

Attachment A.4
Amendment No. 3
ALASKA POWER AUTHORITY
SUSITNA HYDROELECTRIC PROJECT

PLAN OF STUDY - REVISION 3
MAY 19, 1982

by

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R.1 - INTRODUCTION

Since the issue of the February 1980 POS, two amendments to the POS have been completed. These amendments have been in response to suggestions from state and federal agencies, interested citizens, and public and private organizations. In response to continuing dialogue among study participants (i.e., APA, state and federal agencies, and Acres) it has been determined that the project would benefit by extending the date for FERC license application from June 30, 1982 to September 30, 1982, and continuing with certain of the ongoing work. This will substantially improve the quality of the license application and, although postponed by 90 days, should not delay granting of the license by FERC. The license application would be improved as follows:

- Additional time will be available for APA and the agencies to review and comment on the project Feasibility Report and supporting documents. Acres will then have sufficient time to address the comments in the FERC license application.
- The data obtained by ADF&G during the 1981/1982 winter season will be used in the development of mitigation proposals and will be included in Exhibit E - Environmental Report.
- Time will be available for obtaining additional field data and developing more detailed fish and wildlife impact mitigation proposals than presently exists.
- Additional information will be developed and included in the license application regarding various project financing arrangements.

Additional work items which are planned through the end of September 1982 are:

- Additional planning and permitting activities and associated field work to develop a comprehensive geotechnical program to meet the long-term needs of the project.
- Field reconnaissance and further study of the access route location and elimination of the "pioneer road" concept.
- Continued operation of the field camps and logistics support.
- Continued monitoring of hydrologic, climatic and geotechnical instrumentation.
- Continued Project Management and Administration for the extended time period.
- Preparing/updating cost estimates and schedules in connection with the above.
- Continued environmental studies and analyses concerning socioeconomics, land use, recreation, fish ecology and wildlife.
- Investigation of various design changes necessary to meet changing environmental criteria.

R.2 - REVISIONS TO DETAILED ACTIVITY DESCRIPTIONS BY TASK

Revisions to detailed activity descriptions by Task are presented in the following pages.

Subtask 2.02 - Provision of Field Camps and Associated Logistics Support

(a) Objective

Provide ongoing field camp and logistics support for the continuing field studies.

(b) Approach

During the time period from April 1 to June 30, 1982, the camp operation will be maintained at a minimum level and fuel consumption will be minimized through the use of the smaller 60kw generator. During this time period the actual calculated fuel needs for camp and helicopter operations will be supplied to the camp by helicopter.

During the period July 1 to September 30, 1982, camp staff will be increased to handle the increased field staff to support continuing environmental and geotechnical activities. Helicopter contracts for up to four aircraft will be awarded, and fixed wing service from Anchorage and Fairbanks will be initiated.

Fuel resupply will be made early in July to supply the needs for the summer operation.

In addition to the above needs, a contract will be negotiated with High Lake Lodge to provide accommodations for personnel involved in environmental and access studies.

(c) Schedule

See above.

Subtask 2.10 - Access Roads

(a) Objective

To evaluate alternatives to the "pioneer road" concept.

(b) Approach

During the time period from April 1 to June 30, 1982, the preliminary engineering studies for the recommended access road route will be completed. Due to the concern over the pioneer road concept, recommended alternatives to this concept will be reviewed and a corridor studied which could help alleviate schedule constraints. The level of study and preliminary design on this alternative route will be brought up to the same level as the studies on the recommended route. Appropriate amendments to the access road report will be prepared.

(c) Schedule

April 1, 1982 to June 30, 1982.

Subtask 3.03 - Field Data Collection and Processing

(a) Objective

To continue field data acquisition and perform studies to address newly identified needs to support the instream flow program.

(b) Approach

Studies will be undertaken in eight main areas.

(i) Continuing Field Data Acquisition and New Field Work

Field data acquisition will continue at the same level of effort as Phase I in the Upper Susitna Basin, with additional field work in the river below Devil Canyon to support new studies. All six climate stations will continue to operate, as will the Watana stream-gaging site. Water quality sampling will continue to be conducted at Vee Canyon and Gold Creek, with possible expansion to other sites. Snow surveys will be continued through the 1982 winter and spring. New field work is concentrated on obtaining data in selected side-channels above Talkeetna and in the main river below Talkeetna. Additional staff gages, bed material sampling, cross-sections in sloughs and channel sections will be obtained to support additional studies for fisheries and navigation. Selection of data acquisition sites will be made following discussions with Acres, ADF&G, and Environmental subcontractor.

(ii) Water Source Studies of Sloughs and Side-Channels

Studies will be conducted at representative sloughs and side-channels to determine the relative contributions to flow of ground water and of intergravel flow from the mainstem Susitna, especially during the winter period. Determination of permeability of soils in the islands and berms will be made and used in an analysis of contributions during post-project winter flows and stages.

(iii) Incremental Flow Study - Fisheries Enhancement

Hydraulic analysis of side channels and sloughs, using existing models, will determine the effects of varying flow rates on the hydraulic characteristics at salmon spawning habitat reaches. It is anticipated that this will be an interdisciplinary effort with fisheries biologists. The budget estimate is for conducting the hydraulic studies.

(iv) Ice and Hydraulic Studies, Lower Susitna River

The Susitna River below its confluence with the Chulitna will have a reduced capacity to transport sediment due to the reduced summer

flows from the Susitna River. Consequently, additional study is required to further refine the impact on the channel configuration and to refine aggradation estimates. Bedload data will be gathered by the U.S. Geological Survey at the Chulitna River, Talkeetna River, Susitna River above the confluence, and Susitna River at Sunshine. Bed material, particle-size distribution data, cross-sections, and stage data will be collected and used to analyze morphological changes in reach between the Chulitna confluence and Montana Creek. Ice observations and water temperature data will also be collected in this reach. Both studies will attempt to identify how far downstream the effects will be noticed.

Note: U.S. Geological Survey and Alaska Power Authority have discussed a joint funding agreement for bedload data collection for the 1982 season. The agreement is for \$200,000 (\$100,000 from APA, \$100,000 from USGS). (Refer to the letter from Phil Emery, USGS, to APA, dated 22 September 198).

(v) Lower Susitna Cross-Sections

Reduced summer flows may have impacts on navigation on the river below Talkeetna. Cross-sections will be surveyed at critical points between Talkeetna and Cook Inlet, and crest and staff gages installed to establish a stage-discharge relationship.

(vi) Hydraulic Studies - Talkeetna to Devil Canyon

Additional studies of the water surface elevations between Devil Canyon and Talkeetna may be required in support of fisheries studies. Further refinement of the accuracy of the model is possible with additional cross-sections and crest stage data at critical sites.

(vii) Cross-Sections, Middle Susitna

Additional cross-sections may be required to support the hydraulic studies between Talkeetna and Devil Canyon. The budget is for up to 20 additional cross-sections.

(viii) Glacier Studies

Phase 1 studies indicate that possibly 10 to 15 percent of the flow recorded at Gold Creek may have been provided by the shrinking of Susitna Basin glaciers. Consequently, studies to define the volume, the mass balance, and the flow dynamics assume increasing importance.

(c) Schedule

(i) 1 April to 30 June

- (1) Mass balance data are to be collected by the Geophysical Institute in late April or early May, the period of maximum

snowpack. The budget is to obtain data, with only preliminary analysis. A continuing data acquisition program following the 1981 season is important in gathering annual mass balance data.

- (2) Glacier velocity data acquisition is to be expanded to the MacLaren and East Fork Glaciers, with control points to be located on each. Data will continue to be collected at West Fork and Susitna Glaciers.

(ii) 1 July to 30 September

- (1) A second mass balance measurement is to be conducted in August in order to obtain the net balance. The scope of work is similar to that during 1 April to 30 June.
- (2) Photogrammetric Mapping West Fork and East Fork Glaciers. The relative elevation change in the above glaciers (and the total ice loss) between 1950 and 1982 can be determined through photogrammetric techniques, as determined in a feasibility study conducted on East Fork Glacier in 1981. Accuracy is limited by that of the control. Using available data, accuracy can be pinned down no closer than +60 feet.

Surveyed horizontal and vertical control, together with paneling and new photography will enable accuracies to within +10 feet. Studies should include both West Fork and East Fork Glaciers in order to bracket the major glaciers.

Subtask 3.07 - Sediment Yield and River Morphology

(a) Objective

To further evaluate glacial flour setting behavior.

(b) Approach

The Reservoir Sedimentation Report completed January 1982 under Subtask 3.07 included results from a literature search to gather information on the trap efficiency of natural glacial lakes and associated sedimentation processes. Results of this search show that published literature offers little insight into glacial flour-setting behavior.

(i) Phase I Studies

Under Phase I of the current reservoir sedimentation study, investigations have begun to retrieve any unpublished data or reports from those references included in the Reservoir Sedimentation Report and to search out any additional information from sources worldwide. Table I lists the individuals interviewed to date concerning the problem of reservoir sedimentation processes and water quality. Each described his relevant work experiences, recommended additional publications, and/or suggested other individuals to be contacted. Several, as indicated, have agreed to forward unpublished information for use in the study.

Table 2 lists those individuals worldwide who have been contacted by letter requesting any information in published or unpublished form, concerning but not limited to: temperature stratification, turbidity levels, particle-size distribution, sediment concentration, or controls on productivity in lake or reservoir systems. Information from these sources will be reviewed, and if judged applicable to Susitna, additional analyses of the data will be carried out.

(ii) Phase 2 Studies: Watana Reservoir Clarity Analysis

There is available a considerable amount of data and studies on the proposed Watana Reservoir that should be further analyzed with respect to the water clarity problem. The work outlined below in Table 3 and Figure I will utilize this information and analyze the physical processes associated with settlement of fine particles (less than 20 microns). Emphasis is placed on interpreting and quantitatively analyzing the driving mechanisms that retain the fine sediment in suspension. These consist primarily of wind-driven currents, thermal currents, and reservoir operation. The end result would be an annual turbidity vs. time graph.

The analyses will be carried out for each month and summarized on a figure similar to that which is attached. This will portray key parameters and their variability. After each month has been analyzed, it will be an easy task to summarize it on an annual graph. Since this is in part a qualitative assessment, all results will be discussed thoroughly and founded by expected maximum and minimum values.

(iii) Phase 3 Studies: Comparison With Other Northern Reservoirs and Lakes

The results of analyses conducted in Phase 2 need to be compared with other northern systems. Due to limitations of the existing data base and analytical techniques, it would be difficult to instill confidence in the Phase 2 results without making comparisons with similar systems. For example, from the engineering standpoint, the longer the detention time, the greater the settlement of particles, and hence, clearer the water. However, Jeff Koenings (ADF&G) has found that through his observations on Kenai Peninsula Lakes, the shorter the detention time, the clearer systems become during winter. His preliminary explanation for this is that the short detention period allows the clear winter water input to displace the cloudy water. During summer, glacial waters would again fill the lakes with cloudy water.

If the efforts explained in Phase I produce other case histories or studies similar to Susitna, then a thorough-as-possible comparison will be made. Basic principles will be reviewed to insure their applicability to Susitna. Resultant values of key parameters on Susitna will be compared with those on other projects and an assessment of representiveness made. Key parameters will be bounded so that an appreciation of expected maximum and minimum values for each can be defined.

Results of the natural lake suspended sediment concentration and turbidity survey currently being conducted by R&M Consultants will be compared with Phase 2 results. Since there is no lake system that has physical characteristics that can be directly related to the Watana Reservoir, it will be important to screen the key parameters prior to making the comparison.

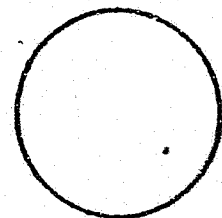
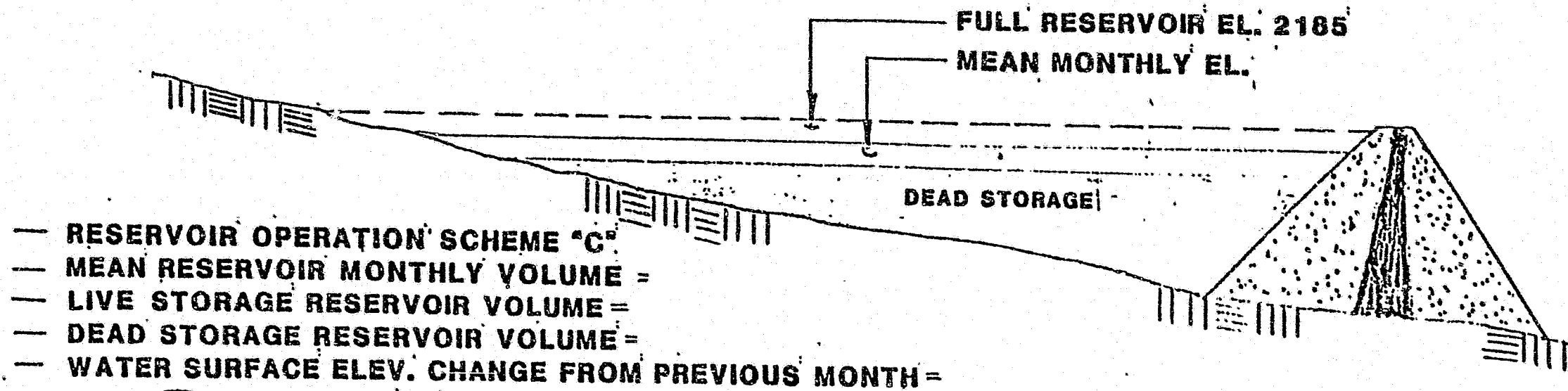
It is proposed that bulk samples be retrieved from some of the lakes being studied. These samples then would be run through a settling-column analysis, as was conducted on Susitna River water last summer. If the lake water cleared in a similar manner as the Susitna water, then it would indicate that water currents are present in deep northern lakes of sufficient magnitude to retain the glacial flour in suspension. This would indicate as well that a similar process would be expected in the Susitna Reservoir. It is recommended that samples be retrieved from the lakes before the ice leaves.

(c) Accomplishments and Deliverables

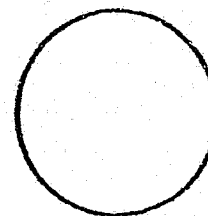
<u>Report</u>	<u>Date</u>
Field Data Index (update)	July 1982
Climate Data (Meteorological)	
10/81 - 6/82	July 1982
7/82 - 9/82	September 1982
Ice Observations, 1981-1982	August 1982
Field Data Collection	October 1982
Water Quality Interpretative Report	September 1982
Side Channel Analysis	
Interim Report (Including available ground water, water surface elevation, and cross- section data)	July 1982
Final Report	November 1982
Glacial Lake Thermal & Sediment Regime Analysis	
Interim Report	June 1982
Final Report	November 1982
Glacier Mass Balance Data Report - 1982	September 1982

EXAMPLE MONTH

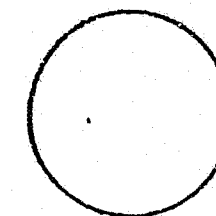
FIGURE I



TYONE
WIND ROSE



KOSINA
WIND ROSE



WATANA
WIND ROSE

DRIVING MECHANISM

INFLOW
OUTFLOW
FLOW THRU VELOCITY
DETENTION TIME
ICE COVER PRESENT
MEAN AMBIENT TEMP.
MEAN RESERVOIR TEMP.
THERMAL TREND
INFLOW TEMP.
FLOW PATTERN
MIXING POTENTIAL
THERMAL CURRENT VELOCITY
WIND DRIVEN CURRENT VELOCITY

WATER CHARACTERISTICS

SEDIMENT CONCENTRATION IN
SEDIMENT CONCENTRATION MID
SEDIMENT CONCENTRATION OUT

REENTRAINMENT POTENTIAL
STRATIFICATION POTENTIAL

RELATIVE TURBIDITY IN
RELATIVE TURBIDITY MID
RELATIVE TURBIDITY OUT

TABLE 1

Individuals interviewed concerning reservoir sedimentation processes and water quality.

- * . Jeff Koenings - ADF&G - FRED Division - Soldotna
- . Jack Colonell - Woodward-Clyde Consultants - Anchorage
- * . Paul Chao - TAMS Eng. - N.Y.
- . Bill Wilson - AEIDC - Anchorage
- . Earl Hadfield - CH2M-HILL - Corvallis, Oregon
- * . Joe Scott - CH2M-HILL - Seattle
- . Bill Fullerton - Simons, Li & Assoc. - Ft. Collins, CO
- . Victor Galay - Northwest Hydraulics, Ltd. - Canada
- . Mike Okum - Northwest Hydraulics, Ltd. - Canada
- * . Arve Tvede - Norwegian Water Resources & Electricity Board
- . Iver Hagen - Norwegian Water Resources & Electricity Board
- . Larry Peterson - L.A. Peterson & Associates - Fairbanks
- . Dr. Donald Gray - University of Michigan, Dept. of Civil Engineering
- . Dr. Richard Woods - University of Michigan, Dept. of Civil Engineering
- . Dr. Bob Carlson - Institute of Water Resources - Fairbanks
- . Jacqueline LaPerriere - Alaska Cooperative Fisheries Research Unit - Fairbanks
- . Dr. Tom Osterkamp - Geophysical Institute - Fairbanks
- . Jim Aldrich - State Pipeline Coordinator's Office - Fairbanks
- . Dr. Charles Slaughter - Institute of Northern Forestry - Fairbanks
- . Dr. C.T. Dyrness - Institute of Northern Forestry - Fairbanks
- . Dr. Sathy Naidu - Institute of Marine Sciences - Fairbanks

* Will provide additional information for use in this study.

TABLE 2

Individuals Contacted by Letter Requesting Additional Data

Dr. Paul Chao
TAMS Engineering
New York, New York

Dr. Carl J. Bowser
University of Wisconsin
Madison, Wisconsin

Dr. Robert A. Ragotzkie
University of Wisconsin
Madison, Wisconsin

Dr. Gabriel T. Csanady
Woods Hole, Massachusetts

Dr. Abraham Lerman
Northwestern University
Evanston, Illinois

Dr. Daryl Simons
Simons, Li & Associates
Fort Collins, Colorado

Dr. Hans P. Eugster
The Johns Hopkins University
Baltimore, Maryland

Dr. Lawrence A. Hardie
The Johns Hopkins University
Baltimore, Maryland

Dr. Tyler B. Coplen
U.S. Geological Survey
Reston, Virginia

Dr. F.J. Pearson, Jr.
U.S. Geological Survey
Reston, Virginia

Mr. Herb Schneider
University of California - Davis
Davis, California

Mr. Walter Wunderlich
Engineering Laboratory
Tennessee Valley Authority
Norris, Tennessee

INDIA

Dr. Devendra Lal
Physical Research Laboratory
Navrangpura, Ahmedabad, India

Dr. S. Krishnaswami
Physical Research Laboratory
Navrangpura, Ahmedabad, India

NORWAY

Mr. Gunnar Ostrem
Norwegian Water Resources & Electricity Board
Oslo, Norway

SWEDEN

Mr. Ake Sundborg
Uppsala University
Uppsala, Sweden

SWITZERLAND

Dr. Werner Stumm
Swiss Federal Institute of Technology
Duebendorf, Switzerland

Dr. Dieter M. Imboden
Swiss Federal Institute of Technology
Duebendorf, Switzerland

Dr. Kenneth J. Hsu
Geological Institute
Zurich, Switzerland

Dr. Kerry Kelts
Geological Institute
Zurich, Switzerland

CANADA

Dr. Peter G. Sly
Canada Centre for Inland Waters
Burlington, Ontario, Canada

Dr. Mary A. Barnes
University of British Columbia
Vancouver, B.C., Canada

Dr. William C. Barnes
University of British Columbia
Vancouver, B.C., Canada

TABLE 3
WORK OUTLINE

1. Climate Data

- . Obtain summaries of ongoing data gathering activities (R&M).
- . Extract and tabulate pertinent data.

2. Reservoir Data

- . Extract from Hydrology Report.
- . More detailed modelling results (Acres).

3. Sediment Data

- . Obtain USGS and R&M data.
- . Summarize monthly.
- . Tabulate.

4. Verify Sediment Concentrations vs. Turbidity Relationship

- . Investigate other projects.
- . Meet with experts in field.

5. Conduct Sediment Settling Velocity Analysis

- . Assume quiescent conditions.
- . Simulate water temperature, viscosity, etc. for each month.
- . Calculate settling velocity for the following sized particles:
 - 20, 10, 5, 2, 1 and 0.5 microns.
 - Consider various shaped particles.

6. Wind-Driven Currents and Transport

- . Based on wind data, compute frequency of significant wind-driven current for each month.
- . Assume a simple one-dimensional reservoir configuration.
- . Compute current velocity at incremental depths.
- . Qualitatively assess potential of establishing wind-driven coastal current magnitude and direction.
- . Summarize for each month frequency, duration, current velocities, and expected current direction.

7. Thermal Currents and Stratification

- . Obtain reservoir temperature modeling report and data.
- . Obtain available data on deep northern lakes.
- . Incorporate results of reservoir thermal modelling studies (Acres).
- . Qualitatively assess thermal-generated currents and density stratification potential for each month.
- . Determine potential for separate flow patterns; i.e., underflow, interflow, or overflow.

TABLE 3 - Cont'd

8. Reservoir Operation

- . Obtain reservoir operation scheme and data for each month.
- . Assume one-dimensional flow.
- . Calculate live and dead storage for each month.
- . Calculate flow velocity for live storage zone.
- . Calculate flow velocity for total storage zone.
- . Qualitatively assess reentrainment potential along live storage shore zone.

9. Suspended Sediment Concentration and Turbidity Analysis

- . Assume that if the driving mechanisms produce currents equal to or greater than particle size, no settling will occur.
- . Assume that if driving mechanisms produce currents less than the fall velocity, a linear relationship exists and the fall velocity is retarded proportionally.
- . Compare various particle settling velocities with current velocities, and determine the proportion of sediment that is expected to stay in suspension during each month at mid-reservoir and outlet.
- . Determine turbidity levels based on sediment concentrations from relationship curve for each month.
- . Plot annual turbidity vs. time based on these results.

10. Qualitative Assessment

- . The above analysis obviously is simple and assumes a modified ideal situation. The results would probably portray maximum clarity that could be expected in the Watana Reservoir.
- . Address each assumption made and qualitatively assess it with respect to the real situation.
- . Develop other scenarios that would bound the above results and reasonably represent confidence limits. Plot on turbidity vs. time graph.

TABLE 4

SUSITNA SEDIMENTATION AND WATER CLARITY STUDY
WATANA RESERVOIR

VARIABLES TO BE CONSIDERED IN ANALYSES

Morphological

- . Depth
- . Length
- . Width
- . Surface area
- . Volume
- . Shoreline characteristics
- . Lake surface and land drainage relationship

Physical

- . Basin characteristics
- . Latitude
- . Altitude
- . Drainage area
- . Percent glacier coverage

Reservoir

- . Orientation
- . Distance from source
- . Streamflow - post project inflow/outflow
- . Detention time
- . Wind-generated currents
- . Thermal currents
- . Operational induced currents

Climate

- . Wind
- . Air temperature
- . Solar radiation
- . Cloud cover
- . Mean annual precipitation
- . Water temperature
- . Ice cover development
- . Albedo

Sediment

- . Incoming sediment concentration
- . Turbidity/light attenuation
- . Particle size distribution

TABLE 4 (Cont'd)

- . Specific weight
- . Mineralogy
- . Electrical properties

Chemical

- . pH
- . Conductivity
- . Alkalinity
- . Phosphorous
- . Nitrogen

Reservoir Operation

- . Potential bank erosion
- . Permafrost processes
- . Effects of changing water levels
- . Outlet elevations
- . Drawdown

Processes Active in the Reservoir

- . Trap efficiency
- . Flow patterns
 - Underflow
 - Inflow
 - Overflow
 - Currents
 - . Wind
 - . Density
 - . Thermal
- . Sedimentation processes
 - Coagulation
 - Flocculation
 - Aggradation
 - Reentrainment
 - Stratification
- . Thermal processes
 - Stratification

Subtask 5.09 - Scoping FY83 Program (Geotechnical)

(a) Objective

This work will be done from April 1, 1982 through June 30, 1982, and will consist of preparing a detailed scope and cost for performing the geotechnical work during fiscal year 1983.

(b) Approach/Discussion

Work from April 1 through June 30 will consist of preparing a detailed scope and cost for performing the geotechnical work during FY83.

The scope of work to be undertaken will be prioritized based on geotechnical and engineering design requirements. The scope will clearly define the objective and purpose for performing the work. Based on the results of the 1980-81 geotechnical work performed at the Watana site, the principal areas to be investigated during FY83 are:

- . Borrow Areas D, E, and I; and
- . Relict channel.

The scope of work to be prepared will include details of:

- . Type of equipment to be used;
- . Number, location, and depth of boreholes and test trenches;
- . Seismic work;
- . In-hole testing; and
- . Laboratory testing.

Also included in the scope will be a detailed schedule and cost for performing the work and preparation of necessary permit application to local and state agencies. Alternative contingency plans for accomplishing this work will also be addressed.

(c) Schedule

April 1, 1982 through June 30, 1982.

Subtask 5.10 - Specification Preparation and Contract
Administration (Geotechnical)

(a) Objective

To prepare the necessary specifications and contracts to do the work defined under Subtask 5.09.

(b) Approach/Discussion

Based on the scope of work prepared under Subtask 5.09, the necessary specifications and contracts will be prepared to perform the work within the project schedule. The Anchorage and Buffalo offices will identify equipment suppliers and testing facilities that are capable of performing the FY83 work. Discussions will be held with various vendors and contractors to ascertain their capabilities of performing the work.

In order to meet the project schedule for commencing field investigations by July 1982, drilling and testing contracts must be in place so that mobilization can begin on July 1. Where necessary, Acres will:

- . Prepare specifications and bid documents;
- . Issue for bids and review quotations; and
- . Award and prepare contracts.

(c) Schedule

It is anticipated that all contracts for performing the summer work from July 1 through September 30 will be in place by June 1982.

Subtask 5.11 - Field Investigations, Testing, and Reports (Geotechnical)

(a) Objective

To perform additional field investigations, laboratory testing, data reduction, and prepare the fiscal year 1983 geotechnical program.

(b) Approach/Discussion

Based on a detailed review of the geologic and geotechnical conditions at the Watana site, three principal areas warrant further investigation during the July through September period. These are:

- . Borrow Areas D, E, and I; and
- . Relict channel.

Details of the proposed FY83 investigation program will be presented to APA during May 1982. The work to be undertaken during July through September will consist of geologic mapping, drilling, laboratory testing, and data processing.

(i) Borrow Area D Investigation

- Objective

To confirm the quantity and material properties of borrow materials in Area D.

- Approach

Acres proposes to use two auger type drill rigs capable of drilling to depths of 100 to 150 feet in Area D. Disturbed and undisturbed samples will be taken as required for laboratory testing. Selected holes will be instrumented upon completion to monitor ground water and permafrost conditions.

(ii) Relict Channel Investigation

- Objective

To confirm the stratigraphy and material properties within the relict channel and to determine the extent of these units at depth. To perform preliminary tests to determine the hydrologic regime in the relict channel.

- Approach

Acres proposes to use the auger drill rigs used in the Borrow Area D to perform drilling in the relict channel. The limited capacity of these rigs preclude the drilling to the bottom of the thalweg; however, it is expected that sufficient shallow surface data will

be obtained to develop a detailed investigative program for the winter FY83 drilling program.

(iii) Geologic Mapping

Acres will perform a limited geologic mapping program in the relict channel, Borrow Area D and the damsite. The mapping is required to obtain recorded data for the scoping of the FY83 winter and spring drilling programs. In addition, the geologic features identified during the 1980-81 program will be mapped for continuity. Detailed survey control will be provided to accurately locate these features relative to the damsite. In addition, survey controls will be established along the river for that which is used by the Becker drilling program.

(iv) Laboratory Testing

Concurrent with the field investigation, a detailed soils testing program will be implemented for the borrow area and relict channel. To expedite the testing program, Acres proposes to establish a soils laboratory at the Watana camp to perform routine soil tests. The more sophisticated tests, including cyclic triaxial and resonant column tests, will be performed by qualified laboratories.

(v) Data Reduction

To expedite the data reduction, Acres proposes that the information coming from the program be reduced and analyzed in the field. To accomplish this, Acres proposes to place a contingent of engineers and geologists who have worked extensively on the project in the field during this period. They will work in the collection and reduction of the data. It is anticipated that at the termination of the exploration program in September, all the field data will be in a draft form suitable for final reduction and report preparation. Long-term laboratory testing will likely not be completed within the September time frame.

(vi) Preparation of FY83 Winter Program

As a result of the lengthy lead time required to mobilize special equipment needed for the winter program, it will be necessary to implement the planning and contractual arrangements for this equipment during July and August 1983. As part of this task, Acres proposes to prepare the detailed scope of work (which will be based on preliminary results obtained from activities in the relict channel) and to prepare the necessary specifications and contracts for performing the winter program.

(c) Accomplishments and Deliverables

Report

Date

Geotechnical Field Data (Draft)

September 30, 1982

Engineering and Geotechnical Reconnaissance
Report of Primary Routes

September 1, 1982

FIELD EXPLORATION PROGRAM

Instrumentation Monitoring

June 20, 1982

July 20, 1982

August 20, 1982

September 20, 1982

Laboratory Tests on Aggregate Samples

September 15, 1982

TASK 6 - DESIGN DEVELOPMENT

(a) Objective

Update various design aspects of project and address those design changes necessary to meet changing environmental criteria.

(b) Approach/Discussion

Although not precisely defined at this time, there will be certain proposed design changes or investigation of various possible alternatives to the design which will be required to meet changing environmental criteria. Examples of these are possible changes in access route location, elimination of the pioneer road concept, intake structure changes if additional gathering of temperature data so indicates, etc. Appropriate budget has been designated for this work.

(c) Schedule

April 1, 1982 through September 30, 1982.

Note: REMOVED SUBTASK 7.01 FOR
USE IN ANNUAL #4

Subtask 7.05 - Socioeconomic Analysis

The proposed socioeconomic studies are divided into two separate work packages. The numbers one and two are used consistently to refer to work packages eight and nine.

(a) Objectives

The objectives of the two different proposed work packages are as follows:

1. Determine economic effects of Susitna Hydroelectric Project on commercial, recreational, and subsistence fish and game user groups.
2. Determine the significance of the economic effects of the Project for each user group.

(b) Justification

Reasons for implementing the two socioeconomic work packages are as follows:

1. Economic value is a common denominator. These values will provide a better understanding of what could be gained or lost by user groups and will facilitate the development of mitigation measures.
2. Frequently, dollar values by themselves are not meaningful. Dollar values need to be put into contexts that are meaningful to both those persons being impacted and those who make decisions.

(c) Approach/Discussion

1. Work Package 8: Economic Effects of Project on Commercial, Recreational, and Subsistence User Groups.

To complete this work package, a determination will be made of the economic effects on user groups that could result from project-induced changes in the harvestable stocks of fish (e.g., salmon, Dolly Varden, Arctic grayling, etc.) and game (e.g., moose, caribou, brown bear, etc.). For fish, the focus is on salmon that utilize the Susitna River and its tributaries and drainages; and for game, the focus is on Game Management Unit 13.

2. Work Package 9: Significance of Economic Effects of Project on Commercial, Recreational, and Subsistence User Groups.

Minimum resource conditions/standards will be determined for each user group. Past and present utilization rates and patterns will play a key role in these determinations. The minimum resource conditions for each user group will be compared to the expected resource condition (i.e., project-induced resource conditions). Differences in the conditions will be calculated on a per-user basis. Where losses are identified, opportunities for users to make up part or all of losses will be identified. These opportunities will involve harvest of fish and game in other geographic areas and/or habitat replenishment.

(d) Accomplishments and Deliverables

- 4th Quarter FY82

Work Package 8 will be concentrated during this quarter. The accomplishments during the quarter are as follows:

1. Describe user groups and user group utilization of selected fish and game species (salmon, arctic grayling, Dolly Varden, moose, caribou, bear, and selected furbearers).
2. Determine and describe user group characteristics.
3. Determine quantity and value of harvest by location and user group.
4. Assess project-induced changes in harvestable stock and value of harvestable stock by location and user group.
5. Determine potential changes in unit fish and game values and implication of these changes to user groups.

It should be noted that in this analysis it will be assumed that, where the cost of harvest exceeds the cost of delivery of a fish or animal to a person's residence, the user will be considered a recreational user. At the end of the quarter a draft report will be available.

The basic information needed to accomplish Work Package 9 will be assembled during this quarter. Accomplishments include:

1. Establish minimum resource conditions on a per-user basis.
2. Describe future fish and game utilization rates on a per-user basis.
3. Compare future utilization rates to the minimum resource conditions on a per-user basis.
4. Compare future resources value per user to current resource value per user.
5. Identify ways to mitigate losses or enhance benefits.
6. Briefly assess impact of increasing demand for fish and game on current users.

- 1st Quarter FY83

Both Work Package reports will be finalized by early September. Under Work Package 8 a draft report will be released for comments to various project member's. A final report will be prepared two weeks following receipt of all comments. Under Work Package 9, a draft report will be available at the end of July. The report will be finalized four weeks from receipt of comments on the Work Package 8 report.

Subtask 7.06 - Cultural Resources Investigation

(a) Objective

To identify the archaeological and historical resources of the project study area and to propose mitigation measures to lessen the impact of ground-disturbing preconstruction and construction activities.

(b) Approach

The Cultural Resources Investigation is designed to fulfill the cultural resource obligation for both the licensing and construction phases of this project, through pre-license application (Phase I) and post-license application (Phase II) efforts.

Cultural resources experts at the University of Alaska Museum will execute an intensive five-step research effort specifically to satisfy both state and federal legislation pertinent to cultural resources. The five steps are:

- (1) Preparation for field studies;
- (2) Reconnaissance-level archaeological survey of project areas;
- (3) Intensive testing of archaeological and historic sites discovered during Step (2);
- (4) Final report preparation; and
- (5) Registration of all collections in accordance with state and federal requirements pertinent to the preservation of antiquities.

The University Museum will execute a multi-step research effort specifically designed to satisfy both state and federal legislation pertinent to cultural resources.

The steps are as follows:

- Step 1 - Recruitment of personnel and field work staging. Clearance work in preparation for geotechnical testing. Limited scope in late June for initial crew.
- Step 2 - Reconnaissance-level archaeological survey of priority areas, including access corridors and potential sites identified in previous work. This will be an intensive effort within the relatively short field season.
- Step 3 - Intensive testing of archaeological and historical sites discovered during earlier work. Steps 2 and 3 activities may continue simultaneously.
- Step 4 - Draft report preparation to provide location and preliminary description of cultural sites recorded. All steps will provide recommendations for mitigation of adverse effects.

(c) Schedule

June 15, 1982 through September 30, 1982.

Subtask 7.07 - Land Use Analysis - Winter Navigation Survey

(a) Objective

To determine the magnitude and significance of dogsled and snowmobile use of the Susitna River in areas that could be affected by the Susitna Hydroelectric Project. To qualitatively assess the impacts of the project upon this means of transportation and associated human activities.

(b) Justification

The Susitna River, in its frozen winter condition, is currently used as an avenue of transportation by means of dogsleds and snowmobiles. The degree of significance of this use, however, is presently unknown. Ice studies have predicted that during project operation the Susitna River below the Devil Canyon dam will have open water in the winter at least as far downstream as Talkeetna. Agencies and private individuals have expressed and documented their concern about the impact of the project on winter use of the river. A study based on interviews and existing information will be the first step in answering these concerns.

(c) Approach/Discussion

Interviews with agency personnel and private individuals (including representatives of dogsledding organizations) will yield information on the purposes of winter travel--for example, trapping, recreation, travel between Trapper Creek and Talkeetna. Such information on the purpose of travel will be used to make qualitative assessments of the potential ramifications of the preclusion of winter river travel due to changes in ice conditions. Published and unpublished reports that might contain information on winter river use will also be sought. Available results of Susitna ice studies will be reviewed, and a qualitative assessment of the impacts on winter river travel due to changes in ice conditions will be made.

(d) Quarterly Accomplishments and Deliverables

- 4th Quarter FY82

None.

- 1st Quarter FY83

Interviews and data review will be performed in July and August 1982. A draft report of findings will be prepared by the end of September 1982. No results from this study will be incorporated into the license application. (As in the Feasibility Report, this impact issue will be addressed in general terms in the License Application.)

Subtask 7.07 - Land Use Analysis - Mitigation of Aesthetic Impacts

(a) Objective

To develop a draft plan for mitigation of impacts of the Susitna Hydroelectric Project on the aesthetic resources of the Upper Susitna River Basin.

(b) Justification

FERC requires a license application to contain, in a report on aesthetic resources, "a description of mitigative measures proposed by the applicant, including architectural design, landscaping, and other reasonable treatment to be given project works to preserve and enhance aesthetic and related resources during construction and operation of proposed project facilities." The recently enacted FERC regulations place this requirement in the environmental report (Exhibit E) rather than in a separate exhibit (Exhibit V under the superseded regulations). The FERC license application, by June 1982, will address the mitigation of aesthetic impacts. Because of the general and conditional nature of many of the statements to be made, however, this report will not represent a "mitigation plan." Although the environmental team has provided input to the design engineers on many issues of visual impact, sites for some project facilities were selected too late in the feasibility study process to permit a thorough dialogue between the design engineers and the environmental team prior to the preparation of the license application. Therefore, without additional work, the FERC requirements for the Report on Aesthetic Resources cannot be completely addressed. Furthermore, many aspects of project facilities will undergo refinement during continuing design studies, thereby presenting an opportunity to mitigate some potential impacts on aesthetic resources.

(c) Approach/Discussion

The essence of this effort will be coordination between Acres and the environmental team. The preparation of the draft mitigation plan requires substantial cooperation and written input from project architects and engineers.

Project facilities that will be discussed with design engineers include the architectural design and landscaping of the permanent village at Watana and the appearance and design of other facility components. The plans for restoration of borrow areas, to reduce the degree of permanent visual impact, also need further refinement. Further planning and design of recreation facilities (see Subtask 7.08) will require coordination to assure that these facilities themselves are compatible with the landscape and also that unattractive aspects of project facilities do not detract from the setting of the recreation facilities.

This aesthetic mitigation effort does not include the proposed transmission facilities or access road, although further mitigation of the potential aesthetic impacts associated with these facilities will eventually be

required. Visual impacts will be the primary consideration, but limited attention will also be given to noise, where appropriate, and to odor, where applicable. Emphasis will be placed on the avoidance or minimization of permanent impacts to aesthetic resources, rather than on temporary intrusions during the construction period, when public access will be restricted.

(d) Quarterly Accomplishments and Deliverables

- 4th Quarter FY82

None.

- 1st Quarter FY83

The product of this work package will be a draft plan in early September for the mitigation of aesthetic impacts.

Review of the assembled report by Acres and approval by APA will then be required, but revision of the report prior to September 30 is not anticipated. Such revision, as well as continued coordination and mitigation planning, will likely be needed as part of subsequent efforts.

Subtask 7.08 - Recreation Planning

(a) Objective

To obtain quantitative estimates of existing use of the project vicinity in the Upper Susitna River Basin and to refine the recreation plan for the Susitna Hydroelectric Project.

(b) Justification

Because of the subtle and dispersed nature of existing recreational use in the vicinity of the proposed hydroelectric project, quantitative estimates of such use are very difficult to obtain. With recognition that existing use is low in comparison with more accessible areas, the Phase I Plan of Study did not propose to attempt quantification. Nevertheless, state agency personnel have expressed their desire to know how much existing use would be affected by the proposed project. Also, FERC license application requirements include "estimates of existing and future recreational use at the project, in daytime and overnight visitation (recreation days), with a description of the methodology used in developing these data." To fully comply with this regulation, some attempt at quantification of existing use seems necessary.

Although a conceptual recreation plan has been developed, including specific proposed sites for recreation facilities, many details of these facilities remain to be worked out. As plans are refined, the cost and schedule of recreation development should be refined accordingly.

(c) Approach/Discussion

A concerted effort will be made to obtain quantitative estimates of existing recreational use of the Upper Susitna River Basin. A field survey of recreationists in the project area is not considered to be practical, and will not be attempted. Potential sources of existing data, however, will be probed. These potential sources include guiding records and other statistics maintained by the Alaska Department of Public Safety, Division of Fish and Wildlife Protection. Air taxi operators, riverboat services, and the managers of the three lodges in the project vicinity (Stephan Lake, High Lake, and Tsusena) will be contacted for information on the levels of present recreation.

Refinement of the recreation plan itself will consist of planning and preliminary site drawings for specific recreation facilities. To avoid unnecessary expenditures, this effort will be limited at this time to those facilities which form the nucleus of the recreation plan. Such site planning will present agencies with a more detailed proposal and, thus, may facilitate the approval process. This effort will include, in particular, continuing and strengthening dialogue on a technical level with ADNR, Division of Parks, and USDI, National Park Service. Coordination with the Alaska Division of Parks is especially important in the plan refinement stages to ensure consistency in objectives and standards. Refinement of

the schedule and costs associated with the proposed recreation facilities will also be accomplished as additional details are developed.

(d) Quarterly Accomplishments and Deliverables

- 4th Quarter FY82

None.

- 1st Quarter FY83

The results of this subtask will be presented in a supplementary report on recreation resources, which is scheduled to be completed in draft form in early September. Additional site planning and design of recreation facilities will be required in subsequent Phase II studies.

Subtask 7.10 - Fish Ecology Baseline Studies and Analysis

(a) Objective

To perform the necessary analyses and prepare various technical reports in support of Exhibit E of FERC license application. Specific objectives to be accomplished are:

- Provide a review of the feasibility report and identify data analysis deficiencies, related data gaps for all subjects, the proposed course of action to be taken by the group to rectify deficiencies within its area of responsibility.
- Recommended studies to be implemented in 1982 to fill any data gaps. These studies would be funded within the 1982 budgets of other organizations or from the allocation of discretionary resources allotted to the analysis group. Detailed study plans will be provided for any new studies recommended by the analysis group.
- Prepare technical reports within a variety of the subject areas in support of the FERC license application. May 31, 1982, will be the cut-off date for any additional data that might be included in support documents for a September 30, 1982 license application. These documents will include an analysis of historic, literature, and project data. They will provide a comprehensive discussion of project effects on the instream use or resource of interest, and identify any 1982 summer studies that might provide pertinent data or information which could be amended to the application. Mitigation options will be described in as much detail as is presently possible, in a sequence consistent with the USFWS definition of mitigation. The limitations and the benefits for each mitigation option will be detailed.
- Provide periodic technical seminars/workshops for the resource agencies through the Susitna Hydro Steering Committee.
- Interim administrative reporting will be minimal; finished technical support documents will be submitted as required.
- Prepare technical amendments and responses to support the FERC license application which includes 1982 summer study results.

(b) Approach/Discussion

The interdisciplinary group would identify project effects (positive and negative) on the instream uses and resources of the Susitna River with the exception of riparian vegetation and wildlife habitat. In addition, the analysis group will oversee the conduct of the necessary studies and prepare a report on the limnology and fishery potential of the impoundments.

The analysis group will consist of five or six professionals familiar with the Susitna project, with demonstrated experience in conducting field investigations, and prepare technical reports related to their respective subject areas.

The group will be responsible for technical coordination of the studies, including contents of the report, their review, editing, and final report production.

The following are specific reports that will be prepared by this group in support of the license application. Each of these reports will be the assigned responsibility of one of the members of the analysis group.

(i) Streamflows

This study will involve the review of the feasibility report and evaluation of the data base supporting comments on downstream flow impacts. All existing ADF&G and R&M data will be reviewed and recommendations will be made for expanding or modifying the field work proposed for the summer of 1982. This plan will emphasize use of the summer 1982 field data for making a preliminary assessment of the effect of incremental changes in discharge on the utility of the slough habitats. An interim assessment will be prepared for submission to the FERC in September. Impact minimization between these extremes will also be discussed to the extent existing information will allow.

(ii) Downstream Temperature Studies

This study will involve review of the stream temperature model and temperature data available from Acres, R&M, and ADF&G. In addition to the review of comments contained in the feasibility report, which pertain to project effects on stream temperatures, recommendations will be made to improve the predictive capability of the stream temperature models. An analysis will be provided, based on existing data as of May 31, 1982, which will include quantitative estimates of the effects of altered temperatures on egg incubation and emergence. Preliminary statements will be made regarding the anticipated effects of altered temperatures on the fisheries. The 1982 winter thermal data will be included in the license application.

(iii) Water Quality Studies

This study will include review of the feasibility report and will make recommendations for implementing additional study during the 1982 field season. All of the existing data sources will be compiled and analyzed to define baseline water quality conditions for the system. Further, this information will be used to predict the water quality of the post-project reservoirs, limnological parameters of these reservoirs, and productivity of the reservoirs under post-project conditions. Information of the water quality of the reservoirs will also be used to determine water quality of the

downstream releases and the probable effects such water quality conditions would have on the downstream fisheries resources.

(iv) Fisheries Studies

It is the specific intent of this element of the analysis group program to emphasize and describe the various mitigation options available to alleviate the impacts identified in the streamflow, stream temperature, and water quality study reports.

This study will involve a review of the feasibility report and will determine additional analysis and data that are needed to support the FERC license application. Additional field studies that need to be completed during the 1982 summer field season will be designed and implemented. A report will be prepared that provides a summary description of the impacts on the fisheries below Devil Canyon and discusses specific methods for mitigating these impacts. A report will also be prepared on the anticipated limnological characteristics of the Watana Reservoir and its fishery potential.

(v) Navigation Studies

This study will involve review of the section on navigation contained in the feasibility report and other support documents and assure that any needed data are obtained during the summer of 1982. The September 30 support document would provide a comprehensive assessment of river navigation based on all information available by May 31. Preliminary conclusions regarding effects of incremental discharge changes on navigation will be provided for the Susitna River from Alexander slough to Devil Canyon.

(vi) Estuarine Studies

This study will involve review of the section on estuarine impacts in the feasibility report. A review of the available literature on the Cook Inlet estuary will be completed, and interviews will be conducted with biologists and physical scientists familiar with estuarine problems. Information on ice formation and problems associated with icing in Cook Inlet will be a major area of discussion. Any field studies that will be required will be designed and implemented or scheduled for implementation prior to the September 30, 1982 application date. A report will be produced presenting all existing information and literature pertinent to anticipated estuarine impacts attributable to the project.

(vii) Geomorphological and Bedload Studies

This study will entail review of the existing documents and statements contained in the feasibility report and make recommendations for upgrading the data base and analyses supporting these statements. Particular attention will be given to utilizing the bedload

data collected by the USGS in an analysis which addresses the stability of the confluence area. A report will be prepared providing an impact assessment of the project and mitigation plans with regard to those subject areas.

(viii) Downstream Ice Study

This study will be limited to a review of the feasibility report and supporting documents describing the ice process models and providing a summary of statements and concerns regarding the present level of confidence in the statements contained in the feasibility report pertaining to downstream ice cover.

(c) Schedule

April 1, 1982 through September 30, 1982.

Subtask 7.11 - Coordination of Wildlife Studies

(a) Objectives

The purpose of this task would be to continue the coordination effort among environmental contractors, subcontractors, and ADF&G. An associated goal would be to respond to questions by review agencies.

(b) Justification

This effort is necessary because additional wildlife and habitat data will be collected during Phase II, and there will be comments and questions from review agencies that will have to be addressed. In addition, coordination of the ongoing habitat studies with the big game studies will be required.

(c) Approach/Discussion

The wildlife work being performed by ADF&G and subcontractors along with habitat data collected by the University of Alaska will be reviewed in order to assure that the two types of data provide the appropriate information in the proper fashion. This would be accomplished through several means, one of which would be by obtaining the opinions of a few select species authorities. In addition, a 2-to-3-day workshop would be held in order to formulate an approach to integrate the big game data with the habitat data. Attending this workshop would be representatives from the ADF&G study team, consultants, plant ecology subcontractors, and personnel outside the study program who have extensive experience with the habitat relationships of the appropriate big game species.

(d) Schedule

This effort would continue throughout the 4th quarter of FY82 and the first quarter of FY83. Accomplishments will include the resolution of wildlife-habitat interdigitation problems, the initiation of Phase II studies, and the coordination of data collection efforts among the study participants.

Subtask 7.11 - Riparian Zone of Lower Susitna River - Bird and Beaver Surveys

(a) Objective

The purpose of this study is to determine the species composition of birds inhabiting the riparian zone along the lower river and to obtain sufficient information on the ecology of beavers to enable a greater understanding of how the changes in hydrology caused by the Susitna Project will affect them.

(b) Justification

During Phase I, data were gathered which served to document the general distribution of beaver abundance from Devil Canyon to the Delta Islands. Further studies concerning specific characteristics of dens, lodges, and food caches are needed in order to determine the degree of change that beaver populations may incur as a result of changes in flow regimes, ice conditions, and successional trends of riparian vegetation. Since changes in riparian vegetation are possible, it will also be necessary to ascertain the avian species that inhabit the area and could be affected by changes brought about by the project. With the exception of one census plot near Sherman and a cursory survey of migrating waterfowl and nesting bald eagles, little bird study effort was expended downstream from Devil Canyon. The studies proposed herein are designed to fill this data deficiency.

In addition, since portions of the lower basin, including the riparian zone, are under consideration for moose habitat management efforts, it will be necessary to predict what impacts any habitat changes that result from moose management will have on other faunal groups. If efforts such as logging, crushing, or burning are conducted, they will likely have more of an impact on non-target species than will changes brought about by altering the flow regime of the river. Therefore, an understanding of non-target species such as the beaver, as well as the avian populations involved, will be needed, if a well-planned moose management program is to be approved.

(c) Approach/Discussion

Several aerial surveys would be conducted during spring to further document the extent of waterfowl use of the river and also to accurately determine the number of active bald eagle nests between Cook Inlet and Devil Canyon. During the breeding season, bird surveys would be conducted in major vegetation types in the riparian zone and immediately adjacent to the riparian zone to document the species composition and general habitat use by breeding birds. For this effort, selected areas from Sherman south to Cook Inlet would be used and would be chosen following a review of vegetation studies conducted during Phase I.

The study of beavers along the lower Susitna River would be divided into the three river segments used previously, i.e., Devil Canyon to Talkeetna, Talkeetna to Montana Creek, and Montana Creek to the Delta Islands. To gain a more complete understanding of the abundance of beavers, the first step will be to conduct an aerial survey, using helicopters, of all

three reaches of the river. This will be done prior to breakup and again during the open water period of the year. This effort will then be followed by ground surveys, expedited through the use of a riverboat, to determine the relationship between bank dens, lodges, and dams to vegetation characteristics of the river. Notes concerning the location and phenology of food cache construction and utilization will also be gathered. All beaver data will be collected in such a manner as to enable the use of corresponding hydrology information in order to predict what changes the project may have on the ecology of beavers in this area.

(d) Quarterly Accomplishments and Deliverables

- 4th Quarter FY82

1. The survey of waterfowl would be conducted at two-week intervals from breakup to mid-June. Data tables summarizing the results of the waterfowl survey would be prepared by July 1.
2. Bald eagle surveys would be conducted during late June, or possibly the first half of July.
3. Breeding bird surveys would begin in late May and continue through the quarter.
4. Aerial surveys for beaver would be conducted just before breakup, and surveys from the river would occur during the latter half of the quarter.

- 1st Quarter FY83

1. Results of the bald eagle survey would be available on August 1, 1982.
2. Breeding bird surveys would be completed by mid-July, with a preliminary species list of breeding birds presented by September 1, and data analysis completed by September 30.
3. A summary of the spring beaver studies will be prepared by September 30, 1982.

Subtask 7.11 - Breeding Bird and Small Mammal Census - Upper Basin

(a) Objective

The goal of this study would be to obtain a second year's data on breeding bird densities and a third year's data on small mammal abundance in the Upper Basin.

(b) Justification

The need for this effort is two-fold. First, due to annual differences in abundance, especially small mammal species which are subject to cyclic and fluctuating changes in abundance, additional data are needed to provide statistical validity to the information used in the initial impact predictions. The second, and probably more important need, is to gather sufficient data concerning the habitat relationship of these two faunal groups for use in planning mitigation programs for other species. This is very important in regard to habitat management for moose. At the present time, prescribed burning is being considered as a means of improving moose habitat. Any such program will result in major changes in habitat with resulting impacts on species other than moose. In order to predict and, if possible, minimize negative impacts on non-target faunal groups, such as birds and small mammals, it will first be necessary to properly understand the habitat requirements of all associated faunal groups. Failing to take the impacts of moose management on other species into proper consideration could be justifiably criticized. In addition to these two reasons for conducting additional bird and small mammal censuses, there is the fact that several resource agencies have recently been focusing their attention on the habitat relationships of these faunal groups, and their review of the Susitna will probably be more favorable if this aspect is addressed in a scientifically valid manner.

(c) Approach/Discussion

Since study plots for birds and small mammals have already been established and complete habitat data collected, this effort will simply entail an additional census of breeding birds and small mammal abundance. Breeding bird census techniques and small mammal trapping would be conducted during the spring of 1982, and mammal trapping would be conducted during early fall, 1982.

(d) Accomplishments and Deliverables

- 4th Quarter FY82

1. During April and the first half of May, continued detailed analysis of Phase I data would be conducted.
2. Breeding bird census would start in late May and continue through the quarter.

- 1st Quarter FY83

1. Breeding bird censuses would be completed in early July with a summarization of results available by September 30, 1982. Detailed data analysis will follow.
2. Fall trapping of small mammals would take place in early September with a brief tabulation of data prepared by the end of the quarter.

Subtask 7.11 - Pine Marten Densities - Upper Basin

(a) Objective

The goal of this study is to determine the density of pine marten in the vicinity of the proposed impoundments.

(b) Justification

Although a considerable volume of data was collected during Phase I on the abundance and distribution of this key furbearer species, the effort was not designed to determine the density of this species. The determination of furbearer density was originally scheduled for Phase II. Although sufficient data exist to predict the general nature and extent of impact that will result, determining the actual numbers of pine marten inhabiting the impoundment zone would require additional survey effort.

(c) Approach/Discussion

Several techniques would be used to determine the density of pine marten within the proposed Watana and Devil Canyon impoundments. Aerial snow transects would be flown in the spring and fall to further document the distribution and comparative abundance of pine marten. During summer, a limited amount of radio telemetry data would be gathered to improve the estimate of home range size that was developed during Phase I and to determine the utilization of the dominant habitat types in the impoundments. Also, an intensive mark-recapture effort would be undertaken in the dominant habitat type in the Watana impoundment area as well as in the Devil Canyon impoundment area. The results of the density estimate produced from the mark-recapture effort, in conjunction with the aerial snow transect data and radio telemetry data, would permit the generation of an estimate of how many pine marten will be displaced by the two impoundments.

(d) Accomplishments and Deliverables

- 4th Quarter FY82

The radio telemetry effort would begin during June.

- 1st Quarter FY83

1. Radio telemetry studies would continue.
2. The mark-recapture effort would be conducted during July and August.
3. Since neither a spring nor a fall aerial snow transect survey will have been completed by the end of the quarter, a report presenting tentative conclusions, along with data summaries, will be available by September 30, 1982. A preliminary estimate of pine marten populations will be available for inclusion in the license application.

Subtask 7.11 - Refinement of Wildlife Mitigation Plan

(a) Objective

The purpose of this task would be to continue the mitigation planning conducted during Phase I. The goals would be to add quantification to the mitigation effort and to interact with the resource agencies in the development of a final plan.

(b) Justification

Due to a lack of both data and time, it was impossible to develop a final plan for mitigation during Phase I. Although analysis of many options was conducted and the process of developing a plan accomplished, a considerable amount of work still remains to be done.

(c) Approach/Discussion

A wide variety of activities will be conducted under this effort. Of foremost importance will be further analysis of wildlife baseline data, as well as vegetative data, in order to quantify more precisely the degree of impacts and, therefore, the extent of mitigation effort required. An effort that will parallel this analysis would be the development of preliminary cost efforts for mitigation. Obviously, final estimates could not be prepared until the resolution of the final mitigation plan.

In some cases, moose habitat management being a good example, preliminary steps would be initiated to identify candidate areas for management efforts. Areas in both the Upper Basin as well as the Lower Basin would be considered under this task.

An additional effort that would fall under this work package would be continued interaction and coordination with review agencies. This would probably entail the clarification or modification of some mitigation issues.

(d) Accomplishments and Deliverables

This would be an ongoing effort covering the entire period of April through September. No specific report is presently envisioned for preparation during the identified time period. However, the Draft Wildlife Mitigation Plan in the June Exhibit E will be updated and refined as a result of this task.

Subtask 7.12 - Browse Quality and Production Assessment in the BLM
Prescribed Burn Area

(a) Objective

To collect baseline data necessary to measure the change in the quantity of moose browse resulting when scrub forest, muskeg, and other relatively unproductive shrublands are burned; and to establish permanent plots to monitor vegetation.

(b) Justification

Manipulation of habitat through burning to promote an increase in moose browse is one of the few promising measures for mitigating loss or degradation of wildlife habitat.

The extent to which browse production increases following a fire is unknown. Responses are positive for most habitat types; however, some responses to wildfire have been negative on the Kanai National Moose Range. The duration of benefits is also undocumented.

The assessment of prescribed burning can be delayed by land ownership problems. Currently the BLM plans to burn an area in the Alphabet Hills region of the Upper Susitna Basin. They would be responsible for the costs and manpower involved with setting and controlling the fire. A unique and economical opportunity therefore exists for preburn habitat and big game studies to be conducted in this area. This proposed effort is directed at the vegetation studies, with the big game studies being handled separately by ADF&G.

(c) Approach/Discussion

Investigations will include vegetation mapping, plant production, inventories, community structure, and species composition surveys, with emphasis on important browse plants such as willow. These data will demand establishing permanently marked plots within the burn and beyond its borders. Data will be collected on current year's production available for winter use.

Fire severity and intensity will also be measured at each plot. Cones that melt at different temperatures will be placed in the field prior to the burn.

(d) Quarterly Accomplishments and Deliverables

- 4th Quarter FY82

The burn area will be mapped during May. A draft vegetation map will be available by the end of the quarter. Preburn plots will be located during this quarter.

- 1st Quarter FY83

The primary emphasis during this quarter will be the finalization of the vegetation maps and summer sampling of the preburn plots. Vegetation sampling including browse production and forage will be performed in July and August. By the end of the quarter, a final draft of the vegetation map will be presented; a species list of vegetation by community within the burn area will be compiled; and raw data for browse production and forage will be available.

Subtask 7.12 - Browse Inventory

(a) Objective

To measure the annual production, a rough estimate of summer use, and quality of moose browse in various habitat types in the Susitna Basin and use these data to calculate carrying capacities of the moose ranges affected by the Susitna Hydroelectric Project.

(b) Justification

Browse production and use of different habitat types are key ingredients for assessing losses (impacts) and assessing the extent of mitigation (principally compensation) required for the proposed facilities. The implementation and design of a mitigation plan for wildlife will be greatly enhanced by the browse information. This study is directed at moose, which is the key big game species.

(c) Approach/Discussion

Available browse production, an estimate of summer use, and quality will be determined by vegetation/habitat type in the upper basin and selected downstream areas. Plots will be established in various vegetation/habitat types, both within and outside direct impact areas. Browse will be measured once during the growing season. Summer production and an estimate of summer use will then be calculated.

As vegetation develops during the spring season, plots will be established for spring forage production and spring phenology studies in selected areas in the Upper Basin. The forage production will involve small enclosure plots placed in areas determined by ADF&G to sustain heavy spring use by moose. The phenological studies will be directed at vegetation development on south-facing slopes.

During the field effort, samples will be collected for the quality analysis. Chemical analysis of these samples will be made at the Agricultural Experiment Station laboratories in Palmer. Analysis will be made for various components including protein content, minerals, digestibility, and tannin content. Input will be requested from ADF&G for other important components.

The production and use data will be available to be used in conjunction with the annual requirements of a moose to predict the carrying capacity of each habitat type. By knowing the amount of each habitat type to be lost and the amount remaining, an estimate can then be made of the project's effect on carrying capacity. Several other factors, however, influence the ability of a given area to support a population. Further adjustments will have to be made to the estimated figures. Input will be required from ADF&G project personnel and also from personnel involved in the research on the Kenai Moose range.

In addition to the browse work, soil samples and pellet counts will be made at each plot. Supporting information will be obtained from these data.

(d) Quarterly Accomplishments and Deliverables

- 4th Quarter FY82

During this quarter raw data for spring phenology and forage production will be collected.

- 1st Quarter FY83

The phenology and spring forage data will be summarized during this quarter. As part of the chemical analysis, data will be available on the Jay Creek salt lick. Data on browse and forage production in the upper Basin and selected downstream areas will be collected and will be in raw data form by the end of the quarter.

Subtask 7.12 - Identifying Sites Having Potential for Wildlife Mitigation

(a) Objective

To identify habitat types and associated sites which, through various techniques, could be altered to increase productivity of wildlife forage and browse, and to locate specific areas for mitigation purposes.

(b) Justification

Increasing browse production and quality to compensate for moose habitat losses associated with the project is one of the primary mitigation options. Predictability of how and where such treatments should be applied has not been developed at this time.

Providing information on where suitable mitigation practices might be best applied will be needed in both the Upper and Lower Basin areas. The identification of areas that could be set aside is another avenue of mitigation.

(c) Approach/Discussion

Land use and land ownership will be investigated as a major consideration in this task. Field investigation will also be a source of information. Prior experience with plant community mapping and data from the proposed browse and burning studies will also prove useful. Currently existing vegetation cover maps and aerial photographs will be utilized to develop potential locations for mitigation. The identification of lands for mitigation purposes is primarily directed at moose mitigation, although some potential caribou mitigation lands may also be identified. Field surveys and further information will be utilized to refine this assessment.

(d) Quarterly Accomplishments and Deliverables

Information will be provided as needed with the final schedule being coordinated with the wildlife personnel. It is anticipated that an interim report will be prepared by the end of September. The results of this task will also be utilized in updating of the Draft Wildlife Mitigation Plan for the license application. The effort will probably be concentrated in the first quarter FY83.

Subtask 7.15 - Revision of the License Application and Preparation of Backup Reports

(a) Objective

To revise various portions of the license application and to compile and organize the available reports of certain environmental disciplines into backup reports.

(b) Justification

Since the license application will be prepared by June 30, 1982, but not submitted to FERC until September 30, 1982, various revisions to the application may be required. Additional information, agency comments, change in facility design or location, etc., will influence the contents of the application.

Certain of the environmental studies proposed for implementation during 1982 will be compiled as backup reports.

(c) Approach/Discussion

For the revision of the license application, Acres will provide the environmental contractor with any changes in the proposed action. This will generally include any modifications to location and design of project components, scheduling of project events, and construction and operation specifications. Revised sections of the application will then be prepared and submitted to Acres. Refinement of the mitigation plan will be handled as a separate work package.

Reports received from subcontractors will be refined into reports designed to be used as backup reports. Technical review, typing, editing, drafting, and other services will be required to produce these reports.

(d) Accomplishments and Deliverables

Revisions to the license application as a result of changes in the proposed action will be performed during July and August, with revised sections submitted to Acres by August 15, 1982.

The preparation of backup reports will begin following the receipt of reports from subcontractors. Most of the effort will probably be performed during the July to September period.

Subtask 7.16 - Response to Interrogatories

(a) Objective

The objective of this proposed effort is to prepare responses to questions and comments raised by agencies and other concerned groups on pertinent environmental report sections.

(b) Justifications

Following release of the Feasibility Report and the Phase I Final Reports various questions and comments will be received. The comments will warrant a response as part of the agency contact program.

(c) Approach/Discussion

Response to many of the comments received by APA and Acres will require input from the environmental contractor, who will provide input for questions or comments that are received pertaining to the environmental reports. All input will be coordinated through Acres or APA. Any new information generated during this process and received in time will be incorporated into the application revision under Subtask 7.15.

The level of effort needed for providing input into responses is difficult to estimate. For costing purposes, an estimate was made of the technical input required. If more extensive work is required, additional funds may be requested.

(d) Accomplishments and Deliverables

Technical input and letters will be provided as needed. It is anticipated that most of the comments will be received in July and August. As a result, the effort will probably be concentrated in July, August, and September.

Subtask 9.03 - Prepare Cost Estimate Update

(a) Objective

Update cost estimates in connection with the proposed elimination of the pioneer road and alternate access routes for inclusion in FERC license application.

(b) Approach/Discussion

Investigate the elimination of the pioneer road and alternative access routes and their impact on construction costs resulting from changes in schedule. Investigation to include a review of access alternatives covered in Task 2, plus other possible alternatives. The emphasis of investigation will be to determine access that will have minimum impact on schedule and costs already developed for the project. The investigation will include a site visit and discussions with subconsultants.

(c) Schedule

May 15 through June 30, 1982.

(d) Report

A supplemental report will be prepared to summarize the results of the study and recommendations for access.

Subtask 9.04 - Develop Engineering/Construction Schedule

(a) Objective

Update construction schedules in connection with the proposed elimination of the pioneer road and alternate access routes for inclusion in FERC license application.

(b) Approach/Discussion

Similar to Subtask 9.03 concerning cost estimates, an investigation of the elimination of the pioneer road and alternative routes and their impact on construction methodology and on-line power dates will be made.

(c) Schedule

May 15 through June 30, 1982.

(d) Report

A supplemental report will be prepared to summarize the results of the study and recommendations for access.

Subtask 12.07 - Document Distribution

(a) Objective

To prepare and distribute additional copies of the Feasibility Report and supporting reference documents to APA, state agencies and various other interested parties in accordance with APA directives.

(b) Approach/Discussion

The additional quantity requirements and distribution of the various project documents were well over the original budgeted amount and involved the collating, binding, packing and shipping of over 5,500 separate documents and resulted in more than 12,000 pounds of material being shipped. Considerable overtime had to be expended, as well, to meet the very strict time constraints imposed.

(c) Schedule

March 15, 1982, through June 30, 1982.

Subtask 13.05 - Develop Cost Control System

(a) Objective

Continue with the necessary management tools and control systems for monitoring, reporting and control of project costs for the period July 1, 1982, through September 30, 1982.

(b) Approach

The cost control system will continue to use the expertise of both Acres and Moolin personnel.

Both man-hours and dollars expended will be reported for the extended period and the total to date. Completion costs will be forecasted and projected overruns/underruns will be tabulated. Reports will be submitted to APA monthly.

(c) Schedule

July 1, 1982, through September 30, 1982.