STATE OF ALASKA

DEPARTMENT OF FISH AND GAME

OFFICE OF THE COMMISSIONER

ESFESV

Bill Sheffield, Governor

P.O. Box 3-2000
Juneau, AK 99802
Phone: 465-4100

January 13, 1983

Alaska Power Authority
334 West Fifth Avenue
Anchorage, Alaska 99501

Attention: Eric Yould, Executive Director

Gentlemen:

Re: Review Comments - Draft Exhibit E - Susitna Hydroelectric Project

The Alaska Department of Fish and Game (ADF&G) has reviewed the Draft Exhibit E, dated November 15, 1982, that was prepared for inclusion in the license application for the Susitna Hydroelectric Project that the Alaska Power Authority (APA) intends to submit to the Federal Energy Regulatory Commission (FERC).

The Department's review of the Draft is based on the adequacy with which the fish and wildlife resources affected by the project, the impacts to those resources attributable to the project, and specific mitigation proposals to offset impacts are identified and quantified.

The types of information required for an adequate assessment of feasibility, with respect to fish and wildlife resources were originally identified for the APA in November 1979 through correspondence relative to the Plan of Study and were most recently identified in Commissioner Ronald Skoog's statement to the APA Board of Directors on 16 April, 1982.

Our review comments on the following chapters are appended to this letter:

Appendix A - Chapter 2 - Water Use and Quality;

Appendix B - Chapter 3 - Fish, Wildlife and Botanical Resources;

Appendix C - Chapter 5 - Socioeconomic Impacts;

Appendix D - Chapter 7 - Recreational Resources; and

Appendix E - Chapter 9 - Land Use.

The time afforded the ADF&G to review the Draft Exhibit E has not been sufficient to allow a detailed review of all the chapters, nor has it

enabled us to present our comments in as thorough and refined a manner as we would have liked. We do, however, expect to take advantage of future review opportunities to further address these issues.

The appended reviews (Appendices A-E) contain general statements regarding the overall adequacy of each chapter. Following these are specific comments addressing the technical content of the report. In the specific comment section, we have on occasion clarified the Department's policies and positions with respect to the proposed Susitna Hydroelectric project.

Throughout the chapters of the Draft Exhibit E that we reviewed, both the information presented and the assessment of impacts are generally insufficient for the kind of a planning and source document needed for preparation of an EIS. We are concerned that the benefits and cost aspects of the project have not been presented completely and clearly. The general problems with the Draft Exhibit E chapters that were reviewed by the ADF&G are as follows:

1. Data and information contained in the Exhibit E are, in many cases, incomplete or not properly interpreted.

2. Many potential impacts and issues attributed to the Susitna Hydroelectric Project are not addressed. Impacts to fish and wildlife resources and users that are addressed are not adequately quantified and proposals to mitigate impacts are not sufficiently developed.

3. Not all source materials, other Draft Exhibit E chapters, or the results of other study disciplines that are pertinent to the project are referenced.

4. Throughout the document there is a failure to discriminate between fact and speculation.

Our comments, recommendations, and suggestions to strengthen the material contained in Draft Exhibit E in relation to the problem areas identified above are as follows:

1. The APA should examine the specific comments appended to this letter and clarify or expand sections in the Draft Exhibit E chapters where inadequate treatment of the data or information is suggested. The suggestion here is that while some interpretations by the authors are not necessarily inaccurate, they are incomplete. This type of problem in the Draft Exhibit E may be either editorial or a function of the short time frame allotted to assemble, assess and analyze the information available. The Draft Exhibit E chapters should utilize currently available and relevant information and data sources.

2. The Draft Exhibit E chapters should accurately reflect the current state of resource knowledge and information on impacts which are understood and those which are still undetermined. Consequently, the mitigation plans cannot be considered adequate unless the information and analysis of impacts is current and comprehensive. The mitigation plans should clearly indicate how impacts are considered in the design of the project; what measures will be taken to avoid, minimize or rectify impacts; and how effective these measures will be in mitigating losses.

3. Source material in the Draft Exhibit E is not adequately referenced. Furthermore, data and information reported in chapters of the document should be consistent with other chapters. The lack of coordination between the resource groups and the engineering and construction groups is evident; conflicts have not been clearly identified between uses and disciplines. To remedy this deficiency all conflicts between engineering and economic factors and environmental alternatives should be identified and the consequences of altering those factors should be listed. The environmental concerns should be weighed equally with engineering and economic constraints.

4. Throughout the document, there is not always adequate discrimination between fact and speculation about resource values, concerns, issues, impacts and mitigation alternatives.

In some cases adequate referencing and reporting of data in the chapters may resolve this. Where baseline data collection is required to remove speculation it should be done, or if relevant data and information are available elsewhere they should be collected and evaluated.

The Department of Fish and Game recognizes the general character of the above recommendations. These recommendations are made based on an overview of the ADF&G comments for the chapters we have examined. We invite further consultation by the APA with our agency to discuss the specifics of the chapters we reviewed and our general recommendations.

The fish and wildlife resources of the Susitna River Basin are of high value. Construction and operation of the proposed Susitna Hydroelectric Project can have wide ranging implications for these resources and their users. It is the objective of this Department to help Governor Sheffield insure that fish and wildlife resources are considered along with other project features during all stages of project planning, construction and operation.

Based on the above overview of the Draft Exhibit E and the chapter-specific comments contained in the enclosed Appendices, the ADF&G does not believe that this planning document is sufficiently complete. Furthermore, we believe that the APA can best insure expeditious review and approval by FERC if it does as much as possible

to resolve agency concerns or establishes the mechanism to resolve those concerns.

We hope our review assists the APA in addressing the concerns expressed herein and consider that this review represents only part of the process needed to reach the objective we wish to attain. It is highly important from our perspective that the FERC License Application scheduled for submission in February and the process of consideration of the Exhibit E will positively contribute to the equitable consideration of fish and wildlife concerns.

Thank you for the opportunity to review and comment on this document. We would appreciate your providing an explanation of how you eventually respond to the comments we have made.

Sincerely,

Don W. Collinsworth
Acting Commissioner

Enclosures

cc w/enclosures: Lennie Boston, Special Assistant to the Governor
APA Board Members:
John Schaeffer
Charles Conway
Robert Weeden
Daniel A. Casey, Commissioner,
Department of Transportation and Public Facilities
Richard A. Lyon, Commissioner,
Department of Commerce and Economic Development
Richard A. Neve, Commissioner,
Department of Environmental Conservation
Peter McDowell, Office of Management and Budget
John Hayden, Acres American
Mark Robinson, FERC, Washington D.C.

APPENDIX A

Susitna Hydroelectric Project, Draft Exhibit E

Volume 1, Chapter 2

Water use and quality

GENERAL COMMENTS

This document generally fails to cite supporting evidence for the statements made or for potential impacts considered to be of major importance to this agency. An example can be found in the discussion of ice processes in the lower river. The ice formation processes are simply stated as causing staging of 4 feet at Talkeetna to 3 feet at Sherman (E-2-59). The method used to determine this estimate has not been defined. Also, no references have been provided that evaluate whether ice processes are or are not a problem below other hydro projects. If this is a purely speculative scenario, it should be so noted. Otherwise, a scenario assuming that the staging would be 6 to 8 feet at Talkeetna during the winter months and annual floods would occur is just as supportable as the statements provided.

The failure to provide a separation of the speculative comments from the segments of the text supported by documentation creates severe problems in assessing the overall credibility of the report.

This document also needs a preface on how the flow scenario and access route were selected for the license submittal and a discussion of other available options. The Exhibit A document referenced on page E-2-86 on access routes was not provided for our review.

SPECIFIC COMMENTS

The following comments are addressed to page specific areas and paragraphs and primarily address general deficiencies rather than grammatical errors.

Page/Paragraph

E-2-3/4

The source of the 40 percent stream flow statistic should be identified.

E-2-3/5

State that all the flows listed other than upper Susitna River are also mean annual flows.

E-2-4/1-4

References are needed to support the flood information discussed.

E-2-5/1

References are needed to support the statement that the shape of the listed duration curves is indicative of flow from northern glacial rivers.

E-2-5/3

Reference(s) are required to support the discussion regarding Susitna River morphology.

E-2-10/1

The description of sloughs as having a steeper gradient than the mainstem is misleading. The gradient within the sloughs is generally variable, with a steep upper section and a lesser slope in the lower end. In upland sloughs, those without scour channels, the gradient appears to be even less. Overall, the sloughs have a steeper gradient, but the variability of their gradient is important to their fisheries production.

E-2-11/2

There is a need to cite specific references in the water quality text even though a general reference section was provided in the preface for the water quality section.

E-2-12/3 & 4

The months that are included in the "winter, spring and summer" time frames need to be identified.

E-2-12/5

Clarification needs to be provided as to whether the Gold Creek temperature data presented in Fig. E-2-30 were correct. The location of this station was determined to be influenced by Gold Creek flows in 1981 and the station location was changed in 1982 to the northwest bank as a consequence.

E-2-14/1

A reference is needed for the Portage Creek temperature data.

E-2-14/3

It should be noted here that under natural conditions, staging during freezeup reportedly causes flooding of portions of the town of Talkeetna near the downtown airport. There is a need to reference the material presented in this paragraph.

E-2-14/5 & 6

The term frazil ice should be defined for the readers. Also it cannot be overstated that ice jams could have severe consequences to portions of the community of Talkeetna.

E-2-17/5

In order to properly assess the effects of the project on the downstream fisheries and fisheries potentials of the impoundments, a relationship of suspended sediment and associated particle size to vertical illumination is desirable. This does not appear to have been done, in that no quantitative measurements of vertical illumination have been obtained.

E-2-20/5

The dissolved gas concentrations above the Devil Creek rapids were not supersaturated and were recorded as approximately 100 percent. The 105 percent value was recorded above the Devil Canyon dam site.

E-2-24/2

These sloughs also contain important anadromous and resident fish rearing habitat.

E-2-25/5

Power generation could be considered an instream flow use under only unusual circumstances. In the case of reservoirs which store water for later power generation, the storage of water is definitely an out of

stream use. Using the terminology of "in-stream flow" in the context presented here for power generation is inappropriate and inaccurate.

E-2-26/3

Fry emergence occurs at different times within and among species. Emergence is most closely correlated with accumulated thermal units and has little to do with the hydrograph. Also burbot and Dolly Varden should be added to the list of important resident species.

E-2-28/6 & E-2-29/1

Seasonal salinity measurements should be collected and correlated to a wide range of flow levels and tide conditions instead of to a few selected flow levels.

E-2-29/2

The location of the sampling site and a definition of the mouth of the Susitna River should be provided to give credence to this statement. Saltwater intrusion would be expected to be dependent upon tidal action so this must also be taken into account when describing saltwater mixing and intrusion.

E-2-29/4-5

The use of regression equations to calculate the peak and low flows without data on actual discharge of the tributary streams to be crossed by the access road is inappropriate and should not be used as a substitute for collection of discharge information. This is particularly important to the design of bridges or culverts for engineering integrity or for fish passage. The sizes of many drainage structures placed in the North Slope haul road and pipeline workpad were underestimated when these methods were applied. This resulted in hydraulic erosion and structure failures that were unnecessary.

E-2-29/6

It is stated that "The line between the dam and the intertie has yet to designed, sited or constructed." The Exhibit E should include information on the siting (corridors) of the transmission lines, baseline information on resources which may be impacted, an assessment of the impacts, and the methods proposed to offset impacts.

E-2-30/1-5

Discharge measurements should be collected at any stream crossings associated with the transmission lines if road access is to be developed. These measurements should be used in determining the size of bridges or culverts for fish passage and engineering integrity. If

any other transmission line routes were considered they should be listed.

E-2-31/General Comment on Section 3, PROJECT IMPACT ON WATER QUALITY AND QUANTITY.

It is essential to present a discussion of the rationale and process for selecting the operational schemes on which the impact discussions were based. In other words, it needs to be made clear why this specific operational scheme was selected above other alternatives, what the engineering rationale is and how considerations of environmental values, concerns or needs were incorporated into the judgement that this is a satisfactory operational scheme.

E-2-32/1

The statement that dewatering a 1-mile section of the Susitna River will not result in any serious impacts is incorrect. This area is used by grayling for wintering, and dewatering will result in a permanent barrier to migrating fish in the system. Data collected by the ADF&G in 1981 on intrasystem movements of grayling between Deadman and Tsusena Creek indicated migration between these systems.

E-2-33/4

The statement does not address the large amount of spoil that will be generated and the large amount of grading and washing that will be necessary to obtain proper sized materials for the construction of the dam. This will generate an enormous water quality and spoil disposal problem that has not been addressed. Spoil disposal sites should be located in a manner to preclude introduction of sediments into the Susitna River and fish-bearing tributaries.

E-2-34/4

Petroleum and petroleum product spills in the smaller grayling streams can have significant impacts on these fisheries. An oil spill contingency plan is essential to provide proper direction to prevent or mitigate spill events.

E-2-34/5

The description of the treatment of the waste water is totally inadequate. The discussion of waste water treatment should describe the volume of the waste water, the nature of the contaminant, a documented system for appropriate water treatment, the anticipated quality and the volume of the effluent, and an analysis of the instream concentrations of the effluent.

E-2-35/1

Groundwater can be impacted by polluted surface water drained into a well.

E-2-35/2

The term minor impacts, to describe the effects of excavation of borrow material, appears to be a mis-statement. If borrow material is taken from streams or lakes in the impoundment area, the impacts could have serious consequences on these fish populations. The types and volume of borrow materials to be removed, and the availability of materials need to be identified. An inventory of the fisheries in these areas needs to be made and baseline water quality conditions need to be documented. An analysis of the effects of borrow removal and mitigative actions to reduce the impacts by altering site locations or construction and operation techniques should be presented. This is a major oversight in this document.

E-2-35/5

Structural measures to prevent downstream movement of fishes through the tunnels is a necessary mitigative action that is not addressed. Downstream movement of fish without passage upstream essentially means these fish are lost to the population.

E-2-35/6

Upstream migration of fishes will be completely blocked by the velocity barrier in the diversion gates.

E-2-36/5

As with earlier comments (E-2-29/4-5), the regression analysis of peak and minimum discharges should not be substituted for the collection of discharge information.

E-2-37/3

The level of analysis presented here and detail of mitigation of the effluent should be provided for all effluents related to the project, not just sewage.

E-2-38/6

Reference to this information as a personal communication is inappropriate. The outmigration of salmon in the spring is as likely related to photoperiod and development as the other factors listed. Very low flows in the spring could cause many of the juveniles to remain trapped in backwater pools that are normally flooded by the mainstem under pre-project conditions.

E-2-39/2

The proposed flows of 12,000 cfs have not been demonstrated to maintain the character of sloughs and provide the flushing flows needed to clean fines out of the gravel. Also the cycle of vegetation succession will be altered if flows do not wash away old vegetative growth. Consequently, what is now aquatic habitat may become terrestrial habitat over time.

E-2-39/3

Minimum flows for the winter period should be established according to fishery resource requirements. This is a critical period for the populations of overwintering fish and even minor dewatering may have significant deleterious effects.

E-2-39/5 & E-2-40

There needs to be an analysis of longer filling periods and associated consequences. The short filling period evaluated (3 years) may produce unacceptable consequences to fisheries resources. An extended schedule for filling may provide for a higher and more preferable mitigation option for fisheries through the 3-year schedule.

E-2-42/5

The potential negative impacts to slough areas downstream from Talkeetna resulting from decreasing the recurrence intervals of what are now mean annual bank full floods is not addressed.

E-2-43/2-5

The timing and the consequences of the thermal regimes created within the reservoir during filling to downstream water temperatures must be better defined.

E-2-43/5

The water temperatures downstream from Watana need to be defined more accurately. The cause of these low temperatures should be identified.

E-2-44/4

What are the predicted depths at which photosynthesis will occur and how will the quality of water discharged downstream compare with the preproject conditions with regard to photosynthetic processes? Data or discussion regarding this question should be presented.

E-2-45/3

The method used to estimate the 30-50 NTU values should be defined and better described. The reasons why winter turbidity levels are neither quantifiable nor subject to estimation should be clarified.

E-2-47/6

The section regarding impacts to slough habitats is not adequately presented. Basically, the relationship of mainstem discharge to slough discharge should be illustrated graphically. The response of the ground water wells to changes in the mainstem at the various locations (for those wells that were not silted in) should be plotted; a gradient profile of the groundwater, rather than just the thalweg of the slough, should be illustrated; and a map of the locations of upwelling in the sloughs should be presented. The text as written does not present data and many speculative comments are provided without appropriate qualifications.

E-2-49/2

The statements suggesting that there will be no changes in the temperature of upwelling groundwater and consequently, no impacts to incubating salmon eggs are not supported by data or citation. The reduction of flows through these sloughs is not quantitatively defined and could easily be major as well as minor. The loss of scouring flows that remove sediment in these sloughs as well as beaver dams, and

removal of spring ice buildups could easily cause a senesence process to begin which may ultimately destroy the sloughs is not addressed.

E-2-49/4-5

There are no citations, references or data to support these statements.

E-2-50/1

There is no reference to the commercial boat launch at Sunshine located immediately below the Parks Highway bridge on the east bank nor is there acknowledgement of the boat launch at the Talkeetna Village airstrip which is becoming more heavily used due to bank degradation and channel erosion at the "new" Talkeetna boat landing. If the mainstream of the Chulitna River moves west from its present position as defined in the Draft Exhibit E (E-2-42/4), access to the Chulitna River and Susitna River north of Talkeetna River confluence could be considerably more difficult than at present. The source of the data, analysis or other documentation to support the comment that minor restriction on upstream access to Alexander Slough may occur during years of low stream flow needs to be provided.

E-2-51/1

Downstream flow requirements have not yet been determined or agreed upon.

E-2-51/2

The criteria used to develop the 5,000 cfs minimum flow as well as any of the other "target" flows should be presented. There must be some documentation of the rationale, review or selection process by which these "target flows" were developed and justified.

E-2-52/1

Optimally operated reservoir scenarios should be examined for other target flows downstream using the new synthesized flows.

E-2-52/3

A scenario wherein Devil Canyon Dam is not constructed in the projected time frame should be presented.

E-2-56/2

A detailed discussion on ice processes should be presented.

E-2-57/5

To evaluate the effectiveness of the multiple level intake structures, their efficiency at removal of a layer of water at a particular depth must be analyzed hydraulically. The velocity at the port of the intake structure must be low enough to prevent upwelling at the face of the

dam. This is a common occurrence that effectively eliminates the functionality of these types of structures.

E-2-58/1

The strata modelled for the reservoirs during the winter under alternative operational scenarios must be presented. The ability of the structures to control temperature during the winter needs further documentation.

E-2-59/2

The process by which staging elevations were estimated should be documented. Under preproject conditions with lesser flows, staging is often much higher than these levels. Local flooding in November reportedly affects the town of Talkeetna.

E-2-61/1

There should be an explanation why turbidity in the top 100 feet of the reservoir is the main interest.

E-2-63/5

Other potential sources of waste water need to be listed.

E-2-64/3

We recognize that this section refers to the operational phases; however, there is no explanation how the valves will be operated during the initial filling and startup procedure. An explanation of the thermal effects of using these valves is also needed, since the valves will facilitate discharge of waters from the hypoliminion.

E-2-66/1-3

Data to support this presentation should be provided.

E-2-66/5-6

We disagree that navigation and transportation will not be significantly impacted. These are somewhat contradictory to the statements in E-2-66/5-6. Information to substantiate this conclusion should be presented.

In the continuation of paragraph 6 on the next page it is stated that "...caution will be required in navigating various reaches." Also E-2-67/2 refers to the winter season and the fact that winter travel by snowmachine and dog sled will be impeded.

E-2-67/1

Reduction of floating debris will not benefit navigation significantly in our opinion. Low water flows are expected to be the most significant hazard in the downstream reach. The source or data to support statements in this paragraph should be provided.

E-2-69/2

This paragraph conflicts with Page E-3-137, second paragraph, wherein it states the dam construction will adversely impact temperature from a fisheries perspective.

E-2-70/3

See earlier review comments for E-2-34/5 concerning the analysis needed to determine the water quality hazard from the discharge of concrete wastewater.

E-2-76/4

Documentation of the statement that, "As Devil Canyon reservior is filled, additional fishery habitat will become available in the reservoir." should be provided.

E-2-87/1

Accurate discharge information on the creeks is needed to insure proper culvert sizing and fish passage. This information is needed to insure proper mitigation of potential impacts.

E-2-90/2

The minimum flow to maintain fisheries should be refined because 12,000 cfs may not be adequate.

E-2-90/3

The seasonal timing of the construction has not been addressed. This is an important factor in addressing fish and wildlife impacts.

E-2-91/2

Twelve thousand cfs for a flow at Gold Creek <u>will not</u> afford adequate access to 50 percent of available slough spawning habitat. A higher flow is required to maintain adequate access. This flow must be determined by an analytical process. Also, other life phases of fish in the downstream reaches below Devil Canyon are not addressed. All of the statements regarding the effects of 12,000 cfs flows are purely speculative and are not supported by data or measurements yet available. The release of water through the valves may present downstream thermal problems by releasing cold water in mid-summer.

E-2-91/4

Changes in downstream river morphology have not been fully assessed. To state that no mitigation is necessary to maintain slough habitats is premature. The lack of ice scour and flood flows may cause an aggradation of sediment in sloughs and may reduce natural cleaning processes necessary to maintain productive spawning substrate and rearing areas.

E-2-91/5 Line 8

Mitigation should be required and should be borne by the project developer as a standard project cost.

E-2-92/1

Data to support statements in this paragraph should be provided.

E-2-92/3

Thermal control by withdrawing water close to the surface can result in vortices causing air entrainment and supersaturation which is detrimental to fisheries. This subject should be addressed with supporting analysis to ensure that surface withdrawal of water can occur without detrimental impacts to fisheries.

The report cited did not demonstrate supersaturation because of faulty analytical techniques. The sample of water was not pressurized before gas chromatographic analysis as is required by standard methods. Therefore, any supersaturation would have probably dissipated before the sample was analyzed. The study did show, however, that the thermal conditions will not be affected by the valve and that the temperature downstream will essentially be the same as the temperature at the withdrawal layer in the dam.

Tables

E-2-1 through E-2-20 References to data sources for tabular material should be made where they are missing.

Figures

E-2-1 through E-2-39 Reference to data sources for figures should be made where they are missing.

Appendix B

Susitna Hydroelectric Project, Draft Exhibit E

Volume 2, Chapter 3

Fish, Wildlife and Botanical Resources

GENERAL COMMENTS - FISH

This report lacks sufficient data to support most of the statements on project impacts, whether adverse or beneficial. It does not reference or use the literature or experience obtained from other hydro projects. Many of the statements regarding populations of fishes do not adequately reflect consideration of the instream flow requirements necessary to sustain those populations. It does not separate opinion from statements supported by correlative data regarding responses of the fishery to river regulation and impoundment. It also does not refer to or cite in the text the economic consequences of the flow regime presented. The document does not provide information relative to Alaska or other locations as to the success or failure of proposed mitigation measures. In short, the data base presented is insufficient to support most statements of impacts or the quantitative effects that the project will have on downstream fisheries.

Additional difficulties in reading the report are encountered due to lack of literature references, processes by which conclusions or assumptions were

developed, and an absence of lists of technical documents and their locations. Sources of tabular or figure material often are not cited. In general, mistakes are common, many errors are apparent, and the report is neither well organized nor edited.

GENERAL COMMENTS - WILDLIFE AND BOTANICAL RESOURCES

There are numerous typographical errors, incomplete sentences, and inconsistent or contradictory statements. The format is frequently violated with impacts of one project feature incorporated into the discussion under the heading of another feature. Terminology is at times inconsistent or vague. The level of detail varies greatly from one subsection to another with "minor" impacts often treated more comprehensively than "major" impacts. There are numerous examples of incompletely thought out ideas, some of which will not stand up to close scrutiny. These are all indications that the terrestrial portions of Draft Exhibit E, especially the impact sections, were written too quickly before information was organized and had received very little proofing. The draft is in such poor shape that a meaningful, detailed review is very difficult if not impossible. However, some major problem areas that require extensive modification of the impact and mitigation sections can be identified and specific examples of types of deficiencies can be cited.

1. Quantification of impacts - Magnitude of impacts are rarely indicated except in terms such as "minimal" or "moderate." Even those terms are rarely supported by a rationale. Most judgments of the significance of impacts appear to be subjective. While studies are incomplete, and some data (such as available vegetation maps) are of marginal value, it should be possible to place outer limits on many impacts, at least indicating the order of magnitude. Indication of the general proportion of a population's range subjected to a particular impact would be useful as a crude indicator of magnitude that could be refined at a later date. As written, the reader does not know if a species will lose 10 percent or 90 percent of its habitat.

2. Impacts based on current populations - Current populations are almost always used as the basis for impact assessment. Impacts are judged under current management plans and management strategies. This approach is not adequate for assessing many of the impacts of the Susitna Hydroelectric Project. Impacts should be assessed in terms of the range of population levels that could reasonably be expected to occur during the life of the impact. Current populations might be adequate for short-term impacts, as the population would not change greatly during that period. However for long-term impacts, such as those resulting from inundation of habitat, a full range of population levels that could be supported by the habitat (carrying capacity) and the range of management objectives that could be supported by those population levels should be presented.

It should be recognized that carrying capacity as well as population levels may vary over time. Consequently, likely changes in carrying capacity during the life of an impact should be considered. Any action that maintains carrying capacity at a generally higher or lower level than expected in the absence of the project would have a positive or negative impact respectively.

Carrying capacity cannot always be measured. Where current populations are near carrying capacity, they are an appropriate measure even for long-term impacts. Where current populations are believed to be below carrying capacity, some estimate of carrying capacity is required. In some cases, historical population data may suffice. In other cases, measures of habitat quality may be used as direct or indirect indicators of carrying capacity.

There are numerous examples where the Draft Exhibit E completely ignores these concepts. Prime examples are caribou and wolf. Both populations are currently at levels below carrying capacity, caribou because of current management goals and wolves because of high harvest, much of which is illegal. Exhibit E concludes that project impacts would be minimal under current harvest levels and avoids discussing impacts that would occur if these goals and actions were altered and the populations were allowed to increase. Wildlife populations, user demand, and management goals have changed dramatically over the last 50 years and can be expected to continue to change over the life of the Susitna project. For example, increased hunter demand is likely to result in an upward adjustment of the caribou population and harvest

goals, perhaps even before construction begins. If the Susitna project precludes attainment of goals that could have been attained without the project, there will be a negative impact that has not been adequately addressed by the Draft Exhibit E.

3. Failure to discuss cumulative impacts - Impacts are usually discussed one at a time, with little discussion of the potential cumulative effects on the population. Often each impact is sufficiently isolated that its effect on the population is judged "minimal." However the cumulative effect of all habitat alteration and all mortality factors may significantly affect the population's ability to sustain major impacts such as habitat loss. For example, inundation of moose winter range may reduce carrying capacity, increasing the impact of severe winters on the population. Project induced mortality could slow or even prevent recovery during subsequent years of milder winters. At the very least, there would be an impact on the amount of hunter use the population could sustain.

4. Ranking of impacts - When impacts are ranked, the most significant impact listed is often one that is easily mitigated. For example, increased hunter harvest resulting from improved access is often suggested to overwhelm all other impacts. In such cases, the discussion of other impacts is often cursory. However, hunting can be regulated and it is certain that the Board of Game will take measures to minimize adverse effects of hunting on wildlife populations, usually shifting the impact to the users. This treatment is inconsistent with that of

other easily mitigated impacts such as borrow pits where the impact after rectification (revegetation) is discussed.

By suggesting that the greatest impact will be unregulated hunting, a distorted view of total impacts is created. Less easily mitigated impacts such as loss of critical foods tend to be obscured and are discussed only superficially.

5. Incomplete and inconsistent treatment of impacts of improved access - Some of the greatest and longest term impacts of the Susitna project will be secondary effects of improved access and attraction of people to the area. This will likely precipitate development and increased recreational use of the area that might not occur for decades without the project. Impacts of improved access through hunting, including direct mortality, disturbance, and ORV use, are discussed repeatedly, often to the exclusion of less controllable impacts. But impacts of improved access through individuals other than the hunters are almost completely ignored. This is inconsistent and ignores a significant source of impacts.

6. Inadequate treatment of habitat alteration - Habitat alteration is consistently treated superficially. As noted above, this is sometimes done through failure to even roughly quantify the impact or consider cumulative effects. There are other examples where alteration is dismissed without adequate rationale. The most serious example is downstream impacts to moose habitat.

It is concluded that habitat may be enhanced between Devil Canyon and Talkeetna during the license period. However it fails to consider that areas of current early successional stages may become mature more rapidly than new areas will become vegetated, resulting in an immediate loss of habitat quality.

Changes in frequency of flooding are dismissed because bank full floods will still occur every 5 to 10 years. However this could reduce the rate of cutting and filling to 20 percent of current levels with a corresponding reduction in habitat created by that mechanism. Effects of peak floods and ice scouring below Talkeetna are dismissed even though changes in stage will exceed 4 feet in some areas.

This is an example where conclusions were presented without supporting rationale. Close scrutiny of the problem shows that the underlying rationale was either faulty or that alternative conclusions are possible.

The problems listed above, singly or in combination, work to systematically minimize potential impacts that might require mitigation. This appears to stem from a tendency to seek a rationale that nullifies the need to fully discuss impacts. However, if an underlying assumption is rejected (e.g., downstream effects on moose habitat), the entire section of the impact assessment becomes inadequate. Virtually every section of the wildlife impact assessment suffers from at least one of the problems listed.

Mitigation Plan

The wildlife mitigation plan is too incomplete to warrant detailed comments. Measures to avoid, minimize, or rectify impacts are scattered. Some are included in the vegetation section but there is little indication of how effective these measures will be for wildlife. It also is not clear which measures have been incorporated into the project design and which are merely recommendations from environmental consultants. The mitigation plan should clearly indicate how wildlife impacts are considered in the design of the project; what measures will be taken to avoid, minimize, or rectify impacts; and how effective these measures will be in mitigating losses. This is necessary to demonstrate that the option analysis the Susitna Hydroelectric Project Fish and Wildlife Mitigation Policy has been followed and so that residual impacts can be estimated for compensation planning.

The inadequacies of the impact assessment are evident in the mitigation plan. There is no mention of compensation for impacts to species other than moose. It is suggested that mitigation measures for moose will partially mitigate for losses to bears and wolves, but that will depend on what actions are taken and where. No mention of options for out-of-kind compensation is made.

SPECIFIC COMMENTS - FISH

Page/Paragraph

E-3-2/5

In this paragraph it is stated, "...criteria for assessing the relative importance of biological impact issues have been provided by....(2) comments and testimony by the Alaska Department of Fish and Game (Skoog, 1982; ...)." We have reviewed the text of Skoog, 1982 and, we do not believe this statement can be construed as establishing "...criteria for assessing relative importance of biological impact issues...." The context of the comments by ADF&G were specific to three alternative access plans, numbers 13, 16, and 17, and provided qualitative assessment of impacts for each of those plans. It was clearly noted in several areas of the letter that ADF&G's assessment was subjective and qualitative. We would like to state that the criteria by which project impacts are judged should lead to a quantifiable determination of impacts. These criteria for project access routes to our knowledge have not been established. Programs which will collect quantifiable information to insure equal consideration of fish and wildlife and their habitats and mitigation of those impacts in access corridors have not been performed.

A reference to Commissioner Skoog's April 1982 testimony to the APA Board of Directors would be appropriate. Also, references to comments

and testimony provided by Schneider (1979, 1982 a.b.c.) are not cited in the bibliography.

E-3-3/1

The ADF&G disagrees that its policy implies "...that project impacts on fish and game species will be of greater concern than changes in the distribution and abundance of non-game wildlife and invertebrate species." First, the terms "fish and game" and "fish and wildlife" are used interchangeably throughout our policy document, and secondly, the ADF&G's greatest concern is fish and wildlife habitat and its ability to maintain productive populations. As stated in ADF&G policy, "The overall mitigative goal of the Department of Fish and Game is to maintain or establish an ecosystem with the project in place that is as nearly desirable as the ecosystem that would have been there in the absence of that project." We are primarily interested in maintaining the quality, quantity and diversity of the habitat for fish and wildlife with the project that is similar to that existing without the project.

E-3-3/2

The general tone of statements in this paragraph indicates a process of rationalization rather than of a clear sense of direction and logic. It is stated in this paragraph, "Where there is a high degree of confidence that an impact will actually occur, it has been ranked above impacts predicted with less certainty." For this thesis to have any

validity one must also specify the vulnerability of the resource to be evaluated. The same applies to assessing the process for evaluating the probability that an impact will occur. It is equally important, if not more so, to specify the magnitude of the impact that will occur.

E-3-3/3-4

The priority sequence for ADF&G mitigation policy is not only for mitigation option analysis in a planning sense but also for mitigation option implementation. We have five potential options for implementation as listed, and require an assessment which quantifies project impacts, and determines the parameters under which the project must operate to implement each option. The highest priority mitigation option which is feasible is the one which this Department will require for direct implementation. Quantifiable information sufficient to determine whether an option is feasible must be available to enable the ADF&G and others to select the appropriate mitigation option. As stated in the ADF&G mitigation policy, "The burden of proof to justify lower estimates of damage to fish and wildlife habitat lies with the developer."

E-3-5/3

We suggest that management strategies will require the concurrence of resource management boards and agencies.

E-3-7/2

Chinook, pink, chum and coho salmon mill at the entrance to Devil Canyon. Chinook salmon spawn in Devil Canyon in Cheechako Creek (RM 152.5) and Chinook Creek (RM 156.8). The lower limit of Devil Canyon is defined as RM 152. It would therefore be correct to state that "The Susitna River is a migrational corridor, spawning area and juvenile rearing area for five species of salmon from its point of discharge into Cook Inlet to upstream within Devil Canyon."

E-3-8/1

Impacts to less sensitive species with similar habitat requirements would be mitigated, however, species with a lower evaluation priority may be highly sensitive to change and may not be mitigated. For example, species that are adapted to turbid waters may be adversely affected if a project creates substantial decreases in turbidity. Burbot are an example of a species which may be so affected.

E-3-8/3

Chinook and coho do not have a greater commercial value than chums, although they do have a greater sport fishing value.

The projected change in conditions in the mainstem are not necessarily beneficial to rearing juveniles as suggested in this paragraph. The conditions (parameters) referred to should be identified. Further,

mainstem habitat will not necessarily be improved in winter months, higher turbidity is an example. Juveniles are also consistently present in sloughs. There are no data or literature cited to support the last two statements in this paragraph.

E-3-8/4

Arctic grayling also utilize mainstem habitats not only clearwater tributaries as implied.

E-3-9/1

What are the resident evaluation species below Talkeetna? None are indicated in the listing.

Rainbow and burbot should be included in the list of evaluation species because of their importance to the sport fishery and because of their abundance and adaptation to the turbid conditions. There may be a particular sensitivity to possible changes in the case of burbot.

E-3-10/3

Table E.3.3 does not reflect the 1.2 million figure discussed in text.

E-3-10/4

Table E.3.4. reflects different figures than the text with regard to chum salmon escapement. The chum salmon escapement was 20,800 and 49,100 in 1981 and 1982 respectively.

E-3-11/1

Value (ex-vessel) on coho salmon is not presented.

E-3-11/5

If Mills (1980) data are to be used to indicate significance of recreational use, the 1981 information should be included.

E-3-12/1

The harvest figures reported here reflect primarily Susitna River harvest. Additional harvest occurs on some of the anadromous species (chinook for example) outside the Susitna drainage, i.e., in Lower Cook Inlet saltwater fisheries. The statement that the sport fishing harvest is from an area larger than that which may be impacted is incorrect.

E-3-12/3

The Tyonek Village subsistence fishery is principally supported by Susitna River chinook salmon stocks, not "at least in part" as stated in the text. The Department not only recognizes the subsistence harvest of fish by Tyonek, but is responsible to insure the continuation of this stock of fish.

E-3-13/1

Throughout the discussion, the escapement year is unidentified.

E-3-13/4

Types of individuals or species of fish should be identified.

E-3-16/1

The statement that, "Out-migration in the reach from Talkeetna to Devil Canyon peaks prior to early June and terminates by the end of July throughout the drainage." requires documentation.

E-3-18/2

There are lakes with sockeye in the upper Susitna River (Talkeetna to Devil Canyon reach). The potential for sockeye enhancement in the upper Susitna Basin should also be mentioned.

E-3-19/3-4

Based on the 1982 evaluation of sonar versus tag/recapture Petersen estimates, the latter has been determined to be more representative of escapements than sonar estimates. Therefore, it is recommended that Petersen population estimates be used where available.

E-3-22/1-5

We suggest Petersen population estimates would be more meaningful in lieu of sonar counts for the stations at Sunshine, Talkeetna and Curry. The 1982 evaluation of sonar versus tag/recapture Petersen estimates indicates that the latter are more reliable. Therefore escapement should be defined on Petersen estimates when available.

E-3-24/1-7

The year the data represent is not stated in the text.

E-3-26/4

Eulachon are known to extend as far upstream as RM 58 based on 1981 observations by Su Hydro Aquatic Studies staff. The RM 48 figure provided by Trent (1982) was for 1982 observations.

E-3-28/2

Principal study areas were located in the first mile of the tributaries upstream of their confluence with the Susitna. The reference to upper stream reaches in the fourth sentence should be removed.

E-3-29/1, Subsections 1 and 2

These statements are speculative and cannot be supported by existing data.

E-3-29/2

A much larger number of grayling depend upon the area to be inundated over and above those included in this estimate.

E-3-29/3

Grayling fry were captured at Watana Creek area in 1981, indicating spawning in the immediate vicinity.

The final sentence concludes that if other unidentified conditions are suitable, spawning habitat will not be a limiting factor for grayling. This needs proper referencing and evaluation.

E-3-30/1

Burbot also inhabit Susitna River tributaries, not just the mainstem.

E-3-30/2

Areas downstream from Talkeetna of importance to burbot were identified specifically. The four mainstem sites upstream from Talkeetna should also be specifically identified.

E-3-31/3

The discussion of whitefish occurrence in the impoundment is not clear.

E-3-32/4

The juvenile longnose sucker collection effort was not sufficiently uniform to conclude changes in distribution from the catch per unit effort data.

E-3-37/3

Chinook salmon extend to RM 156.8 (Chinook Creek) not RM 158.2.

E-3-37/4

Resident species of sculpin also occur in the Susitna mainstem. The text should therefore report seven species.

E-3-40/1

Timing for respective salmon use based on 1981 data would be more accurate if changed to:

Coho - 30 July through mid-September,

Pink - 27 July through 20 August.

E-3-41/1

The Arctic lamprey also occurs in the Susitna River above the Chulitna confluence.

E-3-41/5

Based on set net and electrofishing catches in 1982, pink salmon mill in the Susitna mainstem immediately below Devil Canyon.

E-3-43/1

Not all sloughs are overtopped by flows of 20,000 to 24,000 cfs. Examples are Sloughs 10, 11, 14, and 15.

E-3-44/4

Holding areas at the mouth of sloughs are not considered a critical factor any more than "holding areas" at the confluence of many of the chum salmon producing streams. The fact that there are holding areas does not necessarily make the sloughs more productive.

E-3-44/8

In the last sentence, are the authors speaking of a tributary mouth or tributary? In either case, importance of the habitat type for rearing cannot be measured simply by number of fish captured at a site. This is particularly true for tributary mouths because they are part of the downstream and out-migratory pathway where fish may be seasonally concentrated.

E-3-46/4

These are not static populations. The populations of individuals becomes redistributed to favorable rearing habitat locations, including tributary mouths.

E-3-46/7

Chum salmon preference to slough habitat over tributary streams is unsupported. Only index surveys were conducted on tributaries whereas sloughs have been surveyed in total. The 1974 investigations and 1982 ADF&G surveys indicate that tributaries may be equally as important to overall chum salmon spawning in the Talkeetna to Devil Canyon reach as slough habitats.

E-3-47/1

Indian River is a major chum salmon spawning stream. Based on 1974, 1981, and 1982 escapement surveys, this stream supported higher numbers of chum salmon than chinook and coho salmon.

E-3-49/4

Eulachon were found upstream to RM 58 in 1981, and to RM 48 in 1982.

E-3-51/7

Based on 1981 and 1982 ADF&G spawning surveys, sloughs do serve as chum, sockeye and pink spawning habitat.

E-3-52/3

Yes, all species of salmon were recorded in tributaries in 1981 but sockeye were not found in notable numbers. We do know that the Chase Creek system supports a "small" sockeye run. ADF&G surveys are conducted in the half mile reach of tributaries upstream from the confluence with the Susitna River. The balance of the tributaries are not surveyed. If the report is to reflect that all species utilized tributaries, then it would be appropriate to modify Page E-3-46, paragraph 2 which presently excludes sockeye as being present in tributaries.

E-3-55/3

Fish Creek in the Big Lake drainage supports a significant rainbow trout population and also pink salmon.

E-3-62/4

Cheechako Creek is a chinook salmon spawning stream. Chinook salmon spawn both in the creek and the mixing area at its confluence with the Susitna River.

Gravel removal/dam construction will destroy this production area, which is a long term impact. The Cheechako Creek plume area is a spawning site. Will project impacts be mitigated here at least until Devil Canyon is built?

If Tsusena Creek will have the long-term and degree of impacts stated it seems contradictory and optimistic to say it will or can be rehabilitated.

E-3-65/4

Investigations should be conducted to determine the presence or absence of fish in the referenced lake.

E-3-67/3

This is a mid-summer estimate of only those grayling inhabiting the impoundment area and is not an accurate reflection upon the number of grayling that depend upon that same area for spawning, rearing, or wintering.

E-3-68/3

Data are required to support the suggestion that the reservoir may provide additional wintering habitat.

E-3-71/3

The ADF&G studies document juvenile salmon occurrence in mainstem habitats all summer. Catch rates were relatively low, however, and large numbers of fish could be present in low densities over a large area at any time.

E-3-73/4

Water temperatures of 5° to 6°C at Talkeetna during open water period may have major impact on returning adults. If higher flows will reduce temperature, it may be better to reduce flows or find ways to tap warmer layers of water for discharge.

E-3-74/2

The statements in this paragraph are speculative and reflect the need for further study and analysis.

E-3-75/2

Same comment as E-3-74, paragraph 2.

E-3-78/1

The statements here are speculative and not supported by data or references.

E-3-78/3

Beaver dams in Sloughs 9B and 19 did not inhibit use by adult salmon in August of 1982. Slough 9B had a peak survey count in 1982 of five chum and one sockeye salmon on 19 September. Low water condition in mid-August generally precluded adult salmon access to Slough 9 which is the access corridor for salmon using Slough 9B. Slough 19 was essentially void of adult salmon spawning in 1982. Only one pink salmon was observed in this slough and this fish was recorded on 4 August 1982. No beaver dams were present in Slough 19 which would have precluded fish access.

E-3-79/4

Deadhorse Creek (RM 121.0) is not an established anadromous fish stream. Occasionally, one or two adults enter this stream, usually pink salmon. However, no successful spawning has been documented.

Annually, Deadhorse Creek flows go below the surface in the lower one-third mile during the late fall and winter period.

It is questionable whether successful salmon production occurs in Sherman Creek. About 25 pink salmon entered Sherman Creek on or about 12 August 1982, presumably for spawning, it has not been established that the eggs will successfully incubate. The creek flows subsurface in the winter and eggs may be frozen.

Skull Creek (RM 124.7) is another stream which probably will be perched with flow changes in the Susitna mainstem. This creek supports a small chum salmon population.

E-3-80/1

Devil Creek (RM 161.0) would be equally accessible to salmon as Tsusena or Fog creeks. Devil Creek appears to have potential chinook salmon spawning habitat.

E-3-80/2

Data regarding flow characteristics are insufficient to substantiate minimal impacts into Susitna River reaches downstream from Talkeetna. A greater proportion of the Susitna River fishery resources utilize this downstream reach. A small change may affect a proportionately larger resource base.

E-3-80/3

See comments for E-3-80/2.

E-3-80/4

In addition to salmon utilization, the Susitna River reach from approximately RM 4.5 to RM 29 is almost entirely eulachon spawning habitat, sustaining a spawning adult population ranging in the millions of fish.

E-3-81/1

All resident species occupy mainstem habitats during ice free months, not "may" occupy.

E-3-82/1

Eulachon spawning limits extend from approximately RM 4.5 to RM 58.

E-3-82/3

Eulachon do not spawn in backwater or semi-placid areas. Principle spawning areas are adjacent to cut banks where the substrate included deposits of unconsolidated sands and gravels, and riffle zones or bars with relatively moderate velocity and unconsolidated sands and gravels.

E-3-88/4

The statement on sediment in this paragraph contradicts the statement on page E-3-90, paragraph 2, sentence 3.

E-3-90/1

These statements are not supported by data.

E-3-90/3

Ice cover would probably form at RM 114 not RM 14 as presented.

E-3-90/4

The impacts to fish habitat due to backwater and staging processes caused by increased post-project winter flows are not defined.

E-3-90/5

These statements are not supported by data and are speculative.

E-3-95/6

Eulachon do not spawn in backwaters. See comment on E-3-82, paragraph 3.

E-3-98/6

Other species are known to be present. A relatively small population of Dolly Varden inhabits the subject areas along with at least one sculpin species.

E-3-100/3

Additionally, Jack Long Creek supports adult coho salmon. Portage Creek also has spawning populations of chum and pink salmon.

E-3-103/3

Changes in streamflow during open-water seasons will affect slough habitats depending on the flow released. The potential for destroying these aquatic habitats appears high.

E-3-122/5

Does restricting unauthorized traffic mean that project personnel will be allowed to fish and the general public will not be allowed access to the fisheries? This may not be an acceptable form of mitigation during a construction phase that may span 20 years. The Board of Fisheries management decisions will also supercede the stated policy of APA on catch and release fisheries by project personnel. It does not seem likely that the public will be barred from the area while project personnel have exclusive access and use of the fisheries.

E-3-126/4

The lakes for water withdrawal should be identified and their resources inventoried.

E-3-127/2

Individual fish will not necessarily be lost by filling of the reservoir. Fish do not have to be moved through the diversion tunnel. Structural protection from passage through the tunnel is a potential mitigative measure.

E-3-130/3

A 10 percent reduction of flows during a critical and stressful period for fish does not constitute a minor reduction. The potential effect of reducing the November flow have on the recharge of groundwater reserves which will be needed throughout winter should be evaluated. Icing may take place much sooner with reduced flows and be much more severe.

E-3-130/4

There are no data presented to support the statements regarding fisheries impacts at the referenced flows.

E-3-131/5

Pink salmon fry moved out primarily during the ice breakup period. Chums out-migrated primarily following the early run-off period.

E-3-134/2

There are no assurances that responses, i.e., releases of water, will happen quickly enough to keep from losing one year class of fish. By the time the problem appears to be sufficiently severe to warrant correction, it is most probably too late to act. This problem needs to be further examined.

E-3-134/4

We are not aware of testing of this procedure in this area of Alaska, or that the technique is feasible. Additional research needs to be conducted to evaluate the feasibility of the concept of introducing spawning substrate.

E-3-135/4

Data have not been presented to suggest this procedure will work for chinook salmon. It is as likely that suitably sized gravels placed in side channels, given maintenance flow, may attract chum salmon.

E-3-136/3

There is no definition of species to be produced, nor a management scenario. In addition a suitable location for the proposed hatchery facility has not been identified. To be considered a feasible mitigation alternative, these considerations must be included.

E-3-138/3

There are no data or references presented to document the feasibility of this mitigation approach. Altered thermal regimes in the mainstem and side-channels would cause potential pre-emergence of salmon fry in these areas. However, early emergence of salmon fry spawned in sloughs may not result as a consequence of higher mainstem temperatures. Therefore, the proposed feeding and rearing of pre-emergent salmon fry would not be resolved by the proposed spawning channel and rearing ponds (E-3-143-and 144) as mainstem fish would have no access to them.

E-3-138/4

A much larger number of grayling than included in this estimate depend upon the area to be inundated. Also, this is <u>not</u> a wintering population estimate.

Additional Comments on Mitigation

On a more general basis, the attitude implicit in the mitigation plan is that losses are inevitable but unquantifiable, and that some mitigation measures will be implemented but may not work. It is also implied that if monitoring demonstrates inadequacy of a mitigation measure other steps will be taken.

How and by whom will the effectiveness of mitigation measures be determined? Under natural conditions small sub-populations of salmon undergo extreme variations in survival. This will confound evaluation of the mitigation measures and could be a source of continuing conflict between the operators and the resource agencies. The frequent references to alternatives and operations which could be implemented if a mitigation measure proves inadequate puts the burden on the wrong parties. The mitigation aspects of this document are too tentative and too speculative. Substantially more detail and information is required before ADF&G can make a reasonable decision on mitigation methods.

Other additional comments specific to the mitigation section are as follows:

E-3-136 and E-3-140/1

Reference the following statement from the Exhibit E document:
"Since the effective mitigation measures to avoid, minimize, rectify or reduce impacts to the grayling population in the impoundment area are

not available, it will be necessary to compensate for the loss of these grayling. Compensation is proposed to be in the form of hatchery propagation of grayling... Sufficient grayling will be planted such the number [sic] of catchable grayling will be similar to the number lost."

The FRED Division of ADF&G has been experimenting with grayling culture for several years, first at Fire Lake, then Ft. Richardson, and now at Clear Hatchery. We are continuing to work with grayling and intend to develop techniques that someday will support a grayling production program. At this time and for the forseeable future, grayling production in Alaska must be considered experimental. In brief, several factors impact hatchery grayling production:

1. It is difficult to find egg sources that are sufficient in number. Whereas salmon egg takes in the tens of millions are common, a one million grayling egg take is a major undertaking.

2. The eggs and fry are extremely small and from a culturist's standpoint, very difficult to work with. Grayling fry hatch at 30,000 per pound as compared with salmon which are ten times that size at emergence. Marking and therefore evaluation of survival after stocking are not possible with existing technology.

3. Survival from green egg to fry have generally been low - 50 percent as compared to 80 to 95 percent for salmon production.

4. Attempts to rear fry in hatcheries have been largely unsuccessful. The obvious survival advantage that could be gained by releasing larger fish cannot be obtained until techniques are developed which will permit holding and feeding of fry. Grayling have been successfully reared in the lower 48. However, those fish hatch at a larger size (20,000 per pound) and behave differently in raceways.

We intend to overcome these problems as we learn more about the performance of grayling in our hatcheries. However, the idea that an irrevocable loss of grayling due to habitat inundation can be compensated by hatchery propagation must be judged speculative at this point.

The development and operation of spawning channels and the modifications of sloughs, that has been proposed as mitigation warrants further discussion.

Reference the following seven excerpts from Chapter 3, of the Draft Exhibit E document:

1. "The slough habitat for the incubating salmon embryos may be enhanced through increased intergravel flow associated with larger flows, or it may be degraded if the higher flows substantially alter the intergravel temperature regime or ice conditions." [E-3-131]

2. "The [proposed] flows are of sufficient magnitude, however, to undertake to rectifying (SIC) impacts to salmon spawning activity by modifying existing spawning habitat to maintain natural spawning by salmon." [E-3-132]

3. "If further impact reduction is required to maintain existing fish populations, additional mitigation measures will be incorporated. Certain target mitigation issues will receive priority in the monitoring program." [E-3-133]

4. "The outmigration of salmon fry will be monitored to evaluate if proper timing of outmigration is achieved. The basis for such an evaluation will be the baseline outmigration studies and within year comparison to adjacent unregulated systems." [E-3-134]

5. "Success of a multi-level intake depends on the thermal structure of the reservoir, the existence of sufficient water at the desired temperature and location with the reservoir...Temperatures near this [8 to 12°C] range may exist in the top 100 feet...If this layer is present, it can be accessed by the multi-level intake gates..." [E-3-137, 138]

6. "The most significant adverse impact associated with the altered thermal regime would be accelerated incubation and early emergence of salmon fry...The modified sloughs or spawning channels designed to rectify or compensate for lost spawning and incubating habitat will be provided with a rearing pond at their downstream end...

Used to collect early emergents and hold them to prevent their downstream migration...Until appropriate conditions, including temperatures are reached in downstream habitats." [E-3-138]

7. The fry will be fed if natural food production is insufficient to support the number of fry present." [E-3-144]

In response to the above: The major problems appear to be flow alteration with resulting affects on slough access, hydraulics and water temperature. As might be expected, the determination of the degree of impact (loss of habitat and fish) is very difficult to quantify and there is not specific information provided. Instead, engineering solutions are proposed for engineering problems. Modified sloughs also known as spawning channels are addressed on a conceptual level. Somehow it is proposed, that an unquantifiable loss of fish will be rectified/compensated by a multi-purpose habitat modification program which includes channelization, flow control structures with day-to-day flow alteration, gravel cleaning, gravel introduction, enhancement of upwelling, rearing ponds with fry screens on the outlets and artificial feeding of fry.

The engineering, construction and operation of these channels is totally lacking in detail. There are not operational spawning channels for these species in Alaska. Canada has had mixed success, but they are located in environments far more temperate.

The cost of maintenance and operation of these channels should be included in any determination of feasibility. The proposed demonstration project should focus on fish production and survival as well as the physical properties of the modified slough.

The concern about changes in the thermal regime are inadequately addressed. It is apparent that the impoundment temperatures and hence the utility of a multi-level intake are not known. The rearing ponds at the downstream end of the channels may not be effective in accomplishing the desired objective. Emergence of fry will not occur within a short time span but over a period of weeks. Therefore, at any given time the fish in the slough or pond will cover a wide range of developmental stages. A schedule of "release" of these fry into the mainstream must be provided. Once emergence timing is upset due to altered temperatures it is unlikely that survival levels could be maintained by holding them in a pond.

Fry will not automatically feed on an artificial diet, there is an aspect of "training" which is obviously successful in a hatchery raceway. Washington has had some success with pond culture but the fish are generally hatchery lots of similar size.

Assuming that the 'operator' of these sloughs and the proposed rearing ponds determines that artificial feeding is required, how will this be accomplished through the ice cover that may develop on the rearing ponds?

SPECIFIC COMMENTS - WILDLIFE AND BOTANICAL RESOURCES

The following specific comments are intended to illustrate the types of deficiencies in the wildlife sections of the draft Exhibit E. The poor state of editing and overriding major problems listed in the general comments precluded a complete listing of inconsistencies, errors, omissions and other deficiencies.

Page

E-3-279

Rationale for considering alteration of habitat less significant than hazards is not supported.

Increased predation is mentioned on page 284, with no indication of its significance to the population, but ignored in the ranking of impacts. The current moose population is highly impacted by predators. The project is likely to increase the vulnerability of the moose population to predation in several ways. Brown bear and wolf populations are likely to be less affected than moose in the early years of the project, causing an alteration in predator/prey ratios. The project could reduce the availability of spring foods for bears and caribou for certain wolf packs, causing a further increase in predation on moose. The drawdown zone and ice conditions are likely to facilitate hunting of moose by wolves. The moose population may have reduced productivity

because of poorer habitat quality, especially after severe winters, reducing its ability to sustain predation. These factors could allow predation to drive the moose population to very low levels and maintain it there for long periods. Similar situations have occurred throughout much of Interior Alaska. Ultimately predator populations would suffer and any habitat enhancement attempts could fail.

E-3-280

Sections relating to impoundment clearing are inconsistent, illustrating poor editing and confusion about the certainty of mitigative actions. Most sections assume the impoundments will be cleared in a stepwise manner, but on page 306 it says, "If portions of the impoundment are cleared..." On page 286 it suggests a brief increase in forage, but on page 287 it predicts a substantial reduction in value.

Moose are sometimes attracted to areas being logged by availability of branches of deciduous trees.

E-3-283

Overuse of winter range can lead to reduced natality as well as mortality. Moose that never use impoundment areas will be impacted by over utilization of adjacent areas (see page 287 also). This could expand the zone of impact for several decades.

E-3-284

No rationale for concluding that mortality factors will have a negligible effect on the population. Mortality along access routes should be considered along with dam construction activities because they occur together.

E-3-288

It should be possible to quantify areas subject to erosion (and other types of habitat alteration) and estimate the proportion that will revegetate. This is an example of an impact that is mentioned with potential negative and positive effects then dropped. The reader has no idea how much area will be affected and whether the net impact on moose will be positive or negative.

Effects of drifted snow on vegetation, availability of vegetation and phenology are not addressed.

E-3-289-290

See general comments on adequacy of assessment of downstream effects on vegetation. Frequency of flooding (290 first paragraph) is probably very important. No rationale is provided for assessment of the effects of ice scouring on vegetation. The potential effects of scouring should be quantified.

E-3-290

The effects of drifted snow on movements of moose are not mentioned here, but are for caribou (page 298).

E-3-292

Increased mortality resulting from increased predation should be considered. Floating ice during latter stages of breakup could have the same effect as floating debris.

Accidental kills will continue during operation of Watana.

E-3-294

The summary of impacts for Watana comes closest to addressing cumulative impacts. However it is not systematic, ignores some impacts mentioned earlier and contains many subjective judgements that are not supported by quantitative rationale. It also does not include impacts of access routes and transmission lines which must accompany Watana. The uninformed reader is likely to be confused and have no real concept of the range of potential changes in moose populations.

E-3-297

There is no basis for the conclusion that the Nelchina caribou herd will not use the area north of the impoundments at its current population size. It is highly likely that this area of high quality range will be used heavily in the future even at moderate population levels.

Large movements of caribou across the impoundment areas have only been observed once since 1973. Movements were not monitored closely in most years.

It is highly likely that the management goal of 20,000 caribou will be modified, perhaps before Watana is constructed. Therefore the conclusions about level of impact are invalid even if the assumptions about range use were correct.

E-3-298

Statements about drifting snow remaining in the impoundment conflict with statements made in the Feasibility Report. This needs to be clarified and documented.

E-3-298

The most significant mortality factor to caribou could be floating ice. In many years the spring migration to the calving grounds would coincide with breakup of the Watana impoundment. During a period of northerly winds, caribou could encounter open water when they reach the north shore. Seeing no obvious barrier they would start to swim across and would encounter a mass of broken floating ice. This would create a problem similar to floating debris. Mortality could be substantial in some years.

E-3-299

The impression is created that the four possible responses are mutually exclusive. More likely all four responses will be exhibited by varying proportions of the herd.

E-3-300

The statement that the Mount Watana sheep population does not occur near the impoundment is an example of a statement based on a brief period of observation. Sheep have been observed near the impoundment in the past.

E-3-301

All portions of exposed soil at the Jay Creek mineral lick are not used equally. Some of the most heavily used areas are low on the bluff. Therefore the percentage of the lick that would be inundated is misleading. This is also an example of an "operation" impact being discussed under "construction."

E-3-305

Carrion is not mentioned as a spring brown bear food in the first paragraph.

The assumption that spring foods are not important to bears is incorrect. Food intake during periods of stable weight or even weight loss can be absolutely critical because it reduces a negative energy balance. A prime example is the importance of winter forage for moose.

The suggestion that loss of carrion is more important than loss of green vegetation is questionable. A moderate quality, but abundant, food may be more important to the population than a high quality, but sparse, food.

The assumption that, because lactating female brown bear do not use areas that would be inundated, other bears could do well without those areas is not supportable. Females with cubs probably have overriding reasons to avoid these areas. This includes the cub's ability to

travel and the risk of predation on cubs by males. Pregnant females develop heavier fat deposits that probably help sustain them during this period. A female that was not able to coast through this period would probably lose her cubs and move to riparian areas near the river. Spring foods in the impoundments are probably most important to yearlings which emerge from dens in poorer condition, particularly in years following poor berry crops, and suffer the highest rate of mortality. It is unreasonable to conclude that yearlings could survive as well as a lactating female without spring foods.

E-3-303-308

Importance of spring foods to brown bears is inconsistent among "construction," "filling" and "operation" sections.

E-3-308

While bears are capable of crossing the impoundments and some will, there still may be a hindrance of movements between seasonal food concentrations that could reduce productivity of the population. This section is inconsistent with a similar section on black bears (page 310). This is another example of where the potential significance of an impact to the population is not discussed in even general terms.

The fact that healthy bear populations exist where salmon are not available is not pertinent. Salmon are one of several seasonal food concentrations. They are probably most important during years when

other summer foods, such as berries fail. Bear productivity and survival are probably higher because salmon are present and hence the population is generally higher.

The entire brown bear impacts section is filled with unsubstantiated speculation. Most of it is biased towards minimizing potential impacts. It fails to consider how several impact mechanisms may work in combination and how they might influence the population. The impact section should list important foods of bears by season, indicate how the project might influence the availability of each food to bears, and indicate the possible effects of these changes in availability on bear productivity and survival.

E-3-310

The consequences of disturbance of denning black bear during clearing are not emphasized. This is likely to cause problems for both bears and crews. A number of bears are likely to be shot. Many of the disturbed bears will not be able to find new dens and mortality is likely to be high. This can result in a more rapid, more violent and more visible adjustment of the bear population to the project.

E-3-310

There currently is no resident black bear population near the Tyone River confluence and the Fog Lake area supports low densities. Therefore it is unreasonable to expect these areas to support viable populations during operation.

E-3-310

Project facilities may block movements of bears from the Devil Canyon impoundment area to berry areas adjacent to Watana.

E-3-311-312

The entire wolf impact section is deficient in that it fails to adequately address impacts of reduced prey densities.

Caribou populations may be reduced. Even if changes in caribou numbers are minor the distribution is likely to be altered in a way that reduces availability of caribou to specific packs. There <u>are</u> data from the Susitna basin indicating that moose densities influence wolf territory size, pack size and pack stability. Some current territories may be reduced to the point where social factors would cause loss of a pack.

E-3-313

The statement that the amount of habitat lost would potentially affect only two wolverines is not completely accurate. The habitat lost will remove portions of territories of a number of wolverines, not all of only two territories.

E-3-314

Impacts of prey loss on belukha whales is inadequately addressed. This section appears to focus on adult salmon only. Outmigrating salmon and eulachon are more likely the foods attracting belukhas to the area. Eulachon in particular may be important. Until effects of the project on the availability of these foods are determined, no conclusions on impacts on belukha can be drawn.

E-3-340

Statements of climatic effects should be documented and quantified with regard to magnitude of impact.

Elimination of ice scouring is suggested as a benefit, yet ice scouring may be the most important factor maintaining early successional stages north of Talkeetna (on page 289 reduction in ice scouring is seen as detrimental). Even the potential short term benefits may be offset by current shrub communities advancing to more mature stages.

E-3-341

The flow regime would be used for fisheries management and its affect on vegetation should be identified. It could prevent vegetation of newly exposed substrate and further offset the potential benefits suggested on page 340.

E-3-340-342

The discussion of downstream effects of Devil Canyon Dam are misleading. On page 340 it states "moose may benefit from an increased availability of riparian habitat." Then, on page 341 it points out that much of the habitat will not be available in winter because of open water. (The potential effects of ice fog on use of these areas by moose is ignored.) Finally on page 342 it pulls the two statements together and states that effects on moose could be "moderate to

severe." Then on page 370 it says changes in vegetation will have a "small population - level effect."

This is an example where the combined effects of several impacts have not been clearly thought out. The full range of possible changes in vegetation has not been discussed, only the most optimistic possibilities. When one of several potential overriding factors is identified, the acreage affected is not quantified.

A far more enlightening impact assessment should be possible by building a simple model with existing data. The analysis on page 172 takes a step in the right direction but does not carry it to a useful conclusion. It crudely estimates the maximum acreage that could become available for vegetation. This should be refined to estimate the amount that would enter productive successional stages annually during the life of the project. Uncertainties about rates of colonization would produce a broad range of estimates, but the order of magnitude of change and more importantly the chronological patterns of change should become apparent. Similar estimates for currently productive habitat that will advance to mature stages should be subtracted to provide an estimate of net change in acreage of value to moose. The proportions of this acreage that occurs on islands and would be inaccessible to moose during winter should be subtracted to produce a crude estimate of possible changes in available winter range.

A similar systematic approach should be applied to all areas that might be subject to habitat loss or alteration. Impacts that show a

potential for serious effects can then be studied in more detail to refine the estimates for mitigation planning.

E-3-342

Devil Canyon impoundment will primarily affect <u>different</u> moose than Watana. Therefore the statement that moose population will have already been greatly reduced is misleading. The summary of impacts uses the word "minimal" five times in reference to impacts on moose in the upper basin, but completely fails to convey any impression of the range of population changes that could occur during the life of the project.

E-3-343

"... small proportion of acceptable black bear habitat ..." What proportion of what area? How important is that proportion?

E-3-350

The orientation of access routes in relation to wildlife concentrations and movement patterns should be considered. Some subpopulations will be more heavily impacted than others. Mortality and habitat loss from access routes should be added to other impacts affecting the same subpopulations during the same time periods.

E-3-351

Impacts of road and railroad traffic start at tidewater. Increases in unscheduled traffic on existing roads, particularly the Parks and Denali Highways are likely to be substantial. Levels should be estimated and impacts assessed.

E-3-352

The timing of railroad and highway traffic is more important than an average rate. Both seasonal and diurnal patterns should be considered. Scheduling of traffic should be considered as a mitigation measure.

Secondary impacts of access routes, other than hunting, should be considered.

Combined effects of access potential of transmission corridors and access routes should be considered.

E-3-355

Caribou calving north of the Susitna River is sufficiently dispersed that no alignment of the Denali access road will avoid calving areas completely.

E-3-356

Frequency of traffic will be substantially higher during construction unless unscheduled traffic is restricted.

E-3-355-356

It is not always clear which "herd" is being referred to. The Denali access road runs through a central part of the upper Susitna-Nenana subherd's range. It also runs through one of the highest quality portions of the main Nelchina herd's range. Use of the word "peripheral" is highly misleading.

Potential cumulative effects of the access routes and impoundments on caribou range use should be discussed.

E-3-359

Potential alterations of prey distribution, especially caribou, on specific wolf packs should be discussed.

E-3-360

The access routes will provide excellent access to tundra habitats. Therefore human use of areas important to wolverine during summer will increase.

E-3-366-368

Transmission corridors should be considered along with other impacts. For example where they intersect the range of a subpopulation the changes in habitat quality should be added to changes caused by other project features within the range of the same subpopulation.

Placement and management of transmission lines in proximity to roads and railroads can influence animal movements and rates of mortality. For example moose train collisions could be greatly increased if a transmission corridor attracted moose in a manner that increased crossings of the railroad.

E-3-370-371

The big game impact summary is completely inadequate. It addresses only impacts on existing populations. It ignores many impacts, including some judged substantial, suggesting that these need not be mitigated. It conveys no impression of the potential magnitude of change, even in current populations. The one effort at quantification uses the smallest possible number of moose that would be impacted by one mechanism. Even those numbers are stated in a misleading way. They are numbers estimated on one survey during a mild winter. There is no basis for the statement that this represents "most years," and it certainly does not represent even a minimum number of moose that would be eliminated by the project.

Appendix C

Susitna Hydroelectric Project, Draft Exhibit E
Volume 3, Chapter 5
Socioeconomic Impact

GENERAL COMMENTS

The ADF&G has continuously expressed concern regarding the adequacy of socioeconomic studies relating to the determination and assessment of potential impacts of the Susitna Hydroelectric project to fish and wildlife. Expression of these concerns dates back to initial meetings with the Alaska Power Authority in 1979. The original study plan developed by the ADF&G in 1979 contained an objective designed to assess these very impacts.

Upon review of this chapter, these concerns remain. In our view, little substantial progress has been made to define project related socioeconomic impacts.

Impacts to fish and wildlife users have not been adequately addressed, either in the areas most directly effected by construction or those areas outside the immediate project area. Portions of the fish and wildlife resources produced within the Susitna project area are harvested or utilized in other more distant regions. There needs to be an assessment of these uses of fish and wildlife with regard to (1) identification of resources used; (2) quantification of use levels; (3) description of use patterns including seasonality, its context within the local communities, etc.; and (4) description of geographic areas of use.

Throughout this chapter reference is made to current and/or planned studies. These studies, however, are not described, objectives are not presented and time of implementation or completion is not defined.

SPECIFIC COMMENTS

Page/Paragraph

E-5-6/1

Only characteristics of personal monetary income have been described. There should be some description (especially in the Local Impact Area) of relative importance of natural resource harvests as part of the household income. Any income determination need not necessarily be made in monetary terms, but should be done (1) qualitatively by (a) assigning importance values to the harvest and use of each resource; (b) assessing culturally significant practices; (c) describing the type of economic organization of the area; and (2) quantitatively by (a) assessing amounts of time spent harvesting resources; (b) assessing estimated proportions of household food consumption; (c) determining amounts of money spent in pursuit of wild resources; and (d) expressing the overall output or consumption of a household unit.

E-5-12/4-6

This section on recreational facilities related to fish and wildlife resources would be more appropriately termed recreational opportunities. This area has an abundance of opportunities but little development like trail systems, shelters and other man-made facilities. A full assessment of the use of these opportunities and existing facilities would be appropriate. Certainly there is information available on Mt. McKinley National Park and the State park recreation areas.

E-5-54/4

The indirect influences affecting commercial businesses dependent upon fish and wildlife resources as discussed are undefined.

E-5-54/5

The "partial short term displacement" as discussed is not defined. The statement made that with increased access, business opportunities will increase is purely speculative. One might also expect business opportunities to be reduced as a result of increased access, particularly if the business is associated with the commercial use the of limited fish and wildlife resources.

E-5-54/7

This paragraph indicates similar factors are necessary for both successful lodge and guide operations. This statement is incorrect.

Commercial lodges are most successful with improved access and visitation by large numbers of visitors or customers. With construction of new roads, railroads and airstrips the project area would appear to best fit this category.

A big game guide, on the other hand, appreciates and can tolerate less competition from additional hunters and recreational visitors. His type of business best functions at low levels of human activity and participation.

E-5-54/8

Loss of additional habitat, and the change in location and amount of salmon harvested as stated requires definition. The statement "long term" impacts to Cook Inlet fishermen and other fish and wildlife users will be small, is speculative. Long term is not defined, nor are "other user groups," or "recent activity levels." No supportive data or study results are presented to support this statement. Types of on-going studies should also be clarified and referenced.

This entire section includes many categories of users who are not licensed. Trappers and subsistence users, for example, are not

required to have business licenses to operate. The definition of business needs to be presented.

SECTION 3.7, LOCAL AND REGIONAL IMPACTS ON FISH AND WILDLIFE USER GROUPS

General Comments

1. Organizationally, the section of FISH is not comparable to that of GAME which make it deficient in the presentation of vital information:

   a. It makes no mention of guided sport fishing activities which are a major use of the Susitna River and its tributaries.

   b. No mention is made of fishing lodge operations dependent on Susitna River fisheries.

   c. No category comparable to that of "The Hunter," E-5-75, is made for sport or subsistence fishermen.

   d. The category "Resources" on E-5-75 elaborates on game resources, their characteristics and the users of those resources. Only limited information is currently available pertaining to recreational and subsistence uses in the Susitna River Basin. There is a need for additional data collection.

e. In the Game section, no "Methodology" is presented as it is for Fish.

Although it may be true that impacts to the fishery resource depend upon loss of habitat and subsequent loss of fish, the issue in this section (3.7) is also the impact upon user groups. In this case, the methodology in this chapter should address both impacts to the respective user groups, and to fish and wildlife resources.

Specific Comments

E-5-68/1-3

This section is labeled "Methodology," but provides no methods appropriate to the evaluation of impacts to user groups. Implicit in this type of evaluation is the need for a measure of existing use. The only statement defining methods is included in Paragraph 2 which described data used to determine impacts of the dam on the fishery resources. It should be noted that pink salmon are more abundant on even years than on odd numbered years. As such, 1981 was a year of low pink salmon occurrence.

E-5-68

A survey of community usage of wild resources by Cantwell would be useful in assessing levels of use and importance of the salmon, moose, caribou, and other resources.

The Cantwell area is likely to be affected by (1) wildlife population fluctuations due to construction activity; (2) population fluctuations because of increased hunting pressure which could result from (a) increased human population, and/or (b) increased access to resources.

While local residents may not appear as a "significant" portion of the overall harvest, those resources may very well be important to the community in many ways.

E-5-68/4

The assumption is made in the first sentence that "...the commercial fishery for salmon produced in the Susitna system occurs only in Upper Cook Inlet." This assumption is invalid since Susitna River salmon stocks are harvested throughout Cook Inlet, including the lower district. Impacts to Susitna River fish are indeterminable because it is not possible to separate the mixed salmon stocks as they migrate through Cook Inlet.

E-5-68-69/5

The monetary figures presented here cannot be used to determine the specific financial loss of Susitna fish, because of the mixed stock (see comment E-5-68/4). Many of these fish are Kenai River or Kasilof River fish.

E-5-69/3

The first sentence states "The specific impacts which would result from construction of the Susitna dams have not been determined in a manner which allows accurate quantification." This statement invalidates comments in E-5-70/1-3, and statements in other Draft Exhibit E report chapters.

The paragraph does not address impacts to Susitna River salmon resources downstream of Talkeetna. Greater salmon occurrence exists in these areas, than does the area further upstream of Talkeetna.

E-5-70/3

Chinook salmon are harvested incidentally by commercial fishermen in both upper and lower Cook Inlet. Project impacts to these users requires definition as do the criteria for establishing "significant quantities" as stated.

E-5-71/1

Personal communications with sport fish biologists should be properly cited.

E-5-71/2

The discussion indicates the area and level of impacts to resident and migratory fishes is not determined. Chapter 2 and Chapter 3 of the Draft Exhibit E present relatively detailed presentations of these impacts.

The statement, "Data on specific angler use of the Susitna and tributaries above the Talkeetna River confluence are virtually nonexistent." is incorrect. Data are available on angling use in this area from the ADF&G Statewide Harvest Survey.

Impacts are limited not only to areas upstream of the Talkeetna River confluence, as implied. Sport harvest of stocks utilizing the upper Susitna River are thought to occur elsewhere in Cook Inlet, as far south as the Homer area.

E-5-71/4

Table E.5.40 as referenced in the paragraph omits burbot in the list of major species. This paragraph states study is underway to define recreational values of Susitna River fisheries resources which may be

impacted by the project. We are unaware of these studies, and they should be referenced.

Section Summary:

The sport fish discussion is not complete nor does it compare with the commercial section in the presentation of figures and numbers. For example, population estimates are available for several species as are data regarding recreational utilization. These data are not presented. The research mentioned as "currently underway" is not referenced.

E-5-71/5

Generally, the section on Subsistence Fishing is based on the assumption that the harvests which occur in Cook Inlet are from the Susitna River. This assumption is not necessarily true as most of the effort occurred in the Central District where Kenai and Kasilof salmon stocks are taken. Information in Stanek (1980) indicated the residency of subsistence permit holders. Net survey information (Stanek, unpublished data) is available depicting general areas utilized by subsistence fishermen in the Northern District. Similar information is available for the Central District (ADF&G, 1980).

Additional assessment of user groups should be made under the category of domestic use of salmon. Salmon for domestic use is obtained from commercial, sport and subsistence fisheries.

Information on use of salmon resources in Tyonek is also available (Stanek and Foster, 1980). More recently, data were collected during the spring of 1982 on the specific uses of salmon by Tyonek residents (Foster, 1982). It is assumed that most of the chinook salmon caught in the subsistence fishery at Tyonek are Susitna River fish.

E-5-72/2

The value of "subsistence" caught fish cannot adequately be determined using a shadow price. Usher (1976) described the difficulty in determining the value of wild foods. The "point of subsistence capture estimate" would not adequately estimate value. A more appropriate value would be the processed cost. In addition, the nutritional value, cultural value, and equipment investment must be added as cost qualifiers.

It is also stated that value might be determined using "...the price of an equally desirable alternative food source." A major question would be how an equally desirable food would be determined when, for many people, there is not a better source in terms of quality, nutritional value, cultural value, social value and recreational value. Indeed, salmon is <u>the</u> standard by which value is determined.

E-5-73

Under the category of Game there is no section on methodology as under the Fish section.

In the section on "Guides and Guide Services" there is no quantification of the number of guides operating in the area or their revenue. In addition quantification of the numbers of people providing outfitting and transporting services that are not guides is required. Information is available from the ADF&G and from the Guide Licensing and Control Board.

E-5-74/2-3

There is no discussion of available data (Phase 1 of big game reports) that provide estimates of losses of animals, effects of access, new hunting regulations, etc., that would influence "available harvestable animals."

In the category of "Lodge Operators" no indication is made of the amounts of services and relative value of services furnished.

Many additional lodges on the highway system provide services to the individuals who hunt along the highway system or who use the highway system as a point of departure.

E-5-75/2

Apparently the intention of the statement "The impact of the proposed project on the lodge operators would be indirect and of the same nature as that of the guiding industry." is that any direct impacts would be upon the resources. However, in the case of the inundation of land areas utilized for hunting, camps and travel, the impact would be direct.

E-5-76/2

Reference to the figure 71,000 animals must be put into proper perspective with regard to the present management for the population and range carrying capacity.

E-5-76/3

The information presented deals with the residency of hunters rather than the experiences they seek.

E-5-77/1

A comparison is drawn between hunting pressures or numbers of hunters during the early 1970's and 1980's. Hunting pressure is a function of the number of permits and the number of animals in recent years. This paragraph is misleading and, in fact, the comparisons are invalid.

E-5-78/5

The category "Experience Sought" is inappropriate for the informational content of this section. It provides information on characteristics of user groups.

E-5-79/2

Although harvest ticket reports allow for the reporting of multiple means of transportation, analysis of the data allow for only one primary means of transport. The use of highway vehicles is the most common method of transport to the general area. Within the area, however, other forms are more common.

E-5-80/1

References should be noted with regard to who is doing the studies and their schedules for completion.

E-5-80/2

The first sentence is misleading and inaccurate because the implication is that regulations will be of greatest impact to the users. Regulations are a function of resource status and user groups characteristics. Those regulations which may be promulgated due to any reduction in quantities of resources are a reflection of resource status and perhaps increased user access to the area.

The statement, "In such cases, the project would cause little or no additional reduction in hunting opportunity." when referring to already stringent regulations on some species is inaccurate. Indeed, some regulations are more stringent as with caribou, but may become even more stringent if range is inundated and the area of available habitat is reduced. Regulations on increasing numbers of moose in the region may be relaxed in the near future, but if these prove unsatisfactory and mitigation measures do not compensate for moose losses in the impoundment area, further restrictions may be required.

E-5-80/3

The statements indicating that regulatory structures will be the major impact on the user is misleading and inappropriately identified as the major impact on the user.

E-5-80/4

There is no indication of how the quality of the surrounding environment will be changed thereby affecting the expectations of the user.

E-5-81/2

Subsistence users in the region have not been identified with regard to the use of game resources, except caribou. In this case, a set of criteria were developed which qualify a certain number of people on a

first-come first-served basis. For other game resources, further work is required to determine resource use patterns. Information provided in the text refers only to caribou.

Although "bringing home food meat may be the 'main goal,'" there are other goals of the user. These include (1) obtaining a high quality goods at a relatively low price; (2) fulfilling certain cultural traditions and obligations to the community and/or family; (3) attaining goals of self-determination and independence of welfare programs; and (4) attaining the knowledge and ability to support one's self.

E-5-82/3-4 & E-5-83/1

Data limitations on trappers do exist; however, a survey of trappers in the Local Impact Area would be appropriate.

E-5-84/5

The term "on balance" is unclear. There is some question as to whether existing trappers will benefit or if there will just be more numbers of trappers due to access. It is doubtful that increased access to the inundated area will, in fact, benefit trappers since fluctuating water levels will not benefit more aquatic species especially if draw-downs occur during winter months where food caches and burrows may become inaccessible.

E-5-85/2-3

Construction of access roads and transmission lines may provide added access to some areas for trappers. However, the loss of habitat and increased pressure on martens from trapping and human activity generally may reduce the numbers of marten and thereby be a major loss to trappers. Paragraph 3 more accurately portrays likely impacts than does paragraph 2.

E-5-86/3-4

The assessment of trapping activity and its importance to users in the Local Impact Area should be more extensive. There is some confusion as who an Alaskan trapper is, compared to "recreational" trappers who supplement their income by trapping. Especially when, as stated in paragraph 4, "It is estimated that there are a large number of residents in the Local Impact Area who do some trapping on a part-time basis...," more information is required on how large this group is and the level of importance trapping is to them.

E-5-88/4-6

There is no mention of what people's attitudes were toward changes in section other than 3.1 and 3.5. Because natural resource use is important in the area, there should be some indication of local attitudes toward changes in the availability of resources.

It therefore follows from E-5-89/3 that only the attitudes presented with regard to section 3.1 and 3.5 are addressed.

No further mention is made regarding measures to mitigate impacts to resource users. There should be some indication as to what can be done to resolve the impacts.

Appendix D

Susitna Hydroelectric Project, Draft Exhibit E
Volume 4, Chapter 7
Recreational Resources

GENERAL COMMENTS

This report segment lacks supportive data for many statements related to project impacts. Statements or discussions are often simplistic, based on faulty assumptions and methodologies; and lack the necessary definitions to provide adequate project impact analysis.

In general, analysis of current trends in recreational boating and fishing in Upper Cook Inlet, leads to the conclusion that many of the recreational use projections in this report are far too conservative.

Discussion of project impacts in some instances is limited only to statements that anticipated impacts are similar to others discussed, or to other impoundment projects. The specific comments that follow will demonstrate many of these deficiencies.

SPECIFIC COMMENTS

Page/Paragraph

E-7-13/2

Fairbanks is not considered to be within the Southcentral area of Alaska.

E-7-13/3

The paragraph implies members of the Knik Kanoers and Kayakers are representative of the overall increase in recreational boating within the Susitna River basin. They are not, as they comprise only a minor segment of the recreational boating users. Substantially greater increase in boating, and water oriented recreation with other types of watercraft has occurred.

E-7-15/3

Lake Susitna, Tyone Lake and Tyone River are already major recreation areas. They are not potential areas for "future development" as stated in the text. Both Lake Susitna and Tyone Lake have numerous recreational cabins located around their perimeters.

Boaters are <u>not</u> able to float down the Susitna River and up to Lake Louise as stated. Powered watercraft are necessary (often equipped with jet or air-drive propulsion) to ascend the Tyone River, to Tyone Lake.

E-7-20/1

We are not aware of any recreational boaters traveling upstream on the Talkeetna River to Stephen Lake for fishing, due both to the distance and presence of major rapids on the Talkeetna River.

E-7-21/2

See comment (E-7-20/1)

E-7-24/2

Management of lands for public recreation and appreciation as presented in the paragraph requires additional clarification. It is not clear what will be accomplished to achieve these goals.

E-7-25/1

This paragraph refers primarily to wildlife related impacts, and little mention is made of potential fisheries impacts. In addition to quarry activities discussed for Tsusena Creek, it can be anticipated that the lower reaches of all Susitna River tributaries within the impoundment may be effected by vegetative clearing, road construction, gravel removal, as well as the stated water quality changes.

Paragraph one also implies the actual construction area is a relatively minor one. It in fact will be almost 50 miles in length, and one which does not constitute only a minor inconvenience to recreational users.

E-7-25/2

As in the previous paragraph the discussion is directed primarily to wildlife and wildlife related impacts. The discussion fails to address the fact that the lower reaches of all clear water tributaries to the Susitnà River, within the impoundment, will be inundated. These areas are the most valued aquatic habitats at present, and are the areas where all recreational use currently occurs.

E-7-25/5

This paragraph does not clarify why fish populations are not expected to occur in the impoundment. Statements in Chapter 3 (fish, wildlife & botanical resources) indicate the impoundment waters are expected to provide additional fisheries habitat.

The apparent inconsistency in these statements, and report segments, requires clarification.

E-7-25/6

This paragraph is unclear as to locations of areas where sport fishing will be disturbed. Dredging reference is to "channel" but does not clarify if it is within the Susitna River or the tributaries where sport fishing currently occurs.

Additionally, dredging may create impacts other than just changes in water quality as stated. Quarry activities, road construction and resultant recreational use restrictions as a result of these activities are not discussed.

E-7-26/1

The flows predicted during the fill period will not only "temporarily diminish" fishing opportunities as stated, but will totally eliminate some of the slough and side channel habitats. The effects of slough dewatering during the fill period may result in the loss of several year classes of some species of fish, creating not a temporary impact, but a "long-term" one.

E-7-26/2

There is no information to support the statement of increased fishing opportunities with increased winter turbidity levels as stated.

E-7-28/1

No data exist to support the statement that the presence of construction workers will not have detrimental effects to the recreational resources, nor is there an adequate discussion of what constitutes "proper control."

E-7-28/2-3

References to the impacts of 550 workers, the loss of 32 miles of river, construction of a 34-mile road, and current uses of the river are treated superficially. Impacts to recreational resources resulting from improved road access alone will affect not only waters within the impoundment but those of adjacent areas as well.

E-7-29/3

This paragraph is speculative. No data are presented to support the statement that winter fishing is unaffected by increased turbidity levels. The increase in turbidity levels requires definition.

E-7-30/3

No data are presented to support the assumption that recreational use is non-specific to the area, and can simply be moved to adjoining areas. A definition of subject species and recreational uses discussed is required.

E-7-37/4

Data extracted from the 1970 report should not be used when similar data from the 1976 and 1981 reports are available. Existing ADF&G data suggest that per capita participation days and projected increases as published in the 1970 plan, and for demand estimation, are inappropriate for 1980 and 2000.

E-7-38/1

Quality is not the same for all activities and should not be discussed as though it were. The assumption that travel time and cost totally influences recreational use is faulty.

E-7-39/4

Data in this paragraph are interpreted incorrectly. A careful review of the evidence cited does not suggest that fishing effort has been decreasing in the impact area, or even that it has decreased relative to statewide trends. Areas used for yearly comparisons do not represent the impact areas. In addition, areas used for comparison were not the same from year to year.

E-7-40/4

No data are presented in this paragraph to support the assumption of a declining recreational demand in the Susitna River area. The

discussion does not define the other "attraction values," nor does it address the increasing recreational needs of an increasing human population in the railbelt area.

E-7-41/4

The doubling of recreational use as presented is considered conservative. With the addition of a road system into the upper Susitna River area and the expanding human population, greater increases are expected to occur.

E-7-41/6

With the decreased flows downstream from Devil Canyon dam, and improved road access to the dam site, we would expect <u>increased</u> days of recreational use by kayakers, canoers and rafters.

Appendix E

Susitna Hydroelectric Project
Draft Exhibit E
Volume 4, Chapter 9
Land Use

GENERAL COMMENTS

This document is written in such a general manner that it is difficult to comment on. It contains information that contradicts statements made in other chapters, and ignores potential impacts to land use and access downstream from Gold Creek.

Although mitigation of impacts to land use is mentioned, there is no commitment to implementing possible measures. In addition, there is no discussion of which measures will be implemented or when or how. Some impacts to land users are completely glossed over and it is suggested that users will have to accept impacts or move elsewhere.

SPECIFIC COMMENTS

Page/Paragraph

E-9-2/7

Activities such as consumptive, recreational or subsistence use of fish and and wildlife resources are considered as dispersed use and isolated non-site-specific activities which do not involve a commitment of resources at any particular site.

Harvest, and production of harvestable resources is specifically dependant on a commitment of a specific amount of land (habitat). Participation in the harvest of fish and game (levels of effort) is therefore site-specific. Consequently, the loss of species habitat including the lands and waters used as harvest areas will have a measurable impact both on management of wildlife and on public use.

E-9-3/5

An assumption is made that because the project is isolated and located in a subarctic environment, extremely low density land use results. However, use of land both by the public and wildlife is seasonal and can be very high for a specific season.

E-9-15/3

Hunting use of Zone 1 is less than in Zones 2 and 3. However, hunting in Zones 2 and 3 is basically associated with the existing lodges and cabins and is more readily quantifiable than identifying independent hunter effort. Use of ADF&G harvest statistics would help quantify independent hunter effort.

Figure E.9.5

Reference to rating public use of lands occurs throughout Chapter 9 and is ultimately reflected in Figure E.9.5 a map which identifies 11 use or sample use sites with evaluations of use intensities for each site.

The designation of Low, Medium and High intensity uses should be defined.

E-9-32/1

Proposed mitigation for the loss of public use of project lands has only addressed the consideration of establishing restrictive access regulations. Other mitigation alternatives should be identified including replacing opportunities lost with lands that provide equal value.