JUVENILE FISH PASSAGE PLAN

FOR 1985

FOR CORPS OF ENGINEERS PROJECTS

1 APRIL 1985

NPDEN-WM

TABLE OF CONTENTS

List of Appendices

JUVENILE FISH PASSAGE PLAN FOR 1985 FOR CORPS OF ENGINEERS PROJECTS

I. Introduction

This Corps of Engineers' 1985 Juvenile Fish Passage Plan was designed to assist the survival of juvenile anadromous fish at the Corps' eight lower Columbia and Snake River projects consistent with other project functions. This Plan has been developed in consultation and coordination with the fish and wildlife agencies and tribes and other interested parties, but a mutually agreed-upon plan was not achieved for 1985. The plan described in this document is the Corps' plan designed to meet the Northwest Power Council's Fish and Wildlife Program criteria.

II. Background

A heightened awareness of the problems facing juvenile fish during their migration past Columbia and Snake River Dams was brought about during the spring freshet of 1973. As the runoff was one of the lowest experienced in many years, migrating juvenile fish suffered heavy mortalities as a result of the extended transit time through the system and because most of the fish passed through the powerhouse turbine units. A Committee on Fishery Operations (COFO) was established in 1975 to coordinate the effort to provide protection of juvenile fish within a balance of reduced firm power and adverse impacts of other uses of the water resource. In 1977, during a drought more severe than the one which occurred in 1973, definitive steps were taken to assist juvenile fish passage. COFO continued to coordinate the annual juvenile fish passage program through 1982.

In November 1982, the Northwest Power Planning Council (NWPPC), under guidelines of the Pacific Northwest Electric Power Planning and Conservation Act of 1980 (Regional Act, P.L. 96-501), developed the first regional Fish and Wildlife Program for the Columbia River and its tributaries. The Fish and Wildlife Program, amended in October 1984, proposes development of an interim regional plan to coordinate, refine, and develop operations and facilities which reflects the intent of Section 4(h) of the Regional Act. In response to the amended F&W Program this interim juvenile passage plan sets forth the criteria to be followed by the various water management entities for the 1985 downstream migration of the juvenile anadromous fish.

The initial step in the formation of this plan was the development of a draft document entitled Procedure for Development of a Coordinated Interim Juvenile Fish Passage Plan for Corps of Engineer Projects. (Appendix 1.) This document describes the organizational structure, responsibilities, and guidelines of the Corps of Engineers, fishery agencies and tribes, and other affected entities to facilitate the preparation and implementation of this interim juvenile fish passage plan. As explained in Appendix 1 a Working Committee and an Executive Committee were formed to facilitate the preparation of the plan. The procedure document has not been formally approved by the Executive Committee.

III. Purpose of the Plan

On October 10, 1984, the Northwest Power Planning Council adopted amendments to the Columbia Basin Fish and Wildlife Program of November 1982.

Included in the amended program is a new section, Section 1500: Five-Year Action Plan, which includes Action Items (1504). Action item, Number 32.2, Corps Actions, is an item designating the Corps of Engineers as the Federal agency to develop and implement a coordinated systemwide annual juvenile fish passage plan for Corps of Engineers projects. The Fish and Wildlife Program calls for a submittal to the Council by February 15 of each year and implementation by April 1 of each year. At Lower Monumental, Ice Harbor and The Dalles projects, the fish and wildlife agencies and tribes will prescribe the method of determining smolt survival according to Section 404 of the Fish and Wildlife Program. In addition, Section 404(b) designates the Corps as the Federal agency to implement various proposals for improvement of passage efficiencies and smolt survival at its projects on the Columbia and Snake Rivers. Proposals included in the Fish and Wildlife Program require development of a coordinated interim juvenile passage plan, in consultation with the fish and wildlife agencies and the tribes. The passage plan may include spilling of water at Corps of Engineers projects, while developing a permanent solution to passage problems at John Day, The Dalles, Bonneville, Lower Monumental and Ice Harbor Dams. This 1985 Juvenile Fish Passage Plan for Corps of Engineers projects has been prepared through discussion with all parties responsible for Columbia River Basin hydropower operations and fish management.

IV. Principles and Guidelines

The following principles and guidelines (See Appendix 1 for additional detail) have governed the development of an interim systemwide juvenile passage plan for 1985. These principles and guidelines have not been formally adopted by the Executive Committee.

a. The Corps of Engineers will submit a fish passage plan to the Power Planning Council by 1 April 1985. This plan is being developed in consultation and coordination with the fishery agencies and tribes and other affected parties.

The parties agree that because the agencies and tribes have the necessary biological expertise, they are responsible for the development of the fish protection portion of the plan through the deliberation of the Working Committee. The Plan is to be developed recognizing that the Corps of Engineers must consider other uses and authorized purposes of its projects as well as fish passage and power production and act in accordance with Section 4(h)(11) of the Northwest Power Planning Act.

b. The Juvenile Passage Plan is being developed in accordance with the equitable treatment provision of Section 4(h)(11)(a) of the Northwest Power Planning Act. The Plan is to be based on and supported by the best scientific knowledge.

c. The Plan is to focus on juvenile fish passage but include consideration of adult fish passage. Spill patterns for adult fish, nitrogen supersaturation control and project fish facilities and operating criteria are to be considered in the passage plan.

d. The 1985 Plan is being developed cooperatively by project operators, fish and wildlife agencies and tribal representatives. The fishery agency/

tribes' 1985 Detailed Fisheries Operating Plan (DFOP) was provided as recommendations for plan development. The 1984 Corps of Engineers Spill Plan, Fish Transport Guidelines and past bypass activities of the Committee on Fisheries Operations (COFO) are also being given full consideration in developing the 1985 juvenile passage plan.

e. The Power Planning Council has adopted an interim smolt survival standard of at least 90 percent at all Corps projects except Bonneville Dam. At Bonneville Dam, an 85 percent bypass efficiency standard was adopted. Development of the plan is to give full consideration to incorporation of these standards recognizing that a 90 percent survival standard is unacceptable to the fish and wildlife agencies and tribes on either an interim or long term basis because of its adverse impact on upriver anadromous fish runs.

f. In accordance with the Fish and Wildlife Program, the fish and wildlife agencies and tribes were given the responsibilty to prescribe the method of determining smolt survival where appropriate. Assumptions and criteria are to be supported by best available knowledge and are to be documented in the 1985 juvenile fish passage plan.

g. Turbines are screened and bypasses are operational at Lower Granite and Little Goose dams on the Snake River and McNary Dam on the Columbia River, and it is anticipated that most fish collected at these dams will be transported in accordance with established guidelines. The 1985 FTOT Guidelines are attached as Appendix 3.

h. The Juvenile Fish Passage Plan includes provisions for spilling water over spillways as necessary while new or improved passage systems are being investigated and developed at John Day, The Dalles, Bonneville, Lower Granite, Little Goose, Lower Monumental and Ice Harbor dams.

i. The Juvenile Fish Passage Plan is to include estimates of the quantities of water necessary for spill to achieve at least 90 percent survival at each project. FELCC for the 1984-85 operating year has been agreed to for the 1984-85 Coordinated System Operating Plan. An 80 average MW reduction in FELCC for the fish spill has been included in the Operating Plan.

j. The Plan is being developed consistent with provisions of the Regional Power Act requiring an economical, efficient, reliable and adequate power supply. Spill will be limited to levels necessary to achieve juvenile passage objectives.

k. During periods of juvenile passage, the Corps of Engineers and fishery agencies or tribes will provide personnel and resources to index and monitor the concentration of smolts and evaluate the success of measures employed to move juvenile fish past Columbia River and Snake River projects. The Plan defines responsibilities for indexing, monitoring and evaluation and provides a communication and coordination process for all phases of implementation of the juvenile passage plan.

l. The Plan is to provide for project operations needed for the conduct of approved fishery research.

m. A hatchery release schedule is to be provided and will be updated as part of the Plan so that it can be incorporated into system operation considerations at the earliest possible date. (Appendix 4)

V. Organizations Involved In The Plan

Consistent with Section 4(h)(11) of the Northwest Power Act and Section 1304(c) of the Fish and Wildlife Program, the Corps of Engineers is consulting with the following entities at each stage of plan development and will continue to consult and coordinate during implementation:

a. Fish and wildlife agencies.

b. Tribes.

c. The project operators and BPA.

d. Others as required.

The agencies and tribes indicated in Section 108 of the F&W Program will be consulted in formulating interim and permanent juvenile fish passage plans. Refer to Enclosure 1 of Appendix 1.

VI. Implementation Of The Juvenile Passage Plan

Implementation of the 1985 Juvenile Fish Passage Plan requires the coordinated effort between Bonneville Power Administration, the Corps, Indian Tribes, and the Federal and State Fishery Agencies. The Water Budget Managers will provide coordination for the fishery agencies and tribes and the Corps of Engineers Reservoir Control Center (RCC) will provide the coordination for the project operators as required to determine the operation of the Corps projects.

RCC daily briefings are held at 1330 hour Monday through Friday in the Custom House. Immediately following these briefings the RCC representatives will be available to meet with the Water Budget managers to discuss the latest weather and runoff forecasts, as well as fish, hydrologic and power information to assist in the planning of a coordinated operation for fish passage for the next few days. Fishery requests being considered by the Water Budget Center can then be incorporated into the next days forecast runs for overall system operational planning. Requests for significant changes in spill levels may take up to three days to implement to permit thorough coordination with other project functions. However, every effort will be made to respond as quickly as possible to fish passage operational requests.

Written verification of operational changes being requested by the Water Budget managers for fish passage will be provided to the RCC as soon as practicable after each coordination meeting. Unexpected changes in fish passage or operational considerations may be coordinated through discussions between RCC and WBC outside the daily afternoon meetings.

Monitoring and surveillance of the fish migration will be provided by the fisheries agencies, tribes, and the Corps in accordance with Section VII. f. Project monitoring personnel will be present during periods of voluntary spill

for fish. Information related to the migration of fish and passage operations at each dam will be relayed daily to the Reservoir Control Center on the Columbia Basin Telecommunication System. Indices of juvenile fish migration will be the basis for initiating spills at a particular project. Additional information on the 1985 monitoring and surveillance program are contained in Section VII.

a. Responsibilities of Fishery Management Agencies and Tribes

(1) Request spill levels with supporting data and information upon which the request is based.

(2) Provide monitoring and surveillance throughout the migration period.

(3) Provide status reports on the timing of the downstream migration, including pertinent marked fish release and recovery data, with weekly written reports estimating percentages of run past key projects.

(4) Where biologically feasible, coordinate hatchery releases to insure they are protected by regulated fishery flows and spills. Release schedules will be provided and updated in a timely manner.

(5) Provide appraisal to the operating agencies of the amount of flexibility in fisheries operations which may affect energy production while maintaining acceptable conditions for migrants.

(6) Provide information on all proposed and scheduled studies or special operations designed to improve fish passage operations which may affect energy production or project operation. Coordinate unforeseen changes with the Corps.

(7) Assure that all viable methods and procedures to reduce mortality to migrants are utilized. In addition to spilling this would include such operations as collection and transportation of migrants, use of ice and trash sluiceways and others.

(8) Coordinate input to water management decisions through the Water Budget Managers. Where possible provide 72 hour notice to the RCC on special spill requests.

b. Responsibilities of the Corps of Engineers

(1) Provide timely formulation of volume runoff forecasts in January, February, March, April, May, and June to enable the fisheries management agencies and tribes and those in energy production and marketing as much lead time as possible to prepare for operations relative to the impending migration.

(2) Provide the Water Budget Center with planned reservoir operations to achieve fishery spill requirements during the period of juvenile migration.

(3) In cooperation with the fishery agencies and tribes, provide monitoring, surveillance, and reporting at Corps projects throughout the migration period.

(4) Coordinate project operations with regard to releases and/or transport of hatchery stocks with the Water Budget Center.

(5) Coordinate project operations with the power and fishery entities to assure that operating flexibility is made available for both fish passage and energy production.

(6) Provide timely information on all proposed and/or scheduled studies or special operations which may negatively impact or otherwise constrain fish passage or energy production. Coordinate unforeseen changes in fish passage operation through the Water Budget Center.

(7) Within five working days following availability of the official monthly runoff forecast, the Corps will advise the Water Budget Center of its views on spills, and collection and transportation criteria.

(8) In the event that specific spill requests by the Water Budget Center are not implemented or are modified, the Corps RCC will provide a written explanation of the reasons.

(9) Remove debris from forebay areas at all projects prior to and during juvenile migration to reduce potential buildup on trash racks and resultant smolt mortality.

(10) Inspect turbine intake trash racks and orifices and remove debris at all projects just prior to and during migration, to assure that they are free of debris.

(11) Check, service, and repair mechanical equipment needed for collection and transportation program prior to and during juvenile migration to assure equipment is in good working order.

(12) Inspect traveling screens on regular basis as specified in the Corps Project Operation and Maintanence Plans (Appendix 2).

c. Responsibilities of the Bonneville Power Administration

(1) Report to the RCC and WBC on updated load-resource studies during the April through September period to supplement the Corps volume inflow forecast for fish passage planning assistance.

(2) Provide the RCC and WBC their estimate of water available for involuntary spill.

(3) Provide the RCC and WBC their estimate of power market impacts of voluntary spill operation.

(4) Utilize available load-resource flexibility to shape flow requirements, spill priorities, and plant generation to minimize fish passage losses.

(5) Adjust system generation to provide adequate water to meet fishery operations requirements as soon as possible, but no later than 72 hours after the request.

(6) Schedule operations to assist in providing spills in support of the juvenile fish passage plan.

d. Responsibilities of Mid-Columbia Public Utility Districts

(1) Frequently update status reports on the timing and numbers of the downstream migrants and provide this information daily to the Reservoir Control Center via the CBT System.

(2) Operate projects in accordance with provisions of the juvenile fish passage plan for spill transfer.

e. Resolution of Differences

Should any major differences arise during the process of implementing the 1985 fishery operation program that cannot be resolved between the Reservoir Control Center and the Water Budget Managers, these will be referred to the Executive Committee (Appendix 1).

VII. 1985 JUVENILE FISH PASSAGE PLAN

The Working Committee has met frequently beginning in November 1984, and continuing into March 1985 but has been unable to develop a Juvenile Fish Passage Plan that is mutually acceptable to all parties. Much progress has been made, however, since the "Status Report on the Development of a Interim Fish Passage Plan for 1985 for Corps of Engineer Projects" was completed in early February towards narrowing the difference between the Corps' Plan and the Plan proposed by the fishery agencies and tribes. The Corps has carefully considered the fishery agencies and tribes Plan of February 22, 1985 (additional detailed information provided on March 1, 1985), and has concluded that the power revenue impacts associated with implementation of their Plan are excessive when compared to the incremental benefits to juvenile fish survival that are estimated over those provided by the Corps' Plan. The Corps Juvenile Fish Passage Plan is presented in this section, with additional detail provided in Appendix V. Since consensus was not reached on this Plan, comments of the fish and wildlife agencies and tribes and other affected parties on the Corps' Plan are contained in Appendix VI.

a. General. The Power Planning Council amended Fish and Wildlife Program provides guidance for the preparation of the interim Juvenile Fish Passage Plan. This guidance includes:

(1) The adoption of an interim smolt survival standard of at least 90% at all Corps projects except Bonneville Dam. At Bonneville Dam an 85% bypass efficiency standard was adopted as the goal.

(2) The fish and wildlife agencies and tribes will prescribe the method for determining smolt survival where appropriate. Assumptions and criteria are to be supported by best available knowledge and documented in the 1985 Juvenile Fish Passage Plan.

Additional clarification of the Council's intent was provided on February 8 1985 which included:

(1) The interim survival objective does not include reservoir mortality.

(2) The interim survival objective does not include crediting for transported fish.

The Corps Plan adheres to the above guidance. Details on the Plan, estimated accomplishments of the Plan, and comparison of this Plan with other Plans including the most recent fishery agencies and tribes Plan are described in the following paragraphs. Elements of the Plan that contain large amounts of detail have been placed in Appendices.

Smolt survival at the eight Corps projects ranges from 91.9 to 96.1 percent depending upon the project (See Table 1, page 20). In addition, the operation of the Bonneville Second powerhouse is to be in accordance with fish passage considerations, both juvenile and adult. This Bonneville operation conforms to the Council's requirements and is mutually acceptable to both the fishery agencies and tribes and the Corps of Engineers, and is described in detail in VII.c.(1).

b. Corps Project Operation and Maintenance. Appendix II contains detailed information on the criteria for the operation and maintenance of fish passage facilities and project operation procedures for fish passage at the Corps' eight Snake and Lower Columbia River projects. This criteria has been fully coordinated with the fish and wildlife agencies and tribes.

c. Fish Transportation Oversight Team's (FTOT) Overall Work Plan For 1985. Appendix III contains this document which describes the fish collection and transportation operations at Lower Granite, Little Goose, and McNary Dams for the 1985 season. The FTOT Plan has been fully coordinated with the fish and wildlife agencies and tribes.

d. Fish Hatchery Release Schedule. Appendix IV is the fish hatchery release schedule provided by the fishery agencies and tribes. Coordination of hatchery releases so that they coincide in-so-far as possible with Water Budget operation and the migration of the natural juvenile fish is an important aspect of the Juvenile Fish Passage Plan.

e. Project Operation Criteria. The following paragraphs list, by project, the project specific operating criteria of the Corps Juvenile Fish Passage Plan. The spill levels contained in this Plan have not been approved by the fishery agencies and tribes, and are based on the volume of runoff forecasts of March 1.

(1) Bonneville Dam

The first and second powerhouses at Bonneville both have structural powerhouse bypass systems. Presently there is poor juvenile guiding efficiency at the second powerhouse. For that reason, the units will not be operated at the second powerhouse during the spring and summer migration period unless units are needed to meet firm energy demands or to reduce spill to 75,000 cfs during daylight hours (7:00 AM to 8:00 PM). That means that typically at flows above the capacity of the first powerhouse units, spill will occur. Units in the second powerhouse may be operated as necessary for fishery research.

(a) Operation for Juvenile Passage.

- Operate juvenile fish passage facilities in accordance with operating criteria contained in Appendix 2.

- No restriction on operation of screened units at the first powerhouse.

- The second powerhouse will not be operated during the nighttime hours (8:00 PM to 7:00 AM) except as necessary for fishery research.

- The second powerhouse will be operated during the daytime hours (7:00 AM to 8:00 PM) if required to reduce spill to less than 75,000 cfs. Units 11, 18 and then 17 will be the first units on and last units off.

(b) Operation for Adult Passage.

- Operate adult fish passage facilities in accordance with operating criteria as specified in Appendix 2.

- When spill occurs during the daytime hours, spill shall be shaped in accordance with the established criteria shown in adult operating criteria Appendix 2.

(2) The Dalles Dam

Approximately 3,600 to 4,000 cfs flow will be routed through the ice and trash sluiceway for at least 16 hours per day, from sunrise to sunset, during the juvenile passage season. In addition 24% of project discharge (spill 10% of average daily flow) when monitoring by on-site personnel indicates spill would be effective in passing fish and when Federal non-firm energy exists. Spill to begin at 10:00 A.M. and continue until 8:00 P.M. In addition surplus spill will also be provided based upon availability and the fishery agencies and tribal spill requests. The project will operate fish passage facilities, including spill, in accordance with juvenile and adult operating criteria, Appendix 2.

(3) John Day Dam

Construction of a juvenile bypass system was initiated in 1984. It is expected that the first 9 units will have bypass facilities including screens by April 1, 1985 and the remaining 7 units screened by 1986. One of the screened units may be required for limited testing of fish guiding efficiency in 1985. Unit 9 will be down through May for rewind then unit 8 will be down for rewind.

(a) Operation for Juvenile Passage

- Operate juvenile fish passage facilities in accordance with operating criteria Appendix 2. Operate screened units 1 through 9 prior to operating 10 through 16.

- When sonar monitoring indicates 30,000 juveniles per day are arriving at the dam, spill 50% of the river flow exceeding the capacity of the screened units beginning at 8:00 P.M. and continuing until 6:00 A.M. as long as monitoring by on-site personnel indicates spill is effective in passing of juveniles.

- When juvenile counts drop to less than 30,000 juveniles per day during the spring migration or 50,000 juveniles per day during the summer migration for three consecutive days or 90% of the spring and summer migration has passed the project the spill program will end, but will again be implemeted if juvenile counts increase.

- The planned spill level described above will be available when Federal non-firm energy exists.

- When spilling at night, spill in south end bays up to 80,000 cfs, then next 20,000 cfs in north end bays. Spill in excess of 100,000 cfs should be split 80% in the south bays and 20% in the north bays.

- Spill levels and duration will take into account dissolved gas levels as determined by monitoring.

(b) Operation for Adult Passage

- Operate adult passage facilities in accordance with operating criteria Appendix 2.

- Whenever possible, operate unit 1 in the 80 to 100 MW range to provide best ladder entrance condition for adult fish passage.

- Daytime Spill will be distributed across the spillway in accordance with adult passage criteria Appendix 2.

(4) McNary Dam

All units at McNary are screened and the project has facilities to separate juveniles by size, bypass directly to tailrace or to holding ponds for transport by barge or truck to below Bonneville Dam.

(a) Operation for Juvenile Passage

- Operate juvenile fish passage facilities in accordance with operating criteria Appendix 2, and FTOT Plan Appendix 3.

- Powerhouse bypass system and surplus spill (no planned spill) are to be used during the spring season to pass yearling migrants.

(b) Operation for Adult Passage

- Operate adult fish passage facilities in accordance with operating criteria, Appendix 2.

- Operate units 1 and 2 during daylight hours for adult attraction.

- When spilling during daylight hours spread spill in accordance with operating criteria Appendix 2.

(5) Ice Harbor Dam

Approximately 2,700 cfs will be routed through the ice and trash sluiceway for 24 hours per day during the juvenile passage season. In addition, spill 30% of project discharge (12.5% of the average daily flow) beginning at 8:00 P.M. and continuing until 6:00 A.M.. Spill season and night duration will be the same as Lower Monumental. The planned spill level of 30% described above will be available when Federal non-firm energy exists. The project will operate fish passage facilities, including spill, in accordance with juvenile and adult operating criteria Appendix 2.

(6) Lower Monumental Dam

Lower Monumental has only a gatewell salvage bypass system.

(a) Operation for Juvenile Passage

- Operate juvenile fish passage facility in accordance with operating criteria Appendix 2.

- When Little Goose collection counts reach 10,000 yearling juveniles per day during the spring run or 1,000 subyearlings per day during the summer run or sonar monitoring indicates significant concentrations of juveniles in the LMN forebay, spill 50% of project discharge (25% of the average daily flow) beginning the hour before sunset and continue through the night as long as on-site monitoring indicates spill is effectively passing juveniles.

- Spill will be terminated when Little Goose collection counts fall below the prescribed index numbers of juveniles per day for three consecutive days or 90% of the spring and summer runs have passed the project or sonar monitoring does not show juvenile fish in the LMN forebay. If juvenile counts indicate that spill should be reinstated, it will be.

- The planned spill level described above will be available when Federal non-firm energy exists.

- When spilling at night spill will be concentrated to the extent practicable in spill bays 7 and 8.

- Spill levels and duration will take into account dissolved gas levels as determined by monitoring.

- Daytime spill will take into account adult passage criteria.

(b) Operation for Adult Passage

- Operate adult passage facilities in accordance with operating criteria Appendix 2.

- Whenever possible operate unit 1 during daylight hours to provide adult attraction.

- Daytime spill will be distributed across the spillway in accordance with adult passage criteria Appendix 2.

(7) Little Goose Dam

All units at Little Goose are screened and the project has the facilities to separate juveniles by size, bypass directly to tailrace or to holding ponds for transport by barge or truck to below Bonneville Dam.

(a) Operation for Juvenile Passage

- Operate juvenile fish passage facilities in accordance with operating criteria, Appendix 2, and FTOT Plan Appendix 3.

- Powerhouse bypass system will provide at least 90% survival of juvenile migrants. Surplus spill may also be used to augment juvenile passage.

(b) Operation for Adult Passage

- Operate adult passage facilities in accordance with operating criteria Appendix 2.

- Operate unit 1 during daylight hours for adult attraction.

- When spilling during daylight hours spread spill in accordance with operating criteria Appendix 2.

(8) Lower Granite Dam

All units at Lower Granite are screened and the project has the facilities to bypass directly to tailrace or to holding ponds for transport by barge or truck to below Bonneville Dam.

(a) Operation for Juvenile Passage

- Operate juvenile fish passage facilities in accordance with operating criteria Appendix 2 and FTOT Plan, Appendix 3.

- Powerhouse bypass system will provide at least 90% project survival, of yearling migrants. Surplus spill may also be used to augment yearling passage.

(b) Operation for Adult Passage

- Operate adult passage facilities in accordance with operating criteria Appendix 2.

- Operate unit 1 during daylight hours for adult attraction.

- When spilling during daylight hours spread spill in accordance with operating criteria Appendix 2.

f. Monitoring Program A key element in the 1985 Interim Juvenile Fish Passage Plan is onsite monitoring of the juvenile fish outmigration. This means that at each dam where there is a need to provide special spills to pass smolts, there will be some method of monitoring or accounting for the status of the smolt migration. This monitoring will entail use of different techniques such as hydroacoustic sampling, gatewell dipping, powerhouse indexing, or upstream project extrapolation. In all cases it is intended to provide the information necessary to establish spill protocol and to most effectively employ the available spill.

Although highly desirable, a fully comprehensive monitoring program at all Corps projects will not be possible in 1985 for the following reasons:

- The limited time available to set up and contract out monitoring studies.

- There is a limited monitoring capability presently available.

Therefore, the 1985 monitoring effort will focus on determining diel, seasonal and spatial passage distributions at the dams rather than specifically addressing the more basic questions of spill effectiveness or fish population size. This latter information is important in effectively controlling spill for fish passage but requires extensive onsite calibration of the hydroacoustic equipment. In 1985 only the John Day hydroacoustic samples have been calibrated. At the other dams it will be necessary to use other techniques to determine the absolute number of smolts passing the dam.

(1) Project-Specific Monitoring. Because of the limitations on onsite monitoring in 1985, our efforts will be at key projects where substantial amounts of water is expected to be spilled for juvenile fish passage. These key projects are as follows:

•The Dalles Dam
•John Day Dam
•Lower Monumental Dam

Secondary monitoring sites include those dams which already have some level of indexing or monitoring in conjunction with the WBC smolt indexing/monitoring program or the juvenile fish transportation program. These secondary sites include:

•McNary Dam
•Little Goose Dam
•Lower Granite Dam

There will be only limited monitoring at Bonneville and Ice Harbor Dams.

(2) Planned Operation - Key Projects.

(a) The Dalles

•Set up an array of hydroacoustic transducers on the powerhouse turbine intakes, sluiceway, and the spillway.

•Operate the array daily to determine the spatial and seasonal distribution of smolts passing the dam.

•Operate the array daily to assess spill and sluiceway effectiveness.

•Operate the array periodically for 24 hours in order to obtain information on the diel passage characteristics of the smolt population.

•Maintain this monitoring capability onsite during the approximate period 22 April to 1 June and 1 July to 15 August.

Because the hydroacoustic samples will not be related to fish population size in 1985, the John Day Dam counts will be used as the primary index of the number of juvenile fish approaching The Dalles Dam.

(b) John Day

•Set up an array of hydroacoustic transducers on both the powerhouse and on the spillway.

•Operate the array during the agreed-upon daily period for spill to determine the population of fish approaching the dam.

•Operate the airlift system periodically for 24 hours in order to obtain additional information on the diel passage characteristics of the smolt population.

•Maintain this monitoring capability during the approximate period 15 April to 15 September 1985.

(c) Lower Monumental Dam

•Set up an array of hydroacoustic transducers on the powerhouse turbine intakes, sluiceway, and the spillway.

•Operate the array daily to determine the spatial and seasonal distribution of smolts passing the dam.

•Operate the array during the daily spill period to assess spill effectiveness.

•Operate the array periodically for 24 hours in order to obtain information on the diel passage characteristics of the smolt population.

•In so far as possible carry out daily gatewell dipping operations during the period 22 April to 15 July to establish smolt population estimates.

•Maintain this monitoring capability onsite during the period 15 April to 15 July 1985. Because the hydroacoustic samples will not be related to fish population size in 1985, the Little Goose and the Lower Granite Dam collection system counts will be used as an index of the number of juvenile fish approaching Lower Monumental Dam.

(3) Planned Operation - Secondary Projects

(a) McNary Dam There will be no voluntary spill at McNary Dam and therefore no monitoring for the spillway. Because McNary Dam is a juvenile fish collection and transportation project it has a powerhouse indexing facility which will provide extensive information on the status of the juvenile fish run from the period 1 April to 30 October 1985.

(b) Little Goose Dam There will be no voluntary spill and therefore no monitoring for the spillway, because Little Goose Dam is a juvenile fish collection and transportation project it has a powerhouse indexing facility which will provide extensive information on the status of the juvenile fish run from the period of 1 April to approximately 1 September 1985.

(c) Lower Granite Dam There will be no voluntary spill and therefore no specific spill operations monitoring. At present, Biosonics, Inc. is conducting an extensive hydroacoustic research study of Lower Granite Dam to assess impacts of the forebay trashboom on the STS FGE. In this study both the powerhouse and spillway will be ensonified. The information resulting from the study will be available by Fall. 1985. Lower Granite Dam also has a juvenile fish collection and transportation facility which will provide extensive information on the status of the juvenile fish run from the period 1 April to approximately 1 September 1985.

(4) Planned Operation - Limited Monitoring Projects

(a) Ice Harbor Dam If voluntary spill occurs during the months of April, May, and July, then some type of monitoring will have to be set up at this site. In all likelihood this would consist of the existing Wesmar sidescan sonar devices presently available in Walla Walla District. Because of equipment and personnel limitations, monitoring would be a minimal program designed to simply identify concentrations of fish in the immediate project forebay. The Little Goose and Lower Monumental Dams fish passage estimates would also be used as a basis for spill actions.

(b) Bonneville Dam There will be large quantities of spill at Bonneville Dam in 1985 because of the Corps agreement to limit operation of the Second Powerhouse. There is presently no spillway monitoring capability at Bonneville Dam. There are, however, limited indexing facilities at each powerhouse. These facilities will be operated at each powerhouse to get a feel for status of the smolt outmigration and to look for marks.

g. Dissolved Gas Monitoring Program

(1) The main goal of the total dissolved gas (TDG) monitoring program in the Columbia-Snake Rivers is to collect data for use in scheduling spills during the juvenile fish passage season. This program is conducted annually during April through August under the coordination of the North Pacific Division (NPD) Water Quality Section (WQ) in collaboration with project personnel and other participating agencies.

(2) The 1985 TDG Monitoring program is scheduled to start in early April and continue into August. The monitoring network was expanded in 1984 to cover seven Corps projects, four PUD dams, one Bureau of Reclamation dam and one fish release site monitored by the Water Budget Center (WBC). This represents nine more stations than in 1983. Operational procedures for 1985 will generally follow those developed for earlier years, revised as needed to meet specific local current conditions.

(3) Comprehensive equipment upgrading by contract to a private company Common Sensing began in early 1984 to incorporate the latest TDG instrumentation technology on all NPD/WBC instruments in use. Following the upgrading completed in May 1984 all instruments now have 2 or 4 recording channels and improved direct digital read-out capacity.

(4) Data collected include TDG and barometric pressures, water temperature and other project operational data. They are used by the NPD Reservoir Control Center (RCC) and WBC to (1) guide in-season spill decisions and (2) develop optimum spill allocation procedures to minimize spill impacts on other project functions. Project personnel will record digital readings approximately every four hours starting at 0100 hours for the following elements:

-Water Temperature (WC) in degrees C.
-Barometric Pressure (BH) in mm of HG.
-Dissolved Oxygen Pressure (OP) in mm of HG.
-Total Dissolved Gas Pressure (NT) in mm of HG.
-Nitrogen + Argon Pressure (NP) in mm of HG.

All of these data will be transmitted via CBT or satellite to RCC for immediate CROHMS data daily use as well as for permanent data storage in easily accessible files.

(5) The following tabulation lists the stations and location of instruments proposed for the 1985 monitoring program.

Monitoring Station ID	Location	Owner	Tensionometer Model	
CIBW	Columbia River at Boundary(1)	(USBR)	TGO-FT	(4-Ch)
GCLW	6 miles downstream of Grand Coulee Dam (1)	(USBR)	TGO-FT	(4-Ch)
CHJ	Forebay(1)	(NPD)	FTR=TGO	(4-Ch)
WEL	Forebay	(Douglas Co.PUD)	FTR	(2-Ch)
RRH	Forebay	(Chelan Co. PUD)	FT	(2-Ch)
RIS	Forebay	(Chelan Co. PUD)	FT	(2-ch)
PRD	Forebay	(Grant Co. PUD)	TGO-FTR	(4-Ch)
LWG (3)	Forebay (1)	(NPD)	FTR-TGO	(4-Ch)
LGS (3)	Forebay	(NPW)	TGO-FTR	(4-CH)

IHR	Forebay	(NPW)	TGO-FTR	(4-Ch)
MCQW	Forebay-Wash Side Fishladder		TGT-FR	(2-Ch)
MCQO	Forebay - OR side PH No. 1	(NPD)	TGT-F	(2-Ch)
JDA	Forebay (1)	(NPD)	TGT-FTR	(4-Ch)
TDA	Forebay	(NPD)	TGO-FRT	(2-Ch)
WRNO	Warrendale, OR (Covert's Landing 6 miles D/S of Bon	(BPA)(2)	TGO-FTR	(4-Ch)

NOTES:

(1) Equipped with automatic data transmission facilities via satellite.

(2) Negotiations are underway between BPA and the Corps for putting these instruments under direct Corps operations.

(3) Auxiliary portable instruments for special monitoring needs are/or will be available at these sites.

h. Project Survival Accomplishments of Corps Plan

Dam survival estimates for 1985 of the Corps Plan are as follows:

Project	Dam Survival
Bonneville	96.1
The Dalles	93.9
John Day	92.8
McNary	95.4
Ice Harbor	92.8
Lower Monumental	91.9
Little Goose	93.9
Lower Granite	94.1

Additional details on the Corps evaluation of the 1985 Juvenile Fish Passage Plan are contained in Appendix V.

i. Comparison of Corps Spill Plan with other Plans. Table 1 compares the Corps Plan with the Fishery Agencies and Tribes (FAT) Plan II; with a plan that would meet the requirements of the Power Planning Councils amended Fish and Wildlife Program; and a plan that would utilize only inadvertent spill. The comparisons were made by utilizing the Corps FISHPASS computer program described in Appendix VII. Some modifications to the computer program have been made since the documentation was made in January 1985.

TABLE 1 1985 JUVENILE FISH PASSAGE PLANS

	LGR	LGS	LMN	IHR	MCN	JDA	TDA	BON	System Survial w/o reservoir mortality or transportation	Revenue Foregone in Millions of Dollars
Fishery Agencies & Tribes (FAT) Plan II										
Dam Survival in %	95.80	95.80	92.75	94.25	97.30	95.42	96.05	97.03	69.42	
Spill in % of project total flow	31.49	31.49	31.49	41.77	8.83	31.49	41.09	53.27		
Corps Analysis of FAT Plan II										
Dam Survival in %	96.20	96.30	93.30	95.40	95.00	95.30	95.90	95.00	68.00	44.70
Spill Requirements in % of Average Daily Q	31.50	31.50	31.50	41.70	08.90	31.50	41.30	53.30		
Spill in % of Total Project Flow (Apr.-Aug.)	17.50	17.50	23.10	35.50	18.90	21.90	28.00	51.40		
Bypass Efficiency in %	88.30	89.10	69.40	83.20	80.50	82.40	86.60	80.70		
Power Planning Council Requirements										
Dam Survival in %	94.10	93.90	90.10	91.90	95.40	91.50	90.90	95.70	55.62	14.80
Spill Requirements in % of Avg. Daily Flow	INADV	INADV	16.70	INADV	INADV	INADV	INADV	60.00		
Spill in % of Total Project Flow (Apr.-Aug.)	8.00	8.00	16.80	16.80	17.30	2.20	2.00	60.00		
Bypass Efficiency in %	74.30	73.40	48.60	60.20	83.00	57.70	53.90	84.80		
Corps Plan V										
Dam Survival in %	94.10	93.90	91.90	92.80	95.40	92.80	93.90	96.10	60.20	15.80
Spill Requirements in % of Avg. Daily Flow	INADV	INADV	25.00	12.50	INADV	10.40	10.00	INADV		
Spill in % of Total Project Flow (Apr.-Aug.)	8.00	8.00	23.70	22.40	17.80	10.80	10.30	32.30		
Bypass Efficiency in %	69.70	68.70	52.80	60.10	80.40	59.60	68.60	85.60		
Inadvertant Spill Plan										
Dam Survival in %	94.00	93.70	86.20	91.20	95.20	91.50	90.70	93.60	51.2	00.00
Spill Requirements in % of Average Daily Q	00.00	00.00	00.00	00.00	00.00	00.00	00.00	00.00		
Spill in % of Total Project Flow (Apr.-Aug.)	8.00	8.00	7.40	16.80	17.90	2.20	2.20	32.30		
Bypass Efficiency in %	69.00	66.60	9.30	47.50	78.00	49.60	44.10	66.20		

PROCEDURE FOR

DEVELOPMENT OF A COORDINATED

INTERIM JUVENILE FISH PASSAGE PLAN

FOR CORPS OF ENGINEERS

PROJECTS

Dec 7 '84

APPENDIX 1

1. Introduction

The purpose of this document is to describe the organizational structure, responsibilities, and guidelines of the Corps of Engineers, fishery agencies and tribes, and other affected entities to facilitate the preparation and implementation of interim juvenile fish passage plans. The impetus behind the development of this procedural paper is the recognition by the fisheries agencies, tribal representatives and the Corps of Engineers that a fully cooperative approach to planning and implementation will benefit both the fish and water resources. The process also recognizes the responsibilities and authorities of each participating organization and related tribal treaties, trust responsibilities, the Fish and Wildlife Coordination Act and the Northwest Electric Power Planning and Conservation Act of 1980.

II. Background

A heightened awareness of the problems facing juvenile fish during their migration past Columbia and Snake River Dams was brought about during the spring freshet of 1973. As the runoff was one of the lowest experienced in many years, migrating juvenile fish suffered heavy mortalities as a result of the extended transit time through the system and because most of the fish passed through the powerhouse turbine units. In 1977, during a drought more severe than the one which occurred in 1973, definitive steps were taken to assist juvenile fish passage. A Committee on Fishery Operations (COFO) was established to coordinate the effort to provide protection of juvenile fish within a balance of reduced firm power and adverse impacts of other uses of the water resource. COFO continued to coordinate the annual juvenile fish passage program through 1983. In November 1982, the Northwest Power Planning Council (NWPPC), under guidelines of the Pacific Northwest Electric Power Planning and Conservation Act of 1980 (Regional Act, P.L. 96-501), developed the first regional Fish and Wildlife Program for the Columbia River and its tributaries. The Fish and Wildlife Program, amended in October 1984, proposes development of an interim regional plan to coordinate, refine, and develop operations and facilities which reflects the intent of Section 4(h) of the Regional Act. As the Corps of Engineers response to the amended F&W Program, this paper sets forth a procedure by which a coordinated juvenile fish passage plan is developed and may be implemented.

III. Implementation

On October 10, 1984, the Northwest Power Planning Council adopted amendments to the Columbia Basin Fish and Wildlife Program of November 1982. Included in the amended program is a new section, Section 1500: Five-Year Action Plan, which includes Action Items (1504). Of these action items, Number 32.2, Corps Actions, is an item designating the Corps of Engineers as the Federal agency to develop and implement a coordinated systemwide annual juvenile fish passage plan for Corps of Engineers projects. The Fish and Wildlife Program calls for a submittal to the Council by February 15 of each year and implementation by April 1 of each year. In addition, Section 404(b) designates the Corps as the Federal agency to implement various proposals for

improvement of passage efficiencies and smolt survival at its projects on the Columbia and Snake Rivers. These proposals include development of coordinated interim juvenile passage plans, in consultation with the fish and wildlife agencies and the tribes, including spilling of water at Corps of Engineers projects, while developing a permanent solution to passage problems at John Day, The Dalles, Bonneville, Lower Monumental and Ice Harbor Dams.

The Corps of Engineers, in consideration of the Fish and Wildlife Program, in the exercise of its management and operation responsibilities for Corps of Engineers hydroelectric projects and the need to provide equitable treatment (Section 4(h)(11)(A) of the Regional Act), proposes to undertake development of these passage plans and develop procedures for their formulation in consultation with the fish and wildlife agencies and tribes and the additional parties listed on Enclosure 1 under Section 4(h)(11) of the Regional Act. The plans will be developed in a collaborative manner by the Corps, the fish and wildlife agencies and tribes and other parties listed on Enclosure 1 and will be approved by a consensus of the Executive Committee. In the event that consensus is not reached by the Executive Committee, the North Pacific Division Engineer will approve a plan and submit said plan to the Power Council including any differing views of the fish and wildlife agencies, tribes and other affected parties.

IV. Scope

The interim systemwide juvenile passage plan will be prepared in coordination with all parties responsible for Columbia River Basin hydropower operations and fish management. It will draw upon past experience and guidelines, the 1985 Detailed Fishery Operating Plan (DFOP) prepared by the fishery agencies and tribes, the 1984 Corps of Engineers Spill Plan, the Transport Guidelines and other documents. Further, it will be based upon principles and guidelines summarized in Section VII below. The juvenile passage plan will be updated annually.

V. Consultation and Coordination

Consistent with Section 4(h)(11) of the Northwest Power Act and Section 1304(c) of the Fish and Wildlife Program, the Corps of Engineers intends to consult with the following entities at each stage of program development and implementation:

a. Fish and wildlife agencies.
b. Tribes.
c. The project operators and BPA.
d. Others as required.

The agencies and tribes indicated in Section 108 of the F&W Program will be consulted in formulating interim and permanent juvenile fish passage plans. Refer to Enclosure 1. As indicated in its comments in Section 1504, the Northwest Power Planning Council places high priority on interim juvenile passage plan and urges that the Corps begin consultation as soon as possible.

VI. Management Plan

Active consultation and coordination with all affected parties will be maintained by the Corps of Engineers throughout the development and implementation of the juvenile passage plan. However, to develop and implement the plan in the limited time available will require joint management participation by the Corps of Engineers, fish and wildlife agencies and tribal representatives. A structure will be established to bring together those organizations with significant responsibilities and expertise for juvenile passage planning and implementation. This structure is described in Enclosure 3 and includes:

-- An Executive Committee

--A Working Committee

1. Executive Committee. The Executive Committee will be responsible for assisting the NPD Division Engineer in developing and implementing an interim, systemwide juvenile fish passage program. The Committee will consist of four members, chaired by the NPD Deputy Division Engineer with a member each from the Columbia River Inter-Tribal Fish Commission (CRITFC), the Columbia Basin Fish and Wildlife Council (CBFWC) and the Bonneville Power Administration (BPA).

Responsibilities of the Executive Committee

a. Provide general guidance and policy, and amend policies or guidelines as determined from actual conditions or experience.

b. Review the interim juvenile fish passage plan developed by the Working Committee and recommend any changes and/or approval to the NPD Division Engineer.

c. Designate key policy personnel to implement specific policies, discuss and resolve specific problems and review specific documents on behalf of the Executive Committee.

2. Working Committee. The Working Committee will consist of persons with practical, technical expertise and experience in Columbia River system operation, juvenile fish management and other expertise deemed necessary by the Executive Committee to effectively develop an interim systemwide juvenile passage plan.

Responsibilities of the Working Committee

a. Complete assignments under the direction of the Executive Committee.

b. Develop, evaluate and exchange information and studies for inclusion in the interim juvenile passage plan.

c. Test strategies and prepare a preliminary draft juvenile passage plan for presentation to the Executive Committee by 15 February 1985 and a final draft plan by 15 March 1985.

d. Take advice, consultation and guidance from the Executive Committee on interpretation of policy, guidelines and procedures as necessary to carry out responsibilities.

e. Disputes are referred to the Executive Committee for resolution.

VII. Principles and Guidelines

The following policies and guidelines will govern development and implementation of an interim systemwide juvenile passage plan for 1985:

1. The Corps of Engineers will develop and submit a fish passage plan to the Power Planning Council. This plan is to be developed in consultation and coordination with the fishery agencies and tribes. The parties agree that because the agencies and tribes have the necessary biological expertise, they will be responsible for the development of the fish protection portion of the plan thru the deliberation of the Working Committee. The plan will be developed recognizing that the Corps of Engineers must consider other uses and authorized purposes of its projects as well as fish passage and power production and act in accordance with Section 4(h)(11) of the Northwest Power Planning Act.

2. The interim juvenile passage plan will be developed in accordance with the equitable treatment provision of Section 4(h)(11)(a) of the Northwest Power Planning Act. The plan will be based on and supported by the best scientific knowledge.

3. The plan will focus on juvenile fish passage but will include consideration of adult fish passage. Spill patterns for adult fish, nitrogen supersaturation control and project fish facility cirteria will be considered in the passage plan.

4. The 1985 plan is to be developed cooperatively by project operators, fish and wildlife agencies and tribal representatives. The fishery agency/tribes' 1985 Detailed Fisheries Operating Plan (DFOP) will be provided as recommendations for plan development to the Working Committee. The 1984 Corps of Engineers Spill Plan, Fish Transport Guidelines and past bypass activities of the Committee on Fisheries Operations (COFO) will be given full consideration in developing the 1985 juvenile passage plan.

5. The Power Planning Council has adopted an interim smolt survival standard of at least 90 percent at all Corps projects except Bonneville Dam. At Bonneville Dam, an 85 percent bypass efficiency standard was adopted. Development of the plan will give full consideration to incorporation of these standards recognizing that a 90 percent survival standard is unacceptable to the fish and wildlife agencies and Tribes on either an interim or long term basis because of its adverse impact on upriver anadromous fish runs.

6. In accordance with the Fish and Wildlife Program, the fish and wildlife agencies and tribes will prescribe the method for determining smolt survival where appropriate. Assumptions and criteria will be supported by best available knowledge and will be documented in the 1985 juvenile fish passage plan.

7. Turbines are screened and bypasses are operational at Lower Granite and Little Goose dams on the Snake River and McNary Dam on the Columbia River, and it is anticipated that most fish collected at these dams will be transported

in accordance with established guidelines. The 1984 FTOT Guidelines will be updated for use in 1985. Detailed operating criteria for the 1985 juvenile transportation program will be outlined in the Fish Transportation Oversight Team (FTOT) Annual Work Plan and incorporated into the annual juvenile passage plan. Transported fish will be considered in calculations of project bypass efficiency and survival.

8. The juvenile fish passage plan will include provisions for spilling water over spillways as necessary while new or improved passage systems are being investigated and developed at John Day, The Dalles, Bonneville, Lower Granite, Little Goose, Lower Monumental and Ice Harbor dams.

9. The juvenile fish passage plan will include estimates of the quantities of water necessary for spill to achieve at least 90 percent survival at each project. FELCC for the 1984-85 operating year has been agreed to for the 1984-85 Coordinated System Operating Plan. An 80 average MW reduction in FELCC for the fish spill has been included in the Operating Plan.

10. The plan will be developed consistent with provisions of the Regional Power Act requiring an economical, efficient, reliable and adequate power system. Spill will be limited to levels necessary to achieve juvenile passage objectives.

11. During periods of juvenile passage, the Corps of Engineers and fishery agencies or tribes will provide personnel and resources to index and monitor the concentration of smolts and evaluate the success of measures employed to move juvenile fish past Columbia River and Snake River projects. The plan will define responsibilities for indexing, monitoring and evaluation and will provide a communication and coordination process for all phases of implementation of the juvenile passage plan.

12. The plan will provide for project operations needed for the conduct of approved fishery research.

13. A hatchery release schedule will be provided and updated as part of the plan so that it can be incorporated into system operation considerations at the earliest possible date.

VIII. Process

The process to develop and adopt the 1985 interim juvenile passage plan will take place in discrete steps and will consist of specific actions and results as shown on the attached schedule (Enclosure 2). Each step has a specified timeframe and completion date and one or more organizations are assigned responsibility to carry out each step. Consultation meetings will be held with all participants during the development of the juvenile fish passage plans. A notice of consultation meetings will be mailed to all the entities listed on Enclosure 1.

IX. Operations

Requests for implementation of the plan will originate with the Water Budget Center. Plan implementation conflicts will be resolved by the Executive Committee.

INTERIM JUVENILE FISH PASSAGE PLAN

CONSULTING AND COOPERATING AGENCIES AND UTILITIES

COOPERATING AGENCIES

Bonneville Power Administration, U.S. Department of Energy
Bureau of Reclamation, U.S. Department of the Interior
Bureau of Indian Affairs
Federal Energy Regulatory Commission, U.S. Department of Energy
Pacific Northwest Utilities Conference Committee
Columbia River Inter-Tribal Fish Commission
Columbia River Basin Fish and Wildlife Council
Northwest Power Planning Council

CONSULTING AGENCIES, TRIBES AND AFFECTED UTILITIES

Fish and Wildlife Service, U.S. Department of the Interior
Idaho Department of Fish and Wildlife
Montana Department of Fish, Wildlife and Parks
National Marine Fisheries Service, U.S. Department of Commerce
Oregon Department of Fish and Wildlife
Washington Department of Fisheries
Washington Department of Game
Burns-Paiute Indian Colony
Coeur d'Alene Tribes
Confederated Tribes of the Colville Reservation
Confederated Salish and Kootenai Tribes of the Flathead Reservation
Confederated Tribes of the Umatilla Reservation of Oregon
Confederated Tribes of the Warm Springs Reservation of Oregon
Confederated Tribes and Bands of the Yakima Indian Nation
Kalispell Indian Community
Kootenai Tribe of Idaho
Nez Perce Tribe of Idaho
Shoshone-Bannock Tribes of the Fort Hall Reservation
Spokane Tribe of Indians
PUD #1 of Chelan County
PUD #2 of Grant County
PUD #1 of Douglas County
Idaho Power Company

Enclosure 1

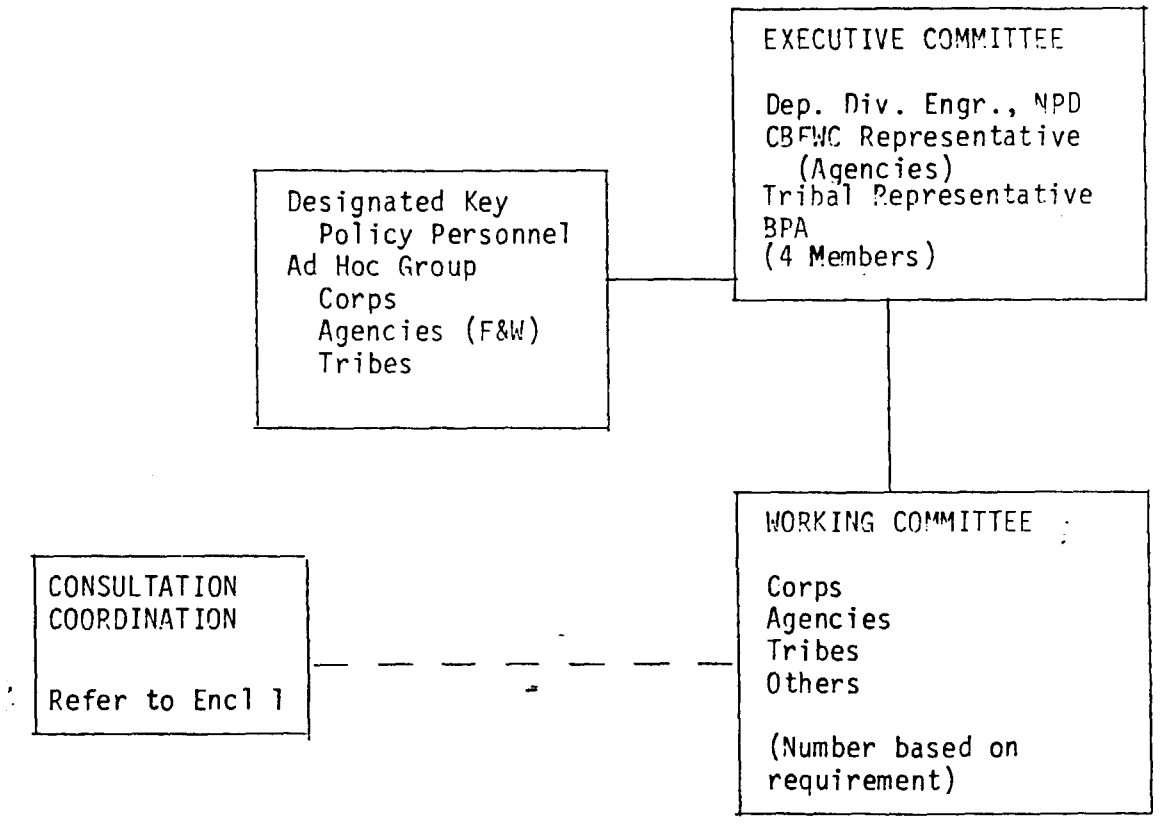
Encl 2

1985 INTERIM JUVENILE FISH PASSAGE PLAN

STEP 1	STEP 2	STEP 3
Corps solicits input for an interim juvenile fish passage plan from fishery agencies and tribes. DUE DATE - 15 Nov 84	Fishery agencies and tribes develop and forward their recommendations for a juvenile fish passage plan based upon Executive Committee principles and guidelines and upon working Committee agreements. DUE DATE - 15 Dec 84	Corps prepares a draft juvenile fish passage plan based upon the input from step 2 and issues draft plan to the operating agencies, fishery agencies, and tribes for comment. Working Committee meetings held as required. DUE DATE - 15 Jan 85

STEP 4	STEP 5	STEP 6
Operating agencies, fishery agencies, and tribes forward formal written comments to the Corps. Corps submit general conceptual plan to Power Council by 15 Feb. DUE DATE - 15 Feb 85	Corps amends draft juvenile fish passage plan. Working Committee identifies remaining major differences. Executive Committee reviews and submits to NPD Engineer for approval. DUE DATE - 15 Mar 85	Corps adopts draft plan after consideration of comments. Comments appended to adopted plan. Juvenile fish passage plan submitted to the Power Council. DUE DATE - 1 Apr 85

ORGANIZATION CHART
FOR
PREPARATION OF THE JUVENILE
PASSAGE PLAN FOR MAIN
STEM COLUMBIA AND SNAKE RIVER PROJECTS



Enclosure 3

CORPS PROJECT FISH FACILITIES

OPERATION AND MAINTENANCE

APPENDIX 2

NPP PROJECTS
FISH FACILITIES MAINTENANCE PLAN
BONNEVILLE, THE DALLES, JOHN DAY, FOSTER AND GREEN PETER DAMS
FEBRUARY 1985

I. Bonneville Dam

A. Adult Fish Passage System

1. Fish Passage Season - March 1 through November 30 each year operate according to criteria in Appendix B.

2. Winter Maintenance Season - December 1 through February each year operate according to criteria in Appendix B.

3. Fishway Auxiliary Water Systems

(a) Scheduled Maintenance (See Appendix A for coordination procedures) - Bonneville Project auxiliary water systems consist of gravity flow and generating systems. Preventive maintenance and normal repair are carried out during the winter maintenance season.

(b) Unscheduled Maintenance (See Appendix A for coordination procedures) - Most fishway auxiliary water systems are operated automatically. If the automatic system fails the system can usually be operated manually by project personnel. This will allow the fish facility to operate according to criteria while repair of the automatic system is carried out. When this operation becomes necessary project personnel will increase the surveillance of the adult system to ensure that criteria are being met.

Bonneville First Powerhouse - If any of the valves or any other part of the system fails, the project is to attempt to maintain criteria by adjusting those valves which continue to function. Conduit pressures must be monitored and not allowed to exceed the established limits. If this maneuver fails to keep the facility operating according to the adult fishway criteria and repairs cannot be made within 24 hours then close powerhouse entrances (9, 21, 34, 58 and 62) one at a time starting with gate 9 and proceed north.

If closing the orifice gates fails to achieve a minimum fishway head of 1.2 feet when tailwater is greater than 17 feet then raise gate 65 weir in one-foot increments up to 6 feet of depth below the tailwater surface. If this fails to meet the fishway head criteria, then raise gate 1 weir in one-foot increments to 6 feet of depth below the tailwater surface.

When tailwater elevation is less than 17 feet and the gate 65 weir crest is at least 6 feet below tailwater, close gate 64 in one-foot increments until the proper head is achieved or the gate is fully closed, then raise gate 65 in one-foot increments up to 6 feet below tailwater. If the gate 65 weir crest is less than 6 feet below tailwater, fully open gate 64 and close gate 65. If this fails to achieve the proper fishway head and the gate 1 weir crest is at

least 6 feet below tailwater, close gate 2 in one-foot increments until fully closed, then raise gate 1 in one-foot increments up to 6 feet below tailwater. If the gate 1 weir crest is less than 6 feet below tailwater, fully open gate 2 and close gate 1. At this point maintain the gates position regardless of whether criteria are met or not, until the auxiliary water system is repaired.

Bonneville Spillway - Two separate fishway auxiliary water valves add water to each spillway ladder (Cascades Island and B-Branch ladders). If one of these valves or any other part of the system malfunctions, the functioning parts of the system are to be adjusted to compensate. If repairs cannot be made in 24 hours, close the sluicegate entrance, if open. This will divert the reduced available water to the entrance slots. If a head of 1.0 foot is still not achieved, stoplogs are to be added to the entrance slots until the desired head or a weir depth of not less than 6 feet below the tailwater surface is reached. At this point maintain the gate positions until the auxiliary water system is repaired.

Bonneville Second Powerhouse - If either of the fishway auxiliary water turbines are unable to provide water sufficient to meet full criteria, raise the North Upstream Entrance (NUE) in one-foot increments until the weir crest is 6 feet below the tailwater or a fishway head of at least 1.2 feet is achieved. If this fails to achieve the above criteria then apply the same procedure, until the criteria is achieved, using in addition the North Downstream Entrance (NDE) then, the South Upstream Entrance (SUE), and finally the South Downstream Entrance (SDE). The weir crests for these three entrances should not be raised above 8 feet below tailwater. If the correct fishway head criteria is still not achieved after this procedure, then fully close NUE and operate in this configuration until repairs can be made to the system.

If both of the fishway auxiliary water turbines fail, the backup fishway auxiliary water system, using gravity flow through the ice and trash sluiceway, will be started up. The adult facility will be operated as follows: (1) Close NDE, SUE and NUE; (2) Operate the SDE weir crest at eight feet below tailwater; (3) Operate the floating orifice gates. However, if the backup fishway auxiliary water system must be used for a period exceeding 30 days, then block off as many of the center floating orifice gates as possible and open NDE with a weir depth of eight feet below the tailwater water surface. While under this configuration power generation at the second powerhouse will be minimized to reduce fish attraction into this area.

If both auxiliary water systems fail or malfunction close SUE, NDE and NUE and raise SDE weir crest to six feet below tailwater elevation with the floating orifice gates open. Maintain this configuration until the system is repaired. While under this configuration power generation at the second powerhouse will be minimized to reduce fish attraction into this area.

4. Powerhouse and Spillway Adult Fish Collection System

(a) Scheduled Maintenance - (See Appendix A for coordination procedures). Preventive maintenance and repair occurs throughout the year. During the adult fish passage season this maintenance will not involve any operations which will cause failure to comply with the adult fishway criteria. Because these systems are newly constructed, frequent inspections may be required until observed problems occur less often. Inspection of those parts of the adult collection channel systems which require dewatering, such as diffusion gratings, picketed leads and entrance gates, will be scheduled at least once every ten years with at least one underwater inspection in between unless a channel must be dewatered for fishway modifications or to correct observed problems(See Appendix D for dewatering procedures). Inspection by a diver or underwater video system may be used for the underwater inspections. This scheduled inspection and any associated maintenance will occur during the winter maintenance period. Any non-routine maintenance and fishway modificatons will be handled on a case by case basis. Corps biologists will be on hand during all dewatering activities as well as during inspection operations to provide fishery input (See Appendix D). However, if a biologist cannot be contacted in an emergency, the project will proceed, using all due care to ensure that fish are not stranded or injured. The project will continue to attempt to contact the biologists.

(b) Unscheduled Maintenance (See Appendix A for coordination procedures) - The Bonneville Project contains several types of fishway entrances. There is little potential for failure in some of the entrance types while other types do have histories of occasional failure. In most cases when a failure occurs the entrance can and will be operated manually by project personnel until repairs are made. When this operation becomes necessary project personnel will increase the surveillance of the adult system to insure that criteria are being met. In those cases in which the failure will not allow the entrance to be operated manually the gate will be maintained, to the extent possible, in an operational position. If this is not possible the entrance will be repaired expediently (receive high priority) and the entrance will be brought back into manual or automatic control at the earliest possible date.

6. Adult Fish Ladders and Counting Stations

(a) Scheduled Maintenance (See Appendix A for coordination procedures). - The adult fish ladders are usually dewatered (See Appendix D for dewatering procedures) once each year during the winter maintenance period. During this time the ladders are inspected for blocked orifices, projections into the fishway that may injure fish, stability of the weirs, damaged picketed leads, exit gate problems, loose diffusion gratings, unreadable or damaged staff gauges, defective diffusion valves and malfunctioning operating equipment at the counting stations. Problems identified throughout the passage year that do not affect the ladder operation, as well as those identified during the dewatered period are then repaired.

(b) Unscheduled Maintenance (See Appendix A for coordination procedures). - The Bonneville First Powerhouse ladder was completed in 1937 and the Bonneville Second Powerhouse ladder in 1981. Modification of the first powerhouse ladder was completed during the winter of 1981-82. The structures of the ladders include picketed leads, counting stations, fishway exits and overflow weirs with orifices. Picketed leads can cause problems. Pickets with excessive spacing (greater than 1"), erosion of concrete around the picketed leads or missing pickets can allow fish into areas where escape is not possible. In some instances of picketed lead failure spare picketed leads and spare installation slots are available. In these cases the spare leads are installed and the damaged leads are removed and repaired. In the remaining instances of picketed lead failure or concrete erosion, the timing and method of repair will depend upon the severity of the problem. The decision of whether or not to dewater the fishway and repair any problem will be made in consultation with the fishery agencies and Indian tribes.

B. Juvenile Fish Passage System

1. Fish Passage Season - March 1 through November 30 each year operate the juvenile bypass systems according to the criteria in Appendix C.

2. Winter Maintenance Period - December 1 through February operate according to the criteria in Appendix C.

3. Submersible Traveling Screens (STS)

(1) Scheduled Maintenance (See Appendix A for coordination procedures) - The STS system will receive preventive maintenance or repair at all times of the year including the winter maintenance period. Whenever a generator malfunctions or is scheduled for maintenance, the three STS' in that turbine may be maintained, repaired or exchanged for other STS' needing maintenance or repair. One third of the STS' at Bonneville are scheduled for complete overhaul each year resulting in a three-year maintenance cycle unless future developments indicate that longer life expectancy is possible.

(2) Unscheduled Maintenance (See Appendix A for coordination procedures) - If an STS is found to be damaged or inoperative in an operating unit refer to Figure 1. During the peak juvenile passage periods (April 15 to August 15), the day of and four days following a juvenile fish release in the Bonneville pool or when the 24 hour juvenile Salmonid passage by Bonneville exceeds 30,000, a crane crew will be taken off lower priority work or will work overtime to remove and replace (if spare available) a damaged or malfunctioning STS or VBS from any unit needed or likely to be needed for power within the next 48 hours. Crews will work overtime or as call-outs on weekends as required.

4. Juvenile Bypass Systems.

(a) Scheduled Maintenance (See Appendix A for coordination procedures) - The Bonneville juvenile bypass facilities will receive preventive

maintenance at all times of the year. During the juvenile fish passage season this will normally be above water work such as maintenance of automatic systems, air lines, electrical systems and monitoring equipment. During the winter maintenance period the systems are dewatered downstream of the gatewell orifices. The systems are then visually inspected in all accessible areas for damaged equipment and areas that may cause problems to the juvenile fish. Any problem areas identified are repaired if the project is able. In extreme cases the work will be contracted as soon as possible or repaired during the next winter maintenance period. Modifications and general maintenance to the channels are also to be completed at this time. The trash racks are to be raked just prior to the juvenile fish passage season (March 1) and whenever trash accumulations are suspected because of increased head differential across the trash racks or increased juvenile fish descaling is noted at Bonneville. Additional raking of trash racks may be necessary when a storm brings large quantities of debris down river to the project. Gatewell orifices of the unit being rake must be closed during the procedure.

(b) Unscheduled Maintenance (See Appendix A for coordination procedures)

(1) General Statement - The Bonneville projects' juvenile bypass systems are controlled by automatic systems. When an automatic system fails it usually can be operated manually. This allows either facility to operate according to criteria while repair of the automatic system is completed. Orifices allow fish out of the gatewells into a bypass channel. When the orifices become plugged with debris they are either mechanically (Second Powerhouse) or pneumatically (First Powerhouse) cleaned out.

Figure 1. Operating and Maintenance Instructions in the Event of STS or VBS Failure at Bonneville Dam:

1. If the project is operating with all available units during low debris conditions and BPA declares a power emergency continue operating until step 3 can be accomplished, otherwise proceed immediately to step 2.

2. Units 10, 9, 18, and 17 will have high priority and will continue in operation under any load conditions (except during high debris period) with failed STS or VBS until step 3 can be accomplished. Under high debris conditions any unit with a failed or malfunctioning STS will be shut down. If either unit 1 or 2 is out of service and the other of these two units has a malfunctioning screen, that unit must stay in operation until station service is available elsewhere. If it is a priority unit the failed STS or VBS will be repaired or replaced within 24 hours. Turbine units 1 and 2 will replace turbine units 9 and 10 in the above priority when the First Powerhouse bypass channel flow is to the south. Any other unit with failed STS or VBS will be shut down until step 3 can be accomplished or until BPA declares a power emergency and that unit is needed for power, in which case the unit will be the last to be brought on line and the first off line.

3. During working hours (0730 -1600 Monday - Friday,) assuming the BPA dispatcher will unload Bonneville on request, the unit will be taken out of service and the failed STS or VBS examined. If the required repairs can be accomplished that day, they will be done and the unit may then be returned to service. During the peak juvenile passage period (April 15 - September 15), the day of and four days following a juvenile fish release in the Bonneville pool, or when the 24 hour juvenile salmonid passage by Bonneville exceeds 20,000, an STS fails on a unit required for generation, then a crane crew will be taken off all but higher priority work or will work overtime or weekends to remove and replace (if spare available) the damaged or malfunctioning STS or VBS.

4. If repairs require longer than the rest of the day, the STS or VBS will be replaced with a spare or one from a long term out of service unit. If all available turbines are required to avoid a power emergency, unscreened turbines will be operated. The STS or VBS will be replaced with one from Unit 8 then 7 (PH-1) or Unit 15-13 (PH-2), and the unit will be returned to service. If the unscreened unit must be operated for longer than one week then remove the damaged STS or VBS according to table 1. STS or VBS should be removed from the A-slot first, B-slot second, C-slot third except at unit 7 where the STS or VBS should be removed from the B-slot first, C-slot second and A-slot third. If the failed STS or VBS is in units 7 or 8 the failed STS or VBS will be removed and repaired.

5. All partially screened or unscreened units will be operated according to Appendix C, Bonneville standards 15 through 18 until a spare or repaired STS or VBS is available for installation.

Table 1
Submersible Traveling Screen Removal Order When It Becomes Necessary to Replace Malfunctioning Submersible Traveling Screen and Operate the Unscreened Unit at Bonneville

	1st Powerhouse Turbine Units		2nd Powerhouse Turbine Units	
Order to Pull 1/	Mar 1 - Jul 5	Jul 6 - Nov 30	Mar 1 - Jul 5	Jul 6 - Nov 30
1	8	8	15	15
2	2	7 1/	14	14
3	1	9	13	13
4	9	10	12	12
5	7 1/	6	16	16
6	10	2	11	11
7	3	5	17	17
8	4	1	18	18
9	6	3	N/A	N/A
10	5	4	N/A	N/A

1/ STS should be removed from the A-slot first, B-slot second, C-slot third except at unit 7 where the STS should be removed from the B-slot first, C-slot second and A-slot third.

The gatewells will be inspected daily and debris removed (debarked) when the gatewell water surface is covered with debris to maintain clean orifices and minimize fish injury. The gatewell orifices must be closed during the debarking process.

(2) Bonneville First Powerhouse - If any part of the dewatering screen, downwell or juvenile release pipe fails, making this portion of the system unsafe for juvenile fish, the juveniles will be diverted to the ice and trash sluiceway. This operating mode will require the gate at the south end of the downstream migrant (DSM) channel to be removed and a stoplog at the north end to be installed so migrants will flow down into the ice and trash sluiceway channel. Sluiceway gate 6C will be opened and maintained at a depth 2.5 feet below forebay to provide safe flows for juveniles. Forebay will be maintained between 74.0 to 76.0 m.s.l. to the extent practicable. The bypass will then continue to function while repairs are completed. In either operating mode the orifices will be cleaned with the air pressure system at least once per day, when plugged orifices are indicated, after trash rack raking and gatewell debarking.

(3) Bonneville Second Powerhouse - If the bypass system fails in the dewatering section, downwell or release pipe, fish may be released through the emergency relief conduit. This operation will continue until repairs are accomplished or until the end of the fish passage season. Any decision on whether or not to shut this system down for dewatering and repairs will be made in consultation with the fisheries agencies and Indian tribes. During this emergency operating mode, power generation will be minimized at the second powerhouse to the extent possible. Repairs will receive high priority. If the hoisting mechanism used to adjust the weir controlling the water depth in the DSM channel fails, the system will have to be partially dewatered to make needed repairs.

During fishway inspection activities the VBS may be found to be plugged or damaged. In these cases refer to Figure 1.

C. Turbines and Spillways

1. Scheduled Maintenance (See Appendix A for coordination procedures) - The maintenance and routine repair of project turbines and spillways is a regular and reoccurring process which requires that units be shut down for up to two months (see Appendix D for dewatering procedures). The schedule for this maintenance will be reviewed by NPPOP-P-NR biologists and coordinated within NPP, NPD and BPA. Certain turbine and spillway discharges at the projects are secondarily used to attract adult fish to the area of fishway entrances, to keep predator fish from accumulating in the area of juvenile release sites and to move juveniles downstream away from the project. The maintenance schedules for these turbines (Appendix E) and spillways will reflect equal weighting given to fish, power and water management and will be coordinated with the appropriate resource agencies. No other fish related restrictions regarding maintenance will be placed on any units at these projects, except to coordinate research activities.

II. The Dalles Dam.

A. Adult Fish Passage System.

(1) Fish Passage Season - March 1 through November 30 according to criteria in Appendix B.

(2) Winter Maintenance Season - December 1 through February each year operates according to criteria in Appendix B.

(3) Fishway Auxiliary Water Systems.

(a) Scheduled Maintenance (see Appendix A for coordination procedures) - The Dalles Project auxiliary water systems consist of gravity flow and generating systems. Preventive maintenance and normal repair are carried out during the winter maintenance season.

(b) Unscheduled Maintenance (see Appendix A for coordination procedures) - Most fishway auxiliary systems are operated automatically. If the automatic system fails, the system can usually be operated manually by project personnel. This will allow the fish facility to operate according to criteria while the repair of the automatic system is carried out. When this operation becomes necessary project personnel will increase the surveillance of the adult system to ensure that criteria are being met.

The Dalles Powerhouse - If one of the two fishway auxiliary water turbines fails or malfunctions during the spring or summer (April 1 - July 31) adult migration seasons use the following procedure until a fishway head of 1.2 feet is achieved: (1) Raise the open West Powerhouse Entrance (W1, W2 and/or W3) weirs in one foot increments until proper head is achieved or until the weir reaches 6 feet of depth below the tailwater surface. (2) Raise the East Entrance weirs (E1, E2, E3) in one foot increments to 6 feet of depth below the tailwater surface. (3) If more than one West Entrance weir is operating close all but one entrance. (4) Close one east entrance (E1). (5) Raise the South spillway entrance weirs (S1, S2) in one foot increments to 6 feet of depth below the tailwater surface. (6) Close alternating floating orifice starting from the west end of the powerhouse. (7) Close one South spillway entrance (S2). (8) If a fishway head of 1.2 feet is still not achieved leave in this configuration until more auxiliary water becomes available. Then reverse the above procedure.

If one of the fishway auxiliary water turbines fails or malfunctions during the fall (August 1 - November 30) adult migration season use the following procedure until a fishway head of 1.2 feet is achieved: (1) Raise the open West Powerhouse Entrance weir(s) in one-foot increments to 6 feet of depth below the tailwater surface. (2) Raise the South spillway entrance weirs in one foot increments to 6 feet of depth below the tailwater surface. (3) If more than one West Entrance weir is operating close all but one (W1). (4) Close one South Spillway entrance (S2). (5) Raise the East Entrance weirs in one foot increments to 6 feet of depth below the tailwater surface. (6) Close every other floating orifice starting from the west end of the powerhouse.

(7) Close one East Entrance weir (E1). (8) If a fishway head of 1.2 feet is still not achieved leave in this configuration until more auxiliary water becomes available. Then reverse the above procedure.

If both of the fishway auxiliary water turbines fail or malfunction, regardless of fish passage season, the adult fish passage facility will be operated as follows: (1) S1 open with the weir crest 6 feet below the tailwater surface, S2 closed; (2) The junction pool weir supplying the powerhouse collection system and west powerhouse entrances will be closed; (3) E3 will be open with the weir crest 6 feet below the tailwater surface and E1 and E2 will be closed.

The Dalles North Ladder - If the gravity flow fishway auxiliary water system fails, N1 will remain open with a weir depth of 6 feet below the tailwater surface and N2 will be closed.

(4) Powerhouse and Spillway Adult Fish Collection System

(a) Scheduled Maintenance - (see Appendix A for coordination procedures) - Preventative maintenance and repair occurs throughout the year. During the adult fish passage season the maintenance will not involve any operations which will cause a failure to comply with the fishway criteria. Inspection of those parts of the adult collection channel systems, such as diffusion gratings, picketed leads and entrance gates, will be scheduled at least once every five years unless a channel must be dewatered for fishway modifications or to correct observed problems. Inspection by a diver or underwater video system may be used for the underwater inspections. This scheduled inspection and any associated maintenance will occur during the winter maintenance period. Any non-routine maintenance and fishway modification will be handled on a case by case basis. Corps biologists will be on hand during the dewatering activities as well as during inspection operations to provide fishery input (See Appendix D). However, if a biologist cannot be contacted in an emergency, the project will proceed using all due care to ensure that fish are not stranded or injured. The project will continue to attempt to contact the biologists.

(b) Unscheduled Maintenance (see Appendix A for coordination procedures) - The Dalles Project contains several types of fishway entrances. There is little potential for failure in some of the entrance types while other types do have histories of occasional failure. In most cases when failures occur the entrance can and will be operated manually by project personnel until repairs are made. When this operation becomes necessary project personnel will increase the surveillance of the adult system to ensure that criteria are being met. In those cases in which the failure will not allow the entrance to be operated manually the gate will be maintained, to the extent possible, in an operational position. If this is not possible the entrance will be repaired in an expedient manner (high priority) and the entrance will return to manual or automatic control at the earliest possible date.

4. Adult Fish Ladders and Counting Stations

(a) Scheduled Maintenance (See Appendix A for coordination procedures). - The adult fish ladders are usually dewatered (See Appendix D for dewatering procedures) once each year during the winter maintenance period. During this time the ladders are inspected for blocked orifices, projections into the fishway that may damage fish, stability of the weirs, damaged picketed leads, exit gate problems, loose diffusion gratings, unreadable or damaged staff gauges, defective diffusion valves, and malfunctioning operating equipment at the counting stations. The wooden weir caps are inspected and replaced if necessary. Problems identified throughout the passage year that do not affect the ladder operation, as well as those identified during the dewatered period are then repaired.

(b) Unscheduled Maintenance (See Appendix A for coordination procedures). - The structures of the ladders include picketed leads, counting stations, fishway exits and overflow weirs with orifices. The Dalles Dam has experienced a problem with the East fish ladder in which a weir tipped over. This created a large head across the next upstream orifice which completely stopped shad passage but did not appear to impede salmonid passage. In this case, after consulting with the fishery agencies, the ladder was dewatered, the weir was tipped upright and bolted into place. The remaining weirs were inspected and the ladder was then watered back up. The following winter all weirs in the east fish ladder were bolted into place.

Picketed leads can cause problems. Pickets with excessive spacing (greater than 1"), erosion of concrete around the picketed leads or missing pickets can allow fish into areas where escape is not possible. In some instances of picketed lead failure there are spare picketed leads and spare installation slots. In these cases the spare leads are installed and the damaged leads are removed and repaired. In the remaining instances of picketed lead failure or concrete erosion, the timing and method of repair will depend upon the severity of the problem. The decision of whether or not to dewater the fishway and repair any problem will be made in consultation with the fishery agencies and Indian tribes.

B. Juvenile Fish Passage System

(1) Fish Passage Season. April 1 through November 15 each year operate according to the criteria in Appendix C.

(2) Winter Maintenance Period. November 16 through March 31 each year operate according to the criteria in Appendix C.

3. Juvenile Collection and Transportation Systems.

(a) Scheduled Maintenance (See Appendix A for coordination procedures) - The Dalles ice and trash sluiceway will receive preventive maintenance at all times of the year. During the juvenile fish passage season this will normally be above water work such as maintenance of automatic systems, air lines, electrical systems and monitoring equipment. During the

winter maintenance period the systems are dewatered downstream of the gatewell orifices. The system is then visually inspected in all accessible areas for damaged equipment and areas that may cause problems to the juvenile fish. Any problem areas identified are repaired and modifications to the channel and general maintenance are completed. The trash racks are raked just prior to the juvenile fish passage season (April 1), whenever trash accumulations are suspected because of increased head differential across the trash racks or increased descaling of juvenile fish is noted at The Dalles or Bonneville dams and that Bonnevilles's trash racks are clean.

(b) Unscheduled Maintenance (See Appendix A for coordination procedures)

(1) The ice-trash sluiceway is now being used as a juvenile bypass system. Historically there have been few problems associated with this system. The chain gates on The Dalles' juvenile bypass system are fully opened during normal operation. When a chain gate fails, an adjacent gate can be operated until repairs can be made. Orifices allow fish out of the gatewells into the sluiceway. When the orifices become plugged with debris they are mechanically cleaned. The gatewells will be inspected daily and debris removed (debarked) when floating debris covers more than one-half the water surface. Gate hoists have been added to the system to simplify the adjustment of the gates used to attract fish into the sluiceway. If one of the hoists fail, repair promptly. If this cannot be done, the gate can be adjusted with the intake deck gantry crane or an adjacent gate may be operated with the intake deck gantry crane until repairs are completed on the hoist. The gate will be removed when there are problems with the seal and the difficulty cannot be repaired promptly. If the epoxy lined section of the sluiceway is found to be damaged, it will be repaired.

C. Turbines and Spillways

1. Scheduled Maintenance (See Appendix A for coordination procedures) - The maintenance and routine repair of project turbines and spillways is a regular and reoccurring process which requires that units be shut down for up to two months (see Appendix D for dewatering procedures). The schedule for this maintenance is reviewed by NPPOP-P-NR biologists and coordinated within NPP, NPD and BPA. Certain turbine and spillway discharges at the projects are secondarily used to attract adult fish to the area of fishway entrances, to keep predator fish from accumulating in the area of juvenile release sites and to move juveniles downstream away from the project. The maintenance schedules for these turbines (Appendix E) and spillways will reflect equal weighting given to fish, power and water management and will be coordinated with the appropriate resource agencies. No other fish related restrictions regarding maintenance will be placed on any units at these projects, except to coordinate research activities.

III. John Day Dam.

a. Adult Fish Passage System

1. Fish Passage Season - March 1 through November 30 each year operate according to criteria in Appendix B.

2. Winter Maintenance Season - December 1 through February each year operate according to criteria in Appendix B.

3. Fishway Auxiliary Water Systems

(a) Scheduled Maintenance (See Appendix A for coordination procedures) - The John Day Project has pump style auxiliary water systems. Preventive maintenance and normal repair are normally carried out during the winter maintenance season.

(b) Unscheduled Maintenance (See Appendix A for coordination procedures) - The fishway auxiliary water systems are operated mostly automatically. If the automatic system fails the system can usually be operated manually by project personnel. This will allow the fish facility to operate according to criteria while the automatic system is repaired. When this operation becomes necessary project personnel will increase the surveillance of the adult system to ensure that criteria are being met.

John Day South Ladder - If one of the three fishway auxiliary water turbines fails, assuming all three turbines are being used to meet criteria, bulkheads will be installed in the failed turbine discharge conduit and the output of the two remaining turbines will be increased to bring the fishway into agreement with the adult fishway criteria.

If a second turbine unit fails, bulkheads will be installed in the second failed turbine discharge conduit and the adult fish facility will be operated as follows until a fishway head of 1.2 feet is achieved: (1) Raise the South powerhouse entrance 1 weir (SE1) in one foot increments to 6 feet of depth below the tailwater surface; (2) Raise the north powerhouse entrances (NE1, NE2) in one foot increments to 6 feet of depth below the tailwater surface. (3) Close the center five floating gate submerged orifice entrances starting at the north end (17, 15, 12, 9, 6); (4) Close NE1. (5) If the above criteria is still not achieved leave in this configuration until more auxiliary water becomes available. Then reverse the above procedure.

If all three turbine units fail, bulkheads will be installed in the failed turbine discharge conduit and the adult fish facility will be operated as follows until repairs can be made: (1) SE1 will be open with the weir crest 6 feet below the tailwater surface; (2) Cross channel bulkheads will be placed in the powerhouse collection channel between units 2 and 3. (3) The floating orifice gate in front of unit 2 will be closed, leaving the floating orifice gate in front of unit 1 open.

John Day North Ladder - This system can operate according to the adult fishway criteria under most conditions by using fewer than the six fishway auxiliary water pumps. If one pump fails, one of the standby pumps will be started up. This routine will be followed until the available pumps can no longer meet the adult fishway criteria. When this occurs N2 will be raised in 1 foot increments until a fishway head of 1.2 feet is met or until the weir crest reaches a depth of 6 feet below the tailwater surface. If this fishway criterion is still not met, N1 will be raised in one-foot increments until that criterion is met or the weir crest reaches a depth of 6 feet below the tailwater surface. If criterion is still not achieved close N2 and the N1 weir will be maintained at the six-foot level until repairs reach a stage which allows more water to be added to the system. The weirs should then be opened in the reverse order in which they were closed.

4. Powerhouse and Spillway Adult Fish Collection System

(a) Scheduled Maintenance - (See Appendix A for coordination procedures) Preventive maintenance and repair occurs throughout the year. During the adult fish passage season this maintenance will not involve any operations which will cause a failure to comply with the adult fishway criteria. Inspection of those parts of the adult collection channel systems, which reuire dewatering such as diffusion gratings, picketed leads and entrance gates, will be scheduled at least once every ten years with at least one underwater inspection in between unless a channel must be dewatered for fishway modifications or to correct observed problems (See Appendix D for dewatering procedures). Inspection by a diver or underwater video system may be used for the underwater inspections. This scheduled inspection and any associated maintenance will occur during the winter maintenance period. Any non-routine maintenance and fishway modifications will be handled on a case by case basis. Corps biologists will be on hand during all dewatering activities as well as during inspection operations to provide fishery input (See Appendix D). However, if a biologist cannot be contacted in an emergency, the project will proceed, using all due care to ensure that fish are not stranded or injured. The project will continue to attempt to contact the biologist.

(b) Unscheduled Maintenance (See Appendix A for coordination procedures). - The John Day Project contains several types of fishway entrances. There is little potential for failure in some of the entrance types while other types do have histories of occasional failure. In most cases when failures occur the entrance can and will be operated manually by project personnel until repairs are made. In those cases in which the failure will not allow the entrance to be operated manually the gate will be maintained, to the extent possible, in an operational position. If this is not possible the entrance will be repaired in an expedient manner (receive high priority) and the entrance will be brought back into manual or automatic control at the earliest possible date.

5. Adult Fish Ladders and Counting Stations

(a) Scheduled Maintenance (See Appendix A for coordination procedures). - The adult fish ladders are usually dewatered (See Appendix D for dewatering procedures) once each year during the winter maintenance period. During this time the ladders are inspected for blocked orifices, projections into the fishway that may injure fish, stability of the weirs, damaged picketed leads, exit gate problems, loose diffusion gratings, unreadable or damaged staff gauges, defective diffusion valves and malfunctioning operating equipment at the counting stations. Problems identified throughout the passage year that do not affect the ladder operation, as well as those identified during the dewatered period are then repaired.

(b) Unscheduled Maintenance (See Appendix A for coordination procedures). - The structures of the ladders include picketed leads, counting stations, fishway exits and overflow weirs with orifices. Picketed leads can cause problems. Pickets with excessive spacing (greater than 1"), erosion of concrete around the picketed leads or missing pickets can allow fish into areas where escape is not possible. In some instances of picketed lead failure there are spare picketed leads and spare installation slots. In these cases the spare leads are installed and the damaged leads are removed and repaired. In the remaining instances of picketed lead failure or concrete erosion, the timing and method of repair will depend upon the severity of the problem. The decision of whether or not to dewater the fishway and repair any problem will be made in consultation with the fishery agencies and Indian tribes, according to the described coordination procedures (Appendix A).

B. Juvenile Fish Passage System

(1) Fish Passage Season. April 1 through November 15 each year operate according to the criteria in Appendix C.

(2) Winter Maintenance Period. November 16 through March 31 each year operate according to the criteria in Appendix C.

(3) Submersible Traveling Screens (STS).

(1) Scheduled Maintenance (See Appendix A for coordination procedures) - The STS system will receive preventive maintenance or repair at all times of the year including the winter maintenance period. Whenever a generator malfunctions or is scheduled for maintenance, the three STS' in that turbine may be maintained, repaired or exchanged for other STS needing maintenance or repair. About one third of the STS at John Day are scheduled to get a complete overhaul each year resulting in a three-year maintenance cycle unless future developments indicate that a longer life expectancy is possible.

(2) Unscheduled Maintenance (See Appendix A for coordination procedures) - If an STS is found to be damaged or inoperative in an operating unit refer to Figure 2. During the peak juvenile passage periods (May 1 to August 15), the six days following a juvenile fish release in the John Day pool or when the 24 hour juvenile salmon passage by John Day exceeds 30,000 a

crane crew will be taken off lower priority work or will work overtime to remove and replace (if spare available) a damaged or malfunctioning STS or VBS from any unit needed or likely to be needed for power within the next 48 hours. Crews will work overtime or as call-outs on weekends as required.

4. Juvenile Bypass Systems.

(a) Scheduled Maintenance (See Appendix A for coordination procedures) - The John Day juvenile bypass facilities will receive preventive maintenance at all times of the year. During the juvenile fish passage season this will normally be above water work such as maintenance of automatic systems, air lines, electrical systems and monitoring equipment. During the winter maintenance period the system is dewatered downstream of the gatewell orifices. The system is then visually inspected in all accessible areas for damaged equipment and areas that may cause problems to the juvenile fish. Any problems identified are repaired if the project is able, in extreme cases the work will be contracted as soon as possible or repaired during the next winter maintenance period. Modifications and general maintenance to the channel are also completed at this time.

The trash racks are raked just prior to the junvenile fish passage season (April 1) and whenever trash accumlations are suspected because of increased head differntial across the trash racks or increased juvenile fish descaling is noted at John Day Dam. Additional raking of trashracks may be necessary when a storm brings large quantities of debris down river to the project. The gatewell orifices must be closed during the raking process.

(b) Unscheduled Maintenance (See Appendix A for coordination procedures)

(1) - John Day's juvenile bypass system is controlled by automatic systems. When an automatic system fails it can usually be operated manually. This allows the facility to operate according to criteria while repair of the automatic system is completed. Orifices allow fish out of the gatewells into a bypass channel. When the orifices become plugged with debris they are mechanically cleaned out. The gatewells will be inspected daily and debris removed (debarked) when it covers over one-half of the water surface to maintain clean orifices and minimize fish injury. The gatewell orifices must be closed during the debarking process.

(2) If the bypass system fails in the powerhouse conduit, tainter gate, or transportation outfall making the system unsafe for fish the decision to dewater for repairs will be made in consultation with the fisheries agencies and Indian tribes. During this emergency operating mode, power generation will be minimized. If this operating mode is expected to last longer than four days all units required for generation will be sequentially shut down, fish salvaged from the gate well, the STS removed and the unit restarted. The orifice gates will be closed then opened once each day to float any debris accumulating around the orifice. During fishway inspection activities VBS may be found to be plugged with debris or damaged. In these cases refer to Figure 2.

Figure 2. Operating and Maintenance Instructions in the Event of STS or VBS Failure at John Day Dam.

1. If the project is operating with all available units during low debris conditions and BPA declares a power emergency continue operating until step 3 can be accomplished, otherwise proceed immediately to step 2.

2. Unit 5 will have high priority and will continue in operation under any load conditions (except during high debris period) with a failed STS or VBS until step 3 can be accomplished. Under high debris load conditions any unit with a failed or malfunctioning STS or VBS will be shut down. If it is the priority unit, the failed STS or VBS will be repaired or replaced within 24 hours. Any other unit with a failed STS or VBS will be shut down until step 3 can be accomplished or until BPA declares a power emergency and that unit is needed for power.

3. During working hours (Monday - Friday, 0730 - 1600) assuming the BPA dispatcher will unload John Day on request, the unit will be taken out of service and the failed STS or VBS will be examined. If the required repairs can be accomplished that day, they will be done and the unit may then be returned to service. During the peak juvenile passage period (May 1 - September 15), six days following a juvenile fish release in the John Day pool, or when the 24-hour juvenile salmonid passage by John Day exceeds 20,000, an STS or VBS fails on a unit required for generation, then a crane crew will be taken off all but higher priority work, will work overtime or weekends to remove and replace (if spare available) the damaged or malfunctioning STS orVBS.

4. If repairs require longer than the rest of the day, the STS or VBS will be replaced with a spare or one from a long term out of service unit. If this is not the situation begin removing the replacement STS or VBS from the northernmost unit and move sequentially to the South. STS or VBS should be removed from the A-slot first, B-slot second, C-slot third.

5. All partially screened or unscreened units will be operated according to Appendix C, John Day standards 13 through 17 until a spare or repaired STS or VBS is available for installation.

C. Turbines and Spillways

1. Scheduled Maintenance (See Appendix A for coordination procedures) - The maintenance and routine repair of project turbines and spillways is a regular and reoccurring process which requires that units be shut down for up to two months (see Appendix D for dewatering procedures). The schedule for this maintenance will be reviewed by NPPOP-P-NR biologists and is coordinated within NPP, NPD and BPA. Certain turbine and spillway discharges at the projects are secondarily used to attract adult fish to the area of fishway entrances, to keep predator fish from accumulating in the area of juvenile release sites and to move juveniles downstream away from the project. The maintenance schedules for these turbines (Appendix E) and spillways will reflect equal weighting given to fish, power and water management and will be coordinated with the appropriate resource agencies. No other fish related restrictions regarding maintenance will be placed on any units at these projects, except to coordinate research activities.

IV. Foster (adult fish passage facility).

A. Operating criteria.

(1) Head over submerged weirs: 12-15 inches.

(2) Fish ladder flow: 35-39 cfs.

(3) Position of entrance gate and gate opening width: use six-foot gate only, operated as a submerged orifice.

(4) Elevation of surface of entrance pool above tailwater: 12-18 inches.

(5) Number of attraction water pumps used in relation to unit discharge:

(a) Minimum one unit powerhouse discharge (800 cfs) one pump.

(b) Minimum two unit powerhouse discharge (1600 cfs) two pumps.

(c) Powerhouse discharge equal to or in excess of that for two unit rated load at full pool (2200 cfs) - three pumps.

(6) Side entrance gate:

(a) Not operated except under the following conditions: (a) during spill and (b) for one day following the end of spill.

(b) Criteria when operated: Operate as a weir 18 inches above tailwater with approximately 40 cfs discharge from entrance pool.

(7) Maximum flow through spillgate adjacent to fish facility: 2000 cfs.

(8) Criteria shall be checked by operator whenever unit discharge and spill conditions change. In any case, the facility shall be checked to ensure that it is in criteria at least once a day during the peak of the run.

B. Schedule of maintenance (any reference to annual maintenance work means work is done in January). Time required for annual maintenance is usually two weeks. Date will be coordinated with NPPOP-P-NR biologist at least one month prior to dewatering (See Appendix A).

(1) Structure, including holding pool, transportation channel and fish ladder.

(a) Clean, inspect, service and repair annually.

(2) Transfer equipment (includes hopper, craneway hoists, trolley, sweep and brail).

(a) Inspect, service and repair mechanical system quarterly.

(b) Inspect, service, and repair electrical system semiannually.

(3) Side gate and entrance gate.

(a) Inspect, service, and repair mechanical system quarterly.

(b) Inspect, service and repair electrical system semiannually.

(4) Inspect, service and repair water supply valves annually.

(5) Valves (E), (F) and (G).

(a) Inspect, service and repair mechanical annually.

(b) Inspect, service and repair electrical system quarterly.

(6) Attraction water pumps nos. (1), (2), and (3) inspection, service and repair-monthly (while fish facility is in operation).

(7) Attraction water pump no. (4) inspection, service and repair - annually (Note: attraction water pumps nos. (1), (2), and (3) are used regularly. Pump no. (4) is used only occasionally as required.)

C. Schedule of facility operation.

(1) Determination of when operation of facility begins and ends requires close coordination (See Appendix A) with the Oregon Department of Fish and Wildlife.

(2) Tentative dates of operation (subject to change depending on presence of fish in river).

(a) Start of operation - February 1.

(b) Shut-down of facility - December 1.

(c) Contingency shut-down - upon request by ODFW and coordinated with NPPOP-P-NR, facility may be shut down to permit chinook, excess to hatchery needs, to be available to the fishery and to allow the fish to hold over in cooler river water. In such a case the facility will be restarted August 15.

(3) In any case, facility must be ready to operate by above mentioned date.

D. Criteria for determining frequency of inspections for fish and removal of fish.

(1) Frequency of inspections - at least once a day.

(2) Number of fish present requiring notification of ODFW personnel within 24 hours is an estimated 50-100.

(3) ODFW personnel will remove fish during peak of run three times/week.

(4) Maximum number of days fish are to be left in facility until ODFW personnel are notified (at beginning and end of run) is four days.

(5) The personnel at South Santiam Hatchery are to be notified concerning removal of fish from facility.

E. Contingencies - preparation for and dealing with major and minor problems.

(1) A major problem is considered to be any failure or problem which completely prevents fish passage for a period of three days or more during the run. (Since the facility has been in operation there has never been a major problem.) The OP-P-NR biologist will be notified as soon as possible when such a problem occurs (see Appendix A).

(a) Routine inspection and overhaul are designed to prevent a major failure of the facility during the fish run.

(b) Should a failure occur during the runs which may be serious enough to become a major problem, all available resources will be used to repair the facility as quickly as possible. This includes the use of overtime which will be authorized. Highest priority will be given to repairing the facility in such a case.

(2) Other problems.

(a) Routine preventive maintenance and minor repairs can usually be done during the fish run while the ladder is still in service. Repairs will usually be completed within two days.

F. Coordination with Oregon Department of Fish and Wildlife and OP-P-NR specific to this Facility concerning situations requiring that ODFW and the OP-P-NR biologist be informed within 24 hours (see Appendix A).

(1) Whenever the salmonid run decreases to a point that fish are no longer entering the facility.

(2) Whenever more than 50 fish are estimated to be present in the facility.

(3) Whenever fish are seen in the river below the facility prior to start of operation for the season.

V. Green Peter (adult fish passage facility).

A. Operating criteria.

(1) Head over weirs: 12-15 inches.

(2) Fish ladder flows: 37-42 cfs (with preference to the lower figure.)

(3) Position of gate: operated as an orifice with bottom sill at elevation 684.5 feet, mean sea level.

(4) Entrance head: 1 foot.

(5) Flow into loading pool: 10-15 cfs.

(6) Brail pool orifice opening widths: 1.2 to 2.2 feet.

(7) Number of attraction water pumps used in relation to unit discharge:

(a) Units not discharging: one pump.

(b) Unit discharging: no pumps as experience has shown that fish do not enter facility when units are discharging.

(8) Criteria shall be checked by operator whenever facility is inspected for numbers of fish present or whenever the project manager considers it necessary due to changing conditions.

B. Schedule of maintenance (any reference to annual maintenance work means work is performed in January and February. Time required for annual maintenance is usually two weeks). Data will be coordinated with OP-P-NR biologist at least one month prior to dewatering (see Appendix A).

(1) Structure, including fish ladder.

(a) Clean, inspect, service and repair annually.

(2) Craneway machinery, hoist and trolley.

(a) Inspect, service and repair mechanical system quarterly.

(b) Inspect, service and repair electrical motors quaterly.

(3) Turntable machinery.

(a) Inspect, service and repair mechanical system annually.

(b) Inspect, service and repair electrical system annually.

(4) Brail hoist machinery.

(a) Inspect, service and repair mechanical system quarterly, and more thorough overhaul done annually.

(b) Inspect, services and repair electrical system annually.

(5) Brail pool exit gate.

(a) Inspect, service and repair mechanical system annually.

(b) Inspect, service and repair electrical system annually.

(6) Fish hopper

(a) Inspect, service and repair mechanical system quarterly.

(7) Thirty-six inch main entrance gate.

(a) Inspect, service and repair mechanical system quarterly.

(b) Inspect, and repair wire rope semiannually.

(c) Inspect, service and repair electrical system semiannually.

(8) Eighteen inch entrance gate.

(a) Inspect, service and repair mechanical system quarterly.

(b) Inspect and repair wire rope semiannually.

(c) Inspect, service and repair electrical system semiannually.

(9) Valves (A) through (H).

(a) Mechnical inspection, service and repair annually.

(10) Valves (C), (D) and (E).

(a) Electrical inspection, service and repair - annually.

(11) Inspect, service and repair attraction water pumps annually (note: because operating criteria has been changed, the pumps are not run as frequently as they had been in the past.)

(a) Inspect, service and repair fish turbine annually.

C. Schedule of operation of facility.

(1) Determination of when operation of facility begins and ends requires close coordination with the Oregon Department of Fish and Wildlife (see Appendix A).

(2) Tentative Dates (subject to change depending on presence of fish in river).

(a) Start operation - February 15.

(b) Shut down of facility - December 15.

(3) Facility must be ready to operate by above mentioned date.

D. Criteria for determining frequency of inspections for fish and removal of fish.

(1) Frequency of inspections - at least once a week.

(2) If fish are present when facility is inspected, they are to be put over the dam after notifying ODFW.

E. Contingencies - preparation for and dealing with major and minor problems.

(1) A major problem is considered to be any failure or problem which completely prevents fish passage for a period of three days or more during the run. (Since the facility has been in operation there never has been a major problem.) The OP-P-NR biologist will be notified as soons as possible when such a problem occurs (see Appendix A).

(a) Routine inspection and overhaul are designed to prevent a major failure of the facility during the fish run.

(b) Should a failure occur during the run which may be serious enough to become a major problem, all available resources will be used to repair the facility as quickly as possible. This includes the use of overtime which will be authorized. Highest priority will be given to repairing the facility in such a case.

(2) Other problems:

(a) Routine preventative maintenance and minor repairs can usually be done during the fish run while the ladder is still in service. Repairs will usually be completed within two days.

F. Coordination with Oregon Department of Fish and Wildlife and OP-P-NR specific to this facility concerning situations requiring that ODFW and the OP-P-NR biologist be informed within 24 hours (see Appendix A).

(1) Whenever, after a period of two weeks after the last steelhead had been put over Foster Dam, fish are no longer entering the facility.

(2) Whenever fish are seen in the river below the facility prior to the start of operation for the season.

VI. Green Peter (fingerling fish passage facility).

A. Operating criteria.

1. Flow through fish horn: 190-194 cfs.

2. Flow across separator: 6-10 cfs.

3. The transport pipe will be maintained at a water depth sufficient to transport fish.

4. During periods when the reservoir is filling rapidly due to high flood it may be necessary to take the facility out of service. Rapid filling of the reservoir requires the adjustment of the facility every six hours. In any case, when the reservoir is filling for flood control the lack of flow downstream does not provide adequate transportation for the fingerlings.

5. Whenever the reservoir is being drawn down during the run the facility will be kept operating at all times even if this requires frequent adjustment. It is essential that the fingerlings be permitted to migrate out of the reservoir during these conditions.

6. Criteria shall be checked by operator whenever reservoir conditions change significantly or whenever sampling of fish by ODFW indicates a problem. An alarm will sound in the powerhouse should the pumps cease operation.

B. Schedule of maintenance (any reference to annual maintenance work refers to work done during time facility is not in operation.)

1. Transport pipe valves.

(a) Electrical inspection, service and repair - annual.

2. Internal surface of transport pipe inspection with TV camera - whenever inspection of fingerlings by ODFW personnel indicates injury.

3. Intake gate and hoist.

(a) Inspect, service and repair mechanical system quarterly.

(b) Inspect, service and repair electrical system quarterly.

4. Hose cart and hoist.

(a) Inspect, service and repair mechanical system quarterly.

(b) Inspect, service and repair electrical system quarterly.

5. Main hoist and main hoist brakes.

(a) Inspect, service and repair mechanical system quarterly.

(b) Inspect, service and repair electrical system quarterly, and a more thorough overhaul annually.

6. Air compressor.

(a) Inspect, service and repair electrical system annually.

7. Attraction water pumps.

(a) Mechnical inspection, service and repair monthly, during fish run.

(b) Electrical inspection, service and repair semiannually, with overhaul as necessary.

C. Schedule of operation of facility.

1. Determination of when operation of facility begins and ends requires close coordination with the Oregon Department of Fish and Wildlife (see Appendix A).

2. Tentative dates (subject to change depending on presence of fish in river).

(a) Start of operation - February 15.

(b) Shut down of facility - June 1.

(c) Start of fall operation - October 25.

(d) Shut down of facility - January 1.

3. Facility must be ready to operate by above mentioned dates.

D. Contingencies - preparation for and dealing with major and minor problems.

1. A major problem is considered to be any failure or problem which completely prevents fingerling passage for a period of three days or more during the run. (There has not been a major problem with the facility since the facility has been put into operation.) The OP-P-NR biologist will be notified as soon as possible after such a problem occurs (see Appendix A). When bypass is operating the facility should be inspected at least twice each week.

(a) Routine inspection and overhaul are designed to prevent a major failure of the facility during the fish run.

(b) Two pumps provide the attraction water. Should one pump fail, the other would be operated to provide some attraction water.

(c) Should a failure occur during the run which may be serious enough to become a major problem, all available resources will be used to repair the facility as quickly as possible. This includes the use of overtime, which will be authorized. Highest priority will be given to repairing the facility in such a case.

2. Other problems.

(a) Routine preventative maintenance and minor repairs can usually be done during the fish run while the facility is still in service.

(b) Vandalism has been a minor problem at the facility. Minor accidents involving debris have occurred.

E. Coordination with Oregon Department of Fish and Wildlife and OP-P-NR specific to this facility concerning situations requiring that ODFW and the OP-P-NR biologist (next working day) be notified within 24 hours (see Appendix A).

1. Whenever high flooding and rapid filling of the reservoir require that the facility to be taken out of service.

2. Whenever there is a malfunction severe enough that any of the facilities are shut down or it would disrupt fingerling or adult passages for more than three days.

APPENDIX A
INSPECTION PROGRAM AND COORDINATION

I. Columbia River Projects

A. Inspection Program.

1. During the juvenile fish passage season, the juvenile fish passage facilities will be inspected by project personnel, at least once during each working shift, to assure that the systems are operating according to criteria (see Appendix C for criteria).

2. During the adult fish passage season project personnel will make visual inspections of the adult fish passage facilities prior to 0600 each day and at least once during the day shift (0800-1600 P.S.T.) to assure that the systems are operating according to criteria (see Appendix B for criteria).

3. During both the adult and juvenile fish passage seasons, a Project Operations Division (POD) biologist will inspect the adult and juvenile fish passage facilities at least once a week to assure that the systems are operating according to criteria. This inspection will include contacts with the projects' operations superintendents, fish counters and appropriate researchers conducting work on either the adult or juvenile facilities.

4. During the winter maintenance period, POD biologists will inspect the adult and juvenile fish passage facilities at least once every two weeks.

5. Just prior to the juvenile fish passage season project personnel will inspect the STS, VBS and gatewell orifices and again at least once every three months. A video monitoring system may be used in these inspections.

6. There will be monthly inspections of project fish facilities by fishery agencies and tribal representatives.

B. Coordination Plan

1. Scheduled Maintenance - Project managers plan in advance for the maintenance activities that are to occur on their respective projects each year. These activities include maintenance of the turbine generators, navigation locks, adult and juvenile fish facilities and the spillway dam. These activities may also include special tasks conducted by the projects for various research groups. The maintenance for these activities is traditionally set at particular times of the year to coincide with such things as low fish passage, low power demand, low river flows and equal distribution of work load.

The projects' turbine and spillway maintenance schedules will be reviewed annually by NPPOP-P-NR biologist for fishery impacts. The fishway maintenance schedule will be submitted to the NPPOP-P-NR biologist, by 15 September each year, for coordination with NPPPL-FW, the fishery agencies and Indian tribes.

Other scheduled maintenance needs are to be coordinated with the NPPOP-P-NR biologist when they may impact the projects' ability to keep the fish facilities operating according to the present fishway operating criteria. The above submittals should take place far enough in advance so that conflicts between fishery needs and required project maintenance can be resolved.

The project fishway maintenance schedules will be considered tentative, but any changes should be coordinated with the NPPOP-P-NR biologist as early as possible. There are many events that could occur during the planned maintenance that should be coordinated with the NPPOP-P-NR biologist. Examples of these are:

(a) Dewatering of turbine intakes and draft tubes.

(b) Closing of fishway entrances

(c) Interruption of auxiliary fishway water

(d) Ladder dewatering or lowering of the water level

(e) Cycling of STS during fish passage season.

2. Unscheduled Maintenance - Unscheduled maintenance or repair will need to be handled by the project manager on a case by case basis using the available information. Unscheduled maintenance or repair is defined as the correction of any situation that impacts fish passage and survival, or impairs the project's ability to operate the facilities according to standard operating criteria. The NPPOP-P-NR biologist must be notified as soon as the need for such work becomes apparent. The project manager has the authority to initiate the work prior to this notification when, in his opinion, delay of the work will result in an unsafe situation for people, property or fish. Information needed by the NPPOP-P-NR biologist in the above coordination includes:

(a) Description of the problem

(b) Type of repair necessary

(c) Length of time for repair

(d) Expected impacts on fish passage

(e) Description of any priority work or situation that prevents the repair from proceeding immediately.

3. The NPPOP-P-NR biologist will be notified when work requested by any entity may impact fish passage or survival. Also notification of the NPPOP-P-NR biologist is strongly recommended when project personnel observe work being conducted by other groups which may impact fish passage. The NPPOP-P-NR biologist must be notified when a malfunction or accident occurs on or near the project which may impact fish passage or survival. Such

malfunctions or accidents would include petroleum spills, chemical spills, vehicle accidents or natural disasters.

II. Mid-Willamette Valley Project

A. Coordination with ODFW

(1) Project Manager will coordinate on all matters concerning all fish passage facilities. Project Manager may delegate the responsibility.

(2) Whenever there is a malfunction severe enough that any of the facilities is shut down, ODFW will be notified within 24 hours.

B. Coordination with the District Office biologist (NPPOP-P-NR): The project has the responsibility for operation and maintenance of the facility and coordination with ODFW. It is, however, necessary that the project keep the NPPOP-P-NR biologist informed of all significant circumstances concerning the facility and coordination with ODFW.

1) Whenever the project coordinates with ODFW on significant changes in criteria, the NPPOP-P-NR biologist will be informed of such changes and the reasons for them.

2) The Project will directly inform the District Office within 24 hours of any malfunction during the fish run which would prevent fingerling passage or adult passage for more than three days.

3) Whenever operation of the facility begins, the facility is shut down or malfunctions or there are any significant changes in operation the information will be entered on the teletype and recorded in the station log.

4) The project will directly inform the NPPOP-P-NR biologist whenever a significant or unusual maintenance or repair problem occurs. This is particularily important in the event one of the attraction water pumps at the Green Peter fingerling fish passage facility fails or seems likely to fail.

5) Responsibilities of the District Office:

(a) The District Office will inform the project of any special needs or requests concerning fingerling passage or any other requests pertaining to fish. Such requests will be made in sufficient time that the project may adequately plan the work schedule or as soon as the District Office has received the request from the fisheries agencies.

(b) If needed, the District Office will have the responsibility of obtaining information on work performed on the facility.

APPENDIX B
BASIC OPERATING STANDARDS
FOR
ADULT MIGRANT FISH PASSAGE FACILITIES
BONNEVILLE DAM
FEBRUARY 1985

Prior to March 1 each year

1. Inspect all staff gauges and water level indicators, repair and/or clean where necessary.

2. Inspect dewatered sections of fish facilities for projections, debris or plugged orifices which could injure fish or slow their progress up the ladder. Repair deficiencies.

March 1 through November 30 (Fish Passage Period)
All Adult Fish Facilities

3. Water depth over fish ladder weirs: 1.3 ($\pm$0.1) feet.

4. Head on all entrances: 1.0 to 2.0 feet (1.5 feet prefered). Refer to maintenance plan when unable to achieve head criterion.

5. A transportation velocity of 1.5 to 4 feet per second (2.0 fps prefered) shall be maintained in the powerhouse collection channel, the lower ends of the fish ladders which are below the tailwater, and the adult transportation channel (UMT).

6. Maximum of 0.6 feet head on the first powerhouse attraction water intakes and trash racks at all the ladder exits, with a 0.4 feet maximum head on all picketed leads. Debris shall be removed when significant amounts accumulate.

7. Staff gauges and water level indicators will be readable at all water levels encountered during the fish passage period.

8. Unit operation priority will be: 10, 9, 1, 18, 17, 11, 2, (3 - 8, and 12). Unit 12 will be used only when required for on going research study. This operation will be followed until the juvenile passage problem (collection efficiency) is resolved at the second powerhouse.

9. Unit 16 will replace units 17 or 18 in the above priority if either of these are taken out of service. Also, unit 2 will replace unit 9 in the above priority when the First Powerhouse bypass channel flow is to the south.

Spillway Ladders

10. Spill bay gates 1 and 18 open 4 inches.

11. Side entrances SW-SG-5 and SO-SG-7 and downstream entrances SW-SG-1 and SO-SG-2 shall operate as free flowing vertical slots. Downstream entrances

SW-SG-3 and SO-SG-4 (adjacent to shore) shall close 1 sluice-gate each on rising tailwater elevations from 9.0 to 17.0 and close both sluicegates at each entrance for tailwater elevations above 17.0. The reverse procedure will occur on falling tailwaters at 16.5 and 8.5. This operation should maintain a head of 1.5 feet on the entrances for all tailwater elevations up to 32 feet.

First Powerhouse

12. Entrance gate 65 operates as an adjustable height submerged weir with crest elevation 8 feet below tailwater for tailwater elevations above 17.0, for tailwater elevations below 17.0 the weir is fully lowered with crest at elevation 8.5.

13. Operate powerhouse entrance gates 9, 21, 34, 58 and 62.

14. Orifice A (lower sluicegate) operates from tailwater elevation 7 to 16 on a rising tailwater and elevation 15 to 7 on a falling tailwater.

15. Orifice B (higher telescoping gate) operates from tailwater elevation 16 to 38 on a rising tailwater and elevation 38 to 15 on a falling tailwater.

16. Powerhouse entrance gate 1 operates as an adjustable height submerged weir which acts as the primary control to regulate head differential between the collection channel and tailrace (head on all entrances). Entrance gate 2 is a submerged orifice entrance which operates only when entrance gate 1 is completely lowered to regulate the head differential between the collecion channel and tailrace at lower tailwater elevations. Gate 1 is fully lowered at tailwaters below 22.0, then Gate 2 takes over fishway head regulation.

Second Powerhouse

17. Operate all four North (NUE & NDE) and South (SUE & SDE) entrances. Operate weir crests at elevation 1.0 (full lowered) for tailwater elevations up to 14.0. For tailwater elevations greater than 14.0, operate weir crest 13.0 feet below tailwater.

18. Operate all 12 powerhouse floating orifices.

Spillway Operations

19. The following spill schedules shall be followed during the spill period.

December 1 through February (Winter Operating Period)

20. Operate the adult fish passage facilities according to the fish passage period standards above except systems may be dewatered or operated out of criteria for repair and maintenance. Only one of the ladders servicing the two powerhouses and the associated powerhouse collection system (including the auxiliary water supply system) can be out of service at any one time except

under extreme situations. One of the two ladders servicing the spill channel should be in full operation at all times except under extreme conditions.

21. Adjust crowders at fish counting stations to full open at the end of the counting season.

BASIC OPERATING STANDARDS
FOR
ADULT MIGRANT FISH PASSAGE FACILITIES
THE DALLES DAM
FEBRUARY 1985

Prior to March 1 each year

1. Inspect all staff gauges and water level indicators, repair and/or clean where necessary.

2. Inspect dewatered sections of fish facilities for projections, debris or plugged orifices which could injure fish or slow their progress up the ladder. Repair deficiencies.

March 1 through November 30 (Fish Passage Period)

All Adult Fish Facilities

3. Water depth over fish ladder weirs: 1.2 feet ($\pm$0.1).

4. Head on all entrances: 1.0 to 1.5 feet (prefer 1.3 to 1.5). Refer to maintenance plan when unable to achieve head criteria.

5. A transportation velocity of 1.5 to 4.0 feet per second (prefer 2.0 f.p.s.) shall be maintained in all channels and the lower ends of the fish ladders which are below the tailwater.

6. Maximum of 0.6 feet head on attraction water intakes and trashracks at all the ladders exits, with a 0.4 feet maximum head on all picketed leads. Debris shall be removed when significant amounts accumulate.

7. Staff gauges and water level indicators will be readable at all water levels encountered during the fish passage period.

8. Main entrance weir depths: 8 feet or greater below tailwater. Weirs will be lowered to bottom when 8 feet depth is not possible.

North Fishway

9. North Fishway Entance: Operate both N-1 and N-2 entrances.

10. South Spillway Entrance: Operate both downstream entrances (S1 and S2).

Powerhouse

11. West Powerhouse Entrance: Operate at least one entrance located on outboard of array (W-1).

12. East Powerhouse Entrance: Operate all three entrances (E-1, E-2, E-3).

13. Operate 11 submerged orifices along the powerhouse collection system. Orifice numbers are: 3, 12, 24, 39, 57, 78, 102, 117, 129, 135, and 136.

14. The cul-de-sac entrance will remain closed to avoid fallout of upstream migrants.

Spillway Operations

15. The following spill schedule shall be followed during the spill period.

December 1 through February (Winter Operating Period)

16. Operate the powerhouse and south spillway adult fish passage facilities according to the fish passage period standards above except the system may be dewatered or operated out of criteria for repair and maintenance. Adjust the fish crowder to full open and pull picketed leads at counting station at the end of the counting season.

17. Operate the north spillway adult fish passage facilities according to the following criteria:

No spill period - operate entrance gate N-1, head attainable by ladder flow only, weir crest 6 feet below tailwater.
Spill period - operate entrance gate N-1, 1.0 foot head weir crests 8 feet below tailwater.
East ladder dewatered or operating out of fish passage period criteria - operate entrance gates N-1 and N-2, 1.0 foot head, weir crest 8 feet below tailwater.

18. Only one of the two fish facilities can be out of service at any one time except under extreme situations.

BASIC OPERATING STANDARDS
FOR
ADULT MIGRANT FISH PASSAGE FACILITIES
JOHN DAY DAM
FEBRUARY 1985

Prior to March 1 each year

1. Inspect all staff gauges and water level indicators, repair and/or clean where necessary.

2. Inspect dewatered sections of fish facilities for projections, debris or plugged orifices which could injure fish or slow their progress up the ladder. Repair deficiencies.

March 1 through November 30 (Fish Passage Period)

All Adult Fish Facilities

3. Water depth over fish ladder weirs: 1.2 (±0.1) feet

4. Head on all entrances: 1.2 to 1.7 feet (prefer 1.5). Refer to maintenance plan when unable to achieve head criteria.

5. A transportation velocity of 1.5 to 4.0 feet per second (prefer 2.0 f.p.s.) shall be maintained in all channels and the lower ends of the fish ladders which are below the tailwater.

6. Maximum of 0.6 feet head on attraction water intakes and trashracks at all the ladders exits, with a 0.4 feet maximum head on all picketed leads. Debris shall be removed when significant amounts of accumulate.

7. Staff gauges and water level indicators will be readable at all water levels encountered during the fish passage period.

8. Main entrance weir depths: 8 feet or greater below tailwater. Weirs fully lowered when 8 feet depth is not possible.

North Fishway

9. Operate two downstream gates (N1 & N2).

Powerhouse

10. Operate entrances NE-1 and NE-2.

11. Operate ten powerhouse floating orifices (numbers 1,2,3,6,9,12,15,17, 18,19).

12. Operate SE-1.

13. From 0400-2000 P.S.T. operate powerhouse turbine unit #1 near 100 megawatts (+10MW) to facilitate best entrance conditions, unless B.P.A. declares a power emergency.

Spillway Operations

14. The following spill schedule shall be followed during the spill period.

December 1 through February (Winter Operating Period)

All Adult Fish Facilities

15. Water depth over fish ladder weirs: 1.2 feet ($\pm$0.1).

16. Only one of the two fish facilities can be out of service at a time except under extreme situations.

17. Main entrance weir depths: 6 feet or greater below tailwater. Weirs fully lowered when 6 feet depth is not possible.

18. Pull picketed leads at counting stations and have crowders adjusted such that the counting slots are fully open at the end of the counting season.

19. Maximum of 0.6 foot head on attraction water intakes and trashracks at all ladder exits. Debris shall be removed when significant amounts of accumulate.

North Fishway

20. Operate gate N-1 with N-2 closed with a head of:

    a. No spill - that attainable by ladder flow and one auxiliary water pump.

    b. With spill - 1.0 foot

    c. South ladder dewatered or operating with no auxiliary water flow - 1.0 foot.

Powerhouse

21. Head on all entrances - 1.0 foot

22. Operate NE-2 with NE-1 closed.

23. Operate all ten floating orifices.

24. Operate SE-1

25. Whenever possible, turbine unit 1 shall be operated in the 100 megawatt range (+10 MW) to facilitate best entrance condition. However, if needed, the unit may be placed on load control for peaking purposes or carried on a stand-by status.

Spillway Operations

26. The following spill schedule shall be used during the spill period.

APPENDIX C
BASIC OPERATING STANDARDS
FOR
JUVENILE MIGRANT FISH PASSAGE FACILITIES
BONNEVILLE DAM
FEBRUARY 1985

First Powerhouse

Prior to March 1 each year

1. Remove debris from forebay, trashracks and gatewell slots.

2. Inspect vertical barrier screens for damage, holes, debris accumulations or protrusions. (video inspection acceptable) and repair when problem detected.

3. Inspect each Submersible Traveling Screen (STS) and operate on trial run (dogged off at deck level). By March 1, STS in each intake of operational units.

4. Inspect and, where necessary, clean and/or repair all gatewell orifices and orifice lighting systems.

5. Inspect and, where necessary, clean and/or repair dewatering screens and associated equipment.

6. Inspect and correct any deficiencies of DSM channel and conduit walls and floor.

March 1 through November 30

7. Remove debris from forebay and trashracks as required to maintain less than 1 foot of additional drawdown in gatewell or as indicated by fish condition (i.e., higher than expected descaling).

8. Inspect each STS and VBS a minimum of once every three months (video acceptable). Inspections should be concentrated on the priority units and those others with the longer operating time. More frequent inspections may be required under the following conditions: 1) deterioration of fish condition; 2) increased debris load in bypass system; and 3) other indications of STS or VBS malfunction or failure. If STS or VBS damage or plugging is detected follow procedures in Fish Facilities Maintenance Plan.

9. Operate all gatewell orifices. Inspect each daily to assure that the orifice valves are operating correctly. Backflush at least every day or more often if indicated by debris accumulations (Second powerhouse orifices with less than clear flow jet should be cleaned at least once per day).

10. Inspect each STS amp gauge readings at least once each shift. If an STS failure occurs follow procedures in Fish Facilities Maintenance Plan.

11. Inspect all gatewells daily and clean when gatewell water surface becomes fully covered to maintain clean orifices and minimize fish injury. After debarking a gatewell, backflush (First Powerhouse) or inspect and clean if necessary (Second Powerhouse) the orifice in that gatewell. Check gatewell drawdown.

12. Coordinate cleaning efforts with personnel operating downstream migrant sampling facilities.

13. Turbines should be operated at peak efficiency whenever practicable.

14. STS cycling operation may begin when the mean length of the majority of the juvenile salmonids passing the project reqches or exceeds 120 mm. This time will be determined by the fisheries agencies and Indian tribes. A cycling time of a maximum 20 minutes off and a minimum of 2 minutes on must be followed.

15. Inspect and maintain the predator control system.

16. During the period March 1 through April 15 turbine units without a full complement of STS may operate to meet load demands. Exceptions to this are:

a. The day of and four days following juvenile fish releases in the Bonneville pool unscreened units will not operate unless B.P.A. declares a power emergency. The release dates will be supplied to NPPOP-P-NR biologists by the Water Budget Center as soon as these dates are available. The release date must be received by the above biologists ten days prior to the release to facilitate necessary coordination to accomplish the unscreened unit shutdown.

b. Unscreened units will not operate when the 24 hour passage by Bonneville exceeds 30,000 juvenile salmon unless B.P.A. declares a power emergency.

Units without a full complement of STS will be the last ones to be brought on line to meet power demands and the first ones off line when the power demand has diminished.

17. During the period April 16 through August 30 turbine units without a full complement of STS will not operate except during the morning peak load hours or when B.P.A. declares a power emergency.

18. During the period August 30 through October 15 operate the same as the March 1 through April 15 period (#15).

19. During the period October 16 through November 30, turbine units without a full complement of STS may operate to meet load demands, with the addition

that up to one-half of each powerhouses STS may be removed for maintenance (Units required to pass the projected 24 hour average river flows will remain screened). Units without a full complement of STS will be the last ones to be brought on line to meet power demands and the first ones off line when power demand has diminished.

December 1 through February

20. All STS removed and D.S.M. channel dewatered (see Appendix E for dewatering procedures). D.S.M. channel will be dewatered throughout most of this period as STS must be stored beneath the intake deck which places the STS directly in front of the gatewell orifices. In addition, follow Bonneville criteria #13.

Second Powerhouse

Operating criteria will be subject to exception and modification for several years because of on-going fisheries research and facility evaluations.

Prior to March 1 each year

21. Same as First Powerhouse standards 1 through 6.

March 1 through November 30

22. Same as First Powerhouse criteria #'s 7 through 14.

23. Operate only turbine units 11, 17 and 18 for adult fish attraction. Operate additional units only as needed for fishery research, as needed by B.P.A. to avert a power emergency, or during morning peak load hours.

24. Maintain D.S.M. water surface at unit #18 orifices between elevations 64.5 - 65.0.

25. Maintain water surface on dewatering screen between elevations 60.8 - 61.2.

26. Maintain water surface in downwell between elevations 56.5 - 58.0.

December 1 through February

27. All STS removed. D.S.M. channel dewatered (see Appendix E for dewatering procedures) only when required for maintenance, the period of maintenance should be minimized to the extent practicable. Additionally all units are available to meet power demands and follow Bonneville standard #13 above.

BASIC OPERATING STANDARDS
FOR
JUVENILE MIGRANT FISH PASSAGE FACILITIES
THE DALLES DAM
FEBRUARY 1985

Prior to April 1 each year

1. Remove debris from forebay, trashracks and gatewell slots.

2. Inspect and, where necessary, clean gatewell orifices of debris.

3. Inspect, test and lube chain gates, end gates and hoists for operation as needed.

4. Inspect and correct any epoxy or concrete deficiencies on walls and floors of ice-trash sluice raceway.

April 1 through November 15 (Passage Period)

5. Clean trash racks when drawdown in gatewell slots reaches 1 foot over clean rack drawdown at full load on unit or as indicated by fish condition at Bonneville (i.e., higher than expected descaling).

6. Remove debris from forebay, when needed, and from gatewell slots when gatewell water surface over one-half covered.

7. Operate all gate slot orifices full time.

8. Either turbine unit 1 or unit 2 or both units should be operating during daylight hours (April 1 through June 30).

April 1 through June 30

9. Operate chain gates l_1, l_2, l_3 - at least 16 hours per day, sunrise to sunset, with full surface flow (lower or raise chain gates completely). During periods of system spill, chain gates may be operated continuously.

10. Operate end gate full open from sunrise to sunset.

11. During period when chain gates do not operate set top of bottom end gate at 142 elevation to create orifice plunge pool.

12. Once each week or more frequently if accumulations of debris are observed close gates l_1, l_2, l_3 and open gates 17_3, 18_1, 18_2 for two hours to flush out debris and fish being held in the sluiceway channel east of unit 1.

July 1 through November 15

13. Operate chain gates 17_3, 18_1, 18_2 - 16 hours per day (July 1 through August 31), and sunrise to sunset (September 1 through November 15) with full surface flow (lower or raise gates completely).

14. Operate end gate full open from sunrise to sunset.

15. During period when chain gates do not operate, set top of bottom end gate at 142 elevation to create orifice plunge pool.

General

16. During chain gate operation, maintain forebay level between elevation 158. - 160. to the extent practicable.

17. Maintain orifices clear or debris.

18. Inspect facilities once each shift.

19. Operate turbine units at peak efficiency whenever practicable.

November 1 through March 31

20. Maintain orifices clear of debris.

21. Set top of bottom end gate at 142 elevation to create orifice plunge pool.

BASIC OPERATING STANDARDS
FOR
JUVENILE MIGRANT FISH PASSAGE FACILITIES
JOHN DAY DAM
FEBRUARY 1985

Prior to April 1 each year

1. Remove debris from forebay, trashracks and gatewell slots.

2. Inspect all vertical barrier screens for damage, holes, debris accumulations or protrusions (video inspection acceptable) and repair when problem detected.

3. Inspect each Submersible Traveling Screen (STS) and operate on trial run (dogged off at deck level). By April 1, STS in each intake of operational units.

4. Inspect and, where necessary, clean and/or repair all gatewell orifices and orifice lighting systems.

5. Inspect, maintain and, where necessary, repair the D.S.M. conduit tainter gate.

6. Inspect and correct any deficiencies of walls and floor of D.S.M. conduit, raceway, and outfall.

April 1 through November 15

7. Remove debris from forebay and trashracks as required to maintain less than 1 foot of additional drawdown in gatewell or as indicated by fish condition (i.e., higher than expected descaling). The trashracks for at least units 1, 2, and 3 should be raked again before June 15. Raking should proceed to the north as long as substantial debris continues to be collected.

8. Inspect each STS and VBS a minimum of once every three months (video acceptable). Inspections should be concentrated on the priority units and those others with the longer operating time. More frequent inspections may be required under the following conditions: 1) deterioration of fish condition; 2) increased debris load in bypass system; and 3) other indications of STS or VBS malfunction or failure. If STS or VBS damage or plugging is detected follow procedures in Fish Facilities Maintenance Plan.

9. Operate all gatewell orifices. Inspect daily to assure that the orifice valves are operating correctly. Close and open each orifice every day or as indicated by debris accumulations in the gatewells.

10. Inspect each STS amp gauge readings at least once each shift. If an STS failure occurs follow procedures in Fish Facilities Maintenance Plan.

11. Inspect all gatewells daily and clean when water surface over one-half covered with debris. After cleaning a gatewell, close and open the orifice at that gatewell. Check gatewell drawdown. Each VBS should be cleaned within three weeks either side of July 1.

12. Coordinate cleaning efforts with personnel operating downstream migrant sampling facilities.

13. Turbines should be operated at peak efficiency whenever practicable.

14. STS cycling operation may begin when the mean length of the majority of juvenile salmonids passing the project reaches or exceeds 120 mm. This time will be determined by the fisheries agencies and Indian tribes. A cycling time of a maximum 20 minutes off and a minimum of 2 minutes on must be followed.

15. During the period April 1 through April 30 turbine units without a full complement of STS may operate to meet load demands. Exceptions to this are:

a. Six days following juvenile fish releases in the John Day pool unscreened units will not operate unless B.P.A. declares a power emergency. The release dates will be supplied to NPPOP-P-NR biologists by the Water Budget Center as soon as these dates are available. The release date must be received by the Corps biologist ten days prior to the release to facilitate necessary coordination to accomplish the unscreened unit shutdown.

b. Unscreened units will not operate when the 24 hour passage by John Day exceeds 30,000 juvenile salmon unless B.P.A. declares a power emergency.

Units without a full complement of STS will be the last ones to be brought on line to meet power demands and the first ones off line when the power demand diminishes.

16. During the period May 1 through August 30 turbine units without a full complement of STS will not operate except during the morning peak load hours or when B.P.A. declares a power emergency.

17. During the period September 1 through September 30 operate the same as the April 1 through April 30 period (#14).

18. During the period October 1 through November 15, turbine units without a full complement of STS may operate to meet load demands, with the addition that STS from up to six of the project's sixteen turbine units may be removed for maintenance (Units required to pass the projected 24 hour average river flow will remain screened). Units without a full complement of STS will be the last ones to brought on lint to meet power demands and the first ones off line when power demand has diminished.

November 16 through March 31

19. All STS removed. D.S.M. channel dewatered (see Appendix D for dewatering procedures) only when required for maintenance, the period of maintenance should be minimized to the extent practicable. In addition follow John Day standard #13 above.

APPENDIX D
DEWATERING PLANS

Adult Fish Ladder

Scheduled Maintenance (See Appendix A for coordination procedures)

1) When possible operate ladder to be dewatered at orifice flow for at least 24 hours but no more than 48 hours immediately prior to dewatering.

2) Discontinue all fishway auxiliary water supply at least 24 hours but more than 48 hours immediately prior to dewatering.

3) Corps biologist will assure that fish rescue equipment and adequate numbers of personnel will be available to move fish out of the dewatered ladder.

4) Project personnel will install head gates to shut down ladder flow. Where possible, a flow of 1-2 inches will be maintained in the ladder until fish are rescued.

5) At least one Corps biologist will immediately inspect the dewatered ladder and direct the rescue crews to the stranded fish. The ranking Corps biologist will make all decisions regarding fish safety and continue to oversee the rescue operation. The rescue personnel will then walk the inside of the ladder from the head gates down to tailwater salvaging all fish either by moving fish to tailwater within the ladder flow or capturing and placing the fish in a large water filled tank which is then transported to the forebay or tailwater, whichever is closest, for release.

Unscheduled Maintenance (See Appendix A for coordination procedures)

1) When possible, discontinue fishway auxiliary water and operate ladder at orifice flow as long as possible (prefer 3-24 hours) prior to dewatering.

2) Follow steps 3-5 above.

Scheduled Maintenance (See Appendix A for coordination procedures)

1) During the pumping or draining operation to dewater a portion or all of the collection channel, the water level will not be allowed to drop to a level which strands fish.

2) Corps biologists will assure that rescue equipment is available if needed.

3) The ranking Corps biologist will make all decisions regarding fish safety and direct any necessary rescue operation.

Turbines (Applies to Bonneville, The Dalles and John Day Dams Only)

1) When possible, place tail logs immediately after turbine unit is shut down if draft tube is to be dewatered.

2) If turbine unit draft tube is to be dewatered and turbine unit has been idle for longer than three hours it will be operated when possible, at "speed/no load" for 5 minutes and stop logs will then be placed immediately.

3) Water levels in the draft tube will not be allowed to drop to a level which strands fish.

4) Corps biologists will be on site to inspect dewatered turbine draft tubes and intakes as soon as the water levels reach a depth permitting visual inspection and the hatch cover is opened.

5) Corps biologists will assure that rescue equipment is available if needed.

6) The ranking Corps biologist will make all decisions regarding fish safety and direct any necessary rescue operation.

APPENDIX E

TURBINES USED AT NPP COLUMBIA RIVER
PROJECTS FOR FISH*

Project	Turbine	Dates Required	Remarks
Bonneville	1,2	1 March - 30 November	Used for adult fish attraction to gate 1 and provide flows for juvenile outfall (ice-trash sluiceway) during the interim bypass operation.
	9,10	1 March - 30 November	Used for adult fish attraction to gate 65 and provides flows for the Bradford Island juvenile transportation release site and juvenile bypass outlet.
	11	1 March - 30 November	Used for adult fish attraction to the second powerhouse upstream and downstream shore fishway entrances.
	17,18	1 March - 30 November	Used for adult fish attraction to the second powerhouse upstream and downstream north shore fishway entrances and provides flows for the juvenile bypass outlet.
John Day	1	1 March - 30 November	Used for adult fish attraction to SE 1 and orifice gate 1.

* Overhauls and other planned outages (longer than 1 day) of these units (a maximum of two units per year) will occur during low juvenile and adult fish passage periods (October 15 to March 1) unless specially coordinated.

DEPARTMENT OF THE ARMY
WALLA WALLA DISTRICT, CORPS OF ENGINEERS
BUILDING 602, CITY-COUNTY AIRPORT
WALLA WALLA, WASHINGTON 99362 - 9265

REPLY TO
ATTENTION OF

NPWOP-RM

12 February 1985

SUBJECT: District Operations and Maintenance Criteria for Project Fish Passage Facilities

Commander, North Pacific Division
Attention: NPDPL-ER

1. Reference NPDPL-ER letter dated 2 January 1985, subject as above.

2. Inclosed is Walla Walla District's Fish Facility Maintenance Plan with updated 1985 operating criteria. All differences in our criteria and those recommended by the fishery agencies and tribes have been resolved. Appendix E, Fish Transport Oversight Team's 1985 Annual Work Plan, will be added when it is finalized.

3. If you have any questions please contact Mr. Dave Hurson, FTS 434-6710.

FOR THE COMMANDER:

Paul F Winborg

PAUL F. WINBORG
Chief, Operations Division

Incl a/s

WALLA WALLA DISTRICT

FISH FACILITY MAINTENANCE PLANS

I. McNary Dam

A. Adult Fish Passage Facilities.

1. Facilities Description: The adult fish passage facilities at McNary are comprised of separate north and south shore facilities. The north shore facilities are made up of a fish ladder with counting station, a small collection system, and a gravity-flow auxiliary water supply system. The collection system has three downstream entrances and a side entrance into the spillway basin. Two of the downstream entrances are used during normal operation. The gravity-flow auxiliary water supply system takes water from the forebay through a series of conduits and distributes it through diffusers at the bottom of the ladder and in the transportation channel. There are four main conduits numbered 1 to 4, with conduits 1 and 4 providing the required flow. Conduits 2 and 3 were sealed off when the fishlock was deactivated and are not available for use. The south shore facilities are comprised of a fish ladder with counting station, two south shore entrances, a powerhouse collection system, and gravity and pumped auxiliary water supply systems. The powerhouse collection system contains three downstream and one side entrance into the spillway basin at the north end of the powerhouse, thirty floating orifices located across the powerhouse, and a common transportation channel for all of the entrances. At the north end of the powerhouse, two of the downstream entrances are used during normal operation with the other downstream and side entrances closed. The gravity-flow auxiliary water is provided by one conduit from

the forebay and supplies the diffusers at the bottom of the ladder at tailwater level. The pumped auxiliary water is supplied by three electric pumps with variable-pitched blades. Two pumps are capable of providing the required flow, but all three pumps are normally operated at reduced output per pump. The electric pumps supply the auxiliary water for the diffusers at the entrances and in the transportation channel.

2. Fish Passage Season: 1 March through 31 December operate according to criteria in Appendix C.

3. Scheduled Maintenance: Scheduled maintenance of a facility which must be unwatered to work on or whose maintenance will have a significant effect on fish passage will be done during the winter maintenance period from 1 January to 1 March. Maintenance of facilities which will not effect fish passage may be conducted during the rest of the year. Maintenance is normally conducted on one fish ladder at a time during the winter to provide some fish passage at the project at all times. Appendix B contains the scheduled maintenance that is normally conducted each year. When facilities are not being maintained during the winter maintenance period, they will be operated according to the criteria in Appendix C unless otherwise coordinated with the fishery agencies and tribes.

4. Unscheduled Maintenance: Unscheduled maintenance which will significantly effect the operation of a facility will be coordinated with the fishery agencies and tribes (see Appendix A for coordination procedures). If part of a facility malfunctions or is damaged during the fish passage season and the facility can still be operated within criteria

without any detrimental effects on fish passage, repairs may not be conducted until the winter maintenance period or until fewer numbers of fish are passing the project so there will be less impact of it being unwatered or taken out of service. If part of a facility is damaged or malfunctions that may significantly impact fish passage, it will be repaired as soon as possible.

(a) Fish ladders and counting stations. The fish ladders contain tilting weirs, fixed weirs, counting stations with picketed leads, and fish exits with trash racks. If any part of the fish ladder fails or is blocked with debris during the fish passage season, efforts will first be made to correct it without unwatering the ladder. Trash racks, picketed leads, tilting weir mechanisms, and counting stations can sometimes be repaired or maintained without unwatering the ladder. The decision on whether to unwater the ladder and make repairs during the fish passage season or wait until the winter maintenance period will be made after consultation with the fishery agencies and tribes.

(b) North Shore Auxiliary Water Supply System: During normal operation, conduits 1 and 4 are operated along with entrance weirs WFE2 and WFE3. Conduit #4 feeds diffusers 1 through 4 and conduit #1 feeds diffusers 5 through 12. Each diffuser has two or more rotovalves which control the amount of water going into a diffuser. If a rotovalve fails, the closest rotovalve that is closed will be opened to provide the required flow. If more rotovalves fail than there are closed valves and it is not possible to operate the entrances within criteria, WFE2 weircrest will be raised at one-foot increments to maintain the required 1.0 to 1.5 head differential.

If this is not possible by the time the weir reaches 4 feet below tailwater, the entrance will be closed. If one conduit fails, WFE2 will be closed and WFE3 will be operated as deep as possible to maintain the 1.0 to 1.5 feet head differential. If it is not possible to maintain the head differential at a depth of 6 feet or greater, the weir will be maintained at 6 feet regardless of the head. If both conduits fail, WFE 2 will be closed and WFE3 operated at a depth of 6 feet until repairs can be made.

(c) South Shore Auxiliary Water Supply System: The south shore auxiliary water is made up of a combination of gravity flow from the forebay and pumped water from the tailrace. The gravity flow supplies the diffusers above weir 253 (diffusers 7 through 14) and the pumps supply the diffusers below weir 253 (diffusers 1 through 7 and the main unit diffusers). Diffuser 7 is where both systems meet and is supplied by either gravity flow or pumped flow. The gravity flow diffusers are regulated by rotovalves and the pumped flow diffusers by sluicegates. If a rotovalve fails, the nearest closed rotovalve will be opened to supply the flow. If more rotovalves fail than there are closed valves the sluicegates in diffusers 3 through 7 will be opened more to provide the required transportation flows. If any sluicegates fail, the sluicegates nearest it will be opened further to make up the water. If one pump fails, the other two pumps will be adjusted to pump additional water to keep the facilities within criteria. If two pumps fail, SFE2 and NFE3 will be closed and SFE1 and NFE2 will be operated as deep as possible to maintain the 1.0 to 1.5-foot head differential. If all three pumps fail, the powerhouse transportation channel will be bulkheaded off at the junction pool and SFE1

and SFE2 operated a deep as possible and to maintain the 1.0 to 1.5 head differential. If a depth of 6 feet on both gates cannot be maintained, SFE2 will be closed. If the gravity flow and pumped auxiliary water supply systems both fail, the powerhouse transportation channel will be bulkheaded off at the junction pool, SFE2 closed, and SFE1 operated at 6 feet below tailwater until repairs can be made.

(d) Fishway Entrances: The fishway entrances are made up of main entrance weirs with hoists and automatic controls, and floating orifices which regulate themselves with tailwater fluctuations. If any of the automatic controls malfunction the weirs can usually be operated manually by project personnel and kept within criteria. If there is a further failure which prevents the entrance from being operated manually, the entrance may be lowered down and left in an operating position or an alternate entrance opened until repairs can be made. If a floating orifice fails, it will be pulled out of the water and replaced with a spare floating orifice.

B. Juvenile Fish Facilities.

1. Facilities Description: The juvenile facilities at McNary dam are made up of traveling screens, gatewell orifices, bypass flume, and collection and transportation facilities. The collection and transportation facilities include an upwell and separator structure, raceways, distribution system for distributing the fish among the raceways, a sampling and marking building, truck and barge loading facilities, and associated water supply lines.

2. Fish Passage Season: 1 April to end of transport and bypass season operate according to criteria in Appendix D and the Fish Transportation Oversight Team's (FTOT) Annual Work Plan (Appendix E).

3. Scheduled Maintenance: Scheduled maintenance of the juvenile facilities is conducted during the entire year as listed in Appendix B, Fish Facility Scheduled Maintenance. Long-term maintenance or modification of facilities which require them to be out of service for extended periods of time are conducted during the winter maintenance period from 1 November to 31 March. During the fish passage season, parts of the facilities are maintained on a daily, weekly, or longer interval to keep them in proper operating condition.

4. Unscheduled Maintenance: Unscheduled maintenance which will have a significant impact on juvenile fish passage should be coordinated with the fishery agencies and tribes. Maintenance of facilities such as traveling screens, which sometimes break down during the fish passage season, will be carried out according to the FTOT annual plan (Appendix E). In these cases, repairs will be made as prescribed and the fishery agencies and tribes notified through established channels agreed to in the plan. Other unscheduled maintenance will be coordinated as per Appendix A.

(a) Traveling screens: Traveling screens are inspected periodically throughout the juvenile migration season with a video monitoring system and once each work shift by the powerhouse operators. If a screen is found to be damaged or malfunctions at any time, measures will be taken in accordance with the FTOT Annual Work Plan (Appendix E).

(b) Gatewell orifices and bypass flume: Each gatewell has two orifices with valves to allow fish to exit the gatewell. Under normal operation, one orifice per gatewell is operated in accordance with Appendix D. If an orifice becomes blocked with debris or is damaged, it will be closed and the alternate orifice for that gatewell operated until repairs can be made. The bypass flume is operated to transport juveniles to the collection facility or the overflow screens can be pulled to bypass them into the ice and trash sluiceway which enters the tailrace by turbine unit 14. If there are any problems with the flume, efforts will first be made to repair it without dewatering. If that is not possible, the flume will be dewatered and repaired as soon as possible. Traveling screens will remain in operation and the juveniles allowed to accumulate in the gatewells for up to two days. If repairs are to take longer than two days, a salvage program will be initiated to dipnet the juveniles from the gatewells until repairs are made and the system watered up again.

(c) Collection and Transportation Facilities: The collection facilities can be operated to either collect and hold juveniles for the transportation program or to bypass them back into the river through the ice and trash sluiceway. If part of the facility malfunctions or is damaged, efforts will first be made to bypass the fish around the damaged area. If this is not possible, the overflow screens in the bypass flume will be pulled to bypass fish directly into the ice and trash sluiceway and around the collection facilities or the entire bypass and collection system may need to be dewatered to allow repairs to be made.

II. Ice Harbor Dam.

A. Adult Fish Passage Facilities.

1. Facilities Description: The adult fish passage facilities at Ice Harbor are made up of separate north and south shore facilities. The north shore facilities include a fish ladder with counting station, a small collection system, and a pumped auxiliary water supply system. The collection system includes two downstream entrances and one side entrance into the spillway basin. In normal operation one downstream entrance is used and the other two entrances are closed. The auxiliary water is supplied by three electric pumps with either two or three pumps being operated at any one time, depending on tailwater. The south shore facilities are comprised of a fish ladder with counting station, two south shore entrances, a powerhouse collection system, and a pumped auxiliary water supply system. The powerhouse collection system includes two downstream entrances and one side entrance into the spillway basin at the north end of the powerhouse, twelve floating orifices, and a common transportation channel. One of the downstream north powerhouse entrances and seven of the floating orifices are used during normal operation. At the south shore entrances, one entrance is normally used. The auxiliary water is supplied by eight electric pumps of which from five to seven are normally used to provide the required flows.

2. Fish Passage Season: 1 March to 31 December operate according to criteria in Appendix C.

3. Scheduled Maintenance: Scheduled maintenance of a facility which must be unwatered to work on or whose maintenance will have a significant effect of fish passage will be done during the winter maintenance

period from 1 January to 1 March. Maintenance of facilities which will not effect fish passage may be conducted during the rest of the year. Maintenance is normally conducted on one fish ladder at a time during the winter to provide some fish passage past the project at all times. Appendix B contains the scheduled maintenance that is normally conducted each year. When facilities are not being maintained during the winter maintenance period, they will be operated according to the criteria in Appendix C unless coordinated otherwise with the fishery agencies and tribes.

4. Unscheduled Maintenance: Unscheduled maintenance which will significantly effect the operation of a facility will be coordinated with the fishery agencies and tribes (see Appendix A for coordination procedures). If part of a facility malfunctions or is damaged during the fish passage season and the facility can still be operated within criteria without any detrimental effects on fish passage, repairs may not be conducted until the winter maintenance period or until fewer numbers of fish are passing the project. If part of a facility is damaged or malfunctions that may significantly impact fish passage, it will be repaired as soon as possible.

(a) Fish Ladders and Counting Stations: The fish ladders contain fixed weirs, counting stations with picketed leads, and fish exits with trash racks. If any part of the ladder fails or is blocked with debris during the fish passage season, efforts will first be made to correct it without unwatering the ladder. Trash racks, picketed leads, and counting stations can sometimes be repaired or maintained without unwatering the ladder. The decision on whether to dewater the ladder and make

repairs during the fish passage season or wait until the winter maintenance period will be made after consultation with the fishery agencies and tribes.

(b) North Shore Auxiliary Water Supply System: The north shore facilities contain three electric pumps which provide auxiliary water to the diffusers at the bottom of the ladder and at the entrances. During normal operation two or three pumps are required, depending on the tailwater elevation, to provide the necessary auxiliary water. If a pump fails during a two-pump operation, the pump on standby will be operated to provide the necessary flows. If a pump fails during a three-pump operation, NEW1 will be raised until the required 1.0 to 1.5-foot head differential is acheived. If this cannot be met by the time the weir reaches 6 feet below tailwater, the gate will remain at that level regardless of the head. If two or all three pumps fail, the weir will be maintained at a level of 6 feet below tailwater until repairs are made.

(c) South Shore Auxiliary Water Supply System: The south shore auxiliary water is supplied by eight electric pumps. Fluctuating tailwater levels require from five to seven pumps to be operated to provide the auxiliary water. If one pump fails, a standby pump will be started to keep the fishway within criteria. If more pumps fail, this procedure will continue until all the standby pumps are in operation. If criteria cannot be met, the floating orifices should be closed in the following order: OG-12, OG-10, OG-8, and OG-6. If the required head differential of 1.0 to 1.5 feet cannot be reached when the floating orifices are closed, SSE 1 and NFE 2 will be closed equally at one-foot intervals until it is reached or until the weirs are 5 feet below tailwater. Then the remaining floating

orifices should be closed in the following order: OG-4, OG-1, and OG-2. If there is still not enough auxiliary water to maintain the head differential on the two main entrances, NFE 2 will be closed, the transportation channel bulkheaded off at the junction pool, and SSE 1 operated as deep as possible to maintain the head differential. If it cannot be maintained at a depth of 6 feet or greater, the weir will remain at 6 feet regardless of the head.

(d) Fishway Entrances: The fishway entrances are made up of main entrance weirs with hoists and automatic controls, and floating orifices which regulate themselves with tailwater fluctuations. If any of the automatic controls malfunction, the weirs can usually be operated manually by project personnel and kept within criteria. If there is a further failure which prevents the entrance from being operated manually, an alternate entrance will be opened until repairs can be made. If a floating orifice fails, it will be pulled out of the water and the entrance bulkheaded off until the floating orifice is repaired.

B. Juvenile Fish Passage Facilities.

1. Facilities Description: The juvenile passage facilities at Ice Harbor consist of 6-inch orifices drilled through the concrete leading from the gatewells to the ice and trash sluiceway, and electric hoists attached to the A-slot gates of the ice and trash sluiceway to allow operation of the sluiceway as a surface bypass system.

2. Fish Passage Season: 1 April to one week later than Lower Granite transport and bypass season operate according to criteria in Appendix D.

3. Scheduled Maintenance: Scheduled maintenance of the juvenile facilities is conducted during the non-fish passage season from the end of the bypass season (approximately 1 September) to 31 March as listed in Appendix B. Long-term maintenance or modifications to the facilities which require them to be out of service are done during this time period. During the fish passage season, the facilities are inspected on a daily basis to insure that they are operating correctly.

4. Unscheduled maintenance: Unscheduled maintenance which will have a significant effect on fish passage will be coordinated with the fishery agencies and tribes as per Appendix A. If orifices become blocked with debris, they will be cleared by project personnel as soon as possible. If a sluiceway gate hoists fails, the gate will be closed and an alternate gate opened until repairs can be made.

III. Lower Monumental Dam

A. Adult Fish Passage Facilities.

1. Facilities Description: The adult fish passage facilities at Lower Monumental are comprised of north and south shore fish ladders and collection systems with a common auxiliary water supply. The north shore fish ladder connects to two north shore entrances and the powerhouse collection system. The powerhouse collection system has two downstream and one side entrance into the spillway basin at the south end of the powerhouse, ten floating orifices, and a common transportation channel. The two north shore entrances, two downstream south powerhouse entrances, and five of the floating orifices are used during normal operation. The south shore fish ladder has two downstream entrances and a side entrance into the spillway basin. The two downstream entrances are used during normal operation. The auxiliary water is supplied by three turbine-driven pumps located in the powerhouse on the north side of the river. The water is pumped into a supply conduit which travels under the powerhouse collection channel, distributing water to the powerhouse diffusers, and under the spillway to the diffusers in the south shore collection system.

2. Fish Passage Season: 1 March through 31 December operate according to criteria in Appendix C.

3. Scheduled Maintenance: Scheduled maintenance of a facility which must be unwatered to work on or whose maintenance will have a significant effect on fish passage will be done during the winter maintenance period from 1 January to 1 March. Maintenance of facilities which will not have a significant effect on fish passage may be conducted during the rest of the

year. Fishway auxiliary water supply pumps require monthly, semi-annual, and annual maintenance. Monthly maintenance requires a one-day outage per pump, semi-annual maintenance requires a two-day outage per pump in July, and annual maintenance requires a two-week outage per pump during the winter maintenance period. Maintenance is normally conducted on one fish ladder at a time during the winter to provide some fish passage at the project at all times. Appendix B contains the scheduled maintenance that is normally conducted each year. When facilities are not being maintained during the winter maintenance period, they will be operated according to the criteria in Appendix C unless otherwise coordinated with the fishery agencies and tribes.

4. Unscheduled Maintenance: Unscheduled maintenance which will significantly effect the operation of a facility will be coordinated with the fishery agencies and tribes (see Appendix A for coordination procedures). If part of a facility malfunctions or is damaged during the fish passage season and the facility can still be operated within criteria without any detrimental effects on fish passage, repairs may not be conducted until the winter maintenance period or until fewer numbers of fish are passing the project. If part of a facility is damaged or malfunctions that may significantly impact fish passage, it will be repaired as soon as possible.

(a) Fish Ladders and Counting Stations: The fish ladders contain fixed weirs, counting stations with picketed leads, and fish exits with trash racks. If any part of the ladder fails or is blocked with debris during the fish passage season, efforts will first be made to

correct it without unwatering the ladder. Trash racks, picketed leads, and counting stations can sometimes be repaired or maintained without unwatering the ladder. The decision on whether to dewater the ladder and make repairs during the fish passage season or wait until the winter maintenance period will be made after consultation with the fishery agencies and tribes.

(b) Auxiliary Water Supply System: The auxiliary water for the fish ladders and the collection systems is supplied by three turbine-driven pumps on the north shore with all three pumps being required for normal operation. If one, two, or all three pumps fail, the fishway will be adjusted in the following manner until repairs can be made: SPE 2 and SSE 2 will be closed and SPE 1 raised to provide the required 1.0 to 1.5 foot head differential in the system. If the desired head differential cannot be reached by the time SPE 1 reaches 5 feet below tailwater, the floating orifices should be closed starting at OG-9 and working north across the powerhouse. If the head differential still cannot be maintained when all the floating orifices are closed, SPE 1 should be closed, the collection channel bulkheaded off at the junction pool, and NSE 1 and 2 and SSE 1 operated as deep as possible to maintain the head. If it cannot be maintained at a depth greater than 6 feet, the weirs should be maintained at 6 feet regardless of the head differential.

(c) Fishway Entrances: The fishway entrances are made up of main entrance weirs with hoists and automatic controls, and floating orifices which regulate themselves with tailwater fluctuations. If any of the automatic controls malfunction, the weirs can be operated manually by project personnel and kept within criteria. If there is a further failure

which prevents an entrance from being operated manually. The weirs can usually be left in a lowered position while repairs are being conducted or the entrance closed and the water redistributed to other entrances while repairs are made. If a floating orifice is damaged, it will be pulled out of the water and the entrance bulkheaded off until it is repaired.

B. Juvenile Fish Passage Facilities.

1. Facilities Description: The juvenile facilities at Lower Monumental consist of an imbedded pipe running the length of the powerhouse from turbine unit 1 to unit 6 and then dropping down to the tailrace deck, releasing the fish downstream of turbine unit 6. Each gatewell slot contains one orifice to allow fish to move from the gatewell into the bypass pipe.

2. Fish Passage Season: 1 April to one week later than Lower Granite transport and bypass season operate according to criteria in Appendix D.

3. Scheduled Maintenance: Scheduled maintenance of the juvenile facilities is conducted during the non-fish passage season from the end of the bypass season (approximately 1 September) to 31 March as listed in Appendix B. Long-term maintenance or modifications to the facilities which require them to be out of service are done during this time period. During the fish passage season, the facilities are inspected on a daily basis to insure that they are operating correctly.

4. Unscheduled Maintenance: Unscheduled maintenance which will have a significant effect of fish passage will be coordinated with the fishery agencies and tribes as per Appendix A. During daily inspections, gatewell slots are monitored for debris buildup and are cleaned when it

accumulates to prevent the orifices from becoming blocked. The bypass pipe should be routinely closed twice per week and blown back with air to clear any blocked orifice. If the orifices or the bypass pipe appear to be blocked with debris they will be cleaned by project personnel as soon as possible.

IV. Little Goose Dam

A. Adult Fish Passage Facilities

1. Facilities Description: The adult fish passage facilities at Little Goose are made up of one fish ladder on the south shore, two south shore entrances, a powerhouse collection system, north shore entrances with a transportation channel underneath the spillway to the powerhouse collection system, and auxiliary water supply system. The powerhouse collection system is comprised of ten floating orifices, two downstream entrances and one side entrance into the spillway basin on the north end of the powerhouse, and a common transportation channel. Four of the floating orifices and the two downstream entrances at the north end of the collection system are normally used. The north shore entrances are made up of two downstream facing entrances and a side entrance into the spillway basin with the two downstream entrances normally used. The auxiliary water is supplied by three turbine-driven pumps that pump water from the tailrace into the distribution system for the diffusers.

2. Fish Passage Season: 1 March through 31 December operate according to criteria in Appendix C.

3. Scheduled Maintenance: Scheduled annual maintenance of a facility which must be unwatered to work on or whose maintenance will have a significant effect on fish pasage will be done during the winter maintenance period from 1 January to 1 March. Maintenance of facilities which will not have a significant effect on fish passage may be conducted during the rest of the year. Fishway auxiliary water supply pumps require monthly, semi-annual, and annual maintenance. Monthly maintenance requires

a one-day outage per pump, semi-annual maintenance requires a two-day outage per pump in July, and annual maintenance requires a two-week outage per pump during the winter maintenance period. Appendix B contains the scheduled maintenance that is normally conducted each year. When facilities are not being maintained during the winter maintenance period, they will be operated according to the criteria in Appendix C unless otherwise coordinated with the fishery agencies and tribes.

4. Unscheduled Maintenance: Unscheduled maintenance which will significantly effect the operation of a facility will be coordinated with the fishery agencies and tribes as per Appendix A. If part of a facility malfunctions or is damaged during the fish passage season and the facility can still be operated within criteria without any detrimental effects on fish passage, repairs may not be conducted until the winter maintenance period or until fewer numbers of fish are passing the project. If part of a facility is damaged or malfunctions that may significantly impact fish passage, it will be repaired as soon as possible.

(a) Fishladder and Counting Station: The fishladder contains fixed weirs, a counting station with picketed leads, and a fish exit with trashrack. If any part of the ladder fails or is blocked with debris during the fish passage season, efforts will first be made to correct it without unwatering the ladder. Trash racks, picketed leads, and counting stations can sometimes be repaired or maintained without unwatering the ladder. The decision to dewater the ladder and make repairs during the fish passage season or wait until the winter maintenance period will be made after consultation with the fishery agencies and tribes.

(b) Auxiliary Water Supply System: The auxiliary water for the fish ladder and the powerhouse collection system is supplied by three turbine-driven pumps on the south shore with all three pumps being required for normal operation. If one, two, or all three pumps fail, the fishway will be adjusted down in the following manner to get the best fish passage conditions possible until repairs can be made: First, NSE 2 and NPE 2 should be closed and NPE 1 operated to provide the required 1.0 to 1.7-foot head differential. If the desired head differential cannot be maintained at a depth of 5 feet or greater, then NSE 1 should be raised until a depth of 5 feet below tailwater is reached. If the head differential cannot be maintained at this point, floating orifices OG-6 and OG-4 should be closed and SSE 1 and 2 should be raised at one-foot increments until 6 feet below tailwater is reached. If the head differential still cannot be maintained, the transportation channel to the north shore should be bulkheaded off at the end of the powerhouse collection channel. Next, OG-10 and OG-1 should be closed followed by NPE 1 and the powerhouse collection channel bulkheaded off at the junction pool. SSE 1 and 2 should then be operated as deep as possible to maintain the head, but not shallower than 6 feet regardless of the head.

(c) Fishway Entrances: The fishway entrances are made up of main entrance weirs with hoists and automatic controls, and floating orifices which regulate themselves with tailwater level. If any of the automatic controls malfunction, the weirs can be operated manually by project personnel and kept within criteria. If there is a further failure which prevents an entrance from being operated manually. The weirs can usually

be left in a lowered position while repairs are being conducted or the entrance closed and the water redistributed to other entrances while repairs are made. If a floating orifice is damaged, it will be pulled out of the water and the entrance bulkheaded off until it is repaired.

B. Juvenile Fish Passage Facilities

1. Facilities Description: Little Goose's juvenile facilities consist of a bypass system and a juvenile collection system. The bypass system contains traveling screens, gatewell orifices, a bypass channel running the length of the powerhouse, and a hopper and bypass pipe to transport the fish to the collection facilities or to the river. The collection facilities include an upwell and separator structure, raceways for holding fish, a distribution system for distributing the fish among the raceways, a sampling building, truck and barge loading facilities, and associated water supply lines.

2. Fish Passage Season: 1 April to end of transport and bypass season operate according to criteria in Appendix D and the Fish Transportation Oversight Team's (FTOT) Annual Work Plan (Appendix E).

3. Scheduled Maintenance: Scheduled maintenance of the juvenile facilities is conducted during the entire year as listed in Appendix B, Fish Facility Scheduled Maintenance. Long-term maintenance or modification of facilities which requires them to be out of service for extended periods of time are conducted during the winter maintenance period from the end of the bypass season (approximately 1 September) to 31 March. During the fish passage season parts of the facilities are maintained on a daily, weekly, or longer interval to keep them in proper operating condition.

4. Unscheduled Maintenance: Unscheduled maintenance which will have a significant impact on juvenile fish passage should be coordinated with the fishery agencies and tribes. Maintenance of facilities such as traveling screens, which some-times break down during the fish passage season, will be carried out according to the FTOT Annual Work Plan (Appendix E). In these cases, repairs will be made as prescribed and the fishery agencies and tribes notified through established channels agreed to in the plan. Other unscheduled maintenance will be coordinated as per Appendix A.

(a) Traveling Screens: Traveling screens are inspected periodically throughout the juvenile migration season with a video monitoring system and once each day by the resources personnel. If a screen is found to be damaged or malfunctions at any time, measures will be taken in accordance with the FTOT Annual Work Plan (Appendix E).

(b) Gatewell Orifices: Each gatewell has two orifices with valves to allow fish to exit the gatewell. Under normal operation, one orifice per gatewell is operated in accordance with Appendix D. If an orifice becomes blocked with debris or is damaged, it will be closed and the alternate orifice for that gatewell operated until repairs can be made.

(c) Hopper and Bypass Pipe: The hopper and bypass pipe are attached to the outside of the powerhouse at the end of the powerhouse juvenile bypass channel. All juvenile fish in the bypass system must pass through these to the collection facilities or to the tailrace. If any part of the hopper or bypass pipe is damaged, the gatewell orifices will be closed and the bypass system unwatered until repairs can be made. Traveling screens will remain in operation and the juveniles allowed to accumulate in

the gatewells for up to two days. If repairs are to take longer than two days, a salvage program will be initiated to dipnet the juveniles from the gatewells until repairs are made and the system watered up again.

(d) Collection Facilities: The collection facilities can be operated to either collect and hold juveniles for the transportation program or to bypass them back to the river. If part of the facility malfunctions or is damaged, efforts will first be made to bypass the fish around the damaged area. If this is not possible, the fish will be bypassed around the collection facilities or the entire bypass system unwatered to allow repairs to be made.

IV. Lower Granite Dam

A. Adult Fish Passage Facilities

1. Facilities Description: The adult fish passage facilities at Lower Granite are made up of one fish ladder on the south shore, two south shore entrances, a powerhouse collection system, north shore entrances with a transportation channel underneath the spillway to the powerhouse collection system, and an auxiliary water supply system. The powerhouse collection system is comprised of ten floating orifices, two downstream entrances and one side entrance into the spillway basin on the north end of the powerhouse, and a common transportation channel. Four of the floating orifices and the two downstream entrances at the north end of the collection system are normally used. The north shore entrances are made up of two downstream entrances and a side entrance into the spillway basin with the two downsteam entrances normally used. The auxiliary water is supplied by three electric pumps that pump water from the tailrace to the diffusers with two pumps normally used to provide the required flows.

2. Fish Passage Season: 1 March through 31 December operate according to criteria in Appendix C.

3. Scheduled Maintenance: Scheduled maintenance of a facility which must be unwatered to work on or whose maintenance will have a significant effect on fish passage will be done during the winter maintenance period from 1 January to 1 March. Maintenance of facilities which will not effect fish passage may be conducted during the rest of the year. Appendix B contains the scheduled maintenance that is normally conducted each year. When facilities are not being maintained during the winter maintenance

period, they will be operated according to the criteria in Appendix C unless otherwise coordinated with the fishery agencies and tribes.

4. Unscheduled Maintenance: Unscheduled maintenance which will significantly effect the operation of a facility will be coordinated with the fishery agencies and tribes as per Appendix A. If part of a facility malfunctions or is damaged during the fish passage season and the facility can still be operated within criteria without any detrimental effects on fish passage, repairs may not be conducted until the winter maintenance period or until fewer numbers of fish are passing the project. If part of a facility is damaged or malfunctions that may significantly impact fish passage, it will be repaired as soon as possible.

(a) Fishladder and Counting Station: The fishladder contains fixed weirs, a counting station with picketed leads, an adult fish trap located in an offshoot from the ladder, and a fish exit with trashrack. If any part of the ladder fails or is blocked with debris during the fish passage season, efforts will first be made to correct it without unwatering the ladder. Trash racks, picketed leads, and counting stations can sometimes be repaired or maintained without unwatering the ladder. If the fish trap malfunctions or is damaged, fish may be passed around it until repairs are made. The decision to dewater the ladder and make repairs during the fish passage season or wait until the winter maintenance period will be made after consultation with the fishery agencies and tribes.

(b) Auxiliary water supply system: The auxiliary water for the fish ladder and the powerhouse collection system is supplied by three electric pumps. During normal operations and most flow conditions, two

pumps are capable of providing the required flows. If a pump fails during flows. If two pumps fail, NSE 2 and NPE 2 will be closed and NPE 1 raised in one-foot increments to provide the required 1.0 to 1.7-foot head differential. If the head cannot be maintained by the time the top of the weir reaches 5 feet, the floating orifices should be closed in the following order: OG-4, OG-7, OG-10, and OG-1. If the head in the system still cannot be maintained at this point, SSE 1 and SSE 2 should be raised in one-foot increments until 5 feet below tailwater is reached. If all three pumps fail, NSE 1 and NPE 1 should be closed, the powerhouse collection channel bulkheaded off at the junction pool, and SSE 1 and SSE 2 operated at 6 feet below tailwater regardless of the head.

(c) Fishway Entrances: The fishway entrances are made up of main entrance weirs with hoists and automatic controls, and floating orifices which regulate themselves with tailwater level. If any of the automatic controls malfunction, the weirs can be operated manually by project personnel and kept within criteria. If there is a further failure which prevents an entrance from being operated manually. The weirs can usually be left in a lowered position while repairs are being conducted or the entrance closed and the water redistributed to other entrances while repairs are made. If a floating orifice is damaged, it will be pulled out of the water and the entrance bulkheaded off until it is repaired.

B. Juvenile Fish Passage Facilities.

1. Facilities Description: Lower Granite's juvenile facilities consist of a bypass system and a juvenile collection system. The bypass

system contains traveling screens, gatewell orifices, a bypass channel running the length of the powerhouse, and a bypass pipe to transport the fish to the collection facilities or to the river. The collection facilities include an upwell and separator structure to separate the fish from the excess water, raceways for holding fish, a distribution system for distributing the fish amoung the raceways, a sampling and marking building, truck and barge loading facilities, and associated water supply lines.

2. Fish Passage Season: 1 April to end of transport and bypass season operate according to criteria in Appendix D and the Fish Transportation Oversight Team's (FTOT) Annual Work Plan (Appendix E).

3. Scheduled Maintenance: Scheduled maintenance of the juvenile facilities is conducted during the entire year as listed in Appendix B, Fish Facility Scheduled Maintenance. Long-term maintenance or modification of facilities which require them to be out of service for extended periods of time are conducted during the winter maintenance period from the end of the bypass season (approximately 1 September) to 31 March. During the fish-passage season parts of the facilities are maintained on a daily, weekly, or longer interval to keep them in proper operating condition.

4. Unscheduled Maintenance: Unscheduled maintenance which will have a significant impact on juvenile fish passage should be coordinated with the fishery agencies and tribes. Maintenance of facilities such as traveling screens, which sometimes break down during the fish passage season, will be carried out according to the FTOT Annual Work Plan (Appendix E). In these cases, repairs will be made as prescribed and the fishery agencies and tribes notified through established channels agreed to in the

plan. Other unscheduled maintenance will be coordinated as per Appendix A.

(a) Traveling Screens: Traveling screens are inspected periodically throughout the juvenile migration season with a video monitoring system and once each work shift by the powerhouse operators. If a screen is found to be damaged or malfunctions at any time, measures will be taken in accordance with the FTOT Annual Work Plan (Appendix E).

(b) Gatewell Orifices: Each gatewell has two orifices with 8-inch slide gates to allow fish to exit the gatewell. Under normal operation, one or two orifices per gatewell are operated. If an orifice becomes blocked with debris it will be cleaned; however, a damaged orifice will be closed and the alternate orifice for that gatewell operated until repairs can be made.

(c) Bypass Pipe: The bypass pipe goes from the end of the powerhouse bypass channel to the collection facilities downstream of the dam. All juvenile fish in the bypass system must pass through this to the collection facilities or to the tailrace. If any part of the bypass pipe is damaged, the gatewell orifices will be closed and the bypass system unwatered until repairs can be made. Traveling screens will remain in operation and the juveniles allowed to accumulate in the gatewells for up to two days. If repairs are to take longer than two days, a salvage program will be initiated to dipnet the juveniles from the gatewells until repairs are made and the system watered up again.

(d) Collection Facilities: The collection facilities can be operated to either collect and hold juveniles for the transportation

program or to bypass them back to the river. If part of the facility malfunctions or is damaged, efforts will first be made to bypass the fish around the damaged area. If this is not possible, the fish will be bypassed around the collection facilities or the entire bypass system unwatered until repairs are made.

Appendix A
Coordination Procedures

1. Scheduled maintenance: Scheduled maintenance is the normal preventative maintenance conducted at yearly or other intervals to maintain facilities in proper operating condition.

a. Adult fish passage facilities: Scheduled maintenance of fish ladders, collection systems, and fish pumps which must be unwatered to maintain or whose maintenance will take the facilities out of operating criteria will be conducted during the winter maintenance period. NPWOP-RM (Fish and Wildlife Section) will coordinate the District's winter maintenance outages with the fishery agencies and tribes at the September Fish Passage Development and Evaluation Program Technical Coordinating Committee (FPDEPTCC) Meeting. Project Engineers shall inform NPWOP-RM (FWS) prior to 1 September of their estimated winter maintenance for that year. Information required should include:

(1) Facilities to be unwatered or taken out of service.

(2) Estimated dates of outages.

(3) Type of maintenance to be performed.

(4) Any special maintenance or modifications to be done.

b. Juvenile fish passage facilities: Most scheduled maintenance of juvenile facilities occurs during the non-fish passage season when facilities are not in service. At projects with collection and transportation facilities, some scheduled maintenance occurs at daily, weekly, or longer intervals to keep the facilities in operating criteria. Scheduled maintenance will be conducted as stated in the Juvenile Facilities Operating Criteria (Appendix D) and FTOT Annual Work Plan (Appendix E) agreed to by the Corps, fishery agencies, and tribes. Major modifications of the juvenile facilities to be conducted during the non-fish passage season will be coordinated with the fishery agencies and tribes by NPWOP-RM (FWS) prior to any work being done.

c. Turbine unit and spillways: Certain turbine units and spillway gates are operated on a priority basis to provide attraction flows to the ladder entrances. Annual maintenance of turbine units and spillgates or modifications which take them out of service, should be coordinated with NPWOP-RM (FWS) far enough in advance so that effects on fish passage can be minimized.

2. Unscheduled maintenance: Unscheduled maintenance is the correction of any situation which prevents the facilities from operating according to criteria or which will impact fish passage and survival. Unscheduled maintenance will be coordinated with the fishery agencies and tribes on a case-by-case basis by NPWOP-RM (FWS). NPWOP-RM (FWS) will be notified as soon as possible after it becomes apparent that maintenance repairs are required. The Project Engineer has the authority to initiate work prior to notifying NPWOP-RM (FWS) when in his opinion delay of the work will result in an unsafe situation for people, property, or fish. Information required by NPWOP-RM (FWS) includes:

a. Description of the problem.

b. Type of outage required.

c. Impact on facility operation.

d. Length of time for repairs.

e. Expected impacts on fish passage.

APPENDIX B

FISH FACILITY

SCHEDULED MAINTENANCE

PROJECT McNary TYPE OF MAINTENANCE Scheduled

ITEM	TIME OF YEAR	MAINTENANCE OR MEASURE TAKEN
Adult Fish Passage Facilities		
North and south shore fish ladders	Annually in January and February	Dewater and clean ladders of all debris. Inspect and perform preventative maintenance and repairs as required.
North and south shore fish counting stations	Annually in January and February	Inspect, clean, and perform preventative maintenance on picketed leads and counting station equipment.
South shore attraction water pumps	Annually in January and February	Inspect and perform required preventative maintenance.
Entrance weir hoists and automatic control systems	Biannually in March and September	Inspect and perform required preventative maintenance.

PROJECT McNary TYPE OF MAINTENANCE Scheduled

ITEM	TIME OF YEAR	MAINTENANCE OR MEASURE TAKEN
Juvenile Fish Passage Facilities		
Traveling screens	Annually from November through March	Perform annual maintenance, overhauls, and rehabilitations as required.
	During the juvenile outmigration as per FTOT Annual Work Plan	Inspect with underwater TV camera.
Bypass facilities: orifices and collection and bypass flume	Annually from November through March	Inspect and perform preventative maintenance and repairs as required.
	Daily during the transportation season	Inspect and maintain daily. Repair damaged parts as soon as possible.
Transportation facilities: Upwell and separator, raceways, sample tank, barge and truck loading facilities, and associated water supply lines	Annually from November through March	Inspect and perform preventative maintenance and repairs as required.
	Daily or weekly during the transportation season	Inspect and maintain on a daily or weekly basis depending on the item. Repair damaged parts as soon as possible.
Trash racks	Annually in February and March and throughout the juvenile transport and bypass season per FTOT Annual Work Plan.	Clean trash racks of debris.

PROJECT Ice Harbor TYPE OF MAINTENANCE Scheduled

ITEM	TIME OF YEAR	MAINTENANCE OR MEASURE TAKEN
Adult Fish Passage Facilities		
North and south shore fish ladders	Annually in January and February	Dewater and clean ladders of all debris. Inspect and perform preventative maintenance and repairs as required.
North and south shore fish counting stations	Annually in January and February	Inspect, clean, and perform preventative maintenance on picketed leads and counting station equipment.
North and south shore attraction water pumps	Annually in January and February	Inspect and perform required preventative maintenance.
Powerhouse collection system entrance weir hoists	Annually in March	Inspect and perform required preventative maintenance.
Juvenile Fish Passage Facilities		
Sluiceway gate hoists and controls	Annually from September through March	Inspect and perform preventative maintenance and repairs as required.
Gatewell orifices	Annually in March	Inspect and cleanout debris.
Trash racks	Annually in March	Clean trash racks of debris.

PROJECT Lower Monumental TYPE OF MAINTENANCE Scheduled

ITEM	TIME OF YEAR	MAINTENANCE OR MEASURE TAKEN
Adult Fish Passage Facilities		
North and south shore fish ladders	Annually in January and February	Dewater and clean ladders of all debris. Inspect and perform preventative maintenance and repairs as needed.
North and south shore fish counting stations	Annually in January and February	Inspect, clean, and perform preventative maintenance on picketed leads and counting station equipment.
Attraction water pumps	Annually in January and February; monthly, and semi-annually in July	Inspect and perform required annual, monthly, semi-annual maintenance.
Powerhouse collections system entrance weir hoists	Biannually in April and October	Inspect and perform required preventative maintenance.
Juvenile Fish Passage Facilities		
Orifices and bypass pipe	Annually in March	Inspect and clean out debris.
Trash racks	Annually in March	Clean trash racks of debris.

PROJECT Little Goose TYPE OF MAINTENANCE Scheduled

ITEM	TIME OF YEAR	MAINTENANCE OR MEASURE TAKEN
Adult Fish Passage Facilities		
Fish ladder	Annually in January and February	Dewater and clean ladder of all debris. Inspect and peform preventative maintenance and repairs as required.
Fish counting station	Annually in January and February	Inspect, clean, and perform preventative maintenance on picketed leads and counting station equipment.
Attraction water pumps	Annually in January and February, monthly, and semi-annually in July	Inspect and perform required annual, monthly, and semi-annual maintenance.
Powerhouse collection system and transportation channels	Annually in January and February	Inspect and perform preventative maintenance and repairs as required. Replace lights in transportation channel.

PROJECT Little Goose TYPE OF MAINTENANCE Scheduled

ITEM	TIME OF YEAR	MAINTENANCE OR MEASURE TAKEN
Juvenile Fish Passage Facilities		
Traveling screens	Annually September through March	Perform annual maintenance, overhauls, and rehabilitations as required.
	During the juvenile outmigration as per FTOT Annual Work Plan	Inspect with underwater TV camera.
Bypass facilities: orifices, bypass gallery, and bypass pipe	Annually September through March	Inspect and perform preventative maintenance and repairs as required.
	Daily or as required during the transportation season	Inspect and maintain daily or as required. Repair damaged parts as soon as possible.
Transportation facilities: upwell and separator, raceways, sampling facilities, barge and truck loading facilities, and associated water supply lines	Annually September through March	Inspect and perform preventative maintenance and repairs as required.
	Daily or as required during the transportation season	Inspect and maintain daily or as required. Repair damaged parts as soon as possible.
Trash racks	Annually in March and throughout the transport and bypass season per FTOT Annual Work Plan	Clean trash racks of debris.

PROJECT Lower Granite TYPE OF MAINTENANCE Scheduled

ITEM	TIME OF YEAR	MAINTENANCE OR MEASURE TAKEN
Adult Fish Passage Facilities		
Fish ladder	Annually in January and February	Dewater and clean ladder of all debris. Inspect and perform preventative maintenance and repairs as required.
Fish counting station	Annually in January and February	Inspect, clean, and perform preventative maintenance on picketed leads and counting station equipment.
Powerhouse collection and transportation channels	Annually in January and February	Inspect and perform preventative maintenance and repairs as required. Replace lights in transportation channel.
Fish ladder secondary exit water supply pumps	Quarterly	Inspect and test pumps.
Attraction water pumps	Annually in January and February, and quarterly	Inspect and perform required annual and quarterly preventative maintenance.
Adult fish trap	Annually in March	Inspect and perform required preventative maintenance.

PROJECT Lower Granite TYPE OF MAINTENANCE Scheduled

ITEM	TIME OF YEAR	MAINTENANCE OR MEASURE TAKEN
Juvenile Fish Passage Facilities		
Traveling screens	Annually September through March	Perform annual maintenance, overhauls, and rehabilitation as required.
	During the juvenile outmigration as per FTOT Annual Work Plan	Inspect with underwater TV camera.
Bypass facilities: orifices bypass gallery, and bypass pipe	Annually September through March	Inspect and perform preventative maintenance and repairs as required.
	Daily or as required during the transportation season	Inspect and maintain daily or as required. Repair damaged parts as soon as possible.
Transportation facilities; upwell and separator, raceways, sampling facilities, truck and barge loading facilities, and associated water supply lines	Annually September through March	Inspect and perform preventative maintenance and repairs as required.
	Daily or as required during the transportation season	Inspect and maintain daily or as required. Repair damaged parts as soon as possible.
Trash racks	Annually in March and throughout the transport and bypass season per FTOT Annual Work Plan	Clean trash racks of debris.

APPENDIX C

OPERATING STANDARDS FOR UPSTREAM MIGRANT FISH PASSAGE FACILITIES

McNARY DAM

OPERATING STANDARDS FOR ADULT PASSAGE FACILITIES

Fishway Ladders

Water depth over weirs: 1.0 to 1.3 feet

Head on all Entrances

Head range: 1.0 to 1.5 feet

North Shore Entrances (NFE 2 & 3)

Operate 2 downstream gates

Weir depth: 8 feet or greater below tailwater.

North Powerhouse Entrances (NFE 2 & 3)

Operate 2 downstream gates.

Weir depth: 8 feet or greater below tailwater.

Powerhouse Collection System

Operation 30 floating orifices O.G. numbers, 1, 2, 3, 4, 6, 8, 9, 10, 12, 14, 15, 17, 18, 20, 21, 23, 24, 26, 27, 29, 30, 32, 33, 35, 36, 37, 39, 41, 43, and 44.

South Shore Entrances (SFE 1 & 2)

Operate 2 entrances.

Weir depth: 8 feet or greater below tailwater.

Transportation Velocity

1 to 4 feet per second.

Head on Trashracks

Maximum head of 0.8 feet on ladder exit and attraction water intakes. Maximum head on picketed leads shall be 0.2 feet.

Staff Gauges and Water Level Indicators

Shall be readable at all water levels encountered during fish passage period.

Turbine Unit Operating Priority

Unit operation will be 1, 2, 14, 4 through 10, and then 3, 11, 12, 13, consecutively.

Recommended Spilling Schedule for Lower Spills at McNary Dam (Openings in feet) 1/

Gate Number																						
*	2*	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20*	21*	22**	Total CLOSED
1																						
1	1																			(1)		
1	1	1																	(1)	1		
1	1	1	1															(1)	1	1		
1	2	1	1															1	1	(2)		9
1	2	1	1	1													(1)	1	1	2		
1	2	1	1	1	1											(1)	1	1	1	2		
1	2	1	1	1	1	1									(1)	1	1	1	1	2		
1	2	1	1	1	1	1	1							(1)	1	1	1	1	1	2		
1	2	1	1	1	1	1	1	(1)					1	1	1	1	1	1	1	2		19
2	2	1	1	1	1	1	1	1					1	1	1	1	1	1	1	2		
2	2	1	1	1	1	1	1	1	(1)			1	1	1	1	1	1	1	1	2		
2	2	1	1	1	1	1	1	1	1	(1)	1	1	1	1	1	1	1	1	1	2		
2	2	1	1	1	1	1	1	1	1	1	(2)	2	1	1	1	1	1	1	1	2		
2	2	1	1	1	1	1	(2)	1	1	1	2	2	1	2	1	1	1	1	1	2		28
2	2	1	1	1	(2)	1	2	1	1	1	2	2	1	2	1	2	1	1	1	2		
2	3	1	1	1	2	1	2	1	1	1	2	2	1	2	1	2	1	1	1	(3)		
2	3	1	(2)	1	2	1	2	1	1	1	2	2	1	2	1	2	1	2	1	3		
2	3	1	2	1	2	1	2	1	(2)	2	2	2	1	2	1	2	1	2	1	3		
	3	1	2	1	2	1	2	(2)	2	2	2	2	2	2	1	2	1	2	1	3		38
3	3	1	2	1	2	1	2	2	2	2	2	2	2	2	1	2	1	2	1	3		
3	3	1	2	1	2	(2)	2	2	2	2	2	2	2	2	2	2	1	2	1	3		
3	4	1	2	1	2	2	2	2	2	2	2	2	2	2	2	2	1	2	1	(4)		
3	4	1	2	1	2	2	2	2	2	2	3	(3)	2	2	2	2	1	2	1	4		
3	4	(2)	2	1	2	2	2	2	2	2	3	3	3	2	2	2	1	2	1	4		47
3	4	2	2	1	2	2	2	2	(3)	3	3	3	3	2	2	2	1	2	1	4		
3	4	2	2	(2)	2	2	2	2	3	3	3	3	3	2	2	2	2	2	1	4		
3	4	2	2	2	2	2	(3)	2	3	3	3	3	3	2	2	3	2	2	1	4		
3	4	2	2	2	2	2	3	(3)	3	3	3	3	3	3	2	3	2	2	1	4		
3	4	2	2	2	(3)	2	3	3	3	3	3	3	3	3	3	3	2	2	1	4		57
3	4	2	2	2	3	3	3	3	3	3	3	3	3	(4)	3	3	2	2	1	4		
3	5	2	2	2	3	3	3	3	3	3	3	3	3	4	3	3	2	2	(2)	4		
3	5	2	2	3	3	3	3	3	3	(4)	3	3	3	4	3	3	2	2	2	4		
4	5	2	2	3	3	3	3	3	3	4	3	3	(4)	4	3	3	2	2	2	4		
4	5	2	2	3	3	3	3	3	3	4	3	3	4	4	3	3	3	2	2	4		66

1/ Circled values may be 1 foot less than value shown.
For example: (1) means 0 or 1 foot
(2) means 1 or 2 feet

*Gates 1, 2, 20, and 21 are split leaf openings.
*Gate 22 is closed because of the juvenile collection facilities immeidately adjacent to it.

Recommended Spilling Schedule for Higher Spills at McNary Dam
(Openings in feet) 1/

Gate Number																						
	2*	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20*	21*	22**	TOTAL
																					CLOSED	
4	5	2	2	3	3	3	3	3	(4)	4	3	3	4	4	3	3	3	2	2	5		
4	5	2	2	3	3	3	3	3	4	4	3	3	4	4	3	3	3	3	2	5		
4	5	2	2	3	3	3	3	(4)	4	4	3	3	4	4	4	3	3	3	2	5		
4	5	2	2	3	3	3	3	4	4	4	3	4	4	4	4	(4)	3	3	2	5		
4	5	2	2	3	3	3	3	4	4	4	3	4	4	4	4	4	3	3	(3)	6		74
4	5	2	2	3	3	3	3	4	4	4	4	4	4	4	4	4	3	(4)	3	6		
5	5	2	(3)	3	3	3	3	4	4	4	4	4	4	4	4	4	3	4	3	6		
5	5	2	3	3	3	3	4	4	4	4	4	4	4	4	4	4	3	4	3	6		
5	(6)	2	3	3	3	3	4	4	4	4	4	4	4	4	4	4	3	4	4	6		
5	6	3	3	3	4	3	4	4	4	4	4	4	4	4	4	4	3	4	4	6		84
6	(6)	3	4	3	4	3	4	4	4	4	4	4	4	4	4	4	3	4	4	6		
6	6	3	4	3	4	3	4	4	4	(5)	4	5	4	4	4	4	3	4	4	6		
6	(7)	3	4	3	4	3	4	4	4	5	4	5	4	4	4	4	3	4	4	7		
6	7	3	4	3	4	(4)	4	4	4	5	4	5	5	4	4	4	3	4	4	7		
(7)	7	3	4	3	4	4	4	4	4	5	4	5	5	4	4	4	3	4	4	7		93
7	7	3	4	3	4	4	(5)	4	4	5	4	5	5	5	4	4	3	4	4	7		
7	7	3	4	3	4	4	5	4	(5)	5	5	5	5	5	4	4	3	4	4	7		
7	7	(4)	4	3	4	4	5	4	5	5	5	5	5	5	4	4	4	4	4	7		
7	(8)	4	4	3	4	4	5	4	5	5	5	6	5	5	4	4	4	4	4	7		
	8	4	4	3	4	4	5	(5)	5	5	5	6	5	5	4	5	4	4	4	7		103
7	8	4	4	4	4	4	5	5	5	6	5	6	5	5	4	5	4	4	4	7		
7	8	4	4	4	(5)	4	5	5	5	6	6	6	5	5	4	5	4	4	4	7		
(8)	8	4	4	4	5	4	5	5	6	6	6	6	5	5	4	5	4	4	4	7		
8	8	4	4	4	5	4	5	(6)	6	6	6	6	6	5	4	5	4	4	4	7		
8	8	4	4	4	5	4	5	6	6	6	(7)	6	6	5	4	5	4	4	4	8		113
8	8	4	4	4	5	4	5	6	6	(7)	7	7	6	5	4	5	4	4	4	8		
8	8	4	4	4	5	5	5	6	6	7	7	7	6	5	(5)	5	4	4	4	8		
8	8	4	4	4	5	5	5	6	7	7	7	7	6	(6)	5	5	4	4	4	8		
8	9	4	4	4	5	5	(6)	6	7	7	7	7	6	6	5	5	4	4	4	8		
8	9	4	4	4	5	5	6	7	7	7	(8)	7	6	6	5	5	4	4	4	8		123
8	9	4	(5)	4	5	5	6	7	7	7	8	7	6	6	5	5	4	5	4	8		
(9)	9	4	5	4	5	5	6	7	7	7	8	7	6	6	5	5	4	5	4	8		126
9	10	4	5	5	6	5	6	7	8	8	9	9	9	7	6	5	5	5	4	9		141
10	11	5	6	5	6	6	6	7	8	9	10	10	10	9	8	6	5	6	5	10		158

1/ Circled values may be 1 foot less than value shown
For example: (1) means 0 or 1 foot
(2) means 1 or 2 feet

*Gates 1, 2, 20, and 21 are split leaf openings.
Gate 22 is closed because of the juvenile collection facilities immediately adjacent to it.

ICE HARBOR

OPERATING STANDARDS FOR ADULT PASSAGE FACILITIES

Fishway Ladders

Water depth over weirs: 1.0 to 1.3 feet

Head on all Entrances

Head range: 1.0 to 1.5 feet

North Shore Entrance (NEW 1) *

Operate downstream gate closest to shore.

Weir depth: 8 feet or greater below tailwater.

North Powerhouse Entrance (NFE 1 & 2) *

Operate 1 downstream gate.

Weir depth: 8 feet or greater below tailwater.

Powerhouse Collection System

Operate 7 floating orifices, O.G. numbers 1, 2, 4, 6, 8, 10, and 12.

South Shore Entrance (SFEW-1) *

Operate entrance closest to powerhouse.

Weir depth: 8 feet or greater below tailwater.

Transportation Velocity

1 to 4 feet per second.

Head on Trashracks

Maximum head of 0.8 feet on ladder exits attraction water intakes.

Maximum head on picketed leads shall be 0.2 feet.

* At extremely low tailwater and river flows, entrance weirs may bottom out and not reach 8 feet below tailwater.

Ice Harbor Dam (Continued)

Staff Gauges and Water Level Indicators

Shall be readable at all water levels encountered during fish passage period.

Turbine Unit Operating Priority

Unit operation will be : 1, 2, 3, 4, (5 or 6 in either order).

Tentative Spilling Schedule at Ice Harbor Dam Adjusted for Expanded Powerhouse in 1976 (Openings in feet).

Gate Number										
2	3	4	5	6	7	8	9	10	Total
(1) 1								1.5	
1	(1) 1						1	1.5	
1	1	(1) 1					1	1.5	
1	(2) 1	1					1	1.5	
1	2	1	(1)			1	1	1.5	10.5
1	2	1	1	(1) 1	1	1	1	1.5	
1	2	(2) 1	1	1	1	1	2	1.5	
1	2	2	(2) 1	1	1	2	2	1.5	
1	2	2	2	(2) 2	2	2	2	1.5	
1	2	2	2	2	2	2	2	1.5	20.5
1	2	2	(3) 3	3	3	3	2	1.5	
1	2	(3) 3	3	3	3	3	2	1.5	
1	2	3	3	(4) 4	4	3	2	1.5	
1	2	3	3	4	4	4	2	1.5	
1	2	3	3	4	(5) 5	4	2	1.5	30.5
1	2	3	(4) 4	5	5	4	3	1.5	
1	(3) 3	3	4	5	5	4	3	1.5	
1	3	(4) 4	5	6	5	4	3	1.5	
(2) 2	3	4	(6) 6	6	5	4	4	1.5	
2	3	4	6	6	(6) 6	5	4	1.5	40.5
2	3	(5) 5	6	6	6	5	4	1.5	
2	3	5	6	(7) 7	6	5	5	1.5	
2	3	5	(7) 7	7	6	6	5	1.5	
2	3	(6) 6	7	8	6	6	5	1.5	
2	(4) 4	6	7	8	6	6	5	1.5	50
2	4	6	7	8	(7) 7	7	5	2	
2	4	6	(8) 8	8	7	7	6	2	
2	4	6	8	(9) 9	8	7	6	2	
2	4	(7) 7	8	9	9	7	6	2	
2	4	7	(9) 9	10	9	7	6	2	60
2	4	7	(10) 10	10	9	8	6	2	
2	4	7	10	11	9	8	(7) 7	2	
2	4	7	(11) 11	11	10	8	7	2	
2	4	(8) 8	11	12	10	8	7	2	
2	4	8	11	13	10	(9) 9	7	2	70

1/ Circled values may be 1 foot less than values shown.
For example: (1) means 0 or 1 foot.
(2) means 1 or 2 feet.

LOWER MONUMENTAL

OPERATING STANDARDS FOR ADULT PASSAGE FACILITIES

Fishway Ladders

Water depth over weirs: 1.0 to 1.3 feet

Head on all Entrances

Head range: 1.0 to 1.5 feet

North Shore Entrances (NSE 1 & 2)

Operate both gates.

Weir depth: 8 feet or greater below tailwater.

Powerhouse Collection System

Operate 5 floating orifices, O.G numbers 1, 2, 3, 7, 9 until unit is returned to service then operate 1, 3, 5, 7, 9.

South Powerhouse Entrances (SPE 1 & 2) *

Operate both downstream gates.

Weir depth: 6 feet or greater below tailwater.

South Shore Entrances (SSE 1 & 2)

Operate both downstream gates.

Weir depth: 8 feet or greater below tailwater.

Transportation Velocity

1 to 4 feet per second.

Head on Trashracks

Maximum head of 0.8 feet on ladder exits, attraction water intakes. Maximum head on picketed leads, such as around counting station, shall be 0.2 feet.

* The fishery agencies and tribes have requested a weir depth of 8 feet or greater below tailwater. Project personnel should attempt to obtain depths as close to this as is possible within existing pump capacities.

Staff Gauges and Water Level Indicators

Gauges shall be readable at all water levels encountered during fish passage period.

Turbine Unit Operating Priority

Unit operation will be: Daytime (0400 to 2000 h) 1, 2, 3, 4, 5, 6
Nighttime (2000 to 0400 h) 6, 5, 4, 3, 2, 1

LOWER MONUMENTAL SPILL PATTERN

Gate numbers								Total	
1	2	3	4	5	6	7	8	Stops	Kcfs
1								1	1.1
1							1	2	2.2
1	1						1	3	3.3
1	1					1	1	4	4.4
2	1					1	1	5	6.1
2	1					1	2	6	7.8
2	1	1				1	2	7	8.9
2	1	1			1	1	2	8	10.0
2	1	1	1		1	1	2	9	11.1
2	1	1	1	1	1	1	2	10	12.2
2	1	2	1	1	1	1	2	11	13.9
2	1	2	1	1	2	1	2	12	15.6
2	1	2	2	1	2	1	2	13	17.3
2	1	2	2	2	2	1	2	14	19.0
3	1	2	2	2	2	1	2	15	20.0
3	2	2	2	2	2	1	2	16	22.5
3	2	2	2	2	2	1	3	17	24.3
3	2	2	2	2	2	2	3	18	26.0
4	2	2	2	2	2	2	3	19	27.7
4	2	2	2	3	2	2	3	20	29.5
4	2	2	2	3	2	2	4	21	31.2
4	2	2	2	3	2	3	4	22	33.0
4	2	3	2	3	2	3	4	23	34.0
4	3	3	2	3	2	3	4	24	36.6
4	3	3	3	3	2	3	4	25	38.4
4	3	3	3	3	3	3	4	26	40.2
4	3	3	4	3	3	3	4	27	41.9
4	3	3	4	4	3	3	4	28	43.6
5	3	3	4	4	3	3	4	29	45.3
5	4	3	4	4	3	3	4	30	47.0
5	4	3	4	4	3	3	5	31	48.7
5	4	3	4	4	3	4	5	32	50.4
5	4	4	4	4	3	4	5	33	52.1
5	4	4	4	4	4	4	5	34	53.8
5	4	4	5	4	4	4	5	35	55.5
5	4	4	5	4	5	4	5	36	57.2
6	4	4	5	4	5	4	5	37	58.9
6	5	4	5	4	5	4	5	38	60.6
6	5	4	5	4	5	4	6	39	62.3
6	5	4	5	4	5	5	6	40	64.0
6	5	5	5	4	5	5	6	41	65.7
6	5	5	5	5	5	5	6	42	67.4
6	5	5	6	5	5	5	6	43	69.1
6	5	5	6	5	6	5	6	44	70.8
7	5	5	6	5	6	5	6	44	72.5
7	6	5	6	5	6	5	6	46	74.2
7	6	5	6	5	6	5	7	47	75.9
7	6	5	6	5	6	6	7	48	77.6
7	6	6	6	5	6	6	7	49	79.3
7	6	6	6	6	6	6	7	50	81.0
7	6	6	7	6	6	6	7	51	82.7
7	6	6	7	6	7	6	7	52	84.4

LOWER MONUMENTAL SPILL PATTERN

Gate Numbers								Total	
1	2	3	4	5	6	7	8	Stops	Kcfs
8	6	6	7	6	7	6	7	53	86.3
8	7	6	7	6	7	6	7	54	88.0
8	7	6	7	6	7	6	8	55	89.9
8	7	6	7	6	7	7	8	56	91.6
8	7	7	7	6	7	7	8	57	93.3
8	7	7	7	7	7	7	8	58	95.0
8	7	7	8	7	7	7	8	59	96.9
8	7	7	8	7	8	7	8	60	98.8
9	7	7	8	7	8	7	8	61	100.4
9	8	7	8	7	8	7	8	62	102.3
9	8	7	8	7	8	7	9	63	103.9
9	8	7	8	7	8	8	9	64	105.8
9	8	8	8	7	8	8	9	65	107.7
9	8	8	8	8	8	8	9	66	109.6
9	8	8	9	8	8	8	9	67	111.2
9	8	8	9	8	9	8	9	68	112.8
10	8	8	9	8	9	8	9	69	114.6
10	9	8	9	8	9	8	9	70	116.2
10	9	8	9	8	9	8	10	71	118.0
10	9	8	9	8	9	9	10	72	119.6
10	9	9	9	8	9	9	10	73	121.2
10	9	9	9	9	9	9	10	74	122.8
10	9	9	10	9	9	9	10	75	124.6
10	9	9	10	9	10	9	10	76	126.4
11	9	9	10	9	10	9	10	77	128.1
11	10	9	10	9	10	9	10	78	129.9
11	10	9	10	9	10	9	11	79	131.6
11	10	9	10	9	10	10	11	80	133.4
11	10	10	10	9	10	10	11	81	135.2
11	10	10	10	10	10	10	11	82	137.0
11	10	10	11	10	10	10	11	83	138.7
11	10	10	11	10	11	10	11	84	140.4
12	10	10	11	10	11	10	11	85	142.2
12	11	10	11	10	11	10	11	86	143.9
12	11	10	11	10	11	10	12	87	145.7
12	11	10	11	10	11	11	12	88	147.4
12	11	11	11	10	11	11	12	89	149.7
12	11	11	11	10	11	11	12	89	149.7
12	11	11	11	11	11	11	12	90	150.8

LITTLE GOOSE

OPERATING STANDARDS FOR ADULT PASSAGE FACILITIES

Fishway Ladder

Water depth over weirs: 1.0 to 1.3 feet

Head on all Entrances

1.4 to 1.7 feet on south shore entrances.

1.0 to 1.5 feet on north powerhouse entrances.

0.8 to 1.5 feet on north shore entrances. (Preferably 1.0 to 1.5 if possible.)

North Shore Entrances (NSE 1 & 2)*

Operate both downstream gates.

Weir depth: 6 feet or greater below tailwater.

North Powerhouse Entrances (NPE 1 & 2) *

Operate both downstream gates.

Weir Depth: 6 feet or greater below tailwater.

Powerhouse Collection System

Operate 4 floating orifices, numbers 1, 4, 6, and 10.

South Shore Entrances (SSE 1 & 2)

Operate both gates.

Weir depth: 8 feet or greater below tailwater.

Transportation Velocity

1 to 4 feet per second.

* The fishery agencies and tribes have requested a weir depth of 8 feet or greater below tailwater. Project personnel should attempt to obtain depths as close to this as is possible within existing pump capacities.

Little Goose Dam (Continued)

Tunnel Lights

Lights in the tunnel section, under the spillway, shall be on during fish passage period.

Head on Trashracks

Maximum head of 0.8 feet on ladder exits and attraction water intakes.

Maximum head on picketed leads shall be 0.2 feet.

Staff Gauges and Water Level Indicators

Shall be readable at all water levels encountered during fish passage period.

Turbine Unit Operating Priority

Unit operation will be: Operate unit 1, 2, 3, and then 4 - 6.

Tentative Spill Schedule at Little Goose Dam with Six Powerhouse Units and Deflectors in Bays 2 through 7 in 1982 (openings in increments) 1/

Gate Numbers								Total	
1	2	3	4	5	6	7	8	Increments	Kcfs
(1)							1		
1	(1)					1	1		
1	1	(1)			1	1	1		
1	1	1	(1)	1	1	1	1		
1	1	(2)	1	1	2	1	1	10	19
1	1	2	(2)	2	2	1	1		
(2)	1	2	2	2	2	1	2		
2	2	2	2	2	2	(2)	2		
(3)	2	2	2	2	2	2	3		
3	2	(3)	(3)	2	2	2	3	20	39
3	3	3	3	2	(3)	2	3		
3	3	3	3	2	3	(3)	4		
3	3	3	(4)	3	3	3	4		
4	3	(4)	4	3	3	3	4		
4	4	4	4	3	3	(4)	4	30	60
5	(5)	4	4	3	3	4	4		
5	5	(5)	4	4	3	4	4		
5	5	5	4	4	(4)	4	5		
5	(6)	5	5	4	4	4	5		
5	6	5	5	4	4	(5)	6	40	80

1/ Circled Values may be 1 increment less than indicated

For example: (2) means 2 or 1 increments
(3) means 3 or 2 increments

LOWER GRANITE

OPERATING STANDARDS FOR ADULT PASSAGE FACILITIES

Fishway Ladder

Water depth over weirs: 1.0 to 1.3 feet

Head on All Entrances

Head range: 1.0 to 1.7 feet.

1.5 to 1.7 feet on South Shore entrance is required to maintain the necessary transportation flow at bottom of ladder and first bend in channel.

North Shore Entrances (NSE 1 & 2)

Operate both downstream gates.

Weir depth: 7 feet or greater below tailwater.

North Powerhouse Entrances (NPE 1 & 2)

Operate both downstream gates.

Weir depth: 8 feet or greater below tailwater.

Powerhouse Collection System

Operate 4 floating orifices, numbers 1, 4, 7, and 10.

South Shore Entrances (SSE 1 & 2)

Operate both gates.

Weir depth; 8 feet or greater below tailwater.

Transportation Velocity

1 to 4 feet per second.

Tunnel Lights

Lights in the tunnel section, under the spillway, shall be on during fish passage period.

Lower Granite Dam (Continued)

Head on Trashracks

Maximum head of 0.8 feet on ladder exits and attraction water intakes.

Maximum head on picketed leads shall be 0.2 feet.

Staff Gauges and Water Level Indicators

Shall be readable at all water levels encountered during fish passage period.

Turbine Unit Operating Priority

Unit operation will be: 1, 2, 3, and then 4 - 6.

Lower Granite Spill Pattern
Elevation 737

Gate # 1	2	3	4	5	6	7	8	Total stops	kcfs
1								1	1.75
1							1	2	3.5
1						1	1	3	5.25
1	1					1	1	4	7.00
1	1				1	1	1	5	8.75
1	1	1			1	1	1	6	10.50
1	2	1			1	1	1	7	12.37
1	2	1			1	2	1	8	14.25
1	2	1	1		1	2	1	9	15.99
1	2	2	1		1	2	1	10	17.86
1	2	2	1	1	1	2	1	11	19.61
1	2	2	2	1	1	2	1	12	21.48
1	2	2	2	2	1	2	1	13	23.35
1	2	2	3	2	1	2	1	14	25.27
2	2	2	3	2	1	2	1	15	27.14
2	2	2	3	3	1	2	1	16	29.06
2	2	2	3	3	2	2	1	17	30.93
2	2	3	3	3	2	2	1	18	32.85
2	3	3	3	3	2	2	1	19	34.77
2	3	3	4	3	2	2	1	20	36.67
3	3	3	4	3	2	2	1	21	38.61
3	3	4	4	3	2	2	1	22	40.53
3	3	4	4	3	3	2	1	23	42.45
3	4	4	4	3	3	2	1	24	44.37
3	4	4	4	4	3	2	1	25	46.29
3	4	4	5	4	3	2	1	26	48.21
3	4	5	5	4	3	2	1	27	50.13
4	4	5	5	4	3	2	1	28	52.05
4	5	5	5	4	3	2	1	29	53.97
4	5	5	5	4	4	2	1	30	55.89
4	5	5	5	5	4	2	1	31	57.81
4	5	5	6	5	4	2	1	32	59.73
4	5	6	6	5	4	2	1	33	61.65
4	6	6	6	5	4	2	1	34	63.57

APPENDIX D

BASIC OPERATING STANDARDS FOR

DOWNSTREAM MIGRANT FISH PASSAGE FACILITIES

BASIC OPERATING STANDARDS

FOR DOWNSTREAM MIGRANT FISH PASSAGE FACILITIES

McNARY DAM

Prior to April 1 each year

Powerhouse

Forebay Area and Intakes

1. Remove debris from forebay and trash racks.
2. Rake trash racks
3. Remove debris from gatewell slots.
4. Measure drawndown in gatewell slots.

STS Screens

5. Inspect screens and operate on one trial run.
6. Log trial run.

Gallery Bypass Flume

7. Orifice lights operational.
8. Orifices clean and operational.
9. Orifice valves operational.
10. Water dissipation screens clean and ready for operation.

Sorter and Raceways

11. No rough edges on perforated plate.
12. Check wet separator and fish distribution system for operation.
13. All raceway retainer screens and crowder brushes in good order with no holes or protruding wires.
14. Raceways clean of debris

McNary Dam (Continued)

15. Sample and holding tanks smooth and clean.

16. All electronic counters checked for operation.

17. Inspect PVC pipes to insure they are clear of debris and cracks. Repair if required.

Fish Trailers

18. All systems operate properly.

19. No leaks around air stone fittings.

    a. Plugs in end of air stones.

    b. Turn stones on lathe if necessary to allow free air passage through stones.

20. Each trailer carries two 5-inch hoses and necessary 5-inch "Kamlock" caps.

21. All valves operating properly.

22. Overall condition of trailer in good shape including hatch covers, release gates, and oxygen manifold system.

Maintenance

23. Record all maintenance and inspections.

BASIC OPERATING STANDARDS

FOR DOWNSTREAM MIGRANT FISH PASSAGE FACILITIES

McNARY DAM

April 1 - End of Transport and Bypass Season

Powerhouse

Forebay Area and Intakes

1. Remove trash from forebay.

2. Inspect gatewell slots daily and clean as required.

3. Remove debris from forebay and trashracks as required to maintain less than one foot of additional drawdown in gate slots. Additional raking may be required when heavy debris loads are present in the river. Fish quality will also be an indicator of debris buildup on the trash racks.

4. Coordinate cleaning effort with personnel operating downstream migrant facilities.

5. Log drawdown differentials once a week.

Submersible Traveling Screens (STS)

6. Inspect, operate, and cycle screens as per FTOT plan.

Gallery Bypass Flume

7. Operate one orifice per gate slot.

8. Orifices clean and operating.

9. Orifice lights operating on open orifices.

10. Orifice valve either full open or closed.

11. Water dissipation screens clean.

12. Maintain pinch valve in good operating condition and operate as open as is possible.

13. Adjust water flow over sorter to maintain a smooth, stable flow condition.

Sorter and Raceways

14. Operate in accordance with FTOT plan.

BASIC OPERATING STANDARDS

FOR DOWNSTREAM MIGRANT FISH PASSAGE FACILITIES

ICE HARBOR DAM

Prior to April 1 each year

1. Remove debris from forebay and gatewell slots.
2. Rake trash racks.
3. Inspect and clean orifices of debris. Video inspection permitted.
4. Test that chain gates are operational.
5. Run gates on manual and automatic operation.

April 1 to End of Bypass Season

6. Remove debris from forebay.
7. Remove debris from trashracks as required to maintain less than one foot of additional drawdown in gate slots. Additional raking may be required when heavy debris loads are present in the river.
8. Inspect orifices daily and clean as required.
9. Inspect gatewell slots twice a week and clean as required.
10. Operate chain gates 1A, 2A, 3A, 4A, 5A, and 6A at maximum flows allowed by sluiceway capacity 24 hours a day.

Maintenance

11. Record all maintenance and inspections.

BASIC OPERATING STANDARDS FOR

DOWNSTREAM MIGRANT FISH PASSAGE FACILITIES

LOWER MONUMENTAL DAM

Prior to April 1 each year

1. Remove debris from forebay and gatewell slots.
2. Rake trash racks.
3. Inspect and clean orifices. Video inspection permitted.
4. Check regulating valve for full open.
5. Check and repair downstream migrant pipe and air valve as required.
6. Downstream migrant pipe outlet turned toward powerhouse tailrace.

April 1 to End of Bypass Season

7. Remove debris from forebay and trashracks as required to maintain less than one foot of additional drawdown in gate slots. Additional raking may be required when heavy debris loads are present in the river.
8. Inspect gatewell slots twice a week and clean when required.
9. Close bypass pipe and blow back with air twice per week to maintain clean orifices. If a heavy debris load is present, blow back more frequently. If outfall flow appears to be less than normal, check orifices for blockage.
10. Inspect facilities daily.

Maintenance

11. Record all maintenance and inspections.

BASIC OPERATING STANDARDS

FOR DOWNSTREAM MIGRANT FISH PASSAGE FACILITIES

LITTLE GOOSE DAM

Prior to April 1 each year

Powerhouse

Forebay Area and Intakes

1. Remove debris from forebay and gatewell slots.

2. Rake trash racks.

3. Measure drawdown in gatewell slots.

Submersible Traveling Screens (STS)

4. Inspect screens for good running order and operate on one trial run (dogged off on deck).

5. Log trial run.

Collection Gallery

6. Makeup water gate operational.

7. Orifice lights operational.

8. Orifices clean and operational.

Tailrace Area

Sorter and Raceways

9. 42-inch and 48-inch sluice gates operational.

10. Incline screens clean and good shape with no holes.

11. Perforated plate edges smooth with no rough edges.

12. Check wet separator and fish distribution system for operation as designed.

13. Brushes on crowder in good order.

14. Crowder operates properly.

Little Goose Dam (Continued)

15. All slide gates in and around separator and raceways in good operating order.

16. Retainer screens in place with no holes or sharp wires protruding.

17. Barge and truck loading pipes free of debris, cracks, or blockages.

Sampling Facility

18. Building and all equipment operable.

Maintenance

19. Record all maintenance and inspections.

BASIC OPERATING STANDARDS

FOR DOWNSTREAM MIGRANT FISH PASAGE FACILITIES

LITTLE GOOSE DAM

April 1 to end of transport and bypass season

Powerhouse

Forebay Area

1. Remove debris from forebay.

Intakes

2. Inspect gatewell slots daily (preferably early in day shift) and remove debris when needed.

3. Clean trash racks in front on units as recommended in FTOT work plan.

4. Coordinate cleaning effort with personnel operating downstream migrant facilities.

5. Log drawdown differentials at least once a week.

Submersible Traveling Screens (STS)

6. Inspect screens as recommended in FTOT Plan.

7. Make formal determination at end of season with FTOT transport inspection for adequacy of screen mesh and replacement if necessary.

Collection Gallery Checks

8. Orifice clean and operating.

9. Orifice lights operating.

10. Orifice jets not hitting backwall (bypass gallery full).

11. Makeup water gate and float control equipment operational.

12. Operate at least one 12-inch orifice per slot when possible.

13. Water surface at inlet hopper to transport pipe at proper elevation.

Little Goose Dam (Continued)

Tailrace

Sorter and Raceways

14. 42-inch and 48-inch sluice gate operational.

15. No holes in screens.

16. Crowder brushes in good operating condition.

17. Retainer screens in raceway clean with no holes or protruding wires.

18. Operate wet separator and fish distribution system as designed.

19. Truck hopper and release valve in good operating order, i.e., no sharp edges, smooth paint on inside.

Inspection

20. Inspect fish facilities once each shift.

Log Maintenance

21. Record all maintenance and inspections.

BASIC OPERATING STANDARDS

FOR DOWNSTREAM MIGRANT FISH PASSAGE FACILITIES

LOWER GRANITE DAM

Prior to April 1 each year

Powerhouse

Forebay Area and Intakes

1. Remove debris from forebay and gatewell slots.
2. Rake trash racks.
3. Measure drawdown in gatewell slots.

STS Screens

4. Inspect screens for good running order and operate on one trial run (dogged off on deck).
5. Log trial run.

Collection Gallery

6. Makeup water gates and float control equipment operational.
7. Orifice lights operational.
8. Orifices clean and operational.

Tailrace Area

Sorter and Raceways

9. 42-inch and 48-inch sluice gates operational.
10. Incline screens clean and in good shape with no holes.
11. Perforated plate edges smooth with no rough edges.
12. Check wet separator and fish distribution system for operation as designed.
13. Brushes on crowder in good order.
14. Crowder operates properly.

Lower Granite Dam (Continued)

15. All slide gates in and around separator and raceways in good operating order.

16. Retainer screens in place with no holes or sharp wires protruding.

Sampling/Marking Facility

17. Building and all operational equipment operable.

Barges

18. All pumps (including spare) in good working order.

19. Dump gates operational.

20. No rough edges or support beams protruding into compartments.

21. No brass or galvanized fittings in circulation lines.

22. All loading hoses properly installed so fish will not hit sides of compartments or support beams when loading.

23. Loading hoses in good shape with rubber gaskets in "Kamlock" fittings.

24. Inside edges of Kamlock Lock joints should be beveled to avoid sharp edges.

25. Warning system operational.

26. Provide net and/or deck covers.

Log Maintenance

27. Record all maintenance and inspections.

BASIC OPERATING STANDARDS FOR

DOWNSTREAM MIGRANT FISH PASSAGE FACILITIES

LOWER GRANITE DAM

April 1 to End of Transport Season and Bypass Season

Powerhouse

Forebay Area and Intakes

1. Remove debris from forebay.

2. Clean trash racks in front of units as recommended in FTOT work plan.

3. Coordinate cleaning effort with personnel operating downstream migrant facilities.

4. Inspect gatewell slots daily (preferably early in day shift), and remove debris when needed.

5. Log drawdown differentials at least once a week.

Submersible Traveling Screens (STS)

6. Inspect screens as recommended in FTOT plan.

7. Make formal determination at end of season for adequacy of screen mesh and replacement if necessary.

Collection Gallery Checks

8. Orifices clean and operating.

9. Orifice lights operating.

10. Orifice jets not hitting backwall, bypass gallery full.

11. Makeup water gates and associated float controls operational.

12. Alternate orifices in fish screens slots daily (12 open)

13. Bulk head slots orifices opening (30) (6 unit operation).

14. Both orifices open in A and B slots.

15. One orifice open in C slot.

*Note: 42 orifices should be open to produce best juvenile fish passage. Operation of orifice in the above manner is conditional on turbine units operating.

Tailrace

Sorter and Raceways

16. 42-inch and 48-inch sluice gate operational.

17. Maintain stable water conditions in upwell at sorter.

18. No holes in screens.

19. Crowder and brushes in good operating order.

20. All slide gates and inflow gates in and around separator and raceways operational.

21. Raceway retainer screens to be clean and have no holes or protruding wire.

Barges and Trucks

22. Barge and truck loading pipes free of debris, cracks, or blockages.

Tugs

23. Capable of making turn-around trip in less than 84 hours.

Inspection

24. Inspect fish facilities once each shift.

Log Maintenance

25. Record all maintenance and inspections.

THE FISH TRANSPORTATION OVERSIGHT TEAM'S

ANNUAL WORK PLAN FOR TRANSPORT OPERATIONS

AT LOWER GRANITE, LITTLE GOOSE, AND McNARY DAMS

FOR 1985

APPENDIX 3

18 JAN 85

THE FISH TRANSPORTATION OVERSIGHT TEAM'S ANNUAL WORK PLAN FOR TRANSPORT OPERATIONS AT LOWER GRANITE, LITTLE GOOSE, AND MCNARY DAMS FOR FIELD YEAR (FY) 1985

Introduction

This work plan is provided to describe operations and establish criteria for the transportation of juvenile migrants at the following collector dams: Lower Granite, Little Goose, and McNary. It was prepared based on policies set forth in the Transport Guidelines and Criteria (Appendix 1) and Sampling Guidelines (Appendix 2). There are cooperative agreements between State fishery agencies and Walla Walla District, Corps of Engineers (NPW) to provide biologists who represent the States through direct onsite participation. The Fish Transportation Oversight Team (FTOT) will provide oversight of the transport program. Fishery agencies will provide biological oversight through the Columbia Basin Fish and Wildlife Council (CBFWC) while NPW will be responsible for facilities management. The FTOT will manage the 1985 transport program and provide necessary coordination of transport activities among the CBFWC members, tribes, NPW, and Water Budget Center (WBC). The WBC will provide communications between the CBFWC and tribes for FTOT.

Objectives:

The purpose of this plan is to transport juveniles within established guidelines and maximize survival of fish collected and transported.

1. Provide efficient collection and safe barge or truck transport of juvenile salmonids from collector dams to their release points below Bonneville Dam.

2. Inspections prior to, during, and after the juvenile migration season will be conducted by FTOT, project, state, and tribal biologists. These inspections should ensure facility readiness and operation at established criteria as well as determining maintenance requirements for the following season.

3. Identify and recommend any changes which would be beneficial to fish collection and transport operations and/or bypass systems as related to transportation.

4. Ensure that collection, transport, and release site facilities will be ready for operation prior to the spring juvenile outmigration (April 1, 1985).

5. Follow operating criteria established for facilities, barges, and trucks. Criteria will be updated to maintain standards for holding fish, i.e., fish densities, sampling, and facility operation and maintenance. The FTOT will monitor and coordinate changes during the transport season.

6. Coordinate evaluation of the transportation program for 1985.

7. Training of new personnel associated with collection and transport facilities.

8. Preparation of an annual report detailing the past year's transportation effort.

Project Operations for Smolt Protection

The NPW has responsibility for maintaining all equipment and providing safe passage for migrating fingerlings. Procedures to meet these requirements are listed below:

1. Turbine Operations/Generation

During the juvenile outmigration normal turbine unit loading should be as near to peak efficiency (135 mw at Snake River Projects and 70 mw at McNary) as possible. This will minimize fingerling mortalities.

2. Unit Priority and Operation

Research has shown that certain units collect more fish than other units. Units with higher collections are referred to as "priority units". These priority units are 1 through 4 at Lower Granite and Little Goose Dams, and 4 through 10 at McNary Dam. The schedule of unit operation at Lower Granite and Little Goose will proceed from unit 1 through 6. McNary Dam turbine schedule will be units 1, 2, 14, 4-10, 3, 11, 12, 13 consecutively.

3. Submersible Traveling Screens (STS)

a. Operation

STS's will be installed and in operation at three collector projects by March 15, 1985. STS's will be cycled except when chinook average 115 mm or less. Screens must then be operated continuously. Cycling will resume once mean length of chinook exceeds 115 mm. FTOT will be responsible for determining when to implement continuous or cyclic operation of screens based on input from state and project biologists.

A sudden decline in fish condition may also warrant continuous screen operation. Immediately after resumption of screen cycling, fish condition will be monitored to verify that the operational change does not affect fish quality.

b. Maintenance

The number and condition of fish collected are dependent upon well-maintained screens. Continuous monitoring of screens is provided by annunciation (automatic warning system) to the powerhouse control room. Control room operators will notify appropriate officials in the event of a screen failure. FTOT and fishery biologists at each dam will be informed of any STS malfunctions. During peak migration periods or when a priority screen malfunctions, the malfunctioning screen must be replaced within 24 hours (Figure 1). When a malfunctioning screen is noted, there are two options within flow limits that NPW can take:

1) cease generation in the affected unit until the screen is pulled and repair, or:

2) pull the STS and either repair or replace with the spare or a designated replacement screen.

NOTE: A known damaged screen must not be used in a generating unit.

At each collector dam, spare screens will be provided, 1 each at Lower Granite and Little Goose and 2 at McNary. If additional screens are needed to replace damaged screens in high priority units, they should be from non-operating units (long term out of service) or taken from C-slots of the lowest priority units on line. A low priority unit from which a screen has been removed to replace a damaged screen can be operated without a full complement of screens.

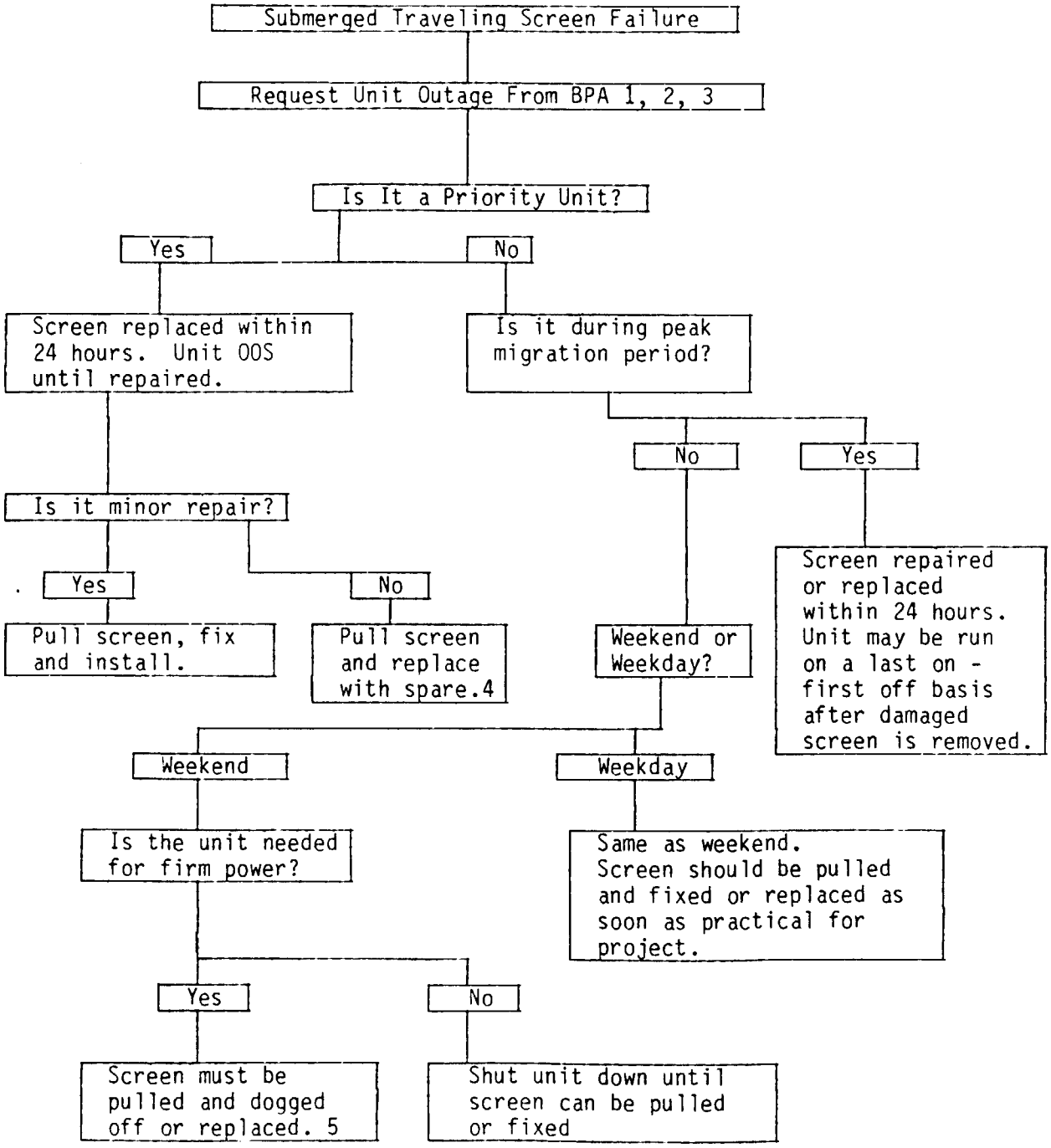
During weekends, if project maintenance crews are not available and a screen malfunctions, the affected unit must be shut down and generation switched to a non-operating screened unit. If all screened units are operating, then generation may exceed peak efficiency ranges in non-affected units if necessary, or water can be spilled as necessary until the STS can be pulled and repaired or replaced with a spare or designated screen. If the affected unit is required for adult passage attraction (unit 1 at Snake River projects, units 1 and 2 at McNary), a decision to shut the unit off over a weekend must not be made without coordinating adult passage concerns through appropriate channels.

c. Inspection

FTOT will be given an opportunity to perform a visual inspection of STS's at all projects prior to the transport season.

The STS monitoring schedule at Snake River projects should begin with an initial TV video inspection during April, prior to the outmigration peak that normally occurs during the final week of April or early May. Subsequent inspections should be conducted each month that screen operations continue.

Figure 1



NOTES:
1. A unit must not be run with a known damaged or malfunctioning screen.
2. Project biologists should be notified as soon as practical of any screen damage or malfunctions. The project biologists will in turn notify FTOT including details of problem and anticipated repair time.
3. If a screen malfunctions and additional generation is needed, the remaining units can be operated above peak loading efficiency. Load should be spread evenly among all available units or all placed on low priority units.
4. If no spare screen is available then C slot screen from lowest priority unit should be used.
5. Any units that must be operated without a full compliment of screens should be done so on a last on - first off basis in order of priority.

At McNary there will be three comprehensive TV video inspections. All screens will be inspected prior to May 1, in mid June, and in early August. Spot checks should be made between the comprehensive inspections. Spot checks cover individual screens in A and/or B slots of all priority units, or as recommended by FTOT.

Unscheduled inspections may be required at any of the collector projects under the following conditions: 1) deterioration of fish condition; 2) increased debris load in bypass system; and 3) other indications of STS malfunction.

4. Peak Migration Periods

The peak migration period begins when total collection at an individual project reaches 20,000 fish per day. Peak migration periods may vary at each dam. Migration peaks at Snake River projects generally occur between April 15 and May 31. McNary peaks vary, but major migrations of spring and summer fish occur between May and mid-August.

5. Debris Problems and Trash Raking

Debris should be removed from in front of turbine units prior to April 1 and thereafter as it accumulates.

Trashracks will be raked at each dam immediately prior to the beginning of the juvenile outmigration season. Gatewells will be monitored daily for trash buildup and checked at least twice a week for water drawdown (head differential) between the forebay and gatewells. Drawdown may be measured once per week at Little Goose and McNary during periods of low debris accumulation and good fish condition. Head differential measurements at Lower Granite, Little Goose, and McNary Dams will be recorded upon initial trash rack raking. Thereafter, when head differential is greater than 1 foot over the initial measurement without debris, or when on-site biologists determine that higher than normal descaling rates indicate that trash racks are likely to be the cause of injury, trashracks will be raked again. Additional raking of trashracks may be necessary as determined by on-site biologists such as when a storm causes massive quantities of debris to be brought down the river system.

When raking is necessary at Lower Granite and Little Goose, unit outages are required. When the center rack (B) is being raked adjacent units do not have to be shut off. When racks A or C are being raked, the adjacent unit must be shut down. At McNary Dam raking is accomplished by pushing debris down the trashracks. Adjacent units do not have to be shut down; however, gatewell orifices must be turned off in the unit being raked. Project biologists will inform FTOT when trash racks are raked.

6. Facility Operations

The collection facility will be manned 24 hours per day until system operations cease. Fish will be returned to the tailrace when they are not being transported.

Gatewell orifices will be checked daily for flow volume and cleaned when necessary. Water level in the gallery will be checked daily and flows at the fingerling separator will be monitored continuously (at least hourly).

When screens and bypass systems are not providing safe passage and meeting criteria, FTOT will alert the Water Budget Managers of problems that may require system operational changes who may in turn request spill.

a. McNary

If minimum flows are exceeded (220 kcfs), fish will be separated by size as long as yearling salmon predominate in the collection. Smaller fish (salmon) will be bypassed through the facility back to tailrace and larger fish (steelhead) will be transported. When subyearling summer/fall chinook numbers exceed numbers of yearling salmon, all collected fish will be transported. Subsamples will be examined for marks or used for research purposes and then released to tailwater or transported. Maximum collection and transportation of all species will be implemented when flows are at or below minimum.

Fall chinook fry (alevins) will be bypassed to the ice/trash sluiceway by pulling the flume screen if impingement problems arise.

b. Lower Granite

All fish collected will be transported. Maximum collection of juveniles for transportation will begin when approximately 80 percent of yearling chinook (as determined by Water Budget managers) have passed the project.

c. Little Goose

If 1984 modifications continue to be effective and flow exceeds minimums, fish will be separated by size and smaller fish bypassed through the facility back to the tailrace. Larger fish will be transported until approximately 80 percent of the yearling chinook migrants (as determined by the Water Budget managers) have passed and steelhead numbers predominate. Then, all fish collected will be transported.

7. Sampling Procedures

a. Sampling will be done in accordance with sampling guidelines for 1985 as developed by CBFWC and tribes (Appendix 2).

Fish that are in the sample group will be counted by electronic counting tunnels. All estimated fish counts and raceway loading densities will be based on a sample of the total fish collected. Samples will be taken throughout a 24 hour day, i.e., about 3-5 minutes per hour.

Species composition and weight samples are necessary to determine loading densities in individual raceways. This sampling will require that project personnel keep a running hourly total of expanded fish numbers and raceway totals.

8. Facility and Equipment Logs and Records

To monitor collection and transport activities the following items will be logged at each dam by either NPW personnel or state fishery biologists.

a. STS Activity - A log of STS operation and inspection should be maintained by the projects. Changes in operational modes or malfunctions and repairs will be noted, including dates of occurrence.

b. Gatewells - Recordings of head differential between the gatewells and forebays will be logged. Trash raking will occur when differentials reach established limits, or as noted in Section 5, Debris Problems and Trash Raking. All debris assessments will be recorded.

c. Fingerling Facilities - Daily logs will be maintained of fish counts/hr/day by species, truck and barge operations, fish sampling, mark recovery, and general observations of fish condition and fingerling passage. Mortalities will be listed by species in all areas of the collection and transport system.

d. Trucks and Barges - Fish transport equipment activities will be logged daily including transport time, problems encountered, estimated fish mortalities, and any equipment malfunctions.

e. At Little Goose dissolved gas levels in the forebay, upwell, hopper, gallery and raceways will be measured and recorded at appropriate time intervals. Hopper water surface elevation will be noted coincident with gas measurements.

9. Loading Criteria

Maximum raceway holding capacity is 0.5 lbs. of fish per gallon of water.

Inflow to raceways is approximately 1200 gpm at Snake River projects and 1000 gpm at McNary. Individual raceway volume is approximately 12,000 gallons of water at Snake River dams. Individual Raceway capacity at McNary Dam is 5,000 gallons plus 2 temporary Raceways with 7,400 gallons each. Exceeding holding criteria is not anticipated except during peak outmigration periods. During peak periods, a decision to exceed loading densities at Snake River projects will be coordinated by FTOT. A decision will then be made by the tribes and agencies to either exceed recommended densities, or bypass fish back to the river. Conditions that must be considered include: 1) species composition; 2) total anticipated collection during the critical holding period; 3) inriver bypass conditions; and 4) fish condition.

At McNary Dam, loading criteria will be adhered to regardless of collection capabilities. When fish poundage in raceways reaches established limits (holding capacity), fish will be bypassed to the river. During periods when large numbers of fall chinook are collected, poundage limits may be inadequate. Total numbers of fall chinook should not exceed 50,000 per concrete raceway or 75,000 per temporary raceway. Total facility holding capacity is 500,000 fall chinook.

At Lower Granite Dam, when maximum raceway holding capacity is reached, fish will be bypassed to the river or passed directly into a barge to avoid overloaded conditions in raceways. During low flow conditions criteria established for Little Goose Dam will be followed.

At Little Goose Dam, the raceway capacity may be temporarily exceeded above the established criteria of 0.5 lb/gal. Exceeding recommended loading criteria is dependent on the percentage of steelhead to chinook ratio in the sample. Little Goose Dam may hold fish at the higher criteria (up to 1.0 lb/gal) only when steelhead composition in the raceway exceeds 80 percent of the total fish collected. This will minimize the impact of overcrowding spring/summer chinook.

Collected fish should be spread among raceways to prevent crowding and reduce the risk of disease and disaster even when densities are less than holding criteria. Maximum holding time in raceways will not exceed two days except as noted in Section 11a.

The following are criteria established for the fish barges and trucks:

Barge	Capacity (gal.)	Inflow(gpm)	Fish Holding Capacity (lbs)
2817	85,000	5,200	26,000
2127	85,000	5,200	26,000
4382	100,000	10,000	50,000
4394	100,000	10,000	50,000
Truck	3,500		1,750

Holding criteria for the barges have been set at 5 lb. of fish/gpm inflow. Truck loading criterion is 0.5 lb. of fish/gallon of water.

10. Transport Operations

a. Truck and Barge Operations (Spring and Summer Migration)

Four fish barges are available which will allow a barge load of fish to leave Lower Granite daily. It takes approximately 90 hours to make a round trip to the release site below Bonneville Dam and return. The barges are unloaded below Beacon Rock near the Skamania light buoy.

Early migrants will be trucked until barging is implemented approximately April 10. Fish holding criteria during early April at Snake River Projects can be increased to 4 days or until daily counts exceed 20,000 fish. Barging should continue through the peak spring migration period or until smolt numbers decline to below 20,000 per day. Direct loading of fish into barges should be done at Lower Granite whenever possible.

Two fish barges will be available to transport fall chinook during the peak summer migration, occurring about June 20 to August 10 at McNary Dam.

Corps personnel will be on barges to supervise all loading and off-loading operations. During the training period, barge personnel will receive instructions on dealing with emergencies. If an emergency situation occurs while the barge is underway, the barge rider is responsible for deciding if and where an early release will be made. There will be radio contact between barges and dams on the transportation route. Project biologists will be notified of any major problems that occur. They will in turn notify FTOT.

Five tank trailers are available for hauling fish. Release of trucked fish will be at Bradford Island, adjacent to Bonneville First Powerhouse. Alternate truck release sites are located at Dalton Point and Bonneville Second Powerhouse.

Truck drivers will be familiar with fish life support systems on their tank trailer and the sensitivity of juvenile salmonids to stress. Drivers will be trained to know where and under what conditions fish must be released in an emergency.

b. Summer Transport Program

At McNary Dam, collection and transportation of all species will begin when subyearling chinook exceed yearling salmon counts. Transportation will continue at McNary through September. Termination may occur earlier if fish numbers collected are 1,000 or less for 5 consecutive days. Other factors that may cause early

termination of transport include high fish mortality or injury rates.

Collection and transportation of summer migrants will be maximized at Lower Granite and Little Goose dams. Transport will continue until approximately August 1 or until fish numbers approach 500 per day. Factors that could cause earlier termination of truck transport include high fish mortality or injury rates.

11. State Roles

Fishery agencies and tribes are responsible for biological oversight of fish at transport dams. NPW funds State fish biologists or culturists at each collector facility by Cooperative Agreement. Idaho personnel will be stationed at Lower Granite, Oregon's at Little Goose, and Washington's at McNary.

Cooperative agreements between States and NPW specify duties of state personnel in task orders as follows: 1) fish sampling and handling, 2) evaluations of fish condition, 3) double checks on expanded calculations of total facility collection, 4) quality control inspections of collection and transport facilities, 5) monitoring fish research activities at dams, and 6) conducting a gatewell dipping program to monitor quality of fish arriving at projects.

12. Dissemination of Information

Fishery biologists at each dam will be responsible for providing pertinent information on fish numbers to project powerhouse operators daily. This will include spring chinook, fall chinook, steelhead, sockeye, and coho daily collection and transport totals. NPW operators will place this information on the teletype which will then be available in Walla Walla and Portland Districts, and North Pacific Division (NPD) office. Information will be provided to user groups through the Smolt Monitoring Program. Water Budget Center will provide a weekly summary report of transport numbers from collector dams to fishery agencies, tribes, Corps offices, BPA, NPPC, PUDs, etc.

13. NPW Project Requirements for Fishery Agency Activities

To maintain a good working relationship and communication process at NPW projects, fishery agencies and tribes will follow certain courtesy and safety habits. They include: 1) checking into the project properly, i.e., notifying project engineers or biologists that you will be arriving or have arrived on site; 2) adherence to local project requirements (hard hats, safety procedures, etc.), and 3) prior arrangements or notification of any unscheduled activities (research, etc).

Appendix 1 - Transport Guidelines
Appendix 2 - Sampling Guidelines

APPENDIX 1

Transport Guidelines and Criteria

The fishery agencies, tribes, and Corps of Engineers recognize the need for guidelines and operational criteria for the Snake and Columbia River fish transportation programs. This document includes measures developed as a result of past transportation evaluations that indicated positive benefits occur from transport of juvenile steelhead and appear likely for subyearling summer and fall chinook salmon. Yearling spring and summer chinook receive less benefit from transportation than steelhead.

In the development of operational criteria for the transport of juvenile fish, potential consequences of upriver operational strategies upon migrants for their entire journey to the ocean must be considered. For example, a decision to spill for a given period at Lower Granite must consider both the likelihood of achieving comparable protection at downstream projects and probable survival for the migrants if spill is not provided, i.e., survival in passing the powerhouse. The decision to operate for spill passage or powerhouse passage is greatly influenced by the collection efficiency of the powerhouse bypass system at a given project and passage systems at downstream projects. During periods when spill is available for migrant protection, spill priority is dependent upon project collection efficiency and expected survival of those migrants collected.

Steelhead transportation is currently used because transported groups have consistently exhibited higher survival rates than non-transported groups. However, safely and efficiently separating chinook from steelhead for different treatment adds to the operational complexity.

Development of operational criteria for yearling chinook migrants is complex since transport success has been varied in recent years. Fishery agencies presently support "spreading the risk" by transporting a small proportion of the run and bypassing the remainder in years when flow is above the agreed-upon minimum, and maximum collection and transportation in years when flows are at or below agreed-upon minimums. The purpose of this strategy is to provide migrants the opportunity to benefit from improved survival which may occur as operational refinements are made to both techniques.

The Corps of Engineers maintains the position that field research supports full transport in all flow years but recognizes the management responsibility of the fishery agencies and tribes. In the spirit of compromise, the Corps will support the above-stated fishery agency strategy. The fishery agencies and tribes must recognize, however, that water availability for spill is uncertain.

These guidelines are based on the best available information recognizing that many questions still remain unanswered. Some special considerations that have influenced the development of these guidelines are listed below.

Special Considerations

1. Evaluate modifications designed to improve transportation success. Regardless of flow conditions, groups of spring chinook and steelhead must be collected, marked, and transported at Lower Granite.

2. Spilling large amounts of water may increase mortality caused by gas bubble disease, descaling, and other factors.

3. Increasing spill and reducing powerhouse operation may adversely impact adult passage.

4. Low fish collection efficiency at Lower Granite and Little Goose leads to higher turbine losses and makes spill a considered alternative at this time.

5. Collection, loading and handling problems associated with the Little Goose bypass system cause injuries and mortalities to fish.

6. Wild steelhead benefit greatly from transportation and tend to migrate with yearling chinook. They are similar in size to the yearling chinook, which makes it difficult to separate the two by size.

Research and evaluation of the transport/bypass program is being conducted to improve bypass and collection facilities and transportation success of juvenile salmonids, including evaluation of in-river survival rates. Sampling rates will be set prior to the season to assure statistically valid research results while protecting downstream migrants from excessive handling.

Guidelines for transport operations during 1985 are listed by project.

1. When flows are at or below minimums (approximately 85 kcfs in the Snake and 220 kcfs in Columbia)[1]:

Lower Granite, Little Goose, McNary

At each collector dam, maximum collection and transportation of all species will be implemented when flows are at or below minimums. Based on present data, years when minimum flow conditions are expected on the Snake River are about 1 in 2 and on the Columbia River about 3 in 40. Therefore transportation may occur on the Snake River because of inadequate flows while

---

[1] Estimated total travel time for migrants which are influenced by flows encountered in the main stem Columbia must be considered in determining adequacy of flows in the Snake.

fish are bypassed at McNary Dam because of adequate flows in the lower Columbia River.

2. When minimum flows are exceeded (approximately 85 kcfs in the Snake and 220 kcfs in the Columbia)[1]:

Lower Granite

Spill for bypassing spring chinook should be considered because many fish would, with the present low fish guiding efficiency, be subjected to turbine passage. Improvements in bypass collection efficiencies will reduce the need for high spill levels. Research has shown that, by raising the turbine intake operating gates 20 feet from their normal stored positions, fish guidance can be increased. The fishery agencies and tribes believe that this modification should be completed prior to the 1986 season.

All fish collected will be transported. Maximum collection of juveniles for transportation will begin when approximately 80 percent of yearling chinook have passed the project, as determined by Water Budget managers.

The barge schedule should begin April 10. Test results have shown that barged yearling chinook have survived to adults at a higher rate than trucked groups. Therefore early arriving yearling chinook would receive more protection because they would be barged.

If species separation by adjustment of hatchery release dates proves ineffective, maximum collection for transportation may begin at an earlier date, e.g., when 50 percent of the collection is steelhead smolts. The design, construction, and installation of a fish size separation system is necessary for Lower Granite in the future.

Little Goose

Currently, new facilities are scheduled for completion by 1989 and should improve fish quality and passage conditions. Interim modifications to the existing system have been made. When bypass collection efficiency is improved, the need for high spill levels will be reduced. Results of research must be used to determine such changes.

As long as existing facility operation is satisfactory yearling salmon will be separated from larger steelhead smolts by a mechanical fish size separator. Yearling salmon separated will be bypassed to the river while steelhead and those yearling salmon not separated will be transported. Maximum collection of juveniles for transportation will begin when approximately 80 percent of yearling salmon have passed the project.

McNary Dam

Powerhouse bypass systems and spill are to be used during the spring season to pass yearling migrants. Yearling salmon will be separated from larger steelhead smolts by a mechanical fish size separator. Yearling salmon will be bypassed to the river while steelhead and those yearling salmon not

separated will be transported. When subyearling chinook counts exceed those of yearling salmon, transportation of all species will begin. The intent is to limit the proportion of the spring chinook run transported from McNary Dam to 10 percent or less.

Summer Migration

Summer migrants collected at the three collector projects will be transported below Bonneville Dam. Because of increased abundance of fall chinook migrating past McNary, barging should be operational from approximately June 15 to August 15.

Changes to the Guidelines:

These guidelines are intended to provide the framework for carrying out the juvenile fish transportation program. As such, any changes to the guidelines will be approved by the North Pacific Division Engineer, the Executive Director of the Columbia River Inter-Tribal Fish Commission, and the directors of the Northwest fisheries agencies.

APPENDIX 2

SAMPLING GUIDELINES FOR COLLECTOR DAMS IN 1985

Each year the fishery agencies are faced with the need to sample significant numbers of smolts at the collector dams and other sample points. These smolt samples are used in monitoring survival and abundance and to evaluate bypasses, the transportation program and various other research needs. Because the capability exists to sample an extremely high percentage of the total run at each collector dam, it is necessary to set some guidelines for sampling at these projects to prevent the sampling program from becoming an impact on fish survival of and by itself.

Currently there are four collector dams: Lower Granite, Little Goose, McNary and Bonneville. If each collector dam sampled only 3% of the entire outmigration, the total sample rate of Snake River fish available at each project for the inriver migration would be 12%. Since there is mortality at and between projects, and some transportation of fish, the actual sample level of the total run arriving at Lower Granite Dam would be something less than 12%[1].

In addition to the four collector dams are numerous other sample points along the migration path. These include (1) the White Bird trap; (2) Lewiston area trapping; (3) mid-Columbia tributary traps; (4) gatewell dipping at mid-Columbia dams; (5) airlift pumping of John Day gatewells; (6) Jones Beach seining; and (7) other smaller sampling programs. Several of these sampling programs may be capable of sampling up to 1% of the run. Given that Snake River fish could encounter three to four of these fish would be sampled at greater than a 10% total rate.

Given the need to balance research and evaluation against minimum impacts on these important runs, it seems reasonable to restrict sampling to 10% or less of the total run over the entire season. Further, that since a mix of transportation and inriver passage is being used to provide two separate means of overcoming mortality, no more than 10% of either of these two segments of the run should be sampled. These guidelines presume that only a small percentage of the fish sampled are actually sacrificed and that most are returned to the river or transported alive with a relatively good, though reduced, chance of survival.

Based on the presumption that in 1985 Little Goose and Bonneville dams will sample fish at a combined rate of less than 3% of the entire run, and that sampling done at sites other than collector dams will not exceed a total of 3%

---

[1] At an inriver survival rate of 85% past each project, a 3% sample level would sample 8.2% of the total outmigration arriving at Lower Granite Dam. If all fish sampled became mortalities, it would reduce the number of smolts surviving past Bonneville Dam by about 4%.

for any one population segment, the following specific sampling guidelines are proposed for the collector dams:

LOWER GRANITE

Sampling Objective

Not to exceed the lesser of 3% of the estimated weekly outmigration or 10% of the weekly total of smolts collected and/or bypassed.[2]

Daily Sampling Rate (as obtained hourly by the sampler)

To allow flexibility in obtaining fish without adding confusion to meeting the sampling objective (above), the daily sampling rate (noon to noon) may not exceed the sampling objective rate except as follows:

(1) For two days during any one week (Sunday to Saturday) the sampling rate may be doubled (the lesser of 6% of the outmigration or 20% of smolts collected or bypassed), provided that

(2) For each day that the sample rate is raised above the sampling objective, there must be a day within the same week in which the sample rate is lowered an equal or greater amount.

Coordination

All researchers must coordinate their sample needs with the FTOT prior to March 15. FTOT will coordinate the sampling for maximum efficiency of fish use. Researchers must apprise the Corps operations biologist (John Ferguson) of their exact smolt needs at least one week prior to obtaining the actual sample. Any request for deviations from these guidelines must be routed through the FTOT.

LITTLE GOOSE

Sampling Objective

As required to determine pound counts, species composition, enumeration, quality control, etc. for standard bypass and transport operations. Generally not to exceed 1.5% of daily collection and/or bypass.

MCNARY - Same as for Lower Granite

---

[2]Given a 50% FGE and an effective spill of 40%, a sample rate of 10% of fish collected or bypassed should be equal to about 3% of the total run. If the FGE is increased in 1985 to 70%, then with little or no spill a 4% to 5% sample rate of fish bypassed and/or collected should provide about a 3% total run sample.

HATCHERY RELEASE SCHEDULE

APPENDIX IV

PROPOSED 1985 HATCHERY RELEASES ABOVE BONNEVILLE DAM
PREPARED BY WATER BUDGET CENTER

HATCHERY **0001**

AGENCY	HATCHERY		SPECIES	STOCK	BRD YR	MGR YR	RELEASE START DATE	RELEASE END DATE	NUMBER RELEASED	SIZE #/LB	RELEASE SITE	RIVER SYSTEM	COMMENTS	WBC LOT ID
IDFG	MCCALL	SU	CHINOOK	SOUTH FORK	83	85	85/04/08	85/04/08	560,000	25	S F SALMON R	S F SALMON R	TRUCKED,83K CWT,25K FB	85057
*									560,000					
*													# RELEASES	1
IDFG	NIAGARA SPRING		STEELHEAD	"A"	84	85	85/04/01	85/04/30	740,000	4	PAHSIMEROI R	PAHSIMEROI R	40K CWT	85062
			STEELHEAD	"A"	84	85	85/04/01	85/04/30	140,000	4	BRUNDS	SALMON R	20K CWT	85061
			STEELHEAD	"A"	84	85	85/04/01	85/04/30	140,000	4	PANTHER CRK	SALMON R	40K CWT	85060
			STEELHEAD	"A"	84	85	85/04/15	85/04/15	180,000	4	LITTLE SALMON R	SALMON R	40K CWT	85063
			STEELHEAD	"A"	84	85	85/04/28	85/05/03	500,000	4	HELLS CANYON	SNAKE R	30K FB	85059
*									1,700,000					
*													# RELEASES	5
IDFG	PAHSIMEROI H	SU	CHINOOK	PAHSIMEROI	83	85	85/03/01	85/04/01	217,000	25	PAHSIMEROI R	PAHSIMEROI R	VOLITIONAL RELEASE	85058
		SP	CHINOOK	HAYDEN CRK	83	85	85/03/01	85/04/01	186,000	25	PAHSIMEROI R	PAHSIMEROI R	VOLITIONAL RELEASE	85056
*									403,000					
*													# RELEASES	2
IDFG	RAPID RIVER H	SP	CHINOOK	RAPID R	83	85	85/02/15	85/04/20	2,000,000	24	RAPID RIVER H	RAPID R	VOLIT.REL.,40K FB	85052
		SP	CHINOOK	RAPID R	83	85	85/03/18	85/03/22	900,000	24	HELLS CANYON	SNAKE R	TRUCKED, 40K FB	85053
*									2,900,000					
*													# RELEASES	2
IDFG	RED RIVER	SP	CHINOOK	RED R	83	85	85/04/01	85/04/01	80,000	25	RED R	RED R	VOLITIONAL RELEASE	85054
*									80,000					
*													# RELEASES	1
IDFG	SAWTOOTH H	SP	CHINOOK	SAWTOOTH	83	85	85/03/25	85/03/25	430,000	25	SAWTOOTH H	SALMON R	82K CWT,40K FB,TRUCKED	85055
*									430,000					
*													# RELEASES	1
**									6,073,000					
**													# RELEASES	12

PROPOSED 1985 HATCHERY RELEASES ABOVE BONNEVILLE DAM
PREPARED BY WATER BUDGET CENTER

HATCHERY **0001**

AGENCY	HATCHERY		SPECIES	STOCK	BRD YR	MOR YR	RELEASE START DATE	RELEASE END DATE	NUMBER RELEASED	SIZE #/LB	RELEASE SITE	RIVER SYSTEM	COMMENTS	WBC LOT ID
ODFW	BONNEVILLE H	FA	CHINOOK	COL URB	83	85	85/03/15	85/03/15	225,000		UMATILLA R	UMATILLA R	MID MAR,15% AD-CWT	85201
		FA	CHINOOK	COL URB	84	85	85/06/24	85/06/24	3,000,000		UMATILLA R	UMATILLA R	10% AD-CWT	85202
*									3,225,000					
*													# RELEASES	2
ODFW	IRRIGON	SU	STEELHEAD	IMNAHA	84	85	85/04/29	85/05/04	83,000		LI SHEEP CRK	IMNAHA R		85214
		SU	STEELHEAD	WALLOWA	84	85	85/04/29	85/05/04	400,000		BIG CANYON CRK	WALLOWA R	100% AD	85215
		SU	STEELHEAD	WALLOWA	84	85	85/04/29	85/05/04	445,000		SPRING CRK CHNL	WALLOWA R		85216
*									928,000					
*													# RELEASES	3
ODFW	LOOKINGGLASS H	SP	CHINOOK	FALL CRK/CARSON	83	85	85/04/15	85/04/15	225,000		LOOKINGGLASS H	GRANDE RONDE R	100% AD-CWT	85206
		SP	CHINOOK	CARSON	83	85	85/04/15	85/04/15	696,000		LOOKINGGLASS H	GRANDE RONDE R	100% AD-CWT	85207
		SP	CHINOOK	IMNAHA	83	85	85/04/15	85/04/15	54,000		IMNAHA R	IMNAHA R	100% AD-CWT	85204
		SP	CHINOOK	IMNAHA	84	86	85/09/01	85/09/01	18,000		IMNAHA R	IMNAHA R	100% AD-CWT	85205
		SP	CHINOOK	CARSON	84	86	85/09/15	85/11/01	400,000		LOOKINGGLASS CR	GRANDE RONDE R	25% AD-CWT	85208
*									1,393,000					
*													# RELEASES	5
ODFW	OAK SPRINGS	SU	STEELHEAD	SOUTH SANTIAM	84	85	85/04/01	85/04/12	85,000	5	HOOD R	HOOD R	100% AD	85211
		SU	STEELHEAD	UMATILLA	84	85	85/05/06	85/05/10	60,000	5	UMATILLA R	UMATILLA R	100% AD	85213
*									145,000					
*													# RELEASES	2
ODFW	ROUND BUTTE H	SP	CHINOOK	DESCHUTES	83	85	85/03/08	85/03/08	60,000	6	BELOW PELTON D	DESCHUTES R	100% AD-CWT,VOLIT RELEASE	85210
		SP	CHINOOK	DESCHUTES	83	85	85/04/01	85/04/01	60,000	9	BELOW PELTON D	DESCHUTES R	100% AD-CWT,TRUCKED	85209
		SP	CHINOOK	DESCHUTES	83	85	85/04/01	85/04/01	60,000	6	BELOW PELTON D	DESCHUTES R	100% CWT,VOLIT RELEASE	85217
		SU	STEELHEAD	DESCHUTES	84	85	85/04/08	85/04/19	162,000	5	DESCHUTES R	DESCHUTES R	100% AD RV	85212
*									342,000					
*													# RELEASES	4
**									6,033,000					
**													# RELEASES	16

PROPOSED 1985 HATCHERY RELEASES ABOVE BONNEVILLE DAM
PREPARED BY WATER BUDGET CENTER

HATCHERY ##0001##

3/18/85 8.14.:
PAGE

AGENCY	HATCHERY		SPECIES	STOCK	BRD YR	MOR YR	RELEASE START DATE	RELEASE END DATE	NUMBER RELEASED	SIZE #/LB	RELEASE SITE	RIVER SYSTEM	COMMENTS	WBC LOT ID
USFW	CARSON NFH	SP	CHINOOK		83	85	85/02/13	85/02/15	849,746	26	CARSON NFH	WIND R		85010
		SP	CHINOOK		84	86	85/02/15	85/02/15	500,000	200	CARSON NFH	WIND R		85011
		SP	CHINOOK	CARSON	83	85	85/04/15	85/04/15	100,000	18	CATHERINE CRK	GRANDE RONDE R		85009
		SP	CHINOOK		83	85	85/04/15	85/04/15	1,850,000	18	CARSON NFH	WIND R		85008
*									3,299,746					
*													0 RELEASES	4
USFW	DWORSHAK NFH	SP	CHINOOK		83	85	85/04/01	85/04/15	1,500,000	15	DWORSHAK NFH	CLEARWATER R	40K FB	85031
			STEELHEAD		84	85	85/05/01	85/05/15	2,000,000	7	DWORSHAK NFH	CLEARWATER R	35K FB	85030
*									3,500,000					
*													0 RELEASES	2
USFW	ENTIAT NFH	SP	CHINOOK		83	85	85/04/15	85/04/15	920,000	20	ENTIAT NFH	ENTIAT R		85001
*									920,000					
*													0 RELEASES	1
USFW	HAGERMAN NFH	FA	CHINOOK	HAGERMAN URB	84	85	85/05/01	85/05/01	200,000	70	GRANDE RONDE R	GRANDE RONDE R	TRUCKED, 40K FB, 60K CWT	85035
			STEELHEAD	HAGERMAN "B"	84	85	85/04/01	85/04/30	300,000	4	E F SALMON R	E F SALMON R	32-40K FB, 154K CWT	85034
			STEELHEAD	HAGERMAN "A"	84	85	85/04/01	85/04/30	1,100,000	4	STANLEY	SALMON R	32-40K FB, 150K CWT	85033
*									1,600,000					
*													0 RELEASES	3
USFW	KOOSKIA NFH	SP	CHINOOK		83	85	85/03/21	85/03/29	305,000	20	KOOSKIA NFH	MF CLEARWATER R		85032
*									305,000					
*													0 RELEASES	1
USFW	LEAVENWORTH NFH	SP	CHINOOK		83	85	84/09/13	84/09/15	102,833		YAKIMA R	YAKIMA R	BY YAKIMA TR	84001
		SP	CHINOOK		83	85	84/10/01	84/10/01	100,000		YAKIMA R	YAKIMA R	BY YAKIMA TR	84002
		SP	CHINOOK		83	85	85/04/13	85/04/13	2,050,000	17	LEAVENWORTH NFH	WENATCHEE R	30K FB	85003
		SP	CHINOOK	LEAVENWORTH	83	85	85/04/13	85/04/13	100,000	16	YAKIMA R	YAKIMA R	BY YAKIMA TR	85004
		SP	CHINOOK	LEAVENWORTH	84	85	85/06/01	85/06/01	100,000	50	YAKIMA R	YAKIMA R	BY YAKIMA TR	85005
		SP	CHINOOK	LEAVENWORTH	84	86	85/09/01	85/09/01	100,000	22	YAKIMA R	YAKIMA R		85006
		SP	CHINOOK	LEAVENWORTH	84	86	85/11/01	85/11/01	100,000	20	YAKIMA R	YAKIMA R		85007
*									2,652,833					
*													0 RELEASES	7
USFW	LWHITE SALMON H	SP	CHINOOK		83	85	85/04/17	85/04/17	900,000	15	LWHITE SALMON H	LWHITE SALMON R		85026
		SP	CHINOOK		83	85	85/04/17	85/04/17	412,000	12	LWHITE SALMON H	LWHITE SALMON R		85027
		SP	CHINOOK		84	85	85/05/05	85/05/05	400,000	60	LWHITE SALMON H	LWHITE SALMON R		85028
		SP	CHINOOK		84	85	85/06/20	85/06/20	150,000	40	LWHITE SALMON H	LWHITE SALMON R		85029

AGENCY	HATCHERY		SPECIES	STOCK	BRD YR	MGR YR	RELEASE START DATE	RELEASE END DATE	NUMBER RELEASED	SIZE #/LB	RELEASE SITE	RIVER SYSTEM	COMMENTS		WBC LOT ID
		FA	CHINOOK	URB	83	85	85/04/17	85/04/17	96,000	15	LWHITE SALMON H	LWHITE SALMON R			85024
		FA	CHINOOK	TULE	84	85	85/06/20	85/06/20	1,600,000	110	LWHITE SALMON H	LWHITE SALMON R			85023
		FA	CHINOOK	URB	84	85	85/06/20	85/06/20	1,000,000	120	LWHITE SALMON H	LWHITE SALMON R			85025
			COHO		83	85	85/06/01	85/06/01	900,000	18	LWHITE SALMON H	LWHITE SALMON R			85022
*									5,458,000						
*														# RELEASES	8
USFW	SPRING CRK NFH	FA	CHINOOK	TULE	84	84	85/03/25	85/03/25	6,000,000	126	SPRING CRK NFH	LOWER COLUMBIA			85014
		FA	CHINOOK	TULE	84	85	85/04/18	85/04/18	3,000,000	90	SPRING CRK NFH	LOWER COLUMBIA			85015
		FA	CHINOOK	TULE/SPR CRK	84	85	85/05/14	85/05/14	2,700,000	75	WHITE SALMON R	WHITE SALMON R			85017
		FA	CHINOOK	TULE	84	85	85/05/16	85/05/16	3,000,000	65	SPRING CRK NFH	LOWER COLUMBIA			85016
		FA	CHINOOK	URB	84	85	85/06/01	85/06/01	750,000	70	HANFORD	MID COLUMBIA R			85021
		FA	CHINOOK	URB	84	85	85/06/01	85/06/01	1,700,000	120	YAKIMA R	YAKIMA R	BY YAK TR,200K CWT,10K FB		85020
		FA	CHINOOK	URB	84	85	85/06/06	85/06/06	480,000	85	ROCK CREEK	LOWER COLUMBIA			85019
		FA	CHINOOK	URB	84	85	85/06/06	85/06/06	210,000	85	SOC SEC PONDS	LOWER COLUMBIA			85018
*									17,840,000						
*														# RELEASES	8
USFW	WINTHROP NFH	SP	CHINOOK		83	85	85/04/15	85/04/23	40,000	18	BELOW PRST RAPI	MID COLUMBIA R	40K FB		85036
		SP	CHINOOK		83	85	85/04/16	85/04/16	1,000,000	18	WINTHROP NFH	METHOW R	125K FB		85002
*									1,040,000						
*														# RELEASES	2
USFW	WARM SPRINGS H	SP	CHINOOK		83	85	85/04/01	85/04/01	415,000	15	WARM SPRINGS H	WARM SPRINGS R			85012
		SP	CHINOOK		84	86	85/10/01	85/10/01	350,000	10	WARM SPRINGS H	WARM SPRINGS R			85013
*									765,000						
*														# RELEASES	2
**									37,380,579						
**														# RELEASES	38

AGENCY	HATCHERY		SPECIES	STOCK	BRD YR	MGR YR	RELEASE START DATE	RELEASE END DATE	NUMBER RELEASED	SIZE #/LB	RELEASE SITE	RIVER SYSTEM	COMMENTS	WBC LOT ID
WDF	KLICKITAT H	SP	CHINOOK	KLICKITAT	83	85	84/10/08	84/10/10	235,000	33	UPPER KLICKITAT	KLICKITAT R		85114
		SP	CHINOOK	KLICKITAT	83	85	85/04/01	85/04/01	600,000	10	KLICKITAT H	KLICKITAT R		85101
		SP	CHINOOK	KLICKITAT	84	86	85/04/15	85/04/15	250,000	125	UPPER KLICKITAT	KLICKITAT R	CHECK MIGRATION YEAR	85102
		FA	CHINOOK	SNAKE R	83	85	85/05/15	85/05/15	143,000	100	KLICKITAT H	KLICKITAT R		85103
			COHO	TYPE-S	84	86	85/03/28	85/03/28	1,000,000	350	KLICKITAT H	KLICKITAT R	50K CWT	85105
			COHO	TYPE-S	83	85	85/04/15	85/05/15	288,000	15	KLICKITAT H	KLICKITAT R	MAY TAG 50K, VOLIT RELEAS	85104
*									2,516,000					
*													6 RELEASES	6
WDF	LYONS FERRY	FA	CHINOOK	SNAKE R	83	85	85/04/15	85/04/15	800,000	8	LYONS FERRY	SNAKE R	406K CWT-AD	85106
		FA	CHINOOK	SNAKE R	84	85	85/06/10	85/06/10	250,000	60	LYONS FERRY	SNAKE R	100% CWT-AD	85107
*									1,050,000					
*													2 RELEASES	2
WDF	PRIEST RAPIDS H	FA	CHINOOK	PRIEST RAPIDS	84	86	85/06/01	85/06/30	7,000,000	70	PRIEST RAPIDS H	MID COLUMBIA R	200K CWT,80K FB-AD	85109
*									7,000,000					
*													1 RELEASES	1
WDF	RINGOLD H	FA	CHINOOK	BRTS-BONNV DAM	83	85	85/04/01	85/04/07	1,200,000	7	RINGOLD H	MID COLUMBIA R		85108
*									1,200,000					
*													1 RELEASES	1
WDF	ROCKY REACH H	FA	CHINOOK	PRIEST RAPIDS	83	85	85/04/01	85/04/01	250,000	8	ROCKY REACH H	MID COLUMBIA R	200K CWT	85115
			COHO	TYPE-S	83	85	85/05/01	85/05/01	400,000	20	ROCKY REACH H	MID COLUMBIA R		85116
*									650,000					
*													2 RELEASES	2
WDF	WELLS-WDF	SU	CHINOOK	WELLS DAM	83	85	85/04/15	85/04/15	180,000	8	WELLS-WDF	MID COLUMBIA R	150K CWT	85110
		SU	CHINOOK	WELLS DAM	84	86	85/06/01	85/06/01	1,400,000	58	WELLS-WDF	MID COLUMBIA R	250K CWT,100K FB-AD	85111
		SU	CHINOOK	WELLS DAM	84	86	85/08/01	85/08/01	100,000	20	WELLS-WDF	MID COLUMBIA R	50K CWT	85112
*									1,680,000					
*													3 RELEASES	3
**									14,096,000					
**													15 RELEASES	15

PROPOSED 1985 HATCHERY RELEASES ABOVE BONNEVILLE DAM
PREPARED BY WATER BUDGET CENTER

HATCHERY **0001**

3/18/85 8.14.3
PAGE

AGENCY	HATCHERY		SPECIES	STOCK	BRD YR	MGR YR	RELEASE START DATE	RELEASE END DATE	NUMBER RELEASED	SIZE #/LB	RELEASE SITE	RIVER SYSTEM	COMMENTS		WBC LOT ID
WDG	CHELAN PUD	SU	STEELHEAD		84	85	85/04/15	85/05/01	40,000	5	ENTIAT R	ENTIAT R	AD		85153
		SU	STEELHEAD		84	85	85/04/15	85/05/01	295,000		WENATCHEE R	WENATCHEE R	AD		85154
*									335,000						
*														# RELEASES	2
WDG	LYONS FERRY	SU	STEELHEAD		84	85	85/05/01	85/05/01	30,000		ASOTIN CREEK	SNAKE R			85165
		SU	STEELHEAD		84	85	85/05/01	85/05/10	110,000		LYONS FERRY	SNAKE R	AD,100K FB,56K CWT-LV		85158
		SU	STEELHEAD		84	85	85/05/01	85/05/01	175,000		WALLA WALLA R	WALLA WALLA R	AD		85159
		SU	STEELHEAD		84	85	85/05/05	85/05/13	24,000		BELOW ICE HARBR	SNAKE R	100% FB		85167
		SU	STEELHEAD		84	85	85/05/05	85/05/13	40,000		BELOW LI GOOSE	SNAKE R	100% FB		85166
		SU	STEELHEAD		84	85	85/05/15	85/05/15	125,000		GRANDE RONDE R	GRANDE RONDE R	AD,80K FB-CWT		85156
		SU	STEELHEAD		84	85	85/05/15	85/05/15	125,000	6	TUCANNON R	TUCANNON R	AD,80K FB-CWT		85157
*									629,000						
*														# RELEASES	7
WDG	NACHES H	SU	STEELHEAD	WELLS	84	85	85/04/01	85/04/15	90,000	6	NACHES R	NACHES R	AD		85155
*									90,000						
*														# RELEASES	1
WDG	RINGOLD H	SU	STEELHEAD		84	85	85/04/12	85/04/30	120,000	6	RINGOLD H	MID COLUMBIA R			85164
*									120,000						
*														# RELEASES	1
WDG	SKAMANIA H	SU	STEELHEAD		84	85	85/04/15	85/05/01	85,000	6	KLICKITAT R	KLICKITAT R	AD		85160
		SU	STEELHEAD		84	85	85/04/15	85/05/01	10,000		WHITE SALMON R	WHITE SALMON R	AD		85161
		SU	STEELHEAD	VANCOUVER	84	85	85/04/15	85/05/01	25,000		WIND R	WIND R	AD		85162
*									120,000						
*														# RELEASES	3
WDG	WELLS-WDG	SU	STEELHEAD		84	85	85/04/12	85/05/01	75,000	5	SIMILKAMEEN R	SIMILKAMEEN R	AD		85151
		SU	STEELHEAD		84	85	85/04/15	85/05/08	385,000		METHOW R	METHOW R	AD		85152
		SU	STEELHEAD		84	85	85/04/25	85/05/05	40,000		BELOW PRST RAPI	MID COLUMBIA R	100% FB		85163
*									500,000						
*														# RELEASES	3
**									1,794,000						
**														# RELEASES	17
***									65,376,579						
***														# RELEASES	98

SUPPORTING INFORMATION ON CORPS

1985 JUVENILE FISH PASSAGE PLAN

APPENDIX V

APPENDIX V

SUPPORTING INFORMATION ON CORPS 1985 JUVENILE FISH PASSAGE PLAN

The Corps FISHPASS Computer Program is described in detail in Appendix VII. This program was utilized to analyze various spill scenarios including the plan selected by the Corps for 1985. Input and output from the computer analysis are available upon request. Highlights of the data used in the analysis include:

1. Fish data for Lower Granite and Priest Rapids utilize 1982 daily estimates of juvenile fish population by species: yearling chinook, subyearling chinook and steelhead. 1982 is the best of the limited years for which fish collection data is available.

2. The January-July runoff volume used in the studies is for 1975 which had essentially the same volume as forecasted for 1985 and similar runoff distribution based on the 1 February forecast. It was also desirable to use a year which had been used in the power studies and for which monthly power data are available. This will be needed to evaluate the power impacts of the various scenarios used in the fish passage plan studies.

3. Sluiceways at Ice Harbor and The Dalles were operated in all runs in the same manner as they have since 1983 and are expected to operate in the future.

4. Nine units at John Day will be equipped with screens and bypass facilities in 1985 and this has been incorporated into the studies.

5. Inadvertent spill at collector projects occurs when river flow exceeds the projects' hydraulic capacity.

6. Mortality values due to various project features were furnished by the Fishery Agencies and Tribes.

7. Spill is targeted at Lower Monumental, Ice Harbor, John Day and The Dalles to assist in the passage of downstream migrants. Spill will commence in early spring and continue through the season as long as secondary energy is available on the Federal system. A primary beneficiary from this spill will be to those fish entering the Columbia and Snake Rivers downstream of the collector projects.

In addition to providing spill to assist in passage, the Corps will continue to aggressively pursue collection and transportation of downstream migrants. As stated earlier, fish are collected at Lower Granite, Little Goose and McNary Projects for transportation to release sites downstream of Bonneville

Dam. Both barges and trucks are used. Currently, the Corps operates four barges which have capacities ranging from 26,000 to 50,000 pounds of fish. Five tanker/trailers are also operated by the Corps to transport fish, each of which has a capacity of 1,750 pounds. Further details on the transportation plan are contained in the FTOT, Appendix 3.

COMMENTS ON THE CORPS 1985 JUVENILE FISH PASSAGE PLAN

APPENDIX VI

COLUMBIA BASIN FISH AND WILDLIFE COUNCIL

LLOYD BUILDING • SUITE 1240
700 N. E. MULTNOMAH STREET
PORTLAND, OREGON 97232

(503) 231-2241
FTS 429-2241

OFFICE OF
EXECUTIVE SECRETARY

March 29, 1985

Colonel James R. Fry
Deputy Division Engineer
North Pacific Division
Corps of Engineers
P.O. Box 2870
Portland, Oregon 97208-2870

Dear Colonel Fry:

Attached are the Transport Guidelines and Criteria revised February 1985. The Guidelines have been endorsed by your agency, the fish and wildlife agencies and, with the understandings in their letter (attached), the Columbia River Inter-Tribal Fish Commission. As was agreed with the first version of the Guidelines, the original document is provided for your files.

Sincerely,

for John R. Donaldson, PhD
Chairman

Attachments

cc: Tim Wapato
Members
Working Group
FPC
FTOT
WBC

Transport Guidelines and Criteria

The fishery agencies, tribes, and Corps of Engineers recognize the need for guidelines and operational criteria for the Snake and Columbia River fish transportation programs. This document includes measures developed as a result of past transportation evaluations that indicated positive benefits occur from transport of juvenile steelhead and appear likely for subyearling summer and fall chinook salmon. Yearling spring and summer chinook receive less benefit from transportation than steelhead.

In the development of operational criteria for the transport of juvenile fish, potential consequences of upriver operational strategies upon migrants for their entire journey to the ocean must be considered. For example, a decision to spill for a given period at Lower Granite must consider both the likelihood of achieving comparable protection at downstream projects and probable survival for the migrants if spill is not provided, i.e., survival in passing the powerhouse. The decision to operate for spill passage or powerhouse passage is greatly influenced by the collection efficiency of the powerhouse bypass system at a given project and passage systems at downstream projects. During periods when spill is available for migrant protection, spill priority is dependent upon project collection efficiency and expected survival of those migrants collected.

Steelhead transportation is currently used because transported groups have consistently exhibited higher survival rates than non-transported groups. However, safely and efficiently separating chinook from steelhead for different treatment adds to the operational complexity.

Development of operational criteria for yearling chinook migrants is complex since transport success has been varied in recent years. Fishery agencies presently support "spreading the risk" by transporting a small proportion of the run and bypassing the remainder in years when flow is above the agreed-upon minimum, and maximum collection and transportation in years when flows are at or below agreed-upon minimums. The purpose of this strategy is to provide migrants the opportunity to benefit from improved survival which may occur as operational refinements are made to both techniques.

The Corps of Engineers maintains the position that field research supports full transport in all flow years but recognizes the management responsibility of the fishery agencies and tribes. In the spirit of compromise, the Corps will support the above-stated fishery agency strategy. The fishery agencies and tribes must work with the Corps of Engineers to effectively manage what water is available for spill.

These guidelines are based on the best available information recognizing that many questions still remain unanswered. Some special considerations that have influenced the development of these guidelines are listed below.

Special Considerations

1. Evaluate modifications designed to improve transportation success. Regardless of flow conditions, groups of spring chinook and steelhead must be collected, marked, and transported at Lower Granite .

2. Spilling large amounts of water may result in mortality by gas bubble disease, descaling, and other factors.

3. Increasing spill and reducing powerhouse operation may adversely impact adult passage at some projects.

4. Low fish collection efficiency at Lower Granite and Little Goose leads to higher turbine losses and makes spill a considered alternative at this time.

5. Collection, loading and handling problems associated with the Little Goose bypass system cause injuries and mortalities to fish.

6. Wild steelhead benefit greatly from transportation and tend to migrate with yearling chinook. They are similar in size to yearling chinook, which makes it difficult to separate them by size.

Research and evaluation of the transport/bypass program is being conducted to improve bypass and collection facilities and transportation success of juvenile salmonids, including evaluation of in-river survival rates. Sampling rates will be set prior to the season to assure statistically valid research results while protecting downstream migrants from excessive handling.

Guidelines for transport operations during 1985 are listed by project.

1. When flows are at or below minimums (approximately 85 kcfs in the Snake and 220 kcfs in Columbia)[1]:

Lower Granite, Little Goose, McNary

At each collector dam, maximum collection and transportation of all species will be implemented when flows are at or below minimums. Based on present data, years when minimum flow conditions are expected on the Snake River are about 1 in 2 and on the Columbia River about 3 in 40. Therefore transportation may occur on the Snake River because of inadequate flows while fish are bypassed at McNary Dam because of adequate flows in the lower Columbia River.

---

[1]Estimated total travel time for migrants which are influenced by flows encountered in the main stem Columbia must be considered in determining adequacy of flows in the Snake.

2. When minimum flows are exceeded (approximately 85 kcfs in the Snake and 220 kcfs in the Columbia)[1]:

Lower Granite

Spill for bypassing spring chinook should be considered because many fish would, with the present low fish guiding efficiency, be subjected to turbine passage. Improvements in bypass collection efficiencies may reduce the need for high spill levels. Research has shown that, by raising the turbine intake operating gates 20 feet from their normal stored positions, fish guidance can be increased. The fishery agencies and tribes believe that this modification should be completed prior to the 1986 season.

All fish collected will be transported. Maximum collection of juveniles for transportation will begin when approximately 80 percent of yearling chinook have passed the project, as determined by Water Budget managers.

The barge schedule should begin April 10. Test results have shown that barged yearling chinook have survived to adults at a higher rate than trucked groups. Therefore early arriving yearling chinook would receive more protection because they would be barged.

If species separation by adjustment of hatchery release dates proves ineffective, maximum collection for transportation may begin at an earlier date, e.g., when 50 percent of the collection is steelhead smolts. The design, construction, and installation of a fish size separation system is necessary for Lower Granite in the future.

Little Goose

Currently, new facilities are scheduled for completion by 1989 and should improve fish quality and passage conditions. Interim modifications to the existing system have been made. When bypass collection efficiency is improved, the need for high spill levels will be reduced. Results of research must be used to determine such changes.

As long as existing facility operation is satisfactory yearling salmon will be separated from larger steelhead smolts by a mechanical fish size separator. Yearling salmon separated will be bypassed to the river while steelhead and those yearling salmon not separated will be transported. Maximum collection of juveniles for transportation will begin when approximately 80 percent of yearling salmon have passed the project.

McNary Dam

The powerhouse bypass system and spillway are to be used during the spring season to pass yearling migrants. Yearling salmon will be separated from larger steelhead smolts by a mechanical fish size separator. Yearling salmon will be bypassed to the river while steelhead and those yearling salmon not separated will be transported. In the absence of an effective fish size separator, all fish collected will be returned to the river. When subyearling chinook counts exceed those of yearling salmon, transportation of all species

will begin. The intent is to limit the proportion of the spring chinook run transported from McNary Dam to 10 percent or less.

Summer Migration

Summer migrants collected at the three collector projects will be transported below Bonneville Dam. Because of increased abundance of fall chinook migrating past McNary, barging should be operational from approximately June 15 to August 15.

Changes to the Guidelines:

These guidelines are intended to provide the framework for carrying out the juvenile fish transportation program. As such, any changes to the guidelines will be approved by the North Pacific Division Engineer, the Executive Director of the Columbia River Inter-Tribal Fish Commission, and the directors of the Northwest fisheries agencies.

James R. Fay, Col for
North Pacific Division Engineer
Corps of Engineers

John R. Hamilton
Director
Oregon Department of Fish & Wildl.

A. Timothy Weaver
Executive Director
Columbia River Inter-Tribal Fish Commission

Kenneth D. Brace
Director
Idaho Department of Fish & Game

Regional Director
National Marine Fisheries Service

Russell W. Cahill Deputy
Director
Washington Department of Fisheries

Richard J. Myshak
Regional Director
U.S. Fish and Wildlife Service

James A. Weyerhaeuser
Director
Washington Department of Game

Date: March 29, 1985

COLUMBIA RIVER INTER-TRIBAL FISH COMMISSION

2705 East Burnside Street, Suite 114, Portland, Oregon 97214 Telephone (503) 238-0667

March 6, 1985

Colonel James R. Fry
Deputy Division Engineer
North Pacific Division, Corps of Engineers
P.O. Box 2870
Portland, OR 97208

Dear Colonel Fry,

Attached are the 1985 Transport Guidelines and Criteria. The Columbia River Inter-Tribal Fish Commission endorses this document for 1985 operations with the following understandings:

1. In the absence of data conclusively showing significant transportation benefits to species other than steelhead, we believe that spill must remain a necessary alternative passage method. We do not endorse the concept of "spreading the risk" as a long term transportation policy for spring chinook. Both the workplan and guidelines fail to acknowledge the appropriateness of spill for juvenile fish protection for 1985.

2. We are concerned that steelhead kelts are not receiving any benefit from transportation and urge development of a means to hold and transport these fish without jeopardizing ongoing transportation programs.

We recognize the beneficial contribution of transportation to juvenile steelhead protection, and we support the efforts of the Fish Transportation Oversight Team to develop consistent guidelines.

Sincerely,

S. Timothy Wapato

S. Timothy Wapato
Executive Director

Attachment
SB:hs

COLUMBIA RIVER INTER-TRIBAL FISH COMMISSION

2705 East Burnside Street, Suite 114, Portland, Oregon 97214 Telephone (503) 238-0667

Colonel James R. Fry
Deputy Division Engineer
North Pacific Division
U.S. Army Corps of Engineers
P.O. Box 2870
Portland, Oregon 97208

March 26, 1985

Dear Colonel Fry:

Despite the sincere and concentrated efforts of the Corps, BPA, and the fishery agencies and tribes, a joint juvenile fish passage plan for 1985 has not been approved. The Corps' proposed plan is presented in the preliminary document, "Interim Juvenile Fish Passage Plan for 1985 for Corps of Engineers Projects." Because agreement on a mutual plan has not been reached, we offer the following comments on the Corps' document. We are using legislative drafting style in our comments. Proposed language additions are underlined, and language proposed for deletion is in parentheses and lined through.

I. Introduction

> ...Thisplan has been developed in consultation and coordination with the fish and wildlife agencies and tribes but (~~did not achieve mutual agreement on all aspects of the actions proposed for 1985~~.) a mutually agreed-upon plan was not achieved for 1985. The plan described in this document represents the Corps' recommended plan.

Comment: As originally drafted, this section implies that mutual agreement was reached on most but not "all" aspects of the plan. While many minor issues and a few major ones were agreed to, the most significant issue, spill levels and duration, remained an issue of contention.

II. Background (end of paragraph 2)

> (~~In response to the amended F & W Program this interim juvenile passage plan sets forth the criteria to~~

~~be followed by the various water management entities and fishery agencies and tribes for the 1985 downstream migration of the juvenile anadromous fish.~~)

Comment: Since the plan has not been mutually agreed upon, the tribes will not agree to accept and follow the plan's operating criteria. In the absence of a joint plan, the tribes will adopt the Detailed Fish Operating Plan prepared by the fishery agencies ~~and tribes.~~

VI. Implementation of The Juvenile Passage Plan

Meetings of the Water Budget managers and Reservoir Control Center representatives should be held when necessary rather than on a daily basis. Extensive communication between the Water Budget Center and the RCC should be expected, however the Water Budget managers cannot propose fish passage operational requests in a meeting without first analyzing current hydrologic, power, and biological conditions.

We suggest inserting the language proposed by the fishery agencies (Memorandum to Gary Flightner from Douglas DeHart, dated March 21, 1985).

a. Responsibilities of Fishery Management Agencies and Tribes
b. Responsibilities of the Corps of Engineers

For both sections we suggest adoption of the language proposed by the fishery agencies (Memorandum to Gary Flightner from Douglas DeHart, dated March 21, 1985).

VII. Interim 1985 Juvenile Fish Passage Plan

We endorse the comments submitted by the fishery agencies (Memorandum to Gary Flightner from Douglas DeHart, dated March 21, 1985) and offer these additional comments:

*We do not believe that the spill levels proposed for The Dalles, John Day, Ice Harbor, Little Goose, and Lower Granite will adequately protect fish. Incremental improvements in fish protection must be made each year to reach as close to 100 percent project survival as possible.

*Spill at The Dalles Dam is instituted by the presence of "significant" numbers of fish as determined by monitoring. The lack of a definitive criterion may lead to inseason management controversies as the term, "significant," is interpreted.

*The tribes do not support the trigger number of 50,000 juveniles per day during the summer migration at John Day Dam. Extensive planning and funding by state and federal agencies and the tribes has resulted in increased numbers of juveniles released in the mid-Columbia and tributaries in recent years. The much lauded U.S.-Canada Pacific Salmon Treaty, designed to dramatically

increase returns of adult salmon to the Columbia River and coasts of Washington and Oregon, is dependent on increased releases and passage survival of juveniles for its success. Since the Corps has been willing to use a 30,000 trigger number in recent years, it is apparent that improved protection of the migration is not infeasible. We are seeking improved protection wherever possible to rebuild depleted upriver runs and to ensure the success of the U.S.-Canada treaty.

*The descriptions of spill management at John Day, Ice Harbor, and Lower Monumental dams state that the spill program will end when counts drop below the trigger number for three consecutive days or when 90% of the spring and summer migration has passed the project. It was our understanding from discussions with the Corps that while spill would not be provided after three days of counts below the trigger number, it could be reinstituted later in the season whenever counts return to the trigger number level. We support this management scheme and suggest that it be clarified in the Corps' interim plan.

*As stated previously, the tribes believe that spill is necessary at Lower Granite and Little Goose dams to protect spring chinook juveniles. We will request spill at these projects to protect at least 80 percent of the spring chinook downstream migrants passing the projects.

Appendix 2 CorpsProjectFishFacilitiesOperationand Maintenance

The tribes have repeatedly opposed operation of partially or fully unscreened units. We cannot accept those sections of Appendix 2 that permit operation of unscreened units.

At an informal meeting with the Corps, the tribes and agencies requested inspections of submersible traveling screens to be scheduled at two month intervals. Without regular inspections, screen damage may persist undetected, reducing both collection efficiencies and the magnitude of fish protection. Although we suggested two-month inspection intervals, we prefer more frequent inspections and are opposed to the three-month intervals proposed by the Corps.

At the Dalles Dam, the tribes and agencies requested full flows in the auxiliary water system throughout the year. The Corps has proposed to reduce flows in the auxiliary water system during the winter season. We are opposed to reduced winter operations because we believe that full protection of those fish passing in winter months is necessary to offset delays caused by ladder shutdowns for maintenance and construction.

* * * * * * * * *

We understand that the Corps will attach the agencies' and tribes' comments in Appendix VI of the Corps' plan. We ask that

our comments on earlier drafts of the Corps' plan be included in Appendix VI, since many of the comments remain applicable. We also request the Corps to provide an explanation detailing reasons why the Corps has been unable to accomodate the tribes' proposal and comments.

The Columbia River Inter-Tribal Fish Commission will continue to work with the Corps to protect fish during the 1985 fish passage season. We hope that the experience gained in developing a 1985 plan will facilitate future efforts to achieve a joint plan.

Sincerely,

S. Timothy Wapato
Executive Director

SB:clr

cc: Jack Donaldson
Janis Crisman
Janet McClennan

COLUMBIA RIVER INTER-TRIBAL FISH COMMISSION

2705 East Burnside Street, Suite 114, Portland, Oregon 97214 Telephone (503) 238-0667

Colonel James R. Fry
Deputy Division Engineer
North Pacific Division
U. S. Army Corps of Engineers
PO Box 2870
Portland, OR 97208

February 22, 1985

Dear Colonel Fry:

The Columbia River Inter-Tribal Fish Commission has reviewed the "Status Report on the Development of an Interim Juvenile Fish Passage Plan for 1985 for Corps of Engineers Projects." We have been participating in consultations with the Corps through the Working Committee to develop a mutually agreed upon plan. We had intended for our comments on the Corps' proposed fish passage plan that was presented in Appendix IX of the Status Report to be delivered to the Working Committee in order to promote further deliberations. However we understand that the Corps has decided to postpone all Working Committee actions until after its March 1 submittal of a fish passage plan to the NPPC. In light of this decision, we are submitting these comments so that they may be of assistance to you in preparations of the March 1 submittal.

Since the Status Report was mailed, the deliberations of the Working Committee have brought about significant changes in both the Corps' and the fishery agencies' and tribes' proposed plans. At the February 8, 1985 meeting, Jim Ruff of the Northwest Power Planning Council (NPPC) presented comments that reflect the text and administrative record of the section 404(b) amendments of the Fish and Wildlife Program. Essential elements of these comments include: 1)that the fishery agencies and tribes are responsible for determining the method of and coefficients for calculating project survival; 2)that the interim survival objective does not include reservoir mortality; and, 3)that the interim survival objective does not include crediting for transported fish. The Working Committee tentatively agreed to redirect its efforts to develop a plan that will achieve at least 90 percent project survival in 1985 as defined by the NPPC's new guidelines. The Corps indicated that it will attempt to provide protection above

the interim 90 percent project survival objective if biologically justified.

While it appears that the Corps is considering changes in its proposed plan we offer the following comments on the plan presented in Appendix IX of the Status Report:

1. The fishery agencies and tribes have repeatedly stated their opposition to survival modeling as a policy element because of the lack of survival data and the extreme range and variability of existing data. Since models are abstractions and simplifications of reality, they are only as good as the real data input. With extreme ranges in the data inputs, the reliability of data outputs is greatly diminished.

The mathematical models can serve useful purposes, however, such as identifying significant data gaps. Long-term planning can then be developed to incorporate research and monitoring programs that will close data gaps.

Models can also be used to compare management alternatives such as spill proposals if all factors are kept constant except the spill amounts. The fish and wildlife agencies and tribes have used a model in this way (See joint memo of February 22 from Doug DeHart and Stephanie Burchfield to Gary Flightner). The project and system survival estimates from this exercise should not be construed as real-life estimates. Instead, the estimates of each alternative can be compared to identify relative differences between alternatives. If a different set of coefficients were used as data inputs for these alternative spill amounts, the survival estimates would change but the relative differences between each alternative would be similar.

We are seriously troubled by indications from the Corps that it would use a model to predict actual survival levels for use in day-to-day spill management decisions. Due to the uncertain nature of data inputs, a model should not be used as the basis for daily management or policy decisions.

2. Unless the Corps indicates otherwise, we must assume that the Corps is following the Power Planning Council's directives regarding transportation, reservoir mortality, and the responsibility of the agencies and tribes to determine coefficients for survival calculations. However, if the Corps is not following this guidance, then the following comments apply.

Turbine Mortality

The Corps has selected a turbine mortality rate of 11% which resulted from tests conducted at McNary Dam. The specific studies conducted at McNary Dam were conducted in March prior to the actual migration season. Turbine backroll mortality due to predation would be minimal, due to low water temperatures and low fish density in March. Many studies have been conducted of

turbine mortality, and most study results of Kaplan style turbines have shown higher mortality rates. Many of these studies were conducted at Corps projects: Lower Monumental 20% (Long et al, 1975), John Day 13% (Raymond and Sims, 1980), Bonneville Dam 15% (Holmes, 1952), Ice Harbor 32% (Long, 1968). Recent Mid-Columbia studies showed turbine mortality of 17% at Wells Dam (Weitkamp et al, 1981).

Spill Efficiency

The model assumes a 1 to 1 spill to powerhouse proportion of flow for spillway passage efficiency. Spill passage efficiency data has not been collected at Corps projects. Extensive spill passage efficiency data collected at Mid-Columbia projects showed that the 1 to 1 flow proportion relationship did not exist at any of the projects. Those studies showed that spill passage and flow was not a linear relationship. Spill efficiency varied with each project design and river flow level. Because comparable studies have not been carried out at Corps projects research and monitoring is thus needed at Corps projects to identify spill efficiency relationships to allow more efficient use of spill in fish passage management.

Reservoir Mortality

The Corps' model includes a .7% per day value for reservoir mortality. The basis for this value is an earlier modeling attempt by Milo Bell, in which he pieced together data from various sources and then calculated the .7% per day rate. In that report, Mr. Bell stated that if nitrogen levels approached 116%, the reservoir mortality rate would be 3.5% per day. Subsequent to the publication of this report ("Effects of Power Peaking..."), the Corps constructed another computer model which included downstream migrant reservoir mortality (Downstream Migrating Juvenile Salmon Survival Model, Columbia Basin Water Withdrawal Environmental Review, Appendix D, Part III, May 1980, Fish and Wildlife Division, U.S. Army Corps of Engineers). During the development of this model, the Corps, after consultation with Milo Bell, decided that the .7% per day rate was unrealistic. In personal communication with National Marine Fisheries Service staff on September 25, 1980, Mr. Bell indicated that a 3.5 to 3.7 percent per day reservoir attrition rate was more realistic.

In fact, when reservoir mortality rates are calculated from actual data, it becomes obvious that the .7% per day value is not realistic. Calculating reservoir mortality from data collected from 1966 to 1975 indicate that an average water year's reservoir mortality averaged 10%, or approximately 3.5% per day ("Effects of Dams and Impoundments on Migrations of Juvenile Chinook Salmon and on Steelhead from the Snake River 1966 to 1975, Raymond 1979").

Nitrogen Supersaturation

The Corps plan relates nitrogen supersaturation levels to project spill levels using curves developed in past years. During 1983 and 1984, nitrogen levels were monitored throughout the migration season on a system-wide basis. The recent data indicates that the Corps nitrogen curves are inaccurate. Laboratory data utilized by the Corps overstates mortality and injury due to dissolved gas levels by not taking into account water depth, water temperature, and fish exposure time at given dissolved gas levels.

Transportation

The Corps modeling efforts have included factors which credit transportation for project and system survival. Full credit for transported fish at each project is given with a mortality rate of only 1 percent for those fish transported to below Bonneville Dam. The faulty premise in this approach is in assuming that transported fish have the same survival as in-river migrants. On the contrary, numerous transportation experiments and returning adult data have shown that in-river migrants which arrive below Bonneville Dam will contribute to the adult return at a higher rate than the same number of fish transported to below Bonneville.

Sluiceway Passage Efficiencies

The Corps has selected sluiceway passage efficiencies of 55 - 63% for The Dalles Dam and 51% for Ice Harbor Dam.

The Dalles Dam sluiceway efficiencies selected by the Corps are indirectly calculated from population estimates of the migrations in past years. The basis for these calculations are collection efficiency estimates at McNary and John Day Dams. In January of 1984, fishery agency and tribal representatives met with the Corps and indicated that large errors were associated with this indirect method. The agencies and tribes previously indicated that errors in the magnitude of 50% are associated with the estimate which the Corps uses to arrive at the 55 - 63% sluiceway efficiencies. At that time, we indicated that the direct measure method utilized in most recent studies (1982) of The Dalles sluiceway by Oregon Department of Fish and Wildlife were more reliable. From the direct measure method, we are utilizing a maximum of 40% sluiceway efficiency at 0% spill at The Dalles.

The Corps has selected a 51% sluiceway efficiency for Ice Harbor Dam, even though other sluiceway efficiency measurements were only 24%. The error associated with both these estimates was not evaluated. Questions of study design, validity and sensitivity of the study design have been raised.

3. As stated above, the tribes do not endorse the use of a

mathematical model in directing policy and management decisions. The bar graphs of studies 1 through 10 illustrate why this type of modeling effort, with highly variable input data, cannot be used as a predictive tool. If system survival levels predicted from the spill levels specified in the Corps studies were accurate, fish returns to the Columbia River would be orders of magnitude greater than presently experienced.

4. The Corps' proposed plan does not address the concepts of predetermined spill volumes and spill management. The fishery agencies and tribes proposed these concepts in December and expected an indication of the Corps' position in the Status Report issued since then. However, on February 6, 1985, the Ninth Circuit Court of Appeals issued its final opinion in the case of Kittitas Reclamation District vs. Sunnyside Valley Irrigation District, Nos. 80-3505 et.al. slip op. (9th Cir. Feb 6, 1985). This case involved the rights of the Yakima Indian Nation to protect salmon spawning redds by requiring the Bureau of Reclamation to release water from an irrigation project in the Yakima Basin. In relevant part, the court stated that the United States, as a party to a treaty with the Yakima Indian Nation that protects fishing rights, bears a duty to refrain from actions interfering with the amount of fish present at the Indians' fishing grounds. The United States constructs water projects subject to that duty and when its operation of a project threatens to further deplete an already low chinook salmon run, it violates its duties under the treaty. In light of this case, we have reassessed our support of a specified spill volume and have concluded that we support a spill volume only as a means of ensuring that water is available for spills when spills are needed and that spill volumes must be adequate to ensure maximum survival of fish reaching a specific project. While we believe this position can be made consistent with the criteria of "at least 90% survival", further elaboration is necessary before our member tribes can consider agreeing to a 1985 spill plan.

At the February 14, 1985 Working Committee meeting, the Corps presented a proposed spill management scheme. This proposal called for predetermined spill volumes where necessary to achieve the interim 90 percent survival objective and in-season management of spill to achieve greater than 90 percent suvival. We do not believe that the 90 percent project survival objective as recently defined by the Corps adequately protects juvenile migrants. We, therefore, believe that spill management for protection above the 90 percent level should be clarified in preseason commitments rather than be left for ad hoc judgments based on no agreed upon criteria. See Morton v. Ruiz, 94 S.Ct. 1055 (1974). In addition, the Corps' proposal fails to differentiate between surplus, inadvertent spill and voluntary spill and to describe the Corps' plans for managing these types of spill for fish protection.

5. The Corps' proposal briefly mentions the need for monitoring at Corps projects. The fish and wildlife agencies and tribes have recommended an extensive monitoring program including

spill efficiency tests in 1985. In the joint memo of February 22, we are proposing a monitoring program. The Corps and BPA indicated at the February 20 meeting of the Working Committee that they are designing a program that is similar in some respects. We encourage the Corps to consider our proposed monitoring program and to include this program in its fish passage plan.

We appreciate the opportunity to comment on the Corps' proposed fish passage plan. The modeling efforts of the Corps, as well as those of the fishery agencies and tribes, have been useful in demonstrating the magnitude of differences that exist and in reaching agreement on important factors such as turbine mortalities and bypass efficiencies. We must now move forward to determining the proper forum for requests and utilization of spill to protect downstream migrants. I look forward to discussing this matter with you further in the upcoming weeks.

Sincerely,

S. Timothy Wapato

S. Timothy Wapato
Executive Director

cc: Jack Donaldson
Jan Crisman
Fish Passage Committee

PNUCC

PACIFIC NORTHWEST UTILITIES CONFERENCE COMMITTEE

March 29, 1985

Colonel James R. Fry
Deputy Division Engineer
Corps of Engineers
North Pacific Division
Department of the Army
P.O. Box 2870
Portland, Oregon 97208

Dear Colonel Fry:

This letter is submitted by the Pacific Northwest Utilities Conference Committee (PNUCC) in response to the preliminary 1985 Juvenile Fish Passage Plan dated March 13, 1985. PNUCC has been monitoring your workshops throughout the development of the preliminary passage plan up to the March 13 draft. However, we understand there have been a number of recent executive level meetings to which we were not party. We are very interested in establishing direct PNUCC involvement in the Corps of Engineers fish passage planning since, obviously, all costs of fishery programs are borne by the ratepayers in the form of BPA revenues foregone or loss of FELCC. In addition, PNUCC wishes to be involved in determining what fishery measures the Corps of Engineers accepts as reasonable, since many of our members may be requested to comply with similar measures on their FERC licensed projects as a result of such decisions.

PNUCC is alarmed by continuing reports that the Corps of Engineers may consider going beyond the spill levels indicated in the March 13 draft. The membership of PNUCC believes such increases in spill would be totally unreasonable in light of current events.

When the existing draft plan was developed, the plan participants assumed a better than average water year based on the "early bird" forecasts. Given those forecasts, it seemed reasonable for the Corps of Engineers to agree to a fish passage plan that was in excess of the minimum 90 percent smolt survival criteria found in the Northwest Power Planning Council's (Council) Fish and Wildlife Program. Section 400 of the Program provides for development of a "passage plan which will result in at least a 90 percent level of smolt survival . . " It is our understanding that the Corps of Engineers plan (Plan IV) would provide an average of 93.6 percent survival per project for the eight Corps projects in question. This plan, therefore, more than satisfies the Council's Program. PNUCC, as you know, is opposed to the level of spill proposed in the fishery agencies' and tribes' plan which would result in serious power impacts even in a better than average water year.

Since the development of the first plan proposals, the water forecasts have been drastically declining to the point where the most recent forecast is less than average at The Dalles. Northwest BPA Customers are seriously concerned about the declining forecasts since the cost of spill programs increases (in the form of BPA revenues foregone) with each decline in the water forecast. While there is considerable debate as

to the exact cost projected for implementation of the Corps of Engineers Plan IV, PNUCC's preliminary analysis (which is substantiated by other ongoing studies) indicates that costs could be at least twice what the Corps originally estimated ($11.6 million) and may be as much 400 percent of that original estimate depending on runoff timing and availability of Canadian storage.

Despite the obvious economic implications to the electric industry, PNUCC does not oppose the present plan in the Corps of Engineers draft. However, we urge the Corps to continue to carefully monitor the water forecasts and reassess the consequences of this plan in light of revised water projections. While we appreciate the balancing of interests required in the Corps consideration of divergent views, PNUCC remains opposed to any increases beyond the generous spill amounts established in the March 13 draft which are based upon the most optimistic of water forecasts. In sum, PNUCC urges the Corps of Engineers to carefully consider the recent developments of reduced runoff forecast, projected reservoir levels, and the projected higher unit value for energy sales in 1985 as it implements the 1985 fish passage program.

PNUCC has concerns about the agreement on operation of Bonneville second powerhouse. We believe certain restrictions upon powerhouse operations have very limited biological benefits, especially in the early morning hours when very few juvenile fish are passing the project. We understand that the Corps is attempting, to the maximum extent practicable, to comply fully with the Council's Fish and Wildlife Program measures for Bonneville second powerhouse. For this reason, PNUCC intends to open this question with the Council for constructive discussion at the earliest opportunity.

PNUCC comments are intended to be constructive and we appreciate the efforts of the Corps of Engineers in keeping us informed of the technical level working group activities.

Very truly yours,

Diana E. Snowden

Diana Snowden
Executive Director

AW:gh:159Q

COLUMBIA BASIN FISH AND WILDLIFE COUNCIL
LLOYD BUILDING • SUITE 1240
700 N. E. MULTNOMAH STREET
PORTLAND, OREGON 97232

(503) 231-2241
FTS 429-2241

OFFICE OF
EXECUTIVE SECRETARY

March 28, 1985

Colonel James R. Fry
Deputy Division Engineer
North Pacific Division
Corps of Engineers
P.O. Box 2870
Portland, OR 97208-2870

Dear Colonel Fry:

We have received and reviewed the Preliminary Draft Interim Juvenile Fish Passage Plan for 1985. Our comments on this plan as well as the Fishery Agencies' and Tribes' recommendations for spill for downstream migrant protection at each project, an analysis of survival impacts and Project Fish Facilities Operation and Maintenance Plans, are enclosed. We understand that these documents will be attached to the Corps' final Juvenile Fish Passage Plan. Our complete recommendations for fish protection at mainstream Columbia and Lower Snake Projects will be included in the 1985 Detailed Fishery Operating Plan which will be available soon.

We are disappointed that we were unable to reach an agreement on levels of spill necessary for fish protection at Corps projects during 1985. The Corp plan still does not provide adequate protection to downstream migrants. However, significant progress was made as a result of our several coordination meetings. Even though we have agreed to differ this year, I am hopeful that we can reach an understanding soon on how we will proceed toward concurrence for the 1986 plan.

Sincerely,

John R. Donaldson, PhD

jds
Enclosures:
1. A & T Proposed 1985 Interim Spill Plan
2. Specific Comments on Corps Interim Plan
3. Comments on Appendix 2 - Operation and Maintenance
4. Review of Corps IV Proposal

1985 INTERIM SPILL PLAN

Introduction

Beginning in October of 1984, the fishery agencies and tribes have met with the Corps to discuss the development of a joint juvenile passage plan as required by the Northwest Power Planning Council Fish and Wildlife Program. The NPPC program includes an interim survival standard of 90% for each Corps project and an 85% passage efficiency standard for Bonneville Dam.

After extensive discussion and comparison of alternatives, it was clear that both the Corps proposal and agencies' and tribes' proposal met the NPPC requirements when mortality in the reservoir is not considered. The Corps proposal provides a small increase in survival over the "no-intentional spill" plan, but depends primarily upon inadvertent spill. The agencies' and tribes' proposal provides an approximate 20% increase in system survival over the Corps proposal. The Corps rejected the agencies and tribes proposal on the basis that the cost of providing protection was too high. Agreement has not been reached with the Corps, and a joint passage plan was not achieved.

The Water Budget Center, representing the fishery agencies and tribes, will request passage operations according to the following joint fishery agencies and tribes spill plan.

The agencies' and tribes' spill plan incorporates several factors which are intended to economize the spill required at individual projects.

These factors, as well as the entire spill plan, are interim for 1985, and do not set a precedent for spill plans for future years.

In an attempt to reach agreement with the Corps and to economize spill, the agencies and tribes (A&T) incorporated the following several compromises into the 1985 plan which reduce the amount and cost of spill.

Cap on Spill Passage - The A&T plan utilizes a cap on spill passage which limits fish passage in spill to 50% of the migration.

Migration Window - The A&T plan utilizes a migration window to efficiently manage spill. After reviewing past migration data the agencies believe 80% of the spring and 80% of the summer migrants can be provided protection by concentrating spill during the following periods.

Spring:		
Upper Snake	4/1 -	5/15
Lower Snake	4/15 -	6/15
Lower Columbia Ap	4/15 -	6/5
Summer:		
Lower Snake	6/15 -	7/15
Lower Columbia	6/15 -	8/31

Methods for identifying start and end points will be determined by the Water Budget Center.

Diel Passage - The A&T plan utilizes diel passage patterns as another means of increasing fish protection while decreasing spill. The A&T plan concentrates spill during peak daily passage. It is important to note that diel passage patterns vary. The agencies and tribes will attempt to concentrate spill during the primary

daily passage periods, determined by monitoring or by historical data.

Use of Fish Guidance Efficiency Values - In determining spill levels, the A&T plan credits projects with operational bypass systems. Fish collection efficiency values are lower than fish guidance efficiency values. The use of fish guidance efficiency values gives the highest credit to bypass system efficiency and lowers the spill requirement at that project.

Ice Harbor Sluiceway Efficiency - The A&T plan utilizes a sluiceway guidance efficiency of 41%. Research conducted at Ice Harbor resulted in two estimates of guidance efficiency: 24% and 51%. Studies conducted at Bonneville and The Dalles indicate that the 51% efficiency for Ice Harbor is overly optimistic. Studies at Bonneville Dam have shown sluiceway efficiencies of about 20%. Studies at The Dalles have indicated efficiencies of 40%. Ice Harbor is more similar to Bonneville than The Dalles. The agencies and tribes believe the efficiency of Ice Harbor is closer to 24% than 51%, but have selected a value of 41%, in an attempt to reach compromise with the Corps.

Lower Granite - The spill period at Lower Granite is April 1 through May 15. Spill will be initiated as determined by WBC, based upon sampling at the Snake River trap catches at Lewiston. Because of low guidance efficiency at Lower Granite and Little Goose Dams, spill will be requested in accord with special

operations required for research and in accord with the agreed upon FTOT work plan. Approximately 31% of daily average flow as spill will be utilized within the previously stated constraints.

Little Goose - Approximately 31% daily average flow spilled will be utilized to provide passage to spring chinook prior to the maximization of transportation, as determined in the FTOT work plan. Expanded daily collection totals of fish at this project will provide the basis for initiating spill at Lower Monumental and Ice Harbor, with some lag time for travel between projects as determined by monitoring and past data.

Lower Monumental - Approximately 31% daily average flow will be spilled according to diel and other passage information determined by monitoring at the project. The passage goal at this project is passing 50% of the migration.

Ice Harbor - The ice and trash sluiceway will be operated at an assumed efficiency of 41% and 50% of the migration will be passed in 41% of the daily average flow spilled, to reach a project passage efficiency of 71%.

McNary - Juvenile fish passage operations at McNary will be managed according to the 1985 FTOT workplan and the 1985 sampling guidelines. Spill will not usually be requested but inadvertent spill is expected to occur.

John Day - The 30,000 fish per day passage criteria will be utilized to initiate spill at John Day. The appropriateness of this criteria is being scrutinized since the project is scheduled to be partially screened and past monitoring techniques may not result in comparable data. Approximately 31% of the daily average flow will be spilled to provide an alternate passage route to the unscreened turbine units. This operation is dependent upon the assumption that one half of the operating powerhouse units will be screened. The total effectiveness of this operation is unknown, since spill will probably draw fish from the screened as well as unscreened units.

The agencies and tribes planned operation at John Day is aimed at providing a 73% project passage efficiency.

The Dalles - The ice and trash sluiceway will be operated at its maximum efficiency, as determined by criteria established by studies conducted by ODFW. The agencies and tribes are assuming a 40% sluiceway efficiency at no spill conditions. Forty one percent of the daily average flow will be spilled to reach a project bypass efficiency of 84%.

Bonneville - The agencies and tribes goal is to reach the 85% bypass efficiency standard established by the NPPC. Fifty three percent of the daily average flow will be spilled with a 75 kcfs daytime, 7 a.m. to 8 p.m. spill limit. The agencies will request

the limitation of second powerhouse operation within the daytime spill limitation.

145/85
3/28/85

Enclosure #2

COLUMBIA BASIN FISH AND WILDLIFE COUNCIL
LLOYD BUILDING • SUITE 1240
700 N. E. MULTNOMAH STREET
PORTLAND, OREGON 97232

(503) 231-2241
FTS 429-2241

OFFICE OF
EXECUTIVE SECRETARY

March 21, 1985

MEMORANDUM

TO: Gary Flightner, Corps of Engineers

FROM: Douglas DeHart, CBFWC

SUBJECT: Review Comments on Preliminary 1985 Juvenile Fish Passage Plan

The following are the fishery agencies specific comments on the preliminary draft. We will formally transmit these comments plus general comments on the 1985 planning process by letter to the North Pacific Division prior to April 1. Many of the inclosed comments reiterate comments that we made on previous drafts that were not incorporated in this plan. We believe these comments are still applicable and should be incorporated.

Specific Comments

I Introduction

The reference to consultation and coordination with the fishery agencies in this paragraph is misleading. This reference infers that the fishery agencies comments and input were incorporated into the present plan. A more accurate statement would be that the fishery agencies were advised of the Corps development of the plan as it progressed.

IV Principles and Guidelines

1st paragraph - This paragraph should be modified to state that the principles and guidelines have not been formally adopted by the executive committee, and have not been approved by the fishery agencies.

VI Implementation of the Juvenile Passage Plan

The agencies do not agree with or accept the implementation process proposed in the section. The implementation procedure described does not include BPA. Past experience has shown that open discussion with and involvement of BPA expedites the implementation of spill programs. This procedure should include a role for BPA in implementation of spill requests.

The Corps implementation procedure proposes a process in which spill requests are developed during and as a result of discussions with RCC. We believe that this will obscure the fishery basis, requirements and expected benefit of a requested spill operation. The second and third paragraph of this section should be omitted.

The following language should be inserted:

> "The Water Budget managers will submit operations requests to RCC with copies to Bonneville Power Administration. The requests will specify the operations requested and the fishery data and information upon which the request is based. The RCC will review the request, and discussions with the WBC will take place if necessary. The Water Budget managers will attend RCC daily briefings at their own discretion. The WBC will discuss any requests or fishery information as desired with RCC. The Corps will provide written rationale to the WBC explaining the reasons for denial or modification of a request based on operations or energy production impacts. Any unforseen changes in fish passage or operational considerations may be coordinated through discussions between RCC and WBC at anytime."

The fourth paragraph in this section should be omitted because it does not reflect present proposed monitoring programs or the approved smolt monitoring program. The following language should be inserted:

> "The WBC smolt monitoring program including the recent additions to that program of monitoring at Lower Monumental and The Dalles, jointly agreed upon by the Corps and the agencies, will provide the basic fishery information for fish passage operations. This information and available data will provide the basis for spill operations requests."

a. Responsibilities of Fishery Management Agencies and Tribes

Item (1.) "Request spill levels in accordance with the interim passage plan," should be omitted since the agencies do not approve or accept the interim passage plan.

Item (4.) This should be modified to read, "Regulated flow and spill operations will be coordinated and managed to provide the best possible protection to fish migrating from hatchery releases which will be scheduled in advance of the migration season. Hatchery release schedules will be provided to all parties by WBC, as part of their weekly report."

b. Responsibilities of the Corps of Engineers

Item (3.) This should be modified to read, "The Corps will provide monitoring, surveillance and reporting at Corps

projects according to plans agreed upon the by agencies and the Corps."

Item (8.) This should be modified to read, "In the event that specific spill requests by the Water Budget Center are not implemented or are modified, the Corps RCC will provide a written explanation of the reasons, including operations impacts."

VII Interim 1985 Juvenile Fish Passage Plan

In this section the Corps states that the agencies' proposal was considered but rejected on the basis of power resource impacts. The analysis which led to the Corps conclusion to reject the fishery agencies' proposal should be provided. This should include projected impacts on secondary energy production, assumptions regarding the cost versus fishery benefit, assumptions regarding power rates, and assumptions regarding load demand. The conclusion to reject the agencies' proposal on the basis of power resource impact infers that the Corps has established some acceptable level of power resource impact and some target fishery benefit. These should be specifically identified.

The first paragraph of this section should include language that clearly states that the agencies have reviewed and considered this plan, and rejected it because it does not provide adequate protection to downstream migrants.

The fourth paragraph in this section discusses the 85% passage efficiency standard and operations at Bonneville Dam. In this discussion, the Corps states that most of the screened units at Bonneville Dam would be shut down to reach the 85% passage standard. We believe that with limited operation of the 2nd powerhouse and higher spill levels, the goal could be reached.

(e.) Project Operating Criteria

The introductory paragraph to this section should include language that states that the fishery agencies do not agree with the interim spill plan or any of its components. In addition, it should state that the agencies will proceed through 1985 utilizing the Detailed Fishery Operating Plan, and agreements contained therein.

We wish to reiterate the comments we previously submitted to you on February 22 regarding the Appendices to this plan. In particular we re-emphasize the comments regarding the variable nature of the input information to the Corps modelling effort, the assumptions incorporated into the model, the use of modelling as a technique, and the subsequent misleading results which form a partial basis for the Corps spill plan.

These comments should be incorporated into your final plan, in order to accurately reflect events an agreements to date, as well as operations which will probably occur in 1985.

cc: Stephanie Burchfield, CRITFC
Dick Harper, BPA
Members, AFPC

Comments on The Corps Interim Juvenile Fish Passage Plan for 1985

VIIa. The Corps has not addressed the alternative of closing down the second powerhouse to achieve an 85% juvenile fish bypass at Bonneville Dam. With the second powerhouse shut down and 40% of the total river flow spilled, an 85% bypass efficiency can be achieved, assuming 75% FGE at the first powerhouse and a 1:1 ratio of fish to water (40% + .75(60%) = 85%).

VIIIe 2. Proposed spill at The Dalles from 10:00 am until 8:00 pm is not in agreement with the agencies and tribes 1985 DFOP that proposes spill from 5:00 pm to 10:00 pm.

Appendix 2, Figure 1; Appendix C, Bonneville Dam, 16. Operation of partially or fully unscreened units is not in agreement with the 1985 DFOP which requires that unscreened units not be operated during the fish passage season.

Appendix B, The Dalles Dam, 16. Operation of the The Dalles north fishway according to a winter criteria is not in agreement with the 1985 DFOP. The DFOP requires a net head of 1.0 to 1.5 feet at the fishway entrance during the entire year, whereas the Corps plan allows for ladder flow only in the winter during periods of no spill. No spill is the usual situation at The Dalles during the winter.

Appendix C, Bonneville Dam, 8. Inspections of STS's and VBS's once every three months is in disagreement with the DFOP requirement of inspections once every two months.

Appendix C, Little Goose Dam. The Corps Plan criteria for weir gate depths at Little Goose Dam are 6 feet at the north shore and north powerhouse entrances. The 1985 DFOP calls for 8 feet weir depths at these entrances.

Appendix C, Lower Granite Dam. The Corps Plan criterion for weir gate depth at Lower Granite Dam is 7 feet at the north shore entrances. The DFOP requires 8 feet or greater weir depths at these entrances.

Appendix D, Lower Monumental Dam. No mention of orifice cycling at Lower Monumental Dam is made in the Corps' Plan. The 1985 DFOP requires orifice cycling between units 2 and 3.

W A T E R B U D G E T C E N T E R

To: Gary Flightner

From: Doug DeHart, CBFWC
Stephanie Burchfield, CRITFC

Subject: Response to Corps February 22 submission.

Date: March 6, 1985

We have reviewed your most recent fish passage proposal, CORPS IV, and we cannot accept the proposal without significant modification because it fails to provide adequate fish protection. We will elaborate on our concerns at today's meeting of the Working Committee.

We are including with this memo our analysis of CORPS IV using RivMod5. Since your proposal relies heavily on inadvertent spill, it was necessary to run the model seven times- once for each of the identified flow periods: first half April, second half April, May, June, July, first half August, second half August.

In the attached runs, the same project coefficients were used as in our earlier analysis of FAT III. Yearling chinook guidance efficiencies were used during the spring, and subyearling chinook FGE was used beginning in July. You have apparently used 0.74 for the FGE at Bonneville which means you would not use the second powerhouse at all. This makes it possible to achieve the 85% bypass goal at that project. However, we felt it was more plausible to use the FGE of 0.57 which includes four units operating in the second powerhouse. In each of the attached runs, the first output page uses 0.57 FGE while the second uses the 0.74.

We included reservoir mortality in this analysis (10% average), although transportation benefits were not included. We feel it is misleading to not include reservoir mortality in an estimate of smolt survival through the Columbia system. Transportation, however it is treated, does not affect the survival of river migrants which is what we are trying to affect by a spill program. So that these runs could be compared to previous runs, a line was added in the output entitled "Dam Survival Index". This is the product of all the individual dam survivals without reservoir mortality.

Flow and spill data was obtained from the Corps FishPass output, and is summarized in Table 1. A summary of the RivMod5 analysis is in Tables 2 and 3.

Table 1. Corps IV flow and spill data.

Project	Apr 1	Apr 2	May	June	July	Aug 1	Aug 2
LGR							
Q (MAF)	1.88	2.25	6.46	9.77	5.28	0.87	0.94
% Spill	0.0	0.0	2.78	20.46	0.0	0.0	0.0
LGO							
Q (MAF)	1.88	2.25	6.46	9.77	5.28	0.87	0.94
% Spill	0.0	0.0	2.78	20.46	0.0	0.0	0.0
LMO							
Q (MAF)	1.83	2.23	6.35	9.55	5.18	0.90	0.92
% Spill	25.0	25.0	25.0	26.0	25.0	0.0	0.0
IHR							
Q (MAF)	1.83	2.23	6.35	9.55	5.18	0.90	0.92
% Spill	12.5	12.5	17.63	39.07	12.5	0.0	0.0
MCN							
Q (MAF)	5.75	6.12	15.25	21.98	17.41	4.35	4.18
% Spill	0.33	4.63	10.63	37.04	18.75	0.0	0.0
JDA							
Q (MAF)	5.98	6.19	15.39	21.5	17.11	4.21	4.02
% Spill	10.42	10.42	10.49	11.65	10.42	10.42	10.42
TDA							
Q (MAF)	6.17	6.4	15.85	21.85	17.45	4.36	4.18
% Spill	10.00	10.00	10.11	11.09	10.00	10.00	10.00
BVL							
Q (MAF)	6.35	6.62	15.95	21.84	17.97	4.53	4.40
% Spill	21.62	24.88	35.1	54.14	42.42	1.81	0.29

Table 2. Dam Survival in Corps IV

	APR 1	APR 2	MAY	JUNE	JULY	AUG 1	AUG 2
LGR	.9244	.9244	.9305	.9502	.9244	.9244	.9244
LGO	.9244	.9244	.9305	.9502	.9244	.9244	.9244
LMO	.9171	.9171	.9171	.9198	.9171	.8620	.8620
IHR	.9180	.9180	.9239	.9412	.8994	.8813	.8813
MCN	.9678	.9712	.9737	.9805	.9506	.9271	.9271
JDA	.9365	.9365	.9365	.9377	.9203	.9203	.9203
TDA	.9226	.9226	.9226	.9249	.9226	.9226	.9226
BVL	.9563	.9579	.9579	.9705	.9664	.9312	.9304
w/o 2nd	.9696	.9706	.9706	.9782	.9765	.9564	.9559
Syst.Inx	.5752	.5783	.5912	.6452	.5498	.4758	.4754
w/o 2nd	.5833	.5860	.5990	.6503	.5555	.4887	.4885
Syst.Surv	.2459	.2472	.2527	.2758	.235	.2034	.2032
w/o 2nd	.2493	.2505	.2561	.2778	.2375	.2089	.2088

Table 3. PROJECT BYPASS in Corps IV.

	APR 1	APR 2	MAY	JUNE	JULY	AUG 1	AUG 2
LGR	.5052	.5052	.5517	.7038	.5052	.5052	.5052
LGO	.5052	.5052	.5517	.7038	.5052	.5052	.5052
LMO	.4485	.4485	.4485	.4699	.4485	.0253	.0253
IHR	.5224	.5224	.5675	.7007	.3796	.2400	.2400
MCN	.8385	.8650	.8846	.9365	.7066	.5254	.5254
JDA	.5983	.5983	.5983	.6073	.4732	.4732	.4732
TDA	.5579	.5579	.5579	.5760	.5579	.5579	.5579
BVL	.7501	.7625	.7625	.8595	.8279	.5573	.5511
w/o 2nd	.8530	.8605	.8605	.9191	.9059	.7512	.7476

ICP 20 REV. 10-80

3 PAGE
PLEASE CALL CRAIG
WITH QUESTIONS
509-489-0500 X 2559

ICP INTERCOMPANY POOL

TELEPHONE. 509/489-0500
P.O. BOX 3727
SPOKANE. WASHINGTON 99220

March 26, 1985

Colonel James Fry
Deputy Division Engineer
North Pacific Division
U. S. Corps of Engineers
P. O. Box 2870
Portland, OR 97208

Dear Colonel Fry:

Current system conditions indicate that actions taken to enhance juvenile fish migration this spring and summer might have severe impacts on FCRPS revenues and might, in fact, jeopardize system refill. In the past several years, these actions have had relatively small effects, but the situation is vastly different in 1985:

1. The January-July volume runoff forecast is much lower this year. The March 1 forecast predicted subnormal runoff, and unless there is above-average precipitation in the remainder of March, the April 1 forecast will be even lower.
2. The combined storage of the Coordinated System is now slightly below the composite Variable Energy Content Curve. That curve is intended to provide high confidence of refill by July 31, but it is based on the assumption that all cyclical reservoirs can be operated to project minimum discharges during the freshet and beyond, until July 31. And, if the April 1 runoff forecast drops, the VECC will rise.
3. Largely because of BPA's Intertie Access Policy, the unit value of energy is much higher this year.

I consider the Water Budget to be an issue on which debate is largely foreclosed, although I urge the Corps to manage that program with great care this year so as to achieve its objectives substantially but with as little loss to the power system as possible. The amount of deliberate spill which will be provided to assist juvenile salmonids in bypassing the turbines, however, is still an issue to be decided at the Corps' discretion. It appears that any spill in excess of that which will occur inadvertently during the Water Budget period, if any, would have significant value as generation in 1985.

I have perused the Preliminary Interium Juvenile Fish Passage Plan (NPDEN-WM, 13 March 1985) and question the estimates of impacts shown in Table I, page 21, for the various alternatives. First, if the quantities of spill shown as inadvertent are based on earlier runoff forecasts or on last year's operation, they are much too high. Second, if the conversion of spill into dollars of foregone revenue is based on anything less than Bonneville's NF Standard Rate, the economic increments are woefully understated. Even as stated, though, the revenue impact is hardly trivial; ten or eleven million dollars is still an amount worth sharpening pencils for, and I believe that the real impacts would be much bigger.

I am concerned that the issue might be treated too complacently, and that the generosity accorded the Fishery Agencies and Tribes in the past several years, when non-firm energy prices were low and the system had potential generation in excess of market, might be extended without sufficiently rigorous examination. I regret that there has not been more public involvement by the utilities on this issue before now. Respectfully, on behalf of Northwest investor-owned utilities, I urge you to examine the balance between incremental fisheries gains and ratepayer impacts of proposed mitigation measures most objectively.

My views, I'm certain, are generally shared by the publicly-owned utilities, the BPA direct-service industries and Bonneville.

If you would like a fuller explanation of the rate-payers' position in this matter, we would be happy to meet with you and discuss it. PNUCC could be an excellent vehicle through which to set up such a discussion.

Sincerely yours,

Merrill S. Schultz

cc: ICP Committee, Alternates
Diana Snowden, PNUCC
James Litchfield, NWPPC
Ed Sienkiewicz, BPA

Department of Energy

Bonneville Power Administration
P.O. Box 3621
Portland, Oregon 97208

In reply refer to: PJI

APR 0 1 1985

Colonel James R. Fry
Deputy Division Engineer
North Pacific Division
U.S. Army Corps of Engineers
P.O. Box 2870
Portland, Oregon 97208

Dear Colonel Fry:

The Bonneville Power Administration (BPA) is pleased with the efforts of the U.S. Army Corps of Engineers (Corps), the fishery agencies, and the Tribes to develop a joint juvenile passage plan for 1985. We hope that the inability to reach a mutually acceptable solution for fish passage will not deter any of the parties from a timely and earnest effort to achieve a joint plan for 1986. The following specific comments to your "Interim Juvenile Fish Passage Plan for 1985 for Corp of Engineers Projects" are offered.

SPECIFIC COMMENTS

IV Principles and Guidelines

(Pg 3) k. During periods of juvenile passage, the Bonneville Power Administration, the Corps of Engineers....

VI Implementation of the Juvenile Passage Plan

(Pg 4) Monitoring and surveillance of the fish migration will be provided by the fisheries agencies, Tribes, the Bonneville Power Administration, and the Corps.

(Pg 7) c. (7) Provide funding and assist in the implementation of smolt monitoring activities.

e. ....cannot be resolved between the Reservoir Control Center, the Bonneville Power Administration, and the Water Budget Managers, ...

VII Interim 1985 Juvenile Fish Passage Plan

(Pg 15) f. (2)(a) ·Maintain this monitoring capability onsite during the period ~~15 April to 15 September~~ 22 April - 1 June and 1 July - 15 August 1985.

f. (2)(c) ·Maintain this monitoring capability onsite during the period ~~15 April to 15 July~~ 22 April to 1 June 1985.

·In addition monitor juvenile salmonid passage 29 April through 12 July by use of a boxtype dipnet.

Table 1 1985 Juvenile Fish Passage Plan

The enclosed tables provide BPA's estimate of the revenue which would be foregone to implement either the Fishery Agencies and Tribes (FAT) Plan II or the Corps Plan IV. Some detail is provided. Additional information can be obtained from Mr. Roger Hearn of BPA's Division of Power Supply.

Sincerely,

Janet W. McLennan, Asst. Power Manager
Natural Resources & Public Services

Enclosures

cc:
Ms. J. Chrisman - Northwest Power Planning Council
Mr. J. Donaldson - Columbia Basin Fish and Wildlife Council
Mr. T. Wapato - Columbia River Inter-Tribal Fish Commission

FAT II Spills

	APR	MAY	JUN	JUL	AUG
LWG	105	105	-	-	-
LGS	105	105	-	-	-
LMN	55	200	230	90	-
IHR	77	260	317	115	-
MCN	56	25	-	-	-
JDA	-	532	667	530	200
TDA	-	570	710	573	216
BON	-	524	600	540	190
Total	398 MW	2321 MW	2524 MW	1848 MW	606 MW
Cost	398 @ 19 mills	2196 @ 19 125 @ 7	600 @ 24 1/ 1100 @ 19 824 @ 7	650 @ 24 1/ 1198 @ 7	606 @ 24
Cost	$5.5 M	$31.1 M	$30.0 M	$17.5 M	$10.6 M
				Total $94.7 Million	

Mica

1/ Stored in Revelstoke and sold later at 24 mills.

Hydrometeorology Branch
March 28, 1985

(WP-PSH-0317H)

Corps IV Spills

	APR	MAY	JUN	JUL	AUG
LWG	-	-	-	-	-
LGS	-	-	-	-	-
LMN	84	160	185	100	-
IHR	42	112	175	50	-
MCN	-	-	-	-	-
JDA	112	165	250	165	117
TDA	90	135	185	140	90
BON	160	340	560	430	
Total	488 MW	912 MW	1355 MW	855 MW	207 MW
	488 @ 19 mills	787 @ 19 125 @ 7	600 @ 24 1/ 755 @ 7	650 @ 24 1/ 235 @ 7	207 @ 24
Cost	$6.7 M	$11.6 M	$14.4 M	$12.5 M	$3.6 M
				Total $48.8 Million	

1/ Stored in Revelstoke and sold later at 24 mills.

Hydrometeorology Branch
March 28, 1985

(WP-PSH-0317H)

DESCRIPTION OF CORPS FISHPASS COMPUTER MODEL

APPENDIX VII

FISHPASS

MODEL CONCEPTS AND APPLICATIONS

JAN 1985

NPDEN-WM

NPDEN-WM
1/30/85

FISHPASS, AN ANALYTICAL MODEL OF FISH PASSAGE FOR THE COLUMBIA-SNAKE RIVER SYSTEM

This note provices information on the backgrounc, general modeling concepts anc practical applications of the FISHPASS Model used in the cevelopment of the 1985 Juvenile Fish Passage Plan.

1. PURPOSES OF THE MODEL

FISHPASS Mocel simulates fish passage operations in a river system under varying corditions of flows anc "spill-for-fish" plans. It was originally cesigneo to develop preliminary cata bases on fish passage to aic in the formulation of annual anc long range spill plans for the lower eight Corps reservoirs along the Columbia/Snake river system. The model is, hcwever, general in nature anc could be usec, with minor mocifications, with any other river system.

The Mocel was ceveloped for the AMDAHL Computer System during May-December 1984 as part of a cooperative effort between the Water Management Branch, Engineering Division anc the Environmental Branch, Planning Division, Corps of Engineers North Pacific Division. Suggestions anc inputs received from the staff of the Fishery agencies anc Tribes, the Northwest Power Planning Council anc tne Bonneville Power Administration have alsc been included.

2. GENERAL MODEL CCNCEPTS

FISHPASS models fish operations of all individual projects included in the system and calculates project survival at varicus dams for three fish species- yearling, subyearling anc steelhead. Given a set of known daily count of the migrating juvenile fish population , known inflows to the projects and the necessary spill schecule and criteria, the Mocel automatically cetermines the amount of spill required to either meet an assigned project fish survival target or to implement a pre-oetermined spill level schecule. It keecs tract of incidences where involuntary spills have to take place because plant hydraulic capacities have been exceeded. Except for the hydraulic capacity limitation, the Mocel assumes there is no load restriction to power generation, when water is available.

Calculation of project fish survival is based on the best biological information available tocate on fish mortality in pools, over spillways, through turbines and bypasses, and curing collection anc transportation. Because these data are limited, a set of low anc high values are used for some of the less well defineo model coefficients to reflect the range of variations that can be expected. Consistent with this data limitation, the essentially deterministic algorithm selected for the Model has to be kept at a relatively modest level of sophistication.

FISHPASS maintains a continuous accounting of the juvenile fish population along their out-migration route, from headwater projects to Bonneville Dam and further downstream. Fish input data include an assumed daily fish distribution at initial upstream locations such as the upper end of Lower Granite Reservoir, on the Snake River and the upper end of McNary Reservoir, or the mid-Columbia River. As fish continue their downstream migration, their count will change as a result of losses sustained during pool travels and dam passages. Fish counts will also change when fish are transported from one project to another, or when new hatchery fish are released at specific points along the System. Although projects are considered one at a time, there is nonetheless continuity in the simulation because the Model proceeds logically from upstream to downstream, in the direction of the flows. Carry-over of dissolved gas supersaturation, from one pool to another, is also modeled to the extent possible.

Three options are provided in the Model to account for fish mortality in reservoir pools. The first option assumes that pool mortality, in most cases and for most fish species, is directly related to the duration of the travel -which, in turn, depends on the flows and the length of the reservoirs under consideration. In this case, percent mortality per day of travel must be given. The second option relies on the concept of optimum flows used in the instream flow methodologies. It assumes there exists an optimum flow for each reservoir that yields the highest fish survival coefficient. As flows depart from that optimum value, fish survival will decrease according to an empirical, all-inclusive bell-shaped function as a result of increased fish losses. Finally, the third option treats pool mortality as a constant fixed loss, independent of flows and time of travel.

Three typical hourly fish distribution patterns are provided to model variations in the daily fish movement, differentiating predominantly night-time migrations from those that are predominantly day-time migrations. To ensure maximum passage efficiency, daily spills are concentrated on those hours of the day or the night when most of fish are present at the dam's forebays. Start and end days of the spill season may be defined beforehand by the model users, or automatically determined by the Model. In the latter case, a given number of fish is used as threshold to trigger the beginning and the end of the daily spill.

Flows used in the FISHPASS Model are calculated by the Corps's Hydro Seasonal System Regulation Model (HYSSR). These flows reflect the results of a system regulation pattern that already includes the regulating effects of other storage reservoirs such as Grand Coulee and Dworshak. FISHPASS makes no change to those flows; it merely re-assigns spill amounts as needed.

Like in the HYSSR Model, the April-August study period used in the FISHPASS Model is subdivided into 7 sub-periods. There are two 15/16 day sub-periods in April and August; one 30 day sub-period in June, and one 31 day sub-period each in May and July. Sub-period mean regulated discharges are converted into daily flows using flow modulating factors. These factors are defined as the ratios of daily flows over corresponding sub-period mean flows for the year of interest.

Although current interest rests with the lower eight Corps projects, other dams and reservoirs of the Columbia River System could also have been included in the Model. Simulated projects may be classified as either "spill-active" or "spill-non active" project, depending on whether the spill level is a given input or a yet-to-be- calculated number. Also, they may or may not have transportation facilities. Various levels of credit are given to transported fish in the calculation of project fish survival and passage efficiency. Generally, the Corps confers full credit to all transported fish, regardless of the location where the transport originates. The Fish and Tribes agencies, on the other hand, give full transportation credit at site only for fish collected for transport; they do not allow for that credit to be carried on to downstream projects.

At the end of the calculation, the Model provides a summary accounting for each of the fish species under consideration. This includes, at each project, a break-down of surviving fish counts for the various migration and passage routes such as spillways, turbines, bypasses and transportation. Numerical values for project and system survival are also given, assuming both full and no credit for transportation. If detailed intermediary outputs are desired, the model will also print out these same values at the end of each iteration, while trying to increase or decrease the spill level as required to meet the imposed project survival target.

Several model runs are usually required to adequately address a reasonable number of plausible hydrologic and basic fish input assumptions. Within each basic set of fish and flow data, varying assumptions on the model coefficients must be made to test the model's sensitivity and estimate the range of the results that can be expected.

3. DETAILED SIMULATION OF POOL TRAVEL AND DAM PASSAGE

This section explains in detail the modeling of fish travel through reservoir pools and their passage over the dams, and the calculation of the project survival and passage efficiency. The algorithm starts with migrating fish arriving at the upper end of a reservoir and ends with fish leaving the dam below the reservoir under consideration. Definition sketches are provided in Figures 1 and 2.

Data on yearling, subyearling and steelhead populations are needed at the upper end of the reservoir pools. However, calculations are made separately for each of the fish species, using the same procedure. The following specific steps are made:

a. Given the total flow release from the upstream dam and known pool length, the total time of travel and dissolved gas supersaturation level are computed.

b. Fish losses in the reservoir are calculated based on the time of travel and daily mortality rates. These include mortality caused by sheer travel duration (generally assuming 0.7 percent daily mortality) and exposure to supersaturated dissolved gas. Total fish losses due to the two causes are printed out so the model user can assess the magnitude of the losses involved.

c. Fish migrating through the pool are depleted by losses computed in step b). Their movement is also lagged in time to account for travel time. This will result in a new fish distribution for each species at the forebay of the dam that creates the pool.

d. Fish going over the spillway are first computed, based on the amount of the spill and the percent of fish present during the specified spill hours. At all dams except The Dalles and Bonneville, it is assumed that a 50 percent spill, for example, will involve same percentage of fish that are present in the forebay (1:1 ratio). For Bonneville, separate fish distribution splits are assumed for each of the two powerhouses to account for differences in their configurations and passage efficiency. For The Dalles, a special curve relating percent flow spilled and percent fish going over the spillway is used. Based on pre-assigned hourly fish distribution, the spill operations will, therefore, only involve a fixed percentage of the fish species count for the day. Spillway mortality is applied to that percentage and results in a new count of fish that survive the spillway trip.

e. The remaining fish are automatically routed to the powerhouse where they are either collected or passed through the turbines. Guidance efficiency coefficients for each fish species determine this split.

f. Fish going through the turbines will sustain turbine-caused losses. Their survivors will join other fish that made it to the dam's tailwater via the spillway route.

g. Fish that go through the collection system will sustain some losses. Only those that survive will either be transported downstream or bypassed back into the stream, immediately below the dam. This determination is controlled by collection-for-transportation coefficients assigned to each species, depending on the relative proportion of the fish collected and the project involved. Only projects with transportation facilities provide this type of option; projects without such facilities can only bypass collected fish back into the stream.

h. Both fish that are transported and those which are bypassed sustain losses, at a pre-determined rate.

i. At the dam's tailwater, fish species are now grouped into those which get transported to below Bonneville Dam, and those continuing their journey via the downstream pool.

j. At this point, project survival is calculated for each species. Several values are given that characterize system and project survival. These include the following:

(1) system survival up to the dam in question, SYSS. Data that enter in the calculation of SYSS include those fish that continue their journey from the dam's tailwater via downstream pool (FWTR), the cumulative sum of those which are transported up to this point (SFTR2), including those transported at this dam; and the total initial fish input at the upper end of Lower Granite Reservoir (and McNary Reservoir, when considering the lower Columbia River projects), (SFO). SYSS is defined as the ratio of FWTR+SFTR2 over SFO.

(2) dam survival, DAMS, which takes into account the number of fish that make it to the forebay of the dam via the pool (FFRB) and via transportation (SFTR1); and FWTR and SFTF2 referred to above. DAMS is defined as the ratio of (FWTR+SFTR2) over (FFRB+SFTR1).

(3) project survival, PROS, which takes into account the fish that enter the upper end of this dam's reservoir via the pool (FUPW) and via transportation (SFTRO); the fish that are collected are transported from this dam (FTR); and FWTR and SFTR2 referred to above. When full credit is given to transportation, PROS is defined as the ratio of (FWTR+SFTR2) over (FUPW+SFTRO). When no transportation credit is considered, then PROS is defined as the ratio of (FWTR+FTR) over FUPW.

k. Finally, the Model prints out a flow summary showing the amount of spill for each of the 7 sub-periods of study. It also produces a tally of the total number of days when surplus spill occurred as a result of the plant hydraulic capacity being exceeded.

4. INPUT DATA FOR FISHPASS MODEL

Modeling using FISHPASS Model is performed on a seasonal basis. Required input consists of system-related data and project specific information (See sample input listing shown in Figure 3).

4.1 System-related Data

System-related data refer to the following options :

- level of details desired for print-outs
- admissible level of dissolved gas supersaturation
- project survival target
- definition mode for calculating project survival
- minimum fish count to signal the end of the transportation
- weighting factor representing transportation credit
- option for calculating the time of travel (using travel time curves, equations or fixed constant)
- pool survival at Lower Granite and McNary Reservoirs so estimate initial fish input at the upper end of the reservoirs
- code for maximizing transportation during critical flow years
- correction factors for initial daily fish distribution at Lower Granite and McNary Reservoirs

These basic input data must be followed by daily fish distribution data for yearling, subyearling and steelhead for each day of the 1 April- 31 August study period. These fish count data start with Lower Granite and end with McNary.

The next group of basic input data includes three typical hourly fish distribution curves, starting at 00 hours. These curves generally cover three different migration patterns, each of them emphasizing different hours of highest fish concentration.

Information on daily mortality due to dissolved gas supersaturation is given next in the form of a table of gas supersaturation level versus daily mortality rate. Since different spills last for different hours, corrections to dissolved gas mortality to reflect the length of time exposure to supersaturation may also be entered.

The last series of system-related input data concerns the flow modulators. One modulator is to be provided for each day of the 153 day simulation period.

4.2 Project-specific Data

Project-specific data refer to the following:

- project title
- headwater project identification
- hydraulic capacity
- spill status of the project (active or non-active)
- identification of transportation facilities
- length of the reservoir pool
- special time of travel specification for subyearling
- start/end days and hours of the spill operations
- start/end days and hours of sluiceway operations, and bypass discharges
- specified spill level, if any
- fish survival rates for spillway, turbines, collection facilities, bypass and transportation
- pool mortality rate due to travel time
- guidance efficiencies for yearling, subyearling and steelhead
- ratios of collected fish that are transported

- curve of Percent Flow Spilled versus Percent Daily Fish Count Affected by the Spill
- regulated flows for the project, as excerpted from HYSSR outputs
- curves of Percent Flow Spilled versus Percent Total Project Passage
- curves of Flow Spilled versus Percent Dissolved Gas Supersaturation

5. MODEL OUTPUT

Standard print-out of FISHPASS includes interpretation of the input data submitted by the model user, temporary results obtained at the end of each iteration, summary fish accounting and project survival results for each project and final summaries for the entire system.

A sample output is shown in Figure 4.

6. APPLICATIONS OF FISHPASS

Applications of FISHPASS Model were made to derive spill levels required to bring about at least a 90 percent project survival at all Corps projects (except Bonneville where an 85 percent passage efficiency is spelled out).

For these runs, fish input data at Lower Granite and McNary were prepared based on fish population monitoring made in 1982. The flows used are those of 1954, which are very similar in magnitude to the 1982 flows.

Fish operations currently carried out at the various Corps projects simulated by the Model were duplicated as closely as possible. In this regard, projects were grouped into several categories dependent upon their mode of operations.

Lower Granite, Little Goose and McNary share the same operational constraints and criteria. For those three projects, the spill-for- fish season consists of three phases. The first phase starts from 1 April and continues until the proportion of subyearling and steelhead collected exceeds 50 percent of the total fish collected. During this phase, most of the yearling are bypassed and most of the steelhead and subyearling, transported. During Phase II, which lasts until the total of collected fish is less than a given daily fish count, all bypass is closed off and transportation is carried out at full swing. During Phase III, transportation is discontinued; only bypass operations are active.

Lower Monumental is treated as a separate case by itself. Spill at this project starts two days after a specified minimum 1 daily fish count is reached at Little Goose. Spill stops two days after fish count at Little Goose drops below that same specified minimum. There is no transportation; spill is from 2000 hours to 2400 hours.

Ice Harbor is another isolated case project. The sluiceways, using 2600 cfs, are in operation from 1 April. There is no fixed schedule for spill. 55 percent of all fish approaching the powerhouse are collected and bypassed directly into the dam's tailwater area. There is no transportation.

John Day operates without transportation facilities and no sluiceways. Spill are made daily, usually from 2000 to 0600 hours. Different guidance efficiencies are obtained depending on the number of power units operating. The first 9 units, with a total hydraulic capacity of 160,000 cfs, are equipped with screens; they are in service first. When needed, another 7 units may also be used. These 7 units have no bypass facilities.

The Dalles relies on sluiceways, which uses up some 3,600 cfs day-round. There are no transportation facilities; spill of surplus water is frequently in force. The percent of fish affected by the spillway is not directly related to spill amount. Also, 46 percent of the fish approaching the powerhouse are bypassed, leaving 54 percent for the turbines.

Operations at Bonneville may take place at both powerhouses, depending on the flows and spill level. The order in which turbine units are put in operation is as follows:

(1) Units 1 and 10 in the first powerhouse and Units 11,17 and 18 in the second powerhouse;

(2) Units 2 through 9 in the first powerhouse; and

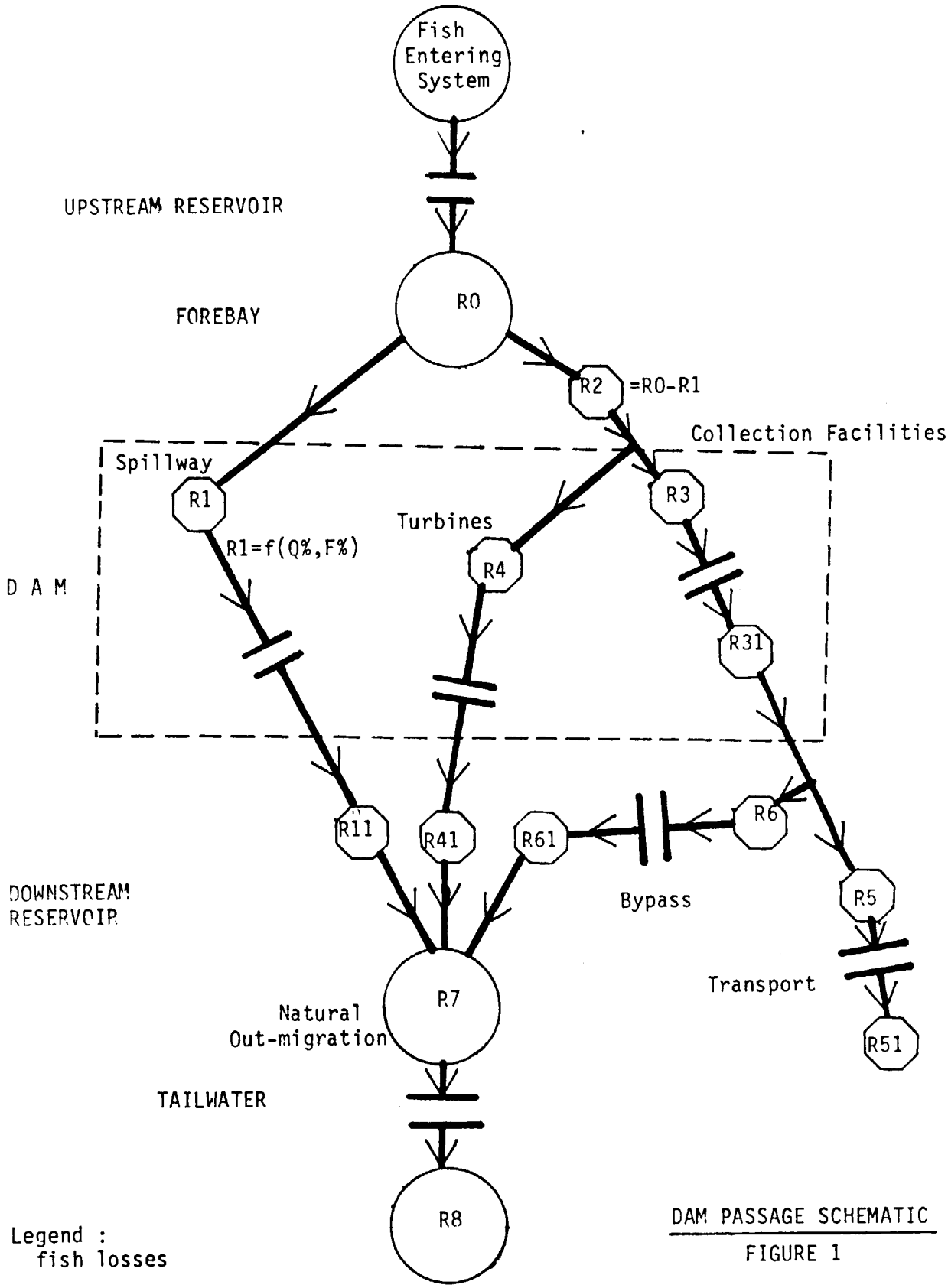
(3) Units 12 through 16 in the second powerhouse, if needed to meet firm load.

The percent of daily fish count affected by the spill is directly related to the spill percent. Different guidance efficiencies are obtained, however, when the two powerhouses are operating, the first powerhouse units being the most efficient. For example, if flow distribution to spillways, first and second powerhouse is in the ratio of 30, 50 and 20 percent respectively, the corresponding percent of fish affected is assumed to be 30, 63 and 7 percent respectively. There are no transportation facilities.

It is interesting tc note that a high spill level does not necessarily cring about a hign project survival. Heavy spill sends a large amount of juverile fish over the spillway and leaves them exposed to high pool mcrtality because of high dissolved gas supersaturation. By the same token, heavy spill ceprives fish from being transported at much lower mortality rates in barges and trucks.

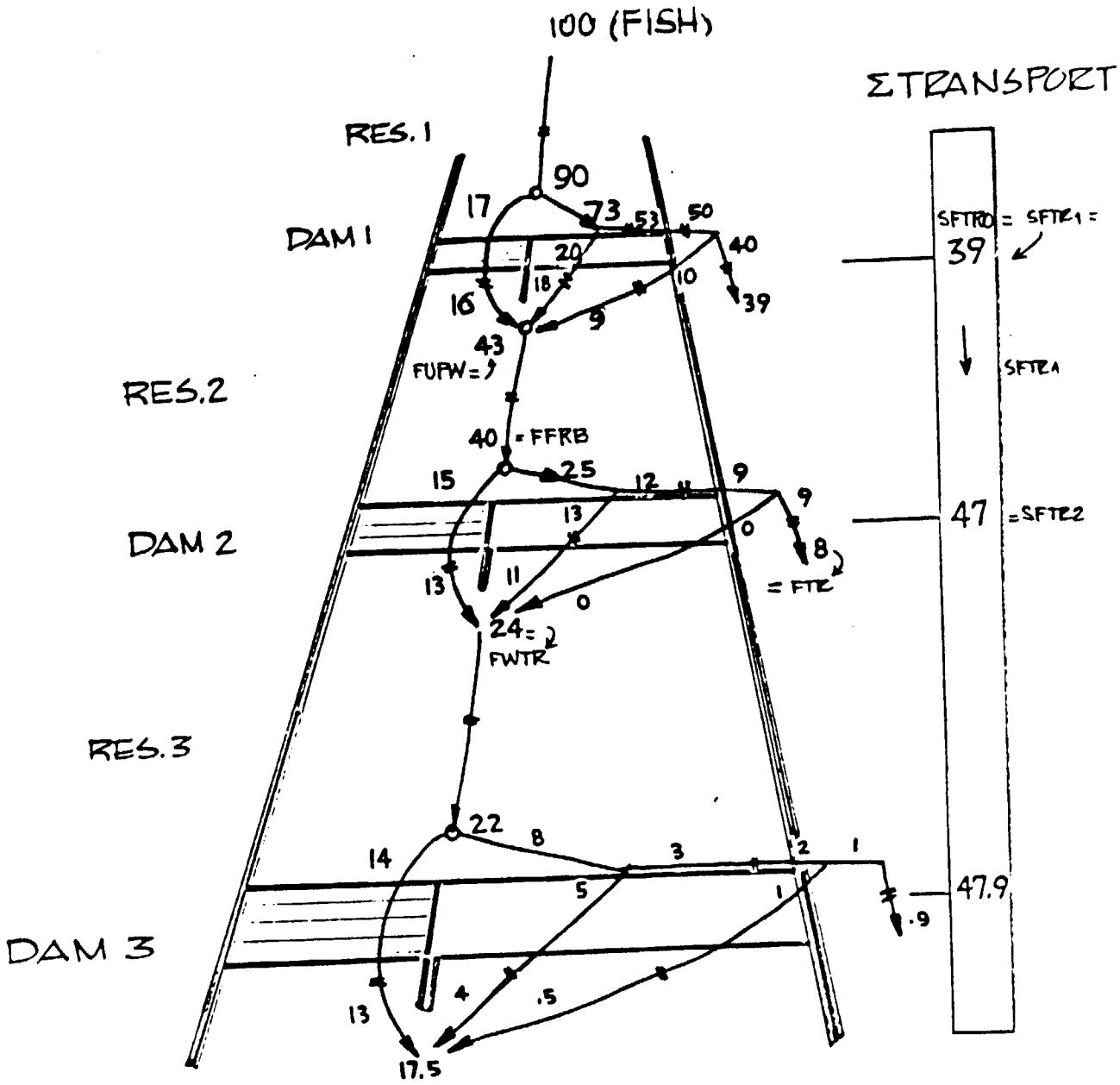
7. CONCLUSIONS

FISHPASS Model is a convenient anc expeditious analytical tool for assessing the impacts of various juvenile fish passage plans on project fish survival and passage efficiency. It incorporates most of the commonly accepted moceling features of juvenile fish migration and project spill operations. If properly used, FISHPASS can produce many of the basic answers a planner needs to formulate his/her fish passage plans.



DAM PASSAGE SCHEMATIC

FIGURE 1



$$DSV_2 = \frac{FWTR\ 24+47\ SFTR2}{40+39\ SFTR1} = .899 = DAMS$$

(FFRB)

$$PSV_2 = \frac{FWTR\ 24+47\ SFTR2}{43+39\ SFTRO} = .866 = PROS$$

(FUPW)

$$PSV_2(F\&T) = \frac{FWTR\ 24+8\ FTR}{43} = .794$$

(FUPW)

$$\Sigma SURV_2 = \frac{FWTR\ 24+47\ SFTR2}{100} = .710 = SYSS$$

(SFO)

ILLUSTRATIVE CALCULATION OF PROJECT SURVIVAL

FIGURE 2

SAMPLE INPUT LISTING FOR FISHPASS MODEL

This is a sample input listing for the FISHPASS Model. nstructions on how to fill the input are given below in lower case etters.

System-Related Data
****

(1) This first line is for the run title. Format 20A2.

```
INPUT DATA FOR FISHPASS MODEL - SAMPLE RUN 1/21/85
```

---

(2) This line is made up of 5-column fields

NPR=1 : print option. 10 is the highest. will then print all calc. details needed for debugging purposes

AN2MAX=200 : max. admissible level (%) of dissolved gas super-saturation

TARGET=90 : project fish survival target (%)

NPASEF=1 : definition code for the calc. of project survival (1=f & T; 2=COE; 3=dam survival target). If +, average project survival is used as objective function. If -, means the minimum value of the project survival (for the 3 species) is used instead.

FISMIN=.5 : 500 fish is the minimum daily count of fish collected that will end transportation operations

CREDIT=0 : credit for transportation (1 is full credit) in the calc. of project survival

NTRAX=0 : code for using time of travel curves. 0 means Do not use curves, use equations instead. 1 means Use curves

RMORLG=1. : pool survival for Lower Granite Reservoir

RMORUC=1. : pool survival for McNary Reservoir

NCRIT=0 : this is not a critical flow year. Use 1 if critical flow year. In that case, all fish collected are transported at projects that have transportation facilities. No bypass operation.

```
NPR 1  200   90    1   .5    0    1   .7   .7    0
```

---

(3) This line gives the global correction factors for initial fish input at LWG and MCN.

CF1=1. : correction factor (daily fish count multiplier is 1, meaning no correction)

LAG1=0 : correction to lag time is 0 days (meaning no correction) for the LWG fish curve)

CF2=1 : ditto for MCN

LAG2=0 : ditto for MCN

'FLAG',1.,0,1,0

---

(4) This line is formatted as 4X,15F3.0. Provide daily fish distribution in 1,000's fish for LWG Forebay. Start with yearling, from 1 April - 31 August (153 values); continue with subyearling and end with steelhead.

L1,4	0	0	0	0	0	2	2	2	2	3	4	6	5	20	27	
	28	19	18	15	21	27	38	39	44	43	53	39	32	35	39	
L1,5	43	20	20	18	18	25	16	14	12	22	18	7	7	4	11	
	9	5	10	7	8	4	4	5	8	6	4	7	6	5	4	3
L1,6	1	2	1	1	1	2	3	2	1	2	2	1	1	1	1	
	2	1	0	1	1	1	1	1	1	1	0	1	0	1	1	
L1,7	1	1	1	1	0	1	1	0	1	1	0	1	1	1	1	
	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
L1,8	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
L2,4	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
L2,5	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
	0	0	0	0	0	0	0	0	0	0	1	1	1	1	0	0
L2,6	0	1	8	9	5	1	1	1	1	1	1	1	4	12	5	
	9	4	6	9	13	8	5	5	3	4	5	2	4	16	89	
L2,7	31	11	5	6	4	3	3	3	2	3	2	0	1	1	1	
	1	1	1	1	1	1	2	1	1	1	1	1	1	1	0	0
L2,8	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
L3,4	0	0	0	0	0	1	1	1	6	8	8	14	22	17	74	
	47	41	29	15	19	10	17	15	42	49	76	80	52	53	96	
L3,5	112	75	73	43	52	167	112	102	63	116	155	92	74	63	77	
	88	62	109	122	116	90	71	72	87	68	80	100	80	74	32	30
L3,6	17	16	13	22	15	19	17	14	12	8	10	13	14	39	19	
	33	19	15	8	8	5	2	3	3	3	4	2	1	3	1	
L3,7	1	1	1	0	1	1	0	0	1	0	0	1	0	0	1	
	1	0	1	1	0	1	0	0	1	0	0	0	0	1	0	0
L3,8	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0

MCN Forebay fish input starts here

```
M1,4  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0
      0  0  0  0  0  0  0 60 80 60120 60140200170
M1,523024029035027023015013015012016015013019015
      90130140190100150 50 90 80170 60110130 40 20 20
M1,6 20 60 60 40  0  0  0  0  0  0  0  0  0  0  0
      0  0  0  0  0  0  0  0  0  0  0  0  0  0  0
M1,7  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0
      0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0
M1,8  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0
      0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0
M2,4  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0
      0  0  0  0  0  7  2  1  0  0  0  0  0  0  0
M2,5  1  0  0  1  1  1  1  0  0  1  1  1  0  1  1
      1  1  2  1  6  6  8  9 15 26 35 23 37 25 41 36
M2,6 35 27 24 27 34 32 46 66 62 60 49 39 40 54 54
     60 60 34 57 74128338315211139142 53 52 55 49
M2,7 21 28 46 37 15 17 39 21 43 64 34 28 35 28 39
     50 94189176154245134136157 81 55 36 48 60181114
M2,8 45 15 14 10 22 53 77 47 38 35 20 19 11 15 40
     43 68 66 66 44 43 13  7  8 12 10 10  8  8  6  8
M3,4  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0
      0  0  0  0  0  0  0 14 14 13 13 13 13 12 12
M3,5 11 11 10 10 11 11 12 15 18 24 30 26 20 14 11
     11 10  9  8  7  7  7  6  8  5  4  3  3  2  1  1
M3,6  1  1  1  1  1  1  0  0  0  0  0  0  0  0  0
      0  0  0  0  0  0  0  0  0  0  0  0  0  0  0
M3,7  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0
      0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0
M3,8  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0
      0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0
```

---

(5) The next 9 lines enter data on hourly fish distribution starting from mid-night. Three typical patterns are given in ratio of total daily. Total of the 24 values must be 1.00 (or close to it). Program will check that this is the case.

```
'HFD1',.13,.08,.06,.05,.03,.02,.008,0,.01,.03
.02,.02,.02,.01,.01,.0,0,0,0,.01
.05,.106,.136,.153
'HFD2',.06,.06,.06,.06,.085,.117,.096,.053,.02,.005
0,0,0,0,0,.005,.005,.005,.026,.058
.06,.06,.05,.05
'HFD3',.02,.01,.01,0,0,0,0,.01,.05,.106
.136,.153,.13,.08,.06,.05,.03,.02,.008,0
.01,.03,.02,.02
```

(6) This line gives the relationships between Percent Supersaturation and Mortality due to N2 (in % per day).

'N2SA',7,0,0,100,0,105,.03,110,.1,115,.83,120,2.17,999,10

(7) This line gives the relationships between Duration of Spill (in portions of a day) and the Correction Factors to be applied to N2 Mortality. In this case, no correction needed.

'CRN2',2,0,1,1,1.

Ui(8) The following lines are formatted 5X,10F5.0. They contains the daily flow modulators for conversion of Mean Period Flows into daily discharges. Start from 1April until 31 August.

RAT4	1.26	1.1	1.14	1	.76	1.06	1.06	1.02	1.08	.99
	.36	.75	1.11	.96	.94	.98	.88	.66	.83	.89
	.78	1	.92	.97	1.10	.91	.76	1.33	1.33	1.34
RAT5	.86	.87	1	1.11	1.13	1.09	.91	.31	.74	.84
	.97	.87	.9	.9	.9	.92	.7	.91	.93	.75
	.89	.9	.87	1.03	.87	1.03	1.24	1.31	1.41	1.59
	1.53									
RAT6	1.1	1.03	1.02	1.05	1.05	1.11	1.06	1.06	1.14	1.23
	1.18	1.14	1.12	1.13	1.04	.96	.93	.91	.94	.99
	1	1	1	.94	.91	.9	.82	.75	.76	.69
RAT7	.99	.97	1.07	.97	1.11	1.22	1.3	1.31	1.02	.84
	1.01	1.09	1.15	1.09	1.08	.76	.67	1.05	.99	.84
	.94	.96	.87	.74	.87	1	.91	.97	.97	.97
	.97									
RAT8	1.12	1.02	1.09	1.17	1.19	1.2	1.50	1.20	0.84	1.03
	0.93	1.15	1.00	0.97	1.26	1.13	0.99	0.97	1.00	0.82
	0.83	0.86	0.80	0.93	0.89	0.91	0.87	0.84	0.66	0.92
	0.92									

The previous line concludes system-related input data.

****
PROJECT-SPECIFIC DATA

---

(10) Format 1X,I5

NHEAD=1 : this identifies LWG. Put 2, if MCN. Else, put 0.

* 1 0

---

(1) Title for this Project : 20A2.

LOWER GRANITE

---

(12) Free Format
QCAP=132 : hydraulic capacity is 132 KCFS
NSPILL=1 : spill-active project. Will attempt to define spill level through iteration to meet survival target
If 0, means no iteration required. Will then spill as specified below.
NTRANS=1 : transportation facilities identifier. 0 means No transportation facilities at this project.
POOLL=40 : pool length is 40 KM
TRAJDA=-1 : No need to set travel time for subyearling to a constant number of days. If +, that number means time of travel for subyearling.

'QCAP',132.,1,1,40,-1

---

(13) Free format
NDSPI1=1 start day of spill
NDSPI2=153 : end day of spill
NHSPI1=20 : start hours of spill (at 2000 h)
NHSPI2=6 : end spill at 0600 hours
LFHDIS(1,2,3)=1,2,1 : hourly fish distribution curves to be used for this project are #1 for yearling, #2 for subyearling, and #3 for steelhead

'DSPI',1,153,20,6,1,2,1

---

(14) Free format
GSLUS=0 : flows = 0 KCFS for sluiceways
NDSLU1=1 : start sluiceway operations on day 1
NFSLU2=153 : end sluiceway operations on day 153
NHSLU1, and NHSLU2 = start/end sluiceway operation hours
PCTQIN=0.4 : spill ratio of total flow
SURVSP, SURVTU, SURVCF, SURVBY, SURVTR = survival factor for spillway, turbines, collection facilities, bypass and transportation
DMORTP=.7 : daily pool mortality due to time of travel
If - means that Optimum Flow concept is used

'SLUS',0,1,153,1,24,0.,.98,.85,.99,.99,.99,.70

---

(14) Relationships between Flows in KCFS and time of travel in days

'TRAV',9,20,14.2,40,7.1,60,4.7,80,3.5,100,2.8,120,2.5,140,2.2
160,20,300,.9

---

(15) Guidance efficiencies for yearling, subyearling and steelhead
COFA= .5, .5, and .74 respectively
COTR= .2, 1. and .8 : ratio of fish collected that are transported
for yrlg, subyrlg and steelhead

'COFA',.5,.5,.74,.2,1.,.8

---

(16) Relationships between Percent Spill and Percent Fish affected by the spill.

'SPIL',2,0.,0.,100,100

---

(17) Sub-period regulated flows, in KCFS, starting in APR1

'QREG',63.3,75.6,105.2,164.5,86.1,29.4,29.8

---

(18) Relationship between Percent Spill and Percent Total Passage efficiency

'PASS',3,0,30.,80,94,90,100

---

(19) Relationships between Flows in KCFS and Percent N2 supersaturation. Use curves developed for spillways with deflectors if applicable.
cable.

'N2CU',8,0,100.,28,120,50,125,76,130,110,133,150,134,500,136,5000,200

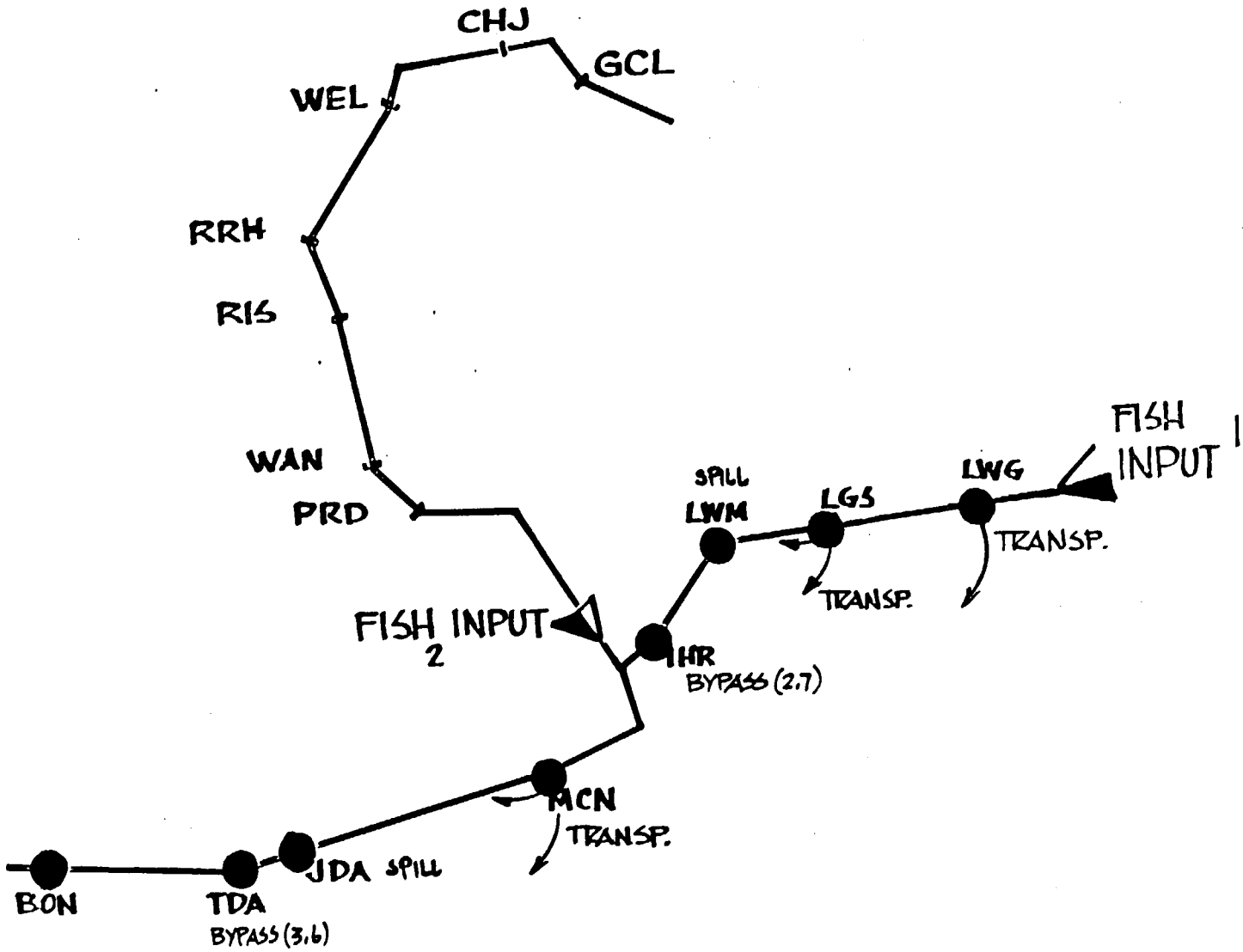
```
---------------------------------------------------------
This concludes the input for the first project (LWG).
Redo the same for the next downstream project (LGS)

*    0   90
LITTLE GOOSE
'QCAP',132.,1,1,63.,-1
'DSPI',1,153,20,6,1,2,1
'EMIN',0
'SLUS',0,1,153,0,24,0,.98,.85,.99,.99,.99,.7
'TRAV',9,20,14.2,40,7.1,60,4.7,80,3.5,100,2.8,120,2.5,140,2.2
160,2.,300,.9
'COEA',.5,.5,.74,.2,.8,.8
'SPIL',2,0.,0.,100,100
'QREG',63.31,75.58,105.20,164.52,86.12,29.41,29.77
'PASS',3,0,30.,80,94,90,100
'N2CU',6,0,100.,30,120,60,130,175,142,500,146,5000,200
*    0    0    1
LOWER MONUMENTAL
'QCAP',132,2,0,48.,-1
'DSPI',1,61,20,6,1,2,1
'DSP2',61,122,.60
'SLUS',0,1,153,0,24,.6,.98,.85,.99,.99,.99,.7
'TRAV',10,20,9.4,40,3.8,60,3.1,80,2.4,100,1.9,120,1.7,140,1.5,160,1.3,
200,.9,300,.6
'COEA',.025,.025,.025,.0,0,0
'SPIL',2,0.,0.,100,100
'QREG',61.56,75.07,103.42,160.82,84.40,30.35,28.93
'PASS',2,0,0,100.,100
'N2CU',7,0,100.,8,110,30,120,70,126,150,131,500,146,5000,200
*    0    0
ICE HARBOR
'QCAP',96.,1,0,54.,-1
'DSPI',1,122,20,6,1,2,1
'SLUS',2.7,1,153,4,22,.3,.98,.85,.99,.99,.99,.7
'TRAV',7,20,10.2,40,5.1,60,3.4,80,2.6,100,2.,200,1,300,.7
'COEA',.415,.415,.415,0,0,0
'SPIL',2,0.,0.,100,100
'QREG',61.56,75.07,103.42,160.83,84.40,30.35,28.93
'PASS',2,0,52.,100,100
'N2CU',8,0,100.,15,113,30,120,50,125,90,130,150,123,500,137,5000,200
*    2   90
MCNARY
'QCAP',231.,1,1,64.,-1
'DSPI',1,153,20,6,1,2,1
'SLUS',0,1,153,0,24,0,.98,.85,.99,.99,.99,.7
'TRAV',5,100,6.7,200,3.4,400,1.8,600,1.2,800,.8
'COEA',.74,.74,.76,.2,.8,.8
'SPIL',2,0.,0.,100,100
'QREG',193.78,206.08,248.38,370.10,283.73,146.45,132.08
'PASS',2,0,40.,100,100
'N2CU',5,0,100.,20,110,75,115,500,132,5000,200
```

```
*    0    0
JOHN DAY
'QCAP',352.,2,0,129.,12
'DSPI',1,153,20,6,1,2,1
'SLUS',0,1,153,0,24,.25,.98,.85,.99,.99,.99,.7
'TRAV',5,100,11.7,200,5.9,400,3,600,2,800,1.5
'COEA',.5,.5,.74,0,0,0
'SPIL',2,0.,0.,100,100
'QREG',201.65,208.38,250.72,362.04,278.83,141.86,126.95
'PASS',5,0,40.,20,70,40,85,61,90,100,100
'N2CU',6,0,100.,20,106,60,111,125,115,500,124,5000,200
*    0    0
THE DALLES
'QCAP',360.,1,0,40.,-1
'DSPI',1,153,6,18,3,3,3
'SLUS',3.6,1,153,0,24,.20,.98,.85,.99,.99,.99,.7
'TRAV',5,100,1.5,200,.8,400,.4,600,.3,800,.2
'COEA',.425,.425,.425,.0,0,0
'SPIL',4,0,0,20.,52.,41.,80.,100.,95.
'QREG',208.03,215.36,258.31,367.91,284.30,146.76,131.86
'PASS',5,0,40.,20,70,40,85,60,90,100,100
'N2CU',7,0,100.,20,116,60,111,125,115,300,119,500,126,5000,200
*    0    0
BONNEVILLE
'QCAP',165.,1,0,77,-1
'DSPI',1,153,0,24,1,2,1
'SLUS',0,1,153,1,24,0,.98,.85,.99,.99,.99,.7
'TRAV',4,130,3,225,1.8,460,1,600,.8
'CEA1',.76,.72,.78,0,0,0
'CEA2',.19,.24,.35,0,0,0,.1
'SPIL', 2,0.,0.,100,100
'QREG',213.70,222.82,259.78,367.68,292.80,152.39,138.91
'PASS',2,0,100.,100,100
'N2CU',7,0,100.,25,116,55,125,85,129,200,134,500,140,5000,200
IKJ52500I END OF DATA
EDIT
```

SYSTEM NETWORK

FIGURE 5



**** TSO FOREGROUND HARDCOPY ****
OSNAME=GOTKBT.PFIERCE.DATA

1

RUN REF(H.M.S.SS):16 28 53 82

```
*************************************************
*                                               *
*        P R O G R A M   F I S H P A S S        *
*                                               *
*                                               *
*                    26 MAR 1985                *
*************************************************
```

RUN DATE : 3/27/85

TITLE : PTER H.CORPS PROPOSAL 1975H20A 26MAR BON SPEC4:SPILL=75

PROGRAM CHANGES MADE TODATE

1. PE/PS DEFINITION OPTION (CODE 1=F&T, 2=COE)
2. TRAVEL TIME CALC. BY CURVES (1) OR EQUATIONS (0)
3. CREDIT FOR TRANSPORTATION 0 TO 1. MULTIPLIER
4. POOL SURVIVAL U/S FROM LWG AND MCN
5. USE OF MIN. PE/PS AS OBJECTIVE FF (CODES -1 OR -2)
6. REVISED CALC. OF POOL MORTALITY BASED ON DFISH2
7. REV. CALC. OF FISH SPILLED USING HSPILL
8. OPTION FOR MAXIMIZING TRANSPORT.DURING CRITICAL YR
9. AUTOMATIC CARRY-OVER OF N2% FROM U/S TO D/S
10. REV.CALC. FOR RSV.LOSSES FOR SUBYRLG
11. NEW TARGET FOR DAM SURVIVAL (NPASEF=3)
12. TWO SPILL SEASONS WITH DIFFERENT SPILL %
13. NEW RESULTS FOR DAM BYPASS EFFICIENCIES
14. SPECIAL TREATMENT FOR BONNEVILLE
15. HATCHERY FISH RELEASES
16. UNDERFLOW EXPONENT FIXED
17. SPECIAL BONNEVILLE MAX. SPILL=75 KCFS

GENERAL RUN INFORMATION

PRINT= 1 N2MAX=200.0 PE/PS TARGET(%)= 0.0 DEF.CODE=-3(1=F&T,2=COE
3=DAM SURVIVAL TARGET; -=MIN.VALUE USED AS OBJ
MIN.CULL.FISH COUNT (1,000) TO END TRANSPORT..= 0.5
CREDIT FOR TRANSPORTATION= 0.00 TRAVEL TIME CURVES USED= 0 (0=NOT USED)
U/S POOL SURVIVAL (RATIO) FOR LWG= 1.00 MCN= 1.00
CRITICAL YEAR ? = 0

GLOBAL CORR. CF AND NLAG AT LWG AND MCN: 1.00 0 1.00 0

BASIC FISH DISTRIBUTION AT LWG FOREBAY (1,000)

FISH SPECIES (1=YRLG, 2=SUBYRLG, 3=STEELH) : 1

APR	0.	0.	0.	0.	0.	2.	2.	2.	2.	3.	4.	6.	5.	20.	27.
	28.	19.	18.	15.	21.	27.	38.	39.	44.	43.	53.	39.	32.	35.	39.
MAY	43.	20.	20.	19.	18.	25.	16.	14.	12.	22.	18.	7.	7.	4.	11.
	9.	5.	10.	7.	8.	4.	4.	5.	8.	6.	4.	7.	6.	5.	4.
	3.														
JUN	1.	2.	1.	1.	1.	2.	3.	2.	1.	2.	2.	1.	1.	1.	1.
	2.	1.	0.	1.	1.	1.	1.	1.	1.	1.	0.	1.	0.	1.	1.
JUL	1.	1.	1.	1.	0.	1.	1.	0.	1.	1.	0.	1.	1.	1.	1.
	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
	0.														
AUG	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
	0.														

TOTAL (1,000) APR-AUG= 960.0

1

FISH SPECIES (1=YRLG, 2=SUBYRLG, 3=STEELH) : 2

APR	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
MAY	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	1.	1.	1.	1.	0.
	0.														
JUN	0.	1.	8.	9.	5.	1.	1.	1.	1.	1.	1.	1.	4.	12.	5.
	9.	4.	6.	9.	13.	8.	5.	5.	3.	4.	5.	2.	4.	16.	89.
JUL	31.	11.	5.	6.	4.	3.	3.	3.	2.	3.	2.	0.	1.	1.	1.
	1.	1.	1.	1.	1.	1.	2.	1.	1.	1.	1.	1.	1.	1.	0.
	0.														
AUG	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
	0.														

TOTAL (1,000) APR-AUG= 328.0

FISH SPECIES (1=YRLG, 2=SUBYRLG, 3=STEELH) : 3

APR	0.	0.	0.	0.	0.	1.	1.	1.	6.	8.	8.	14.	22.	17.	74.
	47.	41.	29.	15.	19.	10.	17.	15.	42.	49.	76.	80.	52.	53.	96.
MAY	112.	75.	73.	43.	52.	167.	112.	102.	63.	116.	155.	92.	74.	63.	77.
	89.	62.	109.	122.	116.	90.	71.	72.	87.	68.	80.	100.	80.	74.	32.
	30.														
JUN	17.	16.	13.	22.	15.	19.	17.	14.	12.	8.	10.	13.	14.	39.	19.
	33.	19.	15.	8.	8.	5.	2.	3.	3.	3.	4.	2.	1.	3.	1.
JUL	1.	1.	1.	0.	1.	1.	0.	0.	1.	0.	0.	1.	0.	0.	1.
	1.	0.	1.	1.	0.	1.	0.	0.	1.	0.	0.	0.	0.	1.	0.
	0.														
AUG	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
	0.														

TOTAL (1,000) APR-AUG= 3822.0

TOTAL FISH INPUT AT LOWER GRANITE (1,000)= 5110.0

BASIC FISH DISTR. FOR MID-COLUMBIA U/S OF MCN(1,000)

FISH SPECIES (1=YRLG, 2=SUBYRLG, 3=STEELH) : 1

APR	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
	0.	0.	0.	0.	0.	0.	0.	60.	80.	60.	120.	60.	140.	200.	170.
MAY	230.	240.	290.	300.	270.	230.	150.	130.	150.	120.	160.	150.	130.	190.	150.
	90.	130.	140.	190.	100.	150.	50.	90.	80.	170.	60.	110.	130.	40.	20.
	20.														

```
JUN   0.  0.  0.  0.  0.  0.  0.  0.  0.  0.  0.  0.  0.  0.  0.
      0.  0.  0.  0.  0.  0.  0.  0.  0.  0.  0.  0.  0.  0.  0.
JUL   0.  0.  0.  0.  0.  0.  0.  0.  0.  0.  0.  0.  0.  0.  0.
      0.  0.  0.  0.  0.  0.  0.  0.  0.  0.  0.  0.  0.  0.  0.
      0.
AUG   0.  0.  0.  0.  0.  0.  0.  0.  0.  0.  0.  0.  0.  0.  0.
      0.  0.  0.  0.  0.  0.  0.  0.  0.  0.  0.  0.  0.  0.  0.
      0.
      TOTAL (1,000) APR-AUG=  5580.0

FISH SPECIES (1=YRLG, 2=SUBYRLG, 3=STEELH) : 2
APR   0.  0.  0.  0.  0.  0.  0.  0.  0.  0.  0.  0.  0.  0.  0.
      0.  0.  0.  0.  0.  7.  2.  1.  0.  0.  0.  0.  0.  0.  0.
MAY   1.  0.  0.  1.  1.  1.  1.  0.  0.  1.  1.  1.  0.  1.  1.
      1.  1.  2.  1.  6.  6.  8.  9. 15. 26. 35. 23. 37. 25. 41.
     35.
JUN  35. 27. 24. 27. 34. 32. 46. 66. 62. 60. 49. 39. 40. 54. 54.
     60. 60. 34. 57. 74.128.338.315.211.139.142. 53. 52. 55. 49.
JUL  21. 28. 46. 37. 15. 17. 39. 21. 43. 64. 34. 28. 35. 28. 39.
     50. 94.189.176.154.245.134.136.157. 81. 55. 36. 48. 60.181.
    114.
AUG  45. 15. 14. 10. 22. 53. 77. 47. 38. 35. 20. 19. 11. 15. 40.
     43. 68. 66. 66. 44. 43. 13.  7.  8. 12. 10. 10.  8.  8.  6.
      8.
      TOTAL (1,000) APR-AUG=  5994.0

1                                                                    PAGE  3

FISH SPECIES (1=YRLG, 2=SUBYRLG, 3=STEELH) : 3
APR   0.  0.  0.  0.  0.  0.  0.  0.  0.  0.  0.  0.  0.  0.  0.
      0.  0.  0.  0.  0.  0.  0. 14. 14. 13. 13. 13. 13. 12. 12.
MAY  11. 11. 10. 10. 11. 11. 12. 15. 18. 24. 30. 26. 20. 14. 11.
     11. 10.  9.  8.  7.  7.  7.  6.  8.  5.  4.  3.  3.  2.  1.
      1.
JUN   1.  1.  1.  1.  1.  1.  0.  0.  0.  0.  0.  0.  0.  0.  0.
      0.  0.  0.  0.  0.  0.  0.  0.  0.  0.  0.  0.  0.  0.  0.
JUL   0.  0.  0.  0.  0.  0.  0.  0.  0.  0.  0.  0.  0.  0.  0.
      0.  0.  0.  0.  0.  0.  0.  0.  0.  0.  0.  0.  0.  0.  0.
      0.
AUG   0.  0.  0.  0.  0.  0.  0.  0.  0.  0.  0.  0.  0.  0.  0.
      0.  0.  0.  0.  0.  0.  0.  0.  0.  0.  0.  0.  0.  0.  0.
      0.
      TOTAL (1,000) APR-AUG=   436.0

TOTAL FISH INPUT FROM MID-COLUMBIA (1,000)=  12010.0

BASIC HOURLY FISH DISTRIBUTION
------------------------------

  0.130   0.080   0.060   0.050   0.030   0.020   0.008   0.000
  0.010   0.030   0.020   0.020   0.020   0.010   0.010   0.000
  0.000   0.000   0.000   0.010   0.050   0.106   0.136   0.153

HOURLY FISH DISTR  1 SUM= 0.953 CORR.DISTR 1-24 :
 0.1364  0.0839  0.0630  0.0525  0.0315  0.0210  0.0084  0.0000
 0.0105  0.0315  0.0210  0.0210  0.0210  0.0105  0.0105  0.0000
 0.0000  0.0000  0.0000  0.0105  0.0525  0.1112  0.1427  0.1605

 0.060   0.060   0.060   0.060   0.085   0.117   0.096   0.053
 0.020   0.005   0.000   0.000   0.000   0.000   0.000   0.005
 0.005   0.005   0.026   0.058   0.060   0.060   0.050   0.050
```

0.0642 0.0642 0.0642 0.0642 0.0909 0.1251 0.1027 0.0567
0.0214 0.0053 0.0000 0.0000 0.0000 0.0000 0.0000 0.0053
0.0053 0.0053 0.0278 0.0620 0.0642 0.0642 0.0535 0.0535

1

0.020 0.010 0.010 0.000 0.000 0.000 0.000 0.010
0.050 0.106 0.136 0.153 0.130 0.080 0.060 0.050
0.030 0.020 0.008 0.000 0.010 0.030 0.020 0.020

HOURLY FISH DISTR 3 SUM= 0.953 CURR.DISTR 1-24 :
0.0210 0.0105 0.0105 0.0000 0.0000 0.0000 0.0000 0.0105
0.0525 0.1112 0.1427 0.1605 0.1364 0.0839 0.0630 0.0525
0.0315 0.0210 0.0084 0.0000 0.0105 0.0315 0.0210 0.0210

N2SAT(%) VS. DAILY FISH MORTALITY (%), NN2M= 7
0.00 0.00 100.00 0.00 105.00 0.03 110.00 0.10 115.00 0.83
120.00 2.17 999.00 10.00

CORRECTION OF MORT.BY N2 FOR SPILL .LT.1 DAY N= 2
0.00 1.00 1.00 1.00

RATIO MULTIPLIED BY : 0.994 1.022 1.007 1.000 1.010 0.900 1.116
ADJUSTED FLOW MODULATORS
APR
1.25 1.09 1.13 0.99 0.76 1.05 1.05 1.01 1.07 0.98 0.85 0.75 1.10 0.95 0.93
1.00 0.90 0.67 0.85 0.91 0.80 1.02 0.94 0.99 1.12 0.93 0.78 1.36 1.36 1.37
MAY
0.87 0.88 1.01 1.12 1.14 1.10 0.92 0.82 0.75 0.85 0.98 0.88 0.91 0.91 0.91
0.93 0.71 0.92 0.94 0.76 0.90 0.91 0.88 1.04 0.88 1.04 1.25 1.32 1.42 1.60
1.54
JUN
1.10 1.08 1.02 1.05 1.05 1.11 1.06 1.06 1.14 1.23 1.18 1.14 1.12 1.13 1.04
0.96 0.93 0.91 0.94 0.99 1.00 1.00 1.00 0.94 0.91 0.90 0.82 0.75 0.76 0.69
JUL
1.00 0.98 1.08 0.98 1.12 1.23 1.31 1.32 1.03 0.85 1.02 1.10 1.16 1.10 1.09
0.77 0.68 1.06 1.00 0.85 0.95 0.97 0.88 0.75 0.88 1.01 0.92 0.98 0.98 0.98
0.98
AUG
1.01 0.92 0.98 1.05 1.07 1.08 1.35 1.08 0.76 0.93 0.84 1.03 0.90 0.87 1.13
1.26 1.10 1.08 1.12 0.91 0.93 0.96 0.89 1.04 0.99 1.02 0.97 0.94 0.74 1.03
1.03

1

****
* NRUN= 1 NHEAD= 1 TITLE : LOWER GRANITE *
****
DAM SURVIVAL TARGET(%)= 90.0 TWO SPILL SEASONS ?= 0 (0=NO)
NO. OF SITES FOR HATCHERY FISH RELEASE = 0

HYD. CAP (KCFS)= 132.0 NSPILL,NTRANS= 1 1 U/S RSVOIR L(KM)= 40.0

SPILLING START/END DAYS F-L : 1 153 HOURS : 20 6
SPECIES HOURLY DISTR.CURVES : 1 2 1
SLUICEWAYS Q(KCFS)= 0.0 START/END : DAYS F-L= 1 153 HOURS F-L= 0 24
RATIO QSPIL(1-2)= 0.00 0.00 (NOT USED IF TARGET =+)
SURVIVAL RATE SPWY, TUR, COL.FAC., BYP, TRAN : 0.98 0.85 0.99 0.99 0.99
POOL MORTALITY DUE TO TRAVEL (%/DAY)= 0.70

Q (KCFS) VS. U/S POOL TRAVEL TIME (DAYS) N= 9
20.0 14.2 40.0 7.1 60.0 4.7 80.0 3.5 100.0 2.8 120.0 2.5
140.0 2.2 160.0 2.0 300.0 0.9

RATIO FISH THRU COL.FAC. FOR YRLG,SUBYRLG,STLHD : 0.50 0.50 0.74
RATIO FISH COLLLECTED FOR TRANSPORTATION : 0.20 1.00 0.80

PCT. FLOW RIVER SPILLED VS. PCT. TOT. FISH OVER SPWY : N= 2
0.00 0.00 100.00 100.00

REGULATED FLOWS (KCFS) : 63.3 75.6 105.2 164.5 86.1 29.4 29.8

TRAVEL TIME (DAYS) FOR EACH DAILY Q
2. 2. 2. 2. 2. 2. 2. 2. 2. 2. 2. 2. 2. 2. 2.
2. 2. 2. 2. 2. 2. 2. 2. 2. 2. 2. 2. 2. 1. 1.
2. 2. 1. 1. 1. 1. 2. 2. 2. 2. 1. 1. 2. 2. 1.
1. 2. 2. 2. 2. 2. 2. 1. 1. 1. 1. 1. 1. 1. 1.
1. 1. 1. 1. 1. 1. 1. 1. 1. 1. 1. 1. 1. 1. 1.
1. 1. 1. 1. 1. 1. 1. 1. 1. 1. 1. 1. 1. 1. 1.
1. 1. 2. 2. 2. 2. 1. 1. 1. 1. 2. 2. 1. 1. 2.
2. 2. 2. 2. 2. 2. 2. 2. 2. 2. 2. 2. 2. 2. 2.
2. 3. 3. 3. 4. 4. 4. 4. 4. 4. 4. 4. 4. 4. 4.
4. 4. 4. 4. 4. 4. 4. 4. 4. 4. 4. 4. 4. 4. 4.
4. 4. 4.

PCT. SPILL VS. PCT. PASSAGE N= 3
0.0 30.0 80.0 94.0 90.0 100.0

Q(KCFS) VS. N2 (%), N = 8
0.0 100.0 28.0 120.0 50.0 125.0 76.0 130.0 110.0 133.0 150.0 134.0
500.0 136.05000.0 200.0

MAX. N2 SAT %= 200.0 REACHED FOR Q=5000.0

1

NRUN= 1 LOWER GRANITE

FISH PASSAGE ACCOUNTING	YRLG	SUBYRLG	STEELHD	ALL SPEC
01.TOT.INIT.NATURAL FISH INPUT TO SYSTEM:	960.0	328.0	3822.0	5110.0
.HATCHERY FISH RELEASED IN THIS RSVOIR:	0.0	0.0	0.0	0.0
.CUMULATIVE HATCH.FISH UPTO THIS POINT:	0.0	0.0	0.0	0.0
02.TOTAL FISH COUNT ARRIVING AT PROJECT :	960.0	328.0	3822.0	5110.0
03.FISH GOING OVER THE SPILLWAY :	20.2	44.8	217.3	282.3
04.FISH GOING THROUGH THE TURBINES :	399.2	120.0	795.7	1314.8
05.FISH BYPASSED AFTER BEING COLLECTED :	10.8	3.4	0.0	14.2
06.FISH COLLECTED AND TRANSPORTED D/S :	449.5	134.9	2611.2	3195.6
07.FISH CONTINUING D/S MIGRAT. IN STREAM:	430.2	168.2	1012.9	1611.4
08.CUMUL.TOTAL OF FISH TRANSPORTED SOFAR:	449.5	134.9	2611.2	3195.6
09.SURVIVAL RATIO AT THIS POINT :	0.916	0.924	0.948	0.941
10.RESERVOIR+DAM PASSAGE SURVIVAL ,PPS :	0.916	0.924	0.948	0.941
11.DAM PASSAGE SURVIVAL ,DPS :	0.916	0.924	0.948	0.941

```
  .F & TPIBES PROJ.PASS.SURV.(AVERAGE)  :   0.930
13.DAM BYPASS EFFICIENCY (W/LOSSES)     :   0.584   0.634   0.792   0.743
14.DAM BYPASS EFF.MODIFIED (W/O LOSSES) :   0.511   0.570   0.755   0.697

EXCEEDENCE SUMMARY : MAX.N2=   0. QCAP=  31.


                                NRUN= 1   LOWER GRANITE
   ITEMS          APR1   APR2     MAY     JUN     JUL    AUG1    AUG2   TOTAL    AVE.
-------------------------------------------------------------------------------------
* 0 REGULATED    63.3   75.6   105.2   164.5    86.1    29.4    29.8   553.9    91.0
2. SPILL FLOW     0.0    0.0     2.9    33.7     0.0     0.0     0.0    36.6     7.3
3. #. OF DAYS    15.0   15.0    31.0    30.0    31.0    15.0    16.0
4. SPILL (%)     0.00   0.00    2.78   20.46    0.00    0.00    0.00

SPILL DAY & HR F/L:  1 153 20  6 HSPILL=0.42 VOL.SPILL(1,000 AF)= 2182.4
RATIO OF DAILY FISH  DURING SPILL PERIOD = 0.866 0.770 0.866
FISH MORT.: N2=     0.0     0.0     0.0 :TRAVEL=     0.0     0.0     0.0
SPILL SEASON, F/L DAYS AND RATIO Q= 0   1 153 0.00   0   0 0.00

1
                                                                        PAGE  7

*******************************************************************************
* NRUN=  2 NHEAD= 0 TITLE : LITTLE GOOSE                                      *
*******************************************************************************
DAM SURVIVAL TARGET(%)= 90.0 TWO SPILL SEASONS ?= 0 (0=NO)
NO. OF SITES FOR HATCHERY FISH RELEASE = 0

HYD. CAP (KCFS)=  132.0 NSPILL,NTRANS= 1 1 U/S RSVOIR L(KM)=  63.0
FIXED TRAVEL TIME (DAYS) FOR SUBYRLG (IF+)= -1.0 FOR RSV. U/S FROM THIS DAM

SPILLING START/END DAYS F-L :   1 153 HOURS :  20   6
SPECIES HOURLY DISTR.CURVES :   1  2  1

MIN. FISH COUNT AT LGS TO SIGNAL SPILL AT LWM=   0. (IN 1,000)

SLUICEWAYS Q(KCFS)=   0.0 START/END : DAYS F-L=   1 153 HOURS F-L=   0  24
RATIO OSPIL(1-2)= 0.00 0.00 (NOT USED IF TARGET =+)
SURVIVAL RATE SPWY, TUR, COL.FAC., BYP, TRAN :  0.98  0.85  0.99  0.99  0.99
POOL MORTALITY DUE TO TRAVEL (%/DAY)=  0.70


0 (KCFS) VS. U/S POOL TRAVEL TIME (DAYS) N= 9
 20.0  14.2  40.0   7.1  60.0   4.7  80.0   3.5 100.0   2.8 120.0   2.5
140.0   2.2 160.0   2.0 300.0   0.9

RATIO FISH THRU COL.FAC. FOR YRLG,SUBYRLG,STLHD :  0.50  0.50  0.74
RATIO FISH COLLLECTED FOR TRANSPORTATION        :  0.20  0.80  0.80


PCT. FLOW RIVER SPILLED VS. PCT. TOT. FISH OVER SPWY : N= 2
  0.00   0.00 100.00 100.00

REGULATED FLOWS (KCFS) :  63.3  75.6 105.2 164.5  86.1  29.4  29.8

TRAVEL TIME (DAYS) FOR EACH DAILY Q
```

3. 3. 3. 3. 3. 3. 3. 3. 3. 3. 3. 3. 3. 2. 2.
2. 2. 2. 2. 2. 2. 2. 3. 3. 3. 2. 2. 2. 2. 2.
2. 3. 3. 3. 3. 3. 3. 2. 2. 2. 2. 2. 2. 2. 1.
1. 1. 1. 1. 1. 1. 1. 1. 1. 1. 1. 1. 1. 1. 1.
1. 1. 2. 2. 2. 2. 1. 1. 1. 1. 2. 2. 2. 2. 2.
2. 2. 3. 3. 3. 2. 2. 2. 2. 2. 2. 2. 2. 2. 3.
3. 3. 3. 3. 3. 3. 3. 3. 3. 3. 3. 3. 3. 3. 3.
4. 4. 4. 4. 6. 6. 6. 6. 6. 6. 6. 6. 6. 6. 6.
6. 6. 6. 6. 6. 6. 6. 6. 6. 6. 6. 6. 6. 6. 6.
6. 6. 6.

PCT. SPILL VS. PCT. PASSAGE N= 3
0.0 30.0 80.0 94.0 90.0 100.0

Q(KCFS) VS. N2 (%), N = 6
0.0 100.0 30.0 120.0 60.0 130.0 175.0 142.0 500.0 146.05000.0 200.0

MAX. N2 SAT %= 200.0 REACHED FOR Q=5000.0

1

1

NRUN= 2 LITTLE GOOSE

FISH PASSAGE ACCOUNTING	YRLG	SUBYRLG	STEELHD	ALL SPEC
01.TOT.INIT.NATURAL FISH INPUT TO SYSTEM:	960.0	328.0	3822.0	5110.0
.HATCHERY FISH RELEASED IN THIS RSVOIR:	0.0	0.0	0.0	0.0
.CUMULATIVE HATCH.FISH UPTO THIS POINT:	0.0	0.0	0.0	0.0
02.TOTAL FISH COUNT ARRIVING AT PROJECT :	422.5	165.9	997.7	1586.1
03.FISH GOING OVER THE SPILLWAY :	15.2	26.7	132.6	174.6
04.FISH GOING THROUGH THE TURBINES :	173.0	58.9	190.6	422.5
05.FISH BYPASSED AFTER BEING COLLECTED :	11.9	5.8	1.3	19.0
06.FISH COLLECTED AND TRANSPORTED D/S :	187.6	62.2	624.1	873.8
07.FISH CONTINUING D/S MIGRAT. IN STREAM:	200.1	91.4	324.5	616.0
08.CUMUL.TOTAL OF FISH TRANSPORTED SOFAR:	637.1	197.0	3235.3	4069.4
09.SURVIVAL RATIO AT THIS POINT :	0.872	0.879	0.931	0.917
10.RESERVOIR+DAM PASSAGE SURVIVAL ,PPS :	0.901	0.913	0.937	0.925
11.DAM PASSAGE SURVIVAL ,DPS :	0.917	0.926	0.951	0.939
12.F & TRIBES PROJ. PASSAGE SURVIVAL :	0.901	0.913	0.937	0.925
.F & TRIBES PROJ.PASS.SURV.(AVERAGE) :	0.917			
13.DAM BYPASS EFFICIENCY (W/LOSSES) :	0.591	0.645	0.809	0.734
14.DAM BYPASS EFF.MODIFIED (W/O LOSSES) :	0.518	0.582	0.775	0.687

EXCEEDENCE SUMMARY : MAX.N2= 0. QCAP= 31.

NRUN= 2 LITTLE GOOSE

ITEMS	APR1	APR2	MAY	JUN	JUL	AUG1	AUG2	TOTAL	AVE.
* Q REGULATED	63.3	75.6	105.2	164.5	86.1	29.4	29.8	553.9	91.0
2. SPILL FLOW	0.0	0.0	2.9	33.7	0.0	0.0	0.0	36.6	7.3
3. #. OF DAYS	15.0	15.0	31.0	30.0	31.0	15.0	16.0		
4. SPILL (%)	0.00	0.00	2.78	20.46	0.00	0.00	0.00		

SPILL DAY & HR F/L: 1 153 20 6 HSPILL=0.42 VOL.SPILL(1,000 AF)= 2182.4
RATIO OF DAILY FISH DURING SPILL PERIOD = 0.866 0.770 0.866
FISH MORT.: N2= 0.0 0.0 0.0 :TRAVEL= 7.9 2.2 15.5
SPILL SEASON, F/L DAYS AND RATIO Q= 0 1 153 0.00 0 0 0.00

```
**********************************************************************************
* MRUN=  3 NHEAD= 0 TITLE : LOWER MONUMENTAL                                     *
**********************************************************************************
DAM SURVIVAL TARGET(%)=  0.0 TWO SPILL SEASONS ?= 1 (0=NO)
NO. OF SITES FOR HATCHERY FISH RELEASE = 0

HYD. CAP (KCFS)=  137.0 NSPILL,NTRANS= 2 0 U/S RSVOIR L(KM)=  48.0
FIXED TRAVEL TIME (DAYS) FOR SUBYRLG (IF+)= -1.0 FOR RSV. U/S FROM THIS DAM


SPILLING START/END DAYS F-L :   1  61 HOURS :  20   6
SPECIES HOURLY DISTR.CURVES :   1  2  1
SECOND SPILL SEASON F/L DAYS=  61 122 0 RATIO=0.60
SLUICEWAYS Q(KCFS)=   0.0 START/END : DAYS F-L=   1 153 HOURS F-L=   0  24
RATIO QSPIL(1-2)= 0.60 0.60 (NOT USED IF TARGET =+)
SURVIVAL RATE SPWY, TUR, COL.FAC., BYP, TRAN :  0.98  0.85  0.99  0.99  0.99
POOL MORTALITY DUE TO TRAVEL (%/DAY)=  0.70


Q (KCFS) VS. U/S POOL TRAVEL TIME (DAYS) N=10
 20.0   9.4  40.0   3.8  60.0   3.1  80.0   2.4 100.0   1.9 120.0   1.7
140.0   1.5 160.0   1.3 200.0   0.9 300.0   0.6

RATIO FISH THRU COL.FAC. FOR YRLG,SUBYRLG,STLHD :  0.02  0.02  0.02
RATIO FISH COLLLECTED FOR TRANSPORTATION        :  0.00  0.00  0.00


PCT. FLOW RIVER SPILLED VS. PCT. TOT. FISH OVER SPWY : N= 2
  0.00   0.00 100.00 100.00

REGULATED FLOWS (KCFS) :  61.6  75.1 103.4 160.8  84.4  30.4  28.9

TRAVEL TIME (DAYS) FOR EACH DAILY Q
 2.  2.  2.  3.  3.  3.  3.  3.  3.  3.  3.  3.  3.  3.  3.
 3.  3.  3.  3.  3.  3.  2.  2.  2.  2.  2.  2.  2.  2.  2.
 2.  2.  2.  2.  2.  2.  2.  2.  2.  2.  2.  2.  2.  2.  2.
 2.  2.  2.  2.  2.  2.  2.  2.  2.  2.  1.  1.  1.  1.  1.
 1.  1.  1.  1.  1.  1.  1.  1.  1.  1.  1.  1.  1.  1.  1.
 1.  1.  1.  1.  1.  1.  1.  1.  1.  1.  1.  1.  1.  1.  2.
 2.  2.  2.  2.  2.  2.  2.  2.  2.  2.  2.  2.  2.  2.  2.
 2.  2.  2.  2.  2.  2.  2.  2.  2.  2.  2.  2.  2.  2.  2.
 2.  2.  2.  4.  4.  4.  4.  4.  4.  4.  4.  4.  4.  4.  4.
 4.  4.  4.  5.  5.  5.  5.  5.  5.  5.  5.  5.  5.  5.  5.
 5.  5.  5.

PCT. SPILL VS. PCT. PASSAGE N= 2
    0.0    0.0  100.0  100.0

Q(KCFS) VS. N2 (%), N = 7
   0.0 100.0   8.0 110.0  30.0 120.0  70.0 126.0 150.0 131.0 500.0 146.0
5000.0 200.0

MAX. N2 SAT %= 200.0 REACHED FOR Q=5000.0
```

NRUN= 3 LOWER MONUMENTAL

FISH PASSAGE ACCOUNTING	YRLG	SUBYRLG	STEELHD	ALL SPEC
01.TOT.INIT.NATURAL FISH INPUT TO SYSTEM:	960.0	328.0	3822.0	5110.0
.HATCHERY FISH RELEASED IN THIS RSVOIR:	0.0	0.0	0.0	0.0
.CUMULATIVE HATCH.FISH UPTO THIS POINT:	0.0	0.0	0.0	0.0
02.TOTAL FISH COUNT ARRIVING AT PROJECT :	197.4	90.4	321.2	609.0
03.FISH GOING OVER THE SPILLWAY :	101.0	40.5	166.4	307.9
04.FISH GOING THROUGH THE TURBINES :	78.2	40.7	125.5	244.4
05.FISH BYPASSED AFTER BEING COLLECTED :	2.3	1.2	3.7	7.2
06.FISH COLLECTED AND TRANSPORTED D/S :	0.0	0.0	0.0	0.0
07.FISH CONTINUING D/S MIGRAT. IN STREAM:	181.5	82.4	295.6	559.5
08.CUMUL.TOTAL OF FISH TRANSPORTED SOFAR:	637.1	197.0	3235.3	4069.4
09.SURVIVAL RATIO AT THIS POINT :	0.853	0.852	0.924	0.906
10.RESERVOIR+DAM PASSAGE SURVIVAL ,PPS :	0.907	0.901	0.911	0.908
11.DAM PASSAGE SURVIVAL ,DPS :	0.919	0.911	0.920	0.919
12.F & TRIBES PROJ. PASSAGE SURVIVAL :	0.907	0.901	0.911	0.908
.F & TRIBES PROJ.PASS.SURV.(AVERAGE) :	0.906			
13.DAM BYPASS EFFICIENCY (W/LOSSES) :	0.604	0.550	0.609	0.599
14.DAM BYPASS EFF.MODIFIED (W/O LOSSES) :	0.534	0.470	0.540	0.528

EXCEEDENCE SUMMARY : MAX.N2= 0. QCAP= 8.

NRUN= 3 LOWER MONUMENTAL

ITEMS	APR1	APR2	MAY	JUN	JUL	AUG1	AUG2	TOTAL	AVE.
* Q REGULATED	61.6	75.1	103.4	160.8	84.4	30.4	28.9	544.5	89.3
2. SPILL FLOW	15.4	18.8	25.9	41.8	21.1	0.0	0.0	122.9	21.2
3. #. OF DAYS	15.0	15.0	31.0	30.0	31.0	15.0	16.0		
4. SPILL (%)	25.00	25.00	25.00	25.98	25.00	0.00	0.00		

SPILL DAY & HR F/L: 1 61 20 6 HSPILL=0.42 VOL.SPILL(1,000 AF)= 6388.0
RATIO OF DAILY FISH DURING SPILL PERIOD = 0.866 0.770 0.866
FISH MORT.: N2= 0.0 0.0 0.0 :TRAVEL= 2.7 1.0 3.4
SPILL SEASON, F/L DAYS AND RATIO Q= 1 1 61 0.60 61 122 0.60

****
* NRUN= 4 NHEAD= 0 TITLE : ICE HARBOR *
****
DAM SURVIVAL TARGET(%)= 0.0 TWO SPILL SEASONS ?= 0 (0=NO)
NO. OF SITES FOR HATCHERY FISH RELEASE = 0

HYD. CAP (KCFS)= 96.0 NSPILL,NTRANS= 1 0 U/S RSVOIR L(KM)= 54.0
FIXED TRAVEL TIME (DAYS) FOR SUBYRLG (IF+)= -1.0 FOR RSV. U/S FROM THIS DAM

SPILLING START/END DAYS F-L : 1 122 HOURS : 20 6
SPECIES HOURLY DISTR.CURVES : 1 2 1

RATIO QSPIL(1-?)= 0.30 0.00 (NOT USED IF TARGET =+)
SURVIVAL RATE SPWY, TUR, COL.FAC., BYP, TRAN : 0.98 0.85 0.99 0.99 0.99
POOL MORTALITY DUE TO TRAVEL (%/DAY)= 0.70

Q (KCFS) VS. U/S POOL TRAVEL TIME (DAYS) N= 7
20.0 10.2 40.0 5.1 60.0 3.4 80.0 2.6 100.0 2.0 200.0 1.0
300.0 0.7

RATIO FISH TPU COL.FAC. FOR YRLG,SUBYRLG,STLHD : 0.42 0.42 0.42
RATIO FISH COLLLECTED FOR TRANSPORTATION : 0.00 0.00 0.00

PCT. FLOW RIVER SPILLED VS. PCT. TOT. FISH OVER SPWY : N= 2
0.00 0.00 100.00 100.00

REGULATED FLOWS (KCFS) : 61.6 75.1 103.4 160.8 84.4 30.4 28.9

TRAVEL TIME (DAYS) FOR EACH DAILY Q
3. 3. 3. 3. 3. 3. 3. 3. 3. 3. 3. 3. 3. 3. 3.
3. 3. 3. 3. 3. 3. 3. 3. 2. 2. 2. 2. 2. 2. 2.
2. 2. 2. 2. 2. 2. 2. 2. 2. 2. 2. 2. 2. 2. 2.
2. 2. 2. 2. 2. 2. 2. 2. 2. 2. 2. 2. 2. 1. 1.
1. 1. 1. 1. 1. 1. 1. 1. 1. 1. 1. 1. 1. 1. 1.
1. 1. 1. 1. 1. 1. 1. 1. 1. 1. 1. 1. 1. 2. 2.
2. 2. 2. 2. 2. 2. 2. 2. 2. 2. 2. 2. 2. 2. 2.
2. 2. 2. 2. 2. 2. 2. 2. 3. 3. 3. 2. 2. 2. 2.
2. 2. 5. 5. 5. 5. 5. 5. 5. 5. 5. 5. 5. 5. 5.
5. 5. 5. 5. 5. 5. 5. 5. 5. 5. 5. 5. 5. 5. 5.
5. 5. 5.

PCT. SPILL VS. PCT. PASSAGE N= 2
0.0 52.0 100.0 100.0

Q(KCFS) VS. N2 (%), N = 8
0.0 100.0 15.0 113.0 30.0 120.0 50.0 125.0 90.0 130.0 150.0 123.0
?00.0 137.05000.0 200.0

MAX. N2 SAT %= 200.0 REACHED FOR Q=5000.0

1

NRUN= 4 ICE HARBOR

FISH PASSAGE ACCOUNTING	YRLG	SUBYRLG	STEELHD	ALL SPEC
01.TOT.INIT.NATURAL FISH INPUT TO SYSTEM:	960.0	328.0	3822.0	5110.0
.HATCHERY FISH RELEASED IN THIS RSVOIR:	0.0	0.0	0.0	0.0
.CUMULATIVE HATCH.FISH UPTO THIS POINT:	0.0	0.0	0.0	0.0
02.TOTAL FISH COUNT ARRIVING AT PROJECT :	170.5	78.2	281.5	530.2
03.FISH GOING OVER THE SPILLWAY :	46.7	26.4	92.3	165.4
04.FISH GUING THROUGH THE TURBINES :	61.1	25.5	93.2	179.7
05.FISH BYPASSED AFTER BEING COLLECTED :	50.0	20.9	76.2	147.0
06.FISH COLLECTED AND TRANSPORTED D/S :	0.0	0.0	0.0	0.0
07.FISH CONTINUING D/S MIGRAT. IN STREAM:	157.7	72.7	261.6	492.1
08.CUMUL.TOTAL OF FISH TRANSPORTED SOFAR:	637.1	197.0	3235.3	4069.4
09.SURVIVAL RATIO AT THIS POINT :	0.828	0.822	0.915	0.893
10.RESERVOIR+DAM PASSAGE SURVIVAL ,PPS :	0.869	0.883	0.885	0.880
11.DAM PASSAGE SURVIVAL ,DPS :	0.925	0.930	0.929	0.928
12.F & TRIBES PROJ. PASSAGE SURVIVAL :	0.869	0.883	0.885	0.880
.F & TRIBES PROJ.PASS.SURV.(AVERAGE) :	0.879			
13.DAM BYPASS EFFICIENCY (W/LOSSES) :	0.642	0.674	0.669	0.661
14.DAM BYPASS EFF.MODIFIED (W/O LOSSES) :	0.579	0.616	0.611	0.601

[illegible]

NRUN= 4 ICE HARBOR

ITEMS	APR1	APR2	MAY	JUN	JUL	AUG1	AUG2	TOTAL	AVE.
* Q REGULATED	61.6	75.1	103.4	160.8	84.4	30.4	28.9	544.6	89.3
2. SPILL FLOW	7.7	9.4	18.2	62.8	10.6	0.0	0.0	108.7	20.0
3. #. OF DAYS	15.0	15.0	31.0	30.0	31.0	15.0	16.0		
4. SPILL (%)	12.50	12.50	17.63	39.07	12.50	0.00	0.00		

SPILL DAY & HR F/L: 1 122 20 6 HSPILL=0.42 VOL.SPILL(1,000 AF)= 6015.7
RATIO OF DAILY FISH DURING SPILL PERIOD = 0.866 0.770 0.866
FISH MORT.: N2= 8.6 3.1 10.8 :TRAVEL= 2.7 1.0 3.4
SPILL SEASON, F/L DAYS AND RATIO Q= 0 1 122 0.30 0 0 0.00

1


```
*************************************************************************
* NRUN= 5 NHEAD= 2 TITLE : MCNARY                                       *
*************************************************************************
DAM SURVIVAL TARGET(%)= 90.0 TWO SPILL SEASONS ?= 0 (0=NO)
NO. OF SITES FOR HATCHERY FISH RELEASE = 0

HYD. CAP (KCFS)= 231.0 NSPILL,NTRANS= 1 1 U/S RSVOIR L(KM)= 64.0
FIXED TRAVEL TIME (DAYS) FOR SUBYRLG (IF+)= -1.0 FOR RSV. U/S FROM THIS DAM

SPILLING START/END DAYS F-L : 1 153 HOURS : 20 6
SPECIES HOURLY DISTR.CURVES : 1 2 1
SLUICEWAYS Q(KCFS)= 0.0 START/END : DAYS F-L= 1 153 HOURS F-L= 0 24
RATIO QSPIL(1-2)= 0.00 0.00 (NOT USED IF TARGET =+)
SURVIVAL RATE SPWY, TUR, COL.FAC., BYP, TRAN : 0.98 0.85 0.99 0.99 0.99
POOL MORTALITY DUE TO TRAVEL (%/DAY)= 0.70

Q (KCFS) VS. U/S POOL TRAVEL TIME (DAYS) N= 5
100.0 6.7 200.0 3.4 400.0 1.8 600.0 1.2 800.0 0.8

RATIO FISH TRU COL.FAC. FOR YRLG,SUBYRLG,STLHD : 0.74 0.74 0.76
RATIO FISH COLLLECTED FOR TRANSPORTATION : 0.20 0.80 0.80

PCT. FLOW RIVER SPILLED VS. PCT. TOT. FISH OVER SPWY : N= 2
0.00 0.00 100.00 100.00

REGULATED FLOWS (KCFS) : 193.8 206.1 248.4 370.1 283.7 146.4 132.1

TRAVEL TIME (DAYS) FOR EACH DAILY Q
2. 2. 2. 3. 3. 3. 3. 3. 3. 3. 3. 3. 3. 3. 3.
3. 3. 3. 3. 3. 3. 3. 3. 3. 3. 3. 3. 2. 2. 2.
2. 2. 2. 2. 2. 2. 3. 3. 3. 2. 2. 2. 2. 2. 2.
3. 3. 3. 2. 2. 2. 2. 2. 2. 2. 2. 2. 2. 2. 2.
2. 2. 2. 2. 2. 2. 2. 2. 2. 2. 2. 2. 2. 2. 2.
2. 2. 2. 2. 2. 2. 2. 2. 2. 2. 2. 2. 2. 2. 2.
2. 2. 2. 2. 2. 2. 2. 2. 2. 2. 2. 2. 2. 2. 2.
2. 2. 2. 2. 2. 2. 2. 2. 2. 2. 2. 2. 2. 2. 2.
2. 2. 2. 3. 3. 3. 3. 3. 3. 3. 3. 3. 3. 3. 3.
```

3. 3. 3.

PCT. SPILL VS. PCT. PASSAGE N= 2
0.0 40.0 100.0 100.0

Q(KCFS) VS. N2 (%), N = 5
0.0 100.0 20.0 110.0 75.0 115.0 500.0 132.05000.0 200.0

MAX. N2 SAT %= 200.0 REACHED FOR Q=5000.0

1

NRUN= 5 MCNARY

FISH PASSAGE ACCOUNTING	YRLG	SUBYRLG	STEELHD	ALL SPEC
01.TOT.INIT.NATURAL FISH INPUT TO SYSTEM:	6540.0	6322.0	4258.0	17120.0
.HATCHERY FISH RELEASED IN THIS RSVOIR:	0.0	0.0	0.0	0.0
.CUMULATIVE HATCH.FISH UPTO THIS POINT:	0.0	0.0	0.0	0.0
02.TOTAL FISH COUNT ARRIVING AT PROJECT :	5734.3	6065.3	692.2	12491.8
03.FISH GOING OVER THE SPILLWAY :	854.7	1992.1	119.4	2966.2
04.FISH GOING THROUGH THE TURBINES :	1074.5	891.2	116.4	2082.1
05.FISH BYPASSED AFTER BEING COLLECTED :	695.6	26.5	0.0	722.0
06.FISH COLLECTED AND TRANSPORTED D/S :	2830.9	2898.3	424.9	6154.0
07.FISH CONTINUING D/S MIGRAT. IN STREAM:	2624.8	2909.7	235.8	5770.3
08.CUMUL.TOTAL OF FISH TRANSPORTED SOFAR:	3468.0	3095.3	3660.2	10223.5
09.SURVIVAL RATIO AT THIS POINT :	0.932	0.950	0.915	0.934
10.RESERVOIR+DAM PASSAGE SURVIVAL ,PPS :	0.951	0.957	0.947	0.954
11.DAM PASSAGE SURVIVAL ,DPS :	0.951	0.958	0.954	0.955
12.F & TRIBES PROJ. PASSAGE SURVIVAL :	0.951	0.957	0.947	0.954
.F & TRIBES PROJ.PASS.SURV.(AVERAGE) :	0.952			
13.DAM BYPASS EFFICIENCY (W/LOSSES) :	0.813	0.853	0.832	0.833
14.DAM BYPASS EFF.MODIFIED (W/O LOSSES) :	0.780	0.827	0.802	0.804

EXCEEDENCE SUMMARY : MAX.N2= 0. QCAP= 76.

NRUN= 5 MCNARY

ITEMS	APR1	APR2	MAY	JUN	JUL	AUG1	AUG2	TOTAL	AVE.
* Q REGULATED	193.6	206.1	248.4	370.1	283.7	146.4	132.1	1580.6	248.3
2. SPILL FLOW	0.8	10.0	77.2	139.1	55.0	0.0	0.0	232.1	45.3
3. # OF DAYS	15.0	15.0	31.0	30.0	31.0	15.0	16.0		
4. SPILL (%)	0.40	4.85	10.93	37.58	19.40	0.00	0.00		

SPILL DAY & HR F/L: 1 153 20 6 HSPILL=0.42 VOL.SPILL(1,000 AF)=13647.8
RATIO OF DAILY FISH DURING SPILL PERIOD = 0.866 0.770 0.866
FISH MORT.: N2= 0.8 0.4 1.8 :TRAVEL= 2.5 1.0 3.6
SPILL SEASON, F/L DAYS AND RATIO Q= 0 1 153 0.00 0 0 0.00

1

****
* NRUN= 6 NHEAD= 0 TITLE : JOHN DAY *
****
DAM SURVIVAL TARGET(%)= 0.0 TWO SPILL SEASONS ?= 0 (0=NO)

HYD. CAP (KCFS)= 352.0 NSPILL,NTRANS= 2 0 U/S RSVOIR L(KM)= 129.0
FIXED TRAVEL TIME (DAYS) FOR SUBYRLG (IF+)= 12.0 FOR RSV. U/S FROM THIS DAM

SPILLING START/END DAYS F-L : 1 153 HOURS : 20 6
SPECIES HOURLY DISTR.CURVES : 1 2 1
SLUICEWAYS Q(KCFS)= 0.0 START/END : DAYS F-L= 1 153 HOURS F-L= 0 24
RATIO QSPIL(1-2)= 0.25 0.00 (NOT USED IF TARGET =+)
SURVIVAL RATE SPWY, TUR, COL.FAC., BYP, TRAN : 0.98 0.85 0.99 0.99 0.99
POOL MORTALITY DUE TO TRAVEL (%/DAY)= 0.70

Q (KCFS) VS. U/S POOL TRAVEL TIME (DAYS) N= 5
100.0 11.7 200.0 5.9 400.0 3.0 600.0 2.0 800.0 1.5

RATIO FISH THRU COL.FAC. FOR YRLG,SUBYRLG,STLHD : 0.50 0.50 0.74
RATIO FISH COLLLECTED FOR TRANSPORTATION : 0.00 0.00 0.00

PCT. FLOW RIVER SPILLED VS. PCT. TOT. FISH OVER SPWY : N= 2
0.00 0.00 100.00 100.00

REGULATED FLOWS (KCFS) : 201.6 208.4 250.7 362.0 278.8 141.9 126.9

TRAVEL TIME (DAYS) FOR EACH DAILY Q
5. 5. 5. 5. 5. 5. 5. 5. 5. 5. 5. 5. 5. 5. 5.
5. 5. 5. 5. 5. 5. 5. 5. 5. 5. 5. 5. 5. 5. 5.
4. 4. 4. 4. 4. 4. 5. 5. 5. 5. 5. 5. 5. 5. 5.
5. 5. 5. 5. 5. 5. 5. 5. 5. 4. 4. 4. 4. 4. 3.
3. 3. 3. 3. 3. 3. 3. 3. 3. 3. 3. 3. 3. 3. 3.
4. 4. 4. 4. 4. 4. 4. 4. 4. 4. 4. 4. 4. 4. 4.
4. 4. 4. 4. 4. 4. 4. 4. 4. 4. 4. 4. 4. 4. 4.
4. 4. 4. 4. 4. 4. 4. 4. 4. 4. 4. 4. 4. 4. 4.
4. 4. 6. 6. 6. 6. 6. 6. 6. 7. 7. 7. 7. 7. 7.
7. 7. 7. 7. 7. 7. 7. 7. 7. 7. 7. 7. 7. 7. 7.
7. 7. 7.

TRAVEL TIME @ THIS RSV. FIXED AT (DAYS)= 12.0 FOR SUBYRLG

PCT. SPILL VS. PCT. PASSAGE N= 5
0.0 40.0 20.0 70.0 40.0 85.0 61.0 90.0 100.0 100.0

Q(KCFS) VS. N2 (%), N = 6
0.0 100.0 20.0 106.0 60.0 111.0 125.0 115.0 500.0 124.05000.0 200.0

MAX. N2 SAT %= 200.0 REACHED FOR Q=5000.0

1

1

NRUN= 6 JOHN DAY

FISH PASSAGE ACCOUNTING	YRLG	SUBYRLG	STEELHD	ALL SPEC
01.TOT.INIT.NATURAL FISH INPUT TO SYSTEM:	6540.0	6322.0	4258.0	17120.0
.HATCHERY FISH RELEASED IN THIS RSVOIR:	0.0	0.0	0.0	0.0
.CUMULATIVE HATCH.FISH UPTO THIS POINT:	0.0	0.0	0.0	0.0
02.TOTAL FISH COUNT ARRIVING AT PROJECT :	2541.5	2823.3	228.8	5593.6
03.FISH GOING OVER THE SPILLWAY :	543.6	546.3	50.4	1140.4

05.FISH BYPASSED AFTER BEING COLLECTED	:	935.1	1068.2	123.4	2126.7
06.FISH COLLECTED AND TRANSPORTED D/S	:	0.0	0.0	0.0	0.0
07.FISH CONTINUING D/S MIGRAT. IN STREAM:		2356.5	2614.0	217.6	5188.2
08.CUMUL.TOTAL OF FISH TRANSPORTED SOFAR:		3468.0	3095.3	3660.2	10223.5
09.SURVIVAL RATIO AT THIS POINT	:	0.891	0.903	0.911	0.900
10.RESERVOIR+DAM PASSAGE SURVIVAL ,PPS	:	0.898	0.898	0.923	0.899
11.DAM PASSAGE SURVIVAL ,DPS	:	0.927	0.926	0.951	0.928
12.F & TRIBES PROJ. PASSAGE SURVIVAL	:	0.898	0.898	0.923	0.899
.F & TRIBES PROJ.PASS.SURV.(AVERAGE)	:	0.906			
13.DAM BYPASS EFFICIENCY (W/LOSSES)	:	0.655	0.646	0.809	0.657
14.DAM BYPASS EFF.MODIFIED (W/O LOSSES)	:	0.594	0.583	0.775	0.596

EXCEEDENCE SUMMARY : MAX.N2= 0. QCAP= 9.

NRUN= 6 JOHN DAY

ITEMS	APR1	APR2	MAY	JUN	JUL	AUG1	AUG2	TOTAL	AVE.
* 0 REGULATED	201.6	209.4	250.7	362.0	278.8	141.9	126.9	1570.4	246.2
2. SPILL FLOW	21.0	21.7	26.4	42.7	29.0	14.8	13.2	168.9	26.7
3. #. OF DAYS	15.0	15.0	31.0	30.0	31.0	15.0	16.0		
4. SPILL (%)	10.42	10.42	10.52	11.80	10.42	10.42	10.42		

SPILL DAY & HR F/L: 1 153 20 6 HSPILL=0.42 VOL.SPILL(1,000 AF)= 8077.9
RATIO OF DAILY FISH DURING SPILL PERIOD = 0.866 0.770 0.866
FISH MORT.: N2= 0.0 0.0 0.0 :TRAVEL= 83.7 244.4 7.0
SPILL SEASON, F/L DAYS AND RATIO Q= 0 1 153 0.25 0 0 0.00

1

****
* NRUN= 7 NHEAD= 0 TITLE : THE DALLES *
****
DAM SURVIVAL TARGET(%)= 0.0 TWO SPILL SEASONS ?= 0 (0=NO)
NO. OF SITES FOR HATCHERY FISH RELEASE = 0

HYD. CAP (KCFS)= 360.0 NSPILL,NTRANS= 1 0 U/S RSVOIR L(KM)= 40.0
FIXED TRAVEL TIME (DAYS) FOR SUBYRLG (IF+)= -1.0 FOR RSV. U/S FROM THIS DAM

SPILLING START/END DAYS F-L : 1 153 HOURS : 6 18
SPECIES HOURLY DISTR.CURVES : 3 3 3
SLUICEWAYS Q(KCFS)= 3.6 START/END : DAYS F-L= 1 153 HOURS F-L= 0 24
RATIO QSPIL(1-2)= 0.20 0.00 (NOT USED IF TARGET =+)
SURVIVAL RATE SPWY, TUR, COL.FAC., BYP, TRAN : 0.98 0.85 0.99 0.99 0.99
POOL MORTALITY DUE TO TRAVEL (%/DAY)= 0.70

Q (KCFS) VS. U/S POOL TRAVEL TIME (DAYS) N= 5
100.0 1.5 200.0 0.8 400.0 0.4 600.0 0.3 800.0 0.2

RATIO FISH TRU COL.FAC. FOR YRLG,SUBYRLG,STLHD : 0.43 0.43 0.43
RATIO FISH COLLLECTED FOR TRANSPORTATION : 0.00 0.00 0.00

PCT. FLOW RIVER SPILLED VS. PCT. TOT. FISH OVER SPWY : N= 4
0.00 0.00 20.00 52.00 41.00 80.00 100.00 95.00

REGULATED FLOWS (KCFS) : 208.0 215.4 258.3 367.9 284.3 146.8 131.9

TRAVEL TIME (DAYS) FOR EACH DAILY Q

1. 1. 2. 2. 2. 2. 2. 2. 2. 2. 2. 2. 2. 2. 2.
2. 2. 2. 2. 2. 2. 2. 2. 2. 2. 2. 1. 1. 1. 1.
2. 2. 1. 1. 1. 1. 2. 2. 2. 2. 1. 1. 1. 1. 1.
1. 2. 2. 2. 2. 1. 1. 1. 1. 1. 1. 1. 1. 1. 1.
1. 1. 1. 1. 1. 1. 1. 1. 1. 1. 1. 1. 1. 1. 1.
1. 1. 1. 1. 1. 1. 1. 1. 1. 1. 1. 1. 1. 1. 1.
1. 1. 1. 1. 1. 1. 1. 1. 1. 1. 1. 1. 1. 1. 1.
1. 2. 2. 1. 1. 1. 1. 1. 1. 1. 1. 1. 1. 1. 1.
1. 1. 2. 2. 2. 2. 2. 2. 2. 2. 2. 2. 2. 2. 2.
2. 2. 2. 2. 2. 2. 2. 2. 2. 2. 2. 2. 2. 2. 2.
2. 2. 2.

PCT. SPILL VS. PCT. PASSAGE N= 5
0.0 40.0 20.0 70.0 40.0 85.0 60.0 90.0 100.0 100.0

Q(KCFS) VS. N2 (%), N = 7
0.0 100.0 20.0 116.0 60.0 111.0 125.0 115.0 300.0 119.0 500.0 126.0
5000.0 200.0

MAX. N2 SAT %= 200.0 REACHED FOR Q=5000.0

1

NRUN= 7 THE DALLES

FISH PASSAGE ACCOUNTING	YRLG	SUBYRLG	STEELHD	ALL SPEC
01.TOT.INIT.NATURAL FISH INPUT TO SYSTEM:	6540.0	6322.0	4258.0	17120.0
.HATCHERY FISH RELEASED IN THIS RSVOIR:	0.0	0.0	0.0	0.0
.CUMULATIVE HATCH.FISH UPTO THIS POINT:	0.0	0.0	0.0	0.0
02.TOTAL FISH COUNT ARRIVING AT PROJECT :	2321.8	2573.8	214.5	5110.1
03.FISH GOING OVER THE SPILLWAY :	1029.0	1149.4	96.4	2274.8
04.FISH GOING THROUGH THE TURBINES :	621.6	684.7	56.7	1363.0
05.FISH BYPASSED AFTER BEING COLLECTED :	529.8	583.5	48.4	1161.6
06.FISH COLLECTED AND TRANSPORTED D/S :	0.0	0.0	0.0	0.0
07.FISH CONTINUING D/S MIGRAT. IN STREAM:	2180.4	2417.7	201.5	4799.5
08.CUMUL.TOTAL OF FISH TRANSPORTED SOFAR:	3468.0	3095.3	3660.2	10223.5
09.SURVIVAL RATIO AT THIS POINT :	0.864	0.872	0.907	0.878
10.RESERVOIR+DAM PASSAGE SURVIVAL ,PPS :	0.925	0.925	0.926	0.925
11.DAM PASSAGE SURVIVAL ,DPS :	0.939	0.939	0.940	0.939
12.F & TRIBES PROJ. PASSAGE SURVIVAL :	0.925	0.925	0.926	0.925
.F & TRIBES PROJ.PASS.SURV.(AVERAGE) :	0.925			
13.DAM BYPASS EFFICIENCY (W/LOSSES) :	0.732	0.734	0.735	0.733
14.DAM BYPASS EFF.MODIFIED (W/O LOSSES) :	0.685	0.687	0.689	0.686

EXCEEDENCE SUMMARY : MAX.N2= 0. QCAP= 9.

NRUN= 7 THE DALLES

ITEMS	APR1	APR2	MAY	JUN	JUL	AUG1	AUG2	TOTAL	AVE.
1. Q REGULATED	208.0	215.4	258.3	367.9	284.3	146.8	131.9	1612.5	252.3
2. SPILL FLOW	20.8	21.5	26.1	40.8	28.4	14.7	13.2	165.5	26.1
3. #. OF DAYS	15.0	15.0	31.0	30.0	31.0	15.0	16.0		
4. SPILL (%)	10.00	10.00	10.11	11.09	10.00	10.00	10.00		

SPILL DAY & HR F/L: 1 153 6 18 HSPILL=0.50 VOL.SPILL(1,000 AF)= 7893.6
RATIO OF DAILY FISH DURING SPILL PERIOD = 0.866 0.866 0.866
FISH MORT.: N2= 12.0 15.9 1.2 :TRAVEL= 22.6 23.8 1.9
SPILL SEASON, F/L DAYS AND RATIO Q= 0 1 153 0.20 0 0 0.00

```
**********************************************************************************
* NRUN=  8 NHEAD= 0 TITLE : BONNEVILLE                                           *
**********************************************************************************
DAM SURVIVAL TARGET(%)=  0.0 TWO SPILL SEASONS ?= 0 (0=NO)
NO. OF SITES FOR HATCHERY FISH RELEASE = 0

HYD. CAP (KCFS)=  265.0 NSPILL,NTRANS= 1 0 U/S RSVOIR L(KM)=  77.0
FIXED TRAVEL TIME (DAYS) FOR SUBYRLG (IF+)= -1.0 FOR RSV. U/S FROM THIS DAM


SPILLING START/END DAYS F-L :   1 153 HOURS :   0  24
SPECIES HOURLY DISTR.CURVES :   1  2  1
SLUICEWAYS Q(KCFS)=   0.0 START/END : DAYS F-L=   1 153 HOURS F-L=   1  24
RATIO QSPIL(1-2)= 0.00 0.00 (NOT USED IF TARGET =+)
SURVIVAL RATE SPWY, TUR, COL.FAC., BYP, TRAN :  0.98  0.85  0.99  0.99  0.99
POOL MORTALITY DUE TO TRAVEL (%/DAY)=  0.70


Q (KCFS) VS. U/S POOL TRAVEL TIME (DAYS) N= 4
130.0   3.0 225.0   1.8 460.0   1.0 600.0   0.8

RATIO FISH THRU COL.FAC. FOR YRLG,SUBYRLG,STLHD :  0.76  0.72  0.78
RATIO FISH COLLLECTED FOR TRANSPORTATION        :  0.00  0.00  0.00

BONNEVILLE SECOND POWERHOUSE : ECOFA/ECOTRA= 0.19 0.24 0.35 0.00 0.00 0.00
PAS.EFF.TARGET(%)=-19.0
QCAP, H1,H2:  120.0 20  7   254.0  7 20

PCT. FLOW RIVER SPILLED VS. PCT. TOT. FISH OVER SPWY : N= 2
  0.00   0.00 100.00 100.00

REGULATED FLOWS (KCFS) : 213.7 222.8 259.8 367.7 292.8 152.4 138.9

TRAVEL TIME (DAYS) FOR EACH DAILY Q
 3.  3.  3.  3.  3.  3.  3.  3.  3.  3.  3.  3.  3.  3.  3.
 3.  3.  3.  3.  3.  3.  3.  3.  3.  3.  3.  3.  3.  3.  3.
 3.  3.  3.  3.  3.  3.  3.  3.  3.  3.  3.  3.  3.  3.  3.
 3.  3.  3.  3.  3.  3.  3.  3.  3.  3.  3.  2.  2.  2.  2.
 2.  2.  2.  2.  2.  2.  2.  2.  2.  2.  2.  2.  2.  2.  2.
 2.  2.  2.  2.  2.  2.  2.  2.  2.  2.  2.  2.  2.  2.  3.
 3.  3.  2.  2.  2.  2.  2.  2.  2.  2.  2.  2.  2.  2.  2.
 2.  2.  3.  3.  3.  3.  3.  3.  3.  3.  3.  2.  2.  2.  2.
 2.  2.  4.  4.  4.  4.  4.  4.  4.  4.  4.  4.  4.  4.  4.
 4.  4.  4.  4.  4.  4.  4.  4.  4.  4.  4.  4.  4.  4.  4.
 4.  4.  4.

PCT. SPILL VS. PCT. PASSAGE N= 2
    0.0  100.0  100.0  100.0

Q(KCFS) VS. N2 (%), N = 7
   0.0 100.0  25.0 116.0  55.0 125.0  85.0 129.0 200.0 134.0 500.0 140.0
5000.0 200.0
```

MAX. N2 SAT %= 200.0 REACHED FOR Q=5000.0

1

NRUN= 8 BONNEVILLE

FISH PASSAGE ACCOUNTING	YRLG	SUBYRLG	STEELHD	ALL SPEC
01.TOT.INIT.NATURAL FISH INPUT TO SYSTEM:	6540.0	6322.0	4258.0	17120.0
.HATCHERY FISH RELEASED IN THIS RSVOIR:	0.0	0.0	0.0	0.0
.CUMULATIVE HATCH.FISH UPTO THIS POINT:	0.0	0.0	0.0	0.0
02.TOTAL FISH COUNT ARRIVING AT PROJECT :	2014.8	2249.9	187.3	4451.9
03.FISH GOING OVER THE SPILLWAY :	980.6	1070.4	99.0	2149.9
04.FISH GOING THROUGH THE TURBINES :	224.0	301.9	17.5	543.4
05.FISH BYPASSED AFTER BEING COLLECTED :	735.7	786.6	64.3	1586.6
06.FISH COLLECTED AND TRANSPORTED D/S :	0.0	0.0	0.0	0.0
07.FISH CONTINUING D/S MIGRAT. IN STREAM:	1940.3	2158.8	180.9	4280.0
08.CUMUL.TOTAL OF FISH TRANSPORTED SOFAR:	3468.0	3095.3	3660.2	10223.5
09.SURVIVAL RATIO AT THIS POINT :	0.827	0.831	0.902	0.847
10.RESERVOIR+DAM PASSAGE SURVIVAL ,PPS :	0.890	0.893	0.897	0.892
11.DAM PASSAGE SURVIVAL ,DPS :	0.963	0.960	0.966	0.961
12.F & TRIBES PROJ. PASSAGE SURVIVAL :	0.890	0.893	0.897	0.892
.F & TRIBES PROJ.PASS.SURV.(AVERAGE) :	0.893			
13.DAM BYPASS EFFICIENCY (W/LOSSES) :	0.889	0.866	0.907	0.878
14.DAM BYPASS EFF.MODIFIED (W/O LOSSES) :	0.869	0.842	0.890	0.856

EXCEEDENCE SUMMARY : MAX.N2= 0. QCAP= 151.

NRUN= 8 BONNEVILLE

ITEMS	APR1	APR2	MAY	JUN	JUL	AUG1	AUG2	TOTAL	AVE.
* Q REGULATED	213.7	222.8	259.8	367.7	292.8	152.4	138.9	1648.1	256.8
2. SPILL FLOW	43.4	52.5	76.8	175.1	102.5	15.0	9.2	474.5	82.9
3. #. OF DAYS	15.0	15.0	31.0	30.0	31.0	15.0	16.0		
4. SPILL (%)	20.33	23.56	29.57	47.62	35.01	9.84	6.60		

SPILL DAY & HR F/L: 1 153 7 20 HSPILL=0.54 VOL.SPILL(1,000 AF)=25032.1
RATIO OF DAILY FISH DURING SPILL PERIOD = 0.136 0.189 0.136
FISH MORT.: N2= 125.5 123.7 10.8 :TRAVEL= 40.0 42.3 3.4
SPILL SEASON, F/L DAYS AND RATIO Q= 0 1 153 0.00 0 0 0.00
QCAP,NH1-2,HSPILL: 120.0 20 7 0.458 0.864 0.811 0.864
254.0 7 20 0.542 0.136 0.189 0.136

1

****
*
* PROGRAM FISHPASS *
*
*
* 26 MAR 1985 *
****

RUN DATE : 3/27/85

TITLE : PTER H.CORPS PROPOSAL 1975H20A 26MAR BON SPEC4:SPILL=75

D/S POOL SURVIVAL LGR= 1.00 MCN= 1.00
CRITICAL YR ?= 0

1. FLOWS (KCFS)	1364.
2. FLOWS SPILLED	237.
3. RATIO TOTSPIL/TOTQ	0.174

	YEARLING	SUBYRLG	STEELHD.	TOTAL
1. TOTAL FISH COUNT AT D/S BONNEVILLE (1,000)	5408.3	5254.1	3841.0	14503.4
2. ARRIVING BY TRUCKS/BARGES :	3468.0	3095.3	3660.2	10223.5
3. ARRIVING BY NATURAL STREAM :	1940.3	2158.8	180.9	4280.0
4. INIT.NATUR.FISH @ LOWER GARNITE:	960.0	328.0	3822.0	5110.0
5. INIT.NATUR.FISH FROM MID-COLUMBIA:	5580.0	5994.0	436.0	12010.0
7. TOT.CUMULATIVE HATCH.FISH RELEASED :	0.0	0.0	0.0	0.0
8. OVER-ALL SYSTEM PASSAGE SURVIVAL :	0.827	0.831	0.902	0.847

1

SUMMARY OF FISH MOVEMENT

N PROJECT	ARRI	SPIL	TURB	BPAS	OUTW	TRAN	STRAN	EDAM	EPRO	ESYS	FET
NPROJ= 1 LOWER GRAN, VPE(FET)=0.941					PCTQIN=	0.000	VOL.SPILL(1,000 AF)=				2182.4
					PCTQIM=	0.000	EBYP=	0.584	0.634	0.792	0.743
	960.	20.	399.	11.	430.	450.	450.	0.916	0.916	0.916	0.916
	328.	45.	120.	3.	168.	135.	135.	0.924	0.924	0.924	0.924
	3822.	217.	796.	0.	1013.	2611.	2611.	0.948	0.948	0.948	0.948
NPROJ= 2 LITTLE GOO, VPE(FET)=0.925					PCTQIN=	0.000	VOL.SPILL(1,000 AF)=				2182.4
					PCTQIM=	0.000	EBYP=	0.591	0.645	0.809	0.734
	423.	15.	173.	12.	200.	188.	637.	0.917	0.901	0.872	0.901
	166.	27.	59.	6.	91.	62.	197.	0.926	0.913	0.879	0.913
	998.	133.	191.	1.	325.	624.	3235.	0.951	0.937	0.931	0.937
NPROJ= 3 LOWER MONU, VPE(FET)=0.908					PCTQIN=	0.600	VOL.SPILL(1,000 AF)=				6388.0
					PCTQIM=	0.600	EBYP=	0.604	0.550	0.609	0.599
	197.	101.	78.	2.	182.	0.	637.	0.919	0.907	0.853	0.907
	90.	40.	41.	1.	82.	0.	197.	0.911	0.901	0.852	0.901
	321.	166.	125.	4.	296.	0.	3235.	0.920	0.911	0.924	0.911
NPROJ= 4 ICE HARBOR, VPE(FET)=0.880					PCTQIN=	0.300	VOL.SPILL(1,000 AF)=				6015.7
					PCTQIM=	0.000	EBYP=	0.642	0.674	0.669	0.661
	170.	47.	61.	50.	158.	0.	637.	0.925	0.869	0.828	0.869
	78.	26.	26.	21.	73.	0.	197.	0.930	0.883	0.822	0.883
	282.	92.	93.	76.	262.	0.	3235.	0.929	0.885	0.915	0.885
NPROJ= 5 MCNARY , VPE(FET)=0.954					PCTQIN=	0.000	VOL.SPILL(1,000 AF)=				13647.8
					PCTQIM=	0.000	EBYP=	0.813	0.853	0.832	0.833
	5734.	855.	1075.	696.	2625.	2831.	3468.	0.951	0.951	0.932	0.951
	6065.	1992.	891.	26.	2910.	2898.	3095.	0.958	0.957	0.950	0.957
	692.	119.	116.	0.	236.	425.	3660.	0.954	0.947	0.915	0.947
NPROJ= 6 JOHN DAY , VPE(FET)=0.899					PCTQIN=	0.250	VOL.SPILL(1,000 AF)=				8077.9
					PCTQIM=	0.000	EBYP=	0.655	0.646	0.809	0.657
	2542.	544.	878.	935.	2357.	0.	3468.	0.927	0.898	0.891	0.898
	2823.	546.	1000.	1068.	2614.	0.	3095.	0.926	0.898	0.903	0.898
	229.	50.	44.	123.	218.	0.	3660.	0.951	0.923	0.911	0.923
NPROJ= 7 THE DALLES, VPE(FET)=0.925					PCTQIN=	0.200	VOL.SPILL(1,000 AF)=				7893.6
					PCTQIM=	0.000	EBYP=	0.732	0.734	0.735	0.733
	2322.	1029.	622.	530.	2180.	0.	3468.	0.939	0.925	0.864	0.925
	2574.	1149.	685.	584.	2418.	0.	3095.	0.939	0.925	0.872	0.925
	214.	96.	57.	48.	202.	0.	3660.	0.940	0.926	0.907	0.926

NPROJ= 6 BONNEVILLE, VPE(FET)=0.892 PCTQIN= 0.000 VOL.SPILL(1,000 AF)= 25032.1

				PCTQIM=	0.000	EBYP=	0.889	0.866	0.907	0.878
2015.	981.	224.	736.	1940.	0.	3468.	0.963	0.890	0.827	0.890
2250.	1070.	302.	787.	2159.	0.	3095.	0.960	0.893	0.831	0.893
187.	99.	18.	64.	181.	0.	3660.	0.966	0.897	0.902	0.897

GLOSSARY OF TERMS

APPENDIX VIII.

APPENDIX VIII

GLOSSARY OF TERMS

Diel Passage distribution is defined as the percent of the total daily smolt population passing the dam each hour. If, for example one fish out of one hundred fish approaching the dam during a 24 hour period passes from 8 am to 9 am, then this would equate to 1 percent of the diel distribution.

Efficiency

Bypass Efficiency is defined as that percent of migrating juvenile fish entering the turbine intake which then enter the gatewells. Even in those intakes without deflection devices a small percentage of the juvenile fish enter the gatewells and can be bypassed.

Collection Efficiency - an indirect estimate of the proportion of the total number of fish approaching a project which enter the powerhouse collection/bypass system. Collection efficiency is a function of many interacting variables such as project operations, flow and spill conditions, fish distribution and specific fish facilities.

Fish Guiding Efficiency - that percentage of the total number of fish moving into the turbine intake, over the test period, which are deflected out of the intake (ususally into a gatewell) by the fish guidance device.

Fish Passage Efficiency - that percentage of the total number of fish passing a project which do not pass through the turbine units.

Orifice Passage Efficiency - the ratio of the number of fish which exit a gatewell through the orifices into the bypass to the number of fish remaining in the gatewell for a specified test period. This does not give any indication of project passage but only gives a relative measure or indication of delay in the bypass.

Sluiceway Efficiency is defined as that percent of juvenile fish approaching the dam which enter the sluiceway and are bypassed to the tailrace. At present, sluiceways are used specifically to bypass juvenile fish at Ice Harbor and The Dalles Dams.

Spillway Efficiency is defined as the percent of the total river flow going through the spillway versus the percent of the total juvenile fish population at the dam going through the spillway.

Transport Efficiency is defined as that percent of smolts collected which are then either trucked or barged downstream past Bonneville Dam.

Mortality

Bypass Mortality is defined as the percent of the bypassed juvenile fish killed in transit through the bypass system.

Reservoir Mortality is defined as that percent of juvenile fish lost in transit between the tailrace of the upper dam to the forebay of the next lower dam. The causes, rate, and the locations of reservoir mortality are unclear and are under study. Certainly a major factor is loss by predation.

Sluiceway Mortality is defined as that percent of juvenile fish entering the sluiceway which are killed prior to entering the downstream reservoir.

Spill Mortality is defined as that percent of smolts killed as they pass the dam through the spillway. Unfortunately, the available information is based upon shortterm survival studies which does not reflect the impacts of injury, descaling or stress.

Transport Mortality is defined as the percent of the bypassed smolts killed from the point of entry into the holding ponds or after direct loading into the transport vehicle until release into the Columbia River below Bonneville Dam. This shortterm mortality is typically estimated by direct counting in the barge or truck and by shortterm (1 to 2 day) post-transport holding studies.

Turbine Mortality is defined as that percent of smolts killed in passage through the turbines. Post-turbine passage is not included in the mortality estimate but rather in the overall reservoir mortality estimate.

* * *

Juvenile fish travel time is defined as the rate at which the smolts migrate down the river.