

SULTAN RIVER PROJECT

FERC NO. 2157

ANADROMOUS
FISH MITIGATION STUDY PLANS
(PROPOSED)

JUNE, 1983

(Revised September, 1983)
(Revised October, 1983)

PUBLIC UTILITY DISTRICT NO. 1 OF SNOHOMISH COUNTY
EVERETT, WASHINGTON

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I. INTRODUCTION

This document presents fish mitigation study plans for agency and tribal review and comment so as to jointly develop studies of the effect of project operation on anadromous fishery resources of the Sultan River. When Snohomish County Public Utility District No. 1 (District) applied to the Federal Energy Regulatory Commission (FERC) for Stage II of the Sultan River Project (FERC No. 2157), several state and federal agencies and the Tulalip Tribes intervened over mitigation and enhancement issues concerning Sultan River aquatic resources. Subsequently, several license articles addressed those issues in the Federal Energy Regulatory Commission's Order Amending License dated October 16, 1981. In accordance with Article 60 a document entitled "Uncontested Offer of Settlement - Joint Agencies" was executed in April, 1982. The Commission approved this settlement on February 9, 1983. It included the series of studies mentioned in the Settlement Agreement and are described more fully in the next sections.

During subsequent implementing steps in the studies the Joint Agencies have requested participation. Specific activities anticipated include technical review of consultant/contractor study plans, periodic monitoring of work through a study committee, and appropriate participation in field studies as described later.

II. STEELHEAD FISHABILITY (CREEL CENSUS)

Evaluation of the effects of powerhouse discharge and river flow fluctuation on the winter-run steelhead sport fishery will be based on creel census above and below the operating powerhouse, and other parameters. Methods will be similar to those described in WDG 1982. Anglers will be interviewed on all weekend days and on two other randomly selected days per week for a total of 48 survey days. The surveys will commence at 9:00 a.m. each day. The same survey route will be followed each survey day, commencing at the diversion dam. The survey route will finish at the Horseshoe Bend access area. A post card survey will be used for vehicles whose occupants can not be located.

All established access areas (trailheads and parking areas) along the Sultan River between the diversion dam (RM 9.7) and the confluence with the Skykomish River will be surveyed. Survey opportunities at other places encountered during a survey will also be exploited. Significant effort should be made to contact all steelhead anglers on the river during sample periods. Information sought in angler surveys will include number of anglers, numbers of hours fished (above and/or below powerhouse), number of fish caught, and whether or not anglers had finished fishing for the day.

Stream flow and water transparency information will also be obtained. Streamflow data will be provided through gaging station records. Water transparency will be determined by the WDG method described in WDG, 1982 (pp. 145-146). Relationships among turbidity, streamflows, transparency and solarity will be evaluated for their potential influence on the catch. Turbidity sampling will be conducted at the powerhouse.

Estimates of catch, angling effort and catch-per-unit-effort above and below powerhouse will be computed for each month and the entire season. Relationships between stream flow and catch-per-unit-effort and between water transparency and catch-per-unit-effort will be investigated and compared to results obtained in previous Washington Department of Game studies (WDG 1982). At this time, however, it is not known whether this comparison is statistically valid and thus meaningful for this purpose. A comparison will also be attempted between the Sultan and Skykomish River steelhead catches, assuming WDG continues Skykomish River censuses. Sultan estimated seasonal catches have been 3.0, 3.5 and 2.3 percent of the Skykomish catches during 1978-79, 1979-80 and 1980-81, respectively (WDG 1982). At this time, however, it is not known whether this comparison is statistically valid and thus meaningful for this purpose.

The results of the survey and statistical analysis are to be used to determine whether or not project operation has caused a significant reduction of the steelhead fishery. The fundamental criteria proposed for this evaluation will be statistical comparison of total Sultan River fishing effort and catch pre and post construction. Survey results will be compared with the existing record base for three previous seasons.

This study will be conducted during the winter steelhead fishing season, December 1, 1984 through February 28, 1985. A final report will be prepared for Joint Agency review and comment. Following that, the report will be prepared for submittal to the FERC.

III. SEDIMENT ANALYSIS STUDY

A three-part study will be conducted to determine the effects of the Sultan River Project on the textural composition of salmonid spawning gravels between the diversion dam and confluence with the Skykomish River. The first part of the study was initiated in the spring of 1982 and evaluated existing (pre-Stage II) spawning gravel quality (Wert 1982).

Study Objective

Determine whether or not project construction or operation causes a significant build-up of fines and/or causes adverse impact at critical life stages of anadromous fish. Existing (pre-Stage II) levels of fines in the gravels (Wert 1982) will be compared with gravel conditions determined in spring 1984 following project construction and again in spring 1987, three years after project startup. These comparisons of silt levels will be made by repeating the sampling, taking into consideration:

1. Spatial variability of sediment samples along selected spawning reaches.
2. Vertical heterogeneity of sediment within and among spawning reaches.
3. Temporal variability expected as a result of changes in natural flows.

Sultan River sediment levels will also be compared with results in available literature on Washington and Oregon streams. Potential changes in survival of incubating salmonid eggs resulting from changes in sediment load will be assessed based on relationships of survival and sediment levels reported from laboratory studies or from other West Coast drainages.

Comparisons of part one (baseline) to post-construction and operational evaluations will thus form the basis to determine whether or not mitigative measures may be required to maintain the quality of Sultan River spawning gravels. However, because there is but a single set of pre-construction samples, natural between-year variability cannot be determined, but significant changes, including build-up of fines, could occur independent of construction and operation. It may therefore be difficult, if a significant build-up does occur, to decide whether it is a consequence of project construction or operation. Data from other West Coast streams may be useful in this case.

Methods used and to be used again in this study are described by Wert (1982). In part one, sediment samples were removed from representative spawning reaches using the tri-tube freeze-core technique. The samples were analyzed by wet sieving through a graduated series of Tyler screens. Textural composition, expressed as percent fines less than 0.841 mm and geometric mean diameter, was calculated using the computer program SEDIMNT at the Fisheries Research Institute (FRI) at the University of Washington.

Parts two and three of the study will be conducted following project construction and three years after project startup, respectively. The same sampling sites will be used for parts two and three as were used in part one. Comparison of results of part one (baseline) to post-construction and operational evaluations will determine whether or not mitigative measures may be required to maintain the quality of Sultan River spawning gravels.

The final report describing baseline (pre-construction) sediment texture was completed in November 1982. Post construction samples will be taken in the spring of 1984 with a report due later in 1984. In the spring of 1987, three years following project startup, samples will again be taken with a final report due later in 1987. These reports will be submitted to the Joint Agencies for review and comment prior to submittal to the FERC.

As a result of Joint Agency review of this proposed study, the initial report, and subsequent consultations, the Joint Agencies requested additional sampling to be done in fall, 1983. The District declined to do so. Subsequently, the Joint Agencies conducted sediment sampling at the middle three sites during the week of September 19 with District-loaned equipment. The Joint Agencies will also conduct the laboratory analyses and report the results. The basis for the equipment loan and related consultations is presented in an agreement (Appendix A) between the Tulalip Tribes, Washington Department of Fisheries and the District.

IV. GRAVEL QUANTITY STUDY

This study will determine whether or not project operation causes significant depletion of spawning gravels in the Sultan River from the diversion dam to the confluence with the Skykomish River. Baseline data will be gathered prior to initial project operation. The initial field work will be conducted during the fall, 1983. After three years and again after ten years of project operation, the same study sites will be surveyed. The District and Joint Agencies will review field study results and jointly determine the effect, if any, of project operation on salmonid spawning gravels. Comparison of results of part one (baseline) to post-construction and operational evaluations will determine whether or not mitigative measures may be required to maintain the quality of Sultan River spawning gravels.

The scope of work is envisaged as follows:

1. Document existing gravel substrate and sources of gravel in recruitment in the Sultan River between Culmback Dam and river mouth, using video camera and/or other methods.
2. Map existing areas and determine volume of spawning gravel suitable for pink, chinook, coho, and steelhead between the Everett diversion dam and river mouth. "Suitability" shall be determined by criteria for spawning gravel size for these salmonid species.
3. Devise methods to determine changes of spawning gravel area and volume at 3 years and 10 years following project start-up.
4. Identify thresholds of river flow causing movement of various sizes of sediment and bedload.
5. Conduct a literature search on potential mitigative measures to determine methods to maintain existing gravel quantity in the river channel system.

The river will be surveyed as described above during the chinook spawning season, October 1983 (pre-operational), three years following initial operation (October 1987) and 10 years following initial operation (October 1994).

Besides visual estimates and recording, another measurement system may be devised and established to provide a permanent base for measurement and evaluation. The proposed system might consist of installed elevation markers at several gravel areas. These sites would then be surveyed and resurveyed as required. Specific methodology is to be proposed, developed and detailed by the consultant assigned to conduct this study.

Following each phase of the study, reports will be prepared and submitted to the Joint Agencies for review and comment. Following that, reports will be prepared for submittal to the FERC.

V. RAMPING RATE STUDY

This study will determine the effect, if any, of the initial project powerhouse ramping rate set at six inches per hour on the early life stages of anadromous fish in the Sultan River. The agency concern is that a slower ramping rate may be needed in order to avoid potentially adverse impacts, especially with the stranding of young fish during the rearing stage. The focus of this study will be primarily on the effects of project ramping rates on stranding of emerged juvenile fish.

Pertinent information on project operation* is summarized briefly below to provide background information essential for understanding the proposed design of ramping rate studies. Water releases from Spada Lake will be governed by a set of rule curves which consider reservoir stages for both that lake and Lake Chaplain. The shape of these curves was determined by 40 years of hydrologic record and meeting operation objectives of minimizing spill while simultaneously maximizing average energy production, but not excessively drafting Spada Lake for a marginally small energy benefit. Additionally, flow constraints must be met for City of Everett water demand and minimum flows for fish in the Sultan River. The release schedule for power production based on Spada Lake and Lake Chaplain reservoir rule curves is presented in Table V-1. That information defines the likely scenarios of powerhouse flow releases into the Sultan River which need to be evaluated.

The assumed operating characteristics of the Pelton and Francis turbines require a minimum discharge specification for power generation. These limiting values were set at 85 cfs and 65 cfs for the individual Francis and Pelton units, respectively. The maximum flow capacity of the two Francis units is 340 cfs. (These values will be verified during initial project start-up and testing including these ramping rate studies.)

The mode of operation for various flows diverted from Spada Lake is visualized as follows:

- 85 cfs - turbines bypassed and water discharged to Lake Chaplain and/or through the fish return line to the Sultan River depending on requirements of the City of Everett and fish. Minimum flow for fisheries or Everett generally requires more discharge through the turbines than this limiting turbine condition.
- 85 cfs to 340 cfs - flow passes through one or both Francis units; one Francis unit and one Pelton unit; or one Pelton unit depending on requirements of the City of Everett and fish.
- >340 cfs - flow passes through one or both Francis units, depending on requirements of City of Everett and fish, and also one or both Pelton units.

* Operation logic and criteria are presented in Exhibit H, Section 3.0 of the FERC License Application for Sultan River Project, Stage II (FERC No. 2157).

TABLE V-1
RELEASE SCHEDULING FOR POWER PRODUCTION *

Spada Lake State	Lake Chaplain State	Flow to Powerhouse	Diversion into Lake Chaplain		Spillage from Spada Lake
			From Powerhouse	From Diversion Dam	
1	1	Max.	0	0	Yes
1	2	Max.	X	X	Yes
1	3	Max.	X	X	Yes
1	4	Max.	Max.	Max.	Yes
2	1	Max.	0	0	No
2	2	Max.	X	X	No
2	3	Max.	X	X	No
2	4	Max.	Max.	Max.	No
3	1	P	0	0	No
3	2	P	0	X	No
3	3	P	P	X	No
3	4	P	Max.	X	No
4	1	X	0	0	No
4	2	X	0	X	No
4	3	X	0	X	No
4	4	X	X	X	No

Notes:

Max: at capacity

0: no flow

X: as permissible for meeting downstream flow constraints

P: proportioning of flow according to relative position within the zone bounded by upper normal level and the base level.

*: Table H-3, Exhibit H, FERC License Application for Sultan River Project, Stage II (FERC No. 2157).

The most critical consideration relative to operation is its effect on the downstream reaches of the Sultan River. Plant operation should be such that power releases are controlled in a systematic and acceptable manner with minimal effects to the environment. The assumed power release criteria limits the water level fluctuation at the powerhouse stream gage station to not more than 6 inches per hour (equivalent to a flow fluctuation of up to 400 cfs per hour). Such a change would normally be at a gradually increasing or decreasing rate. Exceptions to this will occur when the first Pelton unit is brought on line or the last Pelton unit shut down. At this time a flow change equal to 10% or 20% of the unit total flow (65 cfs or 130 cfs) would occur over several minutes.

The plant operating schedule may follow one of the alternatives described below, depending on the releases from Spada Lake.

- 1) When there is abundant water, the power units would be loaded to capacity throughout the day. A constant power release of 1,300 cfs is the maximum release anticipated.
- 2) When both the Pelton and Francis units are at partial capacity, the Pelton units would follow the load demand pattern to the extent permitted by the river fluctuation limits (ramping rates) downstream of the powerhouse. Any fish water releases would be delivered through the Francis units. These releases would normally be uniform throughout the day. However, if the discharge through the Francis units included water destined for Lake Chaplain, this water could be used to generate power following the load demand pattern.
- 3) During low flow conditions, there are occasions when water is released from Spada Lake specifically to meet the minimum river requirements and/or Everett's water demand. In this case, only the Francis units would be used and the power generation could follow the operating schedule for the Francis units.

The study of the effects of rate of change of powerhouse discharge on downstream areas will require a cooperative effort with the fish agencies. Their role, besides review and development of the proposed scope of work, may include field observation during scheduled powerhouse test operations. Methods will generally follow those used in Skagit River fry stranding studies (Stober et al, 1981 and 1982). Sections of stream bank below the powerhouse, which are representative of the lower river and potential problem areas, will be selected for field checking. "Hot spots", areas where fish are known to concentrate, will be selected for field observation of stranding, recognizing that such definition and selection does not mean "representative" of the entire river. About three to five sites are expected to be chosen. These areas should be field checked and accepted by the agencies prior to start of testing.

Specific test design criteria include at least the following:

- Tests should target on species; this will mean scheduling at different times of year for different species - steelhead and chinook/coho.

- Both day and night sampling may be needed.
- Electroshocking will be conducted on "off-days" between ramp tests.
- Peak fry emergence times need to be identified for each species. Tests should be scheduled for peak fry stranding periods.
- Variable ramp rates will be tested related to the downstream area variable response to different flow reductions.
- Each down ramp level to be tested will be conducted on a different day.
- A load rejection shutdown from (maximum to zero discharge) will be conducted.

The number of design criteria and variability possible suggest the need to develop a master schedule or matrix depicting the scope and timing of ramp rate testing.

Temporary staff gages will be established to determine the relative degree of change in water surface elevation in representative downstream juvenile rearing areas. Presumably, the 6-inch-per-hour ramping rate at the powerhouse gage will be a lesser rate in most downstream areas. Streambed exposure/inundation zones created by flow fluctuations will be measured. Fish stranding is a function of the shape of a gravel bar or channel configuration.

More tests will be required when the test schedule in Table V-2 is completed. Another rate or range of rates will be developed based on the results of the initial test. Flexibility is sought in ramping rates for both operational and fish protection advantages. Hence, a series of tests may be necessary to establish variable ramping rates.

Once project operation testing for this purpose commences (reduction of discharge) field teams will survey back and forth between high and low water lines from one end of a designated streambank section to the other and back again. Observers will only collect fry which are visible. Substrate material will not be moved. Observation crews will consist of two persons per stream section and will begin immediately following a scheduled downramp test to prevent loss (if any) of fry. In order to determine fry abundance, a two hundred foot section along each study area will be electrofished to approximately 1.5 feet deep during the afternoon prior to each downramp test. Using these methods a relative index of stranding during each test will be estimated.

Relationships between ramping rates and fry stranding possibly may not be apparent or statistically significant due to sampling methods and/or expected large daily or hourly fry abundance variation among or within study sites (Stober *et al* 1981). Consequently, results of the field observations of ramping rates and stranding/dewatering may be the most reliable means of assessing the situation. Prior to commencement of testing, a pre-test meeting will be held for all observers to review the schedule and assignments. After test operations, field observers will reassemble to present and discuss results with the study manager.

During initial project start-up and testing the relationship of flow to river stage will be established through the new gaging station immediately downstream from the powerhouse and temporary staff gages. Surveys may be made downstream to establish time of travel from powerhouse to specific points and corresponding changes in water surface elevations due to changes in powerhouse discharge rate. The variable effect of daylight will be evaluated by testing during both day and night hours.

Based upon project operational criteria and characteristics described earlier the proposed discharge test flows and schedule is presented in Table V-2. Results of the proposed operational test schedule will determine the need for either reruns or revised ramping rate testing at either higher or lower rates. An interval of at least two days will take place between tests in order to minimize potential effects of consecutive-day testing. This testing is proposed for months when young fish will be in the river. Thus, sometime during the months of April through July 1984 the tests will be held, subject to manpower schedule coordination with the Joint Agencies for their participation.

After ramp rate testing, a report will be prepared and submitted to the Joint Agencies for review and comment. Following that a report will be prepared for submittal to the FERC.

TABLE V-2

SULTAN PROJECT PROPOSED OPERATIONAL
TEST SCHEDULE FOR RAMPING RATE/FISH STUDY

<u>Mode</u>	<u>Discharge Schedule</u>	<u>Stream Flow Condition</u>	<u>Test**</u>
Full power (both Peltons and one or both Francis units)*	1,300 cfs	Minimum fish flow state plus local inflows	Check test areas
Reduce operation of 1 Pelton unit.	1,300 to 900 cfs	same	6"/hr. observe test areas
Continue to reduce operation: Shutdown 1 Pelton unit and start reducing ops of the second unit.	900 to 500 cfs (at 650 cfs 1 unit will be shutdown)	same	same
Continue reduced operation toward shutdown.	500 to 130 cfs	same	At rate equivalent to 6"/hr.
Shutdown of second Pelton unit.	130 cfs to 0 cfs	same	Transition from limiting equipment flow valve to zero will be determined by equipment capability.***
Reduced power (combination of 1 Pelton and 1 Francis unit).	85 to 340 cfs range to 0 cfs	same	Check test areas ****
Reduce Pelton operation.	340 to 130 to 0 cfs		6"/hr; observe test areas****

* Number of Francis units on line will be determined by Everett and fish flow requirements during test period.

** Tests to be conducted during day and night hours.

*** Total test time will be 3 hours plus. The time over 3 hours will be determined by equipment capability at limiting value immediately prior to complete shutdown.

**** Total test time should be about 1 hour.

VI. FISH PASSAGE (POWERHOUSE BERM) STUDY

This study will be conducted to determine whether or not the powerhouse berm facilitates successful upstream migration of anadromous fish past the tailrace area. Also fish entry (if any) into the powerhouse draft tubes and subsequent effects will be determined.

The success of upstream attraction of migrating fish past the powerhouse tailrace will be documented by visual observation and spawner surveys. Behavior of upstream-migrant fishes will be observed in the tailrace pool and below the berm and as these fish approach the berm passageway. Observations will be made visually and photographically from the stream bank, berm and powerhouse top deck. Evidence of retarded movement through the tailrace areas would include the presence of schools of fish headed into the flows issuing from the draft tubes, and tentative movements of individual fish into these flows and out again. These observations can probably best be accomplished from the powerhouse deck. Spawner river use upstream of the powerhouse will be compared to similar records for previous years.

Spawner use of the river upstream will be compared with similar records for previous years. Comparisons will be made of pre-project and operational spawning of the same species downstream of the powerhouse in order to ascertain the degree to which balance of usage between upstream and downstream areas is maintained. Salmon spawning surveys will be conducted on foot; aerial redd counts will assess steelhead distribution. These are the methods used in past reported surveys.

Photographic documentation of the berm structure from an established reference point will be conducted to record the different flow/spill conditions through the berm passageway.

Field studies will be conducted between September 1984 and May 1985. The Joint Agencies will be advised of the field work schedule for their potential participation, if they choose to do so. A report will be completed in 1985 after field observations are transmitted to the Joint Agencies for review and comment. Following that, a report will be prepared for submittal to the FERC.

Prior to implementing the proposed visual method the District will initiate steps on alternative study plans/methods in the event that visual observation is ineffective (fish behavior is unobservable due to conditions created by turbidity, flow turbulence, a combination of these or other factors). These studies or methods could include either trapping, tagging and electronic monitoring, sonar barrier monitoring, screening of tailraces, a combination of these or other alternatives. The alternatives, if selected, will be available to immediate implementation. The Joint Agencies will be consulted prior to final selection.

VII. RIVER TEMPERATURE STUDY

Results of temperature and turbidity simulation studies indicate that water temperatures in the Sultan River below the powerhouse would be generally lower than historical temperatures from May through September of each year (PUD, 1981). Lower water temperatures, if they occurred, would inhibit growth of anadromous fish and reduce their survival rate. Consequently, an adjustable intake structure has been constructed to allow withdrawal of water from different depths of the reservoir (Spada Lake). This variable withdrawal depth capability should provide water temperatures nearly equivalent to existing conditions. The temperature of combined fishwater return flows and river flows passing the diversion dam will be coordinated to the fullest extent possible, the monthly mean of temperatures recorded at the diversion dam for years 1969-1979, and also remain within the recorded minimum-maximum temperature range.

New river gaging stations have been constructed in the immediate vicinity below both the diversion dam and the powerhouse to measure flows in the river. Continuous monitoring of river and project flows will be provided by these facilities. [These stations were constructed for the District by the U.S. Geological Survey. They will be equipped and maintained initially by the USGS.] Annual reports of water temperature recorded at the new gaging stations will be prepared and provided to the Joint Agencies and the FERC.

The project operator has also agreed to notify the Joint Agencies of deviations from the minimum-maximum temperature range whenever such deviations occur for more than one monitoring period. The monitoring period is defined as daily. Temperature data will be recorded through the project operational sensing equipment and logged every hour for back-up purposes. Reporting by the District to the Joint Agencies will be quarterly (cover three-month periods) presenting daily minimum, maximum and mean temperature. Temperature values should be within the monthly range.

TABLE VIII

SULTAN PROJECT - WORK SCHEDULE (TENTATIVE) FOR PROPOSED FISH STUDIES

1984

1983

Study	1983							1984								
	J	A	S	O	N	D	J	F	M	A	M	J	J	A	S	
Steelhead fishability																Agency coord.
Gravel texture							field work		sample analysis (1)			draft report				(1) report to agencies
Gravel quantity									Agency review; revise to FERC?							(Study repeated in 1987)
Ramping rate									Agency coord; scoping; contract			flows tests & field work				draft report
Fish passage																scoping contract; agency coordination
River temperature																field work

(1) Gravel analysis schedule assumed; actual time dependent on laboratory availability. Report completion tentative due to unknown lab scheduling.

TABLE VIII, continued

SULLIVAN PROJECT - WORK SCHEDULE (TENTATIVE) FOR PROPOSED FISH STUDIES

Study	1984					1985									
	O	N	D	J	F	M	A	M	J	J	A	S	O	N	D
Steelhead fishability	scoping contract	field	work	work	draft report	draft report	agency review; revise, to FERC?	agency review; revise, to FERC?	agency review; revise, to FERC?	agency review; revise, to FERC?	agency review; revise, to FERC?	(Study may be repeated 1985-6)			
Gravel texture					study repeated in 1987										
Gravel quantity					study repeated in 1987 and 1994										
Ramping rate	Agency review; revise, to FERC ?														
Fish passage	field			work					draft report		agency review; revise, to FERC				
River temperature (3)					scoping; contract	field work (2)			draft report		agency review; revise, to FERC?				

(2) Field study started second year after reservoir filling for improved stability and indication of likely conditions.

(3) Study repeated in 1986. Also, annual monitoring reports on water temperature

REFERENCES

Bovee, K.D. and R.T. Milhous. 1978. Hydraulic simulation in instream flow studies: theory and techniques. Instream Flow Information Paper No. 5. FW/OBS-78-33. Coop. Instream Flow Serv. Group, U.S. Fish & Wildlife Serv., Ft. Collins, CO. 125pp.

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Stober, Q.J., S.C. Crumley, D.E. Fast and E.S. Killebrew. 1981. The effects of hydroelectric discharge fluctuations on salmon and steelhead survival in the Skagit River, Washington. Ann. Prog. Rept. for City of Seattle Dept. of Lighting, Office of Environmental Affairs. Fisheries Res. Inst., Univ. of Wash., Seattle, WA. FRI-UW-8127. 211pp.

Stober, Q.J., S.C. Crumley, D.E. Fast, E.S. Killebrew, R.M. Woodin, G. Engman, and G. Tutmark. 1982. Effects of hydroelectric discharge fluctuation on salmon and steelhead in the Skagit River, Washington. Final Rept. 1979-1982. Rept. for City of Seattle Dept. of Lighting, Office of Environmental Affairs. Fisheries Res. Inst., Univ. of Wash., Seattle, WA. FRI-UW-8218. 302pp.

Washington Department of Fisheries. 1980. Sultan River salmon studies. A report prepared for the Snohomish County PUD No. 1, Everett, WA. 74pp.

Washington Department of Game. 1982. Fish and wildlife resource studies. Sultan River Project, Stage II Final Report. Available from Snohomish County PUD No. 1, Everett, WA. 217pp. Appendix.

Wert, M.A. 1982. Evaluation of the textural composition of Sultan River salmonid spawning gravels. Prepared for Snohomish County PUD No. 1, Everett, WA. 42pp.

AGREEMENT

THIS AGREEMENT made and entered into this _____ day of September, 1983, by and between PUBLIC UTILITY DISTRICT NO. 1 OF SNOHOMISH COUNTY, hereinafter called the "District," and THE TULALIP TRIBES, and THE STATE OF WASHINGTON DEPARTMENT OF FISHERIES, hereinafter called "Tribes-WDF,"

W I T N E S S E T H :

WHEREAS, heretofore, to-wit: on the _____ day of _____, 19__, the parties, together with other fish agencies, entered into an Agreement designated Joint Agency Agreement; and

WHEREAS, said Joint Agency Agreement provided for certain sedimentation studies in the Sultan River for the benefit of the parties and the Sultan Project; and

WHEREAS, these parties desire to clarify certain questions that have been raised pertaining to such Joint Agency Agreement as to the matter of sedimentation studies; and

WHEREAS, correspondence has passed between the parties, namely the following letters: (1) Letter of Department of Fisheries to W. G. Hulbert, Jr., dated September 2, 1983; (2) Letter from Hulbert to the Department of Fisheries dated September 9, 1983; (3) Letter from Bell & Ingram to Parker Williams, dated September 9, 1983; (4) Letter from Bell & Ingram to Kenneth F. Plumb, Secretary

of FERC, dated September 9, 1983; and (5) Letter from Tulalip Tribes to R. F. Vine, dated September 12, 1983; and

WHEREAS, further and in addition, certain conferences have been held between the parties, and the parties desire to settle all matters pertaining to the times and frequency of sedimentation studies;

NOW, THEREFORE, IT IS HEREBY COVENANTED AND AGREED as follows:

1. Tribes-WDF agree that they will make a sedimentation study in the Sultan River in the Fall of 1983 similar to the study made by the District in the Spring of 1982.

2. Tribes-WDF will pay the costs and expenses of all personnel taking the samples and the expenses of analysis of the samples for said sedimentation studies, and the District agrees to lend its equipment necessary for said studies to Tribes-WDF without cost. A separate list of equipment will be furnished and delivered to Tribes-WDF at or about the time of execution of this Agreement, and said equipment will be used in a reasonable and proper manner and will be returned as soon as said studies are completed, reasonable wear and tear excepted.

3. The District agrees that it will make sedimentation studies in the Sultan River substantially as done in the Spring of 1982 in the Spring of 1984 and again three years after commencement of operation, which is estimated

to be in the Spring of 1987, and the District will pay all costs of such studies including use of its own equipment and for all personqel and analysis for the purpose of completing such studies.

4. Tribes-WDF may, at their option, make similar studies in the Fall of 1984 and in the Fall of 1986 and, again, will pay all expenses of such studies including costs of analysis in the manner above set forth, and the District will provide the said equipment without cost, in the manner as above set forth.

5. There are other parties to said Joint Agency Agreement who, because of time, have not been at this date contacted by the parties to this Agreement, but the District and the Tribes-WDF agree to attempt to obtain the consent of such other parties to this Agreement as soon as possible.

6. A copy of this agreement will be sent to the Federal Energy Regulatory Commission acknowledging that the issues as to time and frequency of sedimentation studies, in the above-referred-to letters, have been settled between these parties.

DATED this ____ day of _____, 1983.

PUBLIC UTILITY DISTRICT
NO. 1 OF SNOHOMISH COUNTY

TULALIP TRIBES OF WASHINGTON

By: _____

By _____

WASHINGTON STATE DEPARTMENT
OF FISHERIES

By _____