Appendix F

AGENCY CONSULTATION

Appendix F

List of Agency Consultation Meetings		
Date	**Agenda**	**Attendees***
02/21/84	Confer on fish mitigation consultant proposal evaluation and consultant selection.	WDF, WDG, TT, NMFS
06/12/84	Field inspection of powerhouse and passage berm; discuss Project operation and finishery issues.	WDF
06/22/84	Discuss study scope of work; fish behavior issues; and life cycle requirements.	WDF, WDG, TT, NMFS
07/31/84	Field trip to observe powerhouse operation; water discharge; fish passage berm study.	WDF, TT, NMFS
01/13/85	Flat trip/field meeting to select test sites.	WDF, WDG, TT, NMFS, FWS
01/29/85	Project operation and District power supply and management issues.	WDF, WDG, TT, NMFS, FWS
02/28/85	Flat trip/field meeting on test sites.	WDF
03/19/85	Discuss study results, implications to salmon, and Project operation.	WDF
04/23/85	Field trip to check on ramping rate test results.	WDF, WDG, TT, NMFS
06/19/85	Progress report to Joint Agencies and discuss study results.	WDF, WDG, TT, NMFS, FWS
03/20/86	Present study results; fry stranding potential; side channel considerations; Project operation; review draft report.	WDF, WDG, TT, NMFS, FWS
03/04/87	Status report; identify remaining tasks; interim report to the FERC.	WDF, WDG, NMFS, FWS
03/24/87	Field trip to check on ramping rate test results.	WDF, TT
03/22/89	Confer on draft revision to Exhibit H; Jackson Project Operating Plan.	WDF, WDW, TT, NMFS, USFWS
05/01/89	Confer on draft revision to Exhibit H; Jackson Project Operating Plan.	WDF, WDW, NMFS, USFWS

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07/25/84	District	WDF	Reply to WDF 07/02/84.	F-7
08/16/84	District	Joint Agencies	Study scope of work.	F-9
08/31/84	WDF	District	Agency comments on study scope of work.	F-17
09/05/84	WDG	District	Agency comments on study scope of work.	F-21
09/05/84	NMFS	District	Agency comments on study scope of work.	F-23
09/06/84	FWS	District	Agency comments on study scope of work.	F-25
05/16/85	District	Joint Agencies	Progress report.	F-27
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03/06/90	District	WDF	Request to reconsider Operating Plan comments.	F-119
03/12/90	WDF	District	Acceptance of Operating Plan downramping rates.	F-123

[a]WDF--Washington Department of Fisheries; WDG--Washington Department of Game (now Wildlife); TT--Tulalip Tribes; NMFS--National Marine Fisheries Services; and FWS--U.S. Fish and Wildlife Service.

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SNOHOMISH COUNTY
PUD
PUBLIC UTILITY DISTRICT No. 1

2320 California St., Everett, Washington 98201 258-8211
Mailing Address: P. O. Box 1107, Everett, Washington 98206

June 19, 1984
PUD 15242

Mr. Lynn Childers
U. S. Fish & Wildlife
2625 Parkmont Lane S.W.
Olympia, Washington 98502

Dear Mr. Childers:

RE: Sultan River Project
Anadromous Fish Study - Powerhouse Ramping Rate

The District has selected the firm of CH2M-Hill as the leading candidate to conduct the study. To follow up on comments made by the joint agencies during proposal review about interest in scoping, you are invited to a study scoping meeting which is scheduled to follow the 1:30 p.m. on June 22nd on the fish berm study at Parametrix's office in Bellevue. Their street address is 13020 Northup Way, Suite 8.

Until after the meeting the consultant is doing very limited work on scoping. To enhance meeting productivity, a copy of the CH2M-Hill initial proposal is enclosed for your advance review and memory refresher. Roy Metzgar is the District's contact for this purpose (258-8560).

Yours very truly,

L. R. Grimes

L. Chet Grimes
Chief, Generating Resources

Enclosure

STATE OF WASHINGTON
DEPARTMENT OF FISHERIES
115 General Administration Building • Olympia, Washington 98504 • (206) 753-6600 • (SCAN) 234-6600

WILLIAM R. WILKERSON
Director

July 2, 1984

Mr. Edward K. Aghjayan, Manager
Snohomish County PUD #1
P. O. Box 1107
Everett, Washington 98206

Dear Mr. Aghjayan:

Down-Ramping of the Pelton Turbines
at the Sultan River Hydroelectric
Facility

Washington Department of Fisheries (WDF) in cooperation with Seattle City Light, has recently completed a study of the effects of down-ramping and the stranding of salmon fry in the upper Skagit River. This study, which is presently in final draft form, showed that down-ramping during the night at the Skagit River Gorge Dam hydroelectric facility consistently caused significantly less salmon stranding mortalities than down-ramping during hours of day-light (1/2 hour before sunrise to 1/2 hour after sunset). Because of these results, WDF requests that down-ramping of the Sultan River project occur during the night in a manner that would allow the river, downstream of the powerhouse, to stabilize prior to 1/2 hour before sunrise. We believe adoption of this operational procedure will be beneficial to the salmon resources of the Sultan River as losses due to stranding will be minimized.

WDF realizes it may be necessary to down-ramp the Project during day-light hours. If such a situation arises, we request that the down-ramping occur at the slowest rate possible, but not to exceed 6" per hour, when flows are less than 600 cfs as measured at the powerhouse gauge. This is in contrast to the license requirement of 6" per hour down-ramp rate without regard to the river stage.

WDF appreciates Snohomish County PUD's involvement with the resource agencies and Tribes in the development of a flow release plan which will protect and possibly enhance the salmon fisheries resource in the Sultan River. Your adoption of the down-ramping changes will further protect the resource by lessening the occurence of stranding mortality.

As was mentioned at a meeting on June 22, 1984, use of the information developed from the Skagit River and other studies will significantly decrease the scope and cost of any stranding study planned for the Sultan River. As promised, a copy of the Skagit Stranding Study Report will be made available to you when it is in final form. If we can provide additional clarification or information regarding this matter, please contact Mr. Bob Gerke or Mr. Ken Bruya at (206) 753-3624.

Sincerely,

Robert J. Gerke/for

William R. Wilkerson
Director

SNOHOMISH COUNTY
PUD
PUBLIC UTILITY DISTRICT No 1

2320 California St., Everett, Washington 98201 258-8211
Mailing Address: P. O. Box 1107, Everett, Washington 98206

July 25, 1984
PUD 15474

Mr. William R. Wilkerson
Director
State of Washington
Department of Fisheries
115 General Administration Building
Olympia, WA 98504

Dear Mr. Wilkerson:

RE: Jackson (Sultan) Project - FERC No. 2157
Down-ramping Operation of Pelton Units

Your letter of July 2nd addressed to Mr. Edward K. Aghjayan requested that down-ramping of the Pelton units, which discharge directly to the river, occur during the night so that the river is stabilized one-half hour before sunrise. Prior to the written request, the same rampdown procedure was requested verbally by Mr. Gerke during an earlier site visit.

Since that time, the District has honored that request in planning the operational schedule for power production by the Pelton units (Nos. 1 and 2). Initially, however, we did not recognize or misunderstood the desire for flow stability also prior to daylight. Subsequent discussion with WDF and other joint agencies' personnel clarified that point for us and operational procedure schedules were further modified accordingly. Furthermore, on the infrequent occasions when a daylight down ramp was required, a rate of three inches per hour was met. We have been able to implement your requests due to the operating conditions this year. However, we can not assure you of such operation in the future throughout subsequent operating years.

During start-up and testing procedures, and in this initial operating season, the District has intentionally chosen a conservative course of action regarding any flow requirements for the fish. The preferred night down-ramp procedure is, however, a significant limitation on project operation. The District will be very interested in reviewing the results of the pending Skagit River Study report regarding fish stranding. Also, the results of pending studies of this issue on the Sultan River will have important bearing on project down ramping.

Down-ramp during daylight hours was at the slowest rate allowable with the equipment during a recent operational demonstration of different discharges to the river for joint agency observation related to scoping the fish passage study. That down-ramp schedule requires over eight hours to complete from full power to minimum instream flow at the powerhouse stream gage.

The District is aware of the agencies' concern about stranding mortality and the lack of supportive ramping rate information for the Sultan River and project operation. We recognize and appreciate the assistance from the joint agencies to the District during project planning, licensing, construction and initial operating. We desire to maintain the positive and cooperative atmosphere experienced thus far. In that spirit, we will attempt to comply with your request while obtaining essential information regarding operation effects of the project on the Sultan River as required by the Settlement Agreement.

Yours very truly,

J. D. Maner
Executive Director
Utility Operations

cc: Mr. G. Engman
Department of Game

Mr. J. Linvog
National Marine Fisheries Service

Mr. D. Somers
Tulalip Tribes, Inc.

Mr. L. Childers
U.S. Fish & Wildlife

Mr. R. Gerke
Department of Fisheries

Federal Energy Regulatory Commission

Mr. P. Foote
FERC

Mr. R. Blukis
FERC

SNOHOMISH COUNTY
PUD
PUBLIC UTILITY DISTRICT No. 1

2320 California St., Everett, Washington 98201 258-8211
Mailing Address: P. O. Box 1107, Everett, Washington 98206

August 16, 1984
PUD 15609

Mr. Gary Engman
Department of Game
509 Fairview Avenue North
Seattle, Washington 98109

Mr. Lynn Childers
U.S. Fish & Wildlife
2625 Parkmont Lane S.W.
Olympia, Washington 98502

Mr. Jon Linvog
National Marine Fisheries Service
7600 Sand Point Way N.E.
Bin C 15700
Seattle, Washington 98115

Mr. Robert Gerke
Department of Fisheries
3939 Cleveland Avenue
Tumwater, Washington 98504

Mr. David Somers
Tulalip Tribes, Inc.
6700 Totem Beach Road
Marysville, Washington 98270

Dear Sir:

Jackson (Sultan) Project - FERC 2157
Anadromous Fish Mitigation - Ramping Rate Study

Article 55 of the Order Amending License and Condition 3(c) in the Uncontested Offer of Settlement requires a study to determine the effects of powerhouse discharge on anadromous trout and salmon populations. In cooperation with the Joint Agencies the District prepared a study plan for all required studies and submitted it on schedule to the FERC last year. Regarding the ramping rate study, stranding of young fish due to reducing powerhouse discharge to the river is the principal concern. Up ramping (increasing flows) is not of significant interest.

Early this year the District requested study proposals from interested consulting entities. Following proposal review by the Joint Agencies, the District selected the firm of CH2M Hill to prepare a detailed scope of work. Subsequent to selection of the consultant, the WDF proposed a strategy for evaluating the ramping rate so as to reduce the loss of young fish. Also certain ramp down procedures were requested verbally and later in writing by the WDF. At this time, the District is complying with those requests.

Due to the unavailability of the Pelton units while undergoing modification at the critical period this year, subsequent lack of stored water necessary for conducting flow studies (reservoir lowered to protect work at Culmback Dam) and the agency expressed desire to avoid loss of young fish through experimental ramping rate flow fluctuations, the District temporarily delayed development of a scope of work. During the July 31st meeting of the Joint Agencies at the powerhouse, Mr. Metzgar proposed conducting ramping rate study work (flow changes) later this year (November - December). As importantly, field work such as site selection and surveying can be accomplished this Fall during low flow periods. With those events and schedule in mind, the District proposes accelerating the scope of work review in order to complete a contract with CH2M Hill which would enable initial field work proposed in the enclosed scope of work to begin in late September or early October.

The target date for District Commission approval of this contract is September 25th. Since a 7-10 day advance minimum is required for Commission agenda items, it is imperative that we receive your comments no later than September 4th on the enclosed scope of work to meet that schedule. If you have any questions on this, please contact Roy Metzgar at 258-8666.

Yours very truly,

J. D. Maner

J. D. Maner
Executive Director
Utility Operations

Enclosure

cc: Roy Metzgar

D R A F T

SULTAN RIVER HYDROELECTRIC PROJECT
RAMPING RATE STUDY
SCOPE OF WORK
AUGUST 15, 1984

PHASE 1

Task 1.1 Refine Study Elements

Review project operation (FERC documents, facility tour); reconnaissance river (review reports, maps, photographs, site visit); meet with joint agencies.

Task 1.2 Select Critical Sites

Review GeoEngineers' maps and select 12 potential sites; electrofish 12 sites and select eight sites; ground truth (via raft) eight sites with joint agencies and select four critical sites for ramp testing.

Task 1.3 Establish Site Parameters (four sites)

Set up bench marks and head pins; survey stream cross sections (three per site); establish temporary staff gages (three per site).

Task 1.4 Define Critical Flow Range

Float river at four flows (850, 650, 450, and 200 cfs) with joint agencies; observe water

surface elevations (WSE) at critical sites at 1,500, 1,200, 850, 650, 450, and 200 cfs; review flow versus WSE's for each cross section with agencies to determine critical flow range; write up decision and rationale.

Task 1.5 Determine Downramp Attenuation and Lag Time

Measure WSE's versus time at temporary staff gages at two flow increments (1,500 to 850 cfs and 850 cfs to 200 cfs); measure and compute area of dewatering.

Task 1.6 Review Literature

Review literature on downramping effects on salmonid fry; identify common trends and apparent site-specific findings; determine information gaps pertinent to the Sultan River project; relate literature findings to physical test results to determine need for stranding tests.

Task 1.7 Verify Downramp Safety

Based on the above tasks, an initial downramp scheme will probably be proposed. If this is the case, observations of potential fry stranding will be made to verify whether or not significant stranding is being avoided with the scheme. Shoreline observations at the critical sites will be made in duplicate during the autumn for juvenile steelhead and salmon, in the spring for salmon fry, and in the summer for emergent steelhead fry. Day and night observations will be made. Electrofishing prior to each test will verify the presence of fry at the critical sites.

Task 1.8 Analyze Data

Reduce survey notes; plot stream cross sections; summarize electrofishing results; plot downramp attenuation and lag time per site; develop attenuation and lag time formulas; prepare maps of critical sites; summarize verification results.

Task 1.9 Prepare Reports

Prepare a client review draft report to include an introduction, description of methods, results of Tasks 1.4 to 1.8, discussion of results, and recommendations. This report will be followed by an agency review draft and final report for Phase 1.

PHASE 2

Phase 2 will consist of the actual testing of variable ramp rates when salmon and/or steelhead fry are present. The step-by-step testing approach (see attached figure) is conservative to minimize fry mortalities. This schedule assumes that a critical flow range is identified during Phase 1 (850 to 200 cfs assumed for illustrative purposes).

Task 2.1 Conduct Fry Stranding Tests

Observe critical test areas for stranded fry; conduct tests in duplicate during spring, summer, and autumn under daytime and nighttime conditions; determine downramp attenuation and lag time at each site; measure dewatered zone areas.

Task 2.2 Determine Fry Availability and Emergence Time

Electrofish study sites prior to each downramp test. Follow progress of electrofishing results to determine peak emergence time; measure fish length.

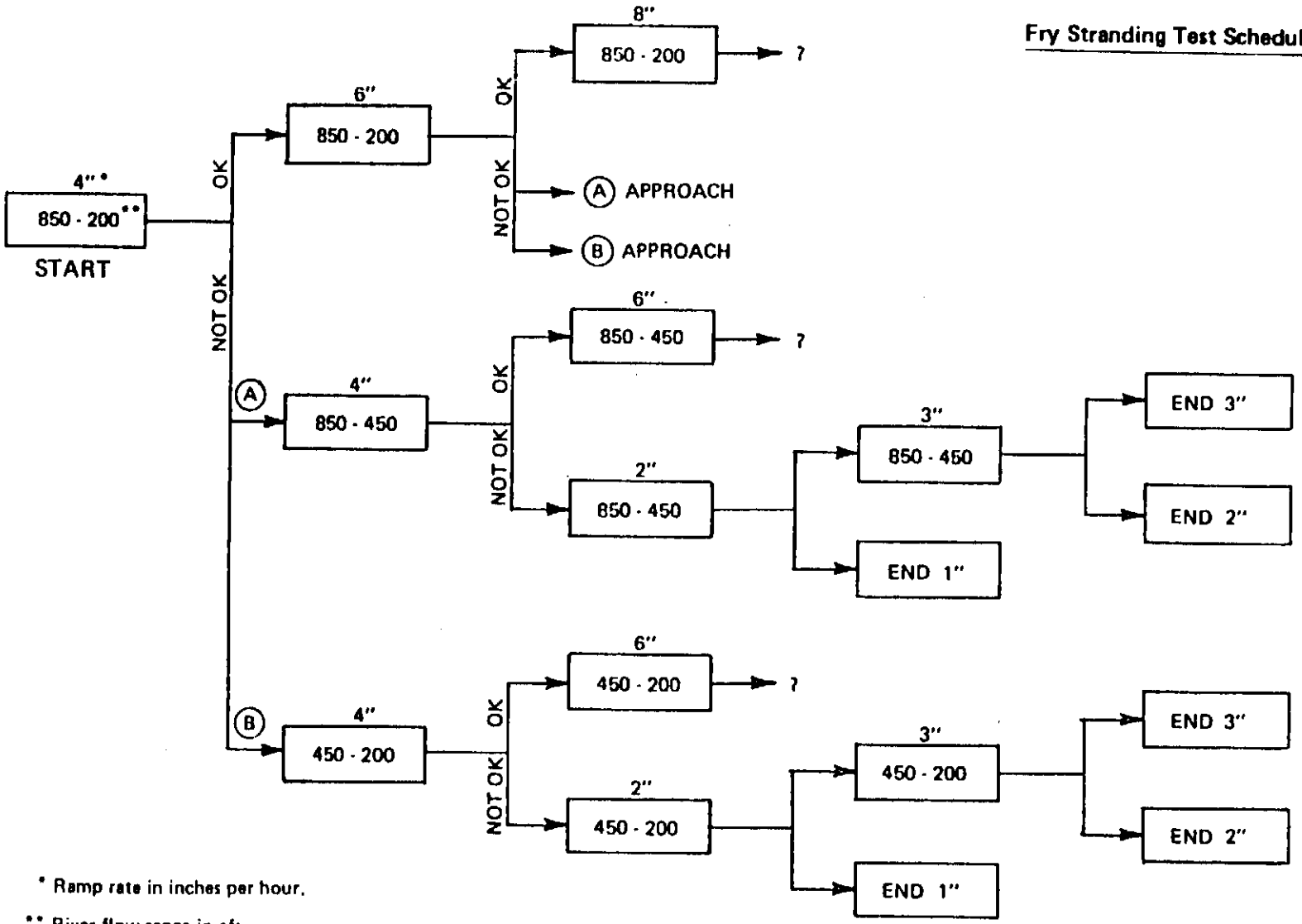
Task 2.3 Analyze Data

Prepare summary tables and graphs showing results by variable tested; conduct statistical tests where appropriate (most likely regression analysis or paired comparison tests).

Task 2.4 Prepare Reports

Prepare a client draft, agency draft, and final report to include introduction, methods, results, discussion, and recommendations.

Fry Stranding Test Schedule



* Ramp rate in inches per hour.

** River flow range in cfs.

JOHN SPELLMAN
Governor

FWP 16-3-5

WILLIAM R. WILKERSON
Director

15694

STATE OF WASHINGTON

DEPARTMENT OF FISHERIES

115 General Administration Building • Olympia, Washington 98504 • (206) 753-6600 • (SCAN) 234-6600

August 31, 1984

NOTED

SEP 04 1984

R. G. METZGAR

Mr. J.D. Maner, Executive Director
Utility Operations
Snohomish County P.U.D.
Post Office Box 1107
Everett, Washington 98206

Dear Mr. Maner:

Jackson (Sultan) Project-FERC 2157
Anadromous Fish Mitigation-Ramping Rate Study

We are providing the following comments on the Draft Scope of Work submitted on August 15, 1984 by your selected consultant (CH2M Hill). We appreciate the timely opportunity to comment on this scope of work and anticipate working closely with you and your consultant in the process of developing data on the operation of Project 2157 to minimize its impact on the fishery resources of the Sultan River.

General Comments

As you are aware, the Washington Department of Fisheries (WDF) has had considerable experience in evaluating the effect of fluctuating flows below hydroelectric projects on the salmon resource. The specific problem to be addressed by your study proposal, relative to the stranding of juvenile salmon, has been identified as a very serious problem for both pre-emergent (within the gravel) and post-emergent (free swimming) juveniles. We have conducted specific evaluations concerning stranding impacts on the Columbia, Cowlitz, North Fork Lewis and Skagit Rivers. A copy of the most recent Skagit River fry stranding study was sent to you on August 19. This study demonstrated very clearly the hazards of downramping on salmon fry, especially during hours of darkness.

Based on extensive background information we are very certain that flow fluctuations which create dewatering of critical habitat will induce significant mortality at the times of year when juvenile salmon are present. Our previous stranding evaluations indicate that altering rates and time periods for dewatering critical habitat can significantly effect the degree of juvenile salmon mortality. However, all conditions examined resulted in at least some mortality.

It is the Department of Fisheries' position that Sultan Project operations should be such that flow fluctuations do not harm the salmon fisheries resource. In order to accomplish this, we believe the downramping events should be conducted above a certain flow level. If flow fluctuations must occur below the critical level then they must be done infrequently and during hours of darkness. We recognize that occasional flow fluctuations below the critical level will occur for season adjustments of project operations, i.e., maintenance purposes, and due to emergency situations. Based on previous experience, we feel that we can stipulate a downramping procedure for these situations and that only limited field verification of these procedures is required. Our desire to only conduct limited field verification of the downramping procedures is based on the fact that extensive downramping tests themselves have an associated significant mortality. WDF is opposed to conducting extensive tests which kill juvenile salmon to corroborate study results from other stream systems, which we are confident produced reliable results.

Our approach to resolving the stranding issue is to conduct a limited field study, primarily to ascertain a "critical flow level". Phase I of your study proposal essentially would accomplish this task. The resulting data in combination with existing information should provide all the data necessary to develop a project operational plan that would protect the salmon fry from incurring stranding conditions.

Our approach to solving the potential stranding problem on the Sultan River was discussed thoroughly at a June 22 meeting with the PUD, fisheries' agency and Tribal personnel. It was our impression that this type of approach was endorsed by those present including PUD staff. It seemed to be the general opinion of all, that a limited study (like Phase I) was warranted but it was not necessary to conduct yet another duplicative stranding study (as proposed in Phase II) that would kill large numbers of fish. For that reason, we are surprised and somewhat distressed that your study proposal includes Phase II.

Specific Comments

The Phase I portion of the scope of work is the study which needs to be conducted and we are supportive of this basic portion of the scope of work.

Task 1.2 - We agree that four final study sites are necessary. However, due to the time period involved, past observations of salmon fry and/or association with spawning habitat may be better selection criteria than electrofishing results, particularly for salmon. Salmon fry are not present during the Fall months when the study is scheduled to take place.

Task 1.3 - We concur with the need for site-specific staff gauges and cross sections at each study site. However, one gauge per site appears sufficient to us at this time. We are open to discussion with CH2M Hill regarding the rationale for three per study site.

Task 1.4 - This is the most important part of the study effort and we are very interested in accurate determination of the critical flow level as discussed above. However, we question the approach outlined here. After the staff gauges are in place and cross sections have been measured, it would be more practical to schedule an initial survey at the intermediate flow of 650 cfs. Based on the results of this survey, schedule subsequent surveys at flows above or below this level to adequately define the "critical flow level" for protection of juvenile salmon rearing habitat.

Task 1.5 - We concur that this data is necessary to the program but caution that the time periods for its collection must be carefully coordinated with the fish and wildlife agencies to minimize adverse impacts of data collection.

Task 1.7 - This task appears to assume that a downramping scheme is required for dewatering of the critical habitat on a regular basis. We feel that this is inappropriate and unnecessary. Limited electrofishing will be required at appropriate times to verify the use of the critical habitat areas by salmon fry. These areas will be identified in Phase I.

Phase 2 - This portion of the scope of work is an extension and expansion of the work outlined in Task 1.7 above. To reiterate, we feel that this work is unnecessary as discussed in general comments.

Task 2.2 - In conjunction with the limited monitoring of the stipulated downramping schedule discussed under general comments and in conjunction with the habitat use verification discussed under Phase I, Task 1.7, the electrofishing work should include sufficient sampling to adequately define the period of presence for salmon fry.

We are looking forward to meeting with you and CH2M Hill to finalize the scope of work for this study. If you have any questions regarding our comments, please contact Bob Gerke at (206) 753-3624, or Ken Bruya at (206) 753-0250.

Sincerely,

Robert J. Gerke

Robert Gerke, Assistant Chief
Habitat Management Division

cc: Gary Engman-Game
Jon Linvog-NMFS
David Somers-Tulalip
Lynn Childers-USFWL

JOHN SPELLMAN
Governor

FRANK LOCKARD
Director

STATE OF WASHINGTON
DEPARTMENT OF GAME
Region Four Office, 16018 Mill Creek Boulevard, Mill Creek 98012 - Telephone: 775-1311

15717

September 5, 1984

NOTED
SEP 07 1984
R. G. METZGAR

Roy Metzgar
Snohomish County PUD No. 1
P. O. Box 1107
Everett, Washington 98206

Re: Draft Scope of Work, Ramping Rate Study, Jackson Hydroelectric Project, FERC 2157.

Dear Mr. Metzgar:

We have reviewed the draft Scope of Work. In view of the stage of development of this work plan, our comments concern the more fundamental questions we have at this time:

1. Review of literature (Task 1.6) should occur as part of Task 1.1. This may be of limited value, however, since few generalities other than that fluctuating flows strand fish may be applicable to Sultan River.

2. Pothole stranding is not mentioned and is apparently excluded from consideration. This aspect may be as critical as open bar stranding.

3. Criteria that will be used in Task 1.4 to identify "critical flow range" are not specified.

4. Task 1.5 includes measurement and computation of dewatered area. This should be accomplished under Task 1.4.

5. The need for "Phase 2" is unclear. Tests under Task 1.7 if appropriately scoped should have already provided needed answers, but test conditions under 1.7 are vague. Bearing heavily on these conditions are actual project operational flexibilities and intended modes of operation.

6. Apparently, considerable reliance is placed on rafting for transportation to study sites. Due to the hazardous nature of some river reaches, this mode of transportation may be impractical.

Before a final Scope of Work is developed, we believe the joint agencies should meet with you and CH2M Hill to discuss agency concerns and to enhance

communication and understanding. We believe this would materially facilitate development of a final study plan.

Very truly yours,

THE DEPARTMENT OF GAME

R. Gary Engman

R. Gary Engman
Habitat Management Division

RGE:td

cc: WDF - Bruya
NMFS - Linvog
USFWS - Stout
Tulalip Tribes - Somers
Division - Fenton
Region - Muller, Phillips, Kraemer

Runoff - F/NWR

UNITED STATES DEPARTMENT OF COMMERCE
National Oceanic and Atmospheric Administration
NATIONAL MARINE FISHERIES SERVICE
ENVIRONMENTAL & TECHNICAL SERVICES DIVISION
847 NE 19th AVENUE, SUITE 350
PORTLAND, OREGON 97232-2279
(503) 230-5400

September 5, 1984 F/NWR5

J. D. Maner, Executive Director
Utility Operations
Snohomish County PUD No. 1
P.O. Box 1107
Everett, Washington 98206

Dear Mr. Maner:

Jackson (Sultan) Project (FERC No. 2157),
Scope of Work for Ramping Rate Study

National Marine Fisheries Service (NMFS) has reviewed the referenced scope of work. We have the following comments for your consideration.

PHASE 1

Task 1.2 Select Critical Sites.

Electrofishing potential survey sites this fall may provide some useful data on juvenile steelhead abundance but limited, if any, information on fall chinook juveniles.

Also, it is not clear what criteria will be used to select a "critical" site. This needs further discussion with the resource agencies. Additionally, when potential sites are being surveyed, observations of potholes should be made. The presence of potholes may indicate a potential stranding problem, and this should be evaluated in the study.

Task 1.4 Define Critical Flow Range.

Without data relating bar slope to stranding potential, it may be difficult to determine what a "critical flow range" will be. Again, this will require the close cooperation and agreement of all parties.

Task 1.5 Determine Downramp Attenuation and Lag Time.

The actual downramp rate is not identified for this task.

Task 1.6 Review Literature. This should be done as part of Task 1.1 when study elements are being refined.

Task 1.7 Verify Downramp Safety. It's stated that "an initial downramp scheme will probably be proposed." This should be more clearly re-stated to indicate that an initial downramp scheme will be proposed. After all, that is the primary purpose of Phase 1. Also, it is unclear how "observations of potential fry stranding will be made..."

Phase 1 should also include a detailed examination of project operational flexibility in achieving various ramping scenarios (i.e. time of day, rate of ramping).

PHASE 2

It's not clear whether phase 2 will be needed. If it does appear that data on actual stranding mortalities will be necessary, then the unanimous agreement of all agencies will be required before this phase of the study can proceed.

We suggest that a meeting between all parties be held as soon as possible so that a final scope of work can be developed.

Sincerely,

Dale R. Evans
Division Chief

cc: WDG (Engman)
WDF (Bruya)
USFWS (Stout)
Tulalip Tribes (Somers)
Snohomish PUD (Metzgar)

Ecological Services
2625 Parkmont Lane S.W., Bldg. B-3
Olympia, Washington 98502

September 6, 1984

Mr. J. D. Maner, Executive Director
Snohomish County Public Utilities District No. 1
P.O. Box 1107
Everett, Washington 98206

Re: Jackson (Sultan) Project - FERC 2157
Anadromous Fish Mitigation - Ramping Rate Study

Dear Mr. Maner:

The Fish and Wildlife Service (FWS) has reviewed the proposed scope of work (phase 1, nine tasks; phase 2, four tasks) for the ramping rate studies for the Sultan River, transmitted with your August 16, 1984 letter. We offer the following comments and suggestions.

Phase 1

Task 1.2 - Selection of Critical Sites

As we understand this proposal, 12 potential study sites would be initially selected on the basis of topographic information provided from the "Geo-Engineering maps". Of these, eight would be retained for further consideration following the results of the electrofishing efforts. After observing the remaining sites from the water (via rafts at some unspecified flow), four "critical sites" will be selected.

We question whether the resolution of the Geo-Engineers' maps will be sufficient to make site selection decisions. We suggest that it may be more effective to first float the river, making observations of problem areas (depressions, side channels, etc.) and carefully locating these areas on maps. The on-river observations should be made when the flow in the river is relatively low. Then, a comparison of this information with the Geo-Engineering maps could be made to determine what similarities exist. We assume that the "critical sites" will be selected, in part, on how well they represent the areas of steelhead and salmon stranding. This information needs to be acquired early in the decision making process.

It is unclear how the electrofishing information will be used in the site selection process. There are many factors which influence the use of any given site, including the time of year, flow rate, time of day, etc. It is important to know what the objectives are, i.e. emphasis on fry, juveniles, a particular species,

a wide range of stream characteristics, etc. The objectives need to be clearly stated.

Task 1.3 - Establish Site Parameters

It is unclear as to the information that would be collected under this task. It sounds from the heading of this task that more than Water Surface Elevations will be taken.

Task 1.4 - Define Critical Flow Range

Although it may be desireable to float the river at the four flows (850, 650, 450, and 200 cfs) as suggested in the work scope proposal, some other flow rates may prove to be more suitable. We recommend that the first trip be taken at an intermediate flow (650 or 450 cfs) and that any changes, if needed, be made following the trip.

Task 1.6 - Review Literature

The task to review the literature should be revised to include the effects of downramping on juvenile salmonids (steelhead and silver salmon). The present proposal only includes salmonid fry.

Phase 2

We have strong reservations concerning the Phase 2 studies, the "actual testing of variable ramp rates when salmon and/or steelhead fry are present". We believe that these studies may cause significant and unwarranted mortality. The concept of "critical flow level" implies that there is some base flow, above which, stranding mortality due to river fluctuations is minimized or insignificant. It is our understanding that the purpose of Phase 1 is to determine the "critical flow level". If the efforts of Phase 1 are successful, we question the need for the Phase 2 studies. In addition, ramping rate studies already conducted on the Skagit River may provide the necessary information to answer the questions that the Phase 2 studies are designed to address. In conclusion, FWS cannot support the Phase 2 studies.

Thank you for the opportunity to review the scope of work for the ramping rate studies.

Sincerely,

Charles A. Dunn
Field Supervisor

cc: WDG (Engman) WDF (Bruya)
NMFS (Linvog) Tulalip Tribes (Somers)

SNOHOMISH COUNTY
PUD
PUBLIC UTILITY DISTRICT No. 1

2320 California St., Everett, Washington 98201 258-8211
Mailing Address: P. O. Box 1107, Everett, Washington 98206

May 16, 1985
PUD 16379

Mr. Gary Engman
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Mr. Robert Gerke
Department of Fisheries
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Mr. Gwill Ging
U.S. Fish & Wildlife
2625 Parkmont Lane S.W.
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Mr. David Somers
Tulalip Tribes, Inc.
6700 Totem Beach Road
Marysville, Washington 98270

Gentlemen:

Re: Anadromous Fish Mitigation Jackson Project
Powerhouse Ramping Rate Study/Project Operations

This is to provide you with a progress report on the District's Ramping Rate Study. Due to the low flow conditions and related project operating schedule, the ramping rate field work fell behind schedule. However, the consultant recently has been able to regain the schedule due to favorable conditions.

Forrest Olson attempted to arrange a group meeting with you a couple of months ago, it was to present the results of "dry run" (without fry) field work and possible ramping rates to be tested. Since chinook salmon fry emergence was imminent, and schedule conflicts prevented a quick group meeting, we met only with the Washington Department of Fisheries (Gerke). Notes of the meeting are attached.

55u

The rates recommended by Forrest Olson and discussed with Bob Gerke were considered to be conservative. Results to date have been good. Two sets (both day/night) of the high flow range (1,300 to 750 cfs ramp down) have been completed. One partial low flow range ramp down was attempted (but instream flows were too high due to runoff). Another low flow test is scheduled for May 11th at this writing. We are optimistic that the low flow range tests will be completed shortly, if runoff and storage conditions continue to be favorable.

Other than for ramp rate tests, the District continues to operate the project as agreed to previously. Powerhouse discharge/river flow changes required to analyze the impact of ramping rates are in accord with the ramp rates discussed at the March 19, 1985 meeting. For example, to reach 600 cfs for a 2"/hr. day light test, when the instream flow is 800-900 cfs the units now are ramped down at one inch/hour during hours of darkness through 750-600 cfs. When fry are in the river and until subsequent field checking on the critically of the 750-600 cfs range, we are attempting to avoid that zone as much as possible. Obviously, even if the project was not built or operating that flow range would be encountered naturally. This is one of the technical issues now identified to be evaluated and resolved in the context of the ongoing study.

As soon as the pending series of field tests are concluded, a meeting will be scheduled to review the results with you and to consider what steelhead fry testing program, if any, is required for that species.

Sincerely,

R. K. Schneider
Power Manager

Enclosure

cc: Mr. F. Olson
CH2M Hill

Mr. R. Blukis
FERC, San Francisco

Mr. P. Foote
FERC, Washington, D.C.

55u

County PUD studies Sultan River fish

Monitor/Valley News 8-7-85

by Fred Willenbrock

The flowing, cool waters of the Sultan River, a home for fish and playground for many people, is now being used as a giant laboratory.

This summer researchers working for the Snohomish County PUD have systematically increased and decreased the flow from their Henry M. Jackson Hydroelectric plant on the river to observe the effects on steelhead fry found in the shallows this time of year.

And according Gary Engman, the Regional Fish and Wildlife Mitigation Specialist for the Department of Game, the results of [illegible] for this summer have be necessary. He believes the PUD and state will have some conclusions by this fall.

Engman said different rates of reducing the flow in the river will be tested. During the tests when the water level was lowered steelhead fry were stranded in shallow water which would result in their death if those flow changes occurred as a regular part of the operation of the Jackson project.

Engman said they are trying to find a rate of change where the fish will sense the need to move into deeper water.

"Right now, we're in the midst [illegible]ing alternatives to see what's [illegible]ways of reducing impacts."

He said steelhead and salmon fry can be vulnerable to stranding on gravel when water levels drop rapidly.

He said as the young fish become larger in late summer they are susceptible to stranding in shallow water.

Engman pointed out that the Jackson project, completed last summer, will cause less flow fluctuations than many other hydroelectric plants in the world.

The PUD is conducting these tests and others on the river as part of a post-project study agreement between the PUD and st[illegible] and federal agencies.

The stranding stud[illegible] fishery wa[illegible]tul in helping us portant this year because of the unusually high density of steelhead fry in the river, according to Chuck Phillips, Department of Game Regional Fisheries Program Manager.

Phillips said the high fry density indicates good spawning rates for steelhead this season.

"This past year we established a selective fishery on the entire Snohomish River system," Phillips said. "We restricted the legal catch to only those wild fish with a dorsal fin length of two inches or less so they could spawn.

"Judging from the high number of steelhead fr[illegible]eing spotted in the Sultan, I'd [illegible]hat the selective

PUD studies Sultan fish

(continued from page 1)

to accomplish our management objective," Phillips said.

The PUD researchers have also trapped adult fish and attached radio transmitters to them to study their movements near the power house.

Other fisheries studies paid for by the PUD have included questioning fishermen on the river this summer to determine any changes in the fishing results since the projec

SNOHOMISH COUNTY
PUD
PUBLIC UTILITY DISTRICT No. 1

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February 20, 1986
PUD 16730

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Mr. Robert Gerke
Department of Fisheries
3939 Cleveland Avenue
Tumwater, WA 98504

Gentlemen:

Jackson Project - FERC #2157
Interim Powerhouse Ramping Rate Schedule

The District's consultant, CH2M-Hill, has completed the field work needed to verify the fry stranding potential of some ramping rate situations. However, all the tests that might be desirable have not been conducted yet due either to low water storage, unsuitable runoff conditions during the past months, or project shutdown for inspection and maintenance. A draft report on the ramping field studies completed to date is nearly finished, but will not be completely ready for your timely review with this year's fry emergence imminent. Therefore, the District is presenting the information herein on powerhouse ramping rates to the Joint Agencies at this time.

A draft recommended downramp rate schedule is attached. This schedule is the tentative "bottom line" results of the work by CH2M-Hill and will be in the pending draft study report. In the interim period between now (commencing February 21) and subsequent report distribution to you (and May 31st if the District hears nothing to the contrary) the District proposes downramping consistent with the attachment, but more conservatively. All 2 inch/hr rate requirements will be followed, but for those higher (4" or 6"/hr) a 3 inch/hr interim rate will be used. For the June 1 - August 15 period, if agency commenting has been delayed, the ramp rates in the attached schedule will be followed.

For the 750-600 cfs flow range, if and when that range must be crossed, an overnight pause or delay will be employed in downramping from a higher flow before continuing with the downramp. Also, the downramp will be done during hours of darkness whenever possible.

As a precautionary measure with suggesting interim ramp rate criteria we have calculated water temperature units (TU's). As of February 14th (excluding 30 days, September 15 - October 14 while the Powerhouse was shutdown for maintenance) the total is 1,099 TU's. Assuming that the water temperature was 6°C (which it was) for those 30 days produces another 330 TU's. The total is thus 1,429 TU's through mid-February. With present water temperatures of 4°C (7 TU's) fry emergence can be projected for near the end of February or early March. Thus, the proposed interim ramping rate period commencing on February 21 should provide full protection for the fry.

The draft report will be ready as soon as possible and sent to you to provide the explanatory discussion about the attached recommended downramp schedule. If you should have any questions in the meantime, please contact Roy Metzgar.

Very truly yours,

ORIGINAL SIGNED BY R. K. SCHNEIDER

Robert K. Schneider
Director, Power Management

Attachment

cc: F. Olson, CH2M-Hill

353U

RECOMMENDED DOWNRAMP RATE SCHEDULE
(Inches Per Hour at Powerhouse)

Flow Range (cfs)	Mar.1 to May 31		June 1 to August 15		Aug. 16 to Oct. 31[a]		Nov. 1 to Feb. 28	
	Day	Night	Day	Night	Day	Night	Day	Night
1,500 to 750	4[a]	6	2	1	4	4	6	6
750 to 600	2[a,b]	2[b]	2[b]	1[b]	2	2	6	6
600 to 300	2	6	2	1	4	4	6	6
300 to 165	2	2	2	1	4	4	6	6

[a] Need to verify.

[b] If river flow prior to downramp has exceeded 1,000 cfs for more than 72 hours, downramp through this flow range (750 to 600 cfs) only after holding flow constant between 750 to 850 cfs through one overnight period.

SNOHOMISH COUNTY
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March 7, 1986
PUD 16746

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Mr. Robert Gerke
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Gentlemen:

Jackson Project - FERC #2157
Anadromous Fish Mitigation - Ramping Rate Study
Transmittal of Draft Report for Review

The District agreed, among other things, in the Uncontested Offer of Settlement with the Joint Agencies, to conduct a study to determine whether and under what operating conditions a down ramping rate (reducing powerhouse discharge) slower than six inches per hour is appropriate to avoid adverse inputs upon critical life stages of anadromous fish (e.g. spawning, emergence, and rearing). Stranding of young salmonids during the rearing stage was of paramount interest and concern. Further, Project License Article 55 required the Licensee to prepare and file with the Commission our outline of proposed anadromous fish mitigation studies, including one for the ramping rate six months in advance of initial Project operation.

In general conformity with the proposed study outline, the District, with consultant assistance and agency consultation, has conducted the requisite ramping rate study. All testing that might be desirable has not been conducted yet due either to low reservoir storage, unsuitable runoff conditions, or project shutdown for inspection and maintenance. A draft report on the ramping rate field studies completed to date has been prepared for your review (two copies enclosed).

353U

Recognizing that this report would not be ready for your review prior to Chinook salmon fry emergence, the District sent you a draft of the proposed down ramp rate for the interim period until the report was reviewed by the Joint Agencies. The ramp rate schedule in the enclosed report is the same as we sent to you on February 20, except more conservative operating procedures are now voluntarily in effect, pending completion of your review.

To facilitate review, we have scheduled a meeting for March 20, starting at 9:30 a.m. to be held in the conference room, NMFS, Sand Pt, Seattle. Mr. Forrest Olson, CH2M-Hill, will be present to provide further supplemental technical discussion and respond to your questions. Also, District staff involved with Project operation/mitigation will attend to provide information useful to your review and to learn of your interest and response. We look forward to another productive meeting with you.

Very truly yours,

ORIGINAL SIGNED BY R. K. SCHNEIDER

Robert K. Schneider
Director, Power Management

Enclosure (2 copies)

cc: F. Olson, CH2M-Hill (w/o enclosure)

SNOHOMISH COUNTY
PUD
PUBLIC UTILITY DISTRICT No. 1

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February 17, 1987
PUD-17256

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Gentlemen:

Jackson (Sultan River) Project - FERC #2157
Anadromous Fish Mitigation Study
Powerhouse Downramping Rates - Revised Study Report

This is to transmit a revised report on the study conducted by Forrest Olson with Ch_2M-Hill. Significant revisions occur principally in Chapter 5 - Recommendations. Some minor editing of a clarification nature was done throughout the report. The revisions in the attached report reflect discussion/comments during the meeting on June 19, 1986. Also, Appendix E has been added presenting the length frequency of salmonids obtained from electrofishing on December 11 and 12, 1985.

One pair of ramp rate tests were conducted in 1986: 4-inch/hour, 1,250 to 500 cfs during daylight in late May and early June. A report on the results is attached also. Another test was conducted on February 16, 1987 on 4-inch/hour at 1,300 to 400 cfs during daylight. The results will be presented at the next meeting.

A meeting to discuss the attachments is scheduled for 0930 at NMFS, on March 4, 1987, Sand Point, Seattle. From this meeting, the District would like to derive a report to the FERC on the status of the ramping rate study.

Very truly yours,

ORIGINAL SIGNED BY R. K. SCHNEIDER

Robert K. Schneider
Director, Power Management

Attachments (2)
RGM:jk

Public Utility District No. 1 of Snohomish County
Henry M. Jackson Hydroelectric Project
FERC #2157

Anadromous Fish Mitigation Study - Powerhouse Ramping Rates
Report on Down Ramp Tests in 1986

Test down ramp rate: Four inches per hour (daylight)

Flow conditions: 1,250 to 750 cfs on 05/23/86
1,000 to 500 cfs on 06/03/88

Report on May 23 test:

- Start 9:00 a.m.
- Areas checked included Ames Bar, Kien's Bar, and Sultan Island.
- One 33-mm fry was stranded on upper Ames Bar. The tail section of the fry was fungused and, therefore, it was not possible to make a positive species identification. However, based on the amber coloration of the fins, we concluded that it was probably a coho. In any case, the fish was not considered a valid indicator of test results because of its injured condition. Numerous fry were observed in all areas; most appeared to be coho.

Report on May 29 dipnetting:

Dipnetting was conducted along several reaches of the Sultan River to identify fry species. Twenty-nine fry were collected in four locations. One was a chum (44 mm); all others were coho. They averaged 40.4 mm (range 32 to 52 mm). Three chinook fry were observed but not collected. They were noticeably larger than the coho and were estimated to be 60 to 70 mm. No steelhead fry were observed.

Report on June 3 test:

- Start 8:00 a.m.
- Areas checked included Ames Bar, Kien's Bar, Sultan Island, and side channels No. 1, 3, and 6.
- No fry were stranded down to approximately 700 cfs.

- As river flow diminished from 700 to 500 cfs, approximately 50 fry (mostly coho, some steelhead) were observed leaving side channel No. 3 (lower Ames Bar) in both an upstream and downstream direction. No fry became stranded in the side channel but three steelhead and one chinook fry became trapped in a shallow depression at the top end of the channel. If flow reduction had continued much past 500 cfs, these four fry would have died.
- In the boulder area on upper Ames Bar, two steelhead fry were stranded and two became trapped toward the end of the test (700 to 500 cfs).
- No fry were observed stranded or trapped in the other areas checked.
- Many steelhead fry were observed at Sultan Island. They were not present on May 29.

Conclusions:

1. Steelhead fry emergence began between May 29 and June 3, 1986, in the lower Sultan River.

2. The two 4-inch/hour daytime downramp rests did not strand or trap any fry when river flows were reduced from 1,250 to 700 cfs, even though numerous coho fry and some steelhead fry were present.

3. Results of these tests indicate that a 4-inch/hour daytime downramp is safe for coho fry at flows greater than 700 cfs in the lower Sultan River.

4. Only a few chinook fry were observed along the river between May 29 and June 3 and they had probably grown large enough (>50 mm) to be relatively unsusceptible to stranding at the 4-inch/hour rate during this time of the year.

5. Daytime downramping at 4-inch/hour between 700 and 500 cfs stranded and trapped fry in side channel No. 3 and on upper Ames Bar. This confirms the sensitivity of this flow range noted during previous tests.

RGM: 2/13/87

SNOHOMISH COUNTY
PUD
PUBLIC UTILITY DISTRICT No. 1

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May 22, 1987
PUD-17325

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Mr. Robert Gerke
Washington Department of Fisheries
3939 Cleveland Ave.
Tumwater, WA 98504

Gentlemen:

Jackson (Sultan River) Project - FERC #2157
Anadromous Fish Mitigation Study
Powerhouse Ramping Rate Study

This is to follow-up on our meeting held on March 4, 1987. Several items will be presented in this letter for your consideration and response. Specifically, we request your written reply to or comment on:

1) additional PUD response to comments from the Joint Agencies;

2) results of the 1987 ramp tests; and

3) the study report or information presented in the attachments with this transmittal.

The purpose of this letter and request for your comments is the same as that of the meeting: to develop a common position for an interim report to the Federal Energy Regulatory Commission (FERC) on the results and status of the powerhouse ramping rate (salmonid fry stranding) study.

580U

To assist you, the following materials are attachments to this letter:

1) District notes for June 19, 1985 (Att. I), and March 4, 1987 meetings (Att. II);

2) Additional District response to Joint Agency comments from March 4, 1987 meeting (Att. III);

3) Study report page revision mark-ups, including revised Table 9 - recommended down-ramping rate schedule (Att. IV);

4) Field trip notes for ramp tests conducted on March 24 and 26, 1987, on 4 inch/hr daylight - high flow range (Att. V); and

5) Transmittal letter to the FERC (Att. VI).

Based on your comments during the March 4, 1987 meeting, report revisions are marked on the pages of the report (Attachment IV) transmitted to you earlier.

Note, Appendix F - Agency Consultation in the report will present your written comments plus meeting notes for the benefit of the FERC. The District is required by FERC Order to submit written comments by the Joint Agencies in presenting annual and final reports to the FERC.

Receipt of written comments from the Joint Agencies and transmittal of those comments with the study report on the powerhouse down-ramping rates to the FERC will conclude the initial phase of this component of the anadromous fish mitigation studies as required by FERC License and the Settlement Agreement. This summer the District will again seek technical assistance from a consultant to continue the tests and other work remaining. At that time, the District will consult with the Joint Agencies about the scope of work and consultant selection.

Please submit your written reply to the District by June 22, 1987. Call Roy Metzgar at 347-4319 if you have any questions or require clarification.

Very truly yours,

Original Signed By
R. K. SCHNEIDER

Robert K. Schneider
Director, Power Management

Attachments (6)
RGM:jk
cc: F. Olson, CH_2M-Hill

Henry M. Jackson Hydroelectric Project
Anadromous Fish Mitigation Studies - Powerhouse Down-Ramping Rates

Meeting Notes

Date: June 19, 1985 (0445 - 1600)

Place: NMFS, Sand Point, Seattle

Attendees: Joint Agencies - Linvog (NMFS); Engman (WDG); Somers (Tulalip Tribes); Ging (USFWS); and Gerke/Bruya (WDF)
PUD - Schneider, Grimes, Metzgar and Kern
PUD Consultant - Olson (CH2M Hill)

Purpose: In accord with the FERC License Order and the Settlement Agreement, the PUD has several ongoing studies for anadromous fish mitigation. Interrelationships between some of them are starting to emerge. This meeting will present results of work to date; include pending work; and identify and agree on a work schedule. Results of this meeting will provide a basis for a progress report to the FERC.

Powerhouse Ramping Rate Study

Olson (CH2M Hill) introduced his presentation by linking the parameters to consider with determining salmonid fry stranding in the Sultan River with operation of the Jackson Project powerhouse. Among them were the following items: downramp rate, salmonid species, fry (abundance/presence), downstream attentuation, streambed morphology, substrate, day vs. night, streamflow before ramping and magnitude of Q change. Mean monthly discharge record from the powerhouse and an operating test schedule were handed out.

Olson explained the study approach as follows:

1. Select critical sites for sampling - four were chosen originally: Ames Creek bar, Kien's Island and bar, and Winter Creek islands after a field trip with the Joint Agencies. Some other sites were added such as some left bank side channels, the mouth of Winter Creek and the Town of Sultan park bar based on later field work and field observations. The sites provided good sampling coverage and were accessible to do so on a daily basis, if needed.

2. Identify potholes and side channels - three side channels were mentioned which come into play at about 600 cfs. Potholes don't appear to be a significant problem because there aren't very many of them.

3. Survey beach/bar slopes - the sites were surveyed looking for slopes with a grade of less than 2% and relate that back to river flow range. The grade of the slope relates to fry stranding potential and the grade of the slope relates to river flow range. Where is the water line on the beach or bar at certain flows?

4. Determine the lag time or attentuation - what is the change downstream when discharge is reduced at the powerhouse? Try and account for the effect of bank and channel storage of water. Results of tests indicate that there is not much lag time for a flow reduction to be reflected downstream. The flow change is 15 minutes at the BPA line crossing and about 50 minutes at the Sultan Park. Attentuation appears to be very minor. An upramp is attentuated but a downramp isn't. There isn't any relief due to in-bank or in-channel storage.

   At 1,300 cfs a 6-inch/hr. change (decrease) in river level at the powerhouse translates into 3.5-inches/hr. downstream for high flows. A 3-inch/hr. drop at the powerhouse in either high or low flow range was 2-inch/hr. downstream. At 800-250 cfs a 6-inch/hr. rate was 3.8-inch/hr. downstream. The recommendations on ramp rates are based on the change at the powerhouse tailrace pool.

5. Identify critical flow ranges - 600 cfs. and below is critical. Other flows above it are bankfull.

6. Recommended ramp rates to test - (handout)

7. Test ramp rate scheme -

8. Refine recommendations -

Test Results Review

On March 4th the chinook fry were first sighted. In discussion Ging asked that the PUD summarize the operation schedule with test results in report to the agencies. Olson commented that flows below 300 cfs increase the exposure of sensitive areas (for stranding). The agencies requested a definition of a power emergency and operating examples. Schneider responded by discussing the frequency of emergency events that might occur with the Centralia Project and the need for water-saving with higher ramp rates in an operating emergency. At the conclusion, it was agreed that a definition and probability was needed of an "emergency event".

Kern reported that this year he would be scheduling the Jackson Project to keep the reservoir as full as possible and just pass instream flows and City water demand.

Gerke commented on the fry stranding losses reported thus far that the numbers (lost) were insignificant at 2-inch/hr.; no data for 4-inch/hr. and that the losses will be significant at 6-inch/hr. The frequency and probability of ramp down events would determine the ultimate losses. Discussion focused next on normal and critical water years as an important variable because it would determine how many times ramp downs would occur.

Gerke indicated that 2-inch/hr. was preferred and he'd accept it for 3/1-6/15 rather than 4-inch/hr. A test on 4-inch/hr. was proposed (tentatively) for next year (1986) by the PUD.

Discussion next addressed the flow range of 750-600 cfs. Gerke suggested that there should be a 24-hour hold in this range when coming down from higher flows prior to moving through this zone (flow range). Fish movement response to flow changes related to downramps was explored, based on Olson's field observations, especially for the June-September period ahead. Also, results from the Skagit River study were brought up by Olson as a basis for application. Engman and Linvog advised that Skagit study data are not a good basis for determining ramping rates. Also, there doesn't appear to be a similar problem for steelhead. They asked for an explanation of the reasoning for groupings of flow ranges. After Olson's response, Engman stated that there is no rationale for steelhead and that whatever applies to steelhead can't be assumed for salmon and vice versa. Linvog advised that specific tests should be added for steelhead rather than rely upon salmon fry test results.

For operating and testing the Project this year (1985), the following guidelines were proposed for steelhead trout fry based on results thus far.

Steelhead: 1500-750 cfs. 2-inch/hr. day and 4-inch/hr. night. Gerke requested notification to WDF about results after 2-inch/hr. tests.

September-October Period

During the period of September 16 - October 31 the agencies requested that the downramp rates stay the same (conservative). If any change, need a scientific basis for it. Olson questioned if at about 9/15-16 that wasn't a biological break point, especially for the 750-600 cfs. range? High flow range testing was of concern to WDF during the fall spawning period. Gerke advised that he considered it to be a problem area and didn't want to see any strong (large) flow changes during adult spawning. Gerke will want to talk to the PUD about setting a flow range for optimum spawning flows.

November - February Period

Somers expressed concern about flow ranges during coho salmon spawning. What is the flow range change? Olson replied that an 8-inch drop translates to a change of about 4.5 inches downstream in the lower river. Grimes pointed out that the range of flow change possible due to Project hydropower operation is limited to 1,378 cfs. which is the capacity of the power tunnel.

At the conclusion of this session of the meeting (about 1400) the concensus was that study work progress was satisfactory, provide reports on test results to the Joint Agencies, and a draft report was expected in the Fall. Also, the set of interim rampdown rates was established and agreed to for Project operation pending results of further field verification.

Note: The powerhouse ramping rate study presentation was followed by presentations on the fish passage study by Parametrix, flood control, and river gravel, steelhead fishability and the Spada Lake creel census by M. Wert.

Henry M. Jackson Hydroelectric Project
Anadromous Fish Mitigation Study - Powerhouse Down-Ramping Rates

Meeting Notes

Date: March 4, 1987 (0945 - 1505)

Place: NMFS, Sand Point, Seattle

Agenda: (attached)

Attendees: Joint Agencies - Linvog (NMFS); Engman (WDG); Ging (USFWS); and Gerke (WDF)
PUD - Schneider, Grimes, Crocker and Metzgar; and
Consultant - F. Olson (CH_2M-Hill)

Purpose: (See Agenda - attached)

1. Refresher - review of the study (Metzgar and Olson)

The study report sent recently to the Joint Agencies by the PUD is the same as discussed at a meeting last year (June 19) except that revisions have been made based upon comments by the Joint Agencies. Limited field work was done: one pair of down-ramping rate tests in May/June; and some checking on the emergence time of steelhead fry. A test was conducted on February 16, 1987, on the 4-inch/hour daylight rate from 1,300 to 450 cfs. A brief report on the results of the May/June, 1986 test was sent to the Joint Agencies as an attachment to the transmittal letter for the revised study report. The 1987 test and 1986 results were discussed latter during the meeting.

2. Study Report - (Chapters 1 thru 3) (Metzgar)

These chapters present the technical background information developed to provide a basis for evaluating the results of down-ramping rate tests. If this information is incorrect, then the fry stranding results would be invalid or misleading. Based on the agency comments (or lack thereof), it is presumed that Chapters 1 thru 3 are acceptable (at this time) as a basis for determining fry stranding potential. Linvog corroborated Metzgar's statement that that was determined during the last meeting.

Before proceeding with discussion about Chapters 4 and 5, Metzgar requested agency comments on Chapters 1 thru 3. Gerke asked if previous agency review comments had been incorporated into the report. Olson replied, yes. Gerke inquired about the basis for fry length measurements reported: was total length used rather than fork length? Olson replied that fry length reported was total length. Gerke suggested that this should be clarified at appropriate places in the report (see below).

Ging asked about the composition of the field crew (bottom p. 9) and the estimated 80 percent of coverage of stranding areas. Was the field crew solely the consultant's or did it include Joint Agency representatives too? Olson responded that it meant only consultant personnel. As to the extent of coverage (80%) where stranding could most likely occur, that estimate was based on professional judgment and familiarity with the lower river and areas of potential fry stranding.

Concerning potholes and side channels (p. 15), Ging asked if this is all that could be expected or might there be more/less in the future? What would be the result in terms of a 50-year flood in changing the pothole/side channel situation? Olson replied that the conditions have been stable during the study, inferring that significant changes aren't expected. Ging stated that changing pothole/side channel conditions could require adjustments in the future. The present ramping rates are designed to fit the present river channel conditions. Some adjustments might be required in the future if channel configurations change, specifically related to potholes and side channels.

Ging requested a definition of "stranding". Clarification of this term is needed. Olson and Metzgar explained how the term has been applied in field verification and in reporting results. Stranding means fry that either were lost or would have been lost if not rescued after it was established clearly that they were trapped in areas that would be dewatered and they could not escape entrapment. Most fry in the latter situation were rescued and returned to the river. Care was taken not to prematurely alter fry behavior. When fry were trapped in large pools that provided survival habitat, those fry were not counted as stranded. For example, the large pool on the left bank in the lower river just upstream from the Town's park on State Highway #2 is supplied by intergravel flow after the upper end is disconnected from the river. There is vegetation and debris in the water for cover, and trees for partial shading of the pool. Many fry in good condition were found in it during electrofishing in August.

Metzgar provided another example with side channel no. 1 (Fig. 3, p. 13). The upstream end of it starts dewatering first, but the upper end still has water and flow for some time due to intergravel flow. The tail end is open for a long time to permanently watered stream channel. Thus, fry can escape for sometime after upper end dewatering. However, Olson has conservatively evaluated this side channel as if it was totally dewatered below a certain flow, when in fact flow continues for some time below the stranding threshold value set by the study.

Olson agreed to provide a definition of stranding as applied and reported in the study.

Ging noted that one of the potholes which had stranded fry was modified later by Olson so that subsequent tests would not cause losses. However, he wondered if modifying the pothole meant changing the possible results? Metzgar recognized the possible implications to results. The change was meant to prevent possible losses, but this was the information that was to be obtained and needed for evaluating the

effect of each ramp rate. Thus, the results for that area were unintentionally biased. It was agreed that the third full paragraph on page 23 should be revised to reflect the biased result due to opening a channel from the pothole to the river, which provided escape for fry which otherwise might have become trapped, stranded and thus, lost due to dewatering.

Concerning steelhead fry stranding discussed on p. 29, Ging asked if sufficient numbers of fry were present to provide accurate size distribution on stranding probability? The 40 mm fry size is a very important point since certain ramp rate schedules/dates are based on this size criteria for reduced stranding probability. Were larger steelhead fry present and what were their numbers in order to provide some confidence with the statement about fry size greater than 40 mm and diminished probability of stranding? Olson indicated that such information was not obtained. He had based his conclusion (assumption) on the fact that nearly all fry sampled in mid-August were >40 mm and thus many were probably >40 mm during the late July/early August tests. Discussion then focused on determining the growth rate (size) for the Sultan River and factors influencing it. Concerning growth rate (size), Metzgar indicated that this issue would be addressed again when Table 9 is discussed. Therefore, defer further discussion since there may be another way to handle it.

On page 36 (last sentence), Ging inquired about the implications of fry loss ratio and agency acceptability of certain ramp rates. Olson explained the thoughts behind the statement, but they were not intended or meant as Ging indicated that they could be. It was agreed to delete the last sentence on p. 36. Gerke referred to p. 25 and a similar statement (as with steelhead) about fry size and stranding susceptibility for chinook salmon. At what length are they most susceptible to stranding (last paragraph)? After discussion, it was agreed to delete "small, recently emerged fry" and substitute with "smaller".

The matter of defining "total length" of fry came up when discussing Chapter 4 (p. 37). Gerke used no. 8 as an example, referring back to fork length v. total length discussed earlier. After discussion and review of the report text, it was agreed as follows:

a) p. 25 (last paragraph, second line) add "total" before length;

b) p. 29 (last paragraph, second line) add "total" before length; and

c) do similarly throughout text where/as appropriate.

3. Review findings (Chapter 4)

On p. 38, Metzgar suggested adding two items (nos. 18 and 19) to clearly present major results of the study. They're mentioned elsewhere in the report, but since they are quite important, they should be presented specifically in the Summary of Findings. As it was agreed that the following would be added to p. 38.

#18 A single, simple downramping rate of 6-inch/hour is not suitable for the Jackson Project's Pelton turbine discharges to the Sultan River.

#19 Downramping rates for the Jackson Project require consideration of the presence or absence of salmonid fry and their size; the flow range in the river and the extent of change of discharge from the powerhouse; and the time of day when downramping.

Metzgar added that #18 is important because that is the present down-ramp rate authorized by the FERC License Order approving Project construction and operation. With #19, it represents a summary of the components of Table 9 which set the basis for down-ramp rates presented in that table.

4. Reports on ramp test results 1986 and 1987

Olson summarized the reports on ramp rates tested since the previous report. A pair of tests were conducted on 4-inch/hour daylight in May/June, 1986. The report on it was attached to the report transmittal letter (report attached). Gerke asked about river and flow conditions prior to the test. Crocker referred to the District's annual operational chart summaries to provide the response.

Gerke also asked if there were any trapping problems in potholes and side channels? Olson replied by referring to the notes which presented the results. Only one fry, which was diseased, was counted as lost. Some possible losses could have occurred if the reduction had continued to a lower flow.

For the recent (2/16) test, there were no agencies comments at this time since the notes on the results were just presented to the Joint Agencies at this meeting. No comment was not meant as acceptance/concurrence or otherwise. However, Gerke requested that the Joint Agencies be notified of ramping tests so that they can send field observers. Metzgar agreed to do so. He advised that in the past, the scheduling of tests has actually been tentative and held on short notice, thus hard to keep everyone notified due to the uncertainty.

5. Recommendations and down-ramping rates (Chapter 5/Table 9)

Before starting on Chapter 5, Linvog requested a summary of the changes made. He noted that the PUD transmittal letter mentioned that "significant revisions occur principally in Chapter 5 - Recommendations". Olson responded that changes were made based upon agency comments at the previous meeting and especially to Table 9. Metzgar added that #1 on p. 37 (Chapter 4) was new; on p. 39 - water temperature discussion; p. 40 - Table 9; p. 41 - winter ramp rates discussion; p. 42 - ramping during twilight; and p. 43 - paragraphs 2, 4 and 5 were added.

Metzgar inquired about water temperature unit calculation and schedule setting for ramping rates. The procedure implies an annual sliding/flexible schedule which poses potential problems for the Project scheduler as well as being a cause for dispute. For example, when do the first salmon eggs go in the gravel? Who determines that, and that benchmark then drives the resultant fry emergence date based on the subsequent water temperatures. The fry emergence causes a shift to a more restrictive ramp rate schedule.

Gerke responded that the ramp rate schedule was always intended to be flexible. WDF does (will do) the calculations on water temperature units. They have had good success on the Cowlitz River such that after the first two years, the Tacoma City Light accepted them without further field checking. Also, the ramp rate schedule was intended to provide general guidelines subject to flexibility on a yearly basis dependent upon the timing of fry emergence. WDF would be willing to field check spawning and fry emergence dates on the Sultan River to set a basis for confirming the calculated method.

On Table 9, Gerke asked for clarification of footnote (e). Are data available to support the 1,000 cfs limit and it appears to be inconsistent with the upper power generation flow limit (1,300 cfs). Olson attempted to recall his reasoning choosing that flow value. The basis for that choice being river side channels and the effect of flow changes, especially decreases, below that flow - dewatering of areas that fry could/would enter if the flow exceeds 750 cfs for a certain period of time. Thus, regardless of the duration of time above a flow of 750 cfs, there might be stranding problems. The flow limit and duration issue was an artifact of observing one down-ramping event. Extensive discussion determined that there were several variables that could be influential, but they were not noted with the observation. Thus, there was uncertainty about cause/effect relationship and therefore, it would be impossible to replicate the conditions for another set of tests and observations. Some of these factors were flow duration, flow, flow change trigger to cue fry to move from side channel areas that will be dewatered.

At the conclusion of this discussion related to footnote (e), the Joint Agencies requested a re-check of the data and field notes for verification/reason for choosing a flow duration of 72 hours and the validity of 1,000 cfs.

Linvog observed that the steelhead emergence date of June 1 in Table 9 was arbitrary. Further information was needed about that date. It is the same issue as discussed about salmon: time when first eggs are deposited in the gravel, water temperature units, and fry emergence. It was agreed that a footnote should be added to June 1.

Engman asked about the distinction between August 15 and 16 as to the readiness of steelhead fry for greater ramping rates. Those dates are based on the size of steelhead fry and presumed growth rates. (Returning to the question by Ging earlier about 40 mm size.) It was agreed after further discussion that steelhead fry growth rates should

be confirmed as a basis for adjusting the ramping rate schedule. Also, the schedule was re-organized as follows to better reflect significant biological conditions in the river:

> June 1 to August 15 and August 16 to October 31 are now June 1 to August 31 and September 1 to October 31.

The ramp rates were generally re-clustered accordingly as follows:

> June 1 to August 15 rates apply to June 1 to August 31; and
> August 16 to October 31 rates apply to September 1 to October 31.

Then certain rates and footnotes were changed to eliminate inconsistencies. Discussion on these revisions covered both biological and operational considerations. The PUD staff explained, for example, the small likelihood of down-ramp events during the annual dry, low rainfall/runoff period from mid-July to early September. Any need/desire to operate the Pelton units is controlled by reservoir state. Nearly every year, the reservoir will be in low State 3 or into State 4. Therefore, except for providing augmentation to meeting minimum instream flows, the PUD won't operate the Pelton turbines. Metzgar pointed out that to conduct verifying tests of some of the down-ramp rates, a waiver would probably be needed for Figure H-3 in Exhibit H. He proposed and consideration was given to setting some rates without testing, especially those that were already at virtual minimums, such as 1-inch/hour. Generally, the PUD would prefer to obtain as much consistency or standardizing of the table as possible for simplification of scheduling and reduce the complexity. Also, there would be significant water conservation benefits, especially during the summer, if 1-inch/hour rates could be increased to 2-inch/hour. A 1-inch down-ramp rate takes a very long time, the water use/loss is compounded by the phase requirement at 750 cfs. In fact, operationally, it can't be done as proposed with a 1-inch/hour rate. Crocker explained the operational implications of the slowest or lowest ramp rate on the schedule (1-inch/hour).

Metzgar reported that one flow range was incorrect. For the September to June period, the minimum instream flow is 200 cfs v. 165 cfs. It was agreed to revise the value to be "minimum flow" rather than 165 cfs or 200 cfs to cover both minimum flows.

Other revisions were made to Table 9:

- For June 1 to August 31, add footnote b;
- Add footnotes (c) and (d) to the 1,300 to 750 cfs flow range rates of 2" (day) and 1" (night), respectively; and change (c's) to (d's) for the night 1" the rate for both 600 - 300 cfs and 300 cfs to minimum.
- For September 1 to October 31 revise the footnote on night rates at 600 - 300 cfs and 300 cfs to minimum flow from (c's) to (d's).

6. Further Ramp Rate Tests

Metzgar identified specific ramp rates that were of importance to Project power operation such that verification/confirmation was desired by the PUD. Those were:

March 1 to May 31 - 1,300/750 cfs day 4-inch/hour.

September 1 to October 31 - all higher rates.

November 1 to February 28 - all higher rates.

For reporting to the FERC, Metzgar proposed that the spring tests be conducted as soon as practicable with the Joint Agencies present, if possible. That would be the last testing under the present contract with CH_2M-Hill. A report would include the results, conclude where we are at, and indicate operational guidelines for down-ramping per Table 9 until further testing could be done later under a new contract. It was agreed to proceed in that manner.

As to report revisions, individual pages will be marked up on which revisions have been made. These will be sent to the Joint Agencies rather than an entire report so as to facilitate agency review.

7. Summary

Metzgar presented the following points as major items covered by the day's meeting:

- The fundamental technical work reported in Chapters 1-3 has been done satisfactorily and, therefore, provides a basis for evaluating results of down-ramping tests on fry stranding.
- There is no restriction on flow increases or rate of up-ramping.
- The term "stranding" should be refined or clarified to explain its application and interpretation of down-ramping test results.
- Additional thought needs to be given to and information provided regarding future (long-term) potholes and side channel conditions.
- The apparent critical size criteria of 40 mm for steelhead fry needs confirming information as well as more on their growth rates.
- Total length required clarification.
- Important findings were added to Chapter 4.
- The Joint Agencies have not completed their review of the latest ramp-down tests, and the agencies should be invited to observe future tests.

- Table 9 was re-organized to reflect the steelhead trout fry vulnerability, probable operational modes of the Project, and consistency of the status on verification of ramp rates.

- Certain operational scenarios during the low flow season are expected to be very infrequent and due only to special circumstances.

- A series of ramp rates remain to be tested and verified.

Attachment
RGM:jk

Jackson Project - FERC #2157
Public Utility District No. 1 of Snohomish County
Anadromous Fish Mitigation Study - Powerhouse Down-Ramping Rates

Meeting between District and Joint Agencies

DATE/TIME: March 4, 1987 - 9:30 a.m.

PLACE: Conference Room - NMFS, Sand Point, Seattle

PURPOSE: Develop a common position (District/Joint Agencies) for an interim report to the FERC on the results and status of the study and identify what remaining tasks should be done.

AGENDA:

1. Refresher - Review of Study
2. Discuss the Study Report - (particularly Chapters 1 thru 3)
3. Review findings (Chapter 4)
4. Discuss Recommended Down-Ramping Rate Schedule - (Table 9 and Chapter 5)
5. Next Step(s)
   - Determine Further Ramp Rate Verifications
   - Report Revisions
6. Summarize

Public Utility District No. 1 of Snohomish County
Henry M. Jackson Hydroelectric Project
Anadromous Fish Mitigation - Powerhouse Down-ramping Rate Study

District Response to Joint Agency Comments
from Meeting of March 4, 1987

During the course of a meeting to discuss the results of a study report on powerhouse down-ramping rates, several issues were identified by the Joint Agencies which could not be addressed or answered completely and satisfactorily at that time by the District. Responses were deferred until a later time. In addition, the response to many of them has already been addressed as represented by report text revisions.

The following items are derived from District meeting notes. In order of appearance in those notes, they are:

1. List of Report Text Revisions

   Copies of revised page mark-ups are attached. Minor corrections for misspellings, typographical errors, page renumbering, etc., are not identified. Pages with important revisions are listed below.

   9, 13, 16, 17, 21, 22, 23, 25, 28, 29, 36,
   38, 39, 42, 43, and Appendix F (to be added)

2. Future River Channel Changes

   Potholes and side channels could change in the future. Present study coverage and ramping rates are designed and based on present river channel conditions and configuration. What would be the result in terms of a 50-year flood changing the pothole/side channel situation (and thus the reliability and applicability of the present ramping rate schedule)?

   Since 1985 when the present ongoing effort on down-ramping rates was initiated, the pothole/side channel situation and gravel bars has been quite stable. That result includes a relatively high river flow situation involving spill at Spada Lake each year since Project power operations began in 1984. It is presumed that if the same flow regimen continues that the river channel potholes/side channels and gravel bars will remain relatively stable as a reflection of that situation. However, recognizing that river channel conditions will change in the future, the District proposes the following actions to account for them as regards the related down-ramping rate schedule.

(a) Annually, the lower 3.5 miles of the Sultan River will be checked to determine the configuration and location of potholes, side channels and gravel bars. The results of this annual field checking will be compared and evaluated with the "baseline condition" (1985 to present) and reported to the Joint Agencies by mid-February each year. If any changes noted warrant reconsideration of the ramping rate schedule in effect, as of now Table 9 in the District's down-ramping rate report of April, 1987, the Joint Agencies would notify the District. Potential mitigating activities would be identified. If the parties are unable to reach an agreement on mitigating action, the matter would be reported to the FERC for resolution.

(b) The present "baseline condition" is defined in the initial study report by Appendix D and text Figure 3. This information will be supplemented by ground and aerial photography of the lower river from the BPA power line crossing to the mouth of the river. This photography will be done in 1987 before the fall-winter runoff period. A report will be prepared for the Joint Agencies and the FERC presenting the results. This report will provide a basis for evaluating the subsequent annual field check proposed in (a) above.

(c) The results of the river gravel studies will be reviewed for possible pertinent information and relevance. Also, this issue will be referred to the consultant for evaluation including the activities proposed above. Results will be presented to the Joint Agencies for review in the context of the river gravel study.

(d) A plan of action (a-b-c above) has been identified by the District. However, the proposed steps have not been reviewed by the Joint Agencies and results may/may not be satisfactory to them. Thus, the pothole/side channel issue will be considered as an unresolved issue at this time and reported as such to the FERC.

3. Stranding Vulnerability Size for Steelhead Fry

The concern about the validity of size (>40 mm) and calendar date (August 15) and reduced vulnerability to stranding was addressed in part by shifting the calendar date on the ramping rate schedule (Table 9) from August 15 to August 31. Thus, the slower, summer ramping rate is extended 16 days. The effectiveness and acceptability of this revision as well as the size issue will be evaluated further by subsequent field work and ramp rate verification tests. At the present time, interim down-ramp rates and conditions apply, as indicated in Table 9.

4. Down-ramp Rate Tests - 1987

This is to note that field reports on recent tests (1987) were or have been presented to the Joint Agencies. No responsive comments have been received, but that the lack of response means neither acceptance or disagreement. The District's position will be that if no comments are received by June 22, 1987, then concurrence/acceptance is inferred from the null response for February 16, and March 24 and 26, 1987 ramp rate verification field notes.

5. Water Temperature Unit Calculations/Fry Emergence

The key dates of March 1 and June 1 are noted in Table 9 to be flexible. The effective date for more conservative or slower ramp rates will be determined annually by projected fry emergence from the river gravel. This will be set by the WDF for salmon and WDG for steelhead based on water temperature unit calculations. The Sultan River water temperature units will be provided to WDF and WDG by the District. The water temperature recordings will be from the powerhouse stream gaging station. Unless notified to the contrary by either WDF and/or WDG, the District will operate the Project according to Table 9 for down-ramping events.

6. Footnote (e) in Table 9

Referring to page 5 of the March 4 meeting notes, the basis for choosing the upper limit flow value of 1,000 cfs and 72 hour exceedance period for the operational restriction was questioned and reference to notes/basis for them was requested. Referral to notes provided the following information.

When full power (1,300 cfs) was held for four days (96 hours) prior to the April 4, 1985 test, the potential problem (as noted in (e) in Table 9) did not exist e.g. large numbers of fry observed entering side channels nos. 1 and 6 due to river flow changes caused by down-ramping. Thus, 72 hours (one day or 24 hours less) was chosen since the problem was not observed with an antecedent flow regime greater than that time interval. So 72 hours is "conservative" based upon the field work and the limited information available.

Regarding the choice of flow of 1,000 cfs as an operational criteria, that value was again chosen conservatively since the problem was observed at the high end of the power generating flow range (1,300 cfs), but wasn't observed at 750 cfs. Thus, the mid-point flow between 1,300 and 750 cfs (1,000 cfs) was chosen for lack of any better basis or scientific information.

7. Table 9 - Revisions

So many revisions were made, both organizationally and substantively, that it was difficult to accurately record or report them. This is to note that based on review of meeting notes and mark-ups on the Table during the meeting, Table 9 (revised) is believed to reflect all comments. Since it is the crux of the whole effort, the District anticipates careful scrutiny of it by the Joint Agencies.

Table 9 represents the basis for the remaining ramp rates to be verified. Some rate tests will be difficult to do because of the infrequency of having enough stored water to allow effective operation of the Pelton turbines. This situation can be addressed by either waiting for an appropriate opportunity created by favorable runoff and reservoir storage conditions or requesting a waiver of reservoir operating curves in Exhibit H, Figure H-3. Reference here is specifically to remaining summer (June 1 - August 31) ramp down rates of one inch/hour at night. Remaining rate tests will be scheduled coincident with operation later in 1987 and 1988. The District will notify the Joint Agencies of scheduling when tests will be conducted. In some cases, however, lead time or advance notice may be relatively short-term due either to operational necessity or limits imposed by the amount of water in reservoir storage or flowing in the river.

Attachment (see Attach. IV)
RGM: 4/9/87

SNOHOMISH COUNTY
PUD
PUBLIC UTILITY DISTRICT No. 1

2320 California St., Everett, Washington 98201 *258-8211*
Mailing Address: P. O. Box 1107, Everett, Washington 98206

November 12, 1987
PUD-17578

Mr. Gary Engman
Washington State Department of Game
16018 Mill Creek Blvd.
Mill Creek, WA 98012

Mr. Jon Linvog
National Marine Fisheries Service
7600 Sand Point Way N.E.
Bin C 15700
Seattle, WA 98115

Mr. David Somers
Tulalip Tribes, Inc.
6700 Totem Beach Road
Marysville, WA 98270

Mr. Gwill Ging
U. S. Fish & Wildlife Service
2625 Parkmont Lane S.W.
Olympia, WA 98502

Mr. Robert Gerke
Washington Department of Fisheries
3939 Cleveland Ave.
Tumwater, WA 98504

Gentlemen:

Jackson (Sultan River) Project - FERC #2157
Anadromous Fish Mitigation Study
Powerhouse Ramping Rate Study

On May 22, 1987, the District sent you a letter (PUD serial 17325) with six attachments on the powerhouse ramping rate study. That letter followed up our meeting held on March 4, 1987. Our letter requested review comments from the Joint Agencies by June 22, 1987, on the attachments, particularly pending revisions to the study report. To date, we have received no comments from the Joint Agencies in reply.

In these matters, silence is inferred to mean concurrence/acceptance or agreement. Before reporting to the FERC as proposed in the draft letter (Attachment VI to PUD 17325), we wish to confirm with you our interpretation of the status on the powerhouse ramping rate study due to its mutual importance for protecting fish resources in the Sultan River and operating the Henry M. Jackson Hydroelectric Project. The major results of the study conducted thus far are as follows:

- Table 9 in the study report provides operational guidance for the Project acceptable to the Joint Agencies. This table is not final as testing of certain down-ramping rates has yet to be done and is needed.

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- Additional down-ramping rate tests will be conducted by the District when favorable water storage conditions and operating schedules permit. The District will notify the Joint Agencies in advance of scheduling for these tests.

- The Washington Department's of Fisheries and Wildlife will project time for emergence from river channel gravel of salmon and steelhead trout alevins, respectively, through water temperature information provided to them by the District. Unless notified to the contrary by either WDF or WDW, the District will operate the Project per schedule in Table 9 for down-ramping events related to power generation.

- Future river channel and gravel changes could effect the validity of present ramping rates in Table 9. This issue requires further attention. A plan of action as proposed in District response to Joint Agency comments from March 4, 1987 meeting is the basis on which the District is proceeding. (See Attachment III to PUD 17325.)

- Steelhead fry stranding vulnerability size requires verification. The size issue (> 40 mm) and schedule for changing ramping rates will be evaluated further by subsequent field work.

Of lesser importance, the District through its consultant submitted field reports to the Joint Agencies on the 1987 ramping rate tests. Agency review/comment was deferred pending your opportunity to evaluate those reports. A null response was to mean agency acceptance/concurrence of those reports. Since we have received a null response, those reports are recorded as accepted by the Joint Agencies.

A revised study report has been prepared. Revisions are in accord with your review comments. A list of revisions and copies of the page mark-ups were sent to you in our May 22 letter. A copy of the final report on work conducted to date is enclosed. If you would like to have any further comment about it in writing within Appendix F - Agency Consultation, please submit your written comments to the District by December 21, 1987.

The District will be closing its contract with its study consultant, CH_2M-Hill since the work within the original scope of work has been completed. Another request for consultant statements of qualification and proposals to conduct the remaining field work will be prepared and publicly noticed in accord with District policy. You will be advised about the consultant responses and consulted for recommendations from the short list. The District will be initiating the consultant notification/RFP, evaluation and selection process as soon as possible. If you should have any questions, please direct them to Mr. Metzgar at 347-4319.

In closing, we reiterate that if you have any written comments at this time on the powerhouse ramping rate study for transmittal to the FERC within the enclosed report, please submit them to the District by December 21, 1987.

Very truly yours,
ORIGINAL SIGNED BY
M. HATSCHER

Martin Hatscher
Acting Director, Power Management

Enclosure

cc: Plumb, FERC (w/o enclosure)
Edson, FERC (w/o enclosure)
F. Olson, CH_2M-Hill (w/o enclosure)

SNOHOMISH COUNTY
PUD
PUBLIC UTILITY DISTRICT No 1

2320 California St., Everett, Washington 98201 258-8211
Mailing Address: P. O. Box 1107, Everett, Washington 98206

December 23, 1987
PUD - 17661

Mr. Robert Gerke
Washington Department of Fisheries
3939 Cleveland Ave.
Tumwater, WA 98504

Dear Mr. Gerke:

Re: Jackson Project - FERC #2157
Anadromous Fish Mitigation
Powerhouse Ramping Rate Study

Your review comments on the downramping rate study report telephoned to us on December 22, 1987 are acknowledged and appreciated. We are presenting your comments and our responses here for the benefit of other Joint Agency members. Thereby, their review may be aided, completion expedited and results coordinated with your comments and our replies.

Your comments and my replies are presented in their order as we discussed them by telephone.

1. Table 9 (p. 42) - Under Flow Range, what does "min" mean? Is it minimum flow at the powerhouse? PUD Reply: Yes. "Min" will be footnoted (f) as follows: "Minimum fishery flows as required at the powerhouse in accord with Uncontested Offer of Settlement approved by FERC (22 FERC ¶ 61, 140 issued February 9, 1983). These flows are 165 cfs (6/16 to 9/14) and 200 cfs (9/15 to 6/15)."

2. Table 9 (p. 42) - "Day" and "Night" need definition. They may be defined in the text, but should be defined in Table 9. PUD Reply: The text will be checked for coverage, and we agree with revising Table 9. "Day" and "Night" will be footnoted (g) as follows: "Day or daylight means one hour before sunrise and night means one hour after sunset as established by standard daily sunrise/sunset tables."

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3. Table 9 (p. 42) - Clarification requested on footnote (a). PUD Reply: The downramping rates in Table 9 cannot be met in an emergency shutdown event with turbine units 1 and 2. Units 3 and 4 have automatic bypass valves to maintain the minimum flow at the Diversion Dam. However, the Pelton turbines (units 1 and 2) do not have a bypass capability to maintain flows in an emergency shutdown. Thus, a totally automatic shutdown of water flow occurs in about 5 - 7 minutes. Usually it takes about 20 minutes to restart the Pelton turbines after an emergency shutdown, if conditions permit resuming power generation, and operating personnel are on-site. Three uncontrolled shutdowns are believed to have occurred with the Jackson Project since start-up of commercial operation.

4. Project Operating Rules and Guidelines (Table 9, p. 42) - Table 9 should be developed as a separate item from the study report and is more than "recommended" downramping rates. Table 9 presents how the Project will be down-ramped under different circumstances. Perhaps the table could be entitled "Provisional Downramping Rate Schedule/Operating Rules/Guidelines" etc.? PUD Reply: Agreed, because Table 9 reflects the results of the study on fry stranding caused by downramping operation. A table separate from this report will be prepared to include the revisions discussed above. A tentative title for it will be "Jackson Project Provisional Downramping Rate Schedule and Rules".

5. 4 inch/hr Ramp Rate During March/May - This rate is not discussed in the text. The observations of test conditions are presented in Table 4, p. 23 (4 tests - 2 each in 1986 and 1987). However, the derivation of the acceptability of the 4"/hr rate from the 6"/hr rate is missing in Chapter 3 under High-Flow-Range Tests on p. 24. How did we get from the 6" to 4" downramping rate? PUD Reply: Earlier results with the 6"/hr rate led to consideration of an alternative. The results of the two tests in 1986 were suspect since they were conducted later (May/June) and it was presumed that larger fry weren't as vulnerable to stranding. Therefore, another set was done earlier the next spring with smaller fry. The results of 1986 and 1987 were summarized and added to the original Table 4. Also, the field tests were described and results reported in consultant memoranda to the PUD. These memos were forwarded to the Joint Agencies. For instance, the 1987 test memo is Attachment V in our letter of May 22, 1987 (PUD - 17325). Apparently, the

1986-87 high-flow range tests were inadvertently omitted or overlooked in terms of the text coverage. Essential discussion covering the 4 inch/hr rate high-flow tests will be added to the report.

I understand that you will also provide written comments to the PUD, the content to be generally as indicated above. Further, the proposed report revisions as discussed by telephone and presented above are acceptable to your agency. If this letter is received by other Joint Agency members prior to submittal of their review comments to the PUD, they may wish to comment also on WDF comments/PUD replies herein.

Yours very truly,

Roy G. Metzgar
Sr. Hydro. Environmental Specialist

cc: J. Jones, Bell & Ingram
G. Engman, Washington Department of Wildlife
G. Ging, U. S. Fish & Wildlife
J. Linvog, National Marine Fisheries Service
D. Somers, Tulalip Tribes
F. Olson, CH2M Hill

JOSEPH R. BLUM
Director

STATE OF WASHINGTON
DEPARTMENT OF FISHERIES
115 General Administration Building • Olympia, Washington 98504 • (206) 753-6600 • (SCAN) 234-6600

January 22, 1988

Mr. Roy G. Metzgar
Senior Hydro. Environmental Specialist
Snohomish County PUD
Post Office Box 1107
Everett, Washington 98201

Dear Mr. Metzgar:

Jackson Project - Powerhouse
Ramping Rate Study

We have received your letter dated December 23, 1987 that serves to document our telephone conversation (December 22, 1987) and presents the PUD's response to our questions and suggested changes regarding the ramping rate study final report. The above are summarized in your letter (items 1-5) and for the most part, accurately reflect our comments and conversation. Rather than reiterate our verbal comments here, I believe it would be more effective to add some clarifying remarks relative to the five items outlined in your letter.

Number 2: Day-time is defined as follows: that period from one hour before sunrise to one hour after sunset. Night-time is defined as follows: that period from one hour after sunset to one hour before sunrise. Perhaps this would suffice for the needed definitions.

Number 4: It was agreed that Table 9 should be modified and developed as a separate powerhouse operating constraint. Table 9 is the most important result of the study as it has major fisheries resource protection implications and should be incorporated into the project's operational plan. Because there is still some additional field work to perform, the operating ramping rate restriction should be termed preliminary or provisional. Therefore, we suggest that the operating modification be entitled - "provisional ramping rate schedule for the Jackson Project".

I appreciate your receiving our comments via telephone and your quick response. Should you have additional questions regarding this matter, please let me know.

Sincerely,

Robert Gerke, Assistant Chief
Habitat Management Division

RG:db

United States Department of the Interior

FISH AND WILDLIFE SERVICE
Fish and Wildlife Enhancement
2625 Parkmont Lane SW, Bldg B
Olympia, Washington 98502
206/753-9440 FTS 434-9440

February 10, 1988

Mr. Martin Hatscher
Acting Director, Power Management
Snohomish County Public Utilities District No. 1
P.O. Box 1107
Everett, Washington 98206

Re: Jackson (Sultan) Project-FERC 2157, Ramping Rate Study Report

Dear Mr. Hatscher:

We have reviewed the CH2M HILL report entitled *Downramping Regime for Power Operation to Minimize Stranding of Salmonid Fry in the Sultan River*, and offer the following comments and recommendations.

Overall, we are satisfied with the contents of the report and the recommendations presented in the document. We appreciate the effort that the Snohomish PUD has made to address the ramping rate issues and to reduce the impact to salmon and steelhead.

We concur with the District's downramping rate schedule (Table 9), with the following understanding: (1) changes in the channel morphology may result in the need to revise the ramping rate schedule, and (2) the frequent downramping for load-following purposes, as was experienced during 1985, is to be avoided as much as possible. The District's November 12, 1987 letter acknowledges that "future river and gravel changes could affect the validity of the present ramping rates...," so it appears that we are in agreement on this issue. The potential for large flood events to alter existing gravel bars, side channels and potholes cannot be ignored. Therefore, we recommend that following large flood events during which there is reason to believe channel changes may have occurred, discussions be opened between the District, resources agencies and affected Tribes to address the need for additional studies.

On the second point, the frequency of downramping has a bearing on the acceptability of the ramping rate. The District in the past routinely downramped on a daily basis over an extended period of time (excluding weekends). It is our understanding,

based on our last communication in 1987 with the District, that the load-following peak-shaving practice is no longer being practiced. Our concerns with the previous operation center on the fact that, cumulatively, small daily impacts can quickly reach significant levels.

In summary, the proposed downramping rate schedule is acceptable to us, given the above understanding. Please include this letter with your consultation report to the FERC.

If you have any questions regarding the above comments, call Mr. Gwill Ging at (206) 753-9440.

Sincerely,

Jay F. Watson

Jay F. Watson
Acting Field Supervisor

c: WDF, Olympia (Gerke)
WDG, Bothell (Engman)
Tulalip Tribes (Somers)
NMFS, Seattle (Linvog)
FERC, Portland

SNOHOMISH COUNTY
PUD
PUBLIC UTILITY DISTRICT No 1

2320 California St., Everett, Washington 98201 258-8211
Mailing Address: P. O. Box 1107, Everett, Washington 98206

March 15, 1988
PUD-17745

Mr. Robert J. Gerke
Washington Dept. of Fisheries
3939 Cleveland Ave.
Tumwater, WA 98504

Mr. Jay F. Watson
U. S. Fish & Wildlife Service
2625 Parkmont Lane S.W.
Olympia, WA 98502

Gentlemen:

Jackson Project - FERC #2157
Anadromous Fish Mitigation
Powerhouse Ramping Rate Study

Thank you for your recent comments in response to our request of November 12, 1987 (PUD-17578) for review of the report on the powerhouse ramping rate study. We have delayed our reply to you in hopes of receiving additional comments from other Joint Agency members. To conclude this phase of the effort on ramping rates now with all members, we offer the following replies to comments we received from the Washington Department of Fisheries (WDF) and the U. S. Department of Interior's Fish & Wildlife Service (FWS).

Washington Department of Fisheries

The clarifying remarks in the letter of January 22, 1988, from the WDF are helpful to the District. They improve the content and meaning of Table 9, page 42, in the study report. Revisions will be made to Table 9 in accord with the WDF suggestion.

Also, please refer to our letter to the WDF of December 23, 1987 (PUD-17661). Other text revisions will be made in accord with our numbers 1 and 5.

U. S. Fish and Wildlife Service

The FWS mentions two specific items which require further attention and response by the District.

1) River channel morphology - is an issue which emerged from earlier agency consultations on the study. The District mentioned it for record purposes in our letter of November 12, 1987. The FWS states that "[T]he potential for large flood events to alter existing gravel bars, side channels and potholes cannot be ignored." The District agrees with that statement. To address the issue, the FWS has recommended ". . . that following large

flood events during which there is reason to believe channel changes may have occurred, discussions be opened between the District, resource agencies and affected Tribes to address the need for additional studies".

The District will temporarily defer responding on this proposal. Related technical aspects of the issue were addressed in the river gravel studies, particularly bedload transport. We intend to confer with the consultant providing us with technical assistance on that matter and respond later in the context of the river gravel study. Our lack of reply at this time should not be inferred to mean either disagreement or agreement. As stated above, we are in agreement about the potential significance of the issue and the need to address it effectively.

2) Downramping frequency - the FWS advises that a high frequency of downramping events, particularly as occurred in the past, can have a significant cumulative effect, if continued. The District agrees with the concept or theory implicit in that statement. However, some clarification about Project operation both past, present and future may relieve some of the agency's concern. Also, certain technical parameters and results of the ramping rate study bear on the downramping frequency and potential cumulative effect issue.

First, the District does not have sufficient total generating capacity to match the total electrical load of its customers. We can provide about 18% of the electrical energy needed, of which the Jackson Project provides about 8%. Consequently, the Jackson Project is not operated in a "load-following" mode. A "load-following" project's operating schedule is based on a 24-hour/day load cycle. Whereas the operating schedule for an intermediate cycle project, such as the Jackson Project, is determined by the daily occurrence of maximum demand for electrical energy. In the case of Snohomish County that usually happens during the winter months between the hours of 7 and 11 a.m. The goal of reducing the maximum daily demand peak is to lower the highest single-day electrical load demand for the month, because the Bonneville Power Administration applies a capacity charge to its customers for electrical energy provided, which is based upon the maximum hourly peak demand in a month.

Second, downramping frequency with the Jackson Project is determined by a combination of meteorological and hydrological conditions, which vary from year to year. Colder air temperatures increase electrical energy demand and the longer relatively lower air temperatures persist, the higher the daily demand peak will be. Coincident with cold weather, surface water runoff decreases because in winter, coldest air temperatures occur with clear weather. Thus, inflows to the reservoir may not meet the District's energy requirements from the Project and at the same time water storage decreases.

The present reservoir rule curve limits the power generating potential from the Project. When the reservoir reaches the present minimum operating level of 1,425' for the Pelton turbines while colder weather persists, the District faces the inevitability of being unable to reduce, to the extent of the power plant's capability, the potential daily peak demand that might occur and thereby will incur a larger capacity charge from the BPA. Hence, there is an incentive for the District to conserve water in the reservoir in order to prolong the ability to continue daily power generation for as long as possible during the coldest weather in a particular month. This scenario applies only when reservoir storage is in the State 3 discretionary operating zone (elevations 1,430' to 1,425') during winter months. When the reservoir is in State 2 and maximum power generation discharge is required, no intermediate-cycle operation occurs. That is one reason why the District has proposed increasing the size of the discretionary zone under License Article 57, flood control. A larger operating zone can and will reduce the need and thus the frequency of downramping to conserve water during normal precipitation months/years.

Regarding the potential implications to fry stranding due to Project operation, which is the major concern and reason for evaluating downramping rates, please recall that the time of year when the need and frequency will be the greatest for downramping coincides with larger size fry with less stranding vulnerability. The reduced stranding risk is implicitly reflected in the recommended provisional ramping rates resulting from field tests. Highest ramp rates are allowed during November 1 to February 28, subject to yearly salmon fry emergence during the latter part of that period.

It should also be pointed out that over the last two years the District has entered into various storage agreements with other utilities, enabling us to return stored energy during peak demand hours. This effort considerably reduced the need for frequent ramping of the Project.

Perhaps one way to address the concern about downramping frequency would be to review and evaluate Project operational history. A logical point to do so might be in conjunction with the Project License Article 55 requirement for a final report to the FERC on June 1, 1990. By that time, the Jackson Project will have accumulated more than five years of operating history.

As a reminder, License Article 55 was amended by the FERC on March 17, 1987, to read as follows:

> "Article 55. Licensees, by June 1, 1990, after completion of mitigation studies for the aquatic resources of the Sultan River, shall file a final report and, for Commission approval, recommendations for further measures needed, if any, to protect aquatic resources of the Sultan River. The licensees shall file with the Commission annual reports on the status of the studies beginning June 1, 1987, including comments from the Washington Departments of Game and Fisheries, U. S. Fish and Wildlife Service, national Marine Fisheries Service, and Tulalip Tribes."

Therefore, a review of Project operational history on the frequency of downrampings and load rejections might provide some useful insight about the potential cumulative impact on fishery losses due to implied fry stranding. The proposed operational history review would occur in 1989 to allow time for agency review and comment before submittal to the FERC in 1990 in accord with Article 55.

In the future, there will be further opportunities to discuss these issues and any others in subsequent consultations with the Joint Agencies. Upon concluding this phase of the effort on downramping rates with transmittal of the study report to the FERC, the District will proceed with obtaining further technical assistance to conduct remaining studies as recommended in Chapter 5 of the report. A scope of work will be developed in consultation with the Joint Agencies later this year before obtaining the necessary consultant services.

In closing, if other Joint Agency members wish to comment at this time on the study report before final editing/revising and report printing, please contact Roy Metzgar at 347-4319 immediately. We appreciate the written comments from the WDF and FWS in providing us with guidance and suggestions essential for reducing any potential negative environmental effects of Project power operations.

Very truly yours,

Martin Hatscher
Acting Director, Power Management

cc: G. Ging, USFWS
J. Linvog, NMFS
D. Somers, Tulalip Tribes
G. Engman, WDW
J. Jones, Bell & Ingram
F. Olson, CH_2M-Hill

SNOHOMISH COUNTY
PUD
PUBLIC UTILITY DISTRICT No. 1

2320 California St., Everett, Washington 98201 258-8211
Mailing Address: P. O. Box 1107, Everett, Washington 98206

May 1, 1989
PUD-18354

Mr. Gary Engman
Washington Dept. of Wildlife
Region 4
16018 Mill Creek Blvd.
Mill Creek, WA 98012

Mr. Gwill Ging
U. S. Fish & Wildlife Service
2625 Parkmont Lane S.W.
Olympia, WA 98504

Mr. David Somers
Tulalip Tribes, Inc.
6700 Totem Beach Road
Marysville, WA 98270

Mr. Jon Linvog
National Marine Fisheries Service
7600 Sand Point Way N.E.
Bin C 15700
Seattle, WA 98115

Mr. Robert Gerke
Washington Dept. of Fisheries
3939 Cleveland Ave.
Tumwater, WA 98504

Gentlemen:

Jackson Project - FERC #2157
License Article 57 (Flood Control)
Draft Operating Plan Consultations - Licensee Response

This is to continue our response to your comments from the second consultation meeting held on March 22. This response transmits our notes for that meeting and proposed revisions to the draft operating plan document from meeting discussion.

In preparing the attached notes, we identified the following specific tasks, besides revising the operating plan document. We list them here to assure that any won't be overlooked.

1) Provide record of U. S. Geological Survey calibration of the stream gage at the Diversion Dam.

2) Conduct a field measurement of the instream flow below Culmback Dam. Notify the Joint Agencies in advance of the method and date of work.

3) Determine fall salmon spawning instream flow regime.

1563U

4) Transmit the steelhead fishability mitigation plan proposal for agency review. (Done - sent to Joint Agencies by PUD-18339.)

5) Improve the timeliness of transmitting water temperature data to the Washington Department of Fisheries for calculating water temperature units/fry emergence.

6) Revise the flow fluctuation tables by extending the spawning seasons and changing the fry emergence date to February 1. (Done - revised tables, including Spada Lake levels simulation with the proposed reservoir rule curve revision, sent to Joint Agencies by PUD-18334.)

7) Provide advance notice to Joint Agencies on operation of the Howell-Bunger valve.

8) Develop interim operating plan evaluation criteria.

9) Revise Exhibits H, I and U for consistency with the operating plan.

10) Conduct additional downramping rate verification work, as indicated by the revised recommended schedule in the operating plan.

11) Notify Joint Agencies in advance when the Diversion Dam sluice will be operated.

Finally, we have prepared some information on minimum flow releases at Culmback Dam and record documentation. We also have a further proposal regarding steelhead fishability mitigation. We will present them to you during our next consultation meeting on May 1, 1989.

Very truly yours,

Original Signed By:
J. B. Olson

Jean B. Olson, Manager
Environmental & Engineering
Support Services

Attachments (2)
RGM:jk
cc: J. Jones, Bell & Ingram (w/o Attachment #2)
S. Foster, Corps, Seattle District
M. Ekman, Corps, Seattle District

JACKSON PROJECT FERC #2157

District/Joint Agency Meeting Notes - Article 57 (Flood Control)

Date: March 22, 1989 (0950-1450)
Place: NMFS (Sand Point), Seattle
Attendees: List attached (Attachment I)
Agenda: Copy Attached (Attachment II)
Purpose: FERC License Article 57 -
Licensee and Joint Agencies confer on draft revision to reservoir operating plan (reservoir rule curve) - Exhibit H for Jackson Project.

1. Opening/Agenda

There were no suggested revisions to the agenda (Attachment II).

2. Comment on Meeting Notes for February 15, 1989

Metzgar asked for Joint Agency comments on the February 15, 1989 meeting notes. There were none at this time. He asked for clarification/guidance concerning the agencies' highest priority between the ramping rate and river gravel/sediment studies. PUD notes from the meeting listed each one. The Joint Agencies affirmed river gravel/sediment studies as having highest priority for reactivation by the PUD. Metzgar responded that the meeting notes would be revised to reflect that advice/guidance (at top of p. 8 in February 15, 1989 meeting notes).

3. License Response to Joint Agencies' Comments

a) Water Quality - a letter dated March 21, 1989 from the District to the Joint Agencies (PUD-18243) was hand transmitted at the meeting. The letter provided pertinent information excerpted from earlier study reports. (A copy of that letter is Attachment III to these notes.)

b) Water Temperature - same as 3a above - Attachment III.

c) Turbidity - same as 3b above - Attachment III.

d) Frequency of Flow Changes/Ramping Events - Meaker handed out and explained three tables (Attachment IV) on the fluctuation frequency of the Sultan River due to Jackson Project operation while Spada Lake is in Reservoir State 3. The range of flow change coverage was increased from ≤10 MW to ≤3 MW. These tables covered the entire operating history of the Project since 1984.

Meaker explained key definitions for the tables:

> Flat fluctuation meant changes, if any, were no more than 3 MW (or about 36 cfs) each day with the Pelton turbines.
> Significant meant that the Sultan River flow was less than 700 cfs at the powerhouse.
> Non-significant meant that the Sultan River stayed above 700 cfs at the powerhouse.

Ging asked if an up/down fluctuation meant occurrence within 24 hours? Meaker answered, yes. Do the numbers represent each individual event, for example, April 20-28, 1985? Answer - yes for each type of fluctuation when the reservoir has been in State 3 for 915 days within the overall total since operational start-up. The other reservoir states (1, 2 and 4) mandate Project operation, there's no operating options.

Metzgar asked Crocker to discuss what the effect of the difference between Figures H-3 and H-3 (revised) would be on the fluctuations in Table 2 for February, 1989, during the record-breaking cold weather/electric load/demand. Crocker responded that the river flow changes or the range of fluctuation would have been smaller, only down to 700-750 cfs on a daily basis rather than lower as occurred this year. Thus, there would probably have been less number ones (downs).

Ging advised (in referring to Table 3) that he would be more interested in the fry stranding period when smaller, younger fish would be most vulnerable to flow changes.

Ging asked about possible biases in the data? Meaker replied that more water in 1988 reduced the need to change operating schedules and the frequency of fluctuations. Other factors to account for are model capability (limitations) and operating experience. The District is more familiar with the Sultan Basin's runoff history and implications to operations scheduling. Thus, performance should start to improve. The reservoir was in State 3 for 54% of the total days (1688) of operation covered by the tables.

Ging advised that his agency's perspective is one of looking ahead as to what could occur. They're looking for protection for the fish resource and language in an operating plan/agreement that satisfies their concerns. The Joint Agencies are concerned about the possibility of more flow fluctuations with greater operating flexibility. They want to be able to come back for reconsideration of any operating plan change, if results are unacceptable.

4. Licensee Report on Regional and Local Water Supply Planning

Metzgar handed out a collection of recent newspaper clippings and a District letter on the subject (Attachment V). The District/City response to local and regional water supply issues and inquiries potentially involving the Sultan River basin as a future source of supply

is based on the output of the same model used for development and evaluation of the reservoir operating rule curve submitted to the FERC for License Article 57. The model takes into account and provides for future City of Everett municipal water supply demand and the minimum instream flow requirements for the Sultan River. Thus, any "surplus" water is available after meeting local and regulatory requirements.

Continuing, Metzgar advised that the role of the Snohomish County PUD in municipal water supply is being re-evaluated by its Board of Commissioners. The District has authority to supply water throughout the County and must do so on demand or request under certain circumstances. With active municipal water supply policy development and planning in north Snohomish County, Marysville, the Town of Sultan and east King County, the Board feels that it must participate to protect its interests and investment in the Jackson Project.

5. Review of Draft Operating Plan

Ging asked if the language in the draft reflected or repeated that of established regulatory obligations such as the FERC License and the Settlement Agreement. Metzgar replied yes/no. The Joint Agencies asked for a "walk-through" pointing out the new elements or "Metzgarese" in the draft. Beginning on pg. 1 of the draft plan, the origin is as follows:

I. Purpose - this is new (pg. 1)
II. Definitions - this is new (pp. 1-2)
III. Background - this is new (pp. 2-3)
IV. Aquatic Resource Protection Criteria and Requirements:

a. Minimum Instream Flow Schedule - this is identical from the Settlement Agreement and approved by FERC Order. Figure (pg. 4) is from Exhibit H, but the instream flows are incorrect. It will be revised accordingly. The second half of IV-A starting at the bottom of pg. 3 is new.

b. Maximum Controlled Flow Releases - this is new (pp. 3-7). B-1 is new and is based on previous discussion with WDF and the present request for flow augmentation during the fall salmon spawning season. B-2 is new and is based on the study on steelhead fishability.

c. Downramping Rate Schedule - this is based on the CH2M-Hill study report reviewed by the Joint Agencies. It is not new material (pp. 8-9).

d. River Temperature - this is old (pg. 9). Figure 2 is old, from the study report on water temperature and turbidity (see Attachment I).

e. Howell-Bunger and Slide Valves at Culmback Dam - this is new (pp. 9-11).

V. Operating Logic and Criteria - this is based on old material, but some important criteria have been revised (pp. 11-13). Figure H-3 is the proposed reservoir rule curve revision (pg. 12).

VI. Power Generation Limit - this is new.

VII. Plan Revision - this is new.

VIII. Interim Plan Schedule - this is new.

IX. Reservation - this idea and language are borrowed almost verbatim from the Settlement Agreement.

X. Execution - this is identical to that in the Settlement Agreement.

Related review discussion was as follows.

IV A. Minimum Instream Flow Schedule (pg. 5)

The discussion on non-compliance is to be revised. Engman advised that the gage reading is the standard for determining compliance. If a later USGS rating change is made which causes the flows to fall below the schedule, that is not a violation. Discussion covered recording problems with the diversion dam gaging station and actions taken to improve the situation. Ging added a caveat about agency evaluation of operator performance concerning instream flows: if the flows are consistently low or below minimum or the relative frequency of occurrence of problems, then it's a different situation. They don't want deficiencies to occur. Ging asked for a copy of the USGS record of calibrating the diversion dam stream gage.

It was mutually agreed that non-compliance coverage on page 5 will be revised based on today's discussion.

Metzgar asked if the agencies intended to comment on the District's recent report on minimum instream flow problems? The response was that no written comments would be submitted.

Linvog asked about the accuracy of the 20 cfs flow at Culmback Dam. The statement regarding compliance is unequivocal about that flow. Metzgar replied that the release is through either a valve or the small hydro turbine with pre-determined settings related to certain flows. Also, during low flow periods, the tributary flows below Culmback Dam are nil so that the upstream flow arriving at the diversion dam is almost totally the release from Culmback Dam. Somers observed that raises some potential problems about documentation of the flow release at Culmback Dam without a direct record or proof of flows. Ging asked if there was any direct physical measurement of instream flow directly downstream from Culmback Dam? Metzgar replied, no. Johnson added that the basis for release through each valve is a rating curve established for the setting or opening of the valve. After further discussion, it was mutually agreed to field measure the instream flow below Culmback Dam in order to verify the minimum flow requirement release. The Joint Agencies asked to (and will) be notified on the method of field measurement and the date of the work.

IV B-2: Fall Salmon Spawning Season

Bruya asked about the basis for this section? Metzgar replied that it is based on previous consultations with the WDF and operating history/experience. The 400 cfs flow value is based on WDF requests in 1985 and 1987 to provide supplemental flow to facilitate pink salmon spawning. Gerke requested this for the 1989 pink salmon spawning run during last year's annual reservoir drawdown consultation under Article 57. Discussion continued among the fishery people about spawning requirements and subsequent protection of redds against dewatering if spawning is promoted in shallower areas of the river channel with higher flows where lower flows may not keep redds watered. Linvog noted that a general rule of thumb is 2/3 of the spawning flow will keep redds covered/watered. Bruya advised that this issue will require further consideration.

IV B-2: Winter-run Steelhead Fishing Season

Engman asked for background explanation and clarification. Metzgar reviewed the results of the steelhead fishability creel census and the mutually agreed to concept of looking at a flow reduction scheme for mitigation. The focus or approach shifted from the fishery itself to instream flows because of the relatively small sample sizes available from the fishery. Also, no need for mitigation was shown, except that when flows go above a certain level, the river becomes less fishable: water depth, velocity and reduced accessibility via wading. The computer model shows that the occurrence of flows above 700 cfs will occur more frequently than in the past. That flow was chosen for mitigation purposes because it is intermediate in the threshhold flow range of 650-750 cfs, above which fishability decreased.

Engman commented on the proposed 36-hour flow reduction as perhaps not providing sufficient time or opportunity for anglers. Saturdays are usually big use days and the proposal doesn't provide for it. Also, let the agency choose the mitigation flow time based on conditions e.g., water temperature, turbidity, presence of fish, etc. The scheme has uncertainty with the flow conditions.

Metzgar responded that Saturdays are a BPA capacity charge day although peak demand usually doesn't occur on that day. Depending upon circumstances - reservoir storage, weather, and power supply/demand situation - it might be possible to provide greater opportunity. However, there are so many variable factors that must be taken into account, it is difficult to develop predictability and a consistent operating plan for fishing mitigation flow reductions. Engman commented that some work needed to be done on definitions and criteria for this section. Metzgar suggested that it would be helpful for agency review to have the mitigative proposal report, which is ready for transmittal to

them. After receipt and review continue this discussion. The District will send the steelhead fishability mitigation plan proposal to the agencies for review.

IV C: Downramping Rate Schedule (pg. 8)

Metzgar advised that the table is from the study report on downramping rates prepared by CH2M-Hill. After review of this table, the District has some proposed revisions for Joint Agency consideration. These proposals are based on the desirability to simplify the rates (there are too many different ones); simplify the table organizationally; and reduce the need for further field studies. Discussion followed on proposals concerning various downramping rates and the schedule for them. The outcome is summarized by a revised downramping rate schedule. That revised schedule will be incorporated in the second draft of the operating plan document.

Some noteworthy items are:

- For June 1 to August 31 for all flow ranges, the night rate should be one inch/hour. Operation needs to take into account the long daylight and twilight hours (short hours of total darkness).
- A Pelton turbine's minimum operation is 5 MW or 65 cfs of flow.
- For a Francis turbine, the minimum flow is 15 cfs with 1 MW.
- The verified and/or proposed six inch/hour rates will be deleted from the schedule, as proposed by the District.
- The preferred rates or goal for the schedule is four and/or two inches/hour.
- One operational goal is to conserve water during all seasons except in the fall when the reservoir water levels are being drawdown for the approaching late fall/early winter flood season.
- Elevation 1,445 feet by July 1 is the reservoir refill operating goal. Five feet of storage is desired for rainfall and snowmelt runoff.

IV D: Water Temperature

Bruya commented that the WDF should receive the water temperature reports on a more timely basis. Especially, because it appears that the fry are emerging earlier than the downramping rate schedule provides. This has

happened in the last two years. Metzgar agreed to improve transmittal of water temperature data.

IV E: Howell-Bunger and Slide Valves at Culmback Dam

Bruya commented that if the Howell-Bunger Valve is opened when high flows are in the river, there will also be suspended fine sediment in the water. The high flows would tend to keep the fine materials released from the reservoir in suspension during transit down the Sultan River. Additional agency comment concerned the time period when the valve would be operated for annual test purposes. The operating schedule should be expanded further on page 11 in the plan. Quite likely, valve operation scheduling would be coordinated with gravel/sediment flushing, if and when required. Metzgar reported on a recent conversation with Beschta (Oregon St.) about bedload transport and gravel flushing. His experience was that it wouldn't require too much time to accomplish, probably one hour. Once the gravel/sediment gets started moving, the whole process goes rather quickly. Further meeting discussion reached the conclusion that the flushing period should allow for travel time to move the fine materials out of the Sultan River. The agencies asked for advance notice about H-B Valve operation.

V: Operating Logic and Criteria

Discussion focused on priorities. The agencies suggested that nos. 1 and 2 on page 11 be combined. That is, "providing municipal supply and maintaining minimum instream flows will have first priority in operation scheduling". Metzgar replied that he will discuss the suggestion with the City of Everett.

VII: Plan Revision

Metzgar observed that the development of this operating plan meant that some of the contents of FERC License Amendment Application Exhibits H, I and U will need review of revisions to maintain consistency with the plan. New information and operating policy developed since those exhibits were prepared and submitted to the FERC should be in them.

VIII: Interim Plan Schedule

Ging expressed a concern that the proposed schedule places the agencies at a disadvantage if any problems should occur with the proposed revisions to the reservoir rule curve and operating plan. They have experienced unwillingness to modify or unresponsiveness to problems with other licensees and their projects. Often the licensee will delay responding or considering concerns of

the agencies. Therefore, he wants some mechanism to assure licensee willingness to respond in a timely manner. The possible mechanism discussed was that during a dispute period the rule curve would revert to the former rule curve while the dispute is being resolved.

Meaker asked when was the agencies' greatest period of concern? Ging replied when the resource is most vulnerable. Bruya added, when the fish are smallest - the fry stage.

Reservoir Matters

Engman noted that there were some issues with the reservoir. Specifically, concerning wildlife, what about the reservoir bottom area revegetation effort and what will be the "fate" of that effort's results? What is apt to be the effect on resident trout in terms of reproduction and food supply productivity? Whatever the effect is, it will be worse than what we have now. Some monitoring is needed and definition of a monitoring plan. Those comments led to a general thought that evaluation criteria are needed for the interim plan.

Miscellaneous/Wrap-up

At the meeting conclusion, these items were noted.

- Flow fluctuation table revisions - the spawning seasons would be extended and salmon fry emergency is February 1 instead of March 1.
- Engman will be reconsidering the steelhead fry emergence date of June 1 v. May 1.

6. Next Meeting

Scheduled for 0930-1430 on April 27 at the same place. Subsequently, the meeting was rescheduled at agency request to May 1.

Attachments (5)
RGM:jk

SNOHOMISH COUNTY
PUD
PUBLIC UTILITY DISTRICT No. 1

2320 California St., Everett, Washington 98201 258-8211
Mailing Address: P. O. Box 1107, Everett, Washington 98206

May 12, 1989
PUD-18383

Mr. Gary Engman
Washington Dept. of Wildlife
Region 4
16018 Mill Creek Blvd.
Mill Creek, WA 98012

Mr. Gwill Ging
U. S. Fish & Wildlife Service
2625 Parkmont Lane S.W.
Olympia, WA 98504

Mr. David Somers
Tulalip Tribes, Inc.
6700 Totem Beach Road
Marysville, WA 98270

Mr. Jon Linvog
National Marine Fisheries Service
7600 Sand Point Way N.E.
Bin C 15700
Seattle, WA 98115

Mr. Robert Gerke
Washington Dept. of Fisheries
3939 Cleveland Ave.
Tumwater, WA 98504

Gentlemen:

Jackson Project - FERC #2157
License Article 57 (Flood Control)
Draft Operating Plan Consultations - Licensee Response

This is to continue our response to your comments from the third consultation meeting held on May 1. This response transmits our notes for that meeting and proposed revisions to the draft operating plan document from meeting discussion.

The attached third draft is submitted for your review and comment. We request that your comments be received by the District no later than May 31, 1989.

That deadline is predicated upon allowing further time for developing a coordinated report to the FERC by the Joint Agencies and the District prior to June 14, 1989. That date is the expiration of the jointly requested stay, which extended time for your comment on the proposed revision to the reservoir rule curve under FERC License Article 57 (FERC 2157-031 issued January 6, 1989).

In preparing the attached notes and the third draft of the plan, we identified several noteworthy items.

1580U

1. May 1, 1989 Meeting Notes: Correction to District Statements - we have revised statements made by Mr. Meaker during the May 1 meeting. Two significant facts about the computer simulation model were erroneously presented. Rather than carry them on into the notes and then correct them, we have made the correction and are calling it to your attention. They are:

   a) Number of years of Sultan Basin streamflow record used was stated to be from 1949-64 (15) plus additional years synthesized by using records from adjoining basins. Actually, we have used 30 years of Sultan Basin record (1934-64) and 65 years total by synthesizing Skykomish River records.

   b) Regression equations for correlating data from the different river basins for input into the model was stated to be in Exhibit 12 in the plan document submitted to the FERC and copied to you. Re-checking that exhibit, we found that those equations are not presented in that document. Shortly, we will prepare an addendum to that exhibit providing that information for the FERC and Joint Agencies.

2. Winter-run Steelhead Trout Fishery Mitigation - we have revised the section addressing this issue. The thrust of the revision is to reduce the uncertainty about scheduling potential flow reductions. We will be sending the Washington Department of Wildlife a separate letter explaining the revisions and presenting a revised mitigation plan proposal.

3. Downramping Rate Schedule Revision - we have revised the table further to clarify its purpose. The rates were not changed from those agreed to during the last meeting. The revision attempts to emphasize the accepted rates versus those yet to be verified. This was done by reversing the order of ramping rates in the schedule and footnotes (c) and (d). The change can be evaluated by comparing the table revision in the meeting notes and/or in the second draft with that in the third draft of the operating plan.

4. The "Assurance" Issue - we have provided some additional language in Section VII (in Operational Record) about flow fluctuations. Further, we suggest that substantial agency safeguard controls already are in place through other existing documents or the status of required mitigation studies and their results. We are referring, for example, to the Settlement Agreement's Section 3(c) on ramping rates. Other operationally-related issues such as minimum flows and water are also covered by the Settlement Agreement. Adult spawner passage at the powerhouse is covered by an understanding derived from the study on the fish berm.

5. Revised fluctuation tables - another set of tables (nos. 1B, 8 & 9) have been prepared based on agency comments during the May 1 meeting. The tables present revised coho and chum spawning season dates and revised fluctuation frequency groups.

We are willing to further assist you in your review of the attached draft operating plan, if desired or needed. Also, we anticipate a cooperative and coordinated effort in drafting a jointly submitted report to the FERC on the results of the ongoing consultation process. In that regard, please continue to work with Roy Metzgar at telephone #347-4319. We appreciate your efforts on this matter.

Very truly yours,

Original Signed By.
J. B. Olson

Jean B. Olson, Manager
Environmental & Engineering
Support Services

Attachments (3)
RGM:jk
cc: J. Jones, Bell & Ingram
S. Foster, Corps, Seattle District
M. Ekman, Corps, Seattle District

THIRD DRAFT

HENRY M. JACKSON HYDROELECTRIC PROJECT
FEDERAL ENERGY REGULATORY COMMISSION PROJECT NO. 2157

Public Utility District No. 1 of Snohomish County
and City of Everett, Washington

PROJECT OPERATING PLAN

I. PURPOSE

This document sets forth philosophy, logic, criteria, and schedules about how the Henry M. Jackson Hydroelectric Project shall be operated beneficially for multiple purposes. The contents herein provide the basis for mutual understanding and agreement among the Licensees and Joint Agencies on those matters. This operating plan provides the basis for further amendment to FERC Project No. 2157, concerning Articles 55, 56, and 57 and Exhibits H, I and U.

II. DEFINITIONS

For this operating plan, the certain terms are defined as follows:

A. Project - The Henry M. Jackson Hydroelectric Project (formerly known as the Sultan River Project - Stage II) located in the Sultan River Basin in central Snohomish County about 20 miles due east from the City of Everett, Washington. This project has been assigned number 2157 under an administrative action by the Federal Energy Regulatory Commission. The Project is described generally and in detail in several other public documents such as the Application for Amended License FERC Project No. 2157 - Volume I - Application and Exhibits A Through V.

B. FERC - An abbreviation for the Federal Energy Regulatory Commission (formerly the Federal Power Commission) which is an agency within the U. S. Department of Energy. The FERC under authority of the Federal Power Act and Electric Consumers Protection Act regulates development of water resources in the United States for hydroelectric power by non-federal entities.

C. Licensee(s) - Public Utility District No. 1 of Snohomish County, Washington ("District") and the City of Everett, Washington ("City") are the joint applicants to whom the Federal Energy Regulatory Commission has issued a license to construct, own and operate certain facilities located in Snohomish County, Washington, for municipal water supply and hydroelectric power generation purposes under the authority of the Federal Power Act. The District operates the Project for the licensees and, by an agreement between them, acts as the representative for both in most regulatory and administrative matters concerning the Project.

D. License - The document issued on June 16, 1961, as amended by order issued October 16, 1981, and later orders by the FERC to the District and City in response to their application for a project to develop the water resources of the Sultan River Basin.

E. Joint Agencies - Composed of five members--two state and two federal agencies and one tribal entity who are: Washington Departments of Fisheries and Wildlife; U. S. Departments of Commerce and Interior as represented by the National Marine Fisheries Service and Fish and Wildlife Service, respectively; and the Tulalip Tribes of Washington.

F. Settlement Agreement - The "Uncontested Offer of Settlement - Joint Agencies" entered into by the Licensee and Joint Agencies on March 24, 1982 and as amended. The Settlement Agreement resolved conflicts between the Project and Sultan River aquatic resources and fulfilled requirements of the FERC Order (of October 16, 1981) issuing amendments to the Project License. The Settlement Agreement was approved by subsequent FERC Order issued February 9, 1983 and amended into the License.

G. Reservoir Spill - The uncontrolled release or discharge of water from the Project's reservoir, Spada Lake, via the morning glory spillway at Culmback Dam. Spill may refer to or mean either the event, a past occurrence, or the total amount (volume) of water involved.

III. BACKGROUND

A. Previous Exhibits H, I and U in Application for Amended License

In September 1979, the Licensees submitted the Application for Amended License to the FERC for Project No. 2157 in order to construct and operate Stage II. In that application, certain exhibits (H, I and U) presented a proposed method of operating the Project; an estimate of dependable capacity and average annual energy to be generated; and utilization of power, respectively. In the elapsed 10 years since preparation and submittal of those exhibits, significant changes have occurred concerning the regional power supply system in the Pacific Northwest. Also, the Licensees and Joint Agencies, in fulfilling License Articles and Orders for protection, mitigation and enhancement of aquatic and terrestrial resources, have acquired additional information on those resources and interrelationships with Project operation. Taking those changes into account with License Article 57 requirements and the proposed reservoir operating rule curve revisions agreed to by the U. S. Army Corps of Engineers and Licensees as submitted to the FERC for approval, the Licensees and Joint Agencies agree on the need for a revised operating plan for the Project.

B. Relationship of Operating Plan to Settlement Agreement

Pursuant to the requirements of the Order Amending License and Providing for Hearing issued on October 16, 1981 (17 FERC ¶ 61,056) the Licensee and Joint Agencies negotiated the Settlement Agreement,

which fulfilled the FERC Order and satisfied Joint Agencies' concerns at that time about protection, mitigation and enhancement of aquatic resources in the Sultan Basin. That agreement contained a section on flood control. This operating plan is complementary to the Settlement Agreement and supercedes Section 7 (Flood Control) in that agreement.

IV. AQUATIC RESOURCE PROTECTION CRITERIA AND REQUIREMENTS

Several anadromous fish species utilize the Sultan River for part of their life cycle. Among them some are present the entire year, but in different life stages (Figure 1). Project operations planning and scheduling will take into account the presence of the fishery resource, its particular requirements at any specific time, and real or potential effects on the resource.

Project operation influences or affects fishery resources through control of river flows - minimums, maximums, fluctuations and the timing or occurrence. Also, Project operation affects water temperature and quality which are other significant factors in fish life cycle requirements.

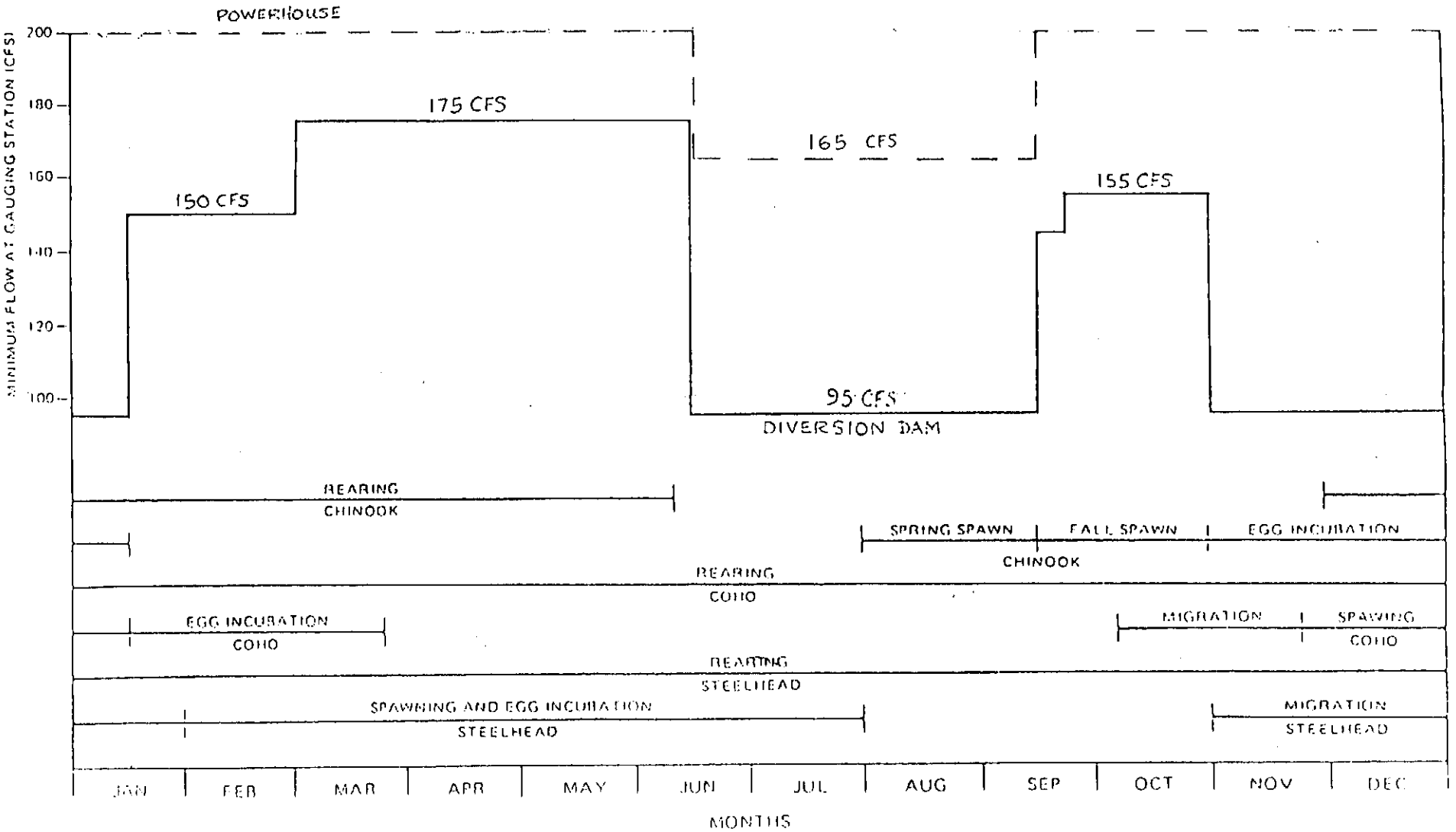
The intent of this plan is to provide operational guidance to protect, mitigate and enhance aquatic resources in the Sultan River Basin for the well understood, frequently encountered, and usually, expected operational situations with the Project. However, all possible natural conditions and occurrence of events can not be identified and accounted for in this plan. Many are and will be beyond the ability of the Licensee to control or respond to effectively.

A. Minimum Instream Flow Schedule

In the Settlement Agreement three Project flow control/release points are established on the Sultan River: (1) Culmback Dam at River Mile 16.5; (2) Diversion Dam at River Mile 9.7; and (3) powerhouse at River Mile 4.5.

The Licensee shall provide for and agrees to maintain, as specified in the Settlement Agreement (Section 2), the following minimum flow releases to protect, mitigate, and in some instances enhance fishery resources at those points on the Sultan River (Figure 1).

Dates	Point of Discharge	Minimum Fishery Flow Cubic Feet/Second (CFS)
All Year	Culmback Dam	20
11/1 - 1/15	Diversion Dam	95
1/16 - 2/28	"	150
3/1 - 6/15	"	175
6/16 - 9/14	"	95
9/15 - 9/21	"	145
9/22 - 10/31	"	155
6/16 - 9/14	Powerhouse	165
9/15 - 6/15	"	200



T6-d

Figure 1
MINIMUM FLOW AT GAUGING STATIONS

The District will provide the Joint Agencies with quarterly and annual flow record reports for the diversion dam and power plant stream gaging stations. In the event of non-compliance with the minimum flow schedule, the District will report on the incident to the Joint Agencies within 10 days of its occurrence, or when determined that such incident, in fact, occurred. Joint Agencies may, if they choose, comment in writing to the District within 14 days of receipt of that report, or at any time thereafter with the FERC. The District will file its report with the FERC, including Joint Agencies' comments, if any, within 30 days of the non-compliance incident or the date of determination that such incident did, in fact, occur.

Non-compliance at either the Diversion Dam or power plant has occurred when the instantaneous recording of flow does not meet the required minimum flow. Revisions to flow records by the U. S. Geological Survey (USGS) in subsequent rating changes for the gaging stations, which reduce flows below minimum requirements, are not non-compliance incidents. The Licensee with the assistance of the USGS will be diligent in maintaining recording accuracy of gaging station equipment.

The upper river flow (Culmback Dam to the Diversion Dam) is maintained by either continuous operation of the small hydroturbine and the 10" cone valve at the base of Culmback Dam or use of the auxiliary water release line. One system or the other shall be operating at all times to provide the required minimum flow. Before either one is closed or shut-off, the other shall be operating so as to maintain continuous water supply to the river. The District will provide the Joint Agencies with quarterly and annual reports on flow releases from Culmback Dam. Anytime the 20 cfs discharge requirement from Culmback Dam is not met shall be considered a non-compliance event. With such occurrence the same reporting procedures will be followed as described above for the other flow control points.

Remote monitoring of streamflow at the gaging stations and Culmback Dam releases is available to the Joint Agencies by calling the Project's power plant control room (tel. #347-5549) during regular work hours (0630 - 1530) Monday - Friday, excepting scheduled holidays. For other hours, weekends and scheduled holidays, streamflow information can be obtained by calling the District's System Dispatch (confidential tel. # provided).

B. Maximum Controlled Flow Releases

A "high" flow is 750 cfs or greater for operating plan purposes. This flow is considered equivalent to a full channel flow. If this flow occurs naturally, without any supplemental discharge from the Project at the control points, excepting Culmback Dam's 20 cfs, it is not considered a high flow. High flow events for the Sultan River are defined also by the time of year when they occur and duration, if the flow was solely controlled by releases from the Project, and natural streamflow. The timing criteria include the fall salmon spawning season (September 15 - October 15), the

winter-run steelhead recreational fishing season (December through February), or if the flow has been exceeded for more than 72 hours.

B-1 Fall Salmon Spawning Season

The District will endeavor to avoid increasing flows above the minimum instream (fishery) flow requirements schedule from September 15 through October 15. However, the reservoir water surface level is to be at elevation 1,430 feet or lower on November 1st. In order to prevent the reservoir from filling above the State 2 line during the fall season reservoir drawdown period (which then requires full power operating if in State 2), Project water releases to the river above minimum flow maintenance will be necessary. Rather than fluctuate river flows by increasing and then decreasing powerhouse releases, a steady, non-fluctuating or slowly increasing flow regime usually will be preferred when adult salmon spawners are in the lower river below the powerhouse.

Flows in the river up to 400 cfs of combined natural flow and Project releases are acceptable during September 15 to October 15 when the reservoir is in State 3 without Licensee consultation with the Washington Department of Fisheries. If any controlled flows are above 400 cfs, or if reservoir water storage moves into State 2 during that period, the Licensee and WDF will confer to identify an operating strategy, which will protect spawning but continue reservoir drawdown. One operating option may be to delay increasing to full power operation, if conditions are favorable to do so. However, concurrence must be obtained from the Corps of Engineers if the District and WDF agree on that option to delay increasing flow releases.

B-2 Winter-run Steelhead Fishing Season

A flow value of 700 cfs will be used as the operating criteria. When the flow in the lower Sultan River (below the Jackson Project powerhouse) has exceeded 700 cfs for more than 14 consecutive days during January/February due to Project operation, the District will evaluate initiating mitigative operation for steelhead trout sport fishing. Naturally occurring, high flow events (pre- and post-Project) often extend for several consecutive days.

To invoke the need for mitigative action, the river flow must have exceeded the threshold value of 700 cfs for a significant period of time. The exceedance must also be due solely to Project operation and not naturally occurring high runoff conditions. For definitional and operational purposes, the criteria "significant" is defined as 21 consecutive days at any time during the months of January and February only.

December is excluded due to the high probability that the frequency and duration of flows $\geq$ 700 cfs have occurred naturally and will continue to be experienced either with or without the Project because of high average annual precipitation during that month. Thus, it would be difficult to determine on a timely basis when or

if the Project is having or has had a significant effect on river flows. Also, importantly, December is usually a low steelhead catch month due to the natural occurrence of unfavorable flow conditions.

Mitigative operation, if feasible, would occur on the next weekend following the 21st consecutive day of flow exceeding 700 cfs, commencing on Saturday at 1200 hours, if flows remain above 700 cfs due to Project operation. The discharge from the powerhouse would be reduced in accord with established ramping rates to provide an instream flow of 700 cfs or less until 2400 hours on Sunday. The total flow reduction period would be 36 hours. The discharge reduction would not be done if naturally occurring flows still exceeded 700 cfs even with reduction of powerhouse discharge to 100 cfs. Also, the water surface level of Spada Lake must be below elevation 1435.0 feet with decreasing inflow to the reservoir. Meteorological and hydrological forecasts for the Snohomish River Basin must be favorable; no projected flow increases. If reduced flow releases from Spada Lake are proposed, the PUD would notify the U. S. Army Corps of Engineers at least 72 hours in advance of the mitigative action. If the Corps does not concur, normal power operational scheduling consistent with Exhibit H will continue. Should no response be received from the Corps within 24 hours after receipt of the proposal, silence will be interpreted as concurrence.

C. Downramping Rate Schedule

In accordance with the Settlement Agreement (Section 3c) the Licensee conducted a study on downramping rates. The Licensee and Joint Agencies have agreed on the results thus far obtained and the consequent recommendations. Chapter 5 in Downramping Regime for Power Operation to Minimize Stranding of Salmonid Fry in the Sultan River (July 1987) is the basis for this section. The District will use the recommended downramping rate schedule below for decreasing flows during power operations.

Downramping recommendations vary depending upon the stage of the river below the powerhouse. Four flow ranges were identified on the basis of relative potential for salmon fry stranding.

At flows above 750 cfs, the river stage is generally above the toe-of-bank and thus most low-gradient stranding areas are inundated. Between 750 and 600 cfs, flow into three side channels ceases thereby creating a potential for stranding if downramping occurs too rapidly. In addition, special precaution is needed if downramping through this range is preceded by an extended period of high flow. Therefore, during the fry period (March 1 to October 31), if the river flow prior to downramping has exceeded 1,000 cfs for more than 72 hours, the downramp should be paused just above 750 cfs for at least 6 hours of daylight and one overnight period to allow fry entering these side channels to distribute to safe areas. At river flows between 600 and 300 cfs, low-gradient gravel bars with stranding potential become exposed. Below 300 cfs, an increasing number of streambed depressions become exposed with further fry stranding vulnerability.

JACKSON PROJECT
RECOMMENDED DOWNRAMPING RATE SCHEDULE[a]

Flow Range (cfs)	March 1[b] to May 31		June 1[b] to September 15	
	Day	Night	Day	Night
1,500 to 750	4	4	2	1
750 to 600	2[e]	2[e]	2[e]	1[e]
600 to 300	2	4	2	1[f]
300 to min	2	2	2	1[f]

	Sept. 16 to Oct. 31		Nov. 1 to Feb. 28	
	Day	Night	Day	Night
1,500 to 750	2[c](4)[d]	1[c](2)[d]	4	4
750 to 600	2[e]	1[ce](2)[de]	2[e]	2[e]
600 to 300	2[c](4)[d]	2[c](4)[d]	4	4
300 to min	2[c](4)[d]	2	4	4

[a] For normal operation. Not for power-generating equipment failures or forced outages. Units are in inches per hour at the powerhouse.

[b] This date may be adjusted annually by determining time of emergence with cumulative water temperature information. Upon notification to the District from the Washington Departments of Fisheries and Wildlife that either salmon or steelhead trout fry are expected to emerge from the river gravel, based on water temperature unit calculations (see River Temperature), the District will shift to the designated slower downramping rates.

[c] Operate at this rate until higher rate is verified as safe.

[d] Need to verify.

[e] If river flow prior to downramping has exceeded 1,000 cfs for more than 72 hours, downramp through this flow range (750 to 600 cfs) only after holding flow constant between 750 and 850 cfs for at least 6 hours of daylight and one overnight period.

[f] Avoid any scheduled flow reduction.

For most cases, different downramping rates are recommended for day and night. However, if downramping is to occur during the twilight period (1 hour before to 1 hour after sunrise or sunset), the lower of the two stipulated day or night rates should be used. For example, a 4-in/hr springtime downramp intended for night should not be initiated at the powerhouse until 1 hour after sunset. As another example, if a summer afternoon downramp initiated at 2 in/hr is to extend past sunset, the ramping rate should be reduced to 1 in/hr at 1 hour before sunset. These precautionary guidelines should minimize the potential for stranding during the twilight hours when the juvenile fish are shifting their diurnal behavior patterns.

The District will conduct additional tests to verify the safety of certain downramping rates for juvenile salmonids. The District will notify the Joint Agencies of the time when such tests will be conducted. Results may lead to amending the downramping rate schedule recommendations. When the downramping rate tests are completed, the final version of this section of the operating plan will supercede Sections 3c and 5 of the Settlement Agreement.

D. River Temperature

Licensee shall operate the Project water withdrawal structure at Spada Lake so that the temperature of water in the Sultan River at the gaging station below the Diversion Dam (combined fishwater return flow and river flow) approximates to the fullest extent possible, * the daily mean of recorded temperatures at the Diversion Dam for the years 1969 - 1979, and also remain within the recorded daily minimum-maximum temperature range (Figure 2).

Licensee shall notify the Joint Agencies of deviations from said minimum-maximum range whenever such deviations occur for more than one monitoring period. A monitoring period is 24 continuous hours.

Licensee shall provide water temperature reports to the Joint Agencies. There shall be three reports: (1) an annual report covering the completed water year; and (2) two timely reports annually, one each to the Washington Departments of Fisheries and Wildlife covering the period from eggs first in the gravel to first fry out of the gravel for Chinook salmon and winter-run steelhead trout, respectively. These latter two reports are for calculating water temperature units, fry emergence and the consequent shift in the downramping rate to slower rates.

* It is understood that meteorological and hydrological conditions may affect reservoir temperatures such that meeting the daily mean temperature standard may be impossible.

E. Howell-Bunger and Slide Valves at Culmback Dam

In recognition of the accumulation of sediment behind the Culmback Dam, the Joint Agencies are concerned about the potential negative effect on water quality and river gravel if and when this material is released to the river. Consequently, the Joint Agencies prefer minimal water releases via the valves at the base of Culmback Dam. Their concern is reflected in the present interim operating plan (#2157-015) approved for the Project by the FERC (28 FERC ¶ 62,215 issued August 15, 1984).

The Licensee and Joint Agencies agree that the valves should not be operated for flood control operations. However, the Howell-Bunger and slide valves at Culmback Dam are important safety features. In the event of high flows causing the reservoir to fill rapidly and water levels to approach the crest of the dam, releases through the valves would be needed besides those over the spillway and via the powerhouse. To assure that these valves are operational they must be tested periodically. Also, any reservoir accumulation of

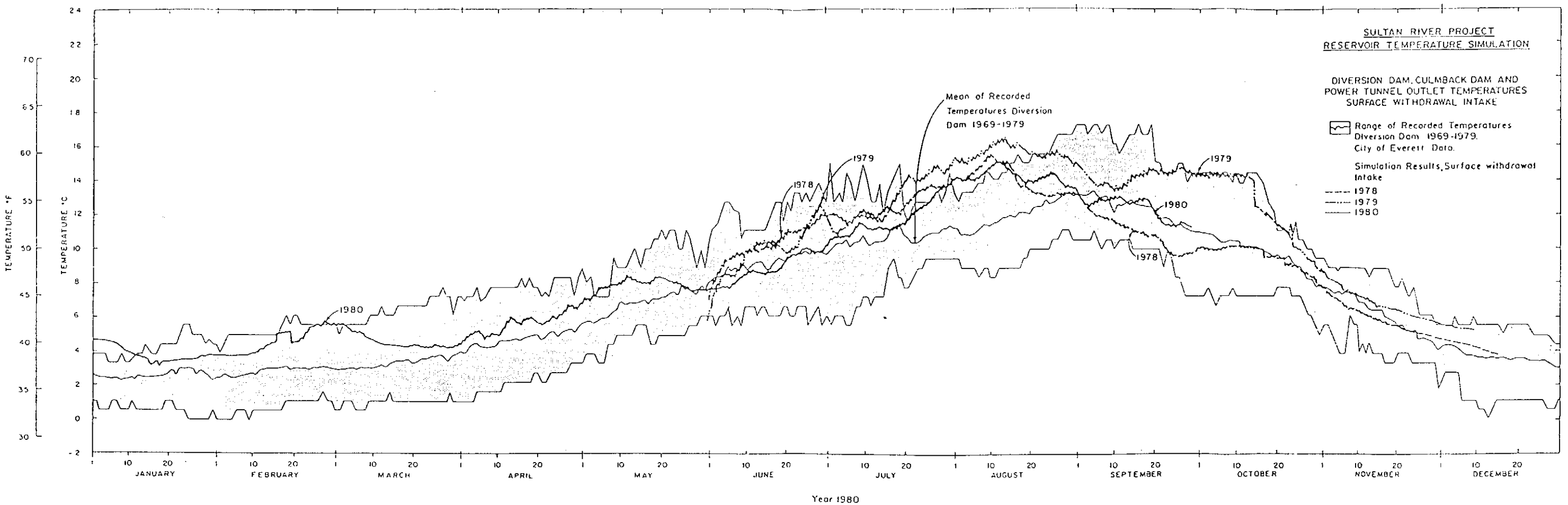


Figure 2. Comparison of the Simulated Temperature of Releases through the Power Tunnel, Surface Withdrawal Intake with Temperatures Recorded at the Diversion Dam by the City of Everett

sediment behind the valves should be flushed to prevent build-up depths which could block or reduce valve operation.

In addition, the valves are a dam safety device in the event of spillway blockage or collapse and provide supplemental ways to release water and/or increase water withdrawal from the reservoir.

When the power plant is shut down for inspection and/or maintenance, the instream flow schedule is maintained by releases at Culmback Dam through these valves. Also, to attain the flows projected for flushing gravel downstream and removal of accumulated fine sediment (when needed), supplemental flow to powerhouse discharges will be necessary through the valves at Culmback Dam, unless sufficient spill occurs in a timely fashion. Therefore, the Howell-Bunger and/or slide valves will be operated. The minimum operating frequency of the valves has yet to be determined based on sediment accumulation rates or other requirements. It may occur at least once every five years, coincident with the required FERC 5-year dam safety inspections. At that time, the valves will provide flows to maintain the minimum instream flow schedule during power plant shutdown for inspection/maintenance.

V. OPERATING LOGIC AND CRITERIA

Section 3.0 in Exhibit H - Proposed Method of Operating Project - within the Application for Amended License FERC Project No. 2157 presents the operating logic and criteria for Figure H-3, Rule Curves for Reservoir Operation, Spada Lake. Exhibit H remains in effect, except as revised by this operating plan.

The Licensee has submitted a proposed revised operating plan that is acceptable to the U. S. Army Corps of Engineers, thus fulfilling one of the principal requirements of License Article 57. In meeting this requirement, the Joint Agencies acknowledge that it was done by the Licensees in accord with the requirements of Section 7 (Flood Control) in the Settlement Agreement.

Figure H-3 on page H-16 is replaced with Figure H-3 (revised), which is Figure 3 herein. The Joint Agencies and Licensee agree that the operating criteria for release of water from Spada Lake in order of priority are:

1. Providing municipal water supply and maintaining minimum instream flows have first priority. Minimum instream flow requirements at the designated control points, and water demand for the City of Everett must always be met.

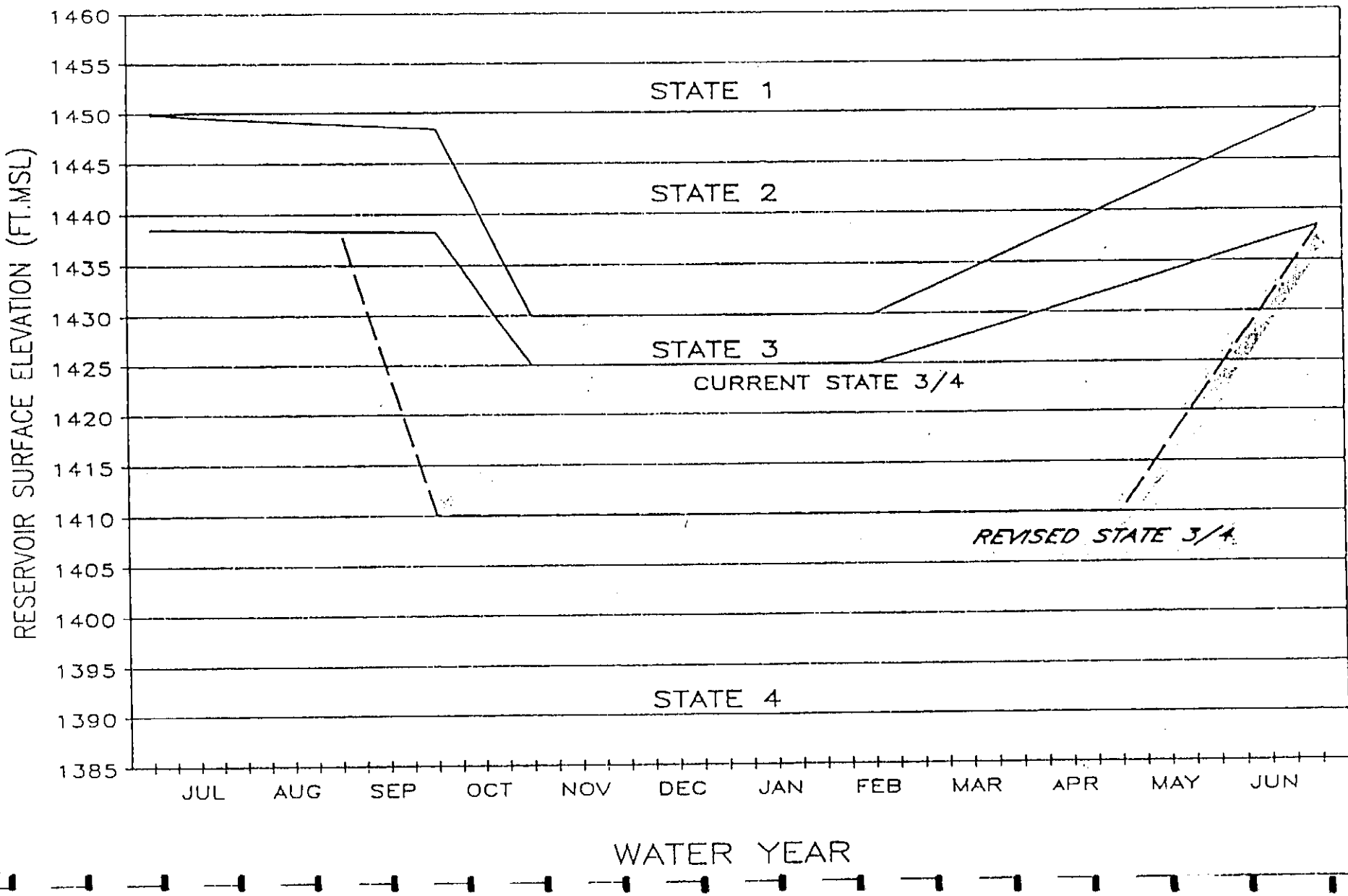
2. Minimum storage level in Lake Chaplain must not be violated (as in Exhibit H, Figure H-4, p. H-16).

3. Minimum storage level in Spada Lake can be violated only to meet water demand for the City of Everett and/or minimum flow constraints in the river.

FIGURE 3

REVISED FIGURE H-3

RULE CURVES FOR RESERVOIR OPERATION - SPADA LAKE



P-100

4. Storage of water in Spada Lake has priority over storage in Lake Chaplain.

Thus, Order Paragraph C (2) in 2157-015 is revoked and the five operating criteria on page H-17 in Exhibit H are included in the operating plan, as revised above.

The Licensees and Joint Agencies agree that, for Project operation, municipal water supply and minimum instream fish flow requirements are co-first priority. Hydropower generation has second priority. All operating plan scenarios account for meeting future Everett water supply demand and providing minimum instream flows at all times. In the event that municipal and industrial water supply cannot be met, water conservation measures and other water demand reduction strategies will be initiated before proposing to the Joint Agencies any reduction in minimum instream flows in Section IV(A) herein above.

VI. SPADA LAKE RECREATION SEASON

The District's operating goal for Spada Lake during the summer season is to maintain water surface elevations as high as possible. The actual water elevations attained will depend on the snowpack, snowmelt and the form and timing of spring precipitation. For this operating plan the summer season is defined as June 15th to Labor Day.

VII. INTERIM PLAN EVALUATION CRITERIA

The following criteria will be used to evaluate the interim operating plan and its effect on aquatic resources in the Sultan Basin.

- Instream flow
- Water temperature
- Spada Lake water surface elevation
- Sediment and river gravel
- Operational record
- Meteorological record

Instream Flow

The requirements of the Settlement Agreement continue. The minimum instream flow schedule at Culmback Dam, the Diversion Dam and the powerhouse must be met. The second five-year record will be compared with the initial five-year record. The District will report annually to the Joint Agencies and the FERC. The District will continue recording and reporting streamflow records to the Joint Agencies with the assistance of the U. S. Geological Survey.

Water Temperature

The requirements of the Settlement Agreement continue. The water temperature must remain within the historic range and trace the mean to the extent possible, excepting when natural conditions prevent doing so. The second five-year record will be compared with the initial

five-year record. The District will report annually to the Joint Agencies and the FERC. The District will continue recording and reporting to the Joint Agencies with the assistance of the U. S. Geological Survey.

Spada Lake Water Surface Levels

The daily water surface elevations will be recorded and reported to the Joint Agencies and the FERC by the District on an annual basis. The second five-year record will be compared with the initial five-year record. These records will be evaluated with the results of the ongoing series of creel surveys on the resident trout sport fishery at Spada Lake.

Sediment and River Gravel

The District has conducted two tri-tube freeze core samplings of sediment in the Sultan River channel. In addition, sources of gravel supply and bedload transport were investigated. Results were presented to the Joint Agencies which led to tentative agreement on the elements of a potential mitigative action plan. The development of the plan is pending. Completion of that plan and successful demonstration of its effectiveness and continued monitoring of river channel sediment and gravel quality and quantity are part of the overall mitigation plan for aquatic resources and monitoring of the Project's operating plan.

Operational Record

The type and frequency of changes in flow discharge to the Sultan River will be recorded by the District and reported annually to the Joint Agencies and the FERC. The second five-year record will be compared with the initial five-year record for number, type and frequency of flow changes. The expectation is that the revised operating plan will result in reduced downramping events, slower rates will be used, and that river fluctuations due to power operations will decrease in the lower critical flow ranges (750 cfs to minimums) for salmonid fry stranding. The operating record must be interpreted, however, in the context of the meteorological record. Each year varies from another. Therefore, differing operational years will be due to differing weather and runoff.

Meteorological Record

Records of air temperature, precipitation, snowpack and runoff will be developed for the initial and second five-year periods to assist evaluation of the Project's operating record. The District will provide these records to the Joint Agencies and the FERC on an annual basis.

VIII. POWER GENERATION LIMIT

License Order Paragraph C (4) in 2157-015 limits power generation from the Pelton turbines to reservoir elevation 1,422 ft. msl. Accounting for the elevation of the tunnel at the withdrawal intake structure at Spada Lake, the physical limit for safe operation of the Project should

be elevation 1,380 ft. msl. This limit is based on a 15-foot height of the tunnel from invert elevation 1,360 ft. msl, plus an additional 5-foot buffer to avoid water vortices which could introduce air into the water conveyance system.

The present computer modelling of revised operating plan scenarios shows that the lowest reservoir water surface elevation would be 1,394 ft. msl, or 14 feet above the safe operating limit of elevation 1,380 ft. msl. Also, in order to meet minimum instream flows at all times, under the present operating limit of 1,422 ft. msl, releases for supplemental flow would have to be made at Culmback Dam through the Howell-Bunger or slide valves. (See discussion on valve operation in Section IV E.) However, instream flows augmentation to maintain the minimum flow schedule requirements can and should be made through the powerhouse rather than from Culmback Dam. The reservoir water surface level limit for operating withdrawals through the intake structure is elevation 1,380 feet msl. Therefore, Order Paragraph C (4) in 2157-015 should be revised to read 1,380 feet msl.

IX. PLAN REVISION

The Project commenced commercial power operations in June 1984. Thus, at this time operating plan development is based on about five years operating experience. Also, all of the anadromous fish mitigation studies have not been completed fully. Consequently, this operating plan is viewed by both the Licensee and Joint Agencies to be an interim document, pending the outcome of final results of pending studies and operation monitoring reports. If this operating plan, based on study results or monitoring reports, warrants revision or fails to meet projected scenarios or expectations, the Licensee and Joint Agencies agree that they jointly or separately based on just cause may petition the FERC to amend this plan.

X. INTERIM PLAN SCHEDULE

This interim operating plan shall be effective from September 1, 1989, through June 30, 1995. No later than six months prior to that date of expiration the Licensee shall notify the Joint Agencies requesting their written comment on changing the interim designation to final, including any proposed revisions. Joint Agencies shall reply within 30 days of receipt such notice from the Licensee. Licensee shall file with the FERC a proposal for a final operating plan no later than March 31, 1995, including written comments by the Joint Agencies. If the proposed operating plan differs from Figure H-3 revised and this plan document, then the Licensee shall request written comment also from the U. S. Corps of Engineers on the proposed plan.

Concerning annual reporting under interim plan monitoring, the District will submit its report to the Joint Agencies by March 31 of each year. The Joint Agencies will reply with written comments, if any, by May 1. The annual report(s) with Joint Agencys' comments will be submitted annually to the FERC by June 1.

XI. RESERVATION

In the event that the FERC shall at some future time order or allow project modifications, or modifications and conditions of project operation, which differ from the terms and conditions herein, and are not based upon the monitoring process in Section VII herein, the Joint Agencies, and each of them, or the Licensee, shall have a reserved right to object to such modifications.

# # #

May 12, 1989

JACKSON PROJECT FERC #2157

District/Joint Agency Meeting Notes - Article 57 (Flood Control)

Date: May 1, 1989 (1130-1620)
Place: NMFS (Sand Point), Seattle
Attendees: List attached (Attachment I)
Agenda: Copy Attached (Attachment II)
Purpose: FERC License Article 57 - Licensee and Joint Agencies confer on draft revision to reservoir operating plan (reservoir rule curve) - Exhibit H for Jackson Project.

1. Opening/Agenda

There were no suggested revisions to the agenda (Attachment II).

2. Report on Ongoing Mitigation Activities

While waiting for late arrivees, the following reports were made:

a) FERC staff meetings in Washington, D.C. - Olson met with several FERC staff to discuss Project #2157 license articles. Concerning instream flows, FERC has developed a policy on gaging station records (handout). FERC looks at trends and patterns of project operation, which will determine enforcement action, if any. On flood control, FERC is waiting on the results of this consultation process. With the wildlife mitigation plan, the FERC is now working on an order. Previously, they were stopped because of the Tulalip Tribes comments. There was concern about the legal issues.

Regarding the wildlife plan, both Ging and Engman expressed concern over the City's sludge disposal plan involving proposed mitigation lands in the Lake Chaplain tract. They felt that the City's sludge plan was unacceptable to use the wildlife mitigation lands.

b) FERC annual Project inspection - 5/17/89 - Metzgar noted that the annual Project inspection by the FERC would be held on May 17, starting at 7:30 a.m. at the Dutch Cup Restaurant, Sultan.

c) Annual report on Articles 55 and 56 - Metzgar mentioned that the next annual report on the fish is due in June. These consultations would provide the main basis for the report.

d) Spada Lake creel survey - Metzgar reported on mitigation studies Spada Lake fishing season opening day (April 23). Over 100 vehicles were counted. Most (70+) were at the main boat launching ramp. About 30 fish were counted. While the weather was favorable, the water was too cold for good fishing. One exceptional fish was caught and sampled: a 4# (22") cutthroat trout taken from the west end of the reservoir.

e) Winter-run steelhead spawning ground survey - Metzgar reported that the latest flight counted 5 redds above and 2 below the powerhouse. However, high flows and turbidity were persisting and interfering with the surveys.

f) Steelhead fishability mitigation - public access - Metzgar advised that the PUD's real estate division had contacted the owners of lands providing public access to the Sultan River. The owner of the highest priority site apparently would be a willing seller. Contact would continue with the others. There would be another proposal for mitigation later in this meeting.

g) Reservoir rule curve waiver request - Metzgar transmitted copies of a letter to the Corps of Engineers on the reservoir rule curve waiver request similar to the one sent earlier to the Joint Agencies. He asked for agency written comments. He called on Crocker to discuss present operating plans and Meaker to report on the latest snow course survey.

Crocker advised that the reservoir water level was at elevation 1,434' and has been dropping. He has reduced discharge, but has been able to stay above 700 cfs and not go through the zone that dewaters river side channels. The dry weather is forecast to continue. The filling goal is projected to be at about elevation 1,435' - 1,440' by the end of May because of the snowpack. River flows will remain in the 750 - 1,000 cfs (54-70 MW) range. Meaker reported that the snowpack had decreased some, but the snow is deeper than last year at this time. It is 290% of normal - based on the District's hydrologic model. Water content was very high; 32" of effective water content is stored in the remaining snow. This should allow operating to everyone's advantage.

Bruya asked if this situation would allow for a gravel flushing test, if spill occurred? Metzgar reminded that the spring season gravel flush was discussed before and had been deferred. The PUD had proposed it, but Engman had asked for a review of streamflow records. Metzgar's review did not find an historical spring season gravel flush, the flows didn't exceed 4,000 cfs. That flow was calculated by Dr. Dunne to be necessary below the powerhouse.

Engman advised that he would want a long-term plan, including a proposal and design procedures before doing it because of the risk to steelhead eggs and alevins in the gravel. Optionally, don't do it, if forced to - yes. Discussion followed on gravel/sediment technical issues such as stream gradient in different reaches of the river, travel times, duration of a flushing event, etc.

3. Comment on Meeting Notes for February 15, 1989

Metzgar apologized for not sending the notes in advance of this meeting. Today's agenda will provide an opportunity to refer to many of the items covered during the last meeting. He will check later about any revisions before transmittal to the FERC with another progress report.

Referring to the letter of transmittal, he pointed out the list of things that came out of the last meeting. Two of them have been done and were sent to the Joint Agencies before this meeting. They were:

- steelhead fishability mitigation report; and
- Spada Lake levels and river flow fluctuations with the new proposed reservoir rule curve.

4. License Response to Joint Agencies' Comments

a & b) Frequency of flow changes/ramping events (fluctuation tables) and Spada Lake water surface levels - Metzgar advised that this information has been sent to the Joint Agencies by PUD 18334. That letter transmitted Tables 1A, 4, 5, 6 and 7 and Figures 1-4. Meaker explained the data presented in the tables and figures. Basically, the calendar dates for fish life cycle seasons was adjusted based on previous review comments by the Joint Agencies.

Bruya commented that September 15 is too early for chum and coho salmon spawning in Table 4. September 15 is "ok" for chinook and pink salmon. Meaker added that the tables present a comparison of operation between the Project's two schedulers (Kern/Crocker). Except for Table 5, the District with the aid of the SCADA system and power storage contracts has operated the Jackson Project since August 1, 1985, with less flow fluctuations. Agency response indicated that this should be one of the evaluation criteria for the revised operating plan (reservoir rule curve). Metzgar pointed out that consistency was needed between the dates in the tables, evaluation criteria and the downramping rate schedule. The ramping rate schedule has seasons and those seasons and the fluctuation frequency tables are linked together. The operational record is listed among other criteria proposed for evaluating the interim plan. Those criteria have been added to the draft plan. Also, the meteorological record must be taken into account in terms of the effect or influence on operations and power scheduling.

Engman asked what are the actual years of record for the Sultan Basin? Meaker answered 1934-64 (30 years). Sixty-five years are used in modelling by synthesizing the longer Skykomish River record. Statistically, the flow records have been compared to produce or create more years of record for the Sultan Basin. He drew a diagram showing years of record and relationship among them.

Bruya asked what the correlation factor is between the flow records for the other basins with the Sultan Basin? Meaker replied that it was done for each month of the years. Meaker replied that the monthly flows of the Sultan for the 30 years of record were regressed against two Skykomish River gaging station records. The gage at Index was used from 1924 to 1928 and the gage at Goldbar was used from 1929 to 1933 and 1964 to 1988.

Ging asked what effect the correlation function has on frequency of fluctuations and ramping? Meaker replied that the Project is really a run-of-the-river operation because reservoir storage is undersized or too small for the extremes of runoff that can be produced from the Sultan Basin. The reservoir doesn't provide carry-over storage from year-to-year. Runoff response and reservoir storage appear to be a function of groundwater storage. Referring to Figure 4, he pointed out the 3-week lag time in the difference between peak flows in November/December in the groundwater recharge factor. The Sultan Basin being smaller and

having shallower soils delivers surface runoff to the reservoir sooner than the larger Skykomish basin in terms of actual versus model output.

Ging asked what is the difference in correlation between wet vs. dry year runoff? Meaker replied that by looking at Figure 4, a dry year could be observed (1987-88). The model started out the year lower than actual because this study of comparison was done over four years (1984-1988) and the year end discrepancies were not reconciled from one year to the next. However, the model shape is still similar into the month at November when moisture returned to the region. At that point, the Sultan basin rebounded quickly due to shallower soils than the Skykomish basin. This is shown by the 3-week delay in recovery of the computer model simulation of the reservoir. Extreme conditions (wet or dry) will produce the greatest differences between actual and model.

Meaker continued, the reservoir level would have gone down 10 feet lower than we have actually experienced, if the revised rule curve had been in effect. However, the computer output tends toward the conservative side, showing a greater decrease than actual. Since the model simulation indicates that at no time in the 65 years of hydrologic extremes, will the reservoir be drawn down below the power tunnel shut-off point (elevation 1,394' vs. 1,380'), meeting all water supply and fishery needs should be assured.

Ging asked about the coverage of the figures? Meaker responded that there is one for each year of operation. They are a small version of the figures brought to the meeting and taped on the windows. Metzgar added that the weather cycles (wet/dry years) will influence the annual reservoir water surface elevation profile(s), power generation and river flow fluctuations.

Ging asked what would be the frequency of ramping in wet years? Crocker answered that it would be less and flow changes that would occur would probably be at the higher flows (>700 cfs). So there should be less effect in the lower flow ranges (<700 cfs). Hatscher added that with more water, there'll be a larger pool to operate with so the reservoir will have higher levels and less need to "conserve" water by more and greater downramping events.

Crocker continued, aggressive ramping occurs during the winter season (November-March) when the economics (cost of power) create an incentive to reduce BPA capacity charge, at times during late spring and during prolonged dry periods to maintain highest water levels. Metzgar observed that based upon Project operating history and fish life cycles, the months of February and March would appear to be the greatest tension or conflict months. Most of the rest of each year, the power/fish interests appear to be compatible. Bruya agreed generally with that assessment of potential conflict/ compatibility. Metzgar continued the operational implications of reservoir rule curves, downramping rates and the critical operating zone (above/below 650-700 cfs) require coordination and reconciliation. Bruya added that is the challenge to cover them in the operating plan.

Crocker advised that energy production shadows basin runoff because the Jackson Project is a run-of-the-river project. The reservoir has small storage capacity versus basin yield. The model and experience show that the reservoir is not going to run out of water, thus allowing the District to bring generation down slowly, rather than with abrupt changes. That operating method is allowed with a larger reservoir Stage 3 in the proposed revised reservoir rule curve.

Bruya noted that in Figure 2 (1985-86), the revised computed peak should have prevented spill. The storage should have been greater than the spill. Meaker replied that an exponential factor is involved: the total volume of the spill is/was greater than the storage pocket created. Looking at the volume and the number of days of spill involved, the revised curve delayed the spill event by 4 to 5 days. Revising the reservoir rule curve will reduce the frequency of spill, but it won't stop them. Those that do occur will be delayed, which may be a flood control benefit.

c) Culmback Dam minimum flow releases - Metzgar pointed out the revisions made in the draft operating plan on minimum instream flows and gaging station recording. He noted that the agency comments during the last meeting were consistent with proposed FERC policy criteria on minimum instream flows (handout - Attachment III). Concerning Culmback Dam minimum flow releases, Metzgar asked for reconsideration of the previous meeting's understanding/ agreement about field measurement of instream flow below Culmback Dam. There are two reasons: 1) information available about flow releases; and 2) the difficulty and hazard of obtaining flow measurements immediately below the dam. Referring to last meeting's notes (at p. 4), he referred to Somers comments about documentation and recording of the required flow release/minimum instream flow.

The 20 cfs minimum flow is provided by water from a small hydroturbine generating operating power for the dam and a release through a 10"-cone valve. The flows are recorded and reported on the Project's daily generation and discharge summary. A sample copy for April 23, 1989, was handed out (Attachment IV). Information on the valve was handed out also (Attachment V). Metzgar pointed out in the valve technical information (pg. 4) that the flow is 30 cfs through the valve with 100 feet of hydraulic head. Referring to the valve's flow rate curve, Metzgar explained how the flow is determined for recording on the daily report form. With Spada Lake at elevation 1,435', that is 187' above valve centerline elevation of 1,248 feet. The valve setting on the SCADA screen in the powerhouse control room is 33.3%. At the intersection of H=187 and valve opening = 33.3, the reading is 17+ cfs.

For the turbine flow, Metzgar handed out another rating curve (Attachment VI). To work this table, values needed are 1 cfs = 448.8 gal/min and the unit operates at constant 60kW. To determine flow, follow 60kW to the intercept with the "output-kW" curve for a reading of about 2350 gpm, which produces a flow value of 5.2 cfs. These mechanical settings provide the releases for minimum instream flows at Culmback Dam as reported on the daily form.

Linvog asked if there was a bypass valve with the turbine? Metzgar replied, no. Since the turbine started operating in 1985, there has been one fault, forcing automatic shutdown. The system operates by constant generation output. Load demand is handled by resistors/switches. As electrical energy demand increases, the resistors switch off. If a shutdown occurs, there is usually tributary flow from dam area drainage and runoff immediately downstream, which keeps water in the channel, in addition to cone valve releases.

Metzgar proposed cancelling field measurement of flow because of the system for flows and the hazard of reaching a downstream area from flow measurement. Crocker pointed out that flow could be measured in the spillway by creating a temporary weir. The agencies affirmed their desire to conduct a field measurement of flows immediately below Culmback Dam.

Metzgar asked for guidance on the reporting of flows at Culmback Dam. The agency response was the same as for both the gaging stations (diversion dam and power plant), which would be quarterly and annually.

d) Winter-run steelhead fishing season (mitigation) - Deferred while Engman was on a conference call.

e) Downramping rate schedule (fry emergence) - Significant and lengthy discussion ensued about revisions made to the recommended schedule table. The major cause was the combining of four seasons into three, particularly September 1 to October 31 and November 1 to February 28 into September 16 to February 28. Metzgar reviewed the revision history from the previous meeting and attendant issues with certain rates in the schedule. Linvog asked if there has been field verification of fry emergence? No. The agency concern was that some of the most liberal downramping rates now occurred as earliest salmon fry emerge from the gravel (in February). And, some rates were lower or slower than others already established as acceptable after fry were up (March 1 to May 31). The revision had inherent inconsistency (too liberal or too restrictive). Discussion sought to unravel the contradictions and develop a consistent logic. Metzgar pointed out that a key assumption is when the first eggs go into the gravel. Bruya advised that experience with the Sultan River shows that's September 15. Calculating 1900 water temperature units later the fry emerge. However, there is variability of egg development in the gravel so that water temperature differences and other factors effect time of emergence. That led to discussion about field verification of fry emergence and technical problems with it. Hence, that was the reasoning behind the present agreement/understanding that when the WDF determines fry emergence, the PUD would shift to lower ramping rates as stated by footnote "b" in the schedule.

Discussion returned to three seasons vs. four seasons and reconciling steelhead and salmon fry vulnerability periods with a three-season table. Further discussion and drafting of schedule revisions returned to a four-season schedule. Bruya drafted proposed revisions for the fall and winter seasons, based on the

discussion. Further comment produced a concensus schedule for those seasons as follows (and presented in the operating plan).

	September 16 to October 31		November 1 to February 28	
	Day	Night	Day	Night
1,500 - 750	4	4	4	4
750 - 600	2^e	$2^{de}2^{ce}$	2^e	2^e
600 - 300	$2^{d}4^{c}$	$2^{d}4^{c}$	4	4
300 - min	$2^{d}4^{c}$	2	4	4

d) Winter-run steelhead fishing season (mitigation - In response to Engman's comments during the last meeting about the uncertainty related to flow reductions, Metzgar responded by developing a scheme to inform steelheaders about river flow conditions. A "Sultan River Steelheader HOTLINE" concept outline was handed out (Attachment VII). Metzgar added that the idea might be tried on a trial basis. See about usage and public response. The desirability or usefulness may vary from season-to-season. Engman replied that he'd need more time to think about the steelhead fishability issues.

Ekman reported that he had discussed the proposed flow reduction scheme for the Sultan River as in the mitigation report and operating plan with the Corps' chief hydrologist. He had no problem with the proposal.

f) Operating Logic and Criteria - Metzgar noted the key revisions on operating priorities. Municipal supply and minimum instream flows are co-first priorities. The agencies asked that the second sentence order by reversed reflecting the shared first priority.

g) Spada Lake Recreation Season - Metzgar pointed out this is a new section, based on last meeting's discussion.

h) Interim Plan Evaluation Criteria - In response to agency comments, a section has been drafted on criteria for evaluating the proposed revised reservoir rule curve and related operating plan. Metzgar advised that another criteria, river gravel, has not been prepared. It would not necessarily be an annual reporting item. The scope for this criteria depends on the results of pending work concluding the present gravel studies and developing and testing a mitigation plan. Agency comment included clarifying the intent of reporting for plan purposes on instream flows and water temperature. Ging mentioned interest in and concern about the frequency of flow fluctuations. What is expected? He'd like to see wording about it - like fewer fluctuations as an operating target or goal under the revised reservoir rule curve and operating plan.

i) Interim Plan Schedule/Dispute Resolution - Ging continuing, asked about District response to dealing with problems, if they occur, under the revised plan. Metzgar referred him to last meeting's notes at VIII on pg. 8. In reply, he was ready to draft language

presenting the concept that if the License didn't respond in a timely and satisfactory manner, then Project operation would revert to the former rule curve (Figure H-3). However, Metzgar didn't include that concept in the plan because of the unacceptable risk exposure to the Licensee without any descriptions, definitions or safeguards about what constitutes an unacceptable response. What if an agency representative decides to be difficult and demand unreasonable actions? Discussion led to the notion that legal review might be necessary. Metzgar pointed out that there were several safeguards or protective restrictions already in the License. If Project operation was causing a serious problem, the Joint Agencies could always petition FERC or seek a Federal court order for relief.

Bruya advised that the agencies need development of some assurance about operation and Licensee responsiveness to any problems. Further discussion did not identify or develop a mutually satisfactory solution.

j) Reservoir matters - terrestrial wildlife and resident fish - Metzgar noted Engman's comments from the last meeting and wanted to discuss it further. First, regarding terrestrial wildlife mitigation and proposed vegetation planting along the reservoir shoreline and exposed shallow bottom areas, it was his recollection that that activity was strictly experimental and not a critical element of the proposed mitigation plan. In other words, if it worked, so much the better, but it might not also. Hence, nothing was lost or something expected now was being terminated by greater drawdown of the reservoir. Changing reservoir water levels may/may not effect reservoir revegetation experimental plantings, but proposed benefits haven't been reduced.

Concerning resident fish, Metzgar continued, the present reservoir fishery is certainly better than expected and provides more recreation than the river fishery lost by reservoir inundation of the Sultan River. The present fishery should certainly be an adequate replacement for the native, original fishery. The issue is, how much mitigation is required and, if revised operation should effect the fishery, how much is too much, especially since the fishery is a result of the Project? Engman responded that destruction or loss of the resident fishery wouldn't be acceptable. Metzgar reminded that the Project study history and mitigation work has been from a perspective that things would worsen, or negative impacts. Thus far, it has been difficult to technically or scientifically show a negative effect on the resident fishery because of design, operation, good luck, lack of evidence or it has not been observed yet. Continued monitoring, studying, and evaluating on an interim basis seems the most logical way to proceed.

5. Review of Second Draft of Operating Plan

Covered by previous items, excepting agency review of entire document later, since the second draft was distributed just before this meeting.

6. Remaining Activities and Schedule

The District will prepare this meeting's notes and revise the draft operating plan based on discussion today. These items will be sent to the Joint Agencies as soon as possible. Discussion developed about when and how to coordinate review by the attorneys. It was decided that would be up to each agency representative, based upon their review of the third draft. However, their review should be concluded by the end of May, leaving time for written response to the District and coordination of a joint report to the FERC by June 14 - the presumed end of the 120-day stay.

Attachments (7)
RGM:jk

JOSEPH R. BLUM
Director

STATE OF WASHINGTON
DEPARTMENT OF FISHERIES
115 General Administration Building • Olympia, Washington 98504 • (206) 753-6600 • (SCAN) 234-6600

August 29, 1989

Snohomish County PUD No. 1
ATTENTION: Mr. J.D. Maner
Executive Director
Post Office Box 1107
Everett, Washington 98206

SUBJECT: Comments on the Third Draft of the Project Operating Plan

Dear Mr. Maner:

F-115

Washington Department of Fisheries (WDF) has reviewed the third draft of the Project Operating Plan. This letter will reiterate the comments relayed to Ms. Jean Olson during our telephone conversation of August 23, 1989.

We have met with the PUD and the Joint Agencies many times over the last few years to develop a plan that allows the PUD maximum generation flexibility, provides additional flood control and protects the salmon fisheries resource we manage. The operating plan proposed by the PUD and graphically depicted by Figure 3, page 12, is supported by the WDF for the five year interim period. During this five year period the PUD needs to maintain dialogue with the Joint Agencies to evaluate project operation and the level of protection provided the fisheries resource under this new operating plan.

During this five year interim period, problems will probably happen and changes may be appropriate for the plan. Dialogue between the Joint Agencies and the PUD regarding project operation plans needs to be initiated as problems are identified. After the five year interim period the Joint Agencies and the PUD should be able to finalize the operating plan if problems are resolved as they are noticed. (1)

We believe the salmon resource can benefit by the proposed plan and the potential for problems are small. But they still exist. If problems occur they need to be resolved as soon as possible to minimize resource loss. Therefore, effective problem resolution during the five year review period is an essential part of gaining final WDF approval of the proposed operating plan. (2)

Henry M. Jackson Hydroelectric Project - FERC 2157
RE: FERC Project No. 2157-037

District Response to Washington Department of Fisheries Comments

1. Agreed.

2. The Licensees have agreed that the proposed project operating plan will be "interim" for a five year period (Part X in the plan). Also, provision has been made for revising the plan, if deemed necessary (Part IX), and a reservation clause, as in the Settlement Agreement, is included to further protect resource agency interests (Part XI). Further, plan monitoring and evaluation criteria have been identified for project operation (Part VII).

3. The proposed operating plan was drafted with resource protection and mitigation as a basic purpose or principle. Effective responsiveness to real or potential problems and resolving them has been demonstrated, we believe, by the District. Otherwise, Joint Agencies members' support would not be forthcoming. The District intends to maintain the present cooperative and productive relationship with the Joint Agencies.

4. The concern is related to Part IV B-1 (Fall Salmon Spawning Season). That part was drafted in recognition of the problem and concern expressed by the WDF and others. The District will continue consulting with the WDF (and now the Tulalip Tribes at their request - see Tribes' comment #5 in their Attachment and District response #17) about operating plans during the fall salmon spawning season. Also, we believe that there should be an exemption when high natural flows occur which aren't due to project operation. That scenario could occur when a "wet" late summer or early fall occurs with high instream flow. The reservoir will then be fuller than desirable. Thus, the need to increase releases from Spada Lake. (Please refer to response #6, also).

   The criteria, which would determine whether or not to invoke the requirement to provide and maintain adequate (higher) spawning and incubation flows must include consideration of the circumstances behind flows released directly to the river by project operation. That is, each instance or occurrence which may be considered damaging to aquatic resources should be evaluated on a case-by-case basis. Also please refer to response nos. 6 and 7 to Fish and Wildlife Service.

5. Figure 1 was copied from an earlier project document and revised to reflect the in-stream minimum flow schedule in the Settlement Agreement (Section 2). The figure has been revised again in accord with WDF's comments.

6. Part IV B (Maximum Controlled Flow Releases) has been revised for clarification purposes, as suggested.

7. A brief discussion describing the reason for Part IV B-1 (Fall Salmon Spawning Season) has been added.

An example of a potential problem that could occur under the proposed operation plan would be project caused loss of salmon eggs/alevins due to desiccation. Normally, the proposed plan should provide fishery related benefits by decreasing the possibility of being in State 2 during the times when salmon are spawning. However, power generation allowed under the expanded State 3 curve provides the PUD the opportunity to create high flow conditions which could place spawning fish in areas that may not be incubated by the agreed upon minimum flows. (3)

If such a power generation need occurred which resulted in this problem, the PUD would be responsible for providing adequate incubation flows. In order to avoid this particular problem, the PUD must continue to avoid high generation flows during September and October. (4)

Specific Comments

Figure 1, Life History Information, Page 4. As discussed on the phone, rearing chinook may be in the river any time of the year, chinook incubation should be extended through at least March, and coho incubation can be extended through May. (5)

B. Maximum Controlled Flow Releases, Page 5. I believe that you are trying to describe the different kinds of flow events which can be characterized as a "high flow". Upon reviewing this paragraph, additional clarification appears to be needed to help the reader distinguish between a bank full high flow event of 750 cfs, a high flow of 1300 cfs from the turbines, the proposed high flows required for break up of the armor layer and removal of fines, and the flows required for steelhead recreational fishing. (6)

B-1 Fall Salmon Spawning Season, Page 6. As discussed earlier in this letter, the problem with flows higher than approximately 400 cfs occurring during salmon spawning is that the agreed upon minimum flows will be insufficient for incubation flows and the deposited eggs/alevins will die if they do not have water during incubation. The relationship between spawning flows and incubation flows should be discussed in this section so the reader understands why WDF and the utility are proposing to prevent high flows during this period. (7)

C. Downramping Rate Schedule, Page 7. WDF is aware that the PUD has agreed to the lower ramping rates during the September 16 to October 31 time frame and the table will be corrected to show the agreed upon rates. (8)

8. Comment noted.

9. Disagree. The 'f' note on June/September night down ramp rates was added because of apparent steelhead fry stranding vulnerability and the District believes that the limitation will not interfere significantly with anticipated project operation at that time of year, based on operating experience and basin hydrologic records. Our ramping rate study has shown that steelhead fry appear to be more susceptible to stranding then salmon fry in comparable situations on the Sultan River. Also, results of rate verification tests showed that potential salmon fry losses, if any, weren't interpreted as excessive. Therefore, the rates presented for 600 cfs to minimum flow for March/May are not superscripted. Further operating restrictions should be avoided. During the reservoir filling period, potential operational scheduling and reservoir control problems caused by more restrictions aren't warranted because of the low risk of fry stranding.

   The District doesn't anticipate frequent down ramping or flow fluctuations in the 600 cfs to minimum flow range during the spring season. The operating record review provided on frequency of ramping by the District during recent consultations shows few occurrences within that flow range at that time of year. Further restricting operation based on salmon fry stranding risk exposure isn't justified. Also,the ramping rate schedule is overly complex now; adding another superscript with a severe flow reduction restriction significantly complicates operational planning and scheduling, especially with the "pause" requirement with "superscript "c".

   The District has subsequently contacted the WDF asking for reconsideration of the requested termination of daytime downramping. That letter of request and the WDF reply accepting the downramping rates as proposed in the third draft of the operating plan are included at the end of the District's response to the WDF.

10. According to District notes from the meetings held previously on ramp rates, the table should be 2 inches per hour during the night in the 300 to minimum flow range from March 1 to May 31. Unless WDF wants it to be 4 inches, the District will honor the 2 inch per hour rate.

11. The District understands the agency's concern and the significance of the problem if it were possible for the postulated situation to occur. However, addressing a potential problem in the operating plan before further review and determination of its possibility of occurrence is premature at this time. The water temperatures in Spada Lake have their greatest differential in the summertime (usually July or August). The surface temperature varies from 64°F to 66°F while those at the bottom of the intake structure (elevation 1,360) vary from 46°F to 48°F. Also, the water surface is highest on average during this time of year (approximately 1,440 feet). Finally, the Sultan River historical temperature range during the summer varies from 46°F to 63°F. Therefore, withdrawals of lake water at depths whose temperatures allow the District to meet its Sultan River water temperature commitments is and has been easily done in the summer.

Superscript "f" is used to identify times and flows when fry are most susceptible to stranding and denote the PUD will avoid any scheduled flow reduction during those times. This superscript is appropriate to modify the 2 inch day rates when river flows are less than 600 cfs in the March 1 to May 31 time frame to protect salmon fry from stranding due to day time ramping. WDF requests it be included to describe the recommended downramping rate schedule for these daytime 2 inch per hour rates during the March 1 to May 31 time frame. (9)

It appears that the nighttime rate for the 300 to minimum flow range for March 1 to May 31 is missing. The 4 inch per hour rate should be included to complete the table. (10)

D. River Temperature, Page 9. Temperatures above 60° F in rivers below reservoirs such as the Elwha River and the Columbia River at Priest Rapids have triggered outbreaks of Dermocystidium which have caused significant pre-spawning mortality. In August, 1987, 31% of the summer/fall chinook escapement to the Elwha River was lost due to an outbreak of this disease.

The additional drawdown of the reservoir allowed under the proposed operating curve may create conditions where the thermocline occurs below the intake gates. This condition would remove the project's ability to easily tap the cooler water of the reservoir for maintenance of temperatures below 60° F and within the maximum-minimum temperature range. Because of the potential for this significant problem, discussion is warranted in this section. (11)

VII. Interim Plan Evaluation Criteria, Page 13. In order to determine whether the proposed operating plan meets the needs of the PUD, the Corps and the Joint Agencies, it is to be evaluated for the next five years. The time frame for evaluation should be included with the evaluation criteria with a statement that the PUD will work with the Joint Agencies and the Corps to resolve problems as they occur during this five year interim period so that the operating plan can be finalized after the evaluation period. (12)

Spada Lake Water Surface Levels, Page 14. Fluctuating water surface levels in the reservoir has the ability to erode the shore of the reservoir. The erosion can be severe enough to cause turbidity problems in the reservoir and the Sultan River. Stream turbidity monitoring should occur (or continue) to determine if reservoir erosion is significantly changing turbidity levels in the river. (13)

From recent past experience and simulation studies using the computer operations model, Spada Lake reaches its annual lowest levels in the months of October or November. In 1987, the year of a severe drought, the surface elevation nearly receded to 1,412 feet in early November. At that time the water temperatures between the lake surface and the bottom on the intake structure equalized at 52°F and the temperature in the Sultan River varied from 54.5°F on October 1 to 42.8°F at the end of November. Therefore, the times of greatest annual drawdown in the reservoir will probably occur after the reservoir has become isothermal. The reservoir temperature during these times will, from the extreme 1987 experience, allow the District to maintain the Sultan River below the 60°F threshold referred to by the WDF.

In operating the project the District will remain aware of the concern raised by the WDF in regards to the 60°F river temperature. Quarterly and annual reporting requirements of the plan will allow the Joint Agencies to verify the District's operation.

12. The intent and purpose of this comment are addressed in response #2 above. However, Part VII in the plan has been revised to incorporate the time frame requested in WDF's comment.

13. This concern was identified during the planning and licensing phase for Stage II of the project. Studies were conducted specifically on water temperature and turbidity.

Actual results thus far have been more favorable than projected by the study. "Usually", the reservoir has clearer water (less turbidity) than the river, particularly during storm runoff periods.

The water quality change (turbidity) issue was responsible (partially) for construction of the City of Everett's water filtration plant at Lake Chaplain. The City monitors water turbidity at Lake Chaplain and in the water supply pipeline from the powerhouse to the discharge structure at Lake Chaplain. The water supplied to the City and being monitored is the same as that discharged into the Sultan River at either the diversion dam or the powerhouse. Thus, there is no need for additional turbidity monitoring in the river for reservoir turbidity values.

Observation of reservoir water quality by City and District staff suggests that reservoir turbidity is usually a result of surface runoff from heavy precipitation. Highest values generally occur as a result of high tributary flows into the reservoir. Monitoring of turbidity will provide data, but cause and effect such as differentiating between reservoir shoreline/bottom erosion versus tributary inflows may be difficult to determine. Spada Lake water surface levels are observed and recorded daily by the District for the United States Geological Survey (USGS). These data are reported quarterly to the USGS. A water resources data base for the reservoir exists (USGS and City) with which to compare the results of the proposed interim operating plan at some future time, if warranted.

Summary

WDF appreciates the work the PUD has done to evaluate our concerns regarding the proposed operating plan. We look forward to working with you during the evaluation period. Please contact Ken Bruya at (206) 753-0250 regarding any questions or clarification of our comments.

Sincerely,

Robert J. Jenke

Robert J. Jenke
Habitat Management Division

RJG:KB:br

cc: Cashell FERC
Engman WDW
Linvog NMFS
Somers Tulalip Tribe

P-118

PUD
PUBLIC UTILITY DISTRICT No. 1
2320 California St., Everett, Washington 98201 258-8211
Mailing Address: P. O. Box 1107, Everett, Washington 98206

March 6, 1990
PUD-18966

Mr. Robert Gerke
Washington State Department of Fisheries
3939 Cleveland Avenue
Tumwater, WA 98504

Dear Mr. Gerke:

RE: Henry M. Jackson Hydroelectric Project
Downramping Rate Schedule

In your August 29, 1989 letter commenting on the third draft of the District's proposed operating plan for the Jackson Project, you requested that the District avoid any daytime flow reduction for flows less than 600 cfs in the time frame March 1 to May 31. Forest Olson of CH_2M Hill, the District's Consultant on Downramping Rates, has responded to our letter of inquiry on this issue. His letter is attached for your review.

Based on his response, we do not feel compliance with your request is warranted, given the conservative and safe nature of the two inches per hour downramp rates recommended in the original study.

We, therefore, ask that you reconsider your request to avoid daytime downramping from March 1 to May 31 when river flows are less than 600 cfs.

Sincerely,

Original Signed By:
J. B. Olson
Jean B. Olson, Manager
Environmental and Engineering
Support Services

Attachment
JBO:BFM:vr/2071U
cc: J. Jones, Bell & Ingram
A. Martin, FERC
D. Lord, FERC
L. Cashell, FERC
C. Olivers, City of Everett
G. Engman, WDW
G. Ging, USFWS
J. Linvog, NMFS
D. Somers, Tulalip Tribes
F. Olson, CH_2M Hill

Engineers
Planners
Economists
Scientists

January 12, 1990

SEA18881.A0

Ms. Jean B. Olson, Manager
Environmental and Engineering
Support Services
Snohomish County PUD
P.O. Box 1107
Everett, WA 98206

Dear Ms. Jean B. Olson

RE: Jackson Project, Downramping Rate Schedule

As you requested, I have reviewed the revisions in the Jackson Hydroelectric Project Downramping Rate Schedule that the District negotiated with the Joint Agencies. For the most part, the new rate schedule adopts as permanent the conservative provisional rates that were contained in our July 1987 report. I believe that the study results indicate that the higher rates probably would be safe, but apparently the District has decided that there is little reason to verify the higher rates given the current manner in which the power plant is operated and recognizing that there is little need for ramping in the summer and early fall.

I would like to first point out an apparent typographic error in the table that you provided me. For the Sept. 16 - Oct 31 period in the 750 - 600 cfs flow range, the table indicates a footnote "e" for the nighttime rate. This footnote should be a "c", indicating side channel precautions.

Second, there appears to be a discrepancy between a rate in the table and a rate noted in WDF's August 29, 1989 letter. WDF indicated that the nighttime rate for the 300 cfs to minimum flow range was missing for the spring period in their review copy, and that this rate should be 4 inches per hour. Our recommendation was 2 inches per hour, and that is the rate shown on the table that you provided me. I believe the 2 inch per hour rate is correct since I wouldn't think WDF would recommend a higher rate than we would. However, you might check your notes on this.

CH2M HILL Seattle Office 777 108th Avenue, N.E., Bellevue, Washington 206.453.5000
P.O. Box 91500, Bellevue, Washington 98009-2050

WDF, as indicated in their August 29, 1989 letter, is now seeking to further restrict the springtime rates by requesting that downramping be avoided during daylight hours. The apparent basis for this request is our finding that salmon fry tend to be more susceptible to stranding during the day. This finding was the basis for our recommendation of 2 inches per hour during the day compared to 6 inches per hour at night. However, our study results clearly showed that 2 inches per hour was safe, and I do not recall that this was ever questioned in the various agency consultation meetings. Therefore, I find it somewhat surprising that WDF is now suggesting that daytime ramping be avoided.

In your September 21, 1989 letter to me you indicate that WDF based their recent request on our recommendations for ramping rates on the Nisqually River for Centralia's Hydroelectric Project. This is not quite accurate because it was WDF that made the initial suggestion to avoid daytime ramping during the spring. We agreed to this restriction only because the Centralia project is not a load following project and it only has a need to downramp about once a year when the diversion canal is being refilled following a maintenance or emergency shutdown. Also, we agreed to the conservative restriction in lieu of having to conduct site specific studies on the Nisqually River. Therefore, it is not appropriate, in my opinion, to apply the Nisqually River recommendations to the Sultan River where we do have site specific data that demonstrate the safety of downramping during the day at 2 inches per hour.

In the next few weeks, I will be preparing the revisions to the study report and the addendum, which will contain the new rate schedule. Since there appears to be some remaining disagreement with WDF over daytime ramping in the spring, I suggest we attempt to resolve that issue before we complete the addendum. Please advise me on how you want to proceed on that.

Sincerely,

CH2M HILL

Forrest Olson

Forrest Olson
Project Manager

ds/fo001/snopud

JOSEPH R. BLUM
Director

STATE OF WASHINGTON
DEPARTMENT OF FISHERIES
115 General Administration Building • Olympia, Washington 98504 • (206) 753-6600 • (SCAN) 234-6600

March 12, 1990

Snohomish County PUD Number 1
Environmental and Engineering Support Services
ATTENTION: Jean D. Olson, Manager
Post Office Box 1107
Everett, Washington 98206

Dear Ms. Olson:

We are in receipt of your letter dated March 6, 1990 regarding the subject of downramping during the March 1 to May 31 period at your Henry M. Jackson Project located on the Sultan River.

As you mentioned, the Washington State Department of Fisheries had requested in our letter of August 1989 to have the Jackson Project ramped down only during hours of darkness to afford the maximum protection for salmon fry. Normally, downramping during daytime hours is far more hazardous to salmon fry than at night. However, examination of the 1985 stranding study results indicate that there is little difference between daytime and nighttime downramping at the rates tested (minimal losses observed in both cases). Therefore, we would accept the downramping rates as shown on page eight of your third draft project operating plan.

It is probable that some fish will be lost during each downramping event, and the only way to prevent these losses would be to maintain the flow in the lower river with little or no variation. However, this is not feasible since "mother nature" and the Jackson Project, itself, cause fluctuating flows. We would ask, however, that you operate your project to minimize the number of flow fluctuations, especially below the 750 cubic feet per second flow level during the salmon stranding season.

Sincerely,

Robert J. Gerke
Assistant Chief
Habitat Management Division

RJG:db

cc: J. Linvog, NMFS
D. Sommers, Tulalip Tribe
G. Ging, USFWS, Olympia
G. Engman, WDW