FISH PASSAGE IMPROVEMENTS AT THREE MILE FALLS DIVERSION DAM, UMATILLA RIVER, OREGON

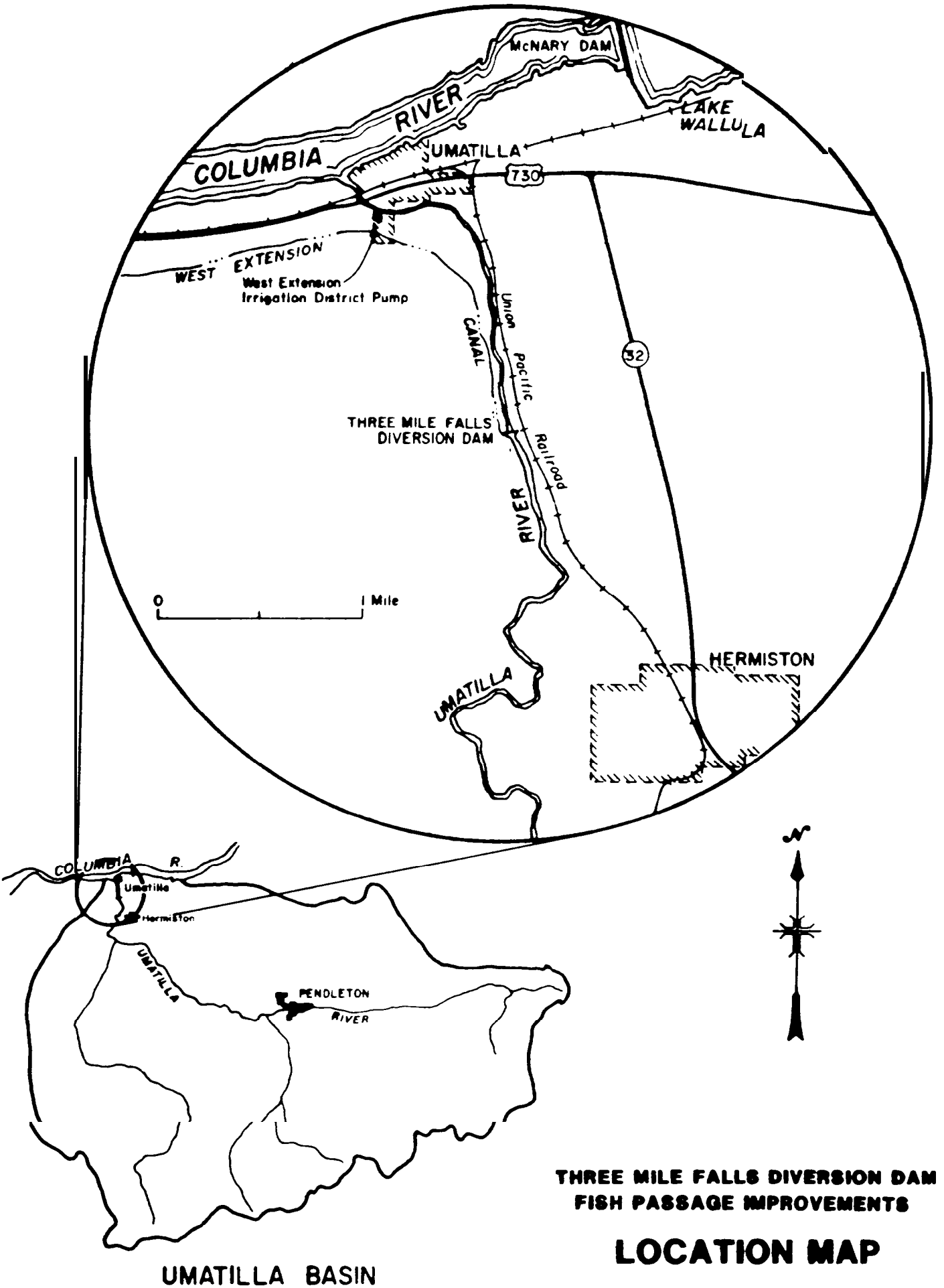
Bureau of Reclamation
Pacific Northwest Region
Boise, Idaho

Final Completion Report

To

Bonneville Power Administration
Division of Fish & Wildlife
Project Manager: Tom Vogel

Project No. 83-436
Contract No. DE-AI79-83BP17463
May 1985



THREE MILE FALLS DIVERSION DAM
FISH PASSAGE IMPROVEMENTS

LOCATION MAP

November 1984

SUMMARY

In June 1984 an interagency agreement between Bonneville Power Administration (BPA) and the Bureau of Reclamation was signed which directed Reclamation to (1) coordinate a thorough biological assessment of fish passage problems and needs at Three Mile Falls Diversion Dam, located on the lower Lhnatilla River, among the fishery agencies and the Confederated Tribes of the Umatilla Indian Reservation (CTUIR) and (2) conduct a feasibility study of alternative plans to meet these needs.

This report contains the results and conclusions from the biological assessment and outlines several alternative plans for solving fish passage problems at the dam. A recommended plan, based on consensus of the fisheries agencies and the tribes, is described, and the rationale for that decision is discussed. Data needs for final designs, a tentative construction schedule, and a discussion of operation and maintenance needs are presented.

Historically, the Lbnatilla River produced large numbers of summer steelhead and fall and spring chinook salmon. The construction of Three Mile Falls Diversion Dam, in combination with other upstream irrigation project development, eliminated all chinook salmon and drastically reduced runs of summer steelhead. Steelhead runs have averaged less than 2,090 returning adults for the past 14 years.

The provision of improved fish passage facilities under existing flow levels would significantly reduce or eliminate losses of adult salmon and steelhead below the dam and reduce delays in adult passage. The inclusion of trapping and counting facilities would permit the selection of adults for brood stock without severely delaying or excessive handling of fish, enhance the trapping of adults to be hauled to suitable spawning areas, and provide for total counts by species to and in the evaluation of all other fish enhancement projects. [This would be a valuable tool in the evaluation of program success and would allow proper crediting to ratepayers for projects accomplished under section 4(h) of Public Law 96-501.] Passage efficiency for juvenile fish would be improved.

Three Mile Falls Diversion Dam was constructed in 1914 by the Bureau of Reclamation as an integral part of the Umatilla Project. The dam is owned by Reclamation, with operation and maintenance responsibilities being handled primarily by the West Extension Irrigation District (WEID). The dam is a concrete buttress dam with a maximum height of 24 feet and a crest length of 915 feet.

Existing fish passage facilities include East Ladder, West Ladder, and louver screen. The East Ladder was built during the initial construction in 1914. Additional weirs were constructed at the toe of the dam as part of the ladder in 1963. This ladder is an overflow weir type. It was taken out of service in 1964 by backfilling it with earth but was reopened in 1984. Successful passage of steelhead has occurred when riverflows exceed 500 cubic feet per second (ft^3/s). Primary problems associated with the East Ladder include false attraction flows along the face of the dam just west of the ladder entrance, obstructions in the channel below the entrance to the ladder, and sedimentation along the upstream face of the dam near the exit (upstream end) of the ladder. Also, the ladder does not contain trapping, holding, or

counting facilities. No additional attraction water is provided to the ladder entrance.

The West Ladder on the left abutment of the dam is a vertical slot-type structure which was completed in August 1964. It has twenty-one 8-foot by l0-foot rectangular concrete pools. The floor slopes and the slots in the pools extend to the floor. The ladder is operated during periods of upstream anadromous fish migrations and uses about 20 to 40 ft /s for ladder operation depending upon forebay depths. When there is a difference of 20 feet between the forebay and tailwater, the ladder will operate with about l-foot difference in water level between pools. A 12-inch-diameter pipe routes water from inside the upper pool through a diffuser in the lower pool to provide about 15 ft^3/s of additional attraction flows for adult anadromous fish.

The ladder is not designed for trapping, counting, and holding of adult anadromous fish. An electronic counter operated at the head of the Uest Ladder for several years but has not been used recently. This counter was difficult to calibrate and gave inconsistent results. Consequently, a temporary conduit fyke-type trap is used in the upper four pools of the ladder for annual counting of summer steelhead. The pools are then partially dewatered, and the fish are individually dip-netted, counted, and passed over the dam. Steelhead brood stock selection (for the juvenile supplemental outplanting program) also occurs in this manner. Downstream juvenile migrants are passed either over the crest of the dam or through a bypass pipe that collects those fish which have been screened from the canal entrance.

The louver is mounted at the intake of the UEID Canal at the left abutment of the dam. It is approximately 30 feet long and consists of a series of fixed metal slats spaced about 1 to 2 inches apart. It prevents most steelhead smolts from entering the canal and directs them to the entrance of the bypass pipe.

During 1954, modifications were made to the Umatilla River channel below Three Mile Falls Diversion Dam to improve upstream fish passage. This work, overseen by the Corps of Engineers and Oregon Department of Fish and Wildlife (ODFU), was about 90-percent complete at the end of the construction season in late 1984. A research project will be conducted in 1985 to monitor the success of this project over a range of flows. According to ODFW the river channel below the dam was observed to be a barrier to upstream passage of adult Salmon and steelhead at flows less than 200 ft^3/s, and flows up to 300 ft^3/s were assumed to limit passage. With channel work near completion, a flow of 100 ft^3/s was assumed to be the minimum flow needed for adult passage However, even with channel work, it is estimated that flows up to 150 ft^3/s will limit passage. Fish passage studies to be conducted in late 1985 should yield information on appropriate passage flow levels.

Adult steelhead use the lower main stem Umatilla River primarily as a migration corridor. Upstream migration begins as early as October, depending on flows, with the peak occurring between November and March. Most spawning occurs in April and May in the upper Umatilla River and its tributaries.

Egg incubation occurs from April through July. Most rearing takes place in the same tributary streams where spawning occurs. The juveniles typically spend 2 years in freshwater before migrating to sea as smolts. The estimated

annual outmigration of summer steelhead smolts is 50,000 to 100,000 native fish. This occurs during the period April through June. The ODFW began supplemental hatchery outplanting of juvenile steelhead in 1980. Since the program began, ODFW released about 17,500 steelhead smolts in 1981 59,500 in 1982, 60,500 in 1983, 58,000 in 1984, and 60,000 in 1985. The outplanted smolts are progenies of native adult fish trapped at Three Mile Falls Diversion Dam.

A self-sustaining run of fall chinook has not existed in the lhnatilla River since shortly after the construction of Three Mile Falls Diversion Dam. However, an abundance of potential spawning habitat fs found throughout the main stem lhnatilla River and in Meacham Creek.

Under a fish release program developed by CTUIR and ODFW, juvenile fall chinook have been liberated in the Umatilla River since 1982.

Once established, adult fall chinook will enter the Umatilla River in October through December, with most spawning expected to occur in November and December. Egg incubation takes place from December to mid-March, with rearing between February and the end of May. Fingerlings are expected to migrate downstream to the Columbia River in March through June.

Large numbers of spring chinook salmon existed in the Unatilla basin prior to construction of Three Mile Falls Diversion Dam. The ODFW reported small numbers of spring chinook in the system into the 1960's, but none have been observed since.

An implementation plan for enhancement of Umatilla River salmon and steelhead has been developed by the CTUIR. Long-term escapement goals presented in this plan are 5,400 hatchery-produced and 5,000 naturally produced adult summer steelhead, 10,000 hatchery-produced and 12,000 naturally produced adult fall chinook salmon, and 10,000 hatchery-produced and 1,000 naturally produced adult spring chinook salmon.

The Bureau of Reclamation recently completed a Planning Report/Environmental Statement on the Umatilla Project. This project emphasizes fishery flow measures to restore chinook runs and enhance steelhead runs in the Umatilla River basin. The plan's major feature and recommended plan of development is that of improving streamflows by "importing" water from the neighboring Columbia River. Water would be pumped from the Columbia River into Cold Springs Reservoir for distribution to irrigators. Use of this imported water by irrigators would permit Umatilla River water which is now diverted or stored for irrigation use to remain in the Umatilla River to improve flow conditions in the lower basin. Other measures would include fish passage improvements at four diversion points on the Umatilla River and a postproject fishery study.

Three Mile Falls Diversion Dam presents a major obstacle to both upstream and downstream migrating salmon and steelhead. As runoff increases to medium to high flows (about 500 ft^3/s or greater), a higher percentage of water spills over the crest of the dam, and attraction flows at both ladders become a smaller portion of the total flow. This creates a false attraction problem in the tailrace area. The resulting migration delay creates increased stress and mortality when fish jump and become trapped in the open bays beneath the

dam. An estimated 20 percent of 1982-83 steelhead return was lost because of these conditions at Three Mile Falls Diversion Dam. Migration delays for fall chinook would be even more harmful than for steelhead due to the relatively short period of time between migration and spawning.

The West Ladder is well designed for salmon and steelhead passage but lacks adequate attraction flows at the entrance during medium to high flows. The East Ladder is not adequately designed by today's standards. It has poor entrance conditions, poor turn pool conditions, poor exit conditions, and is not self-regulating. It also lacks adequate attraction water at all flow levels. Sediment naturally accumulates above the east side of the dam and restricts flow into the East Ladder, thus impeding fish passage. There are no trapping or counting facilities at the East Ladder and only marginal opportunities at the West Ladder.

Debris hanging over the dam crest and accumulating in the tailrace area impedes lateral movement of adult salmon and steelhead along the base of the dam. This situation, combined with insufficient attraction flows at the ladder entrances, also creates migration delay and stress. Accumulation of debris above the east side of the dam restricts the amount of flow entering the East Ladder. Failure to maintain control of debris above and below the East Ladder may cause stranding of adult fish.

Juvenile steelhead migrate downstream past Three Mile Falls Diversion Dam by passing over the crest, through the fish ladders, or through the smolt bypass pipe on the west side. The bypass pipe drops fish 20 feet into the tailrace area below the dam. This may cause injury, stress, and possible mortality to smolts, especially during low flow conditions when the bedrock area below the pipe does not contain adequate pool depths. This condition is even worse for those smolts passing over the crest of the dam. Smolts encounter the louver system at the intake of WEID Canal. Passage efficiency of this type louver system for steelhead smolts under ideal flow conditions is 70 to 95 percent. Passage conditions at Three Mile Falls Diversion Dam are probably near the low end of this range because of problems with the approach velocities, nonlaminar flows, and bypass slot velocities. This efficiency does not meet National Marine Fisheries Service (NMFS) criteria for screening facility design, which requires successful passage of all fish.

Passage efficiency of louvers for fall chinook migrants under ideal conditions would range from 40 to 90 percent. and for spring chinook 60 to 90 percent. The larger-sized yearling fall chinook smolt presently being released would likely be near the upper end of the range. However, future outmigrations of natural and hatchery fry and fingerlings of both fall and spring chinook would likely experience passage efficiencies near the lower end of this range.

This study considered several potential measures for fish passage improvement, including two fish ladders, a concrete apron plus improvements to the existing left bank ladder, a cap on the crest of the dam plus improvements to the left bank ladder, and dam removal.

The main feature of the two-fish ladder plan would be the construction of a new right bank ladder to improve fish passage. In addition, this alternative includes modifications to the existing left bank ladder and the

Installation of rotary drum fish screens and related structures in the WEID Canal. Total construction costs and annual operation and maintenance costs would be $3,475,009 an4 $66,000, respectively.[1/]

The concrete apron plus West Ladder alternative would consist of a training wall (barrier) and apron constructed downstream of the dam and the same modifications to the left bank ladder and new screens and related structures in the WEID Canal. Total construction costs would be $3,560,000, while annual operation and maintenance costs would total $55,000.

The cap-on-crest plus west ladder alternative would feature a concrete cap on the east and center portions of the dam along with the modifications to the left bank ladder and the new screens and related structures in the WEID Canal. Construction costs would total an estimated $2,985,000, while annual operation and maintenance costs would be $55,000.

The dam removal alternative would require the construction of a new pumping plant at the mouth of the Umatilla River to supply water to the WEID Canal. Fish passage in the river would be improved by restoring the river channel to predam conditions. This would require the removal of a portion of the dam and bedrock and/or silt removal behind the dam. No fish ladders would be required, and the canal headworks would be abandoned. Water normally diverted at the dam for irrigation would be allowed to pass downstream for improved fish flows, particularly during low flow conditions and high fish migration. Water for the WEID Canal would be supplied by the pumping plant.

The construction costs for the pumping plant and dam removal are estimated to be $8,280,000. Annual operation and maintenance costs were not calculated for this alternative.

The two-ladder plan was selected as the recommended plan by the fisheries agencies and the Lhnatilla Indian tribes.

Three other alternatives were considered in the earlier stages of this study but were eliminated for various reasons. These alternatives were (1) East Ladder only; (2) ladder at new location (i.e., middle of dam); and (3) center cap-on-crest with sill-type ladder on east side. The East Ladder only alternative was eliminated because it would abandon the best (left bank) existing ladder, and it was thought that a single ladder was not sufficient to meet fish passage problems. The middle ladder alternative was eliminated because of access and maintenance difficulties, particularly when trapping and counting fish. A middle ladder would require more water to operate and would be more costly than a bank ladder due to additional heights and strength requirements. The sill-type ladder was omitted because it would be more difficult to regulate flow, debris in the ladder would be a major problem, and trapping and sampling facilities would not be available.

Present operation and maintenance responsibilities are shared between UEID, ODFW, and NMFS. Estimated annual operation and maintenance expenses borne by WEID are 310,500, which is used for minor and ordinary maintenance and repair on gates, the louvers, and other structures.

1/ All costs cited in this report are based on January 1985 price levels.

The right bank ladder was reopened in 1984 after being out of service for 20 years. The left bank ladder is used to trap and count fish by partially dewatering it and dip-netting individual fish and passing them over the dam. The ODFW has responsibility for this activity, which requires about 50 man-days per year to accomplish.

The louvers were constructed by the Bureau of Commerical Fisheries (now NMFS) in 1961. Funding for annual maintenance and repair is passed to ODFU from NMFS in a program that includes fish screens throughout the Columbia Basin. No funding estimates are available for operation and maintenance on the louvers.

Specific operation and maintenance responsibilities and funding sources have not been identified at this phase of the project. Estimated annual operation and maintenance costs for the facilities outlined in the recommended plan are about $66,000. The Bureau of Reclamation has no authority to provide operation and maintenance funding for fish facilities at the dam and has asked BPA to pursue the possibility of their funding operation and maintenance of new fish passage facilities at Three Mile Falls Diversion Dam. It is assumed that Reclamation would be responsible for overseeing operation and maintenance activities. One possibility under consideration is to include the operation and maintenance function in the Yakima fish passage facilities program since Three Mile Falls Diversion Dam is reasonably close to the Yakima Project.

Resolution of the various questions regarding operation and maintenance of fish passage facilities at Three Mile Falls Diverson Dam should be a top priority as this project moves into the final design phase.

A variety of data must be collected and analyzed before final designs can be prepared and construction begun. Additional control surveys and topographical mapping are needed at each ladder and fish screen structure. Surveys are needed to establish river cross sections above and below the dam and canal cross sections and profiles above and below the screen site. Geological investigations are needed to explore foundation conditions at each structure to locate possible borrow sources and to locate sites for disposal of waste materials. Hydrologic records and analyses are needed to develop water surface profiles above and below the dam and the screen site. Also, a flood frequency analysis needs to be prepared for the site, and operational data needs to be analyzed before final designs and specifications can be determined.

Records of all construction at and within the construction area of the ladders and screens need to be examined to determine how new construction should tie into existing facilities, to locate possible utilities, to establish access routes, and to locate rights-of-way.

Stream maintenance requirements during construction of the fishways need to be determined.

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INTRODUCTION

On December 5, 1980, Congress passed the Pacific Northwest Electric Power Planning and Conservation Act (Public Law 96-501). The act created a council charged with the responsibility to prepare a Northwest Conservation and Electric Power Plan and to develop a program to protect, mitigate, and enhance fish and wildlife including related spawning grounds and habitat on the Columbia River and its tributaries.

The council adopted its Fish and Wildlife Program on November 15, 1982. Section 700 of the program deals with measures to enhance the natural propagation of salmon and steelhead as well as to improve facilities and techniques used for hatchery propagation. The primary objectives of the recommendations to improve natural propagation are:

1. Provision of suitable flows for spawning, incubation, emergence, and rearing in the Columbia River and its tributaries

2. Improvement of anadromous fish spawning, incubation, rearing, and migration habitat which were affected by hydroelectric development and enhancement of habitat at other locations to compensate for direct effects

3. Provision of and restoration of passage to habitats which became unavailable to migratory fish primarily as a result of hydroelectric development (1)[1/]

Much of the anadromous fish habitat in the Columbia River system has been lost as a result of hydroelectric development. However, many tributary streams have good spawning and rearing habitat and could be brought to full potential through habitat improvement measures and improved fish passage. The proposed passage improvement measures at Three Mile Falls Diversion Dam are in concert with goal 3 above.

Two projects have been requested by the Confederated Tribes of the Umatilla Indian Reservation (CTUIR) in cooperation with the Oregon Department of Fish and Wildlife (ODFU) to restore chinook salmon and improve steelhead passage at and below the dam. The first of these was essentially completed in October 1984 and involved the excavation of a channel from the mouth of the Umatilla River to within about 1,000 feet of Three Mile Falls Diversion Dam. Upstream migrating salmon and steelhead now have much improved passage conditions to the dam. Before the channel work, upstream passage was virtually impossible at low flows.

1/ A number in parentheses refers to the number of the reference in the "Literature Cited" section.

A proposal was developed jointly in 1983 by fishery agencies, CTUIR, and Bureau of Reclamation to improve fish passage at the dam. The plan included construction of a fish barrier immediately below the dam to help fish locate the entrance to the fish ladder. Also included were modifications to counting and trapping facilities in the existing vertical slot fish ladder located on the west end of the dam. Reclamation prepared feasibility plans and estimates for the fish barrier in October 1983.

After reviewing these plans and estimates, Bonneville Power Administration (BPA) concluded that it could not commit funds for the final design and construction of the proposed fish barrier because:

1. Information presented did not fully demonstrate that construction of the fish barrier was independent of other required passage improvements at the dam

2. The independent utility of the project from other Umatilla River fish enhancement activities was not established (2)

Consequently, BPA requested that Reclamation (1) coordinate a thorough biological assessment by the various fishery agencies and the CTUIR to clarify fish passage problems and needs and (2) conduct a feasibility study of alternative plans to meet needs. An interagency agreement providing for this work was signed by the agencies in June 1984.

Study Purpose

The Reclamation study has two purposes:

1. To coordinate the completion of and report on a biological assessment of fish passage problems and needs at Three Mile Falls Diversion Dam by several interested fishery agencies and the CTUIR

2. To apply information from the biological assessment in developing alternative plans for solving fish passage problems which can he used by the fisheries agencies, CTUIR, and BPA to recommend a course of action

Study Scope

Included in this study are:

1. Results and conclusions of the biological assessment

2. Preliminary engineering data delineating general configuration and layout of facilities; general flow requirements to operate facilities: data requirements for preparation of final plans, designs, and specifications; and cost estimates for construction and operation and maintenance

3. Identification of Federal, State. and local government permits which may be required before construction can be initiated

4. Estimated schedules for final plans and designs, specifications, and construction

5. Identification of potential arrangements for operation and maintenance of the new facilities

6. Analysis and preparation of information to satisfy National Environmental Policy Act (NEPA) requirements

Need for Action

Historically, the Umatilla River produced large numbers of summer steelhead and fall and spring chinook salmon. No actual population estimates are available prior to the construction of Three Mile Falls Diversion Dam in 1914, but reports of "thousands and thousands" of salmon being caught from spring to fall in the lower Umatilla River by both Indians and non-Indians are documented (3).

The construction of Three Mile Falls Diversion Dam eliminated all chinook salmon and drastically reduced runs of summer steelhead. Present runs of steelhead have averaged less than 2,000 returning adults for the past 14 years.

The Umatilla River basin has an abundance of spawning gravel and potential habitat for both steelhead and spring and fall chinook. Primary factors limiting populations in the basin are low flows exacerbated by irrigation withdrawals and inadequate passage over irrigation diversion dams. The provision of adequate fish passage and protective facilities at Three Mile Falls Diversion Dam would be a very important step in reestablishing chinook salmon runs and enhancing steelhead runs in the Umatilla basin.

Potential Results of Actions

The provision of improved fish passage facilities under existing flow levels would significantly reduce or eliminate losses of adult salmon and steelhead below the dam and reduce delays in adult passage. The inclusion of trapping and counting facilities would permit the selection of adults for brood stock without severely delaying or excessive handling of fish, enhance the trapping of adults to be hauled to suitable spawning areas, and provide for total counts by species to and in the evaluation of all other fish enhancement projects. [This would be a valuable tool in the evaluation of program success and would allow proper crediting to ratepayers for projects accomplished under section 4(h) of Public Law 96-501.] Passage efficiency for juvenile fish would be improved.

Coordination with Others

The Bureau of Reclamation appreciates the assistance of the following entities who provided information or otherwise participated in the study:

Confederated Tribes of the Umatilla Indian Reservation
Oregon Department of Fish and Wildlife
U.S. Fish and Wildlife Service
National Marine Fisheries Service
Columbia River Intertribal Fish Commission
Bureau of Indian Affairs
Corps of Engineers
West Extension Irrigation District
Bonneville Power Administration

The biological assessment was prepared by an interagency team comprised of the U.S. Fish and Wildlife Service, National Marine Fisheries Service (NMFS), ODFW, CTUIR, and the Columbia River Intertribal Fish Commission. Designs for fish ladders and screens were developed by Reclamation in close consultation with the NMFS and ODFW.

DESCRIPTION OF STUDY AREA

Three Mile Falls Diversion Dam

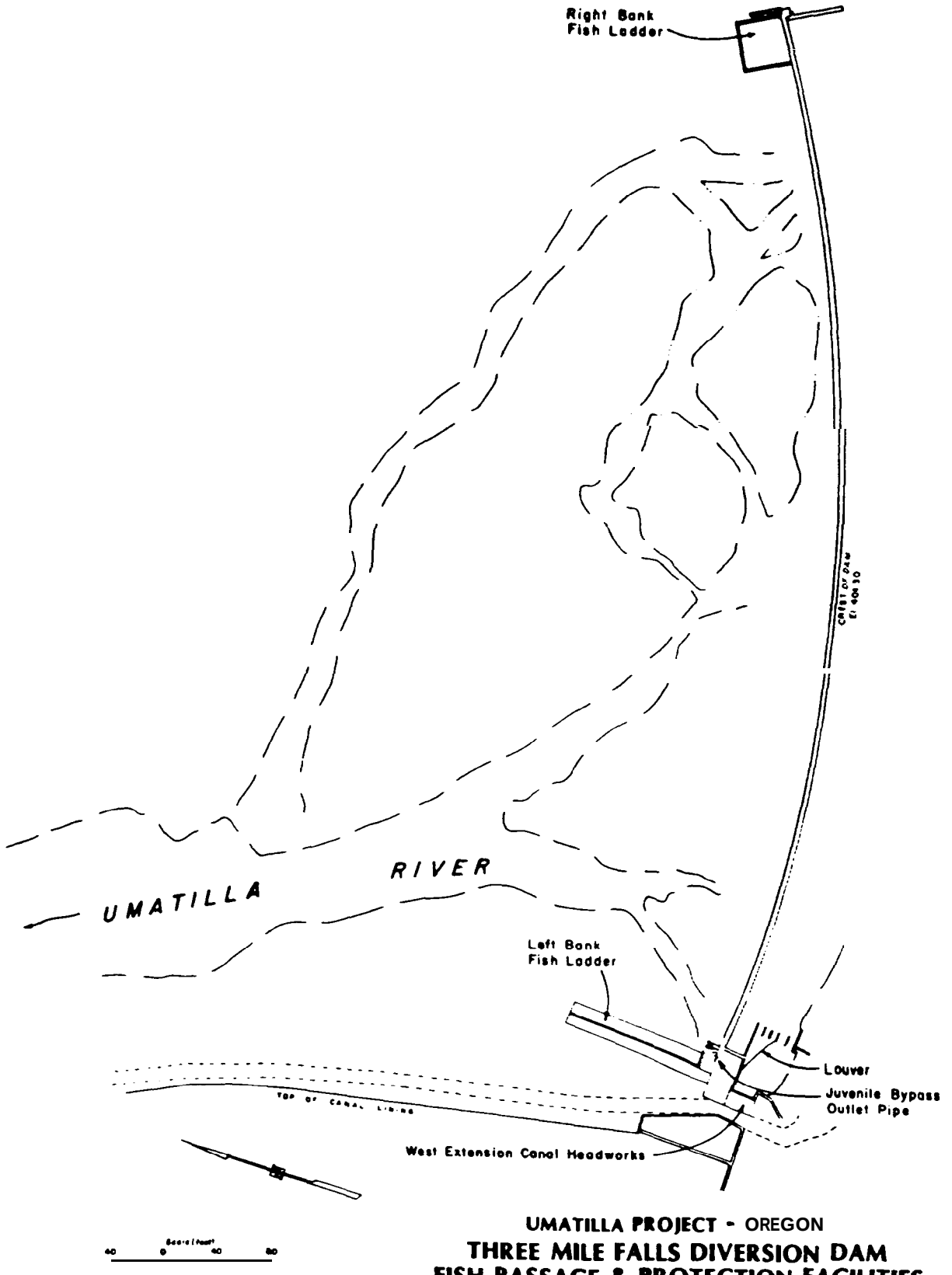
Purpose and Function of Dam

Three Mile Falls Diversion Dam is located on the Umatilla River approximately 3 miles south of Umatilla, Oregon. The dam, headworks, and right bank fish ladder were constructed by the Bureau of Reclamation in 1914 as an integral part of the Umatilla Project under authority of the original Reclamation Act, section 4 (32 Stat. 388) and approved by the President on January 5, 1911. It diverts water to the service area of the West Extension Irrigation District (WEID) through a 27-mile-long main canal (see drawing). The diverted water is used to irrigate about 7,000 acres of farmland.

Ownership, Operation, and Maintenance Responsibility

Title to Three Mile Falls Diversion Dam is held by the United States. The Bureau of Reclamation initially operated and maintained the works until April 27, 1926, when the WEID assumed operation, maintenance, and replacement responsibility for the structure under contract with the Bureau of Reclamation.

Existing fish passage facilities at Three Mile Falls Diversion Dam include the original pool-an4-weir ladder on the right bank (which was reopened in 1984 after being out of service for 20 years). a vertical slot ladder on the left bank, and a louver screen mounted at the intake of the WEID Canal. The left bank ladder is used to trap and count fish by partially dewatering it and dip-netting individual fish and passing them over the dam.



UMATILLA PROJECT - OREGON

THREE MILE FALLS DIVERSION DAM
FISH PASSAGE & PROTECTION FACILITIES
EXISTING FACILITIES

S Bureau of Reclamation

May 1985

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The ODFW has responsibility for this activity, and about 50 man-days a year are expended in its accomplishment. The WEID is responsible for debris removal along the face of the dam and from the louvers. The district has no responsibility for operation and maintenance activities at the right bank ladder. Estimated annual operation and maintenance expenses borne by WEID are $10,500, which includes $9,000 per year for labor (wages) and $1,500 for minor and ordinary maintenance and repairs on gates, louver screens, and other structures. About once every 8 to 10 years the district removes silt from just upstream of the east abutment and snags from the dam crest at an estimated cost of $4,000. The louvers were constructed by the Bureau of Commercial Fisheries (now NMFS). Funding for annual maintenance and repair is passed to ODFW from NMFS in a program that includes fish screens throughout the Columbia Basin. No funding estimates are available specifically for Three Mile Falls Diversion Dam louvers.

Dam Design and Flow Characteristics

Three Mile Falls Diversion Dam is a concrete buttress dam with a maximum height of 24 feet and a crest length of 915 feet. The canal headdworks at the diversion dam has a capacity of 375 cubic feet per second (ft^3/s). The canal capacity is 310 ft^3/s, and the historic peak diversion is 305 ft /s3 average monthly diversions for the period 1935-78 are 145 to 170 ft /s between April and September.

The buttress dam was designed to function as an overflow weir along its entire crest. During the normal irrigation season, (April-October), the WEID diverts available river water to meet its demands and passes any remainder over the dam crest. During periods of low flow, all the available water is diverted (up to the canal capacity) except for about 20 ft^3/s released through the downstream migrant pipe. The fish ladder is operated during periods of upstream steelhead migrations and requires about 20 to 40 ft^3/s for ladder operation.

During the nonirrigation season, all the riverflows in excess of the fish ladder and bypass pipe capacity are passed over the dam. As the flows increase over the dam, the proportion of total flow at the ladder entrance decreases. Table 1 depicts the average flow conditions in the Umatilla River below the dam over the 44-year period 1935-78.

Existing Fish Passage Facilities

Right Bank Ladder.--During its initial construction, the dam was equipped with a low fish ladder on the right abutment (east bank). Additional weirs were constructed at the toe of the dam as part of the ladder in 1963. The right bank ladder is an overflow weir type containing 13 concrete pools, each 6 feet by 8 feet by 6 feet in size. This series of pools contain vertical drops ranging from 6 inches to 1 foot. This ladder was taken out of service in 1964 by backfilling it with earth. It was replaced by a new ladder on the left bank. However, in 1984 the right bank ladder was reopened by a group of volunteers, and successful passage of steelhead occurred when riverflows exceeded about 500 ft^3/s. Primary problems associated with the right bank ladder include false attraction flows along the face of the dam just west of the ladder entrance, obstructions in the channel below the entrance to the ladder, and sedimentation along the upstream face of the dam near the exit (upstream end) of the ladder. Also, the ladder does not contain trapping,

Table 1.--Average Monthly Flows Expressed in Cubic Feet Per Second Below Three Mile Falls Diversion Dam for 44 Years of Record, 1935-78

Year	Oct	Nov 15	Nov 30	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep 15	Sep 30	Average
1935	5.	5.	13.	390.	322.	316.	188.	974.	109.	11.	15.	14.	9.	18.	195.6
1936	4.	84.	106.	88.	365.	289.	1082.	1513.	176.	13.	12.	10.	8.	13.	303.8
1937	9.	31.	84.	79.	51.	198.	578.	1206.	375.	50.	10.	26.	48.	28.	222.2
1938	33.	110.	161.	291.	275.	393.	1041.	1181.	95.	29.	25.	15.	27.	13.	293.2
1939	16.	79.	137.	174.	168.	283.	1560.	692.	48.	18.	38.	14.	5.	21.	261.3
1940	17.	105.	100.	110.	105.	987.	1391.	774.	17.	15.	22.	13.	13.	16.	292.5
1941	13.	128.	268.	484.	319.	117.	321.	11.	36.	211.	15.	41.	49.	68.	152.7
1942	210.	250.	867.	733.	545.	892.	739.	992.	855.	445.	148.	28.	81.	35.	514.0
1943	14.	138.	356.	1280.	1273.	1663.	1181.	2023.	957.	295.	54.	63.	52.	51.	752.1
1944	98.	188.	115.	122.	95.	202.	743.	1037.	148.	26.	22.	21.	40.	14.	223.7
1945	80.	101.	138.	115.	332.	946.	1000.	1267.	855.	91.	26.	32.	58.	42.	405.4
1946	43.	135.	618.	803.	749.	488.	1457.	1409.	535.	99.	48.	45.	151.	97.	515.0
1947	130.	163.	637.	1571.	820.	m .	832.	588.	15.	66.	35.	24.	32.	51.	440.7
1948	76.	645.	1030.	974.	888.	1066.	991.	2120.	3360.	551.	41.	56.	141.	77.	921.6
1949	138.	128.	217.	450.	226.	1584.	1963.	1872.	652.	31.	19.	35.	31.	43.	590.9
1950	44.	113.	157.	171.	521.	1462.	1490.	1363.	797.	804.	11.	51.	65.	45.	568.0
1951	140.	358.	325.	795.	1207.	1815.	1429.	1054.	217.	140.	32.	21.	33.	19.	593.7
1952	171.	181.	258.	344.	371.	882.	829.	1501.	430.	22.	26.	19.	37.	25.	399.6
1953	36.	72.	128.	117.	1007.	1369.	1123.	1481.	726.	417.	26.	68.	80.	71.	538.8
1954	92.	129.	167.	562.	436.	689.	456.	560.	13.	220.	24.	35.	46.	67.	271.1
1955	40.	207.	126.	131.	132.	189.	122.	737.	1478.	116.	27.	45.	52.	34.	269.6
1956	39.	184.	536.	1215.	1309.	742.	1703.	1376.	1107.	44.	14.	44.	28.	19.	666.4
1957	69.	221.	165.	583.	116.	833.	1499.	1407.	914.	39.	12.	36.	24.	12.	474.4
1958	161.	176.	210.	635.	715.	1875.	688.	3055.	980.	11.	8.	45.	47.	11.	688.6
1959	51.	262.	362.	948.	1378.	910.	894.	981.	318.	35.	19.	25.	111.	123.	497.1
1960	311.	192.	567.	160.	306.	587.	1132.	640.	726.	34.	17.	66.	65.	26.	366.2
1961	14.	152.	629.	215.	205.	1477.	1338.	405.	218.	24.	12.	25.	46.	17.	355.4
1962	15.	118.	176.	274.	513.	298.	699.	891.	441.	33.	19.	10.	27.	17.	280.1
1963	127.	146.	282.	452.	221.	1367.	440.	941.	332.	7.	8.	19.	11.	4.	336.9
1964	31.	155.	164.	165.	252.	331.	423.	936.	378.	66.	8.	15.	4.	12.	229.7
1965	26.	62.	116.	1887.	2316.	2254.	569.	1167.	176.	52.	34.	12.	5.	5.	706.2
1966	39.	73.	103.	103.	131.	139.	584.	289.	6.	6.	10.	6.	3.	3.	117.0
1967	11.	155.	48.	489.	810.	610.	241.	188.	619.	9.	5.	7.	7.	3.	257.0
1968	50.	122.	107.	502.	260.	1074.	164.	5.	4.	2.	4.	4.	3.	4.	176.5
1969	74.	256.	413.	456.	1331.	591.	854.	2188.	604.	54.	26.	12.	17.	50.	545.0
1970	127.	145.	115.	147.	1931.	1051.	1106.	942.	839.	25.	4.	5.	71.	19.	527.7
1971	118.	172.	286.	241.	1141.	916.	628.	602.	250.	198.	24.	18.	85.	35.	365.4
1972	85.	209.	307.	775.	866.	1636.	3677.	1023.	795.	42.	17.	16.	22.	24.	765.4
1973	108.	151.	120.	486.	548.	160.	208.	8.	7.	7.	5.	6.	7.	5.	141.3
1974	16.	466.	640.	1898.	2010.	1301.	1388.	2800.	1255.	296.	21.	12.	17.	25.	961.8
1975	66.	138.	153.	225.	1580.	842.	1324.	996.	1271.	59.	15.	12.	10.	14.	546.0
1976	99.	196.	208.	1392.	1492.	763.	751.	1922.	645.	12.	10.	17.	7.	4.	608.8
1977	36.	107.	97.	96.	109.	77.	134.	268.	2.	2.	3.	3.	2.	2.	69.1
1978	4.	164.	448.	1177.	757.	727.	1031.	784.	344.	10.	24.	33.	15.	13.	433.6
AVG	70.	168.	279.	552.	693.	845.	954.	1095.	548.	108.	23.	26.	39.	29.	428.2

holding, or counting facilities. No additional attraction water is provided to the ladder entrance.

Left Bank Ladder.--The left bank ladder on the west abutment of the dam is a vertical slot-type structure which was completed in August 1964. It was built by the State of Oregon under contract with the Bureau of Reclamation and the WEID. It has twenty-one 8-foot by lo-foot rectangular concrete pools. The floor slopes and the slots in the pools extend to the floor. The ladder is operated durin periods of upstream anadromous fish migrations and uses about 20 to 40 ft^3/s for ladder operation depending upon forebay depths. When there is a difference of 20 feet between the forebay and tailwater, the ladder will operate with about l-foot difference in water level between pools. A 12-inch-diameter pipe routes water from inside the upper pool through a diffuser in the lower pool to provide about 15 ft^3/s of additional attraction flows for adult anadromous fish.

The ladder is not designed for trapping, counting, and holding of adult anadromous fish. An electronic counter operated at the head of this ladder for several years but has not been used recently. This counter was difficult to calibrate and gave inconsistent results. Consequently, a temporary conduit fyke-type trap is used in the upper four pools of the ladder for annual counting of summer steelhead. The pools are then partially dewatered, and the fish are individually dip-netted, counted, and passed over the dam. Steelhead broodstock selection (for the juvenile supplemental outplanting program) also occurs in this manner. Downstream juvenile migrants are passed either over the crest of the dam or through a bypass pipe that collects those fish which have been screened from the canal entrance.

Louver.--The louver screen is mounted at the intake of the WEID Canal at the left abutment of the dam. It was constructed by the Bureau of Commercial Fisheries in 1961 under contract with the Bureau of Reclamation and the WEID. It is approximately 30 feet long and consists of a series of fixed metal slats spaced about 1 to 2 inches apart. It prevents most steelhead smolts from entering the canal and directs them to the entrance of the bypass pipe.

Downstream Channel Improvements.--During 1984, modifications were made to the Umatilla River channel below Three Mile Falls Diversion Dam to improve upstream fish passage. This work, overseen by the Corps of Engineers and ODFW was about 90-percent complete at the end of the construction season in late 1984. A research project will be conducted in 1985 to monitor the success of this project over a range of flows. According to ODFW (6), the river channel below the dam was observed to be a barrier to upstream passage of adult salmon and steelhead at flows less than 200 ft^3/s, and flows up to 300 ft^3/s were assumed to limit passage. With channel work near completion, a flow of 100 ft^3/s was assumed to be the minimum flow needed for adult passage However, even with channel work, it is estimated that flows up to 150 ft^3/s will limit passage. Fish passage studies to be conducted in late 1985 should yield information on appropriate passage flow levels.

EXISTING FISHERY RESOURCES OF THE UMATILLA BASIN

Steelhead

Summer steelhead is the only anadromous species that inhabits the Umatilla system. These fish have adapted to a number of limiting habitat conditions in the basin. Run sizes in recent years have averaged about 1,880, ranging from 700 to 2,500 returning adult spawners. Numbers of returning adults appear to be directly related to riverflow conditions during the winter migration period; higher flows allow for greater numbers of fish to pass upstream to spawning areas.

Adult steelhead use the lower main stem Umatilla River primarily as a migration corridor. Upstream migration begins as early as October, depending on flows, with the peak occurring between November and March. Most spawning occurs in April and May in the upper Umatilla River and its tributaries. Estimated distribution of Umatilla summer steelhead spawning is as follows:

Stream	Percent
Meacham Creek	40.0
South Fork Umatilla River	17.0
North Fork Umatilla River	10.0
Main stem Umatilla River	10.0
Squaw Creek	5.0
Birch Creek	15.0
Other tributaries	3.0

Egg incubation occurs from April through July. Most rearing takes place in the same tributary streams where spawning occurs. The juveniles typically spend 2 years in freshwater before migrating to sea as smolts. The estimated annual outmigration of summer steelhead smolts is 50,000 to 100,000 native fish. This occurs during the period April through June. Major periods of summer steelhead use of the Umatilla River basin are as follows:

Upstream adult migration	October-May
Spawning	April-May
Egg incubation	April-July
Rearing	All year
Downstream smolt migration	April-June

The ODFW began supplemental hatchery outplanting of juvenile steelhead in 1980. Since the program began, ODFW released about 17,500 steelhead smolts in 1981, 59,500 in 1982, 60,500 in 1983, 58,000 in 1984, and 60,000 in 1985. The outplanted smolts are progenies of native adult fish trapped at Three Mile Falls Diversion Dam.

Fall Chinook

A self-sustaining run of fall chinook has not existed in the Umatilla River since shortly after the construction of Three Mile Falls Diversion Dam. However, an abundance of potential spawning habitat is found throughout the main stem Umatilla River. In addition, Meacham Creek up to the North Fork also has potential for fall chinook spawning.

Under a fish release program developed by the CTUIR and ODFW, juvenile fall chinook have been liberated in the Umatilla River since 1982 at the following rates:

Year of Release	Approximate Number of Fish	Size	Stock
1982	3.83 million	Fingerlings	Tule
1983	100,500	Yearlings	Upriver bright
1984	223,600	Yearlings	Upriver bright
1985	225,000	Yearlings	Upriver bright

Approximately 20,000, 50,000, and 140,000 fall chinook yearlings were acclimated and released at Bonifer Pond in 1983, 1984, and 1985, respectively. The remaining smolts were released in upper Meacham Creek. A few 2-year-old jacks (probably fewer than 100) from the 1983 release returned to the Umatilla River in the fall of 1983. During the fall of 1984, adult tule and upriver bright fall chinook returned to the mouth of the Umatilla River from the 1982 and 1983 hatchery releases. These fish had spent two to three growth seasons in the ocean environment. The tule fish were 10 to 15 pounds and were mature spawners. The upriver brights were immature males (jacks) of 20-24 inches in length. Due to Umatilla River channel modification work underway below Three Mile Falls Diversion Dam, none of these fish were able to move above the river mouth.

When established, adult fall chinook will enter the Umatilla River in October through December, with most spawning expected to occur in November and December. Egg incubation takes place from December to mid-March, with rearing between February and the end of May. Fingerlings will migrate downstream to the Columbia River in March through June.

The major time periods that fall chinook are expected to utilize Umatilla River basin waters are as follows:

Upstream adult migration	October-December
Spawning	November-December
Egg incubation	November-March
Rearing	February-May
Downstream smolt migration	March-July

Spring Chinook

Large numbers of spring chinook salmon existed in the Umatilla basin prior to construction of Three Mile Falls Diversion Dam. The ODFW reported small numbers of spring chinook in the system into the 1960's, but none have been observed since.

Projected time periods of spring chinook use of the Umatilla River basin are as follows:

Upstream adult migration	Apri 1 -June
Spawning	August-September
Egg incubation	August-December
Rearing	November-April
Downstream smolt migration	April-June

POTENTIAL FUTURE FISHERY RESOURCES OF THE UMATILLA BASIN

Steelhead

An implementation plan for enhancement of Umatilla River steelhead has been developed by the CTUIR (4). Long-term escapement goals presented in this plan for summer steelhead in the basin are 5,400 hatchery-produced adult fish and 5,000 naturally produced adult fish.

Hatchery production goals will be achieved through annual releases of 200,000 steelhead smolts at the existing Bonifer facility and the Minthorn acclimation facility currently in final design phase. The proposed Umatilla hatchery near Irrigon (in the predesign phase) will produce these fish. The 60,000 smolts that are currently being reared at existing ODFW facilities and released at Bonifer will continue at least until the Umatilla hatchery comes online. Any excess broodstock returning to the Bonifer and Minthorn facilities will be used for enhancement of natural production by reseeding (adult or egg outplanting) in underutilized habitat.

Riparian and instream habitat improvement needs were identified in the CTUIR Umatilla River basin report of January 1984 (4). These projects were submitted to the Northwest Power Planning Council in November 1983 as proposed amendments to the Fish and Wildlife Program of the Northwest Power Planning and Conservation Act of 1980. There is an excellent opportunity to vastly improve the natural production of anadromous fish habitat throughout the Umatilla basin.

Fall Chinook

The Umatilla Basin Implementation Plan (4) cites long-term escapement goals of 10,00C hatchery-produced and 12,000 naturally produced fall chinook salmon. Approximately 225,000 yearlings are programed for acclimation and release at the Bonifer and Minthorn facilities through 1987. Based upon the results of ongoing studies at Bonneville hatchery, the most cost-effective

program for juvenile releases will be used. This may include yearling releases, fall reared smolts, or fingerlings. Based upon available data, a return of about 2,500 adult fish would result from either program. Returning adult fall chinook will be used as broodstock for hatchery production and to foster natural production in the system.

Spring Chinook

Potential spring chinook spawning habitat exists in the upper main stem, lower North Fork, and South Fork Umatilla River and in Meacham Creek. The CTUIR and ODFW have plans for reestablishment of spring chinook in the Umatilla basin. Escapement goals are 10,000 hatchery-produced fish and 1,000 naturally produced fish. However, poor spring passage conditions and lack of deep holding pools for adults could limit the production of these fish. To avoid or reduce potential passage problems, broodstock would be selected for early arrival of adults to avoid low streamflows. When introduced, adults would enter the Umatilla River in April and May and migrate to upstream resting pools near spawning grounds. Adults would hold over in these pools until spawning commenced in late August and September. Most juveniles would rear for a year prior to migration in April, May, and June.

Umatilla Basin Project

The Bureau of Reclamation recently completed a Planning Report/Environmental Statement on the lhnatilla Project. This project emphasizes flow enhancement to help restore chinook runs and enhance steelhead runs in the Umatilla River basin. The plan's major feature and recommended plan of development is that of improving streamflows by "importing" water from the neighboring Columbia River.

The recommended plan includes a program to pump water from the Columbia into Cold Springs Reservoir for distribution to irrigators. Use of this imported water by irrigators would permit Umatilla River water which is now diverted or stored for irrigation use to remain in the Umatilla River to improve flow conditions in the lower basin. Structural features include a major pumping plant on the Columbia River (Lake Wallula), a relift pumping station, and carriage facilities. Increased streamflow in the lower Umatilla River in conjunction with improved fish passage at Three Mile Falls Diversion Dam would optimize passage conditions at the dam.

In addition to the pumping feature, the plan proposes improvements to fish passage facilities and installation of protective screens at some existing irrigation diversions. A significant plan feature is a postconstruction monitoring program which would "fine tune" flow improvements and other measures in meeting fishery enhancement objectives. This monitoring program, now expected to extend over a 12-year period, would aid project operators and fishery experts in adjusting operations or proposing additional measures to meet fishery restoration goals.

PRESENT AND POTENTIAL FUTURE FISHERY PROBLEMS ASSOCIATED WITH THREE MILE FALLS DIVERSION DAM

Steelhead

Adults

Adult steelhead enter the Umatilla River in the late fall when the irrigation season has ended and natural flows begin increasing (table 1). As runoff increases to medium to high flows (about 500 ft^3/s or greater), a higher percentage of water spills over the crest of the dam, and attraction flows at both ladders become a smaller portion of the total flow. This creates a false attraction problem for steelhead in the tailrace area. The resulting migration delay creates increased stress and mortality when fish jump and become trapped in the open bays beneath the dam. An estimated 20 percent of the 1982-83 steelhead return was lost because of these conditions at Three Mile Falls Diversion Dam.

The left bank ladder is well designed for steelhead passage but lacks adequate attraction flows at the entrance during medium to high flows. The right bank ladder is not adequately designed by today's standards. It has poor entrance conditions, poor turn pool conditions, poor exit conditions, and is not self-regulating. It also lacks adequate attraction water at all flow levels. Sediment naturally accumulates above the east side of the dam and restricts flow into the right bank ladder. thus impeding fish passage. There are no trapping or counting facilities at the right bank ladder and only marginal opportunities at the left bank ladder.

Debris hanging over the dam crest and accumulating in the tailrace area impedes lateral movement of steelhead along the base of the dam. This situation, combined with insufficient attraction flows at the ladder entrances, also creates migration delay and stress. Accumulation of debris above the east side of the dam restricts the amount of flow entering the right bank ladder. Failure to maintain control of debris above and below the right bank ladder may cause stranding of adult steelhead.

Juveniles

Juvenile steelhead migrate downstream past Three Mile Falls Diversion Dam by passing over the crest, through the fish ladders, or through the smolt bypass pipe on the west side. The bypass pipe drops fish 20 feet into the tailrace area below the dam. This may cause injury, stress, and possible mortality to smolts, especially during low flow conditions when the bedrock area below the pipe does not contain adequate pool depths. This condition is even worse for those smolts passing over the crest of the dam. Smolts encounter the louver system at the intake of WEID Canal. A NMFS study (5) indicates that the passage efficiency of this type louver system for steelhead smolts under ideal flow conditions is 70 to 95 percent. Passage conditions at Three Mile Falls Diversion Dam are probably near the low end of this range because of problems with the approach velocities, nonlaminar flows, and bypass slot velocities. This efficiency does not meet NMFS criteria for screening facility design, which requires successful passage of all fish.

A summary of the current passage conditions for steelhead, expressed as a percentage of adult and juvenile fish passing Three Mile Falls Diversion Dam, is provided in table 2. Future steelhead passage conditions, again assuming no flow enhancement with the present facilities at Three Mile Falls Diversion Dam, would not change. However, greater numbers of fish would be impacted as the benefits of the combined CTUIR/ODFW enhancement program are realized (table 2).

Fall Chinook

Adults

As indicated in table 1, adequate flows (assumed to be 200 ft^3/s or greater) for adult fish passage to Three Mile-Falls Diversion Dam can occur during the October through December migration period. During this period, all the passage problems listed for adult steelhead would be common to fall chinook. These include (1) false attraction flows below the dam, (2) lack of adequate attraction to the ladder entrances, and (3) debris and/or sediment above and below the dam. In addition to these problems, the overflow weir design of the right bank ladder does not promote chinook passage as would the vertical slot design. A submerged orifice or vertical slot is especially important for the ladder entrance.

Table 2.--Assumed Existing Passage Conditions
(Expressed as Percentage of Fish Passing Three Mile Falls Diversion Dam)

	Steelhead		Fall Chinook		Spring Chinook	
Passage Condition	Adults	Juveniles	Adults	Juveniles	Adults	Juveniles
Without flow enhancement	75	75	38	50	48	60
With Reclamation flow enhancement	80	75	90	50	80	75

Migration delays for fall chinook are generally more harmful than for steelhead due to the relatively short period of time between migration and spawning.

During flow periods that could provide adequate fish passage, movement through the left bank ladder could be satisfactory. However, counting, trapping, and holding facilities are poor. During periods of extreme low flows, passage would be reduced or eliminated. Water temperature and swimming duration are not expected to cause passage problems.

Juveniles

The NMFS study (5) indicates that the passage efficiency of louvers for fall chinook migrants under ideal flow conditions varies from 40 to 90 percent. The larger-sized yearling chinook smolt presently being released would likely be near the upper end of this range. Future outmigrations of natural

and hatchery fry and fingerlings would likely experience efficiencies near the lower end of this range. The same problems with velocities and nonlaminar flows affecting louver efficiency for steelhead would be more of a problem for the smaller fall chinook. NMFS policy has been to pass 100 percent of the fish, thus passage criteria would not be met in either case. Chinook downstream migrants would also experience the same problems with injury, stress, and possible mortality from the juvenile bypass system as discussed for steelhead.

A summary of the current passage conditions for fall chinook, expressed as a percentage of adult and juvenile fish passing Three Mile Falls Diversion Dam, is provided in table 2. Future fall chinook passage conditions, again assuming no flow enhancement with the present facilities at Three Mile Falls Diversion Dam, would not change. However, greater numbers of fish would be impacted as the benefits of the combined CTUIR/ODFW enhancement program are realized (table 2).

Spring Chinook

Adults

Medium to high flows often occur during the April and early May migration period. With these conditions, problems listed for steelhead and fall chinook at Three Mile Falls Diversion Dam would also be common for spring chinook. These include (1) false attraction flows below the dam, (2) lack of adequate attraction to the ladder entrances, and (3) debris and/or sediment obstruction above and below the dam. In addition to these problems, the overflow weir design of the right bank ladder does not promote chinook passage as would a vertical slot design. A submerged orifice or vertical slot is especially important for the ladder entrance.

In late May and into June, flows can rapidly decrease to very low flow conditions because of irrigation diversions (table 1). Passage during these periods could be significantly reduced or even eliminated. Migration delays for spring chinook would have very serious implications because upstream passage to holding and spawning areas would he impossible later in the spring and into summer. This would especially be a problem during late May and early June for late arriving adults. During periods of adequate flows, movement through the left bank ladder could be satisfactory. However, existing counting, trapping, and holding facilities are inadequate. Temperature conditions and/or swimming duration are not expected to cause passage problems.

Juveniles

Spring chinook downstream migrants are expected to be yearling smolts. The NMFS study (5) indicates that the passage efficiency of louvers for spring chinook smolts under ideal flow conditions varies from 60 to 90 percent. The previously discussed problems with velocities and nonlaminar flows affecting louver efficiency for steelhead would also affect spring chinook. NMFS policy has been to pass all of the fish. Therefore, NMFS passage criteria would not be met. Spring chinook downstream migrants would also experience the same problems from injury, stress, and mortality with the juvenile bypass system as those listed earlier for steelhead and fall chinook.

A sumnary of the current passage conditions for spring chinook, expressed as a percentage of adult and juvenile fish passing Three Mile Falls Diversion Dam, is provided in table 2. Future spring chinook passage conditions, again assuming no flow enhancement with the present facilities at Three Mile Falls Diversion Dam, would not change. However, greater numbers of fish would be impacted as the benefits of the combined CTUIR/ODFW enhancement program are realized (table 2).

ALTERNATIVE IMPROVEMENT MEASURES

The study considered several potential measures which are discussed below. These include two fish ladders, a concrete apron plus improvements to the existing left bank ladder, a cap on the crest of the dam plus improvements to the left bank ladder, and dam removal.

Two Fish Ladders

Description of Facilities

Right Bank Ladder.--The main feature of this alternative would be the construction of a new right bank ladder to improve fish passage. In addition, this alternative includes modifications to the existing left bank ladder and the installation of rotary drum fish screens and related structures in the WEID Canal.

The right bank fish ladder would be located just left of the existing pool-and-weir fish ladder (which is inadequately designed by today's standards and would become inoperable). A second ladder of adequate design at the dam would prevent stranding and delay of adult migrants that would make their way to the right side due to attraction flows over the dam. The new ladder would be a vertical slot design with a 15-inch-slot opening and a 10:1 sloping floor. Ten pools would be needed, with pools being 8 feet wide and 10 feet long. The overall length of the structure would be about 100 feet, with about 75 feet extending downstream from the crest of the dam (see design drawing).

An entrance pool would be excavated in the rock in front of the entrance structure. The entrance structure would have two gates, one for low flow conditions and one for high flow conditions. However, only one gate would be operated at any one time. Improved channels would be excavated downstream and along the toe of the dam leading to the two entrance gates, and secondary channels and potholes would be capped to facilitate better access to the entrance structure.

Auxiliary water to the entrance structure would be supplied by an overflow gate. The water would spill over the gate into a separate pool, through a baffle structure, and then through a diffuser grate before entering the entrance structure.

The exit structure would have a viewing station for viewing and counting fish, a fish crowder, and a trapping and sampling facility. The exit would be approximately 60 feet left of the exit for the existing pool-and-weir ladder which will help minimize the amount of silt accumulation. A retaining wall

would extend upstream of the exit structure for ease of maintaining an open exit channel. Silt removal in the exit channel and debris removal from the dam crest and channels immediately downstream are essential maintenance tasks necessary to keep the fish ladder functional.

Adult fish could be trapped as they pass through the exit channel just beyond the viewing station. Fish would be diverted into a separate holding pool instead of being allowed to pass into the river. This would be done by controlling a set of hydraulically operated slide gates. Once in the holding pool the fish would he moved into a portable tank by a crowding mechanism. The tank would then be lifted from the holding pool by an elevator system and raised high enough to sluice the fish from the portable tank into fish transport trucks.

Grating over the structures as well as chain link fence around the entire facility would be provided to prevent poaching and vandalism.

Left Bank Ladder Modifications.--The left bank ladder modifications would include a new entrance structure, improved auxiliary water supply, a viewing and counting station, a fish crowder, and a trapping and sampling facility. The vertical slot ladder itself would not be changed, since it meets current state-of-the-art design criteria.

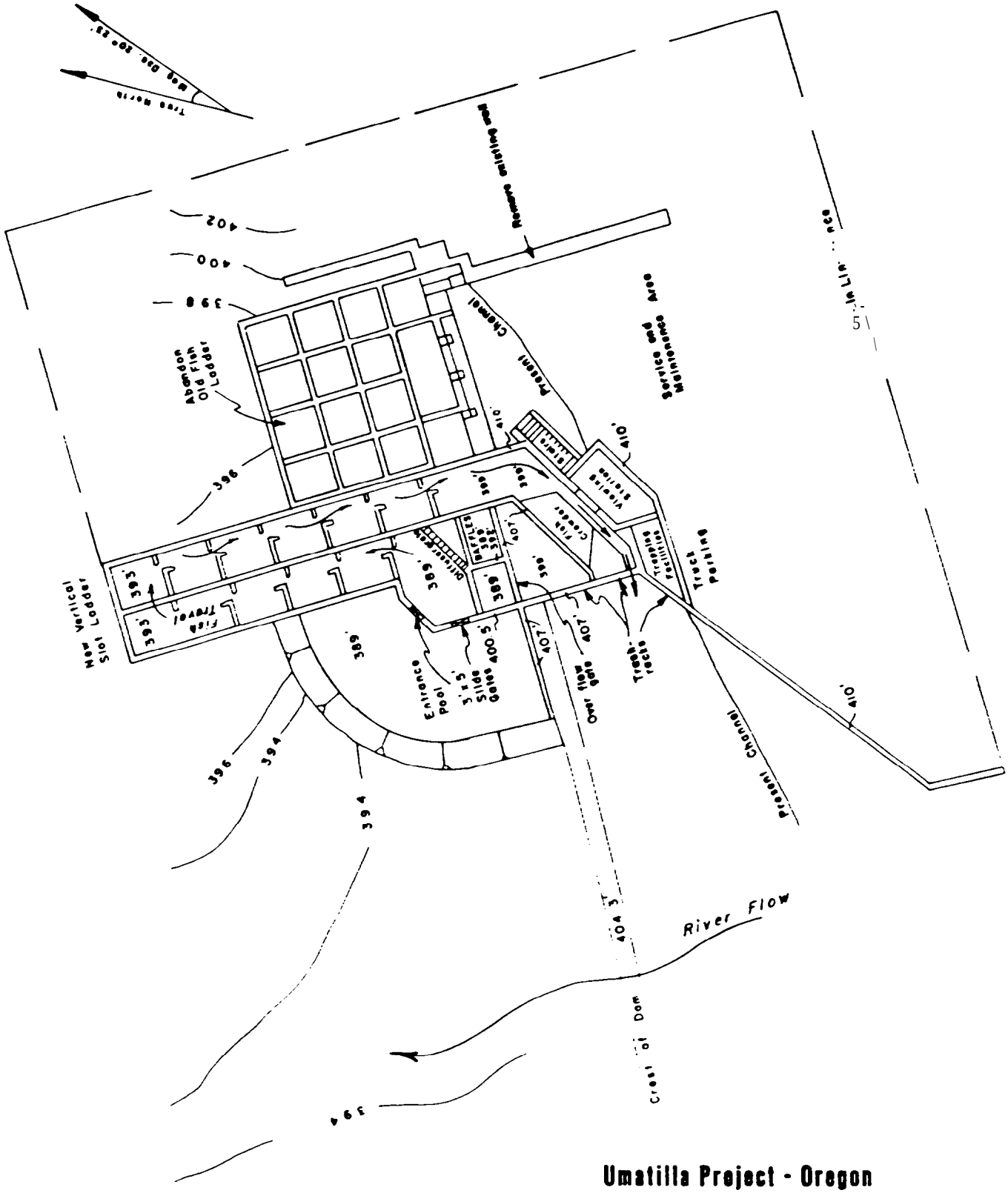
In order to modify the existing fishway exit and entrance, the top of one of the arch buttresses would be removed. The old auxiliary water supply pipe and existing bypass pipe would be removed as well. Much of the existing entrance and exit would be renovated. Trashracks would be required across the exit to the fishway and the entrance to the auxiliary water supply. New trashracks would replace existing ones across the canal entrance (see design drawing).

The trapping and sampling facility would operate in a similar manner as the facility on the right bank ladder. However, tank trucks would not be able to park adjacent to the structure. Tank trucks would load from a location just downstream of the gatehouse, which avoids the use of the canal bridge. A long sluice system would be used to transfer fish from the elevated portable tank to the trucks.

Grating would be placed across open structures to prevent poaching. Access is limited to this side by existing locked gates on the canal access road, so additional chain link fence is not required.

Silt removal would be required to keep the fish ladder operational as well as debris removal from the exit, entrance, and immediate channels downstream.

WE1D Canal Fish Screens.--A new fish screen structure would be located on the WEID Canal just downstream of the existing gatehouse. The existing louver screens in the canal entrance would be removed since they would no longer be needed. The new facility would include seven rotary drum fish screens, each 10 feet in diameter and 12.5 feet long, oriented at an angle of 25" to the canal flows (see design drawings). The total length of the fish screen structure would be 110 feet. The screens are designed to handle flows of



Umatilla Project - Oregon

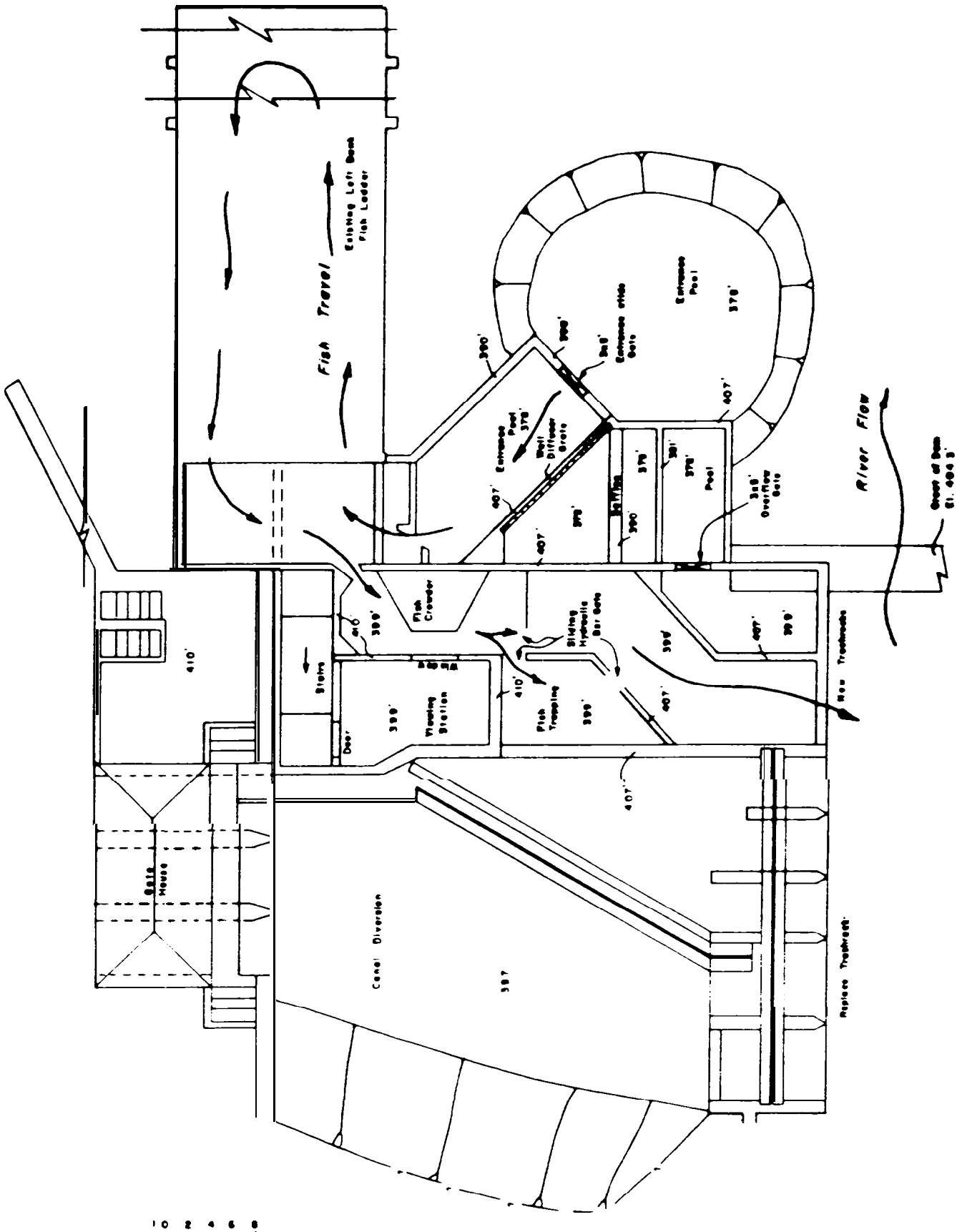
THREE MILE FALLS DIVERSION DAM

FISH PASSAGE & PROTECTION FACILITIES RIGHT BANK FISH LADDER

U.S. Bureau of Reclamation

March 1985

30-100-5568



Umatilla Project - Oregon

THREE MILE FALLS DIVERSION DAM

FISH PASSAGE & PROTECTION FACILITIES
LEFT BANK FISH LADDER MODIFICATION

S Bureau of Reclamation

March 1985

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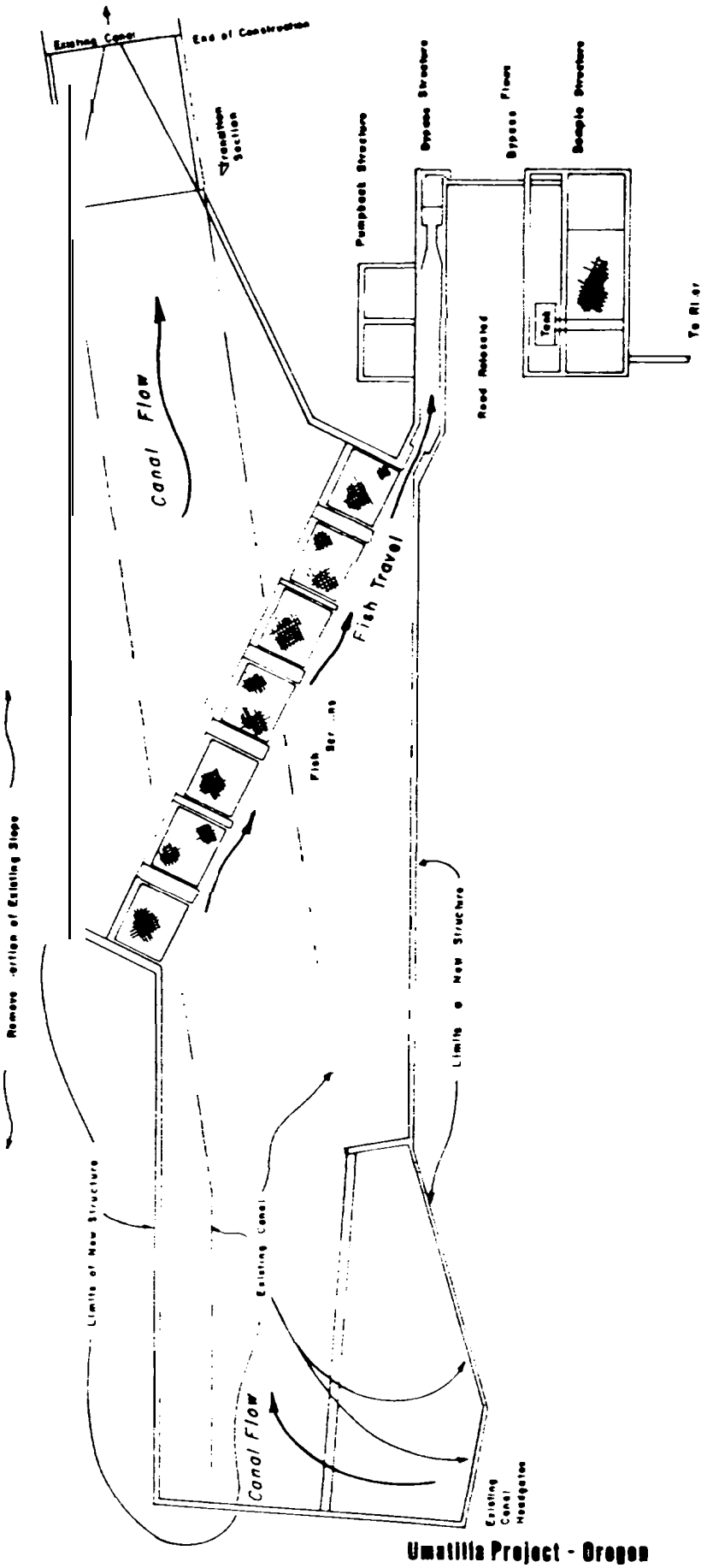


Umatilla Project - Oregon

THREE MILE FALLS DIVERSION DAM

FISH PASSAGE & PROTECTION FACILITIES
FISH SCREENS

10 0 10 20

SCALE IN FEET

310 ft^3/s (which is the design capacity of the canal). Since actual usage averages only 210 ft^3/s during the peak month of the Irrigation season and the existing capacity is only 270 ft^3/s due to settlement of the canal, a new lower design flow may be chosen before the final design stage.

The screening facilities include a single entrance bypass structure with a pump-back system to return a large portion of the bypass water back to the canal. This is needed especially during low flows to optimize water usage. A juvenile sampling structure would be located between the bypass structure and the Umatilla River.

The WEID has been issued a preliminary permit by the Federal Energy Regulatory Commission to study the feasibility of installing a powerplant in the town of Umatilla Water to run the new generator would be diverted at Three Mile Falls Diversion Dam through the WEID Canal. Since the powerplant would primarily be operated during the winter and spring months, some concern has been raised over potential conflicts between operation of the powerplant and winter operation of the new screens, which would be subject to the formation of frazil ice during periods of cold weather.

The possibility of using an advanced louver system, methods of operating the drum screen during cold weather, and winter operating constraints and responsibilities will be addressed during preparation of final designs and specifications.

Operating Plan

The ideal operating flow for each ladder is 85 ft^3/s. This condition provides the desired attraction velocities through the entrance gate to attract the fish. This flow is made up of 45-60 ft^3/s from the ladder (depending on flows over the crest), with the remaining flow being made up from the auxiliary water supply system. The ladders are designed to operate at flows up to 6,000 ft^3/s passing the dam. During low flows over the crest (when not enough water is available to operate two ladders satisfactorily), only the right bank ladder would be in operation. If no flows are going over the crest, then only the left bank ladder would be operational, provided there would be enough water to attract the fish and pass them up to the dam from downstream. Both ladders would successfully pass fish at flows of less than 85 ft^3/s.

The fish screen structure will handle 310 ft^3/s at velocities of 0.5 feet per second (ft^3/s); however, historical irrigation usage has been an average oi 210 ft^3/s in any month. The bypass structure will take approximately 65 ft^3/s under normal conditions; however, the pump-back system is capable of pumping 62 ft^3/s back into the canal if needed. Only 4 or 5 ft^3/s are required to operate the sampling structure and to pass juveniles to the river. However, additional water from the dam or ladders is needed to safely carry the juveniles downstream unless they are trapped and hauled by truck.

Costs

The construction costs for the new right bank ladder, the left bank ladder modifications, and the fish screen facilities are estimated to be $3,475,000. This includes $1,060,000 for the right bank fish ladder,

$605,000 for the left bank ladder modifications, and $1,810,000 for the fish screen facilities.

Annual operation and maintenance costs would be $21,000 for the right bank ladder, $25,000 for the left bank ladder, and $20,000 for the fish screen facilities--a total of $66,000.

Construction and annual operation and maintenance costs are based on an October 1984 price level.

Concrete Apron Plus West Ladder

Description of Facilities

This alternative would consist of a training wall (barrier) and apron constructed downstream of the dam, modifications to the left bank ladder, and new screens and related structures in the WEID Canal (see design drawing).

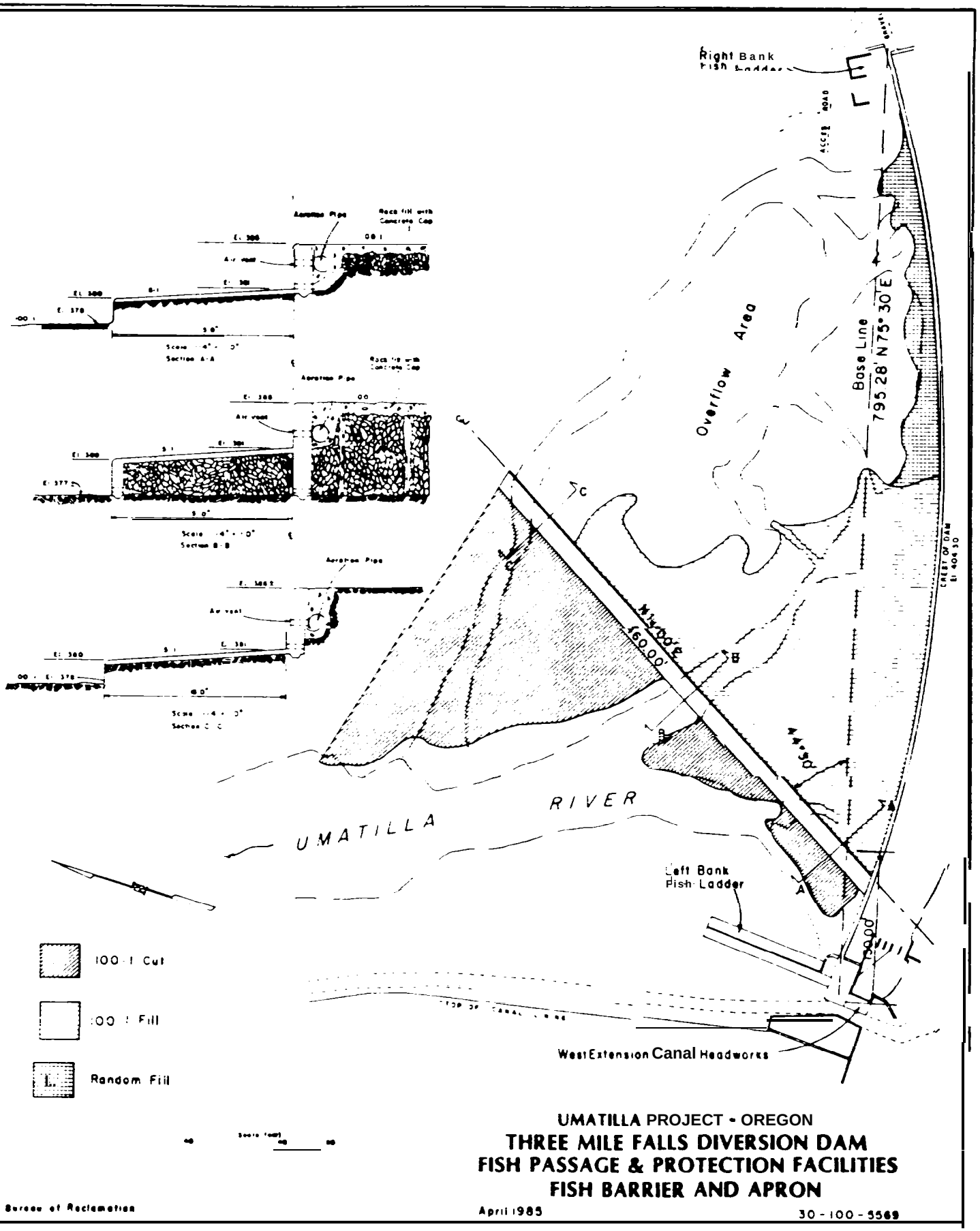
The barrier would consist of a 460-foot-long, 4-foot-high concrete wall with a 15-foot-wide concrete apron, constructed along the interface of the river channel and the overflow area downstream of the dam. The barrier would train upstream migrating adult fish toward the entrance to the fish ladder on the left bank and would prevent fish from reaching the east side of the dam where they are subject to injury, stranding, and poaching. The upstream area would be filled with rock and capped with concrete to eliminate fish resting areas and to reduce trash accumulation. In order for the barrier to function properly, the barrier, fill, and cut areas must be kept clear of debris.

The concrete barrier wall would be equipped with an aeration piping system. This would reduce the differential pressure created beneath the overflowing nappe. The fill area would have drain pipes to reduce uplift pressures and steel anchors to reduce erosion of the fill rock.

The left bank ladder modifications and the fish screen structures would be the same as described under the two-ladder alternative.

Operating Plan

The barrier and apron would operate effectively under a range of flow conditions. However, the structurewas designed such that velocities on the apron would be about 16 ft/s at a flow of 3,000 ft^3/s. This velocity would make it difficult for fish to get on the apron. Those fish that did get on the apron would have to continue to swim against the high velocity to the Upstream end of the apron. Here they would find it difficult to jump the 4-foot-high wall since flow depth on the apron would be too shallow for them to obtain vertical acceleration. At any time, if a fish would turn broadside to the flow, it would be swept off the apron. Any fish which would manage to pass the barrier would eventually be swept back into the main river channel since the area between the barrier and the toe of the dam would be filled to eliminate holes and pools where a fish could rest.



UMATILLA PROJECT - OREGON

THREE MILE FALLS DIVERSION DAM
FISH PASSAGE & PROTECTION FACILITIES
FISH BARRIER AND APRON

U S Bureau of Reclamation

April 1985

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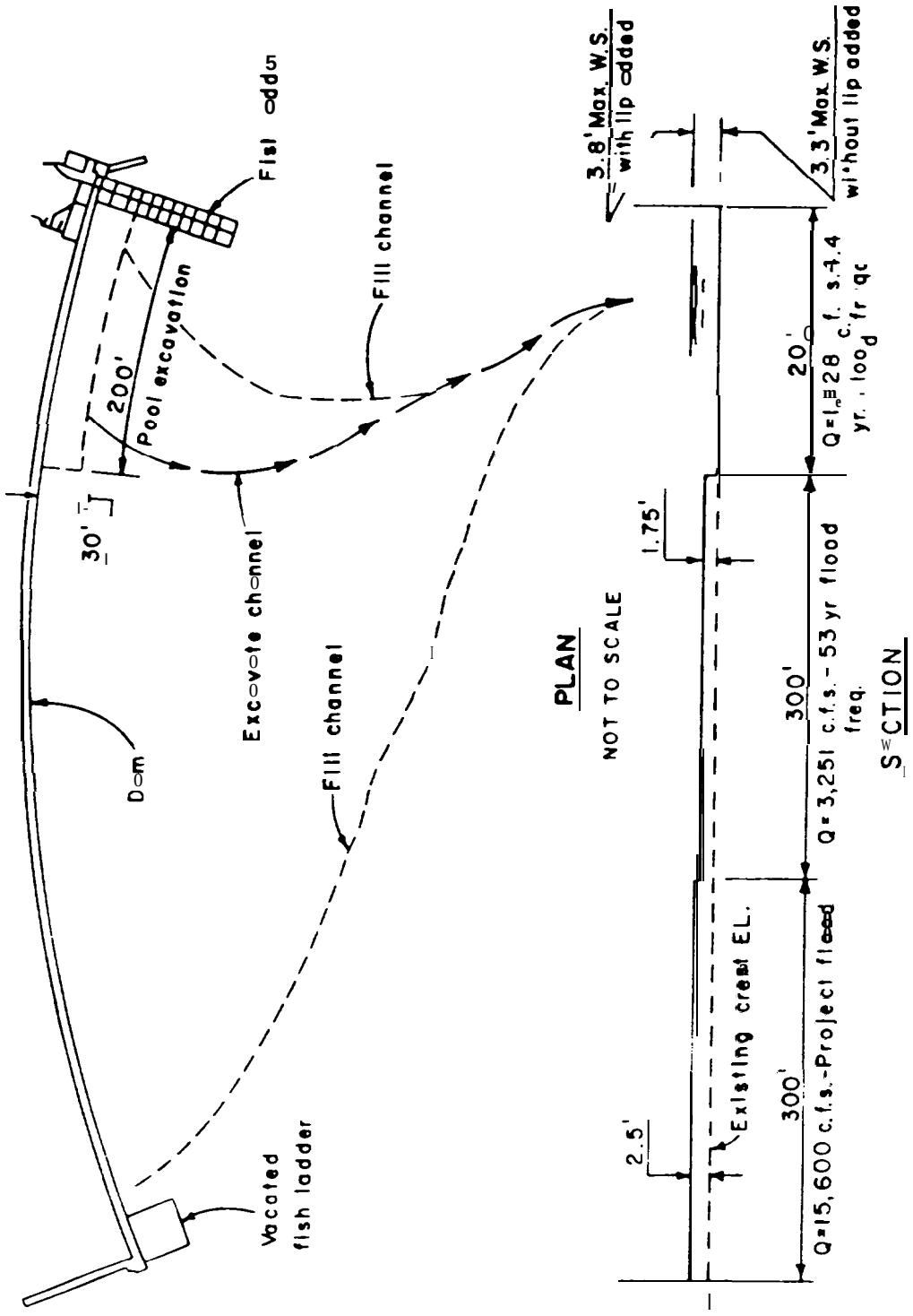

Umatilla Project - Oregon
THREE MILE FALLS DIVERSION DAM
FISH PASSAGE & PROTECTION FACILITIES

CAP ON CREST

Only the left bank ladder would be operational under this scenario. The operation of the left bank ladder and fish screens would be the same as described under the two-ladder alternative.

Costs

The construction costs for the fish barrier and apron, the left bank ladder modifications, and the fish screen facilities are estimated to be S3,560,000. This includes $1,145,000 for the barrier and apron, $605,000 for the left bank modifications, and $1,810,0130 for the fish screen facilities.

Annual operation and maintenance costs would be $7,000 for the barrier and apron, $25,000 for the left bank ladder, and 520,000 for the fish screen facilities--a total of $52,000.

Construction and annual operation and maintenance costs are based on an October 1984 price level.

Cap-on-crest Plus West Ladder

Description of Facilities

A cap on the east and center portions of the dam would be the key features in this alternative. Other features would include modifications to the left bank ladder and new fish screens and related structures in the WEID Canal (see design drawing).

A 2.5-foot-high cap would be constructed on the dam crest for a 300-foot length starting from the east (right) side. A center section would have a 1.75-foot cap for another 300 feet. The west 200 feet of the dam would be left without a cap. During low flow conditions (generally from July through February), fish attraction waters would be directed to the left bank fish ladder. Water cresting the dam would spill into an entrance pool which would be constructedalong the face of the dam for the entire 200 feet of the uncapped section. A new channel would be constructed from the east end of the pool. Old channels would be filled in and capped with concrete to prevent stranding and delaying of upstream migrants.

Debris removal from the dam crest, left bank fish ladder entrance and exit, and the canal entrance would be essential for proper operation of all facilities.

The operation of the left bank ladder and fish screens would be the same as described under the two-ladder alternative. The existing right Sank pool-and-weir ladder would be inoperasle under this alternative.

The cap-on-crest alternative would present a number of problems that would require further investigation. This alternative would result in an approximatel1/2-foot increase in the maximum pool elevation behind the dam, which would require flow routing studies to determine whether the WEID Canal headworks and left fish ladder exit would need to be raised. The weight of the proposed cap may affect the structural stability of the dam. Core samples

from the dam would be taken to determine any need for additional structural support to the dam.

Operating Plan

With the cap on the crest, flows would be directed to the west portion of the dam during low flow conditions.3 The noncapped section of the dam would be ahle to handle flows up to 1,528 ft^3/s, and with the middle section, flows could increase to 3,251 ft^3js. Above 3,251 ft^3/s flows would start cresting the east- capped section of the dam as well. At 15,600 ft^3/s, the cap would raise the water surface behind the dam by 0.5 feet over current conditions.

The left bank fish ladder and bypass structures would require up to 85 ft^3/s and 65 ft^3/s, respectively, as described under the two-ladder alternative.

costs

The construction cost for the cap-on-crest, the left bank fish ladder modifications, and the fish screen facilities are estimated to be $2,985,000. This includes $570,000 for the cap on the dam, S605,000 for the left bank modifications, and 51,810,000 for the fish screen facilities.

Annual operation and maintenance costs would be SlO,000 for the cap-on-crest, 825,000 for the left bank ladder, and $20,000 for the fish screen facilities--a total of $55,000.

Construction and annual operation and maintenance costs are based on an October 1984 price level.

Dam Removal

Description of Facilities

This alternative would require the construction of a new pumping plant at the mouth of the Umatilla River to supply water to the WEID Canal. Fish passage in the river would Se improved by restoring the river channel to predam conditions. This would require the removal of a portion of the dam and bedrock and/or silt removal behind the da:?. No fish ladders would be required, and the canal headworks would be abandoned. Water normally diverted at the dam for irrigation would be allowed to pass downstream for improved fish flows, particularily during low flow conditions and high fish migration. Water for the WEID Canal would be supplied by the pumping plant.

A new pumping plant would be constructed near the mouth of the Umatilla River at the present pumping site. Existing features are obsolete and would be entirely replaced. The new plant would have a capacity of 6,500 horsepower and would be able to lift 270 ft^3/s (present canal capacity) 150 feet to the existing canal structure. The forebay channel would need to be deepened, discharge lines replaced, and a new outlet structure built.

Approximately one-third of the dam would have to be removed to restore the channel to predam conditions. The other portions of the dam and related

structures would be left in place and abandoned. Some of the silt behind the reservoir would be removed to prevent environmental problems downstream. The quantity of silt that would be removed and the amount left to flush downstream are not known at this time.

Operating Plan

WEID would obtain all its water supply from pumping from the mouth of the Umatilla River. A portion of this supply would have to be pumped back toward Three Mile Falls Diversion Dam. However, most of the needs are downstream from this point. The maximum capacity of the pumping plant is 270 ft^3/s, which is more than current supply (however, less than existing water rights).

Water normally diverted for irrigation at Three Mile Falls Diversion Dam would be allowed to pass downstream to improve fish passage flows in the river.

Costs

The construction costs for the pumping plant and dam removal are estimated to be $8,280,000. This includes $7,900,000 for the pumping plant and related structures and $380,000 for removal of a portion of Three Mile Falls Diversion Dam. This includes a limited amount of silt removal.

Annual operation and maintenance costs were not calculated for this alternative. Construction costs are based on an October 1984 price level.

A comparative summary of plans is found in table 3.

Table 3.--Comparative Summary of Plans

Item	Two Fish Ladders	Concrete Apron Plus West Ladder	Cap-on-crest Plus West Ladder	Dam Removal
Advantages	Technology proven on ladder design Reduces stranding of fish Offers most versatility for operation, trapping, and counting Improved attraction water to both ladders Improved passage to and through left bank ladder Ca-al screens included	Facilitates debris removal from face of dam Would only require operation and maintenance on one ladder Addition of counting/ trapping facilities in right bank ladder Canal screens included	Least costly alternative Would only require operation and maintenance on one ladder Improved attraction to right hank ladder Addition of counting/ trapping facilities in right bank ladder Canal Screens included	Would provide most natural conditions for fish passage which would cause, least stress on fish (assuming adequate flows in river and channeliration in reservoir area if needed)
Disadvantages	High operation and maintenance (debris and silt) potential on left bank ladder	Hydraulics of barrier unknown without node: testing Debris or unfavorable hydraulics may create pockets of false attraction flows. resulting in adult migration de!ay	Potential for excessive debris problem at canal headworks Possible safety of dams problen Canal headdworks would need to be raised due to raise in maximum reservoir water surface	Most expensive alternative Pumping costs may increase in future Loss of trapping/ counting opportunities at Three Mile Falls Diversion Dam Environmental impacts more severe than other alternatives
Total ccnstruction costs	$3,475,000	$3,560,000	$2,985,000	$8,280,000
Operation. maintenance replacement and power costs	$66,000	$52,000	$55,000	Not calculated

DEVELOPMENT OF ALTERNATIVES AND SELECTION OF RECOMMENDED PLAN

The various fishery agencies, the Umatilla Indian tribes, and the WEID were involved in the selection of the recommended plan.

During the preparation of the biological assessment in mid-1984, seven conceptual alternatives were defined by the agencies and Indians. Three of these alternatives were eliminated early in the planning stage; a discussion of this process is found in the following section. More detailed engineering designs and cost estimates were done on the remaining four alternatives just discussed. Preliminary designs and cost estimates were presented to the WEID in mid-February 1985 and to the fishery agencies and Indians in late February.

The representative from the WEID (Mr. Darrell Dick) favored the Concrete Apron Plus West Ladder alternative because it was felt that the apron would facilitate debris removal from the face of the dam and would be somewhat self-cleaning. The representative also expressed that the Cap-on-crest Plus

West Ladder alternative would be undesirable because of significantly increased debris problems at the canal headworks. Also, since this plan would result in a slightly higher reservoir pool level during high flows due to reduced spillway width, the canal headworks would probably have to be raised. The WEID's main concern with the two-ladder plan is the question of operation and maintenance funding and responsibility. The construction of a new ladder on the right bank could cause difficulty in access along the face of the dam for maintenance work.

The fishery agencies and Indians have unanimously endorsed the two-ladder plan. However, the U.S. Fish and Wildlife Service, CTUIR, and Columbia River Intertribal Fish Commission initially indicated a preference for dam removal. Since this alternative is much more costly than the other alternatives, they chose the two-ladder plan as their recommended plan. Within the ODFW, some people initially indicated a preference for the concrete apron plan because there would be less effort involved in counting and trapping fish with only one ladder. However, several people expressed concern over the effectiveness of The barrier. It was felt that there was high potential for the creation of pockets of high flows along the face of the barrier, which would attract fish and create delays in upstream migration. Conversely, the technology and effectiveness of the fish ladders are proven.

No preference was shown for the Cap-on-crest alternative.

Based on the above, the two-ladder plan has been chosen as the recommended plan. WEID's concern for a means of access to the face of the dam will be addressed during final design work.

Copies of letters from the various agencies and Indians summarizing their positions on the alternative items are found in the appended material.

OTHER PLAYS CONSIDERED

Three other alternatives were considered in the earlier stages of this study but were eliminated for various reasons. These alternatives were (1) right bank ladder only; (2) ladder at new location (i.e., middle of dam); and (3) center cap-on-crest with sill-type ladder on east side. The East Ladder only alternative was eliminated because it would abandon the best (left sank) existing ladder, and it was thought that a single ladder was not sufficient to meet fish passage problems. The middle ladder alternative was eliminated because of access and maintenance difficulties particularly when trapping and counting fish. A middle ladder would require more water to operate and would be nore costly than a bank ladder due to additional height and strength requirements. The sill-type ladder was omitted because it would be more difficult to regulate flow, debris in the ladder would be a major problem, and trapping and sampling facilities would not be available.

DATA NEEDS FOR FINAL DESIGNS AND CONSTRUCTION

A variety of data must be collected and analyzed before final designs can be prepared and construction begun. Additional control surveys and topographical mapping are needed at each ladder and fish screen structure. Surveys are

needed to establish river cross sections above and below the dam and canal cross-sections and profiles above and below the screen site. Geological investigations are needed to explore foundation conditions at each structure to locate possible borrow sources and to locate sites for disposal of waste materials. Hydrologic records and analyses are needed to develop water surface profiles above and below the dam and the screen site. Also, a flood frequency analysis needs to be prepared for the site, and operational data needs to be analyzed before final designs and specifications can be determined.

Records of all construction at and within the construction area of the ladders and screens need to be examined to determine how new construction should tie into existing facilities, to locate possible utilities, to establish access routes, and to locate rights-of-way.

Stream maintenance requirements during construction of the fishways need to be determined.

IMPLEMENTATION AND OPERATION AND MAINTENANCE

Permits and Clearances

Prior to any construction, Reclamation will submit a joint Application for Permit to both the Army Corps of Engineers and State of Oregon, Division of Lands. This will comply with both section 404 of the Clean Water Act and appropriate State regulations for removal or filling of materials in waterways.

As part of this process, Reclamation will also comply with any local regulations governing alterations and/or development within a flood plain.

Construction Schedule

BPA proposes to fund construction of fish passage and protective facilities at Three Mile Falls Diversion Dam. The construction schedule (on the following page) was developed to provide continued operation of at least one ladder at all times. Design data for the left bank ladder modifications would be collected in July and August of 1985, and preparation of final designs and specifications would begin at the same time. The constructicn contract would be awarded in September 1986, and the modifications would he complete by September 1987. The schedule for the right bank ladder would be the same as the left bank ladder except that it would be 1 year later, with completion in September 1988. Some trapping and hauling of fish during construction may be required to supplement passage through whichever ladder is operating at the time. Both ladders would be fully operational for the fall and winter I988 upstream migration period.

This construction schedule is contingent upon securing funds for construction and upon input and review from appropriate fishery agencies and the CTUIR in a timely manner to complete the designs.

Design data for the WEID Canal screens would be collected in October and November 1985. Preparation of final designs and specifications would start in

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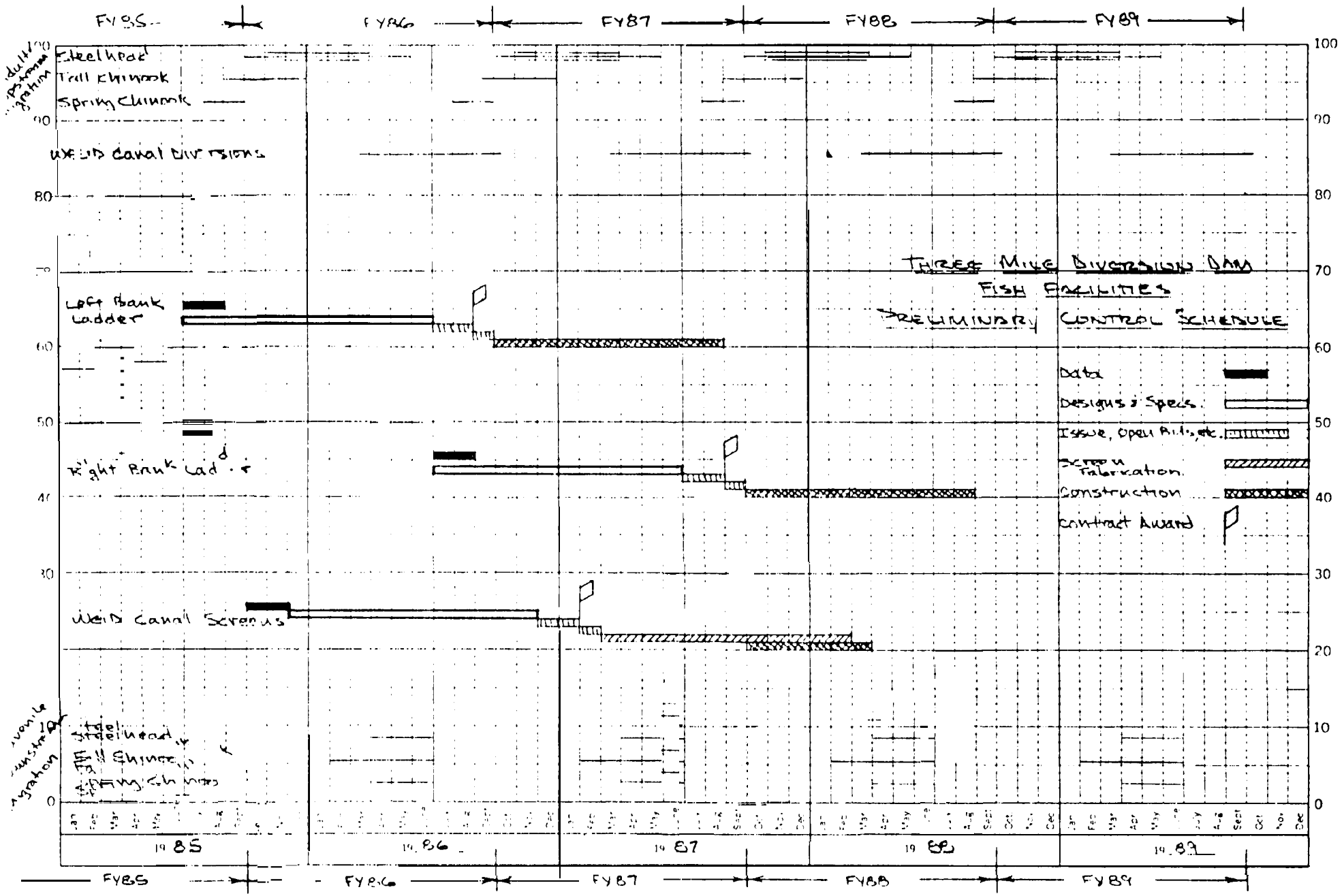

FY85
FY86
FY87
FY88
FY89
Steelhead
Fall Chinook
Spring Chinook
Upper Canal Diversions
Left Bank Ladder
Right Bank Ladder
Weir Canal Screens
Juvenile Downstream Migration
Steelhead
Fall Chinook
Spring Chinook
THREE MILE DIVERSION DAM
FISH FACILITIES
PRELIMINARY CONTROL SCHEDULE
Data
Designs & Specs.
Issue, Open Bids, etc.
Screen Fabrication
Construction
Contract Award
1985
1986
1987
1988
1989
TRDH 7 MAR 1985

December 1985. The construction contract would be awarded in February 1987. Fabrication of screens would begin at that time. Construction of the screen structure would start in October 1987 and would be complete by March 1988.

Operation and Maintenance Costs and Responsibilities

Present operation and maintenance responsibilities are shared between WEID, ODFW, and NMFS. The WEID is responsible for debris removal along the face of the dam and from the louvers. The district has no responsibility for operation and maintenance activities on the right bank ladder. Estimated annual operation and maintenance expenses borne by WEID are $10,500, which includes $9,000 per year for labor (wages) and $1,500 for minor and ordinary maintenance and repair on gates, the louvers, and other structures. About once every 8 to 10 years the district removes silt from just upstream of the east abutment and snags and other debris from the dam crest at an estimated cost of $4,000.

The right bank ladder was reopened in 1984 after being out of service for 20 years. The left bank ladder is used to trap and count fish by partially dewatering it and dip-netting individual fish and passing them over the dam. The ODFW has responsibility for this activity, which requires about 50 man-days per year to accomplish.

The louvers were constructed by NMFS in 1961. Funding for annual maintenance and repair is passed to ODFW from NMFS in a program that includes fish screens throughout the Columbia Basin. No funding estimates are available for operation and maintenance on the louvers.

BPA will fund design and construction of fish passage and protective facilities at the dam, and informal indications are that they will provide operation and maintenance funds perpetually. Specific operation and maintenance responsibilities have not been identified at this phase of the project. Estimated annual operation and maintenance costs for the facilities outlined in the recommended plan are about $66,000. It is assumed that Reclamation would be responsible for overseeing operation and maintenance activities. One possibility under consideration is to include the operation and maintenance function in the Yakima fish passage facilities program since Three Mile Falls Diversion Dam is reasonably close to the Yakima Project.

Resolution of the various questions regarding operation and maintenance of fish passage facilities at Three Mile Falls Diversion Dam should be a top priority as this project moves into the final design phase.

ENVIRONMENTAL CONSIDERATION AND NEPA COMPLIANCE

Environmental Considerations

Constructing fish ladders and fish screening structures at Three Mile Falls Diversion Dam would be classed as a minor construction activity and would have only minor, short-term, and localized negative environmental

effects. None of these effects would be considered significant. The effects of the proposed construction would be limited to four environmental parameters --.air quality, water quality, noise, and fish and wildlife.

Increases in dust and exhaust emissions at all sites would be minor during construction and would result from operation of equipment. These increases would be limited to the immediate area near the construction sites and would be insignificant.

Construction of the fish ladders and fish screens would require constructing cofferdams or other type barriers to dewater the construction sites. This activity would cause short-term and minor increases in turbidity downstream. However, the increase in turbidity would disappear within a few hours after completion of the activity as the natural streamflow cleansed the area.

A minor and short-term increase in noise levels would occur in the immediate area of the construction site. There are no residential areas in the immediate vicinity of the dam, and noise levels are already somewhat high from falling water and traffic on a nearby highway. The increased noise levels during construction would not be significant.

Noise and human activity in the immediate area of construction at each site may cause the temporary displacement of a few animals sensitive to this activity. Construction of the ladders and screens would correct existing passage problems which now result in suhstantial mortality and delay of fish as they attempt to pass Three Mile Falls Diversion Dam. This action would help rebuild the severely depleted anadromous fish runs in the Umatilla giver basin.

Construction of the fish ladders and screens would not change the existing land use which is diversion of water for agricultural purposes. The proposed action would not have any effect on any wild and scenic river, national trail, designated or proposed wilderness area, or threatened or endangered species.

NEPA Compliance

The Bureau of Reclamation and BPA are coordinating the preparation of an environmental assessment, which will be ready for public review during late summer 1985. If tnis environmental assessment supports a Finding of No significant Impact (FONSI), tne FONSI document will be completed by late October 1985.

COSTS DEVELOPMENT

Construction costs shown in this report are total construction costs based on an October 1984 price level and include allowances for contingencies, engineering and supervision during construction. These costs were developed by applying unit prices to quantity estimates developed from preliminary layouts and designs. Ladder and screen layouts and designs were developed in cooperation with ODFW and NMFS Ladder and screen layouts and designs were

also based on Reclamation fish passage and protective facilities being constructed on the Yakima River Basin Project, Washington. Designs reflect the current state-of-the-art for fish passage and protection for this size of project. Quantities for rotary screen and pumpback estimates in this report are based on the specification drawings for the Sunnyside screen facility and adjusted as necessary for site-specific conditions.

The costs developed in this report are the best available at the present time and should provide an adequate cost estimate for project construction. Some items that may be required in final designs were not evaluated in this study. Among other things, these could include a check structure downstream of the fish screens to help regulate the flows in the canal, filling in the bays of the dam to prevent stranding if fish should still be inclined to "jump" the dam, and repair of seepage problems to the canal downstream of the fish screen structure.

CONCLUSIONS AND RECOMMENDATIONS

Conclusions

The provision of adequate fish passage and protective facilities at Three Mile Falls Diversion Dam would be a highly important step in the process of enhancing steelhead runs and reestablishing chinook salmon runs in the Umatilla basin.

Recommendations

It is recommended that final designs and specifications on the recommended plan and NEPA compliance requirements be completed as outlined in the enclosed schedule and construction be initiated as proposed. This objective is in keeping with the recommendations of the Northwest Power Planning Council in its Fish and Wildlife Program and with the goals of the ODFW and Columbia River Intertribal Fish Commission in reestablishing chinook salmon runs in the Umatilla basin.

LITERATURE CITED

1. Northwest Power Planning Council. Columbia River Basin Fish and Wildlife Program. Adopted pursuant to Section 4(h) of the Pacific Northwest Electric Power Planning and Conservation Act of 1980 (Public Law 96-501). November 15, 1982.

2. Bonneville Power Administration. Letter to Bureau of Reclamation dated January 13, 1984.

3. Van Cleve, R. and R. Ting. 1960. The Condition of Salmon Stocks in the John Day, Umatilla, Walla Walla, Grande Ronde, and Imnaha Rivers.

4. Confederated Tribes of the Umatilla Indian Reservation. 1984. Umatilla River Basin Recommended Salmon and Steelhead Habitat Improvement Measures.

5. National Marine Fisheries Service, Portland, Oregon. 1981. Use of Louvers for Downstream Migrant Protection. Unpublished Draft Paper.

6. Oregon Department of Fish and Wildlife. January 1985. Umatilla Rehabilitation Plan Review (Draft).

APPENDED MATERIAL

RIOLOGICAL ASSESSMENT

United States Department of the Interior

FISH AND WILDLIFE SERVICE
Division of Ecological Services
Portland Field Office
727 N. E. 24th Avenue
Portland, Oregon 97232

Reference RG:mm

July 6, 1984

Recipient:

This is the final biological assessment of anadromous fish passage problems at Three Mile Falls Diversion Dam, Umatilla River, Umatilla County, Oregon. The assessment describes: 1) existing and future anadromous fish resources of the Umatilla Basin; 2) current fish passage facilities and passage problems at Three Mile Dam; and, 3) eight alternative actions under two flow conditions (present and future). Future flow conditions are those that would exist with two potential flow enhancement projects--one by the Corps of Engineers and one by the Bureau of Reclamation. These projects are briefly described as they relate to flow conditions at Three Mile Dam.

The purpose of the assessment is to provide the biological aspects of fish passage problems under the above conditions. This information is being provided to the Bureau of Reclamation for its use in development of a structural feasibility/preliminary design study of passage problems and solutions at Three Mile Dam. The study will also include engineering and economic information and will be submitted to the Bonneville Power Administration for possible funding under the Northwest Power Planning and Conservation Act. The assessment is in outline form to assist the Bureau in preparation of its study.

Both written and/or verbal comments were received from the Oregon Department of Fish and Wildlife, National Marine Fisheries Service, Confederated Tribes of the Umatilla Indian Reservation, and the Bureau of Reclamation. The final assessment has been refined and updated as a result of internal review and comments on the draft assessment.

We look forward to your continued interest and cooperation in protecting and restoring anadromous fish resources in the Umatilla River Basin.

Sincerely,

Russell D. Peterson

Russell D. Peterson
Field Supervisor

BIOLOGICAL ASSESSMENT, FISH PASSAGE AT THREE MILE FALLS DIVERSION DAY, UMATILLA RIVER

I. Three Mile Falls Diversion Dam

A. Purpose and Function of Dam

Three Mile Falls Diversion Dam is located on the Umatilla River approximately 3 miles south of Umatilla, Oregon. The structure is a concrete buttress dam with a maximum height of 24 feet, hydraulic height of 23 feet, and a crest length of 915 feet. The dam was constructed by the U.S. Bureau of Reclamation (BR) in 1914 as an integral part of the Umatilla Project. It diverts water to the service area of the West Extension Irrigation District (WEID) through a 27-mile-long main canal. The canal head-works capacity is 375 cubic feet per second (cfs) and the canal capacity is 315 cfs. The historic peak diversion has been 335 cfs witn maximum canal flows averaging about 210 cfs over the past 50 years. The diverted water is used to irrigate about 7,000 acres of farmland.

B. Ownership, Operation, and Maintance Responsibility

The dam is owned by the BR with operation and maintenance responsibilities being handled by the WEID. Provisions for operation and maintenance are handled under contract between the two agencies.

C. Diversion Dam Design and Flow Characteristics

The dam was designed to function as an overflow weir along its entire crest. During the normal irrigation season (April through October) the WEID diverts available river water to meet their demand, and passes the remainder over the dam crest. During periods of low flow, all the available water is diverted (up to the canal capacity), except for about 15 to 20 cfs release.3 through the downstream migrant bypass pipe for downstream diversion at the Brownell site. When river flow is inadequate to meet irrigation requirements, additional water can be pumped into the canal from the Columbia RIver. This has not been done in the last few years because of the pumping costs.

During the non-irrigation season, all river flow in excess of fish ladder and bypass pipe capacity is passed over the dam. AS the flows increase over the dam, the proportion of total

flow at the ladder entrance decreases. Figure 1 depicts the average flow conditions in the Umatilla River below Three Mile Dam over the 44-year period, 1935 to 1978. The photo on page 4 shows the design and operation of the diversion dam, with flows overtopping the crest along most of its length.

D. Existing Fish Passage Facilities

1. West Ladder, Trap, and Counting Facilities

The West Ladder on the left abutment of the dam is a vertical-slot type structure which was completed in August, 1964. It has 21, 8 foot by 10 foot rectangular concrete pools. The floor slopes and the slots in the pools go clear to the floor. The ladder is operated during periods of upstream anadromous fish migrations and utilizes about 20 to 40 cfs for ladder operation, depending upon forebay depths. When there is a difference of 20 feet between the forebay and tailwater, the ladder will operate with about 1 foot difference in water level between pools. A 12-inch diameter pipe routes water from inside the upper pool through a diffuser in the lower pool to provide additional attraction flows (about 15 cfs) for adult anadromous fish.

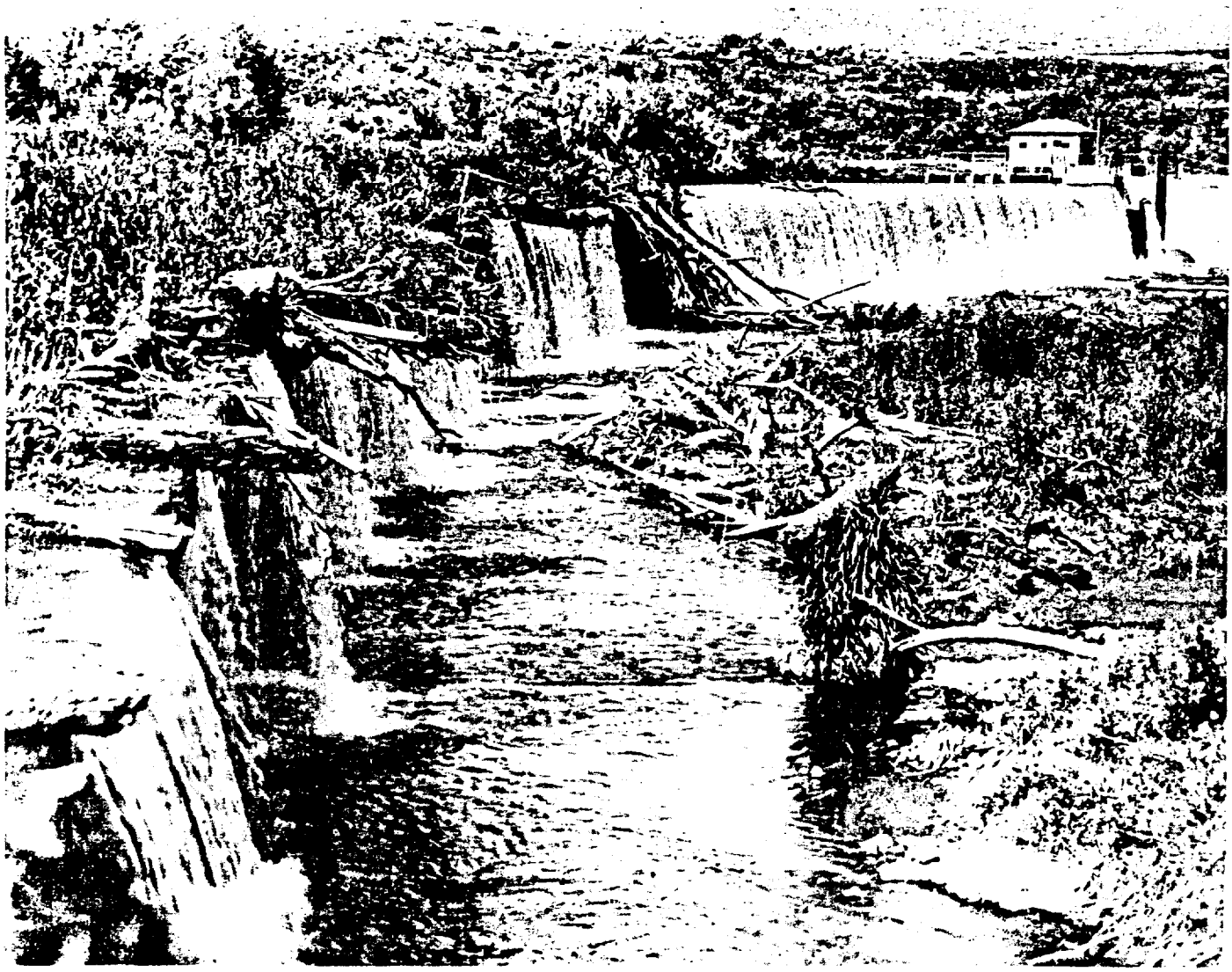
The ladder is not designed for trapping, counting, and holding adult anadromous fish. An electronic counter operated at the head of the West Ladder for several years but has nott been used recently This counter was difficult to calibrate and gave inconsistent results. Consequently, a temporary conduit, fyke-type trap is used in the upper four pools of the ladder for annual counting of summer steelhead. The pools are then partially dewatered and the fish are individually dip-netted, counted, and passed over the dam. Steelhead broodstock selection (for the juvenile supplemental outplanting program) also occurs in this manner. Downstream juvenile migrants are passed either over the crest of the dam or through a bypass pipe that collects those fish which have been "screened" from the canal entrance. The bottom photo on page 5 shows the juvenile bypass pipe existing in the tailrace, and the West Ladder entrance.

2. West Extension Irrigation District Louver

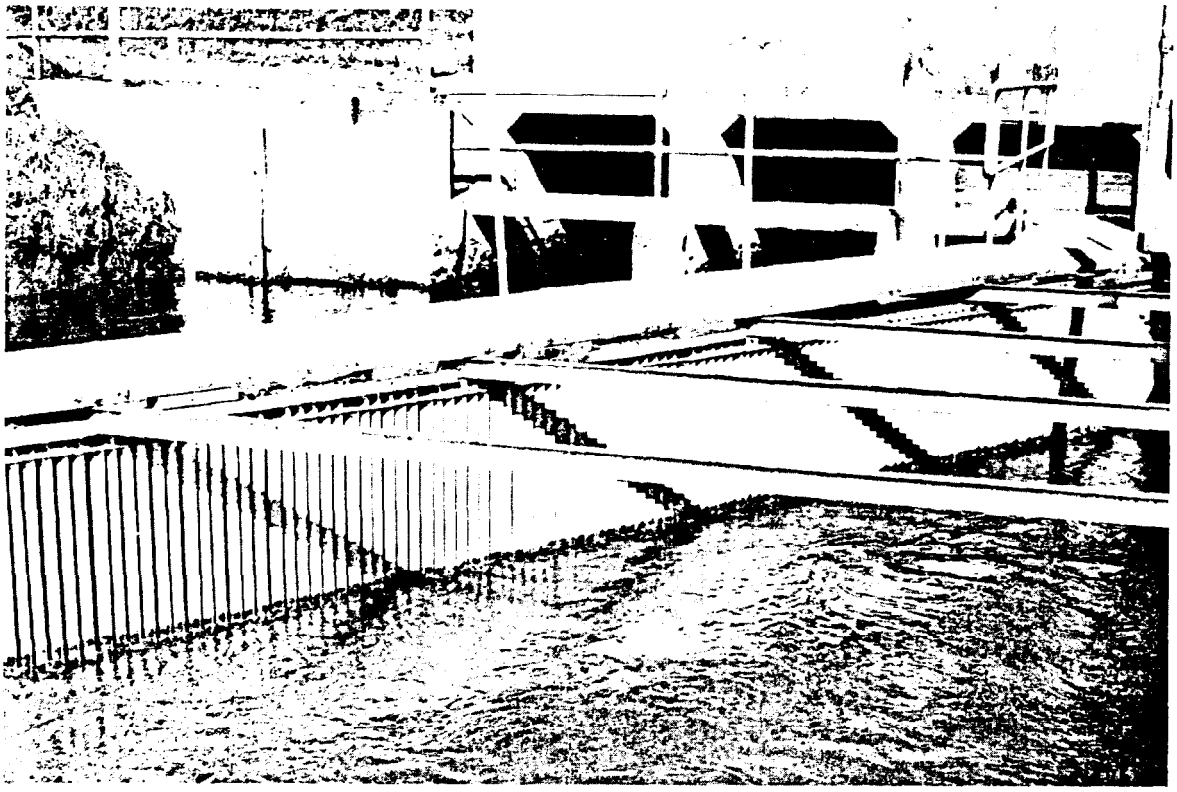
The louver is mounted at the intake of the WEID Canal at the west end of Three Mile Dam. It is approximately 30 feet long and consists of a series of fixed metal slats spaced about 1 to 2 inches apart. It prevents most steelhead smolts from entering the canal and directs them to the entrance of the bypass pipe. The top photo on page 5 shows the louver system.

Figure 1. Average Monthly Flows Expressed in cfs Below Three Mile mm for 44 Years of Record, 1935-1978

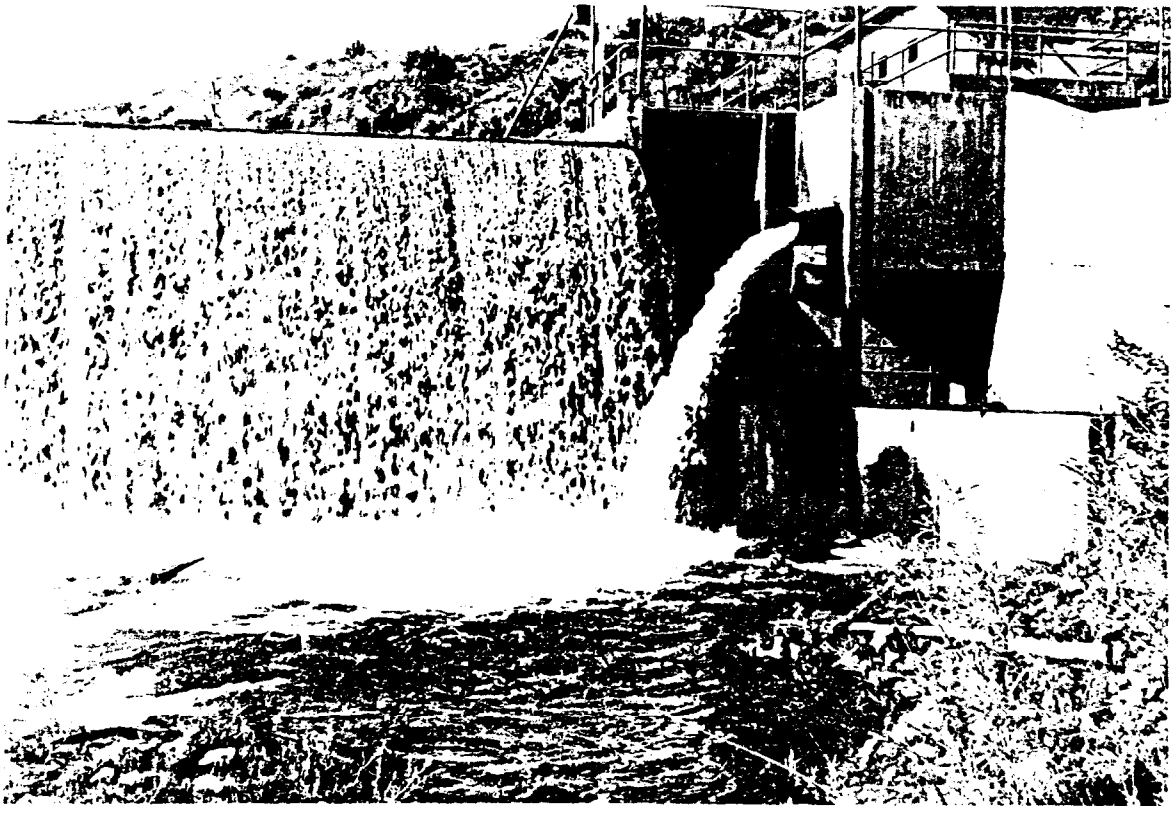
Year	Oct	Nov 15	Nov 30	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep 15	Sep 30	Average
1935	5.	5.	13.	390.	322.	316.	188.	974.	109.	11.	15.	14.	9.	18.	195.6
1936	4.	84.	106.	08.	365.	289.	1082.	1513.	176.	13.	12.	10.	8.	13.	303.8
1937	9.	31.	84.	79.	51.	198.	578.	1206.	375.	50.	10.	26.	48.	28.	222.2
1938	33.	110.	161.	291.	275.	393.	1041.	1181.	95.	29.	25.	15.	27.	13.	293.2
1939	16.	79.	137.	174.	168.	283.	1560.	692.	48.	18.	38.	14.	5.	21.	261.3
1940	17.	105.	100.	110.	105.	987.	1391.	774.	17.	15.	22.	13.	13.	16.	292.5
1941	13.	128.	268.	484.	319.	117.	321.	11.	36.	211.	15.	41.	49.	68.	152.7
1942	210.	250.	867.	733.	545.	892.	739.	992.	855.	445.	148.	28.	81.	35.	514.0
1943	14.	138.	356.	1280.	1273.	1663.	1181.	2023.	957.	295.	54.	63.	52.	51.	752.1
1944	98.	188.	115.	122.	95.	202.	743.	1037.	148.	26.	22.	21.	40.	14.	223.7
1945	80.	101.	138.	115.	332.	946.	1000.	1267.	855.	91.	26.	32.	58.	42.	405.4
1946	43.	135.	618.	803.	749.	488.	1457.	1409.	535.	99.	48.	45.	151.	97.	515.0
1947	130.	163.	637.	1571.	820.	779.	832.	588.	15.	66.	35.	24.	32.	51.	440.7
1948	76.	645.	1030.	974.	888.	1066.	991.	2120.	3360.	551.	41.	56.	141.	77.	921.6
1949	138.	128.	217.	450.	226.	1584.	1963.	1872.	652.	31.	19.	35.	31.	43.	590.9
1950	44.	113.	157.	171.	521.	1462.	1490.	1363.	797.	804.	11.	51.	65.	45.	568.0
1951	140.	358.	325.	795.	1207.	1815.	1429.	1054.	217.	140.	32.	21.	33.	19.	593.7
1952	171.	181.	258.	344.	371.	882.	829.	1501.	430.	22.	26.	19.	37.	25.	399.6
1953	36.	72.	128.	117.	1007.	1369.	1123.	1481.	726.	417.	26.	68.	80.	71.	538.8
1954	92.	129.	167.	562.	436.	689.	456.	560.	13.	220.	24.	35.	46.	67.	271.1
1955	40.	207.	126.	131.	132.	189.	122.	737.	1478.	116.	27.	45.	52.	34.	269.6
1956	39.	184.	536.	1215.	1309.	742.	1703.	1376.	1107.	44.	14.	44.	28.	19.	666.4
1957	69.	221.	165.	583.	116.	833.	1499.	1407.	914.	39.	12.	36.	24.	12.	474.4
1958	161.	176.	210.	635.	715.	1875.	688.	3055.	980.	11.	8.	45.	47.	11.	688.6
1959	51.	262.	362.	948.	1378.	910.	894.	981.	318.	35.	19.	25.	111.	123.	497.1
1960	311.	192.	567.	160.	306.	587.	1132.	640.	726.	34.	17.	66.	65.	26.	366.2
1961	14.	152.	629.	215.	205.	1477.	1338.	405.	218.	24.	12.	25.	46.	17.	355.4
1962	15.	118.	176.	274.	513.	298.	699.	891.	441.	33.	19.	10.	27.	17.	280.1
1963	127.	146.	282.	452.	221.	1367.	440.	941.	332.	7.	8.	19.	11.	4.	336.9
1964	31.	155.	164.	165.	252.	331.	423.	936.	378.	66.	8.	15.	4.	12.	229.7
1965	26.	62.	116.	1887.	2316.	2254.	559.	1167.	176.	52.	34.	12.	5.	5.	706.2
1966	39.	73.	103.	103.	131.	139.	584.	289.	6.	6.	10.	6.	3.	3.	117.0
1967	11.	155.	48.	489.	810.	610.	241.	188.	619.	9.	5.	7.	7.	3.	257.0
1968	50.	122.	107.	502.	260.	1074.	164.	5.	4.	2.	4.	4.	3.	4.	176.5
1969	74.	256.	413.	456.	1331.	591.	854.	2188.	604.	54.	26.	12.	17.	50.	545.0
1970	127.	145.	115.	147.	1931.	1051.	1106.	942.	839.	25.	4.	5.	71.	19.	527.7
1971	118.	172.	286.	241.	1141.	916.	628.	602.	250.	198.	24.	18.	85.	35.	365.4
1972	85.	209.	307.	775.	866.	1636.	3677.	1023.	795.	42.	17.	16.	22.	24.	765.4
1973	108.	151.	120.	486.	548.	160.	208.	8.	7.	7.	5.	6.	7.	5.	141.3
1974	16.	466.	640.	1898.	2010.	1301.	1388.	2800.	1255.	296.	21.	12.	17.	25.	961.8
1975	66.	138.	153.	225.	1580.	842.	1324.	996.	1271.	59.	15.	12.	10.	14.	546.0
1976	99.	196.	208.	1392.	1492.	763.	751.	1922.	645.	12.	10.	17.	7.	4.	608.8
1977	36.	107.	97.	96.	109.	77.	134.	268.	2.	2.	3.	3.	2.	2.	69.1
1978	4.	164.	448.	1177.	757.	727.	1031.	784.	344.	10.	24.	33.	15.	13.	433.6
AVG	70.	168.	279.	552.	693.	845.	954.	1095.	548.	108.	23.	26.	39.	29.	428.2



View of Threemile Dam from above east ladder looking west. Note: Attraction flows over the dam and debris accumulation.



West - Existing louver system used to bypass the downstream juvenile migrants (WEID Canal headgate in background)



West - Juvenile bypass outlet pipe and entrance to fish ladder on west end of Threemile Dam

3. East Ladder

The East Ladder on the right abutment of the dam was constructed in 1914 in conjunction with Three Mile Dam. Additional weirs were constructed at the toe of the dam as part of this ladder in 1963. The ladder is an overflow weir type containing 13 concrete pools, each 6 foot by 8 foot by 6 foot in size. This series of pools contain vertical drops ranging from 6 inches to 1 foot. Because of sedimention problems and access difficulties, this ladder has been used only recently since the West Ladder was completed in 1964. These access problems are the result of sediment buildups and obstructions in the river near the ladder entrance. In 1984 the ladder was reopened and successful passage of steelhead occurred when river flows exceeded about 500 cfs. The ladder does not contain trapping, holding, or counting facilities. No additional attraction water is provided to the ladder entrance. The photos on page 7 show this ladder in operation from both the upstream and downstream side.

II. Existing and Future Fishery Resources

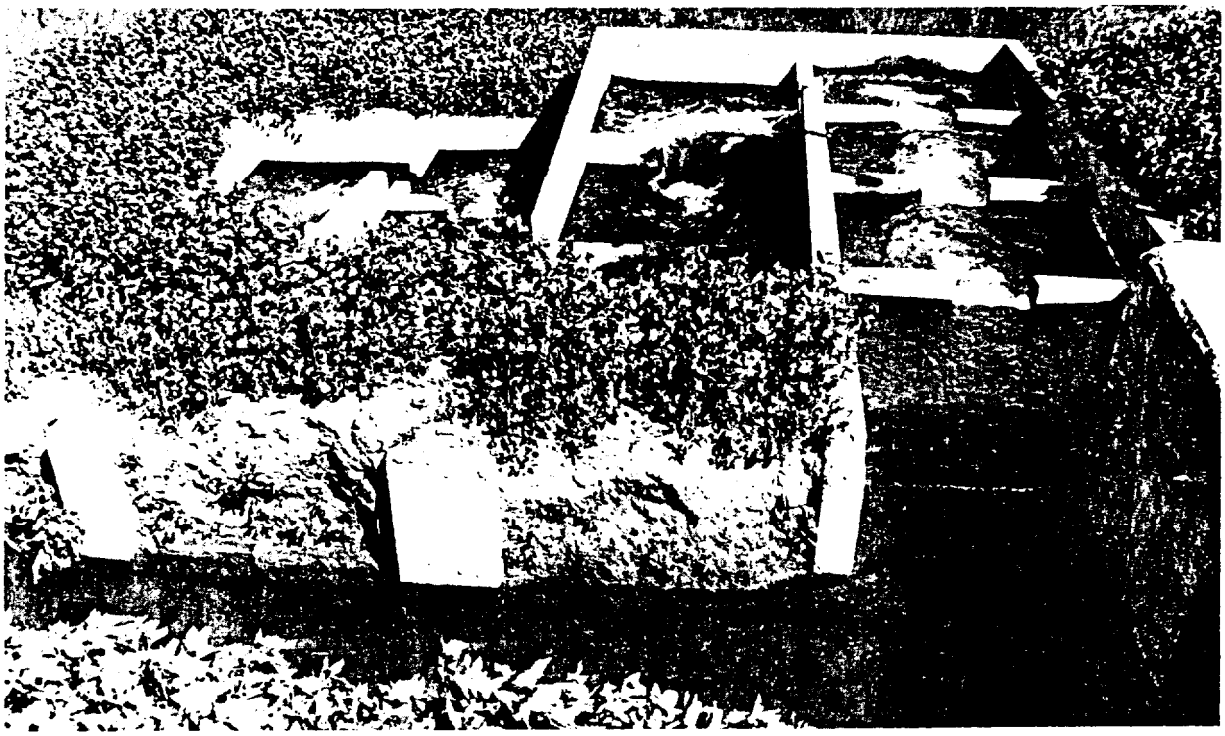
Historically, the Umatilla River System produced large numbers of summer steelhead and fall and spring chinook salmon. The largest run of chinook salmon within the memory of white man occurred in 1914 (Van Cleve and Ting, 1960). In that year, Indians and non-Indians caught "thousands upon thousands of salmon from spring to fall at the site of West Extension Canal and Hermiston Light and Power Company Dams." It was reported that significant declines in the numbers of salmon and steelhead followed that year with the completion of Three Mile Dam.

A. Steelhead

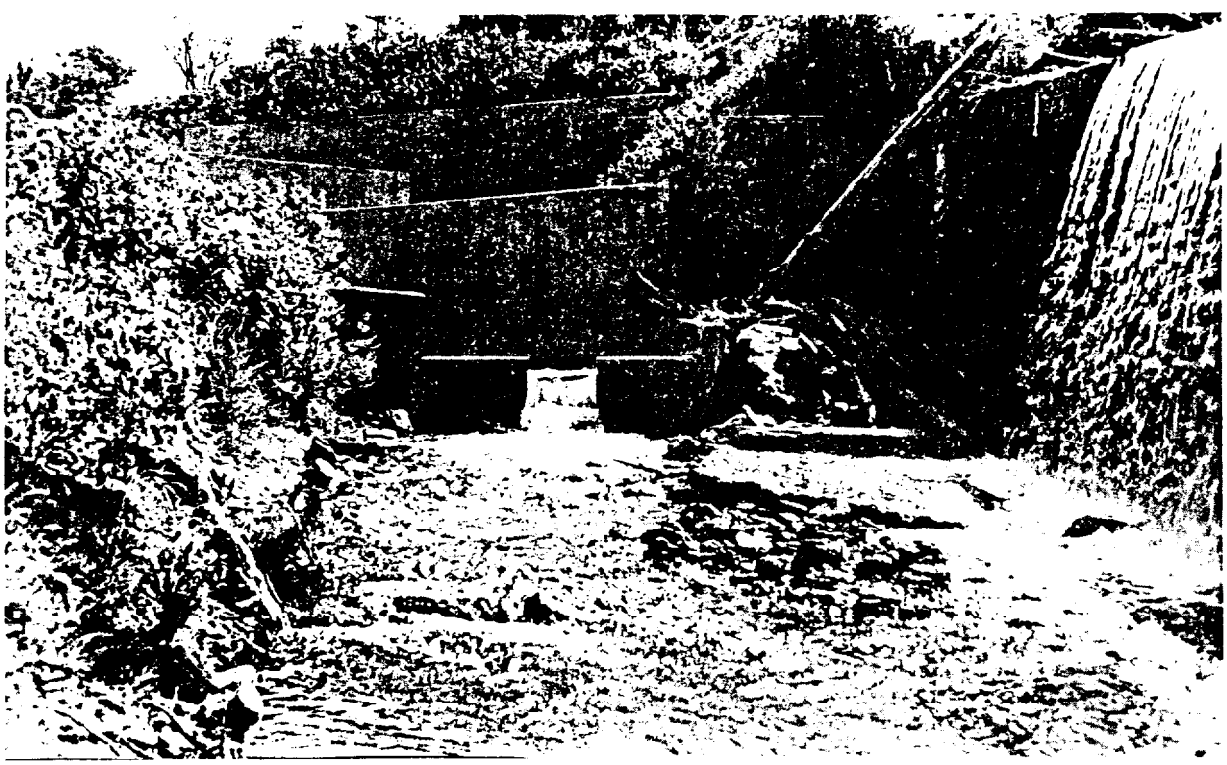
1. Present Situation

The average number of native Umatilla River summer steelhead (based on long-term electronic counts and recent manual counts) passing over Three Mile Dam for the last 14 years has been 1,886 fish.

Adult steelhead use the lower mainstem Umatilla River primarily as a migration corridor. Upstream migration begins as early as October, depending on flows, with the peak occurring between November and March. Most spawning occurs in April and May in the upper Umatilla River and its tributaries. Estimated distribution of Umatilla summer steelhead spawning is as follows:



East - East ladder looking from upstream side showing overflow weir design



East - Entrance to east side fish ladder Note: lack of well-defined channel

Stream	Percent
Meacham Creek	40.0
South Fork Umatilla River	17.0
North Fork Umatilla River	10.0
Mainstem Umatilla River	10.0
Squaw Creek	5.0
Birch Creek	15.0
Other Tributaries	3.0

Egg incubation occurs from April through July. Most rearing takes place in the same tributary streams where spawning occurs. The juveniles typically spend 2 years in freshwater before migrating to sea as smolts. The estimated annual outmigration of summer steelhead smolts is 50,000 to 100,000 native fish. This occurs during the period of April through June. Major periods of summer steelhead use of the Umatilla River Basin are as follows:

Upstream Adult Migration	October - May
Spawning	April - May
Egg Incubation	April - July
Rearing	January - December
Downstream Smolt Migration	April - June

The Oregon Department of Fish and wildlife (ODFW) began supplemental hatchery outplanting of juvenile steelhead in 1980. Since the program began ODFW has released 19,000 steelhead smolts in 1981, 50,000 in 1982, and 60,000 in both 1983 and 1984. The outplanted smolts are progeny of native adult fish trapped at Three Mile Dam.

2. Future Enhancement

An implementation plan for enhancement of Umatilla River steelhead has been developed by ODFW and the Confederated Tribes of the Umatilla Indian Reservation (CTUIR). The elements of this plan are presented in their joint Umatilla River Basin Report (1984). Long-term escapement goals for summer steelhead in the Basin are 4,000 hatchery produced adult fish and 5,000 naturally produced adult fish.

Hatchery production goals will be achieved through annual releases of 200,000 steelhead smolts at the existing Bonifer facility and the Minthorn acclimation facility

currently in final design phase. The proposed Umatilla Hatchery near Irrigon (in the predesign phase) will produce these fish. The 60,000 smolts that are currently being reared at existing ODFW facilities and released at Bonifer will continue at least until the Umatilla Hatchery comes online. Any excess broodstock returning to the Bonifer and Minthorn facilities will be used for enhancement of natural production by reseeding (adult or egg outplanting) in under-utilized habitat.

Riparian and instream habitat improvement needs were identified in the Umatilla River Basin Report of January 1984. These projects were submitted to the Power Planning Council in November, 1983 as proposed amendments to the Fish and Wildlife Program of the Northwest Power Planning and Conservation Act (NPPCA) of 1980. Some of these improvements are being implemented in Squaw and Meacham Creek with Bureau of Indian Affairs and Union Pacific Railroad funds. There is an excellent opportunity to vastly improve the natural production of anadromous fish habitat throughout the Umatilla Basin.

Fall Chinook

1. Present Situation

A self-sustaining run of fall chinook has not existed in the Umatilla River since shortly after the construction of Three Mile Dam. However, an abundance of potential spawning habitat is found throughout the Mainstem Umatilla River. In addition, Meacham Creek up to the North Fork also has potential for fall chinook spawning.

Under a fish release program developed by CTUIR and ODFW juvenile fall chinook have been liberated in the Umatill: River since 1982 at the following rates:

Year of Release	No. of Fish	Size	Stock
1982	4 million	90/lb	Tule stock
1983	100,000	9/lb	Upriver bright stock
1984	225,000	9/lb	Upriver bright stock

Approximately 20,000 and 50,000 fall chinook yearlings were acclimated and released at Bonifer Pond in 1983 and

1984, respectively. The remaining smolts were released in upper Meacham Creek. A few 2 year old mini-jacks, (probably fewer than 100) from the 1983 release returned to the Umatilla River in the fall of 1983. Jacks are also expected to arrive in the fall of 1984.

Adult fall chinook will enter the Umatilla River in October through December, with most spawning expected to occur in November and December. Egg incubation will take place from December to mid-March, with rearing between February and the end of May. Fingerlings will migrate downstream to the Columbia River in March through June.

The major time periods that fall chinook are expected to utilize Umatilla River Basin waters are as follows:

Upstream Adult Migration	October - December
Spawning	November - December
Egg Incubation	November - March
Rearing	February - May
Downstream Smolt Migration	March - June

2. Future Enhancement

The Umatilla Basin Implementation Plan (1984) cites long-term escapement goals of 10,000 hatchery produced and 12,000 naturally produced fall chinook salmon. Approximately 225,000 yearling are programed for acclimation and release at the Bonifer and Minthorn facilities through 1987. Based upon the results of ongoing studies at Bonneville Hatchery, the most cost effective program for juvenile releases will be used. This may include yearling releases, fall reared smolts, or 90/lb. fish. Based upon available data a return of about 2,500 adult fish would result from either program. Returning adult fall chinook will be used as brood stock for hatchery production, and to foster natural production in the system.

The capability of present flows in the Umatilla River to support a self-sustaining run of naturally produced fall chinook is doubtful. The Fish and Wildlife Service (FWS, 1984) evaluated the potential benefits of flow enhancement as part of a Corps of Engineers project to provide flows for anadromous fish from Three Mile Dam downstream to the mouth of the Umatilla River. Channel improvement below Three Mile Dam was also a part of that project.

The channel work is scheduled for completion this year by the Corps with funding from the Bonneville Power Administration (BPA) under the NPPCA. The Fish and Wildlife Service (FWS), National Marine Fisheries Service (NMFS), and ODFW are currently analyzing a potential flow enhancement project being planned by the BR to improve flows for anadroums fish in the Umatilla River Basin. The effect of these two flow projects as they relate to passage at Three Mile Dam are discussed in the last section (Item IV, B and C) of this report.

Future fisheries projects identified in the Umatilla River Basin Report (1984), and included in the Fish and wildlife Program, will also enhance fall chinook runs. These projects include the acquisition of 6,000 acre-feet of McKay Reservoir storage for fish flows, modification or replacement of Umatilla River irrigation screens, and adult passage improvement at Maxwell and Cold Springs diversions.

C. Spring Chinook

1. Present Situation

Large numbers of spring chinook salmon existed in the Umatilla Basin prior to construction of Three Mile Dam. The ODFW reported small numbers of spring chinook in the System into the 1960's, but none have been observed since.

2. Future

Potential spring chinook spawning habitat exists in the upper Mainstem, lower North Fork, and South Fork Umatilla River, and in Meacham Creek. The CTUIR and ODFW have plans for reestablishment of spring chinook in the Umatilla Basin. Escapement goals are 10,000 hatchery produced fish and 1,000 naturally produced fish. However, poor spring passage conditions and lack of deep holding pools for adults could limit the production of these fish. To avoid or reduce potential passage problems, broodstock would be selected for early arrival of adults to avoid low stream flows. When introduced, adults would enter the Umatilla River in April and May and migrate to upstream resting pools near spawning grounds. Adults would hold over in these pools until spawning commenced in late August and September. Most juveniles would rear for a year prior to migration in April, May and June.

Projected time periods of spring chinook use of the Umatilla River Basin are as follows:

Upstream Adult Migration	April - June
Spawning	August - September
Egg Incubation	August - December
Rearing	November - April
Downstream Smolt Migration	April - June

III. Fish Passage Problems Caused by Three Mile Falls Diversion Dam

A. Steelhead

1. Upstream (Adult)

Adult steelhead enter the Umatilla River in the late fall when the irrigation season has ended and natural flows begin increasing (Figure 1, page 13). As runoff increases to medium to high flows (about 500 cfs or greater), a higher percentage of water spills over the crest of the dam and attraction flows at both ladders become a smaller portion of the total flow. This creates a false attraction problem for steelhead in the tailrace area. The resulting migration delay creates increased stress and mortality when fish jump and become trapped in the open bays beneath the dam. An estimated 20 percent of the 1982-83 steelhead return was lost because of these conditions at Three Mile Dam.

The West Ladder is well designed for steelhead passage but lacks adequate attraction flows at the entrance during medium to high flows. The East Ladder is not adequately designed by today's standards. It has poor entrance conditions, poor turn pool conditions, poor exit conditions, and is not self regulating. It also lacks adequate attraction water at all flow levels. Sediment naturally accumulates above the east side of the dam and restricts flow into the East Ladder, thus impeding fish passage. There are no trapping or counting facilities at the East Ladder and only marginal opportunities at the West Ladder.

Debris hanging over the dam crest and accumulating in the tailrace area impedes lateral movement of steelhead along the base of the dam (see photo on page 4). This situation, combined with insufficient attraction flows at the ladder entrances, also creates migration delay and stress. Accumulation of debris above the east side of

the dam restricts the amount of flow entering the East Ladder. Failure to maintain control of debris above and below the East Ladder may cause stranding of adult steelhead.

2. Downstream (Juveniles)

Juvenile steelhead migrate past Three Mile Dam by passing over the crest, through the fish ladders, or through the smolt bypass pipe on the west side. The bypass pipe drops fish 20 feet into the tailrace area below the dam. This may cause injury, stress and possible mortality to smolts, especially during low flow conditions when the bedrock area below the pipe does not contain adequate pool depths. This condition is even worse for those smolts passing over the crest of the dam. Smolts encounter the louver system at the intake of WEID Canal. A NMFS study (1981) indicates that the passage efficency of this type louver system for steelhead smolts under ideal flow conditions is 70 to 95 percent. Passage conditions at Three Mile Dam are probably near the low end of this range because of problems with the approach velocities, nonlaminar flows, and bypass slot velocities. This efficiency does not meet NMFS criteria for screening facility design, which requires successful passage of all fish.

A summary of the current passage conditions for steelhead, expressed as a percentage of adult and juvenile fish passing Three Mile Dam, is provided in Table 1. This information is listed under the No Action Plan, assuming no flow improvements. Future steelhead passage conditions, again assuming no flow enhancement with the present facilities at Three Mile Dam, would not change. However, greater numbers of fish would be impacted as the benefits of the combined CTUIR/ODFW enhancement program are realized.

B. Fall Chinook

1. Upstream (Adult)

As indicated in Figure 1 (Page 3), adequate flows (200 cfs or greater) for adult fish passage to Three Mile Dam can occur during the October through December migration period. During these periods all the passage problems listed for adult steelhead would be common to fall chinook. These include: 1) false attraction flows below the dam: 2) lack of adequate attraction to the ladder entrances; and, 3) debris and/or sediment

Table . Assumed Passage Conditions (Expressed as Percentage of Fish Passing) Three Mile Diversion Dam

Alternative	Without Flow Enhancement						With Reclamation Flow Enhancement1/					
	Steelhead		Fall Chinook		Spring Chinook		Steelhead		Fall Chinook		Spring Chinook	
	Adults	Juvenile	Adult	Juvenile	Adult	Juvenile	Adults	Juvenile	Adults	Juvenile	Adults	Juvenile
Alternative A. No Action	75	75	38	50	48	60	80	75	90	50	80	75
Alternative B. Dam Removal	95	95	50	95	65	95	∞	1∞	∞	1∞	00	00
Alternative C. East Side Ladder Only	95	90	45	90	60	90	95	95	95	95	95	95
Alternative D. Two Ladders No Apron	95	90	45	90	60	90	95	95	95	95	95	95
Alternative E. Cap on Crest West Ladder	95	90	45	90	60	90	95	95	95	95	95	95
Alternative F. Ladder in Middle	95	90	45	90	60	90	95	95	95	95	95	95
Alternative G. Concrete Apron Plus West Ladder	95	90	45	90	60	90	95	95	95	95	95	95
Alternative H. Center Cap East Side Ladder	95	90	45	90	60	90	95	95	95	95	95	95

1/ The Corps flow enhancement would produce passage conditions to Three Mile Dam for steelhead and fall chinook adults equal to those listed under "Reclamation Flow Enhancement," and for spring chinook adults and juveniles of all species, the conditions would be equal to those listed under "Without Flow Enhancement."

above and below the dam. In addition to these problems, the overflow weir design of the East Ladder does not promote chinook passage as would the vertical slot design. A submerged orifice or vertical slot is especially important for the ladder entrance.

Migration delays for fall chinook are generally more harmful than for steelhead, due to the relatively short period of time between migration and spawning.

During flow periods that could provide adequate fish passage, movement through the West Ladder could be satisfactory. However, counting, trapping, and holding facilities are poor. During periods of extreme low flows, passage would be reduced or eliminated. Temperature and swimming duration are not expected to cause passage problems.

2. Downstream (Juveniles)

The NMFS study (1981) indicates that the passage efficiency of louvers for fall chinook migrants under ideal flow conditions varies from 40 to 90 percent. The larger sized yearling chinook smolt presently being released would likely be near the upper end of this range. Future outmigrations of natural and hatchery fry and fingerling would likely experience efficiencies near the lower end of this range. The same problems with velocities and nonlaminar flows affecting louver efficiency for steelhead would be more of a problem for the smaller fall chinook. NMFS policy has been to pass 100 percent of the fish, thus passage criteria would not be met in either case. Chinook downstream migrants would also experience the same problem with injury, stress, and possible mortality from the juvenile bypass system as discussed for steelhead.

A summary of the current passage conditions for fall chinook, expressed as a percentage of adult and juvenile fish passing Three Mile Dam, is provided in Table 1 (Page 14). This information is listed under the No Action Plan, assuming no flow improvements. Future fall chinook passage conditions, again assuming no flow enhancement with the present facilities at Three Mile Dam, would not change. However, greater numbers of fish would be impacted as the benefits of the combined CTUIR/ODFW enhancement program are realized.

C. Spring Chinook

1. Upstream (Adult)

Medium to high flows often occur during April and early May of the migration period. With these conditions, problems listed for steelhead and fall chinook at Three Mile Dam would also be common for spring chinook. These include: 1) false attraction flows below the dam; 2) lack of adequate attraction to the ladder entrances; and 3) debris and/or sediment obstruction above and below the dam. In addition to these problems, the overflow weir design of the East Ladder does not promote chinook passage as would a vertical slot design. A submerged orifice or vertical slot is especially important for the ladder entrance.

In late May and into June, flows can rapidly decrease to very low flow conditions because of irrigation diversions (Figure 1, Page 3). Passage during these periods could be significantly reduced or even eliminated. Migration delays for spring chinook would have very serious implications because upstream passage to holding and spawning areas would be impossible later in the spring and into summer. This would especially be a problem during late May and early June for late arriving adults. During periods of adequate movement through the West Ladder could be satisfactory. counting, trapping holding facilities are poor. Temperature swimming duration are not expected to cause passage problems.

2. Downstream (Juvenile)

Spring chinook downstream migrants are expected to be yearling smolts. The NMFS study (1981) indicates that the passage efficiency of louvers for spring chinook smolts under ideal flow conditions varies from 60 to 90 percent. The previously discussed problems with velocities and nonlaminar flows affecting louver efficiency for steelhead would also affect spring chinook. NMFS policy has been to pass all of the fish. Therefore, NMFS passage criteria would not be met. Spring chinook downstream migrants would also experience the same problems from injury, stress, and mortality with the juvenile bypass system as those listed earlier for steelhead and fall chinook.

A summary of the current passage conditions for spring chinook, expressed as a percentage of adult and juvenile fish passing Three Mile Dam, is provided in Table 1

This information is listed under the No Action Plan, assuming no flow improvements. Future spring chinook passage conditions, again assuming no flow enhancement with the present facilities at Three Mile Dam, would not change. However, greater numbers of fish would be impacted as the benefits of the combined CTUIR/ODFW enhancement program are realized.

IV Conceptual Actions

A. No Action

This alternative would maintain the existing passage facilities at Three Mile Dam. Existing management and operations would continue as in the past. Passage conditions would not change at Three Mile Dam. It is assumed that passage conditions below Three Mile Dam would improve. This would be the result of channel improvements planned at several locations in the three miles of river below the dam. This work is scheduled for completion this year (1984) by the Corps of Engineers. The downstream channel improvement work is assumed to be a condition of all the conceptual actions discussed herein.

B. Dam Removal

This concept would involve three major features. These are: 1) removal of the dam; 2) bedrock and/or silt removal if required; and, 3) construction of a new screen facility and bypass system at the future location of the WEID Canal entrance.

Under this concept the dam would be removed down to bedrock to allow the river to pass unimpeded at all flow levels. Specific flow characteristics, (velocities, depth), channel characteristics (drops), and sediment conditions that would exist with this action need additional engineering study. The specific channel design through the area should provide passage conditions consistent with accepted adult salmon and steelhead passage criteria. The opportunity for trapping and counting at this location would be foregone with this plan.

The need to replace flows to the WEID Canal with this plan also should be considered. It is unlikely that adequate conditions would exist to provide for this need at Three Mile Dam. Alternatives include pumping water from the Columbia River or providing a new, low head diversion futher upstream in the Umatilla River. A new diversion dam should have appropriate passage facilities to insure that existing problems are

not just being moved upstream. Any new source of water should be screened to insure safe passage of juvenile fish.

C. East Ladder Only

This concept would involve six major features. These are: 1) improve or rebuild the East Ladder with vertical slots or other state-of-the-art facilities; 2) addition of trapping and counting facilities; 3) improved attraction water; 4) improved fish access to the ladder; 5) maintenance of the forebay and tailrace; and, 6) construction of a new screen and bypass facility at the WEID Canal.

To improve passage through the East Ladder the overflow weir design of the steps would be changed to submerged orifice, vertical slots, or other more acceptable design. Construction of trapping and counting facilities at the ladder would be required. The West Ladder would be nonfunctional under this concept.

With this plan, additional attraction water would be provided at the ladder. During periods of higher flows (500+ cfs) this would be achieved by removal of debris upstream from the point of inflow, allowing greater volumes of flow to enter the ladder. During low flows appropriate features would be designed to assure that a sufficient amount of water for attraction flows could be diverted through the ladder.

An improved channel would have to be constructed through the bedrock at the face of the dam. At higher flows this would induce fish attracted by spill to cross the channel and enter the ladder.

To assure access to the ladder the forebay and tailrace would have to be maintained. This would include removal of debris and sediment which could physically block or hinder fish movement.

To increase smolt Survival it would be necessary to replace the louver and bypass pipe at the WEID Canal headgate. The new screens and bypass facility would comply with ODFW, NMFS, and FWS criteria.

D. Two Ladders, No Apron

This concept would involve seven major features. These are: 1) improved attraction water to the West and East Ladders; 2) addition of trapping and counting facilities at both ladders; 3) convert the overflow type design in the East Ladder to a

type that would improve passage of steelhead and chinook salmon; 4) improved fish access to the East Ladder (but not to the West Ladder); 5) maintenance of the forebay and tail-race at the East Ladder; 6) modify both ladders so they can be shut off to prevent any flow-through; and, 7) construction of a new screen and bypass facility at the WEID Canal.

Under this concept additional attraction water would be provided at both ladders. During periods of higher flows (500+ cfs) this would be achieved by removal of debris up-stream from the point of inflow. This would allow greater volumes of flow to enter the ladders. During low flows one of the ladders could be shut off and flow would go through the other ladder.

To improve chinook passage through the East Ladder the overflow weir design of the steps would be changed to sub-merged orifice, vertical slots, or other more acceptable design. Construction of trapping and counting facilities at both ladders would be required.

An improved channel would have to be constructed through the bedrock at the face of the dam leading to the East Ladder. At higher flows this would induce fish attracted by spill to cross the channel and enter the ladder.

To assure access to the East Ladder the forebay and tailrace would have to be maintained. This would include removal of debris and sediment which could physically block or hinder fish movement.

During low flow periods there may be insufficient water to keep both ladders operational. To maximize the potential for upstream migration one of the ladders may have to be shut off at the upstream end. This would result in all passage flows entering the other ladder and would improve passage conditions. Associated features would be designed to assure that the water would be diverted efficiently, and that the "shut off" ladder and approaches would be completely drained. This would prevent stranding of fish.

To increase smolt survival it would be necessary to replace the louver and bypass pipe at the WEID Canal headgate. The new screens and bypass facility would comply with ODFW, NMFS, and FWS criteria.

E. Cap on Crest - West Ladder

This concept would involve four major features. These are: 1) improved attraction water to the West Ladder; 2) addition of trapping and counting facilities; 3) addition of a cap on the crest of the dam beginning at the east bank; and, 4) construction of a new screen and bypass facility at the WEID Canal.

Under this concept additional attraction water would be provided at the West Ladder. During periods of higher flows (500+ cfs) this would be achieved by removal of debris upstream from the point of inflow. Also, the cap would allow greater volumes of water to enter the ladder during low flows. The cap would be designed to assure that a sufficient amount of water for adequate attraction flows could be provided at the ladder entrance. The East Ladder would be nonfunctional with this plan. In addition, construction of trapping and counting facilities at the West Ladder would be required.

The addition of a cap on the existing facility would help direct flows near the west bank and eliminate the false attraction flows over the crest of the dam. This flow concentration would also likely reduce the debris problem which exists upstream of the dam.

To increase smolt survival it would be necessary to replace the louver and bypass pipe at the WEID Canal headgate. The new screens and bypass facility would comply with ODFW, NMFS, and FWS criteria.

F. Ladder At New Location (i.e. Middle of Dam)

This concept would involve four major features. These are: 1) construct a new ladder at an optimum location; 2) insure adequate attraction water to the ladder: 3) addition of trapping and counting facilities; and, 4) construct a new screen and bypass facility at the WEID Canal.

The construction of a new fish ladder located approximately in the middle of the existing facility could be used alone, or in conjunction with the West Ladder. It would be designed with a submerged orifice, vertical slots, or other acceptable state-of-the-art features.

Under this concept additional attraction water would be provided at the ladder. During periods of higher flows (500+ cfs) this would be achieved by removal of debris upstream from the point of inflow. During low flows appropriate features

would be designed to assure that a sufficient amount of water for adequate attraction flows could be provided at the ladder entrances.

Construction of trapping and counting facilities at the new ladder would be required. Access to the ladder must also be provided.

To increase smolt survival it would be necessary to replace the louver and bypass pipe at the WEID Canal headgate. The new screens and bypass facility would comply with ODFW, **NMFS,** and FWS criteria.

G. Concrete Apron Plus West Ladder

This concept would involve four major features. These are: 1) improved attraction water to the West Ladder; 2) addition of trapping and counting facilities at both ladders; 3) a concrete apron in the tailrace of the dam (east side only); and, 4) construction of a new screen and bypass facility at the WEID Canal.

Under this concept additional attraction water would be provided at the West Ladder. The East Ladder would be accessible and useable only during high flows. This would be achieved by the concrete apron acting as a velocity barrier to direct both fish and flows in the tailrace to the West Ladder. Flows across the apron would be shallow and swift, thus sweeping any fish off the apron, while at the same time directing them towards the West Ladder. At high flows fish could negotiate the apron and use the East Ladder in its existing condition. The concrete apron would have to be constructed through and on the bedrock at the east face of the dam over to the existing main channel below the west side of the dam. Construction of trapping and counting facilities at the West Ladder would be required.

To increase smolt survival it would be necessary to replace the louver and bypass pipe at the WEID Canal headgate. The new screens and bypass facility would comply with ODFW, NMFS, and FWS criteria.

H. Center Cap On Crest with Sill-Type Ladder on East Side

This concept would involve six major features. These are: 1) construct a small cap across the center crest of the dam; 2) construct a sill-ladder; 3) improved attraction water to the sill-ladder; 4) improved fish access to the sill-ladder; 5) addition of trapping and counting facilities; and, 6) construct a new screen and bypass facility at the WEID Canal.

Under this concept a small cap would be constructed across the center section of the dam, with lower portions remaining on both sides. The gap on the west side would be slightly higher than the east side gap. This would be designed to direct low flows over the east side of the dam.

A sill-type ladder with several large steps would be constructed on the east side where the present ladder is now located. These would act as a ladder, with vertical drops between each sill. The sills would create resting pools and would be deep enough for fish to negotiate vertical jumps.

Under this concept additional attraction water would be provided at the sills by concentrating all low flows at one location. Moderate flows would also pass through the existing West Ladder or over the crest on the west side as a result of the gap on the west side of the dam. Thus, low to medium flows would pass only over each end of the dam but not over the center. The peak high could pass over the center section of the dam, however, this would be an infrequent occurrence and spread a smaller portion of the total flows over a large enough area, that false attraction flows should not be a problem.

An improved channel would have to be constructed through the bedrock at the face of the dam to the sill-ladder. At lower flows this would induce fish attracted by the spill to cross the channel and enter the East Ladder.

The forebay and tailrace would have to be maintained to assure access to the East Ladder. This would include removal of debris and sediment which could physically block fish movement. Construction of trapping and counting facilities at the West Ladder would be required.

To increase srnolt survival it would be necessary to replace the louver and bypass pipe at the WEID Canal headgate. The new screens and bypass facility would comply with ODFW, NMFS, and FWS criteria.

V. Summary

A. Effect of Conceptual Actions Under Present Flow Conditions

Adult and juvenile anadromous fish that reach Three Mile Dam during upstream and downstream migration are confronted with a variety of passage problems. These include: 1) outdated facility design; 2) inadequate attraction flows at the

ladders; 3) inadequate flow through the East Ladder at certain times; 4) sediment and/or debris barriers; and, 5) channel conditions which prevent access to the ladders at some flows. These problems would persist under the No Action Plan. A detailed description of these existing problems is provided in Section III above.

The structural improvements for ladder design and for location, dam modification or removal, and upstream or downstream channel improvements would increase upstream passage of adult fish by about 10 to 20 percent. It is assumed that the dam removal alternative would increase adult passage when compared to the other alternatives because of a small percentage of fish which would not negotiate the structure, even with state-of-the-art designed passage facilities. The opportunity for trapping and counting would be improved with all plans (except for dam removal) and broodstock selection would be available at the dam. Trapping and counting facilities would also allow for a CTUIR terminal fishery at Three Mile Dam; total counts by species to evaluate the habitat improvement measures of the ODFW/CTUIR implementation plan: and trapping and hauling of adult salmon to other areas in the basin where suitable spawning habitat may exist. The lack of these facilities without the dam is not considered to be as important as the improved passage that would result from this alternative. Dam removal would also eliminate expenditures of time and funds required to operate and maintain facilities installed at the dam. With improved design of the juvenile bypass system and more efficient screening, downstream migrant survival would increase by about 15 to 40 percent. A comparison of each plans improvements, for both adult and juvenile fish, is provided in Table 1 (Page 14).

Lack of adequate flows at certain critical times would continue to be the major passage problem for all three anadromous fish species (Table 2). Fall chinook adults would be the most seriously affected because of low flow conditions in September, October and November. Spring chinook passage would be similarly affected, but to a lesser degree, because of low flow periods in May and June. Both early and late returning adult steelhead could experience passage problems during these low flow periods, but the biggest percentage of these fish return during the December through March period when flows are normally adequate. Downstream migrants of all species could experience passage problems because of low flows in May and June. This would require trucking of these smolts during periods of extreme low flow, as is presently done during such periods at the Westland Diversion Dam (river mile 27 on the Mainstem Umatilla River).

Table 2. Present Flow Conditions at Three Mile Dam[1]

	Sept 16-30	Oct	Nov 1-15	Nov 16-30	May	June
Flow Conditions (cfs)						
Average Flow	29	70	168	279	548	108
Median Flow	24	44	145	176	378	33
Number of Years Flows Equal or Exceed 200 cfs[2]	0/44	2/44	9/44	21/44	30/44	8/44

1/ Number of years flows equal or exceed 200 cfs downstream of Three Mile Dam, based on 44 years of record (1935 to 1978) from Figure 1.

2/ The minimum flow for adequate fish passage below Three Mile Dam was considered to be 200 cfs with planned channel improvement (FWS, 1984).

B. Effect of Conceptual Actions Under Reclamation Flow Enhancement

The BR plan (BR, 1982) basically entails a pumping facility to exchange water from the Columbia River for some natural flow rights in the Umatilla River and some McKay Reservoir storage presently diverted for irrigation. Also included is a water storage reservoir on Bear Creek, a tributary to Meacham Creek. This plan would significantly improve streamflow and water quality conditions in Meacham Creek and 79 miles of the Mainstem Umatilla River. Steelhead productivity would be enhanced and salmon runs would be restored on a sustained basis.

The plan provides the following minimum streamflows (cfs) for steelhead trout and chinook salmon in the Umatilla River downstream from the Three Mile Dam.

Jan	Feb	Mar	Apr	May	June	July	Aug	Sept	Oct	Nov	Dec
								1-15/16-30		1-15/16-30	
250	*250*	*250*	*250*	*250*	*250*	*0*	*0*	*0/250*	*300*	*300/250*	*250*

Flow enhancement without structural modifications would not eliminate passage problems associated with: 1) false attraction below the dam; 2) lack of adequate attraction flows at ladder entrances; 3) debris and/or sediment obstructions; and, 4) channel problems in the tail-race. However, with the flow improvements shortages during critical periods would be eliminated, and passage conditions would improve. The combination of structural improvements (plans C to H) plus flows, would eliminate all major passage problems. The dam removal alternative with flows provides for 100 percent passage of anadromous fish, while the structural plans are assumed to impact a small percentage of fish that would not successfully pass the structure. Compared to the existing passage problems without flow enhancement, improvements would range from about 20 to 55 percent for adult fish, to about 25 to 45 percent for juvenile fish. A comparison of each plans improvements with BR flows, for both adult and juvenile fish, is provided in Table 1 (Page 14).

C. Effect of Conceptual Actions Under Corps Flow Enhancement

The Corps of Engineers plan (Corps, 1981) entails use of an existing pumping plant to transport water from near the mouth of the Umatilla River up to Three Mile Diversion Dam.

The pumped water would be added to the WEID Canal to ensure adequate water for irrigation uses. This would allow Umatilla River water to be bypassed as the minimum flows for fishery enhancement. This proposal only provides flows from Three Mile Dam downstream, and has no provisions for flow related improvements upstream from the dam.

The Corps' plan would provide the following minimum streamflows (cfs) for steelhead trout and chinook salmon in the Umatilla River downstream from Three Mile Dam.

Jan	Feb	Mar	hpr	May	June	July	Aug	Sept	Oct	Nov	Dec
200	200	200	200	100	100	0	0	20	200	200	200

Flow enhancement without structural modifications would not eliminate passage problems associated with: 1) false attraction below the dam; 2) lack of adequate attraction flows at ladder entrances; 3) debris and/or sediment obstructions; and, 4) channel problems in the tailrace. However, with the flow improvements, shortages during some critical periods would be eliminated, and passage conditions would improve.

In comparing the Corps flow enhancement project with the BR project the two major differences are: 1) the amount of water provided during the months of September, May and June; and, 2) water with the Corps project would be provided only at Three Mile Dam, while the BR project provides water upstream from Three Mile Dam. In terms of fish passage, the May and June flows with the Corps project (100 cfs versus 250 cfs with BR) are not considered adequate for upstream passage of adult spring chinook. Also, because May and June do have periods of low to no flows as a result of irrigation withdrawals, water provided at Three Mile Dam would not eliminate the need to truck outmigrating smolts that would otherwise be stranded at upstream diversions. The flow differences in September would impact early returning adult fall chinook. However, this should be a very small portion of the run when compared to adults that would return during the October through December period. A comparison of each plan's improvements with the corps flow enhancement, for both adult and juvenile fish, is provided in Table 1 (Page 14).

CONSTRUCTION COST ESTIMATE SHEETS

FOR RECOMMENDED PLAN

7-1432 (1-84)
Bureau of Reclamation

CONSTRUCTION COST ESTIMATE

SHEET 1 OF 7

PROJECT: UMATILLA
DIVISION:
UNIT:
FEATURE: 3-MILE DIVERSION DAM

PREPARED BY: PN REGION 720
ESTIMATE DATE: JANUARY, 1985
ESTIMATE TYPE: FEASIBILITY
PRICE LEVEL: OCTOBER, 1984

PROPERTY CLASS	IDENTIFIED PROPERTY	PLANT ACCOUNT	ITEM	DESCRIPTION	QUANTITY	UNIT	PRICE	AMOUNT	FIELD COST	TOTAL FIELD COST	NONCONTRACT COST	CONSTRUCTION COST
15				GENERAL PROPERTY								
	05			3-MILE DIVERSION DAM								
		151		DAMS								
			(1)	RIGHT BANK FISH LADDER					$ 840,000		$ 220,000	$ 1,060,000
			1.	MOBILIZATION AND PREPARATORY WORK	LUMP SUM	LS	13	32,000				
			2.	DIVERSION AND CARE OF RIVER	LUMP SUM	LS	15	30,000				
			3.	REMOVAL OF EXISTING CONCRETE	30	CY	200	6,000				
			4.	EXCAVATION, COMMON, STRUCTURE	1430	CY	8 00	11,500				
			5.	EXCAVATION, ROCK, STRUCTURE	830	CY	60	50,000				
			6.	EXCAVATION, ROCK, STRUCTURE	320	CY	20	6,400				
			7.	GRADATION AND PLACING ROCK FILL	650	CY	5 00	3,250				
			8.	STRUCTURAL BACKFILL	2310	CY	5	11,500				
			9	COMPACTING BACKFILL	2310	CY	10	23,000				
			10	CONCRETE IN DAM CAP	320	CY	235 00	75,500				
			11.	STEEL ANCHORS	1200	LB	4 50	5,400				
			12	WELDED WIRE FABRIC REINFORCEMENT	13,000	SF	0 65	8,500				
			13.	CONCRETE, STRUCTURAL	380	CY	385 00	146,000				
			14.	REINFORCEMENT	57,000	LB	0 65	37,000				
			15.	CHAIN LINK FENCE	370	LF	25 00	9,300				
			16	GRATING OVER STRUCTURES	21,000	SF	40 00	84,000				
			17	DIFFUSER GRATES, 1-INCH OPENINGS	40	SF	50 80	2,000				
			18	FURNISH AND INSTALL BAFFLE STRUCTURE	LUMP SUM	LS	LS	2,000				
			19	TRASHRACKS, 10-INCH OPENINGS	69	SF	40 00	2,550				
			20.	TRASHRACKS, 1/8-INCH OPENINGS	30	SF	70 00	2,100				
			21	FURNISH AND INSTALL 3X5 SLIDE GATE	2	EA	4000 00	8,000				
			22	FURNISH AND INSTALL 3X5 TELESCOPING GATE	1	EA	3500 00	3,500				
			23	FURNISH AND INSTALL FISH COUNTER	LUMP SUM	LS	15	8,000				
			24	FURNISH AND INSTALL TRAINING FACILITIES	LUMP SUM	LS	15	50,000				
			25	POWER SUPPLY	LUMP SUM	LS	15	5,000				
			26	ALLOWANCE FOR UNLISTED ITEMS	LUMP SUM	LS	15	33,500				
				SUBTOTAL				$ 700,000				
				CONTINGENCIES (20%±)				140,000				
				FIELD COST 15.05.151 (1)				$ 840,000				

7-1432 (1184)
Bureau of Reclamation

CONSTRUCTION COST ESTIMATE

SHEET 2 OF 7

PROJECT: UMATILLA	PREPARED BY: PN REGION 720
DIVISION:	ESTIMATE DATE: JANUARY, 1985
UNIT:	ESTIMATE TYPE: FEASIBILITY
FEATURE: 3-MILE DIVERSION DAM - FISH PASSAGE IMPROVEMENT	PRICE LEVEL: OCTOBER, 1984

PROPERTY CLASS	IDENTIFIED PROPERTY	PLANT ACCOUNT	ITEM	DESCRIPTION	QUANTITY	UNIT	PRICE	AMOUNT	FIELD COST	TOTAL FIELD COST	NONCONTRACT COST	CONSTRUCTION COST
15				GENERAL PROPERTY								
	05			3-MILE DIVERSION DAM								
		01		DAMS								
				(2) 1 LEFT BANK FISH LADDER					$480,000		$125,000	$605,000
				MODIFICATION								
				MOBILIZATION AND PREPARATORY WORK	LUMP SUM	LS	15	18,000				
				EXCAVATION AND CARE OF WATER	LUMP SUMS		15	50,000				
				REMOVAL OF MISC STRUCTURES	LUMP SUM	LS	15	15,000				
			4	EXCAVATION, ROCK	120	CY	60.00	7,200				
				GRAVEL FILL	23	CY	30.00	690				
			5	CONCRETE STRUCTURAL	155	CY	385.00	60,000				
			7	REINFORCEMENT	23,000	LB	0.65	15,000				
			8	GRATING COVER STRUCTURES	3,000	SF	40.00	120,000				
			9	DIFFUSER GRATES, 1 INCH OPENINGS	90	SF	50.00	2,000				
			10	FURNISH AND INSTALL BAFFLE SYSTEM	LUMP SUM	LS	15	7,000				
			11	TRASHRACKS, 10-INCH OPENINGS	350	SF	40.00	14,000				
			11	TRASHRACKS, 3/8-INCH OPENINGS	20	SF	70.00	7,100				
			13	FURNISH AND INSTALL 3'X5' SLIDE GATE	1	EA	4,000.00	4,000				
			14	FURNISH AND INSTALL 3'X5' TRASHBOOM GATE	1	EA	3,500.00	3,500				
			15	FURNISH AND INSTALL FISH COUNTER	LUMP SUM	LS	15	8,000				
		16		FURNISH AND INSTALL TRAPPING FACILITIES	LUMP SUM	LS	15	50,000				
			17	POWER SUPPLY	LUMP SUM	LS	15	5,000				
			18	ALLOWANCE FOR UNLISTED ITEMS	LUMP SUM	LS	15	17,000				
				SUBTOTAL				400,000				
				CONTINGENCIES (20%)				80,000				
				TOTAL (ROUNDED)	(2)			480,000				
				DESIGN SUPERVISION (15%)							$75,000	
				SUPERVISION AND ADMINISTRATION								

7-1432 (1-84)
Bureau of Rec

CONSTRUCTION COST ESTIMATE

SHEET ___ OF 7

PROJECT: [illegible]	PREPARED BY: PN. Region 720
DIVISION	ESTIMATE DATE: January 1985
UNIT	ESTIMATE TYPE: [illegible]
FEATURE: 3-Mile Diversion Dam Fish Passage Improvement	PRICE LEVEL: October 1984

PROPERTY CLASS	IDENTIFIED PROPERTY	PLANT ACCOUNT	ITEM	DESCRIPTION	QUANTITY	UNIT	PRICE	AMOUNT	FIELD COST	TOTAL FIELD COST	NONCONTRACT COST	CONSTRUCTION COST
12				General Property								
	15			3-Mile Diversion Dam								
		151		Dams								
				(3) [illegible] [illegible] [illegible]					$1,440,000		$370,000	$1,810,[illegible]
				[illegible] x 17.5 foot long								
				Rotating Drum Screens								
			1	Mobilization and Preparatory Work	Lump Sum	LS	LS	[illegible]				
			2	Removal of Existing Concrete	120	CY	120.00	[illegible],500				
			3	Excavation [illegible]	[illegible]	[illegible]	[illegible]	[illegible]				
			4	Structural Backfill	2000	CY	5.00	10,000				
			5	Compacting Backfill	2000	CY	10.00	20,000				
			6	Concrete, Structural	1,160	CY	385.00	450,000				
			7	Reinforcement	174,000	lb	0.65	115,000				
				Furnish and Install the Following:								
			8.	Rotating Drum Fish Screens	Lump Sum	LS	LS	$25,000				
			9.	Traveling Belt Fish Screens	Lump Sum	LS	LS	[illegible]5,000				
			10.	Pumpback System	Lump Sum	LS	LS	72,000				
			11.	Hoist System	Lump Sum	LS	LS	60,000				
			12	Sample Structure Facilities	Lump Sum	LS	LS	50,000				
			13.	24" Ø PVC Pipe	200	lf	50.00	14,000				
			14	Grating	470	sf	10.00	16,500				
			15	Catwalk	660	sf	11.50	7,600				
			16	Handrail	220	lf	36.00	7,900				
			17	24" Ø Slide Gates	2	ea.	1800.00	3,600				
			18	Power Supply	Lump Sum	LS	LS	10,000				
			19	Allowance for unlisted items				57,000				
				Subtotal				1,200,000				
				Contingencies (20%)				240,000				
				Field Costs 15,05.6 (3)				$1,440,000				
				Design and Specifications							($370,000)	
				Construction Supervision								

7-1432 R
Bureau R Form

CONSTRUCTION COST ESTIMATE

SHEET 4 OF 7

PROJECT: UMATILLA
DIVISION:
UNIT:
FEATURE: 3-MILE DIVERSION DAM - FISH PASSAGE IMPROVEMENT

PREPARED BY: PN REGION 720
ESTIMATE DATE: JANUARY 1985
ESTIMATE TYPE: FEASIBILITY
PRICE LEVEL: OCTOBER, 1984

PROPERTY CLASS	IDENTIFIED PROPERTY	PLANT ACCOUNT	ITEM	DESCRIPTION	QUANTITY	UNIT	PRICE	AMOUNT	FIELD COST	TOTAL FIELD COST	NONCONTRACT COST	CONSTRUCTION COST
15				GENERAL PROPERTY								
	02			3-MILE DIVERSION DAM								
		151		DAMS								
				(4) DOWNSTREAM FISH BARRIER					710,000		$235,000	$1,145,000
			1	MOBILIZATION AND PREPARATORY WORK	Lump Sum	ls	ls	34,000				
			2	CLEARING BRUSH AND TREES	Lump Sum	ls	ls	10,000				
			3	COFFERDAMS AND DIVERTING WATER	Lump Sum	1	ls	21,000				
			4	ROCK EXCAVATION	4,130	c	20.00	83,000				
			5	FURNISHING LARGE ROCK FROM QUARRY	1,500	cy	7.50	11,500				
			6	INSTALLATION AND PLACING ROCKFILL	7,400	cy	3.00	22,000				
	a		7	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]				
			8	WELDED WIRE FABRIC REINFORCEMENT	31,500	sf	0.80	26,000				
			9	STEEL ANCHORS IN FILL AREA	1900	lb	4.50	8,600				
			10	CONCRETE STRUCTURAL	220	cy	275.00	60,500				
			11	REINFORCEMENT	61,200	lb	0.65	40,000				
			12	FURNISHING AND HANDLING CEMENT	10,890	cwt	6.00	65,000				
				FURNISHING & INSTALLING AERATION PIPING:								
			13	6-INCH PVC	31	lf	8.00	250				
			14	18-INCH PVC	430	lf	30.00	13,000				
			15	FURNISHING AND INSTALLING 4-INCH DRAIN PIPE	70	lf	6.00	700				
			16	PLACING AND COMPACTING ROADFILL	400	cy	8.50	3400				
			17	FURNISHING & PLACING GRAVEL FOR ROAD SURFACE	120	cy	10.00	1200				
			18	ALLOWANCE FOR UNLISTED ITEMS	Lump Sum	ls	ls	36,000				
				SUBTOTAL				760,000				
				CONTINGENCIES (20%±)				150,000				
				FIELD COST 15.05.151(4)				$910,000				
				DESIGN AND SPECIFICATIONS							(235,000)	
				CONSTRUCTIONAL SUPERVISION								

DIVISION

UNIT

FEATURE 3-MILE DIVERSION DAM

ESTIMATE DATE FEBRUARY 1985

ESTIMATE TYPE FEASIBILITY

PRICE LEVEL OCTOBER, 1984

PROPERTY CLASS	IDENTIFIED PROPERTY	PLANT ACCOUNT	ITEM	DESCRIPTION	QUANTITY	UNIT	PRICE	AMOUNT	FIELD COST	TOTAL FIELD COST	NON CONTRACT COST	CONSTRUCTION COST
15				GENERAL PROPERTY								
	05			3-MILE DIVERSION DAM								
		151		DAMS								
				(5) CAP ON DAM CREST					$450,000		$120,000	$570,000
			1	MOBILIZATION AND PREPARATORY WORK	LUMP SUM	LS	LS	17,000				
			2	DIVERSION AND CARE OF RIVER	LUMP SUM	LS	LS	5,000				
			3	EXCAVATION ROCK, STRUCTURE	600	CY	60.00	36,000				
			4	EXCAVATION, ROCK, STRUCTURE	100	CY	20.00	2,000				
			5	GRADATION AND PLACING ROCK FILL	2225	CY	3.00	6,700				
			6	CONCRETE IN ROCK CAP	865	CY	235.00	200,000				
			7	WELD WIRE FABRIC REINFORCEMENT	34,400	SF	0.65	22,500				
			8	STEEL ANCHORS IN FILL	3130	lb	4.50	14,000				
			9	30" CONCRETE CAP	68	CY	408.50	28,000				
			10	21" CONCRETE CAP	57	CY	408.50	23,000				
			11	TRASH BOOMS	1	EA	800.00	800				
			12	TRASH BOOM GUIDES	2	EA	900.00	1800				
			13	ALLOWANCE FOR UNLISTED ITEMS	LUMP SUM	LS	LS	18,000				
				SUBTOTAL				375,000				
				CONTINGENCIES (20%±)				75,000				
				FIELD COST 5.05.151 (5)				450,000				
				DESIGN AND SPECIFICATIONS								
				CONSTRUCTION SUPERVISION							(120,000)	

Bureau of Reclamation

CONSTRUCTION COST ESTIMATE

PROJECT: UMATILLA
DIVISION:
UNIT:
FEATURE: 3-MILE DIVERSION DAM

PREPARED BY: PN REGION 720
DATE: JANUARY 1985
ESTIMATE TYPE: FEASIBILITY
PRICE LEVEL: OCTOBER 1984

PROPERTY CLASS	IDENTIFIED PROPERTY	PLANT ACCOUNT	ITEM	DESCRIPTION	QUANTITY	UNIT	PRICE	AMOUNT	FIELD COST	TOTAL FIELD COST	NONCONTRACT COST	CONSTRUCTION COST
15				GENERAL PROPERTY-								
	05			3-MILE DIVERSION DAM								
		51		DAMS								
				(6) PUMPING PLANT					$5,770,000		$2,130,000	$7,900,000
			1.	PUMPING PLANT SERVICE	LUMP SUM	LS		5,150,000				
				--(INCLUDES 20% FOR MOBILIZATION AND UNLISTED ITEMS								
			2.	DISCHARGE LINE	LUMP SUM	LS	LS	420,000				
			3.	FOREBAY EXCAV.	LUMP SUM	LS	LS	200,000				
				SUBTOTAL				5,770,000				
				FIELD COSTS				5,770,000				
				INDIRECTS (36%)							(2,130,000)	

GPO 841-328

7143-7 (184)
Bureau of Reclamation

CONSTRUCTION COST ESTIMATE

SHEET 7 OF 7

PROJECT: UMATILLA
DIVISION:
UNIT:
FEATURE: 3-MILE DIVERSION DAM

PREPARED BY: PN REGION 120
ESTIMATE DATE: JANUARY 1985
ESTIMATE TYPE: FEASIBILITY
PRICE LEVEL: OCTOBER 1984

PROPERTY CLASS	IDENTIFIED PROPERTY	PLANT ACCOUNT	ITEM	DESCRIPTION	QUANTITY	UNIT	PRICE	AMOUNT	FIELD COST	TOTAL FIELD COST	NONCONTRACT COST	CONSTRUCTION COST
15				GENERAL PROPERTY								
	05			3-MILE DIVERSION DAM								
		151		DAMS								
				(7) DAM REMOVAL					$300,000		$80,000	$380,000
			1	MOBILIZATION	LUMP SUM	LS	LS	$11,000				
			2	DAM REMOVAL	LUMP SUM	LS	LS	225,000				
			3	UNLISTED ITEMS	LUMP SUM	LS	LS	13,000				
				SUBTOTAL				250,000				
				CONTINGENCIES 20%				50,000				
				FIELD 05.05 : 151 (7)				300,000				
				DESIGN AND SPECIFICATIONS							($80,000)	
				CONSTRUCTION SUPERVISION								

GPO 884 - 128

AGENCY CONCURRENCE LETTERS

VICTOR ATIYEH
GOVERNOR

Department of Fish and Wildlife

506 S.W. MILL STREET, P.O. BOX 3503. PORTLAND, OREGON 97208

March 6, 1985

Mr. Larry W. Wolf
Bureau of Reclamation
PO Box 043, U.S. Courthouse
550 W Fort St
Boise, ID 83724

Dear Larry:

We have reviewed the two preferred options for improving adult salmonid passage at Three Mile Falls Dam on the Umatilla River, which were discussed at the coordination meeting held at our headquarters on February 25, 1985, and have concluded that our preference is for a two-fishway system rather than the single fishway and velocity barrier.

In coming to this conclusion, however, we identified several aspects of the systems's operation which were of concern to us. We want to be sure that design and operational criteria will address these concerns, which we list below.

1. Design criteria for the fishways should allow fish to pass through them under any flow condition. However, it is possible that when flow at Three Mile Falls Dam falls below a certain level, there will be an insufficient volume of water passing through a fishway to attract fish to its entrance. Yet, because some water would flow through the channel leading to the base of the fishway, fish may be attracted into the lower end of this channel. This could result in delay and injury to fish attempting to reach the fishway. Likewise, dividing flows between the east and west bank fishways below a certain flow level may result in inadequate attraction flows for both fishways. Therefore, it may be necessary to identify minimum flow levels above Three Mile Falls Dam at which both fishways would be operated. When flows fall below that needed to operate both fishways, the east ladder should be shut down and all flows should be diverted down or in close proximity to the west fishway. At higher flows water should not be spilled over the crest of the dam while one of the fishways (the east bank fishway) is not operating. This could result in uncontrolled attraction of fish into the channel leading to the closed fishway and result in further delay or mortality. Therefore, when flow above Three Mile Falls Dam is at or falls below the combined capacities of the two fishways, all flow should be passed through the fishways.

2. Both fishways should include a capability for counting and trapping since we cannot predict with certainty that most fish will use a fishway of our choosing. However, the renovation should be designed so that at higher flows when both fishways are operational attraction is strongest to the west fishway. It will be more convenient and less expensive operationally if fish can be mainly trapped in one fishway.

3. When flow through the east fishway is shut off, the channel leading to that fishway should drain in such a fashion as to prevent the entrapment of fish in remaining pools. A pool at the lower end of the channel which extends for some distance into the channel and results in a "blind-alley" situation should, likewise, be avoided as this situation could contribute to delays in fish passage. On the other hand, the grade of the channels leading to the base of the fishways should not be so steep and uniform as to result in a velocity barrier under relatively high flow conditions.

We look forward to the continuing opportunity to review and comment on plans for improving fish passage at Three Mile Falls Dam, and are appreciative of this opportunity to comment regarding the preliminary design options. If you need additional information regarding these comments, please let us know.

Sincerely,

Harry

Harry Wagner
Chief of Fisheries

cc T. Vogel (BPA)
Esch (NMFS)
Garst (USFWS)
James (CTUIR)
Marsh (CRITFC)
Prange (BR)
Chaney
Smelcer/Barila (USACE)
Andrews (USFS)
Schneider (NPPC)
Chrisman (NPPC)

CONFEDERATED TRIBES
of the
Umatilla Indian Reservation
P.O. Box 638
PENDLETON, OREGON 97801
Area Code (503) Phone 276-3165

March 15, 1985

Larry Vinsonhaler
Regional Planning Officer
Bureau of Reclamation
PO Box 043, US Courthouse
550 W Fort St
Boise ID 83724

RE: Preferred Alternative for Modification of Three Mile Falls Dam

Dear Larry:

The Umatilla Tribe has long recognized the anadromous fish passage problems associated with Three Mile Falls Dam on the Umatilla River. We have been excited about the recent cooperative efforts and the funding outlook for finally correcting this problem and many others which have impacted anadromous fish runs in the basin since the early 1900's.

The Tribe has always favored a dam modification plan that would result in the best fish passage conditions. Recent reports stated that dam removal would provide the best juvenile and adult passage. However, the cost of this alternative is more than double any other option, as was noted at the February 25, 1985 coordination meeting. Although cost by itself should not be an overriding factor in determining the preferred alternative, there are other issues which are potential problems with the dam removal option. The cost of pumping water into the WEID canal raises several unanswered questions, and the lack of irrigator support for this alternative would no doubt be detrimental to other critical ongoing flow coordination efforts with irrigation districts.

The Tribe also has problems with the velocity barrier option. We are not convinced that this additional structure would result in acceptable levels of false attraction, fish stress, and migration delay.

For the above reasons, the Tribe supports the two-ladder fish passage alternative at Three Mile Falls Dam. We feel that providing passage at both ends of the 900-foot-wide dam is critically important during medium to high flows. The two-fishway system must be versatile so that low flows can be concentrated through either ladder. This alternative should also include a rotary drum fish screening system in WEID canal with juvenile sampling capabilities, fish counting and trapping capabilities in both

fishways, and some channel work immediately below the dam to create pool areas at the ladder entrances and facilitate passage to these areas.

The Umatilla Tribe appreciates the opportunity to comment on the preliminary design options for improved fish passage at Three Mile Falls Dam. We look forward to continued coordination with your agency during the final design phase. We hope that the project can move ahead expediently since upriver brigh fall chinook will begin to return annually to the Umatilla River in the Fall of 1985.

Sincerely,

BOARD OF TRUSTEES

Elwood H. Patawa
Chairman

cc: Fish and Wildlife Committee
Vogel (BPA)
Esch (NMFS)
Garst (USFWS)
Burchfield (CTITFC)
Prange (BOR)
Chaney
Korn (ODFW)
Phelps (ODFW)

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

March 21, 1985

Mr. Larry Vinsonhaler
Regional Planning Officer
Bureau of Reclamation
Federal Building and U.S. Courthouse
Box 043-550 West Fort Street
Boise, Idaho 83724

Dear Mr. Vinsonhaler:

In accordance with a request by Mr. Bill Mullins of your staff, we have reviewed the alternatives for proposed fish passage improvements at Three-Mile Dam. We favor both a right bank and left bank fish ladder in addition to fish screens in the West Extension Irrigation District Canal.

We believe fish ladders on both banks will provide the optimum passage conditions for adult salmon and steelhead approaching the project. Additionally, two ladders will provide greater operational flexibility through a full range of flows and site conditions.

Thank you for the opportunity to comment on this project. Please direct further comments or questions to Steve Rainey at FTS 429-5418 or Randy Lee at FTS 429-5411.

Sincerely,

Dale R. Evans
Division Chief

cc: Jim Phelps, ODFW, Pendleton
Gary James, CTUIR

United States Department of the Interior

FISH AND WILDLIFE SERVICE
Division of Ecological Services
Portland Field Office
727 N. E. 24th Avenue
Portland, Oregon 97232

Reference RG:mm

March 25, 1985

MEMORANDUM

1739

To : Regional Planning Officer, U.S. Bureau of Reclamation, Boise, ID 83724

From : Field Supervisor, ES, Portland Field Office

Subject : Fish Passage Alternatives for Three Mile Falls Diversion Dam

This is a follow-up to the February 25, 1985 meeting on the subject. Preliminary designs and cost estimates were discussed for the alternatives currently under consideration. It is our understanding that the Bureau's assessment of fish passage problems and potential solutions at Three Mile Dam will discuss four alternatives. These will involve a combination of: two ladders; downstream fish barrier; cap on crest; and dam removal. In recent discussions with your staff, we have been asked to identify our preferred alternative.

Based simply on the biological issue of fish passage, it is our opinion that the dam removal option is the best alternative. We realize, however, that there are other considerations (engineering- economics, politics, etc.) which will be weighed in the final selection of a plan. In any event, the Bureau's analysis should include a fair and equal assessment of this alternative as a possible solution to the fish passage problems at Three Mile Dam. This analysis might include other (possibly more economical) means of supplying water to the West Extention Irrigation District (WEID), besides pumping.

The second best alternative from a biological standpoint appears to be the two ladder alternative. This would involve renovating the left bank (west side) ladder and adding a ladder at a new location on the right bank (east side) of the dam. Both ladders would have counting and trapping facilities and a new fish screen and juvenile bypass system would be added on the left bank. As discussed at the meeting, there are several design considerations that still need to be resolved for this option--particularly for the screening facility.

The other two alternatives, while likely improving fish passage compared to the present situation, have many unanswered questions considering the debris, sedimentation, and flow problems at the dam. Without some hydrologic modeling to test these alternatives, we feel the two ladder option can be designed and operated in conjunction with good maintenance at the dam, to satisfactorily allow for fish passage.

These comments should be considered preliminary. We will make final comments on a preferred alternative when detailed plans and specifications are available for review. Thank you for the opportunity to provide early input on this matter.

Ronald L Yanet

for Russell D. Peterson

cc:
ODFW, Portland
NMFS, Portland
ODFW, Pendleton
CTUIR, Pendleton
CRITFC, Portland

COLUMBIA RIVER INTER-TRIBAL FISH COMMISSION

2705 East Burnside Street, Suite 114, Portland, Oregon 97214 Telephone (503) 238-0667

26 March, 1985

Larry Vinsonhaler
Regional Planning Officer
Bureau of Reclamation
P.O. Box 043, U.S. Courthouse
550 W. Fort Street
Boise, ID 83724

Dear Larry,

The Columbia River Inter-Tribal Fish Commission has reviewed the options for fish passage facilities at Three Mile Falls Dam on the Umatilla River. While we consider dam removal as an attractive option, we are aware that a pumping station on the Columbia River would merely transfer the fish passage problem to another site. Substantial changes in water policies are necessary before dam removal can be a suitable solution to fish passage problems at Three Mile Dam. Since it appears water policies are unlikely to change drastically within the next few years, we support the Umatilla Tribes' endorsement (by letter of March 15) of the two-fishway system. Flexibility to operate one or both ladders must be built into the design. The approach channel must be designed to minimize stranding of adults if one ladder is inoperable during low flows. Fish counting and trapping facilities should be designed for both ladders. Additionally, this option should include juvenile screening of WEID canal and juvenile sampling capabilities.

We appreciate the opportunity to provide input to you during these early stages of the design process. We are eager for construction to begin, and we urge you to avoid delays whenever possible.

Sincerely,

S. Timothy Wapato

S. Timothy Wapato
Executive Director

STW:SB:mrm