SUS 344

ADF&G RSA

June 10, 1983

ALASKA POWER AUTHORITY
334 West 5th Avenue,
2nd Floor
Anchorage, Alaska 99501
(907) 276-0001
(907) 277-7641

1135

LETTER OF T

cc: file, ...
Route: Rizer

FILE 1.8.1/2.2.33/4.3.1.4

DATE: 13 June 83
ATTENTION: Att. Gary

RE: ADF+G RSA final draft of 10 June 1983

TO: Harza-Ebasco, Susitna JV
8740 Hatch Rd.
Anchorage

file AdF+G RSA

WE ARE SENDING YOU ☒ Attached ☐ Under separate cover via ______ the following items:

☐ Prints ☐ Plans ☐ Samples ☐ Specifications

☐ Change order ☐ ______

COPIES	DATE	NO.	DESCRIPTION
1	Jun 10, 1983		ADF+G RSA of 10 Jun 1983

THESE ARE TRANSMITTED as checked below:

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REMARKS

RECEIVED
JUN 14 1983
HARZA-EBASCO
Susitna Joint Venture

COPY TO

SIGNED: Richard S. Fleming

1135 1.8.1/2.2.22/7.3.1.4

MEMORANDUM State of Alaska

RECEIVED JUN 10 1983 ALASKA POWER AUTHORITY

TO: Richard Fleming
Deputy Project Manager - Environment
Alaska Power Authority
Anchorage

DATE: June 10, 1983
FILE NO: 02-83-13.03
TELEPHONE NO: 274-7583

FROM: Thomas W. Trent
Aquatic Studies Coordinator
Alaska Department of Fish and Game
Anchorage

SUBJECT: FY84 RSA Program - Budget, ADF&G Su Hydro Aquatic Studies

The Aquatic Studies program and budget information for the Reimbursable Services Agreement (RSA) between the Alaska Power Authority (APA) and the Alaska Department of Fish and Game (ADF&G) for Fiscal Year 1984 is attached. We are requesting your further action and transmittal to the appropriate administrative channels for approval and encumbrance of operating funds.

Page A-4 of the RSA program-budget document contains the Line 100 through 400 totals which should be reflected on the RSA covers for the respective APA and Commercial Fish Division RSA, and the APA and Sport Fish Division RSA. The Line 500 equipment budget total on page A-4 represents the amount of funds which should be allocated to Harza-Ebasco Susitna Joint Venture (SJV) for the purpose of purchasing ADF&G Aquatic Studies Equipment.

Other support services which will have funds administered by Harza-Ebasco SJV are being identified by item in a separate memorandum. Costs for services such as building leases should be determined and forwarded to you by Harza-Ebasco SJV.

In the course of our RSA discussions with you and Harza-Ebasco SJV representatives, several items of a planning and organizational nature have been requested from ADF&G. The ADF&G will provide a response on our consideration of these items in separate correspondence. Two documents which we will need to formulate our responses about these items are (a) a final copy of Harza-Ebasco SJV's comments on our second draft RSA program and budget as drafted to Robert Mohn of APA, and (b) a list of proposed tasks that Harza-Ebasco SJV desires ADF&G Su Hydro Aquatic Studies Team to make staff time available to respond to FERC and agency comments. I should note that with respect to (b), APA has indicated Harza-Ebasco SJV will provide a quarterly review of tasks in which they expect the ADF&G Su Hydro Team participation will be needed.

One item not addressed in the attached RSA program-budget is inclusion of an IFG Model Documentation Report requested by Harza-Ebasco SJV. The ADF&G Su Hydro Aquatic Studies Team will require more specific information on the intended nature and substance of this report from Harza-Ebasco SJV before we can agree to a proposed deadline for its preparation. The preparation of this report could be considered as part of the tasks under (b) of the preceding paragraph.

Another item we have not taken into consideration in drafting this proosal in the RSA with the ADF&G Division of Administration for services rendered by them. We suggest, as in previous years, the Director of The Division of Administration be contacted directly on this matter.

We appreciate your assistance in the development of this RSA program-budget document and we look forward to another challenging year in our aquatic studies investigations.

cc: Commissioner Collinsworth
R. Logan
S. Pennoyer

ATTACHMENT A - GENERAL TERMS AND ACCORD OF AGREEMENT

I. Mutual Agreements

The Alaska Power Authority (APA) and the Alaska Department of Fish and Game (ADF&G) have mutually agreed:

A. That continuing studies of the fisheries resources and their habitat in the Susitna River are necessary to improve the confidence of ~~stating~~ baseline conditions and potential impacts on these resources by proposed hydropower development.

B. That the ADF&G will conduct fisheries and aquatic habitat studies to provide:

1. baseline fisheries and aquatic habitat information, and

2. an analysis of pre-project condition of the fisheries and their aquatic habitat.

C. APA will utilize the information from the ADF&G fisheries and aquatic studies to support:

1. an assessment of potential post project impacts on fish and their aquatic habitats,

2. planning and future implementation of mitigation measures,

3. the Federal Energy Regulatory Commission (FERC) licensing process and other regulatory and permitting processes.

D. That during the processing of the application for license for the Susitna Hydroelectric Project through the FERC it is necessary for the APA to establish a record of communication relating to the project which will document the distribution of project related information as required by the regulations of the FERC.

II. APA agrees:

A. That funding for ADF&G participation in fisheries and aquatic habitat studies will allow the ADF&G to establish the Susitna Hydro Aquatic Studies Team as a unit which is managed and administered by the ADF&G.

B. To fund ADF&G participation in studies of the fishery resources and their aquatic habitat based on objectives of study for which the APA makes the final decision to proceed. Furthermore, that the APA will review in January 1984 the FY 1984 program objectives to reconsider implementation or rescoping of those objectives scheduled for continuance or implementation in the fourth quarter of 1984.

C. That internal administrative and supervisory communications within the ADF&G shall be unencumbered by the FERC process.

III. ADF&G agrees:

A. That an ADF&G Su Hydro Aquatic Studies Team will be established managed, and supervised by the ADF&G.

B. That the ADF&G Su Hydro Aquatic Studies Team will:

1. annually provide a recommended program and budget for fisheries and aquatic habitat studies on the Susitna River for APA's review, consideration, and approval, and

2. implement the studies for FY 84 as shown in attachments B, C, D, E, F and G.

C. That the ADF&G Su Hydro Aquatic Study Team, through the Su Hydro Aquatic Studies Coordinator, will report to the Commissioner of ADF&G and the Executive Director of APA on the direction of the aquatic studies, their findings, and progress.

ATTACHMENT A - 1

Su Hydro Aquatic Studies FY84 Budget Summary

	Sport Fish	Commercial Fish	Totals
Line 100			
Salary	1846.1	356.6	2202.7
Overtime	12.0	N/A*	12.0
Annual Leave Cashout	31.8	2.0	33.8
Subtotal	1889.9	358.6	2248.5
Line 200	42.9	9.1	52.0
Line 300	369.4	37.0	406.4
Line 400	223.2	52.2	275.4
Subtotal	2686.4	456.9	2982.3
Line 500 (Equipment procured through Harza-Ebasco)	160.9	6.4	167.3
Subtotal	2686.3	463.3	
GRAND TOTAL			3149.6

*Overtime budgeted in salary

ATTACHMENT B - ADMINISTRATION AND SUPPORT UNIT

I. Background

The Administrative and Support Unit of the Su Hydro Aquatic Studies is composed of staff supporting or directing the staff and activities of the other four project elements and is also composed of staff who provide clerical, budget and expenditure, equipment purchase, and repair services for the project. This unit is responsible, through the Aquatic Studies Coordinator, for coordination with APA and other contractors as appropriate, on administrative and technical matters. Also, the Aquatic Studies Coordinator, at the direction of the Commissioner of the Department of Fish and Game and Directors of the Sport Fish and Commercial Fish Divisions, carries out those duties assigned as necessary to accomplish and report on the Su Hydro Aquatic Studies as an office of the Department of Fish and Game.

The Alaska Department of Fish and Game Su Hydro Aquatic Studies is composed of five organizational elements:

A. Administrative and Support Unit (Attachment B)
B. Data Processing Unit (Attachment C)
C. Resident and Juvenile Anadromous Project (Attachment D)
D. Aquatic Habitat and Instream Flow Project (Attachment E)
E. Anadromous Adult Project (Attachment F)

The program statements outline the basic objectives for each of these program elements. Tasks to be accomplished within each element, the

manpower requirements and budget to accomplish these tasks for FY 84 are in the attachment sections of the program.

II. Fiscal year 1984 Objectives (Administrative Support)

A. To function, in FY 84, on behalf of the organizational elements of the Su Hydro Aquatic Studies Team and the Alaska Department of Fish and Game, in a coordination role with the APA and their contractors on matters related to the aquatic studies.

Tasks to be performed under this objective are:

1. To plan and coordinate the development of the fisheries, aquatic habitat and instream flow studies by the Su Hydro Aquatic Studies Team with APA.

2. To provide advice and recommendations regarding fisheries resource and aquatic habitat protection to the APA and its contractors.

3. To interact with other study groups, which have a role in assessment of impacts of the Susitna Hydro Project, in development of mitigation studies or other study plans as appropriate.

B. To provide, coordinate and manage administrative, personnel and equipment support services to the other four project elements.

Tasks under this objective are:

1. To provide for the general administration of the collective ADF&G Su Hydro Aquatic Studies office.

2. To provide basic State personnel and budget administration for the Su Hydro Aquatic Studies Team.

3. To coordinate, manage and direct the work of the support personnel, and support contractors, as provided in Part III of this attachment.

4. To administer the bid process for the purchase of capital equipment purchased for the Su Hydro Aquatic Studies.

5. To administer, manage and provide for the inventory, maintenance and repair of capital equipment used by the Su Hydro Aquatic Studies Team.

6. To draft and manage, with the cooperation of the APA or its designated agent, the terms of agreement for: personal service contracts to which ADF&G is the recipient of the services; leases on buildings occupied by ADF&G; and other service agreements to which ADF&G is the recipient of

the service, and as provided further in Part III of this attachment.

7. To review and edit drafts of scientific and technical reports.

III. - APA Support Services

Other support services are provided to the ADF&G Aquatic Studies Team by the APA to enable the Aquatic Studies Team to carry out the tasks outlined in Part 1 of ATTACHMENT B and also outlined in Attachments C, D, E, F and G. The services provided by the APA include:

A. Expedited servicing and payment of contractual services including but not limited to typing, other personal services contracts, and aerial photography by firms contracted to APA or their designated agent for project purposes. These services shall be consistent with ADF&G Aquatic Studies needs to meet ADF&G's delegated program objectives.

B. Expediting of equipment purchases for the ADF&G Aquatic Studies Program including the payment of this equipment.

C. Provide the full time services of a hydraulic engineer to the ADF&G Aquatic Studies Team, to aid, under the direction of the Aquatic Studies Coordinator, in planning, implementation, evaluation, and coordination of aquatic habitat and instream flow studies.

D. Provide office space, warehousing, laboratory, workshop and outside storage space, exclusive of utilities, to support the fisheries field studies, and the program administrative, coordination and support staff in FY 84. Furthermore, selection and management of the aforementioned facilities will be in accordance with ADF&G needs and will be managed by ADF&G as a State facility consistent with general State law, regulation, rules, and policies for the management of a State facility and the normal administrative management rules and policies of the ADF&G.

E. Helicopter support for transport of Aquatic Studies field crews, equipment and material in the studies area. The air hour requirements in FY 84 for helicopter support are:

Project	Hours
Resident & Juvenile Anadromous Project	182
Aquatic Habitat & Instream Flow Project	244
Adult Anadromous Project	31
Subtotal	457
Access & Transmission Corridor	120
TOTAL	577

IV. Project Schedules

A. Administrative, Budget, Planning or Status Reports or Activities

1. Audit Reports	Monthly
2. Status Report	Monthly
3. Draft RSA Program and Budget	March 1, 1984

B. Technical Reports and Procedures Manual

1. Anadromous Adult Project	
a. Draft (Basic Data)	12/15/83
b. Final Draft	2/1/84
2. Resident and Juvenile Anadromous Project	
a. Draft (Basic data & Analysis)	1/15/84
b. Final Draft	3/1/84
3. Aquatic Habitat and Instream Flow Project	
a. Draft (Basic data & Analysis)	3/1/84
b. Final Draft	4/15/84
6. Procedures Manual	6/1/84

ATTACHMENT B-1

ADMINISTRATION AND SUPPORT UNIT

Line 100 - Personal Services

PCN	Class	Grade	MM	Cost
4188	FB IV	20	12	69.6
4192	FB III	18	12	57.2
4220	FB III	18	12	53.2
4187	BM II	19	12	52.8
4194	FB III	18	12	52.2
4189	MM II	52	12	49.2
4185	M IV	54	12	43.2
6079	AA I	12	12	32.5
4222	AC II	9	12	27.0
4120	CT III	8	12	26.4
4232	CT II	7	12	25.2
				488.5

Line 200 - Travel and Per Diem		25.8
Line 300 - Contractual Services		82.3
Line 400 - Commodities		55.2
	Grand Total:	651.8

ATTACHMENT C - DATA PROCESSING UNIT

I. Background

The extensive studies being carried out by the ADF&G/Su Hydro Aquatic Studies Team entail the collection of large quantities of complex field data. The data processing support unit of the study team provides the expertise and manpower necessary to catalog, summarize, and analyze these data.

The cataloging of this field data into computer data bases is a necessary precursor to efficient retrieval, reformatting, and aggregation of data for the purpose of summarization and analysis. Summarization of the large quantities of collected field data into a concise and understandable form requires the capabilities of digital computers with data base management and report production capabilities. The use of computers to facilitate this summarization ensures that errors in data reduction and analysis are kept to a minimum, and such errors are easy to detect and correct.

An additional facet of the data processing unit is the involvement of the unit's biometrician in data analysis and interpretation with the field project leaders. This involvement includes support in the areas of statistical analysis of field data, biometric evaluation of study results, and the design of field parameter sampling programs.

The design of field parameter sampling programs is a necessary step in any scientific investigation because an improperly designed sampling procedure

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The design of field parameter sampling programs is a necessary step in any scientific investigation because an improperly designed sampling procedure

does not allow for evaluation of the extent and nature of the actual variability, due to the introduction of variability by the implementation of the sampling procedure.

Accordingly, evaluation of field measurements collected via an improperly designed sampling procedure is hampered by this extraneous variability. However, a sampling procedure, which accounts for biological and statistical realities, results in the measurements which can be depended upon to provide the best possible answer to the study's objectives.

Evaluation of data collected during the 1981 field season was used to modify sampling procedures used during the 1982 field season. These modifications were implemented to reduce variability in the collected field data. The modifications often included (but were not limited to) increased sampling frequency and intensity (i.e. number of samples taken during one sampling period) at a reduced number of key sites. For example the number of sites sampled for evaluation of the distribution and abundance of resident and juvenile anadromous fish populations was reduced from approximately 40 sites in 1981 to 17 sites in 1982. Conversely some of the modifications entailed an increase in overall scope and frequency of sampling (e.g. thermograph and datapod temperature recorders). The criteria utilized for modification of procedures included evaluation of the intra versus inter site and sampling period variability and professional judgement in terms of the validity of sampling variability as a reflection of actual "real world" variability. Field data collected during 1982 has and will continue to be similarly evaluated for the purposes of modification and design of sampling procedures

of the 1983 field program. Specific details of these modifications will be included in the FY 84 Procedures Manual.

Statistical analysis of field data is necessitated by the inherent variability of field data, for example the number of fish collected by a trap would vary from sample to sample even if the actual density of fish in the population remained constant. However, the density of the fish population is generally expected to vary between one sampling period and the next period, due to changes in distribution and abundance. Accordingly, statistical analysis is necessary to ensure that observed variations in field measurements (e.g. numbers of fish collected) are large enough to indicate an actual variation in the characteristics of interest. The particular statistical procedures to be utilized in analyzing the various field program data will be presented in the FY 84 Procedures Manaul.

Biometric evaluation of study results (i.e. data summarizations, statistical analyses, and biological conclusions) is provided to ensure that all analyses, interpretations, and conclusions are founded upon observed field data, proper application of statistical techniques, and valid evaluation of biological and physical realities.

During FY 1982, the tasks of data processing were carried out by a Biometrician, a Programmer, and a Data Control Clerk. These tasks were primarily directed at the first two objectives listed in the following section (i.e. II General 1983 (FY 84) program objectives).

Statistical design and biometric evaluation beyond that implemented by field biologists was late arriving in the 1981 program. The primary factor contributing to the retardation of program biometric implementation was funding and personnel system constraints. Once established, heavy work loads were imposed upon the biometric positon which are being rectified by the addition of equipment and manpower as quickly as funding and the hiring procedures of the State Personnel system allow.

During FY 1983, the data processing and programming tasks of the project Biometrician were reduced by the addition of the new positions and support equipment. However, due to request for early transmittal of provisional data to other project participants (e.g. Woodward-Clyde and AEIDC) and to time taken for training new personnel, the level of data processing and programming tasks was still greater than anticipated. The participation of the biometrician in project statistical analyses was generally on a consultant/review basis, but did include direct participation in procedures manual development in new program areas in 1982.

This budget proposal includes additional support equipment (both hardware and software) which will allow for a more efficient use of present personnel and will also provide resources to expedite early transmittal of requested provisional data. The major items included in the FY 84 equipment list are three new microcomputers with supporting hardware and software. One of the microcomputers is a new Vector Graphic machine which will provide data processing personnel additional support for data processing activities because present equipment is being used to it's capacity and additional programs are needed. Another of the microcomputers is an IBM PC configured

to allow for efficient interfacing of data processing activities with ADF&G Su Hydro's secretarial and budget staff equipment (i.e. IBM Display Writers) and with the data analysis and interpretation staff equipment. The third microcomputer is also an IBM PC configured to interface with DP's IBM and secretarial staff's equipment, this microcomputer is for use by the data analysis and interpretation personnel for inhouse data analysis.

The FY 84 equipment budget increase of 12.6K is comparable to the increase of 12.8K granted in the FY 83 new equipment budget. The funding levels for personal services, travel, contractual services, and commodities are comparable to the levels requested in FY 1983.

In addition to resources necessary to accomplish the objectives of the data processing support unit, this budget proposal section includes requested resources to support drafting and cartographic services to all field project elements for field data collection (e.g. field data forms) and report production (e.g. maps and figures) support.

II. General 1983 (FY 84) Program Objectives

The objectives of the Data Processing Support Unit of the ADF&G Su Hydro Aquatic Studies Team in FY 84 are:

A. To provide data processing support to the field program and data analysis and interpretation elements. The tasks under this objective are:

1. computerization of all data collected in the field studies. This computerization into retrievable data bases allows for efficient and accurate retrieval of data for analyses and interpretation.

2. production of summary report tables and computer plotted graphics, with simple summary statistics (e.g. mean, median, range, standard errors, etc.); and

3. programming and execution of statistical programs.

B. To provide statistical analyses of scientific and technical data collected by the field program elements (specific details of the analytical procedures to be used will be presented in the appropriate sections of the FY 84 Procedures Manual). The tasks under this objective are:

1. computation of fish population or density estimates from mark/recapture and catch per unit effort data;

2. comparison of biological attributes of fish populations (e.g. length, weight, age, and sex) among sampling areas and sampling periods;

3. testing and analyzing relationships among aquatic habitat parameters as illustrated by field measurements (e.g. intra-

Ogravel water temperature in slough habitats as it relates to mainstem discharge and temperature); and

4. testing and analyzing relationships among aquatic habitat parameters and the associated fish populations occurring in these habitats.

5. evaluation and cross-comparison of data collected in previous year's studies (i.e. 1981 and 1982).

C. To provide advice and direction on experimental sampling design of the field study programs, to ensure that the field studies will yield the type, quality, and quantity of data needed to meet their objectives.

D. To provide biometric evaluation and input into the study team's analysis and interpretation of field data, to ensure that all conclusions are founded upon sound statistical and biological analysis and interpretation of the collected field data.

III. Work Plan

The proposed work plan for meeting the data processing and data base management objective (Objective A, Part II) of the data processing support unit is based upon the procedures developed during FY 1982 and FY 1983. During this time, data collected from the winter of 1980 through the fall of 1982 was cataloged, summarized, and analyzed. The procedures developed during this time are outlined in the following discussion.

A. Data base management consist of a five step process which can be summarized as (refer to the FY 83 Procedures Manual for complete and specific details):

1. Data entry, including coding of data from field data forms and keying to microcomputer storage media;

2. data verification, i.e. checking keyed data for accuracy and validity;

3. error correction;

4. definition and creation of a computer data base management system; and

5. loading of corrected data into a computer data base management system for subsequent retrieval, reformatting, aggregation, and report production.

Step 2 and 3 above are generally implemented in a recursive manner until all mistakes are detected and corrected. Further "error" detection often occurs during step 5. Such errors are often not caught until step 5 due to the reformatting and aggregation of data which allows for a more detailed and straight-forward review. Errors detected during step 5 are corrected within the framework of the data base management system.

Entry of data into the computer will be accomplished primarily through direct keying of field data from field data forms into microcomputer memory and

permanent storage devices (i.e. magnetic discs). Direct keying of data is facilitated by an interactive data entry program called DATASTAR. Data entry via the software package DATASTAR is in the same format as that upon which the data is recorded on field forms. Design of computer based forms for use in DATASTAR is via the companion software package called FORMGEN.

B. Exceptions to data entry via direct keying include:

1. data transferred directly into computer memory from automatic recording devices (i.e. Datapod recording devices);

2. data transferred indirectly via digitizing equipment (i.e. Numonics Digitablet). For example temperature traces recordec on thermograph strip charts; and

3. wordy comments and notes recorded on field data forms, which have lengths (i.e. number of characters) which can not be anticipated or controlled. Notes or comments of this type will be coded onto key-punch coding forms and keyed onto computer punch cards. These notes and comments are utilized during subsequent verification steps. For example missing data explanations in notes or comments allow for evaluation of data gaps (e.g. "D.O. probe malfunctioning - no dissolved oxygen reading taken").

Verification (i.e. error checking) of data entered into the microcomputer system entails checking for accuracy of data entered into the computer in comparison to data recorded on original field data forms. Additionally,

verification includes evaluation of the validity of recorded values (e.g. can the water temperature really be -5.0 degrees?). Correction of keying errors discovered during the verification process is accomplished by rekeying the data which is in error. "Correction" of invalid data often requires consultation with the recording field biologist in order to determine if a correct value can be ascertained from personal field note books or if the invalid value must be "scratched" (i.e. made missing). Responsibility for data entry, validation, correction is primarily with the unit's Data Control Clerk and Fishery Biologist, under the direction of the project Biometrician.

Definition and creation of data base management systems for various kinds of data bases will be facilitated by a data base management package called SIR (Scientific Information Retrieval), available on the Boeing Computer Services EKS1 operating system. SIR is heirarchical database management system with an extensive report writing procedure and will provide data processing with the capability of extensive management tools such as sorting, conditional retrieval, simple statistics and interfacing with more advanced computerized statistical packages (i.e. SPSS and BMDP).

Loading of corrected data into the data base management system can occur directly in the case of data which has been coded and keyed via keypunch coding forms. However, data entered via DATASTAR or directly transferred (e.g. Datapod data) often must be reformatted to conform to data entry and communications requirements of Boeing Computer Services and SIR. This reformatting is accomplished through computer programming and execution of the developed programs on the data processing unit's microcomputer system.

Responsibility for data base management system definition and creation, data reformatting, and system maintenance is a joint effort of the unit's two Analyst/Programmers, the Biometrician, and the Fishery Biologist.

Production of computer reports, computer plotted graphics and execution of statistical analyses involves the use of SIR's reporting facilities and interfacing capabilities or programming and execution of customized computer programs. Responsibility for design and implementation of these procedures lies with the Biometrician and the two Analyst/Programmers.

Responsibility for accomplishment of objectives B through D lies primarily with the unit's Biometrician. Successful completion of these objectives requires a close working relationship with the field biologist responsible for data gathering procedures and data analyses.

Statistical analyses procedures are generally chosen apriori to actual field data collection, during the process of sampling design. However, following collection of data the validity of the procedure chosen must be evaluated in that the procedure's basic underlying assumptions must be adhered to in order for the procedure to be appropriate.

A detailed presentation of procedures for data analysis, evaluation, and presentation will be included in each technical section of the FY 84 Procedures Manual. Proposed statistical procedures (including hypotheses and methods of testing the hypotheses) along with the rationale for choice of each procedure will be included.

ATTACHMENT C-1

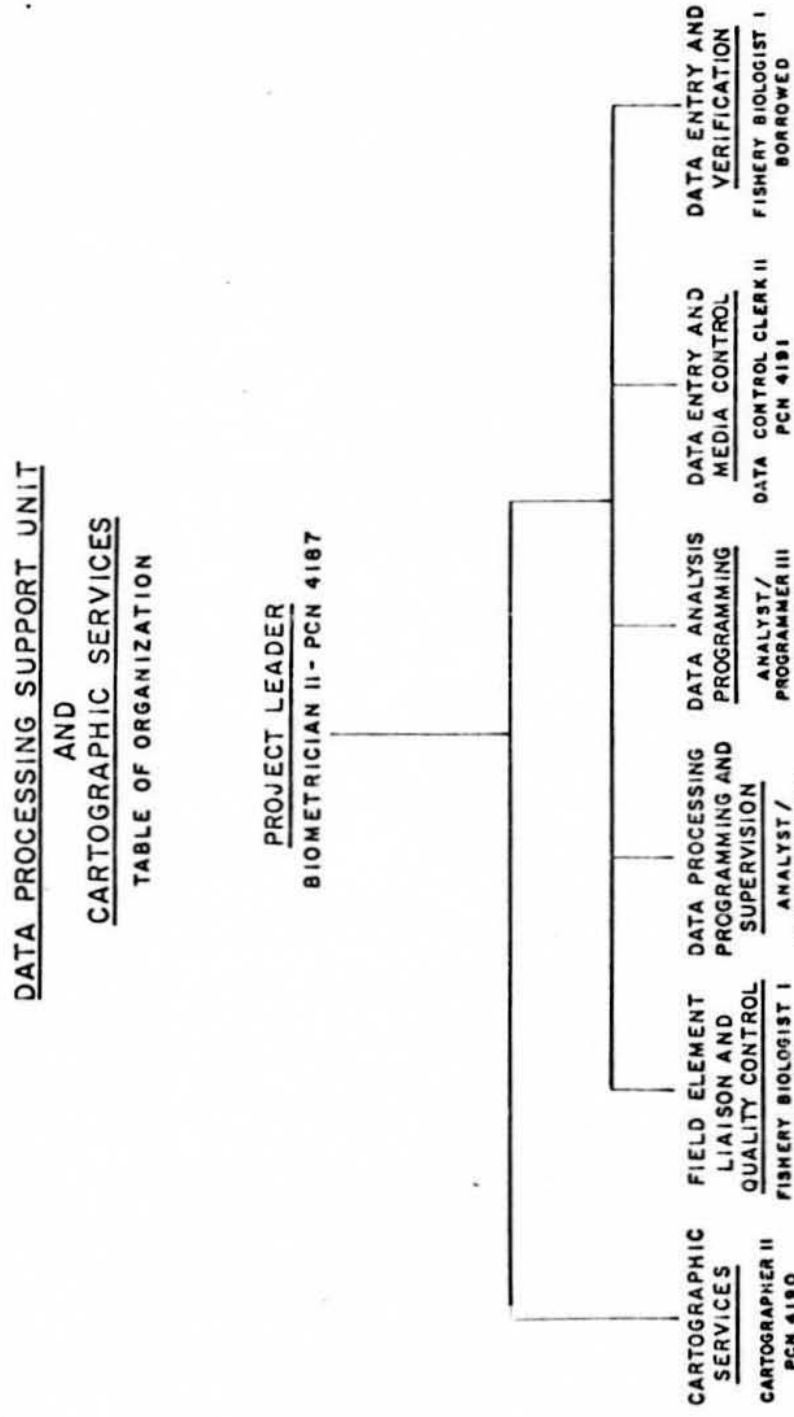
DATA PROCESSING UNIT

Line 100 - Personal Services

PCN	CLASS	GRADE	MM	COST
4193	AP III	17	12	44.2
4229	AP III	17	12	42.7
1381	FB I	14	12	39.0
4191	DCC II	11	12	31.3
4190	C II	15	12	37.5
Borrowed	FB I's	14	6	19.5
			Subtotal	214.2

Line 200 - Travel and Per Diem		1.7
Line 300 - Contractual Services		136.5
Line 400 - Commodities		12.4
	Grand Total	364.8

ATTACHMENT C-2
DATA PROCESSING SUPPORT UNIT



ATTACHMENT D - RESIDENT AND JUVENILE ANADROMOUS FISHERIES PROJECT

I. Background

The Resident and Juvenile Anadromous Fish Studies are directed toward accomplishing the general objectives described in 1979 by the Department of Fish and Game for the Susitna Hydroelectric project. These objectives are stated below:

A. Define seasonal distribution and relative abundance of resident and juvenile anadromous fish in the Susitna River between Cook Inlet and Devil Canyon.

B. Characterize the seasonal habitat requirements of selected anadromous and resident species within the study area.

The Resident and Juvenile Anadromous Fisheries Studies began in November of 1980 and have continued to the present. From the onset of these studies, general surveys of the Susitna River mainstem and associated habitats, and the portions of the basin to be inundated by the proposed impoundments, have been conducted. During the winter of 1981. and the spring and summer of 1982 the studies have been concentrated more intensively on those areas that may be most severely affected by the development of the Susitna project. Investigations also examined mainstem habitats for adult resident species that were not previously covered during the 1980-81 general surveys.

The primary purpose of these investigations was to address objective (A). During the 1982 summer investigations, the studies concentrated on developing more information on objective (B) by gathering data on habitat relationships of rearing resident and juvenile anadromous species that may be affected by the Susitna project.

The amended studies proposed for the 1983-84 season address areas where data have not previously been collected and provides more directed and focused effort on habitat and rearing relationships of the juvenile anadromous species and selected resident species.

II. General FY 84 Program Objectives

A. Provide a third year of baseline information on the distribution and abundance of resident and juvenile anadromous fish for the species and populations that are likely to be affected by the development of the Susitna Hydroelectric Project.

1. Rationale - Populations of juvenile anadromous and certain resident fish species vary considerable from year to year because of variation in survival of juveniles and numbers of adult spawners. Multiple year data are necessary to provide a quantitative estimate of the value of the resources that may be affected by the development of the hydroelectric project.

B. Establish the freshwater survival of the 1982 brood year of chum and sockeye salmon populations for the portion of their life cycle confined to the Susitna River above the Chulitna River confluence.

1. Rationale - Although the monitoring of escapement of adult chum and sockeye salmon provide a relative indication of the productive capabilities of the habitat in the Susitna River above the Chulitna River confluence, the true productive capabilities are best described in terms of survival. By determining the fecundity of adult salmon and quantifying numbers of juvenile salmon outmigrants, the survival of the species within this reach of the Susitna River which will be affected by the development of the Susitna Hydro project, can be estimated. This will be completed on individual sloughs and a total estimate for the Susitna River above the Chulitna River confluence. By comparing discharge and temperature conditions of the slough throughout the spawning, incubation, and emergence period, the effects of these variables on survival for species spawning at the sloughs can be estimated. This type of analysis will provide a quantitative check on the predictions made for various sub-component instream flow evaluations conducted at some of these sites during the previous year. The data will also provide a quantification of the required level of mitigation needed for impacts that may occur. The following objective addresses these types of studies. In addition, these data will provide information that can be used to evaluate the effect of various escapement

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levels on the total production, and will allow a better interpretation of the adult chum and sockeye salmon escapement data.

C. Determine the relationship of the survival of selected resident and juvenile anadromous fish species viability and subsequent survival to a variety of environmental factors that may be affected by the development of the Susitna Hydroelectric project.

1. Rationale - The above objective, which is general and not a specific study design, is the basis for incrementally evaluating the impacts of various project discharge, temperatures, and turbidity levels. Combined with objective (B), it will provide the data base and initial analysis necessary to continue the incremental analysis of "instream flow" requirements for juvenile anadromous species and selected resident species, for the incubation, emergence, rearing, and outmigration phases of their life cycle. These data and associated analysis will provide the basis for evaluation of impacts of the project under any mode of operation and will suggest discharges, temperatures, and turbidity levels that may provide improved conditions for the species being evaluated.

III. Work Plan

As many of the objectived closely coincide with the objectives of the Instream Flow and Aquatic Habitat Studies (AH) group, all of the work will

be closely coordinated, using common resources to meet common objective. However, only the Access/Transmission Corridor Study will be comprised of personnel (1 RJ biologist and 1 AH biologist) from both groups.

Data collected by the Resident and Juvenile Anadromous Studies (RJ) group will include: density estimates of juvenile anadromous species, cover and juvenile density correlation, cover-discharge relationships at representative study sites, turbidity-density correlation, substrate-juvenile density correlations, velocity-depth juvenile density correlations, and others as appropriate. AH will collect data on depth, mean column water velocity, substrate, temperature, and other aquatic habitat parameters.

The utilization of habitats by adult resident species and spawning habitat location, will be used to develop specific habitat distribution data that can then be analyzed in conjunction with the AH development of habitat availability.

The field work program is designed to provide logistics to ensure all needed data are collected. Details of experimental field design, collection methods, and data analysis will be outlined in the procedures manual. Study sites, sampling schedules, gear types, and man power needed to complete each segment of the RJ FY 84 objectives are presented as supplemental information.

A. Studies of the Resident and Juvenile fish of the Susitna River below Devil Canyon.

1. Resident Fish Studies

a. Habitat and population data

(1) Objective

Quantify the important habitat parameters associated with spawning and rearing (growth) of resident fish species such as rainbow trout and burbot and measure fish density in these habitats to provide an estimate of habitat quality.

(2) Rationale

The regulation of discharge by the proposed hydroelectric project will create conditions in the mainstem Susitna River that are different from the current conditions. The resident species, particularly rainbow trout and burbot, are currently harvested by sport fishermen in the Susitna River between the Chulitna River confluence and Devil Canyon. Burbot are widely distributed and relatively abundant in the mainstem. Rainbow trout are heavily fished at tributary mouths. These resident species are of primary concern because of the importance of rainbow trout to the sport fishery and because of the confinement of burbot to the mainstem Susitna. Catch data indicates that burbot largely avoid clear water

areas during the open water season. An evaluation of the suitability of the mainstem Susitna River for burbot under post project conditions can be made by comparing post project turbidity data and hydraulic conditions with the data on the habitat conditions used by the species under preproject conditions.

The resident fish studies will address the following questions regarding the habitat factors that influence the relative abundance and distribution of resident fish.

i. How will rainbow populations respond to decreased turbidity and altered post project mainstem discharges?

ii. What is the current population level of burbot in the mainstem Susitna and what will their response be to altered turbidity and discharge under post project conditions?

The data collection efforts described and outlined in detail in the procedures manual will address these major questions and provide quantitative data on populations and habitat for these species.

(3) Procedure

The proposed study will measure the density of selected resident fish by mark and recapture methods and will quantify the apparent influence of stream flow, turbidity, and temperature on these populations. In addition, radio-tagged fish will be used to determine summer migratory movements and rearing areas, and will be used to collect habitat data at relocation sited. The field study design will include tracking radio-tagged fish to determine their distribution during the spring and summer months. Radio telemetry will provide a means of locating resident fish spawning areas for the collection of habitat data. The data from the radio tagged fish will also indicate when these fish inhabit areas of the Susitna River that may be subjected to altered habitat conditions produced by dam related changes in discharge or turbidity. Tracking will continue through the fall and into the winter months to provide more information on overwintering areas.

Selected mainstem, slough, tributary mouth, and tributary sites will be studied to identify spawning and rearing habitats of resident fish. These sites will be selected based on the previous years distribution and radio telemetry data collected concurrently with this project.

Over specific reaches of the Susitna River and its upper tributaries, mark recapture studies will provide density information. Utilization data will be obtained on two levels. One level will be general river morphological data and water quality (water temperature, gradient, discharge, turbidity). Information on micro-habitats will be measured also at specific collection sites (depth, velocity, substrate, temperature, and turbidity).

Analysis of the data will be examined at two levels of resolution, that is, variability within study reaches and variability among study reaches. The inclusion of clear water tributaries in the analysis will provide a broader range of habitat conditions in the analysis and improve the ability to correlate the distribution of the species in question with the habitat variables. For example, the data base developed for rainbow trout may suggest that post project conditions may improve in the Susitna mainstem because of decreased turbidity and regulated flows.

The resident fish density data will also serve as index to judge post project effects on the resident species. Such baseline data has been valuable in evaluating the post project response of the fisheries to project induced changes at other hydro projects in the Pacific Northwest.

Statistical methods used in the analysis of the data will be defined in the procedures manual.

2. Juvenile Anadromous Fish Studies

a. Abundance, timing, and survival.

(1) Objective

Estimate the total number of outmigrants and the survival of sockeye and chum salmon juveniles. Provide an estimate of the relative abundance of pink, chinook, and coho salmon juveniles outmigrating from the Susitna River above the Chulitna River confluence.

(2) Rationale

The relative abundance of all species of Pacific salmon juveniles has been determined by the operation of a downstream migrant trap on the Susitna River during the 1982 open water season. Because of the June 18 start up date, not enough information was obtained on pink and chum salmon juveniles and on the early outmigration rates of the other juvenile salmon species. To determine the importance of selected environmental factors to the outmigration of juvenile salmon, further data are necessary on the timing and rates of outmigration.

A pilot program has been initiated during the spring of 1983 to determine the feasibility of obtaining population estimates for sockeye and chum salmon from six selected slough by mark and recapture techniques. In addition, the entire production of the drainage will be estimated by the recovery of marked fish at two downstream migrant traps. By developing fecundity data for spawning sockeye and chum salmon, juvenile survival can be estimated for the freshwater life phase of these species in the Susitna River above the Chulitna River confluence. These data can then be used to correlate the survival versus habitat conditions experienced at the individual sloughs which have been monitored over the past season. The data will then provide an indication of the contribution that these sloughs make to the overall production of the chum and sockeye salmon juveniles in the reach of river.

The low flow year experienced during 1982 also provides a unique opportunity to assess the effect of low flow conditions on the overall survival of juvenile salmon in the Susitna River drainage above the Chulitna confluence. As a bonus the coded wire tag will provide the opportunity to monitor the survival of chum and sockeye salmon after they migrate below the Chulitna confluence. The returning adults may be recaptured in four or five years and can be identified to their natal area. The freshwater growth information on tag returns will define

the effects of chum overall survival and the survival rate of 0+ sockeye which migrate and apparently rear in the lower river or estuary.

This will add to an understanding of the importance of the Susitna River from the Chulitna River confluence to Devil Canyon on sockeye salmon. Available data suggests that limited sockeye rearing occurs in this reach. Although not an integral part of the study, the option will remain open for further tag recovery work to provide definitive evidence concerning the contribution that sloughs provide to the overall production of salmon in the system. Depending upon the results of the 1983 program, the option is available to continue the study during the 1984 spring period to provide a comparison of survival under probable differences in habitat conditions and escapement.

(3) Procedures

Specially coded wire tags and clipped adipose fins will be used to mark chum and sockeye salmon juveniles from six sloughs in the Susitna River from the Chulitna River confluence to Devil Canyon. Recoveries will be made in the same sloughs with beach seines or by electrofishing equipment and the mark-recapture information recorded. Two downstream migrant traps will be installed at River Mile 103. Captured downstream migrants will be examined

for tags and their length and species recorded. Scale samples will also be taken to determine their age. Relative abundance of outmigrants will be determined from catch per unit effort data for coho, chinook, pink salmon and incidental resident species collected. Total population estimates will be obtained from mark/recovery ratio calculations for both the slough and the outmigrant trap recoveries. Levels of needed effort of tagging and recapture have been approximated using error limits of 25 percent for the Petersen population estimate. The statistics to be used in the analysis of the mark-recapture data are defined in Ricker, 1975 1/. The Shaeffer and the general Petersen index will each be examined for suitability with the data base. Estimates of the population for these calculations have been made from adult salmon escapement data, literature fecundity and survival estimates, field observation of fry concentrations in sloughs, and the past years efficiency of the downstream migrant trap for recovery.

1/ Ricker, W.E. 1975. Computation and interpretation of biological statistics of fish populations. Fisheries Research Board of Canada. Bulletin 191. Ottawa, Canada pp 78, 102-103.

Staff gage readings, turbidity, and point velocity measurements will be collected daily at the downstream migrant trap. Other mainstem habitat data will be obtained from the AH data. Specific statistical procedures for analysis of abundance, timing, and survival data for juvenile salmon will be outlined in the procedures manual.

b. Emergence and development studies

(1) Objective

Determine emergence timing and rates of embryonic development under natural variable conditions that occur in mainstem, slough, and tributary sites in the Susitna River above the Chulitna River confluence for pink, coho, and chinook salmon. Complete the monitoring activities on chum and sockeye salmon development rates initiated during the winter of 1982-1983.

(2) Rationale

To determine if the post-project conditions will be sufficiently altered to support mainstem spawning chinook, pink, and coho salmon, data on habitat conditions currently experienced by these species in side sloughs and tributaries are needed. Limited use of the

mainstem by all of these species suggest that conditions in the tributaries more closely reflect the conditions necessary for successful reproduction of these species. The hypothesis to be tested is whether or not the mainstem and slough substrate and/or temperatures limit the reproduction of these species at these sites. The results of the study will suggest post-project mainstem conditions have the potential to provide alternative spawning habitat. The data analysis will be limited to testing the above hypothesis and correlating the development rates and observed mortality to habitat conditions such as temperature and substrate.

As assessment of late fall floods will also be evaluated to determine their effect on egg survival. Data collected during the 1982-83 winter on pre-emergent sockeye and chum have provided useful information on factors (such as intergravel temperatures) which may have major influences on survival within a slough environment. Because of the significance of these findings on possible winter post-project operations, a further refinement of the data for sockeye and chum in the slough environment is warranted.

(3) Procedures

Development rates and emergence of incubating chum and sockeye salmon eggs will continue to be collected at

selected tributary and slough sites. (Collection of data on the developmental rates of the other salmon species will also be conducted during the spawning season.) Spawning locations observed by the Adult Anadromous Project (Attachment F) will be used to determine future sampling sites. Temperature data will be collected using intragravel thermal probes and substrate measurements will be made at each site. Observed mortalities will be recorded at each site. Samples will be collected using shovels and a special water pump referred to as an egg pump. Ice augers and chain saws will be used to remove ice cover at these sites as required. Samples collected will be minima' in size to ensure minimal effects of the sampling effort on the overall reproduction of the species at these sites.

Levels of egg and/or fry development will be determined using published standard criteria and the data will be analyzed by comparison of accumulated thermal units with appropriate correction factors developed by statistical methods. Continuous records of intragravel temperatures will be recorded by the AH program and will be used in the data analysis. Comparisons of tributary, slough, and mainstem conditions with regard to substrate and temperature will be made. Further comparisons of post-project effects will be made by other contractors external to ADF&G who are responsible for impact

analysis. The development data obtained from the laboratory study conducted by the USFWS will also be used for comparing the rates of development experienced in the field with those under controlled conditions.

c. Rearing habitat studies

(1) Objective

Determine the relationship of juvenile salmon distribution, hydraulic parameters, temperature, turbidity, and cover at selected study sites that will provide a representative sample of mainstem, slough and clearwater tributary rearing habitat in the study area.

(2) Rationale

Because post-project turbidity, temperature, and discharge will be substantially different from pre-project conditions, it is necessary to determine the key factors of the environment which effect the ability of juvenile salmon to successfully rear in the Susitna River drainage. The various parameters that affect successful rearing are hypothesized as being difference for each the five salmon species that occur in this reach of river. Important factors hypothesized for the juvenile chum salmon include water velocity, available

cover, and access to rearing areas. Similar factors plus the development of plankton populations and stability of water velocities influence sockeye juvenile. Pink salmon juveniles require adequate water for passage out of the natal area. Coho and chinook rearing requirement seem to differ by age class. Basically, adequate cover and food are considered to be main factors for these species, with passage for ingress into sloughs and other backwater rearing areas also being important.

Specific study field designs will be implemented that provide a means to test the above hypothesis which will determine important factors influencing the distribution of juvenile salmon. If a factor or combination of factors is found to be important in determining the distribution of the fish species present, an evaluation of the response of the factor to mainstem discharge of temperature changes will be undertaken.

(3) Procedures

The effects of incremental changes in discharges of the mainstem Susitna on the available rearing habitat will be evaluated whenever it can be established quantitatively that a preference for a particular set of discharge dependent habitat conditions exists for the species in

question. Mainstem side channel sites that are being examined in conjunction with the aquatic habitat and instream flow group will be evaluated using the habitat at various mainstem discharges. The rearing data collection efforts will be concentrated at sites where quantitative hydraulic data is being collected by the AH group. Because juvenile salmon rearing habitats in the Susitna River drainage are more dispersed than spawning habitats for adult salmon, a large number of sites and a large range of conditions must be sampled.

Details of the study design and methods used in this study will be presented in the procedures manual.

B. Quality Assurance and Support Section

(1) Objective

Assist the RJ project leader and the other RJ sub-project elements in support operations such as: (a) coordinating the collection, reduction, transfer, and analysis of data; (b) report preparation, editing, and collating; (c) prepare annual budget documents; (d) serve as a back-up crew in case of emergency or as otherwise called upon, by other sub-project elements; and (e) conduct day to day operations during the project leaders absence.

(2) Rationale

Because of the large and varied support requirements of the RJ project, a coordinating sub-project section is required to ensure consistency in the handling of the various elements listed above.

(3) Procedure

One crew of two biologists will coordinate the above activities and will be assisted by a third biologist. This crew will be located in Anchorage. Methods employed by this group are discussed further in the FY83 Procedures Manual.

ATTACHMENT D - 1

RESIDENT AND JUVENILE ANADROMOUS FISHERIES PROJECT

Line 100 - Personal Services

PCN	Class	Grade	MM	Cost
4204	FB II	16	12	46.0
4201	FB II	16	12	45.9
4200	FB II	16	12	45.9
4205	FB II	16	3	11.3
4206	FB II	16	12	44.6
4198	FB II	16	12	44.7
4197	FB I/II	16	12	43.0
4202	FB I	14	12	41.7
4199	FB I	14	12	40.3
4212	FB I	14	9	29.2
4215	FB I	14	7.5	24.4
1769	FB I	14	7.5	24.4
		Subtotal		441.4

Line 200 - Travel and Per Diem	8.1
Line 300 - Contractual Services	69.8
Line 400 - Commodities	70.6
Grand Total	589.9

ATTACHMENT E - AQUATIC HABITAT AND INSTREAM FLOW

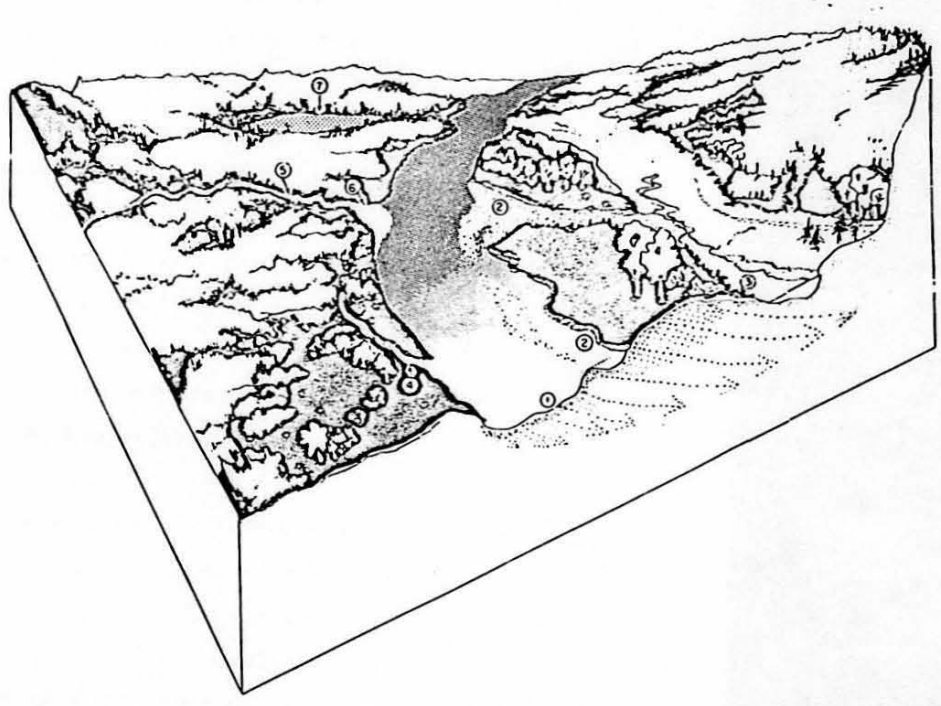
I. Background

The objectives of the revised studies proposed for FY84 (1983-84) are based on comments received from Harza-Ebasco Susitna Joint Venture. The original proposal submitted in early March was based on a review and comparison of the information collected during the FY82 and FY83 field seasons, FERC and agency draft Exhibit E comments submitted to the APA, and comments from Harza-Ebasco Susitna Joint Venture and other agencies.

The FY84 program is specifically designed to evaluate the seven habitat types associated with the Susitna River (Figure E-1) rather than placing an emphasis solely on side sloughs as was done during FY82 and FY83. Attention is given to defining the relationship between various levels of mainstem discharge and the habitat potential of mainstem, side channel, slough, tributary mouth and tributary habitats, with particular attention given towards identifying the influences of mainstem discharge less than 8,000 cfs and greater than 32,000 cfs.

Aquatic Habitat and Instream Flow (AH) studies were initiated in FY82 (1981-82) to characterize the seasonal habitat requirements of selected anadromous and resident fish species present in the various aquatic habitats of the Susitna River basin. Objectives during FY82 included:

Figure E-1



GENERAL HABITAT CATEGORIES OF THE SUSITNA RIVER

1) Mainstem Habitat consists of those portions of the Susitna River that normally convey streamflow throughout the year. Both single and multiple channel reaches are included in this habitat category. Groundwater and tributary inflow appear to be inconsequential contributors to the overall characteristics of mainstem habitat. Mainstem habitat is typically characterized by high water velocities and well armored streambeds. Substrates generally consist of boulder and cobble size materials with interstitial spaces filled with a grout-like mixture of small gravels and glacial sands. Suspended sediment concentrations and turbidity are high during summer due to the influence of glacial melt-water. Streamflows recede in early fall and the mainstem clears appreciably in October. As ice cover forms on the river in late November or December.

2) Side Channel Habitat consists of those portions of the Susitna River that normally convey streamflow during the open water season but become appreciabl, dewatered during periods of low flow. Side channel habitat may exist either in well defined overflow channels, or in poorly defined water courses flowing through partially submerged gravel bars and islands along the margins of the mainstem river. Side channel streambed elevations are typically lower than the mean monthly water surface elevations of the mainstem Susitna River observed during June, July and August. Side channel habitats are characterized by shallower depths, lower velocities and smaller streambed materials than the adjacent habitat of the mainstem river.

3) Side Slough Habitat is located in spring fed overflow channels between the edge of the floodplain and the mainstem and side channels of the Susitna River and is usually separated from the mainstem and side channels by well vegetated bars. An exposed alluvial berm often separates the head of the slough from mainstem or side channel flows. The controlling streambed/streambank elevations at the upstream end of the side sloughs are slightly less than the water surface elevations of the mean monthly flows of the mainstem Susitna River observed for June, July, and August. At intermediate and low-flow periods, the side sloughs convey clear water from small tributaries and/or upwelling groundwater (ADF&G 1981c, 1982b). These clear water inflows are essential contributors to the existence of this habitat type. The water surface elevation of the Susitna River generally causes a backwater to extend well up into the slough from its lower end (ADF&G 1981c, 1982b). Even though this substantial backwater exists, the sloughs function hydraulically very much like small stream systems and several hundred feet of the slough channel often conveys water independent of mainstem backwater effects. At high flows the water surface elevation of the mainstem river is sufficient to overtop the upper end of the slough (ADF&G 1981c, 1982b). Surface water temperatures in the side sloughs during summer months are principally a function of air temperature, solar radiation, and the temperature of the local runoff.

4) Upland Slough Habitat differs from the side slough habitat in that the upstream end of the slough is not interconnected with the surface waters of the mainstem Susitna River or its side channels. These sloughs are characterized by the presence of beaver dams and an accumulation of silt covering the substrate resulting from the absence of mainstem scouring flows.

5) Tributary Habitat consists of the full complement of hydraulic and morphologic conditions that occur in the tributaries. Their seasonal streamflow, sediment, and thermal regimes effect the integration of the hydrology, geology, and climate of the tributary drainage. The physical attributes of tributary habitat are not dependent on mainstem conditions.

6) Tributary Mouth Habitat extends from the uppermost point in the tributary influenced by mainstem Susitna River or slough backwater effects to the downstream extent of the tributary plume which extends into the mainstem Susitna River or slough (ADF&G 1981c, 1982b).

Lake habitat consists of various lentic environments that occur within the Susitna River drainage. These habitats range from small, shallow, isolated lakes perched on the tundra to larger, deeper lakes which connect to the mainstem Susitna River through well defined tributary systems. The lakes receive their water from springs, surface runoff and/or tributaries.

Figure E-1. General habitat catagories of the Susitna River-a conceptual diagram

(adapted from AEIDC 1982; Trihey 1982)

A. identifying the ranges of selected habitat characteristics utilized by fish in the study area;

B. identifying the seasonal relationships between mainstem discharge and the physical and chemical characteristics of selected fish habitats; and,

C. identifying the seasonal relationships between mainstem discharge and general fish distribution and abundance.

Studies downstream of Devil Canyon were primarily focused on the reach of river between Talkeetna and Devil Canyon with emphasis placed on selected slough habitats. Results of the FY82 investigations indicated that mainstem discharge influenced both the immigration of adult salmon to sloughs and the overall availability of spawning habitat within sloughs. Insufficient data however, were collected to quantify these findings. Results and findings of these and other studies are summarized in the ADF&G Phase I Aquatic Studies Program Report.

Impoundment area studies were also initiated in FY82 to identify baseline physical and chemical characteristics of fish habitats which would be inundated by the reservoirs, with the objective of quantifying the amount of resident fish habitat to be lost. Baseline information on resident fish habitat in major tributaries located within the boundaries of the proposed impoundments was collected and analyzed. A summary of the results is presented in the ADF&G Phase I Aquatic Studies Program Report.

During FY83 (1982-83), Aquatic Habitat and Instream Flow investigations downstream of Devil Canyon were primarily focused on a further evaluation and quantification of the influences that mainstem discharge has on the accessibility, availability and utilization of fish habitats within sloughs. A better understanding of the relationships between mainstem discharge and the hydraulic characteristics of side sloughs was obtained for mainstem flows ranging from 8,000 to 32,000 cfs (as recorded at the U.S. Geological Survey gaging station at Gold Creek). This information was used to evaluate and quantify the relationship between these mainstem discharges and the accessibility, availability and utilization of slough habitats for salmon spawning. A study was also initiated in selected side sloughs in the latter part of 1982 to investigate the incubation phase of salmon. These studies are currently in progress.

FY83 studies were also initiated in the mainstem river between Cook Inlet and Devil Canyon to evaluate eulachon, Bering cisco and salmon spawning habitat. The former two species were observed to use the mainstem as their primary spawning habitat whereas salmon were only found to spawn in the mainstem at isolated locations.

Baseline water quality, surface and intragravel water temperature and stage/discharge data were also obtained at selected mainstem, side channel, slough and tributary sites from Cook Inlet to Devil Canyon. The range of mainstem discharge values experienced during the FY83 field season were reduced when compared to historical 30-year mainstem discharge. Therefore, the full range of mainstem flows normally expected during an open water season were not evaluated. It was found however, that for the range of

mainstem flows from 8,000 to 30,000 cfs, the relationship between water surface elevation and mainstem discharge is relatively well defined at various mainstem locations between Talkeetna and Devil Canyon.

A baseline study of the stage/discharge characteristics at two side channel sites downstream of Talkeetna was also initiated to identify the degree of influence that variations in mainstem discharge have on access to known spawning areas in the Cook Inlet to Talkeetna river reach. Data from this study is currently in the process of being analyzed. Complete findings of the FY83 Lower River Studies are summarized in Volume 4 of the Phase II Basic Data Report.

Impoundment studies were expanded during FY83 to include habitat evaluations in a one mile reach upstream of the proposed impoundment boundaries in the seven study tributaries, a general habitat evaluation of Sally Lake and a preliminary evaluation of salmon habitat in two tributaries (Chinook and Cheechako creeks). A study of grayling spawning habitat was also initiated. Due to insufficient information on the timing and locations of grayling spawning activities in impoundment tributaries this study was limited by our ability to coordinate sampling with spawning events. Complete findings of the FY83 Impoundment Studies are summarized in Volume 5 of the Phase II Basic Data Report.

II. FY84 Program Objectives and Work Plan

A work plan has been developed which partitions FY84 objectives into two sub-program elements: Fish Habitat Studies (FHS), and Instream Flow

Evaluations (IFE). A third sub-program element, Quality Assurance and Laboratory Operations (QUALO), supports the overall AH and RJ habitat data collection programs.

Specific data collection methods and sampling designs used in the collection of the basic data to meet FY84 objectives are outlined in the FY82 and FY83 procedures manuals. Any specific data collection methods and sampling designs not outlined in these documents will be presented in the FY84 procedures manual and are briefly described in this proposal.

As many of the objectives closely coincide with the objectives of the Adult Anadromous and Resident and Juvenile Anadromous Fish Investigations, all of the work will be closely coordinated using common resources to meet common objectives. The analysis of data that will address the objectives will also require data collected by other projects within the study team. The field work program is designed to include proper logistics to insure all needed data is collected.

A. Fish Habitat Studies - Slough, Side Channel, Tributary Mouth, Tributary, and Mainstem Habitat Studies

1. Slough Habitat Studies

a. Objective

Evaluate, and if possible, quantify the relationship between mainstem discharge and the availability and

utilization of slough habitats for passage, spawning, incubation, and rearing (see RJ plan of study) of anadromous and resident fish.

b. Rationale

Based on data obtained during FY82 and FY83 studies, the discharge in the mainstem appears to influence the availability and utilization of slough habitats for passage, spawning, incubation, and rearing of anadromous and resident fish. The operation of the proposed hydroelectric project will likely alter the flow characteristics of the mainstem from those which are naturally occurring. For these reasons, it is necessary to evaluate, and if possible quantify, the effects of mainstem discharge on these aspects of the fishery resource. Information from these studies will be needed for impact and mitigation assessments.

c. Procedures

One three person crew will complete a study begun in FY83 to evaluate, and if possible, quantify the relationship between mainstem discharge and the availability and utilization of slough habitats for passage, spawning, incubation, and rearing of anadromous and resident fish. Progress towards meeting

this objective during FY83 was limited due to the low flow conditions of the mainstem river during the 1982 open water field season. It is hoped that data can be collected during FY84 to better evaluate the relationship between the availability and utilization of slough habitats to mainstem discharge at higher discharges. Specific data collection methods and sampling designs used in the collection of this data are summarized in the FY82 and FY83 Procedures Manuals and Volume 4, Part II of the Phase II Basic Data Report. Computer analysis techniques to be used in the analysis of hydraulic data consisting of Instream Flow Group 4 (IFG-4) type computer modelling is described in the above documents and the Fishery Habitat Relationships Report. Sloughs to be investigated during FY84 will be Sloughs 8A, 9, and 21. Operations will be based at Slough 9 and Gold Creek Camps.

2. Side Channel Habitat Studies

a. Objective

Evaluate, and if possible, quantify the relationship between mainstem discharge and the availability and utilization of side channel habitats for passage, spawning, incubation, and rearing (see RJ plan of study) of anadromous and resident fish.

b. Rationale

Based on data obtained during FY82 and FY83 studies, the discharge in the mainstem appears to influence the availability and utilization of slough habitats for passage, spawning, incubation, and rearing of anadromous and resident fish. The operation of the proposed hydroelectric project will likely alter the flow characteristics of the mainstem from those which are naturally occurring. For these reasons, it is necessary to evaluate, and if possible quantify, the effects of mainstem discharge on these aspects of the fishery resource. Information from these studies will be needed for impact and mitigation assessments.

c. Procedures

One three person crew will initiate a study similar to the slough habitat studies in side channel habitats. Similar methods and data analysis techniques will be employed as were used in the study of sloughs during FY83. Side channels to be investigated will include the side channels below Sloughs 21 and 11. Operations will be based at Slough 9 and Gold Creek camps.

3. Tributary Mouth Habitat Studies

a. Objective

Evaluate, and if possible, quantify the utilization and availability of tributary mouth habitats for salmon spawning, holding, and passage at various combinations of mainstem and tributary discharges.

b. Rationale

Based on limited data obtained during the FY82 and FY83 field seasons, tributary mouth/mainstem confluence zones have been identified as being important spawning or rearing habitats for chum, pink, chinook, and coho salmon and provide rearing habitat for resident fish. Preliminary data suggest that the discharge of the mainstem appears to influence the availability and utilization of tributary mouth habitat for salmon spawning and rearing and resident fish rearing. The operation of the proposed hydroelectric project will likely result in altered flow regimes of the mainstem from those naturally occurring. For this reason, it is important to identify, evaluate, and if possible, quantify the effects of mainstem discharge on these aspects of the fishery resource. Information from these studies will be needed for impact and mitigation assessments.

c. Procedures

A study will be initiated in FY84 to evaluate, and if possible, quantify the utilization and availability of tributary mouth habitats for salmon spawning and at various levels of mainstem and tributary discharge. At each study site, data will be collected for available and utilized habitat conditions over various levels of mainstem and tributary discharge. Data to be collected will include:

(1) available and utilized substrates;

(2) available and utilized water depths and velocities;

(3) available and utilized surface and intragravel water temperatures; and,

(4) locations of wetted perimeters, mixing zones, pools, upwelling areas, and riffles and the distribution of fish in these areas.

These data will then be used to determine habitat conditions which are available and utilized at various levels of mainstem and tributary discharges. Data will be analyzed using techniques similar to those incorporated in the preliminary analysis of slough habitat data during FY83

outlined in the Fisheries Habitat Relationships Report and FY82 and FY83 Procedures Manuals. IFG or HEC-II type of computer modelling analyses will not be attempted with these data.

Tributary mouths to be studied will the mouths of Fourth of July and Lane Creeks and possibly Indian River.

4. Tributary Habitat Studies

a. Objective

Identify and evaluate the ranges of habitat conditions utilized for salmon spawning in selected tributaries.

b. Rationale

To prevent the project from resulting in an overall loss of fish habitat, it must be determined whether alternate habitats will be available to replace those which are lost. Adjustment of flow regulations should therefore be evaluated for providing the opportunity to create replacement habitats in slough, mainstem, and side channel habitats. However, in order to identify the potential of these habitats to replace other habitats lost, it is necessary to first evaluate the ranges of physical and chemical characteristics associated with habitats currently utilized by fish.

This process is currently being, or proposed to be, done in slough, side channel, tributary mouth, tributary, and mainstem habitats.

c. Procedures

A study will be initiated in FY84 to identify and evaluate the ranges of habitat conditions utilized in tributary habitats for salmon spawning. Water depth and velocity, substrate composition, and intragravel and surface water temperature data will be collected at areas utilized for salmon spawning. These data will be analyzed using techniques similar to those incorporated in the preliminary analysis of salmon spawning utilization data for sloughs during FY83. These procedures are outlined in the FY82 and FY83 Procedures Manuals and the Fishery Habitat Relationships Report.

Tributaries to be investigated will be the upper reaches of Portage Creek, Indian River, Fourth of July Creek, and Lane Creek. This study will be conducted by the Assistant Project Leader and the FHS Sub-project Leader with assistance from other personnel as required.

5. Mainstem Habitat Studies

a. Objective

Continue to evaluate mainstem habitats utilized by salmon for spawning and the influences of mainstem discharge on these habitats.

b. Rationale

During FY82 and FY83 studies, small numbers of salmon have been observed to utilize the mainstem for spawning. Limited habitat data have been collected at these mainstem sites. These data are important to gain a basis for determining the habitat conditions that are usable for spawning by salmon in the mainstem. This information can be used to evaluate whether or not existing habitat conditions will be reduced by altered flow regimes resulting from the proposed hydroelectric project or whether altered flow regimes can increase the availability of areas having these habitat conditions.

c. Procedures

Mainstem habitats utilized by salmon for spawning will be investigated using specific data collection methods and sampling designs which are presented in the FY83 Procedures Manual and Volume 4 of the Phase II Basic Data Report. Only sites that are located in

conjunction with other study programs will be investigated. This study will be conducted by the Assistant Project Leader and the FHS Sub-project Leader with assistance from other personnel as required.

B. Instream Flow Evaluations

1. Objective

Continue to identify and evaluate the baseline hydrological (stage/discharge) and water quality (surface and intragravel water temperature, pH, dissolved oxygen, specific conductance and turbidity) characteristics of mainstem, side channel, slough, and tributary habitats and evaluate the influences that mainstem discharge has on these baseline characteristics.

2. Rationale

Baseline hydrological and water quality characteristics of mainstem, side channel, slough and tributary habitats and their relationship to mainstem discharge are required to support the evaluation of fish habitat availability and utilization. This information is also of value for calibrating hydraulic and temperature models used for impact and mitigation analyses.

3. Procedures

Two crews of two biologists will collect hydrological and water quality data at a range of discharge levels using data collection methods and sampling designs used in the collection of similar data during FY83. These methods and techniques are summarized in the FY82 and FY83 Procedures Manuals and Volume 4, Part I of the Phase II Basic Data Report. Selected tributaries, sloughs, side channel and mainstem sites in the Talkeetna to Devil Canyon reach will be studied. Operations will be based at Talkeetna and Gold Creek Camps.

C. Quality Assurance and Laboratory Operations

1. Objective

Assist the other AH sub-project elements in support operations such as assuring quality control, coordinating data reduction, catagorization and data transfer, providing laboratory support, equipment calibration, and repair for AH and RJ habitat instruments.

2. Rationale

Because of the large and varied support requirements of the AH project, a coordinating sub-project element is

required to ensure consistency in data collection, laboratory analyses methods and data reduction, and transfer.

3. Procedure

One crew of two biologists will coordinate the above activities. The crew will be located in Anchorage. Methods employed by this group are defined in the FY82 and FY83 Procedures Manual. This crew also acts as a back-up crew in case of emergency or as otherwise called upon, by the other sub-project elements.

ATTACHMENT E-1

AQUATIC HABITAT AND INSTREAM FLOW

Line 100 - Personal Services

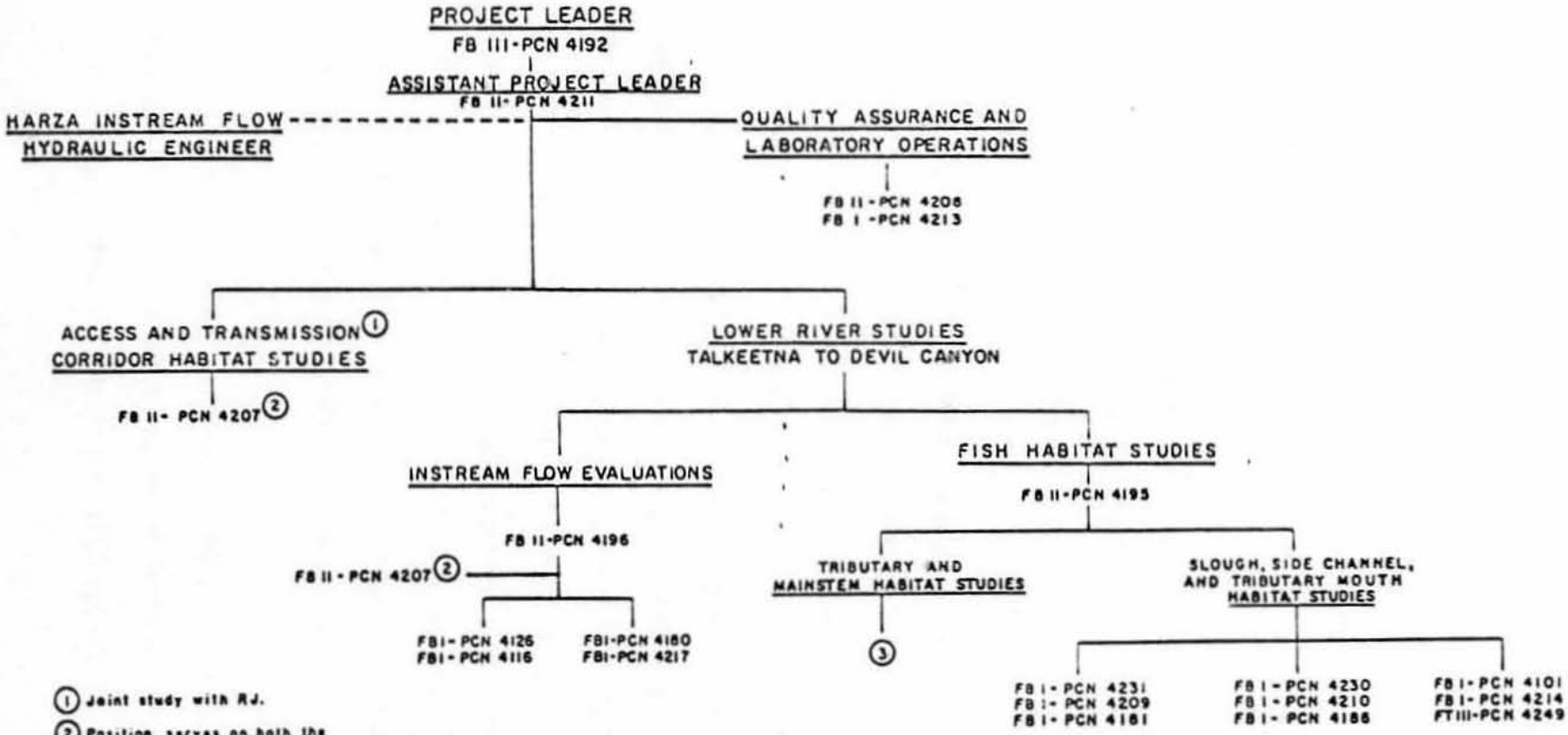
PCN	Class	Grade	MM	Cost
4211	FB II	16	12	46.0
4208	FB II	16	12	44.6
4213	FB I	14	10	32.5
4196	FB II	16	12	47.6
4207*	FB II	16	3	11.5
4126	FB I	14	12	40.3
4217	FB I	14	10	33.6
4180	FB I	14	11	36.9
4116	FB I	14	7	22.8
4195	FB II	16	12	46.0
4231	FB I	14	12	39.0
4209	FB I	14	8	26.9
4186	FB I	14	8	29.7
4101	FB I	14	9	30.2
4210	FB I	14	8	26.9
4230	FB I	14	12	39.0
4214	FB I	14	9	30.2
4181	FB I	14	10	32.5
4249	FT III	11	6	16.8
			Subtotal	633.0

Line 200 - Travel and Per Diem		6.7
Line 300 - Contractual Services		78.0
Line 400 - Commodities		77.2
	Grand Total	794.9

* - See Attachment G for remaining 9 mm.

AQUATIC HABITAT AND INSTREAM FLOW PROJECT

TABLE OF ORGANIZATION
FY 84



(1) Joint study with RJ.

(2) Position serves on both the Access and Transmission Corridor (9mm) and Instream Flow Evaluation Studies (3mm).

(3) Studies to be completed by PCN's 4211 and 4195 with assistance from other personnel as required.

ATTACHMENT F - ANADROMOUS ADULT FISHERIES PROJECT

I. Background

The first year (1981) of Adult Anadromous Investigations were conducted in conjunction with the following general objective:

> Determine timing, distribution and relative abundance of the adult anadromous fish population within the basin that would be affected by Susitna River hydroelectric development.

Operations in 1981 successfully documented sockeye, pink, chum and coho salmon escapement levels, timing and stock characteristics at four main channel locations: (1) Yentna Station (RM 04) on the Yentna River (RM 28); (2) Sunshine Station (RM 80); (3) Talkeetna Station (RM 103) and; (4) Curry Station (RM 120). The 1981 operation at Susitna Station (RM 26) was not successful in establishing total escapement numbers but did provide species timing information and age, length and sex composition data. Additional 1981 investigations established previously unconfirmed spawning by salmon in main channel, slough and tributary stream habitats between Talkeetna and Devil Canyon and milling of salmon in lower Devil Canyon. A quantitative presentation of these and other findings were provided in Phase I, Final Draft Report, Adult Anadromous Project, ADF&G/Su Hydro, 1981.

Studies in 1982 continued at the same level as in 1981, but included investigations of eulachon and Bering cisco species, and assessment of main channel chinook salmon escapement, timing and stock characteristics at and above RM

80. Baseline data on main channel escapement numbers, distribution, timing and stock characteristics were successfully obtained in 1982 at Yentna, Sunshine, Talkeetna and Curry stations. As in 1981, operations at Susitna Station were less successful. Some important 1982 findings were: (a) additional salmon spawning areas identified in main channel Susitna River above RM 103, (b) chinook salmon spawning located in Devil Canyon reach, (c) a first run sockeye salmon population identified upstream of RM 80, (d) a stock separation analysis which indicated that sockeye salmon are either unsuccessfully produced above RM 98.6 or fry spawned above RM 98.6 rear below RM 98.6, and (e) two eulachon runs which spawn in the main channel below RM 48.0. A complete presentation of 1982 adult anadromous findings were provided in Volume 2, First Draft Phase II 1982 Adult Anadromous Fisheries Studies, ADF&G/Su Hydro, 1983.

The FY83 Adult Anadromous program proposed herein was developed after a review of 1981 and 1982 projects results, assessment of agency comments the draft Exhibit E and input of the APA and Harza-Ebasco Susitna Joint Venture. The FY83 program is designed to operate more efficiently, at less operational cost and with a closer focus on the salmon production in the Talkeetna to Upper Devil Canyon reach than in previous years.

II General 1983 (FY84) Program Objectives

A. Provide a third year of salmon escapement evaluation to Susitna River basin to substantiate production and between year variability within sub reaches of the river with principal emphasis on the Talkeetna to upper Devil Canyon reach.

B. Define where salmon spawning occurs upstream of RM 98.6 including slough, stream, and main channel habitats.

C. Define extent and timing of salmon use of lower Devil Canyon.

The rationale behind these objectives are:

The Susitna River supports major commercial and recreational anadromous fish populations and as indicated by the FERC in their List of deficiencies, Draft Susitna Application Exhibit E under 3. FISH AND WILDLIFE AND BOTANTICAL RESOURCES, No. 1, it will be necessary to "describe the existing anadromous and salmonid fishery resources in the Susitna River between the proposed dam sites and Talkeetna (population estimates). Further, quantify the project related reductions in habitat required for successful reproduction and maintenance of these populations and estimates of any population losses projected, and the effectiveness of mitigation measures proposed to offset these losses."

Objective A will form the basis for quantifying escapement into the Susitna River system to monitor and provide information on one complete life cycle of anadromous fish populations. Objectives B and C will provide fundamental information on fish migration, behavior, timing, and spawning to support the definition of post project impacts from flow, water quality changes which are essential to describe required mitigation.

III Work Plan

A. Main Channel Escapement Sampling

1. Objective

Define Susitna River salmon escapement through one contiguous life cycle (5 years) and assess contribution of spawning population upstream of RM 98.6 to total Susitna River production.

2. Rationale

The two previous years (1981 and 1982) of data do not provide a complete assessment of anadromous fish production in the Susitna River drainage. A full life cycle (5 years) should be monitored to accurately define variability in escapements and resource value.

3. Procedure

a. Escapement monitoring

Monitor escapement at four stations (Figure F-1) according to the following schedule for the calendar years of 1983 and 1984.

Figure F-1

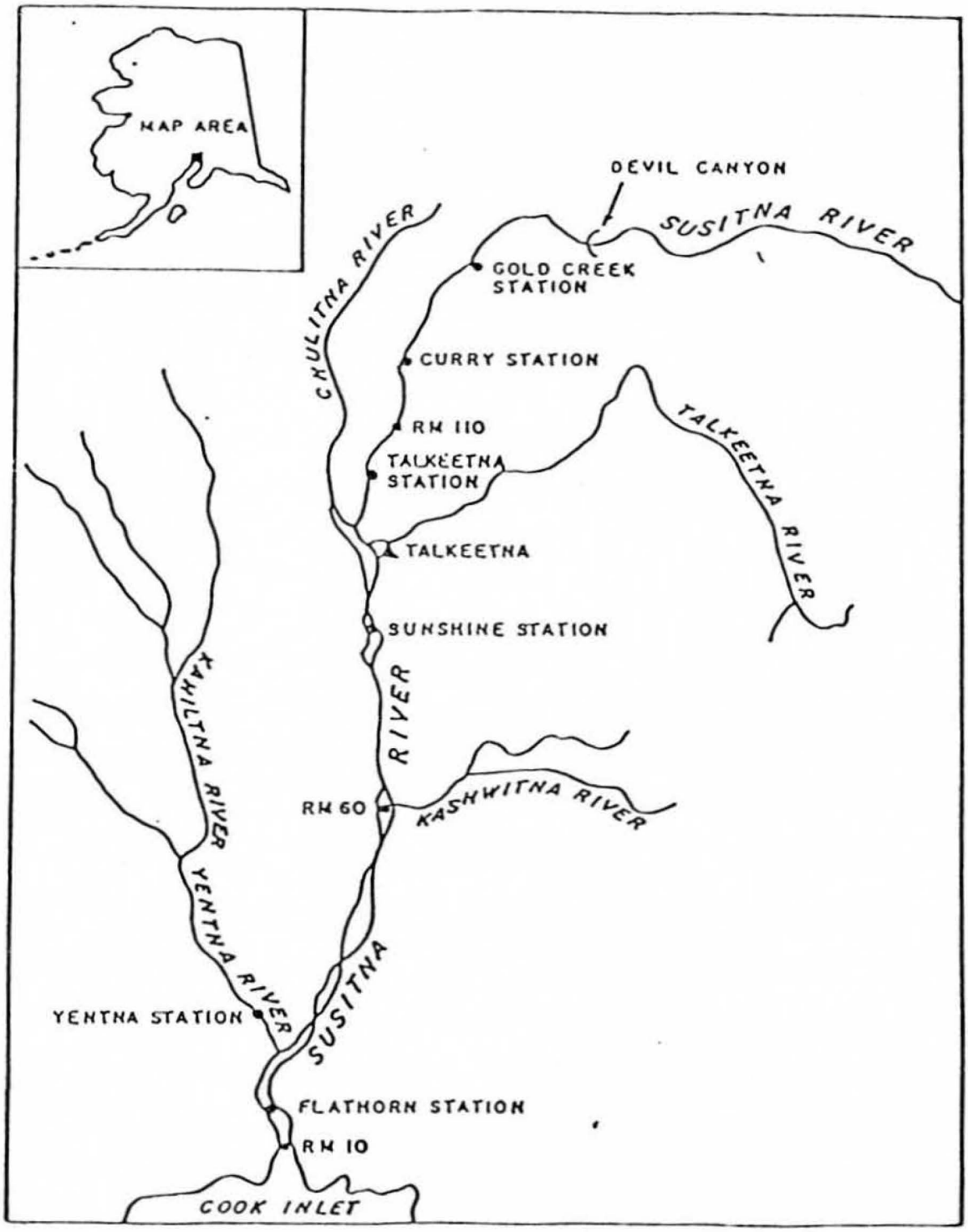


Figure F-1 Susitna River basin map showing field stations and major streams, Adult Anadromous Fisheries Project, Su Hydro Studies, 1983.

	1983	1984
Yentna Station	7/1 - 9/5	7/1 - 9/5
Sunshine Station	7/1 - 9/10	6/4 - 7/1
Talkeetna Station	7/1 - 9/12	6/7 - 7/1
Curry Station	7/1 - 9/14	6/10 - 7/1

Operations proposed at the four stations are intended to provide a perspective of contribution and value of anadromous fish escapement above RM 98.6 to total basin production. Secondarily, the stations are sited to provide a second level check of escapement numbers between stations.

Species investigations will be as follows:

(1) Chinook Salmon

Chinook salmon will be intercepted by fishwheels at Sunshine, Talkeetna and Curry stations and released with Petersen disc or Floy FT-4 tags. Tag recoveries will be made at upstream stations and during spawning ground surveys in the Chulitna River and Talkeetna River drainages.

(2) Sockeye, Pink, Chum, and Coho Salmon

Escapement will be assessed by side scan sonar (SSS) gear at Yentna Station, and by Petersen mark and recapture method at

Sunshine, Talkeetna and Curry stations. Site operation of SSS sonar and fishwheel gear will be as presented in Volume 2, First Draft, Phase II 1982 Adult Anadromous Fisheries Studies, ADF&G/Su Hydro 1983.

B. Spawning Surveys/main channel, streams and sloughs

1. Objective

Define where salmon spawning occurs above RM 98.6 and to what extent.

2. Rationale

Susitna River upstream of RM 98.6 will be subject to change. It is necessary to define where spawning is occurring and to what extent for purposes impact assessment and mitigation. A full life cycle of monitoring (5 years) is necessary in our opinion, to clearly define resource values and concerns; 1983 surveys would be the third continuous year of survey work.

3. Procedure

Ground survey all known and suspected anadromous fish spawning sloughs and stream habitats will be conducted as close to weekly as possible from August 7 to October 7.

Sloughs will be surveyed in their entirety and individual streams will be surveyed from the confluence with the Susitna River to a predetermined distance upstream. Exceptions are Indian River and Portage Creek which are to be surveyed in entirety.

C. Stream Life

1. Objective

Quantify sockeye and chum salmon escapement into slough habitats upstream of RM 98.6.

2. Rationale

Total escapement into slough habitats is unknown. Currently, peak counts provide an index of production. It is apparent that a significant portion of early spawning slough fish are not counted when peak survey counts are effected nor are any late (entering) spawning fish. By assessing mean stream life of chum and sockeye salmon, total escapement into slough habitats can be calculated from survey count data. This study would provide quantification of slough spawning salmon to accurately define their value and the level of mitigation that may be required.

3. Procedure

At Curry Station, all fishwheel intercepted chum and sockeye salmon are to be tagged with Petersen disc tags with large numbers that will be readable from 20 feet with the naked eye. Fish tagged at Curry Stataion and intering sloughs 11, 9, 8A, and Moose will be monitored every third dat from the first day of observed presence to the last day of observed life.

Escapement into sloughs 11, 9, 8A and Moose sloughs will be calculated by dividing total number of fish days by mean stream life. Total fish days will be calculated by multiplying the live count on each stream survey by the mean number of days in the survey period and summing the results. Chum and sockeye salmon escapements into other slough habitats will be quantified using the mean average stream life of respective species for sloughs 11, 9, 8A and Moose slough, and total fish days respectively computed per individual slough from regular survey data.

Stream life investigations will extend from approximately August 16 to October 15. Work will be conducted by a staff of two based at Curry Station.

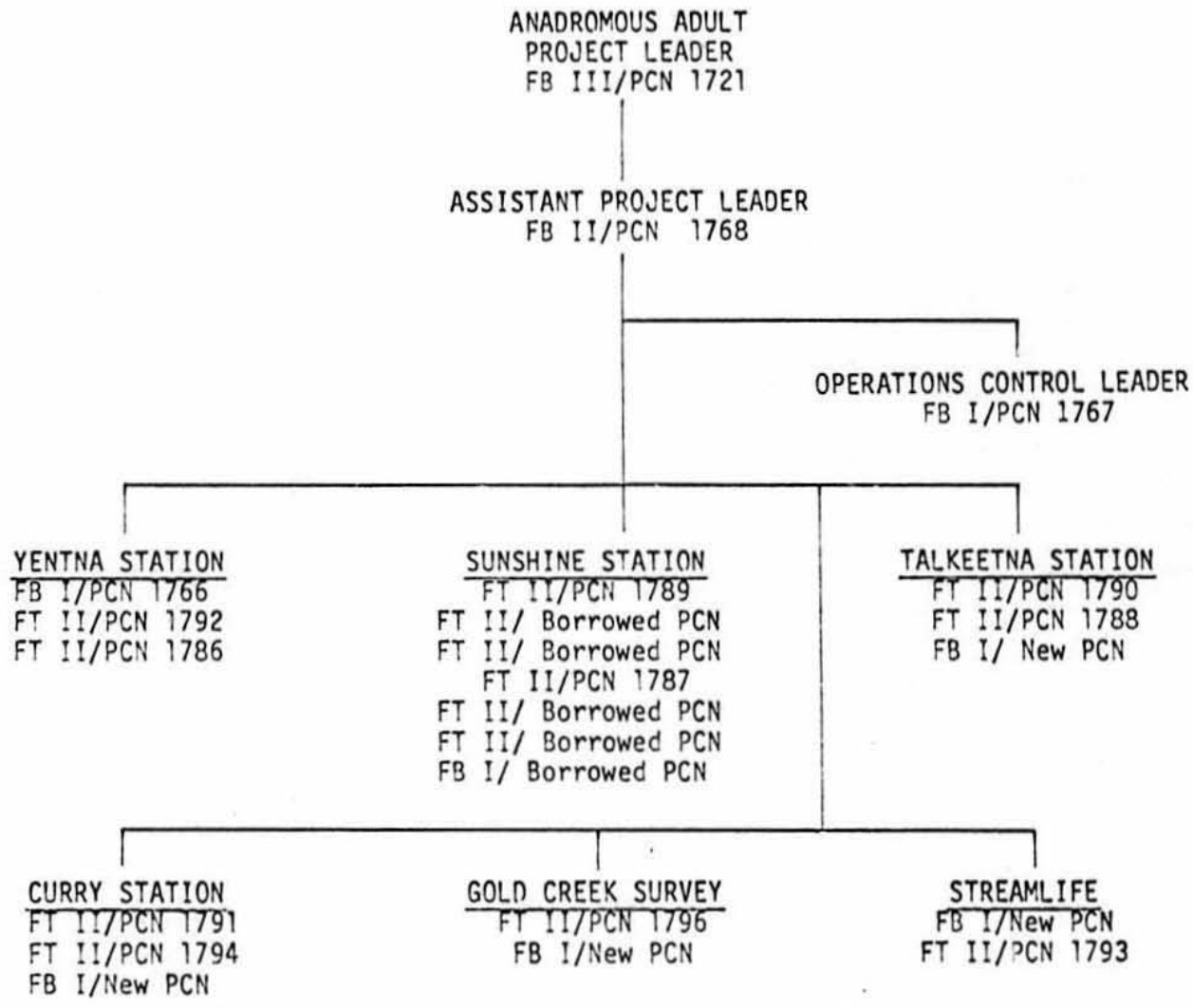
ATTACHMENT F-1

ADULT ANADROMOUS FISHERIES PROJECT
Line 100 - Personal Services

PCN	Class	Grade	MM	Cost
1721	FB III	18	12.0	60.0
1768	FB II	16	12.0	44.4
1767	FB I	14	11.0	36.3
Borrowed	FT II	9	2.0	7.0
Borrowed	FT II	9	1.0	3.5
Borrowed	FT II	9	1.0	3.5
Borrowed	FT II	9	2.5	8.8
New	FB I	14	3.0	10.0
1793	FT II	9	2.5	9.0
1766	FB I	14	3.5	11.6
1792	FT II	9	2.75	9.6
1786	FT II	9	2.75	9.6
Borrowed	FB I	14	4.0	13.2
1789	FT II	9	4.0	14.0
1787	FT II	9	3.5	12.3
New	FB I	14	4.0	13.2
1790	FT II	9	3.5	12.3
1788	FT II	9	3.5	12.3
New	FB I	14	4.0	13.2
1791	FT II	9	3.5	12.3
1794	FT II	9	2.0	7.0
New	FB I	14	3.25	10.7
1796	FT II	9	3.20	11.2
Open (internal Transfer or hire). 1/	FB I	14	3.5	11.6
			Subtotal	356.6
Line 200 - Travel and Per Diem				9.1
Line 300 - Contractual Services				37.0
Line 400 - Commodities				52.2
			Grand Total	454.9

1/ Provides for internal transfer or hire of FB-I staff which will provide back-up in data reduction, report preparation and quality assurance to compensate for the release of principal project staff to Harza-Ebasco SJV and APA Support roles as requested.

ATTACHMENT F - 2
ADULT ANADROMOUS FISHERIES PROJECT



PROJECT LEADER
FB 11
12 mm
QUALITY ASSURANCE AND SUPPORT SECTION
FB 11
PCN 4198
12 mm
FB 11
PCN 4204
12 mm
FB 1
PCN 4202
8 mm
STUDIES BELOW DEVIL CANYON
STUDIES ABOVE DEVIL CANYON
JUVENILE ANADROMOUS FISH STUDIES
RESIDENT FISH STUDIES
ACCESS/TRANSMISSION STUDY
Emergent, Outmigrant and Survival Studies
Habitat Studies
FB 11
PCN 4200
12 mm
FB 1
PCN 4212
9 mm
FB 11
PCN 4205
2 mm
FB 1
PCN 4202
3 mm
Talkeetna
Gold Creek
FB 11
PCN 4206
12 mm
FB 1
PCN 4215
7.5 mm
FB 11
PCN 4197
12 mm
FB 1
PCN 4199
12 mm
FB 11
PCN 4205
1 mm
FB 11
PCN 4201
12 mm
FB 1
PCN 1769
7.5 mm
FB 1
PCN 4202
1 mm
FB 11
PCN 4205
9 mm
FB 11
AH PCN 4207
9 mm

June 10, 1983

ATTACHMENT G - ACCESS AND TRANSMISSION CORRIDOR AND ASSOCIATED CONSTRUCTION SITE STUDIES.

I. Background

This attachment presents a revised Access and Transmission Corridor Program to be performed by a team of Aquatic Habitat (AH) and Resident Juvenile (RJ) biologists. This study supercedes the plan initially proposed in two parts of the earlier RSA versions (Attachments D and E). The access corridor investigations for the primary route into the Watana dam sites, the primary transmission lines between the dam sites and the intertie corridor adjoining associated construction sites are proposed for study this upcoming season (Figure G-1).

II. FY84 Program Objectives and Work Plan

A. Objectives

1. Identify the general physical and chemical characteristics of stream and lake habitats within and adjacent to the selected access and transmission corridor routes to provide information to assess the potential impacts to those habitats from proposed access and transmission corridor construction activities.

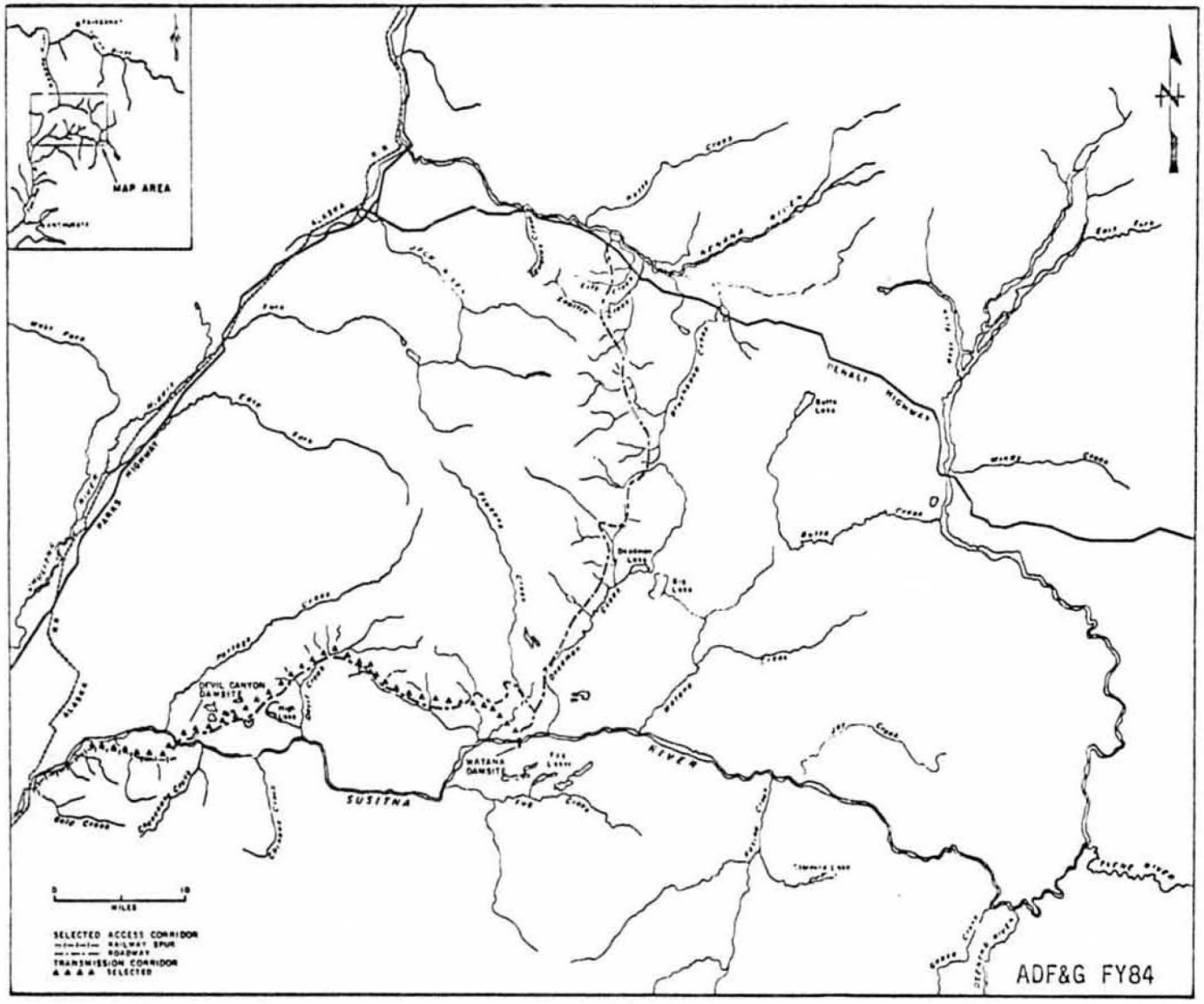


Figure G-1. Selected Access and Transmission Corridors.

2. Inventory the resident fish species and determine the abundance, age, growth, and mortality of Arctic grayling and lake trout in the streams and lakes within and adjacent to the proposed access and transmission corridors and other construction sites.

B. Rationale

1. Establishment of construction camps and development of the access and transmission corridors will have an impact on many of the lakes and streams both during and after development. By providing information on the resident fish populations in areas that may be affected by road crossing, camp construction, borrow pits, and a major increase in sport fishing pressure, impact analysis can be made and appropriate mitigation activities planned.

2. Examination of the physical and chemical characteristics of these habitats and their relationship to fish species present, would assist in identifying potential impacts on these resources for which appropriate mitigation options can then be developed.

3. Arctic grayling and lake trout are the two major sport fish in the proposed study area. An increase in access will allow a substantial increase in sport fishing pressure in an area whose fish populations have been virtually

unexploited due to inaccessibility. In addition, the Deadman Lake and Deadman Creek system, which is adjacent to the proposed access road for approximately 15 miles, is one of the few trophy sport fishing areas for Arctic grayling in South Central Alaska. It is necessary to document the present abundance and biological structure of this species to use as a basis to predict the impacts of increased fishing pressure and increased harvests on this area.

C. Procedures

1. This plan of study will examine the selected access and transmission line corridors, and associated construction sites. These studies will be conducted by one joint AH/RJ two person crew which will collected habitat (AH) and fishery (RJ) data concurrently while in the field. This crew will investigate the portion of the selected access route from the Denali Highway to the Watana Dam site and the portion of the selected access route from the Watana dam site to Gold Creek, including the Gold Creek rail spur and both the selected and alternate transmission line corridors.

2. Habitat data collected on streams will include information on general water quality (pH, DO, conductivity, water temperature, substrate composition and gradient). These data will be collected at or in the vicinity of the

proposed construction activity depending on individual site circumstances. Habitat data collected on lakes will be limited to general water quality. Specific data collection methods and sampling designs used in the collection of the above data are outlined in the Phase II FY82 and FY83 Procedures Manuals.

3. Stream study sites at access and transmission corridor crossings, areas of adjacent parallel routes, and construction sites and camps will be inventoried for resident fish species by hook and line, minnow traps and eletrofishing methods. Population estimates by mark and recapture methods will be conducted on streams found to contain harvestable numbers of Arctic grayling. The lake study sites will be inventoried by gill net, minnow traps and side scan sonar.

ATTACHMENT G

ACCESS AND TRANSMISSION CORRIDOR AND ASSOCIATED CONSTRUCTION SITE STUDIES

Line 100 - Personal Services

PCN	CLASS	GRADE	MM	COST
4205 1/	FBII	16	9	34.5
4207 2/	FBII	16	9	34.5
			Subtotal	69.0

Line 200 - Travel and Per Diem	0.6
Line 300 - Contractual Services	2.8
Line 400 - Commodities	7.8
Grand Total	80.2

1/ RJ biologist, see Attachment D for remaining 3 man months.

2/ AH biologost, see Attachment E for remaining 3 man months.