JUVENILE FISH PASSAGE PLAN

FOR 1987

FOR CORPS OF ENGINEERS PROJECTS

April 1987
NPDEN-WM

TABLE OF CONTENTS

LIST OF APPENDICES

1. Correspondence to Cooperating Agencies and the Consulting Agencies and Affected Utilities.

2. Correspondence and information received from Fishery Agencies and Tribes, NPPC, PNUCC, and BPA.

3. Operation and Maintenance Criteria for Fish Passage Facilities at Corps of Engineers' Projects.

4. Fish Transportation Oversight Team's (FTOT) Overall Work Plan for 1987.

5. Hatchery Release Schedule.

6. Test Plans--Corps Sliding Scale Spill Proposal and Operation of Bonneville Second Powerhouse Special Operation.

7. Corps of Engineers Spill Monitoring Plan for 1987.

8. Dissolved Gas Monitoring Program.

9. Changes to FISHPASS Model for 1987.

10. Agencies and Tribes Spill Criteria for the 1987 Juvenile Migration.

11. Corps Responses to Comments on the Draft 1987 JFPP.

1987 JUVENILE FISH PASSAGE PLAN

1. General. In mid-November 1986 the Corps of Engineers informed the cooperating agencies and the consulting agencies and affected utilities that the Corps was initiating the process for development of the 1987 Juvenile Fish Passage Plan (1987 JFPP). The Corps also informed these parties that the Procedure For Development of a Coordinated Interim Juvenile Fish Plan for Corps of Engineers Projects that was utilized last year had been updated in the interest of expediting the 1987 planning process and that any comments would be considered. Copies of these letters are contained in Appendix 1.

In developing the 1987 JFPP, the Corps has consulted and coordinated with the fishery agencies and tribes. The 1987 JFPP is in accord with the Council's amended Fish and Wildlife Program. If spill is required to achieve the 90 percent smolt survival for either the spring or summer migration, spill operations will begin when the first 10 percent of that migration have passed the dam and will cease when 90 percent of that migration has passed. Spill will be provided regardless of impact on firm energy load carrying capability (FELCC) but no later than August 15, 1987.. A sliding scale spill plan to achieve greater than 90 percent survival has been prepared for 1987 JFPP and will be used on a test basis during periods when river flows exceed the flow required to meet BPA's Firm Energy Load Carrying Capability (FELCC). At Bonneville Dam the spill plan remains unchanged from the 1986 JFPP. The second powerhouse will not be operated unless these generating units are needed to reduce Bonneville Dam spill to 75,000 cfs during daylight hours

(0600 to 2000 hours). Units at the second powerhouse may also be run as necessary for fishery research. In addition, a test plan is proposed for 1987 that will permit operating the second powerhouse during periods of low juvenile fish passage. See Appendix 6.

Spill requirements to accomplish the provisions of the Northwest Power Planning Council's amended Fish and Wildlife Program have been submitted to the Northwest Power Pool Coordinating Group. This has the effect of degrading the Federal Power System's Firm Energy Load Carrying Capability (FELCC) in the amount equivalent to the spill requirement under critical water conditions. During years when nonfirm power generation exists in the Federal system additional spill will be provided as provided for in this plan.

The fishery agencies and tribes have prepared spill criteria for the 1987 juvenile migration and it is included in Appendix 10. This information was used in determining the amount and timing of the spill that will be provided in the 1987 JFPP.

The 1987 JFPP will guide the Corps' actions in regard to providing juvenile fish protection at the Corps' eight mainstem Columbia and Snake River projects. Other Corps documents and agreements related to fish passage at these projects are intended to be in accord with the JFPP.

FISHPASS model studies have been utilized extensively to analyze the benefits of spill to dam and system survival of juvenile salmonids. The information developed by the NPPC Main Stem Advisory Committee has also been utilized. Results from selected FISHPASS studies are summarized in Sections 8, 9, 10, and 11.

2. Corps Project Operation and Maintenance. Appendix 3 contains detailed information on the criteria used for the operation and maintenance of fish passage facilities and project operation procedures for fish passage at the Corps' Lower Snake and Lower Columbia River projects. These criteria have been coordinated with the fish and wildlife agencies and tribes. The Corps has attempted to resolve concerns expressed by the fishery agencies and tribes but some areas of disagreement still exist. Where descrepancies occur between Appendix 3 and the JFPP, the JFPP will rule.

3. Fish Transportation Oversight Team's (FTOT) Annual Work Plan For 1987. Appendix 4 contains this draft document which describes the annual work plan for fish collection and transportation operations at Lower Granite, Little Goose, and McNary Dams for the 1987 season. The FTOT Plan was developed jointly with the fish and wildlife agencies and tribes. The Corps believes that the best available scientific information supports maximum transportation of all juvenile fish. The Corps cannot agree to be a signatory to the transportation guidelines, but will not actively oppose in 1987 the transportation of juvenile fish in accordance with the appended FTOT annual work plan.

4. Fish Hatchery Release Schedule. This schedule, provided by the fish and wildlife agencies and tribes, is contained in Appendix 5. Hatchery releases should be coordinated to coincide, insofar as possible, with Water Budget operation and the migration of the natural juvenile fish.

5. Project Operation Criteria. The following paragraphs list, by project, the project specific operating criteria of the 1987 JFPP.

a. Bonneville Dam.

The first and second powerhouses at Bonneville both have structural powerhouse juvenile 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 middle 80 percent spring and summer migration period unless units are needed to reduce spill to 75,000 cfs during daylight hours (0600 to 2000 hours). Typically, when flows are above the capacity of the first powerhouse units, spill will occur. Units in the second powerhouse may be operated as necessary for fishery research. This restriction on the second powerhouse will not apply after August 15.

(1) Operation for Juvenile Passage.

- Operate juvenile fish passage facilities in accordance with project operating criteria contained in Appendix 3.

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

- o The second powerhouse will not be operated during the nighttime hours (2000 to 0600 hours) except as necessary for fishery research.

- o The second powerhouse will be operated during the daytime hours (0600 to 2000 hours) if required to reduce spill to less than 75,000 cfs. Units 18, 11, and then 17 will be the first units on and last units off.

(2) Operation for Adult Passage.

- o Operate the project in accordance with project operating criteria as specified in Appendix 3.

b. 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.

(1) Operation for Juvenile Passage.

- o Operate juvenile fish passage facilities in accordance with project operation criteria contained in Appendix 3.

(2) Operation for Adult Passage.

- Operate the project in accordance with project operating criteria as specified in Appendix 3.

c. John Day Dam.

Construction of a juvenile bypass system was initiated in 1984. All 16 units will have bypass facilities including screens by April, 1987.

(1) Operation for Juvenile Passage.

- Operate juvenile fish passage facilities in accordance with operating criteria Appendix 3.

- Spill will be required during the summer passage period because the facility capability is only 30 percent fish guidance efficiency (FGE) for subyearling fall chinook.

- There will be onsite hydroacoustic monitoring at John Day during the summer migration period as described in Appendix 7. The scope of work for the hydroacoustic effort will be coordinated with the fishery agencies and tribes prior to June 1987.

- Spill operation will be as follows:

  - Typical dates of 80% passage are June 7 to August 21 for the summer run.

  - Hours of hydroacoustics monitoring will be initially from 1800 to 0600 hours from June 1 through August 15.

  - When monitoring indicates 30,000 or more subyearling fish are passing the project spill will be provided.

  - Spill will begin at 2000 hours and continue for at least 3 hours with additional hours of spill dependent on number of juveniles passing the project and through the spillway as indicated by hydroacoustics.

  - Spill amount will be 18% of instantaneous flow during the defined hours of spill as determined above.

  - In-season modification of spill criteria will be coordinated between the Corps' RCC and the Fish Passage Center.

- Spill will cease when the count is below the hydroacoustic trigger or in the absence of hydroacoustics the airlift trigger for three consecutive days or when the fishery agencies and tribes estimate that 90 percent of the summer migration has passed the project. After spill has been discontinued monitoring will continue as scheduled. Spill will be restarted if 90% of migration has not passed and the hydroacoustic monitoring or in the absence of hydroacoustics the airlift index shows the 30,000 trigger has been exceeded for a single day. Spill will not be provided beyond August 15, 1987.

- When spilling at night (2000 to 0500 hours), 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 percent in the south bays and 20 percent in the north bays.

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

(2) <u>Operation for Adult Passage</u>.

- Operate project in accordance with operating criteria specified in Appendix 3.

- o From 0400 to 2000 hours, operate unit 1 in the 80 to 100 MW range to provide best ladder entrance condition for adult fish passage, unless additional generation is needed to meet firm load.

d. <u>McNary Dam</u>.

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

(1) <u>Operation for Juvenile Passage</u>.

- o Operate juvenile fish passage facilities in accordance with operating criteria shown in Appendix 3, and FTOT Annual Work Plan shown in Appendix 4.

(2) <u>Operation for Adult Passage</u>.

- o Operate project facilities in accordance with operating criteria shown in Appendix 3.

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

e. 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 which provides juvenile survival greater than 92%. Spill will be considered when other noncollector projects are spilling to exceed 92%.

f. Lower Monumental Dam.

Lower Monumental has only a gatewell salvage bypass system. Spill operation will be as follows:

(1) Operation for Juvenile Passage.

- Typical dates of the middle 80% passage are April 20 to May 31 for the spring run. June 1 to July 15 for the summer run. Substantial fish passage may occur outside these dates depending on hatchery release dates and fish travel times.

- Hydroacoustic monitoring will be conducted 24 hours a day from April 20 through approximately June 15.

- When hydroacoustics monitoring indicates 15,000 or more juveniles passing the project, spill will be provided.

- Spill will begin at 2000 hours and continue for at least 3 hours with additional hours of spill dependent on numbers of fish passing the project and through the spillway as indicated by hydroacoustics.

- Spill amount to achieve 90% survival will be about 55% of instantaneous flow during the defined hours of spill as determined in dot 4 above.

- Special spill will be considered during the summer or when Lyons Ferry Hatchery fish are released and appear at Lower Monumental as indicated by hydroacoustic monitoring.

- In-season modification of spill criteria will be coordinated between the Corps' RCC and the Fish Passage Center.

- The project will operate fish passage facilities, including spill, in accordance with juvenile and adult operating criteria shown in Appendix 3. Spill will not be provided beyond August 15.

g. Little Goose Dam.

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

(1) Operation for Juvenile Passage.

- o Operate juvenile fish passage facilities in accordance with operating criteria shown in Appendix 3, and FTOT Annual Work Plan shown in Appendix 4.

(2) Operation for Adult Passage.

- o Operate project facilities in accordance with operating criteria shown in Appendix 3.

- o Operate unit 1 during daylight hours for adult attraction.

h. 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.

(1) Operation for Juvenile Passage.

- o Operate juvenile fish passage facilities in accordance with operating criteria shown in Appendix 3 and FTOT Annual Work Plan shown in Appendix 4.

(2) Operation for Adult Passage.

- o Operate project facilities in accordance with operating criteria shown in Appendix 3.

- o Operate unit 1 during daylight hours for adult attraction.

6. Technical Studies. The Corps' FISHPASS Computer Program modifications are described in Appendix 9. This program was utilized to analyze various spill scenarios with the objective of simulating various spill plans. Input to the FISHPASS program is essentially the input recommended by the Council's Main Stem Passage Advisory Committee in 1986 with some updated information obtained from hydroacoustic monitoring during the 1986 outmigration. Water years utilized in the FISHPASS studies are as shown in Table 1 below:

Table 1

Volume-of-Runoff at The Dalles

Millions of Acre-Feet (MAF)

YEAR	JAN-JUL	APR-AUG	APR-AUG % of 50 YEAR AVG.
	(MAF)	(MAF)	(%)
1929	68.4	63.9	69.2
1939	81.0	74.7	80.9
1968	95.6	81.4	88.2
50 year avg.	102.7	92.3	100.0
March 1, 1987 forecast	78.0	69.8	73.0

The March 1987 volume-of-runoff forecast for the Columbia River at The Dalles for the April-August period is 69.8 MAF. Early in the study period the 1939 water sequence was chosen to be used for evaluating benefits and costs of the various proposed Juvenile Fish Passage Plans because the volume runoff was closest to the 1987 forecast and the shape of the runoff was close to a normal distribution.

7. FISHPASS Studies Discussed in this Report.

This report contains the results of the three scenarios being used to study the estimated affect of various spill/survival levels on dam and system survivals. In addition to the results on the fishery, the report also contains an estimate of the water spilled that could have been used to produce power and estimate of revenues foregone. Each scenario uses the transportation criteria shown in the FTOT. A brief description of the spill criteria for each of the plans is as follows:

a. Fishery Agencies and Tribes Proposal with FTOT. This study utilizes the information and sliding scale spill contained in Appendix 2. The FISHPASS studies for the 1929, 1939, and 1968 water years utilizing these criteria were made available to the Working Committee members and are available upon request from the Corps.

b. Corps Plan with FTOT. No planned spill at collector projects. Some collected fish are bypassed back into the river per the 1987 FTOT. Spill at non-collector projects is initiated and terminated on trigger numbers and monitoring to protect the middle 80 percent of the migration in accordance with the spill percentages presented in Section 5. The FISHPASS studies for the 1929, 1939, and 1968 water years utilizing these criteria were made available to the Working Committee members and are available upon request from the Corps.

c. Sliding Scale Spill Test Plan with FTOT. Using the Corps plan, which provides at least 90 percent survival, described above and information presented at the Working Committee by fishery agencies and tribes, Bonneville Power Administration, and utilities' representatives a sliding scale spill procedure was developed. The Committee members were not able to reach an agreement on a plan but it does consider the input received from all parties. The Corps proposes that the Sliding Scale Plan be used only on a test basis in 1987 as there are several factors that have not been fully analyzed. The FISHPASS studies for the 1929, 1939, and 1968 water years utilizing these criteria were made available to the Working Committee members and are available upon request from the Corps.

8. Spill Requirements. Spill resulting from each of the juvenile fish passage plans is shown in megawatts-hours in Tables 3, 4, and 5 for the 1929, 1939, and 1968 water years, respectively.

Table 2

Energy Equivalent of Water Spilled for Fish

1929 Water Year (Jan-Jul = 68.4 MAF)

Spill from 1900-0300 Hours

Project	Fishery Agencies & Tribes Proposal with FTOT (1000 Mwh)	Corps Plan with FTOT (1000 Mwh)	Corps Plan combined with Sliding Scale Spill Test Proposal with FTOT (1000 Mwh)
Lower Granite	0	0	0
Little Goose	0	0	0
Lower Monumental	240	196	224
Ice Harbor	19	0	0
McNary	0	0	0
John Day	115	103	113
The Dalles	23	0	13
Bonneville	373	373	373
	=======	=======	========
System Total	770	672	729

Table 3

Energy Equivalent of Water Spilled for Fish

1939 Water Year (Jan-Jul = 81.4 MAF)

Spill from 1900-0300 Hours

Project	Fishery Agencies & Tribes Proposal with FTOT (1000 Mwh)	Corps Plan with FTOT (1000 Mwh)	Corps Plan combined with Sliding Scale Spill Test Proposal with FTOT (1000 Mwh)
Lower Granite	0	0	0
Little Goose	0	0	0
Lower Monumental	231	183	210
Ice Harbor	29	0	6
McNary	0	0	0
John Day	179	126	156
The Dalles	41	0	19
Bonneville	592	592	592
	=======	=======	========
System Total	1072	672	983

Table 4

Energy Equivalent of Water Spilled for Fish

1968 Water Year (Jan-Jul = 95.6 MAF)

Spill from 1900-0300 Hours

Project	Fishery Agencies & Tribes Proposal with FTOT (1000 Mwh)	Corps Plan with FTOT (1000 Mwh)	Corps Plan combined with Sliding Scale Spill Test Proposal with FTOT (1000 Mwh)
Lower Granite	0	0	0
Little Goose	0	0	0
Lower Monumental	244	200	236
Ice Harbor	19	0	6
McNary	0	0	0
John Day	343	168	314
The Dalles	55	0	39
Bonneville	851	851	851
	=======	=======	========
System Total	1512	1219	1446

9. Fish Survival. Tabulations of fish survival for each of the plans are shown in Tables 5, 6, and 7 for the 1929, 1939, and 1968 water years, respectively. Total system survival includes hatchery inputs to the various reservoirs in addition to the in river juvenile fish arriving at Lower Granite and McNary projects. Snake River system survival is shown in the lower portion of Tables 5, 6, and 7.

Table 5

1929 Water Year (Jan-Jul = 68.4 MAF)

Total System Juvenile Survival (from Lower Granite, mid-Columbia and Hatcheries to Below Bonneville Dam)

(1,000's of fish)/(percent)

Fish Species	Fishery Agencies & Tribes Proposal with FTOT	Corps Plan with FTOT	Corps Plan Combined with Sliding Scale Spill Test Proposal with FTOT
Yearling	8,631/69.2	8,621/69.1	8,623/69.2
Sub-yearling	14,693/52.1	14,689/52.1	14,691/52.1
Steelhead	4,244/77.0	4,240/76.9	4,241/76.9
All Species	27,567/59.7	27,549/59.7	27,555/59.7

Snake River Juvenile Survival (Lower Granite Dam to Below Ice Harbor Dam)

(1,000's of fish)

Fish Species	Fishery Agencies & Tribes Proposal with FTOT	Corps Plan with FTOT	Corps Plan Combined with Sliding Scale Spill Test Proposal with FTOT
Yearling	793	785	786
Sub-yearling	20	20	20
Steelhead	230	225	226
All Species	1,043	1,030	1,032

Table 6

1939 Water Year (Jan-Jul = 81.0 MAF)

Total System Juvenile Survival (from Lower Granite, mid-Columbia and Hatcheries to Below Bonneville Dam)

(1,000's of fish)/(percent)

Fish Species	Fishery Agencies & Tribes Proposal with FTOT	Corps Plan with FTOT	Corps Plan Combined with Sliding Scale Spill Test Proposal with FTOT
Yearling	8,759/70.2	8,740/70.1	8,746/70.1
Sub-yearling	16,256/57.7	16,231/57.6	16,244/57.6
Steelhead	4,294/77.9	4,287/77.8	4,290/77.8
All Species	29,310/63.5	29,259/63.4	29,280/63.4

Snake River Juvenile Survival (Lower Granite Dam to Below Ice Harbor Dam)

(1,000's of fish)

Fish Species	Fishery Agencies & Tribes Proposal with FTOT	Corps Plan with FTOT	Corps Plan Combined with Sliding Scale Spill Test Proposal with FTOT
Yearling	883	868	874
Sub-yearling	15	15	15
Steelhead	248	240	242
All Species	1,146	1,123	1,131

Table 7

1968 Water Year (Jan-Jul = 95.6 MAF)

Total System Juvenile Survival (from Lower Granite, mid-Columbia and Hatcheries to Below Bonneville Dam)

(1,000's of fish)/(percent)

Fish Species	Fishery Agencies & Tribes Proposal with FTOT	Corps Plan with FTOT	Corps Plan Combined with Sliding Scale Spill Test Proposal with FTOT
Yearling	8,713/69.9	8,698/69.8	8,705/69.2
Sub-yearling	18,346/65.1	18,227/64.7	18,341/65.1
Steelhead	4,290/77.8	4,283/77.7	4,287/77.8
All Species	31,349/67.9	31,208/67.6	31,333/67.9

Snake River Juvenile Survival (Lower Granite Dam to Below Ice Harbor Dam)

(1,000's of fish)

Fish Species	Fishery Agencies & Tribes Proposal with FTOT	Corps Plan with FTOT	Corps Plan Combined with Sliding Scale Spill Test Proposal with FTOT
Yearling	789	780	782
Sub-yearling	21	20	21
Steelhead	227	222	223
All Species	1,037	1,022	1,025

10. Firm Energy Load Carrying Capability (FELCC) Losses. A low flow water year (1929) with January-July volume-of-runoffs of 67.8 maf was studied to determine the FELCC impacts of the 90% survival plan (Corps Plan) with FTOT Transport. Table 8 shows these impacts in FELCC and in MW-MOS for the 1929 water year.

Table 8

Loss of Firm Energy Load Carrying Capability (Avg. MW)

	Apr 15-30	May	June	July	Aug 1-16	Total MW-MOS
1929	158	-0-	254	93	128	490

The Corps' 1987 data submittal to the Northwest Power Pool Coordinating Group contained the spill requirements to meet the 90% survival level. These spill requirements are expected to result in impacts to FELCC during the 1987-88 operating year similar to those shown in Table 8.

11. Power Revenue Foregone Estimates. Table 9 shows the energy revenue foregone estimated for each of the plans. These estimates were prepared by the Corps and were calculated using the FISHPASS computer model and the estimated cost of the energy at the time (flow and month) it was spilled. Final revenue foregone values will be provided by Bonneville Power Administration. Under critical water conditions, like 1929, the estimated firm energy foregone to provide at least 90% survival at all Corps projects with 8 hours of spill is about $9.5 million. The additional revenue foregone that result from the sliding scale spills presented in this report are shown in Table 9. Accordingly, the total revenue foregone is the sum of the firm energy value of $9.5 million plus the value shown in Table 9. For example, the revenue foregone with 1939 water conditions and the Corps Plan plus sliding scale spill would be $9,500,000 + 4,300,000 = $13,800,000. The decrease in revenue foregone in larger runoff years results from an expected lower average cost of energy during large runoff year. Revenue foregone in any particular year will be proportional to the spill provided to increase survival.

Table 9

	1929 Water Year Revenue Foregone Estimate (Millions $)	1939 Water Year Revenue Foregone Estimate (Millions $)	1968 Water Year Revenue Foregone Estimate (Millions $)
Corps Plan with FTOT Transport	0	3.5	3.1
Corps Plan Combined with Sliding Scale Spill Test Proposal with FTOT	0.3	4.3	3.8
Fishery Agencies & Tribes Proposal with FTOT Transport	1.0	5.1	4.2

12. Basis for Selection of Corps Plan.

The JFPP Working Committee reviewed several proposals presented by the fishery agencies and tribes, proposals presented by the PNUCC, several concerns expressed by BPA and several proposals by the Corps. All proposals started with 90% survival and added a form of sliding scale spill to that level. Most of the fishery agencies and tribes proposals started the sliding scale spill at the flow where BPA is making some nonfirm sales even though the sales may be part of BPA's FELCC. Generating utilities representatives did not support spilling additional water during periods when flow was being released from storage projects for the Water Budget because FELCC was foregone to provide Water Budget. The Corps agrees with this concern and is not planning to spill any of the FELCC that has been reshaped to provide Water Budget flows. BPA continued to emphasize that the increased dam survival levels produced insignificant increases in system survival (usually only 0.1 to 0.2 percent increase) for millions of dollars of foregone revenue. The Corps presented several ideas on procedures to increase survival including the ad hoc committee approach to daily/weekly requirements and sliding scale spill alternatives. A consensus of the parties involved was not reached.

After studying the various proposals and considering the input from all parties, the Corps will provide, in 1987, at least 90% survival at each project, including spill when required, and a sliding scale spill plan that will be used on a test basis. The test will include using the graphs shown in Appendix 6 to calculate survival and spill levels with the implementation being subject ad hoc decision of the Corps personnel at the project after reviewing current system conditions and consulting with others. This approach to additional spill beyond the 90% survival level is appropriate because of the large power impacts contracted with the extremely low incremental benefits to fish. This is illustrated in Tables 5 through 8 where only a 0.1% increment in system survival is estimated. These estimates and corresponding power losses were calculated by the most current FISHPASS model configuration using as a base a simulated regulated monthly flows shaped by FISHPASS into daily distributions. Data obtained during 1987 will be utilized in developing proposal for 1988.

In addition to the sliding scale spill test plan, the Corps will continue to provide special regulation for hatchery releases when it can be demonstrated that large numbers of juvenile are passing the project. Also as a test in 1987, the Corps is planning to conduct a special evaluation of the Bonneville second powerhouse operation. An evaluation plan is included in Appendix 6.

13. 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 with them during implementation:

a. Fish and Wildlife agencies.

b. Indian 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 Appendix 1.

14. Implementation of The Juvenile Passage Plan.

Implementation of the 1987 JFPP requires the coordinated effort between Bonneville Power Administration, the Corps, Indian Tribes, and the Federal and State Fishery Agencies. The Fish Passage 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 hours Monday through Friday in the Custom House. Immediately following these briefings, RCC representatives will be available to meet with the Fish Passage 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 operations or requests considered by the Fish Passage Managers 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 Fish Passage 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, BPA, and FPC outside the daily afternoon meetings.

Monitoring and surveillance of the fish migration will be provided by the Corps in accordance with Appendix 7. Project monitoring personnel will be present at projects where hydroacoustics is being used to help control 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. Indices of juvenile fish migration will be the basis for initiating spills at a particular project.

a. <u>Responsibilities of Fishery Management Agencies and Tribes</u>.

(1) Specify "spill criteria" in accordance with the amended NPPC Fish and Wildlife Program.

(2) Provide monitoring and surveillance throughout the migration period at predetermined locations such as the fish trap facilities.

(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 ensure 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 Fish Passage 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 runoff volume 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 Fish Passage 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 Fish Passage 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 Fish Passage Center.

(7) Within five working days following availability of the official monthly runoff forecast, the Corps will advise the Fish Passage Center of its near term implementation plan on spills, and collection and transportation criteria.

(8) In the event that specific spill requests by the Fish Passage Center are not implemented or are modified, a written explanation will be provided.

(9) The Corps is responsible for managing and implementing the annual juvenile fish passage plan, and will make in-season spill decisions or adjustments in consultation with the Fish Passage Managers.

(10) Carry out routine and emergency fish passage operations and maintenance procedures in accordance with criteria in Appendix 3.

(11) Conduct the Dissolved Gas Monitoring Program as described in Appendix 8.

c. Responsibilities of the Bonneville Power Administration.

(1) Report to the RCC and FPC on updated load-resource studies during the April to September period to supplement the NWS River Forecast Center's runoff volume forecast for fish passage planning assistance.

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

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

(4) Utilize available flexibility of the Federal Columbia River Basin Power System 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.

(7) Coordination and implementation of spill priorities on an hour-by-hour basis.

d. Responsibilities of Mid-Columbia Public Utility Districts.

(1) During the period April thru August 15 update status reports on the timing and numbers of the downstream migrants and provide this information daily to the RCC 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 1987 JFPP that cannot be resolved between the RCC and the Fish Passage Managers, these will be referred to the Interagency Executive Committee (Appendix 1).

15. Comments on the Draft JFPP. A draft JFPP was submitted to interested parties for comment in 1987. Comments from the fishery agencies and tribes, Bonneville Power Administration, and the Pacific Northwest Utilities Conference Committee are contained in Appendix 2. Corps responses to these comments are contained in Appendix 11.

NPD Reservoir Control Center

JFPP and CPO Coordinators

	Office Public	Office FTS	Home
Jim Cayanus	(503) 221-3744	423-3744	(503) 646-7773
Erlyn Krueger	(503) 221-3743	423-3743	(503) 656-4916
Jim Fodrea, Alt.	(503) 221-3741	423-3741	(503) 641-6947
Russ George, Alt.	(503) 221-3745	423-3745	(503) 253-1553

NPDEN-WM
6 Apr 87

Encl 3

LIST OF APPENDICES

APPENDIX 1

Correspondence to Cooperating Agencies and the Consulting Agencies and Affected utilities

DEPARTMENT OF THE ARMY
NORTH PACIFIC DIVISION, CORPS OF ENGINEERS
P.O. BOX 2870
PORTLAND, OREGON 97208-2870

REPLY TO
ATTENTION OF

November 4, 1986

Water Management Branch

CONSULTING AGENCIES & 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 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

Gentlemen:

The Northwest Power Planning Councils' Fish and Wildlife Program requests that we submit coordinated yearly plans to them by February 15 of each year and implement the plan by April. Accordingly, we are initiating the process regarding preparation of the 1987 Juvenile Fish Passage Plan (JFPP). Projects included in the Corps' Plan are Lower Granite, Little Goose, Lower Monumental, Ice Harbor, McNary, John Day, The Dalles and Bonneville.

We anticipate that the institutional procedures for development of the JFPP will be similar to the one prepared last year. We are currently coordinating the procedures (Enclosure 1) with the Columbia Basin Fish and Wildlife Council, the Columbia River Inter-Tribal Fish Commission and the Bonneville Power Administration. Any comments you may have will be considered.

The 1987 Juvenile Fish Passage Plan will be developed using these procedures. During the development process your agency will be sent a copy of the JFPP for review and comment. Initial input to the JFPP is to be provided by December 4, 1986 so that material will be available for the working committee meeting on December 11.

I request that you inform me of your desire to participate in development of the 1987 JFPP by indicating in writing the name and address of your representative. Please provide me your response by December 4, 1986.

Sincerely,

James R. Fry
Colonel, Corps of Engineers
Deputy Division Engineer

Enclosure

DEPARTMENT OF THE ARMY
NORTH PACIFIC DIVISION, CORPS OF ENGINEERS
P.O. BOX 2870
PORTLAND, OREGON 97208-2870

REPLY TO
ATTENTION OF

November 4, 1986

Water Management Branch

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
Upper Columbia United Tribes Fisheries Research Center

Gentlemen:

Enclosed for your information is a copy of a letter notifying consulting agencies and affected utilities that the Corps of Engineers is initiating a consultation process to assist in the development of the 1987 juvenile fish passage plan at Corps of Engineers projects.

Sincerely,

James R. Fry

James R. Fry
Colonel, Corps of Engineers
Deputy Division Engineer

Enclosure

DEPARTMENT OF THE ARMY
NORTH PACIFIC DIVISION, CORPS OF ENGINEERS
P.O. BOX 2870
PORTLAND, OREGON 97208-2870

)

REPLY TO ATTENTION OF

November 4, 1986

Water Management Branch

Mr. Rolland Schmitten
Columbia Basin Fish and Wildlife Council
Lloyd Building, Suite 1240
700 N.E. Multnomah Street
Portland, Oregon 97232

Dear Mr. Schmitten:

The Corps of Engineers is initiating the process for development of the 1987 juvenile fish passage plan. To expedite the process we have updated for 1987 the Procedure for Development of a Coordinated Interim Juvenile Fish Passage Plan (JFPP) For Corps of Engineers Projects that was utilized last year. Most of the changes are date revisions. Additions are underlined and deletions are crossed out. The schedule (Enclosure 2) has also been revised. If you feel major revisions are required we can have our Ad Hoc Group address them.

The first meeting of the Working Committee is scheduled for 8:30 a.m. December 11th in the Corps of Engineers briefing room 118 for the purpose of reviewing agency and tribe input to the JFPP. Our intent is to submit the JFPP to the Northwest Power Planning Council by February 15, 1987. We are aware of the Council's ongoing Mainstem Passage Advisory Committee and we will consider information provided by this committee and any future Council recommendations during the preparation of the 1987 Juvenile Fish Passage Plan. Contact Russ George of my staff at 221-3745 if additional information would be helpful. Also, please let him know who your Representive will be on the Working Committee.

Sincerely,

James R. Fry

James R. Fry
Colonel, Corps of Engineers
Deputy Division Engineer

Enclosure

DEPARTMENT OF THE ARMY
NORTH PACIFIC DIVISION. CORPS OF ENGINEERS
P.O. BOX 2870
PORTLAND, OREGON 97208-2870

REPLY TO
ATTENTION OF.

November 4, 1986

Water Management Branch

Ms. Janet McLennan
Assistant Power Manager
Bonneville Power Administration - PG
P.O. Box 3621
Portland, Oregon 97208

Dear ~~Ms. McLennan~~ Janet:

The Corps of Engineers is initiating the process for development of the 1987 juvenile fish passage plan. To expedite the process we have updated for 1987 the Procedure for Development of a Coordinated Interim Juvenile Fish Passage Plan (JFPP) For Corps of Engineers Projects that was utilized last year. Most of the changes are date revisions. Additions are underlined and deletions are crossed out. The schedule (Enclosure 2) has also been revised. If you feel major revisions are required we can have our Ad Hoc Group address them.

The first meeting of the Working Committee is scheduled for 8:30 a.m. December 11th in the Corps of Engineers briefing room 118 for the purpose of reviewing agency and tribe input to the JFPP. Our intent is to submit the JFPP to the Northwest Power Planning Council by February 15, 1987. We are aware of the Council's ongoing Mainstem Passage Advisory Committee and we will consider information provided by this committee and any future Council recommendations during the preparation of the 1987 Juvenile Fish Passage Plan. Contact Russ George of my staff at 221-3745 if additional information would be helpful. Also, please let him know who your Representive will be on the Working Committee.

Sincerely,

Jim

~~James~~ R. Fry
Colonel, Corps of Engineers
Deputy Division Engineer

Enclosure

DEPARTMENT OF THE ARMY
NORTH PACIFIC DIVISION CORPS OF ENGINEERS
P.O. BOX 2870
PORTLAND, OREGON 97208-2870

REPLY TO
ATTENTION OF

November 4, 1986

Water Management Branch

Mr. S. Timothy Wapato
Columbia River Inter-Tribal Fish Commission
975 SE Sandy Blvd, Suite 202
Portland, Oregon 97214

Dear Mr. ~~Wapato~~ Tim:

The Corps of Engineers is initiating the process for development of the 1987 juvenile fish passage plan. To expedite the process we have updated for 1987 the Procedure for Development of a Coordinated Interim Juvenile Fish Passage Plan (JFPP) For Corps of Engineers Projects that was utilized last year. Most of the changes are date revisions. Additions are underlined and deletions are crossed out. The schedule (Enclosure 2) has also been revised. If you feel major revisions are required we can have our Ad Hoc Group address them.

The first meeting of the Working Committee is scheduled for 8:30 a.m. December 11th in the Corps of Engineers briefing room 118 for the purpose of reviewing agency and tribe input to the JFPP. Our intent is to submit the JFPP to the Northwest Power Planning Council by February 15, 1987. We are aware of the Council's ongoing Mainstem Passage Advisory Committee and we will consider information provided by this committee and any future Council recommendations during the preparation of the 1987 Juvenile Fish Passage Plan. Contact Russ George of my staff at 221-3745 if additional information would be helpful. Also, please let him know who your Representive will be on the Working Committee.

Sincerely,

Jim

~~James~~ R. Fry
Colonel, Corps of Engineers
Deputy Division Engineer

Enclosure

PROCEDURE FOR

DEVELOPMENT OF A COORDINATED

INTERIM JUVENILE FISH PASSAGE PLAN

FOR CORPS OF ENGINEERS

PROJECTS

I. 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 (NPPC), 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 1986 Detailed Fishery Operating Plan (DFOP) prepared by the fishery agencies and tribes, the 1986 Corps of Engineers Juvenile Fish Passage Plan, the Transport Guidelines and other documents. Further, it will be based upon principles and guidelines summarized in Section VII below. The juvenile fish 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 state 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 stated in Section 1504, the Northwest Power Planning Council requests the Corps to develop and submit a plan to the Council by February 15 of each year.

SI. 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 planing 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 1 February 1986 and a final draft plan by 15 February 1986.

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 1987:

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 criteria will be considered in the passage plan.

4. The 1987 plan is to be developed cooperatively by project operators, fish and wildlife agencies and tribal representatives. The fishery agency/tribes' 1986 Detailed Fisheries Operating Plan (DFOP) will be provided as recommendations for plan development to the Working Committee. The 1986 Corps of Engineers Juvenile Fish Passage Plan, Fish Transport Guidelines and past bypass activities of the Committee on Fisheries Operations (COFO) will be given full consideration in developing the 1987 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. Any revisions by the Power Planning Council to the standards will also be considered when they become available.

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 1987 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 1986 FTOT Guidelines will be updated for use in 1987. Detailed operating criteria for the 1987 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. <u>Turbines are also screened at John Day and Bonneville Dams where juvenile fish are bypassed to the tailwater</u>.

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 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.

10. The plan will be developed consistent with the provisions of the Regional Power Act requiring an economical, efficient, reliable and adequate power system. <u>As a minimum</u>, spill will be <u>provided</u> 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. <u>Process</u>

The process to develop and adopt the 1987 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 Fish Passage 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
Upper Columbia United Tribes Fisheries Research Center

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

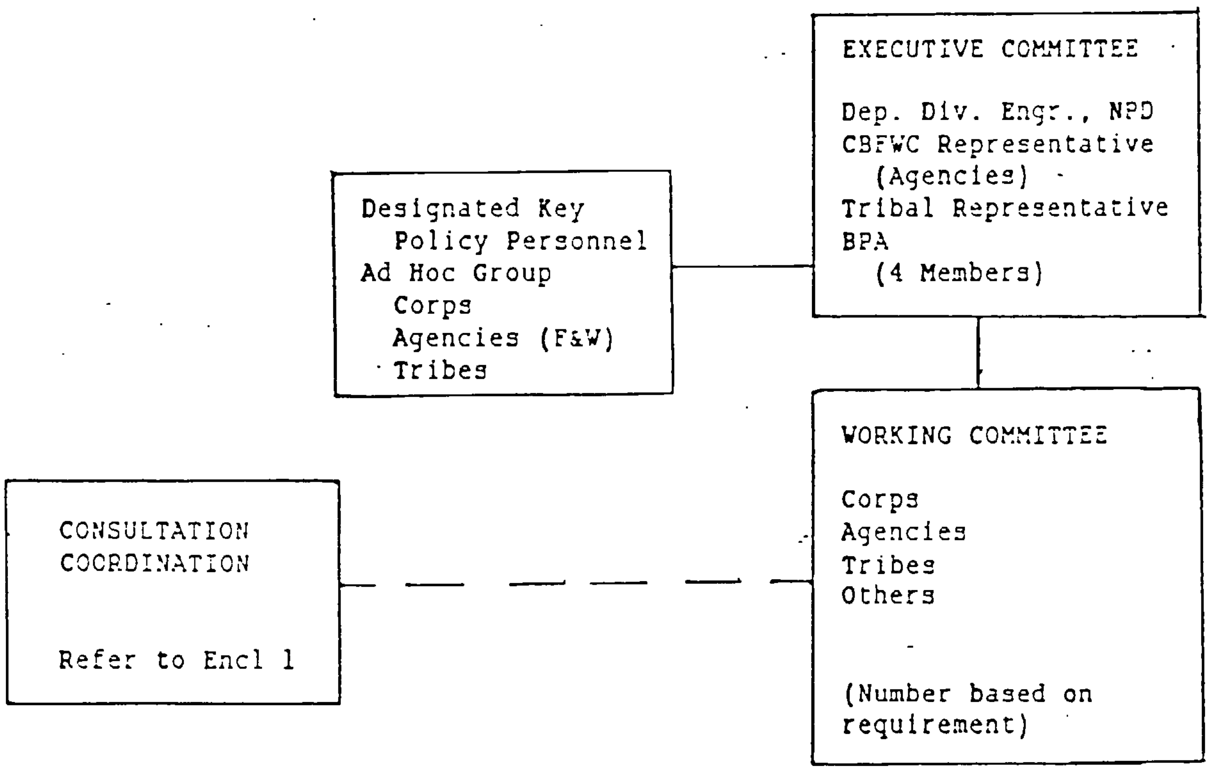
1987 INTERIM JUVENILE FISH PASSAGE PLAN

STEP 1	STEP 2	STEP 3
Corps solicits input for Procedure for Development of a Coordinated Interim Juvenile Fish Passage Plan from fishery agencies and tribes. Set date for first working committee meeting.	Fishery agencies and tribes develop and forward their recommendations for a Juvenile Fish Passage Plan, designate Executive Committee and Working Committee members. Begin Working Committee meeting.	Corps prepares a draft Juvenile Fish Passage Plan based upon the input from step 2 and the January volume - of - runoff forecast and issues draft plan to the operating agencies, fishery agencies and tribes for comment. Working Committee meetings held as required.
DUE DATE - 15 Nov 86	DUE DATE - 11 Dec 86	Due Date - 20 Jan 87

STEP 4	STEP 5
Operating agencies, fishery agencies, and tribes forward formal written comments to the Corps by 7 Feb 1987. Corps submits Juvenile Fish Passage Plan to Power Council by 15 Feb.	Corps implements Juvenile Fish Passage Plan.
DUE DATE - 15 Feb 87	DUE DATE - 1 Apr 87

Enclosure 2

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



Enclosure 3

DEPARTMENT OF THE ARMY
NORTH PACIFIC DIVISION, CORPS OF ENGINEERS
P O BOX 2870
PORTLAND OREGON 97208-2870

REPLY TO
ATTENTION OF

March 20, 1987

Water Management Branch

CONSULTING AGENCIES & 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 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

Gentlemen:

In our letter to you on November 4, 1986, we contacted you regarding the development of our 1987 Juvenile Fish Passage Plan. Enclosed is a copy of our draft Juvenile Fish Passage Plan for 1987. Your review and comments on this document are requested. To ensure that your comments are considered, we should receive them by March 30, 1987.

Sincerely,

James R. Fry
Colonel, Corps of Engineers
Deputy Division Engineer

Enclosure

Copies Furnished:

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 Authority
Northwest Power Planning Council
Upper Columbia United Tribes Fisheries Research Center
Mr. S. Timothy Wapato
Ms. Janet McLennan
Mr. Rolland Schmitten

MFR: 1987 JFPP is being prepared per NPPC Fish and Wildlife Program.

DEPARTMENT OF THE ARMY
NORTH PACIFIC DIVISION CORPS OF ENGINEERS
P O BOX 2870
PORTLAND, OREGON 97208-2870

REPLY TO
ATTENTION OF

March 20, 1987

Water Management Branch

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 Authority
Northwest Power Planning Council
Upper Columbia United Tribes Fisheries Research Center

Gentlemen:

In our letter to you on November 4, 1986, we contacted you regarding the development of our 1987 Juvenile Fish Passage Plan. Enclosed is a copy of our draft Juvenile Fish Passage Plan for 1987. Your review and comments on this document are requested. To ensure that your comments are considered, we should receive them by March 30, 1987.

Sincerely,

James R. Fry
Colonel, Corps of Engineers
Deputy Division Engineer

Enclosure

DEPARTMENT OF THE ARMY
NORTH PACIFIC DIVISION, CORPS OF ENGINEERS
P O BOX 2870
PORTLAND OREGON 97208-2870

REPLY TO
ATTENTION OF

March 20, 1987

Water Management Branch

Mr. Rolland Schmitten
Lloyd Building, Suite 1240
700 NE Multnomah Street
Portland, Oregon 97232

Dear Mr. Schmitten:

In our letter to you on November 4, 1986, we contacted you regarding the development of our 1987 Juvenile Fish Passage Plan. Enclosed is a copy of our draft Juvenile Fish Passage Plan for 1987. Your review and comments on this document are requested. To ensure that your comments are considered, we should receive them by March 30, 1987.

Sincerely,

Col James R. Fry
Colonel, Corps of Engineers
Deputy Division Engineer

Enclosure

DEPARTMENT OF THE ARMY
NORTH PACIFIC DIVISION, CORPS OF ENGINEERS
P O BOX 2870
PORTLAND, OREGON 97208-2870

REPLY TO
ATTENTION OF

March 20, 1987

Water Management Branch

Mr. S. Timothy Wapato
Columbia River Inter-Tribal Fish Commission
975 SE Sandy Blvd, Suite 202
Portland, Oregon 97214

Dear Mr. Wapato:

In our letter to you on November 4, 1986, we contacted you regarding the development of our 1987 Juvenile Fish Passage Plan. Enclosed is a copy of our draft Juvenile Fish Passage Plan for 1987. Your review and comments on this document are requested. To ensure that your comments are considered, we should receive them by March 30, 1987.

Sincerely,

James R. Fry
Colonel, Corps of Engineers
Deputy Division Engineer

Enclosure

DEPARTMENT OF THE ARMY
NORTH PACIFIC DIVISION CORPS OF ENGINEERS
P O BOX 2870
PORTLAND, OREGON 97208-2870

REPLY TO
ATTENTION OF

March 20, 1987

Water Management Branch

Ms. Janet McLennan
Assistant Power Manager
Bonneville Power Administration - PG
P.O. Box 3621
Portland, Oregon 97208

Dear Ms. McLennan:

In our letter to you on November 4, 1986, we contacted you regarding the development of our 1987 Juvenile Fish Passage Plan. Enclosed is a copy of our draft Juvenile Fish Passage Plan for 1987. Your review and comments on this document are requested. To ensure that your comments are considered, we should receive them by March 30, 1987.

Sincerely,

James R. Fry
Colonel, Corps of Engineers
Deputy Division Engineer

Enclosure

APPENDIX 2

Correspondence Received from Fishery Agencies and Tribes, Northwest Power Planning Council, Pacific Northwest Utilities Conference committee, and Bonneville Power Administration.

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

December 4, 1986 F/NWR5

Mr. Russ George
North Pacific Division
Corps of Engineers MPDEN-WM
P.O. Box 2870
Portland, OR 97208

Dear Mr. George:

In response to Colonel Fry's November 4, 1986 request, I have been assigned to serve as the National Marine Fisheries Service representative for development of the 1987 Juvenile Fish Passage Plan. My address appears on this letterhead and my personal telephone number is (503)230-5454.

At this time I would like to request that the agenda for the December 11, 1986 meeting include a discussion of juvenile fish bypass performance standards. Proposed standards that have been jointly developed by the fishery agencies and tribes are enclosed. Also enclosed are some supporting materials used in the development of these standards.

Thank you for your consideration. I look forward to working with you.

Sincerely,

Brian J. Brown

Brian J. Brown
Fishery Biologist

Enclosures

cc: CBFWA
CRITFC

December 4, 1986

Juvenile Fish Bypass Performance Standards for
Mainstem Dams on the Columbia and Lower Snake Rivers

Bypass performance is to be assessed in terms of fish guidance efficiency which is a direct measure of the percentage of juvenile migrants diverted away from hydroelectric turbines and carried past a mainstem dam by an alternate passage route. Fish guidance efficiency is to be measured by fyke and dipnet capture within the turbine intake and gatewell or other diversion device or by hydroacoustic means with species composition determined by direct capture.

The desired design and operating standards are 80 percent guidance efficiency for yearling chinook, steelhead, and coho and 70 percent guidance efficiency for subyearling chinook. These standards are to be used as design objectives during facility development and testing. Alternatives are to be selected for testing and installation based on their ability to attain or exceed these levels of guidance. Existing facilities with lower levels of performance shall undergo continued evaluation and improvements until these standards are achieved.

Minimum functional standards are 70 percent guidance efficiency for yearling chinook, steelhead, and coho and 50 percent guidance efficiency for subyearling chinook. For practical purposes the yearling standard will apply during the spring migration (to

June 1) and the subyearling standard will apply during the summer migration.

The minimum standards are to be used to determine if existing facilities or test installations can be considered useable or worthy of further development rather than expedited replacement. Spills and powerhouse load reductions are to be utilized at passage facilities not otherwise attaining the minimum standards. Existing facilities will be allowed five years to improve guidance efficiency to meet desired operating standards so long as developmental studies are ongoing. Spills and powerhouse load reductions will then be utilized if the desired operating standards are not attained. It is envisioned that a sliding scale spill formula based on anticipated runoff will be utilized at projects requiring spills to attain the minimum standards (or, after five years, the operating standards) in critical water years in order to share the shortage among water users and purposes.

Sockeye are excluded from these standards pending further information on guidance and survival rates for this species.

The desired rate of injury or loss resulting from bypass facility operation is one percent or less above the background level of injury observed in fish arriving at the project. Three percent above background is considered as the maximum acceptable level.

Facilities exceeding this level require immediate evaluation and modification to eliminate causes of injury. A sampled fish would be classified as injured if it was descaled according to FTOT guidelines and/or had evidence of physical trauma; cuts, bruises, abrasions or eye injuries, which the biological sampler judges make survival of the individual unlikely. Facilities with injury or loss rates above one percent but less than three percent will be allowed five years to reduce the injury or loss level to one percent or less. If the project operator does not attain this level after five years, the project will be required to increase bypass or spill passage by the proportion necessary to increase powerhouse survival an amount equal to the uncorrected loss.

ESTIMATED SMOLT SURVIVAL UNDER PROPOSED OPERATING STANDARDS

ESTIMATES OF SMOLT SURVIVAL

A model was used to develop desired design and operation standards. Three scenarios were modeled: no bypasses in place, existing bypass facilities, and full bypass at all mainstem dams. Numbers of fish were based on present and doubled production estimates, respectively. Summaries of modeling results are attached (see tables).

Results indicate the installation of juvenile bypass systems at all mainstem dams would collectively increase the system smolt survival of spring and summer migrants to below Bonneville Dam from 0.43 to 0.63, a 47 percent improvement over the "no bypass" condition. Assuming existing production were doubled, the full bypass condition would collectively increase numbers surviving to below Bonneville Dam by approximately 15 million smolts. Assumptions used in the model are listed below.

ASSUMPTIONS

Reservoir mortality: 5-10 percent

Riverflow (KCFS):	Spring	Summer
lower Snake	110	50
mid-Columbia	160	90
lower Columbia	270	140

Bypass Efficiency:	No Bypass	Existing	Full
Spring:	0	0-70	80
Summer:	0	0-50	70

Spill Survival: 99 percent
Bypass Survival: 99 percent
Turbine Mortality: 15 percent

Percent Transported:	No Bypass	Existing	Full
Spring:	0	0-50	0-50
Summer:	0	0-90	0-90

Transport Survival: 75 percent

ESTIMATED SURVIVAL UNDER PROPOSED OPERATING STANDARDS
EXISTING PRODUCTION SCENARIO

SPRING MIGRANTS

Bypass Status	Total Entering	No.Surv.Passage	No.Surv.Trans	Total	System Survival
No bypass	34.63	14.14	0.00	14.14	0.41
Status quo*	34.63	14.42	4.78	19.29	0.56
Full bypass	34.63	16.10	6.40	22.50	0.65

SUMMER MIGRANTS

Bypass Status	Total Entering	No.Surv.Passage	No.Surv.Trans	Total	System Survival
No bypass	48.31	21.45	0.00	21.45	0.44
Status quo*	48.31	20.58	5.15	25.73	0.53
Full bypass	48.31	21.32	8.67	29.99	0.62

Totals expressed in millions of fish

* Lower Granite, Little Goose, McNary, Bonneville and John Day facilities

ESTIMATED SURVIVAL UNDER PROPOSED OPERATING STANDARDS
DOUBLED PRODUCTION SCENARIO

SPRING MIGRANTS

Bypass Status	Total Entering	No.Surv.Passage	No.Surv.Trans	Total	System Survival
No bypass	69.26	28.28	0.00	28.28	0.41
Status quo*	69.26	28.83	9.74	38.57	0.56
Full bypass	69.26	32.20	12.79	44.99	0.65

SUMMER MIGRANTS

Bypass Status	Total Entering	No.Surv.Passage	No.Surv.Trans	Total	System Survival
No bypass	96.62	42.90	0.00	42.90	0.44
Status quo*	96.62	41.15	10.30	51.45	0.53
Full bypass	96.62	42.64	17.35	59.99	0.62

Totals expressed in millions of fish

* Lower Granite, Little Goose, McNary, Bonneville and John Day facilities

Fish Passage Survival Model (No Bypass, Spring)

	No. (M) Enter	% Res. Survive	No. Arrive	Project Q	% Q Spilled	Spill Eff.	% Spill Pass	Bypass Eff.	% Bypass	% Turb. Pass	Spill Survive	No. Spilled
LGR	10.31	0.90	9.28	110.00	0.00	1.00	0.00	0.00	0.00	1.00	0.99	0.00
LGS	0.00	0.90	7.10	110.00	0.00	1.00	0.00	0.00	0.00	1.00	0.99	0.00
LMN	0.35	0.90	5.75	110.00	0.00	1.00	0.00	0.00	0.00	1.00	0.99	0.00
IHR	0.00	0.90	4.10	110.00	0.00	1.00	0.00	0.00	0.00	1.00	0.99	0.00
WEL	2.01	0.90	1.81	160.00	0.00	2.50	0.00	0.00	0.00	1.00	0.99	0.00
RRH	1.92	0.90	3.11	160.00	0.00	0.50	0.00	0.00	0.00	1.00	0.99	0.00
RRI	3.29	0.95	5.64	160.00	0.00	1.25	0.00	0.00	0.00	1.00	0.99	0.00
WAN	0.00	0.90	4.31	160.00	0.00	1.75	0.00	0.00	0.00	1.00	0.99	0.00
PRD	0.00	0.90	3.30	160.00	0.00	0.75	0.00	0.00	0.00	1.00	0.99	0.00
MCN	3.09	0.90	8.67	270.00	0.14	1.00	0.14	0.00	0.00	0.86	0.99	1.24
JDA	1.41	0.90	8.06	270.00	0.00	1.00	0.00	0.00	0.00	1.00	0.99	0.00
TDA	1.40	0.95	7.84	270.00	0.00	1.50	0.00	0.00	0.00	1.00	0.99	0.00
BON	10.85	0.95	16.64	270.00	0.00	1.00	0.00	0.00	0.00	1.00	0.99	0.00

	Bypass Survive	No. Bypassed	Turbine Survive	Survived Turbine	% Trans.	No. Trans.	Trans. Survive	Survive Trans.	No. Survive	% Survive	Cum U/R Survive	Cum no. Killed
LGR	0.99	0.00	0.85	7.89	0.50	0.00	0.75	0.00	7.89	0.85	0.77	1.39
LGS	0.99	0.00	0.85	6.03	0.50	0.00	0.75	0.00	6.03	0.85	0.59	2.46
LMN	0.99	0.00	0.85	4.88	0.00	0.00	0.75	0.00	4.88	0.85	0.45	3.32
IHR	0.99	0.00	0.85	3.74	0.00	0.00	0.75	0.00	3.74	0.85	0.34	3.98
WEL	0.99	0.00	0.85	1.54	0.00	0.00	0.75	0.00	1.54	0.85		4.25
RRH	0.99	0.00	0.85	2.65	0.00	0.00	0.75	0.00	2.65	0.85		4.72
RRI	0.99	0.00	0.85	4.79	0.00	0.00	0.75	0.00	4.79	0.85		5.56
WAN	0.99	0.00	0.85	3.67	0.00	0.00	0.75	0.00	3.67	0.85		6.21
PRD	0.99	0.00	0.85	2.80	0.00	0.00	0.75	0.00	2.80	0.85		6.70
MCN	0.99	0.00	0.85	6.30	0.50	0.00	0.75	0.00	7.54	0.87	0.27	7.83
JDA	0.99	0.00	0.85	6.85	0.00	0.00	0.75	0.00	6.85	0.85	0.21	9.04
TDA	0.99	0.00	0.85	6.66	0.00	0.00	0.75	0.00	6.66	0.85	0.17	10.21
BON	0.99	0.00	0.85	14.14	0.00	0.00	0.75	0.00	14.14	0.85	0.13	12.71

Total Number Entering (M):	34.63
Total Passage Survivors:	14.14
Total Transport Survivors:	0.00
Total Survivors:	14.14
System Smolt Survival:	0.41

Fish Passage Survival Model (Present, Spring)

	No.(M) Enter	% Res. Survive	No. Arrive	Project Q	% Q Spilled	Spill Eff.	% Spill Pass	Bypass Eff.	% Bypass	% Turb. Pass	Spill Survive	No. Spilled
LGR	10.31	0.90	9.28	110.00	0.00	1.00	0.00	0.60	0.60	0.40	0.99	0.00
LGS	0.00	0.90	5.32	110.00	0.00	1.00	0.00	0.50	0.60	0.40	0.99	0.00
LMN	0.35	0.90	3.36	110.00	0.00	1.00	0.00	0.00	0.00	1.00	0.99	0.00
IHR	0.00	0.90	2.57	110.00	0.00	1.00	0.00	0.00	0.00	1.00	0.99	0.00
WEL	2.01	0.90	1.81	160.00	0.00	2.50	0.00	0.00	0.00	1.00	0.99	0.00
RRH	1.92	0.90	3.11	160.00	0.00	0.50	0.00	0.00	0.00	1.00	0.99	0.00
RRI	3.29	0.95	5.64	160.00	0.00	1.25	0.00	0.00	0.00	1.00	0.99	0.00
WAN	0.00	0.90	4.31	160.00	0.00	1.75	0.00	0.00	0.00	1.00	0.99	0.00
PRD	0.00	0.90	3.50	160.00	0.00	0.75	0.00	0.00	0.00	1.00	0.99	0.00
MCN	3.09	0.90	7.27	270.00	0.14	1.00	0.14	0.70	0.50	0.26	0.99	1.04
JDA	1.41	0.90	5.57	270.00	0.00	1.00	0.00	0.70	0.70	0.30	0.99	0.00
TDA	1.40	0.95	6.35	270.00	0.00	1.00	0.00	0.00	0.00	1.00	0.99	0.00
BON	10.85	0.95	15.44	270.00	0.00	1.00	0.00	0.60	0.60	0.40	0.99	0.00

	Bypass Survive	No. Bypassed	Turbine Survive	Survived Turbine	% Trans.	No. Trans.	Trans. Survive	Survive Trans.	No. Survive	% Survive	Cum U/R Survive	Cum no. Killed
LGR	0.99	5.51	0.85	3.15	0.50	2.76	0.75	2.07	8.67	0.93	0.84	0.61
LGS	0.99	3.16	0.85	1.81	0.50	1.58	0.75	1.19	4.97	0.93	0.71	0.96
LMN	0.99	0.00	0.85	2.85	0.00	0.00	0.75	0.00	2.85	0.85	0.54	1.47
IHR	0.99	0.00	0.85	2.19	0.00	0.00	0.75	0.00	2.19	0.85	0.41	1.85
WEL	0.99	0.00	0.85	1.54	0.00	0.00	0.75	0.00	1.54	0.85		2.13
RRH	0.99	0.00	0.85	2.65	0.00	0.00	0.75	0.00	2.65	0.85		2.59
RRI	0.99	0.00	0.85	4.79	0.00	0.00	0.75	0.00	4.79	0.85		3.44
WAN	0.99	0.00	0.85	3.67	0.00	0.00	0.75	0.00	3.67	0.85		4.09
PRD	0.99	0.00	0.85	2.90	0.00	0.00	0.75	0.00	2.90	0.85		4.56
MCN	0.99	4.31	0.85	1.59	0.50	2.16	0.75	1.62	6.94	0.95	0.36	4.91
JDA	0.99	3.86	0.85	1.42	0.00	0.00	0.75	0.00	5.28	0.95	0.30	5.20
TDA	0.99	0.00	0.85	5.40	0.00	0.00	0.75	0.00	5.40	0.85	0.24	6.16
BON	0.99	9.17	0.85	5.25	0.00	0.00	0.75	0.00	14.42	0.93	0.22	7.18

Total Number Entering (M):	34.63
Total Passage Survivors:	14.42
Total Transport Survivors:	4.87
Total Survivors:	19.29
System Smolt Survival:	0.56

Fish Passage Survival Model (Full Bypass, Spring)

	No.(M) Enter	% Res. Survive	No. Arrive	Project Q	% Q Spilled	Spill Eff.	% Spill Pass	Bypass Eff.	% Bypass	% Turb. Pass	Spill Survive	No. Spilled
LGR	10.31	0.90	9.28	110.00	0.00	1.00	0.00	0.80	0.80	0.20	0.99	0.00
LGS	0.00	0.90	4.73	110.00	0.00	1.00	0.00	0.80	0.80	0.20	0.99	0.00
LMN	0.35	0.90	2.72	110.00	0.00	1.00	0.00	0.80	0.80	0.20	0.99	0.00
IHR	0.00	0.90	2.36	110.00	0.00	1.00	0.00	0.80	0.80	0.20	0.99	0.00
WEL	2.01	0.90	1.81	160.00	0.00	2.50	0.00	0.80	0.80	0.20	0.99	0.00
RRH	1.92	0.90	3.29	160.00	0.00	0.50	0.00	0.80	0.80	0.20	0.99	0.00
RRI	3.29	0.95	6.14	160.00	0.00	1.25	0.00	0.80	0.80	0.20	0.99	0.00
WAN	0.00	0.90	5.31	160.00	0.00	1.75	0.00	0.80	0.80	0.20	0.99	0.00
PRD	0.00	0.90	4.60	160.00	0.00	0.75	0.00	0.80	0.80	0.20	0.99	0.00
MCN	3.09	0.90	8.80	270.00	0.14	1.00	0.14	0.80	0.68	0.17	0.99	1.26
JDA	1.41	0.90	6.24	270.00	0.00	1.00	0.00	0.80	0.80	0.20	0.99	0.00
TDA	1.40	0.95	7.03	270.00	0.00	1.00	0.00	0.80	0.80	0.20	0.99	0.00
BON	10.85	0.95	16.73	270.00	0.00	1.00	0.00	0.80	0.80	0.20	0.99	0.00

	Bypass Survive	No. Bypassed	Turbine Survive	Survived Turbine	% Trans.	No. Trans.	Trans. Survive	Survive Trans.	No. Survive	% Survive	Cum U/R Survive	Cum no. Killed
LGR	0.99	7.35	0.85	1.58	0.50	3.67	0.75	2.76	8.93	0.96	0.87	0.35
LGS	0.99	3.74	0.85	0.80	0.50	1.87	0.75	1.40	4.55	0.96	0.75	0.53
LMN	0.99	2.16	0.85	0.46	0.00	0.00	0.75	0.00	2.62	0.96	0.65	0.64
IHR	0.99	1.87	0.85	0.40	0.00	0.00	0.75	0.00	2.27	0.96	0.56	0.73
WEL	0.99	1.43	0.85	0.31	0.00	0.00	0.75	0.00	1.74	0.96		0.79
RRH	0.99	2.61	0.85	0.56	0.00	0.00	0.75	0.00	3.17	0.96		0.92
RRI	0.99	4.86	0.85	1.04	0.00	0.00	0.75	0.00	5.90	0.96		1.15
WAN	0.99	4.21	0.85	0.90	0.00	0.00	0.75	0.00	5.11	0.96		1.35
PRD	0.99	3.64	0.85	0.78	0.00	0.00	0.75	0.00	4.42	0.96		1.53
MCN	0.99	5.97	0.85	1.28	0.50	2.98	0.75	2.24	8.51	0.97	0.19	1.83
JDA	0.99	4.94	0.85	1.06	0.00	0.00	0.75	0.00	6.00	0.96	0.42	2.07
TDA	0.99	5.57	0.85	1.20	0.00	0.00	0.75	0.00	6.76	0.96	0.39	2.33
BON	0.99	13.25	0.85	2.84	0.00	0.00	0.75	0.00	16.10	0.96	0.35	2.97

Total Number Entering (M):	34.63
Total Passage Survivors:	16.10
Total Transport Survivors:	6.40
Total Survivors:	22.50
System Smolt Survival:	0.65

Fish Passage Survival Model (No Bypass, Summer)

	No.(M) Enter	% Res. Survive	No. Arrive	Project Q	% Q Spilled	Spill Eff.	% Spill Pass	Bypass Eff.	% Bypass	% Turb. Pass	Spill Survive	No. Spilled
LGR	0.15	0.90	0.14	50.00	0.00	1.00	0.00	0.00	0.00	1.00	0.99	0.00
LGS	0.00	0.90	0.10	50.00	0.00	1.00	0.00	0.00	0.00	1.00	0.99	0.00
LMN	2.02	0.90	1.90	50.00	0.00	1.00	0.00	0.00	0.00	1.00	0.99	0.00
IHR	0.00	0.90	1.45	50.00	0.00	1.00	0.00	0.00	0.00	1.00	0.99	0.00
WEL	7.53	0.90	6.78	90.00	0.00	2.50	0.00	0.00	0.00	1.00	0.99	0.00
RRH	2.51	0.90	7.44	90.00	0.00	0.50	0.00	0.00	0.00	1.00	0.99	0.00
RRI	6.62	0.95	12.30	90.00	0.00	1.25	0.00	0.00	0.00	1.00	0.99	0.00
WAN	0.00	0.90	9.41	90.00	0.00	1.75	0.00	0.00	0.00	1.00	0.99	0.00
PRD	0.00	0.90	7.20	90.00	0.00	0.75	0.00	0.00	0.00	1.00	0.99	0.00
MCN	9.59	0.90	15.25	140.00	0.00	1.00	0.00	0.00	0.00	1.00	0.99	0.00
JDA	3.10	0.90	14.45	140.00	0.00	1.00	0.00	0.00	0.00	1.00	0.99	0.00
TDA	0.76	0.95	12.39	140.00	0.00	1.00	0.00	0.00	0.00	1.00	0.99	0.00
BON	16.03	0.95	25.24	140.00	0.00	1.00	0.00	0.00	0.00	1.00	0.99	0.00

	Bypass Survive	No. Bypassed	Turbine Survive	Survived Turbine	% Trans.	No. Trans.	Trans. Survive	Survive Trans.	No. Survive	% Survive	Cum U/R Survive	Cum no. Killed
LGR	0.99	0.00	0.85	0.11	0.00	0.00	0.75	0.00	0.11	0.85	0.77	0.02
LGS	0.99	0.00	0.85	0.09	0.00	0.00	0.75	0.00	0.09	0.85	0.59	0.04
LMN	0.99	0.00	0.85	1.61	0.00	0.00	0.75	0.00	1.61	0.85	0.45	0.32
IHR	0.99	0.00	0.85	1.23	0.00	0.00	0.75	0.00	1.23	0.85	0.34	0.54
WEL	0.99	0.00	0.85	5.76	0.00	0.00	0.75	0.00	5.76	0.85		1.55
RRH	0.99	0.00	0.85	6.33	0.00	0.00	0.75	0.00	6.33	0.85		2.67
RRI	0.99	0.00	0.85	10.45	0.00	0.00	0.75	0.00	10.45	0.85		4.52
WAN	0.99	0.00	0.85	8.00	0.00	0.00	0.75	0.00	8.00	0.85		5.93
PRD	0.99	0.00	0.85	6.12	0.00	0.00	0.75	0.00	6.12	0.85		7.01
MCN	0.99	0.00	0.85	12.96	0.00	0.00	0.75	0.00	12.96	0.85	0.26	9.29
JDA	0.99	0.00	0.85	12.29	0.00	0.00	0.75	0.00	12.29	0.85	0.20	11.46
TDA	0.99	0.00	0.85	10.53	0.00	0.00	0.75	0.00	10.53	0.85	0.16	13.32
BON	0.99	0.00	0.85	21.45	0.00	0.00	0.75	0.00	21.45	0.85	0.13	17.11

Total Number Entering (M):	48.31
Total Passage Survivors:	21.45
Total Transport Survivors:	0.00
Total Survivors:	21.45
System Smolt Survival:	0.44

Fish Passage Survival Model (Present, Summer)

	No.(M) Enter	% Res. Survive	No. Arrive	Project Q	% Q Spilled	Spill Eff.	% Spill Pass	Bypass Eff.	% Bypass	% Turb. Pass	Spill Survive	No. Spilled
LGR	0.15	0.90	0.14	50.00	0.00	1.00	0.00	0.50	0.50	0.50	0.99	0.00
LGS	0.00	0.90	0.06	50.00	0.00	1.00	0.00	0.50	0.50	0.50	0.99	0.00
LMN	2.02	0.90	1.84	50.00	0.00	1.00	0.00	0.00	0.00	1.00	0.99	0.00
IHR	0.00	0.90	1.41	50.00	0.00	1.00	0.00	0.00	0.00	1.00	0.99	0.00
WEL	7.53	0.90	6.78	90.00	0.00	2.50	0.00	0.00	0.00	1.00	0.99	0.00
RRH	2.51	0.90	7.44	90.00	0.00	0.50	0.00	0.00	0.00	1.00	0.99	0.00
RRI	6.62	0.95	12.30	90.00	0.00	1.25	0.00	0.00	0.00	1.00	0.99	0.00
WAN	0.00	0.90	9.41	90.00	0.00	1.75	0.00	0.00	0.00	1.00	0.99	0.00
PRD	0.00	0.90	7.20	90.00	0.00	0.75	0.00	0.00	0.00	1.00	0.99	0.00
MCN	9.59	0.90	15.22	140.00	0.00	1.00	0.00	0.50	0.50	0.50	0.99	0.00
JDA	3.10	0.90	9.29	140.00	0.00	1.00	0.00	0.50	0.50	0.50	0.99	0.00
TDA	0.76	0.95	8.84	140.00	0.00	1.00	0.00	0.00	0.00	1.00	0.99	0.00
BON	16.03	0.95	22.37	110.00	0.00	1.00	0.00	0.50	0.50	0.50	0.99	0.00

	Bypass Survive	No. Bypassed	Turbine Survive	Survived Turbine	% Trans.	No. Trans.	Trans. Survive	Survive Trans.	No. Survive	% Survive	Cum. U/R Survive	Cum no. Killed
LGR	0.99	0.07	0.85	0.06	0.90	0.06	0.75	0.05	0.12	0.92	0.83	0.01
LGS	0.99	0.03	0.85	0.02	0.90	0.03	0.75	0.02	0.05	0.92	0.69	0.02
LMN	0.99	0.00	0.85	1.57	0.00	0.00	0.75	0.00	1.57	0.85	0.52	0.29
IHR	0.99	0.00	0.85	1.20	0.00	0.00	0.75	0.00	1.20	0.85	0.40	0.50
WEL	0.99	0.00	0.85	5.76	0.00	0.00	0.75	0.00	5.76	0.85		1.52
RRH	0.99	0.00	0.85	6.33	0.00	0.00	0.75	0.00	6.33	0.85		2.64
RRI	0.99	0.00	0.85	10.45	0.00	0.00	0.75	0.00	10.45	0.85		4.48
WAN	0.99	0.00	0.85	8.00	0.00	0.00	0.75	0.00	8.00	0.85		5.83
PRD	0.99	0.00	0.85	6.12	0.00	0.00	0.75	0.00	6.12	0.85		6.97
MCN	0.99	7.53	0.85	6.47	0.90	6.78	0.75	5.08	14.00	0.92	0.33	8.19
JDA	0.99	4.60	0.85	3.95	0.00	0.00	0.75	0.00	8.54	0.92	0.28	8.93
TDA	0.99	0.00	0.85	7.51	0.00	0.00	0.75	0.00	7.51	0.85	0.22	10.26
BON	0.99	11.07	0.85	9.51	0.00	0.00	0.75	0.00	20.58	0.92	0.19	12.05

Total Number Entering (M):	48.31
Total Passage Survivors:	20.58
Total Transport Survivors:	5.15
Total Survivors:	25.73
System Smolt Survival:	0.53

Fish Passage Survival Model (Full Bypass, Summer)

	No.(M) Enter	% Res. Survive	No. Arrive	Project Q	% Q Spilled	Spill Eff.	% Spill Pass	Bypass Eff.	% Bypass	% Turb. Pass	Spill Survive	No. Spilled
LGR	0.15	0.90	0.14	50.00	0.00	1.00	0.00	0.70	0.70	0.30	0.99	0.00
LGS	0.00	0.90	0.04	50.00	0.00	1.00	0.00	0.70	0.70	0.30	0.99	0.00
LMN	2.02	0.90	1.83	50.00	0.00	1.00	0.00	0.70	0.70	0.30	0.99	0.00
IHR	0.00	0.90	1.56	50.00	0.00	1.00	0.00	0.70	0.70	0.30	0.99	0.00
WEL	7.53	0.90	6.78	90.00	0.00	2.50	0.00	0.70	0.70	0.30	0.99	0.00
RRH	2.51	0.90	8.04	90.00	0.00	0.50	0.00	0.70	0.70	0.30	0.99	0.00
RRI	6.62	0.95	13.53	90.00	0.00	1.25	0.00	0.70	0.70	0.30	0.99	0.00
WAN	0.00	0.90	11.54	90.00	0.00	1.75	0.00	0.70	0.70	0.30	0.99	0.00
PRD	0.00	0.90	9.85	90.00	0.00	0.75	0.00	0.70	0.70	0.30	0.99	0.00
MCN	9.59	0.90	18.37	140.00	0.00	1.00	0.00	0.70	0.70	0.30	0.99	0.00
JDR	3.10	0.90	8.15	140.00	0.00	1.00	0.00	0.70	0.70	0.30	0.99	0.00
TDR	0.76	0.95	8.06	140.00	0.00	1.00	0.00	0.70	0.70	0.30	0.99	0.00
BON	16.03	0.95	22.19	140.00	0.00	1.00	0.00	0.70	0.70	0.30	0.99	0.00

	Bypass Survive	No. Bypassed	Turbine Survive	Survived Turbine	% Trans.	No. Trans.	Trans. Survive	Survive Trans.	No. Survive	% Survive	Cum U/R Survive	Cum no. Killed
LGR	0.99	0.09	0.85	0.03	0.90	0.08	0.75	0.06	0.13	0.95	0.85	0.01
LGS	0.99	0.03	0.85	0.01	0.90	0.02	0.75	0.02	0.04	0.95	0.73	0.01
LMN	0.99	1.27	0.85	0.47	0.00	0.00	0.75	0.00	1.73	0.95	0.62	0.10
IHR	0.99	1.08	0.85	0.40	0.00	0.00	0.75	0.00	1.48	0.95	0.53	0.19
WEL	0.99	4.70	0.85	1.73	0.00	0.00	0.75	0.00	6.42	0.95		0.54
RRH	0.99	5.57	0.85	2.05	0.00	0.00	0.75	0.00	7.62	0.95		0.96
RRI	0.99	9.38	0.85	3.45	0.00	0.00	0.75	0.00	12.83	0.95		1.66
WAN	0.99	8.00	0.85	2.54	0.00	0.00	0.75	0.00	10.54	0.95		2.26
PRD	0.99	6.83	0.85	2.51	0.00	0.00	0.75	0.00	9.34	0.95		2.77
MCN	0.99	12.73	0.85	4.68	0.90	11.46	0.75	8.59	17.41	0.95	0.15	3.73
JDR	0.99	5.65	0.85	2.08	0.00	0.00	0.75	0.00	7.73	0.95	0.39	4.15
TDR	0.99	5.59	0.85	2.06	0.00	0.00	0.75	0.00	7.64	0.95	0.35	4.57
BON	0.99	15.59	0.85	5.73	0.00	0.00	0.75	0.00	21.32	0.95	0.31	5.74

Total Number Entering (M):	48.31
Total Passage Survivors:	21.32
Total Transport Survivors:	8.67
Total Survivors:	29.99
System Smolt Survival:	0.62

12/11/86

Proposed Revisions to 1987 Procedure for Development of a Coordinated Interim Juvenile Fish Passage Plan for Corps of Engineers Project

(delete overstruck text, insert underlined text)

Section VII. Principles and Guidelines

4. The 1987 plan is to be developed cooperatively by projects operators, fish and wildlife agencies and tribal representatives. The fishery agency/tribes' 1986 Detailed Fisheries Operating Plan (DFOP), ~~will-be-provided-as recommendations-for-plan-development-to-the-Working Committee,~~ the 1986 Corps of Engineers Juvenile Fish Passage Plan, Fish Transport Guidelines and past bypass activities of the Committee on Fisheries Operations (COFO) will be given full consideration in developing the 1987 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. The fish and wildlife agencies and tribes have recently adopted juvenile fish bypass performance standards for mainstem dams on the Columbia and Snake rivers (enclosure #). Those standards established 70 percent and 50 percent fish guidance efficiency for spring and summer migrants respectively, as the minimum functional standards for juvenile fish passage facilities. The fishery agencies and tribes recommend that spills and powerhouse load reductions be utilized at facilities not otherwise attaining these minimum standards. ~~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.--Any-revisions-by the-Power-Planning-Council-to-the-standards-will-also-be considered-when-they-become-available.~~

5a. The parties agree that the 1987 Juvenile Fish Passage Plan will, at a minimum, meet the Power Planning Council's 90 percent survival standard. Any revisions by the Power Planning Council to the standards will also be considered when they became available. The parties also agree to accept the 70/50 standards recommended by the fishery agencies and tribes as the target for juvenile fish protection at each project, and to develop a sliding scale spill formula, based on anticipated runoff, that would lead to the attainment of these levels in most years but that would decrease protection down to the 90 percent survival level to "share the shortage" in critical water years.

6. In accordance with the Fish and Wildlife Program, the fish and wildlife agencies and tribes will prescribe the method for determining smolt survival and fish guidance efficiency ~~where-appropriate~~. Assumptions and criteria will be supported by best available knowledge and will be documented in the 1987 juvenile fish passage plan.

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 Monumental and Ice Harbor dams. During periods when the FTOT work plan specifies bypass operation at Lower Granite and Little Goose dams the plan may also provide for spill at these projects.

9. The juvenile fish passage plan will include estimates of the quantities of water necessary for spill to achieve both the ~~at-least~~ 90 percent survival and the 70/50 standards at each project.

PROCEDURE FOR
DEVELOPMENT OF A COORDINATED
INTERIM JUVENILE FISH PASSAGE PLAN
FOR CORPS OF ENGINEERS
PROJECTS

I. 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 (NPPC), 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 1986 Detailed Fishery Operating Plan (DFOP) prepared by the fishery agencies and tribes, the 1986 Corps of Engineers Juvenile Fish Passage Plan, the Transport Guidelines and other documents. Further, it will be based upon principles and guidelines summarized in Section VII below. The juvenile fish 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 stated in Section 1504, the Northwest Power Planning Council requests the Corps to develop and submit a plan to the Council by February 15 of each year.

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 planing 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 February 1, 1987 and a final draft plan by February 15, 1987.

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 1987:

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 criteria will be considered in the passage plan.

4. The 1987 plan is to be developed cooperatively by project operators, fish and wildlife agencies and tribal representatives. The fishery agency/tribes' 1986 Detailed Fisheries Operating Plan (DFOP), the 1986 Corps of Engineers Juvenile Fish Passage Plan, Fish Transport Guidelines and past bypass activities of the Committee on Fisheries Operations (COFO) will be given consideration in developing the 1987 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. The fish and wildlife agencies and tribes have recently adopted juvenile fish bypass performance standards for mainstem dams on the Columbia and Snake rivers. These standards establish 70 percent and 50 percent fish guidance efficiency for spring and summer migrants respectively, as the minimum functional standards for juvenile fish passage facilities. The fishery agencies and tribes recommend that spills and powerhouse load reductions be utilized at facilities not otherwise attaining these minimum standards.

6. The parties agree that the 1987 Juvenile Fish Passage Plan will, at a minimum, meet the Power Planning Council's 90 percent survival standard. Any revisions by the Power Planning Council to the standards will also be considered when they became available.

7. In accordance with the Fish and Wildlife Program, the fish and wildlife agencies and tribes will prescribe the method for determining smolt survival and fish guidance efficiency. Assumptions and criteria will be supported by best available knowledge and will be documented in the 1987 juvenile fish passage plan.

8. 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 1986 FTOT Guidelines will be updated for use in 1987. Detailed operating criteria for the 1987 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. Turbines are also screened at John Day and Bonneville Dams where juvenile fish are bypassed to the tailwater.

9. 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 Monumental and Ice Harbor dams.

10. 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.

11. The plan will be developed consistent with the provisions of the Regional Power Act requiring an economical, efficient, reliable and adequate power system. <u>As a minimum</u>, spill will be <u>provided</u> to levels necessary to achieve juvenile passage objectives.

12. 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.

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

14. 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 1987 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 Fish Passage 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
Upper Columbia United Tribes Fisheries Research Center

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

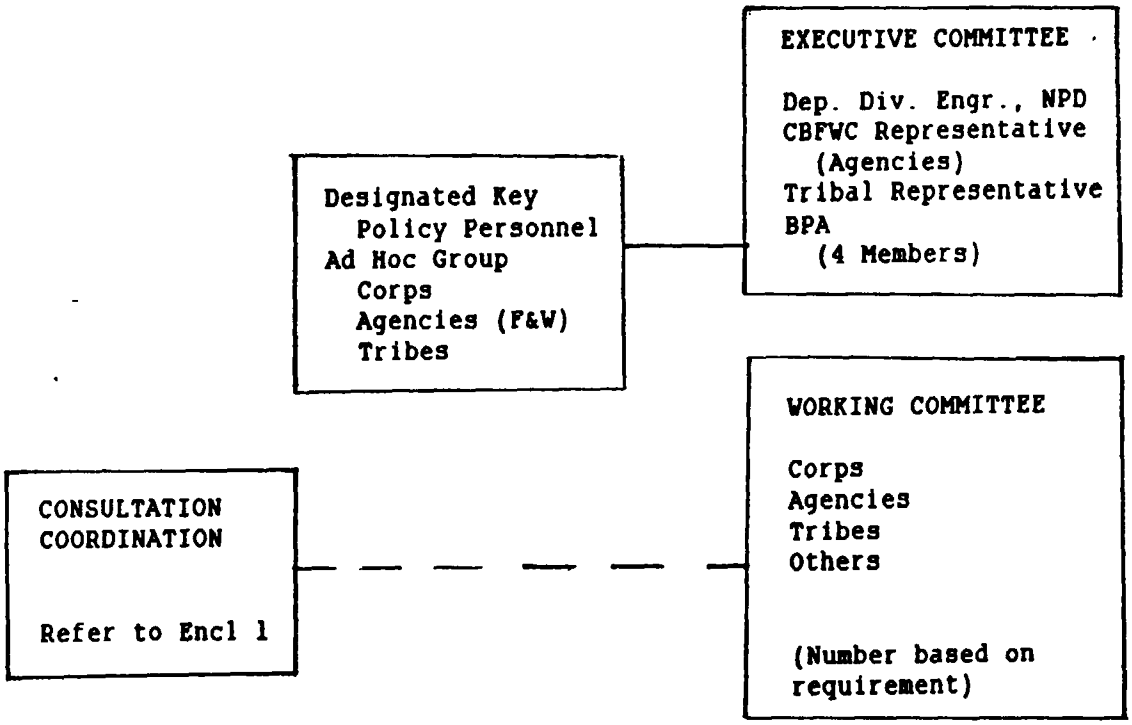
1987 INTERIM JUVENILE FISH PASSAGE PLAN

STEP 1	STEP 2	STEP 3
Corps solicits input for Procedure for Development of a Coordinated Interim Juvenile Fish Passage Plan from fishery agencies and tribes. Set date for first working committee meeting.	Fishery agencies and tribes develop and forward their recommendations for a Juvenile Fish Passage Plan, designate Executive Committee and Working Committee members. Begin Working Committee meeting.	Corps prepares a draft Juvenile Fish Passage Plan based upon the input from step 2 and the January volume - of - runoff forecast and issues draft plan to the operating agencies, fishery agencies and tribes for comment. Working Committee meetings held as required.
DUE DATE - 15 Nov 86	DUE DATE - 11 Dec 86	Due Date - 20 Jan 87

STEP 4	STEP 5
Operating agencies, fishery agencies, and tribes forward formal written comments to the Corps by 7 Feb 1987. Corps submits Juvenile Fish Passage Plan to Power Council by 15 Feb.	Corps implements Juvenile Fish Passage Plan.
DUE DATE - 15 Feb 87	DUE DATE - 1 Apr 87

Enclosure 2

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



Enclosure 3

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

January 13, 1987

Colonel James R. Fry, Deputy Division Commander
North Pacific Division, Corps of Engineers
P.O. Box 2870
Portland, OR 97208-2870

Dear ~~Colonel Fry~~: Jim

Enclosed please find our proposal for juvenile fish bypass performance standards for Columbia and Lower Snake river dams affecting anadromous fish. This proposal was jointly developed by ourselves and the Columbia River Inter-Tribal Fish Commission.

In response to your November 4, 1986 letter, this proposal was sent to Mr. Russ George on December 4, 1986, and was subsequently discussed at the working committee meeting on December 11, 1986. The purpose of this letter is to formalize our recommendation, made at the December 11 meeting, that the minimum functional criteria included in these standards be used as an objective for the Corps' 1987 Juvenile Fish Passage Plan (JFPP). Those criteria would mean attempting to divert 70 percent of spring migrants and 50 percent of summer migrants away from hydroelectric turbines at each Corps' dam in 1987.

As we indicated at the December 11 meeting, our recommendation is to supplement rather than replace the Northwest Power Planning Council's (NPPC) 90 percent survival standard. Therefore, we have proposed the development of a sliding-scale spill formula that would reduce juvenile fish protection down to the NPPC's 90 percent minimum under critical water conditions. The purpose of the sliding scale would be to share the surplus during good water conditions, share the shortage during poor water conditions, and eliminate impact on firm power other than that which the NPPC has already supported.

Thank you for your consideration.

Sincerely,

Jack

John R. Donaldson
Executive Secretary

Enclosure

cc: Tim Wapato, CRITFC
Janet McLennan, BPA
Robert Duncan, NPPC
Al Wright, PNUCC
Russ George, COE

Juvenile Fish Bypass Performance Standards for Mainstem Dams on the Columbia and Lower Snake Rivers

Bypass performance is to be assessed in terms of fish guidance efficiency which is a direct measure of the percentage of juvenile migrants diverted away from hydroelectric turbines and carried past a mainstem dam by an alternate passage route. Fish guidance efficiency is to be measured by fyke and dipnet capture within the turbine intake and gatewell or other diversion device or by hydroacoustic means with species composition determined by direct capture.

The desired design and operating standards are 80 percent guidance efficiency for yearling chinook, steelhead, and coho and 70 percent guidance efficiency for subyearling chinook. These standards are to be used as design objectives during facility development and testing. Alternatives are to be selected for testing and installation based on their ability to attain or exceed these levels of guidance. Existing facilities with lower levels of performance shall undergo continued evaluation and improvements until these standards are achieved.

Minimum functional standards are 70 percent guidance efficiency for yearling chinook, steelhead, and coho and 50 percent guidance efficiency for subyearling chinook. For practical purposes the yearling standard will apply during the spring migration (to

June 1) and the subyearling standard will apply during the summer migration.

The minimum standards are to be used to determine if existing facilities or test installations can be considered useable or worthy of further development rather than expedited replacement. Spills and powerhouse load reductions are to be utilized at passage facilities not otherwise attaining the minimum standards. Existing facilities will be allowed five years to improve guidance efficiency to meet desired operating standards so long as developmental studies are ongoing. Spills and powerhouse load reductions will then be utilized if the desired operating standards are not attained. It is envisioned that a sliding scale spill formula based on anticipated runoff will be utilized at projects requiring spills to attain the minimum standards (or, after five years, the operating standards) in critical water years in order to share the shortage among water users and purposes.

Sockeye are excluded from these standards pending further information on guidance and survival rates for this species.

The desired rate of injury or loss resulting from bypass facility operation is one percent or less above the background level of injury observed in fish arriving at the project. Three percent above background is considered as the maximum acceptable level.

Facilities exceeding this level require immediate evaluation and modification to eliminate causes of injury. A sampled fish would be classified as injured if it was descaled according to FTOT guidelines and/or had evidence of physical trauma; cuts, bruises, abrasions or eye injuries, which the biological sampler judges make survival of the individual unlikely. Facilities with injury or loss rates above one percent but less than three percent will be allowed five years to reduce the injury or loss level to one percent or less. If the project operator does not attain this level after five years, the project will be required to increase bypass or spill passage by the proportion necessary to increase powerhouse survival an amount equal to the uncorrected loss.

Distributed by Fishery Agencies and Tribes

at JFPP meeting on January 13, 1987

FISHERY AGENCIES AND TRIBES PROPOSAL FOR
SPILL CRITERIA AT LOWER MONUMENTAL DAM
January 13, 1987

For fish migrating from the Snake River system above Little Goose:

Spill from April 21 - June 1, inclusive, to protect approximately the middle 80% of the run. Additional days of spill may be provided if the shape of the outmigration deviates markedly from that of 1986.

For fish migrating from Lyons Ferry Hatchery:

Spill starts two days after Lyons Ferry releases. Spill continues until April 21 startup date for Snake River fish (to protect early April release of yearling chinook) or until August 15 (to protect June release of subyearling chinook) OR until no more marked fish from the respective releases are sampled from the Lower Monumental gatewell monitoring program.

Based on 1986 sampling, spill to protect 80% of the Lyons Ferry yearling chinook release was needed from April 8 - 29, and for the subyearling release, from June 16 - July 23.

1986 LOWER MONUMENTAL FISH PASSAGE DATA — LITTLE GOOSE

Date	Proportion Spill	Hydroac Counts	Cumulative Passage	Fish Index	Cumulativ Passage
25-Mar	0.35				
26-Mar	0.28				
27-Mar	0.26				
28-Mar	0.47				
29-Mar	0.79			2004	0.09
30-Mar	0.75			0	0.09
31-Mar	0.37			2861	0.22
01-Apr	0.39			2537	0.33
02-Apr	0.48			3105	0.47
03-Apr	0.42			4420	0.67
04-Apr	0.52			4978	0.89
05-Apr	0.56			3934	1.06
06-Apr	0.61			5609	1.32
07-Apr	0.42			7597	1.65
08-Apr	0.28			6510	1.95
09-Apr	0.23			2969	2.08
10-Apr	0.30			4072	2.26
11-Apr	0.31			4912	2.48
12-Apr	0.62			8651	2.87
13-Apr	0.51			17495	3.65
14-Apr	0.32			19542	4.52
15-Apr	0.39	7785	0.58	16612	5.26
16-Apr	0.33	17731	1.89	17084	6.03
17-Apr	0.30	18095	3.23	19455	6.89
18-Apr	0.27	18704	4.62	18635	7.73
19-Apr	0.26	20939	6.17	27055	8.94
20-Apr	0.30	23952	7.94	31570	10.35
21-Apr	0.31	28524	10.05	37643	12.03
22-Apr	0.23	23596	11.80	47862	14.17
23-Apr	0.39	38735	14.67	47584	16.29
24-Apr	0.38	41260	17.73	53603	18.69
25-Apr	0.39	19031	19.14	56951	21.23
26-Apr	0.41	28980	21.29	66460	24.20
27-Apr	0.38	43253	24.49	57918	26.79
28-Apr	0.29	42479	27.64	49982	29.02
29-Apr	0.29	28765	29.77	53112	31.39
30-Apr	0.20	41902	32.87	45197	33.41
01-May	0.26	31272	35.19	43923	35.37
02-May	0.20	28231	37.28	44036	37.34
03-May	0.23	27456	39.31	40762	39.16
04-May	0.24	34742	41.89	48733	41.34
05-May	0.22	39445	44.81	57646	43.91
06-May	0.34	30700	47.08	59893	46.59
07-May	0.28	32871	49.52	50584	48.85
08-May	0.25	29513	51.70	37274	50.51
09-May	0.37	41216	54.76	35813	52.11
10-May	0.42	28681	56.88	51650	54.42
11-May	0.65	22240	58.53	44435	56.41
12-May	0.31	29545	60.72	41977	58.28
13-May	0.29	17930	62.05	34983	59.84
14-May	0.27	16848	63.29	43666	61.79
15-May	0.34	25328	65.17	33901	63.31
16-May	0.25	20770	66.71	33238	64.79
17-May	0.33	20083	68.20	35605	66.38
18-May	0.61	22839	69.89	30681	67.75
19-May	0.23	21542	71.48	29782	69.09
20-May	0.22	28580	73.60	30862	70.46
21-May	0.34	23649	75.35	32801	71.93
22-May	0.35	15880	76.53	29751	73.26
23-May	0.39	19872	78.00	30925	74.64
24-May	0.58	16809	79.25	33787	76.15
25-May	0.59	19370	80.68	32487	77.60
26-May	0.60	17675	81.99	33975	79.12
27-May	0.43	21863	83.61	33729	80.62
28-May	0.59	19717	85.07	46052	82.68
29-May	0.52	16192	86.27	45388	84.71
30-May	0.58	20441	87.79	50320	86.96
31-May	0.67	23158	89.50	45740	89.00
01-Jun	0.67	10702	90.29	41542	90.86
02-Jun	0.66	11757	91.17	35821	92.46
03-Jun	0.51	9271	91.85	33559	93.96
04-Jun	0.53	6481	92.33	35668	95.55
05-Jun	0.41	4482	92.66	24855	96.66
06-Jun	0.37	4044	92.96	9853	97.10
07-Jun	0.36	4182	93.27	9680	97.53
08-Jun	0.28	4873	93.63	7465	97.87
09-Jun	0.31	6834	94.14	7155	98.19
10-Jun	0.39	4068	94.44	5966	98.45
11-Jun	0.39	29036	96.59	6340	98.74
12-Jun	0.43	18733	97.98	3645	98.90
13-Jun	0.49	16418	99.20	2776	99.02
14-Jun	0.48	6257	99.67	2241	99.12
15-Jun	0.50	4485	100.00	1573	99.19
16-Jun	0.31	---------		1724	99.27
17-Jun	0.23	SUM = 1349912		1968	99.36
18-Jun	0.21			1794	99.44
19-Jun	0.20			1386	99.50
20-Jun	0.19			1458	99.56
21-Jun	0.17			927	99.61
22-Jun	0.19			668	99.64
23-Jun	0.16			857	99.67
24-Jun	0.16			851	99.71
25-Jun	0.1[illegible]			779	99.75

Corps 1986 Proposed Spill Dates

Apr 20 – May 31
June 20 – July 15

1986
LMN Gatewell Counts

	10% Passage	90%
Stlh	Apr 29	Jun 4
Ch 1's	Apr 9	May 22
Ch 0's	Jun 14	July 3
Lyons Ferry:		
ch 1's	Apr 8	Apr 29
ch 0's	Jun 16 (or 12)	July 23
Stlh	Apr 24	May 13

DRAFT January 13, 1987

JOHN DAY DAM

Fish guidance efficiency was evaluated in 1985 and 1986 at John Day Dam. Results were as follows:

	FGE(%)	Test Dates
Chinook, yearling	72 ± 6.0	May 14-20, 1985
Chinook subyearling	21 ± 7.8	July 15-17, 1985
	34.2	June 17-26, 1986
	46.4	July 14-17, 1986
	24.6	July 21-24, 1986
Steelhead	86 ± 5.5	May 14-20, 1985
Sockeye	41 ± 16.2	May 14-20, 1985

Due to the low FGE for chinook subyearlings, the Corps has determined that they must spill during the summer migration in order to meet the 90 percent survival standard required by the Fish and Wildlife Program.

The criteria for summer spill at John Day Dam in 1987 follow:

1. <u>Typical dates of passage</u>

For pre-season planning purposes the period estimated to encompass 80 percent of the typical summer migration at John Day Dam is 8 June to 22 August.

This estimate is based on a review of the unit 3 gatewell data for 1981-86. With the installation of a submersible traveling screen in unit 3 in 1985, actual numbers for 1985 and 1986 are not directly comparable to earlier years. However, to the extent that the sampling period was the same each year, the distributions of captured fish over each of the seasons can be compared.

Figure 1 is a plot of cumulative distributions for each of the six years. Note that the date on which the 10th percentile is met varies from 26 April to 12 July. However, in two of those years (1981 and 1982) there were large April releases of tule stock fall chinook into Rock Creek (1981) and the lower Umatilla River (1982). Similarly timed releases are not expected in 1987. Therefore, the data from these years was not included. The reason for the late timing in 1985 is less clear. The airlift needed some testing, adjustment and modification to compensate for the effects of the STS on conditions in the gatewell but these were resolved by mid-May and, therefore, should not have significantly affected the summer migrant index.

Figure 2 shows the shape of the subyearling chinook outmigration at John Day Dam in 1983-86. Except in 1985, these data show two distinct peaks. It is believed that the June peak is a result of hatchery releases between John Day and McNary, while the July/August peak represents wild and other fish migrating from above McNary Dam (personal communication, Rich Johnson, NMFS). It appears that in 1985 the hatchery fish released in May and June either delayed until July, or failed to migrate altogether.

As part of the "Comprehensive plan for the Rehabilitation of Anadromous Fish stocks in the Umatilla River Basin", the ODFW annually plants subyearling upriver bright fall chinook salmon into that basin. Annual releases have ranged between 1.0 and 3.2 million fish in recent years. Releases started on June 18 and June 17 in 1984 and 1985 respectively. In an effort to take advantage of more favorable water conditions in the Umatilla River earlier in the season, ODFW is attempting to accelerate the growth of these fish to allow earlier release. In 1986, the release began on June 9. In 1987, ODFW expects to release 1.5 to 2.0 million fish on approximately June 1 (personal communication Mike Stratton, ODFW).

As part of its ongoing, BPA-funded studies, the USFWS also releases subyearling upriver bright fall chinook salmon in Rock Creek and in Social Security Ponds. These releases have been in excess of 0.5 million fish per year and have occurred between mid-May and mid-June.

Actual dates for passage of the 10th and 90th percentile of the subyearling chinook at John Day Dam since 1983 are as follows:

	10%	90 %	Number of Days
1983	13 June	22 August	71
1984	12 June	19 August	69
1985	12 July	5 August	25
1986	8 June	24 August	78

In view of the earlier release of hatchery fish into the Umatilla River that is projected by the ODFW, we recommend that 8 June be treated as the projected date for the 10th percentile but that hydroacoustic monitoring be initiated no later than June 1. With respect to the projected date for passage of the 90th percentile, we recommend 22 August, as it represents the average of 1983, 1984 and 1986.

2. Spill Triggers

We recommend that the Corps continue its program of hydroacoustic monitoring at John Day Dam in 1987. Monitoring should begin no later than June 1 and should continue through the end of August. The spill trigger should be 30,000 fish based on hydroacoustic monitoring.

In the absence of hydroacoustic data between June 1 and August 31, the fishery agencies and tribes will request spill based on known releases of hatchery fish above John Day Dam and on smolt monitoring data from McNary and John Day dams. A review of the John Day airlift index data for 1986 (i.e. number of fish captured in the unit 3 gatewells divided by the percent of project flow passing through unit 3) indicates that over 80 percent of the subyearling chinook passed John Day on days in which their index number exceeded 7,500 fish (see Figure 3).

3. Hours of Spill

Figure 4 shows the percentage of subyearling chinook passing during spill hours as a function of hours spilled in 1986. It is apparent from these data that the FISHPASS assumption of 12 hours of spill per day is not being met in practice. Figure 5 shows these same data compared to the FISHPASS assumption that 82.5 percent of the fish pass during spill.

Based on Figures 4 and 5 and on the FGE data presented on page 1, we recommend that the amount of spill needed at John Day Dam be recalculated using the following assumptions:

1. Spill from 2100-0600 hours
2. 70 percent of the fish pass between 2100-0600 hours
3. FGE = 30 percent

FIGURE 1

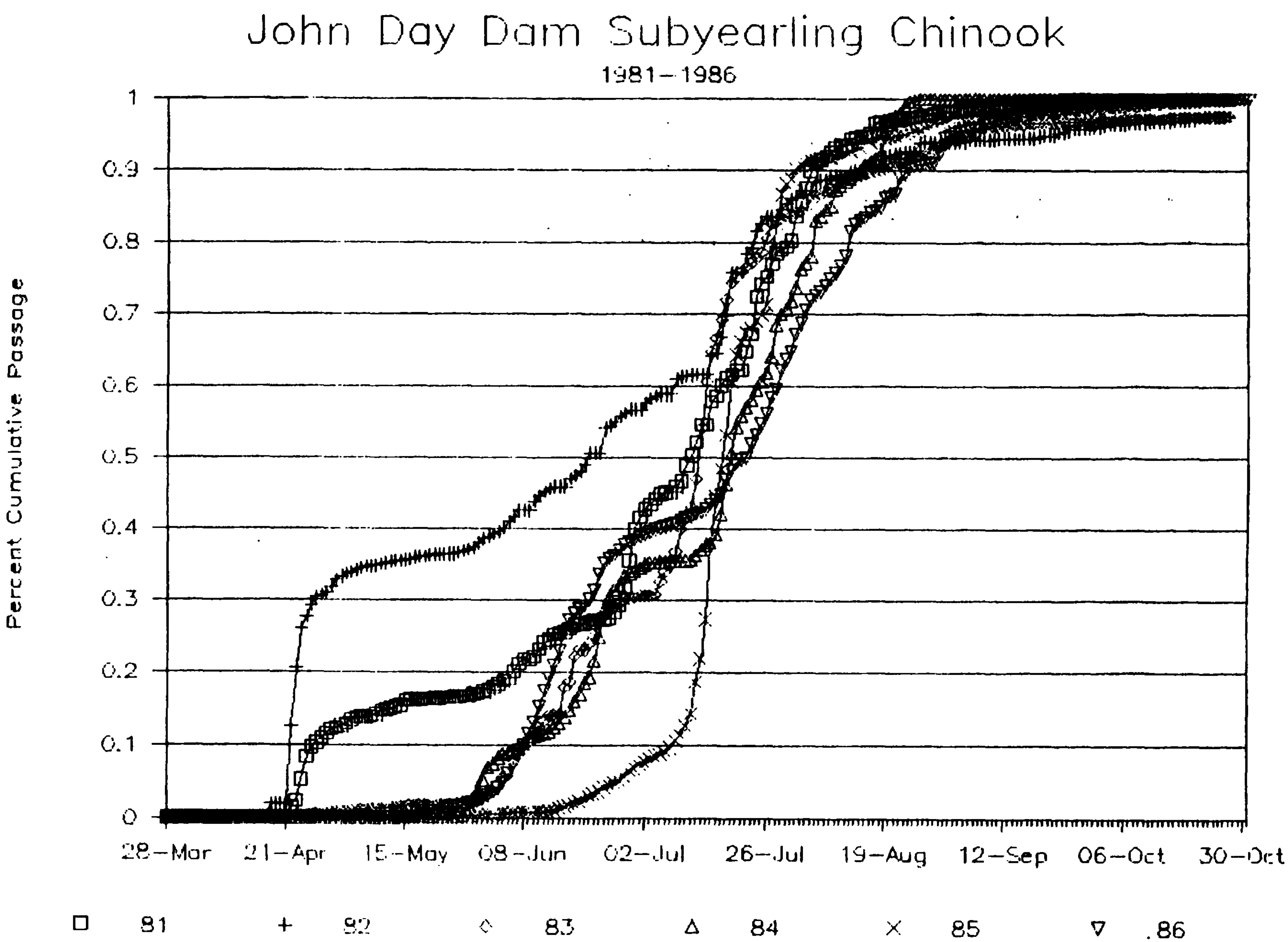

John Day Dam Subyearling Chinook
1981–1986
Percent Cumulative Passage
1
0.9
0.8
0.7
0.6
0.5
0.4
0.3
0.2
0.1
0
28–Mar
21–Apr
15–May
08–Jun
02–Jul
26–Jul
19–Aug
12–Sep
06–Oct
30–Oct
□ 81
+ 82
◇ 83
△ 84
× 85
▽ 86

FIGURE 2

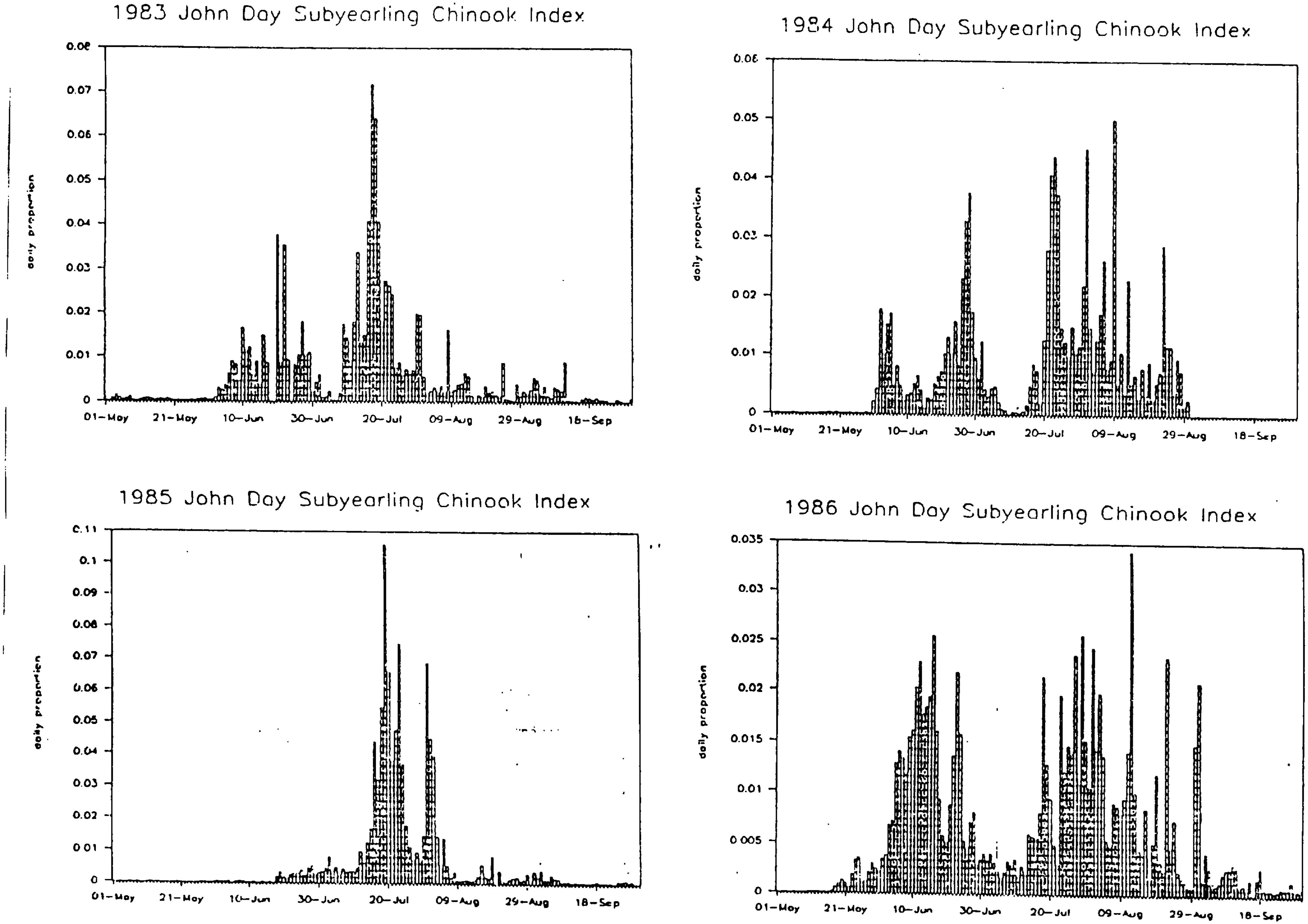
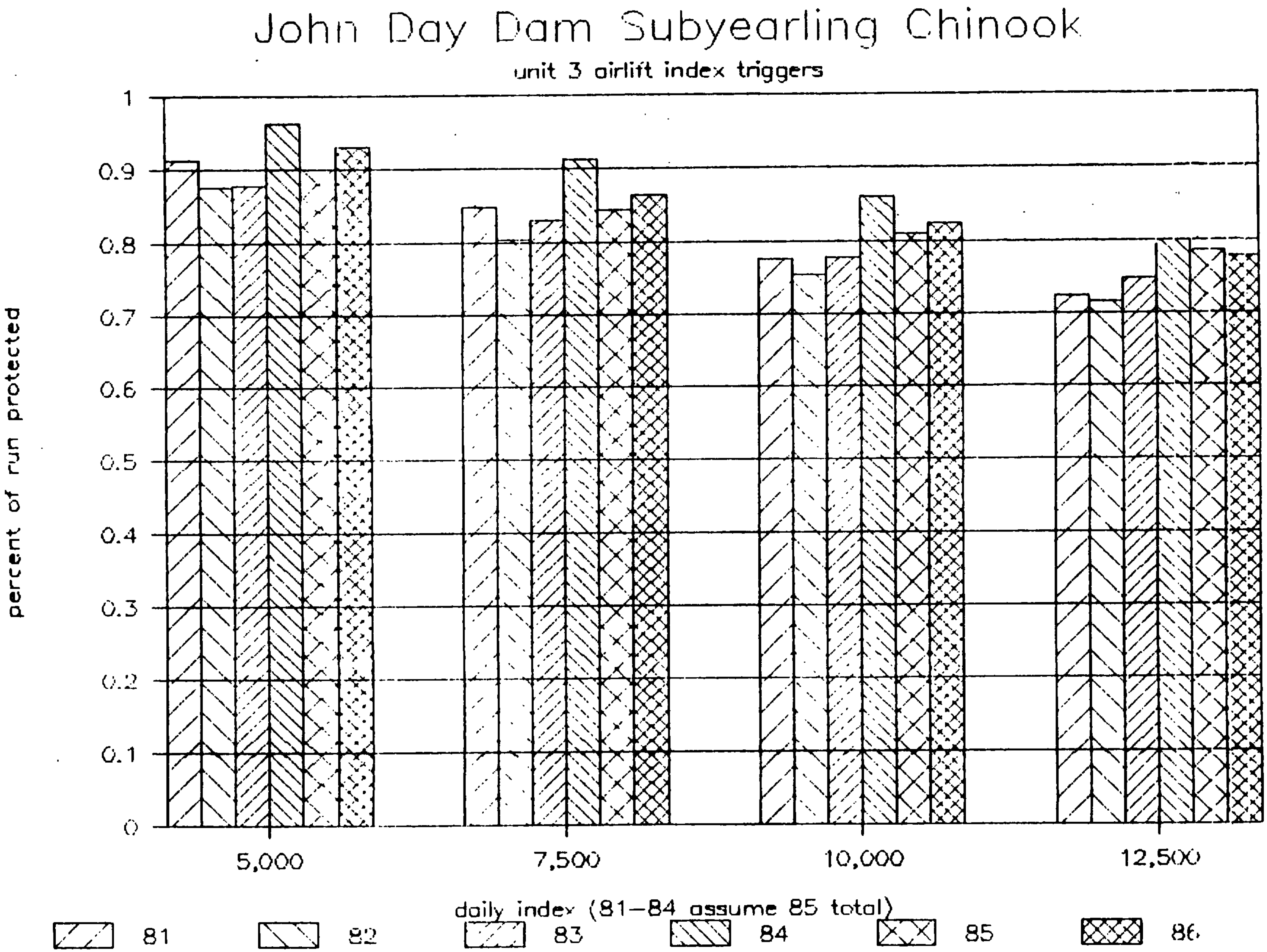

1983 John Day Subyearling Chinook Index
daily proportion
0.08
0.07
0.06
0.05
0.04
0.03
0.02
0.01
0
01-May
21-May
10-Jun
30-Jun
20-Jul
09-Aug
29-Aug
18-Sep
1984 John Day Subyearling Chinook Index
daily proportion
0.06
0.05
0.04
0.03
0.02
0.01
0
01-May
21-May
10-Jun
30-Jun
20-Jul
09-Aug
29-Aug
18-Sep
1985 John Day Subyearling Chinook Index
daily proportion
0.11
0.1
0.09
0.08
0.07
0.06
0.05
0.04
0.03
0.02
0.01
0
01-May
21-May
10-Jun
30-Jun
20-Jul
09-Aug
29-Aug
18-Sep
1986 John Day Subyearling Chinook Index
daily proportion
0.035
0.03
0.025
0.02
0.015
0.01
0.005
0
01-May
21-May
10-Jun
30-Jun
20-Jul
09-Aug
29-Aug
18-Sep

FIGURE 3.



John Day Dam Subyearling Chinook
unit 3 airlift index triggers
percent of run protected
1
0.9
0.8
0.7
0.6
0.5
0.4
0.3
0.2
0.1
0
5,000
7,500
10,000
12,500
daily index (81–84 assume 85 total)
81
82
83
84
85
86

FIGURE 4

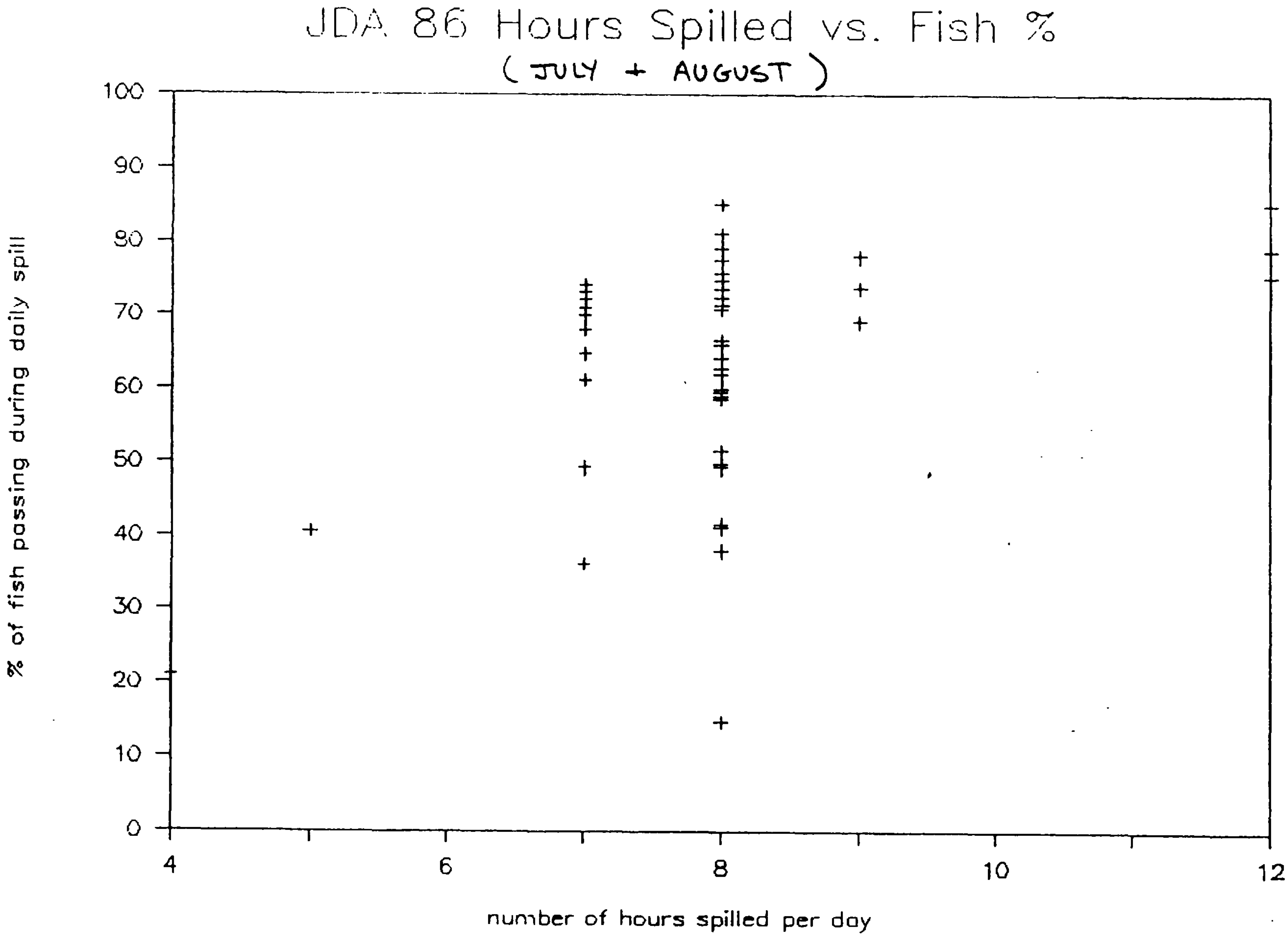
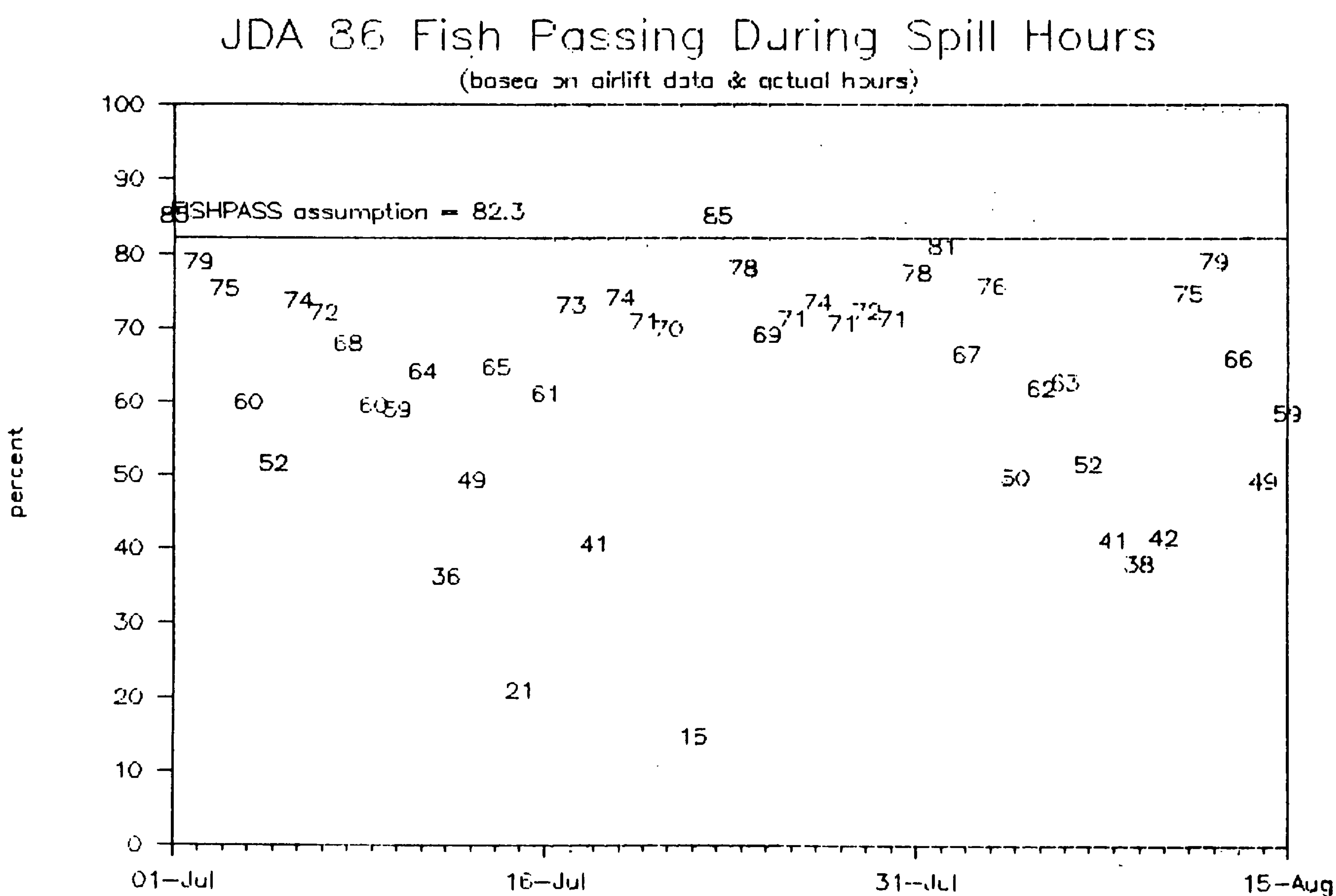
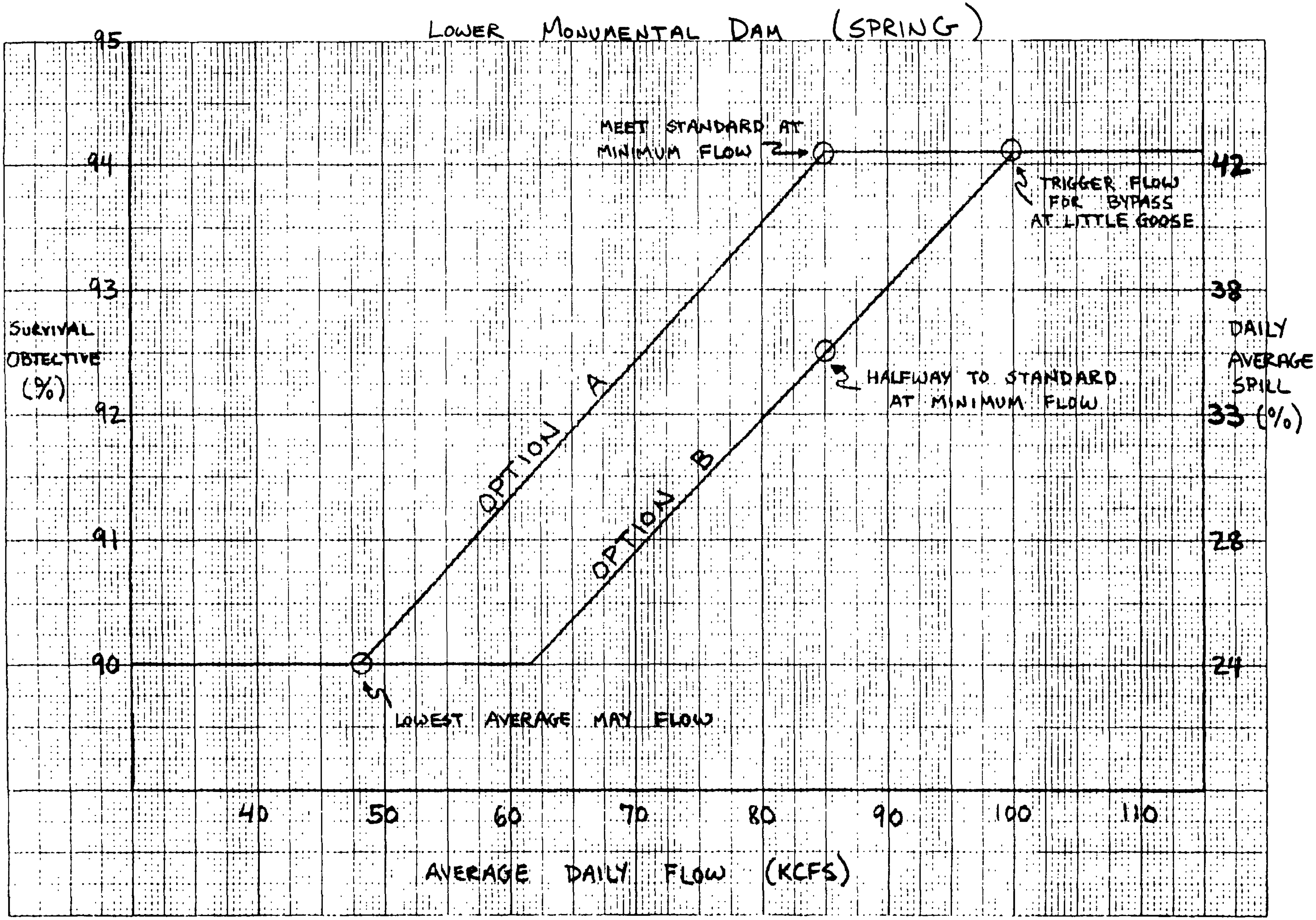

JDA 86 Hours Spilled vs. Fish %
(JULY + AUGUST)
% of fish passing during daily spill
100
90
80
70
60
50
40
30
20
10
0
4
6
8
10
12
number of hours spilled per day

FIGURE 5


JDA 86 Fish Passing During Spill Hours
(based on airlift data & actual hours)
FISHPASS assumption = 82.3
percent
01-Jul
16-Jul
31-Jul
15-Aug

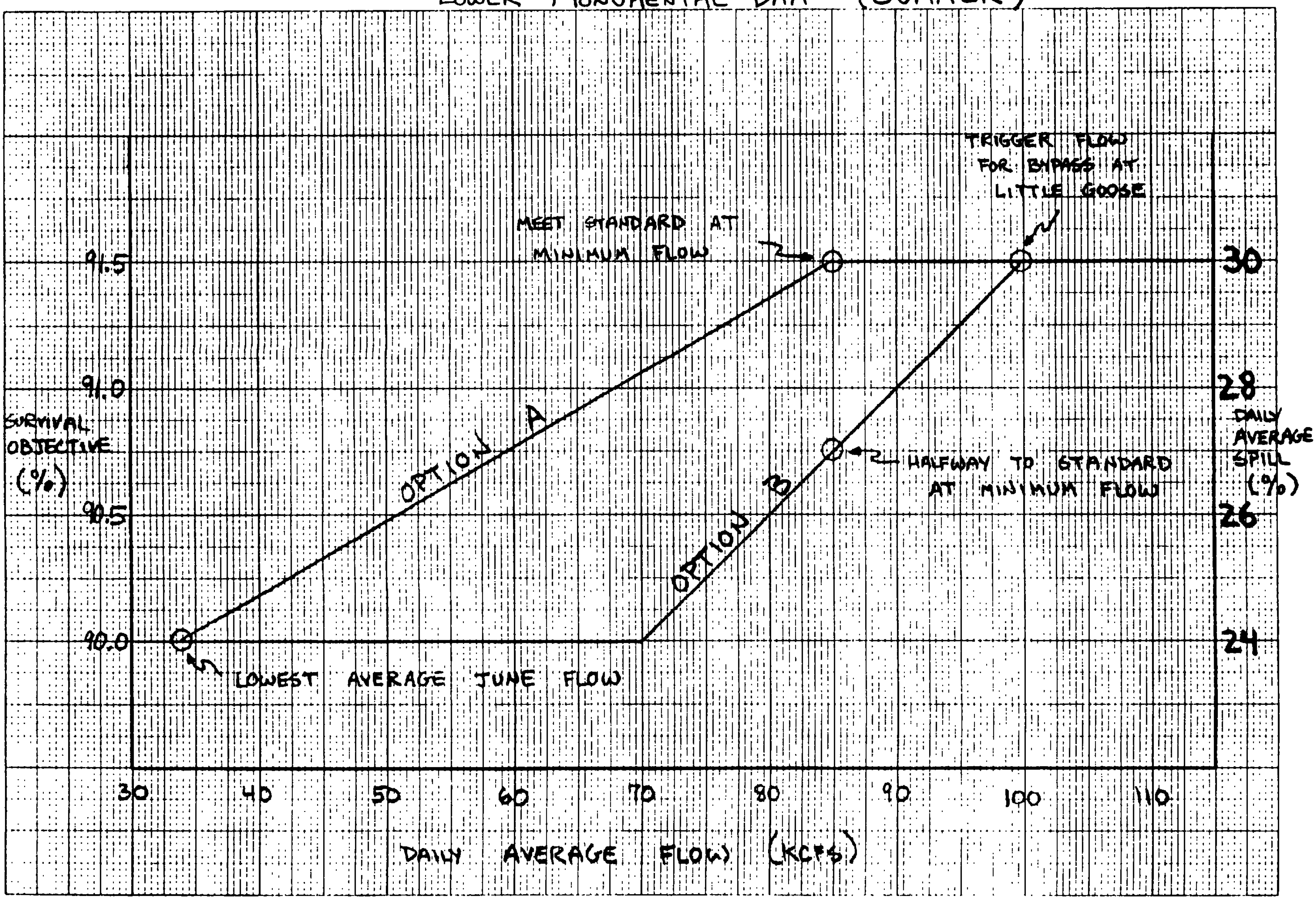


LOWER MONUMENTAL DAM (SPRING)
MEET STANDARD AT MINIMUM FLOW
TRIGGER FLOW FOR BYPASS AT LITTLE GOOSE
SURVIVAL OBJECTIVE (%)
DAILY AVERAGE SPILL (%)
OPTION A
OPTION B
HALFWAY TO STANDARD AT MINIMUM FLOW
LOWEST AVERAGE MAY FLOW
95
94
93
92
91
90
42
38
33
28
24
40
50
60
70
80
90
100
110
AVERAGE DAILY FLOW (KCFS)

NO. 340R-20 DIETZGEN GRAPH PAPER
20 X 20 PER INCH

DIETZGEN CORPORATION
MADE IN U.S.A.

LOWER MONUMENTAL DAM (SUMMER)



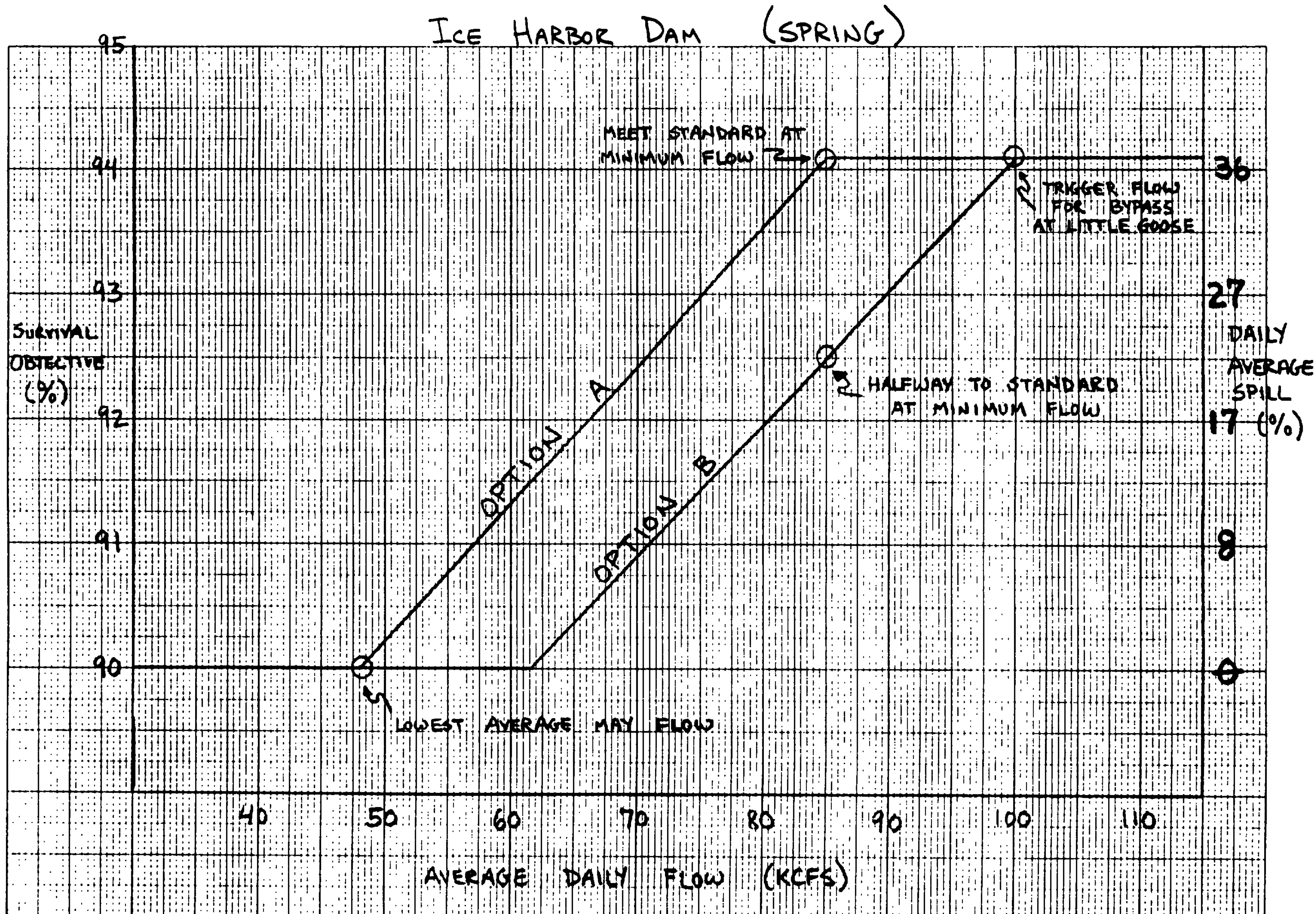
Lower Monumental Dam

Fish Passage Efficiency	Instantaneous Spill Rate	Daily Average Spill Rate	Estimated Survival
0.300	0.365	0.182	0.889
0.310	0.377	0.188	0.890
0.320	0.389	0.194	0.892
0.330	0.401	0.200	0.893
0.340	0.413	0.207	0.894
0.350	0.425	0.213	0.896
0.360	0.437	0.219	0.897
0.370	0.450	0.225	0.898
0.380	0.462	0.231	0.899
0.390	0.474	0.237	0.901
0.400	0.486	0.243	0.902
0.410	0.498	0.249	0.903
0.420	0.510	0.255	0.905
0.430	0.522	0.261	0.906
0.440	0.535	0.267	0.907
0.450	0.547	0.273	0.909
0.460	0.559	0.279	0.910
0.470	0.571	0.286	0.911
0.480	0.583	0.292	0.912
0.490	0.595	0.298	0.914
0.500	0.608	0.304	0.915
0.510	0.620	0.310	0.916
0.520	0.632	0.316	0.918
0.530	0.644	0.322	0.919
0.540	0.656	0.328	0.920
0.550	0.669	0.334	0.922
0.560	0.680	0.340	0.923
0.570	0.693	0.346	0.924
0.580	0.705	0.352	0.925
0.590	0.717	0.359	0.927
0.600	0.729	0.365	0.928
0.610	0.741	0.371	0.929
0.620	0.753	0.377	0.931
0.630	0.765	0.383	0.932
0.640	0.778	0.389	0.933
0.650	0.790	0.395	0.935
0.660	0.802	0.401	0.936
0.670	0.814	0.407	0.937
0.680	0.826	0.413	0.939
0.690	0.838	0.419	0.940
0.700	[illegible]	0.425	[illegible]
0.710	[illegible]	[illegible]	0.942
0.720	0.875	0.437	0.944
0.730	0.887	0.443	0.945
0.740	0.899	0.450	0.946
0.750	0.911	0.456	0.948
0.760	0.923	0.462	0.949
0.770	0.935	0.468	0.950
0.780	0.948	0.474	0.951
0.790	0.960	0.480	0.953
0.800	0.972	0.486	0.954

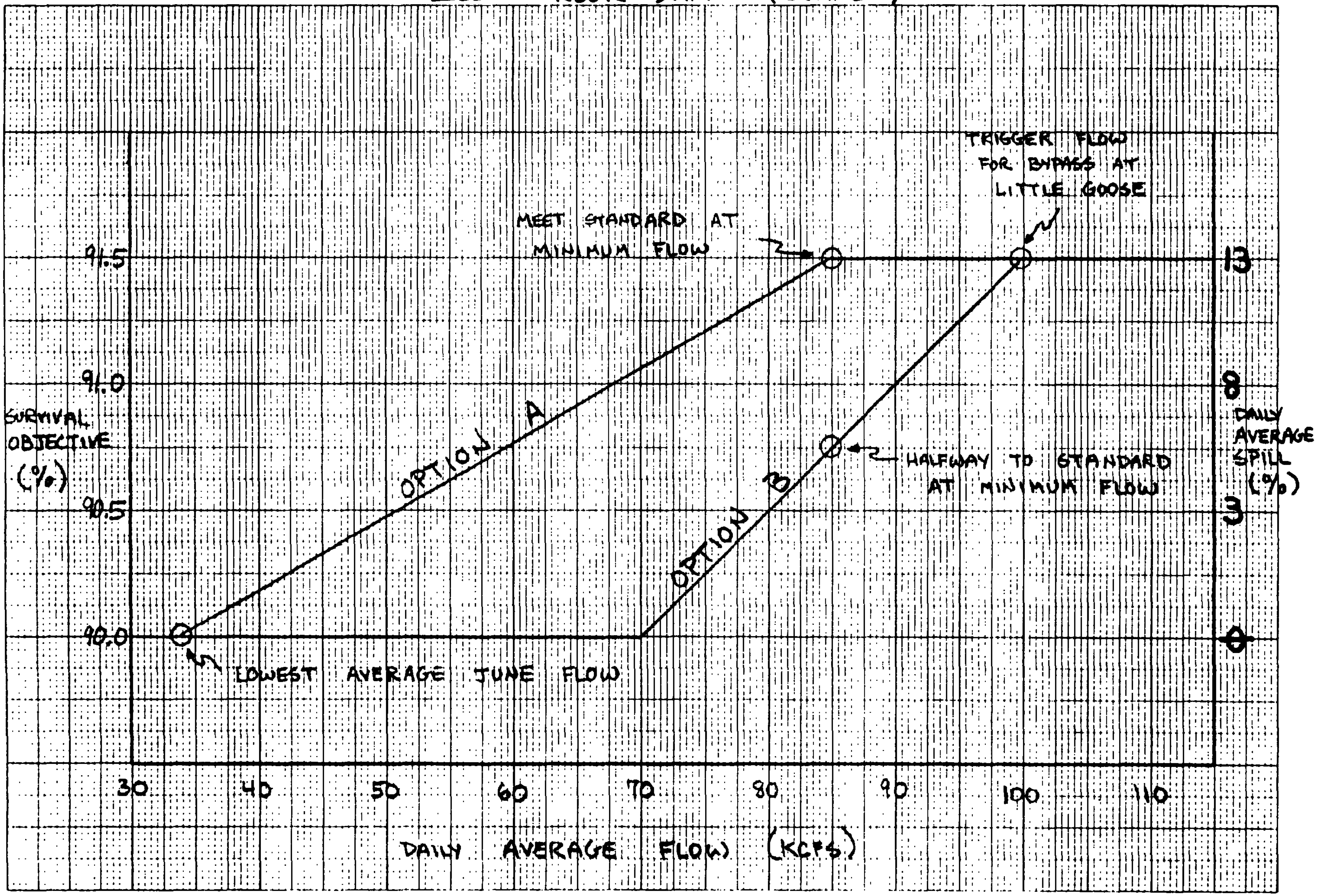
Assumes 1:1 spill efficiency, 12 hours of spill per day, 80.2 percent of fish passing during spill hours, 98 percent spillway survival, and 85 percent turbine survival.

NO. 340R-20 DIETZGEN GRAPH PAPER 20 X 20 PER INCH

DIETZGEN CORPORATION MADE IN U.S.A.



ICE HARBOR DAM (SUMMER)



Ice Harbor Dam

Fish Passage Efficiency	Instantaneous Spill Rate	Daily Average Spill Rate	Estimated Survival
0.400	0.000	0.000	0.902
0.404	0.010	0.005	0.903
0.408	0.020	0.010	0.903
0.412	0.030	0.015	0.904
0.416	0.040	0.020	0.904
0.420	0.050	0.025	0.905
0.424	0.060	0.030	0.905
0.428	0.070	0.035	0.906
0.432	0.080	0.040	0.906
0.436	0.090	0.045	0.907
0.440	0.100	0.050	0.907
0.444	0.110	0.055	0.908
0.448	0.120	0.060	0.908
0.451	0.130	0.065	0.909
0.455	0.140	0.070	0.909
0.459	0.150	0.075	0.910
0.463	0.160	0.080	0.910
0.467	0.170	0.085	0.911
0.471	0.180	0.090	0.911
0.475	0.190	0.095	0.912
0.479	0.200	0.100	0.912
0.483	0.210	0.105	0.913
0.487	0.220	0.110	0.913
0.491	0.230	0.115	0.914
0.495	0.240	0.120	0.914
0.499	0.250	0.125	0.915
0.503	0.260	0.130	0.915
0.507	0.270	0.135	0.916
0.511	0.280	0.140	0.916
0.515	0.290	0.145	0.917
0.519	0.300	0.150	0.917
0.523	0.310	0.155	0.918
0.527	0.320	0.160	0.918
0.531	0.330	0.165	0.919
0.535	0.340	0.170	0.920
0.539	0.350	0.175	0.920
0.543	0.360	0.180	0.921
0.547	0.370	0.185	0.921
0.550	0.380	0.190	0.922
0.554	0.390	0.195	0.922
0.558	0.400	0.200	0.923
0.562	0.410	0.205	0.923
0.566	0.420	0.210	0.924
0.570	0.430	0.215	0.924
0.574	0.440	0.220	0.925
0.578	0.450	0.225	0.925
0.582	0.460	0.230	0.925
0.586	0.470	0.235	0.926
0.590	0.480	0.240	0.927
0.594	0.490	0.245	0.927
0.599	0.500	0.250	0.928
0.603	0.510	0.255	0.928
0.606	0.520	0.260	0.929
0.610	0.530	0.265	0.929

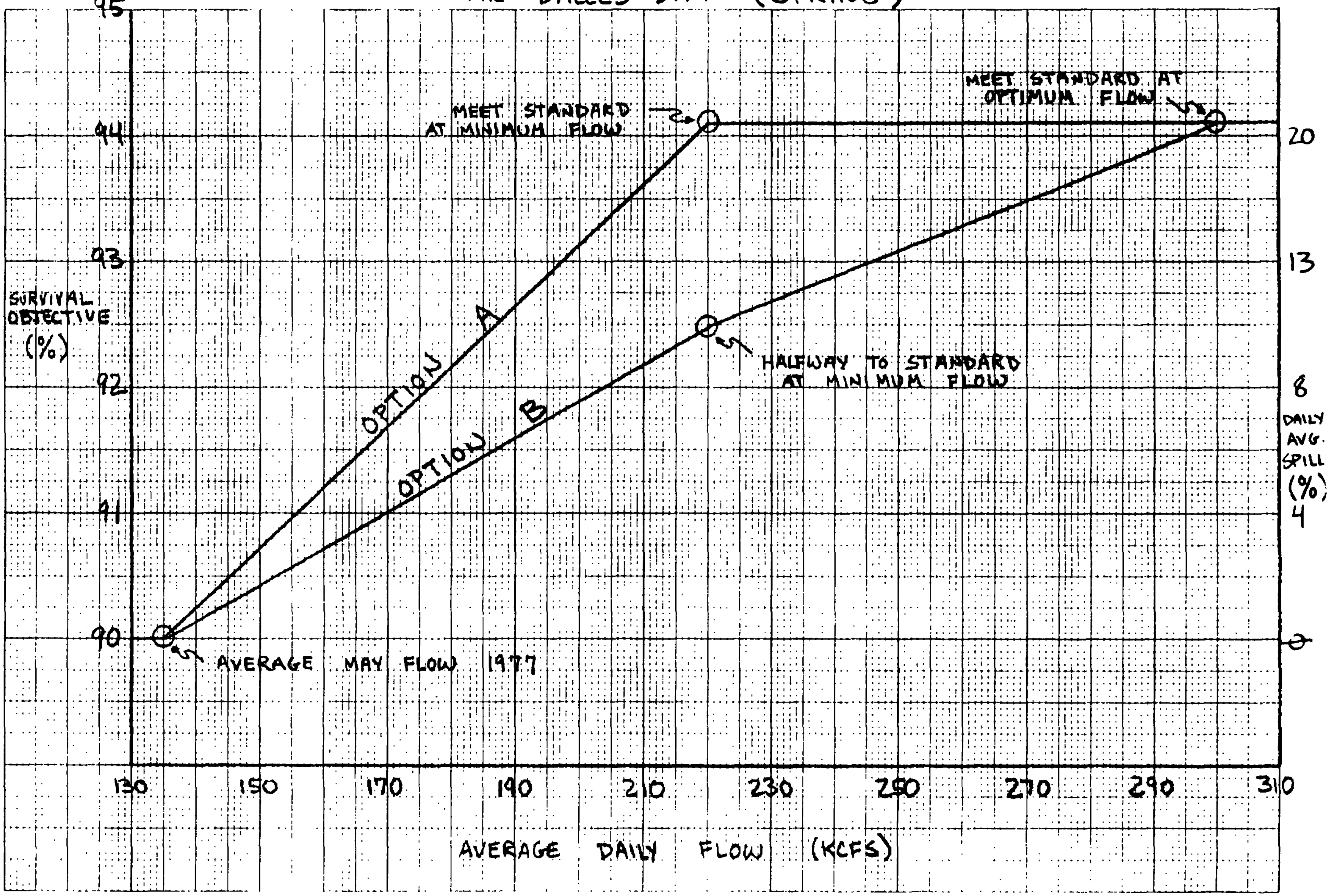
Ice Harbor Dam

Fish Passage Efficiency	Instantaneous Spill Rate	Daily Average Spill Rate	Estimated Survival
0.614	0.540	0.270	0.930
0.618	0.550	0.275	0.930
0.622	0.560	0.280	0.931
0.626	0.570	0.285	0.931
0.630	0.580	0.290	0.932
0.634	0.590	0.295	0.932
0.638	0.600	0.300	0.933
0.642	0.610	0.305	0.933
0.646	0.620	0.310	0.934
0.649	0.630	0.315	0.934
0.653	0.640	0.320	0.935
0.657	0.650	0.325	0.935
0.661	0.660	0.330	0.936
0.665	0.670	0.335	0.936
0.669	0.680	0.340	0.937
0.673	0.690	0.345	0.937
0.677	0.700	0.350	0.938
0.681	0.710	0.355	0.938
0.685	0.720	0.360	0.939
0.689	0.730	0.365	0.940
0.693	0.740	0.370	0.940
0.697	0.750	0.375	0.941
0.701	0.760	0.380	0.941
0.705	0.770	0.385	0.942
0.709	0.780	0.390	0.942
0.713	0.790	0.395	0.943
0.717	0.800	0.400	0.943

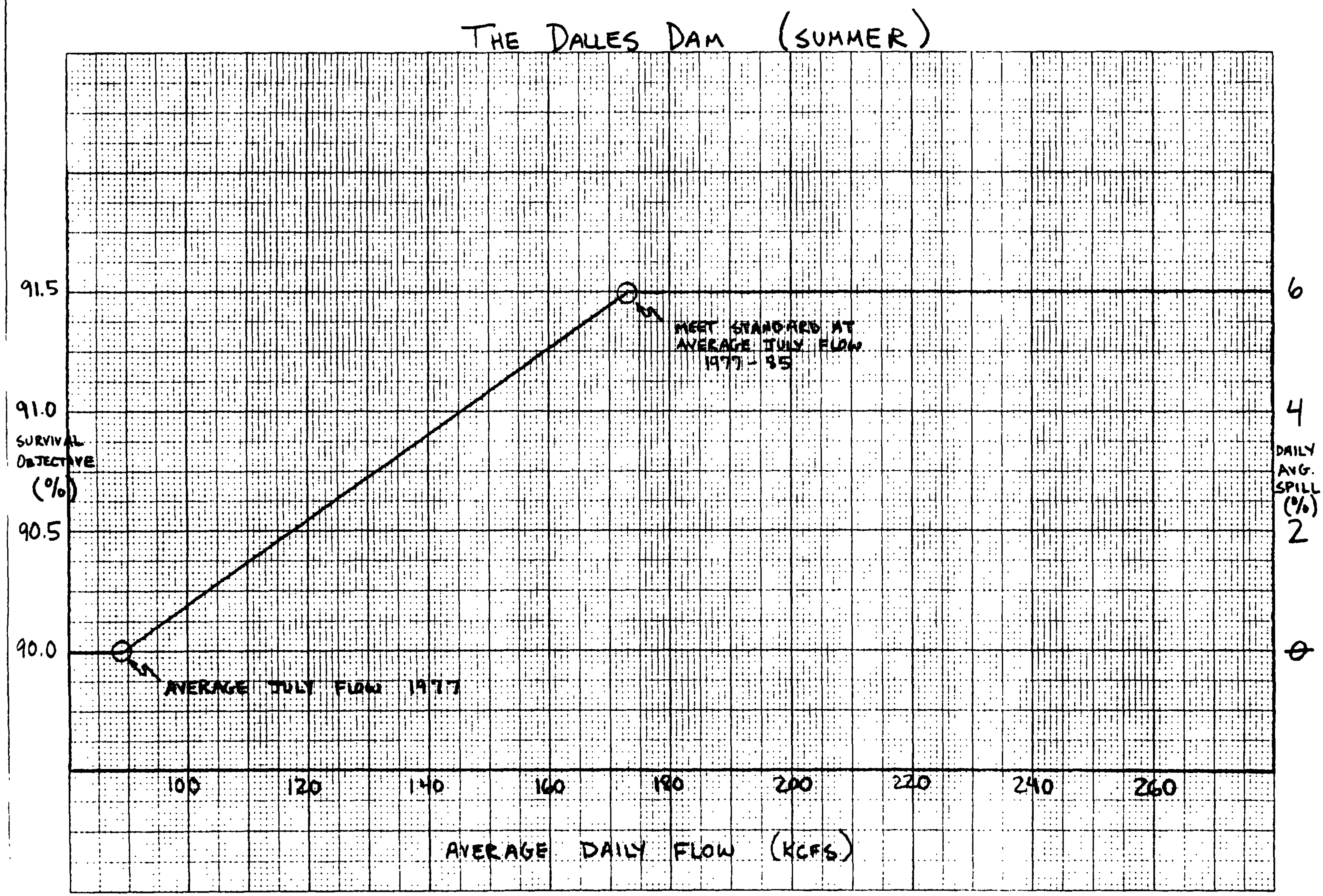
Assumes 1:1 spill efficiency, 12 hours of spill per day, 55 percent of fish passing during spill hours, 98 percent spillway and sluiceway survival and 85 percent turbine survival

DIETZGEN GRAPH PAPER 20 X 20 PER INCH DIETZGEN CORPORATION MADE IN U.S.A.

THE DALLES DAM (SPRING)



20 X 20 PER INCH



The Dalles Dam

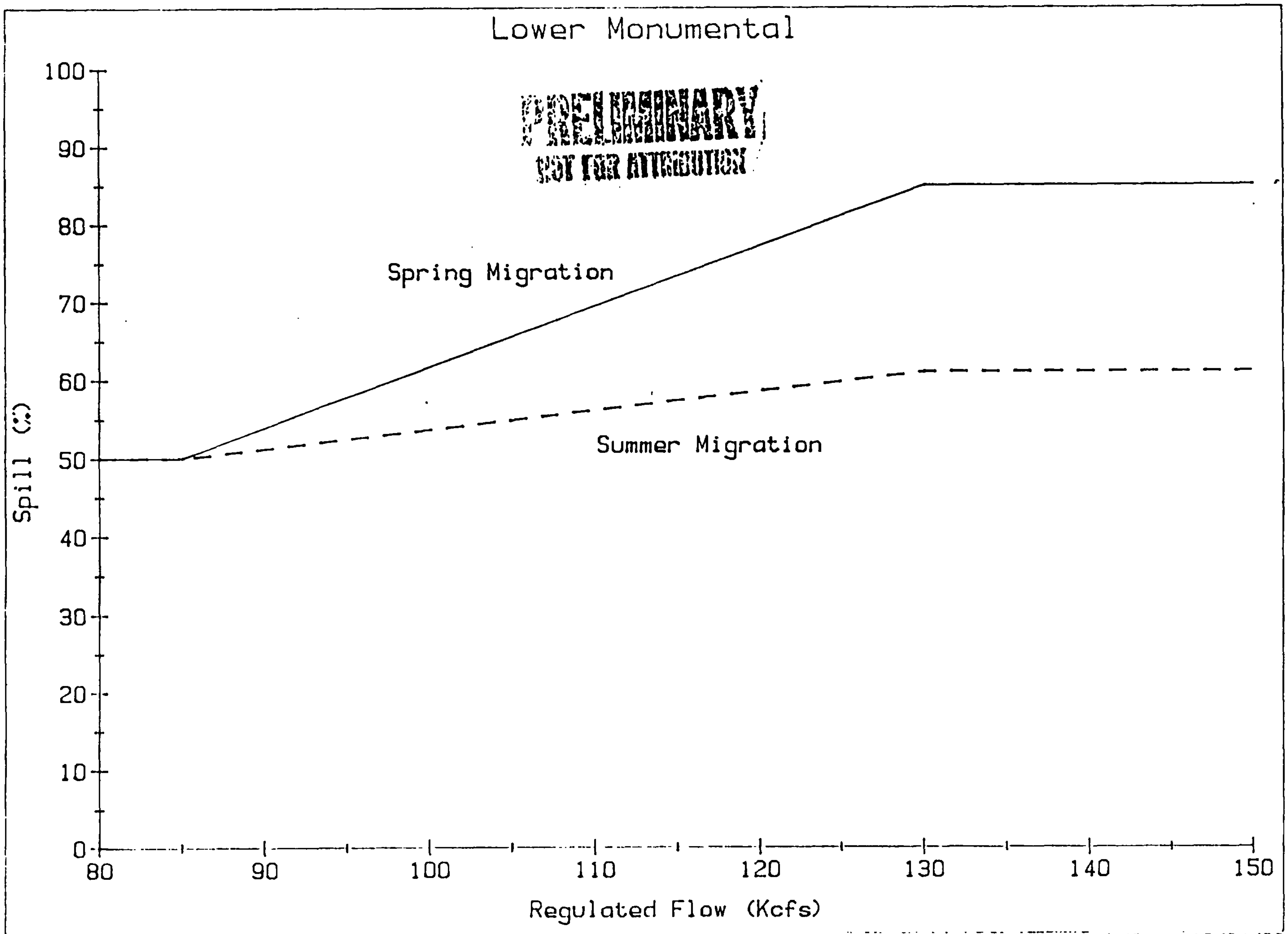
Daily Average Spill Rate	Sluiceway Efficiency	Spill Efficiency	Combined Passage Efficiency	Estimated Survival
0.00	0.406	0.000	0.406	0.903
0.01	0.392	0.020	0.412	0.904
0.02	0.379	0.053	0.432	0.906
0.03	0.366	0.086	0.451	0.909
0.04	0.353	0.117	0.470	0.911
0.05	0.341	0.147	0.488	0.913
0.06	0.329	0.176	0.506	0.916
0.07	0.318	0.204	0.523	0.918
0.08	0.307	0.232	0.539	0.920
0.09	0.297	0.258	0.555	0.922
0.10	0.287	0.283	0.57[illegible]	0.924
0.11	0.277	0.308	0.585	0.926
0.12	0.267	0.331	0.599	0.928
0.13	0.258	0.354	0.613	0.930
0.14	0.249	0.376	0.626	0.931
0.15	0.241	0.399	0.639	0.933
0.16	0.233	0.418	0.651	0.935
0.17	0.225	0.438	0.663	0.936
0.18	0.217	0.457	0.674	0.938
0.19	0.210	0.476	0.686	0.939
0.20	0.202	0.494	0.696	0.941
0.21	0.195	0.511	0.707	0.942
0.22	0.189	0.528	0.717	0.943
0.23	0.182	0.544	0.726	0.944
0.24	0.176	0.560	0.736	0.946
0.25	0.170	0.575	0.745	0.947
0.26	0.164	0.589	0.754	0.948
0.27	0.159	0.603	0.762	0.949
0.28	0.153	0.617	0.77[illegible]	0.950
0.29	0.148	0.630	0.77[illegible]	0.951
0.30	0.143	0.643	0.78[illegible]	0.952
0.31	0.138	0.655	0.79[illegible]	0.953
0.32	0.133	0.667	0.800	0.954

Based on functional relationship developed by ODFW and described in the Detailed Fisheries Operating Plan.

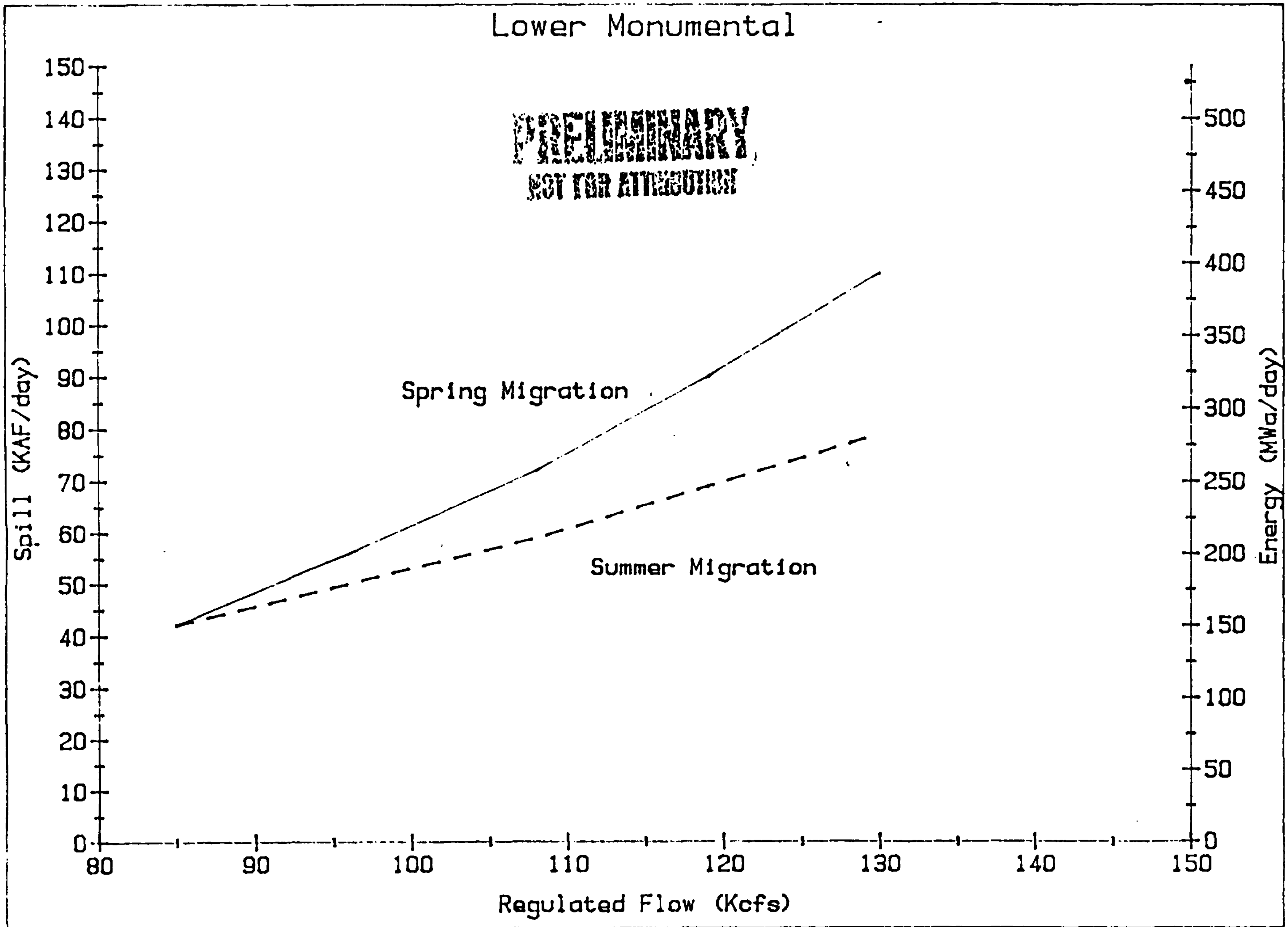
Assumes 98 percent sluiceway and spillway survival and 85 percent turbine survival.

Distributed by PNUCC

at JFPP meeting on January 13, 1987

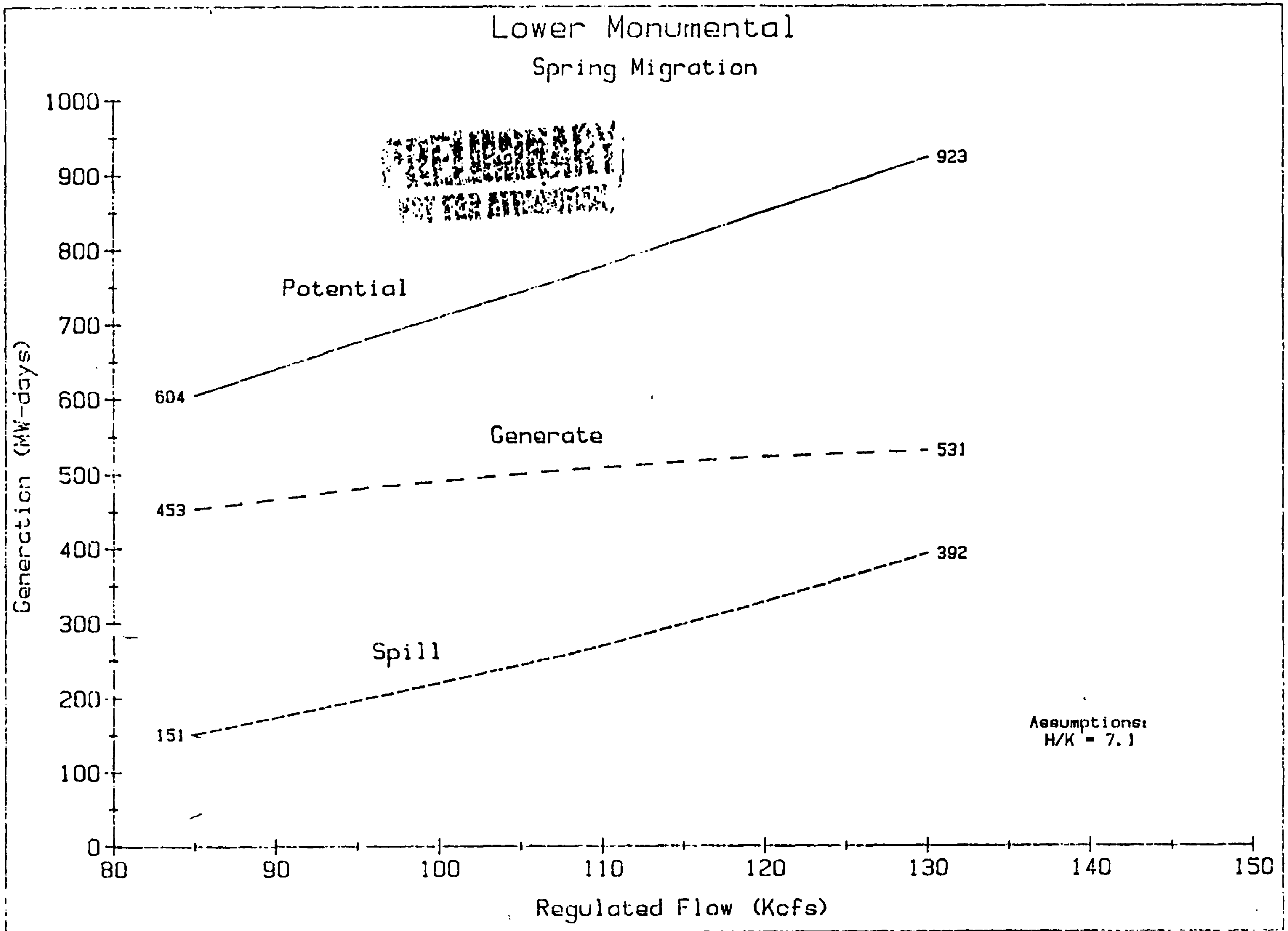


LMOspr 12/24/86

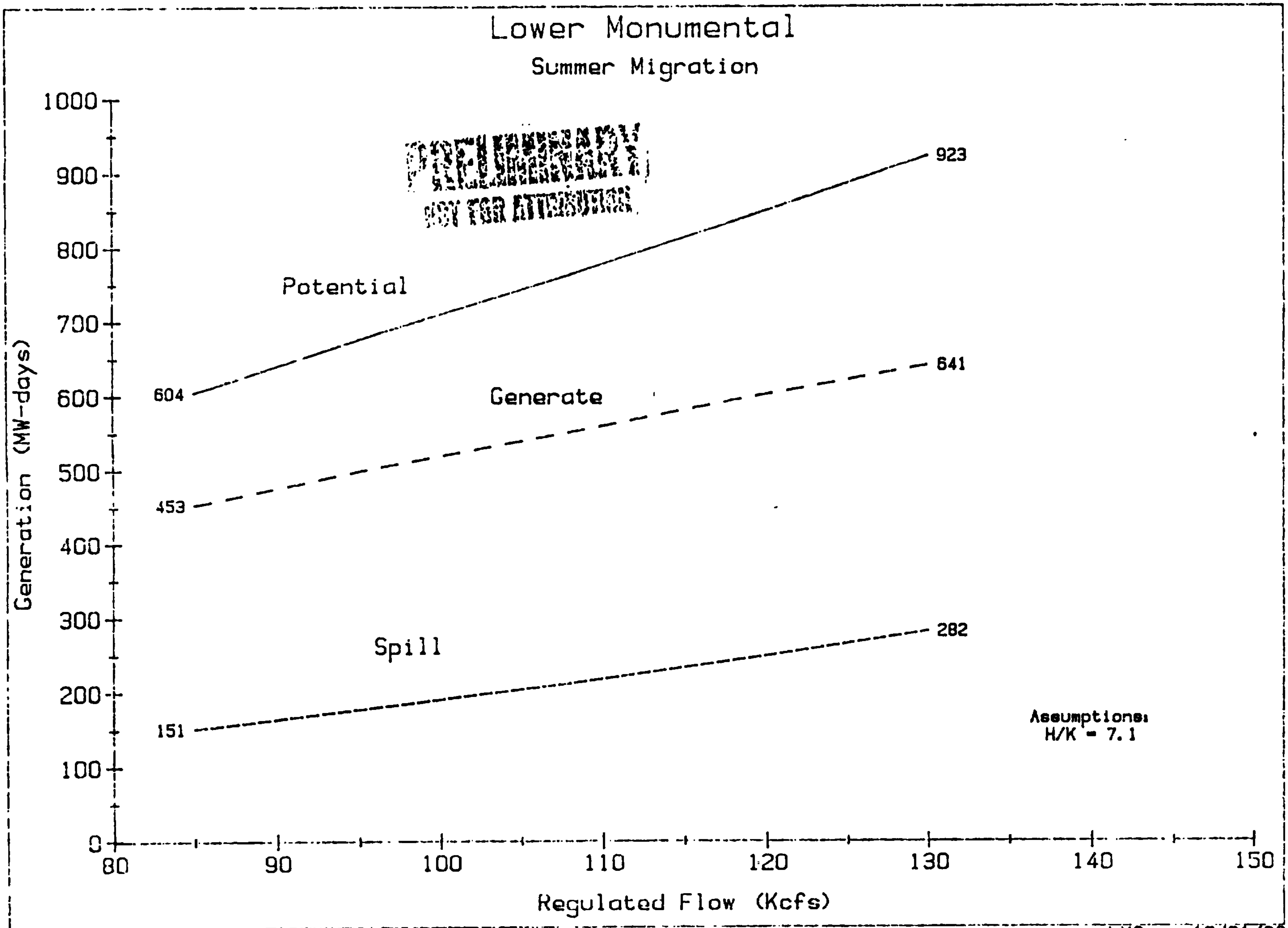


lmospra12/24/86

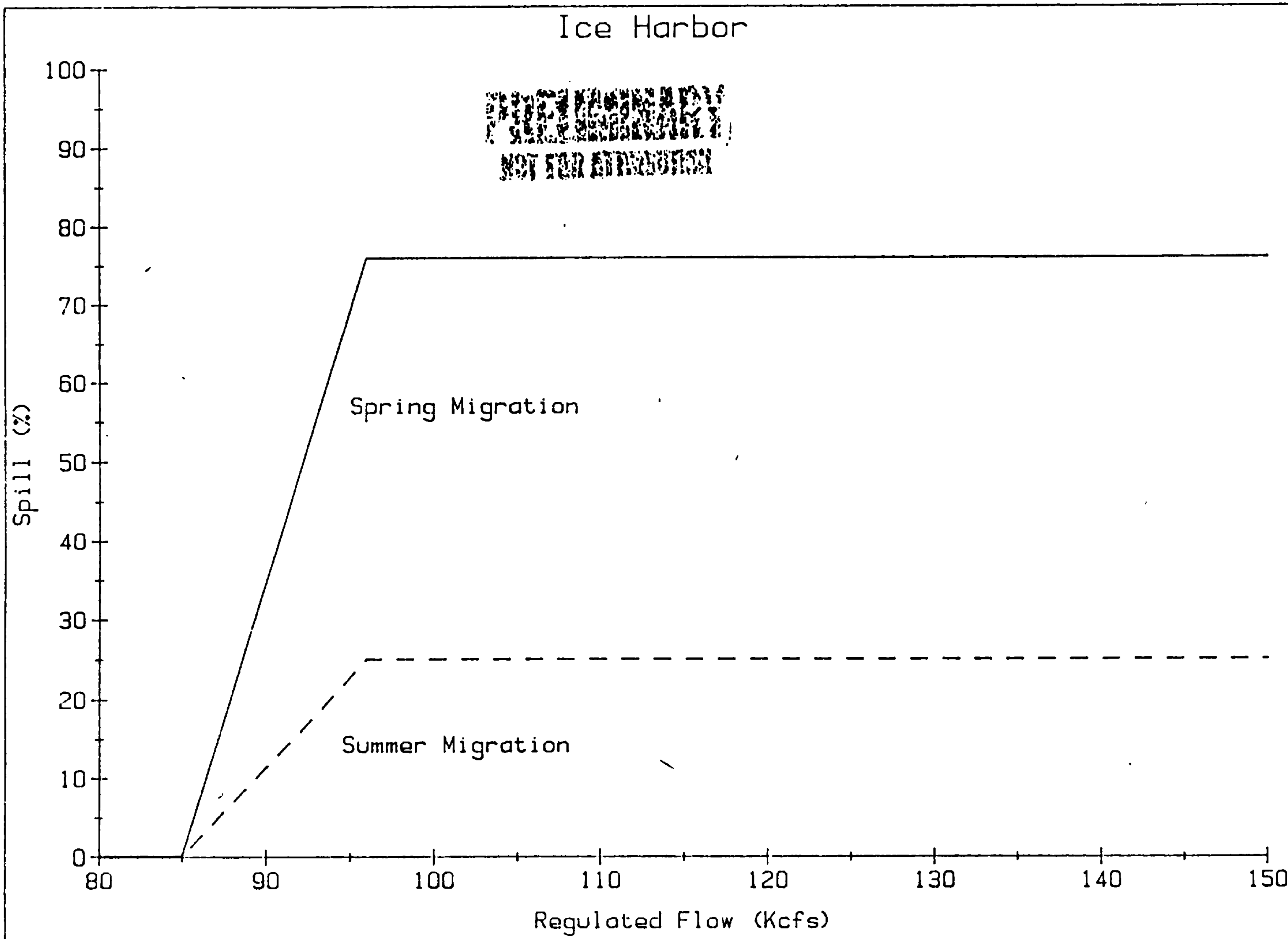
2



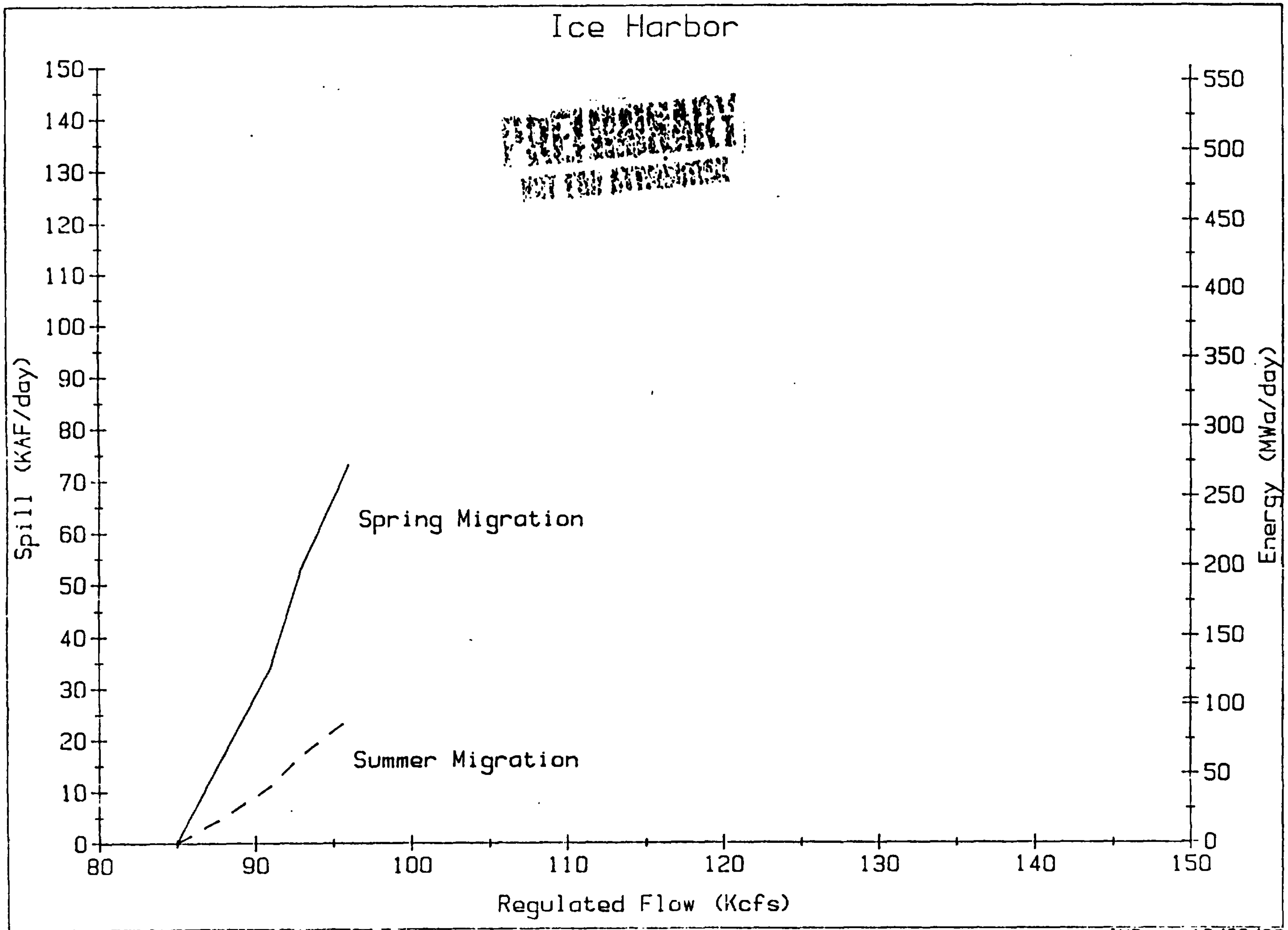
LMOmwsp12/30/86



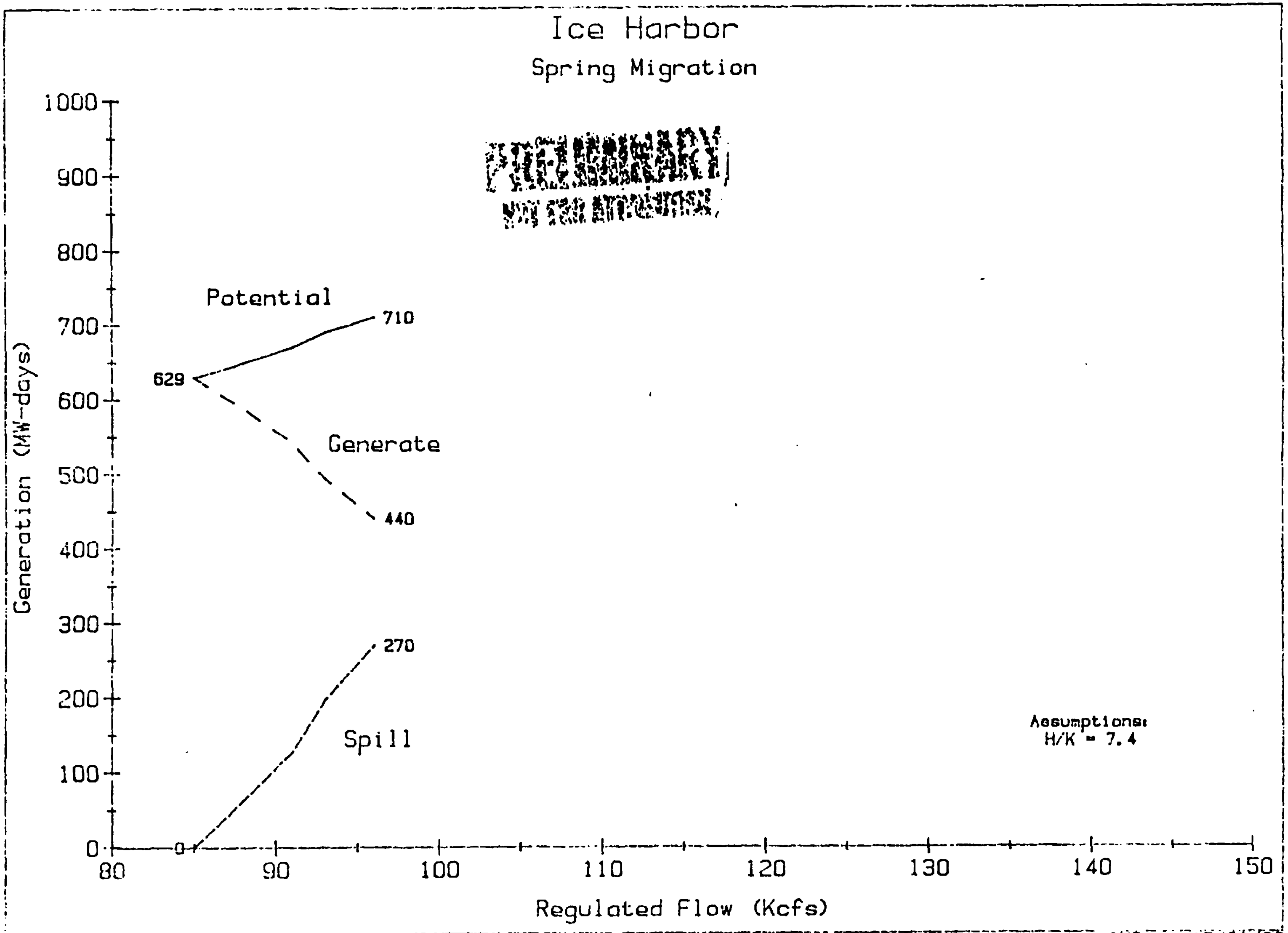
LMOmwsu12/31/86



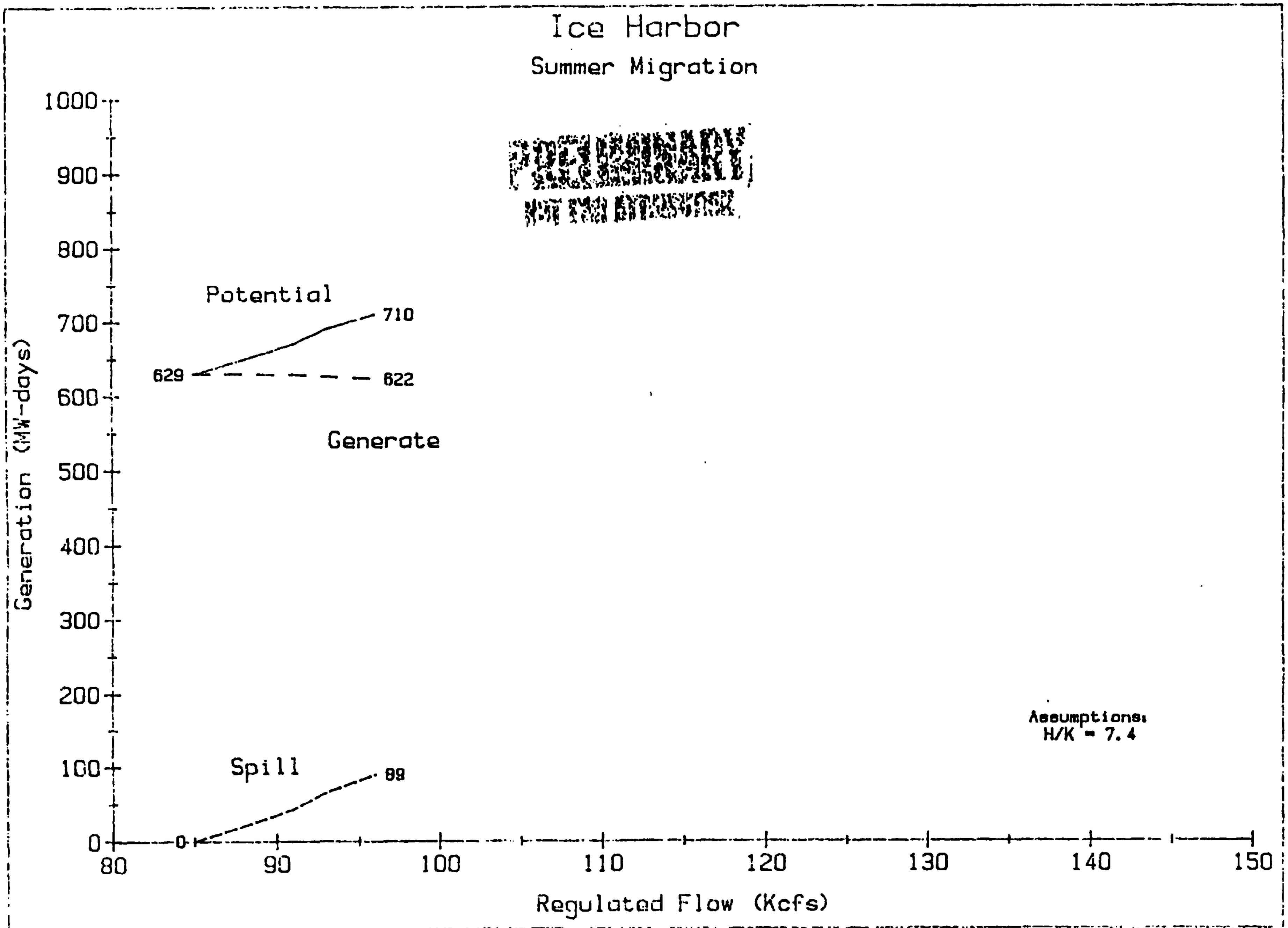
IHRspr 12/29/86



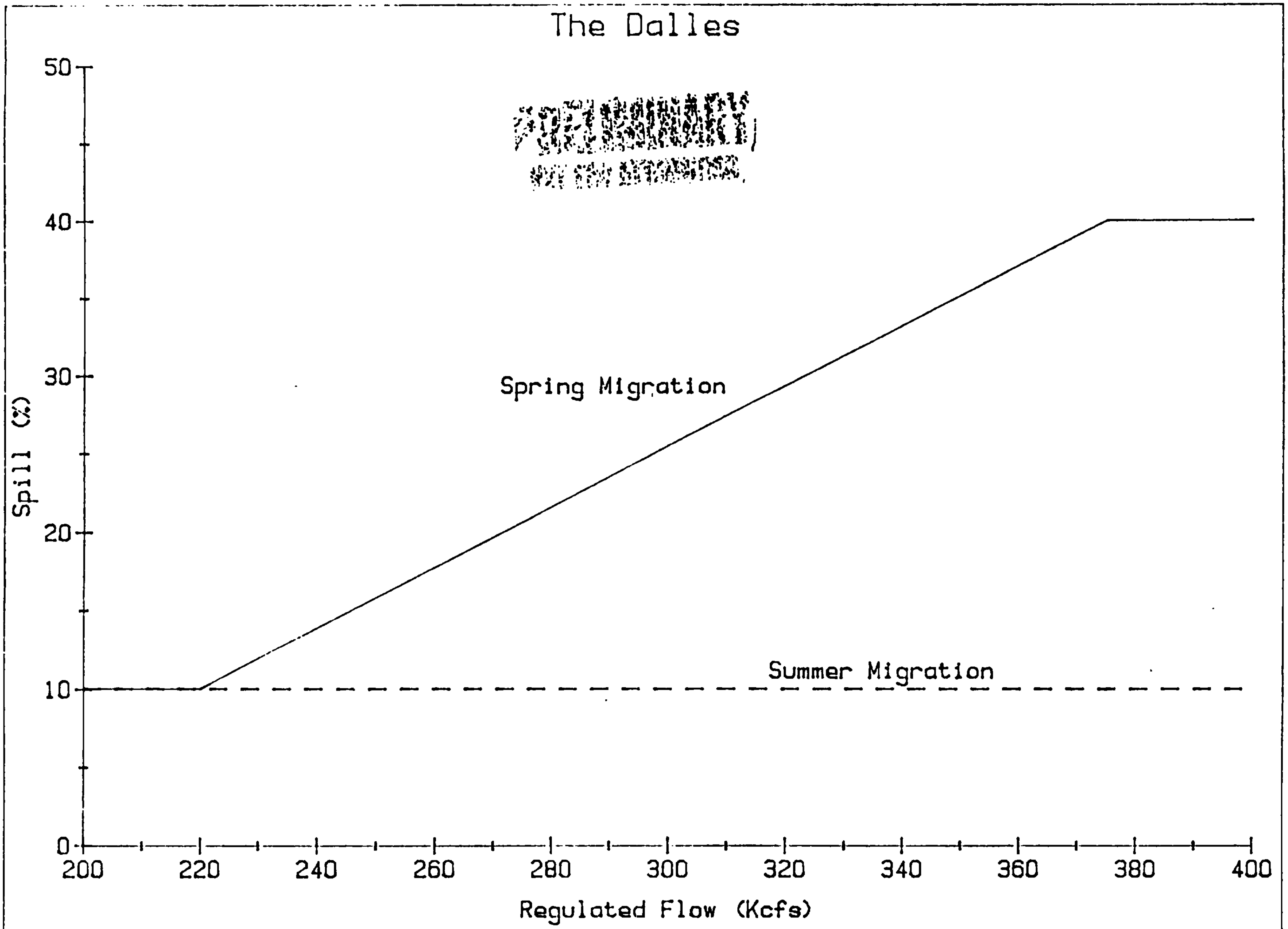
IHRspra12729786



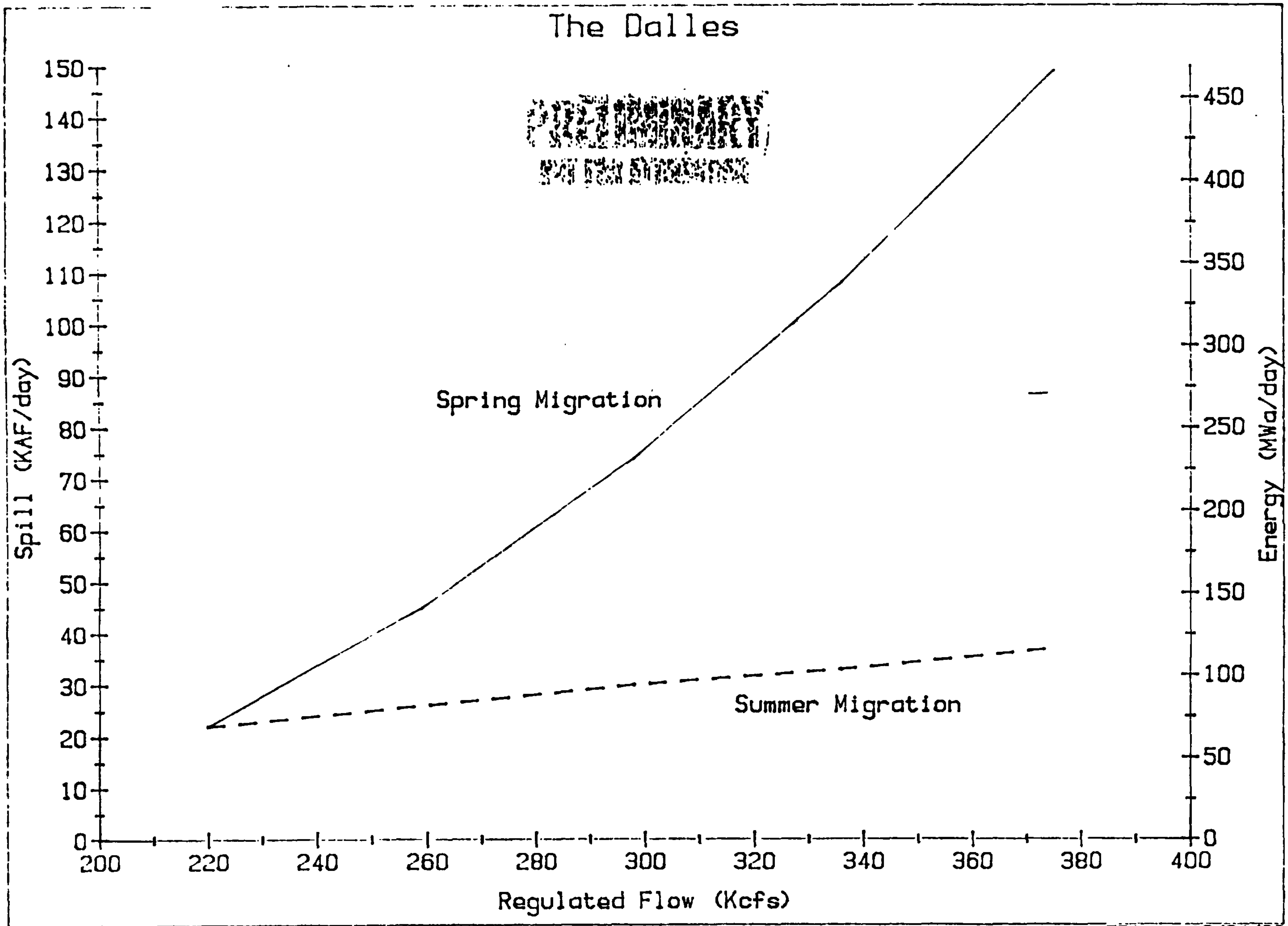
IHRmwsp12/31/86



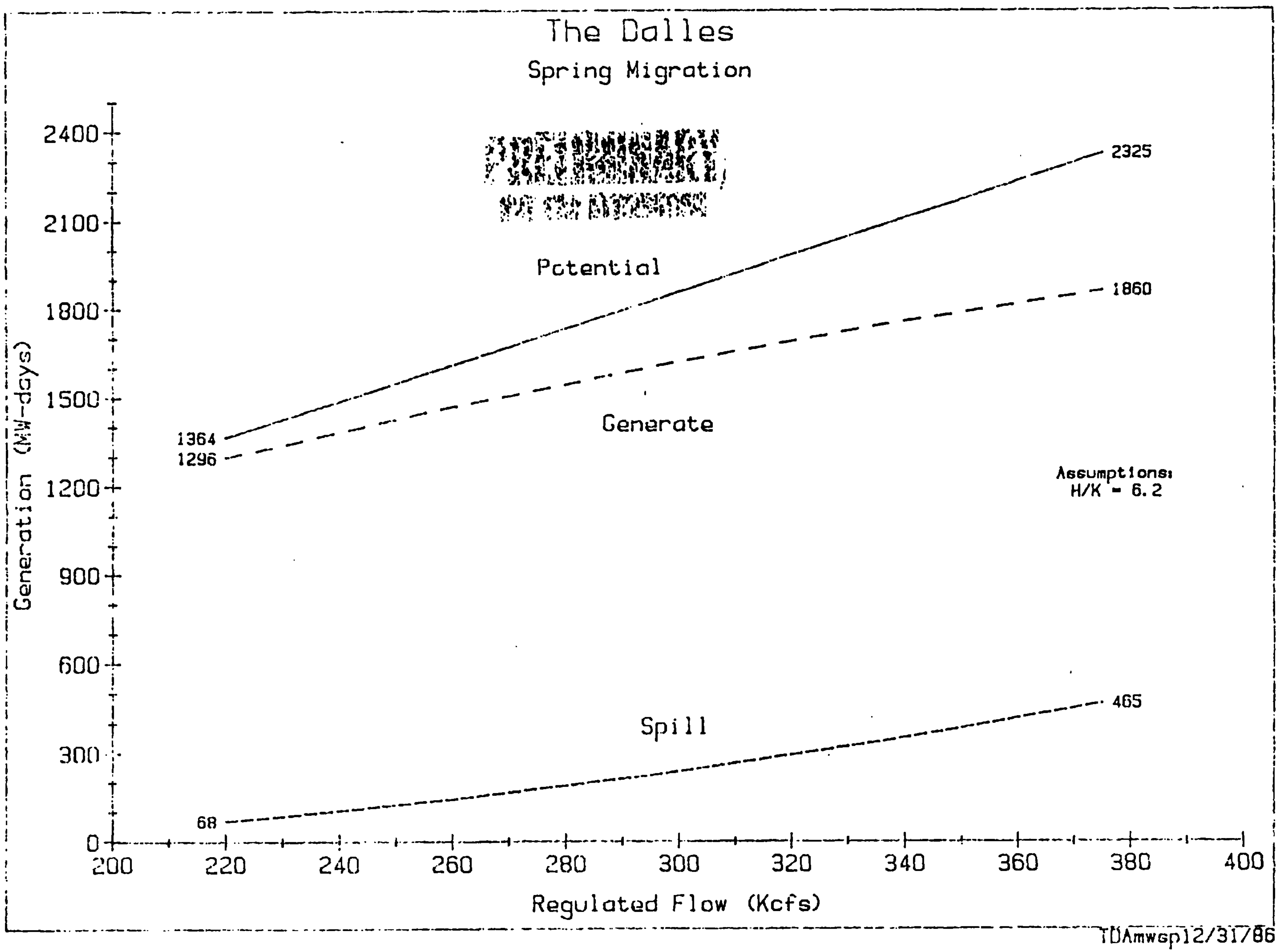
IHRmwsu12/31786

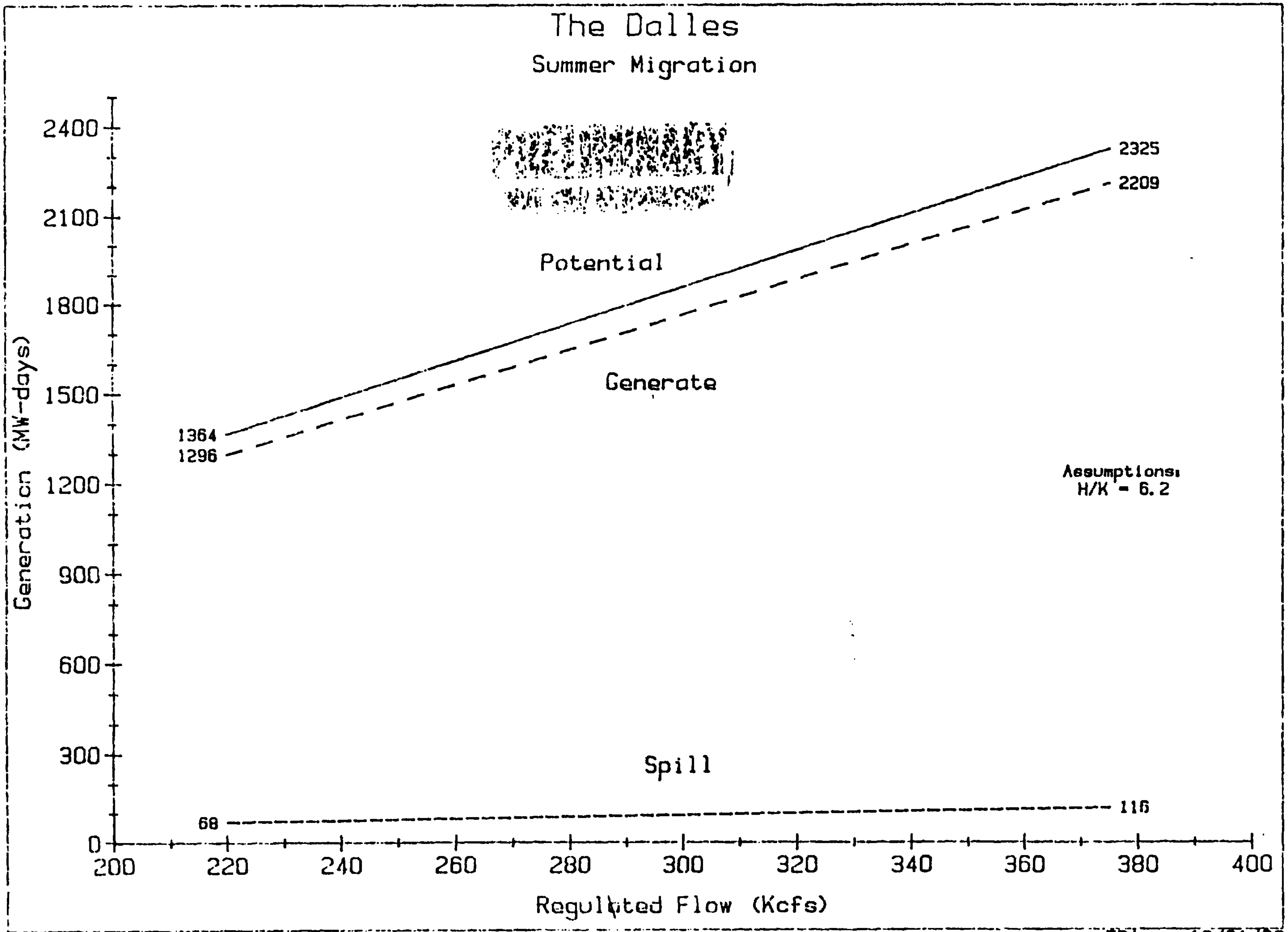


TDAspr 12/24/86



TDAspra12/24/86


The Dalles
Spring Migration
Potential
Generate
Spill
Assumptions:
H/K = 6.2
2325
1860
465
1364
1296
68
Generation (MW-days)
2400
2100
1800
1500
1200
900
600
300
0
200
220
240
260
280
300
320
340
360
380
400
Regulated Flow (Kcfs)
TDAmwsp12/31/86

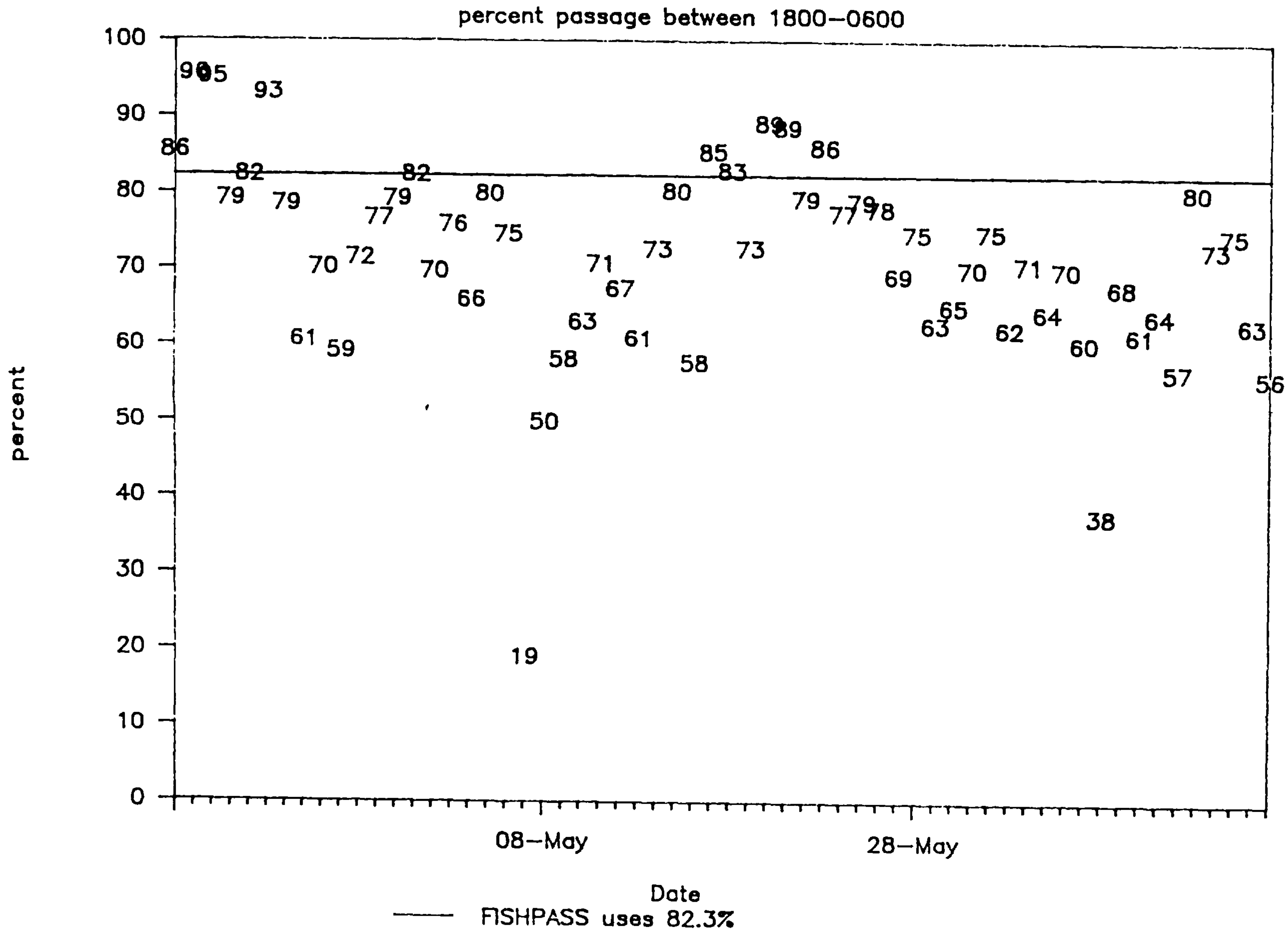


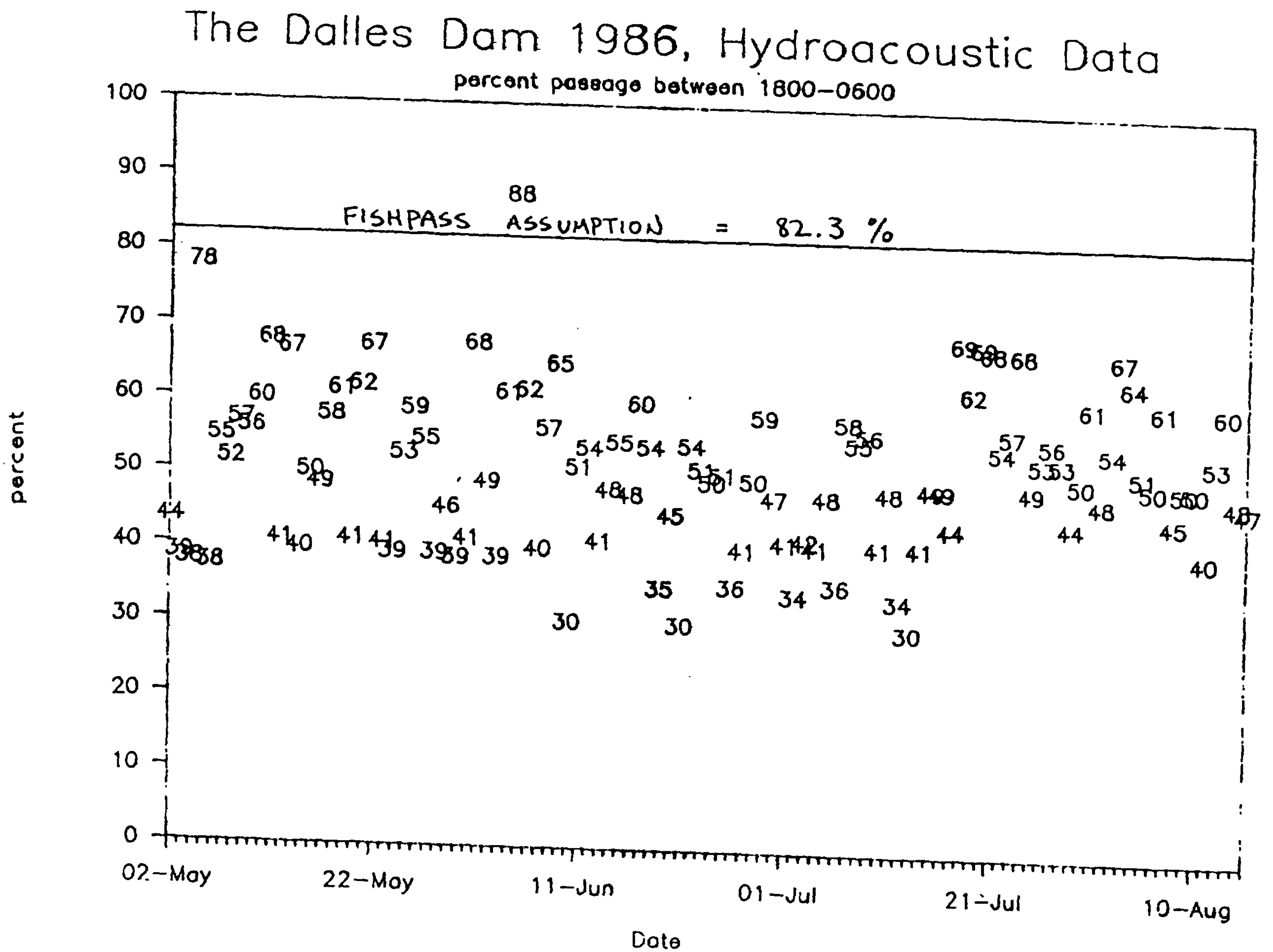
TDAmwsu12/31/86

Distributed by Fishery Agencies and Tribes

at JFPP meeting on February 19, 1987

L. Monumental 1986, Hydroacoustic Data

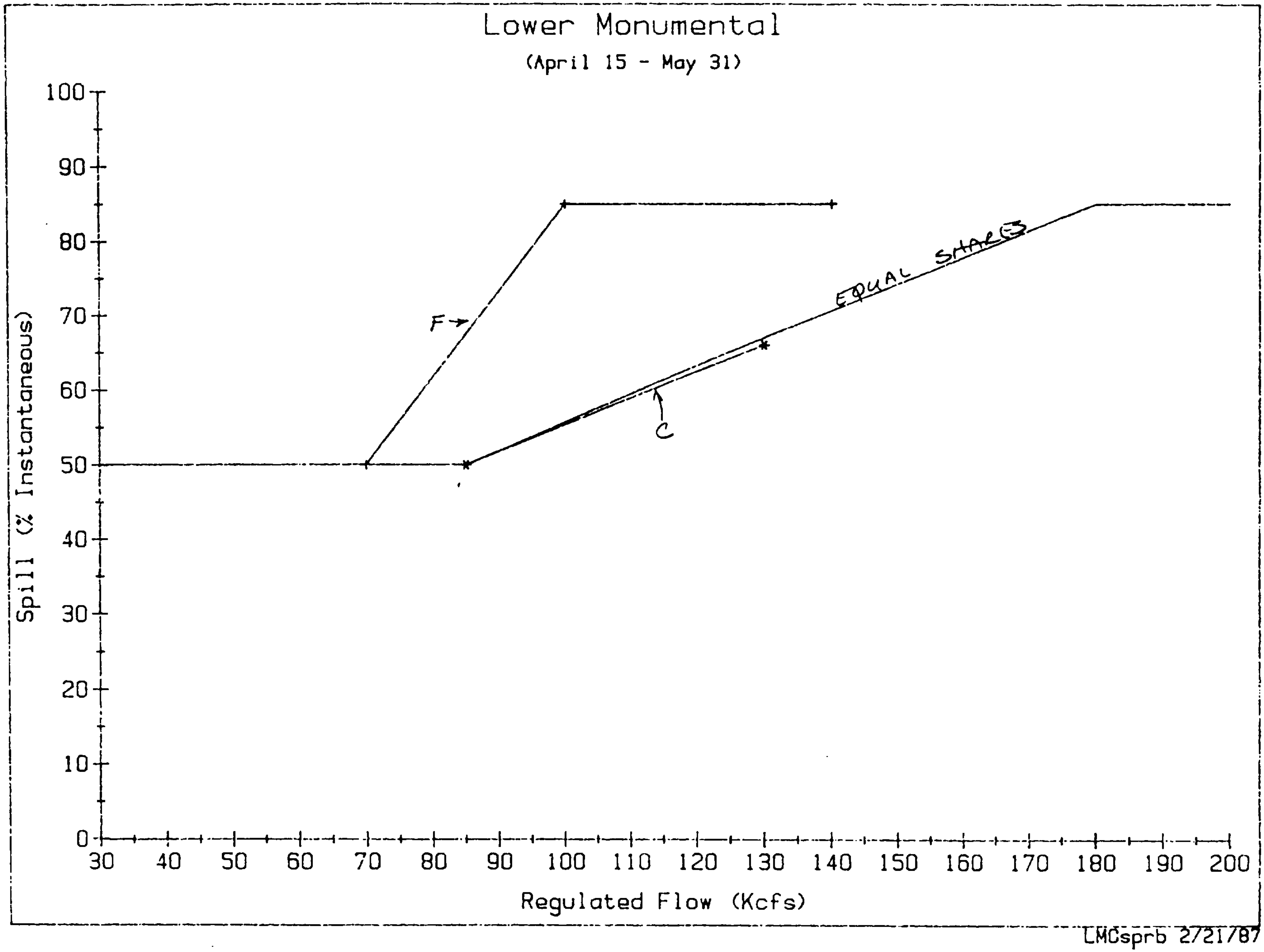




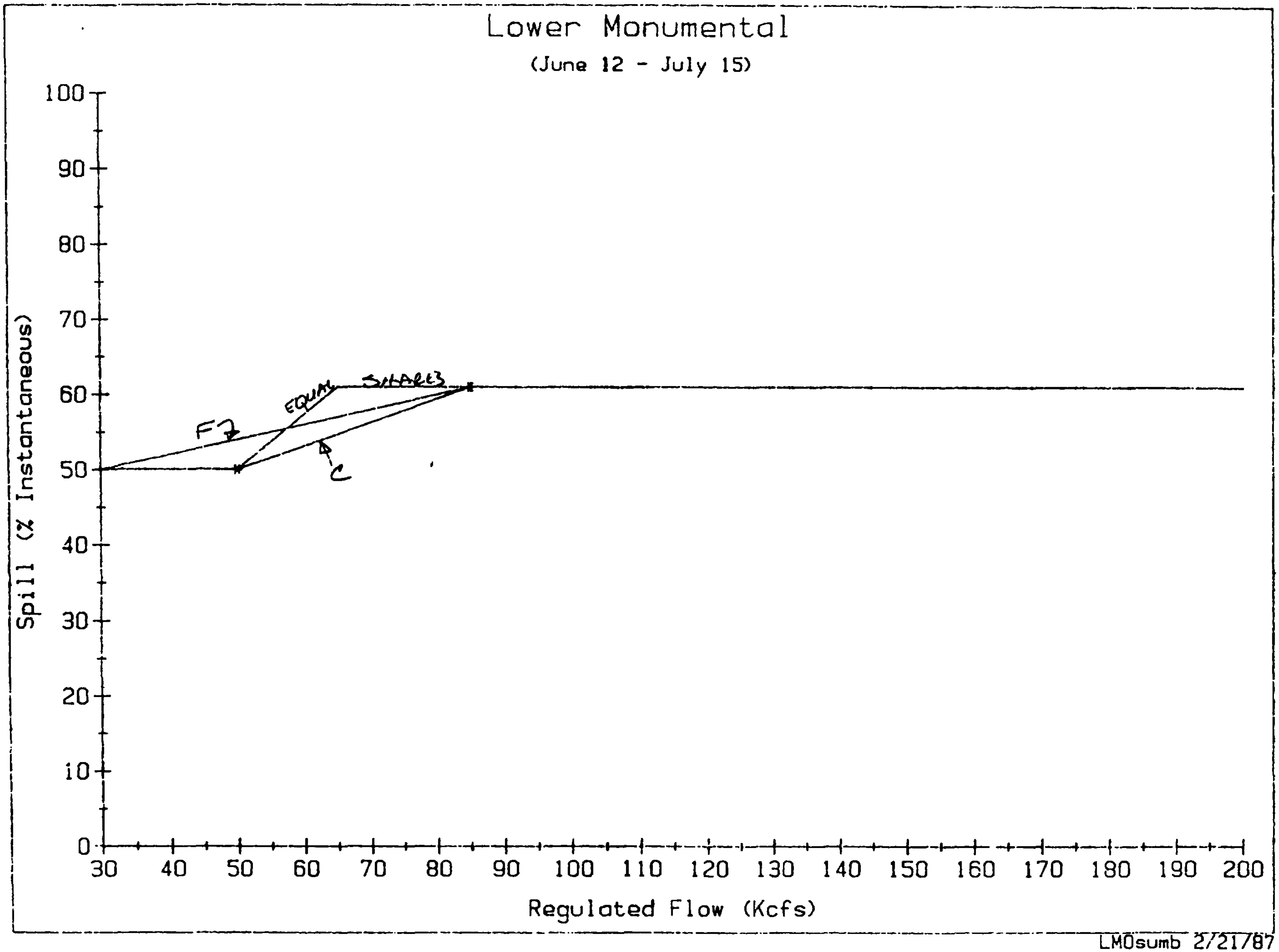
The Dalles Dam 1986, Hydroacoustic Data
percent passage between 1800–0600
FISHPASS ASSUMPTION = 82.3 %
percent
Date
02–May
22–May
11–Jun
01–Jul
21–Jul
10–Aug

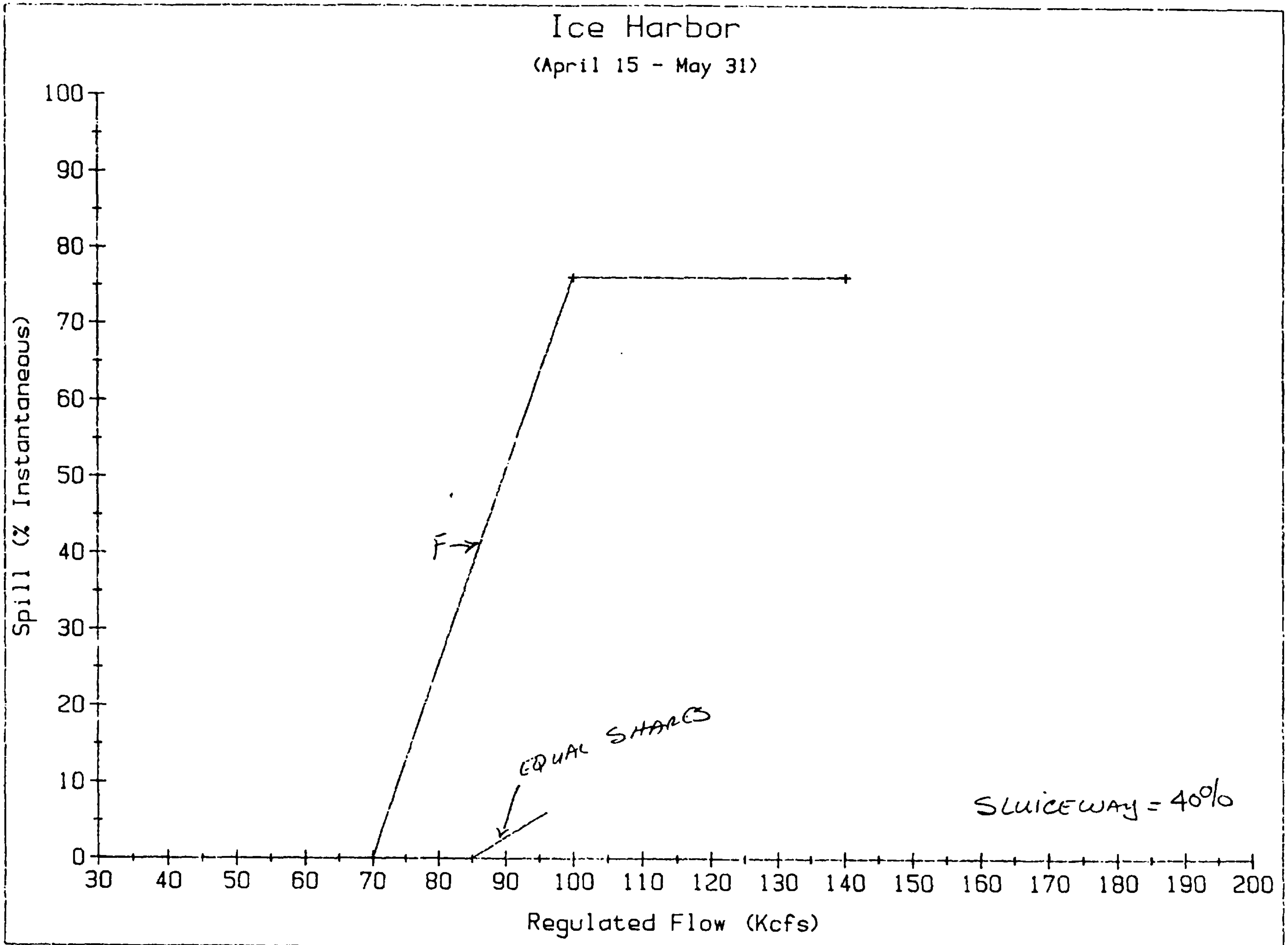
Distributed by PNUCC

at JFPP meeting on February 24, 1987

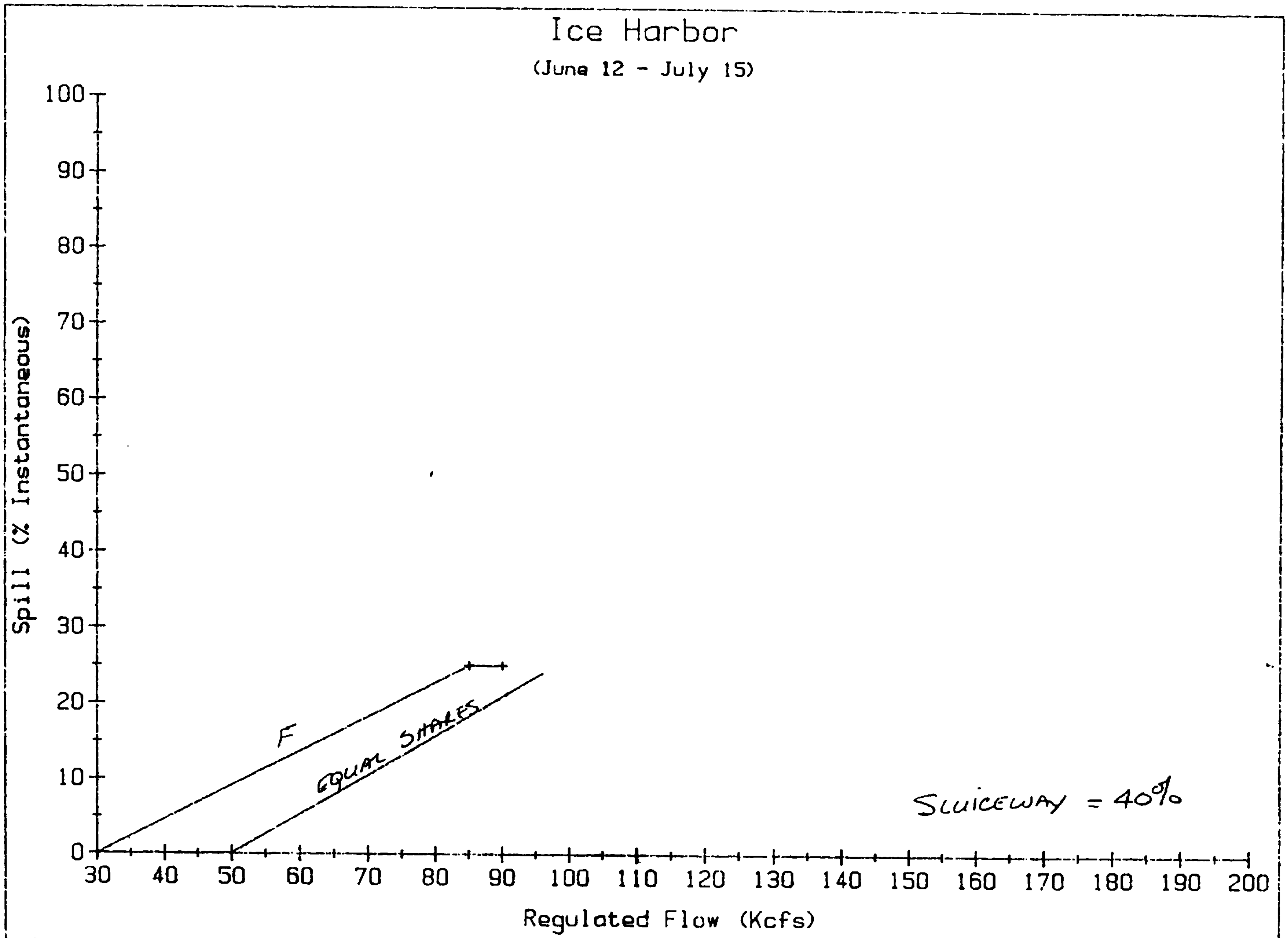


Lower Monumental
(April 15 - May 31)
Spill (% Instantaneous)
Regulated Flow (Kcfs)
F
C
EQUAL SHARES
LMCsprb 2/21/87

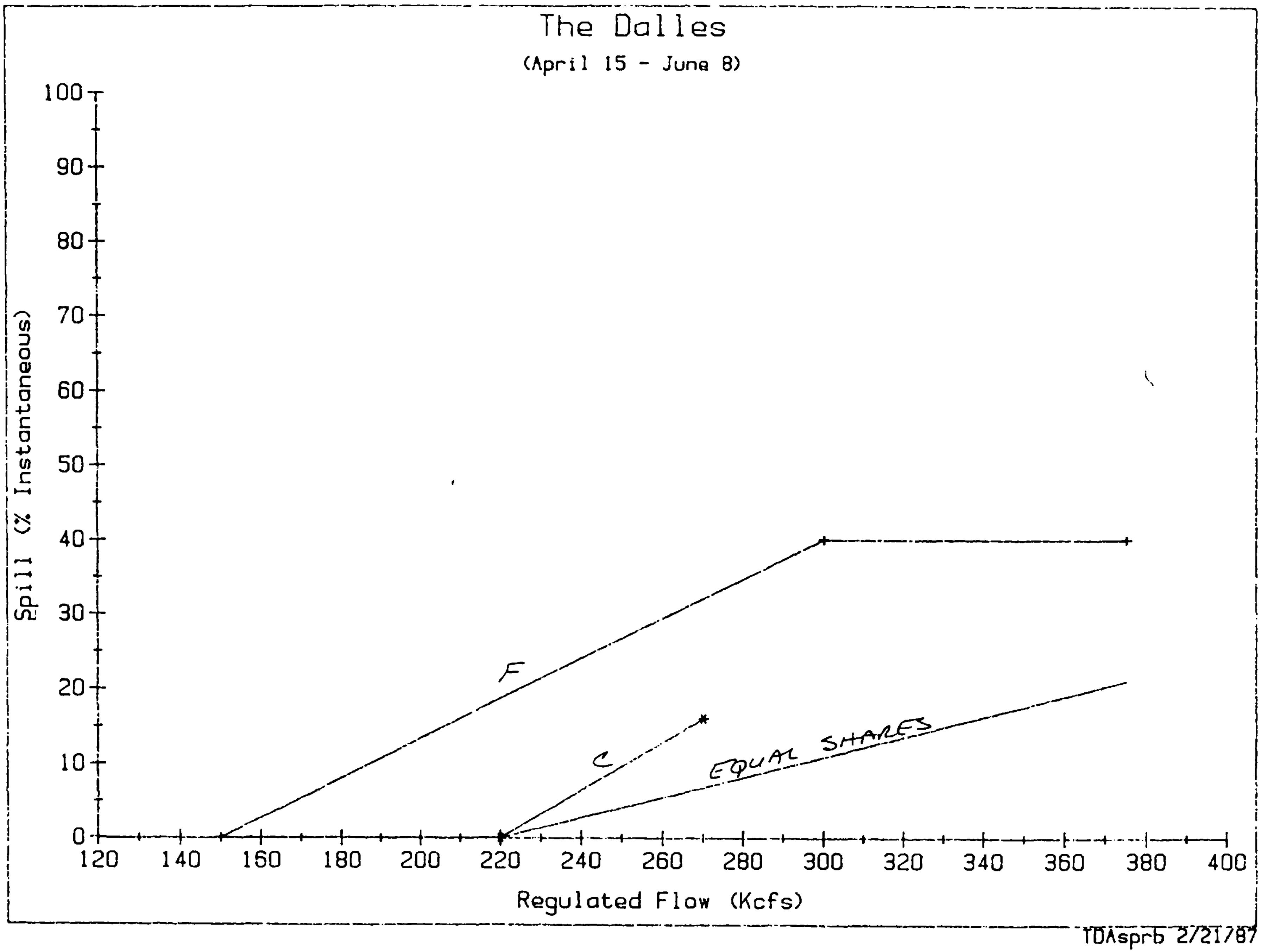

Lower Monumental
(June 12 - July 15)
Spill (% Instantaneous)
Regulated Flow (Kcfs)
EQUAL SHARES
F7
C
LMOsumb 2/21/87



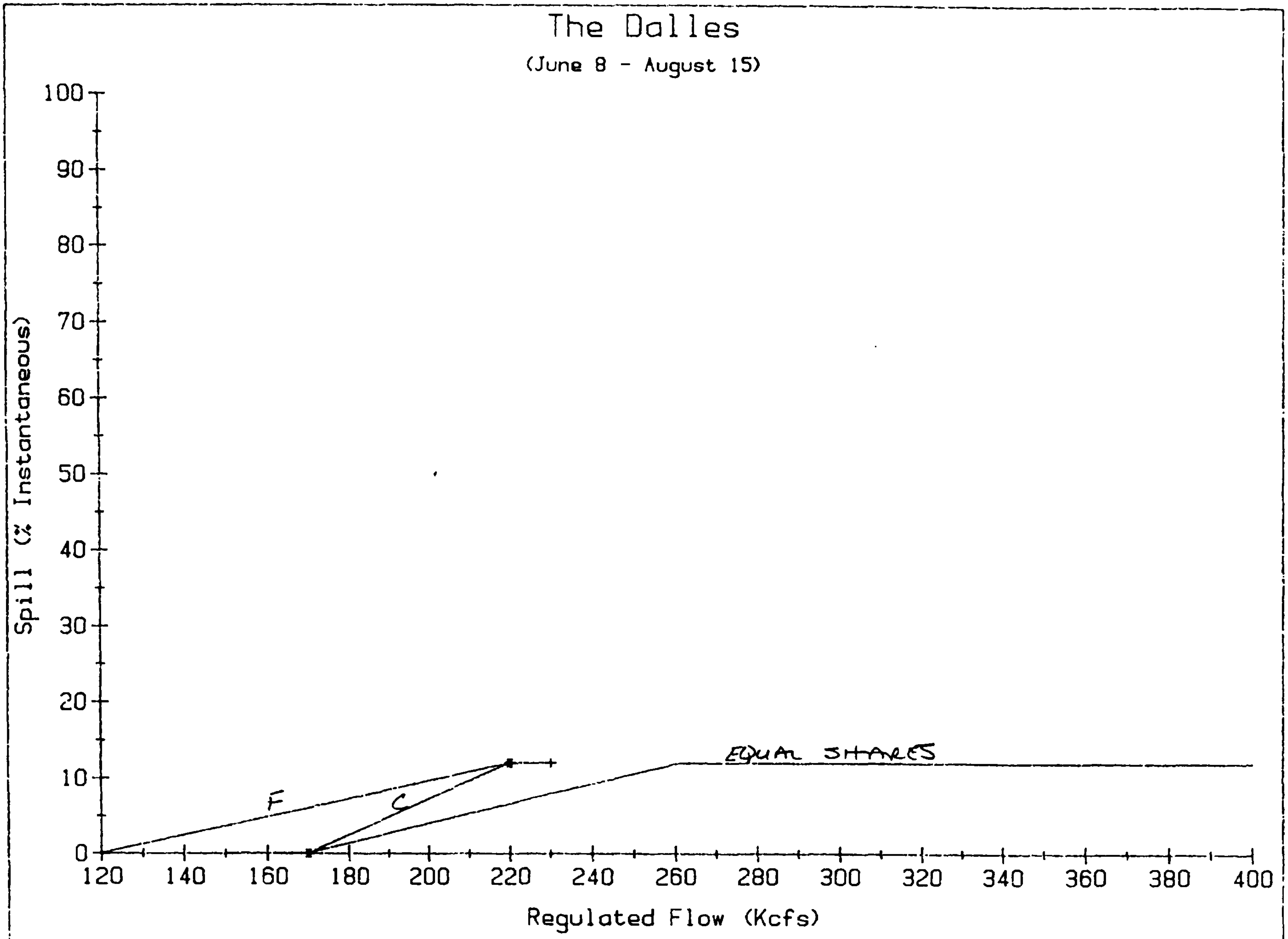
IHRsprb 2/20/87



IHRsumb 2/20787



The Dalles
(April 15 - June 8)
Spill (% Instantaneous)
100
90
80
70
60
50
40
30
20
10
0
120
140
160
180
200
220
240
260
280
300
320
340
360
380
400
Regulated Flow (Kcfs)
F
C
EQUAL SHARES
TDAsprb 2/21/87



TDAsumb 2/21/87

Correspondence received from BPA

Department of Energy
Bonneville Power Administration
P.O. Box 3621
Portland, Oregon 97208-3621

OFFICE OF THE ADMINISTRATOR

In reply refer to: PJ

FEB 26 1987

Major General George R. Robertson
Corps of Engineers
North Pacific Division
P.O. Box 2870
Portland, OR 97208-2870

Dear General Robertson:

The Bonneville Power Administration (BPA) has been participating in the Corps of Engineers' (Corps) planning process for 1987 fish spills at mainstem Columbia and Snake River projects. We appreciate the Corps' efforts to provide for fisheries protection in the management of its multi-purpose dams on the Columbia and Snake Rivers.

In the Northwest Power Planning Council's (Council) recent Fish and Wildlife Program amendment process, BPA reiterated its analyses that spilling water for fish provides minimal benefits in terms of increased fish survival through the hydroelectric system. Yet, significant financial costs are incurred with spill programs. Not only is spill not a cost-effective means to improve fish survival, but repeated debates on spill continue to focus the region's expertise and energies away from scrutinizing better alternatives that could achieve much greater improvement in fish passage.

BPA will participate in the Corps' 1987 spill planning process from a perspective of minimizing losses to power revenues and providing increased predictability for such losses. We see insufficient benefits in spill planning toward our responsibilities to protect, mitigate, and enhance fisheries resources. BPA would request, though, that the Corps, in concluding its spill planning for 1987, carefully document expected benefits to fish survival not only on an incremental "per-dam" basis, but also systematically, that is, fish survival through the entire hydroelectric system. BPA believes, further, that the high cost of spill programs justifies scrutiny of spill objectives from a biological basis. The fishery agencies and tribes participating in spill planning should document effects of planned spills on the viability, harvest, and escapement of fish stocks.

BPA is in the midst of a very poor electric power market that is expected to continue for several years. Given these market conditions and the essential need that BPA maintain its full reimbursements to the U.S. Treasury, BPA is making substantial cuts in the discretionary portion of its budget, and trimming programs and staff. With this state of affairs, it is critical in the near term that the Corps sacrifice power generation only for effective and essential fish spills.

BPA will continue to utilize best available scientific data to analyze effective fish passage alternatives that can be expected to accomplish significantly improved salmon and steelhead survival through the hydroelectric system. Again, we appreciate your staff's efforts to assure hydrosystem operations are effective in improving Columbia River fish runs.

Sincerely,

Jim Jura

Administrator

cc:
N. Dodge - COE
D. Arndt - COE
R. George -COE
J. Donaldson - CBFWA
E. Sheets - NPPC
A. Wright - PNUCC

Distributed by BPA

at JFPP meeting on March 13, 1987

BPA ANALYSIS OF

SLIDING SCALE SPILL PROPOSALS

Background

The examination of sliding scale spill proposals in the COE spill planning process has been limited to a comparison of smolt survival increases and power impacts for a range of low water conditions (1929, 1939, 1968) assumed to bracket the forecasted 1987 runoff (1939 is closest to 1987 forecast). These are all below average water years. The position taken by the COE regarding this limited range of analysis, is that any sliding scale spill implemented for 1987 would be a one year operation only, and any sliding scale spill in 1988 or beyond would involve new analyses using different water conditions, energy cost factors, and results obtained from 1987 spill implementation.

The FISHPASS model was used in the analyses to determine the increase in survival of smolts to below Bonneville Dam ("sound biological objective"). The FISHPASS modeling results reported in the following BPA analysis are for: 1) fish stocks originating above Lower Granite Dam, 2) fish stocks originating in the Mid-Columbia, and 3) total stocks for the entire system. Although the absolute survival values are sensitive to some of the FISHPASS input assumptions, the relative changes in survival due to changes in spill rates are not sensitive. This point is addressed further in the results of this analysis.

Current methods (models) for estimating the costs of a sliding scale spill program are limited. The estimates obtained are believed to be low as a result of: 1) Near perfect foresight in the modeling, 2) use of modulated monthly average flows in place of real time fluctuations that occur on a daily basis, 3) no accounting for the lost revenues associated with spilling water that could have been held in reservoirs for sale at a higher value than that obtainable during the spill period, and 4) poor simulations of real time marketing conditions and interactions. Until the current models have been further developed and tested, BPA believes the cost estimates provided by the SAM model are the best available data. As such, BPA's sliding scale spill analysis will use those cost estimates provided by the Northwest Power Planning Council's (Council) staff, which were developed with the SAM model.

Results

The "Preliminary" Cost Analyses by the Council staff used the SAM model with the Near Term Intertie Access Policy, existing intertie capacity level, no firm contracts to the Southwest, and 17 mil average annual cost of energy to the Southwest market. Two types of studies were performed for calculating the additional costs of sliding scale spill beyond the current 90 percent per-dam spill costs.

Study 1 - Random selection of water conditions limited to 1939 water as the mean and 1929 and 1968 water as two standard deviations below and above the mean.

Plan	Expected Value Cost Increases ($million)
COE Sliding Scale	1.5
FA&T Sliding Scale	5.8

Study 2 - Analysis of all 40 years (1929 - 1968).
Increased Spill Costs in $ millions for selected water years:

Plan	1929	1939	1968	1960	1934
COE Sliding Scale	0.2	0.5	3.1	6.5	12.3
FA&T Sliding Scale	2.5	4.2	6.2	11.2	11.2

Water years 1960 and 1934 are average water conditions and are included here to show the increasing costs asso_iated with higher flow years than projected for 1987. Costs start declining in water conditions above these levels.

Observation of smolt survival and cost increases in table 1 and figures 1 through 3 (attachments) for water years 1929, 1939, and 1968 show that increases in system stock survivals are substantially less than one percent for all three water years analyzed. The maximum increase for any plan or water condition is less than 150 thousand smolts (out of a total of 31 million) at an additional cost of up to $6.2 million. The stock survival values broken down by species (not shown) show the same results (less than one percent increase for all species). Figures 4 and 5 show the significant increases in energy generation losses due to changes in spill plans and water conditions. It should be noted from Figure 4 that the current "base case" spill plan already has sliding scale energy losses. Figure 5 shows that the relative increases in smolt survival compared to energy generation losses is significantly out of balance under both spill plans.

The results of the sliding scale spill analysis support the more extensive BPA spill analyses presented to the Council during the fast track spill amendment process in January 1986. As then, these analyses show that the marginal rate of return for spill above the current 90 percent per-dam survival plan is not cost-effective. The additional costs per surviving smolt projected for 1987 water conditions ($45 to $131 per smolt) are approximately two orders of magnitude greater than current hatchery production costs (including capital and O&M). The total number of additional smolts surviving under the sliding scale proposals (2 to 132 thousand added to current survivals of 28 to 32 million) could be easily obtained with very minimal increases in transportation, hatchery production, or returning adults.

Biological Justification and FISHPASS Sensitivity

During the COE spill planning process, BPA repeatedly asked for an analysis from the FA&Ts to show a biologically based need for increased levels of spill. The only analysis provided has been a life cycle spreadsheet comparison of the COE and FA&Ts' 1986 spill plans by NMFS which was handed out in a COE Working Committee meeting. This analysis attempted to show that over a 10 generation egg-to-adult life cycle for spring chinook above Lower Granite, with the two separate spill plans, only the FA&Ts' plan would sustain the run. However, as we have subsuquently pointed out to NMFS, this was a result of an error in their spreadsheet which when corrected shows that the 1986 COE plan would build adult fish runs to high return levels over a small number of years. Further analysis using the life-cycle model's survival assumptions showed that only an additional 150 returning adults (300 adults entering the mouth of the Columbia) were required with the 1986 COE plan to obtain the same number of surviving smolts to below Bonneville as the 1986 FA&T plan, without the multi-million dollar additional costs.

Concerns have been expressed that the FISHPASS model results for system survival are too sensitive to the high reservoir mortality and low transport mortality assumptions in the model. These inputs were developed in the Councils' Mainstem Fish Passage Advisory Committee (MPAC). Although it is true that the system survival numbers are sensitive to these assumptions, it is important to note that results of the comparative analysis of sliding scale spill performed with FISHPASS for this planning process are not sensitive to these assumptions. This can be shown for reservoir mortality with an extreme sensitivity test. By cutting the reservoir mortality in half for all projects and comparing the current 90 percent plan (base case) to the FA&T sliding scale plan for 1939 water (closest to 1987 projected water), the base case's total fish survival increases to 33.6 million smolts below Bonneville and the FA&T plan increases this survival by only 114 thousand smolts. Thus, although the lower reservoir mortality assumption causes an increase in the number of additional smolts surviving with the FA&T plan, it is still a highly insignificant increase in survival over the base case. This same sensitivity analysis for the transportation assumptions (increasing mortality to 50 percent or more) would show even less change to the sliding scale spill comparative results presented here.

Conclusion and Position

BPA does not support additional planned spill beyond the current 90 percent base plan, because we believe that the data clearly shows the benefits are too minimal to justify the major costs they would incur. Those additional costs of spill would be a significant waste of the region's resources at a time of major revenue shortfalls and program cutbacks. Much more cost-effective means of increasing fish production are available.

JGeiselman:mm:5494 (PJI-1211N)

Sliding Scale Spill Analysis

Changes in System Stock Survivals and Power System Costs

Water Year	The Dalles Mar - Jul Runoff-MAF	Plan	Lower Granite Stocks Surv./ Smolts (%) / (1000)	Mid-Columbia Stocks Surv./ Smolts (%) / (1000)	Total System Stocks Surv./ Smolts (%) / (1000)	Energy Spill (1000 MW-hr)	Cost ($mill)
1929	62.1	Base Case	77.5/ 5,945	54.8/ 12,303	59.9/ 27,655	863	—
		△COE Plan	0 / —	0 / —	0 / 2	2	0.2
		△FA&T Plan	0.1/ 8	0 / —	0 / 19	79	2.5
1939	73.7	Base Case	78.1/ 5,991	57.6/ 12,931	63.7/ 29,413	1,105	—
		△COE Plan	0 / —	0 / —	0 / 11	31	0.5
		△FA&T Plan	0 / —	0.1/ 22	0.1/ 50	198	4.2
1968	81.6	Base Case	77.7/ 5,960	63.2/ 1,491	68.6/ 31,677	1,448	—
		△COE Plan	0 / —	0.4/ 90	0.2/ 102	224	3.1
		△FA&T Plan	0 / —	0.4/ 90	0.3/ 132	344	6.2

The forcast for 1987 Mar-Jul runoff is 69.9 MAF (closest to 1939). The average 1928-1979 Mar-Jul runoff is 91.3 MAF (the above are all below average).

TABLE 1

(1167N)

SLIDING SCALE SPILL ANALYSIS
SYSTEM STOCK SURVIVALS
FOR 1929 WATER CONDITIONS

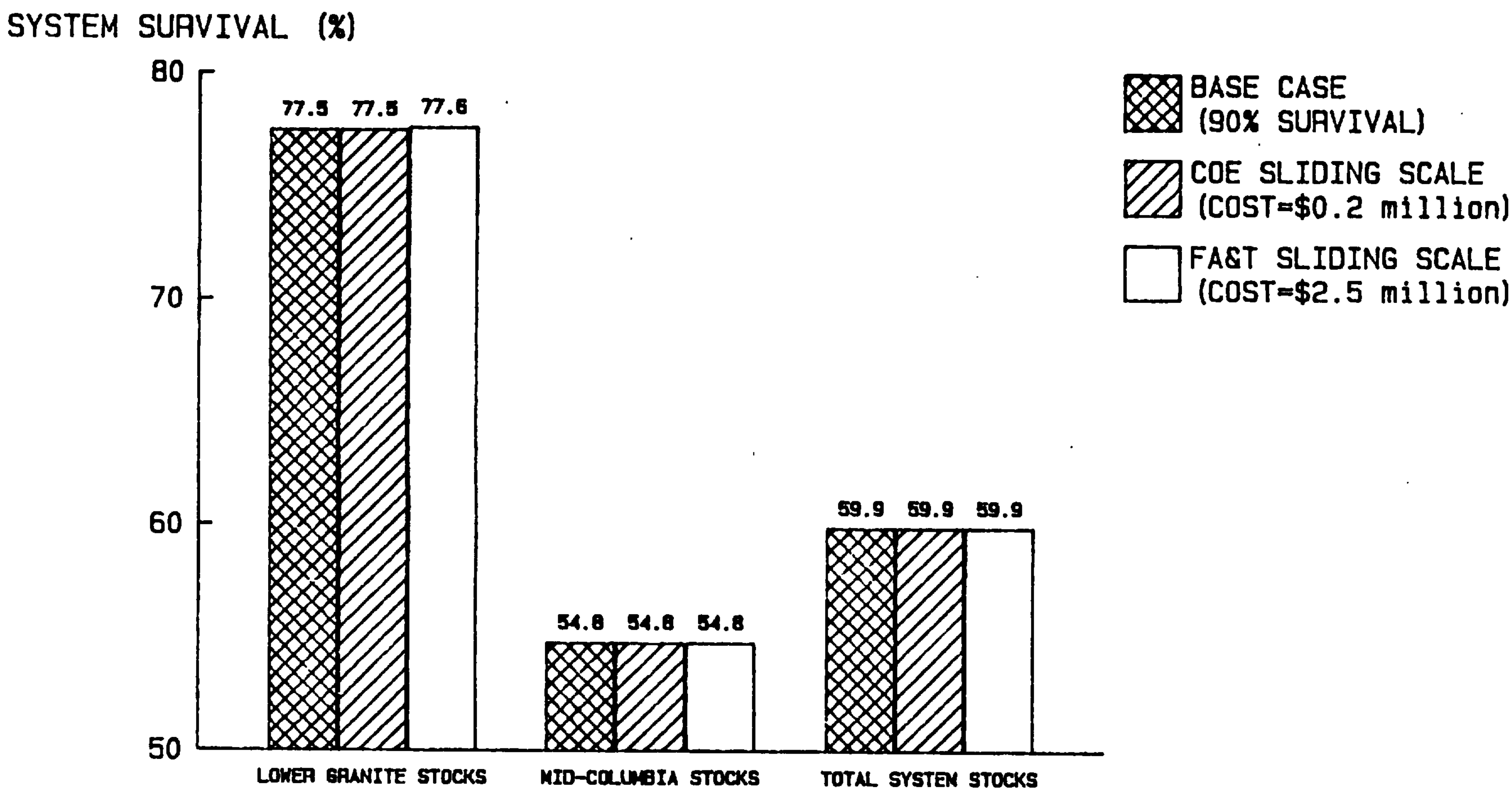


Figure 1

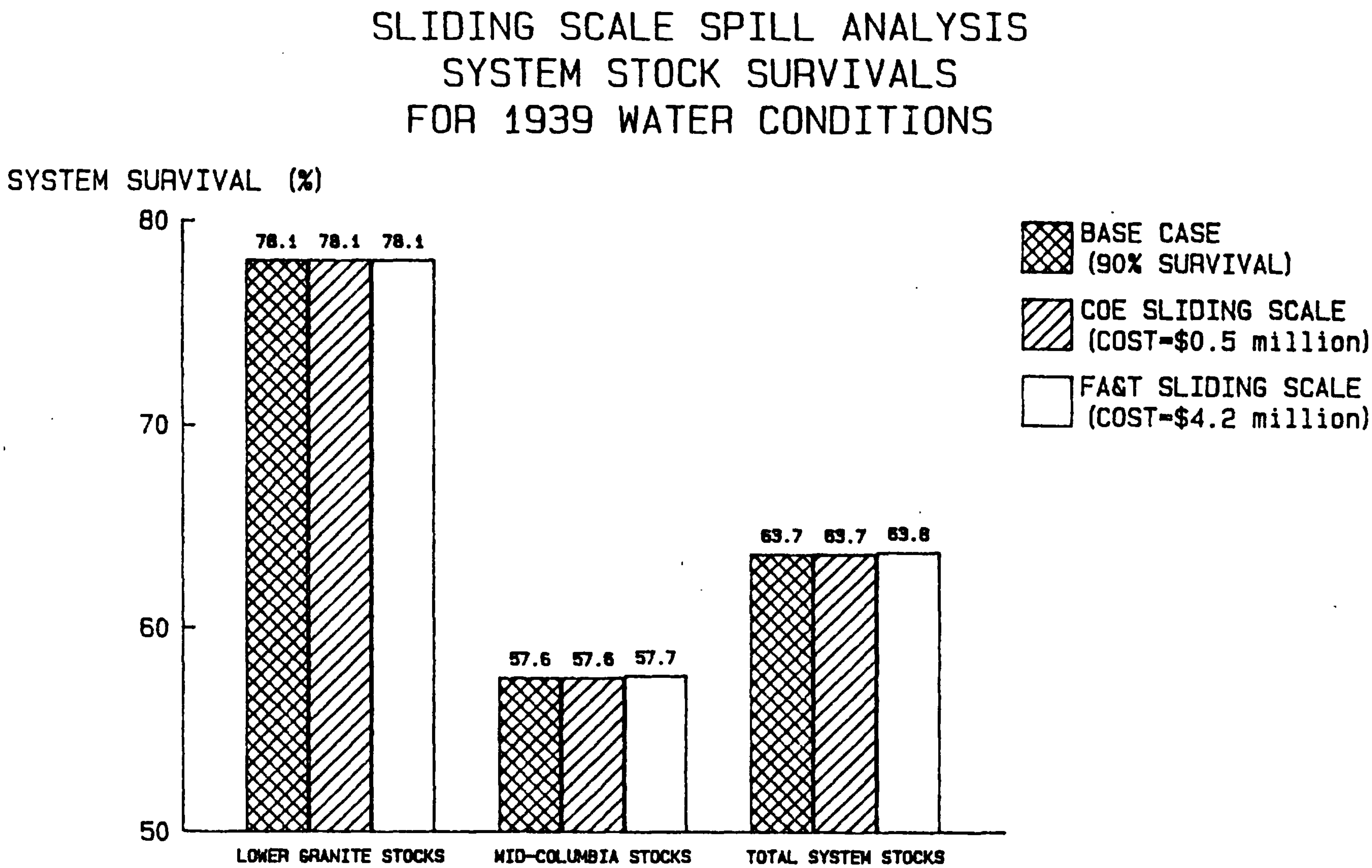
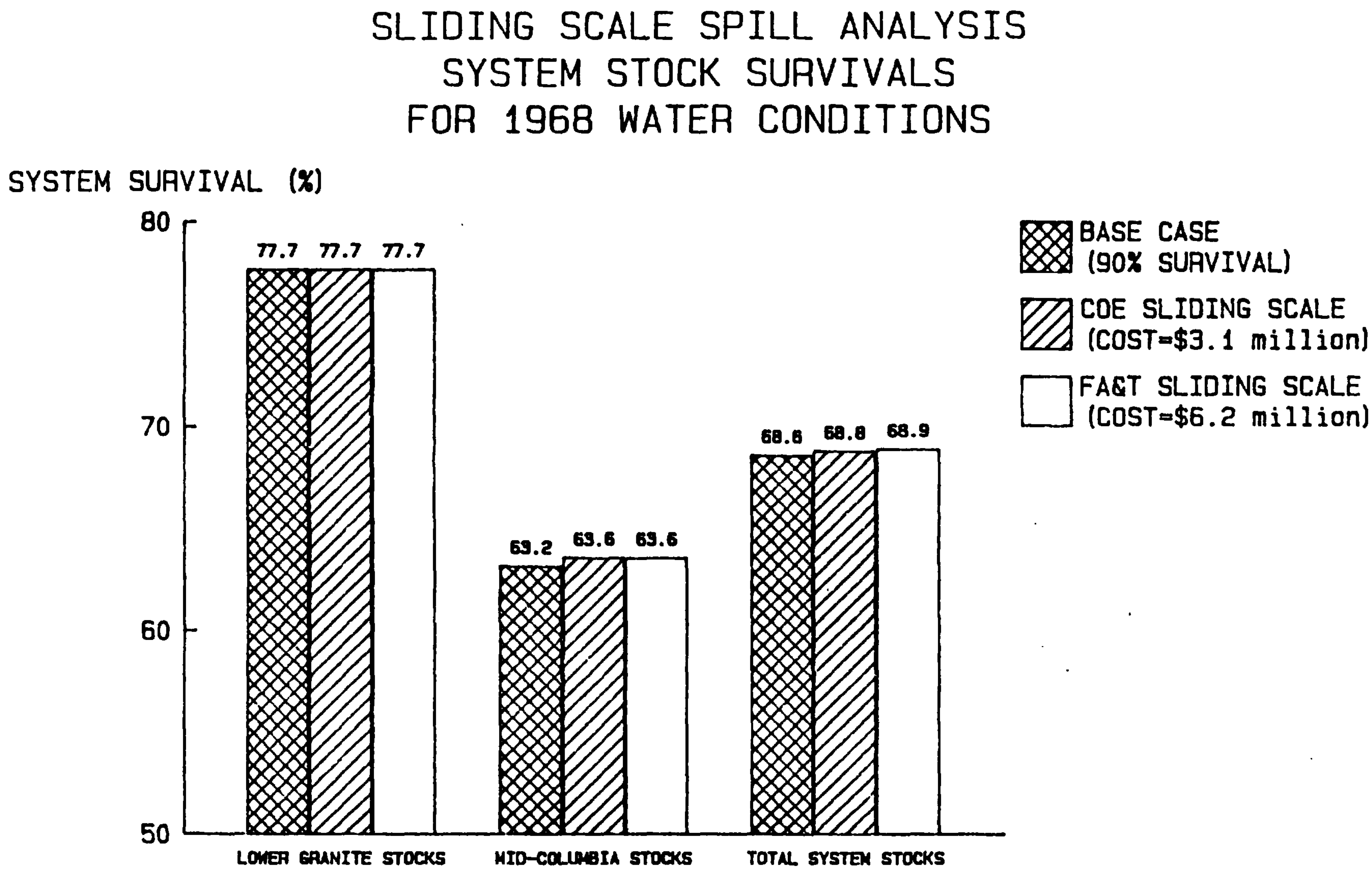

SLIDING SCALE SPILL ANALYSIS
SYSTEM STOCK SURVIVALS
FOR 1939 WATER CONDITIONS
SYSTEM SURVIVAL (%)
80
70
60
50
78.1
78.1
78.1
57.6
57.6
57.7
63.7
63.7
63.8
LOWER GRANITE STOCKS
MID-COLUMBIA STOCKS
TOTAL SYSTEM STOCKS
BASE CASE
(90% SURVIVAL)
COE SLIDING SCALE
(COST=$0.5 million)
FA&T SLIDING SCALE
(COST=$4.2 million)

Figure 2



SLIDING SCALE SPILL ANALYSIS
SYSTEM STOCK SURVIVALS
FOR 1968 WATER CONDITIONS
SYSTEM SURVIVAL (%)
80
70
60
50
77.7 77.7 77.7
63.2 63.6 63.6
68.6 68.8 68.9
LOWER GRANITE STOCKS
MID-COLUMBIA STOCKS
TOTAL SYSTEM STOCKS
BASE CASE (90% SURVIVAL)
COE SLIDING SCALE (COST=$3.1 million)
FA&T SLIDING SCALE (COST=$6.2 million)

Figure 3

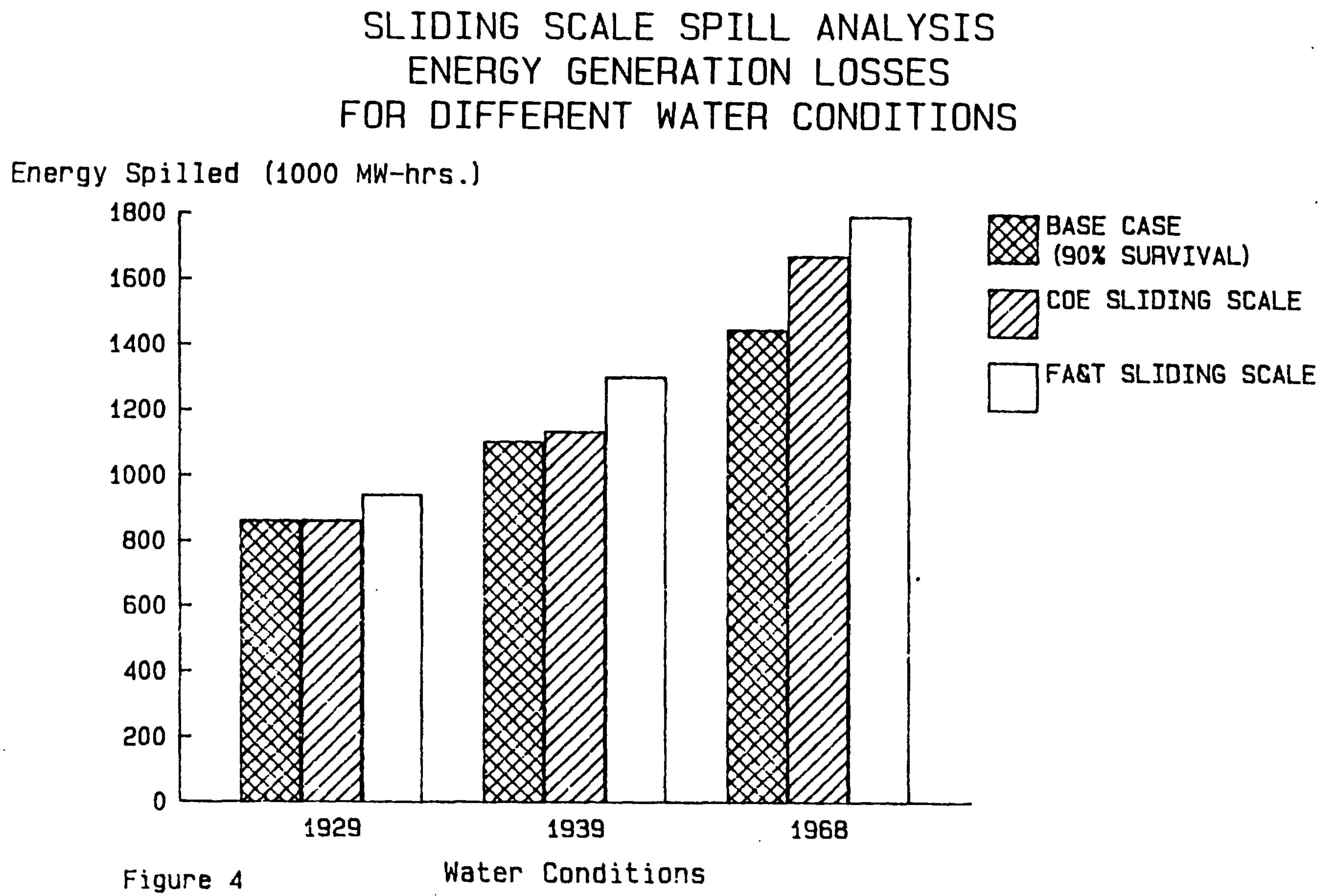

SLIDING SCALE SPILL ANALYSIS
ENERGY GENERATION LOSSES
FOR DIFFERENT WATER CONDITIONS
Energy Spilled (1000 MW-hrs.)
1800
1600
1400
1200
1000
800
600
400
200
0
1929
1939
1968
Water Conditions
BASE CASE
(90% SURVIVAL)
COE SLIDING SCALE
FA&T SLIDING SCALE

Figure 4

SPILL ANALYSIS - Changes from Existing Spill Plan in System Stock Survivals & Energy Losses for 1929, 1939, and 1968 Water Conditions

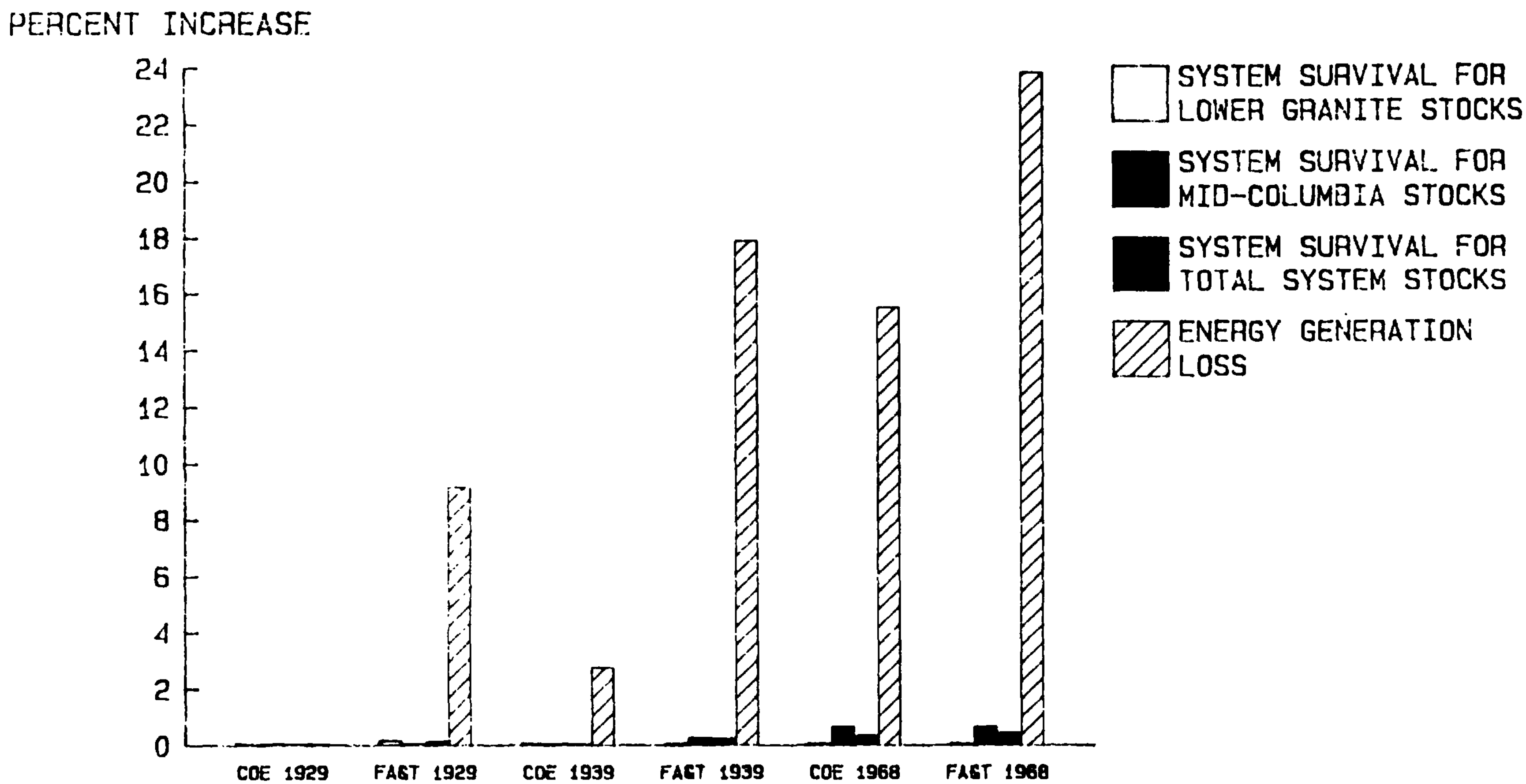


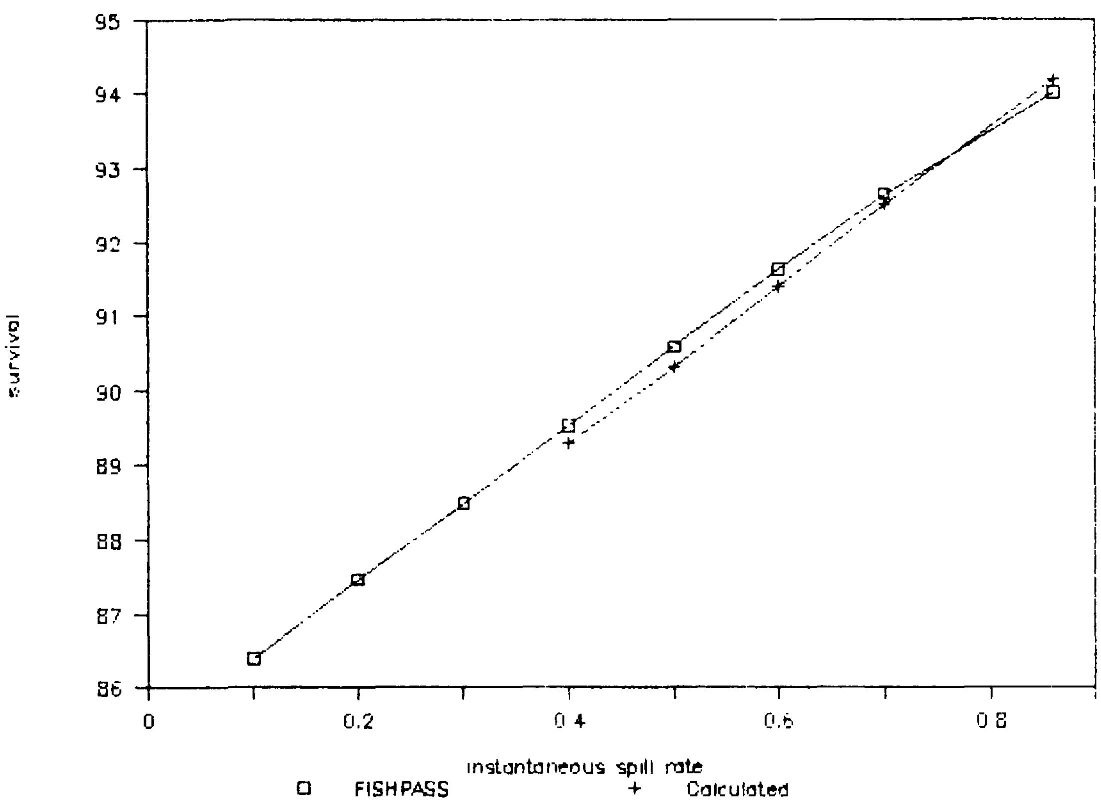
Figure 5

Distributed by Fishery Agencies and Tribes

at JFPP meeting on March 13, 1987

BAB

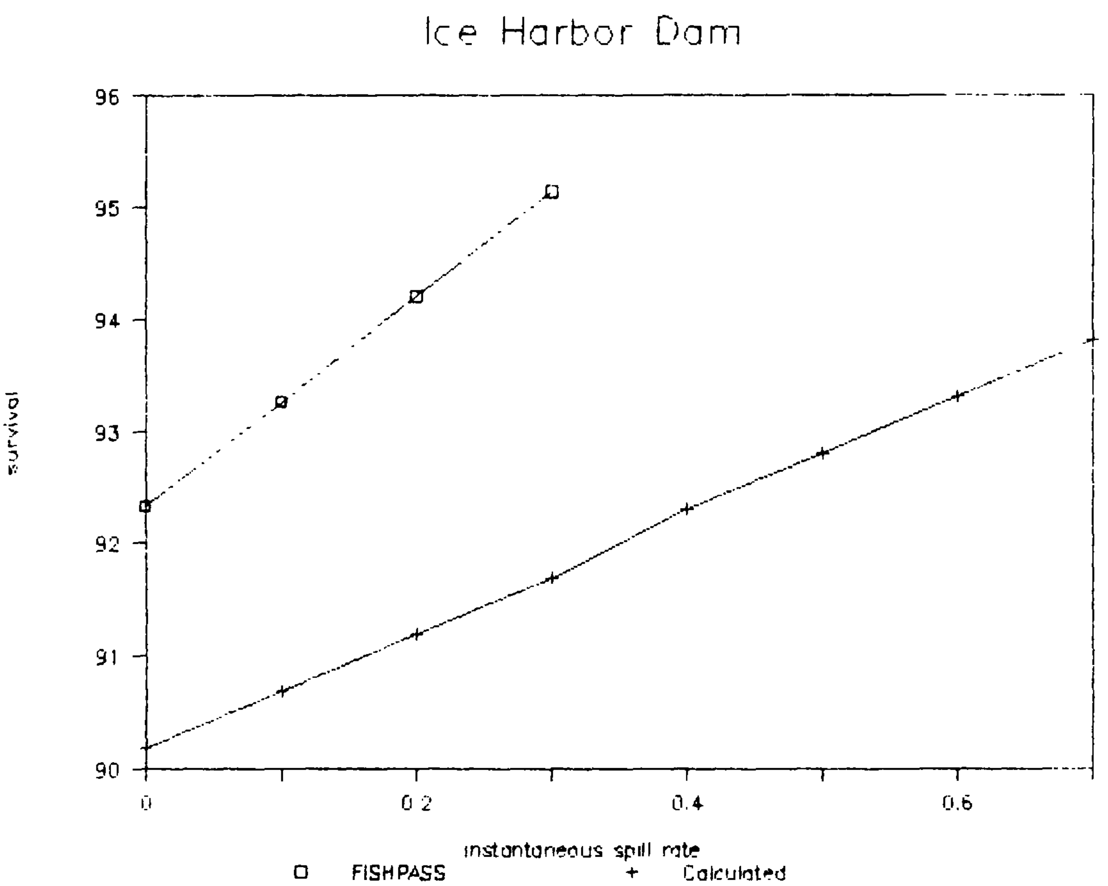
Lower Monumental Dam



Lower Monumental Dam

Instantaneous Spill Rate	Survival FISHPASS	Calculated
0.00		
0.10	86.40	
0.20	87.47	
0.30	88.50	
0.40	89.54	89.30
0.50	90.58	90.30
0.60	91.62	91.40
0.70	92.65	92.50
0.86	94.00	94.20

Calculated values assume 1:1 spill efficiency, 12 hours of spill per day, 82.3 percent of fish passing during spill hours, 98 percent spillway survival, and 85 percent turbine survival.

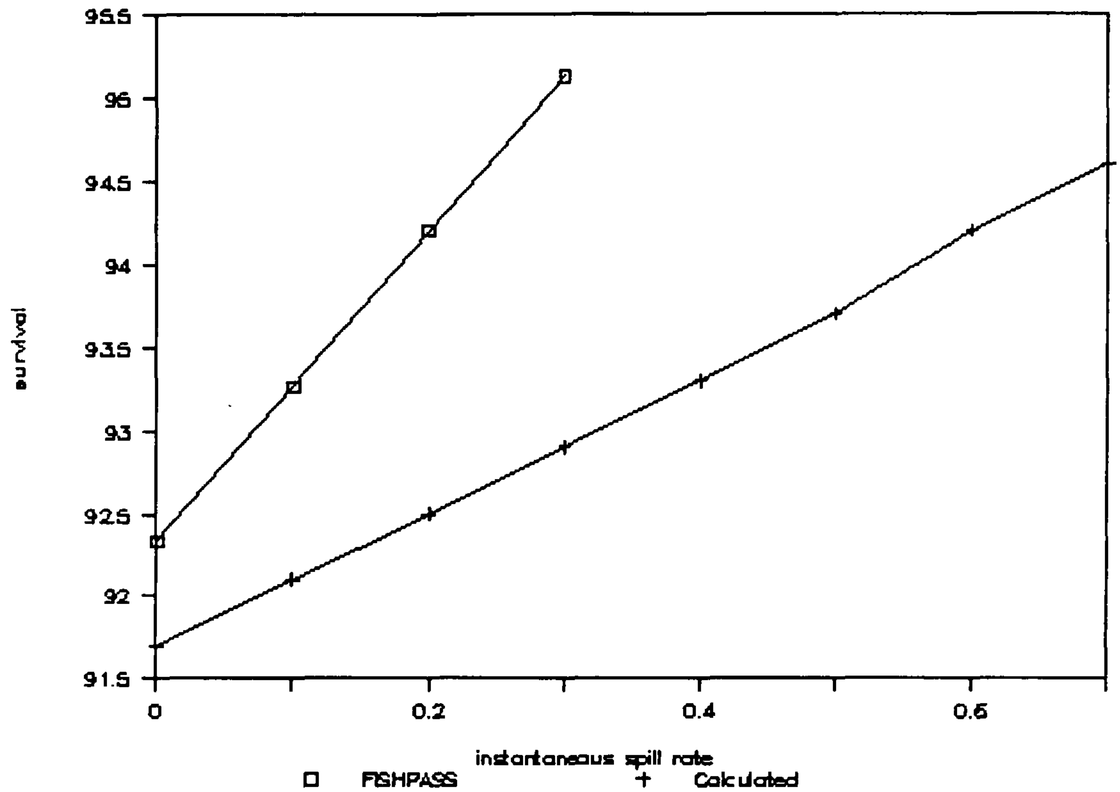


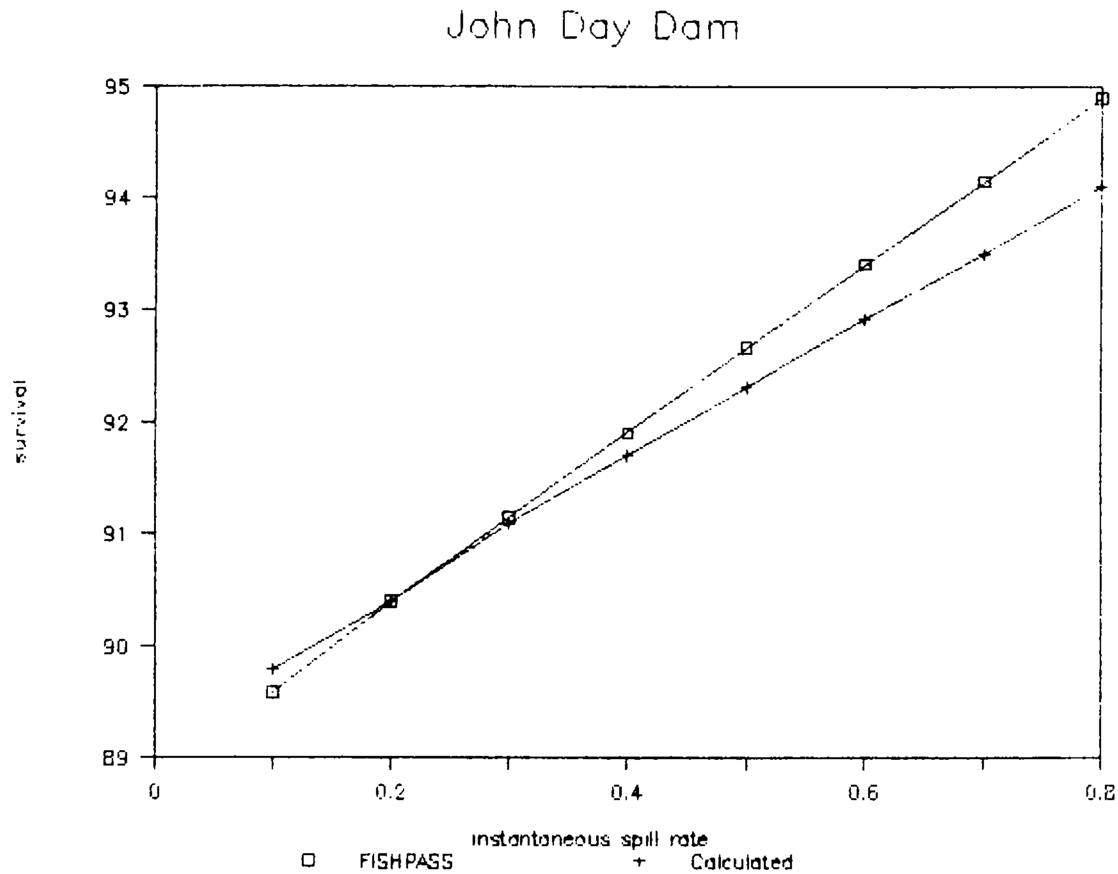
Ice Harbor Dam

Instantaneous Spill Rate	Survival FISHPASS	Survival Calculated
0.00	92.33	90.20
0.10	93.26	90.70
0.20	94.20	91.20
0.30	95.13	91.70
0.40		92.30
0.50		92.80
0.60		93.30
0.70		93.80

Calculated values assume 1:1 spill efficiency, 12 hours of spill per day, 66 percent of fish passing during spill hours, 98 percent spillway and sluiceway survival, 85 percent turbine survival, continuous sluiceway operation, and 40 percent instantaneous sluiceway efficiency.

Ice Harbor Dam

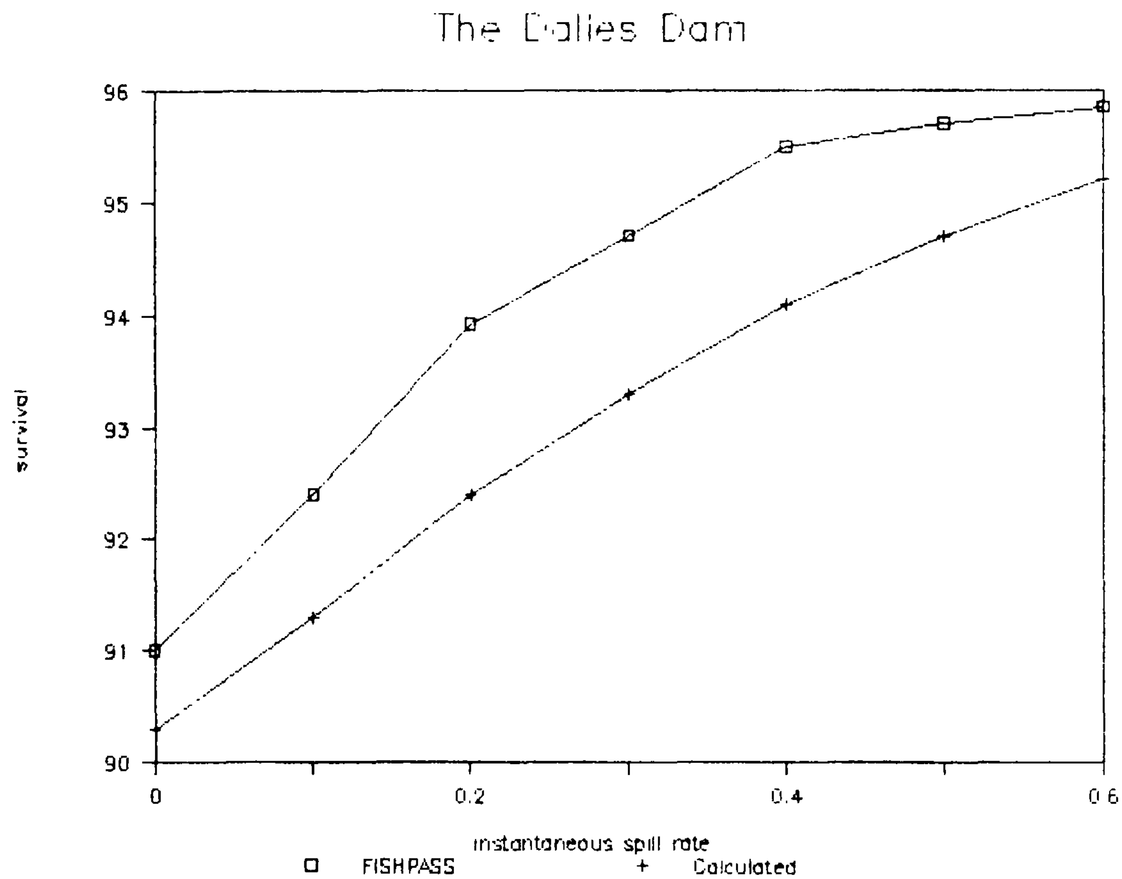




John Day Dam

Instantaneous Spill Rate	Survival FISHPASS	Calculated
0.00		
0.10	89.60	89.80
0.20	90.40	90.40
0.30	91.15	91.10
0.40	91.90	91.70
0.50	92.65	92.30
0.60	93.40	92.90
0.70	94.14	93.50
0.80	94.89	94.10

Calculated values assume 1:1 spill efficiency, 12 hours of spill per day, 70 percent of fish passing during spill hours, 98 percent spillway survival, 99 percent bypass survival, 85 percent turbine survival, and 30 percent fish guidance efficiency.



The Dalles Dam

Instantaneous Spill Rate	Survival FISHPASS	Survival Calculated
0.00	91.00	90.30
0.10	92.40	91.30
0.20	93.93	92.40
0.30	94.71	93.30
0.40	95.49	94.10
0.50	95.70	94.70
0.60	95.85	95.20

Calculated values based on functional relationship developed by ODFW and described in the Detailed Fisheries Operating Plan. They assume 98 percent sluiceway and spillway survival, 85 percent turbine survival.

Appendix Table 5.-- Daily Collection Counts of Chinook, Wild and Hatchery Steelhead, and Sockeye, Facility Mortalities, and Daily River Flows and Spills During 1986, at Little Goose Dam.

DATE	YEARLING CHINOOK	SUB-YEARLING CHINOOK	WILD STEELHEAD	HATCHERY STEELHEAD	SOCKEYE	DAILY TOTAL	COLLECTION MORTALITY		RIVER FLOW IN CFS	SPILL	
							NUMBER	PERCENT		TOTAL	PERCENT
Mar 29	2,004	0	0	0	0	2,004	0	0.00	103,400	0	0.00
Mar 30	0	0	0	0	0	0	0	0.00	109,200	3,200	2.93
Mar 31	836	0	0	1,982	43	2,861	0	0.00	102,900	0	0.00
Apr 1	1,188	0	0	1,299	50	2,537	0	0.00	103,200	0	0.00
Apr 2	1,106	0	0	1,974	25	3,105	0	0.00	109,300	0	0.00
Apr 3	2,054	0	0	2,287	79	4,420	0	0.00	110,200	0	0.00
Apr 4	2,715	0	0	2,202	61	4,978	290	5.83	111,400	0	0.00
Apr 5	2,088	0	0	1,813	33	3,934	0	0.00	91,400	0	0.00
Apr 6	3,076	0	0	2,443	90	5,609	2	.04	100,800	0	0.00
Apr 7	4,903	0	0	2,619	75	7,597	23	.30	97,500	0	0.00
Apr 8	4,843	0	0	1,612	55	6,510	0	0.00	98,200	0	0.00
Apr 9	1,855	0	0	1,104	10	2,969	0	0.00	94,200	0	0.00
Apr 10	3,395	0	96	577	4	4,072	13	.32	104,200	0	0.00
Apr 11	4,125	0	446	313	28	4,912	2	.04	106,200	0	0.00
Apr 12	7,176	0	910	548	17	8,651	160	1.85	100,300	0	0.00
Apr 13	14,606	18	2,255	546	70	17,495	99	.57	94,800	0	0.00
Apr 14	16,161	59	2,032	1,231	59	19,542	362	1.85	92,800	0	0.00
Apr 15	13,356	0	2,143	1,047	66	16,612	129	.78	87,400	0	0.00
Apr 16	13,601	84	2,516	436	100	16,737	356	2.13	88,700	1,800	2.03
Apr 17	12,201	0	6,257	899	98	19,455	182	.94	93,200	0	0.00
Apr 18	9,351	0	7,985	1,234	65	18,635	72	.39	90,700	0	0.00
Apr 19	20,660	0	4,919	1,476	0	27,055	122	.45	83,400	0	0.00
Apr 20	25,256	0	5,367	947	0	31,570	125	.40	90,000	0	0.00
Apr 21	31,910	0	4,488	1,132	113	37,643	80	.21	90,700	0	0.00
Apr 22	41,004	0	5,803	1,055	0	47,862	106	.22	82,100	0	0.00
Apr 23	39,223	90	3,725	1,750	0	44,788	132	.29	103,800	6,100	5.88
Apr 24	39,526	0	3,783	6,173	149	49,631	300	.60	117,400	8,700	7.41
Apr 25	43,127	0	3,199	10,625	0	56,951	469	.82	110,300	0	0.00
Apr 26	49,380	0	5,516	11,564	0	66,460	388	.58	103,300	0	0.00
Apr 27	29,424	0	11,921	16,573	0	57,918	212	.37	90,000	0	0.00
Apr 28	26,193	0	9,616	14,173	0	49,982	129	.26	95,000	0	0.00
Apr 29	17,952	0	15,615	19,545	0	53,112	214	.40	94,500	0	0.00
Apr 30	13,378	0	11,119	20,610	90	45,197	184	.41	87,200	0	0.00
May 1	12,210	0	7,643	23,982	88	43,923	212	.48	89,400	0	0.00
May 2	13,703	0	7,051	23,282	0	44,036	220	.50	83,900	0	0.00
May 3	12,905	0	4,845	23,012	0	40,762	115	.28	83,500	0	0.00
May 4	14,806	0	3,677	30,250	0	48,733	258	.53	89,600	0	0.00
May 5	20,284	0	3,381	33,981	0	57,646	247	.43	102,700	0	0.00
May 6	23,214	0	5,118	31,561	0	59,893	297	.50	113,100	0	0.00
May 7	8,219	0	2,131	40,234	0	50,584	132	.26	103,900	0	0.00
May 8	5,330	0	2,460	29,484	0	37,274	117	.31	96,100	0	0.00
May 9	3,747	0	3,423	28,643	0	35,813	119	.33	91,700	0	0.00
May 10	5,025	0	2,953	43,672	0	51,650	94	.18	105,300	0	0.00
May 11	4,162	0	3,893	36,380	0	44,435	68	.15	98,800	0	0.00
May 12	4,575	0	5,415	31,987	0	41,977	88	.21	107,800	0	0.00
May 13	4,303	0	2,414	28,266	0	34,983	137	.39	99,800	0	0.00
May 14	4,988	0	3,019	35,659	0	43,666	79	.18	87,300	0	0.00
May 15	2,577	0	2,000	29,324	0	33,901	82	.24	99,000	0	0.00

Appendix Table 5.-- Continued.

DATE	YEARLING CHINOOK	SUB-YEARLING CHINOOK	WILD STEELHEAD	HATCHERY STEELHEAD	SOCKEYE	DAILY TOTAL	COLLECTION MORTALITY NUMBER	COLLECTION MORTALITY PERCENT	RIVER FLOW IN CFS	SPILL TOTAL	SPILL PERCENT
May 16	3,871	0	2,937	26,430	0	33,238	108	.32	98,400	0	0.00
May 17	4,308	0	2,279	29,018	0	35,605	86	.24	89,000	0	0.00
May 18	4,675	0	1,517	24,489	0	30,681	48	.16	83,600	0	0.00
May 19	3,053	0	1,556	25,173	0	29,782	37	.12	103,100	0	0.00
May 20	3,294	0	901	26,667	0	30,862	63	.20	103,400	0	0.00
May 21	3,739	0	1,509	27,553	0	32,801	26	.08	116,600	0	0.00
May 22	3,790	0	1,313	24,648	0	29,751	31	.10	126,400	0	0.00
May 23	2,794	0	2,292	25,839	0	30,925	56	.18	116,600	0	0.00
May 24	6,082	0	2,568	25,137	0	33,787	33	.10	98,900	0	0.00
May 25	3,704	0	3,606	25,177	0	32,487	34	.10	93,800	0	0.00
May 26	3,268	0	3,166	27,541	0	33,975	33	.10	106,500	0	0.00
May 27	2,694	0	4,502	26,533	0	33,729	19	.06	126,200	0	0.00
May 28	3,908	0	3,610	29,067	0	36,585	71	.19	164,900	33,900	20.56
May 29	4,665	0	1,715	23,230	0	29,610	50	.17	189,000	65,700	34.76
May 30	2,590	0	2,384	22,629	88	27,691	51	.18	202,800	91,200	44.97
May 31	1,704	0	2,702	23,732	0	28,138	49	.17	212,300	81,700	38.48
Jun 1	1,185	0	3,267	21,569	0	26,021	56	.22	208,500	77,900	37.36
Jun 2	475	0	2,374	19,703	0	22,552	36	.16	204,900	75,900	37.04
Jun 3	1,515	113	1,515	17,980	113	21,236	31	.15	201,800	74,100	36.72
Jun 4	3,859	0	1,319	15,800	122	21,100	37	.18	199,300	81,400	40.84
Jun 5	3,046	0	788	12,762	0	16,596	42	.25	190,500	63,300	33.23
Jun 6	726	453	726	4,989	0	6,894	7	.10	182,800	54,900	30.03
Jun 7	802	78	405	5,867	78	7,230	12	.17	171,100	43,300	25.31
Jun 8	811	0	464	4,737	232	6,244	8	.13	152,200	24,900	16.36
Jun 9	157	0	426	5,468	0	6,051	6	.10	149,100	23,000	15.43
Jun 10	806	83	361	4,188	41	5,479	5	.09	135,900	11,100	8.17
Jun 11	1,255	234	545	3,675	76	5,785	11	.19	116,500	10,200	8.76
Jun 12	932	186	73	2,454	0	3,645	6	.16	116,700	0	0.00
Jun 13	761	0	273	1,742	0	2,776	8	.29	115,900	0	0.00
Jun 14	777	0	213	1,251	0	2,241	5	.22	114,000	0	0.00
Jun 15	401	66	135	971	0	1,573	7	.45	100,100	0	0.00
Jun 16	894	0	65	765	0	1,724	5	.29	104,900	0	0.00
Jun 17	633	0	36	1,299	0	1,968	17	.86	103,000	0	0.00
Jun 18	696	68	0	1,030	0	1,794	4	.22	94,600	0	0.00
Jun 19	798	0	21	567	0	1,386	7	.51	96,000	0	0.00
Jun 20	751	0	65	642	0	1,458	3	.21	78,900	0	0.00
Jun 21	318	220	48	341	0	927	27	2.91	78,800	0	0.00
Jun 22	167	56	37	371	37	668	1	.15	64,300	0	0.00
Jun 23	397	31	0	429	0	857	15	1.75	63,500	0	0.00
Jun 24	549	55	0	239	18	861	7	.81	66,800	0	0.00
Jun 25	474	45	12	248	0	779	11	1.41	61,600	0	0.00
Jun 26	302	36	24	193	0	555	2	.36	58,700	0	0.00
Jun 27	719	88	35	211	0	1,053	10	.95	59,700	0	0.00
Jun 28	1,034	125	42	207	15	1,423	4	.28	46,200	0	0.00
Jun 29	734	250	0	139	13	1,136	13	1.14	48,100	0	0.00
Jun 30	281	53	13	41	0	388	0	0.00	0	0	0.00
Jul 1	137	23	0	114	0	274	3	1.09	42,700	0	0.00
Jul 2	129	18	0	18	0	165	4	2.42	37,100	0	0.00

Appendix Table 5.-- Continued.

DATE	YEARLING CHINOOK	SUB-YEARLING CHINOOK	WILD STEELHEAD	HATCHERY STEELHEAD	SOCKEYE	DAILY TOTAL	COLLECTION MORTALITY NUMBER	COLLECTION MORTALITY PERCENT	RIVER FLOW IN CFS	SPILL TOTAL	SPILL PERCENT
Jul 3	486	112	0	57	11	666	12	1.80	42,600	0	0.00
TOTAL	722,867	2,644	220,973	1,144,436	2,312	2,093,232	7,633	.36			

COLUMBIA BASIN FISH AND WILDLIFE AUTHORITY
LLOYD BUILDING • SUITE 1240
700 N. E. MULTNOMAH STREET
PORTLAND, OREGON 97232

(503) 231-2241
FTS 429-2241

OFFICE OF
EXECUTIVE SECRETARY

March 30, 1987

Colonel James R. Fry
Deputy Division Engineer
Corps of Engineers, NPD
P.O. Box 2870
Portland, Oregon 97208-2870

Dear Colonel Fry:

This letter provides the comments of the Columbia Basin Fish and Wildlife Authority, representing the fishery agencies and tribes of the Columbia River basin, on your Draft 1987 Juvenile Fish Passage Plan and Appendices (JFPP).

The fishery agencies and tribes (A & T) have been working with the Corps since December, 1986, in an effort to develop a joint plan to protect juvenile salmon and steelhead on their downstream migration to the sea.

At the first meeting we presented the fishery agencies' and tribes' Juvenile Fish Bypass Performance Standards for Mainstem Dams on the Columbia and Lower Snake rivers. Implemention of these standards would require spill at some projects to divert 70 percent of spring migrants and 50 percent of summer migrants away from hydroelectric turbines in order to meet interim passage objectives. Our primary objective during the planning process has been to design a plan that will provide spill at levels needed to meet the 70/50 percent interim standards when secondary energy is available. In meetings with the Corps we have considered a number of sliding scale alternatives that would provide spill to meet the 70/50 percent passage efficiency standards while providing for a reduction in spill under critical conditions down to that needed to meet the 90 percent minimum survival standard established by the Northwest Power Planning Council. We believe that a sliding scale could be implemented for 1987 on a trial basis if it were designed 1) to begin when river flows exceed that necessary to meet firm power loads, and 2) to equitably distribute flows above firm power requirements to both power and fisheries needs (in a manner known as the "equal shares" or 1:1 plan). We commend the Corps' willingness to implement a sliding scale on a trial basis in 1987. Unfortunately, the Draft JFPP indicates the Corps' unwillingness to commit to a sliding scale alternative that provides equitable treatment for fish and that will provide any noticeable benefit above the 90 percent level in 1987. Our specific concerns with the JFPP are described in this letter.

The JFPP is not consistent with the NPPC's Fish and Wildlife Program.

The fishery agencies and tribes have developed spill criteria that specify typical dates of passage of the spring and summer migrations, hours of spill, and mechanisms for triggering spill when fish are present at the projects. We provided the Corps with draft spill criteria at several of the initial meetings of the Working Committee. We discussed these criteria further at subsequent meetings in order to clarify for the Corps those criteria that were different from the 1986 criteria. The JFPP does not incorporate many of the agencies' and tribes' spill criteria. We describe below how the JFPP departs from our spill criteria in detail in the project-specific portion of this letter. Additionally, we have attached our 1987 Interim Spill Plan, which includes our spill criteria, to this letter (Enclosure 1).

The Columbia River Basin Fish and Wildlife Program calls for the second powerhouse at Bonneville Dam to achieve 85 percent passage efficiency. In the JFPP, the Corps proposes to adopt a mechanism that would permit operation of the second powerhouse if hydroacoustic monitoring indicates that less than 750 fish per hour are passing the second powerhouse. This proposal is not consistent with the Council's Program and has not been substantiated with biological data. We have twice requested that the Corps provide us with the data upon which the 750 fish per hour trigger number was based. Since we have not received these data and because no other data are available, we have no basis for evaluating the effects of the proposed procedure. We are concerned that operating the second powerhouse until large numbers of fish are present at the powerhouse may attract fish away from the first powerhouse and spillway and then leave them in the forebay without passage opportunity once the second powerhouse is shut down. We do not know how long a delay might be imposed, nor do we know what effect such a delay (in addition to all of the other stresses encountered as the juvenile fish pass up to nine dams and reservoirs on their downstream migration) may have on overall survival. Fish attracted into the forebay of the second powerhouse may remain there until evening hours when the powerhouse will be operated for research. Given the magnitude of uncertainty associated with the proposed procedure, we do not support the Corps' proposal to deviate from the Council's Program.

The Program does not specify an ending date for the special operations required at Bonneville Dam. The draft JFPP calls for an August 15 ending date at Bonneville, despite the fact that considerable numbers of fish continue to pass the dam after that date. In order to be consistent with the Council's Program and to provide necessary fish protection, we recommend that the Corps delete the August 15 date from its Bonneville Dam section.

The Corps' sliding scale fails to treat fish in a manner that is equitable during periods when non-firm power is available.

The Corps' sliding scale is unlikely to offer noticeable fish protection in 1987. The Corps has proposed a sliding scale that begins at flows that are 25 percent above the levels expected to meet Firm Energy Load Carrying Capability (FELCC). This proposed sliding scale would allow substantial generation of non-firm energy during periods when little or no additional fishery protection was being provided. For example, the Corps has estimated that under 1939 water conditions, their proposed sliding scale would result in the spill of 311 gigawatt-hours (GWH) above what would be spilled under the base case. By comparison, the final refill studies developed for the current water year using those same 1939 water conditions indicate that during these same months the system would produce 6980 GWH of power above FELCC. Table 1 provides a comparison of the estimated power and revenue foregone and the expected availability of non-firm power under each of the alternatives and water conditions tested.

Table 1. Impact of two spill alternatives on non-firm power (April 15 - August 15).

	Power above[1] FELCC	Power Loss due to Spill[2] above Base Case: Corps	Power Loss due to Spill[2] above Base Case: Agencies and Tribes
	(GWH)		
1929	-9	57	98
1939	6980	311	400
1968	13,900	227	293

	Revenue from[3] Non-Firm Sales	Revenue Loss due to Spill above Base Case: Corps	Revenue Loss due to Spill above Base Case: Agencies and Tribes
	($1,000,000)		
1929	0	1.0	1.7
1939	118.7	5.3	6.8
1968	236.3	3.8	5.0

Notes:

1. Power above FELCC taken from Final Refill Study.
2. Power loss determined by FISHPASS.
3. Assumes all power can be sold at 17 mils.

There are two specific reasons that the proposed sliding scale provides less than equitable treatment. First, is the use of the 25 percent "flexibility factor" in determining when to begin to increase juvenile fish protection. The Corps has indicated that, although it is a coincidence, the trigger flows developed using the "flexibility factor" fall within the range of flows during which BPA would be meeting what they consider to be a "reasonable secondary market" or the expected secondary demand (3600 average MW). Thus, the Corps' proposal does not equitably share water above that needed to meet firm power but instead shares only the water above that needed to meet firm power and most of the expected secondary demand.

The second reason the proposed plan provides less than equitable treatment is the use of the water budget minimum flow targets as the starting point for the sliding scale in May. The Corps' plan explains that it would not be appropriate to spill FELCC that is available in May due to the way that the Water Budget is incorporated into power system planning. We disagree. We are greatly concerned that the effect of this exclusion on spilling based on actual flows including the Water Budget is to move the greatest amount of juvenile fish protection out of the period of maximum spring passage (at The Dalles Dam, for example, the middle 80 percent of the spring migration roughly coincides with the month of May). We believe that the determination of whether any given flow in the river is needed to produce power to meet firm load should best be made in-season.

In discussions with the Corps we suggested removing the "flexibility factor" and placing the trigger flows lower. (It should be noted that the sliding scale characterized in the Corps' Juvenile Fish Passage Plan as the recommendation of the fishery agencies and tribes is an amalgamation of numerous ideas discussed with the Corps. For the purpose of modeling an alternative to the Corps' proposed plan it generally reflects the range of scales still under consideration after several meetings. It is not, however, the recommendation of the fishery agencies and tribes.) Since we have agreed to accept a caveat to the effect that the sliding scale would only be used when the system was producing power above that needed to meet firm load, we believe that the power system would not be at risk by lowering the trigger flows.

Therefore, our recommendation, which has been incorporated into our 1987 Detailed Fisheries Operating Plan and is herein enclosed, is to provide one-half of the flow above that needed to meet firm power requirements as spill for fish, until either the 70/50 standard is being met at all projects or hydraulic capacity is exceeded. Using the Summary of Planned Daily Operation and other relevant information provided by BPA, the Corps could then determine the flow needed to meet firm power demand on a real time basis. We believe that this approach would provide equitable treatment for fish and would address the Corps' concerns about the need for sufficient flexibility to accommodate in-season conditions.

Under an "equal shares" sliding scale spill formula, the daily average spill proportion would be calculated as follows:

$$s_i = \frac{s_o f_o + 0.5\,(f_i - f_o)}{f_i}$$

where:

s_o = base case spill proportion
f_o = flow needed to meet firm load
f_i = flow on day i
s_i = spill proportion on day i

For the record, we believe that we must respond to the "BPA Analysis of Sliding Scale Spill Proposals" that is included in Appendix 2 of the draft JFPP.

The BPA analysis grossly distorts the costs and benefits of interim juvenile fish passage in spill by comparing relative increases in fish survival with absolute costs in energy foregone. As indicated by Figure 1 (Enclosure 2), we could similarly present comparisons of the costs of these spill programs relative to overall BPA revenues. For instance, BPA's estimate of the costs of the agencies' and tribes' plan in 1987 amounts to less than two-tenths of one percent of BPA's projected fiscal year 1987 revenues ("worst case" costs are less than four-tenths of one percent). It appears, therefore, that the $3 - 11 million range of costs estimated by BPA for an effective sliding scale spill program represents an extremely modest portion of BPA's $3.0 billion in projected revenues. Thus, while we do not agree with BPA's estimate of the biological benefits of the sliding scale plans, we believe that an effective sliding scale would be appropriate even in view of BPA's estimated benefits. There may be alternative means of increasing BPA revenues by roughly two-tenths of one percent, but the fishery agencies and tribes do not believe there are any alternative means (beyond those already in effect) to improve the survival of salmon and steelhead stocks migrating from the upper Columbia and Snake rivers in 1987.

There are also technical deficiencies in the BPA analysis. These stem primarily from incautious assumptions and the inappropriate application of the Corps' FISHPASS model. Furthermore, the conclusions drawn by BPA in this report, in particular those concerning the significance of increases in fish survival, the adequacy of benefits relative to costs and the availability of more cost-effective alternatives, are to be expected from a power management and marketing agency. However, the Northwest Power Act clearly assigns the role of balancing fish and power to the Council, and requires that even they resolve conflicting recommendations "giving due weight to the recommendations, expertise, and legal rights and responsibilities" of the fish and wildlife agencies and tribes.

Despite the conservatism built into the Corps' sliding scale proposal, the JFPP further undercuts the effectiveness of the sliding scale plan by providing for its implementation only at the discretion of the Corps.

Certain revisions to the JFPP appear to provide evidence of the Corps' low level of commitment to the implementation of an effective sliding scale spill plan. In the project-specific sections for The Dalles, John Day, and Lower Monumental, the preliminary draft JFPP noted that spill would be provided "in accordance with a test sliding scale spill plan...." The latest draft of the JFPP deletes this language, and only refers to the sliding scale in the introduction, in section 12, and in Appendix 6. In section 12 of the plan, the Corps also states that implementation will be subject to the "ad hoc decision of the Corps personnel at the project after reviewing current system conditions and consulting with others." Who the others are is not stated, but this is clearly a reversion to the provisions of the 1986 plan which provided spill above the 90 percent level only "at the discretion of the Corps."

In its references to the sliding scale, the Corps indicates that it will be used "on a test basis." Nowhere in the plan, however, is there any discussion of how the sliding scale will be tested or how its effectiveness will be evaluated. We believe that such an evaluation will require detailed information concerning BPA's power marketing activities in the April to August period. If the spill that the fishery agencies and tribes recommend for fish is not provided because of a need to generate "firm" power, then we should know what BPA customers or customer classes were given that priority over this mitigation program. In our 1987 Interim Spill Plan, we request that BPA provide a daily accounting of the amount of power sold at each of the rates contained in the 1985 Wholesale Power Rate Schedule and applicable supplements.

The fishery agencies and tribes will establish priorities for the use of spill.

When flows in the system exceed the levels necessary to meet firm power loads, 50 percent of the excess flow should be spilled until the 70/50 passage standards are attained. However, if the amount of spill is insufficient to meet the 70/50 percent passage efficiency standards at each project, the fishery agencies and tribes will specify in-season amounts of spill and projects at which spill should be concentrated.

Lack of data reduces the value of using a computer model to drive spill planning.

As we have commented in previous correspondence, the FISHPASS model oversimplifies a very complex system of downstream fish passage. Because of data limitations, the model contains many assumptions. Fish survival is determined by a series of calculations, each one adding a factor of uncertainty. Sensitivity analyses conducted by the Mainstem Passage Advisory Committee indicate that the cumulative effect of the uncertainty of individual parameters overshadows the differences in dam and system survival of alternative scenarios.

We recommend that the Corps clearly state the assumptions that were used in the FISHPASS model. To assist the reader, these assumptions should be stated in the body of the JFPP, and key assumptions should be listed with each table.

The fishery agencies and tribes have repeatedly commented before the Corps and the Northwest Power Planning Council their disagreement with the Corps' use of system survival estimates to compare spill alternatives. The Corps continues to give equal credit to transported and in-river fish, despite comments that a post-transport survival factor should be applied to transported fish to reflect the differential in the ocean survival of transported and non-transported fish. Our October 2, 1985 memorandum to the MPAC and our January 24, 1986 comments to Chairman Saxvik describe two approaches to determining an appropriate adjustment factor based on limited available data.

As a result of the apparent deficiencies associated with designing a spill program around a computer model, a comprehensive monitoring program is needed to provide in-season protection for fish. We therefore recommend that the Corps conduct monitoring at all projects where spill is planned, and we believe not doing so would be irresponsible.

Tables 5, 6, and 7 are misleading.

The use of survival values for juveniles originating from all locations to below Bonneville Dam is misleading. A survival estimate that averages juveniles introduced above Lower Granite Dam with those entering above Bonneville Dam (and everywhere in between) is misleading and of no value.

Table 8 would be more useful if the FELCC impacts were project-specific.

We suggest that the FELCC impacts be presented by project in order to more clearly identify where the impacts are greatest.

Project-Specific Comments

Bonneville Dam

We specifically recommend the deletion of all language in this section that relates to the operation of the second powerhouse at Bonneville.

Section 12 of the plan states that the Corps will "continue to provide special regulation for hatchery releases when it can be demonstrated that large numbers of juvenile (sic) are passing the project." We recommend that this language be changed to read "... when these fish are passing..." We also recommend that similar but more specific language to this effect be added under the appropriate projects in section 5. Specifically, under Bonneville Dam, we recommend the following:

> Beginning on the day following the early spring release of fall chinook from Spring Creek Hatchery and continuing for at least 10 days and longer as needed, the following operation will occur:
>
> 1. No operation of unscreened units at Bonneville Dam.
> 2. No operation of Bonneville Second Powerhouse.
> 3. Spill flows in excess of the hydraulic capacity of screened units at Bonneville First Powerhouse.
>
> These operations to protect juvenile migrants will resume again when the fishery agencies and tribes determine that there is significant movement of fish past the Bonneville project.

The Dalles Dam

We disagree with the spill/survival relationship employed by the Corps in their FISHPASS analysis for The Dalles Dam. Attachment 1 to the 1987 Interim Spill Plan includes our estimate of the spill/survival relationships at The Dalles Dam.

Add the following spill criteria:

> Spill will be provided in accordance with the sliding scale spill formula.
>
> In the absence of any monitoring at The Dalles Dam, spill for the spring migration will be initiated five days after the first 10 percent of the yearling chinook migration has passed McNary Dam, as determined by the fishery agencies and tribes on the basis of time-series analysis and consideration of hatchery releases into John Day and The Dalles pools.
>
> It is expected that the date of 90 percent passage of spring migrants will overlap the date of 10 percent passage of summer migrants. The change from the spring to the summer

For the summer migration, spill will be provided every night following days of estimated passage in excess of 30,000 fish at John Day Dam.

Spill will also be provided at the request of the Fish Passage Managers if unusual migration patterns are evident that would prevent the use of the stated spill criteria from protecting 80 percent of the spring and summer migrations.

During the spring, requested spill will be provided as a constant percentage of discharge for 24 hours per day.

During the summer, requested spill will be provided as a constant percentage of discharge between 1800 and 0600 hours. The instantaneous spill percentage during spill hours will be such that it will result in the daily average spill rate requested by the fishery agencies and tribes.

John Day Dam

Add the following spill criteria:

Spill will be provided in accordance with the sliding scale spill formula.

Spill will also be provided at the request of the Fish Passage Managers if unusual migration patterns are evident that would prevent the use of the stated spill criteria from protecting 80 percent of the summer migration.

The draft JFPP recommends that hours of spill be 1900 to 0300 initially until a distinct diel passage pattern is defined. We recommend that spill hours initially be set at 1800 to 0600.

The draft JFPP includes a spill trigger of 30,000 fish "based upon hydroacoustic monitoring or airlift index." We agree that spill should be initiated when the trigger for either of the indices is exceeded. However, 30,000 fish is an inappropriate trigger for the airlift index. Based on the analysis contained in the draft spill criteria provided to the Corps on January 13, 1987, our final criteria include a trigger of 7500 subyearling chinook in the unit 3 airlift index. Additionally, to avoid the confusion that occurred in 1986, it should be noted that the analysis of the airlift data that led to this trigger employed the index (that is the number of fish captured divided by the percentage of flow through unit 3) not the raw gatewell counts.

Ice Harbor Dam

The draft JFPP does not mention the dates of sluiceway operation. We recommend that the 1 April through 1 September period be specified.

We do not agree with the Corps that survival at Ice Harbor with no spill is equal to 92 percent. Attachment 1 to the 1987 Interim Spill Plan includes our estimate of the spill/survival relationships at Ice Harbor Dam. We have repeatedly raised concerns with the use of hydroacoustic data collected without concurrent fyke net capture. At Ice Harbor the 51 percent sluiceway efficiency value was obtained from hydroacoustics in a year when no fyke net studies occurred.

We seriously question the validity of a sluiceway efficiency measurement that requires comparing fish passage through a relatively small flow conduit to passage through turbine intakes and spillways. The areas ensonified and the water velocities through the ensonified areas can vary greatly between the sluiceway, turbine intakes, and spillways. Additionally, the sluiceway efficiency estimate from hydroacoustics is highly questionable because of the potential effect of surface interference due to the relatively shallow (20 feet) sluiceway entrance. Thus, although hydroacoustics may be useful in obtaining relative information regarding passage through a specific area, it should be used cautiously, and even then only with concurrent fyke net or other sampling methods, in comparisons of passage through different areas.

We are particularly concerned that the JFPP calls for no spill during the summer migration. There have been no studies at Ice Harbor regarding sluiceway passage of subyearling migrants. Studies at other dams consistently show that subyearling migrants pass bypass systems and sluiceways at a lower rate than do yearling migrants. The difference in passage rates between yearling and subyearling migrants has been substantial in previous studies of sluiceway passage at Bonneville and The Dalles dams.

The JFPP does not incorporate the spill criteria of the agencies and tribes. We have described these criteria in detail in the 1987 Interim Spill Plan. These criteria include the typical dates of passage (April 23 through June 3 for spring migrants, and approximately June 4 through July 18 for summer migrants), hours of spill (1800 until 0600, lacking monitoring capability at Ice Harbor), and spill triggers (15,000 passage index at Little Goose and three days after spill is initiated at Lower Monumental for Lyons Ferry Hatchery releases).

Spill will also be provided at the request of the Fish Passage Managers if unusual migration patterns are evident that would prevent the use of the stated spill criteria from protecting 80 percent of the spring and summer migrations.

We have included in our 1987 Interim Spill Plan provisions for a sliding scale for spill at Ice Harbor. We do not believe that this sliding scale should start after other projects have reached what is assumed to be the 92 percent survival level at Ice Harbor. We recommend that whenever flows to meet non-firm loads are available the sliding scale may be implemented at Ice Harbor.

<u>Lower Monumental Dam</u>

Add the following spill criteria:

Spill will be provided in accordance with the sliding scale spill formula.

Typical dates of passage are estimated to be April 20 through May 31 for the spring migrants, and approximately June 1 through July 15 for the summer migrants. Substantial fish passage may occur outside these dates depending on hatchery release dates and fish travel times.

Spill will be provided when the passage index at Little Goose for the aggregate number of chinook, sockeye, coho, and steelhead is equal to or greater than 15,000. Two days after the 15,000 trigger is reached at Little Goose, spill will begin at Lower Monumental.

Spill will be provided when Lyons Ferry or other hatchery fish are released and appear at Lower Monumental as indicated by hydroacoustic data and recovery of marked fish in gatewell dipping. Two days after Lyons Ferry fish are released, spill will begin at Lower Monumental.

Spill will also be provided at the request of the Fish Passage Managers if unusual migration patterns are evident that would prevent the use of the stated spill criteria from protecting 80 percent of the spring and summer migrations.

At the start of the season, spill will occur from 1800 until 0600 hours, until a distinct diel passage pattern is discernible. The Corps and Fish Passage Center will review sonar data and jointly agree to adjust hours to match peak passage periods. The instantaneous spill percentage during spill hours will be such that it will result in the daily average spill rate requested by the fishery agencies and tribes.

As indicated in the spill criteria listed above, the trigger of 1000 subyearling chinook migrants is not acceptable to the fishery agencies and tribes. This number was derived from previous years' collection indices at Little Goose Dam. During those years large numbers of subyearling chinook were being released above Lower Granite Dam. These fish are not currently being released above Lower Granite, but instead large numbers of subyearling chinook are being released at Lyons Ferry Hatchery.

Because the Lyons Ferry fish do not pass Little Goose, they cannot be counted as part of the 1000 trigger number that is based on the Little Goose collection index. Thus, the special criteria stated above are needed to protect Lyons Ferry fish. We expect that the operation resulting from the agencies' and tribes' criteria will also adequately protect summer migrants originating above Lower Granite Dam. While there will be no separate counts for yearling and subyearling chinook at Little Goose in 1987, we will also consider movement of summer migrants at Little Goose in formulating spill requests for Lower Monumental.

Little Goose Dam

Spill will be requested at Little Goose by the fishery agencies and tribes to improve passage conditions for yearling chinook. An "equal shares" sliding scale for spill will be utilized. Up to 28 percent of daily average flow (57 percent instantaneous for 12 hours) may be utilized as spill to attain the 70 percent guidance efficiency standard for spring migrants prior to the maximization of transportation. Transportation will be maximized when: 1) average flows are projected to drop below 100 kcfs for approximately 5 days, or 2) it is estimated that 80 percent of the yearling chinook salmon have passed the project.

Lower Granite Dam

Spill will be requested at Lower Granite by the fishery agencies and tribes to improve passage conditions for yearling chinook. An "equal shares" sliding scale for spill will be utilized. Up to 28 percent of daily average flow (57 percent instantaneous for 12 hours) may be utilized as spill to attain the 70 percent guidance efficiency standard for spring migrants prior to the maximization of transportation. Transportation will be maximized when: 1) average flows are projected to drop below 100 kcfs for approximately 5 days, or 2) it is estimated that 80 percent of the yearling chinook salmon have passed the project.

Additional Comments

Due to the limited review period for the draft JFPP, we have been unable to fully review portions of the proposed plan. We especially wish to provide comments on Appendix 7, Corps of Engineers Spill Monitoring Plan for 1987, at a later date. We have previously reviewed the draft Operation and Maintenance Criteria, Appendix 3. We were pleased to note that some of our previous comments (Letter to Colonel James R. Royce, Walla Walla District, from Rolland A. Schmitten, CBFWC, and S. Timothy Wapato, CRITFC, December, 1986, and Letter to Jim Kuskie, Portland District, from Dale R. Evans, NMFS, February 20, 1987) have been incorporated into this revised draft. Those previous comments not addressed are still valid.

Conclusion

We hope that our comments will be useful to you as you finalize the JFPP. We recognize that substantial differences remain between the Corps' draft JFPP and the 1987 Interim Spill Plan of the fishery agencies and tribes. We recommend that the agencies' and tribes' spill plan and spill criteria be incorporated into the JFPP. Although time is running short, we remain willing to discuss with you options for reaching agreement on a joint plan.

Thank you for this opportunity to comment.

Sincerely,

John R. Donaldson
Executive Secretary

cc: CBFWA members
Robert Duncan, NPPC
Rick Applegate, NPPC
Jim Jura, BPA
Al Wright, PNUCC

1987 INTERIM SPILL PLAN

I. Introduction

The fishery agencies and tribes began meeting with the Corps of Engineers (Corps) in December 1986, in an effort to develop a joint 1987 juvenile fish passage plan. The parties entered discussions with the intent to explore a sliding scale for spill that would provide spill above that required to meet the minimum 90 percent dam survival objective required by the Northwest Power Planning Council's (NPPC) Fish and Wildlife Program (Program). In February 1987, the NPPC amended the Program to require the Corps to develop a juvenile fish passage plan which incorporates a sliding scale formula for providing variable levels of additional spill to achieve better than 90 percent smolt survival, exclusive of transportation benefits, for 80 percent of the spring and summer migrants at each project in better than critical water years.

The NPPC's amended Program also called for the fish and wildlife agencies and tribes to develop spill criteria which specify: 1) the spring and summer periods that include 80 percent of the typical spring and summer migrations, 2) the typical daily hours of peak fish passage, and 3) the numbers of juveniles that will trigger spill operations. These spill criteria are described in Section VI of this spill plan.

II. Agencies' and Tribes' Passage Objectives

The agencies' and tribes' ultimate per project passage survival goal is 100 percent. However, the agencies and tribes believe that the best per project survival which can be accomplished with existing project facilities and present technology is 97 percent. This survival rate equates to a fish passage efficiency rate of 85 percent. The tribes and agencies have proposed that minimum functional juvenile bypass performance standards for fish passage at Corps' projects be used as passage objectives for the 1987 interim spill plan. Implementation of these standards would mean attempting to divert 70 percent of spring migrants and 50 percent of summer migrants away from hydroelectric turbines at each mainstem Corps dam in 1987. The fishery agencies' and tribes' Juvenile Fish Bypass Performance Standards for Mainstem Dams on the Columbia and Lower Snake Rivers, are included as Appendix C to the 1987 Detailed Fisheries Operating Plan.

III. Trial Sliding Scale for Spill in 1987

Efforts to develop a sliding scale spill plan with the Corps were hindered by an inability to reach consensus primarily on the slope of a sliding scale and on the flow level which would trigger the sliding scale. The agencies and tribes recognize that any sliding scale is a significant departure from both the 70/50 bypass performance standards and the 97 percent survival objective. However, in an attempt to work cooperatively in the spirit of the Fish and Wildlife Program, the agencies and tribes are willing to conduct a trial sliding scale spill plan for the 1987 juvenile outmigration season. This plan attempts to equitably distribute flows above firm power requirements to both power and fisheries needs, and is known as the "share-the-wealth" plan. Although a joint plan has not been agreed to with the Corps, the agencies and tribes propose to request spill in-season according to the following guidelines:

1. When only firm power is being marketed, spill will not be required above the minimum 90 percent survival level.

2. When riverflows exceed that necessary to meet firm power loads and, thus secondary power is available, 50 percent of the flow in excess of that required to meet firm loads will be spilled. The determination of flow levels required to meet firm load will be based on the Summary of Planned Daily Operation (30-day operation) developed daily by BPA's Dittmer System Control Center and other pertinent information made available by BPA, the CoE and others. In season, the determination of the flow levels needed to meet firm power requirements shall be the responsibility of the Corps in consultation with the BPA.

3. Spill will increase above the 90 percent survival level in accordance with item 2 above until either a) hydraulic capacity is reached and inadvertent spill is necessary, b) spill levels reach that required to meet the 70 percent guidance efficiency standard for spring migrants during the spring migration period, or c) spill levels reach that required to meet the 50 percent guidance efficiency standard for summer migrants during the summer migration period.

Our estimates of the amount of spill that would be needed to meet the 90 percent survival and the 70/50 percent fish passage efficiency standards are presented in Table 1. It should be noted that these estimates are based solely on the assumptions and calculations summarized in Attachment 1. In the formulation of in-season System Operational Requests, the Fish Passage Center will consider whether available monitoring data support these assumptions, and will also consider other factors such as the effects of requested spill levels on adult passage conditions and dissolved gas levels.

Table 1: Spill required to meet standards for interim juvenile fish protection (numbers outside parentheses are spill levels needed to meet 90 percent survival standard; numbers in parentheses are spill levels needed to meet the 70/50 fish passage efficiency standard)

	Spring		Summer	
Project	Daily Average	Instantaneous	Daily Average	Instantaneous
	- - - - - - - - - - - - - -	Percent	- - - - - - - - - - - - - -	
Lower Granite 1/	0 (28)	0 (57)	0 (0)	0 (0)
Little Goose 1/	0 (28)	0 (57)	0 (0)	0 (0)
Lower Monumental	26 (50)	53 (99)	26 (35)	53 (70)
Ice Harbor	0 (48)	0 (97)	0 (14)	0 (29)
McNary	2/	2/	2/	2/
John Day	0 (0)	0 (0)	9 (20)	18 (41)
The Dalles	0 (20)	0 (20)	0 (5)	0 (10)
Bonneville	3/	3/	3/	3/

1/ Spill will not be requested at Lower Granite and Little Goose dams when FTOT guidelines provide for transport maximization.

2/ Spill will not normally be requested at McNary Dam but inadvertent spill is expected to occur.

3/ The fishery agencies and tribes recommend no constraints on the operation of screened units at Bonneville first powerhouse and no operation of Bonneville second powerhouse except for research or to reduce spill to 75,000 cfs during daylight hours. This operation will not in all cases achieve the 85 percent fish passage efficiency required by the NPPC but appears to provide the most reasonable approach to interim protection at Bonneville.

The fishery agencies and tribes believe that this sliding scale, and specifically the 50:50 sharing of water above that needed to meet firm power demands, will provide "equitable treatment", for anadromous fish in the operation of the Corps' mainstem Columbia and Snake River dams. To assess the effectiveness of this, or of any plan that is implemented in 1987, will require information from BPA concerning their power marketing program in the April to August period. Therefore we are requesting that, for each week during the season, BPA provide a daily accounting of the amount of power sold at each of the rates contained in the 1985 Wholesale Power Rate Schedules and applicable supplements for the preceding week, and the projected flows needed to meet firm power requirements for the next week.

IV. In-Season Spill Management

The Fish Passage Center, representing the fisheries agencies and tribes, will request passage operations in accordance with this 1987 Interim Spill Plan, the spill criteria described in Section VI, and other operating criteria established to protect juvenile and adult fish migrants as described in project-specific chapters of the 1987 Detailed Fishery Operating Plan.

The agencies' and tribes' spill plan (A&T 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 for 1987 and do not set a precedent for spill plans in future years. To economize spill, the fishery agencies and tribes (A&T) recommend the following:

a. Migration Window - The A&T plan utilizes a migration window to efficiently manage spill. After reviewing past migration data the agencies believe approximately 80 percent of the spring and 80 percent 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	*3/15	-	6/15
Summer:			
Lower Snake	6/1	-	7/15
Lower Columbia	6/1	-	8/31

° 4/15 or when Lyons' Ferry Hatchery release groups are recovered by gatewell monitoring at Lower Monumental Dam.
* 3/15 or when tule chinook are released from Spring Creek National Fish Hatchery.

Methods for identifying start and end points are further specified in the spill criteria, and will otherwise be determined by the Fish Passage Center.

b. 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 concentrate spill during the primary daily passage periods, determined by monitoring and by historical data.

V. Project-Specific Spill Requirements

The Fish and Wildlife Program requires that the fish and wildlife agencies and tribes prescribe the methods for determining smolt survival at hydroelectric projects requiring spill. The fish and wildlife agencies and tribes have developed such methods in consultation with the CoE, BPA, and PNUCC, and based on the best available scientific knowledge have determined the need for the spill levels summarized below. A summary of the assumptions and of the resulting relationships among spill, fish passage efficiency and survival are presented in Attachment 1 to this plan. As stated above, these spill levels are nothing more than the product of a series of assumptions. Actual requests will also take into account any available monitoring data, and the effect of requested spill levels on adult passage and dissolved gas conditions.

Lower Granite - The spill period at Lower Granite is April 1 through May 15. Spill will be initiated as determined by the FPC, based upon sampling at the Snake River trap at Lewiston and in the Lower Granite collection system. Because of low guidance efficiency at Lower Granite Dam, spill will be requested until transportation is maximized according to the following criteria: 1) average flows are projected to drop below 100 kcfs for approximately 5 days, or 2) it is estimated that 80 percent of the yearling chinook salmon have passed the project. A share-the-wealth sliding scale for spill will be utilized as described in Section III. Up to 28 percent of daily average flow (57 percent instantaneous for 12 hours) may be utilized as spill to attain the 70 percent guidance efficiency standard for spring migrants within the previously stated constraints.

Little Goose - A share-the-wealth sliding scale for spill will be utilized as described in Section III. Up to 28 percent of daily average flow (57 percent instantaneous for 12 hours) may be utilized as spill to attain the 70 percent guidance efficiency standard for spring migrants prior to the maximization of transportation. Transportation will be maximized according to the following criteria: 1) average flows are projected to drop below 100 kcfs for approximately 5 days, or 2) it is estimated that 80 percent of the yearling chinook salmon have passed the project. Expanded daily collection totals of fish at this project will provide the basis for initiating spring spill at Lower Monumental and Ice Harbor dams, with some lag time for travel time between projects as determined by monitoring and past data.

Lower Monumental - A share-the-wealth sliding scale for spill will be utilized as described in Section III. In order to reach the 70/50 percent guidance efficiency objectives, up to 50 percent daily average flow (99 percent instantaneous for 12 hours) will be spilled in the April 1 - May 31 period and 35 percent of daily average flow (70 percent instantaneous for 12 hours) will be spilled in the June 1 - July 15 period. Spill will be called for according to the spill criteria described in Section VI. The minimum spill needed to meet the 90 percent survival level required by the Fish and Wildlife Program is 26 percent of daily average flow (53 percent instantaneous for 12 hours) in spring and summer.

Ice Harbor - The ice and trash sluiceway will be operated at an assumed efficiency of 40 percent. A discussion of the merits of this assumption can be found in Section X of the Detailed Fishery Operating Plan. In addition, a share-the-wealth sliding scale for spill will be utilized as described in Section III. Up to 48 percent of the daily average flow (97 percent instantaneous for 12 hours) will be spilled to attain the 70 percent guidance efficiency standard for spring migrants and up to 14 percent of daily average flow (29 percent instantaneous for 12 hours) will be spilled to meet the 50 percent standard for summer migrants. The combined sluiceway and spill operations will increase survival at the dam over sluiceway operation alone. Spill will be called for according to the spill criteria described in Section VI.

McNary - Juvenile fish passage operations at McNary will be managed according to the 1987 FTOT Annual Work Plan and 1987 sampling guidelines. Spill will not usually be requested but inadvertent spill is expected to occur.

John Day - A share-the-wealth sliding scale as described in Section III will be utilized for the summer migration. The migration window for summer migrants at John Day is June 1 - August 31. In order to meet the 50 percent guidance efficiency objective, up to 20 percent of daily average flow (41 percent instantaneous for 12 hours) maybe requested for spill. The minimum spill needed to meet the 90 percent survival level required by the Fish and Wildlife Program in summer is 9 percent of daily average flow (18 percent instantaneous for 12 hours). Spill will be requested in accordance with the spill criteria described in Section VI.

The Dalles - A share-the-wealth sliding scale will be utilized as described in Section III. In order to reach the 70/50 percent guidance efficiency objectives, up to 20 percent of the daily average flow (20 percent instantaneous for 24 hours) will be requested as spill during the spring migration and up to 5 percent of the daily average flow (10 percent for 12 hours) will be requested as spill during the summer migration. Spill will be called for according to the spill criteria described in Section VI.

Bonneville - The agencies' and tribes' goal is to reach the 85 percent bypass efficiency standard established by the NPPC. While fish guidance efficiencies at the first powerhouse do not in all cases meet that standard, the guidance efficiency is generally good and we, therefore, recommend no juvenile fish passage constraints on the operation of screened units at the first powerhouse (except that normal turbine loading should be as near to peak efficiency as is possible). Due to poor fish guidance efficiencies at the second powerhouse, we recommend that it remain out of service at all times during the spring and summer migrations except as needed to conduct approved research on means to improve fish guidance efficiency at the second powerhouse or to reduce spill to 75,000 cfs during daylight hours (6:00 AM to 8:00 PM). We understand that shutdown of the second powerhouse was anticipated in planning for the current year under the Coordination Agreement and that it will not therefore be needed to meet firm power demands that cannot be met elsewhere in the regional power system.

VI. Spill Criteria for the 1987 Juvenile Migrations

Lower Monumental Dam

Spill at Lower Monumental will be managed according to typical dates of migrations, passage indices at Little Goose Dam, hydroacoustic monitoring and gatewell dipping at Lower Monumental, and hatchery release information.

1. Typical dates of passage are based on five years' data from Little Goose with a lag period of two and three days for yearlings and subyearlings, respectively. The dates for the 10th and 90th percentiles from these data are as follows:

Approximate passage dates at Lower Monumental Dam, 1982-1986.

	Yearling Chinook Percent of Run Past Dam		Subyearling Chinook Percent of Run past Dam	
Year	10%	90%	10%	90%
1982	26 April	19 May	24 June	12 July
1983	15 April	25 June	4 July	11 July
1984	19 April	18 June	13 April	3 July
1985	25 April	1 June	2 July	22 July
1986	22 April	3 June	N/A	N/A

These dates vary not only as a result of yearly variations in migration timing, but also from changes in sampling methods and duration of sampling at Little Goose. The Corps of Engineers suggests that the data from 1983 and 1984 are not useful in this analysis because sampling operations in these years are inconsistent with 1987 planned operations.

In 1986 subyearling and yearling chinook counts were not consistently separated at Little Goose. All chinook will be grouped in a single category in 1987. Hence, dates of passage for summer migrants cannot be based on Little Goose subyearling chinook counts. A Lyons Ferry Hatchery release of subyearling chinook occurred June 7-10, 1986. Based on mark recoveries from gatewell dipping at Lower Monumental, approximately 10 percent of these fish passed Lower Monumental by June 16 and 90 percent by July 23. In 1987 the Lyons Ferry Hatchery will try to release subyearling chinook as early as June 1. For these reasons, typical dates of passage for summer migrants cannot be established.

Typical dates of passage at Lower Monumental for spring migrants entering the Snake River above Little Goose Dam are estimated to be April 20 through May 31. Spill may be required before April 20 if early releases from Lyons Ferry (presently, scheduled release is April 15) arrive at Lower Monumental prior to April 20. As described in the previous paragraph, summer migrant passage dates are less certain. If the Lyons Ferry Hatchery release occurs on June 1, we expect that 80 percent of these fish should pass Lower Monumental between June 1 and July 15.

2. Hours of spill will be based on sonar and gatewell monitoring. At the start of the season, spill will occur for twelve hours, from 1800 until 0600, until a distinct diel passage pattern is discernible. The Corps of Engineers (Corps) and Fish Passage Center (FPC) will review sonar data and joinly agree to adjust hours to match peak passage periods. Decisions will be based on 24 hour sonar and gatewell monitoring of hourly passage through the powerhouse.

3. A spill trigger for spring migrants was developed from collection indices at Little Goose Dam. Spill will be provided at Lower Monumental when one or more of the following criteria are valid:

   a. The passage index at Little Goose for the aggregate number of chinook, sockeye, coho and steelhead is equal to a greater than 15,000. Two days after the 15,000 trigger is reached at Little Goose, spill will begin at Lower Monumental.

   b. Lyons Ferry or other hatchery fish are released and appear at Lower Monumental as indicated by hydroacoustic data and recovery of marked fish in gatewell dipping. Two days after Lyons Ferry fish are released, spill will begin at Lower Monumental.

   c. Unusual migration patterns are evident that would prevent the use of the criteria described in items a and b from protecting 80 percent of the spring and summer migrations.

The FPC will notify the Corps when spill is needed to protect fish as described under items b and c. The trigger criteria are effective from the first through the final days of monitoring. Regardless of what trigger is used, there must be adequate in-season flexibility to consider and act on other relevant data.

Daily spill will be terminated at Lower Monumental when all measures of fish passage indicate that no fish are present:

The passage index at Little Goose for all yearling chinook, sockeye, and coho salmon and steelhead is less than 15,000 for three consecutive days and the passage index of marked fish from Lyons Ferry Hatchery that are recovered in Lower Monumental gatewell monitoring is less than five per day for at least three consecutive sampling days. With a two-day lag period, spill will be terminated on the sixth day after the passage index first drops below the trigger number.

Ice Harbor Dam

Spill at Ice Harbor will be managed according to typical dates of migrations, passage indices at Little Goose Dam, and hatchery release information.

1. Typical dates of passage are based on five years' data from Little Goose with a lag period of five and seven days for yearlings and subyearlings, respectively. The lag period for Ice Harbor is derived from the same travel time data (1984 and 1985) as for Lower Monumental. The dates for the 10th and 90th percentiles from these data are as follows:

Approximate passage dates at Ice Harbor Dam, 1982-1986.

	Yearling Chinook Percent of Run Past Dam		Subyearling Chinook Percent of Run Past Dam	
Year	10%	90%	10%	90%
1982	29 April	22 May	28 June	16 July
1983	18 April	28 June	8 July	15 July
1984	22 April	21 June	17 April	7 July
1985	28 April	4 June	6 July	26 July
1986	25 April	6 June	N/A	N/A

These dates vary not only as a result of yearly variations in migration timing, but also from changes in sampling methods and duration of sampling at Little Goose. The Corps of Engineers (Corps) suggests that the data from 1983 and 1984 are not useful in this analysis because sampling operations in these years are inconsistent with 1987 planned operations.

Typical dates of passage at Ice Harbor for spring migrants entering the Snake River above Little Goose are estimated to be April 23 through June 3. Spill may be required before April 23 if early releases from Lyons Ferry (presently, scheduled release is April 15) arrive at Ice Harbor prior to April 23. As described for the spill criteria at Lower Monumental, summer passage dates are less certain. If the Lyons Ferry Hatchery release occurs on June 1, we expect that 80 percent of these fish should pass Ice Harbor between June 4 and July 18.

2. Hours of spill. Spill will occur for twelve hours, from 1800 until 0600. In the absence of real time monitoring data, there will be no basis for compressing spill hours to economize the program.

3. A spill trigger for spring migrants was developed from collection indices at Little Goose Dam. Because there will be no monitoring of fish passage at Ice Harbor in 1987, spill will begin in accordance with a trigger at Little Goose for spring migrants and the triggers for spill at Lower

Monumental designed to protect Lyons Ferry Hatchery fish. Spill will be provided at Ice Harbor when one or more of the following criteria are valid:

a. The passage index at Little Goose for the aggregate number of chinook, sockeye, coho and steelhead is equal to or greater than 15,000. Five days after the 15,000 trigger is reached at Little Goose, spill will begin at Ice Harbor.

b. Spill is triggered at Lower Monumental as a result of Lyons Ferry Hatchery releases. Three days after spill is triggered at Lower Monumental, spill will begin at Ice Harbor.

c. Unusual migration patterns are evident that would prevent the use of the criteria described in items a and b from protecting 80 percent of the spring and summer migrations.

The FPC will notify the Corps when spill is needed to protect fish as described under items b and c. The trigger criteria are effective from the first through the final days of monitoring. Regardless of what trigger is used, there must be adequate in-season flexibility to consider and act on other relevant data.

Daily spill will be terminated at Ice Harbor when all measures of fish passage indicate that no fish are present:

The passage index at Little Goose for all yearling chinook, sockeye, and coho salmon and steelhead is less than 15,000 for three consecutive days and spill for Lyons Ferry Hatchery fish is terminated at Lower Monumental. With a five-day lag period, spill will be terminated on the ninth day after the passage index first drops below the trigger number at Little Goose or three days after spill is terminated at Lower Monumental.

John Day Dam

Spill at John Day Dam will be managed according to typical dates of the subyearling chinook migration, the passage index at McNary Dam, hydroacoustic monitoring and the unit 3 airlift index at John Day Dam, and hatchery release information.

1. Typical dates of passage for subyearling chinook at John Day Dam are based on a review of the unit 3 gatewell data for 1981-86. For planning purposes the period estimated to encompass 80 percent of the typical summer migration at John Day Dam is June 7 - August 21.

2. Hours of spill will be based on sonar and gatewell monitoring. At the start of the season, spill will occur for twelve hours, from 1800 until 0600, until a distinct diel passage pattern is discernible. The Corps of Engineers (Corps) and Fish Passage Center (FPC) will review sonar and gatewell data and joinly agree to adjust hours to match peak passage periods. Decisions will be based on 24 hour sonar and gatewell monitoring of hourly passage through the powerhouse.

3. Spill Triggers were developed for both the hydroacoustic monitoring and the unit 3 airlift index. Spill will be provided at John Day Dam whenever one or more of the following criteria are met:

   a. Hydroacoustic monitoring indicates that total daily project passage will meet or exceed 30,000 fish.

   b. The unit 3 airlift index (that is the number of fish captured in the gatewell divided by the percent of project flow discharged through unit 3) met or exceeded 7500 subyearling chinook salmon on the previous day.

   c. Unusual migration patterns are evident that would prevent the use of the criteria described in items a and b from protecting 80 percent of the summer migration.

The FPC will notify the Corps when spill is needed to protect fish as described under items b and c. The trigger criteria are effective from the first through the final days of monitoring. Regardless of what trigger is used, there must be adequate in-season flexibility to consider and act on other relevant data.

Daily spill will be terminated at John Day Dam when all measures of fish passage indicate that no fish are present.

The Dalles Dam

Spill at The Dalles will be managed according to sampling in the McNary collection system, gatewell airlift sampling at John Day, and hydroacoustic monitoring at John Day.

1. Typical dates of passage for 80 percent of the spring and summer migrants were determined from review of sluiceway research data at the The Dalles, review of gatewell and hydroacoustic information at John Day, and McNary collection/passage indices. Review of 1977-1982 sluiceway data indicates that the earliest date for the 10 percent passage point at The Dalles is April 30 for the spring chinook migration and April 15 for steelhead. Typically the mid-80 percent of the spring migration passes The Dalles from the first week in May to the first week in June. The latest date that the 90 percent point of passage has occurred for steelhead is June 8 and for spring chinook is June 11.

   Sluiceway studies at The Dalles have produced scant quantifiable data regarding the summer migration. It appears that few summer migrants utilize the sluiceway. Monitoring at John Day, however, gives some indication of summer migration timing. The mid-80 percent of the summer migration at John Day typically occurs from the second week in June to the third week in August. Spill for summer migrants at The Dalles will be cut off at August 15, as determined by the NPPC.

2. In the absence of any monitoring program at The Dalles Dam in 1987, hours of spill will have to be based on existing data. Previous

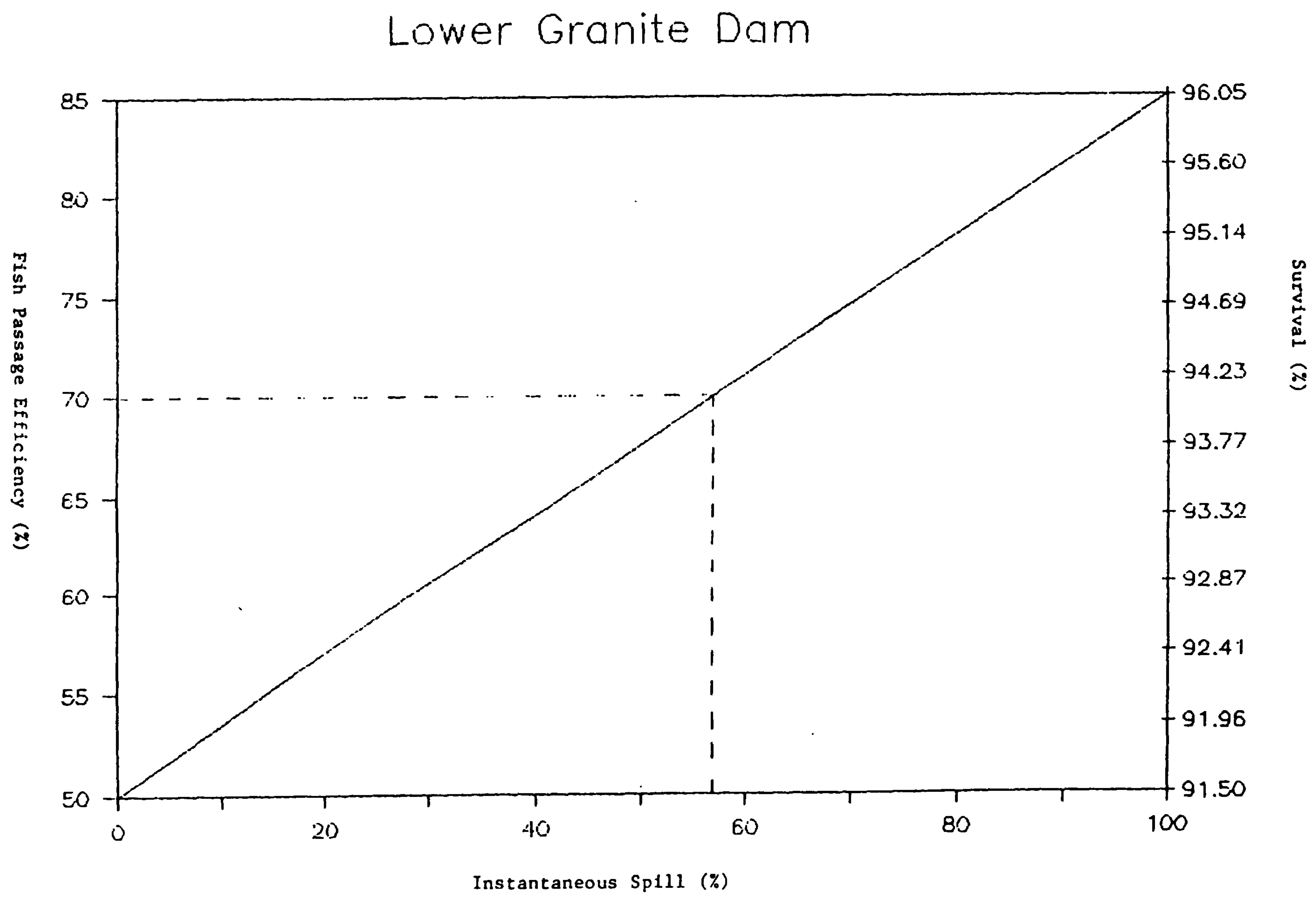
studies in the sluiceway at The Dalles Dam indicate that fish released during the night at John Day Dam would enter the sluiceway at The Dalles the following morning. Those same studies indicated that sluiceway passage was highest during daylight hours and near nothing at night. Hydroacoustic data collected at The Dalles Dam in 1986 indicates that in May and June there is a peak of movement past the project in the morning and second peak in the evening. In May, this was true even when considering only the movement of fish through the turbines. The 1986 hydroacoustic data from July and August, however, showed pronounced peaks in fish movement (both for total passage and for the turbines only) in the evening hours.

In view of the above, we believe that there is substantial daytime passage at The Dalles Dam in spring, and significantly less daytime passage in summer. We believe that what is really needed at The Dalles Dam is to test a 24 hour spill program with monitoring in place to assess the resulting fish passage patterns. Without this information, it is not possible to design a spill program at The Dalles that will economize the use of spill to the greatest extent practicable.

Since there will be no hydroacoustic monitoring in 1987, we believe that the hours of spill must encompass the broadest range of possible conditions. Therefore, we recommend that a 24 hour per day spill program be instituted during the spring of 1987, and a 12 hour per day spill program be implemented during the summer of 1987. In spring, the 20 percent daily average spill estimated in Attachment 1 will be requested as 20 percent of instantaneous flow 24 hours per day. In summer, since there is some indication of reduced daytime passage and since we are concerned that the extremely low daily average spill level may provide inadequate protection if extended over the entire day, we will request that the daily average flow needed to meet the 50 percent fish passage efficiency be concentrated between 1800 and 0600 hours.

3. Spill triggers For the spring migration, spill will be initiated five days after the first 10 percent of the yearling chinook migration has passed McNary Dam, as determined by the agencies and tribes. Hatchery releases into the John Day and The Dalles pools will also be factored into the above determination. We expect that spill will continue through the spring migration until the time the summer migration is in place. For the summer migration, spill will be provided every night following days of estimated passage in excess of 30,000 at John Day Dam.

Attachment 1



Lower Granite Dam
Fish Passage Efficiency (%)
85
80
75
70
65
60
55
50
Survival (%)
96.05
95.60
95.14
94.69
94.23
93.77
93.32
92.87
92.41
91.96
91.50
0
20
40
60
80
100
Instantaneous Spill (%)

Lower Granite Dam

* Assumptions *

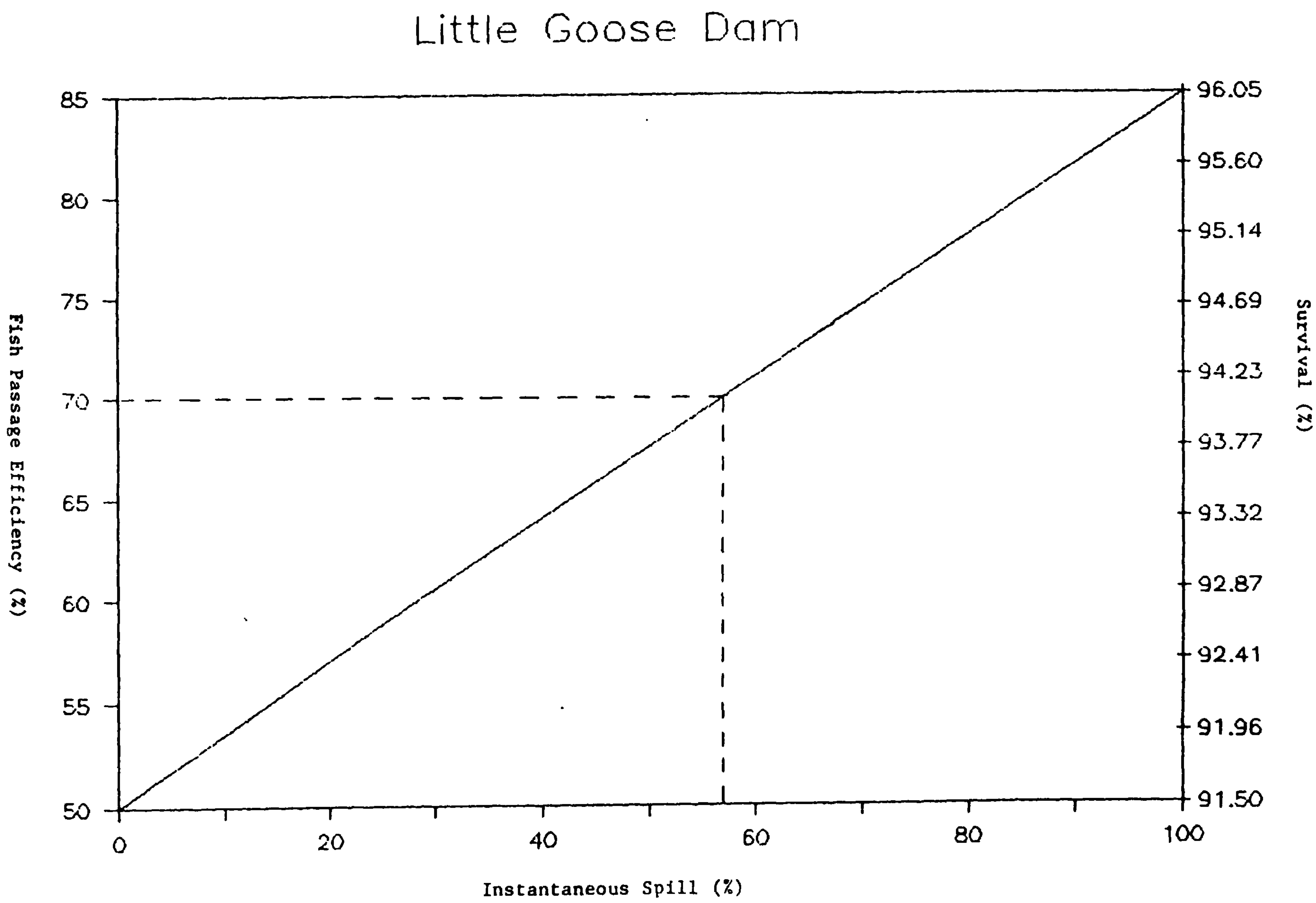
1. uniform hourly flow distribution
2. 12 hours of spill/day (hrs)
3. 70 % of fish passing during spill hours (diel)
4. 1:1 spill efficiency ratio
5. 50 % fish guidance efficiency (fge)
6. 98 % spill survival (spsurv)
7. 98 % bypass survival (bypsurv)
8. 85 % turbine survival (tbsurv)

* Calculations *

```
daily    = instant/(24/hrs)

fpe      = (diel*instant) + (diel*(1-instant)*fge) + ((1-diel)*fge)

damsurv  = (diel*instant*spsurv) + (diel*(1-instant)*fge*bypsurv) +
           (diel*(1-instant)*(1-fge)*tbsurv) + ((1-diel)*fge*bypsurv) +
           ((1-diel)*(1-fge)*tbsurv)
```

* Example *

Fish Passage Efficiency (fpe)	Instantaneous Spill Rate (instant)	Daily Average Spill Rate (daily)	Estimated Survival (damsurv)
0.500	0.000	0.000	0.9150
0.535	0.100	0.050	0.9196
0.570	0.200	0.100	0.9241
0.605	0.300	0.150	0.9287
0.640	0.400	0.200	0.9332
0.675	0.500	0.250	0.9378
0.710	0.600	0.300	0.9423
0.745	0.700	0.350	0.9469
0.780	0.800	0.400	0.9514
0.815	0.900	0.450	0.9560
0.850	1.000	0.500	0.9605



Little Goose Dam
Fish Passage Efficiency (%)
85
80
75
70
65
60
55
50
0
20
40
60
80
100
Instantaneous Spill (%)
Survival (%)
96.05
95.60
95.14
94.69
94.23
93.77
93.32
92.87
92.41
91.96
91.50

Little Goose Dam

****

* Assumptions *

****

1. uniform hourly flow distribution
2. 12 hours of spill/day (hrs)
3. 70 % of fish passing during spill hours (diel)
4. 1:1 spill efficiency ratio
5. 50 % fish guidance efficiency (fge)
6. 98 % spill survival (spsurv)
7. 98 % bypass survival (bypsurv)
8. 85 % turbine survival (tbsurv)

****

* Calculations *

****

daily = instant/(24/hrs)

fpe = (diel*instant) + (diel*(1-instant)*fge) + ((1-diel)*fge)

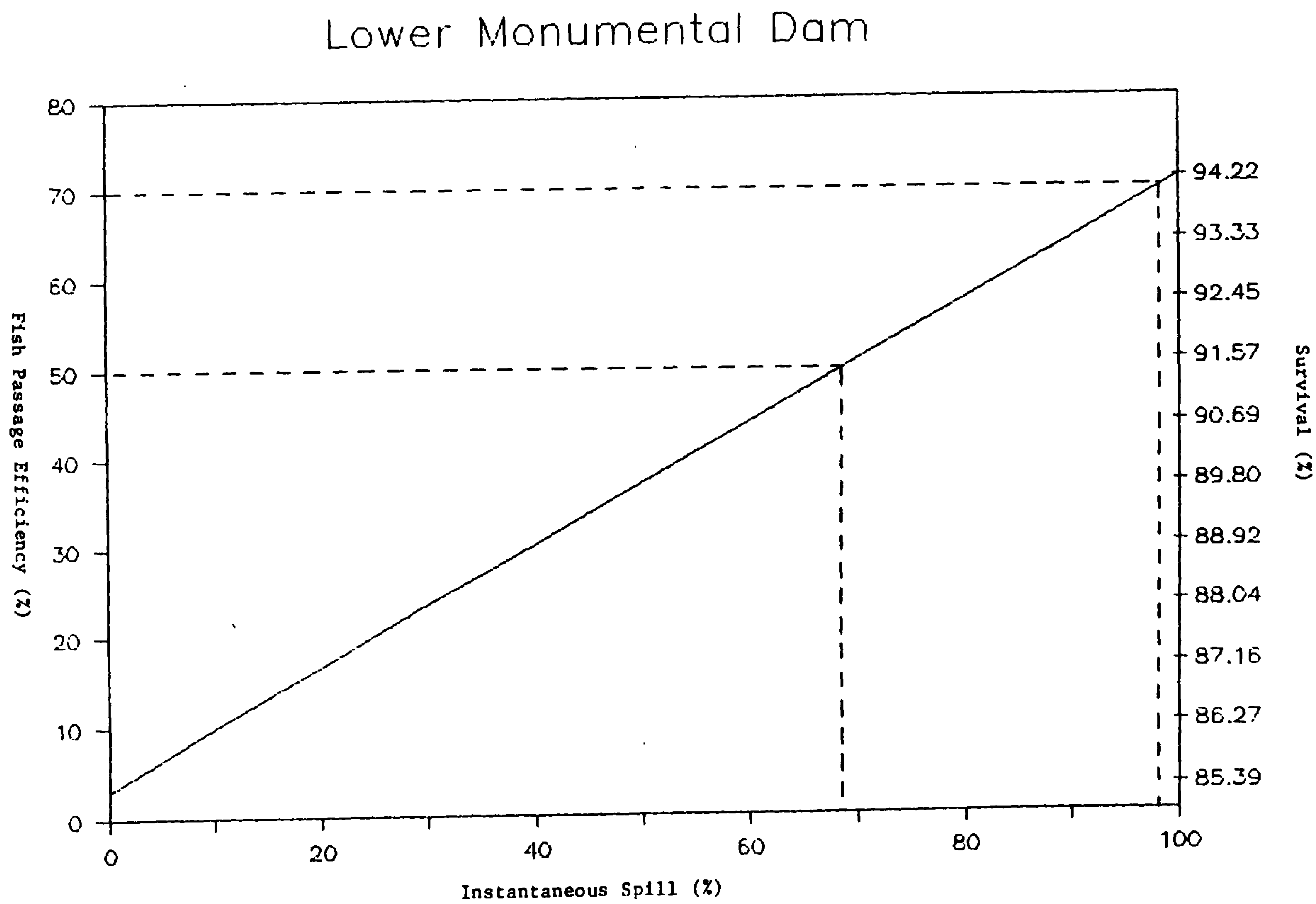
damsurv = (diel*instant*spsurv) + (diel*(1-instant)*fge*bypsurv) + (diel*(1-instant)*(1-fge)*tbsurv) + ((1-diel)*fge*bypsurv) + ((1-diel)*(1-fge)*tbsurv)

****

* Example *

****

Fish Passage Efficiency (fpe)	Instantaneous Spill Rate (instant)	Daily Average Spill Rate (daily)	Estimated Survival (damsurv)
0.500	0.000	0.000	0.9150
0.535	0.100	0.050	0.9196
0.570	0.200	0.100	0.9241
0.605	0.300	0.150	0.9287
0.640	0.400	0.200	0.9332
0.675	0.500	0.250	0.9378
0.710	0.600	0.300	0.9423
0.745	0.700	0.350	0.9469
0.780	0.800	0.400	0.9514
0.815	0.900	0.450	0.9560
0.850	1.000	0.500	0.9605


Lower Monumental Dam
Fish Passage Efficiency (%)
0
10
20
30
40
50
60
70
80
Survival (%)
85.39
86.27
87.16
88.04
88.92
89.80
90.69
91.57
92.45
93.33
94.22
0
20
40
60
80
100
Instantaneous Spill (%)

Lower Monumental Dam

****
* Assumptions *
****

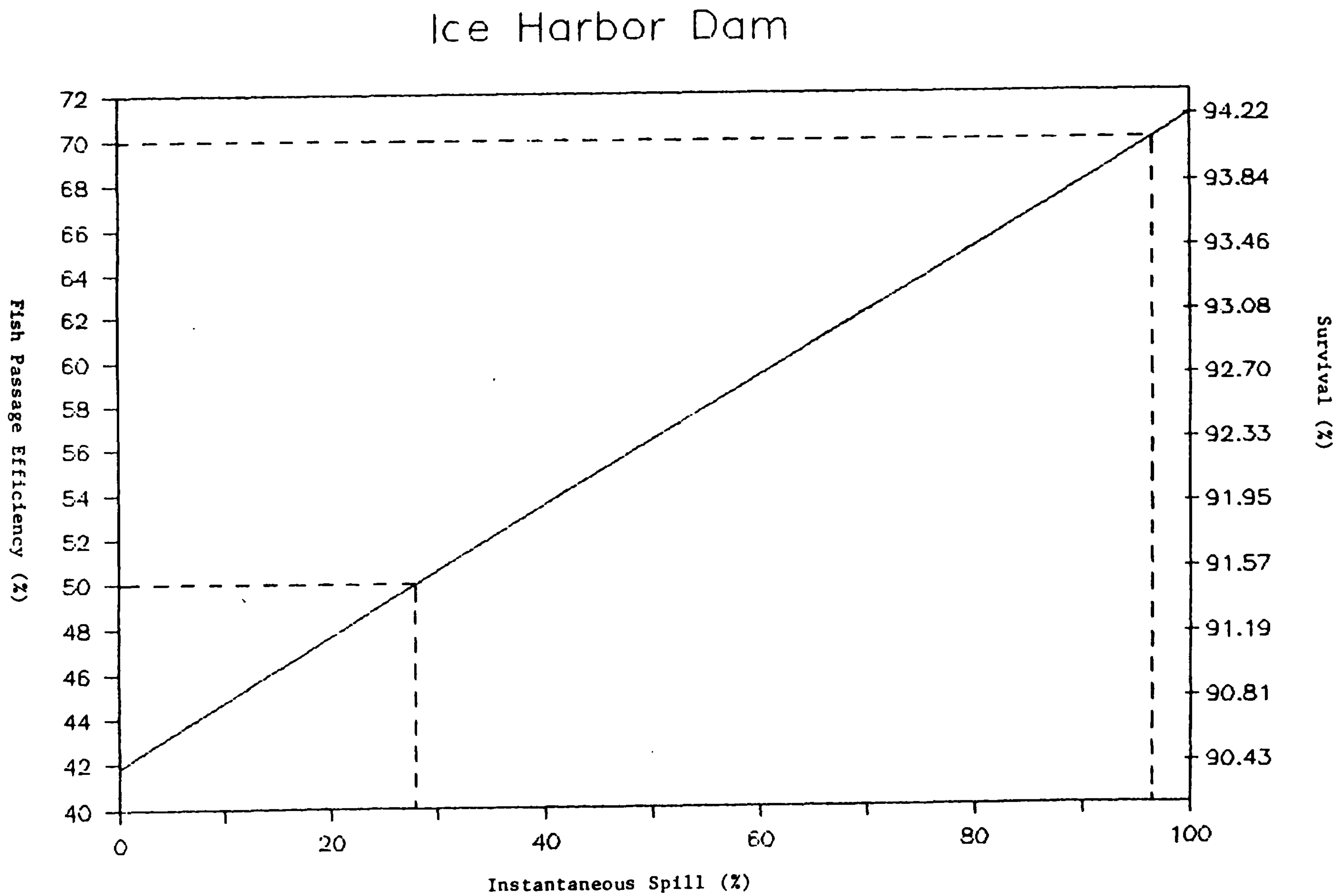
1. uniform hourly flow distribution
2. 12 hours of spill/day (hrs)
3. 70 % of fish passing during spill hours (diel)
4. 1:1 spill efficiency ratio
5. 3 % fish guidance efficiency (fge)
6. 98 % spill survival (spsurv)
7. 98 % bypass survival (bypsurv)
8. 85 % turbine survival (tbsurv)

****
* Calculations *
****

```
daily    = instant/(24/hrs)

fpe      = (diel*instant) + (diel*(1-instant)*fge) + ((1-diel)*fge)

damsurv  = (diel*instant*spsurv) + (diel*(1-instant)*fge*bypsurv) +
           (diel*(1-instant)*(1-fge)*tbsurv) + ((1-diel)*fge*bypsurv) +
           ((1-diel)*(1-fge)*tbsurv)
```

****
* Example *
****

Fish Passage Efficiency (fpe)	Instantaneous Spill Rate (instant)	Daily Average Spill Rate (daily)	Estimated Survival (damsurv)
0.030	0.000	0.000	0.8539
0.098	0.100	0.050	0.8627
0.166	0.200	0.100	0.8716
0.234	0.300	0.150	0.8804
0.302	0.400	0.200	0.8892
0.370	0.500	0.250	0.8980
0.437	0.600	0.300	0.9069
0.505	0.700	0.350	0.9157
0.573	0.800	0.400	0.9245
0.641	0.900	0.450	0.9333
0.709	1.000	0.500	0.9422



Ice Harbor Dam
72
70
68
66
64
62
60
58
56
54
52
50
48
46
44
42
40
Fish Passage Efficiency (%)
94.22
93.84
93.46
93.08
92.70
92.33
91.95
91.57
91.19
90.81
90.43
Survival (%)
0
20
40
60
80
100
Instantaneous Spill (%)

Ice Harbor Dam

Assumptions

1. uniform hourly flow distribution
2. 12 hours of spill/day (hrs)
3. 50 % of fish passing during spill hours (diel)
4. 40 % sluiceway efficiency (sle)
5. 1:1 spill efficiency ratio
6. 3 % fish guidance efficiency (fge)
7. 98 % sluiceway survival (slsurv)
8. 98 % spill survival (spsurv)
9. 98 % bypass survival (bypsurv)
10. 85 % turbine survival (tbsurv)

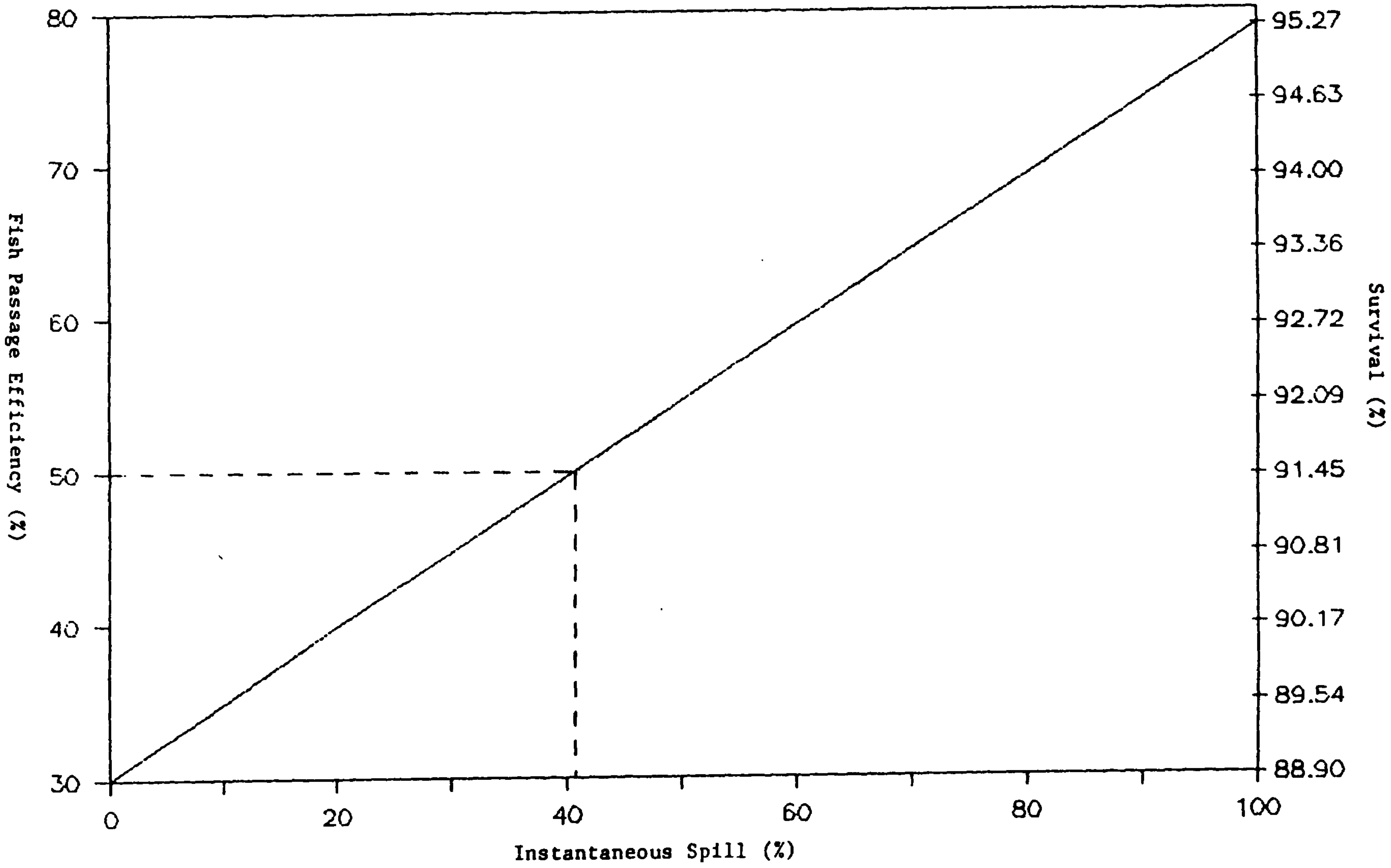
Calculations

```
daily    = instant/(24/hrs)

fpe      = (diel*instant) + (diel*(1-instant)*sle) +
           (diel*(1-instant)*(1-sle)*fge) + ((1-diel)*sle) +
           ((1-diel)*(1-sle)*fge)

damsurv  = (diel*instant*spsurv) +
           (diel*(1-instant)*sle*slsurv) +
           (diel*(1-instant)*(1-sle)*fge*bypsurv) +
           (diel*(1-instant)*(1-sle)*(1-fge)*tbsurv) +
           ((1-diel)*sle*slsurv) +
           ((1-diel)*(1-sle)*fge*bypsurv) +
           ((1-diel)*(1-sle)*(1-fge)*tbsurv)
```

Example

Fish Passage Efficiency (fpe)	Instantaneous Spill Rate (instant)	Daily Average Spill Rate (daily)	Estimated Survival (damsurv)
0.418	0.000	0.000	0.9043
0.447	0.100	0.050	0.9081
0.476	0.200	0.100	0.9119
0.505	0.300	0.150	0.9157
0.534	0.400	0.200	0.9195
0.564	0.500	0.250	0.9233
0.593	0.600	0.300	0.9270
0.622	0.700	0.350	0.9308
0.651	0.800	0.400	0.9346
0.680	0.900	0.450	0.9384
0.709	1.000	0.500	0.9422

John Day Dam



80
70
60
50
40
30
Fish Passage Efficiency (%)
95.27
94.63
94.00
93.36
92.72
92.09
91.45
90.81
90.17
89.54
88.90
Survival (%)
0
20
40
60
80
100
Instantaneous Spill (%)

John Day Dam

* Assumptions *

1. uniform hourly flow distribution
2. 12 hours of spill per day (hrs)
3. 70 % of fish passing during spill hours (diel)
4. 1:1 spill efficiency ratio
5. 30 % fish guidance efficiency (fge)
6. 98 % spill survival (spsurv)
7. 98 % bypass survival (bypsurv)
8. 85 % turbine survival (tbsurv)

* Calculations *

daily = instant/(24/hrs)

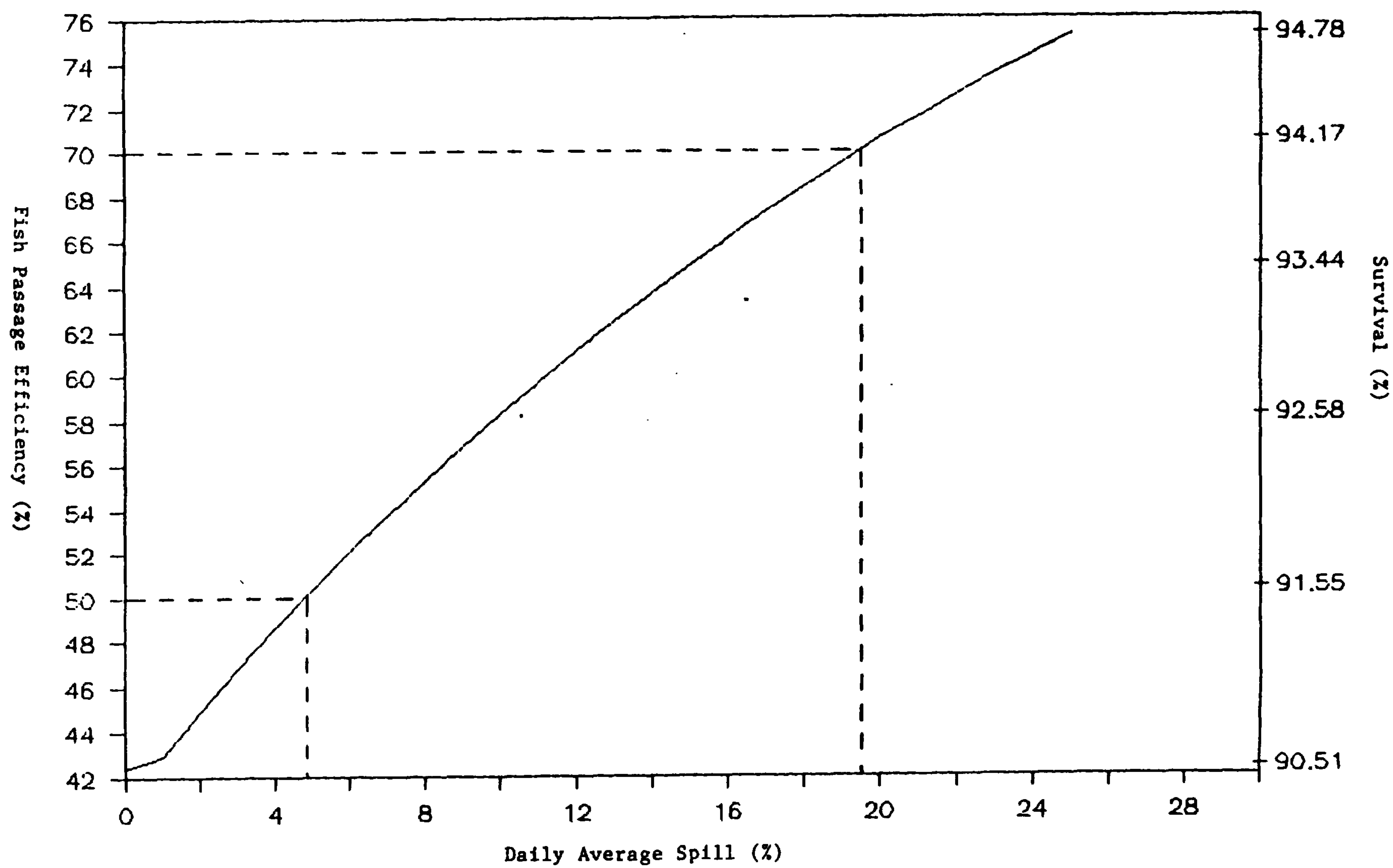
fpe = (diel*instant) + (diel*(1-instant)*fge) + ((1-diel)*fge)

damsurv = (diel*instant*spsurv) + (diel*(1-instant)*fge*bypsurv) + (diel*(1-instant)*(1-fge)*tbsurv) + ((1-diel)*fge*bypsurv) + ((1-diel)*(1-fge)*tbsurv)

* Example *

Fish Passage Efficiency (fpe)	Instantaneous Spill Rate (instant)	Daily Average Spill Rate (daily)	Estimated Survival (damsurv)
0.300	0.000	0.000	0.889
0.349	0.100	0.050	0.895
0.398	0.200	0.100	0.902
0.447	0.300	0.150	0.908
0.496	0.400	0.200	0.914
0.545	0.500	0.250	0.921
0.594	0.600	0.300	0.927
0.643	0.700	0.350	0.934
0.692	0.800	0.400	0.940
0.741	0.900	0.450	0.946
0.790	1.000	0.500	0.953

The Dalles Dam



The Dalles Dam

* Assumptions *

1. spillway and sluiceway efficiencies based on ODFW data (see DFOP)
2. 3 % fish guidance efficiency (gatewell orifices)
3. 98% sluiceway survival
4. 98% spill survival
5. 98% bypass survival
6. 85% turbine survival

* Calculations *

sle = [(40.6) * (exp(-0.0348*daily*100))] / 100

spe = [100 - (2.5*sle*100)] / 100

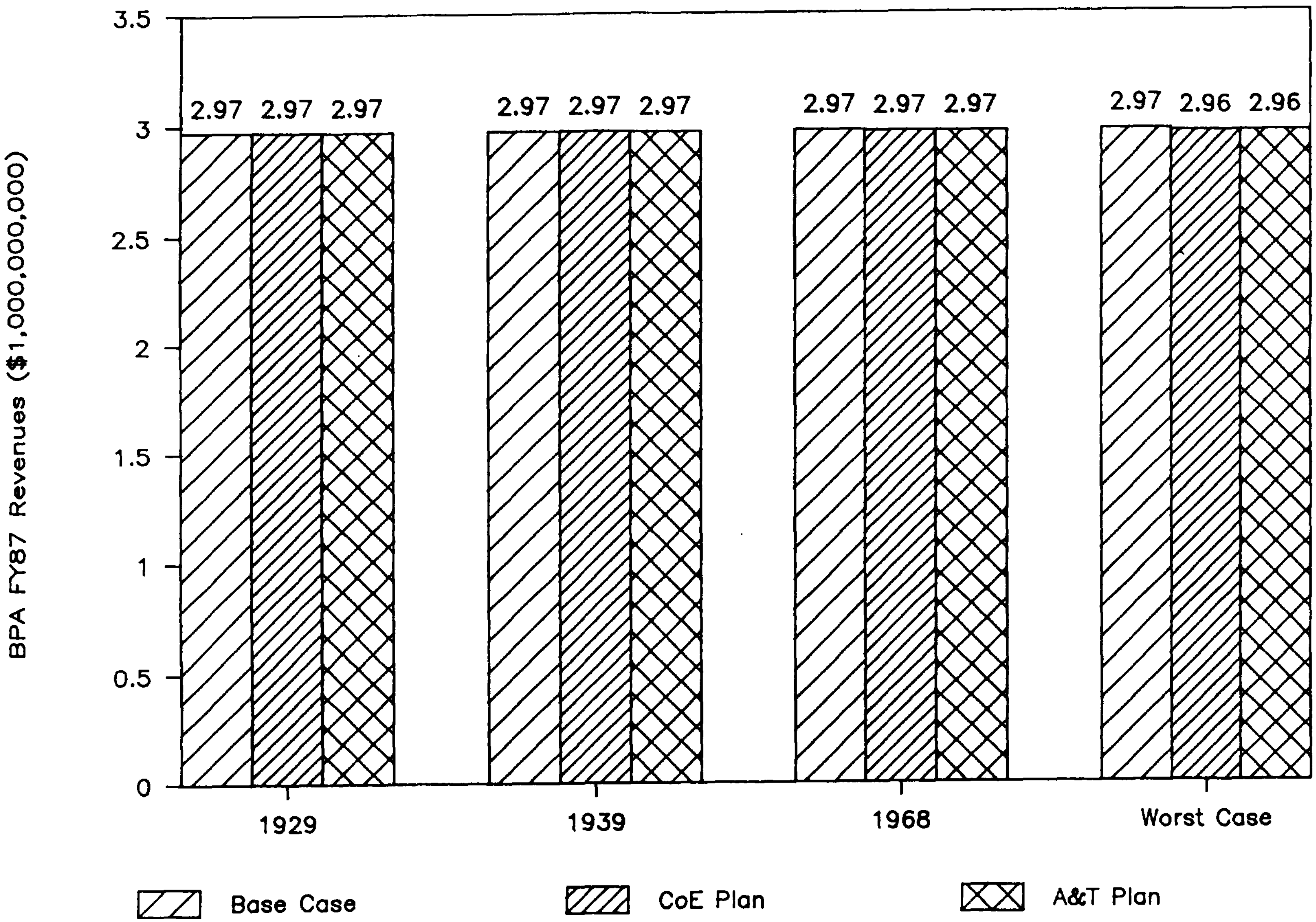
fpe = sle + spe + ((1-sle-spe)*fge)

damsurv = (fpe*.98) + ((1-fpe)*.85)

* Example *

Daily Average Spill Rate (daily)	Sluiceway Efficiency (sle)	Spill Efficiency (spe)	Combined Passage Efficiency (fpe)	Estimated Survival (damsurv)
0.00	0.406	0.000	0.424	0.905
0.02	0.379	0.053	0.449	0.908
0.04	0.353	0.117	0.486	0.913
0.06	0.329	0.176	0.521	0.918
0.08	0.307	0.232	0.553	0.922
0.10	0.287	0.283	0.583	0.926
0.12	0.267	0.331	0.611	0.929
0.14	0.249	0.376	0.637	0.933
0.16	0.233	0.418	0.661	0.936
0.18	0.217	0.457	0.684	0.939
0.20	0.202	0.494	0.705	0.942

Figure 1: Revenue Impacts of Sliding Scale Alternatives



Enclosure

PNUCC

PACIFIC NORTHWEST UTILITIES CONFERENCE COMMITTEE

April 1, 1987

James R. Fry, Colonel
Corps of Engineers
Deputy Division Engineer
North Pacific Division
P.O. Box 2870
Portland, Oregon 97208-2870

Dear Colonel Fry:

Thank you for this opportunity to provide written comments on your draft 1987 Juvenile Fish Passage Plan. We have participated in the activities of the working committee during the last several months and therefore have an appreciation for the difficulty in developing this year's Passage Plan. You and your staff are to be commended for your effort in attempting to balance the needs and desires of all parties affected.

Increase in Fish Survival

The Corps should use a test of cost effectiveness to evaluate any type of sliding scale alternative. PNUCC has always supported the general principle of increasing the survival of juvenile fish if done in a cost-effective manner. This means providing the maximum amount of fish for a given (or minimum) amount of money.

BPA presented results of their analysis at the March 13 meeting of the working committee. They concluded that "BPA does not support additional planned spill beyond the current 90 percent base plan, because we believe that the data clearly shows the benefits are too minimal to justify the major cost they would incur."

The Corps should critically review BPA's analysis. Included in this analysis is an estimate of fish survival. Input should be solicited from the fish agencies and tribes regarding these survival estimates. The results of this type of analysis should be a key factor in making a decision to implement a sliding scale concept. The results indicate a small biological benefit on a system-wide basis from the additional spill, therefore the Corps should only implement the sliding scale concept when the anticipated loss of revenue will also be very small.

Sliding Scale Concept

PNUCC agrees with the basic concept of a sliding scale for spilling water past turbines at Corps' dams on a test basis only for the 1987 migration season. However, we have some serious concerns about the test sliding scales that are proposed in the draft Plan -- both in terms of the flow levels at which the sliding scale begins to increase and also the rate at which the percent of spill increases. Maintaining an acceptable level of system reliability is also of concern to PNUCC and is addressed later in these comments.

PNUCC · 520 SW SIXTH AVENUE, SUITE 505 · PORTLAND, OR 97204 · (503) 223-9343

During the water budget period, spill should be limited to the amount required to meet the 90 percent survival standard for flow levels up to 85 kcfs and 140 kcfs at Lower Granite and Priest Rapids respectively. This translates into a flow level of about 225-240 kcfs in the lower part of the Columbia River. You have recognized our concern by including two sliding scales for the April 15 to June 15 period. One scale is designed for a situation when a water budget request has been made and the other for when there is no request.

We believe that the scale for no water budget request is inappropriate and unnecessary. The Northwest Power System has already suffered the impact of the flow level required by the water budget. The power system struggles very hard to meet the flow levels required during the April 15 to June 15 period. To assume that additional spill above the 90 percent minimum is available at or below these requested flow levels would be providing a second penalty on the power system by impacting firm energy for the water budget and then taking away the converted secondary energy for spill. This was never part of PNUCC's preception of a "share the wealth" program.

We urge the Corps to go one step further. The sliding scales developed for a water budget request period with starter flows of 85 kcfs for the Snake River and 225 kcfs for the lower Columbia River should be used during the entire April 15 to June 15 period regardless of whether an official request for water budget flows has been made. It is feasible that even though the water budget has been exhausted and fish are in the river, there will be a request for the Corps to increase river flows. Having only one sliding scale curve will avoid the debate about which curve to use to determine the spill level. Your test sliding scale plan should be designed to avoid as many potential conflicts in-season as possible.

The other aspect of your sliding scale concept that concerns us is the rate at which the spill level increases. We recommend that the Corps develop a sliding scale such that the slope reflects an equitable sharing of the water between the needs of the fish and the power system during the times of optimum daily fish passage. We presented such a sliding scale for sharing of the water at the February 24 meeting of the working committee. We recommend that this concept of equitable sharing be reflected in the test curves for the 1987 Plan.

The Passage Plan this year reflects a sharing when there is "excess" water available. There is, however, no mention of reducing the amount of spill during a period of low water conditions. Based on the forecasts to date, this may very well be a very low flow year. We recognize that the Council's Fish and Wildlife Program specifies the 90 percent survival level as a minimum. Nonetheless, we believe that the Corps should initiate discussions with all affected parties for reducing the amount of spill during adverse water conditions. While it is unrealistic to include this concept in the 1987 Plan, we encourage the Corps in future years to expand this concept of a sliding scale to provide less than the 90 percent survival in low water years.

<u>Bonneville Second Powerhouse</u>

We strongly support the Corps' plan to have a special operation in 1987 for testing the use of Bonneville's second powerhouse during times when fishery impacts are minimal or nonexistent. According to your own estimates, nearly half of the anticipated costs to the power system from the spill program will occur at the Bonneville second powerhouse. Clearly, it is justified to test operating regimes that will benefit power production at a project that has such a substantial impact on the Northwest Power System.

It is imperative that all data collected during this year's migration season be made available as quickly as possible. Any changes to the operation of the second powerhouse for the 1988 season must be thoroughly evaluated by all parties and discussed with the Power Planning Council. We request that the Corps place a very high priority on providing this information to all involved parties as soon as it is available. The Corps should also take the lead in conducting discussions about the results of this testing.

System Reliability

The test plan for a sliding scale for spill provides for a very high level of spill at some project during high flow conditions. PNUCC is concerned about the potential impacts to the reliability of the power system during periods when a large percent of the flow will be spilled at these projects. According to the draft Plan these high levels of spill could occur at Lower Monumental and John Day dams. The Corps and BPA should investigate the system reliability issues that are related to very low power production at these projects. Examples of issues that should be explored include use of these projects for automatic generation control and transmission problems.

Clarify the 1987 Passage Plan

The final Passage Plan should include the spill levels (in percent) that the Corps determined are required to meet the indicated survival level. The draft Plan includes the percent spill required to meet the 90 percent survival standard at each project. However, the sliding scales are given in terms of percent survival only. Although there is not agreement on translating survival levels to required spill, it will reduce confusion if all parties know what amounts of spill the Corps intends to provide.

The procedures for deciding what days and hours to spill should also be clearly described in the Plan. For example, what criteria will be used to determine when to spill at The Dalles Dam? Will there be an in-season adjustment to the number of hours per day that spill will be provided? If so, how will that decision be made? The final Passage Plan should clearly define the criteria for in-season determination of how much and how long to spill at each project.

PNUCC appreciates the opportunity to participate with the Corps of Engineers in developing its annual Juvenile Fish Passage Plan. We look forward to working with the Corps in the future to seek out ways to improve the survival of the downstream migrants and at the same time minimize the impacts to the Northwest Power System.

Sincerely,

Dick Adams For

Al Wright
Executive Director

Department of Energy
Bonneville Power Administration
P.O. Box 3621
Portland, Oregon 97208

APR 0 2 1987

In reply refer to: PJ

Colonel James R. Fry
Deputy Division Engineer
Corps of Engineers
North Pacific Division
P.O. Box 2870
Portland, OR 97208

Dear Colonel Fry:

The Bonneville Power Administration (BPA) has reviewed the Corps of Engineers' (Corps) 1987 Draft Juvenile Fish Passage Plan and provides the following comments toward the development of a final plan. We appreciate the Corps' efforts in arriving at this draft plan for providing fisheries protection at federal hydropower projects on the Snake and Mainstem Columbia Rivers.

BPA agrees with the Corps that the best available scientific data supports maximum transportation of all juvenile fish. We, therefore, do not agree with the FTOT guidelines which limit the use of a highly efficient fish bypass alternative.

BPA supports the Corps' test plan at Bonneville Dam to provide spill at the second powerhouse only when sufficient numbers of fish are present. This would result in a much more efficient use of expensive levels of spill. The past passage plans, which had blanket spill periods at Bonneville, resulted in periods of spill that may have had little or no fisheries benefits with significant power revenue impacts. BPA's analysis of sliding scale spill options at other Federal dams was provided during earlier planning sessions with your staff. In summary, BPA concluded that increased amounts of planned spill provided only minimal fish benefits, at relatively high power costs.

BPA appreciates your consideration of these comments. We look forward to working with your staff on the implementation of a plan for both effective fish passage operations, and efficient operation of the region's hydropower resources.

Sincerely,

Ed Sienkiewicz
Assistant Administrator for
Power and Resources Management

cc:
J. Donaldson, CBFWA
E. Sheets, NPPC
J. Ruff, NPPC

BPA ANALYSIS OF

SLIDING SCALE SPILL PROPOSALS

Background

The examination of sliding scale spill proposals in the COE spill planning process has been limited to a comparison of smolt survival increases and power impacts for a range of low water conditions (1929, 1939, 1968) assumed to bracket the forecasted 1987 runoff (1939 is closest to 1987 forecast). These are all below average water years. The position taken by the COE regarding this limited range of analysis, is that any sliding scale spill implemented for 1987 would be a one year operation only, and any sliding scale spill in 1988 or beyond would involve new analyses using different water conditions, energy cost factors, and results obtained from 1987 spill implementation.

The FISHPASS model was used in the analyses to determine the increase in survival of smolts to below Bonneville Dam ("sound biological objective"). The FISHPASS modeling results reported in the following BPA analysis are for: 1) fish stocks originating above Lower Granite Dam, 2) fish stocks originating in the Mid-Columbia, and 3) total stocks for the entire system. Although the absolute survival values are sensitive to some of the FISHPASS input assumptions, the relative changes in survival due to changes in spill rates are not sensitive. This point is addressed further in the results of this analysis.

Current methods (models) for estimating the costs of a sliding scale spill program are limited. The estimates obtained are believed to be low as a result of: 1) Near perfect foresight in the modeling, 2) use of modulated monthly average flows in place of real time fluctuations that occur on a daily basis, 3) no accounting for the lost revenues associated with spilling water that could have been held in reservoirs for sale at a higher value than that obtainable during the spill period, and 4) poor simulations of real time marketing conditions and interactions. Until the current models have been further developed and tested, BPA believes the cost estimates provided by the SAM model are the best available data. As such, BPA's sliding scale spill analysis will use those cost estimates provided by the Northwest Power Planning Council's (Council) staff, which were developed with the SAM model.

Results

The "Preliminary" Cost Analyses by the Council staff used the SAM model with the Near Term Intertie Access Policy, existing intertie capacity level, no firm contracts to the Southwest, and 17 mil average annual cost of energy to the Southwest market. Two types of studies were performed for calculating the additional costs of sliding scale spill beyond the current 90 percent per-dam spill costs.

Study 1 - Random selection of water conditions limited to 1939 water as the mean and 1929 and 1968 water as two standard deviations below and above the mean.

Plan	Expected Value Cost Increases ($million)
COE Sliding Scale	1.5
FA&T Sliding Scale	5.8

Study 2 - Analysis of all 40 years (1929 - 1968).
Increased Spill Costs in $ millions for selected water years:

Plan	1929	1939	1968	1960	1934
COE Sliding Scale	0.2	0.5	3.1	6.5	12.3
FA&T Sliding Scale	2.5	4.2	6.2	11.2	11.2

Water years 1960 and 1934 are average water conditions and are included here to show the increasing costs associated with higher flow years than projected for 1987. Costs start declining in water conditions above these levels.

Observation of smolt survival and cost increases in table 1 and figures 1 through 3 (attachments) for water years 1929, 1939, and 1968 show that increases in system stock survivals are substantially less than one percent for all three water years analyzed. The maximum increase for any plan or water condition is less than 150 thousand smolts (out of a total of 31 million) at an additional cost of up to $6.2 million. The stock survival values broken down by species (not shown) show the same results (less than one percent increase for all species). Figures 4 and 5 show the significant increases in energy generation losses due to changes in spill plans and water conditions. It should be noted from Figure 4 that the current "base case" spill plan already has sliding scale energy losses. Figure 5 shows that the relative increases in smolt survival compared to energy generation losses is significantly out of balance under both spill plans.

The results of the sliding scale spill analysis support the more extensive BPA spill analyses presented to the Council during the fast track spill amendment process in January 1986. As then, these analyses show that the marginal rate of return for spill above the current 90 percent per-dam survival plan is not cost-effective. The additional costs per surviving smolt projected for 1987 water conditions ($45 to $131 per smolt) are approximately two orders of magnitude greater than current hatchery production costs (including capital and O&M). The total number of additional smolts surviving under the sliding scale proposals (2 to 132 thousand added to current survivals of 28 to 32 million) could be easily obtained with very minimal increases in transportation, hatchery production, or returning adults.

Biological Justification and FISHPASS Sensitivity

During the COE spill planning process, BPA repeatedly asked for an analysis from the FA&Ts to show a biologically based need for increased levels of spill. The only analysis provided has been a life cycle spreadsheet comparison of the COE and FA&Ts' 1986 spill plans by NMFS which was handed out in a COE Working Committee meeting. This analysis attempted to show that over a 10 generation egg-to-adult life cycle for spring chinook above Lower Granite, with the two separate spill plans, only the FA&Ts' plan would sustain the run. However, as we have subsuquently pointed out to NMFS, this was a result of an error in their spreadsheet which when corrected shows that the 1986 COE plan would build adult fish runs to high return levels over a small number of years. Further analysis using the life-cycle model's survival assumptions showed that only an additional 150 returning adults (300 adults entering the mouth of the Columbia) were required with the 1986 COE plan to obtain the same number of surviving smolts to below Bonneville as the 1986 FA&T plan, without the multi-million dollar additional costs.

Concerns have been expressed that the FISHPASS model results for system survival are too sensitive to the high reservoir mortality and low transport mortality assumptions in the model. These inputs were developed in the Councils' Mainstem Fish Passage Advisory Committee (MPAC). Although it is true that the system survival numbers are sensitive to these assumptions, it is important to note that results of the comparative analysis of sliding scale spill performed with FISHPASS for this planning process are not sensitive to these assumptions. This can be shown for reservoir mortality with an extreme sensitivity test. By cutting the reservoir mortality in half for all projects and comparing the current 90 percent plan (base case) to the FA&T sliding scale plan for 1939 water (closest to 1987 projected water), the base case's total fish survival increases to 33.6 million smolts below Bonneville and the FA&T plan increases this survival by only 114 thousand smolts. Thus, although the lower reservoir mortality assumption causes an increase in the number of additional smolts surviving with the FA&T plan, it is still a highly insignificant increase in survival over the base case. This same sensitivity analysis for the transportation assumptions (increasing mortality to 50 percent or more) would show even less change to the sliding scale spill comparative results presented here.

Conclusion and Position

BPA does not support additional planned spill beyond the current 90 percent base plan, because we believe that the data clearly shows the benefits are too minimal to justify the major costs they would incur. Those additional costs of spill would be a significant waste of the region's resources at a time of major revenue shortfalls and program cutbacks. Much more cost-effective means of increasing fish production are available.

JGeiselman:mm:5494 (PJI-1211N)

Sliding Scale Spill Analysis

Changes in System Stock Survivals and Power System Costs

Water Year	The Dalles Mar - Jul Runoff-MAF	Plan	Lower Granite Stocks Surv./ Smolts (%) / (1000)	Mid-Columbia Stocks Surv./ Smolts (%) / (1000)	Total System Stocks Surv./ Smolts (%) / (1000)	Energy Spill (1000 MW-hr)	Cost ($mill)
1929	62.1	Base Case	77.5/ 5,945	54.8/ 12,303	59.9/ 27,655	863	—
		△COE Plan	0 / —	0 / —	0 / 2	2	0.2
		△FA&T Plan	0.1/ 8	0 / —	0 / 19	79	2.5
1939	73.7	Base Case	78.1/ 5,991	57.6/ 12,931	63.7/ 29,413	1,105	—
		△COE Plan	0 / —	0 / —	0 / 11	31	0.5
		△FA&T Plan	0 / —	0.1/ 22	0.1/ 50	198	4.2
1968	81.6	Base Case	77.7/ 5,960	63.2/ 1,491	68.6/ 31,677	1,448	—
		△COE Plan	0 / —	0.4/ 90	0.2/ 102	224	3.1
		△FA&T Plan	0 / —	0.4/ 90	0.3/ 132	344	6.2

The forcast for 1987 Mar-Jul runoff is 69.9 MAF (closest to 1939). The average 1928-1979 Mar-Jul runoff is 91.3 MAF (the above are all below average).

TABLE 1

(1167N)

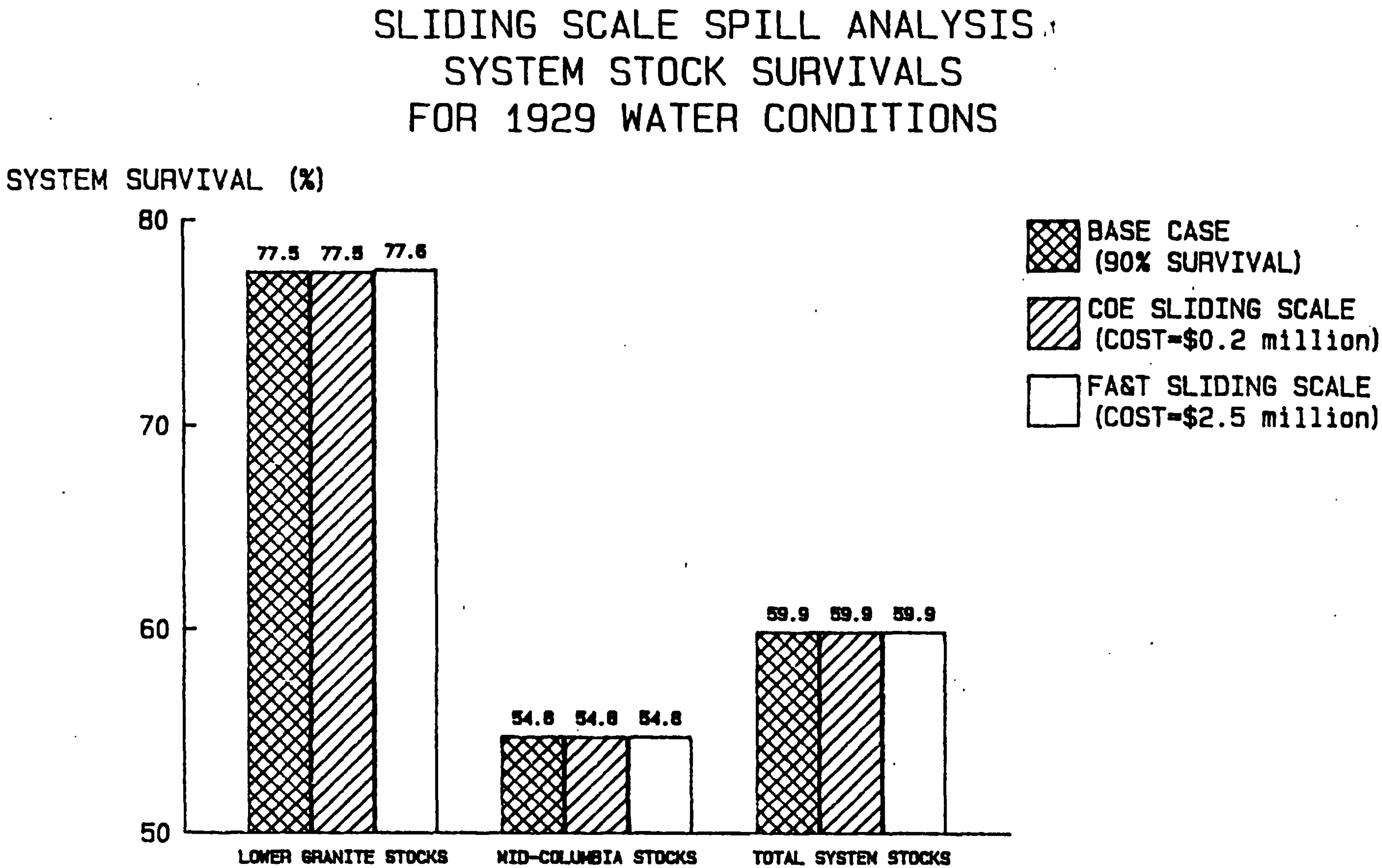

SLIDING SCALE SPILL ANALYSIS
SYSTEM STOCK SURVIVALS
FOR 1929 WATER CONDITIONS
SYSTEM SURVIVAL (%)
80
70
60
50
77.5
77.5
77.6
54.8
54.8
54.8
59.9
59.9
59.9
LOWER GRANITE STOCKS
MID-COLUMBIA STOCKS
TOTAL SYSTEM STOCKS
BASE CASE (90% SURVIVAL)
COE SLIDING SCALE (COST=$0.2 million)
FA&T SLIDING SCALE (COST=$2.5 million)

Figure 1

SLIDING SCALE SPILL ANALYSIS
SYSTEM STOCK SURVIVALS
FOR 1939 WATER CONDITIONS

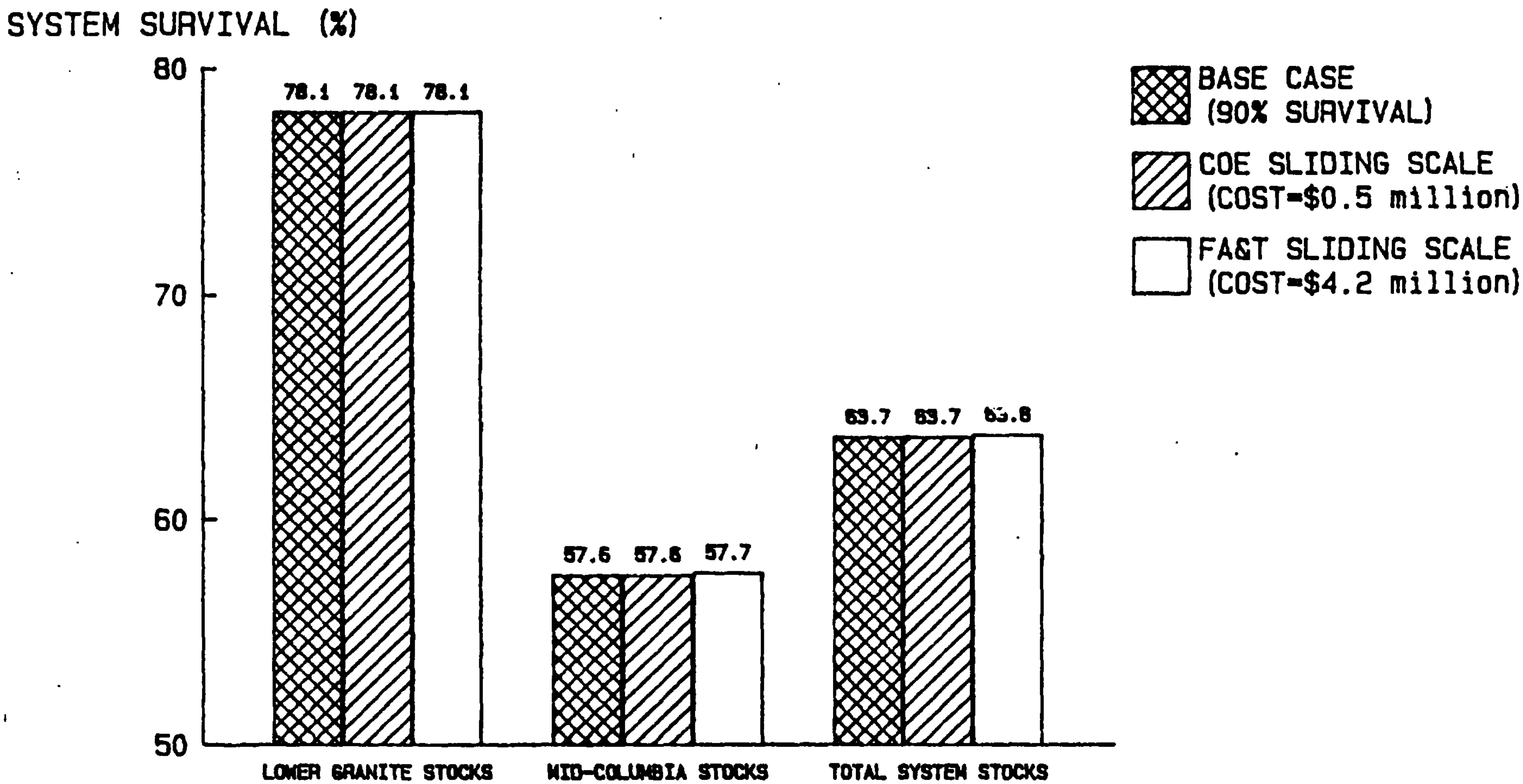


Figure 2

SLIDING SCALE SPILL ANALYSIS SYSTEM STOCK SURVIVALS FOR 1968 WATER CONDITIONS

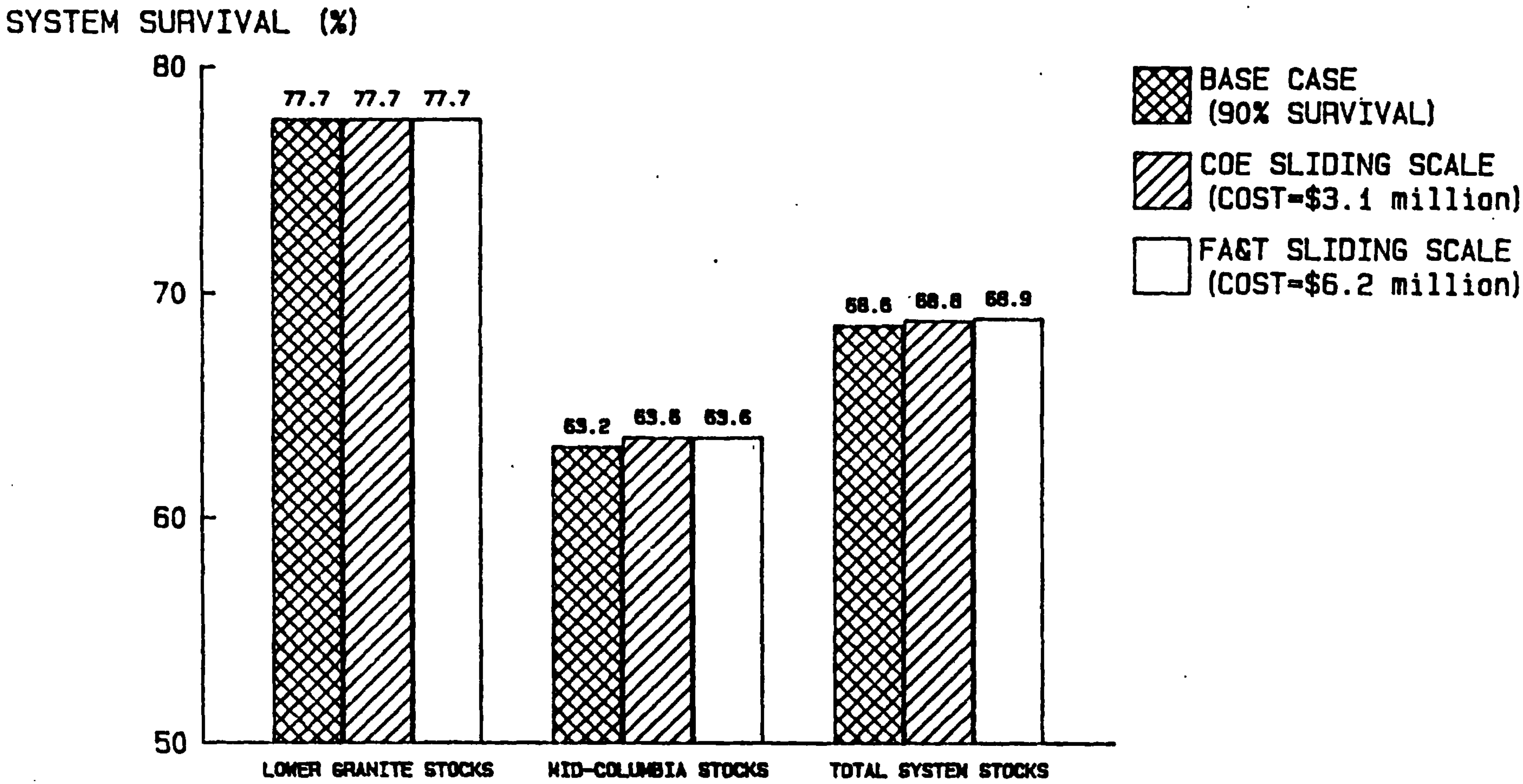


Figure 3

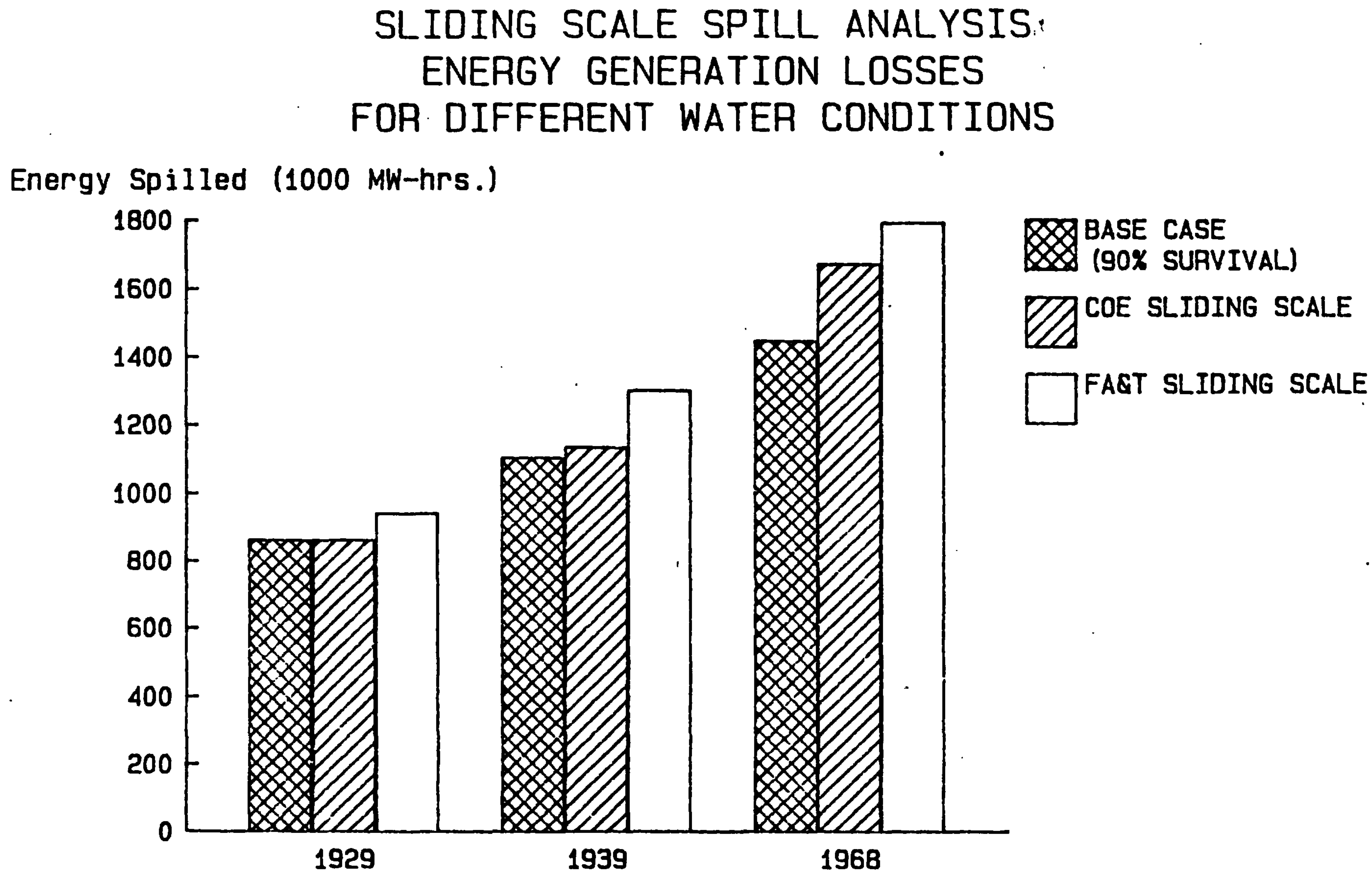

SLIDING SCALE SPILL ANALYSIS
ENERGY GENERATION LOSSES
FOR DIFFERENT WATER CONDITIONS
Energy Spilled (1000 MW-hrs.)
1800
1600
1400
1200
1000
800
600
400
200
0
1929
1939
1968
Water Conditions
BASE CASE (90% SURVIVAL)
COE SLIDING SCALE
FA&T SLIDING SCALE

Figure 4

SPILL ANALYSIS - Changes from Existing Spill Plan in System Stock Survivals & Energy Losses for 1929, 1939, and 1968 Water Conditions

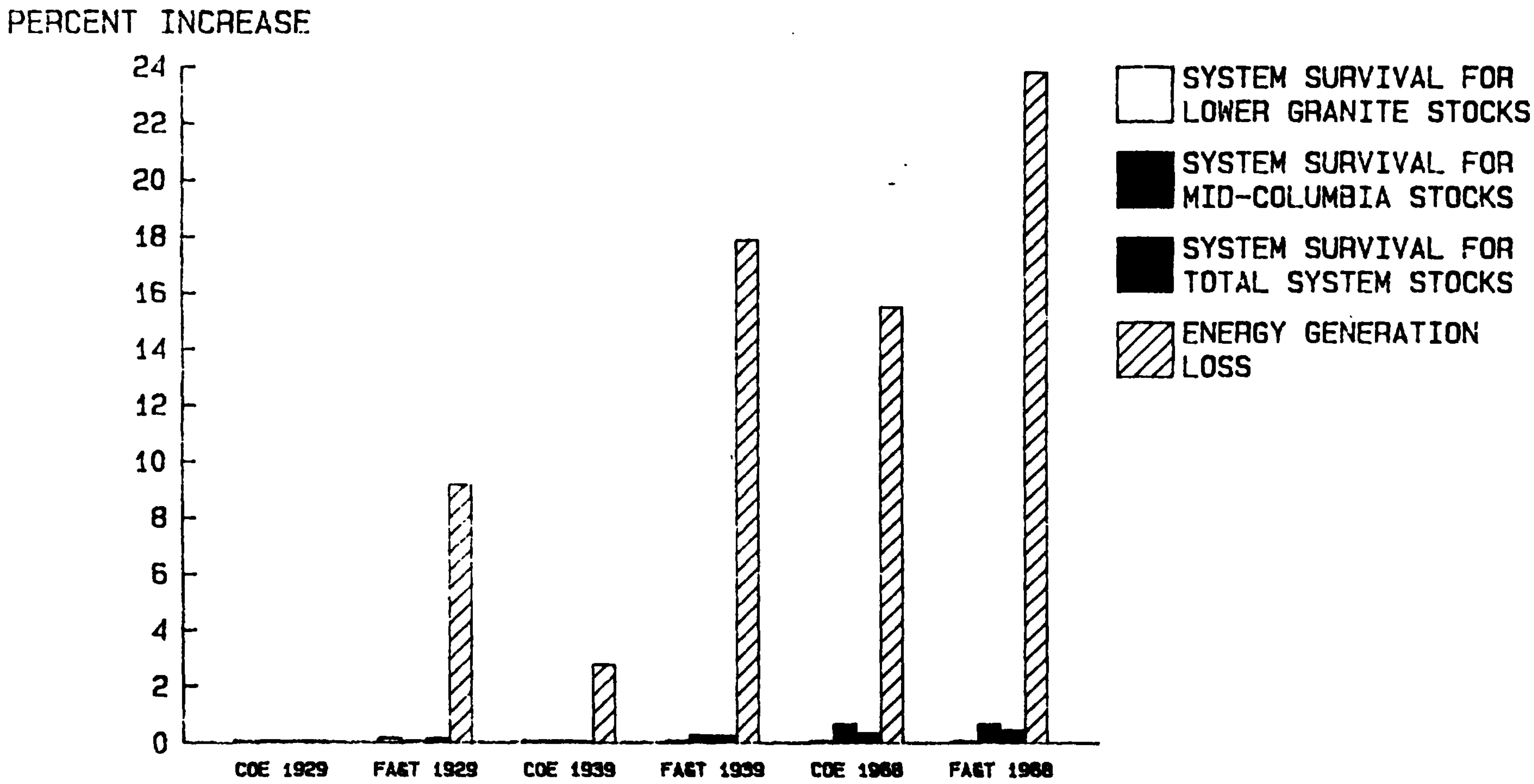


Figure 5

APPENDIX 3

Operation and Maintenance Criteria for Fish Passage at Corps of Engineers Projects

NPP PROJECTS

FISH FACILITIES OPERATING STANDARDS AND MAINTENANCE PLAN

BONNEVILLE, THE DALLES, JOHN DAY, FOSTER AND GREEN PETER DAMS

JANUARY 1987

U.S. Army Corps of Engineers, Portland District
ATTN: NPPOP-P-NR-FFU
Bonneville Fisheries Office
Bonneville Lock and Dam
Cascade Locks, OR 97014
(503) 374-8801

NPP PROJECTS

FISH FACILITIES OPERATING STANDARDS AND MAINTENANCE PLAN

BONNEVILLE, THE DALLES, JOHN DAY, FOSTER AND GREEN PETER DAMS

FEBRUARY 1987

U.S. Army Corps of Engineers, Portland District
ATTN: NPPOP-P-NR-FFU
Bonneville Fisheries Office
Bonneville Lock and Dam
Cascade Locks, OR 97014
(503) 374-8801

TABLE OF CONTENTS

TABLE OF CONTENTS (CONT.)

TABLE OF CONTENTS (CONT.)

BONNEVILLE DAM

A. OPERATING STANDARDS

1. Bonneville Dam Adult Fish Passage Facilities

a. **Prior to March 1**

(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.

(3) Inspect for and, when necessary, clear debris in the ladder exits.

b. **March 1 through November** (Adult Fish Passage Period)

(1) All Adult Fish Facilities

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

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

(c) A transportation velocity of 1.5 to 4 feet per second (2.0 fps preferred) 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).

(d) Maximum of 6" head on the first powerhouse attraction water intakes and trash racks at all the ladder exits, with a 4" maximum head on all picketed leads. Debris shall be removed when significant amounts accumulate.

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

(f) Coordination is in progress at the NPD level at the time of this writing, that will determine how the second powerhouse will be operated in 1987. So, it is expected that the 1987 standards which are influenced by the second powerhouse unit operation will be determined by RCC.

(2) Spillway Ladders

(a) Spill bay gates 1 and 18 open 4 inches.

(b) 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 sluicegate 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.

(3) First Powerhouse

(a) 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.

(b) Operate powerhouse entrance gates 9, 21, 34, 58 and 62.

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

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

(e) Powerhouse entrance gate 1 operates as an adjustable height submerged weir which acts as the primary control to regulate head 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 between the collection 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.

(4) Second Powerhouse

(a) Operate all four north (NUE and NDE) and south (SUE and 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.

(b) Operate all 12 powerhouse floating orifices.

(5) Spillway Operations

The following spill schedules (table 1) shall be followed during the spill period.

c. **December 1 through February (Winter Operating Period)**

(1) 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 or operating out of standard operating criteria 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.

(2) Adjust crowders at fish counting stations to full open at the end of the counting season.

Spill Schedule for Flows at Bonneville Dam
(Gate Opening in Dogs) 1/ Revised June 5, 1975 - Reviewed 1985

Gate Number																		Total	
1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	Dogs	KCFS 2/
4	1															(1)	4		
	1	1													(1)	1			
	1	1	1											(1)	1	1			
	1	1	1	1									(1)	1	1	1			
	1	2	1	1									1	1	(2)	1		10	35.3
	1	2	1	1	1							(1)	1	1	2	1			
	1	2	1	1	1	1					(1)	1	1	1	2	1			
	1	2	1	1	1	1	1			(1)	1	1	1	1	2	1			
	1	2	1	1	1	1	1	1		1	(2)	1	1	1	2	1			
	2	2	1	1	1	1	1	1		1	2	1	1	1	2	(2)		20	68.6
	2	2	1	1	1	1	(2)	1	1	1	2	1	1	1	2	2			
	2	2	1	1	1	1	2	2	(2)	1	2	1	1	1	2	2			
	2	2	1	1	1	1	2	3	(3)	1	2	1	1	1	2	2			
	2	2	1	1	2	1	2	3	3	1	2	1	1	1	2	(3)			
	2	2	1	1	2	1	2	4	(4)	1	2	1	1	1	2	3		30	100.8
	2	3	1	1	2	1	2	(5)	4	1	2	1	1	1	2	3			
	2	3	1	1	2	1	3	5	(5)	1	2	1	1	1	2	3			
	2	3	1	1	2	1	3	(6)	5	1	2	1	1	1	3	3			
	2	3	1	1	2	1	3	6	6	1	2	1	1	1	3	(4)			
	2	3	1	1	2	1	4	6	(7)	1	2	1	1	1	3	4		40	139.7
	2	3	1	2	2	1	4	6	7	(2)	2	1	1	1	3	4			
	3	3	1	2	2	1	4	6	7	2	2	1	(2)	1	3	4			
	3	3	2	2	2	1	4	(7)	7	2	2	1	2	1	3	4			
	3	4	2	2	2	(2)	4	7	7	2	2	1	2	1	3	4			
	3	4	2	2	3	2	4	7	7	(3)	2	1	2	1	3	4		50	176.0
	3	4	2	2	3	3	4	7	(8)	3	2	1	2	1	3	4			
	3	4	3	2	3	3	4	7	8	3	(3)	1	2	1	3	4			
	3	4	3	3	3	3	4	7	8	3	3	(2)	2	1	3	4			
	3	4	3	4	3	3	4	7	8	3	3	2	2	(2)	3	4			
	3	4	3	4	3	4	4	7	(9)	3	3	2	2	2	3	4		60	211.5
	3	4	3	4	4	4	4	7	9	(4)	3	2	2	2	3	4			
	3	4	4	4	4	4	4	7	(10)	4	3	2	2	2	3	4			
	3	4	4	4	4	4	4	8	10	4	(4)	2	2	2	3	4			
	3	4	4	4	4	4	4	8	10	5	4	2	(3)	2	3	4			
	3	4	4	4	4	4	4	9	10	(6)	4	2	3	2	3	4		70	246.5
	3	4	4	4	4	4	5	9	10	6	4	(3)	3	2	3	4			
	3	4	4	4	4	4	5	10	10	6	4	3	3	(3)	3	4			
	3	4	4	4	4	4	6	10	11	6	4	3	3	3	3	4			
	4	4	4	4	4	4	6	10	11	(7)	4	3	3	3	3	4			
	4	4	4	4	4	4	6	11	(12)	7	4	3	3	3	3	4		80	281.0
	4	4	4	4	4	5	6	11	12	7	(5)	3	3	3	3	4			
	4	5	4	4	4	5	6	11	12	(8)	5	3	3	3	3	4			
	4	5	4	5	4	5	6	11	12	8	5	(4)	3	3	3	4			
	4	5	4	5	4	5	6	12	12	8	5	4	3	3	(4)	4			
	4	5	4	5	4	5	7	12	12	8	5	4	3	(4)	4	4		90	316.1
	4	5	4	5	5	5	7	12	12	8	5	4	(4)	4	4	4			
	4	5	5	5	5	5	7	12	12	8	5	4	4	4	4	(5)			
	4	5	5	5	5	5	8	12	12	8	(6)	4	4	4		5			

Spill Schedule for Flows at Bonneville Dam (Cont.)
(Gate Opening in Dogs) 1/ Revised June 5, 1975 - Reviewed 1985

Gate Number 1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	Total Dogs	KCFS 2/
	4	5	5	5	5	5	8	12	12	8	6	5	(5)	4	4	5			
	4	5	5	5	5	6	8	12	12	8	6	5	5	4	(5)	5		100	351.2

1/ ( ) values may be one dog less than value shown.
For example: (1) means 0 or 1 dog, (2) means 1 or 2 dogs, etc.

2/ KCFS-approximate values were calculated using a forebay elevation of 76.0 feet.

2. BONNEVILLE DAM JUVENILE FISH PASSAGE FACILITIES

a. First Powerhouse

(1) **Prior to March 15 each year** (or as early as 1 March depending on timing of Bonneville pool hatchery releases.)

(a) Remove debris from forebay, trash racks and gatewell slots.

(b) Inspect vertical barrier screens for damage, holes, debris accumulations or protrusions. (Video inspection acceptable) and repair when problems are detected.

(c) Inspect each Submersible Traveling Screen (STS) and operate on trial run (dogged off at deck level). Install STS in each intake of operational units by March 15 or earlier if release of Bonneville pool hatchery fish occurs. However, installation will not be required before 1 March. The schedule for early hatchery releases will need to be supplied by the fisheries agencies by February 1 in order to coordinate early STS installation.

(d) Operate STSs at angle of 55 degrees from vertical.

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

(f) Inspect and, where necessary, clean and/or repair dewatering screens and associated equipment.

(g) Inspect and correct any deficiencies of DSM channel and outfall conduit walls and floor.

(2) March 15 through November 15

(a) Remove debris from forebay and trash racks 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). STSs in units being raked should be run on continuous during raking operation. Gatewell orifices of the unit being raked must be closed during the procedure.

(b) Inspect each STS and each VBS a minimum of once every three months (video acceptable). Preferably, inspections will occur immediately prior to peaks in juvenile fish migrations, which begin about May

1, mid-July and September 1. 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 conditions; 2) increased debris load in bypass system; and 3) other indications of STS or VBS malfunctions or failure. If STS or VBS damage or plugging is detected, follow procedures in Fish Facilities Maintenance Plan.

(c) Operate all gatewell orifice systems. Inspect each daily to assure that the orifice valves and lights are operating correctly. Backflush at least every day or more often if indicated by debris accumulations. Replace all burned out orifice lights within 24 hours.

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

(e) Inspect all gatewells daily and clean before gatewell water surface becomes fully covered to maintain clean orifices and minimize fish injury. The first powerhouse gatewell orifices must be closed during the debarking operation. After debarking a gatewell, backflush the orifice in that gatewell. Check gatewell drawdown.

(f) Coordinate cleaning efforts with personnel operating downstream migrant sampling facilities.

(g) Turbines should be operated at peak efficiency unless the additional generation is needed to avoid operation of a partially or fully unscreened unit or to avoid excess daytime spill (greater than 75 kcfs).

(h) STS cycling operation may begin when the mean length of the majority of the juvenile chinook passing the project reaches or exceeds 112mm. This time will be determined by the Corps biologist using appropriate available data. A cycling time of a maximum 20 minutes off and a minimum of 2 minutes on must be followed. Cycling will be discontinued if warranted by fish condition or debris problems.

(i) Inspect and maintain the monofilament strung over juvenile release areas for the purpose of discouraging gull predation.

(j) Before April 15, turbine units without a full complement of STSs 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 BPA needs that additional generation to meet firm energy demands. The release dates will be supplied to NPPOP-P-NR biologists by the Fish Passage Center as soon as these dates are available. The release date must be received by the above biologists one week 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 20,000 juvenile salmon unless BPA needs that additional generation to meet firm energy demands or to avoid excess daytime spill (greater than 75 kcfs).

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

(k) During the period April 16 through August turbine units without a full complement of STSs will not operate except to meet firm energy demands. Units without a full complement of STSs will be the last to be brought on line to meet power demands and the first off line when the power demand has diminished.

(l) During the period September 1 through November 15, operate the same as the March 1-15 through April 15 period. (see (j)).

(m) During periods of involuntary spill, open sluicegate 7A to a depth of 3.5 feet and 10C to a depth of 2.5 feet below the minimum expected forebay elevation.

(3) October 1 through November 15

STSs may be removed from up to one-half of the powerhouse turbine units to reduce wear and facilitate early winter maintenance. These should be removed from lower priority units.

(4) November 16 through March 14

All STSs removed and DSM channel dewatered (see Dewatering Procedures). DSM channel will be dewatered throughout most of this period as STSs must be stored beneath the intake deck, which places the STSs directly in front of the gatewell orifices. Additionally, all units are available to meet power demands and should be operated at peak efficiency whenever possible.

b. Second Powerhouse

(1) Prior to March 15 each year (or as early as March 1 depending on earliest release of Bonneville pool hatchery fish)

(a) Remove debris from forebay, trash racks and gatewell slots.

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

(c) Inspect each Submersible Traveling Screen (STS) and operate on trial run (dogged off at deck level). Install STS in each intake of operational units by March 15 or earlier if release of Bonneville pool hatchery fish occurs. However, installation will not be required before 1 March. Fisheries agencies will provide schedule of early hatchery releases by 1 February to allow time to coordinate preparation.

(d) Operate STSs at angle of 60 degrees from vertical.

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

(f) Inspect and, where necessary, clean and/or repair dewatering screens and associated equipment.

(g) Inspect and correct any deficiencies of DSM channel and conduit outfall walls and floor.

(2) March 15 through November 15

(a) Remove debris from forebay and trash racks 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). STSs in units being raked should be run on continuous during raking operation. Gatewell orifices of the unit being raked must be closed during the procedure.

(b) Inspect each STS or VBS a minimum of once every three months (video acceptable). Preferably, inspections will occur immediately prior to peaks in juvenile fish migrations, which begin about May 1, mid-July and September 1. 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 conditions; 2) increased debris load in bypass system; and 3) other indications of STS or VBS malfunctions or failure. If STS or VBS damage or plugging is detected follow procedures in Fish Facilities Maintenance Plan.

(c) Operate all gatewell orifice systems. Inspect each daily to assure that the orifice valves and lights are operating correctly. Orifices with less than clear flow jet should be cleaned at least once per day. Replace all burned out orifice lights within 24 hours.

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

(e) Inspect all gatewells daily and clean before gatewell water surface becomes fully covered with debris to maintain clean orifices and minimize fish injury. After debarking a gatewell, inspect and if necessary, clean the orifice in that gatewell. Check gatewell drawdown.

(f) Coordinate cleaning efforts with personnel operating downstream migrant sampling facilities.

(g) Turbines should be operated at peak efficiency unless the additional generation is needed to avoid operation of a partially or fully unscreened unit or to avoid excess daytime spill (greater than 75 kcfs).

(h) STS cycling operation may begin when the mean length of the majority of the juvenile chinook passing the project reaches or exceeds 112mm. This time will be determined by the Corps biologist using appropriate data. A cycling time of a maximum 20 minutes off and a minimum of 2 minutes on must be followed. Cycling will be discontinued if warranted by fish condition or debris problems.

(i) Inspect and maintain the monofilament lines installed for the purpose of discouraging gull predation on juvenile salmonids.

(j) Coordination is in progress at the NPD level at the time of this writing, that will determine how the second powerhouse will be operated in 1987. So, it is expected that the 1987 standards which are influenced by the second powerhouse unit operation will be determined by RCC.

B. MAINTENANCE PLAN

1. Adult Fish Passage System

a. Fish Passage Season - March 1 through November.(See Operating Standards)

b. Winter Maintenance Season - December 1 through February (see Operating Standards)

c. Fishway Auxiliary Water Systems

(1) Scheduled Maintenance (see Appendix A for coordination procedures) - Bonneville Project auxiliary water systems consist of gravity flow and hydroelectric generating systems. Preventive maintenance and normal repair are carried out throughout the year.

(2) Unscheduled Maintenance (see Appendix A for coordination procedures) - Most fishway auxiliary water systems are operated automatically. If the automatic system fails, then 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.

(a) 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 pressure 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 until a head of 1.2 feet is achieved. If this fails to achieve the proper fishway head, then raise gate 1 weir in one-foot increments to 6 foot depth below the tailwater surface until a head of 1.2 feet is achieved.

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' positions regardless of whether criteria are met or not, until the auxiliary water system is repaired.

(b) 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.

(c) 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 a least 1.2 feet is achieved. If this fails to achieve the above criteria then apply the same procedure, until the criteria are 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 6 feet below tailwater. If the correct fishway head 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.

d. Powerhouse and Spillway Adult Fish Collection System

(1) 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 except as specially coordinated or as needed for semi-annual maintenance. 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 Dewatering Plans). 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 Dewatering Plans). 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.

(2) Unscheduled Maintenance (see Appendix A for coordination procedures) - The Bonneville Project contains several types of fishway entrances. There is little potential for failure in most of the entrance types while a few 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.

e. Adult Fish Ladders and Counting Stations

(1) Scheduled Maintenance (see Appendix A for coordination procedures) - The adult fish ladders are usually dewatered (see Dewatering Plan) 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 as well as other potential problems. Problems identified throughout the passage year that do not affect fish passage through the ladder as well as those identified during the dewatered period may then be repaired.

(2) 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 problems will be made in consultation with the fishery agencies and Indian tribes.

2. Juvenile Fish Passage System

a. Fish Passage Season - March 15 through November 15 (See Operating Standards). Passage season may start as early as March 1 if a Bonneville pool hatchery release occurs.

b. Winter Maintenance Period - November 16 through March 14 (See Operating Standards). Earlier end of this period is subject to early Bonneville pool hatchery release.

c. Submersible Traveling Screens (STSs)

(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 when all STSs may be removed from the intakes. Whenever a generator malfunctions or is scheduled for maintenance, the three STSs in that turbine may be maintained, repaired or exchanged for other STSs needing maintenance or repair. One third of the STSs 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 I-1. During the peak juvenile passage periods (April 15 through August), 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, 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 firm energy within the next 48 hours. Crews will work overtime or as call-outs on weekends as required.

d. Juvenile Bypass Systems

(1) 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 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 raked must be closed during the procedure (applies only to the first powerhouse).

(2) Unscheduled Maintenance (see Appendix A for coordination procedures)

(a) General Statement - The Bonneville project's 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.

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

(b) 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 7A will be opened to a depth of 3.5 feet below the minimum expected forebay to provide safe transportation flows for juveniles. Forebay elevation will be kept above 74.0 m.s.l. to the extent practicable. The bypass will then continue operating while repairs are completed. In either

Figure I-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 to meet firm energy demands during low debris conditions, continue operating until step 3 can be accomplished, otherwise proceed immediately to step 2.

2. Units 10, 9, 18, and 17 will continue operating 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. The failed STS or VBS in any of the above units 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 that unit is required to meet firm energy demand, in which case the unit will be the last to be brought on line and the first off line.

3. During working hours, 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 meet firm energy demands or to control excess spill during daylight hours, unscreened turbines will be operated. The STS or VBS will be replaced with one from Unit 8 then 7 (PH-1) or Unit 15 (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 I-1. STSs or VBSs should be removed from the A-slot first, B-slot second, C-slot third except at unit 7 where the order of removal should be B, C, A. 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 Juvenile Operating Standards (I2a(2)(j)) until a spare or repaired STS or VBS is available for installation.

Table 1

Submersible Traveling Screen Removal Order When It Becomes Necessary to Remove a Malfunctioning Submersible Traveling Screen and Operate the Unscreened Unit at Bonneville.

	1st Powerhoue Turbine Units		2nd Powerhouse Turbine Units	
Order to Pull 1/	Mar 15 - Jul 5	Jul 6 - Sep 30	Mar 15 - Jul 5	Jul 6 - Sep 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.

operating mode, the orifices will be cleaned with the air pressure system at least once per day, when plugged orifices are indicated, or after trash rack raking and gatewell debarking.

(c) 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.

During fishway inspection activites the VBSs may be found to be plugged or damaged. In these cases refer to Figure I-1.

3. Turbines and Spillways

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 Dewatering Plans). 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 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 coordinated research activities.

C. Dewatering Plan

1. Adult Fish Ladder

a. 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 prior to dewatering.

(2) Discontinue all fishway auxiliary water supply at least 24 hours but no more than 48 hours prior to dewatering.

(3) Corps biologist will assure that fish rescue equipment is available and will coordinate to ensure 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 inform the rescue crews of the locations of all stranded fish. A Corps biologist will provide technical guidance in fish safety and assist in 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.

b. 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.

2. Powerhouse Fish Collection System

a. 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) A Corps biologist will provide technical guidance on fish safety and assist in any necessary rescue operation.

3. Turbines

a. When possible, place head gates and tail logs immediately after turbine unit is shut down if draft tube is to be dewatered.

b. If turbine unit draft tube is to be dewatered and turbine unit has been idle, it will be operated when possible, at "speed/no load" for at least ten minutes and stop logs will then be placed immediately.

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

d. Corps biologist 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.

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

f. A Corps biologist will provide technical guidance on fish safety and assist in any necessary rescue operation.

g. If Unit is planned to be out of service for less than 4 days then it is not required to remove fish from draft tubes as long as a "safety pool" is maintained.

THE DALLES DAM

A. OPERATING STANDARDS

1. The Dalles Dam Adult Fish Passage Facilities

a. 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.

(3) Inspect for, and when necessary, clear debris in the ladder exits.

b. March 1 through November (Fish Passage Period)

(1) All Adult Fish Facilities

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

(b) 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.

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

(d) Maximum of 6" head on attraction water intakes and trash racks at all the ladder exits, with a 4" maximum head on all picketed leads. Debris shall be removed when significant amounts accumulate.

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

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

(2) North Fishway

(a) North Fishway Entrance: Operate entrances N1 and N2 during periods with spill. N2 may be closed during periods with no spill.

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

(3) Powerhouse

(a) West Powerhouse Entrance: Operate two entrances (W1 and W2).

(b) East Powerhouse Entrance: Operate all three entrances (E1, E2, E3) except as required during low tailwater conditions (below el 78') when E1 entrance may be closed.

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

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

(4) Spillway Operations

The following spill schedule (Table II-1) shall be followed during the spill period.

c. **December 1 through February (Winter Operating Period)**

(1) 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.

(2) Operate the north spillway adult fish passage facilities according to the following criteria:

(a) No spill period - Operate entrance gate N1, head attainable by ladder flow only. Weir crest 6 feet below tailwater.

(b) Spill period - operate entrance Gate N1 with 1.0 foot head. Weir crest 8 feet below tailwater.

(c) East ladder dewatered or operating out of fish passage period criteria - Operate entrance gate N1 and N2 with 1.0 foot head. Weir crest 8 feet below tailwater.

(3) Only one of the two fish facilities may be out of service at any one time except under extreme situations.

Spilling Schedule at The Dalles Dam Adjusted for Expanded Powerhouse (openings in feet).

Pool Elevation 159.6'

Gate Number																							kcf's
1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	
(1)																						1	3.0
1	(1)																				1	1	6.0
1	1	(1)																		1	1	1	9.0
1	1	1	(1)																1	1	1	1	12.0
1	1	1	1	(1)														1	1	1	1	1	15.0
1	1	1	1	1	(1)												1	1	1	1	1	1	18.0
1	1	1	1	1	1	(1)										1	1	1	1	1	1	1	21.0
1	1	1	1	1	1	1	(1)								1	1	1	1	1	1	1	1	24.0
1	1	1	1	1	1	1	1	(1)						1	1	1	1	1	1	1	1	1	27.0
1	1	1	1	1	1	1	1	1	(1)				1	1	1	1	1	1	1	1	1	1	30.0
1	1	1	1	1	1	1	1	1	1	(1)		1	1	1	1	1	1	1	1	1	1	1	33.0
1	1	1	1	1	1	1	1	1	1	1	1	(2)	1	1	1	1	1	1	1	1	1	1	36.0
1	1	1	1	1	1	1	1	1	1	2	1	2	1	(2)	1	1	1	1	1	1	1	1	39.0
1	1	1	1	1	1	1	1	2	1	2	1	2	1	2	1	(2)	1	1	1	1	1	1	42.0
1	1	1	1	1	1	2	1	2	1	2	1	2	1	2	1	2	1	(2)	1	1	1	1	45.0
1	1	1	1	2	1	2	1	2	1	2	1	2	1	2	1	2	1	2	1	(2)	1	1	48.0
1	1	1	1	2	1	2	1	2	2	2	(2)	2	1	2	1	2	1	2	1	2	1	1	51.0
1	1	1	1	2	1	2	2	2	2	2	2	2	(2)	2	1	2	1	2	1	2	1	1	54.0
1	1	1	1	2	2	2	2	2	2	2	2	2	2	2	(2)	2	1	2	1	2	1	1	57.0
1	1	1	1	2	2	2	2	2	2	2	2	(3)	2	2	2	2	2	2	1	2	1	1	60.0
1	1	1	1	2	2	2	2	3	2	3	2	3	2	(3)	2	2	2	2	1	2	1	1	63.0
1	1	1	1	2	2	2	2	3	2	3	2	3	2	3	2	2	2	2	(2)	2	1	1	66.0
1	1	1	1	2	2	3	2	3	2	3	2	3	2	3	2	(3)	2	2	2	2	1	1	69.0
1	1	1	1	2	2	3	2	3	2	3	3	3	2	3	2	3	2	(3)	2	2	1	1	72.0
1	1	1	1	2	2	3	2	3	3	3	3	3	(3)	3	2	3	2	3	2	2	1	1	75.0
1	1	1	2	2	2	3	2	3	3	3	3	3	3	3	(3)	3	2	3	2	2	1	1	78.0
1	1	2	2	2	2	3	2	3	3	3	3	3	3	3	3	(3)	3	3	2	2	1	1	81.0
1	1	2	2	2	2	3	2	3	3	3	3	(4)	3	3	3	3	3	3	2	2	1	1	84.0
1	1	2	(3)	2	3	3	2	3	3	3	3	4	3	3	3	3	3	3	2	2	1	1	87.0
1	1	2	3	2	3	3	2	3	3	4	3	3	3	(4)	3	3	3	3	2	2	1	1	90.0
1	1	2	3	2	3	4	3	4	3	4	3	4	3	4	3	3	3	3	2	2	(2)	1	93.0
1	1	2	3	2	3	4	3	4	3	4	(4)	4	3	4	3	3	3	3	2	2	2	1	96.0
1	1	2	3	2	3	4	3	4	4	4	4	4	(4)	4	3	3	3	3	2	2	2	1	99.0
1	2	2	3	2	3	4	3	4	4	4	4	4	4	4	3	3	3	3	2	(3)	2	1	102.0
1	2	2	3	2	3	4	(3)	4	4	4	4	4	4	4	4	3	3	3	2	3	2	1	105.0
1	2	2	3	2	3	4	4	4	4	(5)	4	5	4	4	4	3	3	3	2	3	2	1	108.0
1	2	2	3	2	3	4	4	5	4	5	4	5	4	4	4	(4)	3	3	2	3	2	1	111.0
1	2	2	3	2	3	4	4	5	4	5	5	5	4	(5)	4	4	3	3	2	3	2	1	114.0
1	2	2	3	3	3	4	4	5	4	5	5	5	(5)	5	4	4	3	3	2	3	2	1	117.0
1	2	3	3	3	3	4	4	5	(5)	5	5	5	5	5	4	4	3	3	2	3	2	1	120.0

Gate Number																							kcf's
1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	
1	2	3	3	4	3	4	4	5	5	5	5	5	5	5	4	4	3	3	(3)	3	2	1	123.0
1	2	3	3	4	3	4	5	5	5	5	5	5	5	5	4	4	3	(4)	3	3	2	1	126.0
1	2	3	3	4	4	4	5	5	5	5	5	5	5	5	(5)	4	3	4	3	3	2	1	129.0
1	2	3	3	4	4	5	5	5	5	5	5	5	5	5	5	4	3	4	(4)	3	2	1	132.0
1	2	3	3	5	4	5	5	5	5	5	5	5	5	5	5	4	(4)	4	4	3	2	1	135.0
1	2	3	4	5	4	5	5	5	5	5	5	5	5	5	5	4	(5)	4	4	3	2	1	138.0
1	2	3	4	5	5	5	5	5	5	5	5	5	5	5	5	(5)	5	4	4	3	2	1	141.0
1	2	3	4	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	(4)	2	1	144.0
1	2	3	4	5	5	5	5	5	5	6	5	5	5	5	5	5	5	(5)	5	4	2	1	146.9
1	2	3	4	5	5	5	5	(6)	5	6	5	6	5	5	5	5	5	5	5	4	2	1	149.7
1	2	3	4	5	5	5	5	6	5	6	6	6	6	(6)	5	5	5	5	5	4	2	1	152.5
1	2	3	4	5	5	5	5	6	6	6	6	6	(6)	6	5	5	5	5	5	4	2	1	155.3
1	2	4	4	5	5	5	5	6	6	6	6	6	6	6	5	5	5	5	5	4	(3)	1	158.3
1	2	4	4	5	5	6	5	6	6	6	6	6	6	6	5	(6)	5	5	5	4	3	1	161.1
1	2	4	4	5	5	6	6	6	6	6	6	6	6	6	(6)	6	5	5	5	4	3	1	163.9
1	2	4	5	2	6	6	6	6	6	6	6	6	6	6	6	6	6	5	5	4	3	(2)	166.8
1	2	4	5	2	6	6	6	6	6	6	6	6	6	6	6	6	(6)	5	5	4	4	2	169.7
1	2	4	5	2	6	6	6	6	6	(7)	6	6	6	6	6	6	6	5	5	4	4	2	172.7
1	2	4	5	2	6	6	6	(7)	6	7	6	7	6	6	6	6	6	5	5	4	4	2	175.7
1	2	4	5	2	6	7	6	7	6	7	6	7	6	(7)	6	6	6	5	5	4	4	2	178.7
1	2	4	5	5	6	7	7	7	7	7	(7)	7	7	7	6	6	6	5	5	4	4	2	181.7
1	2	4	5	5	6	7	7	7	7	7	7	7	(7)	7	6	6	6	5	5	4	4	2	184.7
1	2	4	5	(6)	6	7	7	7	7	7	7	7	7	7	6	6	6	6	5	4	4	2	187.5
1	2	(5)	5	6	6	7	7	7	7	7	7	7	7	7	6	6	6	6	5	5	4	2	190.5
1	3	5	5	6	6	7	7	7	7	7	7	7	7	7	7	6	6	6	5	5	4	2	193.5
1	3	5	5	6	7	7	7	7	7	7	7	7	7	7	7	(7)	6	6	5	5	4	2	196.5
1	3	5	6	6	7	7	7	7	7	7	7	7	7	7	7	7	(7)	6	5	5	4	2	199.4
1	3	5	6	6	7	7	7	7	7	8	7	7	7	7	7	(8)	7	6	5	5	4	2	202.3
1	3	5	6	6	7	7	7	8	7	8	7	(8)	7	7	7	8	7	6	5	5	4	2	205.0
1	3	5	6	6	7	8	7	8	7	8	7	8	7	(8)	7	8	7	6	5	5	4	2	207.8
1	3	5	6	6	7	8	7	8	8	8	(8)	8	7	8	7	8	7	6	5	5	4	2	210.6
1	3	5	6	6	7	8	8	8	8	8	8	8	7	8	7	8	7	6	(6)	5	4	2	213.4
1	3	5	6	7	7	8	8	8	8	8	8	8	7	8	7	8	7	(7)	6	5	4	2	216.4
1	3	5	7	7	7	7	8	8	8	8	8	8	(8)	8	7	8	7	7	6	5	4	2	219.3
1	3	5	7	7	8	8	8	8	8	8	8	8	8	8	(8)	8	7	7	6	5	4	2	222.1

Values in parenthesis may be 1 foot less than the values shown.

For example: (1) mean 0 or 1 foot
(2) means 1 or 2 feet

An approved spill schedule which incorporates raising spillbay gates in blocks of four will be implemented when changes in spill discharge are frequent.

2. The Dalles Juvenile Fish Passage Facilities

a. **Prior to April 1 each year**

(1) Remove debris from forebay, trash racks 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.

b. **April 1 through November 15 (Passage Period)**

(1) 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).

(2) Remove debris from forebay when needed, and from gatewell slots when gatewell water surface is over one-half covered.

(3) Operate all gate slot orifices full time.

(4) Either turbine unit 1 or unit 2 or both units should be operating during daylight hours.

(5) Operate chain gates 1-1, 1-2 & 1-3 at least 16 hours per day (sunrise to sunset) through August, and at least sunrise to sunset from September 1 on with full surface flow (lower or raise chain gates completely). During periods of involuntary spill, chain gates may be operated continuously.

(6) Operate end gate full open from sunrise to sunset.

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

(8) Once each week and more frequently if accumulations of debris are observed, close gates 1-1, 1-2 & 1-3, 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.

c. **General**

(1) During chain gate operation, maintain forebay level above elevation 158.0 to the extent practicable.

(2) Maintain orifices clear of debris.

(3) Inspect facilities once each shift.

(4) Operate turbine units at peak efficiency whenever practicable.

d. **November 15 through March**

(1) Maintain orifices clear of debris.

(2) Set top of bottom end gate at 142 elevation to create orifice plunge pool.

B. THE DALLES DAM FISH FACILITIES MAINTENANCE PLAN

1. The Dalles Dam Adult Fish Passage System

a. Fish Passage Season - March 1 through November. Operate according to criteria in Operating Standards.

b. Winter Maintenance Season - December 1 through February each year. Operate according to criteria in Operating Standards.

c. Fishway Auxiliary Water Systems

(1) Scheduled Maintenance (see Appendix A for coordination procedures) - The Dalles Project auxiliary water fishway water is provided by gravity flow and discharge from hydroelectric turbine systems. Preventive maintenance and normal repair are carried out throughout the year.

(2) Unscheduled Maintenance (see Appendix A for coordination procedures) - Most fishway auxiliary water systems operate automatically. If the automatic system fails, the sytem 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.

(a) The Dalles Powerhouse - If one of the two fishway auxiliary water turbines fails or malfunctions during spring or summer adult migration seasons (March 1 - July 31) use the following sequential procedure until a fishway head of 1.2 feet is achieved:

1: Raise the open West Powerhouse Entrance weirs W1 and W2 (W3 normally closed) in one-foot increments until a proper head is achieved or until the weirs reach 6 feet of depth below the tailwater surface.

2: Raise the East Entrance weirs E2 and E3 (E1 closed at tailwater below 78 feet) in one-foot increments to 6 feet of depth below the tailwater surface.

3: Close West Powerhouse Entrance weir W2.

4: Close one East Entrance weir E1.

5: Raise the South Spillway Entrance weirs S1 and S2 in one-foot increments to 6 feet of depth below the tailwater surface.

6: Close one South Spillway Entrance (S2).

7: Close alternating floating orifices starting from the west end of the powerhouse.

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, malfunctions or is out of service for necessary maintenance during the fall adult migration or winter maintenance season (August 1 - February 28) use the following sequential procedure until a fishway head of 1.2 feet is achieved:

1: Raise the open West Powerhouse Entrance weirs 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 one East Entrance weir (E1).

7: Close every other floating orifice starting from the west end of the powerhouse.

8: If a fishway head of 1.2 feet is still not achieved, then 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.

(b) 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.

d. Powerhouse and Spillway Adult Fish Collection System

(1) Scheduled Maintenance - (see Appendix A for coordination procedures) - Preventive 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, unless specially coordinated. 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 Dewatering plan). 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.

(2) Unscheduled Maintenance (see Appendix A for coordination procedures) - The Dalles Project contains several types of fishway entrances. There is little potential for failure in most 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. 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.

e. Adult Fish Ladders and Counting Stations

(1) Scheduled Maintenance (see Appendix A for coordination procedures) - The adult fish ladders are usually dewatered (see Dewatering plan) 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 valves, ladder orifice reduction plates and malfunctioning operating equipment at the counting stations as well as other potential problems. Problems identified throughout the passage year that do not affect fish passage, as well as those identified during the dewatered period are then repaired.

(2) 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. Where picketed lead failure or concrete erosion occurs, 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.

2. <u>The Dalles Dam Juvenile Fish Passage System</u>

a. Fish Passage Season. April 1 through November 15 each year operate according to the Operating Standards.

b. Winter Maintenance Period. November 16 through March each year operate according to the Operating Standards.

c. Juvenile Collection and Transportation Systems.

(1) 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 Bonneville's trash racks are clean.

(2) Unscheduled Maintenance (see Appendix A for coordination procedures) - The ice and 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 manually 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. 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.

3. <u>Turbines and Spillways</u>

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 Dewatering Plan). 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. The maintenance schedules for these turbines 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 this project, except to coordinate research activities.

C. Dewatering Plan

1. Adult Fish Ladder

a. 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 prior to dewatering.

(2) Discontinue all fishway auxiliary water supply at least 24 hours but no more than 48 hours prior to dewatering.

(3) Corps biologist will assure that fish rescue equipment is available and will coordinate to ensure 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 inform the rescue crews of the locations of all stranded fish. A Corps biologist will provide technical guidance in fish safety and assist in 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.

b. 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.

2. Powerhouse Fish Collection System

a. 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) A Corps biologist will provide technical guidance on fish safety and assist in any necessary rescue operation.

3. Turbines

a. When possible, place head gates and tail logs immediately after turbine unit is shut down if draft tube is to be dewatered.

b. If turbine unit draft tube is to be dewatered and the unit has been idle for any length of time, it will be operated when possible, at "speed/no load" for at least ten minutes and stop logs will then be placed immediately.

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

d. Corps biologist 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.

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

f. A Corps biologist will provide technical guidance on fish safety and assist in any necessary rescue operation.

g. When a turbine unit is planned to be out of service for less than 4 days it will not be necessary to dewater the unit and remove fish as long as a "safety pool" is maintained.

III. JOHN DAY DAM

A. OPERATING STANDARDS

1. Adult fish passage facilities

a. **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.

(3) Inspect for and, when necessary, clear debris in ladder exits.

b. **March 1 through November (Fish Passage Period)**

(1) All Adult Fish Facilities

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

(b) Head on all entrances: 1.0 to 1.7 feet (prefer 1.5). Refer to maintenance plan when unable to achieve head criteria.

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

(d) Maximum of 6" head on attraction water intakes and trash racks at all the ladder exits, with a 4" maximum head on all picketed leads. Debris shall be removed when significant amounts accumulate.

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

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

(2) North Fishway

Operate two downstream gates (N1 and N2).

(3) Powerhouse

(a) Operate entrances NE-1 and NE-2.

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

(c) Operate SE-1.

(d) From 0400-2000 P.S.T. operate powerhouse turbine unit #1 near 100 megawatts ($\pm$10MW) to facilitate best entrance conditions, unless additional load is required to meet firm energy demands and that load cannot be attained with another fully screened unit.

(4) Spillway Operations

The following spill schedule (Table III-1) shall be followed during the spill period.

c. **December 1 through February (Winter Operating Period)**

(1) All Adult Fish Facilities

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

(b) Only one of the two fish facilities may be out of service at a time except under extreme situations.

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

(d) 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.

(e) Maximum of 6" head on attraction water intakes and trash racks at all ladder exits. Debris shall be removed when significant amounts accumulate.

(2) North Fishway

(a) Operate gate N1 with N2 closed with a head of:

((1)) No spill - that attainable by ladder flow and one auxiliary water pump.

((2)) With spill - 1.0 foot.

((3)) South ladder dewatered or operating with less than standard auxiliary water flow - 1.0

foot.

(3) Powerhouse

(a) Head on all entrances - 1.0 foot.

(b) Operate NE-2 with NE-1 closed.

(c) Operate all ten floating orifices.

(d) Operate SE-1.

Spill Schedule for John Day Dam (Openings) in stops

Gate Number										
1	2	3	4	5 to 10	11 to 16	17	18	19	20	Kcfs
1									(1)	8.2
1	1							(1)	1	6.4
1	1	1					(1)	1	1	9.6
1	1	2					(2)	1	1	12.8
1	1	2	1			(1)	2	1	1	16.0
1	1	2	2			(2)	2	1	1	19.2
1	2	2	2			2	2	(2)	1	22.4
1	2	2	2	0 or 2	0 or 2	2	2	2	1	60.8
1	2	2	2	(3)	(3)	2	2	2	1	80.0
1	2	3	3	3	3	(3)	2	2	1	84.8
1	2	3	3	3	3	3	(3)	2	1	86.4
1	2	3	3	(4)	(4)	3	3	2	1	105.6
2	3	4	4	(4)	(4)	4	4	3	2	118.4
2	3	4	4	(5)	(5)	4	4	3	2	137.6
2	4	4	5	(6)	(6)	4	4	3	2	160.0
2	4	5	5	6	6	(5)	4	3	2	163.2
2	4	5	6	6	6	5	(5)	3	2	166.4
2	4	6	6	6	6	(6)	5	3	2	169.6
2	4	6	6	6	6	6	(6)	4	2	172.8
2	4	5	6	(7)	(7)	6	6	4	2	190.4
2	4	6	7	7	7	(7)	6	4	2	195.2
2	4	6	7	(8)	(8)	7	6	4	2	214.4
2	4	6	8	8	8	(8)	6	4	2	217.6
2	4	6	8	(9)	(9)	8	6	4	2	236.8
2	4	6	9	(10)	(10)	8	6	4	2	257.6
2	5	6	9	10	10	(9)	6	4	2	260.8
2	5	6	9	(11)	(11)	9	6	4	2	280.0

Continue as in rows above, opening from ends towards the center and using 1 stop increments on innermost gate of gates 5 to 16 if necessary.

Gates 1, 2, 18, 19, and 20 limits at 9 stops.
Circle values may be 1 stop less than value shown.
Each stop equals about 1.6 kcfs.
Night time spill will follow juvenile spill schedule.

2. John Day Dam Juvenile Fish Passage Facilities

a. Prior to April 1 each year

(1) Remove debris from forebay, trash racks 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 DSM conduit tainter gate.

(6) Inspect and correct any deficiencies of walls and floor DSM conduit, raceway, and outfall.

b. April 1 through October 31

(1) Remove debris from forebay and trash racks 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 trash racks 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. STSs in units being raked should run on continuous during raking operation. Gatewell orifices of the unit being raked must be closed during the raking operation.

(2) Inspect each STS and VBS a miminum of once every two months (video acceptable). Preferably, inspections will occur immediately prior to peaks in the juvenile fish migrations (July). 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.

(3) Operate all gatewell orifices. Inspect daily to assure that the orifice lights are operating. Replace

all burned out orifice lights within 24 hours. Close and open each orifice every day or as indicated by debris accumulations in the gatewells.

(4) Inspect each STS watt meter readings at least once each shift. If an STS failure occurs follow procedures in Fish Facilities Maintenance Plan.

(5) Inspect all gatewells daily and clean when water surface over one-half covered with debris. Gatewell orifice of the gatewell being debarked must be closed during the debarking operation. Check gatewell drawdown. Each VBS should be cleaned within three weeks either side of July 1 unless visually inspected and found free of debris.

(6) Coordinate cleaning efforts with personnel operating downstream migrant sampling facilities.

(7) Turbines should be operated at peak efficiency unless the additional generation is needed to avoid operation of a partially or fully unscreened unit.

(8) STS cycling operation may begin when the mean length of the majority of juvenile chinook passing the project reaches or exceeds 112 mm. This time will be determined by the Corps biologist using available fish monitoring data. A cycling time of a maximum 20 minutes off and a minimum of 2 minutes on must be followed. Cycling will be discontinued if warranted by fish condition or debris problems. STSs in intakes used for juvenile indexing will run continuously.

(9) Before April 15 turbine units without a full complement of STSs may operate to meet load demands. Exceptions to this are:

(a) Six days following juvenile fish release in the John Day pool unscreened units will not operate unless BPA needs that additional generation to meet firm energy demands. The release dates will be supplied to NPPOP-P-NR biologists by the Fish Passage Center as soon as these dates are available. The release date must be received by the Corps biologist one week 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 20,000 juvenile salmon unless BPA needs that additional generation to meet firm energy demands.

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

(10) During the period April 16 through August, turbine units without a full complement of STSs will not operate except to meet firm energy demands. Units without a full complement of STSs will be the last to be brought on line to meet power demands and the first off line when the power demand diminishes.

(11) During the period September 1 through October 31 operate the same as the period before April 15. (#9).

c. **October 1 through October 31**

STSs may be removed from up to one-half of the powerhouse turbine units to reduce wear and facilitate early winter maintenance. These should be removed from lower priority units.

d. **November 1 through March**

All STSs removed. DSM channel dewatered (see Dewatering Plans) 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 should be operated at peak efficiency whenever practicable.

B. MAINTENANCE PLAN

1. Adult Fish Passage System

a. Fish Passage Season - March 1 through November (see Operating Standards).

b. Winter Maintenance Season - December 1 through February (see Operating Standards).

c. Fishway Auxiliary Water Systems

(1) 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.

(2) 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.

(a) 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 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 NE1.

4: Close the center five floating gate

submerged orifice entrances starting at the north end (17, 15, 12, 9, 6);

5: If the above criteria are still not achieved, then 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 conduits 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.

(b) 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 one-foot increments until a fishway head of 1.0 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 8 foot level. If head of 1.0 is not met, then raise N1 in one-foot increments until the weir crest reaches a depth of 6 feet below tailwater surface. Maintain in this condition 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.

d. Powerhouse and Spillway Adult Fish Collection System

(1) 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 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 Dewatering Plan). 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 Dewatering Plan). 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.

(2) 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 most 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 until expedient repairs are affected. If this is not possible, then 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 time.

e. Adult Fish Ladders and Counting Stations

(1) Scheduled Maintenance (see Appendix A for coordination procedures) - The adult fish ladders are usually dewatered once each year during the winter maintenance period (see Dewatering Plan). 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 as well as other potential problems identified throughout the passage year that do not impact fish passage, as well as those identified during the dewatered period are then repaired.

(2) 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).

2. <u>Juvenile Fish Passage System</u>

a. Fish Passage Season. April 1 through October 31 (see Operating Standards).

b. Winter Maintenance Period. November 1 through March (see Operating Standards).

c. 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 STSs in that turbine may be maintained, repaired or exchanged for other STSs needing maintenance or repair. About one third of the STSs 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 III-1. During the peak juvenile passage periods (April 16 to August 31), 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 20,000 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.

d. Juvenile Bypass Systems.

(1) 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, electical 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 juvenile fish passage season (April 1) and whenever trash accumulations are suspected because of increased differential across the trash racks or increased juvenile fish descaling is noted at John Day Dam or increased accumulations of tumbleweeds in the forebay. Additional raking of trash racks 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.

(2) Unscheduled Maintenance (see Appendix A for coordination procedures).

(a) 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.

(b) 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 gatewell, 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 VBSs may be found to be plugged with debris or damaged. In these cases refer to Figure III-1.

Figure III-1.

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 to meet firm energy demands during low debris conditions continue operating until step 3 can be accomplished, otherwise proceed immediately to step 2.

2. Unit 5 (the station service unit) 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 that unit is required to meet firm energy demands, in which case that unit will be the last to be brought on line and the first off line.

3. During working hours, 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 (April 16 - August 31), 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, if 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 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 this is not the situation begin removing the replacement STS or VBS from the northernmost unit and move sequentially to the south. STSs or VBSs should be removed from the A-slot first, B-slot second, C-slot third.

5. Operation of all partially screened or unscreened units will be restricted according to the Operating Standards until a spare or repaired STS or VBS is available for installation.

3. Turbines and Spillways

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 Dewatering Plan). 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 B) 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.

C. Dewatering Plan

1. Adult Fish Ladder

a. 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 prior to dewatering.

(2) Discontinue all fishway auxiliary water supply at least 24 hours but no more than 48 hours prior to dewatering.

(3) Corps biologist will assure that fish rescue equipment is available and will coordinate to ensure 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 inform the rescue crews of the locations of all stranded fish. A Corps biologist will provide technical guidance in fish safety and assist in 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.

b. 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.

2. Powerhouse Fish Collection System

a. 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 <u>will not</u> be allowed to drop to a level

which strands fish.

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

(3) A Corps biologist will provide technical guidance on fish safety and assist in any necessary rescue operation.

3. Turbines

a. When possible, place head gates and tail logs immediately after turbine unit is shut down if draft tube is to be dewatered.

b. 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 at least ten minutes and stop logs will then be placed immediately.

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

d. Corps biologist 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. This usually requires the biologist to be lowered into the draft tube for a thorough inspection.

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

f. A Corps biologist will provide technical guidance on fish safety and assist in any necessary rescue operation.

g. If the turbine unit is planned to be down for less than 4 days then removal of fish is not necessary as long as a "safety pool" is maintained.

IV. **FOSTER DAM** (adult fish passage facility).

A. OPERATING STANDARDS

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: 1) during spill and 2) 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. MAINTENANCE PLAN

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.

GREEN PETER DAM

A. OPERATING STANDARDS

1. Adult Fish Passage Facility

a. Head over weirs: 12-15 inches.

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

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

d. Entrance head: 1 foot.

e. Flow into loading pool: 10-15 cfs.

f. Brail pool orifice opening widths: 1.2 to 2.2 feet.

g. Number of attraction water pumps used in relation to unit discharge:

(1) Units not discharging: one pump.

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

h. 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.

2. Juvenile Fish Passage Facility

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

b. Flow across separator: 6-10 cfs.

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

d. 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 could require 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.

e. 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.

f. 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

1. Adult Fish Passage Facility - 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.

a. Structure, including fish ladder.

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

b. Craneway machinery, hoist and trolley.

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

(2) Inspect, service and repair electrical motors quarterly.

c. Turntable machinery.

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

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

d. Brail hoist machinery.

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

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

e. Brail pool exit gate.

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

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

f. Fish hopper.

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

g. Thirty-six inch main entrance gate.

(1) Inspect, service and repair mechanical system semi-annually.

(2) Inspect and repair wire rope annually.

(3) Inspect, service and repair electrical system semi-annually.

h. Eighteen inch entrance gate.

(1) Inspect, service and repair mechanical system semi-annually.

(2) Inspect and repair wire rope semi-annually.

(3) Inspect, service and repair electrical system semi-annually.

i. Valves (A) through (H).

(1) Mechanical inspection, service and repair annually.

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

(1) Electrical inspection, service and repair annually.

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

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

2. Juvenile Fish Passage Facility - Schedule of maintenance (any reference to annual maintenance work refers to work done during time facility is not in operation).

a. Transport pipe valves.

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

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

c. Intake gate and hoist.

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

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

d. Hose cart and hoist.

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

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

e. Main hoist and main hoist brakes.

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

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

f. Air compressor.

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

g. Attraction water pumps.

(1) Mechanical inspection, service and repair monthly, during fish run.

(2) Electrical inspection, service and repair semi-annually, with overhaul as necessary.

C. SCHEDULE OF OPERATION OF FACILITY

1. Adult Fish Passage Facility

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

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

(1) Start operation - February 15.

(2) Shut down of facility - December 15.

c. Facility must be ready to operate by above mentioned date.

2. Juvenile Fish Passage Facility

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

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

(1) Start of operation - February 15.

(2) Shut down of facility - June 1.

(3) Start of fall operation - October 25.

(4) Shut down of facility - January 1.

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

D. CRITERIA FOR DETERMINING FREQUENCY OF INSPECTIONS FOR FISH AND REMOVAL OF FISH.

1. Adult Fish Passage Facility

a. Frequency of inpsections - at least once a week.

b. 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. Adult Fish Passage Facility

a. 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 soon as possible when such a problem occurs (see Appendix A).

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

(2) 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.

b. Other problems.

(1) 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.

2. Juvenile Fish Passage Facility

a. 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.

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

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

(3) 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.

b. Other problems.

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

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

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 (next working day) be notified within 24 hours (see Appendix A).

1. Adult Fish Passage Facility

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

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

2. Juvenile Fish Passage Facility

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

b. 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

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.

2. During the adult fish passage season project personnel will make visual inspections of the adult fish passage facilities each day at daylight and at least once during the day shift (0800-1600 P.S.T.) to assure that the systems are operating according to Standard Operating 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 superintendants, 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 operating adult and juvenile fish passage facilities at least once every two weeks. All inspectors will ensure with the project that a clearance has been posted on a dewatered facility prior to entering the facility for inspection and will notify the project upon leaving that facility.

5. Just prior to the juvenile fish passage season project personnel will inspect the STS's, VBS's and gatewell orifices and again at least once every three months at Bonneville Dam and every two months at John Day Dam. Preferrably, inspections will occur immediately prior to peaks in juvenile fish migrations. 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 inpact 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 projects' ability to operate the facilities according to standard operating criteria. <u>The NPPOP-P-NR biologist must be notified as soon as the need for such work becomes apparent</u>. 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 particularly 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
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 flow for the juvenile bypass outlet.
The Dalles	1,2	1 March- 30 November	Operated during daylight hours for juvenile fish Ice & Trash sluiceway entrance attraction.
John Day	1	1 March - 30 November	Used for adult fish attraction to SE1 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 (1130-2-400) 9 March 1987

SUBJECT: District 1987 Fish Facility Operations and Maintenance Plan

Commander, North Pacific Division
ATTN: NPDEN-WM

1. Enclosed is a copy of Walla Walla District's 1987 Fish Facility Operations and Maintenance Plan for incorporation into the 1987 Juvenile Fish Passage Plan. The Operations and Maintenance Plan contains updated adult and juvenile fish passage facility operating criteria, which was coordinated with the fishery agencies and tribes.

2. If you have any questions on our Operations and Maintenance Plan, please contact Mr. David Hurson at FTS 434-6710.

FOR THE COMMANDER:

Engelbert M. Leonard

Encl

PAUL F. WINBORG
Chief, Operations, Construction,
and Readiness Division

CF:
NPDCO-O (w/enclosure)

WALLA WALLA DISTRICT

FISH FACILITY

OPERATIONS AND MAINTENANCE PLAN

1987

TABLE OF CONTENTS

WALLA WALLA DISTRICT

FISH FACILITY

OPERATIONS AND MAINTENANCE PLAN

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 if a fishing 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 the entrance bulkheaded off until the floating orifice is repaired.

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 for separating fish from the excess water, 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 31 October operate according to criteria in Appendix D and the Fish Transportation Oversite Teams (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, and Appendix F, Traveling Screen Maintenance Plan. 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 may or may not be coordinated with the fishery agencies and tribes on an individual basis. 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) or the Detailed Fishery Operating Plan agreed to by the fishery agencies, tribes, and Corps prior to the season. In these cases, repairs will be made as prescribed and the fishery agencies and tribes notified through established channels agreed to in the plans. 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, the following measures will be taken: The turbine unit will be turned off if possible until the screen can be pulled and replaced with a spare screen. If a spare screen is not available, it will be repaired and put back in service, or if in a high priority unit replaced with a screen from a designated unit. If at all possible, a turbine unit without a full compliment of screens will not be operated or will be on a last on, first off, priority. The prioritization of units for traveling screens going from highest to lowest is units 4 through 10 and then 3, 11, 2, 12, 1, 13, and 14. If a traveling screen must be taken out of a unit to replace one in a higher priority unit, the designated replacement screens are in the C slots of units 14 and 13. These two units may then be operated without a full compliment of screens if required to meet power demands.

(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. 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.

(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 31 August 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 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 31 August 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 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. If the orifices or the bypass pipe become 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 1.5-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 to separate the fish from the excess water, 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 31 August operate according to criteria in Appendix D and the Fish Transportation Oversite 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, and Appendix F, Traveling Screen Maintenance Plan. 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 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 may or may not be coordinated with the fishery agencies and tribes on an individual basis. 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) or the Detailed Fishery Operating Plan agreed to by the fishery agencies, tribes, and Corps prior to the season. In these cases, repairs will be made as prescribed and the fishery agencies and tribes notified through established channels agreed to in the plans. 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, the following measure will be taken: The turbine unit will be turned off if possible until the screen can be pulled and replaced with a spare screen. If a spare screen is not available, it will be repaired and put back in service, or if in a high priority unit replaced with a screen from a designted unit. If at all possible, a turbine unit without a full compliment of screens will not be operated or will be on a last on, first off priority. The prioritization of units for traveling screens going from highest to lowest is from unit 1 out to unit 6. If a traveling screen must be taken out of a unit to replace a screen in a higher priority unit, the designated replacement screens are in turbine unit slots 6C and 5C. These two units may then be operated without a full compliment of screens if required to meet power demands.

(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. 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 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 bypasssed 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 the two-pump operation, the pump on standby will be operated to make up the 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 1.5-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 31 August operate according to criteria in Appendix D and the Fish Transportation Oversite 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, and Appendix F, Traveling Screen Maintenance Plan. 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 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 may or may not be coordinated with the fishery agencies and tribes on an individual basis. 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) or the Detailed Fishery Operating Plan agreed to by the fishery agencies, tribes, and Corps prior to the season. In these cases, repairs will be made as prescribed and the

fishery agencies and tribes notified through established channels agreed to in the plans. 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, the following measures will be taken: The turbine unit will be turned off if possible until the screen can be pulled and replaced with a spare screen. If a spare screen is not available, it will be repaired and put back in service, or if in a high priority unit replaced with a screen from a designated unit. If at all possible, a turbine unit without a full compliment of screens will not be operated or will be on a last on, first off priority. The prioritization of units for traveling screens going from highest to lowest is from unit 1 out to unit 6. If a traveling screen must be taken out of a unit to replace a screen in a higher priority unit, the designated replacement screens are in turbine unit slots 6C and 5C. These two units may then be operated without a full compliment of screens if required to meet power demands.

(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 or is damaged, it will be closed and the alternate orifice for that gatewell operated until repairs can be 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 thier 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 pasage 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 or 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 in traveling screen maintenance plan, Appendix F
	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	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 August 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 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.
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 ights 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 July through March	Perform annual maintenance, overhauls, and rehabilitations as required in traveling screen maintenance, Appendix F.
	During the juvenile outmigration as per FTOT Annual Work Plan	Inspect with underwater TV camera.
Bypass facilities: orifices, bypass gallery, and bypass pipe	Annually July 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 July 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	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 July through March	Perform annual maintenance overhauls, and rehabilitation as required in traveling screen maintenance plan, Appendix F.
	During the juvenile outmigration as per FTOT Annual Work Plan	Inspect with underwater TV camera.
Bypass facilities: orifices bypass gallery, and bypass pipe	Annually July 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 July 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	Clean trash racks of debris.

APPENDIX C

OPERATING STANDARDS FOR ADULT 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 (WFE 2 & 3)

Operate 2 downstream gates

Weir depth: 9.5 feet or greater below tailwater.

North Powerhouse Entrances (NFE 2 & 3)

Operate 2 downstream gates.

Weir depth: 8 feet or greater below tailwater.
At extremely low tailwater, weirs may bottom out on sill and not reach an 8-foot depth.

Powerhouse Collection System

* Operation 12 ~~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).

* Pending review of final research report.

South Shore Entrances (SFE 1 & 2)

Operate 2 entrances.

Weir depth: 8 feet or greater below tailwater.

Transportation Velocity

1.5 to 4 feet per second.

Head on Trashracks

Maximum head of 0.5 feet on ladder exit and attraction water intakes.
Maximum head on picketed leads shall be 0.3 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																						
1*	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**	TOTA
4	5	2	2	3	3	3	3	3	4	4	3	3	4	4	3	3	3	2	2	5	CLOSED	
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		
[illegible]	8	4	4	3	4	4	5	5	5	5	5	6	5	5	4	5	4	4	4	7		103
[illegible]	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 when tailwater is high enough to permit it. At low flow and tailwater, maintain a 6-foot or greater depth.

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

1.5 to 4 feet per second.

Head on Trashracks

Maximum head of 0.5 feet on ladder exits attraction water intakes.

Maximum head on picketed leads shall be 0.3 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									1.5	
1	1							1	1.5	
1	1	1					1	1	1.5	
1	2	1					1	2	1.5	
1	2	1	1			1	1	2	1.5	10.5
1	2	1	1	1	1	1	1	2	1.5	
1	2	2	1	1	1	1	2	2	1.5	
1	2	2	2	1	1	2	2	2	1.5	
1	2	2	2	2	2	2	2	2	1.5	
1	2	2	2	3	3	2	2	2	1.5	20.5
1	2	2	3	3	3	3	2	2	1.5	
1	2	3	3	3	3	3	3	2	1.5	
1	2	3	3	4	4	3	3	2	1.5	
1	2	3	3	4	4	4	3	2	1.5	
1	2	3	3	5	5	4	3	2	1.5	30.5
1	3	3	4	5	5	4	3	3	1.5	
1	3	3	5	5	5	4	3	3	1.5	
1	3	4	5	6	5	4	3	3	1.5	
2	3	4	6	6	5	4	4	3	1.5	
2	3	4	6	6	6	5	4	3	1.5	40.5
2	3	5	6	6	6	5	4	3	1.5	
2	3	5	6	7	6	5	5	3	1.5	
2	3	5	7	7	6	6	5	3	1.5	
2	3	6	7	8	6	6	5	3	1.5	
2	4	6	7	8	6	6	5	4	1.5	50
2	4	6	7	8	7	7	5	4	2	
2	4	6	8	8	7	7	6	4	2	
2	4	6	8	9	8	7	6	4	2	
2	4	7	8	9	9	7	6	4	2	
2	4	7	9	10	9	7	6	4	2	60
2	4	7	10	10	9	8	6	4	2	
2	4	7	10	11	9	8	7	4	2	
2	4	7	11	11	10	8	7	4	2	
2	4	8	11	12	10	8	7	4	2	
2	4	8	11	13	10	9	7	4	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, 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

1.5 to 4 feet per second.

Head on Trashracks

Maximum head of 0.5 feet on ladder exits, attraction water intakes. Maximum head on picketed leads, such as around counting station, shall be 0.3 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 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

1.5 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 0.5 feet on ladder exits and attraction water intakes.

Maximum head on picketed leads shall be 0.3 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/.
Reviewed January 1984.

Gate Numbers								Totals	
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)	3		
(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
(6)	6	5	5	4	5	5	6		
6	6	5	5	(5)	5	6	6		
(7)	6	5	5	5	5	(6)	7		
7	6	5	(6)	6	5	6	7		
7	6	(6)	6	6	6	6	7	50	100
7	6	6	(7)	7	6	6	7		
7	(7)	6	7	7	7	6	7		
7	7	(7)	7	7	7	7	7		
8	7	7	7	7	7	7	(8)		
8	7	(8)	7	8	7	7	8	60	120
8	7	8	(8)	8	8	7	8		
8	(8)	8	8	8	8	8	8		
(9)	8	8	8	8	8	8	9		
9	8	(9)	8	9	8	8	9		
9	8	9	(9)	9	9	8	9	70	140

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

1.5 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 0.5 feet on ladder exits and attraction water intakes.

Maximum head on picketed leads shall be 0.3 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

OPERATING STANDARDS FOR

JUVENILE FISH PASSAGE FACILITIES

OPERATING STANDARDS

FOR JUVENILE 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 and log drawdown in gatewell slots.

STS Screens

5. Inspect screens and operate on one trial run.

6. Log results of trial run.

Gallery Bypass Flume

7. Orifice lights operational.

8. Orifices clean and operational.

9. Clear plastic spools on orifices clean.

10. Orifice valves operational.

11. Water dissipation screens clean and ready for operation.

Sorter and Raceways

12. No rough edges on perforated plate.

13. Check wet separator and fish distribution system for operation.

14. All raceway retainer screens and crowder brushes in good order with no holes or protruding wires.

15. Raceways clean of debris

McNary Dam (Continued)

16. Sample and holding tanks smooth and clean.

17. All electronic counters checked for operation.

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

Fish Trailers

19. All systems operate properly.

20. 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.

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

22. All valves operating properly.

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

Maintenance

OPERATING STANDARDS

FOR JUVENILE 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.

OPERATING STANDARDS

FOR JUVENILE 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.

OPERATING STANDARDS FOR

JUVENILE 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.

OPERATING STANDARDS

FOR JUVENILE 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.

OPERATING STANDARDS

FOR JUVENILE 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.

OPERATING STANDARDS

FOR JUVENILE 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.

APPENDIX 4

Fish Transportation Oversight Team's (FTOT) Overall Work Plan for 1987

THE FISH TRANSPORTATION OVERSIGHT TEAM'S

ANNUAL WORK PLAN FOR TRANSPORT OPERATIONS

AT LOWER GRANITE, LITTLE GOOSE, AND MCNARY DAMS

FOR FIELD YEAR (FY) 1987

A. 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. 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 and tribes will provide biological oversight through the Columbia Basin Fish and Wildlife Authority (CBFWA) while NPW will be responsible for facilities management. The FTOT will manage the 1987 transport program and provide necessary coordination of transport activities among the CBFWA members, NPW, and Fish Passage Center (FPC).

B. Objectives:

The purpose of this plan is to establish guidelines to 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, NPW, 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. Assure that collection, transport, and release site facilities will be ready for operation prior to the spring juvenile outmigration (April 1, 1987)

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 1987

7. Training of new personnel associated with collection and transport facilities.

8. Preparation of an annual report detailing the past year's transportation effort.

C. 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 mortality to fish passing thru turbines.

2. Unit Priority and Operation

Research has shown that certain units collect more fish than others. Units with higher collections are referred to as "priority units". These priority units are 1 through 4 at Lower Granite and Little Goose Dams. The priority of unit operation at Lower Granite and Little Goose will proceed from unit 1 through 6. McNary Dam turbine priority will be units 1, 2, 14, 4-10, 3, 11, 12, 13 consecutively.

Frequently during July, water temperature at McNary increases to a level that causes higher than normal fish mortality. At such time when mortality exceeds 4 percent of fish collected, the following special powerhouse operations should be implemented:

a. Priority unit operation

1) Unit 1 (for adult attraction), then
2) Units 14, 13, 12, 11, 10, 9, and 8.

b. Unit loading

Units should be operated near best efficiency but may be operated between 50 and 80 mw to minimize starting and stopping them. If additional generation is needed beyond 80 megawatts per each above unit then additional units may be brought on line beginning with Unit 7.

3. Submersible Traveling Screens (STS)

a. Operation

STSs in units 1 and 2 will be installed and in operation at Lower Granite and Little Goose by March 15, 1987. The remainder will be installed immediately after the annual lock outage. At McNary, priority unit STSs (4 through 10) will be installed by March 15, 1987, the remainder no later than April 1, 1987. STSs will be cycled except when chinook fork length is less than 112 mm or when a sudden decline in fish condition warrants continuous screen operation. Cycling may resume once chinook fork length exceeds 112 mm and/or fish condition warrants it. FTOT will be responsible for determining when to implement continuous or cyclic operation of screens based on data provided by on-site biologists. 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 depend upon well-maintained screens. Continuous monitoring of screen operation 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 repaired, or:

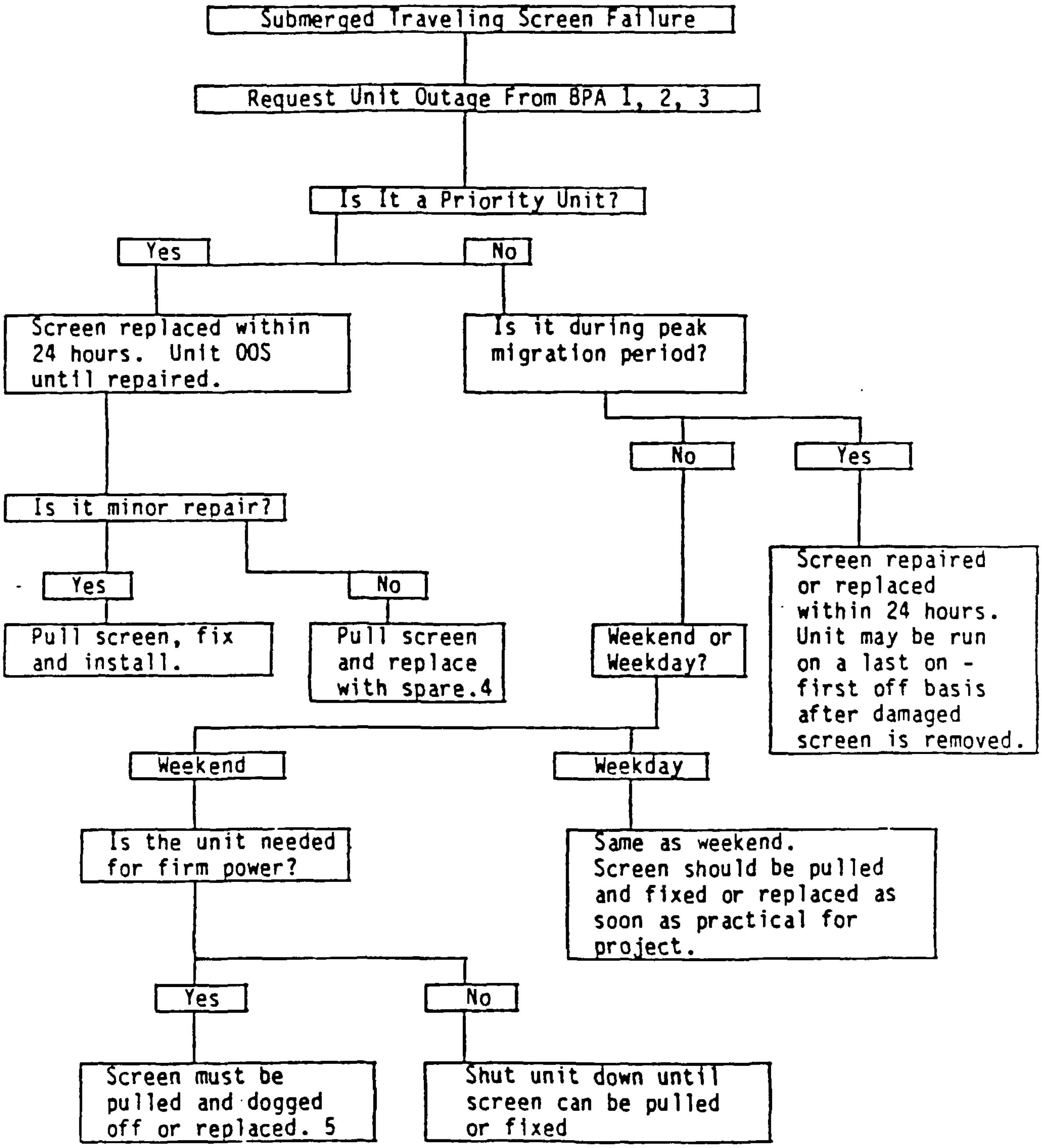
2) pull the STS and either repair or replace with the spare or a designated replacement screen.

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

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 complement of screens should be done so on a last on - first off basis in order of priority.

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 STSs 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.

At McNary, screen inspections will occur on a continuous basis. Beginning April 1, and continuing throughout the collection season, all screens in at least three units will be examined each week. Inspections will be consecutive and scheduled based on the following priority sequence: 1, 2, 14; 4-6; 7-9; 10, 3, 11; 12, 13, 1; 2, 14, 4; etc.

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. 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 trashracks in front of turbine units prior to STS installation 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 conducted at Snake River collector projects, unit outages are required. When the center trashrack (B) is being raked adjacent units do not have to be shut off. When trashracks A or C are being raked, the adjacent unit must be shut down. Gatewell orifices must be closed in the unit being raked. Project biologists will inform FTOT when trashracks are raked.

The same scenario will be evaluated at McNary in 1987, when the trashracks are raked. McNary orifices are larger and may not plug as they do at Lower Granite. The project will monitor orifices with a video camera to confirm whether or not adjacent units need to be shut down. The information will be reviewed by FTOT before a final decision is made.

6. Facility Operations

The collection facility will be manned 24 hours per day until system operations cease. Fish will be returned to the river if 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 every 15 minutes.

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.

a. McNary

If flow exceeds minimum (220 kcfs), fish will be separated by size as long as yearling salmon predominate in the collection. Normally if flows are projected to drop below 220 Kcfs for approximately 5 days, transportation will be maximized to prevent bypassing fish into a deteriorating flow pattern. If existing or projected conditions warrant a change in this criterion, FTOT will coordinate recommended deviations with the fisheries agencies and tribes prior to implementation. Smaller fish (salmon) will be returned to the river 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.

c. Little Goose

If flow exceeds minimum (100 Kcfs), fish will be separated by size and smaller fish returned to the river. Normally if flows are projected to drop below 100 Kcfs for approximately 5 days, transportation will be maximized to prevent bypassing fish into a deteriorating flow pattern. Because of the extended period expected for fish to move through the lower Snake River under low-flow conditions, it is desirable to anticipate sub-minimum flows there as far in advance as is practicable (approximately 3-5 days) and initiate transportation of all species at that time. If existing or projected conditions warrant a change in the criteria, FTOT will coordinate recommended deviations with the fisheries agencies and tribes prior to implementation. 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 1987 as developed by CBFWA (Appendices 1 and 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, any 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.

At Lower Granite and Little Goose Dams, 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. Fish may be held 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 10a.

The following are criteria established for the fish barges and trucks:

Barge (lbs)	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. The spring release of trucked fish in 1987 will be at Bradford Island, adjacent to Bonneville First Powerhouse. The summer release of trucked fish will be at Hamilton Island. 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) participating in gatewell dipping as necessary to monitor quality of fish.

12. Dissemination of Information

Fishery biologists at each dam will be responsible for entering all pertinent information into the computer data base. This will include chinook, steelhead, sockeye, and coho daily collection and transport totals. This information 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. Fish Passage 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, biologists, or powerhouse operator 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

SAMPLING GUIDELINES FOR COLLECTOR DAMS IN 1987

A. INTRODUCTION

Each year the fishery agencies and tribes are faced with the need to sample significant numbers of smolts at the collector dams and other sample points. These samples are used to monitor survival, abundance, and to evaluate bypasses, the transportation program, and other research. Because capability exists to sample an extremely high percentage of the total run at each collector dam, it is necessary to set guidelines for sampling at these projects to prevent the sampling program from overly impacting fish survival.

Currently, there are four collector dams: Lower Granite, Little Goose, McNary, and Bonneville. If each is sampled only 3 percent of the entire outmigration, the number of sampled Snake River outmigrants would approach 12 percent of the total[1].

In addition to the four collector dams, numerous other sample points exist along the migration path. At several of these up to 1 percent of the run may be sampled. Snake River fish may be intercepted at several of these points and thus could be sampled at a rate exceeding 10 percent.

To minimize impacts of research and evaluation work on these runs, no more than 10 percent of the total run should be sampled during the season. Further, since a mix of transportation and inriver passage is being used to reduce mortality, neither segment (transported or bypassed) should be sampled at a rate exceeding 10 percent. (These guidelines presume that only a small percentage of sampled fish die as a result and that most are returned to the river or transported with a relatively good, though reduced, chance of survival).

Based on the presumption that in 1987 Little Goose and Bonneville dams will sample fish at a combined rate of less than 3 percent of the entire run, and that sampling done at sites other than collector dams will not require handling more than three percent of any one population segment, the following specific sampling guidelines are proposed for use at the collector dams:

---

[1] Since fish mortality occurs at and between projects and some fish are transported, the Snake River run is actually sampled at a rate of less than 12 percent. At an inriver survival rate of 85 percent past each project, a 3 percent sample level would sample 8.2 percent of the total outmigration arriving at Lower Granite Dam. If all fish sampled died, it would reduce the number of smolts surviving past Bonneville Dam by about 4 percent.

B. LOWER GRANITE

1. Sampling Objective

Not to exceed the lesser of 3 percent of the estimated weekly outmigration or 10 percent 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 except as follows:

a. For two days during any one week (Sunday to Saturday) the sampling rate may be doubled (the lesser of 6 percent of the outmigration or 20 percent of smolts collected or bypassed), provided that

b. 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.

3. Coordination

All researchers must inform FTOT of their previously approved fish needs prior to March 15. FTOT will coordinate the sampling to maximize efficiency of fish use. Researchers must apprise the Corps biologist of their exact fish needs at the earliest possible date. Requests for in-season deviations from these guidelines must be routed through the FTOT.

C. LITTLE GOOSE

1. 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 percent of daily collection and/or bypass.

D. MCNARY

Same as for Lower Granite.

APPENDIX 2

GUIDELINES FOR INCREASED FISH SAMPLES AT
MCNARY AND LCWER GRANITE DAMS IN 1987

A. INTRODUCTION

In order to evaluate the success of transporting spring chinook smolts to below Bonneville Dam, the fishery agencies and tribes have authorized the Corps to conduct a marking program. However, workers are having difficult collecting and marking the number of spring chinook required in approved study plans. This is because increasing numbers of marked fish are being released from upriver sites.

Approximately 40 percent of the yearling chinook collected at McNary between April 21, and June 6, 1986 were not suitable for marking because they were:

1.	Adipose clipped	15.8%
2.	Branded	5.6%
3.	Descaled	8.1%
4.	Severely injured	1.5%
5.	Dead	1.5%
6.	Fall chinook	7.6%

It is questionable whether the required numbers of markable fish for the transport evaluation program and PIT tag study can be obtained using the established sampling guidelines (APPENDIX 1). The fishery agencies and tribes have agreed to waive portions of these guidelines for the purpose of these studies in 1987.

Allowable exceptions to the established guidelines are as follows:

B. LOWER GRANITE

1. Sampling Objectives

   a. To safely handle the required numbers of fish to operate the transport program and monitor the smolt migration.

   b. To provide previously-approved numbers of markable fish to conduct the transport evaluation and PIT tag study.

2. Daily Sampling Rate

   If sampling under established guidelines (APPENDIX 1) is insufficient to meet objective 2, then the sampling rate may be increased to a level that will provide previously-approved numbers of markable fish as per the study plan. However, this rate may not be increased if it would result in more than 10,000 fish being collected in the sample during the 24-hour sample period.

C. LITTLE GOOSE

Follow established guidelines (APPENDIX 1)

D. MCNARY

1. Sampling Objective

Same as Lower Granite

2. Daily Sampling Rate

If the sample collected under established guidelines (APPENDIX 1) is insufficient to meet objective 2, then the sampling rate may be increased to a level that will provide previously-approved numbers of markable fish as per the study plan. However the rate may not be increased if it would result in more than 12,000 fish being collected in the sample during the 24 hour sampling period.

The following constraints to holding fish in the sample tank apply:

a. If the average daily mortality for yearling chinook (in the "A" tank) exceeds 2 percent for three consecutive days then the sampling rate will be returned to the previously-established rate (APPENDIX 1). If the mortality is not reduced to 2 percent or less after two consecutive days at the reduced rate, it will be assumed the problem is not with the sample density and the rate can be increased as necessary.

b. If the average daily mortality for juvenile sockeye (in the "A" or "B" tanks) exceeds 3 percent for three consecutive days, the sampling rate will be returned to the previously-established rate (APPENDIX 1). If the mortality is not reduced to 3 percent or less after two consecutive days at the reduced rate, it will be assumed the problem is not with sample density and the rate can be increased as necessary.

APPENDIX 5

Hatchery Release Schedule

* These data are preliminary and have been derived from various sources. For *
* verification and/or origin of data, contact the operators of the Fish Passage Data *
* System at (503) 230 4290. *

FROM 6/01/86 TO 12/31/87

AGCY	HATCHERY	SPECIES / STOCK	BRD YR	SIZE #/LB	MGR YR	RELEASE DATES	NUMBER RELEASED	RELEASE SITE	RIVER NAME	ZONE	FPC LOT ID	COMMENTS
IDFG	MCCALL	SU CHINOOK SOUTH FORK	85	20	87	3/30/87 4/10/87	950,000	S F SALMON R	S F SALMON R	SNAK	87001	62K CWT-FB US/CAN & WBMP 255K CWT US/CAN INDEXING
*		HATCHERY TOTAL.					950,000	FROM 1 RELEASES				*
	NIAGARA SPRING	STEELHEAD HELLS CANYON	86	5	87	3/23/87 4/05/87	1,000,000	HELLS CANYON	SNAKE R	SNAK	87002	50K FB WBM PROGRAM 40K CWT IPC TIME/SIZE
		STEELHEAD UPPER SALMON	86	5	87	3/31/87 4/15/87	700,000	PAHSIMEROI R	PAHSIMEROI R	SNAK	87004	35K CWT IPC CONTRIBUTION
		STEELHEAD UPPER SALMON	86	5	87	4/08/87 4/15/87	300,000	PANTHER CRK	SALMON R	SNAK	87003	40K CWT IPC CONTRIBUTION
*		HATCHERY TOTAL.					2,000,000	FROM 3 RELEASES				*
	PAHSIMEROI H	SP CHINOOK RAPID RIVER	85	20	87	3/02/87 3/09/87	400,000	HELLS CANYON	SNAKE R	SNAK	87005	
		SU CHINOOK PAHSIMEROI	85	20	87	3/16/87 3/16/87	296,000	PAHSIMEROI H	PAHSIMEROI R	SNAK	87006	
*		HATCHERY TOTAL.					696,000	FROM 2 RELEASES				*
	RAPID RIVER H	SP CHINOOK RAPID RIVER	85	25	87	3/16/87 3/23/87	2,400,000	RAPID RIVER H	RAPID R	SNAK	87007	60K CWT-FB US/CAN & WBMP 240K CWT US/CAN INDEXING 12K PIT TAG WBM SURVIVAL
		SP CHINOOK RAPID RIVER	85	25	87	3/23/87 3/23/87	100,000	HELLS CANYON	SNAKE R	SNAK	87008	60K FB WBM PROGRAM 3K PIT TAG
*		HATCHERY TOTAL.					2,500,000	FROM 2 RELEASES				*
	SAWTOOTH H	SP CHINOOK RAPID RIVER	85	25	87	10/07/86 10/15/86	100,000	RED R	RED R	SNAK	87010	VOLITIONAL RELEASE 50 CWT LSRCP TIME/SIZE
		SP CHINOOK RAPID RIVER	85	25	87	10/07/86 10/15/86	350,000	M F CLEARWATER	M F CLEARWATER	SNAK	87015	VOLITIONAL RELEASE
		SP CHINOOK RAPID RIVER	85	25	87	10/07/86 10/15/86	250,000	M F CLEARWATER	M F CLEARWATER	SNAK	87016	VOLITIONAL RELEASE
		SP CHINOOK SAWTOOTH	85	17	87	3/11/87 3/13/87	900,000	SAWTOOTH H	SALMON R	SNAK	87012	240K CWT US/CAN INDEXING 60K CWT-FB US/CAN AND WBMP

****
* These data are preliminary and have been derived from various sources. For *
* verification and/or origin of data, contact the operators of the Fish Passage Data *
* System at (503) 230 4290. *
****

FROM 6/01/86 TO 12/31/87

AGCY HATCHERY	SPECIES / STOCK	BRD YR	SIZE #/LB	MGR YR	RELEASE DATES	NUMBER RELEASED	RELEASE SITE	RIVER NAME	ZONE	FPC LOT ID	COMMENTS
IDFG SAWTOOTH H	SP CHINOOK RAPID RIVER	85	25	87	3/16/87 3/19/87	350,000	M F CLEARWATER	M F CLEARWATER	SNAK	87009	50K CWT LSRCP TIME/SIZE
	SP CHINOOK RAPID RIVER	85	25	87	3/16/87 3/19/87	250,000	M F CLEARWATER	M F CLEARWATER	SNAK	87011	
	SP CHINOOK RAPID RIVER	85	25	87	3/16/87 3/19/87	100,000	RED R	RED R	SNAK	87014	
	SP CHINOOK SAWTOOTH	85	20	87	3/17/87 3/18/87	250,000	E F SALMON R	E F SALMON R	SNAK	87013	50K CWT LSRCP CONTRIB

* HATCHERY TOTAL. 2,550,000 FROM 8 RELEASES

** AGENCY TOTAL... 8,696,000 FROM 16 RELEASES

* These data are preliminary and have been derived from various sources. For verification and/or origin of data, contact the operators of the Fish Passage Data System at (503) 230 4290.

FROM 6/01/86 TO 12/31/87

AGCY HATCHERY	SPECIES / STOCK	BRD YR	SIZE #/lb	MGR YR	RELEASE DATES	NUMBER RELEASED	RELEASE SITE	RIVER NAME	ZONE	FPC LOT ID	COMMENTS
ODFW BONNEVILLE H	FA CHINOOK MID COLUMBIA	85	6	87	3/27/87 3/30/87	175,000	BONIFER	UMATILLA R	LCOL	87050	100K CWT STOCK ASSESSMENT VOLITIONAL RELEASE
	FA CHINOOK	85	6	87	3/27/87 3/30/87	100,000	MINTHORN POND	UMATILLA R	LCOL	87122	VOLITIONAL RELEASE
	SP CHINOOK CARSON	85	9	87	4/01/87 4/03/87	104,000	BIG CANYON CRK	WALLOWA R	SNAK	87091	ACCLIMATION RELEASE
	SP CHINOOK CARSON	86	100	88	4/01/87 4/01/87	250,000	UMATILLA R	UMATILLA R	LCOL	87118	PRE SMOLTS
	SP CHINOOK CARSON	86	12	88	11/01/87 11/01/87	100,000	UMATILLA R	UMATILLA R	LCOL	87051	
*					HATCHERY TOTAL.	679,000	FROM 5 RELEASES				
CASCADE H	COHO LOWER COLUMBIA	85	15	87	4/15/87 5/08/87	1,000,000	UMATILLA R	UMATILLA R	LCOL	87093	200K MINTHORN 800K LOWER UMATILLA
	COHO LOWER COLUMBIA	85	15	87	4/15/87 5/08/87	700,000	YAKIMA R	YAKIMA R	MCOL	87094	
*					HATCHERY TOTAL.	1,700,000	FROM 2 RELEASES				
IRRIGON	SP CHINOOK CARSON	85	20	87	10/21/86 10/21/86	75,000	UMATILLA R	UMATILLA R	LCOL	87067	75K CWT REL AT BONIFER HOLDING POND, RM
	STEELHEAD WALLOWA	86	5	87	4/12/87 5/01/87	1,500,000	GRANDE RONDE R	GRANDE RONDE R	SNAK	87055	200K CWT EVALUATIONS WALLOWA ACCLIMATION 850K
	STEELHEAD IMNAHA	86	5	87	4/15/87 4/15/87	94,000	IMNAHA R	IMNAHA R	SNAK	87054	50K CWT EVALUATIONS
	FA CHINOOK MID COLUMBIA	86	79	87	5/01/87 5/01/87	1,500,000	UMATILLA R	UMATILLA R	LCOL	87052	200K CWT STOCK ASSESSMENT
	SP CHINOOK RAPID RIVER	86	18	87	5/15/87 5/15/87	150,000	LOOKINGGLASS CR	GRANDE RONDE R	SNAK	87053	120K CWT STOCK ASSESSMENT
	FA CHINOOK MID-COLUMBIA	86	10	88	10/01/87 10/01/87	100,000	UMATILLA R	UMATILLA R	LCOL	87113	
*					HATCHERY TOTAL.	3,419,000	FROM 6 RELEASES				

* These data are preliminary and have been derived from various sources. For verification and/or origin of data, contact the operators of the Fish Passage Data System at (503) 230 4290.

FROM 6/01/86 TO 12/31/87

AGCY HATCHERY	SPECIES / STOCK	BRD YR	SIZE #/LB	MGR YR	RELEASE DATES	NUMBER RELEASED	RELEASE SITE	RIVER NAME	ZONE	FPC LOT ID	COMMENTS
ODFW LOOKINGGLASS H	SP CHINOOK	85	54	87	7/17/86 7/17/86	88,543	LOOKINGGLASS CR	GRANDE RONDE R	SNAK	87068	100% CWT 7-39-(54,55)
	SP CHINOOK	85	52	87	7/29/86 7/29/86	37,760	CATHERINE CRK	GRANDE RONDE R	SNAK	87069	
	SP CHINOOK LOOKINGGLASS	85	24	87	9/24/86 9/24/86	163,275	LOOKINGGLASS CR	GRANDE RONDE R	SNAK	87070	107K CWT-AD 07-28-3,4
	SP CHINOOK LOOKINGGLASS	85	20	87	11/01/86 11/01/86	164,886	LOOKINGGLASS H	GRANDE RONDE R	SNAK	87115	
	SP CHINOOK CARSON	85	15	87	4/01/87 4/01/87	81,000	BIG CANYON CRK	WALLOWA R	SNAK	87056	
	SP CHINOOK IMNAHA	85	10	87	4/01/87 4/01/87	124,000	LOOKINGGLASS H	GRANDE RONDE R	SNAK	87057	124K CWT EVALUATIONS
	SP CHINOOK LOOKINGGLASS	85	16	87	4/01/87 4/01/87	164,000	LOOKINGGLASS H	GRANDE RONDE R	SNAK	87058	
	SP CHINOOK LOOKINGGLASS	85	20	87	4/01/87 4/01/87	110,000	CATHERINE CRK	GRANDE RONDE R	SNAK	87059	
	SP CHINOOK RAPID RIVER	85	10	87	4/01/87 4/01/87	396,000	LOOKINGGLASS H	GRANDE RONDE R	SNAK	87060	396K CWT US/CAN INDEXING
	SP CHINOOK LOOKINGGLASS	86	65	88	7/15/87 7/15/87	100,000	LOOKINGGLASS H	GRANDE RONDE R	SNAK	87116	
	SP CHINOOK RAPID RIVER	86	25	88	9/15/87 9/15/87	75,000	LOOKINGGLASS H	GRANDE RONDE R	SNAK	87061	80K CWT US/CAN INDEXING
	SP CHINOOK RAPID RIVER	86	25	88	11/01/87 11/01/87	75,000	LOOKINGGLASS H	GRANDE RONDE R	SNAK	87062	80K CWT US/CAN INDEXING
*					HATCHERY TOTAL.	1,579,464	FROM 12 RELEASES				
OAK SPRINGS	SU STEELHEAD SOUTH SANTIAM	86	7	87	4/15/87 4/17/87	60,000	HOOD R	HOOD R	LCOL	87120	
	SU STEELHEAD UMATILLA	86	7	87	5/01/87 5/01/87	[illegible],000	UMATILLA R	UMATILLA R	LCOL	87119	100% AD HATCHERY ID
*					HATCHERY TOTAL.	82,000	FROM 2 RELEASES				

* These data are preliminary and have been derived from various sources. For verification and/or origin of data, contact the operators of the Fish Passage Data System at (503) 230-4290.

FROM 6/01/86 TO 12/31/87

AGCY	HATCHERY	SPECIES / STOCK	BRD YR	SIZE #/lb	MGR YR	RELEASE DATES	NUMBER RELEASED	RELEASE SITE	RIVER NAME	ZONE	FPC LOT ID	COMMENTS
ODFW	ROUND BUTTE H	SP CHINOOK DESCHUTES	86	6	87	4/01/87 4/10/87	60,000	DESCHUTES R	DESCHUTES R	LCOL	87063	
		SP CHINOOK DESCHUTES	86	9	87	4/01/87 5/15/87	210,000	DESCHUTES R	DESCHUTES R	LCOL	87064	
		STEELHEAD DESCHUTES	86	4	87	4/13/87 4/24/87	162,000	DESCHUTES R	DESCHUTES R	LCOL	87065	162K AD HATCHERY ID
*				HATCHERY TOTAL.			432,000	FROM 3 RELEASES				*
	TROJAN POND	WI STEELHEAD	00	5	87	4/01/87 4/01/87	40,000	HOOD R	HOOD R	LCOL	87121	
*				HATCHERY TOTAL.			40,000	FROM 1 RELEASES				*
**				AGENCY TOTAL...			7,931,464	FROM 31 RELEASES				**

****
* These data are preliminary and have been derived from various sources. For *
* verification and/or origin of data, contact the operators of the Fish Passage Data *
* System at (503) 230 4290. *
****

FROM 6-01/86 TO 12/31/87

AGCY HATCHERY	SPECIES / STOCK	BRD YR	SIZE #/LB	MGR YR	RELEASE DATES	NUMBER RELEASED	RELEASE SITE	RIVER NAME	ZONE	FPC LOT ID	COMMENTS
USFW CARSON NFH	CHINOOK	85	33	87	11/26/86 11/26/86	180,000	CARSON NFH	WIND R	LCOL	87178	
	SP CHINOOK CARSON	85	18	87	4/10/87 4/20/87	2,300,000	CARSON NFH	WIND R	LCOL	87150	45K FB WBM PROGRAM
	SP CHINOOK CARSON	85	20	87	4/15/87 4/18/87	100,000	BONIFER POND	UMATILLA R	LCOL	87151	100K CWT DENSITY STUDY
	SP CHINOOK CARSON	86	19	87	6/01/87 6/01/87	300,000	CARSON NFH	WIND R	LCOL	87152	300K CWT DENSITY STUDY
*					HATCHERY TOTAL.	2,880,000	FROM 4 RELEASES				
DWORSHAK NFH	SP CHINOOK RAPID RIVER	85	20	87	4/01/87 4/02/87	1,700,000	DWORSHAK NFH	CLEARWATER R	SNAK	87153	50K CWT LSRCP CONTRIB 60K FB WBM PROGRAM
	STEELHEAD	86	6	87	4/15/87 5/15/87	16,000	CLEARWATER R	CLEARWATER R	SNAK	87189	100% FB
	SP CHINOOK	85	20	87	4/15/87 5/15/87	16,000	CLEARWATER R	CLEARWATER R	SNAK	87191	100% FB
	STEELHEAD CLEARWATER	86	6	87	4/20/87 4/24/87	200,000	NEWSOME CR	S F CLEARWATER	SNAK	87154	50K CWT LSRCP CONTRIB
	STEELHEAD CLEARWATER	86	4	87	4/20/87 4/24/87	150,000	S F CLEARWATER	S F CLEARWATER	SNAK	87155	
	STEELHEAD CLEARWATER	86	4	87	4/20/87 4/24/87	150,000	CLEAR CRK	CLEARWATER R	SNAK	87156	40K CWT COE CONTRIBUTION
	STEELHEAD CLEARWATER	86	7	87	4/20/87 4/24/87	200,000	CROOKED R	S F CLEARWATER	SNAK	87158	50K CWT SPORT CONTRIB
	STEELHEAD CLEARWATER	86	7	87	4/27/87 5/01/87	1,200,000	N F CLEARWATER	N F CLEARWATER	SNAK	87157	20K CWT THN POS PARENTS 60K CWT CONTRIBUTION 50K FB WBM PROGRAM
*					HATCHERY TOTAL.	3,632,000	FROM 8 RELEASES				
ENTIAT NFH	SP CHINOOK ENTIAT	85	18	87	4/21/87 4/21/87	969,000	ENTIAT R	ENTIAT R	MCOL	87160	
*					HATCHERY TOTAL.	969,000	FROM 1 RELEASES				

****
* These data are preliminary and have been derived from various sources. For *
* verification and/or origin of data, contact the operators of the Fish Passage Data *
* System at (503) 230 4290. *
****

FROM 6/01/86 TO 12/31/87

AGCY HATCHERY	SPECIES / STOCK	BRD YR	SIZE #/lb	MGR YR	RELEASE DATES	NUMBER RELEASED	RELEASE SITE	RIVER NAME	ZONE	FPC LOT ID	COMMENTS
USFW HAGERMAN NFH	STEELHEAD UPPER SALMON(B)	86	5	87	3/24/87 3/26/87	50,000	M F SALMON R	M F SALMON R	SNAK	87163	50K CWT LSRCP EVAL STRAIN
	STEELHEAD UPPER SALMON(A)	86	5	87	3/26/87 4/15/87	700,000	SAWTOOTH H	SALMON R	SNAK	87162	50K FB WBM PROGRAM 25K CWT LSRCP CONTRIBUTION
	STEELHEAD UPPER SALMON(B)	86	5	87	3/27/87 4/03/87	480,000	E F SALMON R	E F SALMON R	SNAK	87164	50K FB WBM PROGRAM 25K CWT LSRCP CONTRIBUTION
	STEELHEAD	86	5	87	4/15/87 5/15/87	16,000	M F SALMON R	M F SALMON R	SNAK	87190	100% FB
	STEELHEAD HELLS CANYON(A)	86	5	87	4/16/87 4/24/87	300,000	LITTLE SALMON R	SALMON R	SNAK	87161	50K CWT EVAL. STRAIN
*					HATCHERY TOTAL.	1,546,000	FROM 5 RELEASES				*
KOOSKIA NFH	SP CHINOOK CLEAR CREEK	85	20	87	3/16/87 3/17/87	750,000	CLEAR CRK	CLEARWATER R	SNAK	87165	
*					HATCHERY TOTAL.	750,000	FROM 1 RELEASES				*
LEAVENWORTH NFH	SP CHINOOK LEAVENWORTH	85	16	87	4/01/87 4/01/87	200,000	YAKIMA R	YAKIMA R	MCOL	87171	
	SP CHINOOK LEAVENWORTH	85	16	87	4/22/87 4/22/87	2,200,000	LEAVENWORTH NFH	WENATCHEE R	MCOL	87170	40K FB WBM PROGRAM
	SU STEELHEAD CHELAN	85	7	87	5/01/87 5/01/87	100,000	LEAVENWORTH NFH	WENATCHEE R	MCOL	87172	100K AD HATCHERY STOCK ID
*					HATCHERY TOTAL.	2,500,000	FROM 3 RELEASES				*
LWHITE SALMON H	COHO	85	27	87	9/30/86 9/30/86	1,225,000	LWHITE SALMON R	LWHITE SALMON R	LCOL	87179	
	SP CHINOOK	86	380	88	2/13/87 2/13/87	902,000	LWHITE SALMON R	LWHITE SALMON R	LCOL	87181	OVERSTOCK
	COHO	86	1783	88	2/13/87 2/13/87	114,000	LWHITE SALMON R	LWHITE SALMON R	LCOL	87182	OVERSTOCK
	FA CHINOOK BONNEVILLE	86	1100	87	3/25/87 3/27/87	315,000	LWHITE SALMON R	LWHITE SALMON R	LCOL	87183	OVERSTOCK

* These data are preliminary and have been derived from various sources. For *
* verification and/or origin of data, contact the operators of the Fish Passage Data *
* System at (503) 230 4290. *

FROM 6/01/86 TO 12/31/87

AGCY HATCHERY	SPECIES / STOCK	BRD YR	SIZE #/LB	MGR YR	RELEASE DATES	NUMBER RELEASED	RELEASE SITE	RIVER NAME	ZONE	FPC LOT ID	COMMENTS
USFW LWHITE SALMON H	SP CHINOOK LITTLE WHITE	85	12	87	4/16/87 4/16/87	500,000	LWHITE SALMON R	LWHITE SALMON R	LCOL	87168	
	FA CHINOOK	85	181	87	4/16/87 4/16/87	97,000	LWHITE SALMON R	LWHITE SALMON R	LCOL	87192	
	FA CHINOOK BONNEVILLE	86	108	87	6/01/87 6/01/87	4,300,000	LWHITE SALMON R	LWHITE SALMON R	LCOL	87166	200K CWT EXTENDED REARING
	FA CHINOOK BONNEVILLE	86	108	87	6/01/87 6/01/87	550,000	LWHITE SALMON H	LWHITE SALMON R	LCOL	87167	350K CWT NET PEN REARING
	SP CHINOOK LITTLE WHITE	86	66	87	6/01/87 6/01/87	500,000	LWHITE SALMON R	LWHITE SALMON R	LCOL	87169	
*					HATCHERY TOTAL.	8,503,000	FROM 9 RELEASES				
SPRING CRK NFH	FA CHINOOK SPRING CREEK	86	65	87	3/19/87 3/19/87	3,500,000	SPRING CRK NFH	LOWER COLUMBIA	LCOL	87188	
	FA CHINOOK SPRING CREEK	86	65	87	4/15/87 5/15/87	7,000,000	SPRING CRK NFH	LOWER COLUMBIA	LCOL	87173	600K CWT US/CAN INDEXING 600K CWT RES. REAR/IMPRINTING
*					HATCHERY TOTAL.	10,500,000	FROM 2 RELEASES				
WILLARD NFH	COHO WILLARD	85	15	87	6/01/87 6/01/87	2,500,000	LWHITE SALMON R	LWHITE SALMON R	LCOL	87175	
*					HATCHERY TOTAL.	2,500,000	FROM 1 RELEASES				
WINTHROP NFH	SP CHINOOK WINTHROP	85	14	87	4/20/87 4/28/87	36,000	BELOW PRD DAM	MID COLUMBIA R	MCOL	87176	36K FB WBM SURVIVAL STUDY
	SP CHINOOK WINTHROP	85	16	87	4/20/87 4/28/87	1,080,000	METHOW R	METHOW R	MCOL	87177	150K FB WBM SURV STUDY
*					HATCHERY TOTAL.	1,116,000	FROM 2 RELEASES				
WARM SPRINGS H	SP CHINOOK	85	9	87	10/01/86 10/01/86	160,188	WARM SPRINGS R	WARM SPRINGS R	LCOL	87180	79K LV CLIP, 81K RV CLIP
	SP CHINOOK WARM SPRINGS	85	16	87	4/09/87 4/09/87	555,000	WARM SPRINGS R	WARM SPRINGS R	LCOL	87174	100K RV,LV CLIP TIME RELEASED/BKD
*					HATCHERY TOTAL.	715,188	FROM 2 RELEASES				

** AGENCY TOTAL..... 35,611,188 FROM 38 RELEASES **

****
* These data are preliminary and have been derived from various sources. For *
* verification and/or origin of data, contact the operators of the Fish Passage Data *
* System at (503) 230 4290. *
****

FROM 6/01/86 TO 12/31/87

AGCY	HATCHERY	SPECIES / STOCK	BRD YR	SIZE #/LB	MGR YR	RELEASE DATES	NUMBER RELEASED	RELEASE SITE	RIVER NAME	ZONE	FPC LOT ID	COMMENTS
WDF	COWLITZ H	COHO TYPE N	86	200	88	6/01/87 6/01/87	500,000	WHITE SALMON R	WHITE SALMON R	LCOL	87250	PRE SMOLTS
*					HATCHERY TOTAL.		500,000	FROM 1 RELEASES				
	KLICKITAT H	COHO KLICKITAT	86	572	88	2/24/87 2/24/87	194,500	KLICKITAT H	KLICKITAT R	LCOL	87292	
		SF CHINOOK CARSON	85	10	87	4/15/87 4/15/87	611,000	KLICKITAT R	KLICKITAT R	LCOL	87253	
		SF CHINOOK KLICKITAT	85	10	87	4/15/87 4/15/87	59,000	KLICKITAT R	KLICKITAT R	LCOL	87254	
		COHO TYPE N	85	20	87	5/01/87 6/01/87	1,380,000	KLICKITAT R	KLICKITAT R	LCOL	87251	50K CWT VOLITIONAL REL
		FA CHINOOK	86	120	87	6/01/87 6/01/87	4,796,000	KLICKITAT R	KLICKITAT R	LCOL	87252	1200K WELLS STOCK, 3500K PRIEST RAPIDS STOCK, 96K KLICKITAT STOCK
*					HATCHERY TOTAL.		7,040,500	FROM 5 RELEASES				
	LYONS FERRY	SF CHINOOK SNAKE RIVER	85	7	87	3/25/87 3/25/87	13,000	TUCANNON R	TUCANNON R	SNAK	87259	13K CWT STOCK ASSESSMENT
		FA CHINOOK SNAKE RIVER	85	8	87	4/15/87 4/15/87	229,000	LYONS FERRY	SNAKE R	SNAK	87255	150K CWT US/CAN INDEXING 40K FB WBM PROGRAM
		FA CHINOOK SNAKE RIVER	85	8	87	4/15/87 4/15/87	150,000	BELOW IHR DAM	SNAKE R	SNAK	87256	150K CWT US/CAN (BARGED)
		FA CHINOOK SNAKE RIVER	86	60	87	6/01/87 6/01/87	700,000	LYONS FERRY	SNAKE R	SNAK	87258	80K FB WBM PROGRAM 150K CWT US/CAN
		FA CHINOOK SNAKE RIVER	86	60	87	6/10/87 6/10/87	150,000	BELOW IHR DAM	SNAKE R	SNAK	87257	250K CWT US/CAN (BARGED)
*					HATCHERY TOTAL.		1,242,000	FROM 5 RELEASES				
	PRIEST RAPIDS H	FA CHINOOK PRIEST RAPIDS	86	70	87	6/01/87 6/26/87	7,200,000	PRIEST RAPIDS H	MID COLUMBIA R	MCOL	87260	200K FB WBM PROGRAM 200K CWT DELAYED RELEASE EVALUATION
*					HATCHERY TOTAL.		7,200,000	FROM 1 RELEASES				
	RINGOLD H	FA CHINOOK PRIEST RAPIDS	85	7	87	4/01/87 4/01/87	1,100,000	RINGOLD H	MID COLUMBIA R	MCOL	87261	50K FB WBM PROGRAM 200K CWT US/CAN INDEXING
*					HATCHERY TOTAL.		1,100,000	FROM 1 RELEASES				

****
* These data are preliminary and have been derived from various sources. For *
* verification and/or origin of data, contact the operators of the Fish Passage Data *
* System at (503) 230 4290. *
****

FROM 6/01/86 TO 12/31/87

AGCY	HATCHERY.......	SPECIES...... / STOCK	BRD YR	SIZE #/lb	MGR YR	RELEASE DATES	NUMBER RELEASED	RELEASE SITE	RIVER NAME	ZONE	FPC LOT ID	COMMENTS
WDF	ROCKY REACH H	COHO TYPE N	85	20	87	5/04/87 5/04/87	470,000	TURTLE ROCK H	MID COLUMBIA R	MCOL	87262	
		FA CHINOOK PRIEST RAPIDS	85	9	87	5/04/87 5/08/87	235,000	TURTLE ROCK H	MID COLUMBIA R	MCOL	87263	100K CWT US/CAN INDEXING
		FA CHINOOK WELLS	86	70	87	5/04/87 5/08/87	250,000	ROCKY REACH	MID COLUMBIA R	MCOL	87293	
	*					HATCHERY TOTAL.	955,000	FROM 3 RELEASES				*
	WASHOUGAL H	COHO TYPE N	85	20	87	4/06/87 4/17/87	1,650,000	KLICKITAT R	KLICKITAT R	LCOL	87288	
		COHO TYPE S	85	20	87	4/06/87 4/17/87	980,000	KLICKITAT R	KLICKITAT R	LCOL	87290	
	*					HATCHERY TOTAL.	2,630,000	FROM 2 RELEASES				*
	WELLS H	SU CHINOOK WELLS	85	8	87	4/01/87 4/01/87	400,000	WELLS H	MID COLUMBIA R	MCOL	87264	150K CWT US/CAN INDEXING
		SU CHINOOK WELLS	86	91	87	6/01/87 6/01/87	400,000	METHOW R	METHOW R	MCOL	87265	
		SU CHINOOK WELLS	86	60	87	6/01/87 6/10/87	300,000	WELLS H	MID COLUMBIA R	MCOL	87267	200K CWT US/CAN INDEXING 100K FB WBM PROGRAM
		SU CHINOOK WELLS	86	20	87	7/01/87 7/01/87	200,000	WELLS H	MID COLUMBIA R	MCOL	87266	
	*					HATCHERY TOTAL.	1,300,000	FROM 4 RELEASES				*
**						AGENCY TOTAL......	21,967,500	FROM [illegible]2 RELEASES.				**

* These data are preliminary and have been derived from various sources. For
* verification and/or origin of data, contact the operators of the Fish Passage Data
* System at (503) 230 4290.

FROM 6/01/86 TO 12/31/87

AGCY	HATCHERY	SPECIES / STOCK	BRD YR	SIZE #/lb	MGR YR	RELEASE DATES	NUMBER RELEASED	RELEASE SITE	RIVER NAME	ZONE	FPC LOT ID	COMMENTS
WDG	CHELAN PUD	SU STEELHEAD WELLS	86	6	87	4/13/87 4/16/87	162,000	WENATCHEE R	WENATCHEE R	MCOL	87350	100% AD CLIP 10.5K TO YAKIMA SYSTEM
		SU STEELHEAD WELLS	86	6	87	4/17/87 4/20/87	42,000	ENTIAT R	ENTIAT R	MCOL	87351	100% AD CLIP
*						HATCHERY TOTAL.	204,000	FROM 2 RELEASES				
	LYONS FERRY	SU STEELHEAD LYONS FERRY	86	6	87	4/10/87 5/01/87	35,000	ASOTIN CREEK	SNAKE R	SNAK	87352	100% AD CLIP
		SU STEELHEAD LYONS FERRY	86	6	87	4/10/87 5/01/87	45,000	WALLA WALLA R	WALLA WALLA R	MCOL	87353	100% AD CLIP
		SU STEELHEAD LYONS FERRY	86	6	87	4/10/87 5/01/87	150,000	TUCANNON R	TUCANNON R	SNAK	87354	100% AD CLIP
		SU STEELHEAD WALLOWA	86	8	87	4/10/87 5/01/87	192,000	GRANDE RONDE R	GRANDE RONDE R	SNAK	87355	100% AD CLIP
		SU STEELHEAD WALLOWA	86	8	87	4/10/87 5/01/87	50,000	LYONS FERRY	SNAKE R	SNAK	87356	100% AD, LV, CWT, FB BROODSTOCK EVALUATION
		SU STEELHEAD WALLOWA	86	8	87	4/10/87 5/01/87	50,000	GRANDE RONDE R	GRANDE RONDE R	SNAK	87357	100 % AD CLIP
		SU STEELHEAD WELLS	86	6	87	4/10/87 5/01/87	196,000	WALLA WALLA R	WALLA WALLA R	MCOL	87358	100% AD CLIP
		SU STEELHEAD WELLS	86	6	87	4/10/87 5/01/87	36,000	BELOW THE DAM	SNAKE R	SNAK	87359	100% AD, FB WRM PROGRAM
		SU STEELHEAD WELLS	86	6	87	4/10/87 5/01/87	60,000	LYONS FERRY	SNAKE R	SNAK	87360	100% AD, FB WRM PROGRAM
*						HATCHERY TOTAL.	814,000	FROM 9 RELEASES				
	NACHES H	SU STEELHEAD YAKIMA	86	7	87	4/01/87 5/15/87	90,000	NACHES R	NACHES R	MCOL	87361	100 % AD CLIP
*						HATCHERY TOTAL.	90,000	FROM 1 RELEASES				
	RINGOLD H	SU STEELHEAD RINGOLD	86	[illegible]	87	4/15/87 5/15/87	200,000	RINGOLD H	MID COLUMBIA R	MCOL	87362	100% AD CLIP
*						HATCHERY TOTAL.	200,000	FROM 1 RELEASES				

****
* These data are preliminary and have been derived from various sources. For *
* verification and/or origin of data, contact the operators of the Fish Passage Data *
* System at (503) 230-4290. *
****

FROM 6/01/86 TO 12/31/87

AGCY	HATCHERY	SPECIES / STOCK	BRD YR	SIZE #/LB	MGR YR	RELEASE DATES	NUMBER RELEASED	RELEASE SITE	RIVER NAME	ZONE	FPC LOT ID	COMMENTS
WDG	SKAMANIA H	WI STEELHEAD WASHOUGAL	86	6	87	4/15/87 5/15/87	35,000	WHITE SALMON R	WHITE SALMON R	LCOL	87363	100 % AD CLIP
		SU STEELHEAD WASHOUGAL	86	6	87	4/15/87 5/15/87	40,000	WIND R	WIND R	LCOL	87367	100% AD CLIP
		SU STEELHEAD WASHOUGAL	86	6	87	4/15/87 5/15/87	15,000	WHITE SALMON R	WHITE SALMON R	LCOL	87379	100% AD CLIP
	*				HATCHERY TOTAL.		90,000	FROM 3 RELEASES				*
	TURTLE ROCK H	SU STEELHEAD RINGOLD	86	6	87	4/21/87 5/01/87	10,000	TURTLE ROCK H	MID COLUMBIA R	MCOL	87365	100% AD CLIP
		SU STEELHEAD RINGOLD	86	6	87	4/27/87 5/01/87	190,000	WENATCHEE R	WENATCHEE R	MCOL	87364	100% AD CLIP
	*				HATCHERY TOTAL.		200,000	FROM 2 RELEASES				*
	VANCOUVER H	SU STEELHEAD WASHOUGAL	86	5	87	4/15/87 5/15/87	135,000	KLICKITAT R	KLICKITAT R	LCOL	87366	100% AD CLIP
	*				HATCHERY TOTAL.		135,000	FROM 1 RELEASES				*
	WELLS H	SU STEELHEAD WELLS	86	6	87	4/15/87 5/15/87	200,000	SIMILKAMEEN R	SIMILKAMEEN R	MCOL	87368	100% AD CLIP
		SU STEELHEAD WELLS	86	6	87	4/15/87 5/15/87	36,000	BELOW TRI DAM	MID COLUMBIA R	MCOL	87369	100% AD, FB WBM PROGRAM
		SU STEELHEAD WELLS	86	6	87	4/15/87 5/15/87	550,000	METHOW R	METHOW R	MCOL	87370	120K 2B WBM PROGRAM 100% AD HATCHERY ID
	*				HATCHERY TOTAL.		786,000	FROM 3 RELEASES				*
	YAKIMA H	SU STEELHEAD YAKIMA	86	8	87	4/15/87 4/17/87	45,000	YAKIMA R	YAKIMA R	MCOL	87378	
	*				HATCHERY TOTAL.		45,000	FROM 1 RELEASES				*
**					AGENCY TOTAL...		2,564,000	FROM 23 RELEASES				**
****					TOTAL RELEASE..		76,770,152	FROM 130 RELEASES				****

****
* L A S T P A G E *
****

APPENDIX 6

Test Plans

Sliding Scale Spill

Bonneville Second Powerhouse Special Evaluation

SLIDING SCALE SPILL TEST

The procedure will provide a predetermined survival level that is related to the flow of the river. The test envisions increasing the percent survival at each project after the flows required to serve Bonneville Power Administration's Firm Energy Load Carrying Capability, as defined in the Pacific Northwest Coordination Agreement, are exceeded. Before implementation, several other factors will need to be considered in conjunction with additional spill and they include: number of juvenile fish in the river; dissolved gas levels; flow being released for Water Budget; hatchery releases; cost of energy foregone to provide increased spill; and power system reliability.

In general, the increased spill may begin after flow required to meet the FELCC has been exceeded by 25% (except during periods of Water Budget releases). The 25% flexibility factor is based on studies showing the variability of flows required to meet monthly FELCC and rapid changes that occur in unregulated streamflows. During the spring period, April 15 to early June, the survival level (and spill) at The Dalles and Lower Monumental may be increased gradually as the flows increase until the spill amounts equal that required to meet 94% survival. From early June through mid-July at Lower Monumental and mid-August at The Dalles and John Day the survival level (and spill) may be increased gradually until it reaches 91.5%. The flow used to determine the survival/instantaneous spill will be a four-day running average which would include the forecast for the current day and three-days into the future. This average value would be used to enter the graph for determining the survival/instantaneous spill level for the current evening. During the period when flows may be released for Water Budget there are two curves that may be used. A separate curve has been developed for the time when a release is being made for Water Budget and one without Water Budget. When flows are being released to meet Water Budget requests the sliding scale spill doesn't begin until the normal Water Budget flows (220 kcfs at The Dalles and 85 kcfs at Lower Granite) are exceeded. This criteria was based on the concept that FELCC was foregone to provide Water Budget and it should not be spilled to provide survival levels above 90%.

The attached set of graphs, illustrating the procedure, has been developed using input from fishery agencies, Indian tribes, northwest utilities, and BPA.

Shown below are the project operation criteria that will guide the use of the test sliding scale spill plan:

The Dalles Dam

- o Where it is determined to spill at The Dalles the spill operation will be as follows:

  - Instantaneous spill percentages will be determined by using the attached test sliding scale spill plan and survival/spill percentage graphs.

- During the spring migration spill may be initiated five days after the first 10 percent of the yearling chinook migration has passed McNary Dam.

- During the summer migration the spill trigger will be based on the same criteria used at John Day.

- Hours of spill will be during the nighttime period, generally between 2100 hours to 0600 hours.

<u>John Day Dam</u>

o When it is determined to increase spill above the 90% survival level the spill operation will be as follows:

  - Instantaneous spill percentages will be determined by using the attached test sliding scale spill plan and survival/spill percentage graphs.

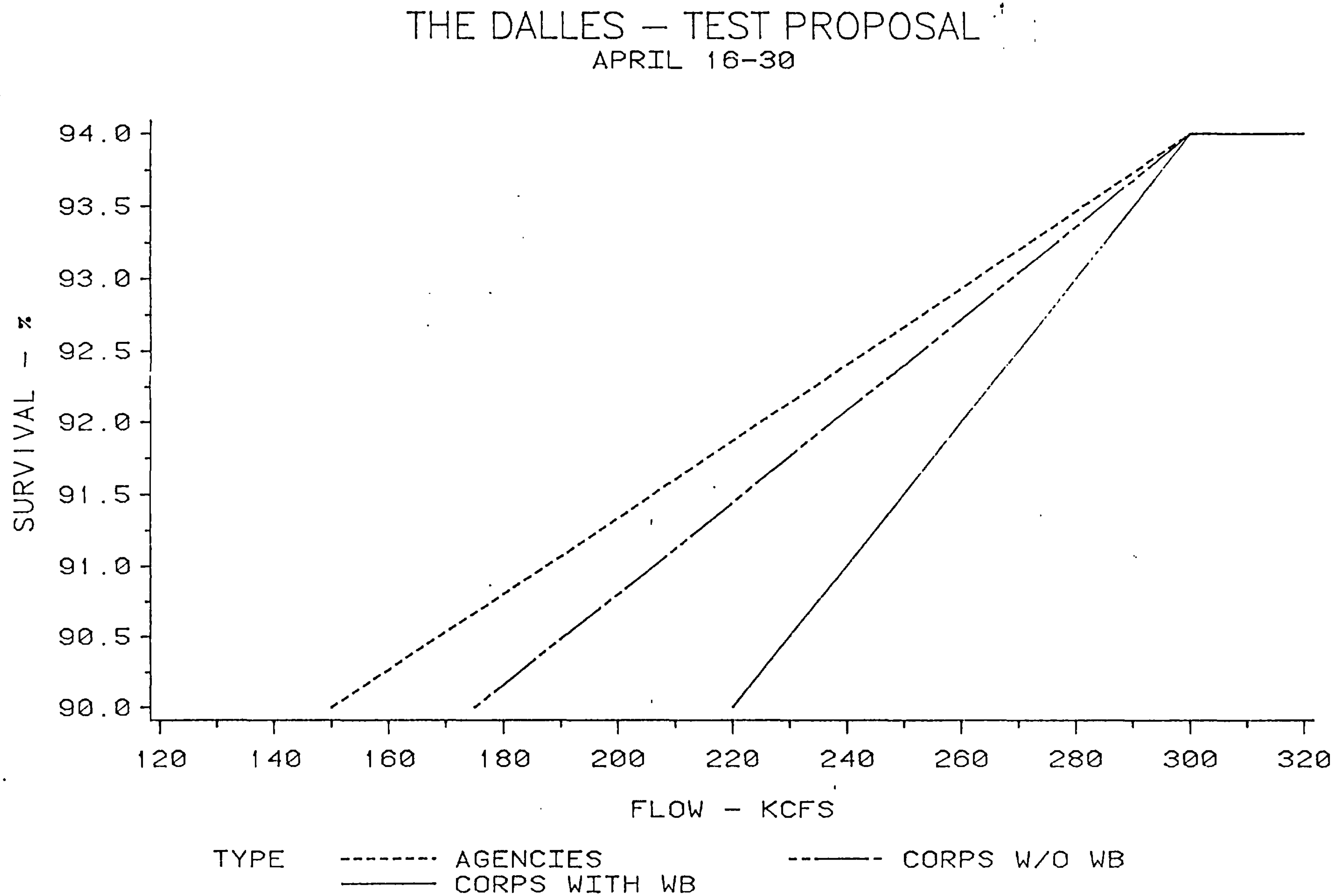
  - The timing of the spill will be the same as shown in the JFPP.

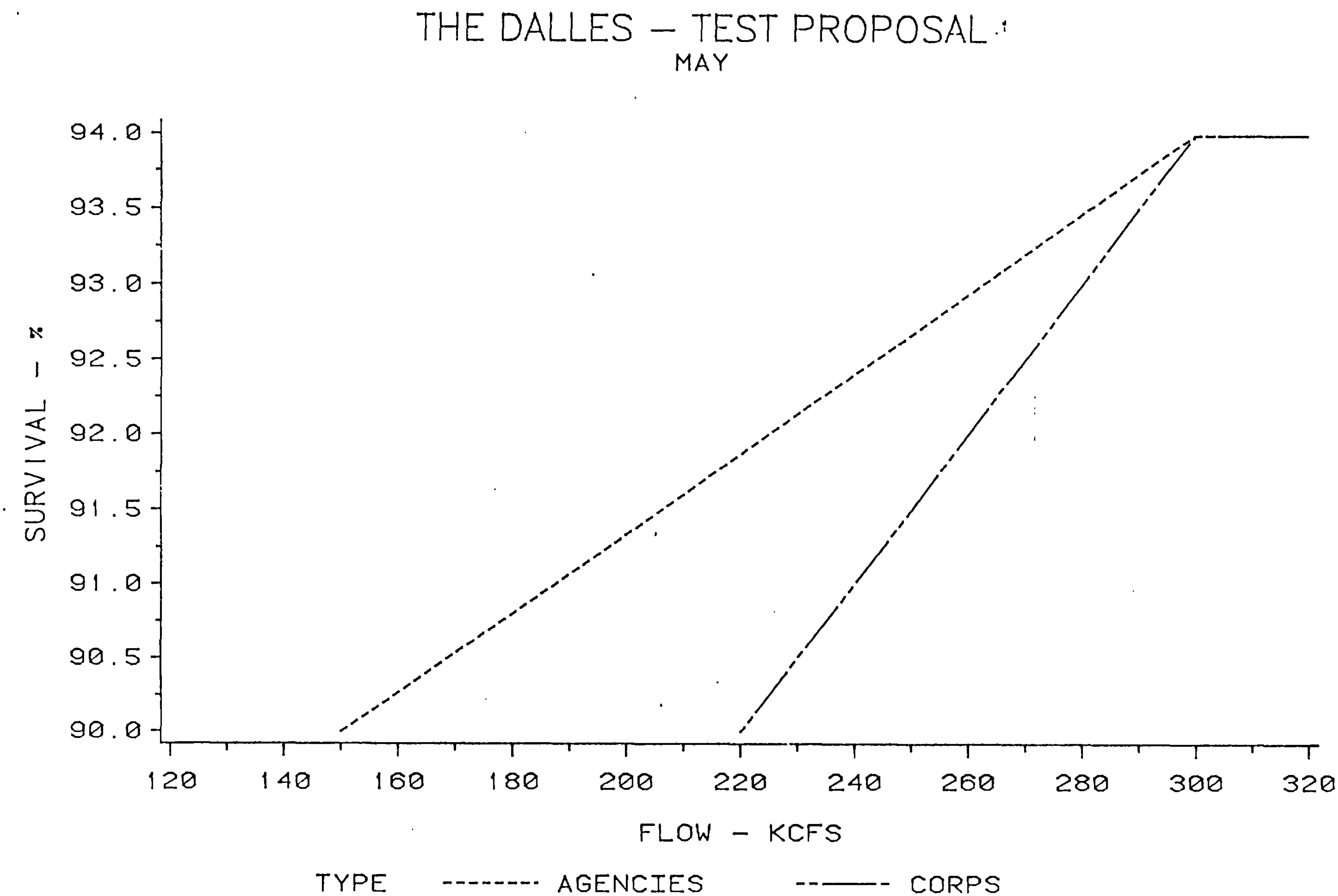
Lower Monumental Dam

- o When it is decided to increase spill above the 90% survival level the spill operation will be as follows:

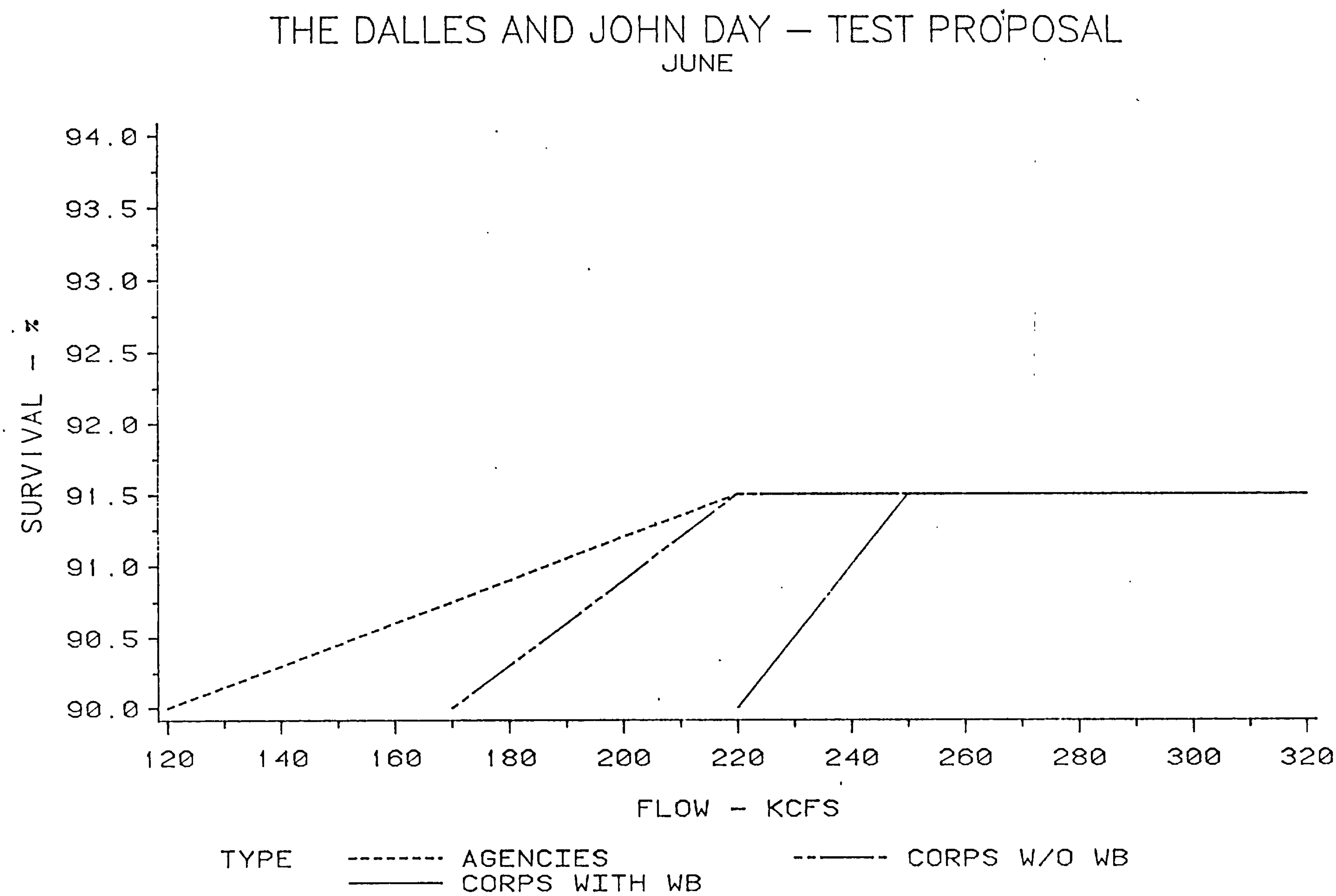
  - Instantaneous spill percentages will be determined by using the attached test sliding scale spill plan and survival/spill percentage graphs.

  - The timing of the spill will be the same as shown in the JFPP.

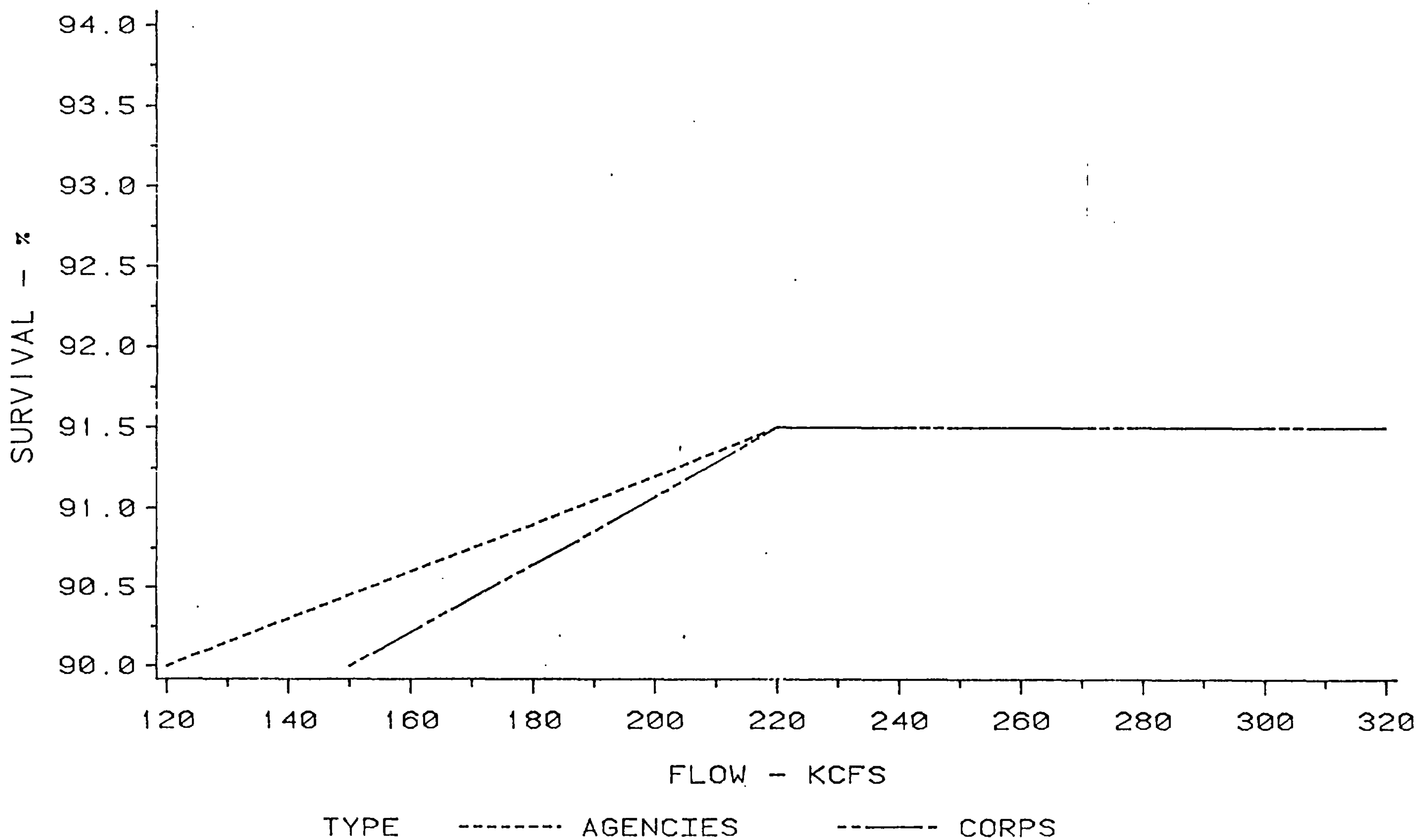

THE DALLES – TEST PROPOSAL
APRIL 16-30
SURVIVAL – %
94.0
93.5
93.0
92.5
92.0
91.5
91.0
90.5
90.0
120
140
160
180
200
220
240
260
280
300
320
FLOW – KCFS
TYPE
AGENCIES
CORPS W/O WB
CORPS WITH WB



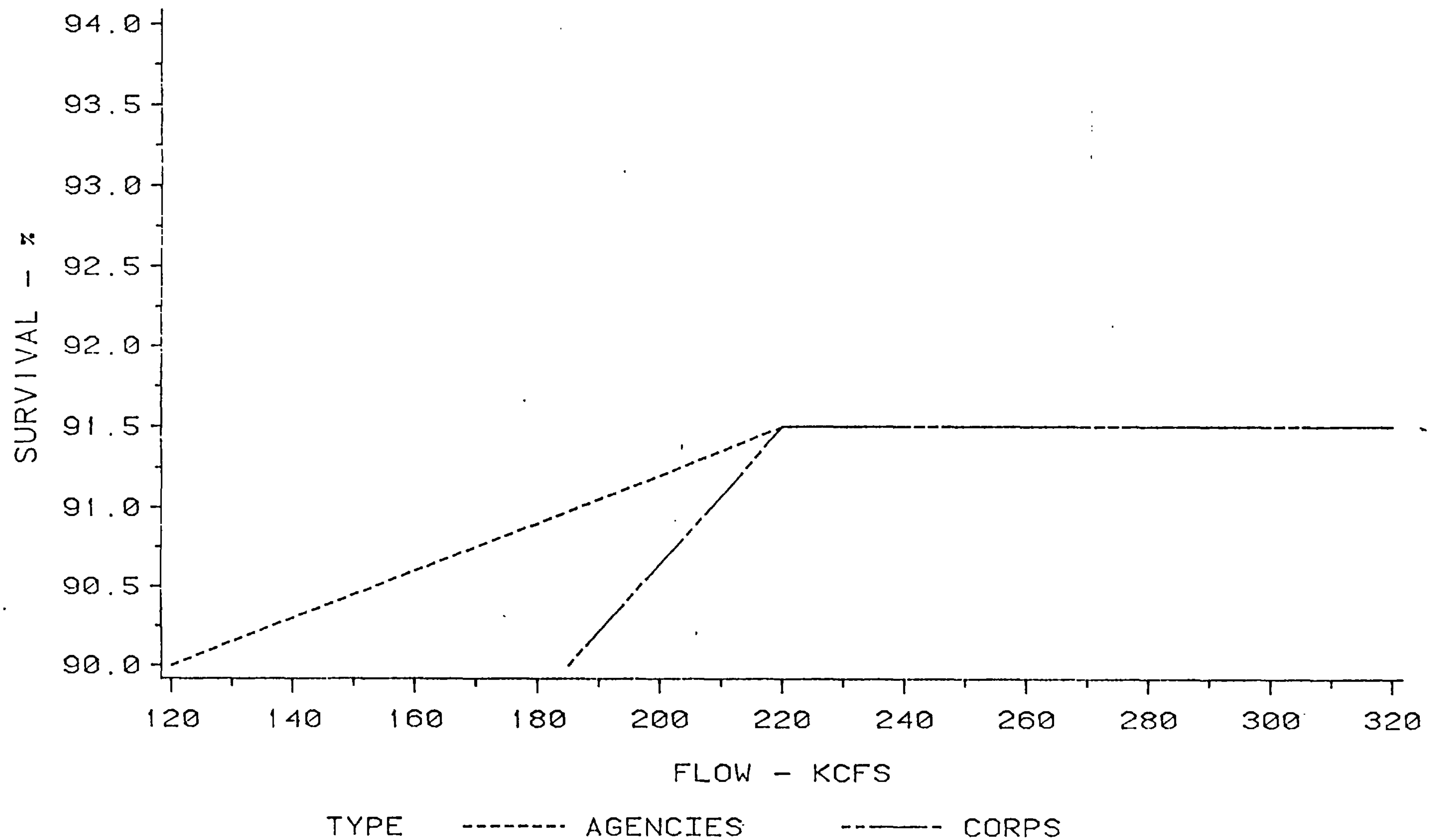
THE DALLES – TEST PROPOSAL
MAY
SURVIVAL – %
94.0
93.5
93.0
92.5
92.0
91.5
91.0
90.5
90.0
120
140
160
180
200
220
240
260
280
300
320
FLOW – KCFS
TYPE
AGENCIES
CORPS

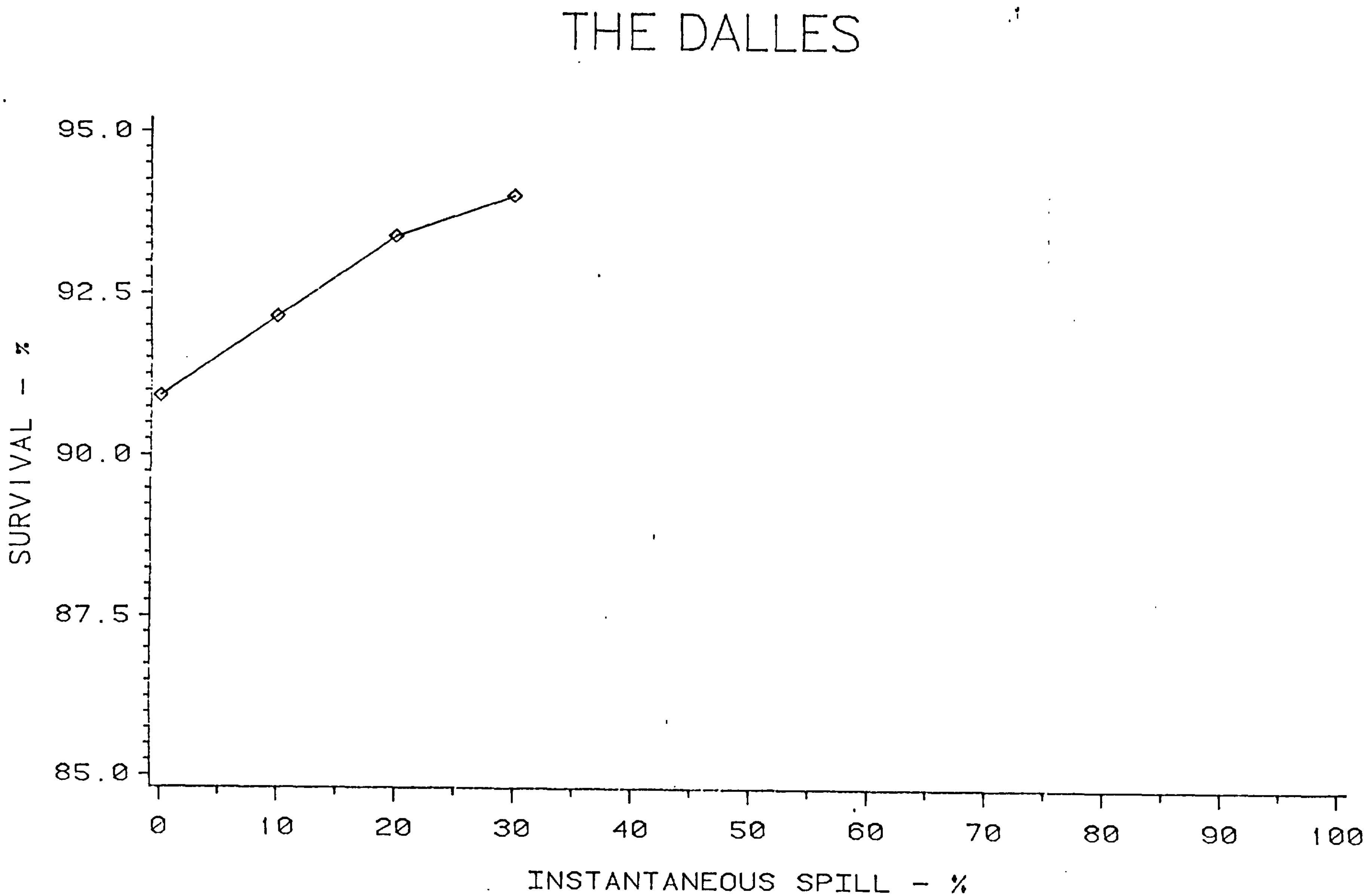

THE DALLES AND JOHN DAY – TEST PROPOSAL
JUNE
SURVIVAL – %
94.0
93.5
93.0
92.5
92.0
91.5
91.0
90.5
90.0
120
140
160
180
200
220
240
260
280
300
320
FLOW – KCFS
TYPE
AGENCIES
CORPS W/O WB
CORPS WITH WB

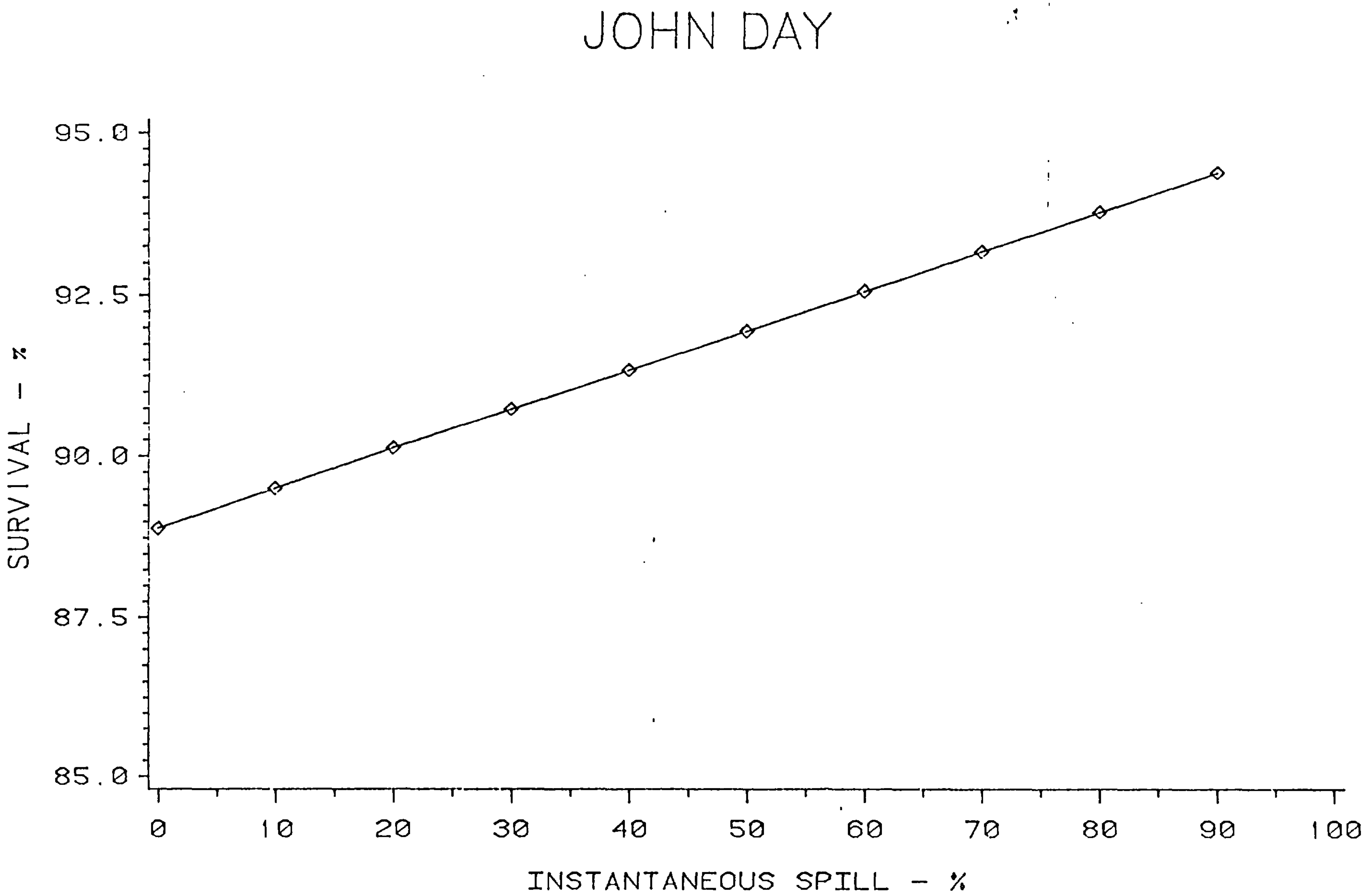
THE DALLES AND JOHN DAY - TEST PROPOSAL
JULY

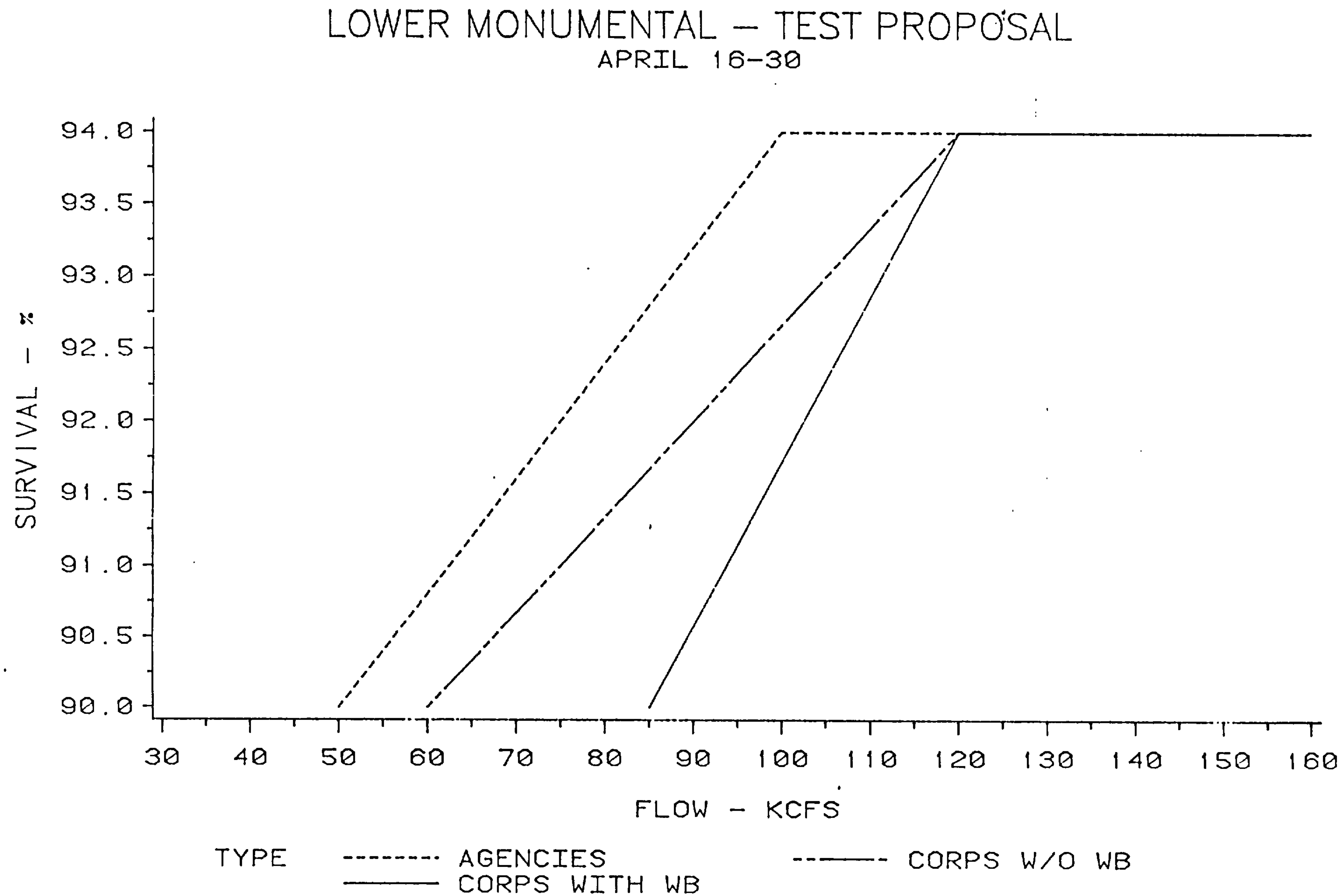


THE DALLES AND JOHN DAY - TEST PROPOSAL
AUGUST 1-15

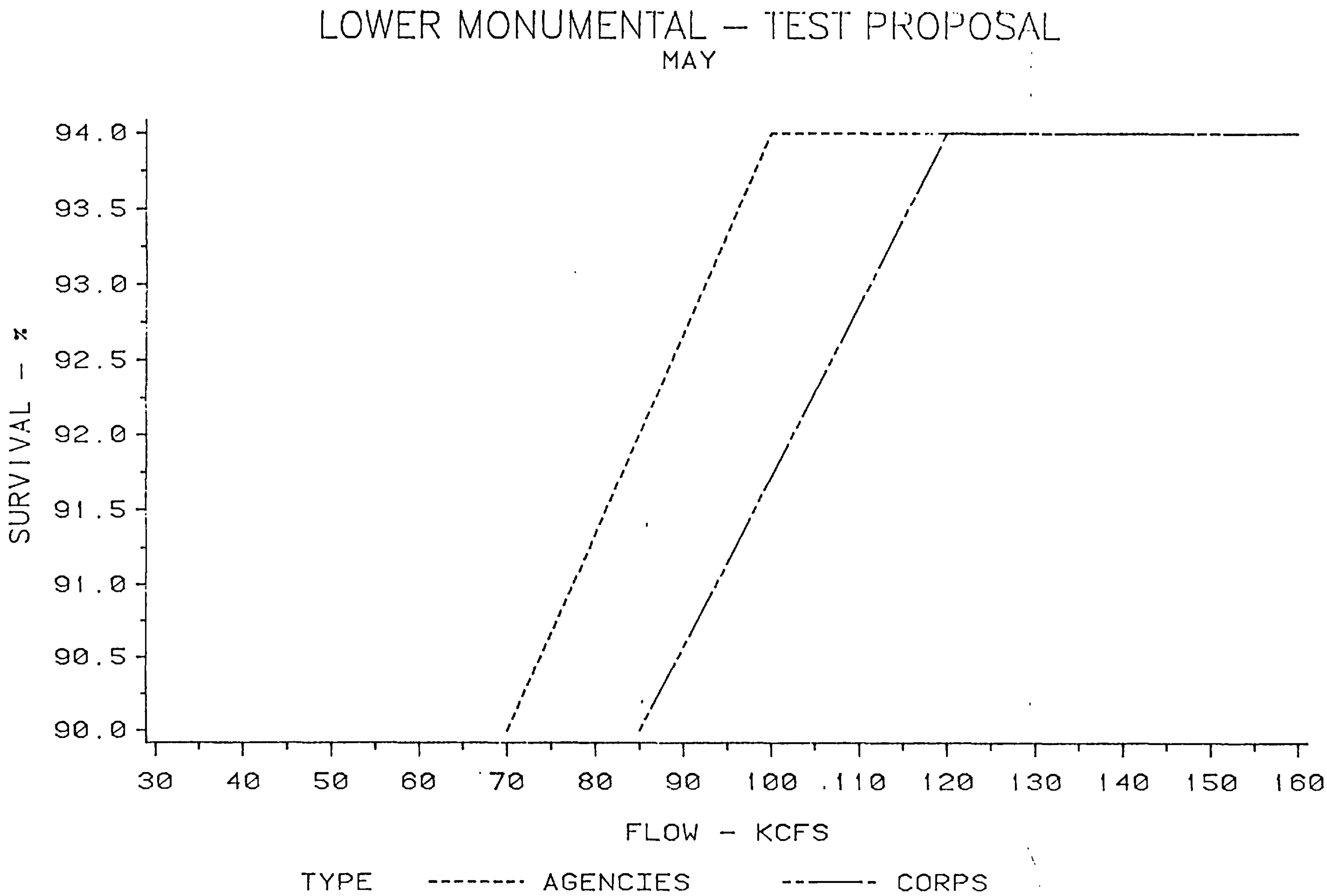



THE DALLES
95.0
92.5
90.0
87.5
85.0
SURVIVAL - %
0
10
20
30
40
50
60
70
80
90
100
INSTANTANEOUS SPILL - %

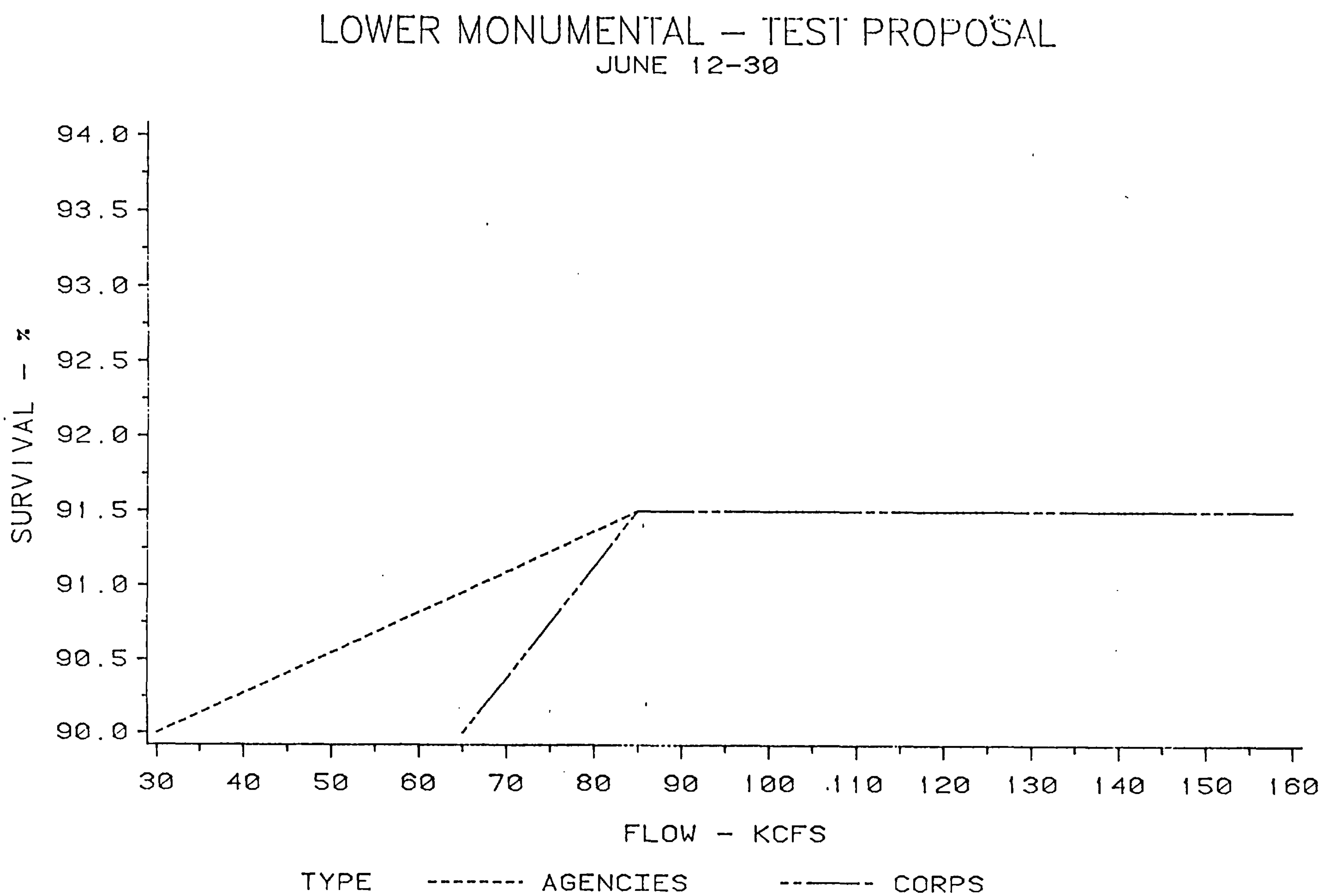

JOHN DAY
95.0
92.5
90.0
87.5
85.0
SURVIVAL - %
0
10
20
30
40
50
60
70
80
90
100
INSTANTANEOUS SPILL - %



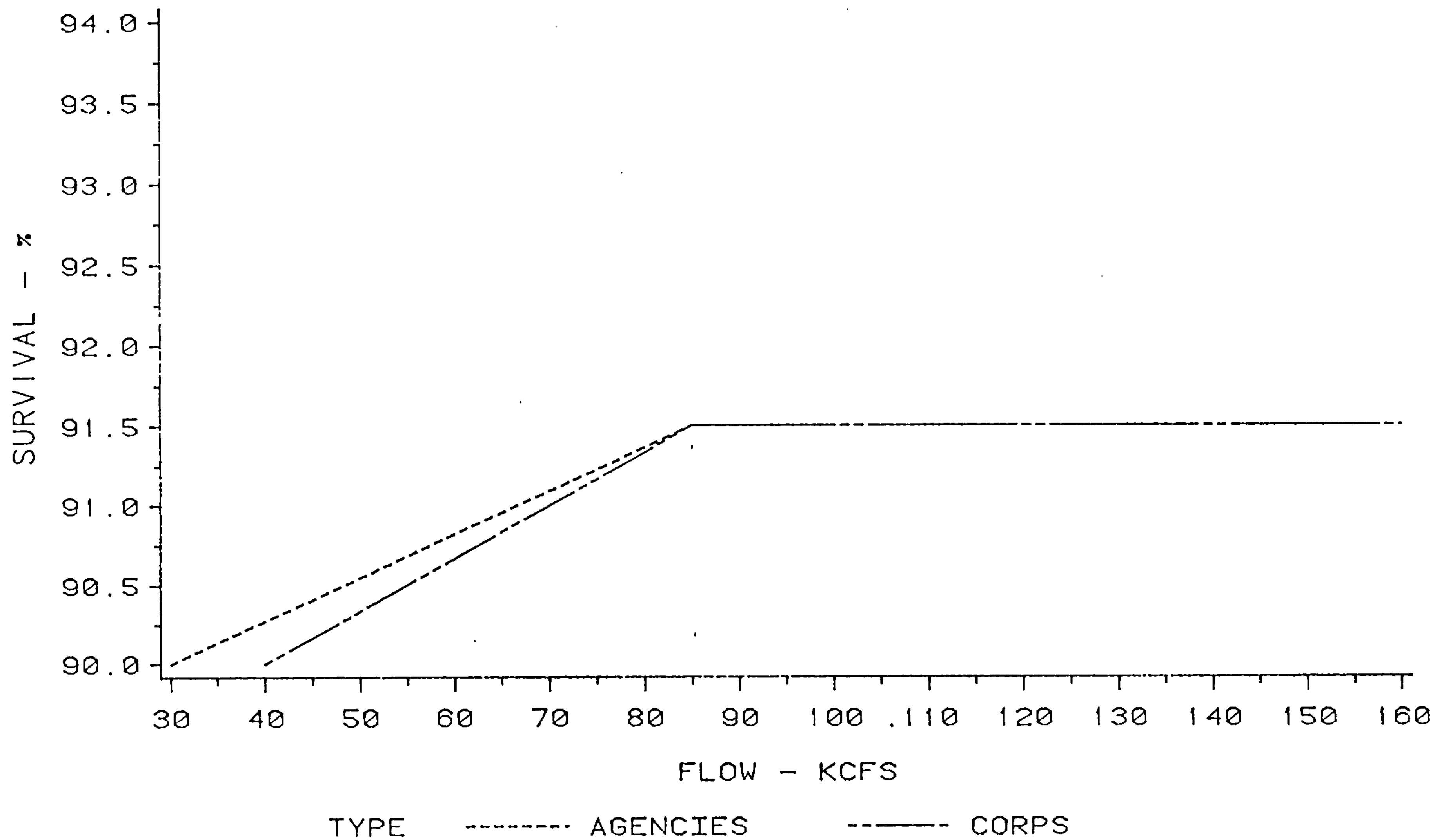
LOWER MONUMENTAL - TEST PROPOSAL
APRIL 16-30
SURVIVAL - %
94.0
93.5
93.0
92.5
92.0
91.5
91.0
90.5
90.0
30
40
50
60
70
80
90
100
110
120
130
140
150
160
FLOW - KCFS
TYPE
AGENCIES
CORPS W/O WB
CORPS WITH WB

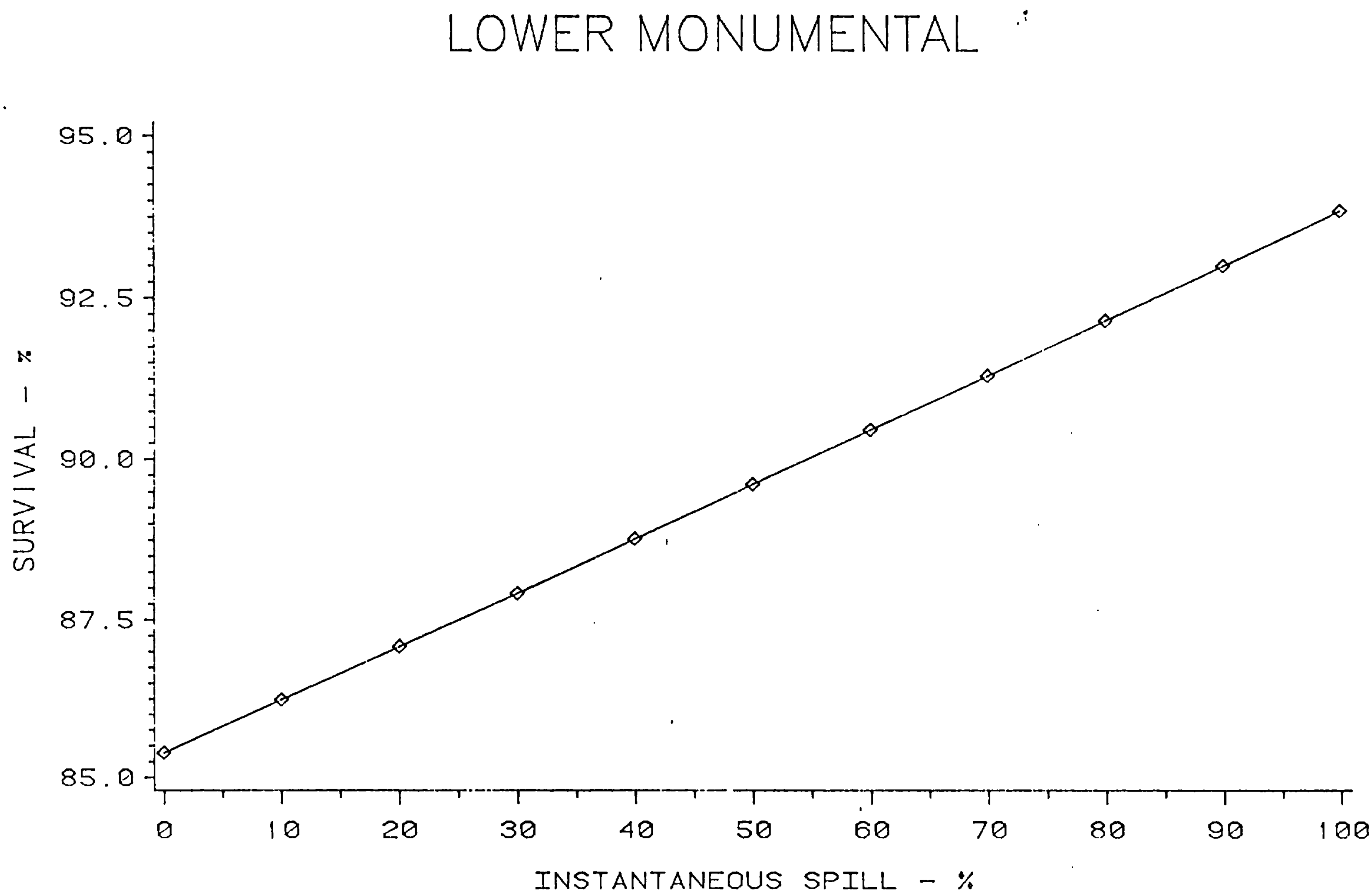


LOWER MONUMENTAL - TEST PROPOSAL
MAY
SURVIVAL - %
94.0
93.5
93.0
92.5
92.0
91.5
91.0
90.5
90.0
30
40
50
60
70
80
90
100
110
120
130
140
150
160
FLOW - KCFS
TYPE
AGENCIES
CORPS


LOWER MONUMENTAL - TEST PROPOSAL
JUNE 12-30
SURVIVAL - %
94.0
93.5
93.0
92.5
92.0
91.5
91.0
90.5
90.0
30
40
50
60
70
80
90
100
110
120
130
140
150
160
FLOW - KCFS
TYPE
AGENCIES
CORPS

LOWER MONUMENTAL – TEST PROPOSAL
JULY 1-15




LOWER MONUMENTAL
SURVIVAL - %
95.0
92.5
90.0
87.5
85.0
0
10
20
30
40
50
60
70
80
90
100
INSTANTANEOUS SPILL - %

1987 BONNEVILLE SECOND POWERHOUSE - SPECIAL EVALUATION

During the last two juvenile outmigration periods the operation of the units at the Bonneville second powerhouse has been limited because the FGE of juvenile passage was below the desired standard. Data obtained during the times when the Bonneville second powerhouse was operated indicate that very few fish enter the Bonneville second powerhouse during the daytime. Also it is known that loss of revenue from not operating this powerhouse is very high. In order to reduce these losses the Corps is conducting various tests to determine what the problems are so the FGE can be improved. Most of the data for these tests are taken at night when the juvenile fish normally enter the powerhouse. In 1987 the Corps is planning to evaluate the effect of operating Bonneville II during daylight hours on the number of juveniles entering the powerhouse at night and during the period when the powerhouse is being operated. The procedure for this study is shown on the following pages.

Evaluation of Operating Bonneville II

I. Two conditions will be tested:

A. The base (control) condition will be the standard operating procedure for the FGE research testing, as follows:

1. Units 11 and 18 are requested to be operated beginning 1600 on days with testing. This is separate from any requirements for adult passage criteria.

2. Units 12 and 13 are turned on at 1745 to begin FGE tests.

3. All units are shut down at the end of the FGE test. The preferred minimum time for a test is considered to be 1 and 1/2 hours.

B. The test condition will be operation of the powerhouse during the daylight hours in addition to the base condition operation outlined in A. The percentage of flow passing through Bonneville II would vary with total river flows and Bonneville I loading, thus exact replicates of any two conditions would not be possible.

II. Length of testing with and without daytime turbine usage will be conducted for a period of time sufficient to determine if increases in fish passing the project occur with daytime turbine operation. This would be expected to change dependent upon the number of fish in the river and the percentage of water passing through Bonneville II.

III. Evaluation of the effect of operating Bonneville II turbine units during the day would be made by comparing the estimated total passage by the project with and without the additional operation, as follows:

A. The 10% sampler at Bonneville II would be operated 24-hr per day. The number of fish collected each 24-hr would be compared on days with and without daytime turbine operation. The number of fish collected would be expanded by 10 to account for the samplers efficiency, and then expanded by 10 four to account for an assumed 25% FGE. These numbers would be added to the actual catches in gatewells and fyke nets from the FGE tests.

B. Hydroacoustic counts would also be made during the night time passage period when the units wee operated for FGE testing, both on nights with and without daytime turbine operations. Additionally, estimates of daytime sluiceway passage will be made.

IV. Decisions on whether or not to operate Bonneville II will be based upon the following considerations:

A. If a large increase in fish occurs under the test conditions, then turbine operation during the day will be curtailed.

B. If increases in catch in the FGE test units occur to the degree that the amount of time the FGE test can be run before capturing 250-300 fish is much less than 1 and 1/2 hours, then daytime operation will be curtailed.

APPENDIX 7

Corps of Engineers Spill Monitoring Plan for 1987

Lower Monumental Dam:

Site Description: Lower Monumental is the second dam on the lower Snake River, and is located at approximately River Mile 42. The project contains a 6 turbine unit powerhouse, an 8 bay spillway, and a navigation lock. The powerhouse contains a gatewell salvage system which allows the small percentage of juveniles that deflect from the turbine intakes up into the gatewells, to exit the gatewells and be bypassed to the tailrace. In addition to the gatewell salvage system, nighttime spill is used for bypassing juveniles around the powerhouse. The spill monitoring at Lower Monumental will be conducted by contract with a Corps representative on site for determining when and how long to spill.

Objectives:

1. Determine when sufficient numbers of juvenile salmonids are present at the project to warrant spill to bypass them.

2. Estimate hourly, daily, weekly, and seasonal numbers of juvenile salmonids passing through the turbine units, spillbays, and the entire project.

3. Determine the effectiveness of the special spills in bypassing juveniles on a daily, weekly, and seasonal basis.

4. Determine diel passage through the turbine units and spillbays on a daily, weekly, and seasonal basis.

5. Determine vertical and horizontal distribution through the turbine units and spillbays on a weekly and seasonal basis.

Monitoring period: Lower Monumental will be monitored 24 hours per day, 7 days a week from 20 April through 15 June for determining spill effectiveness in bypassing juveniles.

Monitoring procedures: Monitoring will be conducted using a 420 kHz hydroacoustic system provided by the Government. The system will be comprised of an echo sounder, multiplexer, chart recorder, 15 degree transducers, and miscellaneous cables and accessories.

1. Turbine units: The B-slot on 3 of the 6 turbine units (1, 3, and 5) will be monitored for fish passage. Transducers will be attached to frames that will slide down the trashrack guides on the pier noses to the bottom of the intakes, and aimed toward the surface.

2. Spillbays: 4 of the 8 spillbays (2, 4, 6,and 8,) will be monitored for fish passage. Transducers will be attached to mounts

that are suspended from the spillway bridge, lowered below the water surface, and aimed downwards.

Data analysis: Monitoring the project for determining when to spill for bypassing migrating juvenile salmonids requires the data to be analyzed in "real time". This will require the contractor to rely heavily on computers for analyzing the data. Information on juvenile fish passage will be entered into the computers as juveniles are detected with the hydroacoustic equipment. Computer programs will then analyze the data and provide timely information. The information required to meet our objectives is as follows:

1. Objective 1: The Corps will be responsible for developing guidelines that the onsite Corps representative will follow for determining when sufficient numbers of juvenile salmonids are present to warrant spill for bypass.

2. Objective 2: The contractor will be responsible for either developing computer programs or modifying Government furnished software for expanding the sampling data to entire powerhouse, spillway, and project passage on an hourly basis. The contractor will be required to provide to the onsite Corps representative, by 15 minutes past every hour that the project is monitored, information on total number and percentage of juveniles that passed through the turbine units and spillway. This information will be used by the Corps representative for making the decisions regarding spill as stated in objective 1.

3. Objective 3: The contractor will be required to provide to the onsite Corps representative by 2100 hours each evening, information on spill effectiveness (number and percent of juveniles that use the spillway versus the turbine units and sluiceway) for the previous day. The contractor will provide a weekly summary of spill effectiveness to the Program Coordinator every Thursday morning, by 1000 hours, and will include daily, weekly, and seasonal spill effectiveness in the final report. Spill effectiveness will include the number and percent of juveniles that use the spillway during the special nighttime spills and of total daily project passage. The basic collection and analysis of this information will be accomplished under objective 2.

4. Objective 4: The contractor will utilize information collected and analyzed under objective 2 to determine daily, weekly, and seasonal diel passage of juvenile salmonids through the turbine units and spillway. The daily diel passage will be furnished to the onsite Corps representative by 2100 hours the next day. The weekly diel passage information will be provided to the Program Coordinator every Thursday morning, by 1000 hours. The final report will include weekly and seasonal diel passage information.

5. Objective 5: The contractor will provide the Program Coordinator information on the horizontal and vertical distribution of juvenile salmonids migrating through the turbine units, sluiceway, and spillway on a weekly and seasonal basis. The weekly distribution

information will be provided every Thursday morning, by 1000 hours, and the seasonal distribution information will be included in the final report.

6. The contractor shall prepare a final report that will include all the information in objectives 2 through 5, plus additional information on daily average project discharge, and average powerhouse and spillway discharges during the special fish passage spills.

Coordination:

1. Program Coordinator: Will be responsible for overall coordination of the spill monitoring program, and the development of spill monitoring guidelines for use by the onsite Corps representative for making spill determinations. The Program Coordinator will be responsible for overseeing the activities of the contractor and determining if we are adequately monitoring the spill program.

2. Onsite Corps Representative: Will be responsible for determining whether to spill or not spill for juvenile fish passage based on guidelines provided by the Program Coordinator. The onsite representative will be responsible for preparing a daily report detailing the number of juveniles estimated to pass the project for that day, level and duration of spill, and the contractors estimate on spill effectiveness from the previous day. This report will be disseminated on a daily basis to all parties involved in the spill monitoring program.

3. Designated Project Point of Contact: Will be responsible for contract administration, informing contractor of all project safety regulations, issuing required project keys, and for coordinating requested project support with other project personnel.

Project Impacts: Project personnel will be required to provide crane service for the following: installing turbine unit transducers at the beginning of the monitoring program, for reaiming or replacing the turbine unit transducers during the program, and for removing turbine unit transducers at the end of the program. Spillway mounted transducers will not require project assistance. Powerhouse operators will have to provide information on project operation on an hourly basis to the contractor for estimating hourly fish passage.

Equipment required: All hydroacoustic equipment will be Government furnished property. Extraneous equipment such an oscilloscopes will be provided by the contractor. Government furnished property for monitoring Lower Monumental Dam includes the following:

1 - Echo sounder
1 - Fast-flux multiplexer
2 - Chart recorders
10 - 15 degree transducers
3 - turbine transducer mounts

4 - spillway transducer mounts
2 - 1000 foot cables
7 - 500 foot cables
4 - 100 foot armored cables

JOHN DAY DAM

Objectives

- Determine, in real-time, hourly and daily estimates of total numbers of juvenile salmonids passing through the turbines and spillway during the prime passage period.
- Determine, in real-time, hourly projections of 24 hour total juvenile salmonid passage by John Day Dam.
- Determine how effective special spills are in bypassing juvenile salmonids during the prime passage period by analysis of passage through the powerhouse and spillway.
- Determine the spatial distribution (horizontal and vertical) of juvenile salmonids passing through the powerhouse and spillway so biologists can maximize the effectiveness of spills.
- Determine how the distribution of water into the operating turbines and spillbays is related to juvenile salmonid passage (i.e. spillway efficiency).

Site Description

John Day Lock and Dam is located at Columbia River mile 216 near Rufus, Oregon (Figure __). The project is oriented perpendicular to the flow and has a 16 turbine powerhouse and a 20 bay spillway. A juvenile fish bypass system is incorporated into the powerhouse structure and is comprised of submersible traveling screens, gatewall orifices, bypass channel, and outfall chute.

Approach

As a result of poor fish guiding efficiency of the submersible traveling screens for subyearling chinook in 1985 and 1986, hydroacoustic monitoring of juvenile salmonid passage at John Day Dam during the summer of 1987 will again be contracted out by the Portland District Army Corps of Engineers.

Hydroacoustic transducers will be deployed at six main turbine intakes to provide an even distribution of monitored sites across the powerhouse. Six transducers will be placed at spillbays at the south end of the spillway where spill for fish passage will occur.

Transducers at the powerhouse will be located at the floor of the turbine intakes on sleds that slide down the pier nose. The transducers will be aimed to sample in front of the "B" slot of each monitored turbine. The spillway transducers will be deployed just below the waters' surface on pole mounts that will be attached to the upstream face of the roadway deck. These transducers will be oriented to sample a nearly vertical, conical volume of water immediately upstream of the spill gate.

Monitoring will be conducted during the 10 - 12 hours of the prime passage period (1800 - 0600) each day. Initially, 12 hours of spill will be provided for fish passage, from 1800 - 0600. If monitoring indicates that fish passage through the spillway is primarily confined to fewer hours, then the spill period could be adjusted accordingly.

Estimates of the total numbers of juvenile salmonids passing into the monitored turbines and spill bays will be used to generate distributions of fish across the powerhouse and spillway. Hourly discharge at each site will then be used to determine the denstiy of fish passing at individual turbines and spill bays. Through interpolation and extrapolation, estimates of the total number of fish passing through the unmonitored sites will be made. In this way, total numbers of fish passing the project will be estimated.

Projections of 24 hour passage will be accomplished early each evening so that spill can be requested when passage is expected to exceed the predetermined threshold of 30,000 fish. Hourly estimates of fish passage will be combined with the hourly temporal distributions of passage averaged across the previous 7 days and the day/night distributions of passage based on the airlift sampling system at turbine 3 to predict passage for the 24 hour period.

Hydroacoustic monitoring at the turbines and spill bays will continue following initiation of spill for fish passage; if the spill provided is not effective at passing fish, then the Corps biologist will terminate the special spill (e.g. spill for fish passage will continue only as long as fish are present to benefit from it).

The density of fish (fish/acre ft.) passing through the spillway will be analyzed to determine the efficiency of spill in bypassing fish. This information will be helpful in determining patterns and rates of spill which are most effective in passing juvenile salmonids, increasing survival of fish, and providing for more efficient use of the water.

Equipment

Most of the equipment that will be used is Corps-owned or will be borrowed from BPA.

o Biosonics Model 101 420 kHz transceivers	2
o Biosonics Model 151 fast multiplexers	2
o Biosonics Model 111 thermal chart recorders	2
o Ross Model 250E chart recorder	1
o Biosonics 15 degree transducers	12
o Oscilloscopes	2
o Micro computers	2
o Cables and deployment hardware	

Monitoring Schedule

Monitoring will be conducted a minimum of 45 minutes each hour, 10 - 12 hours each day, seven days each week from 1 June to 15 August 1987.

Data Analysis and Dissemination

(Echogram information will be entered into on-site computers each hour by the contractor. Hourly estimates of fish passage through the powerhouse and spillway as well as a projection of 24 hour passage will be provided to the on-site Corps biologist within one-half hour of the hour in which the data were collected. Daily passage information, for the period of 0600 - 0600, will be provided to the Corps biologist by approximately 0900 hours each morning. The Corps biologist will then forward to the NPD Reservoir Control Center (via telefax) the twenty-four hour estimates of juvenile salmonid passage through the powerhouse and spillway, and the project total.

The contractor will provide a draft report to the Corps for review and comment by 31 October 1987 with the final report due by 31 December 1987.

Coordination

Program Coordinator: is responsible for administration, planning, and overall coordination for the Portland District spill monitoring program.

On-site Biologist: is responsible for coordination between the contractor and the Corps. The on-site biologist will be responsible for providing technical oversight of the contractor, obtaining data from the contractor on an hourly and daily basis and making requests for operation of the spillway for fish passage, and the timely dissemination of results so that effective daily decisions can be made by the Reservoir Control Center and other agencies.

Project Assistance

Hourly discharge information for the powerhouse and spillway will need to be made available to the contractor. Access to the project, siting for the monitoring trailers, parking space, and keys will all be required by the contractor. The contractor will be required to provide his own support for most activities.

BONNEVILLE DAM SECOND POWERHOUSE FY 87
HYDROACOUSTIC MONITORING PROGRAM

INTRODUCTION

Hydroacoustic monitoring of juvenile salmonid passage at the Bonneville Dam Second Powerhouse in 1987 will be conducted by the Portland District Fishery Field Unit (FFU) which has extensive experience collecting and using hydroacoustics information to control spills for fish passage at John Day Dam. The unit has also provided support for fish guidance efficiency investigations at the Bonneville Dam Second Powerhouse. The 1987 FGE work will include investigations into fish behavior at turbine intakes with modified intake structures (roof extensions). If a Silicon Intensified Target (SIT) video camera can be obtained, observations of juvenile fish behavior between the lower extremity of the STS and the trash rack will be attempted. Also, operation of the second powerhouse has been severely curtailed during the annual fish outmigrations because of poor guiding of fish into the bypass system. Operation of the second powerhouse during these periods is being considered if a database can be developed, using hydroacoustics, to describe estimates of total numbers of juvenile salmonids passing the facility hourly and daily.

OBJECTIVES

- Determine with hydroacoustic techniques, hourly and daily estimates of fish passage into the second powerhouse turbines and sluiceway so that the facility can be operated during the spring and summer fish outmigrations when few fish are passing the dam.
- Determine if juvenile salmonids are accumulating in the water column, between the roof extensions, when the structures are positioned at every other turbine slot.
- Determine if juvenile salmonids are moving down into the turbine intake from above the STS in the area between the lower upstream end of the STS and the trash rack.

- Determine the proportion of juvenile passage into the sluiceway and turbines of total second powerhouse passage.

- Determine the feasibility of hydroacoustic sampling within the turbine intake at the second powerhouse.

SITE DESCRIPTION

Bonneville Dam is located at Columbia River mile 146 near Cascades Locks, Oregon. The project has two powerhouses and a spillway. The first powerhouse has 10 generating units and the second powerhouse eight; the ice and trash chute is located at the extreme south end of the second powerhouse. The 18 bay spillway is positioned between the two powerhouses.

APPROACH

Hydroacoustic conical beam transducers (fifteen degree) at the second powerhouse will be placed at the base of the turbine intake structures initially, attached to fixed mounts on the upstream side of the trash rack on the "B" slots of all 8 turbine unit intakes. Additional elliptical beam transducers (6 degree by 12 degree) will be placed inside turbine units (TU's) 12 and 13. One 15 degree transducer will sample fish passage into the ice and trash chute at the south end of the powerhouse. Upon availability of additional elliptical beam transducers, and successful results of sampling within TUs 12 and 13, pairs of these type transducers will be placed in the other turbine units. The transducers located upstream of the trashracks will then be removed.

One biologist and four biotechnicians will be involved with the field work.. Support personnel will be the program leader and a biostatistician. Technicians will read echograms and enter data into a computer in real-time.

Estimates of total numbers of juveniles entering all of the turbines will be used to generate distributions describing smolt passage across the powerhouse. Hourly discharges at all operating monitored turbine units will be used to estimate the density of fish passage into individual units to allow for uneven discharge across the powerhouse when describing the passage distribution.

Analysis of the hourly passage distribution for the 18 hours each day may reveal particular hours of the day when low passage regularly occurs. The powerhouse could be operated during these hours if this can be shown.

Another technique to provide a way to base decisions to operate the facility is to project daily passage estimates with the hourly data generated over previous days. This information could be used by managers to determine operation of the facility depending on how the estimates related to a pre-agreed upon 24-hour threshold or trigger number.

EQUIPMENT

1. Biosonics model 101 dual channel transceiver 420 Khz (1)
2. Biosonics model 101 single channel transceiver 420 Khz (1)
3. Biosonics model XMPX multiplexer (1)
4. Biosonics model 111 thermal chart recorder (1)
5. Ross chart recorder model 250E (2)
6. Columbia Model 1600 computer sys. (1)
7. Biosonics transducers 15 deg. (8)
8. Biosonics transducers 6 by 12 deg. (16)
9. Biosonics dual beam transducer 15 deg.
10. Oscilloscope (1)
11. Biosonics model 165 recorder interface (1)

12. Biosonics model 181 dual beam processor (1)

13. Miscellaneous cables and deployment gear

MONITORING SCHEDULE

Monitoring will be conducted from 28 March to 31 August, seven days per week, 18 hours a day (0600 h. to 2400 h.).

DATA ANALYSIS AND DISSEMINATION

Echogram information will be entered into an onsite computer hourly. An estimate of the total juvenile fish passage for that hour will be generated within 15 minutes of that hour. The following data will be available at the Reservoir Control Center (RCC) or on the Columbia River Operational and Hydromet Management System network within 24 hours of data collection.

1. Total numbers of smolts passing the second powerhouse in 24 hours.

2. The number and percentage of smolts passing the second powerhouse that went through the sluiceway.

COORDINATION

Program Coordinator: This person, stationed at Bonneville Dam will be responsible for planning, implementation, analysis and dissemination of results.

On-site Biologist: This person will provide coordination between program personnel and the project. This will involve the procurement of individual turbine discharges and on/off times from the control room operator and information on project activities which may impact data collection. This person will also furnish the daily results to the program coordinator. Coordination between the onsite biologist, reservoir control and the control room is necessary if operation of the powerhouse, based on hydroacoustic information, is implemented.

PROJECT IMPACTS/ASSISTANCE

Formulation of a dive plan to have transducers deployed at the upstream face, lower extremity of the bottom trash rack at each turbine unit will be needed. If elliptical transducers become available, deployment will require that STSs be raised to allow diver access to the turbine intake area. This would involve all eight turbines. At the sluiceway, the transducer support pipe on the sluice gate should be repositioned to the center of the gate. Also, fabrication of a suitable mount for a video camera to be attached to the lower STS will be needed.

Hourly discharge information for all turbine units and sluiceway will be provided by the control room operator to the FFU on-site biologist once each hour throughout the monitoring period. Necessary siting of monitoring trailers, restroom facilities, identification badges, parking, access to the project and keys will be requested.

APPENDIX 8

Dissolved Gas Monitoring Program

DISSOLVED GAS MONITORING PROGRAM FOR 1987

1. The main goal of the total dissolved gas (TDG) monitoring program conducted at specific sites in the Columbia and Lower Snake rivers is to gather data for use in scheduling project spills throughout the adult/juvenile fish passage season from April through August. Overall responsibility for the effort is handled by the North Pacific Division's (NPD) Water Quality Section with the cooperation of project personnel and other interested agencies.

2. The 1987 TDG Monitoring is scheduled to begin in mid-April and will run through August. The monitoring network will include 17 stations: ten Corps projects, two U.S. Bureau of Reclamation river locations, four PUD dams, and one fish release site; this is the same number of stations as in 1986. All the 1987 stations are automated except the four PUD dams. No changes in the general operational procedures are anticipated for this year.

3. Automated stations use a SUTRON Data Collection Platform (DCP) linked to a 3- or 5-Channel Tensionometer to read the desired water quality data every
3- or 5-Channel Tensionometer to read the desired water quality data every
hour and transmit them via satellite, at designated times, to the CROHMS data base. At non-automated stations, data are collected every four hours by project personnel for manual transmittal twice a day by CBT to CROHMS.

4. Data collected at either type of sampling station involves TDG and atmospheric barometric pressures, water temperature and selected project operational data. This information is used daily by the NPD Reservoir Control

Center (RCC) and the Fish Passage Center (FPC) to (1) guide in-season project spill decisions, and (2) develop long-range optimum spill allocation procedures to minimize spill impacts on other project functions.

5. The following tabulation lists the stations and location of instruments proposed for the 1987 monitoring program.

Monitoring Station	Location	Owner	Tensionometer Model	
CIBW	Columbia R. at Boundary (1)	USBR	TGO-FT	(4-Ch)
CCGW	6 miles downstream of Grand Coulee Dam (1)	USBR	TGO-FT	(4-Ch)
CHJ	Forebay (1)	NPD/BPA	TBO-FTR	(5-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 (2)	Forebay (1)	NPD	TGO-FTR	(5-Ch)

LGS (2)	Forebay (1)	NPD	TGT-FR	(3-Ch)
LMN	Forebay (1)	NPW	TGO-FTR	(5-Ch)
IHR	Forebay (1)	NPW	TGO-FTR	(5-Ch)
MCQW	Forebay -- Washington Side Fishladder (jl)	NPD/BPA	TBO-FTR	(5-Ch)
MCQO	Forebay -- Oregon Side Powerhouse No. 1 (1)	NPD/BPA	TBO-FTR	(5-Ch)
JDA	Forebay (1)	NPD	TGO-FTR	(5-Ch)
TDA	Forebay (1)	NPD	TB-F-001	(3-Ch)
BON	Forebay (1)	NPD	TB-F-002	(3-Ch)
WRNO	Warrendale, Oregon (Covert's Landing 6 miles downstream of Bonneville Dam) (1)	NPD	TBO-FTR	(5-Ch)

NOTES:

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

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

APPENDIX 9

Changes to FISHPASS Model for 1987

(

TABLE-FISHPASS MODEL IMPROVEMENTS
Parts Affected

PROGRAM CHANGES/ADDITIONS		Program Features: 1986 Version	Program Features: 1987 Version
1. Power Calculation: MW/Month and GWH	Program	None	Calculate MW/ month and GWH for each project; MW and GWH for GWH for the system.
2. Sliding Scale For Spill	Program + Data	None	Calculate daily spill for any given period using survival % FLOW specified by the user.
3. Uniform Diel Distribution used for IHR and TDA	Data	Optional	Optional
4. Sluiceway Simulation	Program	First remove fish going thru sluiceway from incoming fish.	First remove fish going over spillway from incoming fish
5. Daily Spill Duration Affects percent of daily fish totals involved	Data	1800-0600 (hrs)	1900-0300 (hrs)
6. Spill Period	Program	Spill based on meeting survival target for the season.	Spill based on meeting target during specified start/end days.
7. Variable Powerhouse Hydraulic Capacity	Program + Data	Hydraulic Cap. Fixed for the season.	Variable hydraulic capacity to reflect Unit Outage.
8. Inadvertent Spill	Program	No distinction	Weed out Spill caused by Flow exceeding hydraulic capacity in calculation of MW Spilled.
9. Additional Intermediate output	Program		Optional listing of inflows, spills, survival, energy production and inadvertent spill.

APPENDIX 10

Columbia Basin Fish and Wildlife Authority Spill Criteria for 1987 Juvenile Migrations.

The following material was attached to correspondence received from the Columbia Basin Fish and Wildlife Authority on March 30, 1987.

VI. Spill Criteria for the 1987 Juvenile Migrations

Lower Monumental Dam

Spill at Lower Monumental will be managed according to typical dates of migrations, passage indices at Little Goose Dam, hydroacoustic monitoring and gatewell dipping at Lower Monumental, and hatchery release information.

1. Typical dates of passage are based on five years' data from Little Goose with a lag period of two and three days for yearlings and subyearlings, respectively. The dates for the 10th and 90th percentiles from these data are as follows:

Approximate passage dates at Lower Monumental Dam, 1982-1986.

	Yearling Chinook Percent of Run Past Dam		Subyearling Chinook Percent of Run past Dam	
Year	10%	90%	10%	90%
1982	26 April	19 May	24 June	12 July
1983	15 April	25 June	4 July	11 July
1984	19 April	18 June	13 April	3 July
1985	25 April	1 June	2 July	22 July
1986	22 April	3 June	N/A	N/A

These dates vary not only as a result of yearly variations in migration timing, but also from changes in sampling methods and duration of sampling at Little Goose. The Corps of Engineers suggests that the data from 1983 and 1984 are not useful in this analysis because sampling operations in these years are inconsistent with 1987 planned operations.

In 1986 subyearling and yearling chinook counts were not consistently separated at Little Goose. All chinook will be grouped in a single category in 1987. Hence, dates of passage for summer migrants cannot be based on Little Goose subyearling chinook counts. A Lyons Ferry Hatchery release of subyearling chinook occurred June 7-10, 1986. Based on mark recoveries from gatewell dipping at Lower Monumental, approximately 10 percent of these fish passed Lower Monumental by June 16 and 90 percent by July 23. In 1987 the Lyons Ferry Hatchery will try to release subyearling chinook as early as June 1. For these reasons, typical dates of passage for summer migrants cannot be established.

Typical dates of passage at Lower Monumental for spring migrants entering the Snake River above Little Goose Dam are estimated to be April 20 through May 31. Spill may be required before April 20 if early releases from Lyons Ferry (presently, scheduled release is April 15) arrive at Lower Monumental prior to April 20. As described in the previous paragraph, summer migrant passage dates are less certain. If the Lyons Ferry Hatchery release occurs on June 1, we expect that 80 percent of these fish should pass Lower Monumental between June 1 and July 15.

2. Hours of spill will be based on sonar and gatewell monitoring. At the start of the season, spill will occur for twelve hours, from 1800 until 0600, until a distinct diel passage pattern is discernible. The Corps of Engineers (Corps) and Fish Passage Center (FPC) will review sonar data and joinly agree to adjust hours to match peak passage periods. Decisions will be based on 24 hour sonar and gatewell monitoring of hourly passage through the powerhouse.

3. A spill trigger for spring migrants was developed from collection indices at Little Goose Dam. Spill will be provided at Lower Monumental when one or more of the following criteria are valid:

   a. The passage index at Little Goose for the aggregate number of chinook, sockeye, coho and steelhead is equal to a greater than 15,000. Two days after the 15,000 trigger is reached at Little Goose, spill will begin at Lower Monumental.

   b. Lyons Ferry or other hatchery fish are released and appear at Lower Monumental as indicated by hydroacoustic data and recovery of marked fish in gatewell dipping. Two days after Lyons Ferry fish are released, spill will begin at Lower Monumental.

   c. Unusual migration patterns are evident that would prevent the use of the criteria described in items a and b from protecting 80 percent of the spring and summer migrations.

The FPC will notify the Corps when spill is needed to protect fish as described under items b and c. The trigger criteria are effective from the first through the final days of monitoring. Regardless of what trigger is used, there must be adequate in-season flexibility to consider and act on other relevant data.

Daily spill will be terminated at Lower Monumental when all measures of fish passage indicate that no fish are present:

> The passage index at Little Goose for all yearling chinook, sockeye, and coho salmon and steelhead is less than 15,000 for three consecutive days and the passage index of marked fish from Lyons Ferry Hatchery that are

recovered in Lower Monumental gatewell monitoring is less than five per day for at least three consecutive sampling days. With a two-day lag period, spill will be terminated on the sixth day after the passage index first drops below the trigger number.

Ice Harbor Dam

Spill at Ice Harbor will be managed according to typical dates of migrations, passage indices at Little Goose Dam, and hatchery release information.

1. Typical dates of passage are based on five years' data from Little Goose with a lag period of five and seven days for yearlings and subyearlings, respectively. The lag period for Ice Harbor is derived from the same travel time data (1984 and 1985) as for Lower Monumental. The dates for the 10th and 90th percentiles from these data are as follows:

   Approximate passage dates at Ice Harbor Dam, 1982-1986.

	Yearling Chinook Percent of Run Past Dam		Subyearling Chinook Percent of Run Past Dam	
Year	10%	90%	10%	90%
1982	29 April	22 May	28 June	16 July
1983	18 April	28 June	8 July	15 July
1984	22 April	21 June	17 April	7 July
1985	28 April	4 June	6 July	26 July
1986	25 April	6 June	N/A	N/A

These dates vary not only as a result of yearly variations in migration timing, but also from changes in sampling methods and duration of sampling at Little Goose. The Corps of Engineers (Corps) suggests that the data from 1983 and 1984 are not useful in this analysis because sampling operations in these years are inconsistent with 1987 planned operations.

Typical dates of passage at Ice Harbor for spring migrants entering the Snake River above Little Goose are estimated to be April 23 through June 3. Spill may be required before April 23 if early releases from Lyons Ferry (presently, scheduled release is April 15) arrive at Ice Harbor prior to April 23. As described for the spill criteria at Lower Monumental, summer passage dates are less certain. If the Lyons Ferry Hatchery release occurs on June 1, we expect that 80 percent of these fish should pass Ice Harbor between June 4 and July 18.

2. Hours of spill. Spill will occur for twelve hours, from 1800 until 0600. In the absence of real time monitoring data, there will be no basis for compressing spill hours to economize the program.

3. A spill trigger for spring migrants was developed from collection indices at Little Goose Dam. Because there will be no monitoring of fish passage at Ice Harbor in 1987, spill will begin in accordance with a trigger at Little Goose for spring migrants and the triggers for spill at Lower

Monumental designed to protect Lyons Ferry Hatchery fish. Spill will be provided at Ice Harbor when one or more of the following criteria are valid:

a. The passage index at Little Goose for the aggregate number of chinook, sockeye, coho and steelhead is equal to or greater than 15,000. Five days after the 15,000 trigger is reached at Little Goose, spill will begin at Ice Harbor.

b. Spill is triggered at Lower Monumental as a result of Lyons Ferry Hatchery releases. Three days after spill is triggered at Lower Monumental, spill will begin at Ice Harbor.

c. Unusual migration patterns are evident that would prevent the use of the criteria described in items a and b from protecting 80 percent of the spring and summer migrations.

The FPC will notify the Corps when spill is needed to protect fish as described under items b and c. The trigger criteria are effective from the first through the final days of monitoring. Regardless of what trigger is used, there must be adequate in-season flexibility to consider and act on other relevant data.

Daily spill will be terminated at Ice Harbor when all measures of fish passage indicate that no fish are present:

The passage index at Little Goose for all yearling chinook, sockeye, and coho salmon and steelhead is less than 15,000 for three consecutive days <u>and</u> spill for Lyons Ferry Hatchery fish is terminated at Lower Monumental. With a five-day lag period, spill will be terminated on the ninth day after the passage index first drops below the trigger number at Little Goose or three days after spill is terminated at Lower Monumental.

<u>John Day Dam</u>

Spill at John Day Dam will be managed according to typical dates of the subyearling chinook migration, the passage index at McNary Dam, hydroacoustic monitoring and the unit 3 airlift index at John Day Dam, and hatchery release information.

1. <u>Typical dates of passage</u> for subyearling chinook at John Day Dam are based on a review of the unit 3 gatewell data for 1981-86. For planning purposes the period estimated to encompass 80 percent of the typical summer migration at John Day Dam is June 7 - August 21.

2. <u>Hours of spill</u> will be based on sonar and gatewell monitoring. At the start of the season, spill will occur for twelve hours, from 1800 until 0600, until a distinct diel passage pattern is discernible. The Corps of Engineers (Corps) and Fish Passage Center (FPC) will review sonar and gatewell data and joinly agree to adjust hours to match peak passage periods. Decisions will be based on 24 hour sonar and gatewell monitoring of hourly passage through the powerhouse.

3. Spill Triggers were developed for both the hydroacoustic monitoring and the unit 3 airlift index. Spill will be provided at John Day Dam whenever one or more of the following criteria are met:

   a. Hydroacoustic monitoring indicates that total daily project passage will meet or exceed 30,000 fish.

   b. The unit 3 airlift index (that is the number of fish captured in the gatewell divided by the percent of project flow discharged through unit 3) met or exceeded 7500 subyearling chinook salmon on the previous day.

   c. Unusual migration patterns are evident that would prevent the use of the criteria described in items a and b from protecting 80 percent of the summer migration.

The FPC will notify the Corps when spill is needed to protect fish as described under items b and c. The trigger criteria are effective from the first through the final days of monitoring. Regardless of what trigger is used, there must be adequate in-season flexibility to consider and act on other relevant data.

Daily spill will be terminated at John Day Dam when all measures of fish passage indicate that no fish are present.

The Dalles Dam

Spill at The Dalles will be managed according to sampling in the McNary collection system, gatewell airlift sampling at John Day, and hydroacoustic monitoring at John Day.

1. Typical dates of passage for 80 percent of the spring and summer migrants were determined from review of sluiceway research data at the The Dalles, review of gatewell and hydroacoustic information at John Day, and McNary collection/passage indices. Review of 1977-1982 sluiceway data indicates that the earliest date for the 10 percent passage point at The Dalles is April 30 for the spring chinook migration and April 15 for steelhead. Typically the mid-80 percent of the spring migration passes The Dalles from the first week in May to the first week in June. The latest date that the 90 percent point of passage has occurred for steelhead is June 8 and for spring chinook is June 11.

   Sluiceway studies at The Dalles have produced scant quantifiable data regarding the summer migration. It appears that few summer migrants utilize the sluiceway. Monitoring at John Day, however, gives some indication of summer migration timing. The mid-80 percent of the summer migration at John Day typically occurs from the second week in June to the third week in August. Spill for summer migrants at The Dalles will be cut off at August 15, as determined by the NPPC.

2. In the absence of any monitoring program at The Dalles Dam in 1987, hours of spill will have to be based on existing data. Previous

studies in the sluiceway at The Dalles Dam indicate that fish released during the night at John Day Dam would enter the sluiceway at The Dalles the following morning. Those same studies indicated that sluiceway passage was highest during daylight hours and near nothing at night. Hydroacoustic data collected at The Dalles Dam in 1986 indicates that in May and June there is a peak of movement past the project in the morning and second peak in the evening. In May, this was true even when considering only the movement of fish through the turbines. The 1986 hydroacoustic data from July and August, however, showed pronounced peaks in fish movement (both for total passage and for the turbines only) in the evening hours.

In view of the above, we believe that there is substantial daytime passage at The Dalles Dam in spring, and significantly less daytime passage in summer. We believe that what is really needed at The Dalles Dam is to test a 24 hour spill program with monitoring in place to assess the resulting fish passage patterns. Without this information, it is not possible to design a spill program at The Dalles that will economize the use of spill to the greatest extent practicable.

Since there will be no hydroacoustic monitoring in 1987, we believe that the hours of spill must encompass the broadest range of possible conditions. Therefore, we recommend that a 24 hour per day spill program be instituted during the spring of 1987, and a 12 hour per day spill program be implemented during the summer of 1987. In spring, the 20 percent daily average spill estimated in Attachment 1 will be requested as 20 percent of instantaneous flow 24 hours per day. In summer, since there is some indication of reduced daytime passage and since we are concerned that the extremely low daily average spill level may provide inadequate protection if extended over the entire day, we will request that the daily average flow needed to meet the 50 percent fish passage efficiency be concentrated between 1800 and 0600 hours.

3. <u>Spill triggers</u> For the spring migration, spill will be initiated five days after the first 10 percent of the yearling chinook migration has passed McNary Dam, as determined by the agencies and tribes. Hatchery releases into the John Day and The Dalles pools will also be factored into the above determination. We expect that spill will continue through the spring migration until the time the summer migration is in place. For the summer migration, spill will be provided every night following days of estimated passage in excess of 30,000 at John Day Dam.

APPENDIX 11

Corps Responses to Comments on the Draft 1987 JFPP

Response to Comments

Comment

PNUCC indicated that the Corps should critically review BPA's analysis as they concluded that BPA does not support additional planned spill beyond current 90% percent base plan, because PNUCC believes that the data clearly shows the benefits are too minimal to justify the major cost they would incur.

Response

The analysis prepared by BPA is a combination of data prepared by the Corps and the Power Planning Council. We have reviewed their comments and also find that the increase in smolt survival is low and the lost revenue could be several million dollars. However, the Corps believes that using their test spill plan in 1987 will provide an opportunity to determine if it is practical to operate to such a plan and as the Corps studies indicate the expected revenue loss is less than $1 million. Using hydroacoustics at Lower Monumental and John Day will provide the Corps with a mechanism to lower the revenue losses further.

Comment

The starting point and slope of the test sliding scale spill plan are according to PNUCC too liberal towards fishery interests.

Response

In preparing the test sliding scale spill plan the Corps considered input from the A&T, PNUCC, BPA, and the PPC. We believe the test plan is set at a level that will provide a benefit to the fishery while trying to minimize the revenue loss to BPA.

Comment

PNUCC expressed concern about being able to use two sliding scale spill curves and providing spill when the Water Budget is exhausted but water is still being released to help the fishery.

Response

The plan in 1987 will be a test to see if such curves can be used as a practical set of guidelines.

Comment

PNUCC recommended that their concept of equitable sharing of water between the needs of the fish and power system be used to develop the test curves for the 1987 plan.

Response

The curves in the Corps test plan are in between the curves desired by the A&T, the concept recommended by PNUCC. As stated earlier the test curves are expected to provide an opportunity in 1987 to see if the concept of using sliding scale spill plan is practical.

Comment

PNUCC supports testing the affect of using Bonneville II during daylight hours on juvenile passage. In addition they recommend that the Corps make the data available as soon as it is available and conduct discussions about the tests.

Response

A study using Bonneville II will be conducted this spring and summer. The study plan is shown in Appendix 6. Results of the tests will be made available to interested parties.

Comment

PNUCC is concerned about the potential impact on the power system reliability during periods when the powerhouses at John Day and Lower Monumental would be shut down to provide a high spill level.

Response

The test sliding scale spill plan causes high spill levels when trying to reach upper levels of the test spill criteria. It is the Corps' intention to place system reliability above providing spill that would increase juvenile survival level above 90%.

Comment

PNUCC recommended that the test plan be clarified by specifying the instantaneous spill levels required to obtain the survival levels indicated on test plan graphs. Also, PNUCC expressed concern that the spill requirements at The Dalles were not clear.

Response

Graphs showing the instantaneous spill/survival relationship for The Dalles, John Day, and Lower Monumental have been added to Appendix 6. The spill levels at The Dalles have also been added to the test plan as have additional criteria for John Day and Lower Monumental. The spill level at The Dalles in 1987 resulting from the test plan is expected to be low. Therefore, no monitoring is scheduled for The Dalles. Without monitoring the Corps is planning to spill during the nighttime (generally between 2100 and 0600 hours) on those days determined by using the test plan and when the trigger shown in Appendix 6 is met.

Comment

The fishery agencies and tribes express concern that the Corps' proposed test operation of Bonneville second powerhouse is not consistent with the Council's program and that the 750 fish per hour cutoff criteria for the test is not supported by biological data.

Response

The Corps' test operation of the second powerhouse is being conducted under the umbrella of research activities at Bonneville Dam (404) (b) (5). The research is intended to determine the survival levels of fish passing the project and where necessary to improve it. As such this test is viewed by the Corps as being consistent with the Council's program. The Corps agrees that fish passage criteria should be supported by data. For that reason a monitoring study will be incorporated into the test operation. This monitoring study is described in Appendix 6.

Comment

Fishery agencies and tribes commented that the Corps' sliding scale spill fails to treat fish in a manner that is equitable during periods when nonfirm power is available.

Response

The Corps' sliding scale spill test plan with 1939 water provided only a small increase (21,000 juvenile fish) in juvenile protection but it was not much different from the small increase (51,000 juvenile fish) provided from the fishery agencies and tribes plan we tested considering the number of fish surviving to below Bonneville dam in the study was over 29,000,000, Table 6 of draft 1987 JFPP. Using the additional revenue loss between the 90% survival study and the study using the Corps plan or the fishery agencies and tribes plan and an adult return rate of 1% to Bonneville, the Corps' estimate of the value of each fish in this additional group of returning adult fish would be about $3500. Additional spill is not the answer to significantly increasing the run size.

The support for using the starting points shown on the Corps sliding scale test plan are discussed in Section 12 of the 1987 JFPP.

Comment

The fishery agencies and tribes commented on the "BPA Analysis of Sliding Scale Spill Proposals" in Appendix 2.

Response

This analysis is included in Appendix 2 as part of the comments received by the Corps during the development of the 1987 JFPP. Since this is BPA's analysis we have referred this comment to BPA for response. However, with reference to the last sentence of paragraph one of the comment, there is an alternative means of significantly improving juvenile survival which the fishery agencies and tribes have chosen not to use, i.e., maximizing transportation.

Comment

The fishery agencies and tribes commented that "despite the conservatism built into the Corps' sliding scale proposal, the JFPP further undercuts the effectiveness of the sliding scale plan by providing for its implementation only at the discretion of the Corps."

Response

The Corps is concerned about providing protection for juvenile fish and improving survival levels at their projects. The Corps is also concerned about providing for all project functions and is responsible for the operation of its project. Therefore, the Corps will retain discretionary control of these projects. Input from fishery agencies and tribes and BPA will be considered before making changes to our JFPP, the sliding scale spill test plan and operation of Bonneville second powerhouse.

Comment

The fishery agencies and tribes have indicated that they will establish priorities for the use of spill.

Response

This comment does not apply to the JFPP. The Corps will test the sliding scale in 1987 at three projects: The Dalles, John Day, and Lower Monumental. Spill that occurs at other projects will be in excess of that projects hydraulic capacity or an amount assigned to that project to spread out the concentration of dissolved gas.

Comment

The fishery agencies and tribes state that the JFPP should include all of the assumptions that were used in the (FISHPASS) computer analyses. Further they question the input to and the results of FISHPASS modeling.

Response

The general question of computer modeling in analyzing fish passage has been argued at length by the various entities involved in the juvenile fish passage effort. We can add nothing further to that issue other than to reiterate the Corps' position that computer modeling (FISHPASS) is the best tool we have of weighing bypass alternatives. The assumptions used in the FISHPASS modeling for the 1987 plan were made available to the technical workgroup. These assumptions are available in the 1986 bypass plan with changes listed in the 1987 plan. The assumptions used are also available at the Corps' NPD office.

Comment

The fishery agencies and tribes' state that the use of survival values for juvenile fish originating from all locations above Bonneville Dam to below Bonneville Dam are misleading.

Response

System survival is intended in the plan to mean total system survival. That includes all fish above Bonneville Dam, not just upriver Snake and Columbia River fish. In that respect tables 5, 6, and 7 are accurate. However, we recognize the fishery agencies and tribes concern to ensure adequate protection for stocks of upriver fish. In this regard the plan includes project specific survival criteria of a least 90% per dam at all dams and a transport program at Lower Granite, Little Goose and McNary Dams.

Comment

The fishery agencies and tribes recommend that spill provided at The Dalles Dam during the spring period be a constant percentage of discharge for 24 hours per day.

Response

This recommendation is not consistent with the Council's MPAC agreement nor with previous recommendations of the fishery agencies and tribes. It has been generally agreed that spill provided during the daylight hours competes directly with the most effective passage hours of the ice/trash sluiceway. Further, spreading spill out over 24 hours results in a reduced instantaneous volume. This was shown to be a less effective use of spill during 1986 hydroacoustic tests.

Comment

The fishery agencies and tribes indicated that Table 8 would be more useful if the FELCC impacts were project specific.

Response

BPA has an FELCC that is to met by the Federal system of projects, thermal resources, purchases, etc. FELCC is not project specific but the result of a system operation.

Comment

At The Dalles, John Day, Ice Harbor, and Lower Monumental, the fishery agencies and tribes have recommended that the following sentence be added to the JFPP:

> Spill will also be provided at the request of the Fish Passage Managers if unusual migration patterns are evident that would prevent the use of the stated spill criteria from protecting 80 percent of the spring and summer migrations.

Response

Spill requests made by the Fish Passage Center outside the JFPP will be considered for implementation by the Corps. Several special operations have been made in previous years to assist the juvenile migration. Already in 1987 special operations were conducted at the Lower Columbia River projects to reduce the use of Bonneville powerhouse II and the Corps increased releases from Dworshak and Dexter to help protect hatchery releases.

Comment

The fishery agencies and tribes requested spill at The Dalles, John Day, Ice Harbor, and Lower Monumental be provided in accordance with the sliding scale spill formula.

Response

Spill at these projects will be as specified in the JFPP and in the test plan shown in Appendix 6.

Comment

Fishery agencies and tribes recommended the following language be added for Bonneville ...."Beginning on the day following the early spring release of fall chinook from Spring Creek Hatchery and continuing for at least 10 days and longer as need".. to curtail the operation of unscreened units and Bonneville second powerhouse.

Response

This is a new proposal that surfaced with this year's Spring Creek Hatchery release. It was not part of the Portland O&M Plan for Bonneville discussed with fishery agencies and tribes last fall and winter. The Corps has agreed to the fishery agencies and tribes' request for curtailed operation at Bonneville for the day of and four days thereafter. Monitoring in the DSM of the first powerhouse this year indicated the major passage occurred the day after the release (March 20). There may have been greater numbers passing on the weekend but NMFS did not sample over the weekend and was able to get only one sample on Monday, March 23, before the DSM failed. When sampling was resumed on March 25 the passage rates were very low indicating the fish had passed in five days or less. The Corps will continue to provide 5 days of curtailed operation for this early release from Spring Creek Hatchery and will evaluate request for extension of this operation on a case-by-case basis.

Comment

The fishery agencies and tribes have stated that in the absence of any monitoring at The Dalles Dam, spill for the spring migration will be initiated five days after the first 10 percent of the yearling chinook migration has passed McNary Dam, as determined by the fishery agencies and tribes on the basis of time-series analysis and consideration of hatchery releases into John Day and The Dalles pools.

Response

The Corps will use this suggestion and also the fish passage index at John Day as no monitoring is planned at The Dalles.

Comment

The fishery agencies and tribes commented that the Corps' spill trigger at John Day of 30,000 fish based upon hydroacoustics or airlift index was inappropriate when used as an airlift index.

Response

The 1987 JFPP has been revised to reflect this comment.

Comment

The fishery agencies and tribes state a concern that the Ice Harbor survival levels predicted by FISHPASS are too high. This is caused, according to the fishery agencies and tribes, because the ice-trash sluiceway fish bypass efficiencies used in the model are too high.

Response

The ice-trash sluiceway efficiency used in FISHPASS represented the best available data as of 1986 for the operating conditions (51% at 2700 cfs) as was decided in the MPAC process. Data collected in 1986 for this same condition now suggest that the efficiency may actually be in the range of 60-70%. The Corps agrees that most data for sluiceway fish passage efficiency is for yearling salmon and steelhead. There is some limited data for the Dalles Dam in 1986 that suggests a higher efficiency for fall subyearlings. This would be consistent with Ice Harbor data that shows better ice-trash sluiceway efficiency for the smaller young chinook than for steelhead. Nonetheless, lacking direct evidence of fall chinook guiding efficiency through the sluiceway, the Corps has decided to use the 51% efficiency for all species. As noted above this value is expected to be a conservative level.

Comment

Fishery agencies and tribes proposed spill criteria at Lower Monumental based on a Little Goose passage index of 15,000 juveniles.

Response

The Corps will have 24-hour-a-day hydroacoustic monitoring at Lower Monumental and spill will be based on 15,000 juvenile passage at Lower Monumental.

Comment

Fishery agencies and tribes wanted special spill to be provided when Lyons Ferry or other hatchery releases appear at Lower Monumental.

Response

The Corps will consider spill when Lyons Ferry Hatchery fish are released and appear at Lower Monumental as indicated by hydroacoustic data and spill trigger numbers.

Comment

The fishery agencies and tribes recommend that the 1000 juvenile fall chinook criteria for spill during the summer period at Lower Monumental Dam be dropped and that special requests from the FPC be used to guide summer spill operations at Lower Monumental Dam.

Response

The Corps concurs in this recommendation. The RCC will work with the FPC in considering and implementing summertime spill requests. Special spill operations will also be considered for the Lyons Ferry Hatchery releases.

Comment

The fishery agencies and tribes wanted spill at the start of the season to occur from 1800 until 0600 hours at Lower Monumental. They also commented that instantaneous spill percentage during spill hours be such as to result in the daily average spill rate requested by the fishery agencies and tribes.

Response

The Corps will have 24-hour-a-day hydroacoustic monitoring at Lower Monumental. When hydroacoustic monitoring indicates 15,000 juveniles passing the project, spill will begin at 2000 hours and continue for at least 3 hours. Additional hours of spill will be dependent on numbers of fish passing the project and through the spillway. Instantaneous spill percentage indicated in the plan will be based on instantaneous project discharge.

Comment

The fishery agencies and tribes have indicated that typical dates of passage at Lower Monumental are estimated to be April 20 through May 31 for the spring migrants, and approximately June 1 through July 15 for the summer migrants. Substantial fish passage may occur outside these dates depending on hatchery release dates and fish travel times.

Response

The Corps will add similar criteria to the JFPP.

Comment

The fishery agencies and tribes have indicated that they will be requesting spill at Little Goose and Lower Granite to improve passage conditions for yearling chinook.

Response

Little Goose and Lower Granite are important juvenile collection/transport projects and therefore will spill only when the flows exceed the project hydraulic capacity.

Comment

BPA commented that the sliding scale spill above the 90 percent minimum dam survival level shows that the fisheries benefits are too minimal to justify the costs they would incur. Also, BPA indicated that they are more cost-effective means of increasing fish production with the limited financial resources of the region.

Response

The Corps concurs with the comment that there are more cost-effective ways of increasing fish production. We are continuing to work on providing necessary juvenile bypass systems at our projects and reducing the amount of spill occurring at our projects to protect downstream migrants. However, they cannot be implemented in 1987. Therefore, this year we are including a test plan that would provide additional spill for juvenile protection when the regulated flows produce more power than required to meet BPA's FELCC. As stated in our plan we will be considering other factors including: number of fish at the projects, power marketing conditions, refill requirements, dissolved gas content, etc.