two corridor alternatives incorporating the FERC route (659 and 753 acres). The alternatives with the smallest amount of wetland acreages are the combinations of the Little Susitna or MEA/CEA routes with the North Palmer corridor (413 and 368 acres). Acreage of forest habitat within the ROW is highest for the split alternatives including the North Palmer route (1769 to 1899 acres) and lowest for those alternatives that include the South Wasilla route (1515 to 1601 acres).

Alternatives differ considerably in the lengths of new corridor they contain. The FERC/North Palmer Alternative contains the greatest length of new corridor - about 80 miles - while the MEA/CEA-South Wasilla Alternative contains only about one-quarter of this length, most of which is relatively accessible. The Little Susitna-South Wasilla and MEA/CEA-North Palmer Alternatives contain only about half the new corridor contained by the FERC-North Palmer Alternatives.

With the exception of the North Palmer route, much of the area in which the alternatives are located contain waterfowl nesting and molting habitat, and the danger of bird collisions is somewnat proportional to the length of line and number of lines in these areas. The greatest potential for bird collisions is in the Goose Bay and Palmer Hay Flats State Game Refuges, which are not only nesting areas, but attract concentrations of birds during migration. Alternatives with the South Wasilla corridor cross the Palmer Hay Flats State Game Refuge. The Little Susitna transmission corridor alternative crosses one edge of the Goose Bay State Game Refuge, and the MEA/Chugach Parallel goes directly across the middle of the Goose Bay State Game Refuge. Alternatives combining these corridors have potential for bird collisions in both areas.

Among the split alternatives the MEA/CEA-North Palmer and MEA/CEA-South Wasilla Alternatives have the lowest potential for terrestrial impacts. The former has the lowest acreage of wetlands and the latter has the smallest length of new corridor. Both alternatives are low in both categories. Because the MEA/CEA-North Palmer Alternative has a lower potential for waterfowl mortalities than the MEA/CEA-South Wasilla Alternative, it is slightly favored.

However, extending the South Wasilla to the north and further to the east in the vicinity of the Palmer Hay Flats would probably result in this alternative being favored.

- o Parallel/Split Comparison

  The parallel circuit MEA/CEA Alternative is preferred over any of the other parallel or split alternatives, primarily because it has the fewest miles of new corridor and would result in almost no increase in access and is low in terms of wetland and forest habitat modifications.

Fisheries Resources Comparison

- o Parallel Alternatives

  The FERC Alternative has the least number of crossings (approximately 11) of water bodies with the MEA/CEA Alternative having the most (approximately 18). All alternatives make a major crossing of Knik Arm. The terrain for all alternatives is relatively flat, and therefore, potential for erosion and sedimentation for all alternatives would be similar. No stream is paralleled within 500 feet for any significant distance for any alternative. New access would be created for the FERC and Little Susitna Alternatives, whereas existing access would be used for a major portion of the MEA/CEA Alternative. Although the number of streams crossed with the MEA/CEA Alternative is somewhat greater, any problem areas should be more readily identifiable for the existing route than for new routes and mitigative measures should thus be more readily anticipated and applied than in areas where no construction has previously taken place. Therefore, the MEA/CEA Parallel is preferred.

- North Palmer Options

  The East Palmer and Trunk Road/Kepler Lake Options are similar and either could be used. The Trunk Road/Glenn Highway Option has a slightly higher preference because the number of streams crossed is slightly less.

- Split Alternatives

  When making this comparison, the main differences are the type of terrain encountered, the number of streams crossed, resources involved, risks involved, and access. The number of streams or water bodies crossed range from approximately 29 with the FERC/North Palmer (Trunk Road/Glenn Highway Option) to 44 for the Little Susitna/South Wasilla Alternative. Most of the terrain is relatively flat for all alternatives except those that include Segment 9, which passes through a sloped area with numerous small streams and creeks nearby. Segment 9 could require more cut-and-fill construction compared to work in more level terrain. For this reason, the North Palmer Alternatives are least preferred. Between the remaining alternatives, the MEA/CEA-South Wasilla Alternative is preferred because it makes use of existing ROW's. Thus, any existing problem areas should be more recognizable and mitigative techniques more readily anticipated and applied than in areas where no construction has previously taken place.

- Parallel/Split Comparison

  In general, a parallel circuit would be preferred because fewer streams would be crossed. Also, any route that follows an existing corridor is preferred because access is already established and any potential problem areas are more readily identified and mitigative measures applied. Therefore, the MEA/CEA Parallel is preferred over other alternatives because it uses an existing route for a major portion of its length and is a parallel circuit.

Aesthetic Resources Comparison

(Reference Jones and Jones report: Susitna Transmission Line Visual Resource Assessment October, 1983.)

7.5.2 North Study Alternatives

Route mileage across private and native land is used as the primary evaluation criterion in this assessment. Crossing private/native land would potentially create direct effects on landowners, hence would involve the greatest negotiation requirements in ROW acquisition. Federal and state lands that are not to be transferred to non-public ownership generally represent the most favorable condition, although unresolved issues or problems with such lands do exist in certain cases (See maps 15 and 21).

- o Healy to Anderson Alternatives

  In the Healy-Anderson subarea, the Healy East Option has a distinct advantage over the FERC Route (Alternative A) and the GVEA Route (Alternative B) because it crosses no existing private or native lands. A remote parcel, however, proposed by the state is crossed by Segment 7 of the Healy East Option.

- o Anderson to Little Goldstream Alternatives

  The GVEA route Alternative from Anderson to Little Goldstream crosses significant amounts of both private and native lands (table 7-4), thus the FERC route (Alternative C) is the best alternative in this area. The extent of state lands designated for disposal along the GVEA route further reinforces the advantages of the FERC route.

- o Little Goldstream to Ester Alternatives

  In the Little Goldstream-Ester subarea, the FERC route (Alternative E) has a clear advantage on the basis of private land mileage and number of private parcels crossed. This is offset somewhat by native land crossings. Overall,

the FERC route would have to be considered somewhat better from a land ownership perspective.

- Anderson to Wainwright Alternatives

  The South Tanana Ridge route (Alternative G) crosses fewer miles of private and native land compared with the Tanana Flats route (Alternative H). While the mileage figures and private parcel counts are small in both cases, the Tanana Flats Alternative is preferable. Alternative I, which routes into Wainwright from Ester, is the least preferred because it crosses private land in addition to alternatives in the Anderson-Little Goldstream and Little Goldstream-Ester subarea.

- Ester/Wainwright Comparison

  Either of the southerly routes (South Tanana Ridge or Tanana Flats) to Wainwright would be preferable to the FERC or Goldstream routes based solely on land ownership figures presented in Table 7-4. A southerly approach directly to Wainwright would involve relatively little private and native land, compared to the FERC and Goldstream routes. The latter two routes would still cross more than three times as much private and native land even if these routes terminated at Ester.

One unresolved issue concerns military ownership south of the Tanana River. Crossing public land is generally preferable to crossing private lands, but a right-of-way request across the U.S. Air Force land could be refused, particularly across the Blair Lake Air Force Bombing Range. In an informal meeting held with military representatives on the subject, no objections were made regarding the alternatives across military land. However, in the absence of knowing the

military's formal position, it is concluded that the South Tanana Ridge or Tanana Flats route would be best from a land ownership perspective.

Overall, the best complete alternative from a land ownership perspective would appear to consist of the Healy East Option and Segment 9 of the FERC route, plus the Tanana Flats route from Anderson to Wainwright.

Land Use Comparisons

The low level of development between Healy and Fairbanks makes it rather difficult to distinguish advantages on the basis of existing land use, as none of the alternatives would involve very lengthy crossings of developed areas. One or more of the alternatives would have some disadvantages in certain portions of the study area, but these differences are generally small.

- Healy to Anderson Alternatives

  The Healy East Option is preferable to the other two alternatives in this area, as it would avoid the agricultural area near Healy and have considerably less effect on land disposals. In the absence of access controls, construction and maintenance access would potentially increase development pressures.

- Anderson to Little Goldstream Alternatives

  The FERC route (Alternative C) is clearly the most advantageous routing from Anderson to Little Goldstream, as it would cross no existing or planned development. Access would not significantly affect development pressures because the route is still relatively close to the Parks Highway (existing access).

- Little Goldstream to Ester Alternatives

  Virtually no existing land use related distinction can be made between the FERC (Alternative E) and Goldstream (Alternative F) Alternatives to Ester, as neither cross developed land but do cross several miles of proposed disposal areas. The FERC route may be slightly less favorable, on the basis of more mileage through planned industrial and agricultural areas and greater proximity to residential area. However, the Goldstream Valley route is expected to see more residential growth in the future.

- Anderson to Wainwright Alternatives

  The Tanana Flats route (Alternative H) appears to be the best southerly alternative to Wainwright by a very small margin. The South Tanana Ridge route (Alternative G) would cross an industrial site, two small agricultural parcels, and come in closer proximity to existing and planned residential uses in the Chena Ridge area southwest of Ester (Map 22).

- Ester/Wainwright Comparison

  Overall, the Healy East Option combined with the Tanana Flats route to Wainwright (Alternative H), would appear to represent the best complete alternative. This would only affect the existing commercial tract south of Wainwright and three planned disposals south of Anderson (Map 22). The possible bomb contamination of the Blair Lake Air Force Range along this route, however, is a significant issue. If this route is eliminated as a result, the South Tanana Ridge route (Alternative G) appears to be the second-best alternative from a land use perspective. The South Tanana Ridge Alternative is preferable to either route through Ester because

the latter alternatives would have much more significant land use effects within the Fairbanks area and on planned developments to the west.

Terrestrial Resources Comparison

- Healy to Anderson Alternatives

  The GVEA Parallel (Alternative B) and the Healy East Option are similar in acreage of potential wetlands within the ROW (593 and 614 acres, respectively), but the FERC route (Alternative A) has more potential wetlands (766 acres), (see Table 7-4). The GVEA Parallel also has the lowest acreage of forest habitat.

  Miles of new corridor are similar for the FERC Alternative and the Healy East Option (34 and 42 miles, respectively). The GVEA Alternative parallels existing transmission lines and the highway for most of its length, and provides only 2 miles of new corridor. The FERC route parallels the GVEA line, the highway and the railroad, and provides new access only in the area of the Tanana Flats. The Healy East Option provides new access to relatively undeveloped areas for the entire 42 miles.

Potential for bird collisions is similar for all three routes, but the FERC route passes near a bald eagle nest (Map 19).

The GVEA Parallel is preferred primarily because it parallels existing routes and does not disturb or provide access to undeveloped areas. It would also minimize wetland disturbance among the alternatives. The FERC route is a second choice but would also be acceptable.

- Anderson to Little Goldstream Alternatives

  The GVEA Parallel (Alternative D) crosses about 200 acres of potential wetlands; the FERC route (Alternative C) crosses over 700 acres. Altered forest habitat is also highest for the FERC Alternative (see Table 7-4).

  The FERC route (Alternative C) has 24 miles of new corridor, while the GVEA Parallel has no new corridor and is close to the highway. The FERC route crosses relatively undisturbed areas and provides new access.

  The potential for waterfowl collisions is about the same for all routes, but the FERC route (Alternative C) passes within 1-2 miles of a peregrine falcon, bald and golden eagle nesting area.

  The GVEA Parallel is preferable as it crosses less potential wetland, follows existing development corridors, does not provide new access, and avoids the peregrine falcon and eagle nesting area.

- Little Goldstream to Ester Alternatives

  The FERC Alternative and the Goldstream Alternative both include approximately 36 acres of potential wetlands in this subarea, but the Goldstream Alternative would alter 910 acres of forest vegetation as compared to 681 acres on the FERC route.

  The Goldstream Alternative has 38 miles of new corridor and provides new access to a relatively undisturbed area, while the FERC route has only 14 miles of new corridor and largely parallels existing transmission lines and the Parks Highway.

  The FERC route is strongly preferred because it has less new corridor, parallels existing development corridors, does not provide significant new access to undisturbed areas, and has less potential for impacts to forest habitat.

- Anderson to Wainwright Alternatives

  The Tanana Flats Alternative has more potential wetland acreage in the ROW (985) more than the Tanana Ridge Alternative (820), but less forest habitat (908 vs. 1140 acres). For U.S. Army Corps of Engineers regulatory purposes, the entire Tanana Flats area is considered wetlands.

  The length of new corridor is almost the same for the two routes, and both provide new access. However, the Tanana Ridge route is in an area which is being logged and where logging, residential, and possibly industrial development are expected to increase. The Tanana Flats, on the other hand,

is managed as an undeveloped area and is likely to remain so. The potential for bird collisions is higher on the Tanana Flats route, but the Tanana Ridge route is close to two peregrine falcon nest sites. The Tanana Flats line may interfere with prescribed burning for moose habitat enhancement.

Both routes are less desirable from the viewpoint of vegetation and wildlife, but the Tanana Ridge route would be preferable if the route could be shifted away from the peregrine nest sites.

- Ester/Wainwright Comparison

  The most desirable, complete alternative with respect to minimizing impacts on terrestrial resources would be the GVEA Parallel to Little Goldstream (Alternative B and D), and the FERC route to Ester (Alternative E), with or without the Fairbanks segment to Fort Wainwright.

Fisheries Resource Comparisons

- Healy - Anderson Alternatives

  Among these routes, the GVEA Parallel (Alternative B) is recommended because access is already established, and less streams/rivers are crossed than the FERC route or Healy East Option. Also the terrain is relatively level, therefore decreasing the need for cut and fills that could increase the risk for erosion and sedimentation.

- Anderson - Little Goldstream Alternatives

  The GVEA Parallel (Alternative D) is preferred because fewer streams are crossed, the terrain is relatively level and access is already established. Also, any problem areas (such as areas of potential erosion) are more readily identifiable and thus, planning and implementation of mitigative measures should be easier.

- Little Goldstream - Ester Alternatives

  The incremental increase in potential impacts due to placement of the corridor would be expected to be less with an existing corridor than with an entirely new corridor. Therefore, because the FERC route parallels an existing route for a considerable portion of its length, this alternative is preferred.

o Anderson - Wainwright Alternatives

The Tanana Ridge Alternative would be somewhat longer in distance but would traverse fewer streams than the Tanana Flats Alternative. Between the two alternatives, there is no clear preference. However, because fewer streams are crossed, the Tanana ridge route would present less risk than the Tanana Flats Alternative.

o Ester/Wainwright Comparison

Overall, the preferred total alternative with respect to least impact to fisheries resources would appear to be the GVEA Parallel to Little Goldstream, and continuing with the FERC route into Ester (Alternatives B, D, and E). Following an existing route would tend to decrease potential risks associated with access, compared to new access to streams that could occur with the Wainwight Alternatives.

Aesthetic Resource Comparisons

Reference Jones & Jones Report, Susitna Transmission Line Visual Resource Assessment, October 1983.

7.6 POTENTIAL FOR MITIGATION

The intent of the discussion of mitigtion measures in this report was to identify such measures that could change the resource evaluation/comparison results previously addressed. In the absense of detailed field investigations, general mitigation measures identified in the Susitna License Application were reviewed. The result of this was that except for avoidance or route refinement measures, the application of these mitigation measures would not affect the routes significantly enough to change the outcome of the resource evaluations.

Avoidance and route refinements were considered in the resource evaluation/comparison analysis. The general mitigation measures which are applicable to the transmission line alternatives being evaluated in this report can be referenced in the Susitna License Application under the appropriate resource sections in Exhibit E, and in the Visual Assessment Report completed for this study.

Specific mitigation measures would be developed after the preferred route is identified, and detailed design and resource field studies are completed.

7.7 PERMITS

Permits are discussed here in general terms, based upon experience with similar projects. The potential applicability and requirements for each permit are described. Many of the permits required are common to most of the altneratives, such as the U.S. Army Corps of Engineers, Section 404 Dredge and Fill Permit regarding construction in wetlands. Other permits are more specific to the alternatives, such as the Alaska Statute (AS) Title 16 Permit required for those altnernatives that cross state game refuges. A more detailed description of specific permit requirments will be prepared following final route refinements.

U.S. Army Corps of Engineers, Section 404 Dredge and Fill Permit

Pursuant to Section 404 of the Federal Water Pollution Control Act, discharges of dredged or fill material into waters of the United States must be authorized by a Section 404 permit issued by the U.S. Army Corps of Engineers. These waters include navigable waters, lakes, rivers, streams, tributaries, adjacent wetlands, isolated wetlands and lakes, intermittent streams, and other waters. Some of the project may be covered by a nationwide permit for buried cable and for repair or maintenance of an existing transmission line. However, if the design calls for new access roads or pads for support structures in wetlands, a Section 404 permit will be required.

The permit application must include a detailed description of the project, includng cross-section drawings, quantities of fill to be used, locations, soils data, wetlands, etc. Names and addresses of adjoining property owners must also be provided.

U.S. Army Corps of Engineers, Section 10 Navigable Waters Permit

Pursuant to Section 10 of the River and Harbor Act of 1899, construction of any structure in or over any navigable water of the United States, or dredge and fill activities in such waters, requires a Section 10 permit.

Alaska Department of Natural Resources, State Lands Right-of-Way Permit

According to Section 38.05.330 of the Alaska Statutes when crossing state lands, whether to gain access for construction, maintenance or for a permanent structure, requires a right-of-way or easement permit from the Alaska Department of Natural Resources (DNR). A permit application must be filed with DNR and include a description of the width, length, and nature of the right-of-way needed. Separate permit applications will be required for: 1) temporary rights-of-way for construction; 2) permanent access for line maintenance; and 3) permanent transmission line structures. It will also be necessary to define the use restrictions. This permitting process includes an inter-agency review that usually establishes the restrictions.

Alaska Department of Transportation and Public Facilities, Utility Permit

Pursuant to Title 17, Chapter 15 of the Alaska Administrative Code, the placement, construction, or maintenance of a transmission line within or across a state highway right-of-way requires a utility permit from the Alaska Department of Transportation and Public Facilities (DOT). An application must be filed with the Division of Highways and include detailed plans showing where the line will be within the highway right-of-way.

The permit process is initiated by writing to the Railroad Engineering Department and providing project construction plans, including typical cross-sections for crossings, amount of power, total number of lines, total voltage, and slack between the plans. The Alaska Railroad is being sold by the federal government to the State of Alaska, but requirements for the permit will not change.

Other Permits

Other permits and approvals may be necessary, depending upon the exact location of the line, construction plans, and mitigation measures. The U.S. Federal Aviation Administration for example, must approve any structures that exceed a given height if the structures are within the approach area of an airport. The Alaska Department of Environmental Conservation (ADEC) issues activities related to construction camps, such as permits for solid waste and waste water disposal. DEC also has jurisdiction for air pollution control, and must approve plans for prescribed burning if burning is used to dispose of materials resulting from clearing the right-of-way. The U.S. Environmental Protection Agency (EPA) requires a Spill Prevention and Countermeasure Plan for any project involving a given level of oil storage. Additional permits and approvals may also be necessary. That determination will be made after the final route selection.

7.8 AGENCY, NATIVE AND PUBLIC COMMENTS

As a part of the initial planning process, preliminary corridors identified for the South and North Study Areas were presented to agencies and groups in informal and open public meetings. The focus of these meetings was basically on gathering information and discussing the intent of the study, since at the time little data on the alternative routes had been analyzed with respect to evaluation and findings.

Few comments on the routes from agencies and groups were received. Public comments on the alternatives were also few.

Despite sufficient notice, the six public meetings were not well attended. The notification process included public service announcements, press releases, display advertising, and direct mailing. Comments received were summarized and considered by specialists involved in the analysis of each resource category and in the overall decision-making process.

Agency and native group comments have been summarized in Appendix M. Information given includes: agency, dates, and the relevant comment or issue. The public participation effort is summarized in Appendix P.

7.9 ENVIRONMENTAL CONCLUSIONS

Evaluation and comparison of the environmental data collected identified numerous trade offs within resource categories. This is indicated in general terms by Tables 7-5 and 7-6, which summarize the alternatives with respect to high, moderate or low potential impact.

The impact ratings were applied based on the inventoried data in Tables 7-3 and 7-4, and on qualitative evaluations of the relative significance of the potential impacts. The impact ratings indicate that in certain situations, potential impacts may be moderate or high for all the alternatives for a given resource, even though a preferred alternative was selected.

With many trade offs possible, and in the absence of a final weighting and scaling step, preferred alternatives have been identified from each environmental resource category. These preferred alternatives are presented in Table 7-7.

Based on the resource evaluations and comparisons discussed, the following conclusions can be made.

7.9.1 South Study Area

Parallel Alternatives

- The parallel alternatives present significantly less overall environmental impact than the split alternatives. However, the parallel alternatives do not address the reliability issue of a common mode failure of the submarine cables under Knik Arm.

- Land ownership impacts on private/native land is least with the FERC route (Alternative A).

- Land use impacts present a number of trade offs between alternatives; depending on the approach or preference taken, any of the three could be suitable.

- Terrestrial impacts appear to be more significant with the FERC route and least with the MEA/CEA Parallel (Alternative C).

North Palmer Option

- Impacts were considered less for the Trunk Road/Kepler Lakes Option (Option 2) for all resource categories except land ownership. The Trunk Road/Glenn Highway Option was preferred from a land ownership perspective.

- The Trunk Road/Glenn Highway Option (Option 3) was not significantly different from the Trunk Raod/Kepler Lakes Option with respect to land use.

- The Trunk Road/Glenn Highway Option (particularly Segment 15) presents the most significant potential impact to aesthetic resources.

Split Alternatives

- The FERC/North Palmer route is the preferred split alternative with respect to land ownership but it presents over nine times the impact to private lands than the FERC Parallel route. Some of this impact can be reduced through route refinement, but not significantly.

- As with the parallel alternatives, land use impacts present trade offs. Assuming residential use is the most important factor, the FERC/North Palmer Alternative is preferred. Based on the inventory of existing land uses alone, FERC/South Wasilla and MEA/CEA-South Wasilla are not significantly different, although they impact other land uses.

- Terrestrial resource impacts related to new corridor and altered forest habitat are greater with the North Palmer Alternative while impacts to wetlands and waterfowl are greater with the South Wasilla Alternative. The South Wasilla Alternative (in conjunction with the MEA/CEA route) is the preferred alternative.

- The FERC/North Palmer route presents the least visual impact for the same reasons that the FERC route is the preferred parallel alternative, (i.e., because of its more remote location).

- Fishery impacts are considered least with the MEA/CEA-South Wasilla split alternative, because it requires the least amount of new route and access.

7.9.2 North Study Area

Alternatives to Ester

- Overall, impacts to land ownership, land use and visual resources are least following the Healy East Option and then the FERC route into Ester.

- Visual resource impacts within the Little Goldstream to Ester subarea are considered less with the Goldstream route but not significantly.

- Biological resource impacts are minimized with the GVEA Parallel to Little Goldstream and then the FERC route from Little Goldstream to Ester.

Alternatives to Wainwright

- Impacts to land use, land ownership and visual resources are minimized by the Tanana Flats Alternative; however, impacts from the Tanana Ridge Alternative are not significantly greater.

- Impacts to fish, wildlife, and botanical resources are minimized by following the License Application route to Ester plus Segment 28.

- Private and native land ownership impacts are 11-13 times greater with the GVEA Parallel Alternative to Ester than the Healy East and Tanana Flats Alternative to Wainwright.

As noted earlier, final route selections combining all the resource categories were not made at this time. While this is the case, sufficient data has been analyzed to enable certain overall conclusions to be made. These are presented in Chapter 8.

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TABLES

TABLE 7-1

INITIAL LIST OF RESOURCE CATEGORIES

CONSIDERED FOR ROUTE EVALUATION

Geology/Soils

Water Use/Quality

Socioeconomics

Recreational Resources

Historic & Archeological Resources

Terrestrial Resources

Fisheries Resources

Land Ownership

Land Use

Aesthetic Resources

TABLE 7-2

RANKING OF ENVIRONMENTAL RESOURCE CATEGORIES/CRITERIA

INVENTORIED FOR

TRANSMISSION ALTERNATIVES EVALUATION

Resource/Criteria Ranking (order indicates relative rank)

Land Ownership

- Native/Private
- Borough/Municipal
- Federal
- State

Land Use[1]

- Residential
- Recreation
- Public
- Agricultural
- Commercial/Industrial
- Vacant

Terrestrial Resources

- New Corridor/Access
- Wetlands
- Bird Collision Potential
- Raptor and Swan Nest Sites
- Forested Habitat

Aesthetic Resources

- Visual Sensitivity
- Visual Quality
- Visual Compatibility

Fisheries

- Significant Streams (anadromous species)
- Streams & Rivers

Cultural Resources

- Existing Sites
- High Potential
- Moderate Potential

[1]Ranked equally with Landownership

TABLE 7-3
SOUTH STUDY AREA ALTERNATIVES EVALUATION
RESOURCE INVENTORY SUMMARY

TABLE 7-3
SOUTH STUDY AREA ALTERNATIVES EVALUATION
ENVIRONMENTAL RESOURCE INVENTORY SUMMARY

	NORTH PALMER OPTIONS			PARALLEL ALTERNATIVES			SPLIT ALTERNATIVES					
ALTERNATIVES / CATEGORY/CRITERIA	Opt 1 EAST PALMER	Opt 2 KEPLER LAKES	Opt 3 GLENN HWY	A FERC	B LITTLE SU	C MEA/CEA	D FERC-NORTH PALMER	E FERC-SOUTH WASILLA	F LITTLE SU/NORTH PALMER	G LITTLE SU/SOUTH WASILLA	H MEA/CEA NORTH PALMER	I MEA/CEA SOUTH WASILLA
Landownership (miles)[4]												
Private	17.9	9.4	8.3	2.0	5.1	11.5	18.5[3]	22.5	21.2[3]	23.6	27.6[3]	26.9
Native	4.6	4.6	1.3	0	2.6	4.4	8.9	12.1	11.5	14.8	13.3	13.4
Borough	2.3	3.9	0.3	14.9	13.1	12.4	18.9	22.4	60.4	19.5	15.9	16.8
Federal	0	0	1.0	16.4	16.4	16.4	27.1	26.5	27.1	26.5	27.1	26.5
State	4.1	2.1	5.3	35.7	25.7	20.6	60.1	49.9	43.9	32.4	38.9	24.9
Land Use (miles)[4]												
Residential	3.9	1.6	1.6	0	1.5	1.0	3.6	4.0	5.1	5.5	4.6	4.3
Recreation/Wildlife	0.0	0.0	1.6	7.4	1.8	2.3	9.2	10.5	3.2	4.9	3.7	5.4
Agricultural	0.8	2.9	2.9	4.6	1.7	0	7.6	5.2	4.6	2.3	2.9	0.6
Commercial/Industrial	0.3	0.2	0.2	0.9	0.9	0.9	2.2	1.2	1.3	1.2	1.3	1.2
Public	0.0	0.0	0.0	0	0	0	0.5	0.5	0.5	0.5	0.5	0.5
Vacant	22.4	15.9	9.5	53.8	55.9	60.3	123.9	109.7	108.7	100.7	113.1	105.1
Terrestrial Resources												
New Corridor (mi)	25	18	10	39	23	4	77[1]	62	63[1]	43	42[1]	26
Wetlands (ac)	59	48	50	909	518	458	659[1]	763	413[1]	507	368[1]	450
Bird Collision Potential[2]	L	L	M	L	L	M	L	M	L	M	M	M
Raptor/Swan Nesting Areas[2]	VL	VL	VL	L	VL	VL	L	L	VL	VL	VL	VL
Forest Habitat (ac)	466	321	225	1029	914	1133	1845[1]	1601	1767[1]	1515	1899[1]	1598
Aesthetic Resources (miles)												
Mod. High/High Visual Quality	17.2	9.1	4.8	0	0	0	10.3[1]	10.9	10.3[1]	10.9	10.3[1]	10.9
Potential Visibility[5]	10(-)	6.4(-)	10(5.6)	8.1(2.8)	8.1(5.4)	13.3(6.8)	30.7(2.8)	34.2(37.5)	29.5(25.9)	33(37.5)	34.7(27.3)	34.2(37.5)
Potential Resource Problem Areas	4	5	6.0	4.5	2	4	14.5	18.5	12	14.5	14	14.5
Low Visual Compatibility	4.8	4.8	1.1	0	0	0	2	9.0	6.8	3.1	6.8	3.1
Fisheries Resources												
Streams Rivers Crossed	25	25	19	11	12	18	36[1]	42	37[1]	44	43[1]	40
Significant Streams Crossed	12	11	12	5	11	15	30	30	31	28	35	29
Cultural Resources (miles)												
Existing Sites[6]	1	1	2	1	1	1	6[1]	7	6[1]	7	6[1]	/
High Potential Archeological Sites	0.5	2.3	1.8	1.2	1.6	2.4	4.0	2.0	4.4	2.4	5.2	3.2
Mod. Potential Archeological Sites	33.4	29.6	26.9	7.8	14.2	16.8	72.7	48.6	75.8	51.7	78.4	49.1

1/ includes option 2 (Kepler Lakes)

2/ Potential For Impact
VL=Very low, L=low, M=moderate, H=high

3/ includes option 3 (Glenn Highway)

4/ Mileages do not sum to route length due to double-counting where different categories occur on either side of the reference centerline.

5/ includes only parallel situation to road and rail. Number in parenthesis is rail miles.

6/ Sites within 1/2 mile of reference centerline were inventoried.

TABLE 7-4
NORTH STUDY AREA ALTERNATIVES EVALUATION
RESOURCE INVENTORY SUMMARY

TABLE 7-4
NORTH STUDY AREA ALTERNATIVES EVALUATION
ENVIRONMENTAL RESOURCE INVENTORY SUMMARY

ALTERNATIVES / CATEGORY/CRITERIA	HEALY TO ANDERSON A FERC	HEALY TO ANDERSON HEALY EAST OPTION	HEALY TO ANDERSON B GVEA	ANDERSON TO LITTLE GOLDSTREAM C FERC	ANDERSON TO LITTLE GOLDSTREAM D GVEA	LITTLE GOLDSTREAM TO ESTER SUB. E FERC	LITTLE GOLDSTREAM TO ESTER SUB. F GOLD-STREAM	ANDERSON TO WAINWRIGHT SUBSTATION G TANANA RIDGE	ANDERSON TO WAINWRIGHT SUBSTATION H TANANA FLATS	ANDERSON TO WAINWRIGHT SUBSTATION I SEGMENT 28
Landownership (miles)[2]										
Private	2.7	0	3.0	0	3.0	3.8	9.5	2.0	1.5	7.4
Native	0	0	0.4	1.7	2.1	5.6	1.0	1.3	0	0
Borough	0	0	0	0	0	0	0	0.4	0	0
Federal	12.0	11.7	11.7	4.2	7.4	0	4.3	20.9	36.7	0
State	27.9	29.8	30.6	14.5	11.8	21.7	23.0	29.2	10.9	0
Land Use (miles)[2]										
Residential	0	0	1.6	0	0.6	0	0	0	0	1.8
Recreation/Wildlife	0	0	0	0	0	0	0	0	0	0
Agricultural	5.1	0	5.1	0	1.7	0	0	0.9	0	0
Commercial/Industrial	0	0	0	0	0	0	0	2.0	2.0	2.7
Public	0	0	0	0	0	0	0	0	0	0
Vacant	37.5	41.5	39.0	20.4	22.0	31.1	37.8	51.2	47.1	2.9
Terrestrial Resources										
New Corridors (mi)	33	42	2	20	0	14	38	55	49	9
Wetlands (ac)	766	614	593	418	198	367	356	820	985	58
Bird Collision Potential[1]	VL	VL	VL	L	L	VL	VL	L	M	VL
Raptor/Swan Nesting Areas[1]	L	VL	L	M	VL	VL	VL	M	M	VL
Forest Habitat (ac)	636	406	365	418	159	682	911	1141	908	81
Aesthetic Resources (miles)										
Mod. High/High Visual Quality	0	0	0	0	0	0	28.9	0	0	0
Potential Visibility[3]	13.8(20.4)	0(1.4)	50.1(23.9)	0(0)	17.9(21)	17.6(0)	5.9(19.3)	0(0)	0(0)	(0)
Potential Resource Problem Areas	19	0	40.5	1	20	27	12.5	3.5	3	0
V/L/Low Visual Compatibility	0.6	0	2.1	4.0	2.8	12.0	5.3	4.0	0	2.8
Fisheries Resources										
Streams Rivers Crossed	22	21	15	16	8	22	24	25	34	7
Significant Streams Crossed	2	-	2	1	1	0	0	3	1	1
Cultural Resources (miles)										
Existing Sites[4]	3	6	3	0	1	0	0	0	0	0
High Potential Archeological Sites	2.1	11.2	1.9	1.0	0	0.4	0	0.5	0	0
Mod. Potential Archeological Sites	9.5	4.7	16.7	1.5	1.7	11.8	15.8	10.8	0	2.0

1/ Potential For Impact
VL=very low, L=low, M=moderate, H=high, VH=very high

2/ Mileages do not sum to route length due to double-counting where different categories occur on either side of the reference centerline.

3/ includes only parallel situation to road and rail. Number in parenthesis is rail miles.

4/ sites within the 1/2 mile of reference center line were inventoried.

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TABLE 7-5

ALTERNATIVES COMPARISON - SUMMARY OF ENVIRONMENTAL IMPACT POTENTIAL

SOUTH STUDY AREA

ALTERNATIVE / RESOURCE CATEGORY	N. PALMER OPTIONS			PARALLEL ALTERNATIVES			SPLIT ALTERNATIVES					
	1	2	3	FERC Route A	Alt. B	Alt. C	Alt. D	Alt. E	Alt. F	Alt. G	Alt. H	Alt. I
Land Ownership	●	●	◑	○	◑	◑	◑	●	◑	●	◑	●
Land Use	●	◑	◑	◑	◑	◑	◑	●	◑	●	◑	●
Terrestrial Resources	●	◑	●	●	◑	●	●	●	◑	◑	◑	◑
Esthetic Resources	●	◑	●	○	◑	◑	◑	●	◑	●	◑	●
Fishery Resources	◑	◑	◑	◑	◑	◑	●	◑	●	◑	●	◑
Cultural Resources	◑	◑	◑	○	○	○	●	◑	●	◑	●	◑

NOTE: Ratings reflect the potential for impact relative to the other alternatives within the same category (N. Palmer, Parallel, or Split Alternatives).

COMPARATIVE RATING

KEY: ● -Highest Potential Impact

◑ -Moderate Potential Impact

○ -Lowest Potential Impact

TABLE 7-6

ALTERNATIVES COMPARISON - SUMMARY OF ENVIRONMENTAL IMPACT POTENTIAL

NORTH STUDY AREA

ALTERNATIVE / RESOURCE CATEGORY	HEALY TO ANDERSON			ANDERSON TO LITTLE GOLDSTREAM			LITTLE GOLDSTREAM TO ESTER			ANDERSON TO WAINWRIGHT		
	Alt. A	Healy East Option	Alt. B		Alt. C	Alt. D	Alt. E	Alt. F		Alt. G	Alt. H	Alt. I
Land Ownership	◑	○	◑		○	●	●	●		◑	○	●
Land Use	○	○	◑		○	◑	○	○		○	○	◑
Terrestrial Resources	◑	◑	◑		◑	○	◑	◑		●	●	○
Aesthetic Resources	◑	○	●		○	●	●	●		◑	○	●
Fishery Resources	◑	◑	○		◑	○	◑	◑		◑	●	○
Cultural Resources	◑	●	◑		○	○	◑	◑		◑	○	○

NOTE: Ratings reflect the potential for impact relative to the other alternatives within the same category (N. Palmer, Parallel, or Split alternatives).

COMPARATIVE RATING

KEY:
- ● Highest Potential Impact
- ◑ Moderate Potential Impact
- ○ Lowest Potential Impact

TABLE 7-7

ENVIRONMENTAL RESOURCES

PRELIMINARY RECOMMENDATIONS

BY RESOURCE CATEGORY

SOUTH STUDY AREA

RESOURCE CATEGORY	Parallel Alternatives	Options	Split Alternatives
Landownership	FERC (Alt A)	Glenn (Opt 3)	FERC - North Palmer (Alt D)
Land Use	FERC (Alt A)	Kepler (Opt 2)	FERC - North Palmer (Alt D)
Terrestrial Resources	MEA/CEA (Alt C)	Kepler (Opt 2)	MEA/CEA - North Palmer (Alt H)
Visual Resources	FERC (Alt A)	Kepler (Opt 2)	FERC - North Palmer (Alt D)
Fisheries	MEA/CEA (Alt C)	Kepler (Opt 2)	MEA/CEA - South Wasilla (Alt I)

NORTH STUDY AREA

	Healy-Anderson	Andrsn-L. Goldstream	L.Goldstream-Ester	Andrsn-Wainwright
Landownership	Healy East Option	FERC (Alt C)	FERC (Alt E)	Tanana Flats (Alt H)
Land Use	Healy East Option	FERC (Alt C)	FERC (Alt E)	Tanana Flats (Alt H)
Terrestrial Resources	GVEA Parallel (Alt B)	GVEA Parallel (Alt D)	FERC (Alt E)	Tanana Ridge (Alt G)
Visual Resources	Healy East Option	FERC (Alt C)	Goldstream (Alt F)	Tanana Flats (Alt H)
Fisheries	GVEA Parallel (Alt B)	GVEA (Alt D)	FERC (Alt E)	Tanana Ridge (Alt G)

8.0 SUMMARY AND RECOMMENDATIONS

8.0 SUMMARY AND CONCLUSIONS

8.1 GENERAL APPROACH

The conclusions that follow were based on the findings in Chapters 5, 6, and 7. They were made in consideration of the quantified data presented in the tables, experience factors where the quantified data did not clearly distinguish differences, such as the cost of access, and in consideration of compromising impacts between resource categories where no clear preference prevailed. The conclusions are based upon engineering, technical, economic, and environmental perspectives collectively at the time of preparation of this status summary.

8.2 SOUTH STUDY AREA

Assuming reliability of the Susitna Transmission System as the most important overall factor, the preferred alternatives are those in which one transmission line is routed overland around Knik Arm (the split alternatives). This would preclude total interruption of Susitna power to Anchorage because of a common mode failure of the submarine cables under Knik Arm. All the split alternatives (Alternatives D, E, F, G, H, and I) meet this requirement. All of these alternatives also permit utilizing the existing transmission system to a much greater extent than the parallel alternatives. They better permit staging of the transmission system in steps responding to load growth. Finally, they provide flexibility in the event significant changes occur to demography, load patterns and transmission system requirements as discussed in more detail in the Task 7 report, "System Development and Steady State Analysis", Volumes I and II.

The conclusion at this point in the study regarding the split alternatives is that the MEA/CEA-North Palmer route (Alternative H) using the Glenn Highway Option (Option 3)is preferable . Reasons for this conclusion are:

- Environmentally, the North Palmer route appears to have the least overall impact, particularly with respect to impact on land use and consideration of the rapid growth occurring in the Wasilla area.

- Technically, both overland routes (South Wasilla or North Palmer) are acceptable. North Palmer has less existing access, but South Wasilla has more wetland area and requires more structures.

- Economically, North Palmer is less costly.

- The Glenn Highway Option (Option 3) was preferred primarily because technically, the Kepler Lakes Option (Option 2) presents significant problems due to wide river crossings, floodplains, and steep topography. However, environmentally and for the reason explained in Chapter 7 the Kepler Lakes Option appears to be preferable. These two options should be investigated in greater detail.

Recognizing the status of the FERC licensing process, Alternative D FERC-North Palmer is an acceptable alternative. It is recommended that the process outlined in Chapter 8, Section 8.5 be used to establish the preferred overland route around Knik Arm.

Regarding the parallel alternatives to Point MacKenzie, the FERC route (Alternative A) and the MEA/CEA route (Alternative C) appear preferable. The MEA/CEA route overall, appears to have a slight advantage. This is due to the following reasons:

- Technically, the MEA/CEA is preferred.

- Economically, the FERC route is more costly.

- Environmentally, only land ownership had a strong preference for the FERC route.

8.3 NORTH STUDY AREA

Findings to date favor the FERC route to Ester (Alternatives A, C, and E).

The Healy East Option route between Healy and Anderson was not considered preferable to the FERC route, as it is technically less reliable due to lack of access and remoteness. Furthermore, it is more costly when the cost of access roads is considered. However, since this route presents minimal impact to land ownership, land use, and visual resources and it is known that remote parcels are proposed for the area (i.e., future development), this option may have merit in the future.

The route sharing the right-of-way with GVEA Healy-Fairbanks 138 kV line which closely follows Parks Highway has been considered in the sector Healy-Anderson-Little Goldstream (Alternatives B and D). However, these alternatives necessitate a greater number of road crossings, longer line length and potentially utilizing a significant amount of highway-abutting land. Engineering the Tanana River crossing at Nenana Village on a very congested ROW shared by highway, railroad, and GVEA transmission line, and limited by mountains and river from both sides, may prove to be extremely difficult and possibly not feasible. In general, the GVEA route was considered to be too congested and restrictive on existing land use development and private/native ownership. These unfavorable features, in combination, make this route as a whole less advantageous when comparing it to the FERC route.

The alternative route between Little Goldstream and Ester (Alternative F) is the route along Goldstream Valley. However, while the original FERC route is relatively accessible, access to this alternate route is very limited. In addition, there are no other real advantages such as better topography or shorter length. Also, because the lines are

routed on north mountain slopes they will be exposed to much more severe meteorological conditions. For these reasons the FERC route is preferred.

The alternatives to Wainwright (Alternatives G and H) may present significant fish and wildlife impacts, are technically very difficult because of several Tanana River crossings with flood plains and extensive swampy areas, do not have reliable access and likely will not present an economic advantage over the alternative connecting Ester to Wainwright Substation in the Fairbanks metropolitan area, Alternative I. Although a detailed study of Alternative I route was not made, a combination of compact type double circuit pole line sections and underground cable section, if required, appears to be a feasible solution for this segment. Crossing of the Chena River, line sections in the vicinity of the airport area and congested right-of-way are the major engineering problems to be resolved in this segment. Another possibility, which was not studied because of time and budget restraints, is to terminate Susitna power at the Chena Plant of Fairbanks Municipal Utility System.

For all the above reasons, the FERC route, as a whole, is preferred. It is preferred technically and economically, and is environmentally acceptable.

8.4 ISSUES FOR CONSIDERATION

Listed below are a number of issues that could affect the Susitna Transmission System route or substantially effect the impacts related to the route in the future.

	Issue	Remarks
o	Knik Arm Bridge Crossing and road corridor.	Defer/Delete need for underwater crossing of Knik Arm.
o	Rapid growth in the Point MacKenzie and Matanuska Valley areas increasing development, regulations, zoning, ordinances, etc.	Increase in acquisition difficulties and land use/ ownership impacts.
o	Railroad transferred to state.	Possible use of ROW in areas.
o	Long term road development plans by the Matanuska Borough.	Increase in accessibility and reduction in overall impacts related to line construction.
o	Redirection of proposed disposals and remote parcels.	Increased impacts to land use/ownership.
o	Use of access created by line.	Potential impact to fish/wildlife resources, benefit as recreation opportunity.
o	Military acceptance of MEA ROW use in Segment 17.	Denial would create significant problem for finding acceptable alternative.

8.5 RECOMMENDATION FOR FINAL ROUTE SELECTION OF ALTERNATIVES

In the event that this study is continued in order to complete the final steps of the route selection process, the following steps are recommended.

Workshops

Workshops should be conducted with agencies to discuss findings, determine rela tive rankings of all criteria and discuss tradeoffs between alternatives.

Based on agency comments during these workshops, additional data may need to be collected on specific problem areas in order to help select between areas of conflict. Such data could include photosimulations to ascertain visual impacts, waterfowl collision/ mortality studies or detailed technical investigations of specific construction problem areas.

The workshops should include representatives from the following agencies and organizations:

- Department of Natural Resources (DNR)
  - Division of Parks
  - Division of Lands
  - Division of Forestry
- Alaska Department of Fish & Game (ADF&G)
- U.S. Fish and Wildlife Service (USFWS)
- National Marine Fisheries Service (NMFS)

- Local Government Representatives
- Area Utilities
- Alaska Power Authority Staff
- Harza-Ebasco Representatives

Because of the geographical distance and resource differences between the two study areas, two workshops would be held; one in Anchorage for the South Study Area and one in Fairbanks for the North Study Area.

The content of the workshops would focus on the following:

- Reliability issue regarding the routing of all lines under Knik Arm.
- Significance and ranking of evaluation criteria.
- Conflict areas and trade-offs.
- Route refinements and design changes to avoid or reduce impacts.

The workshops would conclude with a general consensus on the preferred system and a route for future detailed studies and refinement.

Public Meetings

The public presentations would serve to inform the public of the alternatives under consideration, record their responses, and incorporate preferences into the route selection process. The meetings would be held in the same locations as the previous-public meetings.

An additional meeting would likely be held in Anchorage. The presentations would focus on the evaluation process, findings of the study and results of the workshops.

Upon completion of the workshops and public meetings, route refinement studies discussed in Chapter 3 can be initiated.

Area for Additional Investigation

Based on the findings and conclusions of this study effort to date, certain route segments were identified as being particularly significant with respect to making a decision.

These route segments are listed below and should be investigated in greater detail to help resolve trade-offs in the final selection:

- South Study Area
  - MEA/CEA route (Segments 2, 3, 6, 7, 8)
  - Kepler Lakes Option (Segments 14 an 16)
  - Glen Highway Option (Segments 13, 15)

- North Study Area
  - Healy East Option (Segments 3, 7)

APPENDIX M

AGENCY COMMENTS

AGENCY/ORGANIZATION CONTACTS
ALASKA POWER AUTHORITY
Task 41 Susitna Transmission

South Study Area

14 November 1983

AGENCY	DATE	SOURCE	COMMENT/ISSUE	INFORMATION RECEIVED
FEDERAL				
U.S. Air Force, Elmendorf Air Force Base, Alaskan Air Command	April 21, 1983	Meeting	Use of an existing Matanuska Electric Association (MEA) right-of-way for Susitna Transmission facilities	Elmendorf A.F.B. Master Plan and detailed drawings received
U.S. Army, Fort Richardson	April 5, 1983	Meeting	Use of the MEA right-of-way is not transferable	Eklutna water project may be utilizing portions of the Alaska Power Administration and Glenn Highway rights-of-way; investigate status of project
			Impacts on air navigation (helicopter and and fixed-wing) would be sustained at Fort Richardson's Bryant Airfield	
			Additional rights-of-way would adversely effect maneuver areas for ground exercises	Fort Richardson boundary and topographic maps were reviewed
			Eklutna, Inc. has filed on all Fort Richardson lands north of the Davis Highway. If land were declared excess, Eklutna would have first option.	
U.S. Army Corps of Engineers, Alaska District				
Real Estate	April 7, 1983	Meeting	Grant of right-of-way on Fort Richardson to MEA is not transferable	Fort Richardson Environmental Assessment Reports and site drawings, new master plans available Fall 1983
	May 3, 1983	Correspondence	Sent drawings of transmission line route	
	April 22, 1983	Correspondence	Request to occupy the MEA right-of-way by Alaska Power Authority	
	July 11, 1983	Correspondence	Request to occupy the MEA right-of-way by Alaska Power Authority denied (conflicts with Fort Richardson Ammunition Storage Area)	
Floodplain Management Services	May 9, 1983	Telephone		Flood hazard boundary maps for Matanuska Susitna Borough

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AGENCY	DATE	SOURCE	COMMENT/ISSUE	INFORMATION RECEIVED
U.S. Department of the Interior Bureau of Land Management, Anchorage District Office	April 12, 1983	Meeting	BLM will administer military lands and native lands not conveyed for grant of right-of-way No use of existing MEA right-of-way other than that use originally specified Examine more than one alternative routing on Elmendorf AFB Alternative routes being evaluated by the Municipality of Anchorage's Eklutna Water Project should be considered	
Fish and Wildlife Service, Western Alaska Ecological Services	April 26, 1983	Meeting	Routes crossing the Matanuska and Knik Rivers will impact migratory birds, trumpeter swans near Cottonwood Creek would also be affected FWS expects new alignments to be evaluated at a level of study similar to those currently proposed	Migratory bird and trumpeter swan nesting sites
U.S. Department of Transportation Alaska Railroad	May 12, 1983	Meeting	MEA right-of-way crosses 2 tracts of Alaska Railroad (ARR) property: 1) Powder Reserve and 2) Birchwood Reserve. The Powder Reserve provides the only storage of munitions for private enterprise in Alaska; the Birchwood Reserve is presently being leased for industrial growth. If these lands are crossed, a new right-of-way should be selected on the perimeter of each property MEA owns only surface rights. ARR owns subsistance rights. The Eklutna Rock Quarry (owned by ARR), should be avoided entirely Eklutna, Inc. has filed on the Powder Reserve Sharing if ARR right-of-way (nominally 200 feet) is not considered likely; crossings should not be a problem	ARR property boundary information
Federal Aviation Administration	April 7, 1983	Meeting	No plans at present to expand the Birchwood Airport VORTAC facilities should be avoided City of Wasilla is considering location of its airport, contact USKH	Airport master records VORTAC location maps Eklutna range facility at Eklutna

AGENCY	DATE	SOURCE	COMMENT/ISSUE	INFORMATION RECEIVED
STATE OF ALASKA Department of Fish and Game Habitat Divisions	April 14, 1983	Meeting	Chugach originally proposed an overland route around Knik Arm and was opposed in its crossing of the Palmer Hay Flats State Game Refuge Impacts to anadromous streams will be addressed in the permit stipulations An overland route will result in bird collisions along the Knik and Matanuska Rivers	State Game Area boundary maps ADF&G and USFW have trumpeter swan and eagle nesting site location information
Department of Natural Resources Division of Land and Resource Planning	April 22, 1983	Meeting	Visual impact will be a major concern, as well as future land use Preference expressed for paralleling the Little Susitna River Impacts on agriculture would not be significant Overland routes around Knik Arm would create varying frequency of visual impacts from Glenn Highway and Alaska Railroad (see T. Arminski for letter from Bill Beatty)	
	June 22, 1983	Correspondence		
Division of Land and Water Management, Southcentral District	April 11, 1983	Meeting	Little state land would be crossed by an overland route around Knik Arm, except at the Palmer Hay Flats State Game Refuge. Considerable private land would be encountered with opposition to be expected Willow to Pt. MacKenzie segment may cross agricultural parcels. Division of Agriculture has not expressed any opposition, however DNR planning is opposed. There may be local support on this matter. Agricultural rights are leased; the state permits all such lands crossed	Fish Creek Management Plan and Willow Sub-Basin Area Plan

M-3

AGENCY	DATE	SOURCE	COMMENT/ISSUE	INFORMATION RECEIVED
Division of Parks	May 10, 1983	Meeting	Little Susitna River is proposed for nomination as a designated state public recreation area and will be managed by the Division of Parks An alternative route paralleling the Little Susitna River would offer some benefits (improved access), if removed from the immediate river corridor Avoidance of the Willow Creek State Recreation Area is preferred by Division of Parks. If a crossing is required, it should be located further east, closer to the Parks Highway	Preliminary Master Plan for Willow Creek State Recreation Area and Susitna Basin Land Use Atlas. Nancy Lake Master Plan is nearing completion, additional lands may have been incorporated into it
Department of Transportation and Public Facilities	April 12, 1983	Meeting	Concept of joint use of Knik Arm crossing for utilities has been considered; however, each proposal should be evaluated on its own merits Concerns were expressed for sharing of right-of-way and crossing of highways	Knik Arm crossing scoping report EIS for Knik Arm Crossing to be completed in 1983

M-4

AGENCY	DATE	SOURCE	COMMENT/ISSUE	INFORMATION RECEIVED
MATANUSKA - SUSITNA BOROUGH Planning Department	April 12, 1983	Meeting	Palmer Hay Flats State Game Refuge is a designated special land use district and will be subject to specific permitting requirements, if a right-of-way is required	Borough will be initiating "Industrial Port" planning; concept is contingent on spur from Alaska Railroad Pt. MacKenzie Road is proposed for extension to planned port site Considerable land speculation is occurring near Big Lake and Pt. MacKenzie Borough awaiting development of Fish Creek Management Plan, access from Burma Road Borough Comprehensive Development Plan (draft) and Transportation Plan received

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AGENCY/ORGANIZATION CONTACTS
ALASKA POWER AUTHORITY
Task 41 Susitna Transmission

South Study Area

14 November 1983

AGENCY	DATE	SOURCE	COMMENT/ISSUE	INFORMATION RECEIVED
MUNICIPALITY OF ANCHORAGE Eklutna Water Project	April 14, 1983	Meeting		Crossing of Fort Richardson was dictated to parallel the Alaska Power Administration right-of-way Construction right-of-way is 100 feet; 40 feet for operations and maintenance Alaska Railroad has expressed a preference for avoidance of their right-of-way; Department of Transportation will consider a parallel of the highway Public meetings have been held in several communities. Response has been mixed, but favorable overall Task 7, Facility Evaluation, Eklutna Water Project reviewed First phase of project is scheduled for bids by January 1984; current routing preference for Eklutna Water Project is the Power Administration right-of-way
Physical Planning Department	April 8, 1983	Meeting	Municipality generally endorsed concept of utilizing existing right-of-way, communities north of Fort Richardson would likely be opposed Other routing concepts should be examined; work session to be arranged	Planning Department now using computer assisted data processing, system not sufficiently advanced for Susitna application Eagle River - Chugiak - Eklutna Comprehensive Plan obtained
	May 3, 1983	Meeting	Planning staff not able to become actively involved due to current workload	Additional planning will focus on designated "Special Study Areas" (potential for high density residential growth)

M-6

AGENCY	DATE	SOURCE	COMMENT/ISSUE	INFORMATION RECEIVED
			Comments on the MEA right-of-way include: 1) impacts on Birchwood community, 2) crossing of Alaska Railroad's Powder Reserve; 3) crossing of Beach Lake Regional Park and 4) displacement of undeveloped lands along Knik Arm (where few remain) Two issues will need to be carefully addressed: location of right-of-way (address alternatives) and tower design Municipality would also like to comment on routes before finalized	Acquire additional data from the Coastal Zone Management Program
OTHER CONTACTS Eklutna, Inc.	April 14, 1983	Meeting	Consideration should be given to overbuild of Alaska Power Administration right-of-way Preference for paralleling the Glenn Highway was stated to avoid further segmenting of Eklutna, Inc. lands Eklutna, Inc. would be interested in substation or equivalent house of local power Eklutna, Inc. will want to review any finalized proposals which would cross their lands	Alaska Power Administration right-of-way file number A 022452, reserves 37.5 feet either side of centerline
ENSTAR crossings which are used	April 21, 1983 ENSTAR has already obtained	Meeting	as reference points by pilots during inclimate weather; parallel existing facilities at river	Concern expressed for river easements from U.S. Department of Transportation, State Department of Transportation and Public Facilities and the Alaska Railroad

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AGENCY/ORGANIZATION CONTACTS
ALASKA POWER AUTHORITY
Task 41 Susitna Transmission

14 November 1983

South Study Area

AGENCY	DATE	SOURCE	COMMENT/ISSUE	INFORMATION RECEIVED
			ENSTAR had little problems during routing studies since the facility will be buried and ENSTAR is providing taps at various locations	60 foot construction right-of-way, 20 foot permanent right-of-way
			Difficulty should be expected in crossing Palmer Hay Flats State Game Refuge and when diverging from existing corridors	Pipeline route location map received
USKH	April 11, 1983	Telephone		USKH undertaking relocation study for the Wasilla Airport; study area is defined as a 5 mile radius from the existing airport site
	September 20, 1983	Telephone		Tentative location of new airport site is T17N, R1W, Section 7.5.M; south of Parks Highway and Jacobson Lake. Final Report - October 1983

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AGENCY/ORGANIZATION CONTACTS
ALASKA POWER AUTHORITY
Task 41 Susitna Transmission

14 November 1983

North Study Area

AGENCY	DATE	SOURCE	COMMENT/ISSUE	INFORMATION RECEIVED
FEDERAL				
U.S. Army, Fort Wainwright	May 6, 1983	Meeting	Proposed substation site conflicts with a new controlled firing range at Fort Wainwright Military Reservation	Fort Wainwright Airspace Docket 75-AL-96NR and reservation map, number 18-02-119
	May 9, 1983	Telephone		Bids for Fort Wainwright's Range "A" Firing Range to be issued on September 30, 1983
U.S. Army Corps of Engineers, Real Estate	May 6, 1983	Meeting		
Floodplain Management	May 6, 1983	Meeting	No transmission structures can be placed on the Tanana River Levy	Status of Chena River Relocation of Project
			Substation site is located within the 100 year floodplain	Flood insurance maps for Tanana River
Clear Mews	May 10, 1983	Correspondence	Mailed FERC plates G47, G48, & G49	
U.S. Department of the Interior				
Bureau of Land Management, Anchorage District Office	April 27, 1983	Telephone		BLM, Anchorage District Office will coordinate review of transmission studies
Fish and Wildlife Service, North Alaska Ecological Service	April 29, 1983	Meeting	Routing south of the Tanana River would impact aircraft use, peregrine falcon, trumpeter swan and sandhill crane nesting sites	Contact Endangered Species for more detailed species information and Department of Transportation and Public Facilities for status of Parks Highway Bypass
			Effects of USACE flood control project on Tanana River are uncertain	

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AGENCY	DATE	SOURCE	COMMENT/ISSUE	INFORMATION RECEIVED
STATE OF ALASKA Department of Fish and Game Habitat, Game and Sport Fisheries Divisions	April 29, 1983	Meeting	Concerns expressed for alignments crossing near the Tanana River bluffs (peregrine falcons sighted in vicinity)	Salchaket Slough is popular for picnicking and hunting (not authorized by military)
			Lack of parallel with existing GVEA transmission line should be addressed	Clear water tributaries to Tanana River of Bear, McDonald and Clear Creeks provide good grayling habitat
			A northerly entrance into Fairbanks substation site would impact residential development near Musk, Dog Patch and Chena Hot Springs Roads; avoid south facing slopes	Forest management west of Fort Wainwright may include a burn policy
				Few comments on the effects on the existing GVEA transmission line
Department of Natural Resouces Division of Land and Water Management, North Central District Office	January 28, 1983	Correspondence	Concerns for impacts of proposed right-of-way on the Northcentral District's land disposals	Existing or planned disposals in vicinity of the proposed right-of-way were described and illustrated (agricultural sales, remotes and subdivisions)
			Need consideration of paralleling existing GVEA transmision line	
	February 14, 1983	Correspondence	Evaluation of possible alternative transmission line routes, route #1 (east of Healy), not econom ically feasible, route #2 (east of Alaska Railroad) excessive visual impacts; route #3 best alternative with reroute through Goldstream Creek Valley	First draft of Nenana River Management report received

AGENCY/ORGANIZATION CONTACTS
ALASKA POWER AUTHORITY
Task 41 Susitna Transmission

14 November 1983

North Study Area

AGENCY	DATE	SOURCE	COMMENT/ISSUE	INFORMATION RECEIVED
	April 29, 1983	Meeting	Crossing of Tanana River (south of Fairbanks) should be evaluated with respect to erosion and slope stability problems	Additional information received on agricultural disposals
			A northerly approach to the Fairbanks substation would be opposed by the public	Division of Research and Development is preparing alternative land management plans for the Tanana River basin
			An existing GVEA right-of-way north of the Tanana River should be discussed with the Department of Transportation and Public Utilities	
			Routing near Northstar Borough industrial sites would be compatible	
	May 13, 1983	Meeting		Resource information obtained for Tanana River basin
Divisior .f Parks	May 17, 1983	Meeting		Recreational data obtained for Tanana River basin
Department of Transportation and Public Facilities, Interior Region	May 11, 1983	Meeting	GVEA is relocating an existing 69KV line parallel to the south Fairbanks Expressway. A portion of the line will be underground to comply with the Fairbanks International Airport airspace requirements	South Fairbanks Expressway location data and project description acquired (right-of-way width: 200-270 feet)

AGENCY	DATE	SOURCE	COMMENT/ISSUE	INFORMATION RECEIVED
FAIRBANKS NORTH STAR BOROUGH Planning Department	May 11, 1983	Meeting	Alternative routing south of Tanana River was preferred in order to avoid residential growth near Rosie Creek, Ester and Chena Ridge	Borough currently preparing a comprehensive plan; draft available by August 1983
			A parallel of the GVEA transmission line should be avoided to reduce visual impacts	Resource data obtained for land use and mineral leases, most data obtained from state DNR
			Alternatives in the Goldstream Creek Valley should avoid the Alaska Railroad; such alignment would also impact Spinach Creek, north of Ester Dome	
Parks and Recreation Department	May 13, 1983	Meeting	Alignment near Ester or alternative substation sites and routes should not affect existing recreational facilities	Park inventory and survey and draft of parks and recreation plan obtained

APPENDIX N

UTILITY COMMENTS

ALASKA POWER AUTHORITY

TASK 41 - SUSITNA TRANSMISSION SYSTEM

UTILITY CONTACTS

UTILITY	DATE	SOURCE	COMMENT/ISSUE	INFORMATION RECEIVED
Anchorage Municipal Light & Power	3/17/83	Meeting	Two separate and independent routes into Anchorage. One over land.	See Meeting Notes
Anchorage Municipal Light & Power	5/11/83	Meeting	Separate over-land route into Anchorage. Tee-land as possible transition sub-station location. FERC request for integrated system diagram.	See Meeting Notes
Chugach Electric Association	5/11/83	Meeting	" " "	" " "
Matanuska Electric Association	5/13/83	Meeting	" " "	" " "
Golden Valley Electric Association Fairbanks Municipal Utility System	5/23/83	Meeting	Power Sales Agreement	See Meeting Notes
Matanuska Electric Association	6/01/83	Meeting	Willow not required. Sub-station north-west of Teeland desireable.	See Meeting Notes
Anchorage Municipal Light & Power	6/06/83	Meeting	No circuits required between Plant 1 and 2 for Susitna Power delivery. Two 230 KV circuits required from Plant 2 to Fossil Creek.	See Meeting Notes
Anchorage Municipal Light & Power	6/13/83	Letter	Transmitted Inter-connected System One Line Diagram	N/A
Matanuska Electric Association	7/26/83	Letter	Preferred site or Susitna Power delivery.	N/A

C/41/7-F

R2

APPENDIX P

PUBLIC PARTICIPATION

PUBLIC PARTICIPATION

To encourage public comment on the transmission line study, the attached public information materials were developed and a series of public meetings held (May 16 - 25, 1983). Following the materials are descriptions of public comments received at the meetings.

ALASKA POWER AUTHORITY

334 WEST 5th AVENUE - ANCHORAGE, ALASKA 99501

Phone: (907) 277-7641
(907) 276-0001

CONTACT: Pat Serie
Harza-Ebasco Public
Participation Coordinator
349-8581
or
George Gleason
Alaska Power Authority
Public Information Officer
276-0001

PRESS RELEASE

The Alaska Power Authority applied to the Federal Energy Regulatory Commission (FERC) in February of this year for a license to construct the Susitna Hydroelectric Project. Since that time the Power Authority has conducted refinement studies to further evaluate and confirm the transmission line corridor which was recommended in the License Application.

The Power Authority realizes that the public may have ideas and concerns regarding selection of transmission line corridors, and is continuing to seek public input during the licensing process. A number of public meetings have been scheduled from May 16 to May 25. They will be held from 7:00 - 10:00 pm. The ideas and concerns of the public are an important part of the decision process, and the Alaska Power Authority invites you to come and discuss your concerns during the public meeting held in your area. The schedule is:

Palmer	Palmer Jr. High School	May 16
Willow	Willow Elementary School	May 17
Birchwood	Birchwood Elementary School	May 18
Fairbanks	Borough Assembly Chambers	May 23
Nenana	Council Chambers	May 24
Healy	Healy Community Center	May 25

The goal of this study is to evaluate the various aspects of transmission line construction and operation, including technical, environmental, economic, and public concerns. One alternative that quickly emerged is a potential opportunity to share rights-of-way which presently exist around the Knik Arm from the Palmer area as shown in the accompanying map. Utilizing an existing right-of-way would reduce the level of impact that would result from acquiring a new right-of-way. The Alaska Power Authority is studying the overland, shared-corridor route around Knik Arm as a complement to the submerged cable route presented to FERC in the License Application. Other alternatives are also being reviewed to provide more information to confirm the proposed corridor.

ALASKA POWER AUTHORITY

334 WEST 5th AVENUE · ANCHORAGE, ALASKA 99501

Phone: (907) 277-7641
(907) 276-0001

PUBLIC SERVICE ANNOUNCEMENT

The Alaska Power Authority invites you to participate in planning for the Susitna Hydroelectric Project's transmission line route. Issues and concerns of the public are important in the decision process. Attend a community workshop in your area to discuss your concerns with the Alaska Power Authority. Community workshops will be held in Palmer at Palmer Jr. High School on May 16th; in Willow at Willow Elementary School on May 17th; in Birchwood at Birchwood Elementary School on May 18th; in Fairbanks at the Borough Assembly Chambers on May 23; at the Nenana Council Chambers on May 24th; and in Healy at the Community Center on May 25.

Be sure and attend - your comments are welcome.

ALASKA POWER AUTHORITY

334 WEST 5th AVENUE - ANCHORAGE, ALASKA 99501

Phone: (907) 277-7641
(907) 276-0001

May 5, 1983

Dear Community Leader:

We wrote to you recently about an ongoing Susitna Hydroelectric Project transmission line routing study. The Alaska Power Authority applied to the Federal Energy Regulatory Commission (FERC) in February of this year for a license to construct the Susitna Hydroelectric Project. Since that time the Power Authority has conducted refinement studies to further evaluate and confirm the transmission line corridor which was recommended in the License Application.

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ALASKA POWER AUTHORITY

334 WEST 5th AVENUE - ANCHORAGE, ALASKA 99501

Phone: (907) 277-7641
(907) 276-0001

May 5, 1983

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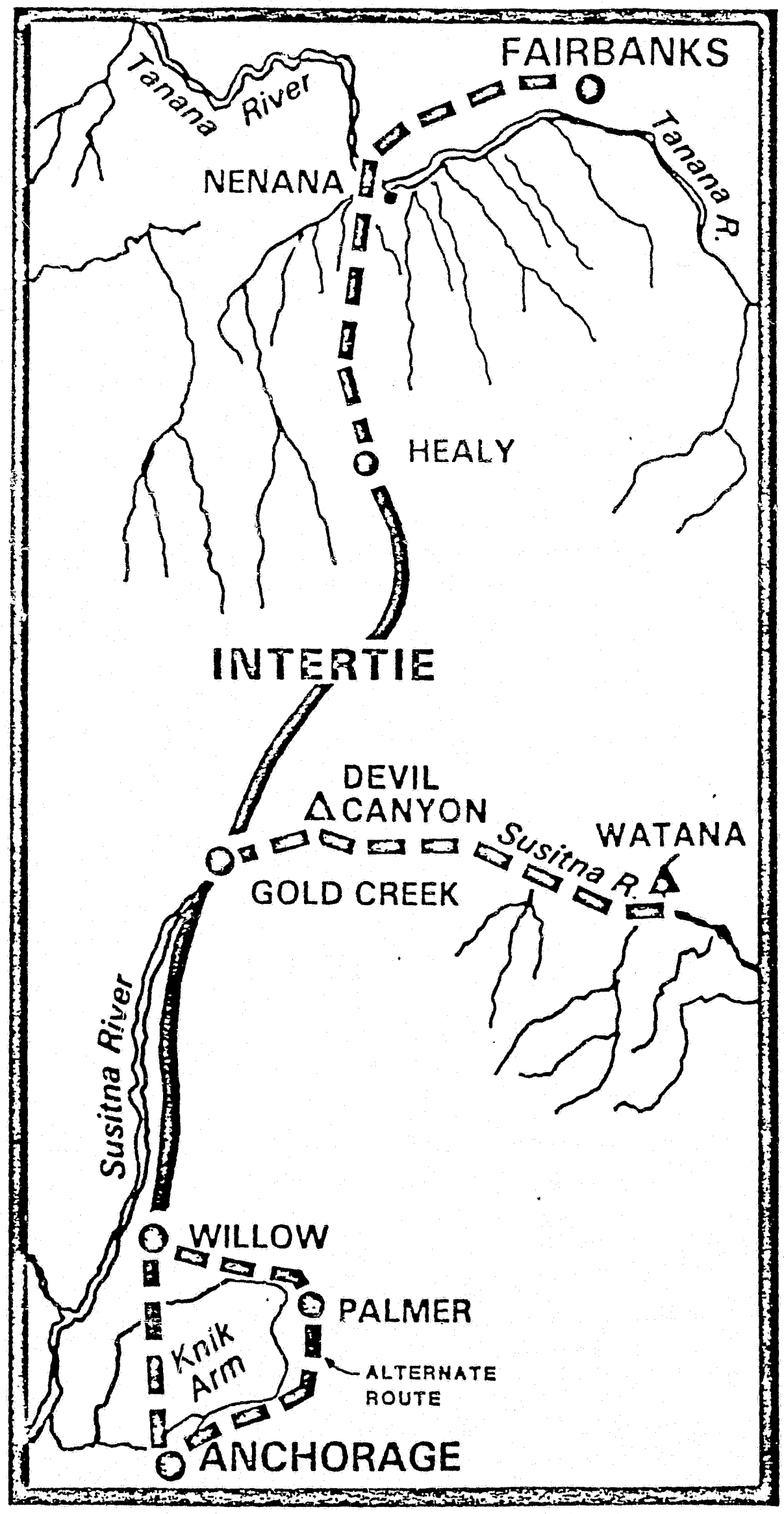
FAIRBANKS
Tanana River
NENANA
Tanana R.
HEALY
INTERTIE
DEVIL
CANYON
Susitna R.
WATANA
GOLD CREEK
Susitna River
WILLOW
PALMER
Knik
Arm
ALTERNATE
ROUTE
ANCHORAGE

A COMMUNITY WORKSHOP on Susitna Transmission Line Routing

TOPICS:

- description of corridor routing process, including environmental considerations
- workshops to identify issues
- general maps of the routes under consideration
- question and answer period

DATES & PLACES:

Palmer -	7:00 p.m., Monday, May 16	• Palmer Junior High School
Willow -	7:00 p.m., Tuesday, May 17	• Willow Elementary School
Birchwood -	7:00 p.m., Wednesday, May 18	• Birchwood Elementary School
Fairbanks -	7:00 p.m., Monday, May 23	• Borough Assembly Chambers
Nenana -	7:00 p.m., Tuesday, May 24	• Nenana Council Chambers
Healy -	7:00 p.m., Wednesday, May 25	• Healy Community Center

Alaska Power Authority

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NEWSPAPER	RUN - DATES
ALL ALASKA WEEKLY - FAIRBANKS	5/13 - 5/20
THE FRONTIERSMAN - PALMER	5/12
VALLEY SUN - PALMER	5/10
FAIRBANKS DAILY NEWS MINER	5/20, 5/23/5/24 5/25
CHUGIAK - EAGLE RIVER STAR	5/12
ANCHORAGE TIMES	5/13, 5/15, 5/14 5/17, 5/18
ANCHORAGE DAILY NEWS	5/13, 5/15, 5/16 5/17 5/18

NEWSPAPER	RUN - DATES
ALL ALASKA WEEKLY - FAIRBANKS	5/13 - 5/20
THE FRONTIERSMAN - PALMER	5/12
VALLEY SUN - PALMER	5/10
FAIRBANKS DAILY NEWS MINER	5/20, 5/23/5/24 5/25
CHUGIAK - EAGLE RIVER STAR	5/12
ANCHORAGE TIMES	5/13, 5/15, 5/24 5/17, 5/18
ANCHORAGE DAILY NEWS	5/13, 5/15, 5/16 5/17 5/18

ALASKA POWER AUTHORITY

334 WEST 5th AVENUE - ANCHORAGE, ALASKA 99501

Phone: (907) 277-7641
(907) 276-0001

Dear Citizen:

Public concerns and comments continue to be important to the Alaska Power Authority as we move toward the licensing of the Susitna Hydroelectric Project. Governor Sheffield submitted the license application for Susitna to the Federal Energy Regulatory Commission (FERC) on February 28 of this year. The Power Authority is now conducting further investigations that will provide the supplementary data needed by FERC to make their licensing decision.

One of the supplementary tasks is to further evaluate transmission line routing. Local community preferences and concerns are key elements in the route evaluation process. The enclosed brochure describes the transmission line evaluation and the opportunities for public participation.

I encourage you to complete the form on the brochure, indicating your feelings on the important issues in transmission line routing. Please feel free to also give us more detailed comments and to be involved in the community workshops to be held in May. Workshop times and dates will be announced locally in the next few weeks.

If you would like more detailed information on transmission line routing or other aspects of the Susitna Project, copies of both the April 1982 Feasibility Report and the FERC License Application are available in the following libraries:

- Noel Wien Library - Fairbanks
- Talkeetna Public Library
- Rasmussen Library - Fairbanks
- Trapper Creek Elementary School Library
- Cantwell School Library
- Palmer Public Library
- Alaska Power Authority Library - Anchorage
- Loussac Library - Anchorage

Again, we invite your involvement in this process and welcome your comments.

Sincerely,

Eric P. Yould
Executive Director

ALASKA POWER AUTHORITY

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Phone: (907) 277-7641
(907) 276-0001

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One of the supplementary tasks is to further evaluate transmission line routing. Local community preferences and concerns are key elements in the route evaluation process. The enclosed brochure describes the transmission line evaluation and the opportunities for public participation.

I encourage you to discuss this information with your membership and to give us your individual or group opinions on the important issues in transmission line routing. You can complete and return the form on the brochure or write us with more detailed comments. We also invite you to participate in the community workshops to be held in May, and would be happy to discuss the study with you or your members. Workshop times and dates will be announced locally in the next few weeks.

If you would like more detailed information on transmission line routing or other aspects of the Susitna Project, copies of both the April 1982 Feasibility Report and the FERC License Application are available in the following libraries:

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One of the supplementary tasks is to further evaluate transmission line routing. Local community preferences and concerns are key elements in the route evaluation process. We see the Community Council structure as a key part of providing information to the public and receiving their input. The enclosed brochure describes the transmission line evaluation and the opportunities for public participation.

I encourage you to discuss this information with your membership and give us your opinions on the important issues in transmission line routing. You can complete and return the form on the brochure or write us with more detailed comments. We also invite you to participate in the community workshops to be held in May, and would be happy to discuss the study with you or your members. Workshop times and dates will be announced locally in the next few weeks.

If you would like more detailed information on transmission line routing or other aspects of the Susitna Project, copies of both the April 1982 Feasibility Report and the FERC License Application are available in the following libraries:

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Eric P. Yould

Eric P. Yould
Executive Director

ALASKA POWER AUTHORITY

334 WEST 5th AVENUE - ANCHORAGE, ALASKA 99501

Phone: (907) 277-7641
(907) 276-0001

PRESS RELEASE

April 20, 1983

Contact: Pat Serie
Harza-Ebasco Public
Participation
Coordinator 349-8581

George Gleason
Alaska Power Authority
277-7641

The Alaska Power Authority is seeking public ideas and comments for use in a transmission line routing study currently underway as part of the Susitna Hydroelectric Project. Local community preferences and concerns are key elements in the route evaluation process.

Community workshops regarding the transmission line routing study will be held May 16-25, 1983, in Birchwood, Palmer, Willow, Fairbanks, Nenana, Healy, and Gold Creek. Local announcements of specific meeting times and places will be made in May.

A transmission line corridor was selected in last year's Susitna Feasibility Study as suitable from both economic and environmental standpoints. The selected corridor was one of serveral potential transmission corridors identified in the study that could connect the Susitna Hydroelectric Project to the proposed Willow-Healy Intertie and extend the Intertie to carry Susitna power to Anchorage and Fairbanks.

The selected transmission corridor will initially be a half-mile strip of land that will be further refined in the future to a right-of-way varying from 100 to 400 feet wide. The right-of-way will contain towers and conductors (wires) required to bring power from the Susitna site to the transmission line between Anchorage and Fairbanks. Depending on the width of right-of-way available, one of several tower designs will be used. They may be of single pole or guyed "x" design, for example. Where appropriate, the selected design will be built from "weathering" steel, which turns a rust brown color within a year.

Further refinement of the routing study will enable the Alaska Power Authority to minimize impacts on land use, visual resources, and natural systems while optimizing construction and operating costs.

HARZA-EBASCO SUSITNA JOINT VENTURE

Design Office: 400-112th Avenue, NE Bellevue, Washington 98004 Tel. (206) 451-4500
Main Office: 8740 Hartzell Road Anchorage, Alaska 99507 Tel. (907) 349-8581

April 20, 1983

Judy Stanek
Federation of Community Councils
801 W. Fireweed Lane, Suite 103
Anchorage, Alaska 99503

Dear Judy:

Attached is the article on Susitna transmission line routing that we discussed for inclusion in the Federation's April Neighbor to Neighbor. Please call me (349-8581) if you would like to discuss it.

We are also making direct mailings to each of the member councils.

I appreciate your help in this and look forward to working further within the community council structure.

Very truly yours,

Patricia J. Serie
Public Participation
Coordinator

PJS/ml

Attachment

cc: Ramon S. LaRusso - H-E
Tom Arminski - APA
George Gleason - APA
Rick Suttle - H-E
Bill Rom - H-E
Steve Ott - Commonwealth Assoc.

0305A

ARTICLE FOR NEIGHBOR TO NEIGHBOR
COMMUNITY COUNCIL NEWSLETTER

The Alaska Power Authority is seeking public ideas and comments for use in a transmission line routing study currently underway as part of the Susitna Hydroelectric Project. Public concerns are an important consideration in the overall route decision process, and the Power Authority invites community councils and their members to participate.

A preferred transmission line corridor was selected in last year's Susitna feasibility study as suitable from both economic and environmental standpoints. This study identified potential transmission corridors to connect the Susitna Hydroelectric Project to the proposed Willow-Healy Intertie and extend the Intertie to carry Susitna power to Anchorage and Fairbanks.

The selected transmission corridor will initially be a half-mile strip of land that will be further refined in the future to a right-of-way varying from 100 to 400 feet wide. That right-of-way will contain towers and conductors (wires) required to bring power from the Susitna site to the transmission line between Anchorage and Fairbanks. Depending on the width of right-of-way available, one of several tower designs will be used. They may be of single pole or guyed "x" design, for example. Where appropriate, the selected design will be built from "weathering" steel, which turns a rust brown color within a year.

In order to build the lines and maintain the right-of-way, it will be necessary to have year-round access. One of the goals is to select areas that are already served by access roads to minimize new construction and disturbance. Where necessary, however, access trails will be developed and maintained.

A great deal of information exists from previous work on these corridors. Earlier data from the Intertie and Susitna projects include aerial photos, USGS maps, land status reports, and field observations. Input is being sought from agencies, interest groups community councils, and the public.

Further refinement of the routing study will enable the Alaska Power Authority to minimize impacts on land use, visual resources, and natural systems while optimizing construction and operating costs.

The Alaska Power Authority will be seeking the public's ideas and comments regarding the transmission line routing study. Your concerns can be considered in the decision process in the following ways:

- Write the Alaska Power Authority with your comments: Alaska Power Authority, Susitna Project Office, 334 West 5th Avenue, Anchorage, Alaska 99501

- Attend community workshops to express your opinions. They will be held May 16-25 in the following communities. Local announcements of specific meeting times and places will be made in May.

  - Birchwood, Palmer, Willow, Fairbanks, Nenana, Healy, Gold Creek

TRANSMISSION LINE PUBLIC MEETING
PALMER JUNIOR HIGH SCHOOL, PALMER, MAY 16, 1983

Questions from Attendees:

1. Whose idea was it to explore the overland route around Palmer and what is the rationale?

2. What will be the cost of the overland route?

3. Which utilities expressed concern about reliability sufficient to trigger the additional study?

4. What are the maximum miles underground beneath Knik Arm? Will you use cable?

5. What is the capacity of a 345 KV line?

6. How far apart will the towers be? What is the ROW width?

7. Why are three lines needed?

8. What would be the initial construction cost difference between the four-mile underwater crossing and overland lines? What is the combined cost?

9. Why is the overland routing around Knik Arm, a new option not in the FERC application, being entertained?

TRANSMISSION LINE PUBLIC MEETING
PALMER JUNIOR HIGH SCHOOL, PALMER, MAY 16, 1983

Issues/Concerns

1. Because of safety aspects of flying in foggy weather, proliferation of routes is unwise in this area. Use the same corridor for more than one application if possible.

2. The southernmost route through the Palmer Hay Flats is relatively undeveloped. A lot of shooting goes on there, which may be trouble for maintenance.

3. Look at where future industrial growth is likely to appear and target those areas. Homeowners will not be the major consumers.

4. Stress environmental factors - avoiding scenic parks, view areas, natural habitat.

5. The northern route seems to parallel the Castle Mountain Fault, a prominent sesimic hazard.

6. Ensure compatibility with residential areas.

7. Keep costs low.

8. Visibility is a concern near the railroad.

9. Investigate sharing or paralleling the Mat-Su Borough's 600-foot ROW down to Point Mackenzie.

10. The corridor north of the Susitna River would probably be the easiest to get through.

11. Try to coordinate with other compatible utility and road corridors wherever possible. There are several planned (e.g. Knik Arm Crossing). This avoids wasting land, lessens costs of easements and ROW acquisition, and minimizes visual impact.

12. Emphasize natural environmental compatibility. Transmission towers and lines are unnatural intrusions on long views. Also assess natural hazards such as seismic effects or landslides.

13. Stress land use compatibility, avoiding intrusion into concentrated settlement (residential) areas. This has cost/benefit advantages but requires anticipating future demands.

14. Routing needs to effectively serve future growth areas and industrial growth. Industrial growth is needed to maintain overall growth and use the Susitna Power capability.

15. Routing should use corridors which avoid scenic areas (parks and views) and populated areas.

16. Avoid route through Hay Flats because of low-flying aircraft and hunters' impacts on maintenance. Other corridors are available.

17. In general, the northern corridor is preferable, as southern routes have heavy recreation and aircraft use.

PALMER ATTENDEES

NAME	MAILING ADDRESS
Guy Woodings	Box 13865, Palmer
Marvin Faris	SRA Box 6631, Palmer
Jack Doull	Box 518, Palmer
Noel W. Lood	Box 827, Palmer
E. J. Voight	228 Eagle River
Robert Mohn	4740 Newcastle Way, Anchorage
Rodney Schulling	Box B, Palmer (Mat-Su Borough)

TRANSMISSION LINE PUBLIC MEETING
WILLOW ELEMENTARY SCHOOL, WILLOW - MAY 17, 1983

ISSUES/CONCERNS

1. I'm concerned about the impact of the power line corridors through what is now wilderness (FERC route) because of access via 3-wheelers, etc, disturbances to wildlife and vegetation and streams.

2. Any possible disturbance from power lines to water fowl or other migratory birds?

3. I'm not convinced we need the Susitna Hydro Project as it is proposed. I'm opposed to footing the bill for a too-big project and also very opposed to inviting in any types of polluting or habitat impacting industries to pay for this power. I think it should be scaled down - wi ı some serious attention paid to this issue by planners and designers.

4. In general, I'd prefer to see the power lines go through already existing corridors rather than impact such a large off-road area (the FERC route).

WILLOW ATTENDESS

NAME	MAILING ADDRESS
Ann Dixon	P. O. Box 1161, Willow 99688
Mark Harris	Frontiersman

TRANSMISSION LINE PUBLIC MEETING
BIRCHWOOD ELEMENTARY SCHOOL, BIRCHWOOD, MAY 18, 1983

Questions from Attendees:

1. Why do we need two routes? Why is reliability (backup) so important?

2. If you can justify overland route, why develop two ROW's?

3. What is ROW requirement for one circuit?

4. With loss of underwater system, only one line would be supporting Anchorage. If one will do it, why do we need additional lines?

5. What amount of electricity does Anchorage need? Use?

6. What is format method for evaluating impacts?

7. How can people participate in the impact evaluation process?

8. Will the public see the evaluation information and recommendation before it goes to Board?

9. How will the evaluation matrix be quantified? How will people know?

10. What is relationship to Interie? What is Intertie's purpose without Susitna?

11. Does MEA ROW go all the way into Anchorage? How wide is it? Is it de-energized now?

12. Does MEA ROW abut private land? What will we recommend for width and number of circuits?

13. Does FERC application address cost of acquiring additional ROW on optional routes?

14. Aren't economics (land cost) the primary factor?

15. How much private land is along the alternative corridors?

16. Why not consider an all-overland route?

17. Who is the Power Authority?

18. Will access to ROW's be controlled?

TRANSMISSION LINE PUBLIC MEETING
BIRCHWOOD ELEMENTARY SCHOOL, BIRCHWOOD, MAY 18, 1983

Issues/Concerns

1. Not enough specific data is available at the meeting regarding the impacts and the evaluation of alternative corridors. Please provide specific data at a future meeting in Anchorage.

2. Detailed environmental data should be presented on the proposed corridor (FERC Application) as is available in the feasibility study.

3. Cost comparisons should be provided between alternative corridors.

4. The community of Anchorage has substantial interest in the final selection of transmission line corridors. This justifies and warrants a public meeting in Anchorage prior to a decision by APA on corridors. Anchorage residents own land in the corridors; they hunt, fish and recreate there; and they will be paying for the lines through power costs.

5. Wildlife habitat is a very important resource which should be given substantial weight in assessing potential impacts of the transmission lines. Several of the alternatives would impact large areas of wildlife habitat and open those areas up to public access/pressure on the resources.

6. The three circuits should be aligned (if all three are indeed justified by the revised Anchorage Power projection) together going overland to Anchorage. Already impacted developed areas are more desirable locations for transmission line impacts and allow for greater stability in the overall system.

7. I'm concerned about the impact of the additional circuits added to the Intertie. I have land near the Intertie north of Talkeetna and I want as little impact on my wilderness land as possible, so I'd like the work on the Intertie to be done in as narrow a time frame as possible, so that as few people and machines will litter, vandalize, and otherwise destroy the nature of the area.

8. Concerning the corridors from Willow to Anchorage, I would prefer a corridor that follows as closely as possible to existing rights of way, so that as little wilderness as possible is impacted. In other words, use areas that already have power lines.

9. Avoid existing residential/recreation uses where possible (higher priority than planned uses).

10. Coordinate with other agency planning (e.g. DNR land use).

NAME	MAILING ADDRESS
Grady E. Taylor	2732 W. 67th, Anchorage, AK.
Gail M. Heineman	2732 W. 67th, Anchorage, AK.
Judy Zumicki	SRA 4007-A, Anchorage, AK.
Bob Schutte	431 Little Diomede Cir., Eagle River
Beau Bassett	1329 East 15th, Anchorage, AK.
Mike Varrone	1718 Russian Jack Dr., Anchorage, Alaska
Martin Chetlen	4108 Reka Drive, Anchorage, AK.

TRANSMISSION LINE PUBLIC MEETING

FAIRBANKS NORTH STAR BOROUGH CHAMBERS, FAIRBANKS, MAY 23, 1983

ISSUES/CONCERNS

1. Concern that power was not needed.

2. Concern over Intertie was expressed. One family reported problems with drilling on/near their land, contractors leaving waste and not filling holes. They wondered how the Power Authority would control contractors.

3. A local lineman with many years of T-line experience supported the project.

4. Questions on width of ROW, clearing and maintenance questions.

5. Questions on relationship to Intertie, whether Intertie would be built without Susitna.

6. Use existing ROW's wherever possible, impacting minimum of untouched areas.

7. Concern over increased access for recreation.

8. Visual impact, land compatibility were key issues.

Twelve people attended this meeting and participated in issues development session and discussions.

TRANSMISSION LINE FEATURES

The selected transmission corridor will initially be a half-mile wide strip of land that will be further refined in the future to a right-of-way varying from 100 to 400 feet wide. That right-of-way will contain towers and conductors (wires) required to bring power from the Susitna site to the transmission line between Anchorage and Fairbanks. Depending on the width of right-of-way available, one of several tower designs will be used. They may be of single pole or guyed "x" design, for example. Where appropriate, the selected design will be built from "weathering" steel, which turns a rust brown color within a year.

In order to build the lines and maintain the right-of-way, it will be necessary to have year-round access. One of the goals is to select areas that are already served by access roads to minimize new construction and disturbance. Where necessary, however, access trails will be developed and maintained.

A great deal of information exists from previous work on these corridors. Earlier data from the Intertie and Susitna projects include aerial photos, USGS maps, land status reports, and field observations. Input is being sought from agencies, interest groups and community councils.

SUSITNA HYDROELECTRIC PROJECT

TRANSMISSION LINE ROUTING

ALASKA POWER AUTHORITY
PUBLIC PARTICIPATION PROGRAM

DETACH AND RETURN:

Please send me future mailings on the Susitna transmission line routing:

Name _____ Organization _____

Street/Box Number _____ City _____ State _____ Zip _____

☐ I plan to attend a Community Workshop in _____

General Comments: _____

The following issues are of most concern to me:

☐ Land Use
☐ Visual Impacts
☐ Lifestyle Conflicts
☐ Sharing Existing Utility Corridors
☐ Environmental Impacts
☐ Construction & Maintenance Costs
☐ Access Roads
☐ Design Features
☐ Other (list) _____

INTRODUCTION

The Alaska Power Authority has applied to the Federal Energy Regulatory Commission (FERC) for a license to construct the Susitna Hydroelectric Project. One aspect of the project that is being further evaluated is transmission line routing. Additional information on routing will be considered by FERC as part of the overall license review. **The ideas and concerns of the public are an important part of the decision process.**

Timeline

Feasibility studies on Susitna	**Jan. '80 - Feb. '83**
FERC application submitted	**Feb. '83**
Transmission routing studies	**March '83 - June '83**
Community workshops	**May 16 - May 28, '83**
Incorporation of comments	**May 29 - June 30, '83**
Draft EIS available for review (probable)	**Feb. - June '84**
Public comment period ends (probable)	**April - August '84**
Susitna license approval (probable)	**1985 - 1987**

PUBLIC PARTICIPATION

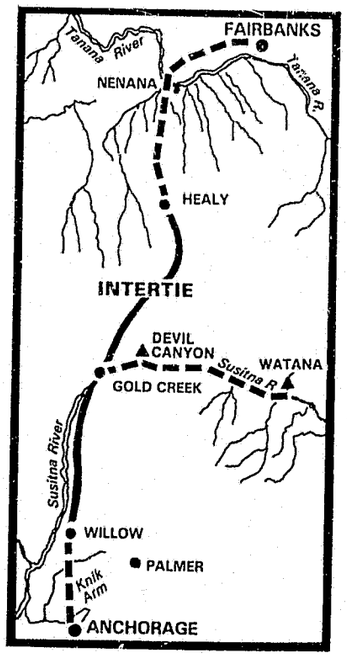
The Alaska Power Authority will be seeking your ideas and comments between now and June 30, 1983. We want to consider all the issues that concern community members and incorporate them in the decision process. Here is how you can be involved:

- Send in the attached response form with specific comments or suggested issues of concern.
- Write us at the address below with more detailed comments.
- Check your local library for information on the Susitna project.
- Attend community workshops and comment on the routing. They will be held May 16-25 in the communities below. Meeting times and places will be announced in May.
  - Birchwood
  - Palmer
  - Willow
  - Fairbanks
  - Nenana
  - Healy
  - Gold Creek

ALASKA POWER AUTHORITY
Susitna Project Office
334 West 5th Avenue
Anchorage, AK 99501

THE PROJECT

The Power Authority has contracted with Harza-Ebasco to conduct the supplementary evaluation of the transmission line routing. Last year's feasibility study identified corridors to connect the Susitna Hydroelectric Project to the Willow-Healy Intertie, and to upgrade and extend the Intertie to carry Susitna power to Anchorage and Fairbanks. The map on the right shows the general study area and the dashed lines show the corridors which are being considered.



The recommended transmission line route was the result of an evaluation of potential transmission line corridors. It considered requirements for technical and economic feasibility, environmental suitability, land availability, and existing land use patterns.

The Power Authority is now further evaluating that route selection. Specific objectives for the supplementary work are:

- Minimize impacts on land use
  - — avoid agricultural lands, recreation areas, parks
  - — avoid currently or potentially developed areas
- Minimize visual impacts
  - — assess scenic resources and visibility of lines
  - — reduce visual impacts
- Minimize impacts on natural systems
  - — evaluate wildlife, vegetation, fisheries for potential impacts
  - — plan to avoid or mitigate negative effects
- Optimize construction and operating costs
  - — provide reliable and maintainable power required for distribution throughout utility systems
  - — balance economics against technical, environmental, and public factors
- Maximize sharing of existing utility corridors
  - — share rights-of-way where practical
  - — reduce need for new access

APPENDIX R

ENVIRONMENTAL RESOURCE DESCRIPTIONS FOR TRANSMISSION ROUTE ALTERNATIVES

1.0 ENVIRONMENTAL RESOURCE DESCRIPTIONS

Following are descriptions of the various alternatives with respect to the five resource categories considered. Summaries of inventoried data are listed in Tables 7-3 and 7-4 of the report.

1.1 SOUTH STUDY AREA ALTERNATIVES

The alternative routes studied are listed in Table 4-2 in the report for the South Study Area. Detailed descriptions of each alternative by resource area, are given below. The descriptions include evaluations of each alternative, according to the criteria listed in Chapter 7, 7.2. The parallel alternatives to Knik Arm are discussed first, followed by the North Palmer Options and the split alternatives. These alternatives are described in Chapter 4.

1.1.1 Alternatives Description

Land Ownership

Existing land ownership within the South Study Area is shown on Maps 6, 9, and 12. Private land dominates the central and eastern part of the study area. Native lands are scattered throughout, with the largest contiguous area occurring near Eklutna Flats, south of Knik Arm/Knik River. Borough and municipal lands are similarily scattered, with the greatest concentration in the western third of the area.

State lands are concentrated in the western and northcentral parts of the study area, federal lands are primarily located in the area bounded by Anchorage, Knik Arm and Eagle River.

Route segments and alternatives were measured to determine linear mileage across the various types of land ownership. Mileage summaries are presented in Table 7-3. (The mileage entries in the table do not sum to the length of each alternative as a result of double-counting where different land ownerships occur on either side of the reference center-

line). The following paragraphs provide a general description of land ownership encountered along each of the alternatives.

o Parallel Alternatives

- Alternative A: FERC Route

  The FERC route crosses primarily state land, including the proposed Willow State Recreation Area, the Susitna Flats State Game Refuge and the Point MacKenzie Agricultural Project. Important federal lands crossed include Elmendorf Air Force Base and Fort Richardson Military Reservation. No native lands are crossed by this route, and private lands constitute a minor amount of the total.

- Alternative B: Little Susitna

  The Little Susitna route also affects primarily state land. This route skirts the edge of the Goose Bay State Game Refuge and the Point MacKenzie Agricultural Project. The route crosses all five of the land categories, including crossing Elmendorf Air Force Base and Fort Richardson Military Reservation. On the basis of land ownership, private lands affected by this route account for less than 10 percent, and native land use is minor in terms of total mileage. The private lands are located along the Parks Highway southeast of Nancy Lake, in the Finger Lake-Papoose Twins area, and near the southwest corner of the Goose Bay State Refuge.

- Alternative C: MEA/CEA

  The MEA/CEA Alternative includes a significant amount of state land, and considerably more mileage

across private and native lands than the FERC route or Little Susitna Alternative. The Goose Bay State Game Refuge is the most significant state tract crossed. All other land ownership categories are affected, including federal, borough, private, and native. As with the other two alternatives, all federal land is within Elmendorf Air Force Base and Fort Richardson. The private and native lands affected by this route account for a significant amount of the total land ownership mileage of this alternative. Most of the private lands are concentrated between Goose Bay and Willow/Teeland. Native parcels are located both north and south of Willow/Teeland, and south of the Little Susitna River (see Map 6).

o Split Alternatives - North Palmer Options

As shown in Map 12, three options exist for routing south from Segment 9 near the Little Susitna River to the south bank of the Knik River.

- East Palmer Option (Segments 12 and 16)

The East Palmer Option affects private lands almost continually from the junction with Segment 9 to the Knik River and Segment 16. This option also crosses the Knik River into private lands. Much of the remainder lies across native land near the Knik River. This option also crosses some borough and state land.

- Trunk Road/Kepler Lakes Option (Segments 11, 14, and 16)

This option primarily crosses private land, but includes significant amounts of borough and state

land, as well as the native land in Segment 16. Amounts of land crossed can be referenced in Table 7-3.

- Trunk Road/Glenn Highway Option (Segments 11, 13, and 15)

  The ownership pattern for this option is generally similar to the other two North Palmer Options, but it affects more state land and fewer borough and native lands. Private lands along the route are located north of the Palmer Hay Flats, and slightly over a mile of native land is located immediately south of the Knik River. It crosses less than half a mile of borough land and covers five miles of state land, including a portion of the Palmer Hay Flats State Game Refuge. This option also passes along the edge of the Alaska Railroad reserve at Matanuska.

Any of these three options would be combined with Segments 2, 9, 17, and 19 to complete the North Palmer route. Segments 2 and 9 lie primarily across state lands, with private lands primarily only in the easternmost portion of Segment 9.

Federal and native lands are the dominate ownerships in Segments 17 and 19 in the route from Eklutna Flats to University Substation. The federal land lies mostly within Fort Richardson, but also includes parts of three Alaska Railroad properties that may soon be transferred to state or native ownership. (The area north of Eagle River between Chugach State Park and Knik Arm is subject to the North Anchorage Land Agreement, a complex land claims settlement involving the Eklutna Native Corporation and federal, state, and municipal governments. Details of this agreement have not been com-

pletely settled, making land ownership determinations for this area somewhat tentative). Most of the native land along this segment is situated on either side of Eklutna. Private lands occupy over one mile of the route north of Birchwood. About three miles of state land are crossed in the vicinity of University Substation south of Tudor Road.

o Split Alternatives

- Alternative D: FERC/North Palmer

The combination of the two routes previously described (FERC and North Palmer) would affect from 18.5 to 28 miles of private land, 9 to 12 miles of native land, 19 to 22.6 miles of borough land, 27 to 28 miles of federal land, and 56 to 60 miles of state land. The range of miles reflects the options possible for the North Palmer route. Important state lands crossed include 4 miles of the Susitna Flats Game Refuge and possibly 1.2 miles of the Palmer Hay Flats if the Trunk Road/Glenn Highway Option is selected.

- Alternative E: FERC/South Wasilla

The South Wasilla route lies almost entirely across private land from Willow/Teeland to Matanuska. All other land ownership categories would also be significantly affected. The Palmer Hay Flats State Game Refuge is the most important state land crossed, while almost all of the federal land crossed is within Fort Richardson. This alternative shares Segments 17 and 19 with the North Palmer route, so land ownership effects from Eklutna Flats south would be the same. The combined

FERC route, previously described, and the South Wasilla overland route collectively affect 22 miles of private land, 12 miles of native ownership, 22 miles of borough lands, 27 miles of federal land, and 50 miles of state land. Important state lands crossed include the Susitna Flats and Palmer Hay Flats Game Refuge.

- Alternative F: Little Susitna/North Palmer

  Both of these routes have been described previously. The combined potential impact on land ownership categories is important; state lands potentially affected include the Palmer Hay Flats, depending on the North Palmer Option selected.

- Alternative G: Little Susitna/South Wasilla

  Land ownership effects for the two routes have been described above. As was the case with Alternative F, some of Alternative G is a parallel situation. This occurs also in Segments 2 and 3. Important state lands affected under this alternative include the Palmer Hay Flats (Segment 15).

- Alternative H: MEA/CEA - North Palmer

  Land ownership effects based on a combination of these two routes were described previously. This alternative has parallel areas (Segment 2), which reduce the overall impact on land ownership. Important state lands affected under this alternative include the Goose Bay Refuge and the Palmer Hay Flats if the Trunk Road/Glenn Highway Option is selected.

- Alternative I: MEA/CEA - South Wasilla

  This alternative has the most parallel area of all the split alternatives. The two routes parallel each other between Willow and Willow/Teeland. Important state lands impacted include the Goose Bay Refuge (Segment 7), and the Palmer Hay Flats (Segment 15).

  Summaries of the inventoried land ownership categories potentially impacted by the nine alternatives are depicted in Table 7-3.

Land Use

A land use inventory was conducted for the South Study Area, and the results are depicted in Maps 7, 10, and 13. Six types of land use were investigated: residential, commercial/industrial, agricultural, recreational, public, and vacant. Higher density residential development is concentrated in the vicinity of Anchorage. Principal areas of low-density residential development occur in a broad band from Big Lake through Wasilla to Palmer; in a band between the town of Eagle River and Mirror Lake; and in the vicinity of Willow. Numerous planned or developing subdivisions are located throughout the study area, primarily in the western half. The Big Lake, Wasilla, and Palmer areas in particular are undergoing substantial growth and development.

Commercial/industrial land occurs in a few concentrated locations, but also is scattered in small parcels throughout many of the areas mentioned above for residential lands. Largest concentrations are found in the Anchorage area, in the vicinity of Wasilla, and around Palmer.

The primary concentration of privately owned agricultural land occurs in the vicinity of Palmer, north of the Knik River and south of the

Little Susitna River. The Point MacKenzie Agricultural Project, situated in the western part of the study area, is being developed for agricultural use through lease to private farmers. Agricultural disposal lands are also located between Big Lake and the Little Susitna River, in the Delta Island area southwest of Willow, and north of Willow Creek.

Large areas of recreation/wildlife/cultural (termed recreation, for short), lands are located in the western portion of the study area. These recreation lands include the Susitna Flats State Game Refuge, the Goose Bay State Game Refuge, and the Nancy Lake Recreation Area. The Palmer Hay Flats State Game Refuge is another large area of recreational land. Other small isolated tracts of recreational land are scattered throughout the study area, including lands around Mirror Lake and Big Lake, and various parcels located near Palmer.

There are also lands other than recreation areas that have some designated public use. The largest contiguous area is the Moose Creek Reserve, situated about 4 miles northwest of Palmer. Other isolated tracts occur near Palmer, in the Anchorage area, and in the corridor between Eagle River and Mirror Lake at various distances from the Glenn Highway.

Vacant land which is land not designated a specific use is the most prevalent land type in the study area. Virtually all of the land between Willow and Point MacKenzie is vacant. The Wasilla-Palmer area has the least amount of vacant land, compared to the western portion of the study area.

The following paragraphs provide a description of the land uses encountered along each of the alternatives.

o Parallel Alternatives

- Alternative A: FERC Route

The FERC route runs north from Willow Substation across Willow Creek, then west until it intercepts the north boundary of the proposed Willow State Recreation Area. The route follows the boundary of this area for 1 mile, with vacant land on the north side of this boundary. The route crosses a portion of the proposed recreation area, then turns south across Willow Creek again and runs south through vacant land. This alignment passes within approximately 1.5 miles of the low-density residential/recreation development along Red Shirt Lake, but does not actually encounter any developed land north of the Little Susitna River. Near John Lake the route enters the Susitna Flats State Game Refuge, and goes through the Point MacKenzie Agricultural Project. The route heads east at Lorraine across Knik Arm (underwater) and through vacant military land to Fossil Creek. From this point, the route heads southwest and west to University Substation, then passes through recreation land (Fort Richardson golf course), commercial/industrial land along the south side of Tudor Road in Anchorage, and vacant land.

To summarize, the FERC route crosses primarily vacant, undeveloped land over most of the route. Other land use categories affected include recreational, agricultural, and commercial/industrial.

Alternative B: Little Susitna

The Little Susitna route begins at Willow Substation, runs southeast to Nancy Lake (Segment 2), and then due south to the point labelled Little Susitna (Segment 3). Only vacant land is crossed although the route passes near the planned Willow subdivision and across the planned Lilly Aliquot subdivision. From Little Susitna, the route runs southwest for about 9 miles, turns southeast for about 7 miles, and then south to a point one mile south of Goose Bay State Game Refuge. In this segment, equal portions of residential land, recreational land, and agricultural land lie along the route. The route also crosses the LeRoux View Remote Parcel, which is currently open for staking. Segment 4 also traverses the northern portion of the Point MacKenzie Agricultural Project and later follows a minor portion of its border. This route also follows the border of the Goose Bay State Game Refuge for 1.5 miles, and then the boundary of the Holstein Heights subdivision for 1.5 miles. At this point the Little Susitna route joins the FERC route, sharing Segments 5, 8, 18, and 19.

From the southern tip of Holstein Heights to Lorraine and on to the western shore of Knik Arm, this route crosses no developed land. However, most of this section is within the Point MacKenzie Industrial Park/Port site, planned for development by the Matanuska-Susitna Borough. Vacant military land is present in Segment 18 east of Knik Arm to Fossil Creek. From Fossil Creek to University Substation the route crosses 10.5 miles of vacant land, about one mile of commercial/industrial land and less than half a mile of recreational land.

- Alternative C: MEA/CEA Parallel

The MEA/CEA Parallel route begins at Willow Substation and shares Segments 2 and 3 with the Little Susitna route. As described above, most of the land use in these segments are vacant. From Little Susitna, the route runs 10 miles southeast to Willow/Teeland, crossing about a mile of residential land and nine miles of vacant land. From Willow/Teeland, the route runs 3.5 miles south through vacant land and then heads southwest for 8.5 miles to a point just south of Goose Bay State Game Refuge. This segment crosses two miles of the refuge, in addition to several scattered residential parcels. The route then heads due south across 5 miles of vacant land to Lorraine. From the game refuge to Knik Arm the route is primarily within the Point MacKenzie Industrial Park/Port site, although no development of this area has yet occurred.

It runs east across Knik Arm and vacant land to Fossil Creek, and from there southwest to University Sub- station. The land use mileage figures between Lorraine and University Substation are the same as for the FERC and Little Susitna routes (see Table 7-3).

o Split Alternatives - North Palmer Options

- East Palmer Option (Segment 12 and 16)

The East Palmer Option crosses 3.9 miles of residential land, primarily in the valley bottom land east of the Matanuska River. It also crosses some commercial and agricultural land, most of which is in the general vicinity of Bodenburg Butte.

- Alternative C: MEA/CEA Parallel

The MEA/CEA Parallel route begins at Willow Substation and shares Segments 2 and 3 with the Little Susitna route. As described above, most of the land use in these segments are vacant. From Little Susitna, the route runs 10 miles southeast to Willow/Teeland, crossing about a mile of residential land and nine miles of vacant land. From Willow/Teeland, the route runs 3.5 miles south through vacant land and then heads southwest for 8.5 miles to a point just south of Goose Bay State Game Refuge. This segment crosses two miles of the refuge, in addition to several scattered residential parcels. The route then heads due south across 5 miles of vacant land to Lorraine. From the game refuge to Knik Arm the route is primarily within the Point MacKenzie Industrial Park/Port site, although no development of this area has yet occurred.

It runs east across Knik Arm and vacant land to Fossil Creek, and from there southwest to University Sub- station. The land use mileage figures between Lorraine and University Substation are the same as for the FERC and Little Susitna routes (see Table 7-3).

o Split Alternatives - North Palmer Options

- East Palmer Option (Segment 12 and 16)

The East Palmer Option crosses 3.9 miles of residential land, primarily in the valley bottom land east of the Matanuska River. It also crosses some commercial and agricultural land, most of which is in the general vicinity of Bodenburg Butte.

- Trunk Road/Kepler Lakes Option (Segments 11, 14, and 16)

  This option would affect about 3 miles of agricultural land, including the Gooding Lake area within Segment 11. In addition, 1.6 miles of residential uses would be crossed. This option is routed just to the east of the currently proposed state recreation area in the Kepler-Bradley Lakes system (Segment 14).

- Trunk Road/Glenn Highway Option (Segments 11, 13, and 15

  This option is similar in impact to the Trunk Road/Kepler Lakes Option. It would affect the same amount of agricultural land, and residential and commercial uses. However, it also crosses one half mile of the Matanuska Valley Experimental Farm (Segment 13), and 1.6 miles of recreation/wildlife lands within the Palmer Hay Flats State Game Refuge.

o Split Alternatives

- Alternative D: FERC/North Palmer

  The North Palmer route also begins at Willow Substation and heads south, diverging to the east from the existing MEA corridor near Nancy Lake. All lands along Segment 2 are vacant, while Segment 9 crosses residential land in several parcels within the general vicinity of the Little Susitna River. From the end of Segment 9, one of the three options discussed above would be selected to a common point near Eklutna Flats, at the intersection of Segments 15, 16, and 17.

Depending upon which option was selected for the Palmer area, the North Palmer route would affect from 3.6 miles to 5.9 miles of residential land, 0.8 to 2.9 miles of agricultural land, and 1.7 to 3.3 miles of recreational lands.

The North Palmer route beyond Eklutna Flats would affect all land uses except agricultural. This route crosses less than half a mile of residential land in two parcels near Birchwood. Affected commercial lands (1.1 miles) are primarily along Tudor Road in Anchorage, while some public Alaska Railroad lands are crossed. Segment 19, which is common to all routes, crosses recreational land on Fort Richardson; Segment 17 also crosses 1.4 miles of undeveloped park land near Psalm Lake.

Results of the total land use impacts combining the FERC route with the North Palmer route are indicated in Table 7-3.

- Alternative E: FERC/South Wasilla

The South Wasilla route follows part of the MEA/Chugach route (Segment 2, 3 and 6). Affected land uses in this area have been described in the previous discussion. From Willow/Teeland, the route runs northeast briefly and then east through the Lucille Creek Valley to a point near Matanuska along the Alaska Railroad. Within this segment about three miles of residential land is crossed, with some agricultural land. The route then runs south and crosses the Matanuska and Knik Rivers, as does the Glenn Highway Option; in this segment the route traverses the Palmer

Hay Flats State Game Refuge. The route then runs southwest using the deactivated MEA ROW to Fossil Creek and University Substation along Segments 17 and 19, for which affected land uses have already been described. Overall, the South Wasilla route crosses 4 miles of residential land, 1.2 miles of commercial land, and 3.4 miles of recreational land. Figures for the agricultural and public/semi-public land categories are 0.6 and 0.5 miles, respectively.

Results of the total land use impacts combining the South Wasilla route with the FERC route are indicated in Table 7-3.

- Alterative F: Little Susitna/North Palmer

Both of these routes have been described above in terms of land use. The combination of the two routes would result in total potential effects as indicated in Table 7-3.

- Alternative G: Little Susitna/South Wasilla

Segments 2 and 3 are commonly shared in this split alternative, and therefore impacts to land use are generally reduced. Land use within these two segments is mostly vacant. Beyond Segment 3, the effects on land use would be the same as those described previously. The total potential effects on land use related to this alternative are indicated in Table 7-3.

- Alternative H: MEA/Chugach - North Palmer

This alternative has one common segment (Segment 2) before the routes split and follow routes previously

described. The miles of land use that would potentially be affected are indicated in Table 7-3.

- Alternative I: MEA/Chugach - South Wasilla

  Alternative I has the most parellel area (Segments 2, 3, and 6). Potential effects on land use for those segments have been described previously. The combined potential land use impact as related to miles crossed is indicated in Table 7-3.

Terrestrial Resources

Mucn of the South Study Area is characterized by drumlins and ridges covered with birch and spruce forest, and depressions with lakes, ponds, and wetlands. Flat, glaciolocustrine deposits in the southern portion of Cook Inlet create extensive areas of wetlands. The large number of water bodies create waterfowl habitat throughout the entire area. Waterfowl concentration during migration in the wetlands include the Susitna Flats, Goose Bay, and Palmer Hayflats Wildlife Refuges (ADF&G 1979). With the exception of the central Matanuska Valley, most of the area is important moose habitat and black bear spring habitat (ADF&G 1976, 1980).

A vegetation map of the South Study Area was prepared based on existing vegetation maps (ADNR 1983) and is provided as Map 2. Tables depicting the acreage of each vegetation type within the right-of-way for each segment and alternative are provided as Tables 5-3 and 5-4 in Appendix S, respectively. In addition, acres of forest habitat were totalled and are summarized by alternative in Table 7-3.

Wetland data for the South Studyb Area were summarized from National Wetland Inventory Maps (USFWS 1983). The acreage of each wetland type

within the right-of-way is provided for each segment in Table 5-1 of Appendix S. Table 7-3 summarizes total wetland acreage by alternative.

Information on wildlife habitats and special use areas within the South Study Area was also summarized from existing data (ADF&G 1976, 1980; ADNR 1982, USFWS 1983b) and is provided in Map 4. The habitat and other wildlife evaluation criteria are quantified, to the extent possible, by alternative in Table 7-3.

The following paragraphs provide a description of the terrestrial resources encountered along each alternative.

o Parallel Alternatives

- Alternative A: FERC Route

  The FERC Alternative runs west from Willow, turns south near the Delta Islands area of the Susitna River, traverses relatively flat lowland with limited access to Knik Arm (Segments 1,5 and 8) crosses Knik Arm and travels through Fort Richardson (Segment 18), and then turns south and enters Anchorage.

  The alternative crosses extensive wetlands mostly classified as palustrine scrub-shrub. Most of the wetlands are located on Segments 1, 5, and 8, between Willow and Knik Arm. Wetlands comprise 60% of the ROW in these segments. Wetlands comprise only 10% of the ROW where it crosses Knik Arm and continues into Anchorage (Segments 18 and 19). The remaining vegetation is largely closed conifer, closed deciduous, closed mixed and open mixed forests. The total area of altered forest habitat

would be 1029 acres. The FERC Alternative has 39 miles of new corridor in a relatively undisturbed area and would improve access into this area.

Most of the whole area crossed by the route, particularly the portion between Willow and Knik Arm, contains waterfowl nesting and molting habitat. Sites where bald eagle nests have been observed are located along the Susitna River near the northern portion of the FERC Alternative, but are more than a mile from the route.

Also, two potential nest sites where trumpeter swan broods have been observed are located in the vicinity of the lower segment of the line, but are also more than a mile from the proposed route (Map 4).

- Alternative B: Little Susitna

The Little Susitna Alternative originates at Willow and travels generally south (Segments 2, 3, 4, 5, and 8), before crossing Knik Arm and going into Anchorage (Segments 18 and 19).

The Little Susitna Alternative crosses a large amount of wetlands, mostly classified as palustrine scrub-shrub. The majority of the non-wetland vegetation is closed mixed forest, but closed conifer, open conifer, and open mixed forest areas are also important vegetation types crossed. Forest habitat alteration would be slightly less and the acreage of wetlands potentially affected would be substantially less under Alternative B compared with Alternative A.

About 23 miles of Alternative B (primarily in Segment 4) follow a new corridor through a relatively undisturbed area and would improve access to this area. The remainder of the route parallels existing transmission lines. Most of the area contains waterfowl nesting and molting habitat, and the ROW also borders the western edge of the Goose Bay Wildlife Refuge, an area of concentrated use by water birds for about 1-1/2 miles (Map 4).

- Alternative C: MEA/CEA Parallel

The MEA/CEA route originates in Willow following the same route as the Little Susitna route along Segments 2 and 3, and then goes southeast on the eastside of Big Lake and southwest along Knik Arm (Segments 6 and 7) before crossing Knik Arm and going into Anchorage (Segments 18 and 19).

The area from Willow to Knik Arm is about 30% wetlands, mostly classified as palustrine scrub-shrub. Closed mixed forest is the dominant vegetation type on this alternative, with smaller amounts of closed conifer, closed deciduous, open mixed and dwarf tree forest.
Only about 4 miles of the route is new corridor; the rest parallels existing transmission lines which already provide access. About 2-1/2 miles of the route cross the Goose Bay Wildlife Refuge, an area of concentrated use for waterfowl. The route parallels an existing 138 kV transmission line along this segment. Much of the route includes waterfowl nesting and molting habitat.

o North Palmer Options

The North Palmer route runs from Willow south along Segment 2, as in the Little Susitna and MEA/CEA Parallel routes. From the Nancy Lake area, it turns east to the Palmer area (Segment 9), where three options are possible to connect with Segments 17 and 19 down the east side of Knik Arm into Anchorage.

- East Palmer Option (Segments 12 and 16)

The East Palmer Option is about 15% wetlands including a portion of riverine wetlands associated with the Matanuska and Knik Rivers. The most common forest vegetation is closed mixed (white spruce and birch), followed by closed conifer, with smaller areas of other forest types. Tall willow and alder stands along the Knik and Matanuska Rivers, which are also crossed.

The East Palmer Option has about 25 miles of new corridor, but the route is mostly located in or near areas which are relatively developed and accessible. The Palmer area includes waterfowl nesting and molting habitat, and the agricultural fields in the area are used by geese and sandhill cranes during migration.

- Trunk Road/Kepler Lakes Option (Segments 11, 14, and 16)

The Trunk Road/Kepler Lakes Option has some wetlands in the ROW, including riverine wetlands of the Matanuska and Knik Rivers. Vegetation is similar to the East Palmer Option, including tall scrub-shrub stands along the rivers.

This option would have 18 miles of new corridor, all through a relatively developed area with existing access. Waterfowl are discussed under the East Palmer Option.

- Trunk Road/Glenn Highway Option (Segments 11, 13 and 15)

The Trunk Road/Glenn Highway Option has 50 acres of wetlands within the ROW, but these wetlands include valuable palustrine emergent, riverine, and estuarine wetlands associated with the Matanuska-Knik estuary area in and near the Palmer Hay Flats Wildlife Refuge.

This option contains about 10 miles of new corridor through relatively developed areas. About 1-1/2 miles of this route crosses the eastern portion of the Palmer Hay Flats Wildlife Refuge, an important concentration area for resting and feeding water birds.

o Split Alternatives

- Alternative D: FERC/North Palmer

The entire North Palmer portion of this alternative (Willow to University Substation) would include only 115 to 126 acres of wetlands, since much of the area crossed is on well-drained slopes with closed mixed forest and closed deciduous forest. Total wetlands for Alternative D would be 659 to 670 acres, depending on the North Palmer Option selected. Total altered forest habitat would be 1990 to 1749 acres. Segment 2 to Nancy Lake parallels an existing transmission line, but Segment 9 from the Nancy Lake Substation to the Palmer area

would create about 21 miles of new corridor through a relatively undisturbed area.

Segment 17, down to Anchorage, largely follows an existing transmission line ROW through developed areas. Total length of new corridor for the FERC/North Palmer Alternative would be 69 to 84 miles, with approximately 62 miles of corridor providing new access to relatively undisturbed areas. For discussions of waterfowl and raptors, see Alternative A and the North Palmer Options, above.

- Alternative E: FERC/South Wasilla

The South Wasilla portion of Alternative E goes from Willow along segments included in the MEA/Chugach Parallel route (2, 3, and 6), before heading east to the Glenn Highway (Segment 10), crossing the Matanuska and Knik Rivers along the Glenn Highway and continuing on into Anchorage along the same corridor as the North Palmer route (Segments 15, 17 and 19). Segment 10 has 46 acres of wetlands in the ROW, mostly palustrine scrub-shrub. Total wetlands in the ROW for this split alternative would be 763 acres. Total altered forest habitat would be 1601 acres.

The only new corridor along the South Wasilla portion of the alternative is 17 miles of Segment 10, which passes through a relatively developed area. The remainder of the South Wasilla portion mostly follows existing transmission line ROW's. The FERC portion includes 39 miles of new corridor, providing new access to relatively undisturbed areas. The South Wasilla

portion of this alternative crosses within a mile of the north boundary of the Palmer Hay Flats Wildlife Refuge and then crosses the eastern portion of the refuge for 1-1/2 miles.

Resources of the FERC route were discussed above under Alternative A.

- Alternative F: Little Susitna/North Palmer

The two routes that comprise Alternative F have been discussed previously. The combined potential impact of the ROW includes 413 to 424 acres of wetlands and 1671 to 1912 acres of altered forest habitat depending on the North Palmer Option selected. The total route has 56 to 71 miles of new corridor, with about 44 miles providing new access to relatively undisturbed areas.

- Alternative G: Little Susitna/South Wasilla

Both of the individual routes that comprise Alternative G have been discussed previously. The combined potential impact of the ROW includes 507 acres of wetlands and 1515 acres of altered forest habitat. The total route has 40 miles of new corridor, of which about 23 miles is through a relatively undisturbed area. This alternative crosses the Palmer Hay Flats Wildlife Refuge.

- Alternative H: MEA/CEA-North Palmer

Both of these routes have been discussed previously. The combined potential impact of the ROW includes 368 to 381 acres of wetlands and 1808 to 2044 acres of altered forest habitat. This alternative would have 34

to 51 miles of new corridor, with almost all of the new corridor in the North Palmer route. Approximately 25 miles of new corridor would be in relatively undeveloped areas.

- Alternative I: MEA/CEA-South Wasilla

  Both of these routes have been previously described. The total ROW would include 450 acres of wetlands and 1598 areas of altered forest habitat. Total new corridor would be 26 miles, with about 5 miles in relatively undeveloped areas. Both the Goose Bay and Palmer Hay Flats Wildlife Refuges would be crossed.

Fisheries Resources

Map 3 shows the streams within the South Study Area that are known to have anadromous salmon. These species could include chinook, coho, pink, chum, and sockeye salmon, depending on the specific river or stream. Table 7-3 shows the approximate number of rivers and streams crossed for each alternative. The underwater crossing of Knik Arm will require the most activity in a water body. Other major rivers crossed will be the Knik, Matanuska, and Little Susitna Rivers.

o Parallel Alternatives

- Alternative A: FERC Route

  The FERC route makes approximately 11 river or stream crossings. These include Willow Creek, Little Susitna River, Knik Arm, and upper Ship Creek, which have been identified as having anadromous runs of fish. The most extensive crossing in terms of distance and time required to complete the crossing will be of Knik Arm.

Most of the terrain appears to be relatively flat. New access would potentially occur to streams within this route. No streams are closely paralleled (within 500') with this route although Willow Creek is paralleled at a somewhat greater distance for approximately four miles.

- Alternative B: Little Susitna

The Little Susitna Alternative crosses approximately 12 bodies of water, including the Little Susitna River, Willow Creek, Knik Arm and Ship Creek, all of which have anadromous fish runs. Most of this route crosses relatively flat terrain, with no streams closely paralleled (within 500'). Segment 4 provides potential new land access to lakes and streams.

- Alternative C: MEA/CEA Parallel

Access exists for a major portion of this alternative. Impacts to aquatic resources should potentially be less than those in new areas. This alternative crosses approximatey 18 water bodies, including Willow Creek, Lake Creek, Little Susitna, Lucille Creek, Knik Arm, Ship Creek and others that have identified runs of anadromous salmonids.

o North Palmer Options

- East Palmer Option

This option makes approximately 25 crossings, including major rivers such as the Matanuska, Little Susitna, and Knik that have anadromous fish runs. This option parallels the Little Susitna (along Segment 9), with construction on or near sloped areas with nearby streams and creeks. This is the longest option of the three.

- Trunk Road/Kepler Lakes Option

  This option has characteristics similar to the East Palmer Option but the route is shorter. The types and numbers of streams crossed are similar, with approximately 25 crossings.

- Trunk Road/Glenn Highway Option

  This option has characteristics that are similar to the other options. It is the shortest option and makes fewer stream crossings (approximately 17) than the other options.

o Split Alternatives

- Alternative D: FERC/North Palmer

  New access would potentially be created to streams and lakes, particularly along Segment 1. This crosses the Matanuska, Little Susitna, and Knik Rivers and other smaller rivers and streams (approximately 29 to 36 depending on the North Palmer Option selected). Along Segment 9 it would parallel the Little Susitna River in a sloped area with nearby creeks and streams. There would be an underwater crossing of Knik Arm that would cause disruption of the substratum. With all segments combined, this could be the longest alternative.

- Alternative E: FERC/South Wasilla

  Characteristics of this route are similar to the FERC and North Palmer route, except that Segment 9, which parallels the Little Susitna River, is not incorporated. The route crosses numerous small streams along Segment 10 that have anadromous fish runs (Map 3) and there is a potential to add additional access to these streams.

- Alternative F: Little Susitna/North Palmer

  This alternative would make 31 - 37 crossings. Most of the route would potentially allow new access to streams and lakes along the corridors. Most of the terrain along these routes is relatively flat except along Segment 9 which is a sloped area with nearby streams and creeks.

- Alternative G: Little Susitna/South Wasilla

  Characteristics of both portions of this alternative have been previously described. The combined total of water bodies crossed would be approximately 44. Most of the terrain along these routes is relatively flat.

- Alternative H: MEA/CEA - North Palmer

  The North Palmer portion has been previously discussed. Access presently exists along the MEA/CEA lines and the potential for impact to fisheries resources or water quality may not be as great as with a new line. Segment 7 crosses several anadromous streams in addition to crossings previously described for other segments. The combined total number of crossings is 37 - 43, depending on which North Palmer Option is selected.

- Alternative I: MEA/CEA - South Wasilla

  Characteristics of both portions of this route have been previously described. The combined total of crossings for this alternative would be approximately 40.

Aesthetic Resources

(Reference Jones & Jones Report: Susitna Transmission Line Visual Resource Assessment.))

7.6 NORTH STUDY AREA ALTERNATIVES

The alternative routes studied are listed in Table 7-4 in the report for the North Study Area. Detailed descriptions of each alternative, by resource category, are described below. The descriptions include evaluations of each alternative according to the criteria listed in Chapter 7, Section 7.2.

7.6.1 Alternative Description

Land Ownership

Land ownership in the North Study Area is dominated by the state and federal governments, except for lands close to Fairbanks. As shown in Maps 15 and 21, almost all land within 10 miles of Fairbanks is privately owned, with mixed ownership along the Tanana River near Nenana. Large state and federal tracts occur between Fairbanks and Nenana and south from Nenana, broken primarily by scattered small private parcels. Four large and several smaller native parcels are located within this study area, including three 5,000-10,000 acre tracts near Nenana and nearly an entire township about midway between Healy and Anderson, west of the Nenana River. Few borough or municipal land exists within the study area.

- Healy to Anderson Alternatives

  Land ownership from Healy to Anderson conforms to the overall north pattern, with 65 percent or more of each alternative crossing state owned land. A significant factor in this sub-

area is the relatively large number of private parcels, virtually all of which are concentrated within one or two miles of the Nenana River and the Parks Highway. The FERC and GVEA Parallel routes (Alternatives A and B) both cross many of these private parcels. The GVEA route would cross between 40 and 50 private parcels, however, compared to about 15 private parcels along the FERC route in this area. Because it follows a course that is well removed from the river valley, the Healy East Option does not cross any of these private lands, although there are a number of mining claims in the vicinity. The FERC and GVEA routes would also have much longer crossings of state lands designated for private disposal. All three routes would cross the large Alaska Railroad reserve west and northwest of Healy, while the GVEA route would also have a short crossing of a similar reserve just south of the Clear M.E.W.S.

- o Anderson to Little Goldstream Alternatives

  The majority of the FERC route (Alternative C) from Anderson to Little Goldstream crosses state or federal land. The only non-public land in this case is native land, located on the south bank of the Tanana River and at the north end of Segment 17. The GVEA Parallel route (Alternative D) affects a long transect of native land, as well as significant amounts of private land in the vicinity of Nenana. Segments 14 and 18 of the GVEA Parallel route include some state disposals (the Two Mile Lake agricultural project), and crosses the Nenana South subdivision which is currently up for sale.

- o Little Goldstream to Ester Alternatives

  The FERC and Goldstream routes to Ester (Alternatives E and F) have similar proportions of land in public ownership, but

the Goldstream route would have a greater effect on non-public ownerships. The latter crosses 3 times as much private land, virtually all in the eastern end of Segment 24, as the FERC route. The Goldstream route would affect 70-75 private parcels, versus about 25 for the FERC route. The FERC route makes a long axial crossing of a large block of native land along Little Goldstream Creek, however, and also crosses approximately four miles of planned private selections within the Goldstream agricultural disposal. The Goldstream route traverses a portion of agricultural disposal land near Martin.

o Anderson to Wainwright Alternatives

Both routes from Anderson directly to Wainwright cross significant amounts of federal land, and both cross private land immediately before entering Wainwright Substation. The South Tanana Ridge route (Alternative G) has higher mileage figures for state, native, and private land, while the Tanana Flats route (Alternative H) crosses predominantly military land. The Tanana Flats route crosses the Blair Lake Air Force Range and Fort Wainwright Substation; and the South Tanana Ridge route crosses private parcels at three locations near the Tanana River, plus some native land south of the Tanana River near Nenana. It would directly affect 8 private parcels, compared to 2 parcels for the Tanana Flats route.

The third alternative to Wainwright (Alternative I) involves adding Segment 28 to the preferred Little Goldstream to Ester Alternative. The route indicated by Segment 28 would parallel the proposed South Fairbanks Expressway to the Wainwright Substation. The route lies almost entirely across private lands.

Land Use

Land use in the North Study Area can be characterized as primarily undeveloped, as indicated in Maps 16 and 22. Medium to low density urban, suburban, and rural residential development exists within approximately 10 miles of the center of Fairbanks, except to the south of the Tanana River. Existing development elsewhere in the study area occurs only in small clusters, primarily at or near Nenana, Anderson and Healy. Scattered development also occurs in a linear pattern along and near Healy, Nenana, and Ester. Large tracts of land throughout the study area have been planned for residential, agricultural, and industrial development, but as yet little activity has taken place. The North Study Area also includes portions of three major federal military reservations, of which the lands are predominantly undeveloped.

- Healy to Anderson Alternatives

  The Healy East Option does not cross any of the developed lands between Healy and Anderson, but it does include roughly 15 route miles through remote parcels (Windy Creek and Southwind), and about 3 miles through the Windy agricultural disposal. The FERC route (Alternative A) also crosses these three disposals, as well as the Healy Agricultural disposal, several existing and planned agricultural areas, plus the Spruce Hills, June Creek, Quota, and Brown's Court subdivisions. The total distance across those four subdivisions would be approximately 9 miles.

  Both Healy-Anderson Alternatives would make relatively lengthy transection of the Clear M.E.W.S. site (shown on Map 16). The FERC route would cross 6.4 miles of this military reservation within the shared Segment 9, compared

to 7 miles for the GVEA Parallel route.

The presence of the existing GVEA line would indicate, however, that this would not be a particularly sensitive issue.

- Anderson to Little Goldstream Alternatives

  The intensity of existing development is somewhat higher in the portion of the study area between Anderson and Little Goldstream Creek, for instance the town of Nenana. Compared to the South Study Area however, planned developments are small in both number and size.

  The GVEA Parallel route (Alternative D) is the only route in this area that would directly affect any existing developed land uses. This route would cross a small portion of residential and existing agricultural land north of Nenana. This route would also pass through a corner of the Nenana South subdivision, between the airport and camping area south of Nenana, near the western edge of Nenana itself, and through the Two Mile Lake agricultural parcels. The FERC route (Alternative C) crosses approximately 6.3 miles of the Tanana State Forest, but this should have little adverse effect upon future multiple use management.

- Little Goldstream To Ester Alternatives

  Little existing development occurs between Little Goldstream Creek and Ester, except for the eastern part of the main Goldstream Valley and near the Parks Highway southwest of Ester. Present development is limited to less than 10

scattered, small commercial or residential sites along the Parks Highway; commercial sites on Ester Dome and Murphy Dome; a few farming areas north and northwest of Ester; and several residential tracts in the Chena Ridge area. However, there are several proposed residential, agricultural and industrial developments in the Goldstream Valley, and between the Parks Highway and the Tanana River located south of Ester.

Although extensive development has been planned throughout this portion of the North Study Area, neither the FERC route (Alternative E) nor the Goldstream route (Alternative F) cross any developed land uses. The FERC route crosses 9.5 miles of the Tanana State Forest, plus a portion of the planned Tanana industrial site and the Goldstream agricultural disposal. The Goldstream route travels across state forest lands for a similar distance, but does not cross any of the industrial sites and only 1.7 miles of agricultural disposal parcels.

- Anderson to Wainwright Alternatives

  The Anderson-Wainwright area, including the lower-elevation lands on either side of the Tanana River, is almost completely undeveloped. The only existing land uses are two small agricultural parcels just south of the Bonanza Creek Experimental Forest, the southwestern extremities of the Chena Ridge residential areas, and low-density commercial lands immediately south of Wainwright. Tanana State Forest lands also are in this subarea. The undeveloped lands of two military reservations represent a potentially significant

land use factor. The Martin industrial site is the only planned disposal in this area.

Both of the direct alternative routes to Wainwright cross commercial land at the terminal end of Segment 27 near the Wainwright Substation location. This should not be a particularly significant routing consideration, as these lands are not highly developed and commercial/industrial lands are less incompatible with transmission lines. The South Tanana Ridge route (Alternative G) also crosses agricultural lands, the Tanana industrial site and the Tanana State Forest. This route may potentially conflict with low-flying aircraft due to two crossings of the Tanana River.

The Tanana Flats route (Alternative H) would not cross any of these latter land types, but would cross a significant amount of military land compared with the South Tanana Ridge route. These lands are undeveloped and are at least partially open for hunting and trapping. The military denied a recent request to declare some of this land excess property, because the land was used for a bombing practice area and is contaminated with unexploded bombs (Wilsey and Ham, Inc., 1983). This contamination would appear to affect the Tanana Flats route within Segment 11, but would have to be confirmed with the military.

The third alternative to Wainwright (Alternative I) focuses on Segment 28 from Ester to Wainwright, crossing developed lands in the south and southwestern portions of the Fairbanks urban area. The development density in much of this area is rather low, however, particularly in the commercial/

industrial area between Fairbanks International Airport and Wainwright. Segment 28 crosses 2.7 miles of commercial/industrial and 1.8 miles of residential land. Almost all of this residential land lies in a tract of ridge-slope land just east of Ester and a mobile home development adjacent to the Wainwright Substation site.

Terrestrial Resources

The terrestrial setting in the North Study Area includes the foothills of the Alaska Range, the Tanana Flats, the edge of the Tanana-Yukon Uplands, and the floodplains of two major rivers, the Nenana and the Tanana. The foothills of the Alaska Range rise to 2000 feet in elevation on a proposed route, with low shrub tundra at higher elevations, and forests in valleys and on lower slopes. This area is part of the range of the Delta caribou herd, which sometimes migrates across the Nenana River Valley (ADNR 1983). Moose are present in the foothills during summer and the fall, but concentrate on the Tanana Flats during winter. The Tanana Flats is a broad, almost level glacial outwash plain with an intricate mosaic of shrub wetlands and dwarf black spruce stands on poorly drained, ice-rich areas (ADNR, 1983). It is considered important moose winter habitat, and also contains waterfowl nesting and molting habitat throughout (USFWS 1983B Map 25). Considerable trumpeter swan nesting also occurs in the flats.

The Nenana and Tanana Rivers are braided and split channel glacial rivers, with actively shifting channels. Islands and terraces support successive stands of willow, alder, and poplar with merchantable stands of mature white spruce. These riparian areas are important winter moose habitats (Wolff and Zasanda 1979).

The Tanana-Yukon uplands in the project area include one to three major ridges parallel to the Tanana River. These uplands have layers of loess up to 100-feet thick. This material is highly erodible when exposed. South slopes support paper birch, aspen, and white spruce forests and have the best site potential for commercial timber of any area in the Interior. This area supports a large population of black bears.

Vegetation maps (17 and 23) were based on existing vegetation inventory maps (ADNR 1983). Acreage of each vegetation type within the right-of-way by segment is presented in Table 5-5 in Appendix S, and acres of forest habitat by alternative are presented in Table 7-4. National Wetland Inventory Maps are in preparation but not completed for this area, so potential wetlands were estimated from vegetation maps, aerial reconnaissance, and field experience. Acreage of each wetland type within the right-of-way segment is presented in Table 5-2 of Appendix S. Table 7-4 summarizes total wetland acreage by alternative.

Information on wildlife hatitats was summarized from meetings with resource agency personnel (Appendix M) and existing data (ADF&G 1983, ADNR 1983, USFWS 1983). Maps 19 and 25 present some of this data.

The following paragraphs provide a description of the terrestrial resources encountered along each alternative.

- Healy to Anderson Alternatives

  All routes originate at the Healy Substation and travel for 1.4 miles along the east side of the Nenana River in floodplain shrub plant communities between the river and the bluffs. The FERC route (Alternative A) and the GVEA Parallel (Alternative B) cross tall alder and willow stands along the river, and then run between the Parks Highway and

the river for about 8 miles (Segment 2). This area slopes gently to the river and is poorly drained. Most of the area is low shrub and dwarf black spruce wetlands. Near Ferry, the GVEA Parallel crosses the highway and runs to the Nenana River on the west side of the highway (part of Segment 10S). The GVEA ROW is partly on well-drained slopes with paper birch and white spruce forest, but also on wetland areas of black spruce and low shrub. The FERC route crosses over the Nenana River at Ferry (Segment 5) and parallels the railroad on poorly drained gentle slopes between the river and the uplands, before rising over an upland area and dropping into the Tanana Flats (Segments 8 and 9). The river floodplain has tall shrub communities of willow and alder, and the better drained areas support birch forest and some white spruce, but about half the route is poorly drained wetlands area with dwarf black spruce and low shrub. The Healy East Option travels across the slopes of the uplands on the east side of the Nenana River to join the FERC route near the Tanana Flats (Segments 3 and 7). Much of the upland area is alpine shrub, some sites are tall alder shrub, and large areas of slopes with cold ice-rich soils are covered with dwarf black spruce. A few well-drained warmer slopes have paper birch forest.

The GVEA Parallel (Segment 10S) and the FERC route (Segment 9) both cross the Tanana Flats to the Anderson area. Miles of new corridor would be 33 for the FERC route, 42 miles for the Healy East Option, and 2 miles for the GVEA Parallel. The GVEA Parallel would provide no new access. The FERC route would provide an access corridor about 17 miles in length within and near the Tanana Flats. Most of the rest of the route parallels the highway or railroad. The

Healy East Option would provide new access along the entire route.

All routes pass through the Tanana Flats, which contain extensive areas of waterfowl nesting habitat. A bald eagle nest has been documented on the Nenana River within about 1 mile of the FERC route and approximately 2 miles from the GVEA Parallel.

- Anderson To Little Goldstream Alternatives

Up to the Tanana River, the FERC and GVEA Parallel Alternatives continue to cross the Tanana Flats, described above. Near the Tanana River, the FERC route crosses white spruce and balsam poplar forest, and willow and alder stands. Across the river the FERC route (Segment 17) crosses a wetland permafrost area of dwarf black spruce before passing through mixed white spruce, birch and aspen forest on the slopes above the Tanana River and Little Goldstream Creek Valleys.

The FERC route would consist of 20 miles of new corridor, while the GVEA Parallel rate contains no new corridor. The FERC Alternative would provide new access to relatively undisturbed areas.

Both routes cross waterfowl habitat of the Tanana Flats. The FERC route passes within one to two miles of a bluff above the Tanana River with previously documented peregrine falcon and bald eagle nests.

o Little Goldstream to Ester Alternatives

The FERC route (Segments 20,22,25) crosses some poorly drained permafrost valley bottoms with 63 acres of wetland shrub. These areas and north slopes have approximately 275 acres of dwarf black spruce. The remainder of the route consists of warmer slopes dominated by birch/aspen/white spruce forest. The Goldstream route (Segments 6, 19 and 24) crosses approximately the same acreages of low shrub wetland and dwarf black spruce in permafrost areas. The remainder of the route is birch forest, mixed birch and spruce, and spruce (probably black spruce).

The FERC route parallels the GVEA ROW for 14.1 miles and has 17 miles of new corridor, mostly in areas with some disturbance. The Goldstream route creates new corridor for all 38 miles in an undisturbed area. The FERC route is close to existing transmission lines and the highway and would provide relatively little new access. The Goldstream route would provide new access to a relatively undeveloped area.

Both routes are against slopes and do not cross waterfowl habitat.

o Anderson to Wainwright Alternatives

The initial segment of the South Tanana Ridge Alternative (Alternative G) is described above under the Anderson to Little Goldstream section. After crossing the Tanana River, the route travels 5.9 miles along level poorly drained permafrost terrain with dwarf black spruce. The remainder of the route crosses the forested south-facing slopes above the Tanana, mostly birch and aspen forest. The route passes through areas burned by the May, 1983 Rosie Creek fire,

including sites in Bonanza Creek Experimental Forest which are scheduled for logging and intensive reforestation efforts (USFS 1983). Segments 26 and 27 cross low lying areas north of the Tanana River and then cross the river into the Tanana Flats. These segments cross approximately 82 acres of shrub and wet herbaceous wetland, and most of the remainder of the route crosses dwarf black spruce. Tall shrub and forested areas are crossed at the Tanana River.

Alternative H, the Tanana Flats route (Segments 11 and 27), crosses approximately 28 acres of shrub and herbaceous wetland, and approximately 738 miles of dwarf black spruce in wet permafrost areas. The remainding one-fifth of the route is paper birch, balsam poplar, and spruce forest in better drained, more deeply thawed sites, particularly along rivers and streams.

Both routes have approximately 50 miles of new corridor and provide new access. On level terrain, the Tanana Ridge route (Alternative G) crosses or is adjacent to numerous lakes and ponds used by waterfowl. The entire area through which the Tanana Flats route passes is extensively used by waterfowl habitat. Several potential trumpeter swan nesting sites have been observed in the vicinity of the ROW.

The Tanana Ridge route is adjacent to a peregrine falcon, bald eagle and golden eagle nesting area. In addition, the route is within one mile of another nesting site which has been previously used by peregrine falcons. Segment 27 of both routes pass within one mile of a bald eagle nest on the Tanana River.

The Tanana Flats is prime moose habitat (Map 25) and prescribed burning is planned by the State of Alaska as a habitat enhancement technique in the area of this route.

Segment 28 from Ester to the Wainwright Substation (Alternative I) passes through 2.1 miles of urban areas. The remainder of the route is mostly dwarf black spruce, with birch/poplar/white spruce forest around the Chena River.

Segment 28 would create no new corridor if the proposed South Fairbanks Expressway is built. No new access would be required as the area is well developed.

Fishery Resources

o Healy To Anderson Alternatives

- Alternative A: FERC Route

This route crosses approximately 22 streams and rivers including 2 crossings of the Nenana River, which is designated as having anadromous runs of salmon (Map 19). Many of the other streams that it crosses probably also contain anadromous and resident fish species at certain times of the year. This route generally follows level terrain. New access would be required along this route.

- Healy East Option

This route crosses somewhat steeper slopes than other routes, thus adding potential for increased risk due to sedimentation and erosion. It also makes a similar number of stream crossings (21) compared to the FERC route. New access would be required along this route.

- Alternative B: GVEA Parallel

  Most of this route follows relatively level terrain. It follows an existing corridor and thus, the incremental impacts due to access would be less. Also, potential problem areas may be more readily identified and either avoided or mitigated. The number of streams crossed is approximately 15, including 2 crossings of the Nenana River.

o Anderson To Little Goldstream Alternatives

- Alternative C: FERC Route

  This route crosses approximately 16 streams including a crossing of the Tanana River. It generally follows level terrain. Access to new areas will potentially be increased.

- Alternative D: GVEA Parallel

  This route parallels the existing GVEA line. It makes crossings of approximately 8 streams including the Tanana River. The terrain crossed is relatively level. Access along this route is mostly established.

o Little Goldstream - Ester Alternatives

- FERC Route

  This route follows an existing GVEA line for a considerable distance along Segment 20. It deviates from the GVEA line near Bonanza Creek Experimental Forest. However, this deviation avoids some sloped areas that could otherwise provide increased risk for erosion. This route crosses approximately 22 streams.

- Goldstream Route

  This route generally follows level terrain. It crosses approximately 24 small streams particularly along Segment 24.

o Anderson - Wainwright Alternative

- Tanana Ridge

  This alternative makes several crossings of the Tanana River and crosses Salchaket Slough, both of which have documented runs of anadromous fish (Map 25). The route is generally level, thus decreasing the risk for runoff and sedimentation. This route would result in new access. The approximate total number of streams crossed is 25.

- Tanana Flats

  This alternative traverses relatively flat terrain and crosses the Tanana River and Salchaket Slough. This route would result in new access. However, this might be mitigated by restrictions imposed by the military in areas where the line crosses the Blair Lake Air Force Range. Approximately 34 streams are crossed with this alternative.

- Ester - Wainwright Segment 28

  Segment 28 crosses the Chena River. This additional segment should not cause any significant risk to water quality or aquatic resources because the line traverses inhabitated areas and thus, known problem areas should be identifiable and avoidable. A total of approximately seven streams would be crossed.

Aesthetic Resources

(Reference Jones and Jones Report: Susitna Transmission Line Visual Resource Assessment.

APPENDIX S

ENVIRONMENTAL INVENTORY SUPPORT DATA

S-1 CULTURAL RESOURCE SENSITIVITY MAPPING OF PRELIMINARY TRANSMISSION CORRIDORS AND ALTERNATIVES

Following is a copy of the memorandum sent to Harza-Ebasco from the University of Alaska, Fairbanks Museum staff regarding the cultural resource sensitivity mapping efforts. Described are the following:

- Approach
- Data Referenced
- Method
- Listing of Known Sites Within Corridors
- References Cited

S-1 CULTURAL RESOURCE SENSITIVITY MAPPING OF PRELIMINARY TRANSMISSION CORRIDORS AND ALTERNATIVES

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CULTURAL RESOURCE SENSITIVITY MAPPING OF PRELIMINARY TRANSMISSION CORRIDORS AND ALTERNATIVES

September 15, 1983

Proposed transmission corridors from Anchorage to Willow, Healy to Fairbanks and from the proposed Watana Dam site to the Intertie were examined during the 1983 field season at the preliminary reconnaissance level. Aerial reconnaissance was conducted on the 0.5 mile wide corridors centered on proposed transmission line routes. The transmission corridors were flown at a height of approximately 1000 feet above the ground level and preliminary assessments of the archeological potential of the regions were noted on U.S.G.S. 1:63,360 scale maps (see enclosed maps). In addition to aerial reconnaissance, archeological and historic sites listed on the Alaska Heritage Resource Survey, within 1 mile of the proposed routes, were plotted on the same scale maps.

The half mile wide corridors are based on transmission lines routes transferred from APA plans to U.S.G.S. 1:63,360 scale maps. The transmission corridor segments from the Watana dam site to the Intertie were transferred from the F.E.R.C. license application, Exhibit G, plates G38, G39, and G40, dated February, 1983. The Fairbanks to Healy and Willow to Anchorage segments appeared on Preliminary Corridor Alternatives - Transmission Lines drawing T-5, T-6, and T-1 dated 8/19/83, produced by Harza-Ebasco

The archeological and historical site potential of the area within the transmission corridors is based upon the research design developed for this project (Dixon et al. 1982a, 1982b) and data derived as a result of the field work. Features characteristically associated with site occurrence are overlooks (areas of higher topographic relief than the surrounding terrain), lake margins, stream margins, lake outlets and inlets, stream junctions, mineral licks, and natural constrictions, which may funnel game animals. These features can be recognized as paleogeographic features based on geomorphic characteristics. When such recognition was possible, the paleogeographic features were also evaluated for site potential. In contrast, areas that have little or no site potential, or which are not surveyable include steep canyon walls, areas of standing water, active stream channels and heavily altered landscapes.

A tripartite classification scheme is used in assigning archeological potential. High potential areas (denoted by horizontal lines) consist of geomorphic features known to contain sites in other regions based upon archeological, historical, and ethnographical data. Moderate potential areas (denoted by diagonal lines) are those areas which display less topographic relief than the high potential areas, but contain areas suitable for the occurrence of sites. Examples of moderate potential areas are well-drained, gentle slopes and planes. Low potential areas (unmarked areas) are regions which are either uninhabitable (e.g. steep slopes) or cannot be tested using current testing techniques (areas of standing water).

Preliminary analysis of site locational data indicates that 9 sites are known to fall within the Willow to Anchorage segment, 12 sites within the Healy to Fairbanks segment, and 3 sites within the Watana Dam to Intertie segment (Table 1). On-the-ground reconnaissance and subsurface testing of the transmission corridors is scheduled to take place during the anticipated 1984 field season. The extent of this program will depend on the length of the 1984 field season and the level of funding.

TABLE 1

KNOWN SITES WITHIN PROPOSED TRANSMISSION CORRIDORS

Willow to Anchorage

Segment	
1	TYO 014
3	ANC 245
4	ANC 245
6	ANC 245
7	ANC 052
10	ANC 082
11	ANC 082
15	ANC 082, ANC 096
16	ANC 118
17	ANC 077, ANC 079, ANC 099

Healy to Fairbanks

Segment	
2	HEA 012, HEA 038
3	HEA 128, HEA 139, HEA 141, HEA 142, FAI 141, FAI 142
4	HEA 143, FAI 144, FAI 145
10	FAI 214

Watana to Intertie

TLM 018, TLM 112, TLM 115

REFERENCES CITED

Dixon, E.J., G.S. Smith, R.C. Betts and R.M. Thorson

1982a Final Report, Subtask 7.06 Cultural Resources Investigations for the Susitna Hydorelectric Project: A Preliminary Cultural Resource Survey in the Upper Susitna River Valley. Report submitted to the Alaska Power Authority through Acres American Inc, April 1982

Dixon, E.J., G.S. Smith, M.L. King and J.D. Romick

1982b Final Report 1982 Field Season, Subtask 7.06 Cultural Resources Investigation for the Susitna Hydroelectric Project: Cultural Resources in the Middle Susitna River Valley. Report submitted to the Alaska Power Authority through Acres American, Inc, December 1982

TABLES

S-2 VEGETATION INVENTORY SUPPORT

Following are tables which inventory vegetation types by alternatives and individual route segments. Tables include the following:

S-1 South Study Area
Wetland Types By Segment (2 sheets)

S-2 North Study Area
Wetland Types By Segment (2 sheets)

S-3 South Study Area
Acres of Vegetation Types By Alternatives

S-4 South Study Area
Vegetation Types By Segments

S-5 North Study Area
Vegetation Types By Segments

Table S-1

South Study Area - Miles and Acreage of
Wetland Types in Transmission Line ROW per Segment

Segment		No. of Circuits	Palustrine Emergent	Palustrine Scrub-Shrub	Palustrine Forested	Palustrine Open Water	River Tidal	Riverine Upper Perennial Flat	Riverine Upper Perennial Streambed	Riverine Upper Perennial Open Water	TOTAL
1	Miles		0.5	18.9	3.9					0.1	23.3
	Acres	1	9.8	384.0	78.5					2.0	474.6
	Acres	2	16.0	630.0	128.7					3.3	778.0
2	Miles			0.9	0.7	0.1					1.7
	Acres	1		16.4	11.8	1.5					29.7
	Acres	2		27.8	20.0	2.5					50.3
3	Miles			1.4	0.6	0.1					2.1
	Acres	1		25.0	11.2	0.9					37.1
	Acres	2		42.6	19.1	1.5					63.2
4	Miles		0.7	6.8	0.8					0.1	8.4
	Acres	1	13.4	140.7	15.8					1.0	170.9
	Acres	2	21.4	225.1	25.2					1.6	273.4
5	Miles			0.1	0.1	0.1					0.3
	Acres	1		3.1	1.0	1.0					5.1
	Acres	2		5.0	1.6	1.6					8.2
6	Miles			2.0							2.0
	Acres	1		37.7							37.7
	Acres	2		64.1							64.1
7	Miles		0.1	4.7	0.4						5.1
	Acres	1	1.3	84.9	6.4						92.6
	Acres	2	2.2	144.4	10.8						157.4
8	Miles			0.2	0.1						0.3
	Acres	1		2.9	17.8						20.7
	Acres	2		4.9	30.2						35.1
9	Miles			0.3	0.2						0.5
	Acres	1		6.8	3.7						10.5

Table S-1 Cont.

South Study Area - Miles and Acreage of
Wetland Types in Transmission Line ROW per Segment

Segment		No. of Circuits	Palustrine Emergent	Palustrine Scrub-Shrub	Palustrine Forested	Palustrine Open Water	River Tidal	Riverine Upper Perennial Flat	Riverine Upper Perennial Streambed	Riverine Upper Perennial Open Water	Estaurine Intertidal	TOTAL
10	Miles		0.1	2.1	0.1							2.3
	Acres	1	1.0	43.8	1.0							45.8
11	Miles			0.3								0.3
	Acres	1		5.2								5.2
12	Miles			1.3		0.2			0.6			2.1
	Acres	1		26.7		5.2			11.3			43.2
13	Miles			0.1								0.1
	Acres	1		2.1								2.1
14	Miles		0.1	0.5	0.1	0.1		0.6				1.4
	Acres	1	1.0	11.3	1.0	1.0		13.4				27.7
15	Miles		0.6	1.2			0.4	0.1				2.4
	Acres	1	10.0	22.7			7.2	0.9				42.6
16	Miles		1.5					0.6		0.1	0.1	2.2
	Acres	1	2.7					10.9		1.8	1.8	15.4
17	Miles			0.3	0.1							0.4
	Acres	1		6.2	2.1							8.3
18	Miles			1.8	0.2	0.1						2.1
	Acres	1		37.1	4.2	2.1						43.4
	Acres	2		59.4	6.7	3.4						69.5
19	Miles		0.1	0.5								0.6
	Acres	1	3.4	15.2								18.6

Table S-3

North Study Area - Miles and Acreage of
Wetland Types in Transmission Line ROW per Segment

Segment		No. of Circuits	Palustrine Emergent	Palustrine Scrub-Shrub	Palustrine Forested	Palustrine Open Water	River Tidal	Riverine Upper Perennial Flat	Riverine Upper Perennial Streambed	Riverine Upper Perennial Open Water	TOTAL
1	Miles			0.4							0.4
	Acres	2		10.2							10.2
2	Miles			5.3	1.2						6.5
	Acres	2		134.9	30.5						165.4
3	Miles			1.5				0.5			2.0
	Acres	2		38.2				12.7			50.9
5	Miles				3.2			0.2			3.4
	Acres	2			81.4			5.1			86.5
6	Miles				0.1						0.1
	Acres	2			2.5						2.5
7	Miles			3.3	4.6						7.9
	Acres	2		84.0	117.1						201.1
8	Miles				6.0						6.0
	Acres	2			152.7						152.7
9	Miles			7.2	6.6						13.8
	Acres	2		183.3	168.0						351.3
10	Miles			6.5	13.0			0.1			19.6
	Acres	2		165.4	330.1						495.5
11	Miles			3.2	25.4						28.6
	Acres	2		81.4	646.5						727.9
12	Miles			2.7	7.2						9.9
	Acres	2		68.7	183.3						252.0
14	Miles			3.0				0.7			3.7
	Acres	2		76.4				17.8			94.2

Table S-2 Con't.

North Study Area - Miles and Acreage of
Wetland Types in Transmission Line ROW per Segment

Segment		No. of Circuits	Palustrine Emergent	Palustrine Scrub-Shrub	Palustrine Forested	Palustrine Open Water	River Tidal	Riverine Upper Perennial Flat	Riverine Upper Perennial Streambed	Riverine Upper Perennial Open Water	TOTAL
15	Miles			0.2	0.6			0.6			1.4
	Acres	2		5.1	15.3			15.3			35.7
16	Miles			0.3	5.9			0.2			6.4
	Acres	2		7.6	150.2			5.1			162.9
17	Miles				5.1						5.1
	Acres	2			129.8						129.8
18	Miles				1.0						1.0
	Acres	2			25.4						25.4
19	Miles			0.8	4.4						5.2
	Acres	2		20.4	112.0						132.4
20	Miles			2.9	5.2						8.1
	Acres	2		73.8	132.7						206.5
22	Miles				2.7						2.7
	Acres	2			68.7						68.7
24	Miles			1.5	7.2						8.7
	Acres	2		38.2	183.3						221.5
25	Miles				3.6						3.6
	Acres	2			91.6						91.6
26	Miles		0.9	0.2	7.0						9.1
	Acres	2	22.9	22.9	178.2			0.3 7.6			231.6
27	Miles		1.4		4.3			1.1			6.8
	Acres	2	35.6		109.4			28.0			173.0
28	Miles				4.8						4.8
	Acres	2			122.2						122.2

S-3 ROUTE LENGTHS BY SEGMENTS

The following table lists the route lengths (in miles) for each North and South Study Area route segment identified. These lengths were used in evaluating the different alternatives.

TABLE S-3
SOUTH STUDY AREA ACRES OF VEGETATION TYPES
WITHIN ROW

ALTERNATIVES / VEGETATION TYPE	PARALLEL ALTERNATIVES A FERC	B LITTLE SU	C MEA/ CHUGACH	D* FERC-NORTH PALMER	E FERC-SOUTH WASILLA	F4 LITTLE SU NORTH PALMER	SPLIT ALTERNATIVES G LITTLE SU SOUTH WASILLA	H* MEA/ CHUGACH PALMER	I MEA/ SOUTH WASILLA	REMARKS
Closed Conifer	142	62	88	127	77	93	210	161	157	*North Palmer Alternatives; Include Trunk Road/Kepler Lakes Option
Open Conifer	17	45	-	25	42	14	10	28	-	
Closed Deciduous	297	236	320	507	469	520	630	592	629	
Closed Mixed	256	368	479	922	907	1053	503	559	616	
Open Mixed	252	161	172	202	144	151	200	141	142	
Closed Dwarf Tree	-	-	32	-	-	20	-	-	20	
Open Drawf Tree	65	42	42	62	48	48	48	34	34	
Open Tall Scrub	7	7	7	55	55	55	7	7	7	
Open Low Scrub	88	-	9	55	-	5	68	12	16	
Brackish Water/ Aquatic Herbaceous	37	37	37	23	23	23	31	31	31	
Byrophytes	448	157	125	295	108	88	322	130	110	
Freshwater Wet Herb.	161	499	366	191	368	285	329	492	391	
Dry to Mesic Herb.	58	-	-	36	-	-	36	-	-	
Barren	-	-	-	13	13	13	-	-	-	
Water	104	104	104	82	82	82	72	72	72	
Urban/Built-up	47	47	47	115	115	115	107	107	107	
Total Acres	1979	1765	1828	2710	2531	2565	2573	2366	2332	
Total Miles	65	60	63	134	122	126	129	113	107	

Table S-4
South Study Area
Miles and Acreage of Vegetation Types by Segment

Segment	No. of Circuits	Closed Conifer Forest	Open Conifer Forest	Closed Deciduous Forest	Closed Mixed Forest	Open Mixed Forest	Closed Dwarf Tree Scrub	Open Dwarf Tree Scrub	Open Tall Shrub Scrub	Open Low Shrub Scrub	Brackish Water Aquatic Herbaceous	Bryophytes	Wet Herbaceous	Mesic Herbaceous	Barren	Water	Urban
1 Miles		4.2	0.5	2.1	4.6	3.6	—	0.7	—	2.6	—	12.8	4.2	1.8	—	—	—
Acres	1	88.0	10.0	43.0	96.0	73.0	—	14.0	—	55.0	—	264.0	86.0	36.0	—	—	—
	2	14.2	17.0	70.0	150.0	118.0	—	23.0		68.0	—	426.0	138.0	58.0	—	—	—
2 Miles					0.6	.3						1.0	4.5				
Acres	1				12.0	60.0						181.0	85.0				
	2				20.0	90.0						291.0	139.0				
3 Miles					1.2	0.1						0.8	2.0				
Acres	1				23.0	2.0						16.0	37.0				
	2				37.0	3.0						26.0	60.0				
4 Miles		1.8	1.4	0.2	6.3	.4						2.4	8.3				
Acres	1	38.0	28.0	5.0	130.0	9.0						49.0	171.0				
	2	62.0	45.0	8.0	210.0	15.0						80.0	276.0				
5 Miles					1.9												
Acres	1				39.0												
	2				63.0												
6 Miles		2.8		2.0	1.4					0.3			2.6				
Acres	1	54.0		38.0	26.0					6.0			48.0				
	2	88.0		62.0	42.0					9.0			79.0				
7 Miles				1.0	11.0		0.1					1.6	2.0				
Acres	1			19.0	210.0		20.0					29.0	40.0				
	2			31.0	343.0		32.0					48.0	65.0				
8 Miles					0.8			0.8				0.7					
Acres	1				14.0			14.0				13.0					
	2				23.0			23.0				22.0					
9 Miles			0.7		18.0			0.7									0.5
Acres	1		14.0		365.0			14.0									10.0
10 Miles		1.4		0.4	0.8					0.4			1.4				2.1
Acres	1	30.0		84.0	16.5					7.0			29.0				43.0
11 Miles																	1.3
Acres	1																26.0
12 Miles		4.2	1.1		11.0	0.9										.6	3.3
Acres	1	88.0	23.0		22.7	18.0										1.1	68.0
13 Miles				0.5	2.0												0.6
Acres	1			10.0	41.0												12.0
14 Miles				1.6	3.0				0.4						.6	.5	.8
Acres	1			33.0	63.0				93.0						13.0	10.0	16.0
15 Miles				2.8							0.4	0.6	1.2			0.4	
Acres	1			59.0							9.0	12.0	25.0			9.0	
16 Miles				1.0	4.4				1.9							0.4	
Acres	1			18.0	80.0				34.0							7.0	
17 Miles		1.9		11.7	5.7			0.4									0.8
Acres	1	3.9		241.0	117.0			8.0									16.0
18 Miles				4.8	0.2	2.6		0.6			1.2		0.2			3.4	
Acres	1			92.0	5.0	48.0		11.0			23.0		4.0			63.0	
	2			150.0	8.0	79.0		18.0			37.0		6.0			104.0	
19 Miles				4.1	0.4	2.9			0.4				.9				2.5
Acres	1			65.0	5.0	46.0			5.0				1.4				39.0

Table S-5
North Study Area
Miles and Acreage of Vegetation Types by Segment

Segment		No. of Circuits	Closed Conifer Forest	Open Conifer Forest	Closed Deciduous Forest	Closed Mixed Forest	Open Mixed Forest	Closed Dwarf Tree Scrub	Open Dwarf Tree Scrub	Closed Tall Shrub Scrub	Open Tall Shrub Scrub	Closed Low Shrub Scrub	Open Low Shrub Scrub	Dry to Mesic Herbaceous	Wet Herbaceous	Barren	Recent/ Burn Logged Area	Water	Urban
1	Miles												0.4			1.0			
	Acres	2											10.0			26.0			
2	Miles						4.3		1.2				5.3						
	Acres	2					94.0		27.0				116.0						
3	Miles						1.4			1.8	.8	1.1	5.1					0.5	
	Acres	2					36.0			46.0	20.0	26.0	130.0					13.0	
4	Miles	.					0.3		1.8			1.3							
	Acres	2					8.0		46.0			33.0							
5	Miles								3.2									0.2	
	Acres	2							82.0									5.0	
6	Miles		0.2		0.6	1.2			0.1										
	Acres	2	5.0		15.0	31.0			3.0										
6A	Miles		0.2		1.0	3.0				0.2									
	Acres	2	5.0		26.0	76.0				5.0									
7	Miles				0.6			4.4	0.2	1.8	0.2	2.7	0.6						
	Acres	2			15.0			112.0	5.0	46.0	51.0	69.0	15.0						
8	Miles				1.7			1.1	4.9	1.5							0.7		
	Acres	2			43.0			28.0	125.0	38.0							18.0		
9	Miles		0.5		.8	0.8		2.5	4.7	1.2		6.6							
	Acres	2	13.0		20.0	20.0		64.0	120.0	31.0		168.0							
10	Miles		1.1	1.7	1.1	0.4		4.7	8.3	6.5		6.5						0.1	
	Acres	2	24.0	37.0	242.0	9.0		102.0	181.0	142.0		142.0						2.0	
11	Miles		0.7		1.9	1.2		16.4	9.0	3.1		3.2		3.1					
	Acres	2	18.0		48.0	31.0		418.0	230.0	79.0		82.0		79.0					
12	Miles							4.7	2.5	0.6		2.7							
	Acres	2						120.0	64.0	15.0		69.0							
13	Miles			0.8	0.5			.5		1.0		3.7						0.4	
	Acres	2		20.0	13.0			13.0		26.0		94.0						1.0	
14	Miles					1.5				8		3						0.7	
	Acres	2				33.0				174.0		65.0						15.0	
15	Miles		0.2		0.6			0.6				0.2						0.6	
	Acres	2	5.0		15.0			15.0				5.0						15.0	
16	MIles		1.9		12.7	0.5	0.7	3.9	2.0			0.3						0.2	
	Acres	2	48.0		324.0	13.0	18.0	100.0	51.0			8.0						5.0	
17	Miles				2.7			1.3	3.8										
	Acres	2			69.0			33.0	97.0										
18	Miles					3.0			1.0	0.2									
	Acres	2				65.0			22.0	4.0									
19	Miles		5.3			3.5		4.4					0.8						
	Acres	2	135.0			89.0		112.0					20.0						
20	Miles					2.9		1.3	3.9			2.9							
	Acres	2				63.0		28.0	85.0			63.0							

Table S-6

ROUTE LENGTHS BY SEGMENTS

Segment	Route Length (miles) South Study Area	North Study Area
1	37.1	1.4
2	6.4	10.8
3	4.1	10.7
4	20.9	3.4
5	1.9	3.4
6	9.9	2.1
6A	-	4.4
7	16.8	12.3
8	2.2	9.9
9	20.6	17.1
10	17.4	40.4
11	6.8	38.6
12	21.1	10.5
13	3.1	6.9
14	7.0	13.2
15	5.6	2.2
16	7.7	22.2
17	20.5	7.8
18	13.0	4.2
19	11.1	14.0
20	-	11.0
21	-	4.5
22	-	7.7
23	-	4.2
24	-	21.9
25	-	12.4
26	-	11.5
27	-	10.5
28	-	8.8