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Portland District

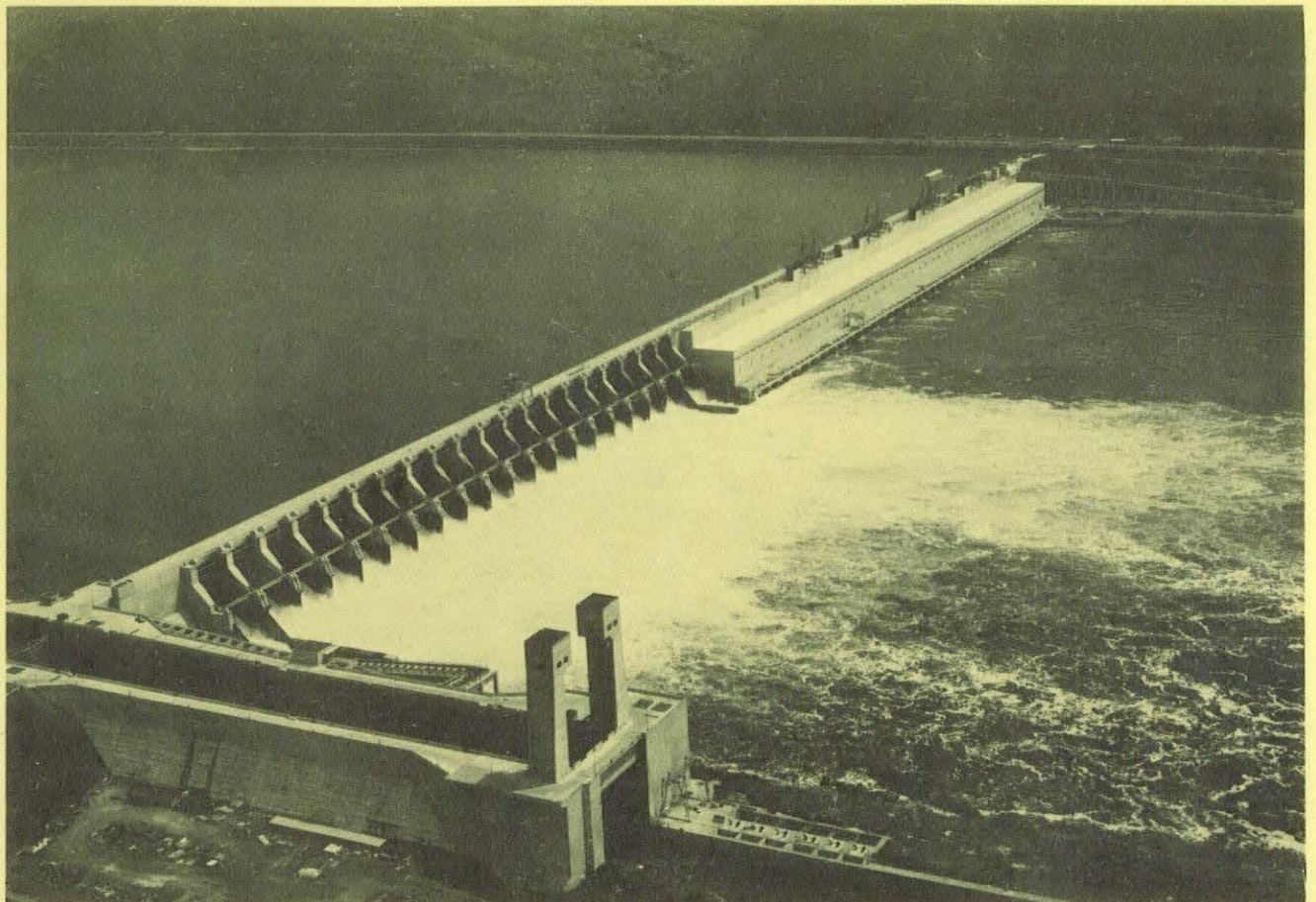
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John Day Lock & Dam Juvenile Fish Bypass System

Columbia River
Oregon-Washington

Supplement No. 3 to General Letter Report
Transportation Conduit and Outfall

June 1983



Report Documentation Page

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DEPARTMENT OF THE ARMY
PORTLAND DISTRICT, CORPS OF ENGINEERS
P. O. BOX 2946
PORTLAND, OREGON 97208

NPPEN-DB-SA

20 June 1983

SUBJECT: John Day Lock and Dam Juvenile Fish Bypass System, Columbia River, Oregon-Washington, Supplement No. 3 to General Letter Report, Transportation Conduit and Outfall

Commander, North Pacific Division
ATTN: NPDEN-TE

1. Inclosed are seventeen (17) copies of the subject supplement for your approval (Incl 1).
2. Schedule information in the supplement is consistent with the 1 January 1983 PB-2A, which provides for the construction to be completed in FY 1989.
3. We are proceeding with a design program that would provide the capability of completing construction of the bypass at the start of the fish season in FY 1986 should funds become available. The program is shown on the inclosed schedule (Incl 2). The following changes have been made in the program since the 5th indorsement to the General Letter Report.

a. The four letter reports that were to replace the feature design memorandum will now be submitted as supplements to the General Letter Report. A fifth supplement, Submerged Traveling Screen (STS) Handling Crane, will be added that will address the design criteria and basic design for the STS crane. This supplement will follow Supplement No. 1, STS Handling System which will investigate various alternatives and recommend the best STS crane for the John Day Bypass.

b. The STS Transportation and Maintenance Facility contract has been divided into the following contracts:

- (1) STS Maintenance Building
- (2) STS Truck and Trailer (supply contract)
- (3) Vertical Barrier Screen (VBS) Cleaning Device and Interim STS Handling Crane Mod (Modification of the emergency gantry crane).

c. In order to maintain our capability for a 1986 bypass completion with a 1985 partial operation, the funding requirements have increased in FY 1984 through 1986. The funding requirements for each year are noted on the inclosed schedule and updated estimates for each contract are shown on inclosure no. 3.

NPPEN-DB-SA

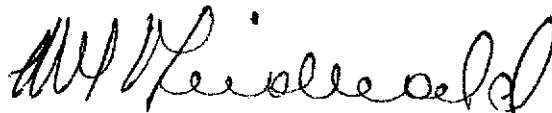
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SUBJECT: John Day Lock and Dam Juvenile Bypass System, Columbia River,
Oregon-Washington, Supplement No. 3 to General Letter Report,
Transportation Conduit and Outfall

4. Last fall it was agreed to proceed with an STS design to include modifications that would approximate the STS intake geometry of McNary. The modifications included lengthening the STS to enable it to be lowered in the intake, the addition of a gap beam to the intake roof, and replacement of the STS solid plates with perforated plates. Field research was conducted on an STS with the above modifications at Lower Granite Dam this spring. Research results for a lowered screen and a screen in the standard position showed both acceptable and similar fish guiding efficiency. Therefore, the expense of a lowered screen is not justified and the lengthened screen and the gap beam will be eliminated from the design. The perforated plates will still be included in the screens.

5. The plans and specifications for the STS contract with the longer screen were nearly completed before the Lower Granite research and the impact of revising the contract will delay completion of the plans and specifications for review by approximately four weeks. If we proceed with concurrent District and Division review, we will still be able to maintain the capability of advertisement in August 1983.

3 Incl
as



R. L. FRIEDENWALD
Colonel, Corps of Engineers
Commanding

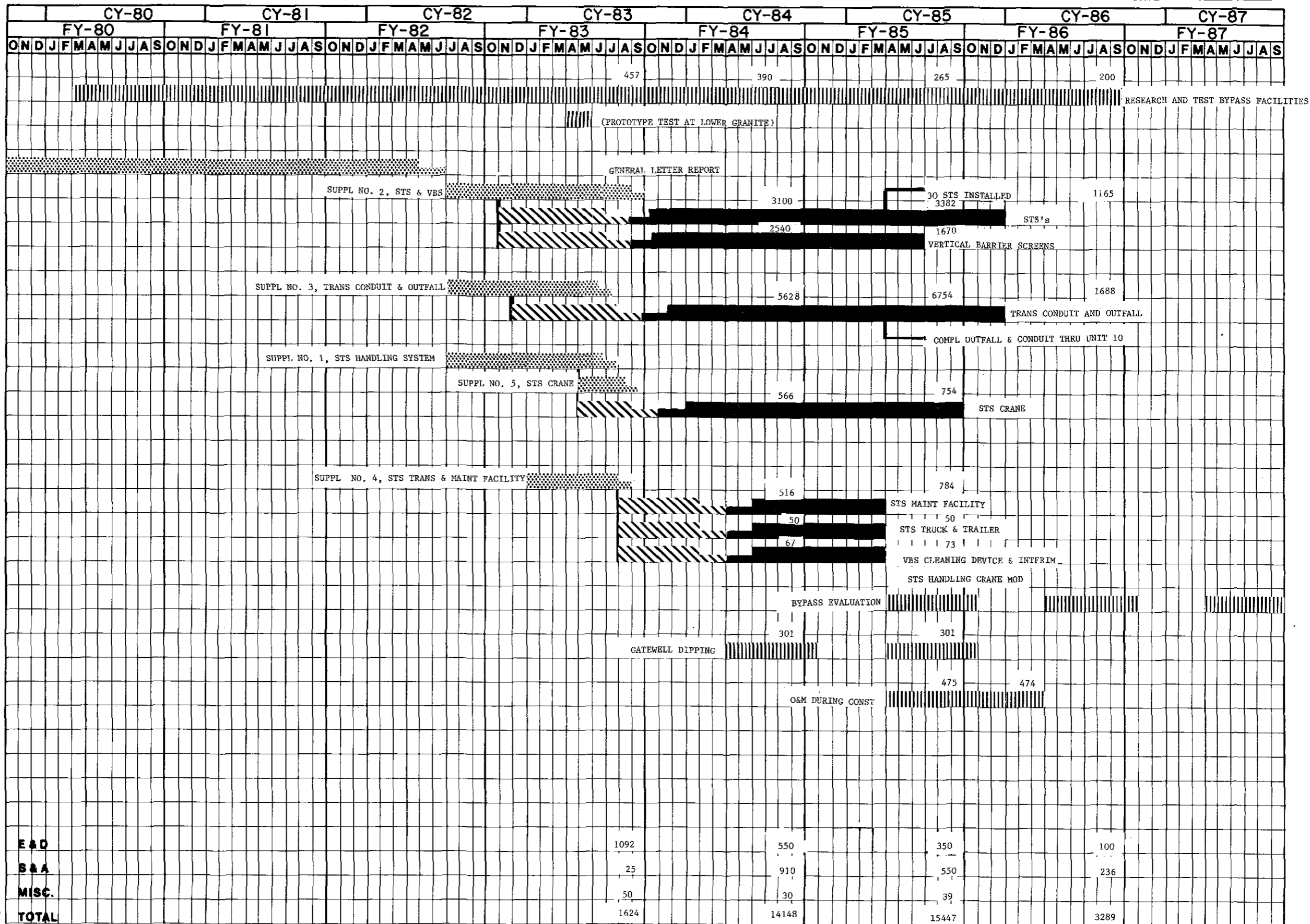
JOHN DAY FINGERLING BYPASS-

CAPABILITY SCHEDULE, 1986 COMPLETION (Oct 82 PRICE LEVEL)

DESIGN MEMO. REVIEW P & S REVIEW AWARD N.T.P. CONST
 ADV. AWARD N.T.P.

SCHEDULED AWARD DATE

DATE: 12 MAY 83



line 2

JOHN DAY JUVENILE FISH BYPASS SYSTEM
 UPDATED CONSTRUCTION
 COST ESTIMATE

ITEM	<u>PB-3 (Oct 82)</u>	<u>Latest Estimate for Supplements (Oct 82)</u>	<u>Difference</u>	<u>Reason</u>
1. STS Contract				
a. STS (48 screens)	\$ 6,960,000	\$7,327,000	\$+ 367,000	(1)
b. STS (One spare)	---	153,000	+ 153,000	(2)
c. Spare STS parts	---	166,000	+ 166,000	(3)
	<u>\$ 6,960,000</u>	<u>7,646,000</u>	<u>\$+ 686,000</u>	
2. VBS Contract	1,155,000	3,710,000	+2,555,000	(4)
3. Transportation Conduit & Outfall Contract	11,949,000	14,070,000	+2,121,000	(5)
4. STS Handling Crane	900,000	1,320,000	+ 420,000	(6)
5. Balance of Features				
a. STS Maintenance	1,300,000	1,300,000	0	(7)
b. STS Truck & Trailer Contract		100,000	+ 100,000	(8)
c. VBS Cleaning Device & Interim STS Handling Crane Mod		131,000	+ 131,000	(9)
Subtotal	<u>\$ 1,300,000</u>	<u>\$ 1,531,000</u>	<u>\$+ 231,000</u>	
Total Construction Costs	<u>\$22,264,000</u>	<u>\$28,277,000</u>	<u>\$+6,013,000</u>	
E&D	1,600,000	2,262,000	+ 662,000	(10)
S&A	1,154,000	1,697,000	+ 543,000	(10)
Total Costs	<u>\$25,018,000</u>	<u>\$32,236,000</u>	<u>\$+7,218,000</u>	

Incl 3 pg 1 of 2

Reasons for the difference between the PB-3 and latest estimate for the supplements are as follows:

- (1) Updated estimate has increased the cost by \$367,000.
- (2) The STS Maintenance Building proposed will repair and maintain STS's on a year around program. It is planned that one STS will be worked on in the building at a time requiring one spare STS.
- (3) Due to the long lead time for obtaining STS parts, enough spare parts will be supplied under the STS contract to provide the capability of timely repair for unforeseen breakdown during the first year of operation.
- (4) The original estimate failed to include the cost of the VBS guides that support the VBS in the gatewell slot. The cost estimate for the guides is \$1,312,000. It was determined by hydraulic model studies that the hydraulic design for the VBS should be increased from 1 ft. to 2 ft. head differential, resulting in increased costs of \$631,000. Also, the results from the 1982 research added perforated plates to the downstream side of the VBS, increasing the cost by \$612,000.
- (5) The estimate in Supplement No. 3 increased the cost of the transportation conduit by \$1,645,000 and the cost of the outfall by \$476,000; both increases due to more refined designs and cost estimates. Regarding the transportation conduit, \$1,252,000 is due to the addition of drilling and grouting of reinforcing steel for the conduit lining and \$393,000 is due to increases in the conduit lining, electrical, and miscellaneous. Regarding the outfall conduit, prior to this supplement, an acceptable outfall had not yet been designed, therefore, a detailed cost estimate was not developed. Supplement No. 3 studied various outfall systems in much more detail, resulting in a more detailed and accurate estimate.
- (6) The PB-3 was based on a preliminary cost estimate for a new hammerhead crane on the trash rake crane rails. This estimate did not include the costs of the modifications to the existing structure which would have increased the cost to \$1,940,000. The STS Handling Crane to be recommended in Supplement No. 1 involves a new gantry crane on the emergency gantry crane rails. This option will be less costly and will more effectively perform the required tasks with the least impact to the other project operation functions on the forebay deck.
- (7) Since the PB-3 estimate was made, an updated estimate for the STS Maintenance Building has not yet been completed.
- (8) A truck and trailer have been added to the bypass for transporting the STS's between the maintenance building and the forebay deck.
- (9) Other projects with VBS must shut the generators down and remove the screens for cleaning. The cleaning device proposed would allow the screens to be cleaned in place while the generator is operating. Modifications to the emergency gantry crane will be made to handle the STS's until the new STS crane is constructed.
- (10) Increased E&D and S&A associated with increased construction cost.

S Y N O P S I S

Supplement No. 3 to the General Letter Report presents the transportation conduit and outfall features of juvenile bypass system at John Day Lock and Dam. The General Letter Report developed the basic bypass system and in place of a feature design memorandum, the following supplements will be prepared:

- Supplement No. 1 - Submerged Traveling Screen Handling System
- Supplement No. 2 - Submerged Traveling Screens and Vertical Barrier Screens
- Supplement No. 3 - Transportation Conduit and Outfall (this report)
- Supplement No. 4 - Submerged Traveling Screen Transportation and Maintenance Facility
- Supplement No. 5 - Submerged Traveling Screen Crane

The bypass system will intercept the migrating salmonids before they enter the turbines and transport them to a release point downstream of the powerhouse. The juvenile salmonids entering turbine intakes are guided upward into the forebay bulkhead slots by submerged traveling screens. Gated orifices allow the fish to pass into a transportation conduit mined through the mass concrete upstream of the bulkhead slot. The fish travel south across the powerhouse and down an outfall chute to a release point in the tailrace.

Based on December 1982 price levels, the construction and design costs for the transportation conduit and outfall are \$16,040,000 and construction time is 24 months with completion by 1 October 1986.

JOHN DAY LOCK AND DAM
JUVENILE FISH BYPASS
SUPPLEMENT #3 TO THE GENERAL LETTER REPORT
TRANSPORTATION CONDUIT AND OUTFALL

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JOHN DAY LOCK AND DAM
JUVENILE FISH BYPASS
SUPPLEMENT #3 TO THE GENERAL LETTER REPORT
TRANSPORTATION CONDUIT AND OUTFALL

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JOHN DAY LOCK AND DAM
JUVENILE FISH BYPASS
SUPPLEMENT #3 TO THE GENERAL LETTER REPORT
TRANSPORTATION CONDUIT AND OUTFALL

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JOHN DAY LOCK AND DAM
JUVENILE FISH BYPASS SYSTEM
PRIOR AND SCHEDULED DESIGN MEMORANDUMS

<u>Design Memo No.</u>	<u>Subject</u>	<u>Date</u>
	General Letter Report	Apr 82
Supp. No. 1	Submerged Traveling Screen Handling System	Jul 83 (estimated)
Supp. No. 2	Submerged Traveling Screens and Vertical Barrier Screens	Sep 83 (estimated)
Supp. No. 3	Transportation Conduit and Outfall	Jun 83
Supp. No. 4	Submerged Traveling Screen Transportation and Maintenance Facility	Aug 83 (estimated)
Supp. No. 5	Submerged Traveling Screen Crane	Aug 83 (estimated)

SECTION 1
INTRODUCTION

1.01 General. The basic juvenile bypass system (JBS) planned for the John Day Powerhouse is presented in the General Letter Report, John Day Lock and Dam, Juvenile Fish Bypass System, dated April 1982. In place of a feature design memorandum, the following supplements will be prepared:

- a. Supplement No. 1, Submerged Traveling Screen Handling System.
- b. Supplement No. 2, Submerged Traveling Screens and Vertical Barrier Screens.
- c. Supplement No. 3, Transportation Conduit and Outfall. (This report)
- d. Supplement No. 4, Submerged Traveling Screen Transportation and Maintenance Facility.
- e. Supplement No. 5, Submerged Traveling Screen Crane.

1.02 Purpose and Scope. The purpose of this supplement (Supplement No. 3 to the General Letter Report) is to present the plan for the transportation conduit and outfall chute for the juvenile bypass system. Included is detailed information on the design criteria and basic design, the associated research, the alternatives studied for the development of the outfall, the conduit optimization study, and the cost estimate and construction schedule.

1.03 Changes From General Letter Report. The changes from the General Letter Report that relate to this report are as follows:

- a. The single level orifice transportation conduit has been adopted. Results from the 1982 research has provided the necessary data for acceptance of a single level orifice transportation conduit, in lieu of the dual level orifice plan. This change will result in a considerable cost savings and eliminate structural and mechanical problems associated with two orifices.

b. The orifice and conduit has been raised 4 feet to reduce orifice submergence at high forebay pool elevations. Research results demonstrated that more effective fish passage can be achieved by this change.

c. The screen-powerhouse system developed for energy recovery has been eliminated from the bypass at this time because of the high cost and marginal economic justification. The bypass proposed in this report precludes an energy recovery system at this time.

d. The outfall has been changed to an open-flow rectangular concrete chute exiting above tailwater on the south shore. The outfall in the General Letter Report, a 2 feet diameter pipeline, was developed in conjunction with the screen-powerhouse system.

e. The evaluation facility will be located near the outfall exit. This location is more desirable, as it evaluates the fish at a location closer to the exit and provides, an evaluation of the outfall chute.

1.04 Coordination We have continued to coordinate with the Fishery Agencies, changes subsequent to the General Letter Report. This coordination was completed at meetings with the Lower Columbia Fish Passage Subcommittee (LCFPS) of the Fish Passage Development and Evaluation Program Technical Coordinating Committee (FPDEPTCC). The subcommittee met on 7 June 1982, 7 October 1982, and 9 November 1982. The minutes of these meetings and those of a 10 March 1982 meeting, noted in the General Letter Report, are contained in Appendix A.

SECTION 2

RESEARCH

2.01. General. Research was conducted in 1982 at McNary Dam to provide information necessary for the design of the bypass system. McNary Dam was chosen as the research site because it has an operating bypass system that could be manipulated to provide conditions being considered for the John Day bypass system. The main objectives of the research were to determine: (1) if one level rather than a two level orifice system is required to cover the entire range of forebay elevations, (2) if orifice passage efficiency (OPE) could be improved with the use of balanced flow vertical barrier screens (BFVBS), and (3) if BFVBS were beneficial, if the fish guiding efficiency (FGE) of the STS's would be adversely affected. The OPE tests and results are outlined below. The FGE tests are presented in Supplement No. 2 to the General Letter Report, Submerged Traveling Screens and Vertical Barrier Screens.

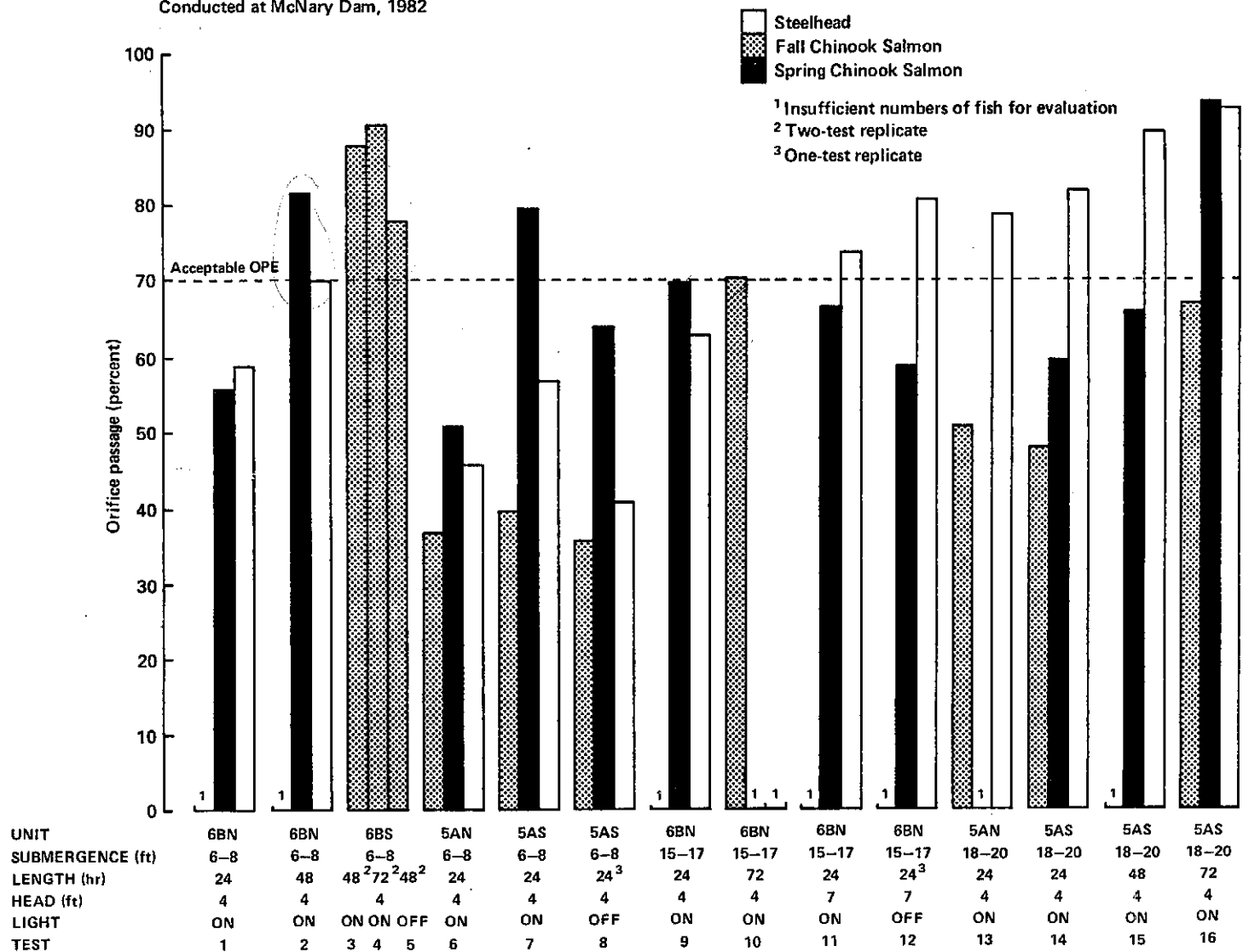
2.02 Orifice Testing at McNary in FY 1982. In 1982, the National Marine Fisheries Service (NMFS) continued research studies at McNary Dam to evaluate fish egress from gatewells through orifices submerged between six and 20 feet. The measure of fish egress was the percentage of fish passing from the gatewell compared to the number of fish remaining in the gatewell, and this was designated as the orifice passage efficiency (OPE). OPE studies conducted in 1981 with a standard vertical barrier screen (SVBS) resulted in less than acceptable levels of fish egress from the gatewells for chinook salmon fingerlings over all ranges of submergences and conditions tested. Turbulence and uneven flows in the gatewell from the additional water diverted into the gatewell by the submerged traveling screens (STS) may have been responsible for the poor OPE. Model studies conducted in early 1982 showed that by reducing the porosity of the barrier screen to 15 percent open area, a more uniform flow pattern was formed. Therefore, in 1982 a barrier screen with reduced porosity was used to try and create a more optimum condition in the gatewell to enhance OPE. This modified barrier screen is referred to as a balanced flow vertical barrier screen (BFVBS).

Criteria for acceptable OPE has been set at 70 percent in a 24-hour period. In addition to lowering OPE, turbulence in the gatewells created by STS was felt to cause an unacceptable level of descaling or stress in fish that remained in the gatewells for longer than 24 hours. With the addition of BFVBS in 1982, OPE tests were conducted over 24, 48 and 72 hours and measures of descaling and stress were taken on fish. OPE varied between orifice depths, period of passage, and fish species (Figure 1). No increase in either descaling or stress was evident in fish from tests of longer than 24 hours duration. In general, acceptable OPE for all species was obtainable between orifice submergences of 6-17 feet. This was in contrast to the less than acceptable OPE measured with SVBS in 1981. No acceptable OPE was obtainable at orifice submergences of 18-20 feet for fall chinook salmon. Additionally, there was some variation between north versus south orifice location OPE. During initial evaluations of the bypass system upon its completions, refinements in the placement of the solid and balanced flow panels of the vertical barrier screens maybe possible to optimize flow conditions in the vicinity of and the OPE through the single orifice.

2.03 Orifice Model Testing. Hydraulic model studies will be conducted in the spring of 1983 on the orifice configuration for the John Day Bypass to determine the orifice discharge coefficient. Orifice model studies that were performed for the Bonneville First Powerhouse juvenile bypass demonstrated an increase in the discharge coefficient and the need for similar tests for John Day. Should the tests demonstrate a coefficient significantly different from that used in the design (with an 18-inch-diameter tube) then modifications to the orifice tube will be tested to obtain the desired coefficient.

2.04 Testing at McNary in FY 1983. Studies will be conducted to determine the length of time that it takes to evacuate fish from gatewell intakes through the orifices after the turbine has been shut down. In conjunction with daily turbine operating fluctuations and the extended shutdown periods at John Day Powerhouse, this information will provide preliminary indications for determining how soon after shutdown orifices can be closed as a water saving measure while still providing adequate fish passage. The final verification for shutting down orifices will be determined by studies on the John Day bypass after construction completion, and then implemented if acceptable.

SUMMARY OF THE ORIFICE PASSAGE TESTS
Conducted at McNary Dam, 1982



NOTE: All tests with 15% Balanced Flow Vertical Barrier Screens.

Figure 1.--A summary of orifice passage tests conducted at McNary Dam under simulated John Day conditions, 1982.

SECTION 3
PROPOSED TRANSPORTATION CONDUIT AND OUTFALL

3.01 General. The proposed juvenile bypass system at John Day Powerhouse consists of submerged traveling screens (STS) in the bulkhead slot to divert the fish from the turbine intakes into the powerhouse bulkhead slot. Vertical barrier screens (VBS) will be installed in the gatewell between the operating gate slot and the bulkhead slot to retain the fish in the gatewell until they volitionally pass through orifices into a transportation conduit. The conduit flows south across the powerhouse and down an outfall chute to a release point downstream of the powerhouse. A general layout of the bypass is shown on Plate 1 and a flow schematic is shown in Figure 2. The STS and VBS features of the system are addressed in Supplement #2 to the General Letter Report, Submerged Traveling Screens and Vertical Barrier Screens.

3.02 Proposed Transportation Conduit. The transportation conduit consists of a conduit mined through the mass concrete upstream of the bulkhead slot with drilled orifices between the slot and conduit. The orifices will consist of 18-inch-diameter holes, 2 feet long and at centerline El. 250.5, located two feet from the south face of each pier. A 14-inch diameter orifice plate with an air-actuated knife gate will be installed in a recess on the bulkhead slot side of the orifice and attraction lighting will be provided by a quartz halogen spotlight through an air filled light well pipe. The transportation conduit will expand uniformly from Pier P-17 in generator bay 16 to bay 1. The width varies from 5' - 4 1/2 in bay 16 to 8'-3" wide in bay 1, and the floor slopes from elevation 245.33 in bay 16 to elevation 236 in bay 1. The top of the conduit will remain at a constant elevation 253.0. From bay 1, the conduit will have a uniform cross section through the station service and assembly bays, and then, transitions to a 5 feet wide by 9 feet high cross section in Monolith 14. Details of the transportation conduit are shown on Plate 2 through 4. The conduit has been sized to provide capacity for inflows from 60 orifices when the conduit is extended if generator units 17 through 20 are installed at some future time.

3.03 Proposed Outfall. From monolith 14, an open flow rectangular concrete chute, 5 feet wide by 10 feet high and 1,555 feet long, will carry juvenile fish to the tailrace. A tainter gate constructed on the downstream face of monolith 14 will control head in the transportation conduit and release flow into the outfall chute. From this gate (sta. 5+00, invert El. 235), the chute will follow an ogee curve to a point just north of the existing fishladder (sta. 6+85, invert el. 176.64) and then slope uniformly to invert elevation 165 at the release location, Sta. 20+55 (shown on Plate 6). This release is located offshore 100 feet from the low tailwater line (El. 155). The roof of the chute will be raised to El. 183 starting at Sta. 15+60 to provide clearance for a hydraulic jump required to sample fish for the evaluation facility which will be located on the downstream side of the chute on the river bank slope. An adjustable weir located in the chute invert will be used to create the hydraulic jump; and a 2-foot by 2-foot wedge wire cone will be placed in the flow upstream of the weir for collecting juvenile fish samples. The collected fish will be transported through a 10-inch diameter pipeline to an adjustable fish sampler in a concrete chamber and then transferred to a moveable holding tank that will lift them to the evaluation building. A stationary holding tank, work table, and recovery tank will be provided for sample evaluation in the evaluation building (see plate 16).

JOHN DAY POWERHOUSE JUVENILE BYPASS SYSTEM FLOW SCHEMATIC

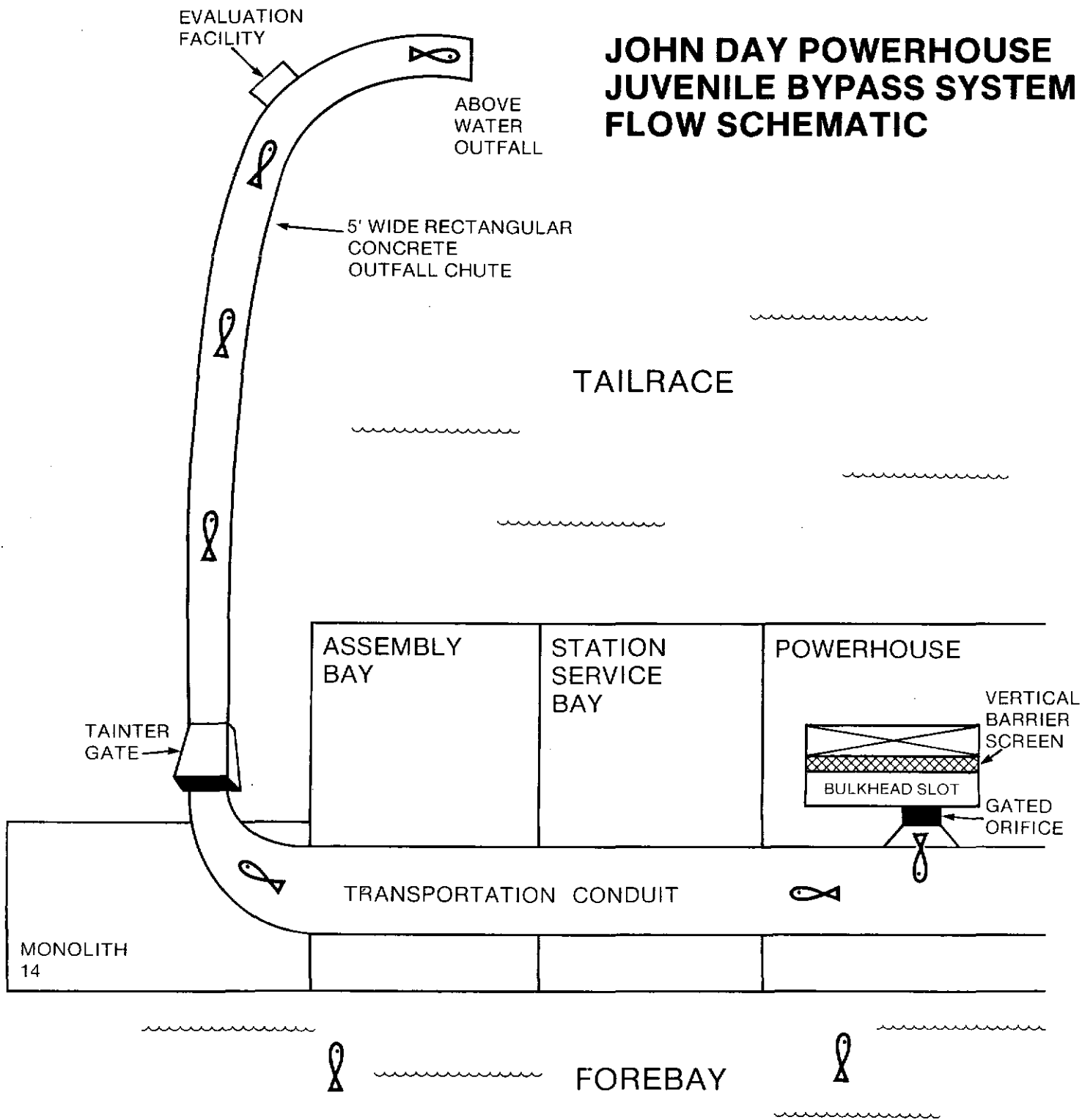


FIGURE 2
3-3

SECTION 4
INVESTIGATIONS

4.01 General. This section includes a transportation conduit optimization study and a bypass outfall alternatives study. The design criteria calls for the conduit to be designed for a 20-unit powerhouse to make it compatible with the future addition of units 17 through 20. Based on this criteria a conduit and outfall for a 20-unit powerhouse (60 orifice flow) was used as the bases for both these studies. The following paragraphs briefly describe the studies and the conclusions. Details of the studies are presented in Appendices B and C.

4.02 Optimization Study. A transportation conduit optimization study was performed evaluating channel volume versus design flow for four different conduit sizes (see Appendix C). Maximum and minimum flows were determined for each of four conduit sizes. Maximum flow was computed for the condition of four out of twenty generating units on-line; minimum flow was computed for the condition of twenty out of twenty generating units on-line. The condition of four operating units was an extreme based on past operating records. From the maximum and minimum flows, the low operating average flow was computed for each conduit, and this average flow was used to determine the value of power loss for each conduit.

The annual cost of conduit excavation and the annual value of power loss were totalled to obtain a cost comparison of each conduit as shown in Table A, following:

TABLE A - - ANNUAL COST

<u>Conduit</u>	<u>Volume (cy)</u>	<u>Average Q</u>	<u>Annual Cost</u>		
			<u>Conduit Excavation</u>	<u>Power Loss</u>	<u>Total</u>
A	7270	632 cfs	\$492,100	\$1,488,500	\$1,981,000
B	6328	648	428,300	1,526,100	1,954,000
C	6051	680	409,600	1,601,500	2,011,000
D	6496	645	439,700	1,519,000	1,959,000

Note: See Appendix C for further details.

Based on comparative annual costs, conduit "B" was selected as being the most economical alternative.

4.03 Bypass Outfall - Alternatives Study. The outfall pipeline recommended in the General Letter Report was designed to operate with a screen-powerhouse facility. However, due to lack of economic justification this facility was eliminated from the juvenile bypass system, and an alternative study for an outfall that would release all the fish and transportation conduit flow into the tailrace was performed. For more detail on this study see Appendix B.

a. Description of Alternatives.

(1) Alternative 1A is an open channel flow, rectangular concrete chute 5-feet wide by 10-feet deep and 1,555-feet long. The horizontal alignment of the chute follows parallel to the existing fishladder and then turns just upstream of the Bonneville Power Administration (BPA) turning towers and then continues straight to the exit.

(2) Alternative 1B is similar to 1A except that it is 1,812-feet long and the alignment turns and goes between the first and second BPA turning towers and then to tailwater.

(3) Alternative 2 is an open channel flow circular steel chute 10-feet in diameter. This alternative has an overall length of 2,248 feet and goes between the third and fourth BPA turning towers to tailwater.

(4) Alternative 3 is a full flow 6-foot diameter pipeline with a make-up water system. This alternative has an overall length of 3,100 feet and empties into tailwater downstream of the BPA turning towers. Alternatives 1A, 1B, and 2 are above water releases and alternative 3 is a submerged release.

b. Conclusions. All four alternatives are acceptable for a bypass outfall. Construction cost, hydraulic conditions, value of bypassed water, and the potential difficulties associated with construction between the BPA turning towers were considered for each alternative. Capital and annual costs for each alternative are shown in Table B as follows:

TABLE B
FINGERLING BYPASS OUTFALL
CAPITAL AND ANNUAL COST SUMMARY

ALTERNATIVE	DESCRIPTION	FIRST COSTS	ANNUAL COSTS		
		OUTFALL	CAPITAL COSTS	ENERGY COSTS	TOTAL ANNUAL COSTS
1A	Open Channel Flow Rectangular Chute, Exit U/S of BPA Towers	2,903,000	229,000	1,526,000	1,755,000
1B	Open Channel Flow Rectangular Chute, Exit between BPA Tower	3,133,000	247,000	1,526,000	1,773,000
2	Open Channel Flow Circular Chute	3,952,000	311,000	1,526,000	1,837,000
3	Full Flow Pipeline with Make-up Water System	3,885,000	306,000	1,842,000	2,148,000

Note: Outfall cost includes all costs in monolith #14 and D/S.

Based on the lowest total annual cost and most desirable fish bypass conditions. Alternative 1A was chosen for construction.

SECTION 5
HYDRAULIC DESIGN

5.01 General. The purpose of the John Day Dam juvenile bypass system (JBS) is to collect downstream migrating fish entering the turbine intakes, and route them around the powerhouse to the tailrace as quickly as possible, with a minimum amount of injury or disorientation. The transportation portion of the JBS consists of four basic components; the STS's, vertical barrier screens (VBS's), gatewell orifices, and the transportation conduit. The hydraulic design aspects of the STS and VBS are not presented in this report. The transportation portion of the JBS discharges to the outfall chute which transports downstream migrant fish to the river. The components of the outfall chute and its transition from the transportation conduit are: (1) CBL station 20+41 to the tainter gate (station 5+00), (2) tainter gate, (3) ogee drop, and (4) the chute itself. Design considerations are as follows:

a. A maximum impact velocity of about 30 fps was adopted for entrance into the tailrace from the chute. This was coordinated with the Fishery Agencies. The end of the chute is at station 20+55 (See Plate 8).

b. Manning's roughness values of 0.013 and 0.011 were used upstream and downstream from the tainter gate respectively. Values are from reference by Ven Te Chow "Open-Channel Hydraulics", page 111. Recommended materials are smooth concrete (0.013) and smooth concrete coated to reduce friction (0.011). Continued maintenance of coated concrete is necessary to maintain low friction value.

c. The amount of water in the chute varies depending on the number of generation units available and on-line. When units go off-line, the orifices need to be kept open for a period of time to pass any fingerlings in the slot; in this case the slot and forebay water surfaces were assumed the same. When a unit is on-line a one-foot difference in water surface between the forebay and slot is assumed.

d. Maximum and minimum forebay elevations of 268.0 and 257.0 feet mean sea level were assumed.

e. The powerhouse operations considered in this study are shown below. Since John Day has been operated as a peaking hydropower plant in the past, the number of units available is normally greater than the number of units on-line. In all cases shown below, the number of units available as on-line are from unit 1 (south end) and proceeding north across the powerhouse.

Number of Units (Orifices Operating)		Forebay Elevation	
		<u>268.0(Max)</u>	<u>257.0 (Min)</u>
<u>On-Line</u>	<u>Available</u>	<u>Chute</u>	<u>Discharge (cfs)</u>
4	4	103	103
8	8	205	205
4	8	224	224
12	12	315	315
4	12	356	356
16	16	438	440
4	16	500	502
20	20	600	604
4	20	695	712

5.02 Gatewell Orifices. Fish diverted into the turbine intake gatewells will be transferred to the transportation conduit through 14-inch diameter orifices installed in the wall between the gatewells and the transportation conduit. The orifices are located 2 feet from the north end of each bulkhead and have a centerline elevation of 250.5. The orifices are formed by mounting an orifice plate on the gatewell side of the wall centered over an 18-inch diameter hole drilled through the wall. The orifice plate and fasteners will be flush and free of projections that may damage fish approaching the orifice opening. The drilled holes are larger than the orifice's diameter to minimize contact of the orifice jet with the hole walls which could result in abrasion injury to the fish in the jet. All orifices are provided on/off control by power operated gates mounted on the upstream side (relative to the orifice flow) of the drilled holes. The gate frame and guides will not disturb flow approaching

the orifices. Details of the gatewell orifices are shown on Plate 3. A backflush system was considered for orifice cleaning in the General Letter Report. With the orifice gate mounted on the upstream side of the orifice tube, the need for routine orifice cleaning by backflushing has been eliminated. Any debris trapped across the orifice would float away by closing the orifice gate, and most debris caught in the orifice would be severed by the knife action of the gate leaf. This was considered to be more effective than a water backflush system that would flush fish back into the bulkhead slot and require shutting the bypass down during the backflush operations. The backflush would also be ineffective in generator units that are not operating. As a backup, a 2'x2' sluice gate in monolith 14 will be provided to supply forebay water to backflush individual orifices that cannot be cleared by orifice closure or by closure of the tainter gate at the exit of the transportation channel. Should any of the above methods fail, a caisson will have to be installed in the gatewell to dewater for access to the orifice plate. The orifices operate submerged, and access for visual inspection of each orifice is not possible. Remote inspection devices, such as television and other monitoring equipment for detecting debris at orifices, STS's and VBS's will be addressed in Supplement No. 4, to the General Report, STS Transportation Maintenance Facility.

The JBS system will operate with the orifice outlets submerged and will be controlled to maintain a minimum velocity, at the orifice plate, of 8 fps and a minimum discharge equal to a 12-inch diameter orifice operating with 4 feet of head. This criterion was developed in coordination meetings with Fishery Agency representatives and is the result of research indicating it to be minimum flow condition that will assure efficient fish passage from the gatewells. Assuming a discharge coefficient of 0.63, the resulting minimum acceptable head is 2.5 feet for 14-inch diameter orifices. The estimated average gatewell drawdown from forebay is 1 foot, so the transportation channel pressure grade line (PGL) will be adjusted, as the pool elevation fluctuates, to maintain a level at least 3.5 feet below forebay at the north end of the mined conduit.

Individual orifice heads could range from a minimum of 2.5 feet at the northern most orifice operating, to a maximum of 6.0 feet at the southern most

orifice. The maximum of 6.0 feet is based on a 20-unit powerhouse; the minimum assumes that all the units available are on-line. The design discharges were computed based on the assumption of a gatewell orifice discharge coefficient of 0.63. The results of a recent model study of the Bonneville First Powerhouse gatewell orifices, which are also submerged orifice plates mounted on the upstream end of a short tube, indicate a discharge coefficient of 0.82. A model study, using the specific John Day orifice layout, will be done to verify the orifice discharge characteristics. If the model results indicate an orifice discharge substantially greater than the value assumed for design, the model will be used to explore modifications to the orifice, or tube, to reduce the discharge.

5.03 Transportation Conduit. Orifices discharge into the transportation conduit, which flows from north to south. The conduit was sized by using combinations of generating unit operation with orifice rating curves. Water surface elevation and PGL (pressure grade line) along the conduit are dependent on forebay elevation and generating unit operations. From past experience, south end generating units are used when possible. Discharge, water surface or PGL elevation, and velocity from north and south, vary between 103-712 cfs, 253.4-264.5 feet (elevation), and 0-5.1 fps respectively. Head loss in transition from transportation conduit (CBL station 20+41) to tainter gate ranges from 0-0.8 feet. This is explained in paragraph 5.04. Various water surfaces, or PGL elevations, and velocity profiles from tainter gate (south end) to conduit at north end are on Plate 15. The table on the bottom of Plate 15 indicates data for combinations of unit operation with maximum (268) and minimum (257) forebay elevations.

5.04 Station 20+41 To Tainter Gate. From CBL station 20+41 to CBL station 18+72, the transportation conduit is of constant cross-section (8'-3" by 17'-0"). Velocities through this reach vary from 0.7 to 5.1 fps for discharges of 103 (minimum) and 712 cfs (maximum), respectively. The friction coefficient (K) was assumed to be 0.20. Head loss varies from 0-0.1 feet. From CBL station 18+72 to the tainter gate (47 feet), the channel goes through the transition, from 8'-3" x 17'-0" to 5'-0" x 9'-0" upstream of the tainter gate (station 5+00, chute stationing). The velocity for 103 cfs varies from 0.7 to 2.3 fps and 5.1 to 15.8 for 712 cfs. The roof elevation remains constant at 253.0 through this transition.

The assumed resistance coefficients (K) are 0.03 for contraction, 0.27 for two 45° bends and 0.09 due to friction. Head losses through the transition varied from approximately 0 - 0.8 feet for 103 and 712 cfs, respectively. Plates 7 and 15 show general and schematic features of the transition.

5.05 Tainter Gate. The tainter gate controls chute discharges, which varies mainly with the number of units available and on-line. The gate will open and close automatically to maintain the P.G.L. in the transportation conduit 3.5 ft below the forebay at the most northerly orifice. Structural details of the tainter gate are shown on Plate 7, and hydraulic data is shown on Plate 14. The conduit invert and roof elevations just upstream of the gate are 235.0 and 244.0 feet, respectively. The width of the gate is 5.0 feet. Minimum energy grade line (E.G.L.) and pressure grade line (P.G.L.) would occur at minimum forebay (257.0) with 4 units on line and 20 units available. Just upstream of the gate, for 712 cfs, the EGL would be 250.1 and the PGL would be 246.2. The gate trunnion elevation is at 243.0. The following table shows the unit operation, forebay, chute discharge, gate opening, and average velocity under the gate; as well as depth and velocity downstream of the gate in the contracted jet. Plate 14 also shows some of the same information.

Number of Units		Forebay Elev. ft.msl	Discharge c.f.s.	Gate		Contracted	
On-line	Available			Opening ft	Velocity f.p.s	Depth ft.	Velocity f.p.s.
4	4	268	103	0.64	32.2	0.48	42.9
4	4	257	103	0.82	25.1	0.61	33.8
8	8	268	205	1.32	31.1	0.96	42.7
8	8	257	205	1.72	23.8	1.24	33.1
4	8	268	224	1.45	30.9	1.05	42.7
4	8	257	224	1.89	23.7	1.36	32.9
12	12	268	315	2.10	30.0	1.50	42.0
12	12	257	315	2.80	22.5	1.96	32.1
4	12	268	356	2.41	29.5	1.70	41.9
4	12	257	356	3.23	22.0	2.24	31.8
16	16	268	438	3.03	28.9	2.11	41.5
16	16	257	440	4.18	21.0	2.86	30.8
4	16	268	500	3.54	28.2	2.44	41.0
4	16	257	502	4.85	20.7	3.33	30.2
20	20	268	600	4.43	27.1	3.03	39.6
20	20	257	604	6.20	19.5	4.34	27.8
4	20	268	695	5.22	26.6	3.60	38.6
4	20	257	712	7.66	18.6	5.82	24.5

5.06 Outfall Chute.

a. Layout. The outfall chute transports the migrant fish from the tainter gate (Monolith 14) to the river. Proposed chute elements are a 5.0 foot wide rectangular channel with two main reaches as described in the following paragraphs. Downstream of the tainter gate, a ogee drop and constant curve are required to lower the channel to a constant bottom slope to the river. A table of channel reaches is indicated below:

CHANNEL

<u>Reach (station)</u>	<u>Bottom El.</u>	<u>Feature</u>
5+55-6+51	235.0 - 190.12	Ogee Drop
6+51-6+85	190.12 - 176.64	50 ft. Radius Curve
6+85-20+55	176.64 - 165.0	0.85% Slope

b. Ogee Drop. The profile of a free jet is the curve of a ogee drop. To prevent separation of the flow and negative pressure, the design velocity is increased by 25% (EM 1110-2-1602, page 5-4). The design velocity is 46 fps for EGL and discharge of 268 feet and 100 cfs, respectively. Resulting equation for the ogee drop is $y = -0.00487x^2$. However, the maximum velocity, EGL and discharge expected are 43 fps, 264.5 feet and 103 cfs, respectively. Design conditions for the equation are high which allows for flexibility in future gate operations. The ogee drop is connected to the constant slope (0.85%) channel by a 50 foot radius curve. This curve provides a smooth transition between sections. Maximum water surface profile and details are on Plate 13.

c. Main Chute. The main chute length is 1370 feet between constant curve radius and river. Reach stations, bottom elevation, and slope are 6+85-20+55, 176.64 - 165.0 and 0.85% respectively. Channel section terminates at station 20+55 and overflow occurs into the river. This portion of design in which all discharges are supercritical assumes no evaluation facility in operation. Operation of the outfall chute with evaluator facility is discussed in paragraph 5.09. A maximum velocity of approximately 20 fps near

the channel outlet is necessary to meet the 30 fps maximum impact velocity in the tailrace adopted by the Fishery Agencies. Maximum velocity near channel outlet is 19.7 fps (station 20+49) considering maximum and minimum forebay elevations and no tailwater effect. Maximum velocities occur at station 6+85 and range from 47.3-66.2 fps. Proposed height of chute is indicated on plate 6. Recommended chute heights are due to hydraulic jump potential (operation of evaluation facility) downstream of station 15+60 and air entrained depths upstream of station 15+60. Minimum freeboard is 4.0 feet which occurs in 10 feet high rectangular channel at station 15+60.

(1) Horizontal Bend. A horizontal bend is located in the main chute at station 12+77.93 - 16+65.36 (Plate 6). Pertinent curve data are central angle and radius of 74° and 300 feet respectively. Another curve was tried with a varying central angle and radius; however, alignment restrictions which include the outfall chute from the powerhouse and exit site into the river, limits horizontal bend options. Three methods and references for determining depth increases are Ven Te Chow, (page 448), "Open Channel Hydraulic", Standish Hall, 1943, ASCE, (page 1394), "Open Channel Flow and High Velocities" and EM 1110-2-1601, (page 28), "Hydraulic Design at Flood Control Channels". Minimum and maximum incremental depth increases were computed which are summarized as follows:

Ven Te Chow - Relates deflection angle around a bend to depth increase. Increase in depth develop cross waves around curves which alternate between outer and inner walls.

Depth increase (range) = 0.06 - 0.46 feet.

ASCE - Using tests of existing structures, the angle of increase in a section was computed, and depth increases were developed.

Depth increase (range) = 0.09 - 0.54 feet

EM - Increases in depth vary with coefficient depending on bend improvement desired.

Depth increase (range) = 0.08 - 0.42 feet.

The previous table indicates that maximum depth increases are very similar. All methods use the approach depth and velocity at station 12+77.93 (start of

bend). Water surface depth due to friction increases about 25-30% compared to about 10% due to bend. Ven Te Chow's method gives average results, considering references used.

(2) Superelevation. The amount that the outer portion of the channel around bend should be raised is the superelevation necessary for increased velocity distribution in the section. No superelevation is assumed necessary based on the following criteria. The height of superelevation is two times the maximum incremental depth increase due to the bend (EM 1110-2-1601, page 28). A ASCE transaction indicates a factor (0.12) is derived from tests on existing structures (1943, Author-Stardish Hall, page 1394). If maximum incremental depth increase due to the bend is less than 0.12, no superelevation is necessary. The computed depth increases do not include channel friction loss. There is no freeboard criteria available for the Ven Te Chow method of computing depth increase due to bend. Apply the EM freeboard criteria to this method. The table below compares the maximum depth increase (due to the bend) for the three methods to the two superelevation criterias outlined above.

<u>Incremental</u> <u>Method</u>	<u>Depth Increase (Bend)</u> <u>Maximum Depth (feet)</u>		<u>Superelevation</u> <u>Criteria</u>
Ven Te Chow	0.46	EM	0.5 > 0.46 feet
ASCE	0.54	ASCE	0.12 > 0.108 feet
EM	0.42	EM	0.5 > 0.42 feet

5.07 Air Entrained Depth. Computed water surface depths are not increased due to air entrainment in the discharges. This incremental depth increase depends on the Froude number for each discharge, and using EM 1110-2-1601 (Plate 45). Effect of air entrainment on computed depth ranges from 0.6 - 1.0 feet at station 6+85, 0-0.3, feet at station 12+78, and 0-0.1 feet at station

16+65. Water surface profile on plate 13 and rating curves on Plate 14 do not indicate effect of air entrainment which are insignificant in indicated reaches.

5.08 Evaluating Facility. The purpose of the facility is to take fish samples from the channel chute and divert them through a 2 X 2-foot opening in a screened cone connected to a 10-inch-diameter pipe with the option for adding pipe to collect samples at various depths. Resulting pipe discharges for minimum and maximum design velocities of 8 - 10 fps are 4 and 5.5 cfs, respectively. Adjustable weir will increase the water surface in the chute to reduce the velocity for fish sampling purpose. Fishery Agencies, who will operated the facility, recommended sampling velocity of about 8-10 fps, a pipe bend radius of 3 times the pipe diameter and an up-well tank reducing velocity from 8 to 4 fps. Portions of the pipe will be cast in channel monolith and will be capped in the chute floor during periods of no sampling. This study is comprised of 2 items which are: 1) a sampling facility, and 2) channel weir.

a. Sampling Facility. Adjustable weir controls chute velocity to about 8-10 fps which is sampling velocities recommended by the Fishery Agencies. Discharges for this velocity range are 190 and 680 cfs from rating curve on plate 14. In order to maintain recommended velocities, the weir controls extreme velocities and discharges of 7.5 fps for 150 cfs and 10.3 fps for 712 cfs. For discharge below 150 cfs, the channel chute is uncontrolled. Discharges and velocities in this range are 100 cfs for 12.5 fps and 135 cfs for 13.5 fps. Head loss in the system is from the cone intake in the chute to the up-well tank in the evaluating facility. The loss coefficient (K) assumed for friction and bends are 1.19 and 0.39, respectively. Head losses for velocity in pipe of 8-10 fps are 2.6 and 4.0 feet. Extreme head loss for computing up-well tank operating range are 4.0 feet for 135 cfs and 712 cfs. This extreme assumes maximum pipe velocity of 10 fps. Water surface elevations in the chute for above discharges are 169.0 and 180.1, respectively. Recommended water surface elevations in up-well tank are 165 through 178, which allow for flexibility in the system. Due to the low elevation in the sampling chamber (150) compared to tailwater range (155-173), a drain with a sump pump discharging into the river is recommended.

b. Channel Weir. Proposed adjustable height weir is located at station 18+25 with a bottom channel elevation of 166.95. The weir height ranges from 0-3.0 feet; however, weir height of 5.0 feet is recommended for flexibility in future facility operations. The rating curve uses a discharge coefficient between 3.60 - 3.98 (HDC 122 - 1/2) and reduction in discharges due to submergence of about 8 percent. Rating curve is on plate 14.

5.09 Operation of Outfall Chute. The reach downstream of station 12+77.93 (upper end of horizontal bend) is comprised of three factors. These 3 factors are (1) water surface depth increase due to horizontal bend, (2) superelevation of outer channel around the horizontal bend, and (3) hydraulic jump due to operation of evaluation facility. Items (1) and (2) have been discussed previously in paragraphs 5.06c (1) and (2), respectively. Hydraulic jump formation in operation of the evaluation facility (item 3) uses factors stated above in the following analysis.

a. Hydraulic Jump in Operation of Evaluation Facility. Representative discharges for analyzing hydraulic jump potential are 315, 438, 600, and 712 cfs (maximum). Procedure used is as follows:

(1) Water surface profiles upstream of station 18+25 (centerline of weir) was computed using a standard step-backwater computation.

(2) Depths required before and after hydraulic jump to satisfy equation in EM 1110-2-1602 (15 Oct 80), page 5-5.

(3) Froude number and type of hydraulic jump from book by Ven Te Chow (Open - Channel Hydraulics), figure 15-2.

(4) Jump length from book by Ven Te Chow (Open - Channel Hydraulic), figure 15-4.

(5) Graphical determination of hydraulic jump location (figure 3).

(6) Maximum depth anticipated (EM 1110-2-1601, Plate 46 and 47).

(7) Summary of results follow and also indicated on figure 3. Froude numbers for 4 discharges are low (1.6 - 1.7), but are gradually increasing as does discharges. Hydraulic jumps for discharges of 315 and 438 cfs are classified as undular, or very weak, which produces waves with maximum depths of 9.0 and 11.9 feet respectively. Above 4 discharges depend on number of generating units available and on-line but are independent of forebay elevation (257-268). The locations of the hydraulic jumps for above discharges are at stations 17+25, 16+25, 15+95 and 15+80. Freeboard available at above stations are 7.0, 3.2, 4.2 and 2.9 feet for discharges of 315, 438, 600 and 712 cfs respectively. Results on figure 3 are variable depending on three possible alternatives.

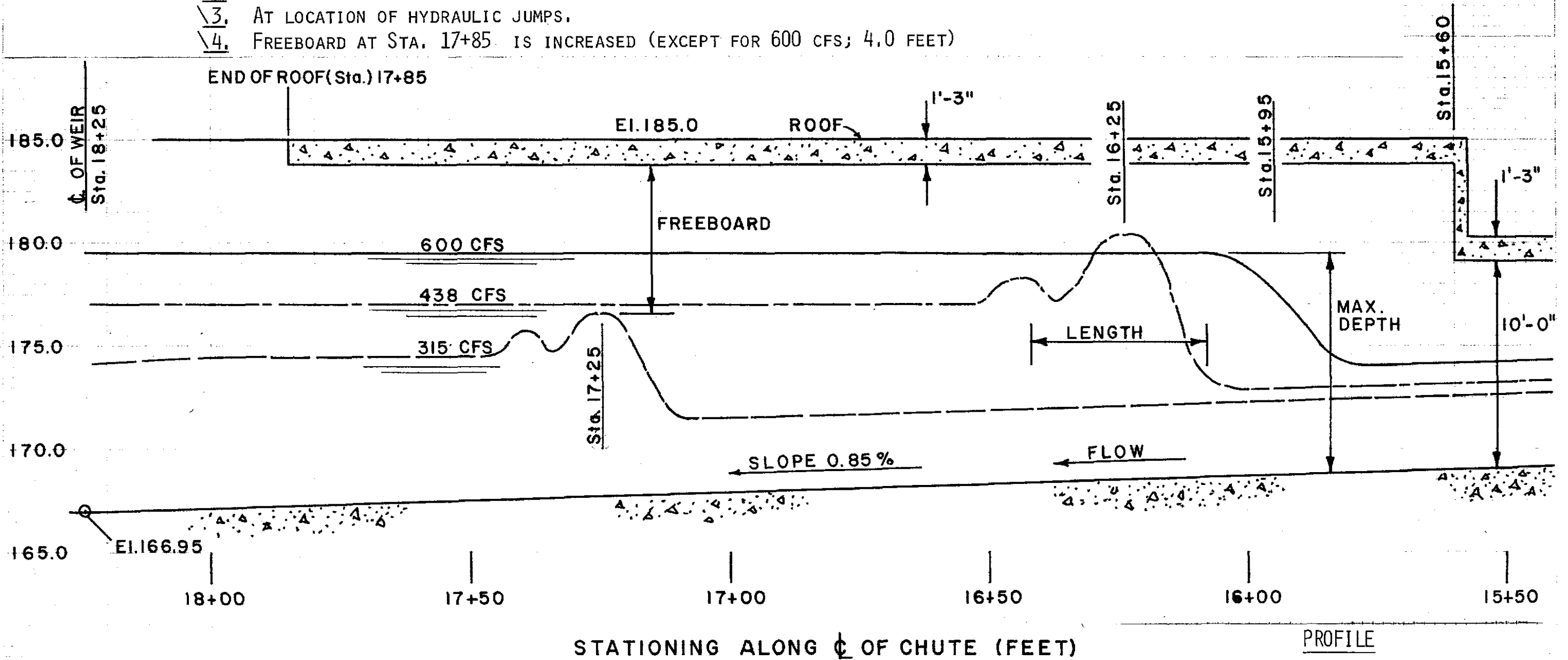
(a) Computed incremental depth increase due to horizontal bend, depends on entrance depth and velocity at the beginning of the bend (station 12+77.93) which are a maximum for all discharges. Water surface depth due to friction increases about 25 - 30% compared to about 10% due to bend. It is assumed that depth increases due to the bend effect are approximate, and are the maximum expected.

(b) Entrance depth to hydraulic jump (D_1) varies across channel width around bend. Likewise, downstream depth (D_2) required for hydraulic jump varies also. As D_1 increases, or decreases, also D_2 decreases and increases conversely. Using the preceding analysis the formation of hydraulic jump is approximate, and location is estimated as indicated by the range of stationing indicated on figure 3. The concept of hydraulic jump presented is approximate and includes a margin of uncertainty. An approximate modified rating curve (station 16+65) at figure 4 indicates changes due to operation of evaluation facility. Presently, the roof of the channel chute is at elevation 183.75 extending from station 15+60 - 17+85. Inspection manholes in roof are proposed to observe flow conditions. No roof coverage is desired in this reach; at least for a short time after construction. If no problems arise after operation of the evaluation facility, then the roof can be constructed as proposed.

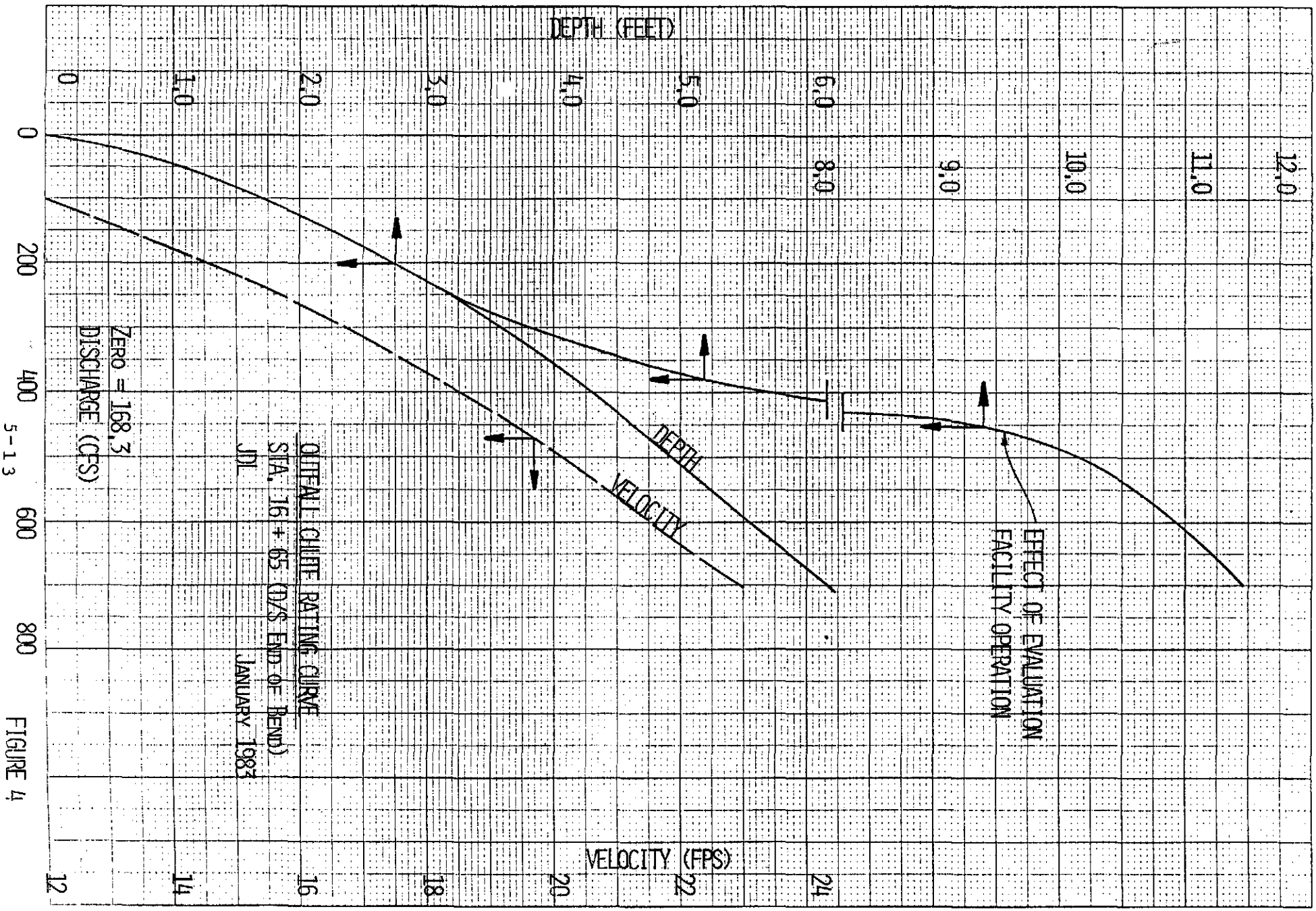
(c) Superelevation of channel is the amount the outer portion around the bend should be raised to increase velocity distribution in the

\1 DISCHARGE (CFS)	NUMBER OF UNITS (ORIFICE OPERATING)		FROUDE NUMBER	HYDRAULIC JUMP (TYPE)	HYDRAULIC JUMP (FEET)		\3 DEPTH (FEET)	\3,\4 FREEBOARD AVAILABLE (FEET)
	AVAILABLE	ON-LINE			\2 STATIONING	LENGTH		
315	12	12	1.6	UNDULAR	17+25	27	9.0	7.0
438	16	16	1.6	UNDULAR	16+25	34	11.9	3.2
600	20	20	1.7	WEAK	15+95	44	10.6	4.2
NOT PLOTTED 712 (MAX)	20	4	1.7	WEAK	15+80	49	11.8	2.9

- NOTES: \1. NO EFFECT DUE TO FOREBAY ELEVATION.
 \2. CENTERLINE OF LENGTHS FOR UNDULAR JUMPS AND 25% FOR WEAK JUMPS.
 \3. AT LOCATION OF HYDRAULIC JUMPS.
 \4. FREEBOARD AT STA. 17+85 IS INCREASED (EXCEPT FOR 600 CFS; 4.0 FEET)



CHUTE UPSTREAM OF WEIR (STA 18+25) FOR
 EVALUATION FACILITY
 JOHN DAY - DSM MARCH 1983



5-13

FIGURE 4

section. This subject has been discussed in paragraph 5.06c(2). No superelevation is recommended within the general guidelines suggested. It is assumed; however, that jump action efficiency will not be influenced by this factor.

b. Operation of Chute Without Evaluation Facility. The discharges and subsequent water surface profiles are classified as supercritical, given a channel slope and friction value. Two variable alternatives concerning (1) depth increase due to bend and (2) superelevation were discussed previously in paragraphs 5.09(a) and (c) respectively. Points along reach for minimum freeboard are 4.3 feet at station 6+85, 5.4 feet at station 9+00 and 4.0 feet at station 15+60. The freeboards includes air entrainment effect.

5.10 Water Surface Profile and Rating Curves. A maximum water surface profile and 6 rating curves for conditions with no evaluation facility operating are shown on plates 13 and 14 respectively. The water surface depths in the chute (and rating curves) are obtained using standard step-backwater computations and adding incremental depth increase at bend when needed. The rating curve at station 20+49 is based on the length from channel brink (station 20+55) using 3.5 times normal depth for low flows. Refer to ASCE transaction 108, 1943, (page 1383), comments by Rouse. The rating curve is the same for station 20+00 - 20+49 since relative length from the brink has a minor effect only. Curves at station 16+65 indicate computed depth, plus bend depth increase. Computed data was used for two rating curves at station 6+80 and 12+80. A weir rating curve at station 18+25 is for use when the evaluation facility is operating. Details are in paragraph 5.08b.

SECTION 6
STRUCTURAL DESIGN

6.01 General. This section presents the basic data, design criteria, loadings, assumptions and methods that apply to the transportation conduit and the outfall.

6.02 Basic Data. Elevations upon which the preliminary design was based, are as follows:

- | | |
|--|---------|
| 1. Minimum forebay pool elevation | El. 257 |
| 2. Maximum regulated forebay pool elevation | El. 268 |
| 3. Maximum tailwater elevation | El. 173 |
| 4. Minimum tailwater elevation | El. 155 |
| 5. Spillway design flood at forebay pool elevation | El. 276 |

6.03 Design Criteria.

a. General. The structural design will conform to the following Engineering Manuals and other applicable manuals:

- (a) EM 1110-1-2101 Working Stresses for Structural Design
- (b) EM 1110-2-2000 Standard Practice for Concrete
- (c) EM 1110-2-2103 Details of Reinforcement-Hydraulic Structures
- (d) EM 1110-2-2902 Conduit, Culverts and Pipes
- (e) EM 1110-2-2702 Design of Spillway Tainter Gates

b. Concrete. General design methods will conform to the latest revisions of the American Concrete Institute, "Building Code Requirements for Reinforced Concrete (ACI-318)." Concrete will have a compressive strength of 3000 psi at 28 days. The allowable compressive stress for concrete in contact with water will be 1050 psi. Reinforcement will conform to ASTM A-615 Grade 40. Concrete may be pneumatically applied or placed using standard formed construction.

c. Structural Steel. General design methods will conform to the latest revision of the American Institute of Steel Construction, "Specification for the Design, Fabrication, and Erection of Structural Steel for Buildings." All structural steel, gates, and bulkheads will be fabricated from ASTM A-36 rolled shapes and plate. Exposed gate guide surfaces will be fabricated from ASTM A-276 stainless steel bars. The following allowable stresses will be used:

Structural Steel	22,000 psi
Gates	18,000 psi

Weldment design will be based on the American Welding Society, "Structural Welding Code D1.1-80."

6.04 Loading.

a. Dead Loads. Dead loads consists of the weight of concrete, which is assumed to be 150 pounds per cubic foot.

b. Water Loads. Forebays from El. 265 to El. 276 were studied. Forebays over El. 268 were considered 33-1/3 percent overstress conditions for both the construction and operating cases.

c. Earthquake. The design will be based on an earthquake acceleration of 0.1 g acting horizontally. When earthquake loads are considered the allowable stresses will be increased by 33-1/3 percent.

6.05 Transportation Conduit.

a. Powerhouse Section. The transportation conduit from Generator Bay 1 through 16 will be designed for the following load cases:

(1) Load Case 1: Forebay at El. 268.0, conduit full, bulkhead slot unwatered, using normal stresses.

(2) Load Case 2: Conduit empty, bulkhead slot at El. 268.0, using normal stresses.

(3) Load Case 3: Forebay at El. 276.0, conduit full, bulkhead slot unwatered, using allowable overstresses.

(4) Load Case 4: Conduit empty, bulkhead slot at El. 276.0, using allowable overstresses.

(5) Load Case 5: Forebay at El. 268.0, conduit full, bulkhead slot unwatered, earthquake.

(6) Load Case 6: Conduit empty, bulkhead slot at El. 268, earthquake.

Conduit surfaces will be reinforced and overlaid with a concrete lining. The concrete lining will have a Class B type concrete finish. Waterstops will be provided at the contraction joints between the generator bays.

b. Stability Analysis. A stability analysis of a typical generator bay with concrete removed for the transportation conduit was done based on the results of the original analysis done in 1960. The new results show that the generator bays still meet the stability criteria outlined in EM 1110-2-2200, "Gravity Dam Design".

c. Station Service Bay, Assembly Bay, and Monolith 14. The transportation conduit in the Station Service and Assembly Bays, and in Monolith 14 was designed for hydrostatic and earthquake loads with the conduit empty and full. This section of the conduit will be reinforced and concrete lined.

6.06 Tainter Gate Housing. The tainter gate housing consists of a 15-foot 6-inch long section of concrete chute with 4-foot thick walls and a concrete housing structure above, integral with the chute section. The chute section is supported vertically by a column and beam frame and is connected horizontally to existing monolith fourteen by 3/4-inch post-tensioning rods. There

is a 3-foot by 3-foot trunnion girder designed to accommodate full pool loading on the tainter gate. This trunnion girder is placed in compression by 3/4-inch post-tensioning rods, and in addition to supporting the tainter gate loads, serves to tie the tainter gate housing together.

6.07 Tainter Gate. The tainter gate will be designed in accordance with the requirements of EM 1110-2-2702, "Design of Spillway Tainter Gates." When in the fully closed position the gate will seal on top, sides and bottom. The gate will be designed for a maximum hydrostatic load of 33-feet at forebay elevation 268. For a forebay elevation between 268 and 276 a 33-1/3 percent overstress is allowed for construction and operating cases. The bottom edge of the gate will be rounded to prevent damage to fish.

6.08 Outfall.

a. Concrete Chute. This section refers to the reinforced concrete chute that extends from sta. 5+17.5 to sta. 20+55. The structural components consist of walls, base slab, roof slab and struts.

The unroofed section of the chute (approx. sta. 5+17.5 to sta. 6+55) will be designed for interior hydrostatic load. The walls will be cantilevered from the base slab.

The buried section of the chute (approx. sta. 6+55 to sta. 17+85) will be designed in accordance with EM 1110-2-2902 "Conduits, Culverts and Pipes." In addition, the buried section of the chute that passes under the existing access road (approx. sta. 12+40 to sta. 15+50), will be designed for the appropriate AASHTO loading and the project crane.

The fish evaluation section of the chute (approx. sta. 17+85 to sta. 18+25) will be open at the top and up to 20-feet deep. The side walls will be braced with reinforced concrete compression struts to support the backfill loading on the walls.

The outfall section of the chute (approx. sta. 18+25 to sta. 20+55) will be designed for interior hydrostatic load and lateral loads from river

flows at tailwater above elevation 163. The walls will be cantilevered from the base slab.

b. Support Frames at Monolith 14. The elevated chute section just downstream from the tainter gate will be supported by three supports frames. A typical frame has 2-foot square columns, a 2-foot by 3-foot cross beam, and a 6-foot by 15-foot footing. One frame will support the tainter gate housing. This frame is similar to the other three, except that the columns will be supported at the base by existing Monolith 14. The following loading conditions will be considered:

1. Dead load of concrete chute.
2. Water loading in chute.
3. Wind load.
4. Seismic load.
5. Foundation bearing capacity.

c. Support Frames at Outfall. These frames support the outfall section of the concrete chute. Each frame consists of two 30-inch diameter steel pipe piles concreted into 42-inch diameter drilled holes. The pipe piles will be connected at the top by a precast concrete beam which also supports the concrete chute. The frames will be designed for water current loading, dead load of chute, water load in chute, wind load, and seismic load.

d. Evaluation Facility. The concrete chamber for the moveable sampling equipment will be designed for exterior hydrostatic load (tailwater El. 173), backfill load, and seismic load.

SECTION 7
MECHANICAL DESIGN

7.01 Entrance Orifices. Fingerlings will enter the transportation conduit through 18-inch-diameter holes located in the upstream wall of each of the 48 gatewells. Each entrance hole has a 14-inch-diameter orifice plate located on the gatewell side. An air actuated knife edge valve located behind the orifice will shut off the flow as necessary. Plate 3 shows the orifice, valve, and operator assembly.

7.02 Orifice Lighting. Orifice attraction lighting will be provided. High intensity, narrow beam lamps will be located in the existing El. 265 Service Gallery. The light will be conducted to a point near the orifice thru a lightwell tube consisting of an embedded 8 inch diameter galvanized steel pipe. The lightwell tube will be open at the bottom end and closed at the top by a clear lens. A very small quantity of compressed air will be constantly introduced into the lightwell tube to keep water out, minimizing the amount of water the light is transmitted through and keeping the lens free from algae growth.

7.03 Backflush Gate. Water from the forebay for backflushing individual entrance orifices will be provided by a standard 2'x2' sluice gate in the transition section of the transportation conduit in Monolith No. 14 (see Plate 7). Backflushing will only be used as a backup method for clearing debris from the orifices when orifice gate closure is not effective.

7.04 Tainter Gate Operator. The tainter gate hoist assembly will consist of a rack and pinion type hoist with a minimum lift capacity of 15000 lbs. The hoist will be driven by a 4100:1 double reduction worm reducer with an electric motor. The rack assembly will be attached to the Tainter Gate by a pinned connection. The upper end of the rack will be held on the Pinion by two follower rollers. All gearing will be designed according to AGMA standards. The pinion shaft will be sized using fatigue strength considerations. All other components will be designed using EM 1110-1-2101; Working Stresses for Structural Design guidelines. All seals will be rubber J-seal types with the top seal being coated with a fluoro-carbon film.

7.05 Evaluation Facility.

a. Adjustable Weir. The adjustable weir will be a vertical weir gate. The gate will be constructed from structural steel ASTM A-36, and painted with a vinyl system. The gate will be raised and lowered by screw operators driven by a single gear motor with torque-limiting switches. The gate will be operated locally with manual controls. The gate will be designed to operate with 5 feet of differential head and will have rollers on the downstream face to reduce friction. Gate guide slots will be covered by steel side plates attached to the gate. Gate guides will be Type 300 stainless steel. The gatewell will be 1 foot deeper than the height of the gate. This will allow space for silt and debris to build up. A 6-inch valved drain to the sump will flush the gatewell of debris.

b. Movable Sampler. A movable fish sampler will be provided to periodically sample fingerlings for evaluation. This sampler will consist of an aluminum upwell tank, a water eliminator, and a holding tank. Electric hoists suspended on a frame at El. 185 will raise and lower the sampler to maintain the proper flow into the upwell tank. Fish are collected through a removeable wedge wire cone mounted in the chute that is connected to the upwell tank with flexible 10 inch diameter plastic hose. The cone will be removed when samples are not being collected. A second moveable holding tank will collect fish from the sampler holding tank and lift them to El. 185 for manual transportation to the holding tank in the evaluation building. The purpose of this second holding tank is to allow the sampler to continue to operate while a sample is being removed for evaluation. A separate hoist on a frame at El. 185 will be used to hoist the second holding tank.

c. Evaluation Equipment. The following evaluation equipment will be provided in the evaluation building.

1. A 4-1/2-foot x 4-1/2-foot x 3-foot-deep stainless steel holding tank.
2. A 3-foot x 3-foot x 2-1/2-foot-deep stainless steel recovery tank.

3. A 4-foot x 6-foot work table with a 6-inch half-round PVC pipe.

The holding and recovery tanks will have pipelines to the outfall chute to release fingerling back into the chute.

d. Pumps. Three submersible pumps will be provided to remove water from the sampling chamber. The pumps will consist of one 250 gpm pump, one 2,000 gpm pump, and one 1,000 gpm pump. The 250 gpm pump will remove water due to miscellaneous leakage when the sampler is not operating. The 2,000 gpm pump will operate during sampling periods of low flow (4.4 cfs) through the 10-inch-diameter plastic hose. During high flow operation (6.5 cfs) through the 10-inch-diameter plastic hose the 1,000 gpm pump will operate in addition to the 2,000 gpm pump. During sampling operations, the 250 gpm pump will not operate. The pumps will be submersible centrifugal pumps with quick disconnect flanges. The quick disconnect flanges will enable the pumps to be raised out of the sump on a series of guide rails for maintenance.

SECTION 8
ELECTRICAL DESIGN

8.01 General.

a. Code. Electrical design will conform to the National Electrical Code and Corps of Engineers Standards for Hydroelectric Powerhouses.

b. Conduit. Conduit will be of rigid steel, galvanized inside and out, and otherwise conform to Federal Specification. WW-C-581.

c. Wire and Cable. Wire and Cable will conform to Guide Specification 1404.04.

d. Grounding. Equipment will be grounded to the nearest existing grounding connection.

8.02 Power and Lighting.

a. Entrance Orifices. A 500 watt quartz halogen spot light will be installed in each light well for fish attraction. Power will be obtained from existing motor control center CQ06 through a lighting transformer to 208/120 volts. A current sensor will be mounted near the fixture to indicate a burned out lamp.

b. Service Gallery. The existing lighting in the service gallery will be adequate for the orifice control equipment.

c. Tainter Gate. Power for the tainter gate located at Monolith 14 will be obtained from the existing power panel DQ2. Lighting for the tainter gate machinery room will be obtained from the existing lighting panel DR9.

d. STS. Power for the submerged traveling screens will be obtained from the existing station service substation SQ02.

8.03 Control System.

a. Orifice, Light, and Gate Control. The mode of operation which will be provided for the orifice gate positions will be full manual control provided from the control room via the Data Acquisitions and Control System (DACS) cursor controlled color graphics screen. This is part of the operators console. The fish attraction lights will automatically turn on when their respective orifice gates are full open. The DACS graphics screen will provide status indication of the orifice gates positions and the fish attraction lights. Control and indication will be provided on a unit select basis. A single alarm will be provided to the DACS to indicate an abnormal condition in the orifice gates, lights, or fish screens.

b. Tainter Gate Control. Two modes of operation of the tainter gate will be provided. In the Automatic Mode, float switches will be provided to monitor the water level in the transportation conduit. At discrete deviations from the desired water level, tainter gate raise-lower commands will be generated by the tainter gate control circuitry. In the manual mode, manual raise and lower function will be provided via the DACS graphics screen or locally at the tainter gate location. A LOCAL/REMOTE manual control switch will be provided at the tainter gate control panel. The position status of the switch, tainter gate full-open and full-closed status, high water level state and low water level state will all be indicated on the DACS graphics screen.

SECTION 9
EXCAVATION, MATERIALS, AND FOUNDATION DESIGN

9.01 General. This section covers the excavation and foundation design for the outfall conduit and associated evaluation facility.

9.02 Explorations. The basic purpose of the subsurface explorations is to determine the depth of bedrock, the nature and properties of the overburden materials, and the level of the water table. The alignment of the outfall conduit has been explored with two backhoe pits. See Appendix D for logs of exploration and test data. Six additional drill holes have recently been drilled. However, the data from these holes has not been fully analyzed. Materials testing includes mechanical analysis and determination of Atterberg limits.

9.03 Geology. Extensive information concerning the site geology is contained in Appendix A to Design Memorandum No. 3 General Design Memorandum, John Day Lock and Dam dated 23 June 1958. The bedrock along the outfall alignment is composed of a series of basaltic lava flows with irregular surface that are characteristically hard, fine grained, dense, and black or grey. Overburden consists of relatively thin river deposits overlain by 5 to 20 feet of fill imported during construction of John Day Dam. River deposits consist of sands, silty sands, sandy gravels and cobbles. Fill materials consist of sandy gravels, cobbles and boulders.

9.04 Foundation Design. Column foundations for the unroofed section of the outfall from station 5+17.5 to 6+55 (see Plate 7) will be on sandy gravel with cobbles and boulders and will be designed for a bearing capacity of not more than six (6) tons per square foot. The foundation for the outfall conduit between stations 6+55 and 18+65 and the sampling chamber will be on silty sands, sandy gravels, and basalt bedrock. Foundation loads in this section will not exceed the weight of the material to be excavated and hauled to waste. The steel pipe piles for the support frames from station 18+65 to 20+55 will be founded in basalt bedrock. The foundation for the evaluation building will be on select fill placed 2 to 10 ft deep to bring the sloping bank to grade. Load will not exceed four tons per square foot.

9.05 Outfall Conduit Excavation. The outfall conduit will be constructed below existing ground from station 6+55 to station 18+50 where it daylights on the river bank slope. Depth of excavation averages 15 feet with a maximum of 20 feet near station 17+50. Excavated materials will include silty sands, sandy gravels, cobbles, boulders, riprap, and bedrock. The overburden materials will be excavated with conventional power excavating equipment. The rock will be excavated by a hydraulic splitter or similar method adjacent to structures and by blasting, away from the structures. The Contractor will be required to monitor each blast with an approved seismograph to prevent vibration induced damage to nearby structures. Riprap will be stockpiled and replaced. To minimize adverse effects on the parking lot and fishladder, the excavation will be shored from station 6+46 to 15+35 and in the area of the electrical substation. Beyond these areas the excavation could be unshored with slopes no steeper than 1V on 1.5H. See Plate 8 for typical excavation sections. Preliminary data from the six (6) drill holes mentioned in 9.02 indicate a water table slightly above the bottom of the proposed excavation. Some dewatering, therefore, will be required. Approximately 5,700 cy of excavated material will be hauled to the waste area on the project, shown on Plate 1, and graded and seeded as discussed in Section 10, Utilities and Landscaping.

9.06 Sampling Chamber Excavation. The sampling chamber mentioned in 5.09 is located next to the proposed evaluation building on the existing riprapped bank slope within 30 feet of the Columbia River. Construction of the sampling chamber will require excavation to elevation 145.0. This is 15 to 20 ft below normal tailwater elevation. Excavated materials will include silty sands, sandy gravels, cobbles, riprap and bedrock. Riprap will be stockpiled and reused. Because of the closeness of the Columbia River and the expected permeability of the overburden, some form of cutoff is proposed to control flows into the excavation. Alternatives include a diaphragm wall, or a sheet pile cutoff encircling the excavation. Because of the small size of the excavation, a sheet pile cutoff will probably be quickest and most economical. Final design of the excavation will be done when all explorations and testing are completed.

9.07 Backfill. Backfill of all excavations will be done with excavated materials except that within 2 ft of structures, free draining granular backfill will be used. All materials will be spread in layers and compacted.

9.08 Concrete.

a. Source. Construction of the juvenile fish bypass system will require the placement of approximately 3,700 cy of concrete. An onsite batch plant will probably be uneconomical since this is a relatively small amount of concrete and there is a ready-mix concrete source in The Dalles, 28 miles to the west of the project. There are also approved concrete aggregate sources in The Dalles, and Scappoose, Oregon.

b. Special Considerations. Concrete designed to withstand cavitation/erosion due to high velocity flows (60-66 fps) will use high quality aggregates, have a maximum water cement ratio of 0.45 ($w/c = 0.45$) and have a slump between 2 and 4 inches. To achieve a Manning roughness factor of $n = 0.011$ for prevention of hydraulic jumps in the channel, an epoxy coating similar to Concrete 1170 general purpose concrete coating will be applied to the concrete surface after the concrete has cured sufficiently.

SECTION 10
SITE WORK, UTILITIES, AND LANDSCAPING

10.01 General. This section presents a summary of the relocations to be accomplished on the South Shore of John Day Dam, during construction of the Juvenile Bypass Outfall Chute. The major items to be affected by the outfall excavation in the vicinity of the fish ladder will be the railroad spur, access road, parking lot, curbs, gutters, sidewalks, flag pole, storm drainage system, irrigation system, plantings, and flood lights. After the system is completed, the surrounding facilities damaged by the construction will be restored or replaced in kind. The double railroad tracks that cross the outfall chute alignment will be removed for the full width of the chute construction boundary and they will not be replaced at completion of the work. The underground electrical conduits, water systems, and sewer line, that will be uncovered when the outfall trench is excavated, will be adequately supported across the trench opening during construction. All utility lines will remain in service, with the exception of the storm drainage in the parking lot, which shall be inoperative until after the concrete for the chute has been placed.

The security fencing in the area of the Bonneville Power Administration substation will be removed, and replaced with temporary fencing along a different alignment during construction, and reinstalled on the original alignment after the outfall work is completed. The concrete chute of the bypass system will be daylighted from station 17+85 to its discharge point in the Columbia River. Where the outfall alignment enters the river, the existing bank protection riprap over the proposed trench alignment will be saved, and later placed on either side of the completed open concrete chute to serve as added bank protection.

10.02 Roadways and Parking. A portion of the powerhouse access road and part of the parking lot adjacent to the fishladder will be partially excavated during construction of the outfall trench. One lane of the access road and the parking lot will be closed to traffic during construction. While construction is in progress, traffic through the work area will be detoured

along the other lane of both the access road and the parking lot for a distance of approximately 600 feet. After the outfall is constructed and back-filled, the areas of the access road and parking lot that were removed for construction will be restored to their original alignment and grade, and be replaced in kind.

10.03 Sidewalks. The existing sidewalks that are within the excavation area will be removed during the construction. The reaches of sidewalk that are damaged or destroyed due to construction shall be replaced in kind along the same alignment and grade after the work on the outfall chute is completed.

10.04 Concrete Curbs, Gutters, and Catch Basins. The existing curbs, gutters, and catch basins located within the construction area for the outfall shall be removed as necessary for construction purposes. After the outfall is completed, the curbs, gutters, and catch basins shall be replaced in kind, and where possible, reconstructed to their original alignment and grade. The storm drainage line will be placed adjacent to, and parallel with, the completed chute and will follow the chute alignment to the drainage discharge point at the river bank.

10.05 Area Lighting. The existing mercury vapor lights on standards that illuminate the project road, parking lot, and grounds in the vicinity of the fish ladder will be removed as necessary for the excavation of the outfall trench. Most lighting in the construction area is considered nonessential and may be disrupted if required.

10.06 Railroad Spur Lines. Two parallel railroad spur lines, located in the vicinity of the parking lot and powerhouse access road, will intersect the outfall chute alignment. During construction, the rail system across the trench area will be permanently removed. A bumper will be installed on the downstream side of the existing tracks by the Contractor.

10.07 BPA Substation. The Bonneville Power Administration has a power substation located on the downstream side of the John Day Dam, near the bank of the Columbia River. The outfall chute will pass approximately 30 feet from the substation boundary at about outfall station 17+50. Through coordination

with BPA, sufficient clearance was provided for safe construction in the vicinity of the power substation.

10.08 Utilities. Existing electrical conduits, water, sewer, and irrigation lines will intersect the outfall chute alignment at various locations and elevations. The following is a tabulation of known existing utilities that are located in the vicinity of the construction area:

a. Storm Drain System and Manhole. An existing 12-inch diameter CMP storm drain extends from approximate station 7+00 to 13+00 of the outfall centerline traverse. This pipe is located close to, and parallel with, the excavation for the outfall trench. One manhole will be disrupted during construction.

b. Water Lines. Two 1-inch and one 6-inch water line will intersect the outfall alignment at various locations. For locations and elevations of utilities, see Plate 11. The water lines will remain in place and service throughout the construction period. If it should be necessary to reroute any line because of unforeseen circumstances, those lines will be returned to their original location, if possible, before construction is completed. Any alternative water systems that may result, because of construction work, will all be connected and operative before the outfall is completed.

c. Sewer Line. One 4-inch diameter pressure sewer line will cross the outfall alignment in the vicinity of station 15+80. It is not practical to reroute this line, so it will remain in place and service throughout the construction period. The sewer line will be adequately supported, during construction, for the length of pipe that is excavated.

d. Irrigation System. See paragraph 10.09, Landscaping, for a discussion of the Irrigation System.

e. Electrical Conduit. Two 1-1/4 inch lighting conduits, two 1-1/4 inch power conduits and one 1-inch telephone conduit will intersect the outfall alignment at various locations. For locations and elevations of conduits, see profile Plate 11. Three 3-inch 4.16 kV electrical conduits will

intersect the outfall alignment at about station 18+00. Electrical conduits will pass through the upper portion of the outfall chute when the chute is constructed. Electrical conduit installation will conform to the National Electrical Code. The conduits will stay in service throughout the construction period.

10.09 Landscaping. All areas disturbed by construction activities will be restored to the original appearing condition. The completed landscape will be functional.

a. Plantings. Prior to planting, six inches of soil will be added to the area to be planted in lawn. Plantings of London Plane Tree will be replaced. Baltic Ivy will be planted as a ground cover with some Red Twig Dogwood and Vine Maple to match that which is existing. Irrigation will be replaced and balanced with the same kind of system that is in place now. The existing 6-inch main line and the main distribution system will not be disturbed.

b. Yard. See Plate 12, Detail Landscape Plans. The chute will be covered over, where possible, and planted.

c. Main Parking Island. Curbs, plantings and irrigation will be replaced as originally designed.

d. Flag Pole Island. The flag pole island will be reconstructed with flag pole and handicapped ramp. Minimal plantings will be used, for the most part pavers will be used to replace plantings.

e. Center Island along Existing Fish Ladder. The center island will be removed and replaced with parking.

f. Service Area Island. The service area island will be reconstructed and planted as originally planted. Brick pavers will be installed over the chute, see Plate 12, Detail Landscape Plans.

g. Waste Area. The waste area will be graded to slopes not exceeding 20 percent and planted to dry land grass. Minimal tree plantings with bark mulch, for moisture retention, will be used. The location of the waste area is shown on Plate 1.

SECTION 11
COST ESTIMATE AND CONSTRUCTION SCHEDULE

11.01 Cost Estimate.

a. General. Detailed costs, presented in paragraph 6.01 b., are based on estimated price levels for October 1982. For comparison purposes the General Letter Report Estimate, based on February 1982 price levels, has been updated to October 1982 price levels. Operation and maintenance costs will be presented in the Supplement No. 4 to the General Letter Report, STS Transportation and Maintenance Facility. Annual energy costs are covered in Appendix B, Table B-1 and Appendix C, paragraph 6.

b. Detailed Cost Estimate. A detailed cost estimate is given on pages 11-5 and 11-6. Total construction costs of the transportation conduit and outfall are \$14,070,000. Total costs for E&D and S&A are \$1,970,000. Total capital costs are \$16,040,000.

c. Comparison of Present Estimate, General Letter Report Estimate, and PB-3 for Transportation Conduit and Outfall.

	General Letter Report Estimate (Feb 82)	General Letter Report Estimate (Updated to Oct 82)	PB-3 (Oct 82)	(This Suppl) Suppl. #3 Estimates (Oct 82)	Difference Between PB-3 and Suppl. #3	Reason
Construction Cost	18,971,000	20,110,000	11,949,000	14,070,000	+2,121,000	(1)
E&D (8%)	1,518,000	1,518,000	956,000	1,126,000	+170,000	(2)
S&A (6%)	<u>1,138,000</u>	<u>1,138,000</u>	<u>717,000</u>	<u>844,000</u>	<u>+127,000</u>	(2)
	21,627,000	22,926,000	13,622,000	16,040,000	+2,418,000	

Reasons for these changes are as follows:

(1) The cost estimate of the transportation conduit increased by \$1,645,000 and the cost of the outfall increased by \$476,000; both increases due to more refined designs and cost estimates. Regarding the transportation conduit, \$1,252,000 is due to the addition of drilling and grouting of reinforcing steel for the conduit lining and \$393,000 is due to increases in the conduit lining, electrical, and miscellaneous. Regarding the outfall conduit, prior to this supplement, an acceptable outfall had not yet been designed, therefore, a detailed cost estimate was not developed. This supplement studied various outfall systems in much more detail, resulting in a more detailed and accurate estimate.

(2) Increased E&D and S&A associated with increased construction costs.

The decreased cost between the Supplement #3 and the General Letter Report is due to the elimination of the screen-powerhouse.

11.02 Construction Schedule. The design and construction schedule for the John Day Juvenile Bypass System is shown in Figure 1. The construction of the transportation conduit and outfall chute, including the evaluation facility, is scheduled for completion and capability of operation by October 1986. The VBS's are also scheduled for completion by October 1986. Partial operation of the bypass may begin in April 1987 as the STS's are fabricated and installed until all 48 are in place by July 1988. Completion of the remaining features of the Juvenile Bypass System are scheduled for October 1989.

11.03 Construction Considerations.

a. Mining Method. Overlapping holes will be rotary drilled around the perimeter of the conduit. Additional holes will be drilled inside the perimeter if the concrete block size is to be limited. Hydraulic jacks will be placed in the holes as necessary and the concrete split and removed. In order to maintain structural integrity, jacking will not be done in the vertical line of holes nearest the slot. Concrete excavation by blasting will not be permitted.

b. Bracing. The concrete removal operation leaves an unreinforced concrete face subject to bending due to water in the slot. As long as the forebay elevation remains below El. 268 and overbreak is limited to 12 inches (leaving a wall thickness of at least four feet) no bracing will be required. Guidance concerning possible bracing requirements due to higher forebay or greater overbreak will be given should these conditions arise.

c. Access Shafts. The mined concrete will be removed through one of the 14 feet (approximately) by 10 feet access shafts, two of which will be provided. One will be in the Assembly Bay, mined horizontally from the gate repair pit at about El. 236. The same size hole will also be provided in the intake deck directly above the pit (See Plate 4). Any gate repair pit lighting and structures that interfere with the mining of the access shaft will be temporarily removed. The other shaft likely will be in Generator Bay 11, mined vertically from the intake deck, through the upstream portion of the service gallery at El. 265, and bottoming out at about El. 249. This shaft will require the rerouting of electrical cables, cable trays, telephone lines, and air and water lines to the downstream wall of the gallery. The downtime for this operation is minimal and will cause no major difficulties. A barrier will be installed at the opening to protect personnel and equipment.

d. Utility Shafts. Several utility shafts of much smaller cross-section area than the access shafts will be required to provide air, water, and power to the conduit during construction. These shafts may be mined from the intake deck or from the service gallery.

e. Orifices. Concrete removal in the slot creates a plane of weakness in the downstream conduit wall. The work on the downstream conduit wall, consisting of placing reinforcement, overlaying with concrete, and curing for seven days is to be completed to within 3 feet of the centerline of the orifices prior to orifice work.

11.04 Fish Passage During Construction.

a. Upstream Migration Period. The upstream migration period is from 1 March to 1 December. Construction over the fishladder will not be permitted

during this period. Construction of the outfall chute in the tailrace will be restricted to the period from 1 December to 1 March.

b. Downstream Migration Period. Alinement of the new transportation conduit is such that it will eliminate the existing transportation pipe. Juvenile fish entering the bulkhead slot during the migration periods in 1984 through 1986 will have to be removed by a bulkhead slot dipping contract. The migration period begins 1 April and ends 1 November.

ENGINEER'S ESTIMATE

Project FINGERLING BYPASS SYSTEM

Sheet 1 of 2

Location JOHN DAY LOCK AND DAM

Estimated by DM ZF Date:

Features TRANSPORTATION CONDUIT AND OUTFALL

Checked by DW

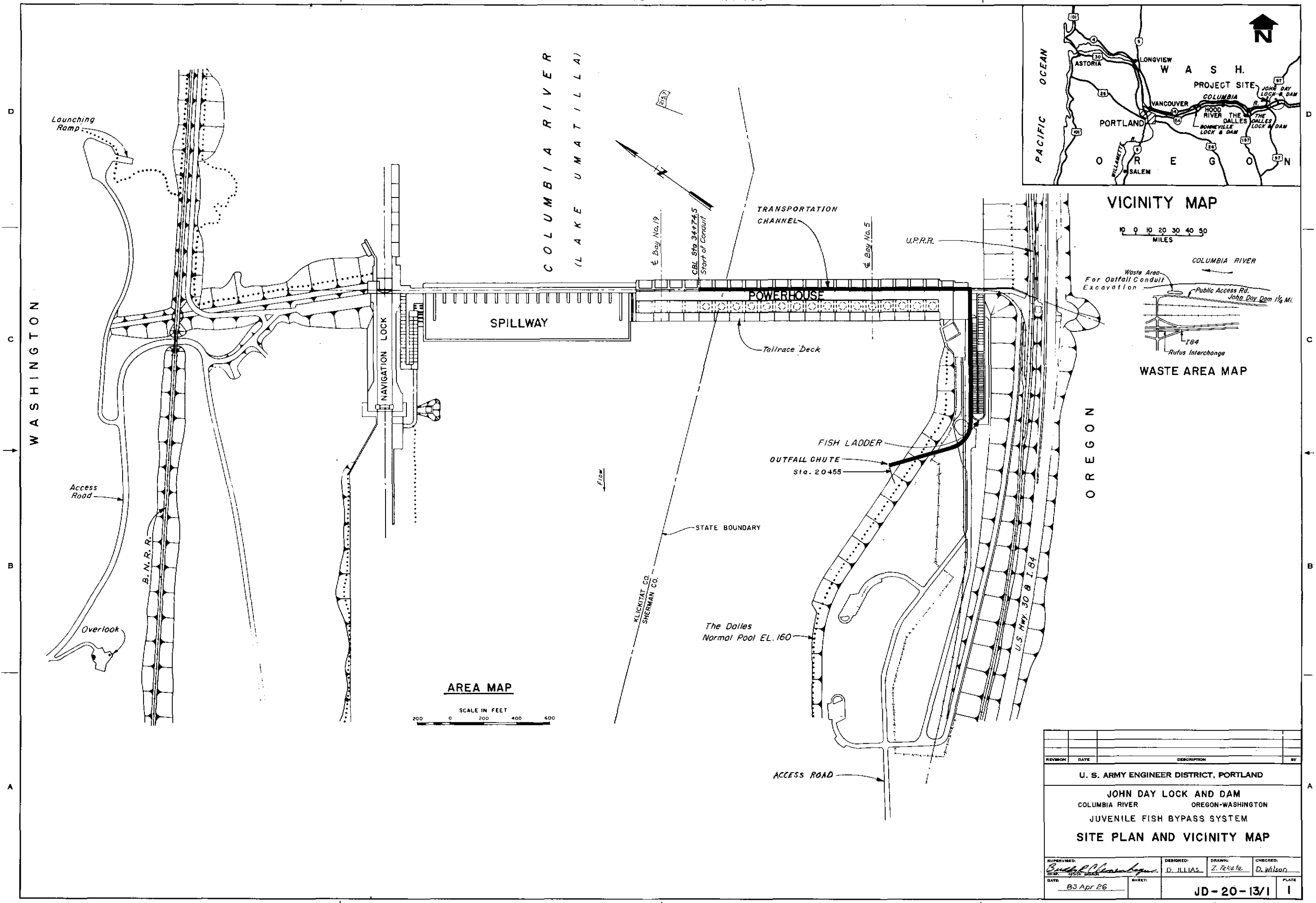
Pertinent Data

ITEM	UNIT	QUANTITY	UNIT PRICE	AMOUNT	REMARKS
TRANSPORTATION CONDUIT					
EXCAVATED CONCRETE	CY	7,549	859	\$6,485,000	
CONCRETE LINING	CY	1,750	530	928,000	
REINFORCING STEEL	LB	207,000	0.53	110,000	
DRILL AND GROUT FOR REINFORCING					
STEEL	LF	20,864	50.00	1,043,000	
6-INCH WATERSTOP	LF	800	5.00	4,000	
SLOT CAISSONS	EA	6	7,000	42,000	
PROTECTIVE CAGE	EA	1	1,000	1,000	
ELECTRICAL WORK	JOB	1	L.S.	240,000	
MECHANICAL WORK	JOB	1	L.S.	750,000	
SUBTOTAL				9,603,000	
OUTFALL					
EXCAVATION AND BACKFILL	JOB	1	L.S.	185,000	
EXCAVATED CONCRETE	CY	79	859	68,000	
CONCRETE LINING	CY	17	530	9,000	
CONCRETE, STRUCTURAL	CY	3,691	297	1,096,000	
2'X2' SLUICE GATE W/OPERATOR	EA	1	19,000	19,000	
TRASHRACK AND GUIDE	EA	1	3,000	3,000	
SUPPORT FRAMES @ MONOLITH #14	EA	4	24,000	96,000	
5X9 TAINTER VALVE	EA	1	12,000	12,000	
TAINTER VALVE OPERATING MACHINERY	JOB	1	L.S.	48,000	
POST-TENSIONING	JOB	1	L.S.	16,000	
SUPPORT FRAMES @ OUTFALL	EA	5	36,000	180,000	
UTILITIES RELOCATION	JOB	1	L.S.	48,000	
LANDSCAPING	JOB	1	L.S.	37,000	
EVALUATION FACILITY	JOB	1	L.S.	305,000	
SUBTOTAL				2,122,000	

SECTION 12

RECOMMENDATION

12.01 Recommendation. We recommended that the proposed Transportation Conduit and Outfall for the Juvenile Bypass System at John Day be approved.



AREA MAP

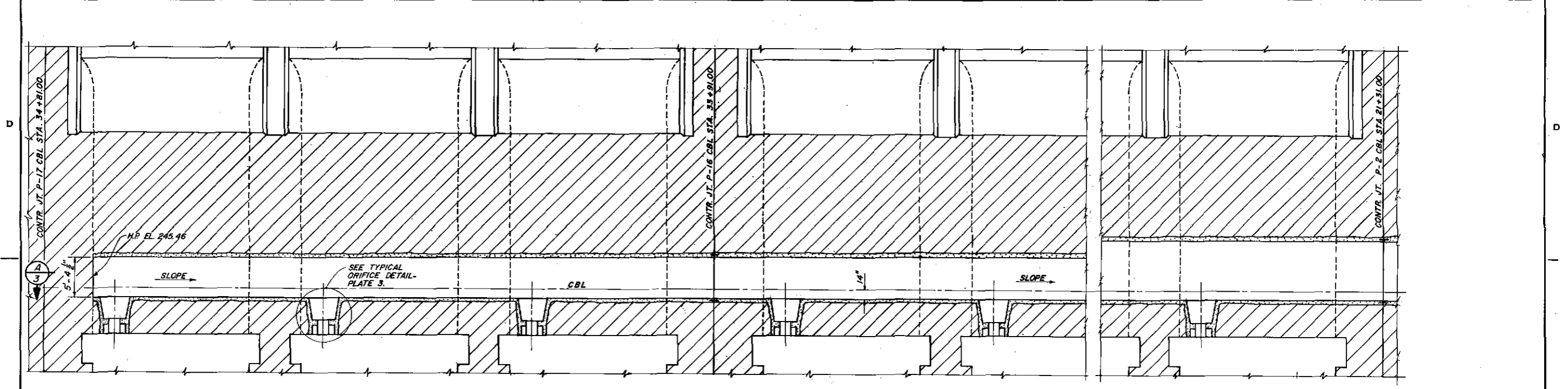
SCALE IN FEET
200 0 200 400 600

VICINITY MAP

0 10 20 30 40 50
MILES

WASTE AREA MAP

REVISION	DATE	DESCRIPTION	BY
U. S. ARMY ENGINEER DISTRICT, PORTLAND			
JOHN DAY LOCK AND DAM			
COLUMBIA RIVER		OREGON-WASHINGTON	
JUVENILE FISH BYPASS SYSTEM			
SITE PLAN AND VICINITY MAP			
SUPERVISED: <i>[Signature]</i>	DESIGNED: D. ILLIAS	DRAWN: Z. Fekete	CHECKED: D. Wilson
DATE: 83 Apr 26	SHEET:	PLATE	
		JD-20-13/1	

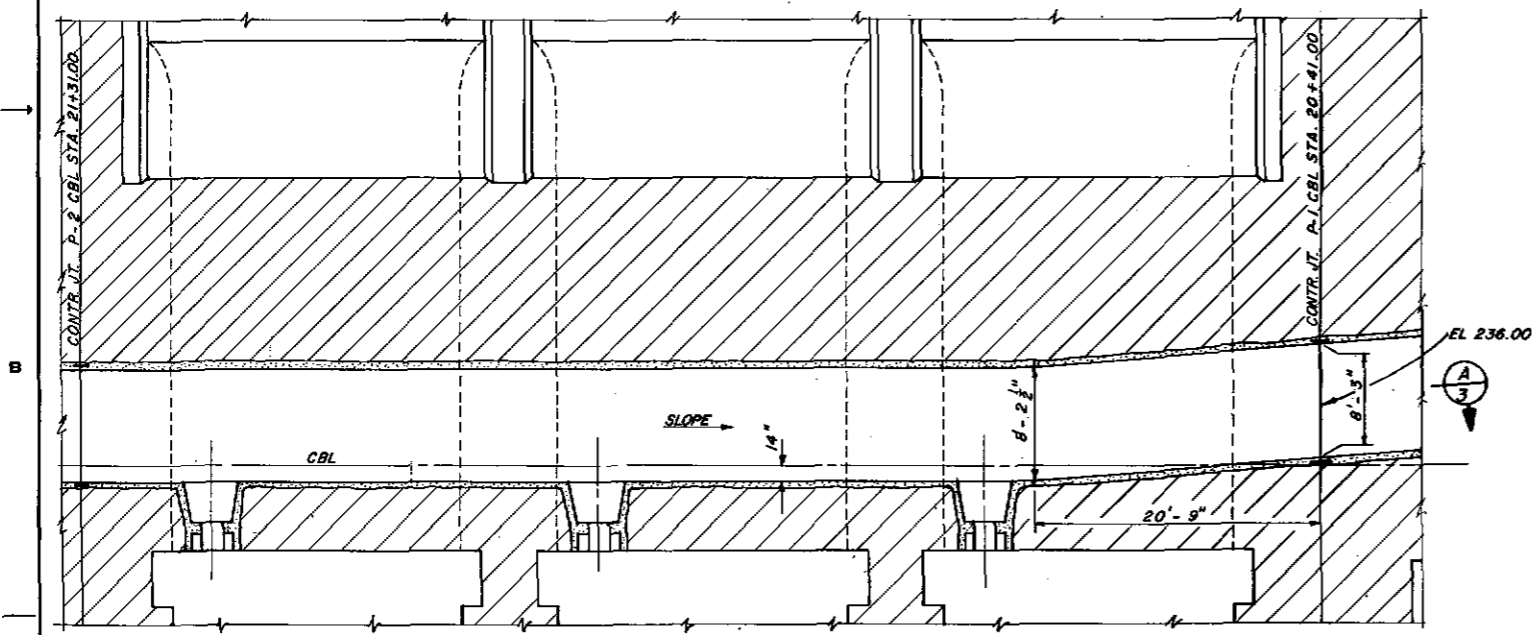


BAY 16

PLAN-EL 250.50
SCALE: 3/8" = 1' - 0"

BAY 15


BAY 2




BAY 1

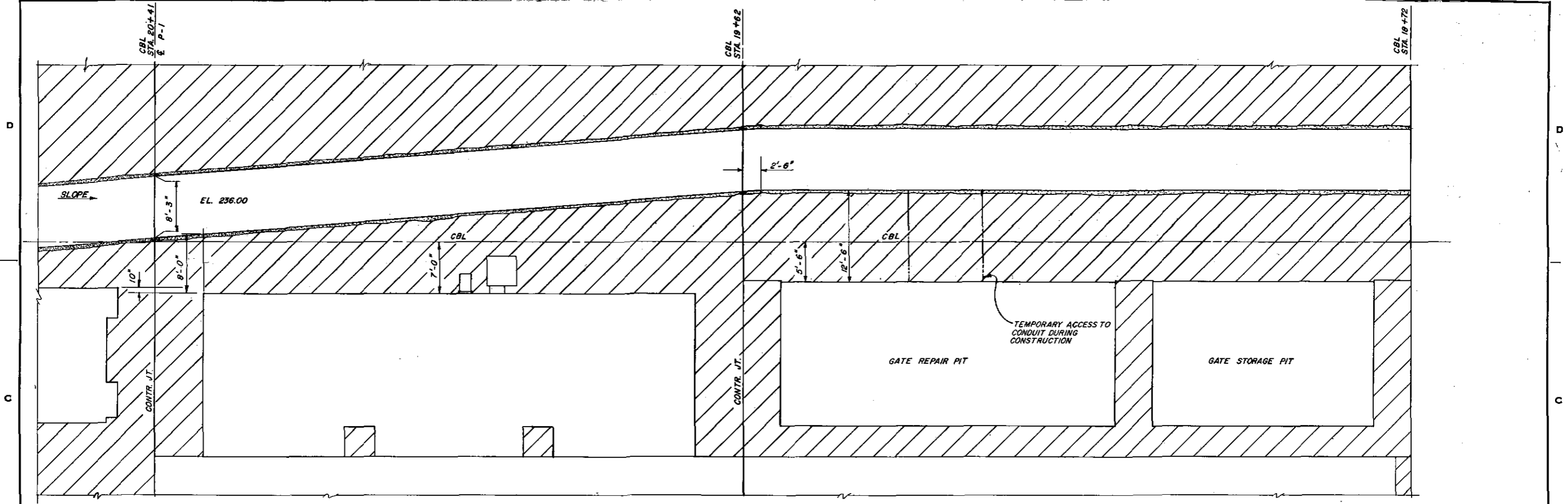
PLAN - EL 250.50
SCALE: 3/8" = 1' - 0"

LEGEND

 EXISTING CONCRETE

 NEW CONCRETE

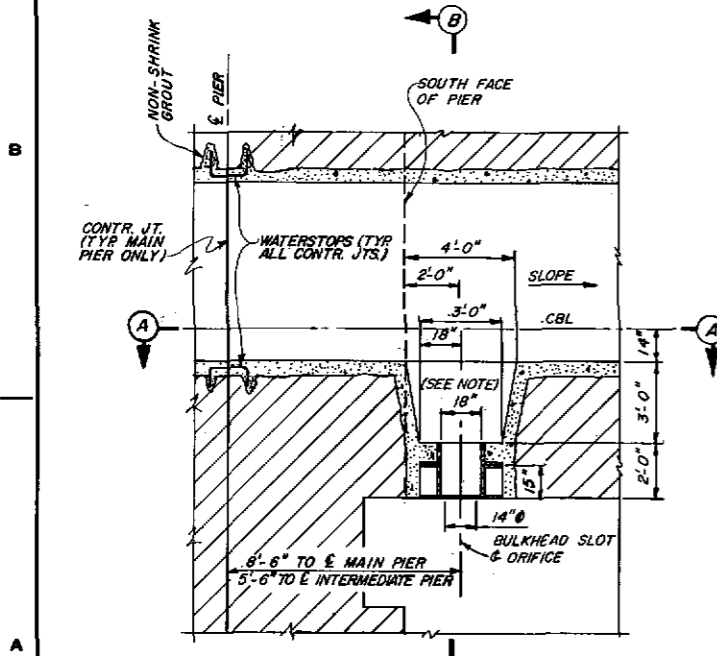
REVISION	DATE	DESCRIPTION	BY	
U. S. ARMY ENGINEER DIVISION, N. P. PORTLAND, OREGON				
DESIGNED BY <u>D.T.M.</u>	JOHN DAY LOCK AND DAM COLUMBIA RIVER, WASHINGTON AND OREGON JUVENILE FISH BYPASS SYSTEM TRANSPORTATION CONDUIT SHEET 1			
DRAWN BY <u>S.H.</u>				
CHECKED BY <u>D.C.R.</u>				
PREPARED BY <u>[Signature]</u>				
SUBMITTED BY <u>R. Melton</u>		APPROVED FOR DIV. ENGINEER DATE <u>1983 APR 15</u>	SCALE AS SHOWN	
		SHEET JD-20-13/2		



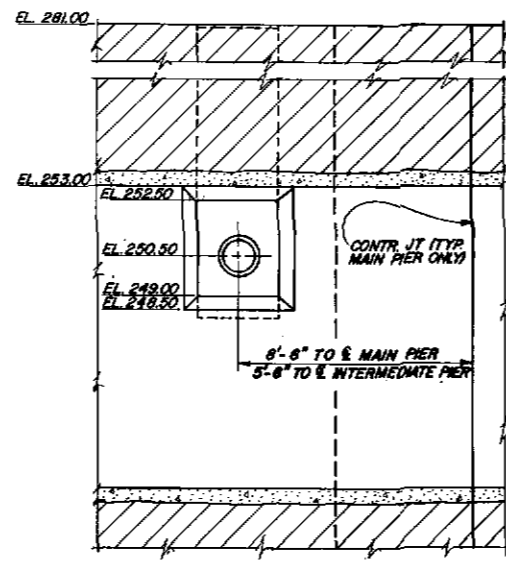
STATION SERVICE BAY

ASSEMBLY BAY

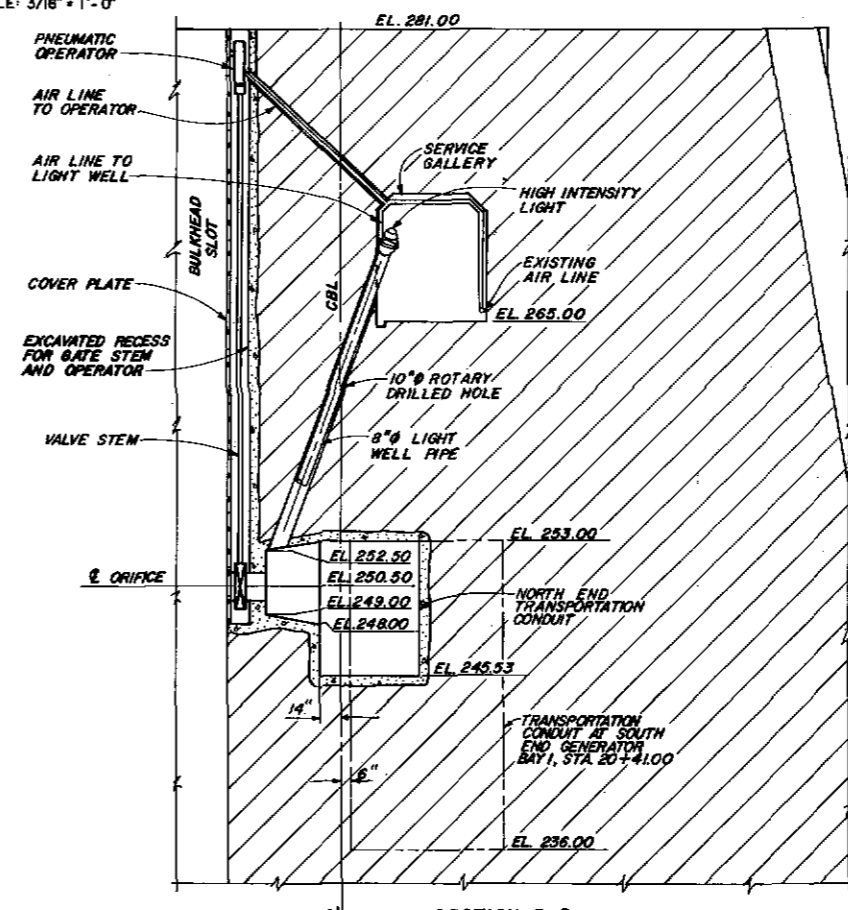
PLAN - EL. 250.50
SCALE: 3/16" = 1'-0"



TYPICAL ORIFICE DETAIL
PLAN EL. 250.50
SCALE: 3/8" = 1'-0"



SECTION A-A
SCALE: 3/8" = 1'-0"

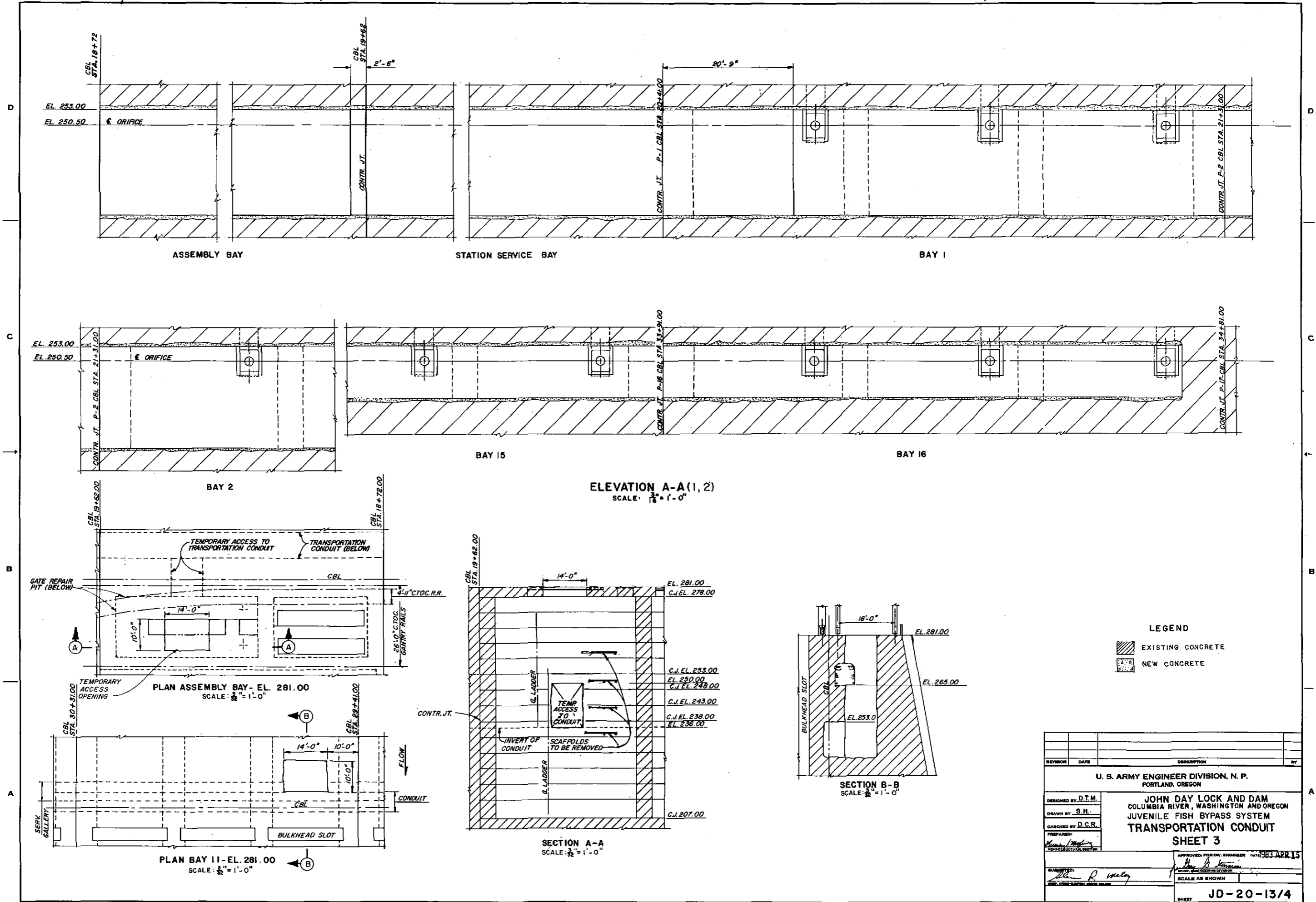


SECTION B-B
SCALE: 1/4" = 1'-0"

- LEGEND
- EXISTING CONCRETE
 - NEW CONCRETE

- NOTES.
1. THE 18" Ø ORIFICE TUBE MAY ENLARGE SUBJECT TO HYDRAULIC MODEL STUDIES.

REVISION	DATE	DESCRIPTION	BY
U. S. ARMY ENGINEER DIVISION, N. P. PORTLAND, OREGON			
JOHN DAY LOCK AND DAM COLUMBIA RIVER, WASHINGTON AND OREGON JUVENILE FISH BYPASS SYSTEM TRANSPORTATION CONDUIT SHEET 2			
DESIGNED BY	D.T.M.		
DRAWN BY	S.H.		
CHECKED BY	D.C.R.		
PREPARED BY			
APPROVED FOR BY	ENGINEER	DATE	1983 APR 15
SCALE	AS SHOWN		
JD-20-13/3			



LEGEND

EXISTING CONCRETE

NEW CONCRETE

REVISION	DATE	DESCRIPTION	BY

**U. S. ARMY ENGINEER DIVISION, N. P.
PORTLAND, OREGON**

**JOHN DAY LOCK AND DAM
COLUMBIA RIVER, WASHINGTON AND OREGON
JUVENILE FISH BYPASS SYSTEM
TRANSPORTATION CONDUIT
SHEET 3**

DESIGNED BY D.T.M.
DRAWN BY S.H.
CHECKED BY D.C.R.
PREPARED BY: *[Signature]*

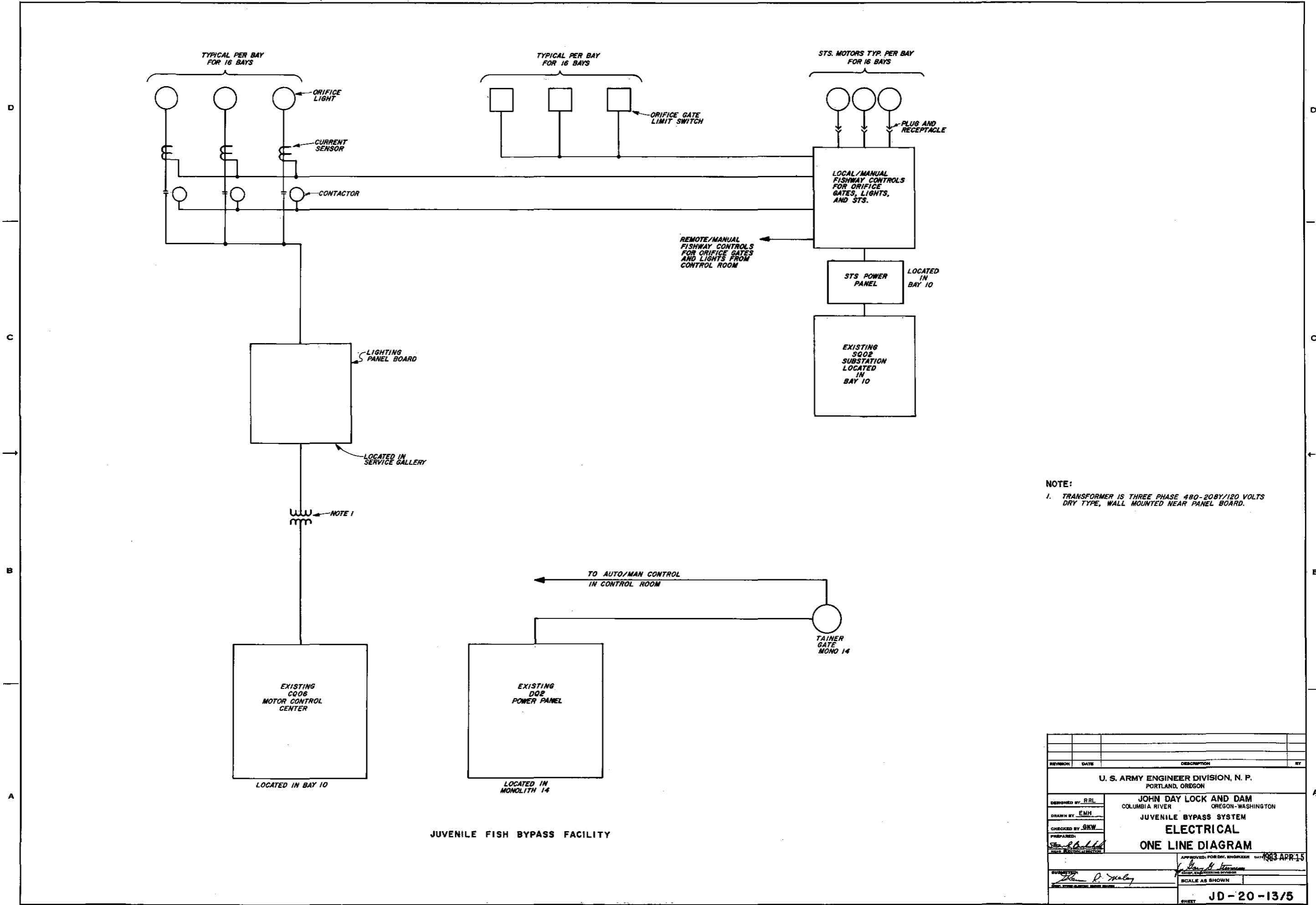
APPROVED FOR DIV. ENGINEER: *[Signature]* DATE: 083 APR 15

SUBMITTED BY: *[Signature]*

SCALE AS SHOWN

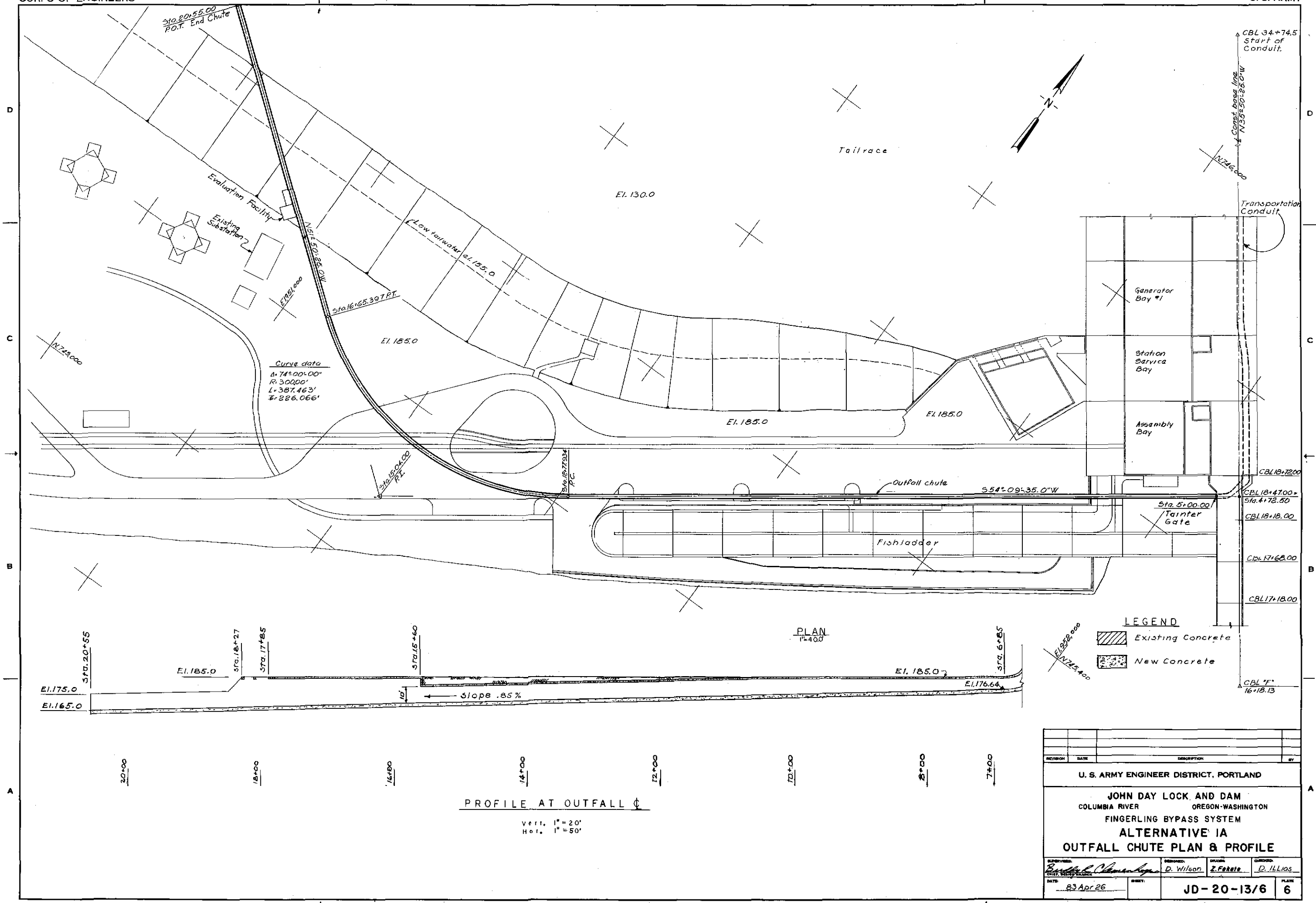
JD-20-13/4

SHEET



NOTE:
 1. TRANSFORMER IS THREE PHASE 480-208Y/120 VOLTS DRY TYPE, WALL MOUNTED NEAR PANEL BOARD.

REVISION	DATE	DESCRIPTION	BY
U. S. ARMY ENGINEER DIVISION, N. P. PORTLAND, OREGON			
DESIGNED BY	RRL	JOHN DAY LOCK AND DAM COLUMBIA RIVER OREGON-WASHINGTON	
DRAWN BY	EMH	JUVENILE BYPASS SYSTEM	
CHECKED BY	SKW	ELECTRICAL	
PREPARED BY		ONE LINE DIAGRAM	
APPROVED FOR DIV. ENGINEER		DATE	1983 APR 15
SUBMITTED BY		SCALE AS SHOWN	
P. Maloy		JD-20-13/5	
SHEET		PLATE 5	



Curve data
 $\Delta = 74^{\circ}00'00''$
 $R = 30000'$
 $L = 387.463'$
 $E = 226.066'$

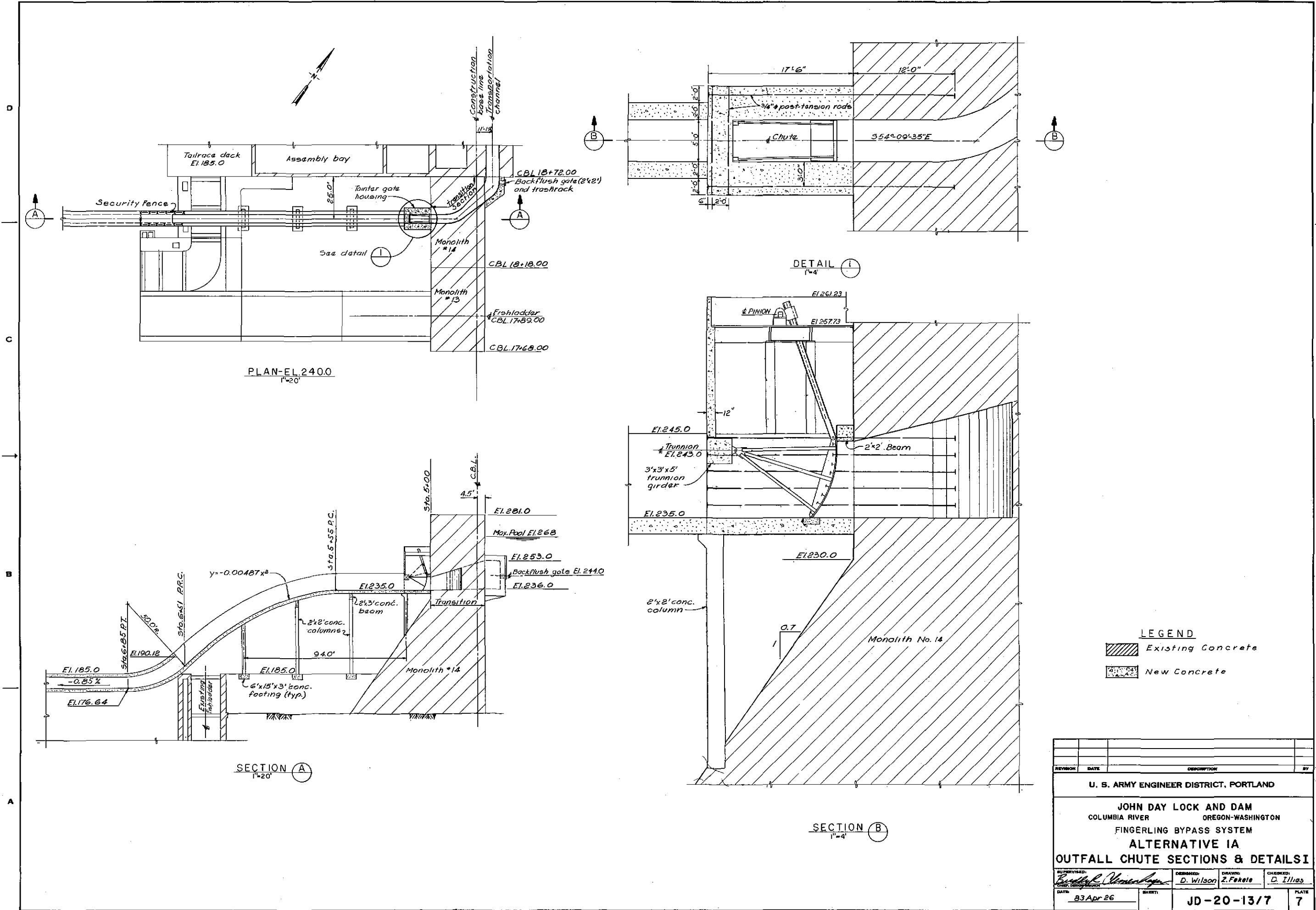
PLAN
 1" = 40.0'

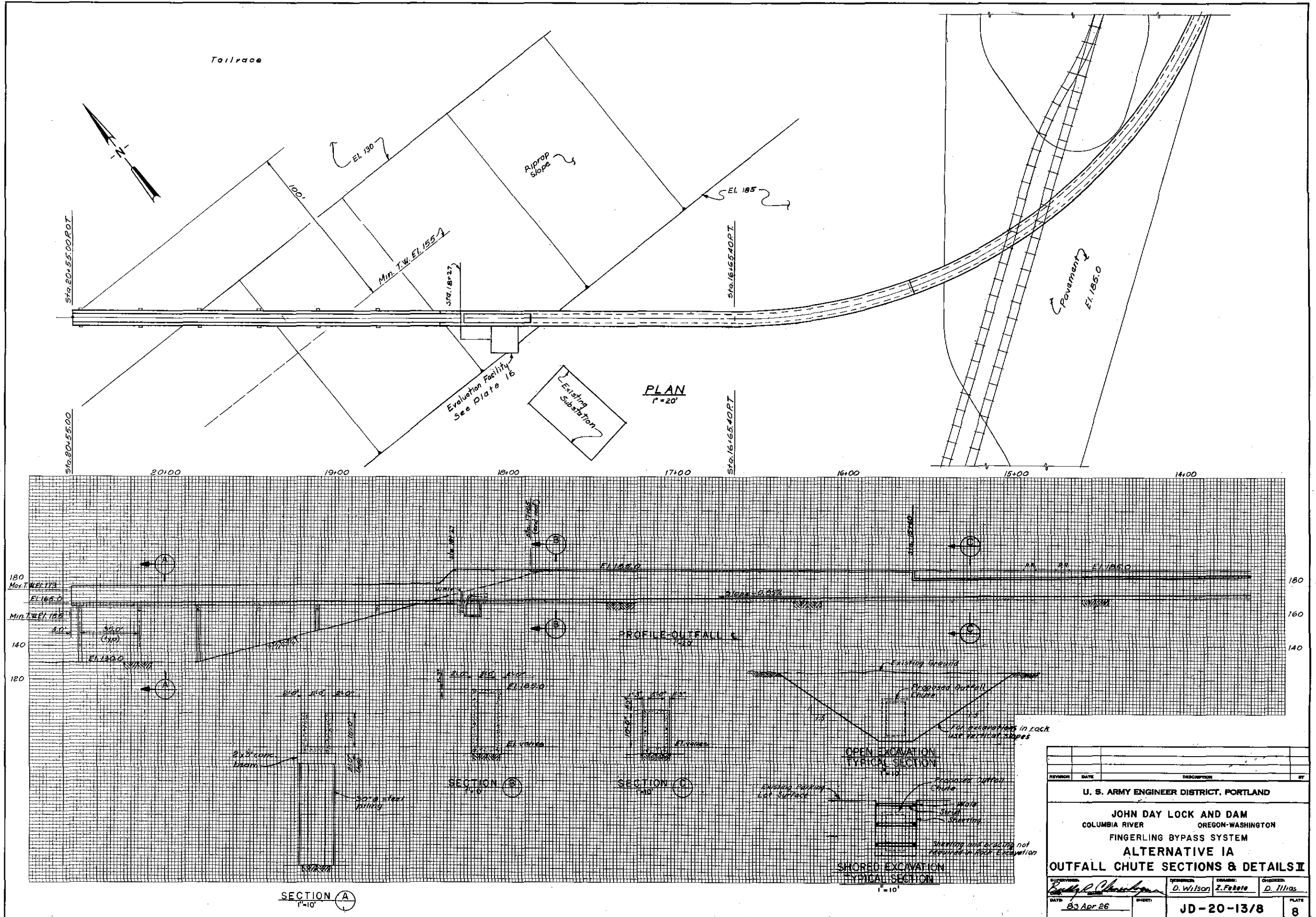
PROFILE AT OUTFALL

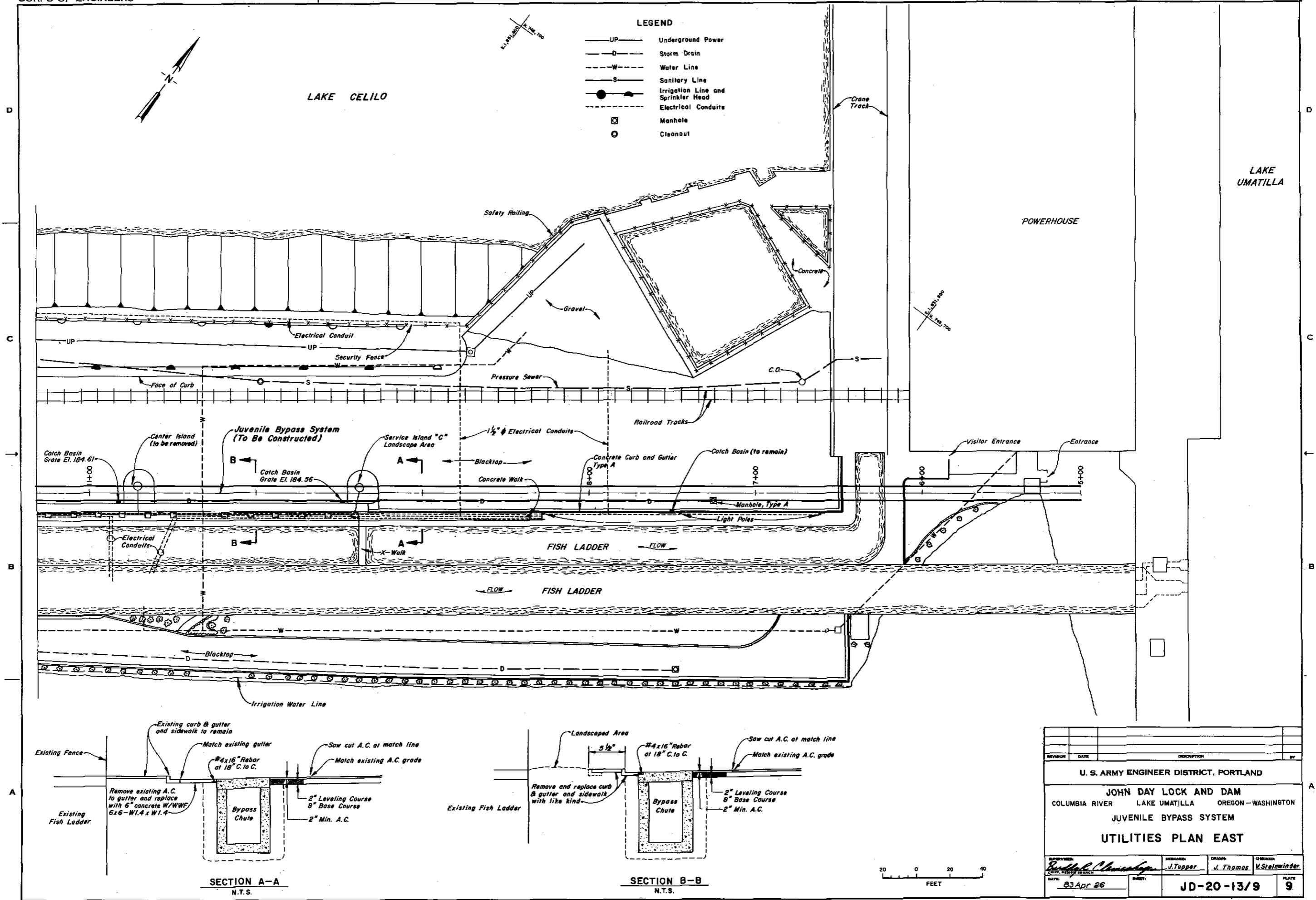
Vert. 1" = 20'
 Hor. 1" = 50'

LEGEND
 Existing Concrete
 New Concrete

REVISION	DATE	DESCRIPTION	BY
U. S. ARMY ENGINEER DISTRICT, PORTLAND			
JOHN DAY LOCK AND DAM			
COLUMBIA RIVER		OREGON-WASHINGTON	
FINGERLING BYPASS SYSTEM			
ALTERNATIVE IA			
OUTFALL CHUTE PLAN & PROFILE			
DESIGNED BY <i>Burke</i>	DESIGNED BY D. Wilson	DRAWN BY Z. Fehle	CHECKED BY D. ILLIAS
DATE 83 Apr 26	PROJECT JD-20-13/6	PLATE 6	



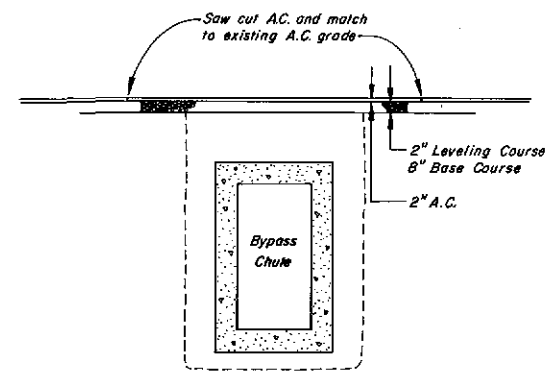
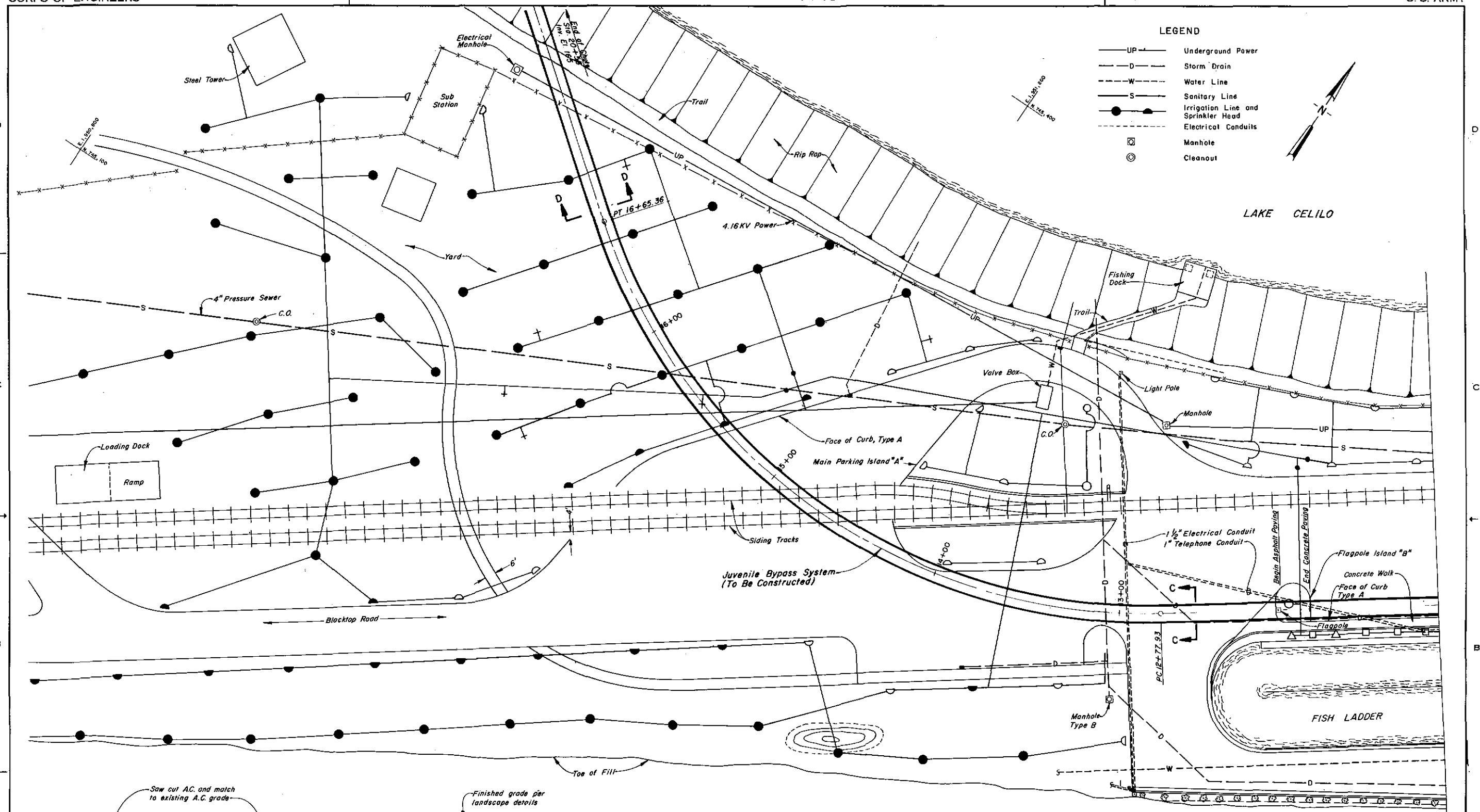
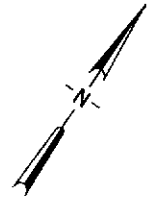




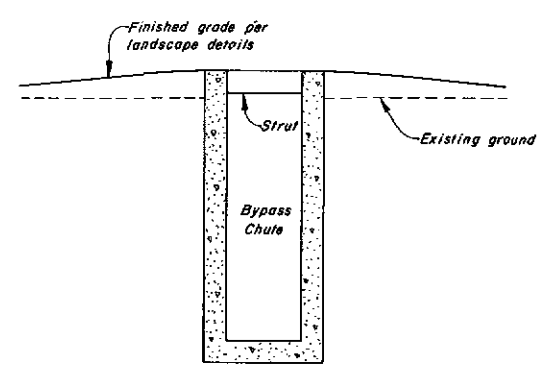
REVISION	DATE	DESCRIPTION	BY
U. S. ARMY ENGINEER DISTRICT, PORTLAND			
JOHN DAY LOCK AND DAM			
COLUMBIA RIVER		LAKE UMATILLA	OREGON - WASHINGTON
JUVENILE BYPASS SYSTEM			
UTILITIES PLAN EAST			
DESIGNED BY <i>Rudolph C. ...</i>	DRAWN BY J. Tupper	CHECKED BY J. Thomas	APPROVED BY V. Steinwinder
DATE 83 Apr 26	PLATE JD-20-13/9	PAGE 9	

LEGEND

- UP— Underground Power
- - - D - - - Storm Drain
- - - W - - - Water Line
- - - S - - - Sanitary Line
- Irrigation Line and Sprinkler Head
- - - Electrical Conduits
- ⊠ Manhole
- ⊙ Cleanout

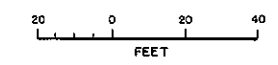


SECTION C-C
N.T.S.

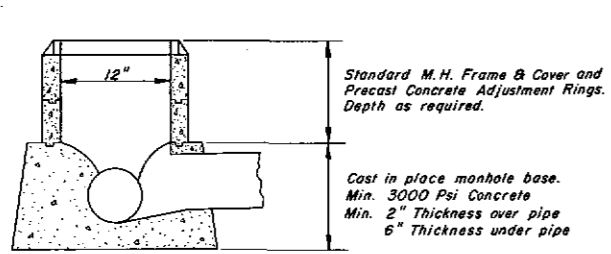


SECTION D-D
N.T.S.

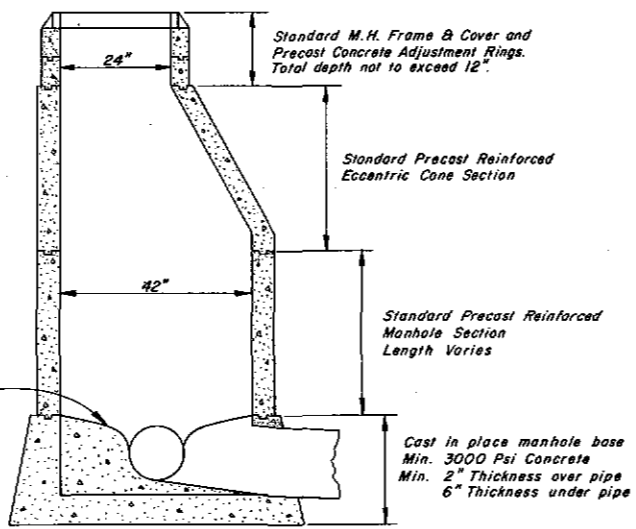
NOTES:
1. Top of chute of Juvenile Bypass System to be skylighted from Sta. 16+65.36 PT to its discharge end at Sta. 20+55.



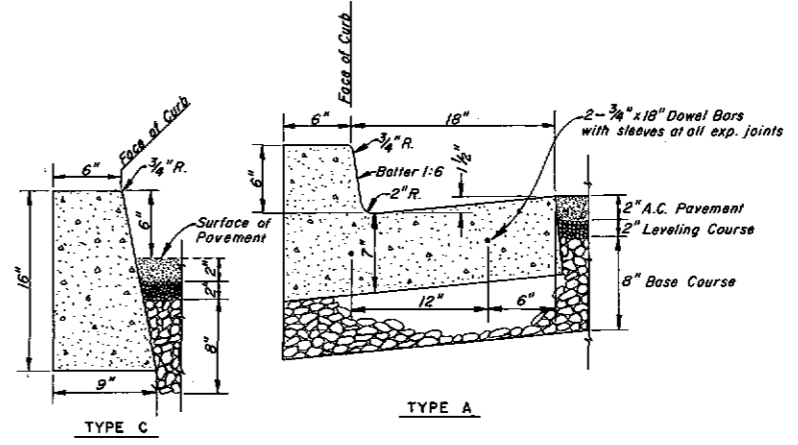
REVISION	DATE	DESCRIPTION	BY
U. S. ARMY ENGINEER DISTRICT, PORTLAND			
JOHN DAY LOCK AND DAM			
COLUMBIA RIVER LAKE UMATILLA OREGON - WASHINGTON			
JUVENILE BYPASS SYSTEM			
UTILITIES PLAN WEST			
APPROVED: <i>Buddy R. Henderson</i>	DESIGNED: J. Tupper	DRAWN: J. Thomas	CHECKED: V. Steinwinder
DATE: 83 Apr 26	SHEET: 10	PROJECT: JD-20-13/10	



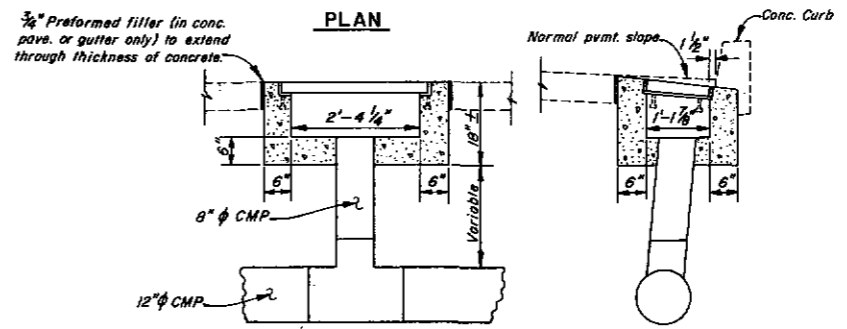
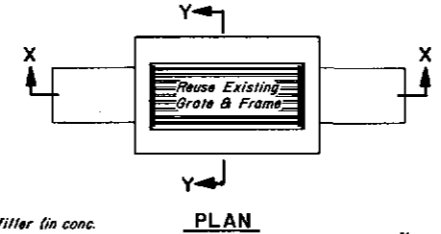
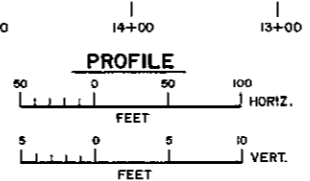
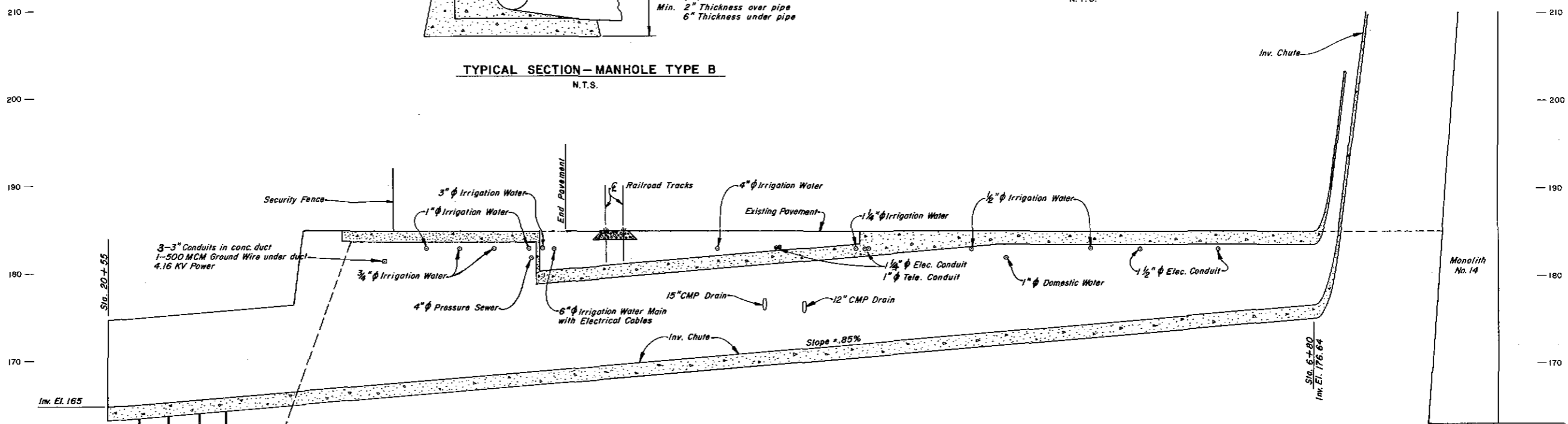
TYPICAL SECTION—MANHOLE TYPE A
N.T.S.



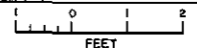
TYPICAL SECTION—MANHOLE TYPE B
N.T.S.



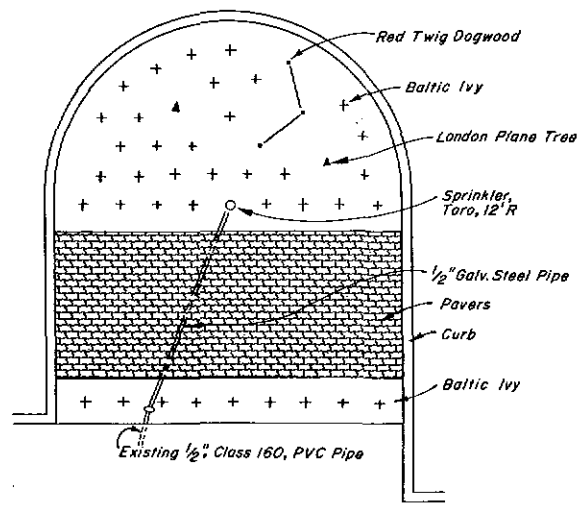
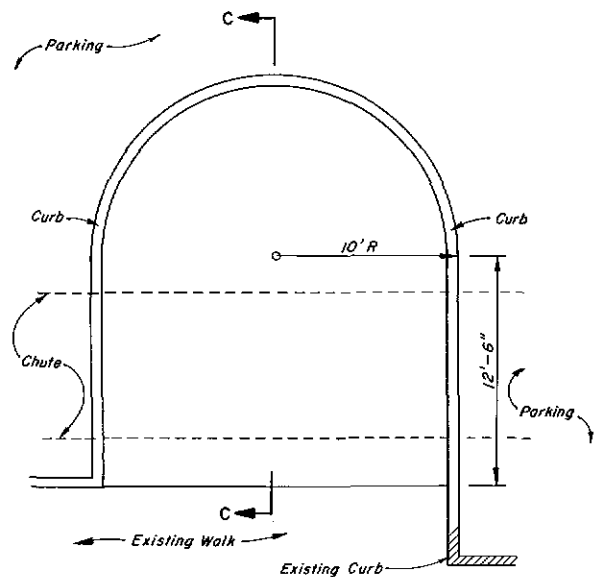
CURB & CURB AND GUTTER DETAIL
N.T.S.



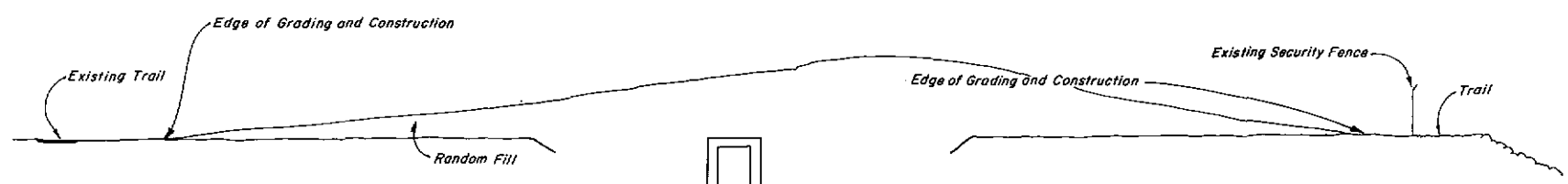
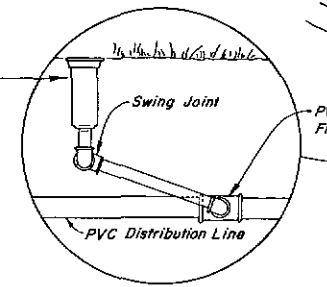
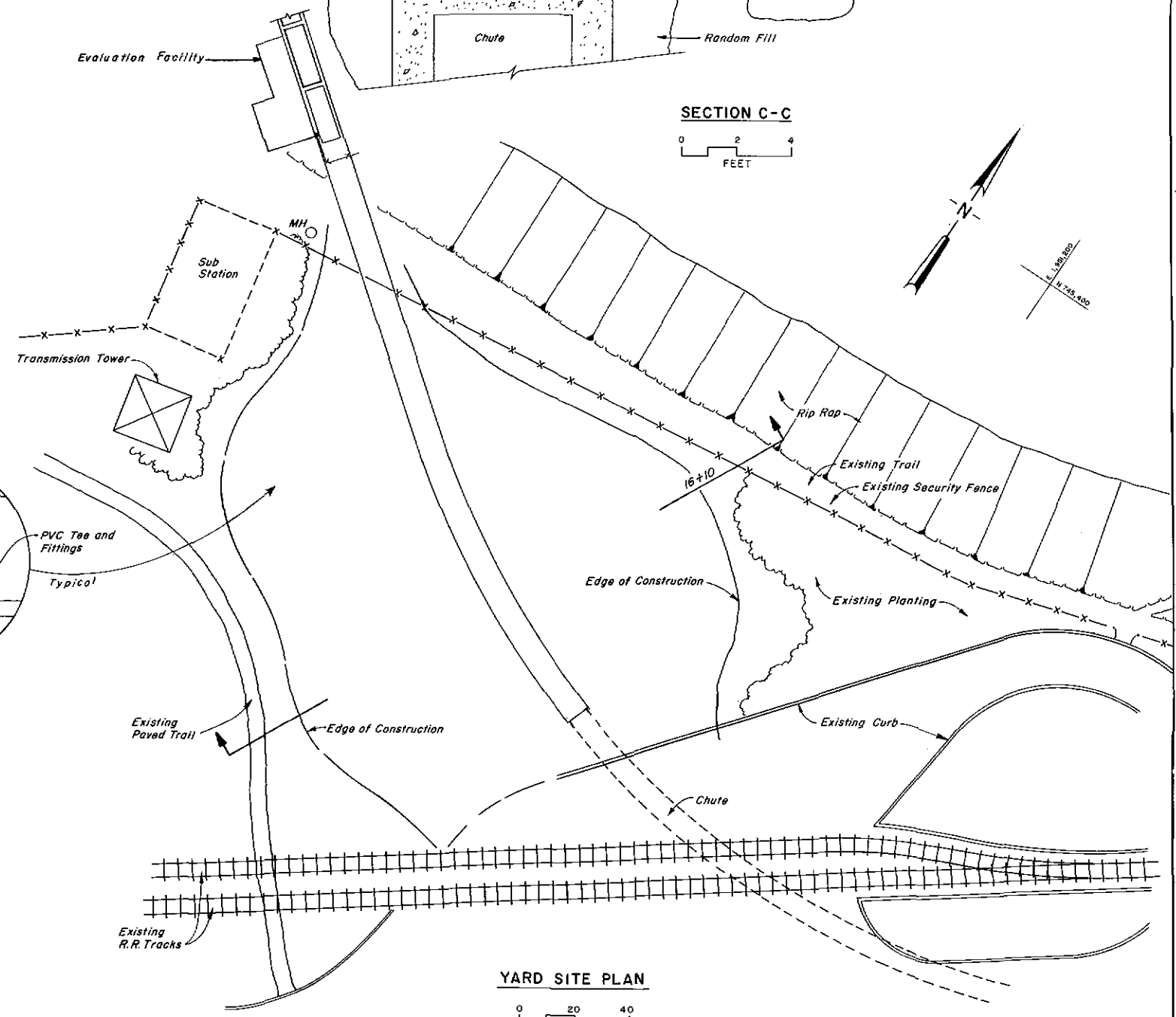
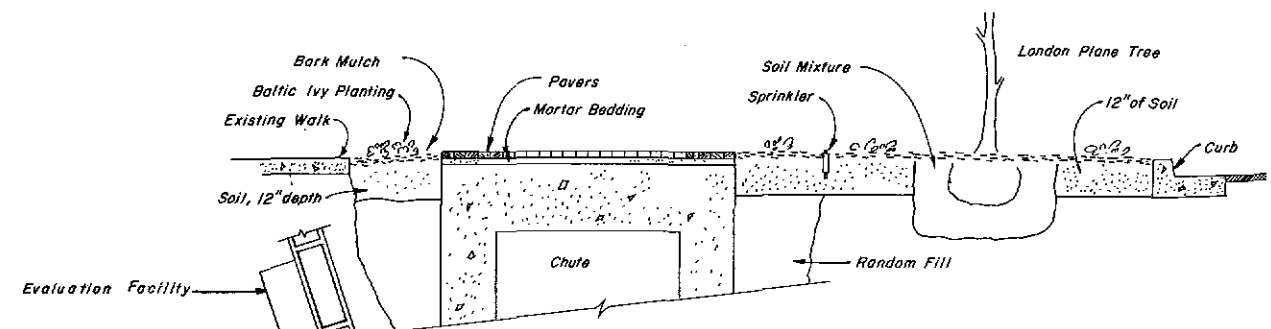
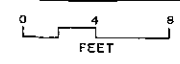
SECTION X-X SECTION Y-Y
TYPICAL CATCH BASIN DETAIL



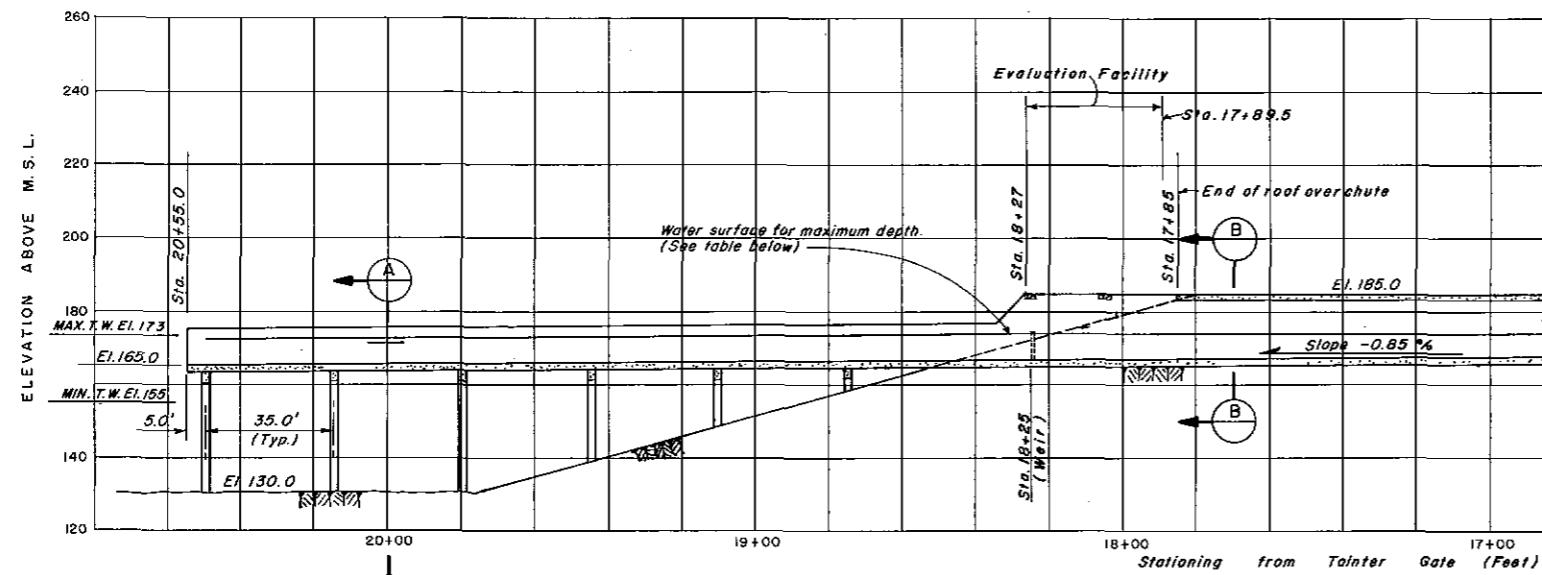
REVISION	DATE	DESCRIPTION	BY
U. S. ARMY ENGINEER DISTRICT, PORTLAND			
JOHN DAY LOCK AND DAM COLUMBIA RIVER LAKE UMATILLA OREGON-WASHINGTON JUVENILE BYPASS SYSTEM			
UTILITY PROFILE & DETAILS			
SUPERVISED: CHIEF, DESIGN BRANCH	DESIGNED: J. Tupper	DRAWN: J. Thomas	CHECKED: V. Steinwinder
DATE: 83 Apr 26	SHEET:	JD-20-13/11	PLATE: 11



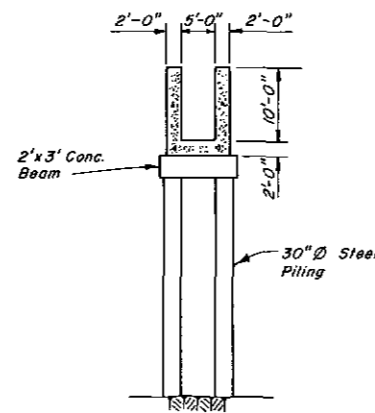
SERVICE AREA ISLAND PLANS



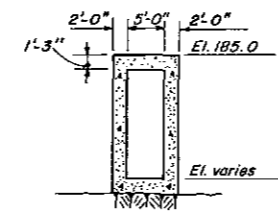
REVISION	DATE	DESCRIPTION	BY
U. S. ARMY ENGINEER DISTRICT, PORTLAND			
JOHN DAY LOCK AND DAM			
COLUMBIA RIVER LAKE UMATILLA OREGON - WASHINGTON			
JUVENILE FISH BYPASS SYSTEM			
DETAIL LANDSCAPE PLANS			
DESIGNED BY <i>Bradley R. Cloninger</i>	CHECKED BY <i>M. Clark</i>	DESIGNED BY <i>A. Steinwinder</i>	CHECKED BY <i>S. Fredeen</i>
DATE 83 Apr 26	SHEET 12	PLATE JD-20-13/12	PLATE 12



PROFILE - CHUTE C
1" = 20'



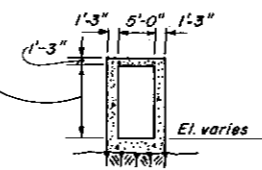
SECTION A
1" = 10'



SECTION B
1" = 10'

Sta. 15+60 to 17+85

NOTE - This dimension varies from Sta. 6+85 to Sta. 10+25 and is 10'-0" from Sta. 10+25 to Sta. 15+60.



SECTION C
1" = 10'

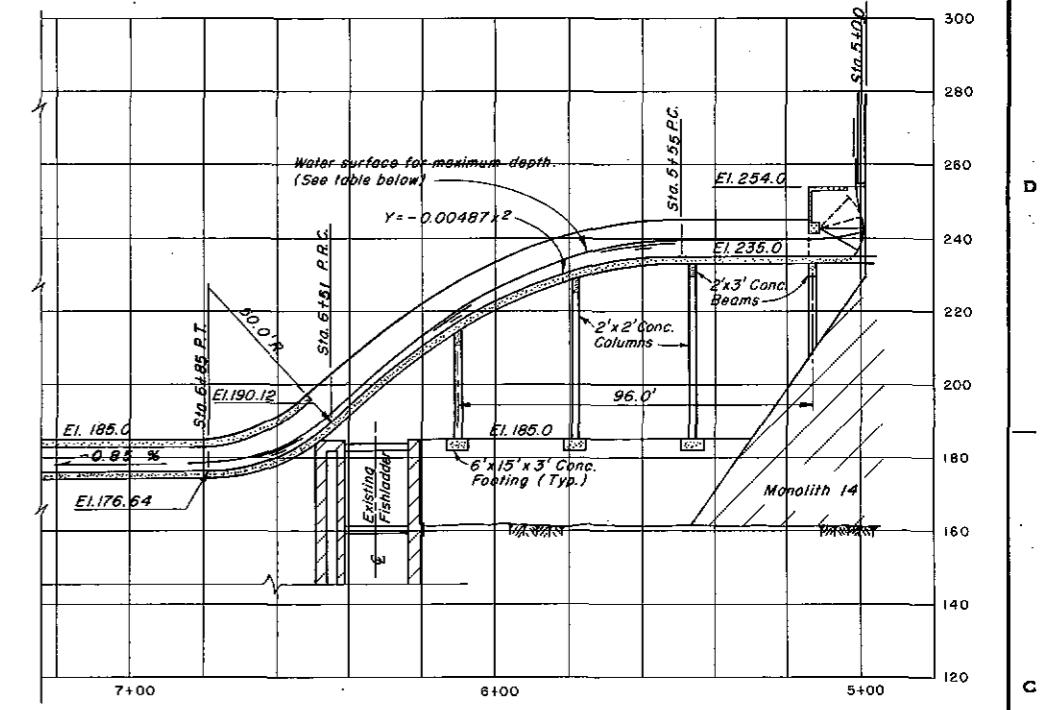
Sta. 6+85 to 15+60

LEGEND

PROFILE NUMBER	FOREBAY ELEVATION	UNIT OPERATIONS	TOTAL DISCHARGE	
1	268	4/4	103	
2	257	4/4	103	
3	REPEATS FOR ALL PROFILES	8/8	205	
4		8/8	205	
5		8/4	224	
6		8/4	224	
7		12/12	315	
8		12/12	315	
9		12/4	356	
10		12/4	356	
11		16/16	438	
12		16/16	440	
13		16/4	500	
14		16/4	502	
15		20/20	600	
16		20/20	604	
17		268	20/4	695
18		257	20/4	712 (PLOTTED)

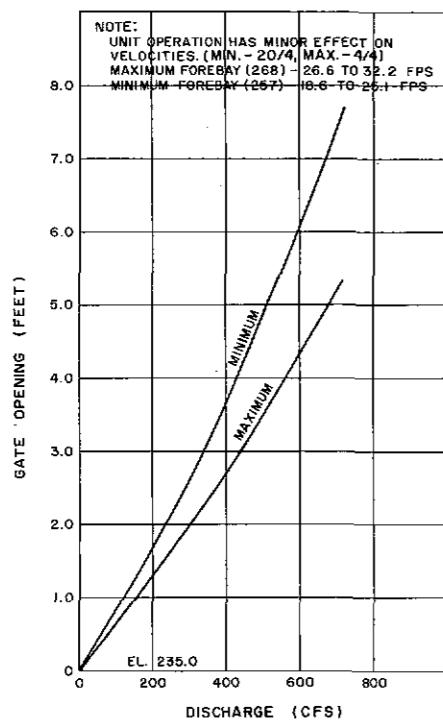
NOTES:

- Unit operations are available versus units generating (Example: 16/4).
- Water surface profiles are for extreme forebay elevation (257, 268) in relation to unit operations.
- Rating curves indicating depths and velocity for profiles are on Plate 14.
- Discharges from powerhouse are controlled with a 5.0 x 9.0 foot tainter gate in monolith #4.
- No air entrainment included.
- Alignment is on Plate 6.
- Mannings n = 0.011.
- Dimensions are in feet.
- All elevations are feet above mean sea level.
- No evaluation facility in operation.
- Profiles with facility operating are on figure 3.

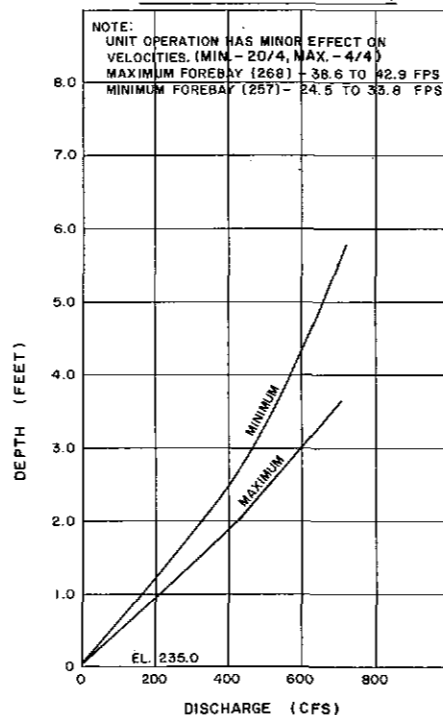


REVISION	DATE	DESCRIPTION	BY
U. S. ARMY ENGINEER DISTRICT, PORTLAND			
JOHN DAY LOCK AND DAM COLUMBIA RIVER LAKE UMATILLA OREGON-WASHINGTON			
JUVENILE FISH BYPASS SYSTEM			
OUTFALL CHUTE PROFILE			
SUPERVISOR: <i>George D. Allen</i>	DESIGNED: JOL/RLW	DRAWN: A. Steinwinder	CHECKED: J. Hall
DATE: 23 Apr 26	SHEET:	JD-20-13/13	PLATE 13

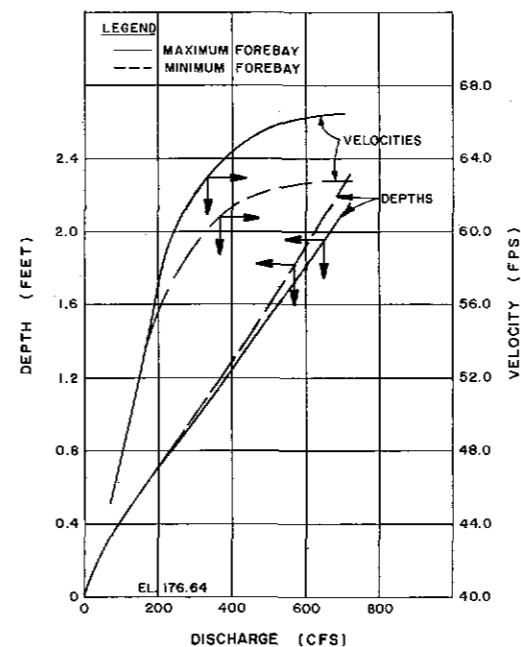
TANTIER GATE (STA. 5+00)



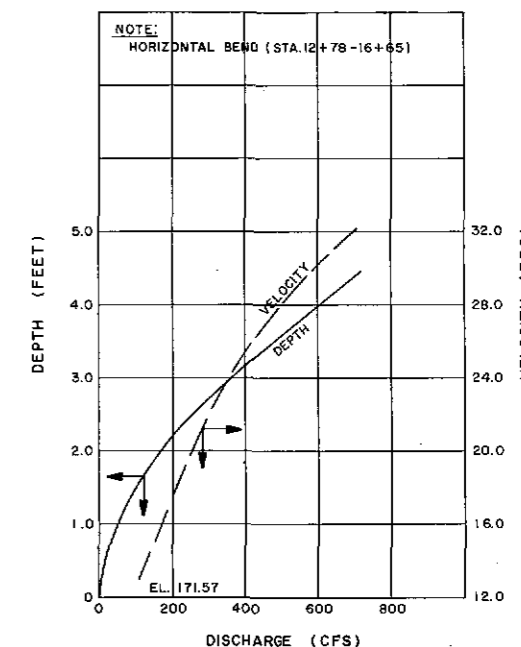
CONTRACTED FLOW (DOWNSTREAM OF GATE)



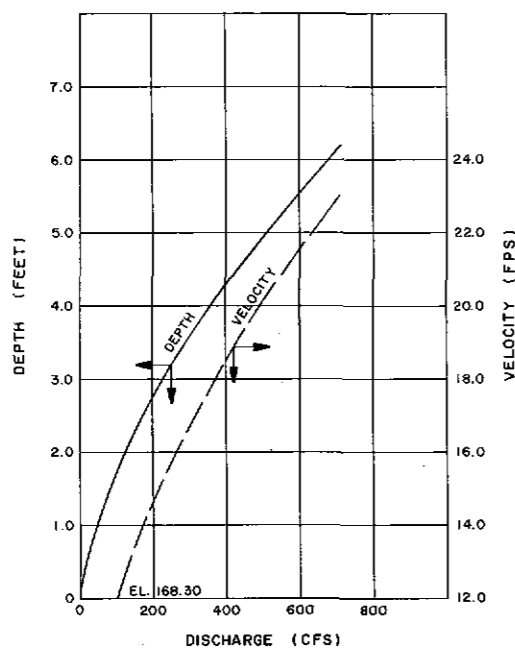
STA. 6+85



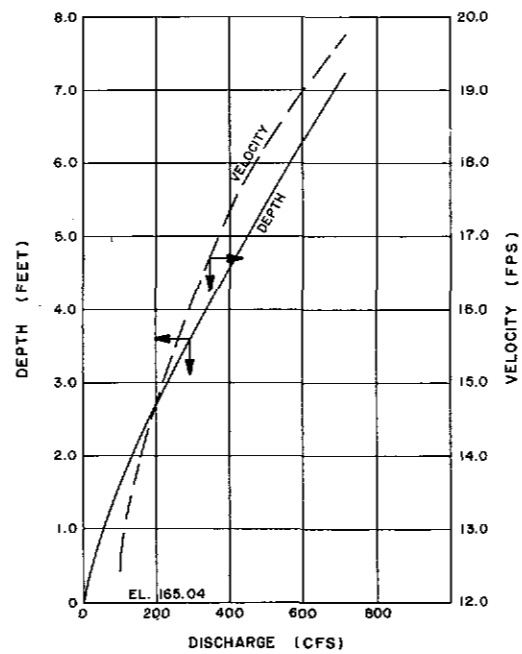
STA. 12+78 (U/S END OF BEND)



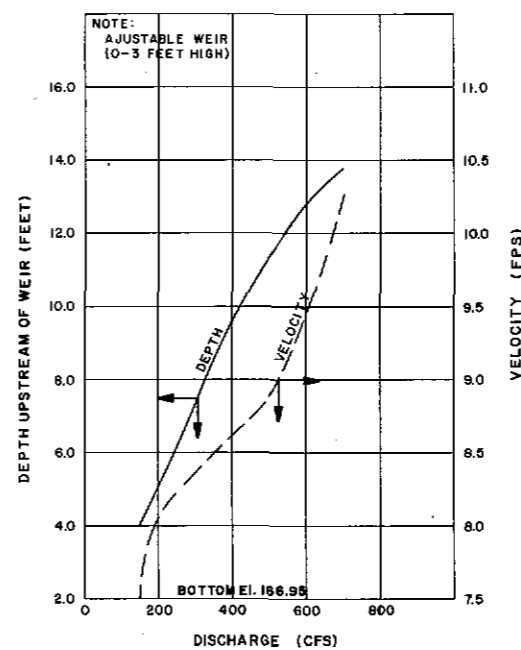
STA. 16+65 (D/S END OF BEND)



STA. 20+49



STA. 18+25 (EVALUATION FACILITY)

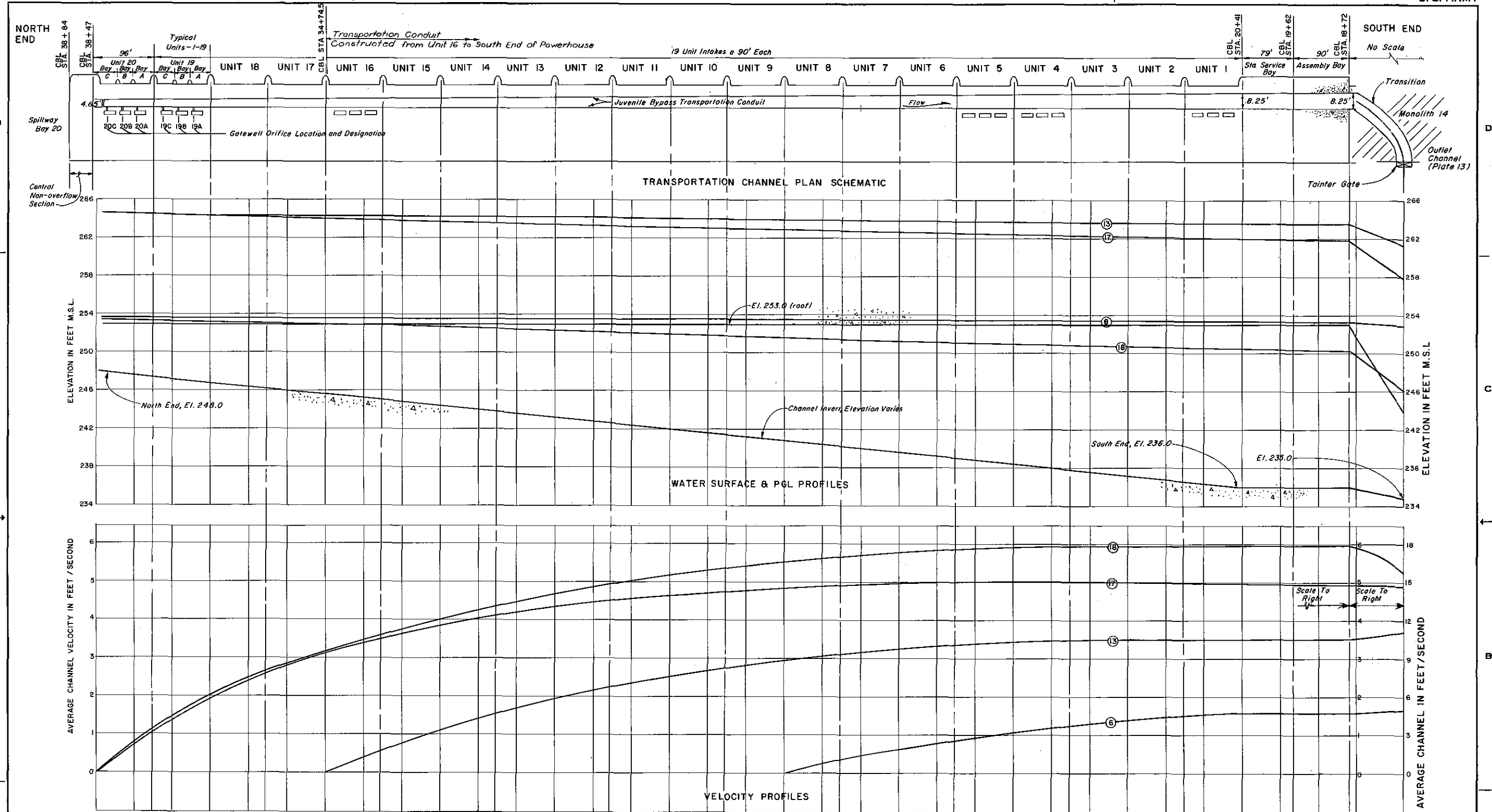


GENERAL NOTES:

1. NO AIR ENTRAINED DEPTH.
2. UNIT OPERATIONS OPTIONS CONSIDERED ARE WITH MINIMUM AND MAXIMUM FOREBAY (257, 268).
3. RATING CURVE LOCATIONS ON PLATE 13.
4. STATION 5+00 = TANTIER GATE (EDGE OF MONOLITH 14).
5. ALL ELEVATIONS ARE FEET ABOVE MEAN SEA LEVEL.

NOTE:
LENGTH FROM CHANNEL BRINK (STA. 20+05)
USING 3.5 TIMES NORMAL DEPTH FOR LOW
FLOW (103 CFS). CURVES FOR REACH FROM
STA. 20+00 - 20+45.

REVISION	DATE	DESCRIPTION	BY
U. S. ARMY ENGINEER DISTRICT, PORTLAND			
JOHN DAY LOCK AND DAM COLUMBIA RIVER LAKE UMATILLA OREGON - WASHINGTON			
JUVENILE FISH BYPASS SYSTEM			
OUTFALL CHUTE RATING CURVES			
DESIGNED BY <i>John D. Johnson</i>	CHECKED BY <i>JDL/RLW</i>	DRAWN BY <i>A. Steinwinder</i>	CHECKED BY <i>J. Hall</i>
DATE 83 Apr 26	SHEET 14	PLATE JD-20-13/14	PLATE 14



LEGEND				LEGEND			
PROFILE NUMBER	FOREBOY ELEVATION	UNIT OPERATIONS	TOTAL DISCHARGE	PROFILE NUMBER	FOREBOY ELEVATION	UNIT OPERATIONS	TOTAL DISCHARGE
①	268	4/4	103	⑩	257	12/4	356
②	257	4/4	103	⑪	268	16/16	438
③	268	8/8	205	⑫	257	16/16	440
④	257	8/8	205	⑬	268	16/4	500
⑤	268	8/4	224	⑭	257	16/4	502
⑥	257	8/4	224	⑮	268	20/20	600
⑦	268	12/12	315	⑯	257	20/20	604
⑧	257	12/12	315	⑰	268	20/4	695
⑨	268	12/4	356	⑱	257	20/4	712

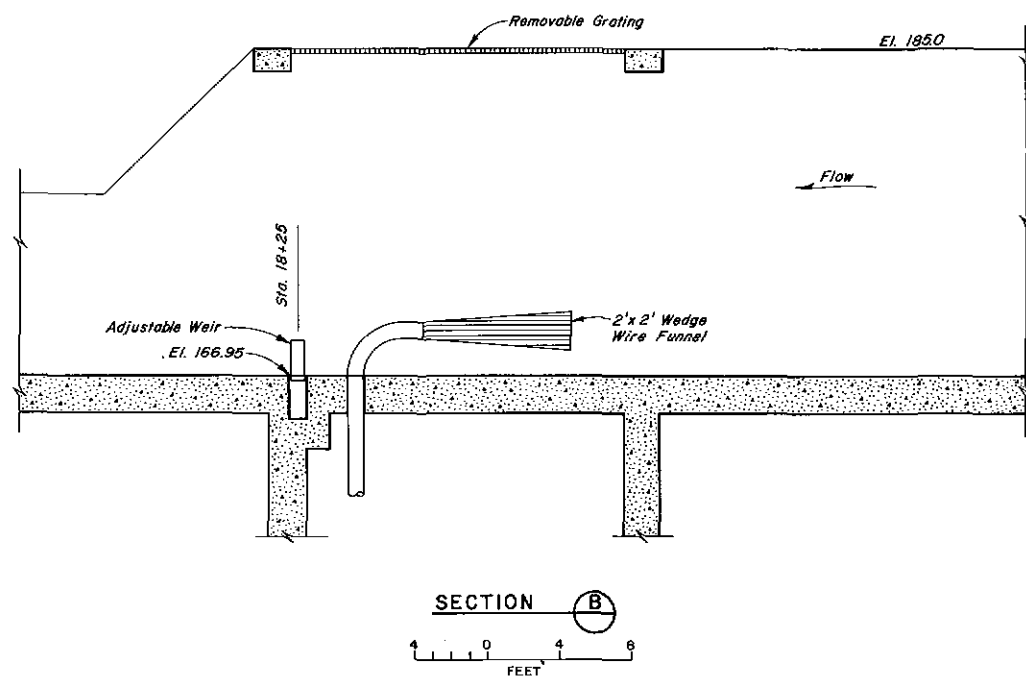
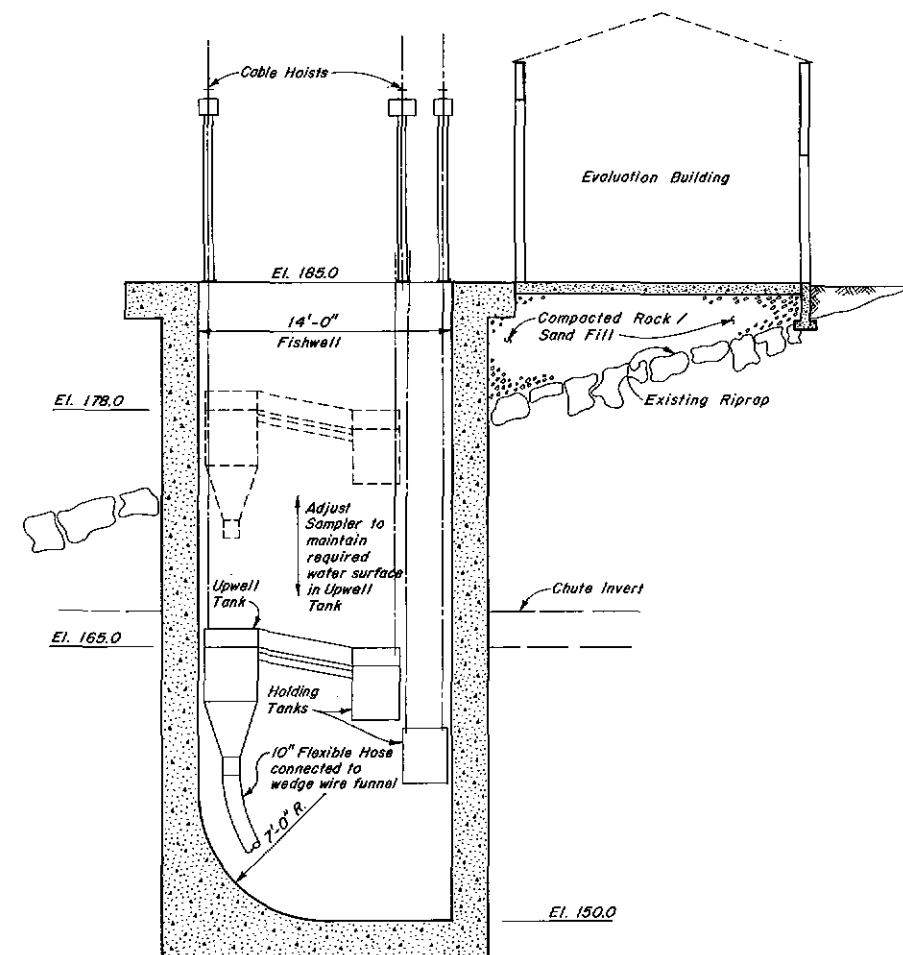
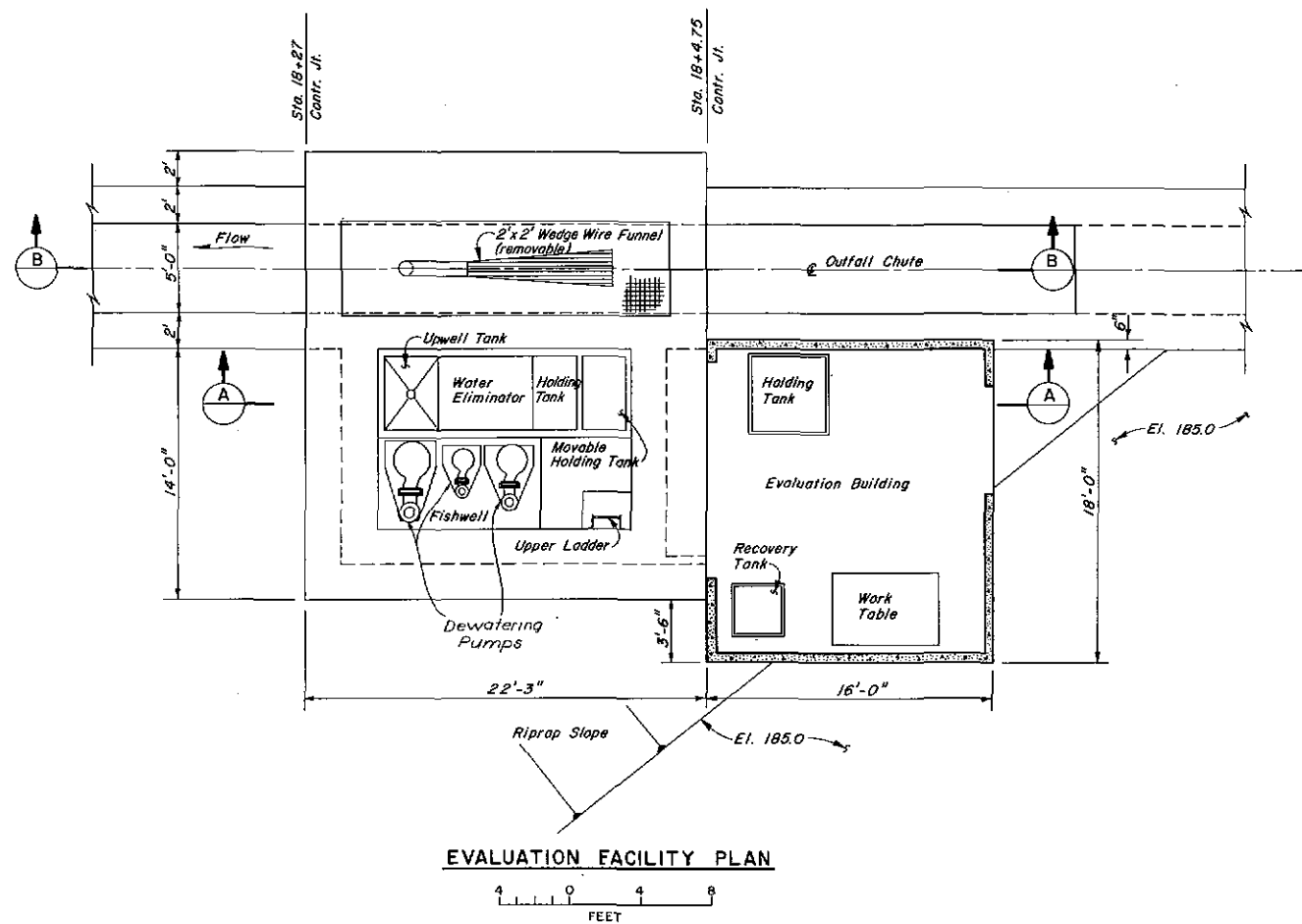
- NOTES**
- UNIT OPERATIONS ARE AVAILABLE VERSUS UNITS GENERATING (EXAMPLE 16/4).
 - ASSUME 60 ORIFICES OPERATING.
 - MINIMUM AND MAXIMUM FOREBOY ELEVATION (257, 268) ARE IN RELATION TO UNIT OPERATIONS.
 - TABLE INCLUDES PROFILES DEPENDING ON UNIT OPERATIONS.
 - UNITS 1-4 ON-LINE AND SLOT WATER SURFACE IS 1-FOOT BELOW THE FOREBOY ELEVATION. IF UNITS 5-20 ARE AVAILABLE TO COME ON-LINE, THE SLOT WATER SURFACE IS THE SAME AS THE FOREBOY ELEVATION.
 - CONTRACTION TRANSITION IS FROM STATION 18+72 TO STATION 5+00 (OUTLET CHANNEL STATIONING). TRANSITION IS 47-FEET IN LENGTH.
 - TAINTER GATE CONTROLS DISCHARGE TO OUTLET CHUTE.
 - MANNING $n = 0.013$.
 - ORIFICES ARE 14-INCHES IN DIAMETER. CENTERLINE ELEVATION OF 250.5 M.S.L.
 - THE ROOF OF THE CHANNEL IS AT A CONSTANT ELEVATION OF 253.0 M.S.L.
 - THE CONDUIT WILL FLOW UNDER PRESSURE FLOW OR OPEN CHANNEL FLOW DEPENDING ON FOREBOY ELEVATION AND UNIT OPERATIONS.
 - ALL ELEVATIONS ARE FEET ABOVE MEAN SEA LEVEL.
 - DISCHARGE ARE CUBIC FEET PER SECOND.
 - ORIFICE DISCHARGE DEPENDS ON UNIT OPERATIONS FOREBOY ELEVATIONS AND TAINTER GATE CONTROL.

U. S. ARMY ENGINEER DISTRICT, PORTLAND

JOHN DAY LOCK AND DAM
COLUMBIA RIVER LAKE UMATILLA OREGON-WASHINGTON
JUVENILE FISH BYPASS SYSTEM

TRANSPORTATION CHANNEL WATER SURFACE AND VELOCITY PROFILES

DESIGNED: JDL/RLW
DRAWN: J. Hall
DATE: '83 Apr 24
SHEET: JD-20-13/15
PLATE: 15



REVISION	DATE	DESCRIPTION	BY
U. S. ARMY ENGINEER DISTRICT, PORTLAND			
JOHN DAY LOCK AND DAM COLUMBIA RIVER OREGON-WASHINGTON			
FINGERLING BYPASS SYSTEM			
EVALUATION FACILITY			
SUPERVISED: <i>Rudolf R. Chmura</i>	DESIGNED: <i>D. Elias</i>	DRAWN: <i>Jack S. Hadden</i>	CHECKED: <i>D. Wilson</i>
DATE: 83 Apr 26	PROJECT: JD-20-13/16	PLATE: 16	

APPENDIX A

FISHERY AGENCY CORRESPONDENCE AND MEETING MINUTES

		<u>PAGE</u>
LCFPS	Meeting Minutes dtd 10 March 1982	A-1 thru 34
MNFS	Letter dtd 28 April 1982	A-35
ODFW	Letter dtd 3 May 1982	A-36
LCFPS	Meeting Minutes dtd 7 June 1982	A-37 thru 49
NMFS	Letter dtd 13 August 1982	A-50
LCFPS	Meeting Minutes dtd 7 October 1982	A-51 thru 84
NMFS	Letter dtd 2 November 1982	A-85
LCFPS	Meeting Minutes dtd 8 November 1982	A-86 thru 97
COE	Letter dtd 9 March 1983	A-98 thru 100
COE	Letter dtd 1 April 1983	A-101 thru 103
NMFS	Letter dtd 6 April 1983	A-104
FWS	Letter dtd 13 April 1983	A-105
CBFWC	Letter dtd 18 April 1983	A-106
NMFS	Letter dtd 18 April 1983	A-107
WSDP	Letter dtd 27 April 1983	A-109 thru 110

JOHN DAY POWERHOUSE

Minutes of Coordination Meeting with Fishery Agencies

Juvenile Bypass System

10 March 1982

1. The purpose of this meeting was to present to the Lower Columbia Fish Passage (LCFP) Subcommittee the latest plan of the Juvenile Bypass System at John Day Powerhouse and to obtain their input. The following personnel attended:

Dale Schoeneman, U.S. Fish and Wildlife Service

Bob Pearce, National Marine Fisheries Service

Grant S. Christensen, Idaho Fish and Game

Don Bartlett, Washington Department of Fisheries

Burt Carnegie, Oregon Department of Fish and Wildlife

Don Wilson, Corps of Engineers

Jack Braithwaite, Corps of Engineers

John Williams, Corps of Engineers

Dick Regan, Corps of Engineers

Norm Tolonen, Corps of Engineers

Doug Arndt, Corps of Engineers

Russ Davidson, Corps of Engineers

Gary Johnson, Corps of Engineers

Laurance Kerr, Corps of Engineers

Dave Illias, Corps of Engineers

Dick Waits, Corps of Engineers

2. Russ Davidson opened the meeting noting that many changes have occurred in the design and layout of the John Day Bypass since the last meeting and so it is appropriate then to present those changes prior to the scheduled publishing of the Letter Report on 1 April 1982. The agenda and handouts are attached as Inclosures 1 through 24.

3. Russ gave a general description of the recommended bypass system. Juvenile salmonids migrating down the river through the powerhouse will be diverted from the turbine intakes into the bulkhead slot by use of the submersible traveling screens. The juvenile fish will be confined to the bulkhead slot by use of vertical barrier screens and the fish trapped in this bulkhead slot will find their way into the mined transportation conduit through 14 inch orifices in the upstream wall of the bulkhead slot into the mined channel. The mined channel will flow south from unit 16 to the screening facility located in the area between the assembly bay and the fish ladder. Here the fish will be separated by use of a large screen into a smaller volume of water. The fish will then flow through a 2-foot diameter outfall pipe to a submerged release point in the tailrace located about 1,000 feet downstream on the south shore near the turning towers. The juvenile salmonids will be released in an area where the flow is 8 feet per second for most powerhouse flows. The excess water which flows through the screen will enter a penstock, then flow to a single unit powerhouse near the fish water intake and discharge into this intake area behind the trashracks.

4. Doug Arndt summarized the research program in 1981 for the development of a John Day Juvenile Bypass. The studies were conducted at McNary dam under conditions simulating John Day Powerhouse. The research objectives and results were as follows:

a. Objective - to determine fish guiding efficiency (FGE) of the STS. Results - the FGE for chinook salmon and steelhead was 75 and 79 percent, respectively.

b. Objective - to evaluate the effectiveness of an airlift system with an STS in the intake. Results - the fish passage efficiency (FPE) of the airlift pump at a 20-foot depth was considerably lower than desirable. The test at the 30-foot depth, however, showed indications for more favorable results.

c. Objective - measure FPE of a gatewell orifice submerged 8 or 17 feet. Results - the overall FPE was not acceptable.

d. Objective - to evaluate the orifice cycling operation and resultant retention and injury level for fish in the gatewell slot. Results - the FPE was lower for cycling tests than for full time operation.

Details of the research are presented in the summary report Research At McNary Dam To Develop an Improved Fingerling-Protection System for John Day Dam, 1981, dated November 1981.

5. John Williams presented this years research program for the John Day Bypass. The primary objectives of the study are as follows: (1) to determine if FGE is acceptable with balanced flow vertical barrier screens (BFVBS) (inclosure 19), and (2) if BFVBS provide acceptable FGE, then test FPE of a deep and shallow orifice with BFVBS in place to determine if one or two orifices are required to cover the entire range of forebay elevations. The north vs. south orifice

location will also be tested. If the BFVBS are not effective, then vanes will be used to direct flow in the gatewell (inclosure 20). The vanes are attached to a frame which will rest on top of the STS. The purpose is to give a consistent circulation pattern within the gatewell to possibly optimize the FPE of the orifices.

6. Messrs. Davidson, Illias, and Waits presented details on the following features of the John Day Bypass System:

a. Collection System. The collection system will consist of STS's and VBS's.

(1) The first element, STS, is used to deflect the fingerling from the intake in the bulkhead slot. Present designs will be adapted for use at John Day and 48 STS's will be provided for the 16 operating generators of the powerhouse.

(2) The second element, VBS, is installed between the bulkhead slot and gate slot. The design is similar to the screens installed at other projects on the Columbia River. Grant Christensen asked if a method has been developed for VBS cleaning. Dave noted we do not have one yet, but one will be developed, not necessarily the same as Bonneville. The BFVBS or flow vanes will be incorporated in the design if this years research shows them to be effective.

b. Transportation System. The transportation system involves orifices between the bulkhead slot and a transportation channel that flows south across the powerhouse. Dave noted at the last coordination meeting that the channel

flowed north, but since that time it was determined that it was not structurally feasible to build a screen-pumpback facility on the central non-overflow section between the spillway and powerhouse.

(1) Two orifices per bulkhead slot, 14 inch in diameter, will be drilled at centerline elevation 252.5 and 246.5. Earlier designs used a 12 inch orifice and the 14 inch was suggested to reduce the problems of plugging by debris. Russ explained that this concern is certainly great in the case of Bonneville Dam, but at John Day the debris problems are of a lesser degree being cast of the Cascades and with the upper projects removing the debris they encounter. Intervening studies showed that there would be an increased cost because of the slightly higher discharge that would occur within the system with a larger orifice. But at the same time the energy recovered by the turbine increased due to a higher operating head which allowed us to adopt the larger orifice. The 14 inch orifice is designed to operate under conditions equal to the 12 inch one. For a 12 inch orifice the minimum differential head of 4 feet yields equal discharge to a 14 inch orifice operating at a minimum of 2.5 feet. On inclosure 8 of the handouts, in the lower right hand corner, is a table of submergences for the upper and lower orifices. The elevation of the orifices was selected so that there was a balance in the range of pool elevations over which they would work. The upper orifice works at a range of 8.5 to 14.5 feet of submergence over pool elevation 262.5 to 268 and the lower orifice operates at the range of 8.5 to 14.5 feet of submergence over the pool elevation 262.5 to 257. Burt Carnegie asked if we go through a full forebay range during the fish migration season. Laurance Kerr replied the pool is usually between 263 and 265 which indicates the upper orifice will be in operation most of the time while

the lower orifice will be just a contingency for infrequent low pool operations. The downstream side of the orifice will be gated and lighted. It will be in a tapered recess which is about 3 feet deep with the orifice tube being only 2 feet long. In past designs the recess extended continuously between the upper and lower orifice, but, due to structural reasons, a beam is required across the recess (shown on inclosure 21). It is shaped such that it will not interfere with orifice jet. A space behind this beam is needed for the gate hardware.

(2) The transportation channel will be a mined conduit upstream of the bulkhead slot along the same alinement as the existing bypass conduit (see inclosure 5). It uniformly tapers from 5 feet wide by 11 feet high at the north end near unit 16 to 9 feet wide by 15 feet high at the south end in unit 1. Dale Schoeneman asked how the channel will be mined and if lined. Dave explained that one method is to core drill the channel perimeter slightly greater than the final dimension and break the concrete into pieces small enough for removal through access shafts to the forebay deck. The channel will be finished with a concrete lining to provide a smooth finish. Several construction headings will be used to finish the work in the scheduled time. Hydraulics of different operating conditions for the channel are shown on inclosures 6 through 9. Inclosure 6 is for 16 generators operating with 48 orifices operating, and inclosure 7 is for 4 generators operating with 48 orifices operating. The latter was considered a rare operating condition for determining a maximum flow condition. The system must also be designed to accommodate the possible future addition of units 17 through 20; therefore, profiles through a mined channel that would serve all 20 units were studied.

Two conditions are shown: (1) all 20 units operating with 60 orifices operating is shown on inclosure 8, and (2) 4 units operating with 60 orifices operating is shown on inclosure 9. For these four different conditions the discharge varies from 430 cfs (16 units w/ 48 orifices operating) to 690 cfs (4 units w/ 60 orifices operating). The velocities in the channel range from zero at the north end to a velocity at the south end which varies from 3.2 feet per second to 7.5 feet per second.

c. Screening - Powerhouse Facility. From bay 1 the transportation channel will be mined through the station service and assembly bays, and into Monolith No. 14, where it turns 90 degrees into a screen facility (see inclosure 10). An inclined screen will separate the bulk of the water to operate an underground powerhouse located next to the auxiliary water supply pump intake. The remaining fish and flow will enter a 2 foot diameter outfall pipeline discharging in the tailrace.

(1) The screening structure will be constructed between the assembly bay and the fishladder. The inclined screen - 10 feet wide by 56 feet long - will travel vertically (constant slope) and follow the forebay in order to control the differential head across the orifices in the mined channel. The screen was sized for maximum discharge of 1 cfs per square foot of gross screen area. The screen weir crest elevation will range between 263.1 and 249.5 feet, maintaining a flow depth of approximately 12 inches just upstream of the weir, separating the inclined screen from the discharge well. A solid panel, attached to the upstream edge of the screen, will raise and lower to direct flow over the screen. Velocity data upstream and across the screen, under different

operating conditions, is shown on inclosures 11 through 13. The velocities just upstream of the screen for different conditions with 48 orifices operating were low, but the agencies felt they were acceptable because of the short distance. The screened water will flow through 4 gated ports into a penstock, and to a turbine. The gates are used to control flow under the screen to insure a relatively uniform flow through the screens surface. If the turbine is not operating then the screened water will flow out the emergency release conduit which discharges into the tailrace. If the screen should be inoperable a bulkhead could be put in place and all the water and fish discharged through the emergency release conduit. Flows over the screen enter a discharge well that transitions into a 2 foot diameter outfall pipeline. Since this pipe is unregulated, add-in water is supplied to maintain a preselected water level in the discharge well as the tailwater fluctuates. Some of the screened water will be directed through an add-in gate for this purpose. A mechanical brush, similar to that at Bonneville 2nd Powerhouse, will be used to clean the screen. Burt Carnegie said that the transition from the discharge well to the 2-foot outfall pipe should be carefully designed, having a long taper, to prevent vortexes and cavitation pressures. He noted we should check with Walla Walla district on their experience with the discharge wells at their projects.

(2) The penstock from the screen facility will flow into a small underground powerhouse for operating a turbine to conserve energy. The turbine discharges into the fishwater pump intake pool behind the trash racks. The question for discharging directly into the auxiliary water supply was addressed. Dave said that from preliminary investigation this alternative did not appear feasible. We were urged to consider discharging into the AWS system.

(3) A backflush gate is provided in Monolith 14 for the purpose of flooding the transportation channel to clear debris lodged across or in the orifices. Further development of this system is planned during the feature design memorandum.

(4) The evaluation facilities, as agreed to with the agencies, will be similar to the one planned at the Bonneville 1st Powerhouse bypass system. An area at elevation 269 in the screen facility is planned for this purpose. The details of equipment required and its operation will be addressed in the next design memorandum. Bob Pearce noted the discharge well needed to be long enough to accommodate the sampler.

d. Outfall System. From the discharge well a 2 foot diameter outfall pipeline carries the juveniles to a submerged release point in the tailrace approximately 1000 feet downstream from the powerhouse (shown on inclosure 14). The release is at elevation 139 and at 100 feet from the shoreline at low tailwater.

The long length of pipeline was required to keep pipeline velocities below 30 feet per second. The pipe will be CRES steel to provide protection for the fish against damage from corrosion, and a profile was laid out that has positive internal pressure along its entire length. Laurance Kerr requested the pipe be buried along its entire length to prevent interference with operations. Dave said he would provide for this in the design. An expansion to 3 foot diameter is provided approximately 25 feet from the release point to slow the exit velocities to approximately 13 feet per second. The discharge varies from 82 cfs at tailwater elevation 173 to 92 cfs at elevation 155. Inclosure 22 shows hydraulic data for the pipeline at different operating conditions and tailwaters.

Russ pointed out the release location is in a high velocity area for carrying and dispersing the fingerling downstream (velocities shown on inclosures 15 and 16). All agreed this would be a favorable location. The pipe will be supported on piling in the tailrace which should not create slack water areas for predator habitat. The subcommittee noted the outfall pipe will have to be inspected for corrosion, even with CRES steel some pitting will occur, and the expansion joints should be of a smooth design so as not cause fish damage.

The emergency release conduit (ERC) is 5 foot diameter concrete pipe. The discharge is submerged just downstream of the fishwater pump intake.

7. Dave noted that construction of the mined channel would eliminate the existing bypass conduit and fish removal from the bulkhead slots will be required during construction. Details of this process will be coordinated with the agencies in subsequent meetings during design.

8. Russ presented the design and construction schedule (shown on inclosure 18). The letter report is scheduled to be completed 1 April 1982. The feature design memo will begin in April and be completed in September 1982. The construction is broken down into 4 contracts: (1) fabrication of submerged traveling screens, (2) mining of the transport conduit, (3) fabrication and installation of the turbine - generator - governor, and (4) construction of the balance of plan features which includes the separator screen plant, vertical barrier screens, the powerhouse structure, and the outfall pipeline.

9. The meeting adjourned at 1430 hours.

JOHN DAY JUVENILES FISH BYPASS

LCFP-SC Meeting

10 March 1982 - 10:15 a.m.

AGENDA

1. Opening Remarks

2. Presentation a Discussion
 - a. Collection System
 - (1) STS
 - (2) VBS
 - (3) Orifice
 - b. Transportation System
 - (1) Orifice
 - (2) Mined Gallery
 - c. Screening Facility
 - (1) Screen
 - (2) Emergency Release
 - (3) Penstock Intake
 - (4) Discharge Wall
 - d. Outfall
 - (1) Pipeline
 - (2) Submerged Outlet
 - (3)

Ind 1

e. Turbine

(1) Penstock

(2) Powerhouse

(3) Outlet

f. Fish Handling During Construction

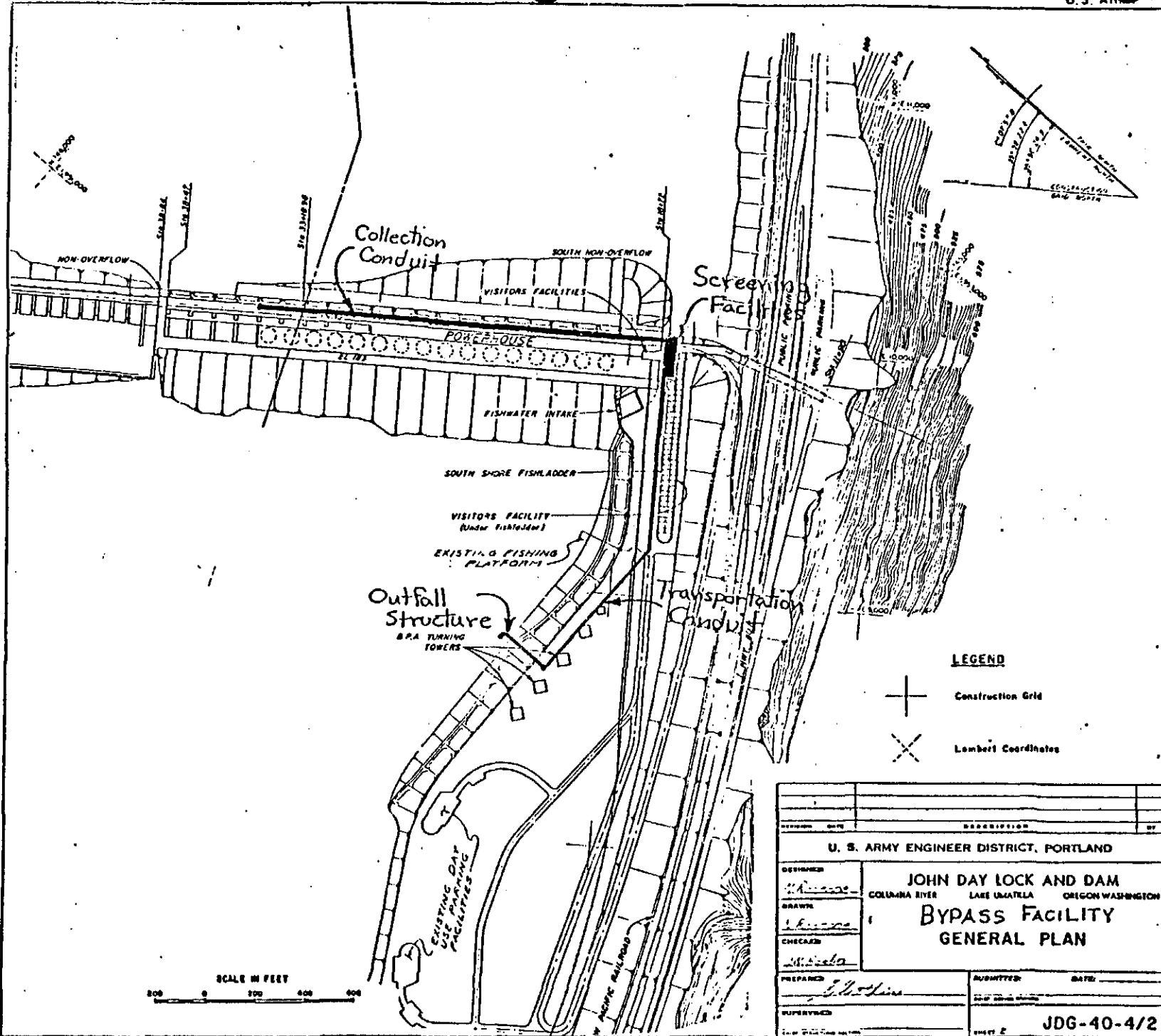
3. Schedule

4. Summary

5. Adjournment

Incl 3

A-13



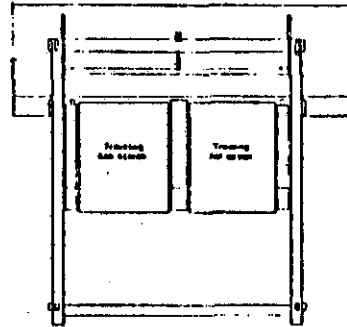
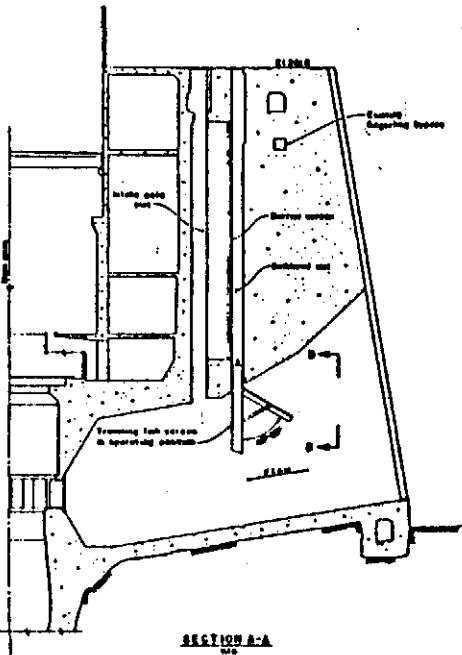
LEGEND

- + Construction Grid
- X Lambert Coordinates

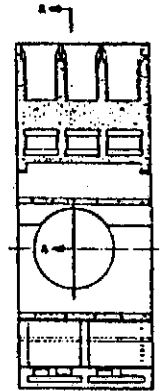
DESIGNED BY	DATE	DESCRIPTION	BY
U. S. ARMY ENGINEER DISTRICT, PORTLAND			
DESIGNED	JOHN DAY LOCK AND DAM		
DRAWN	COLUMBIA RIVER	LAKE UMATILLA	OREGON WASHINGTON
CHECKED	BYPASS FACILITY		
PREPARED	GENERAL PLAN		
SUPERVISED	DATE	BY	DATE
PREPARED BY: <i>E. J. ...</i>		SUPERVISED BY:	
SHEET 2			JDG-40-4/2

SCALE IN FEET
0 200 400 600

Incl. 4



TRAVELING FISH SCREEN



A-14

U. S. ARMY ENGINEER DISTRICT, PORTLAND			
JOHN BAY LOCK AND DAM			
COLUMBIA RIVER BRIDGE AND BARGEWAY			
FINGERLINE BYPASS SYSTEM			
SUBMERGED TRAVELING SCREEN			
DATE	BY	SCALE	NO.
			3

JD-20-11/3

Incl. 6

CORPS OF ENGINEERS, U.S. ARMY

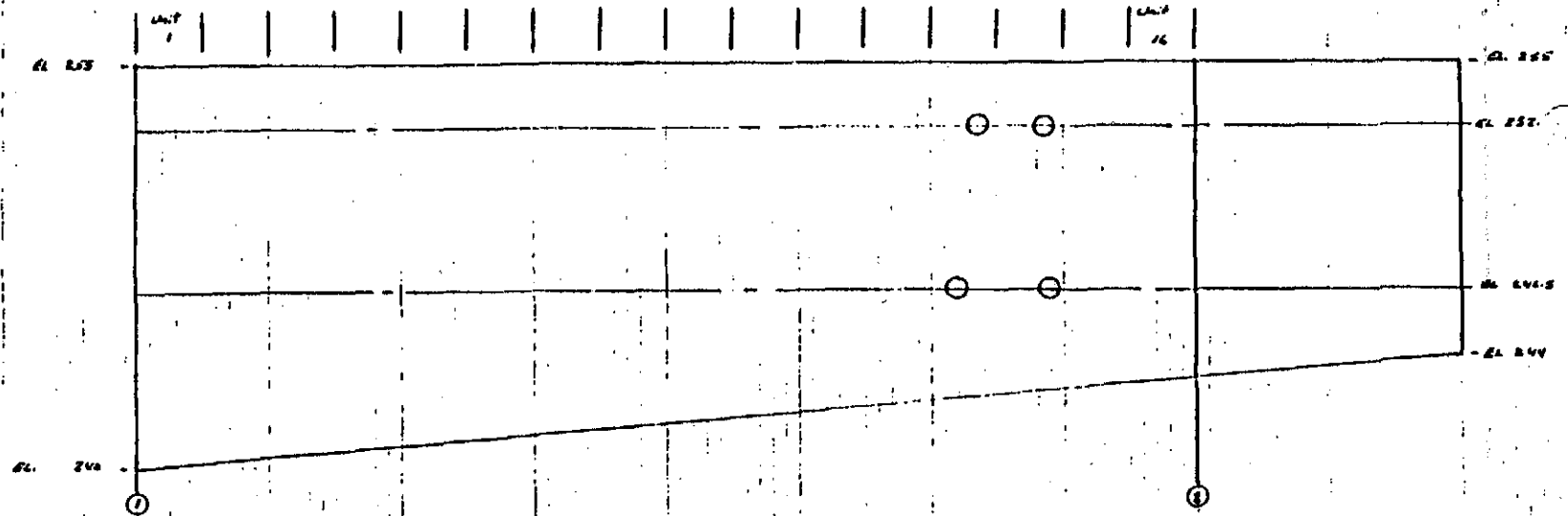
PORTLAND, OREGON DISTRICT

Org. DIV. Des'n BRANCH Hyd'nls Des'n SECTION

PROJECT Taha Dry Dam

SUBJECT R&H Finishing By-pass Collection Channel

BY R.L.W. DATE 10/20/67 RECHECKED PART PAGE OF 16 Units ; All Runways



FR	Flow - ft/s	St. P N.S.	R2 Q	D2 Depth	R2 Vel	A2 FSL	D2 OH	W2 Unit 4 OH
268	1"	267	430	15.00	3.8	262.9	3.1	2.9
267		266				262.9		
266		265				261.9		
265		264				260.9		
264		263				259.9		
263		262				258.9		
262		261				257.9		
261		260				256.9		
260		259	430	15.00	3.8	256.9	3.1	2.9
259		258	430	14.90	3.8	254.9	3.1	2.9
258		257	434	13.80	3.5	253.8	3.3	3.0
257	1"	256	437	12.65	3.9	252.7	3.3	3.1
256	2"	255	442	11.20	4.3	251.5	3.5	3.2

St. Unit 4 OH	Upstream FSL	OH
2.9	264.5	2.5
	263.5	
	262.5	
	261.5	
	260.5	
	259.5	
	258.5	
	257.5	
2.9	256.0	
2.9	255.5	
2.9	254.5	
3.0	253.5	
3.1	252.5	2.5

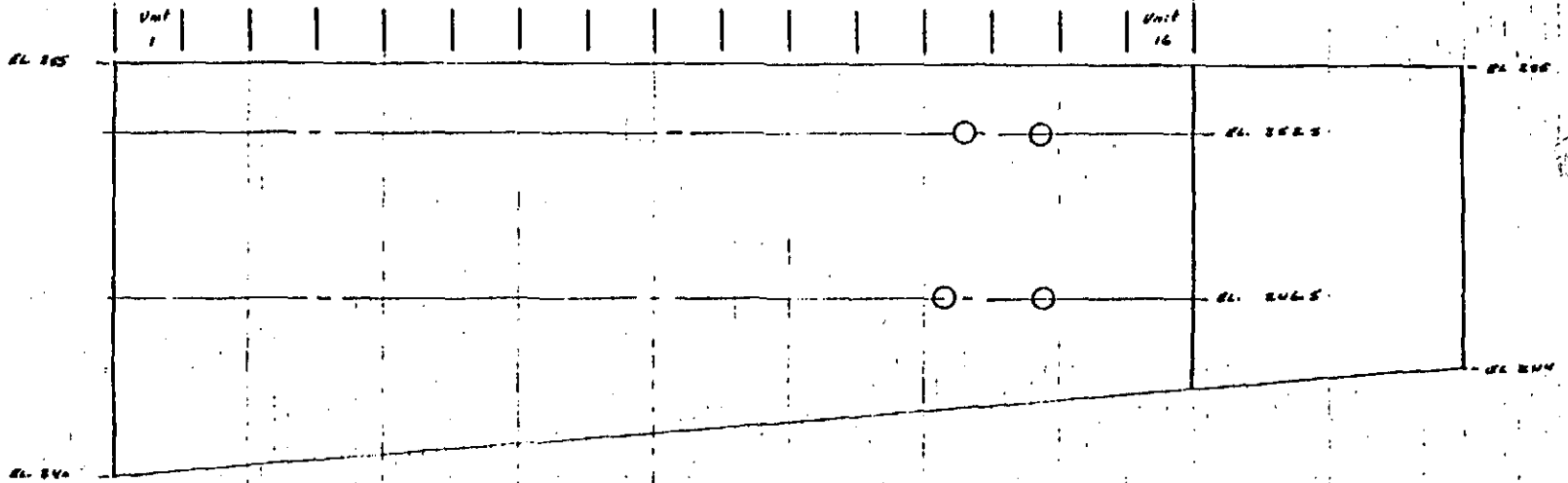
A-16

Incl. 7

CORPS OF ENGINEERS, U.S. ARMY
 PORTLAND, OREGON DISTRICT
 Engr. DIV. Design BRANCH Hydrolic Crags SECTION
 PROJECT Tuba Bay Dam
 SUBJECT DSM Fingering By Pass Collection Channel

BY RKW DATE 10 March 54 CHECKED PART PAGE OF

16 Units; 4 Units Existing; 12 Unit Avail



NO.	UNIT	ACCIDENT	CHECKED	PART	PAUL	OF		
FB	FB	NO.	Q	Depth	Vel	PKL	RH	4H
262	267	1'	493	15.00	3.6	262.7	3.3	3.1
267	266					262.7		
266	265					261.7		
265	264					260.7		
264	263					259.7		
263	262					258.7		
262	261					257.7		
261	260					256.7		
260	259		490	15.00	3.6	255.7	3.3	3.1
259	258		494	14.70	3.7	254.7	3.2	3.1
258	257		496	12.6	4.1	253.6	3.4	3.2
257	256	1'	500	12.4	4.5	252.4	3.6	3.2
259	255	2'	477	12.3	4.4	252.4	2.6	2.4

No Unit 4	PKL	RH
4.1	264.5	3.5
	263.5	
	262.5	
	261.5	
	260.5	
	259.5	
	258.5	
4.1	256.5	
4.1	255.5	
4.3	254.3	
4.2	253.5	
4.4	263.5	3.2

A-17

Incl. 8

CORPS OF ENGINEERS, U.S. ARMY

PORTLAND, OREGON DISTRICT

Engr. DIV. Res. 302 BRANCH Hydraulic Res. 302 SECTION

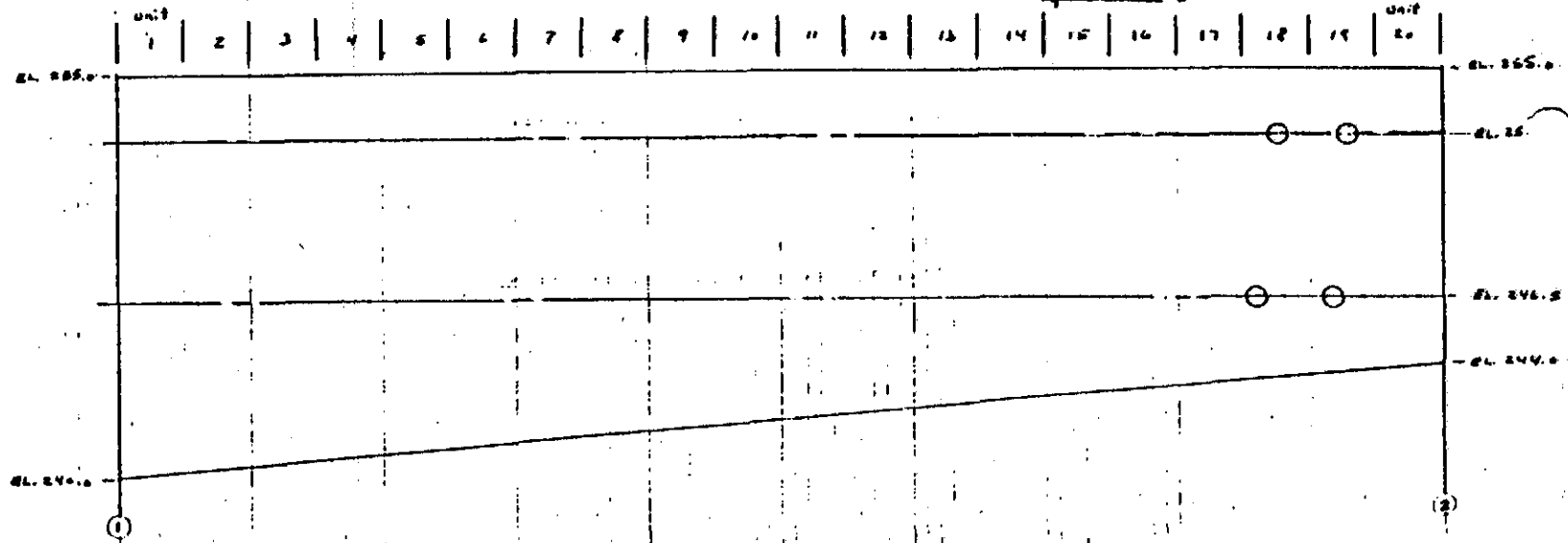
PROJECT Jabon Dam Dam

SUBJECT DRM FINGERLINE BY-PASS COLLECTION CHANNEL

BY R.L.V. DATE 10/24/62 CHECKED PART PAGE OF

All 20-units in use.

Firebas. }
Slot n.o. } drawdown (1'12')



FD	Draw Down	Dist W.S.	Total @	Drawdown P.C.L.	Vol. C.O.	A.H. C.O.	Upstream P.C.L.	Down A.H.
268	1'	267	572	263.2	4.2	3.80	264.2	2.5
267		266		263.2			263.5	
266		265		261.8			262.5	
265		264		260.2			261.5	
264		263		259.2			260.5	
263		262		258.2			259.5	
262		261		257.2			258.5	
261		260		256.2			257.5	
260		259	572	255.2	4.2	3.80	256.5	
259		258	575	254.1	4.5	3.9	255.5	
258		257	584	252.9	5.0	4.1	254.5	
257	1'	256	595	251.5	5.2	4.5	253.5	
257	2'	255	610	249.8	6.4	5.2	252.5	2.5

Submergence of Upstream Level	Submergence of Downstream Level	Submergence of Upstream Level	Submergence of Downstream Level
14.5	10.7	20.5	16.7
13.5	9.7	19.5	15.7
12.5	8.7	18.5	14.7
11.5	7.7	17.5	13.7
10.5	6.7	16.5	12.7
9.5	5.7	15.5	11.7
8.5	4.7	14.5	10.7
7.5	3.7	13.5	9.7
6.5	2.7	12.5	8.7
5.5	1.6	11.4	7.6
4.5	0.4	10.5	6.4
3.5	-1.0	9.5	5.0
2.5	-2.7	8.5	3.3

A-18

6 PM1

CORPS OF ENGINEERS, U.S. ARMY

PORTLAND, OREGON DISTRICT

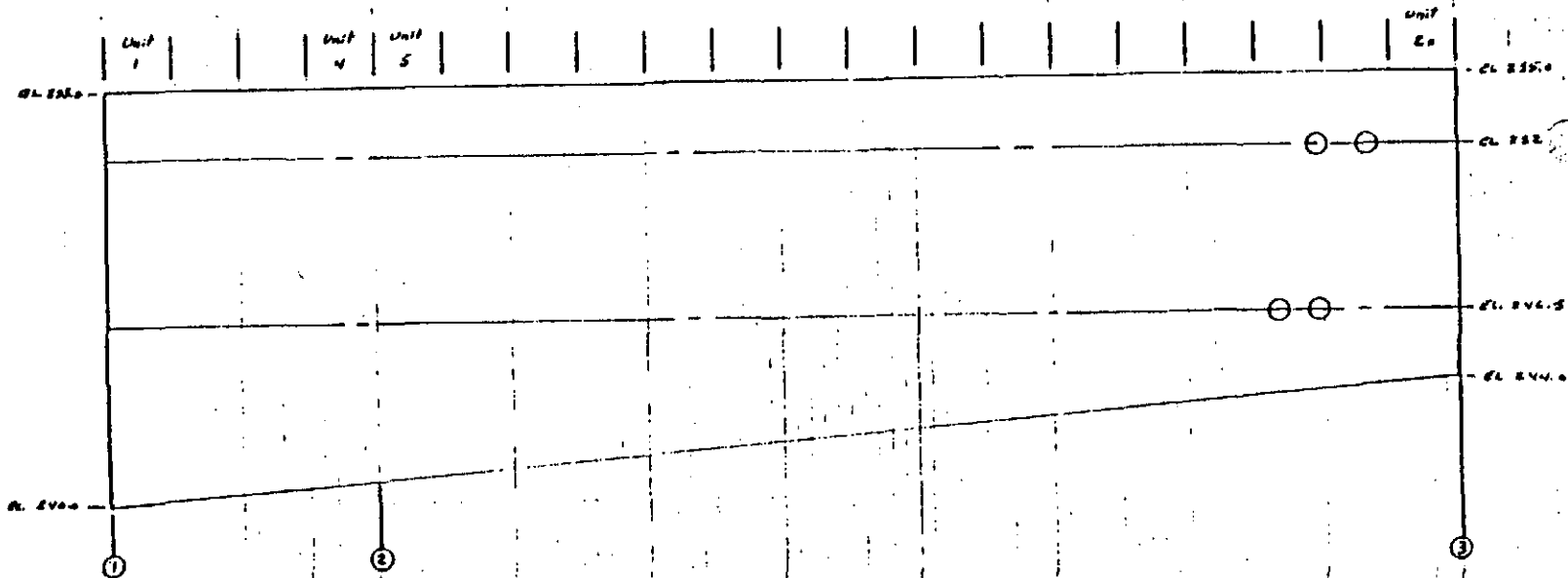
Engr DIV. 26134 BRANCH Hydraulic Design SECTION

PROJECT John Day Dam

SUBJECT PM FINGERLING BY-PASS COLLECTION CHANNEL

BY R. L. W. DATE 10 Nov 52 CHECKED PART PAGE OF

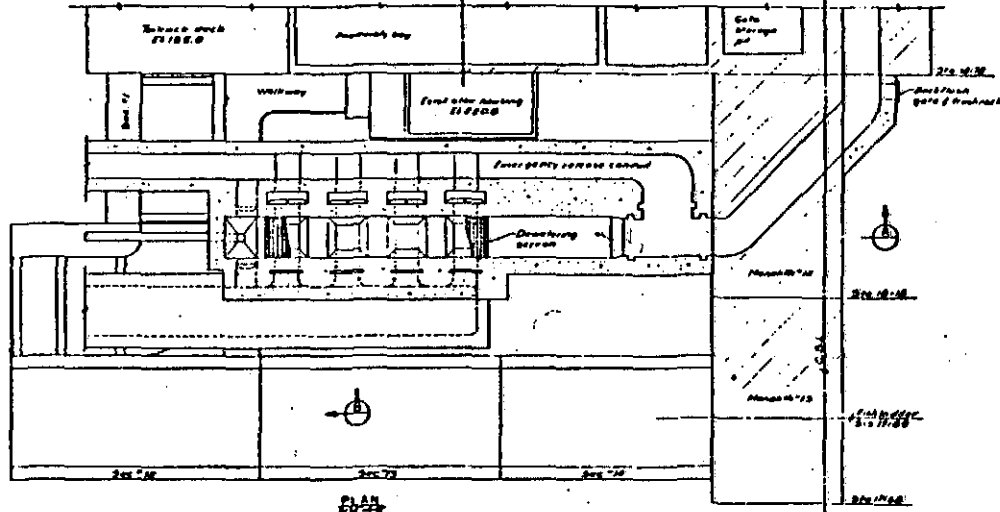
20 Units; 4 in use; 16 Available



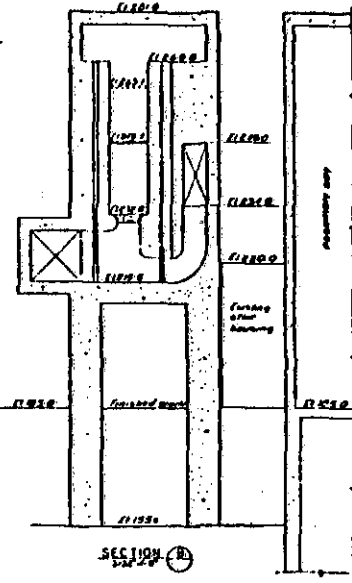
FB	Draw	St. I	CR	PSL	Vol	GH	ΔH d/s	ΔH Ws	PSL	GH
	Down	W.S.	C ①	C ①	C ①	C ①	①	①	C ②	C ②
268	1'	267	650	262.8	4.8	4.2	3.8	4.8	262.8	3.5
267		266		261.8					262.5	
266		265		260.8					262.5	
265		264		259.8					261.5	
264		263		258.8					260.5	
263		262		257.8					259.5	
262		261		256.8					258.5	
261		260	650	255.8	4.8	4.2	3.8	4.8	257.5	
260		259	653	254.8	4.9	4.2	3.9	4.9	256.5	
259		258	668	252.7	5.4	4.3	4.0	5.0	255.5	
258		257	668	252.3	6.0	4.7	4.2	5.2	254.5	
257	1'	256	696	250.3	7.5	5.7	4.8	5.8	253.5	
257	2'	255	690	250.2	7.5	4.8	4.0	6.0	253.5	3.5

A-19

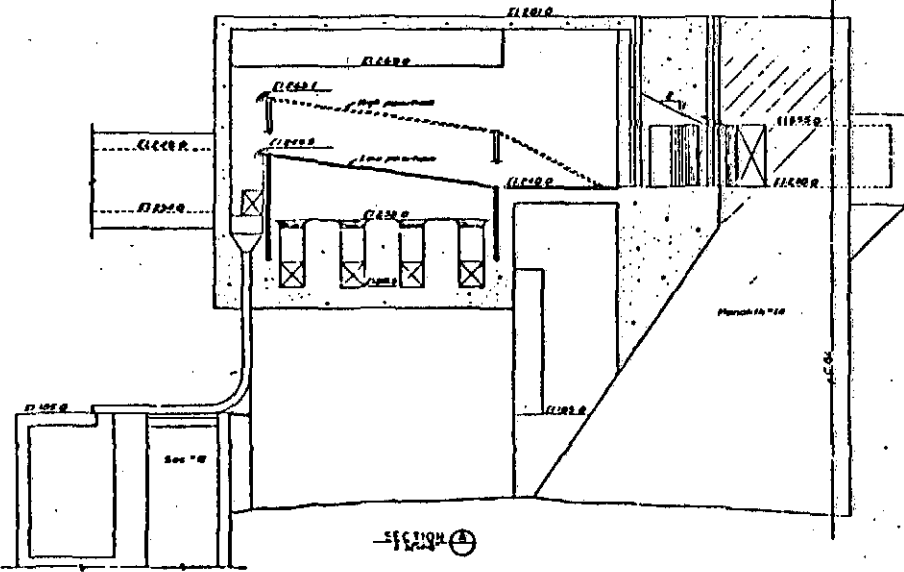
Ind. 10



PLAN 50-23



SECTION 50-24



SECTION 50-25

U. S. ARMY ENGINEER DISTRICT, PORTLAND	
ALTERNATIVE I	
SCREEN SYSTEM DETAILS	
DATE	10-20-11/6
BY	
CHECKED	
APP'D	
SCALE	

A-20

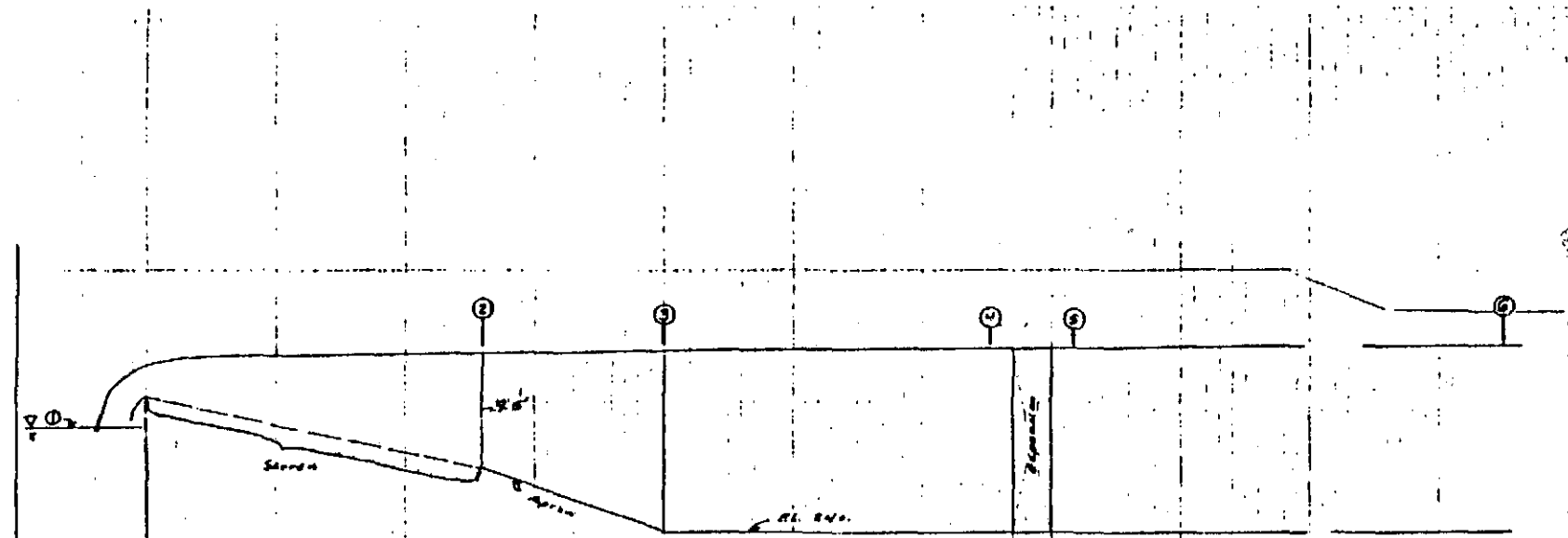
Incl. 11

Engr DIV. Res. En BRANCH Hydraulic Design SECTION

PROJECT John Day Dam

SUBJECT Screening Operation - Velocity Data

BY R.L.W. DATE 10 March 62 CHECKED PART PAGE OF



Collection Well

- ① M.S. IN COLLECTION WELL (① - 2')
- ② U/S End of Screen
- ③ U/S End of Apron
- ④ D/S Expansion
- ⑤ U/S Expansion
- ⑥ D/S End of Collection Channel

A-21

Engr. DIV. Design BRANCH Hydraulic Design SECTION

PROJECT John Day Dam

SUBJECT Screening Operation. - Velocity Data

BY R.L.W. DATE 10 Nov 62 CHECKED PART PAGE OF

	Stat		ws. @		Velocity	② -	④	
FB	ws.	②	①	②	③	④	⑤	⑥
		20 Units, All		20 Units In Use				
268	267	572	261.2	6.0	2.5	2.5	4.2	4.2
267	266		260.2		2.6	2.6		
266	265		259.2		2.7	2.7		
265	264		258.1		2.8	2.8		
264	263		257.1		3.0	3.0		
263	262		256.1		3.2	3.2		
262	261		255.1		3.4	3.4		
261	260		254.0		3.6	3.6		
260	259	572	253.0	6.0	3.8	3.8	4.2	4.2
259	258	575	251.9	6.1	4.1	4.1	4.5	4.5
258	257	584	250.7	6.1	4.6	4.6	5.1	5.0
257	256	595	249.2	6.3	5.3	5.3	5.8	5.8
257	255	610	247.3	6.4	6.6	6.6	7.1	6.9
		20 Units; 4 Units In Use; 16 Units Available						
268	267	650	260.8	6.8	2.9	2.9	4.8	4.8
267	266		259.7		3.0	3.0		
266	265		258.7		3.1	3.1		
265	264		257.7		3.3	3.3		
264	263		256.7		3.5	3.5		
263	262		255.6		3.7	3.7		
262	261		254.6		3.9	3.9		
261	260	650	253.6	6.8	4.2	4.2	4.8	4.8
260	259	653	252.6	6.9	4.5	4.5	4.9	4.9
259	258	660	251.3	6.9	4.9	4.9	5.4	5.4
258	257	668	249.9	7.0	5.6	5.6	6.0	6.0
257	256	696	247.6	7.3	7.2	7.2	7.5	7.5
257	255	690	247.8	7.3	7.1	7.1	7.7	7.5

NPD Form 7G
Sept. 1963
Bond - Tab Column

Army-Port. Dist., Oreg.

1201 12

Engr DIV. Design BRANCH Hydraulic Design SECTION

PROJECT John Day Dam

SUBJECT Screening Operation - Velocity Data

BY R.L.W. DATE 10 March 62 CHECKED PART PAGE OF

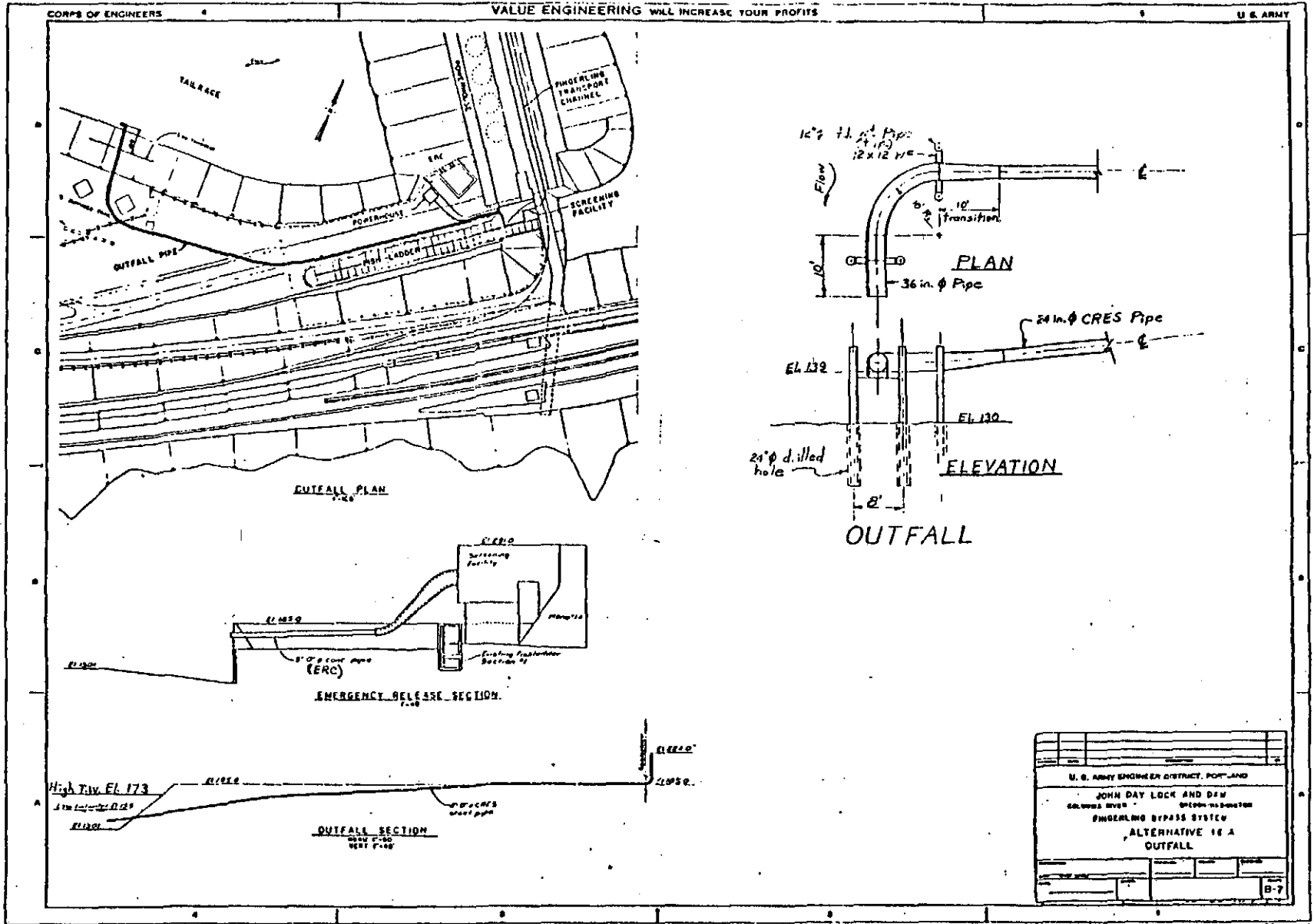
FB	Slot w.s.	w.s. ①	Velocity @ ② - ⑦					
			②	③	④	⑤	⑥	⑦
			16 Units; All Units In Use					
268	267	430	261.9	4.5	1.8	1.8	3.2	3.2
267	266		260.9		1.9	1.9		
266	265		259.9		2.0	2.0		
265	264		258.9		2.1	2.1		
264	263		257.9		2.2	2.2		
263	262		256.9		2.3	2.3		
262	261		255.8		2.4	2.4		
261	260		254.9		2.6	2.6		
260	259	430	253.8	4.5	2.7	2.7	3.2	3.2
259	258	432	252.8	4.5	2.9	2.9	3.2	3.2
258	257	434	251.5	4.6	3.2	3.2	3.5	3.5
257	256	439	250.5	4.6	3.5	3.5	3.9	3.9
257	255	443	249.3	4.7	3.9	3.9	4.3	4.3
			16 Units; 4 Units In Use; 12 Units Available					
268	267	493	261.8	5.2	2.1	2.1	3.6	3.6
267	266		260.8		2.2	2.2		
266	265		259.8		2.3	2.3		
265	264		258.7		2.4	2.4		
264	263		257.8		2.5	2.5		
263	262		256.9		2.6	2.6		
262	261		255.6		2.8	2.8		
261	260		254.6		3.0	3.0		
260	259	493	253.5	5.2	3.2	3.2	3.6	3.6
259	258	494	252.5	5.2	3.4	3.4	3.7	3.7
258	257	496	251.4	5.2	3.7	3.7	4.1	4.1
257	256	500	250.2	5.3	4.1	4.1	4.5	4.5
257	255	487	250.2	5.1	4.0	4.0	4.4	4.4

NPD Form 7G
Sept. 1963
Bond - Tab Column

Army-Port. Dist. Orig.

Incl. 13

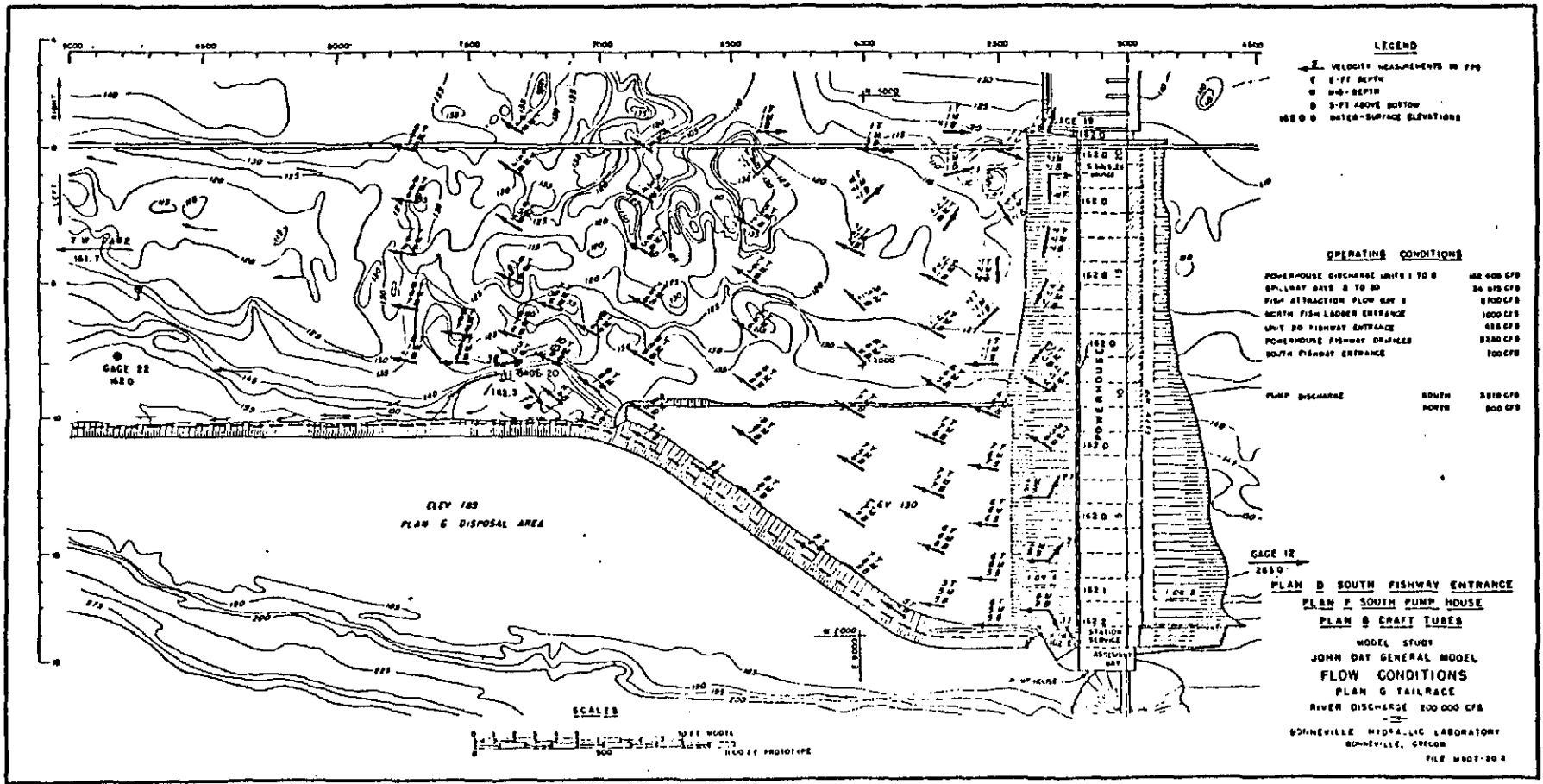
Incl 14



A-24

1 incl 15

A-25



LEGEND

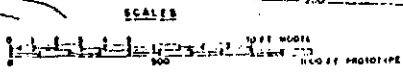
- VELOCITY MEASUREMENTS IN FPS
- 2-FT DEPTH
- 3-FT DEPTH
- 5-FT ABOVE BOTTOM
- ○ ○ WATER-SURFACE ELEVATIONS

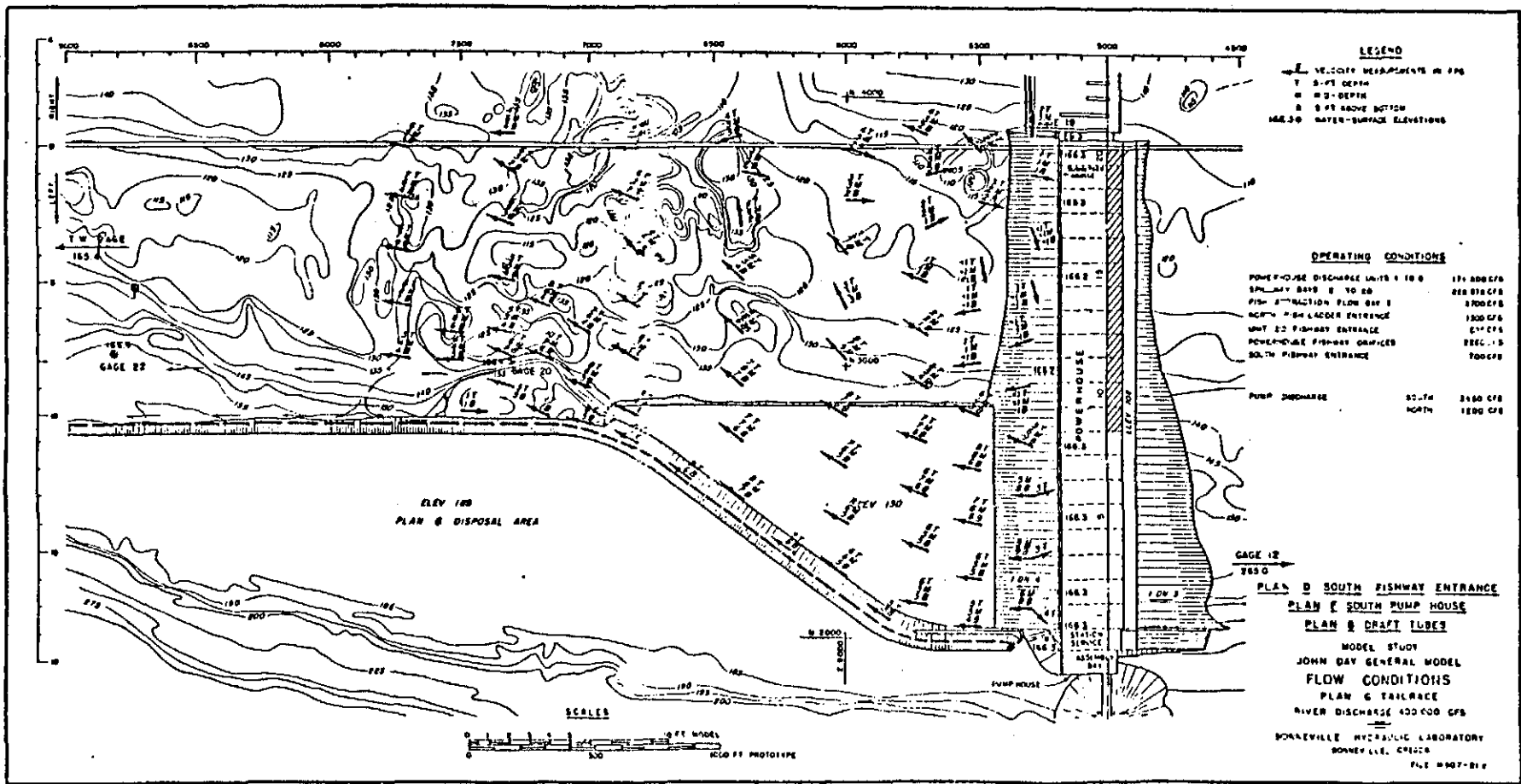
OPERATING CONDITIONS

POWERHOUSE DISCHARGE UNITS 1 TO 8	486,000 CFS
SPURWAY BAYS 2 TO 30	24,000 CFS
FISH ATTRACTION FLOW GUY 1	2,700 CFS
NORTH FISH LADDER ENTRANCE	1,800 CFS
UNIT 20 FISHWAY ENTRANCE	418 CFS
POWERHOUSE FISHWAY ENTRANCES	2,200 CFS
SOUTH FISHWAY ENTRANCE	700 CFS
PUMP DISCHARGE	
SOUTH	2,910 CFS
NORTH	800 CFS

- GAGE 12 285.0
- PLAN D SOUTH FISHWAY ENTRANCE
- PLAN E SOUTH PUMP HOUSE
- PLAN G CRAFT TUBES

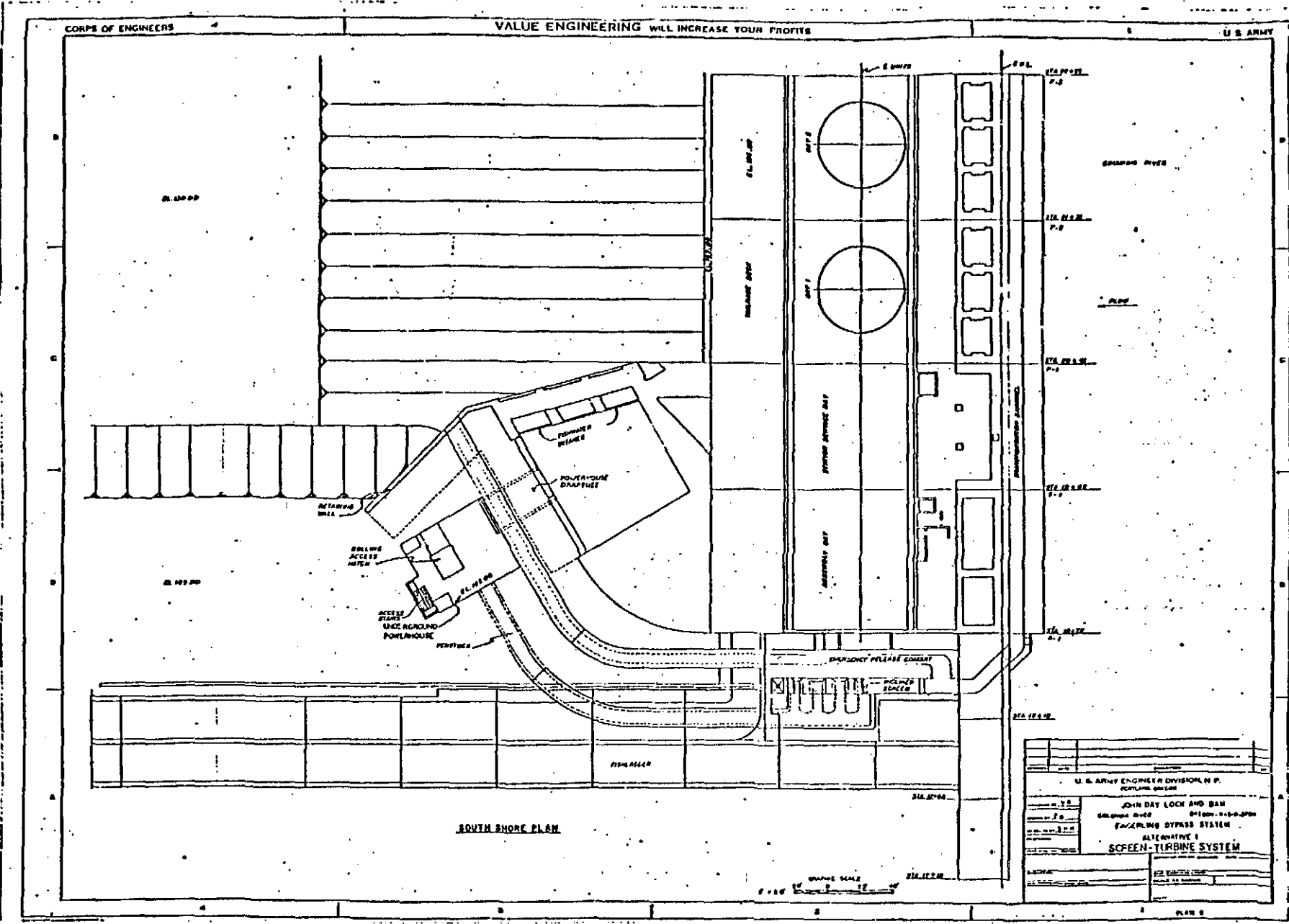
MODEL STUDY
 JOHN DAY GENERAL MODEL
FLOW CONDITIONS
 PLAN G TAILRACE
 RIVER DISCHARGE 200,000 CFS
 CHENEVILLE HYDRAULIC LABORATORY
 CHENEVILLE, OREGON
 FILE 11007-204





Incl 17

A-27



Incl 18

A-28

OTHER FLOAT DESIGN HPS HPS ADV
MEMO. REVIEW P & B REVIEW AWARD CONST
RIP

JOHN DAY FINGERLING BYPASS SYSTEM - DESIGN AND CONSTRUCTION SCHEDULE

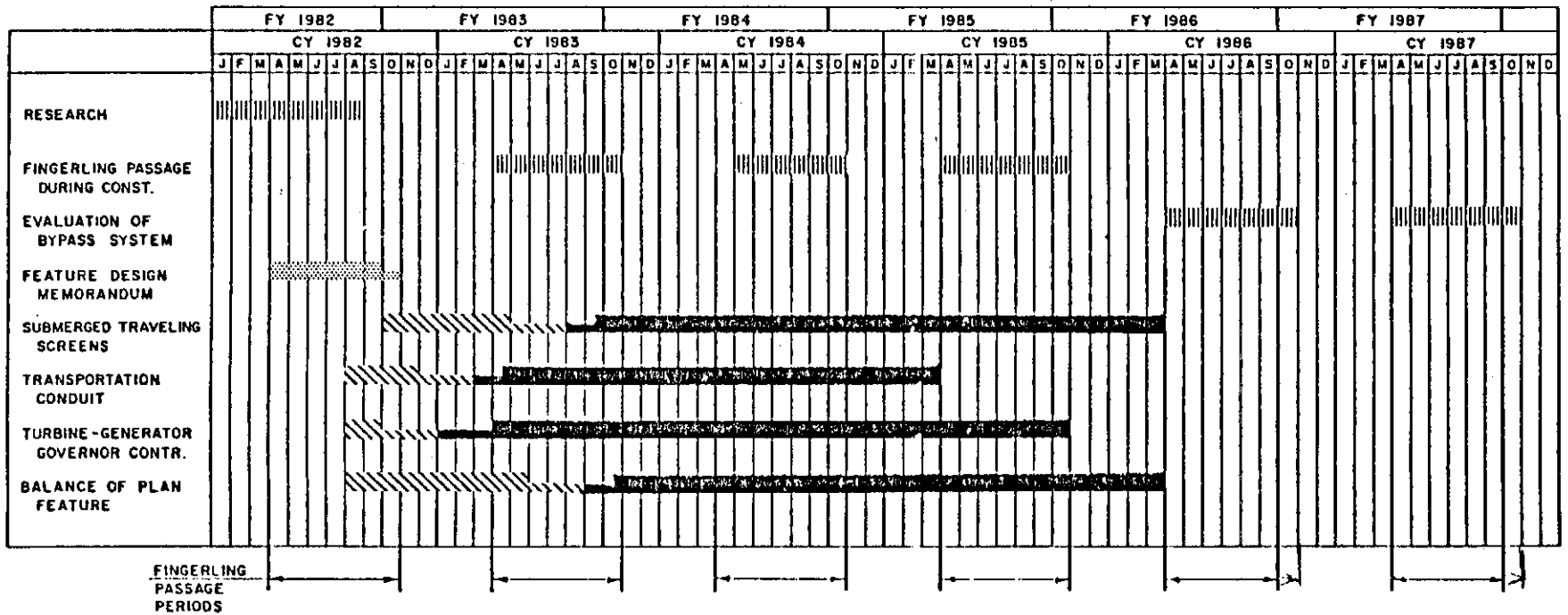
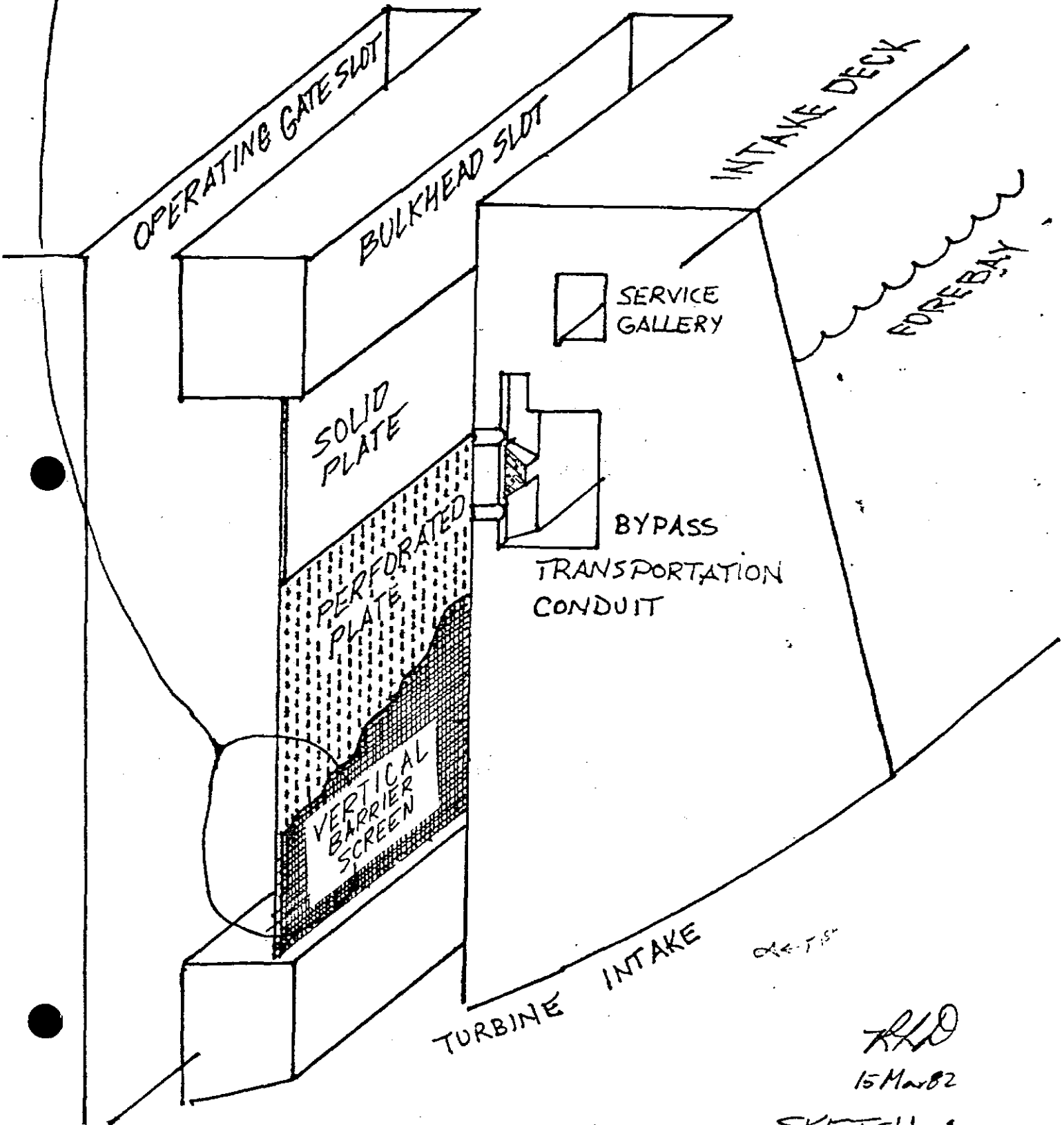


FIGURE 7-1

BALANCED FLOW-VERTICAL BARRIER SCREEN

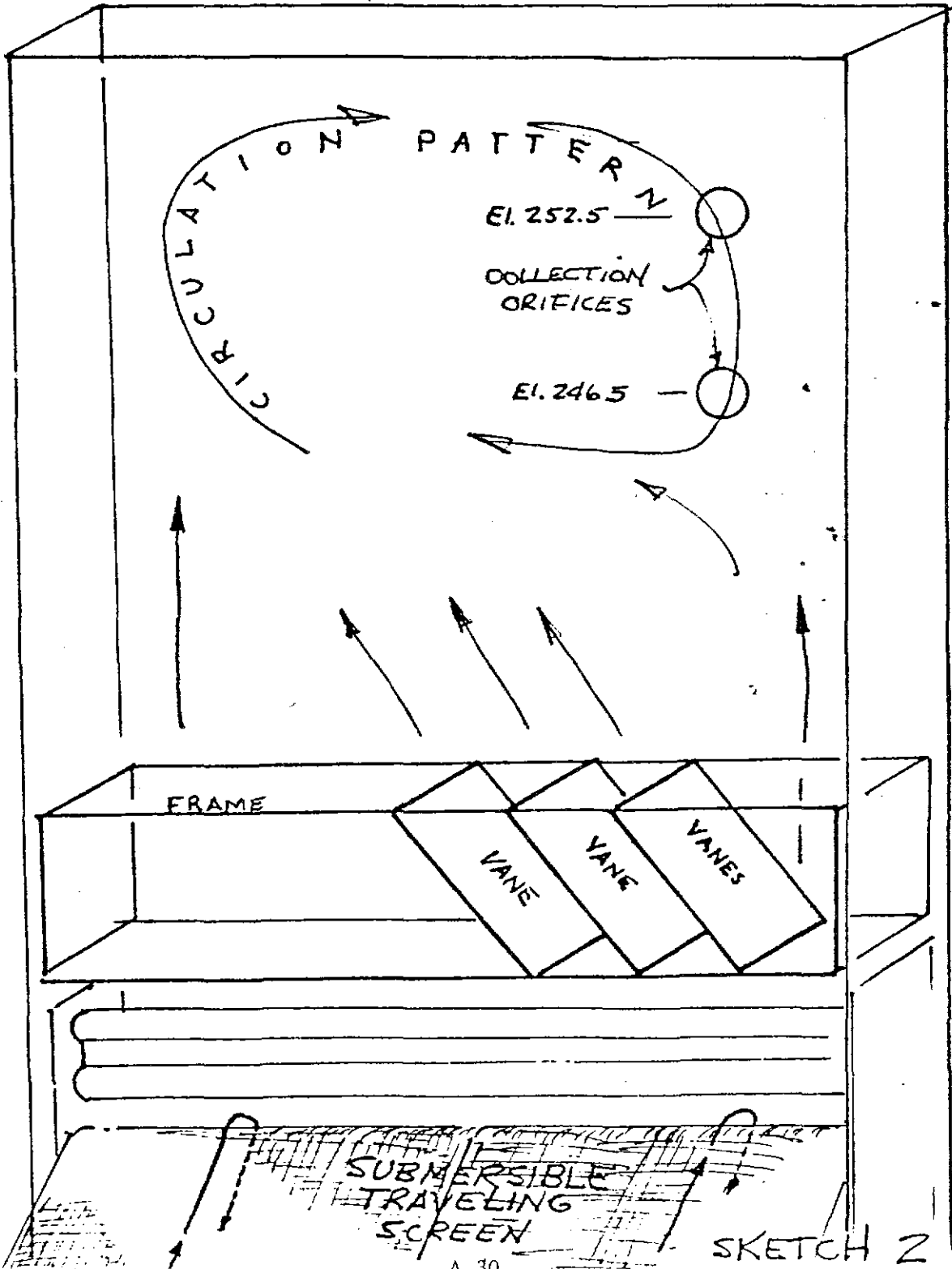


Incl 19

RHD
15 Mar 82
SKETCH 1

EFFECT of VANES on the Circulation Patterns in the Bulkhead Slot

BULKHEAD SLOT



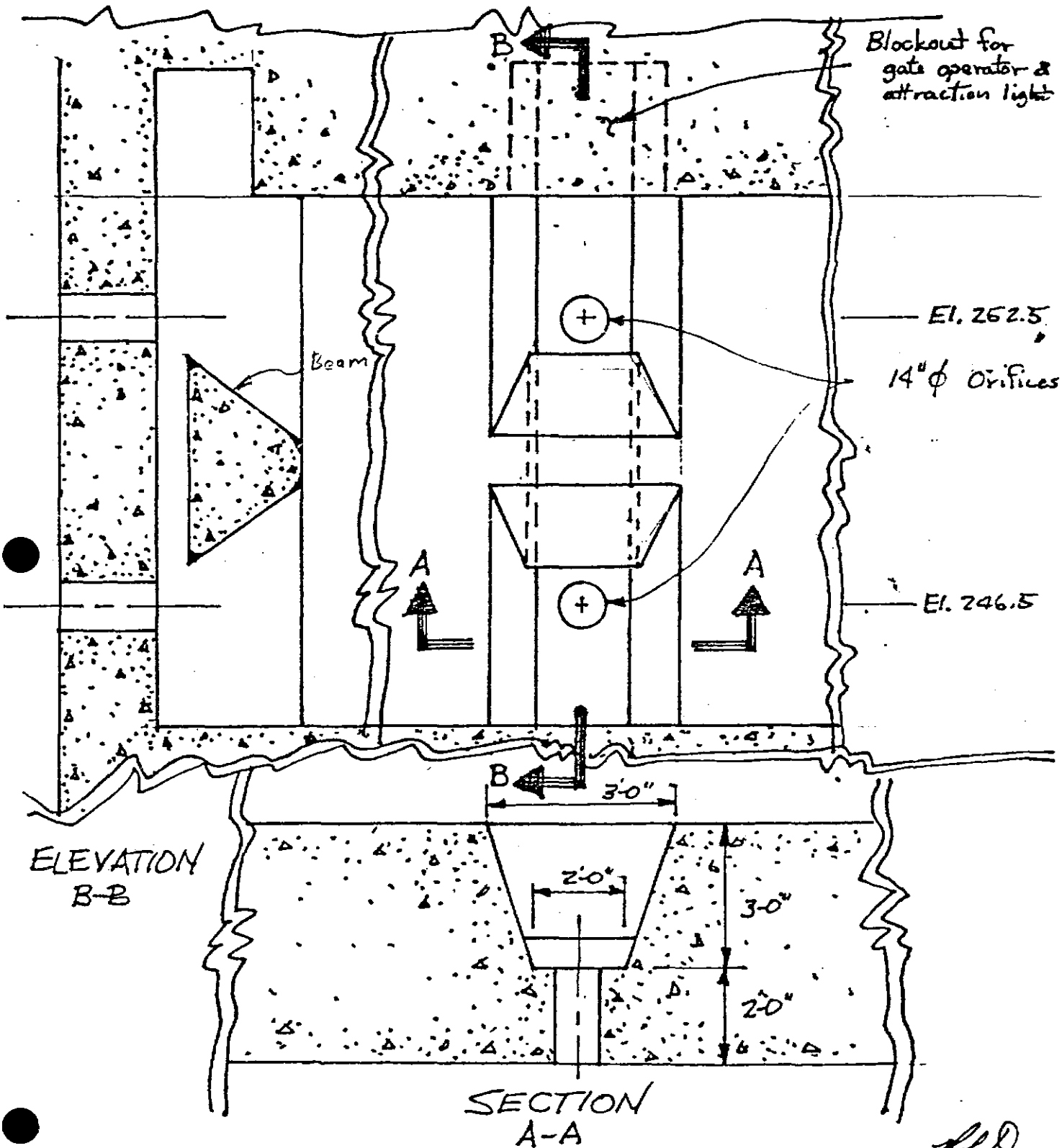
Ind 20

A-30

SKETCH 2

RLB
15 Mar 82

STRUCTURAL BEAM between orifices

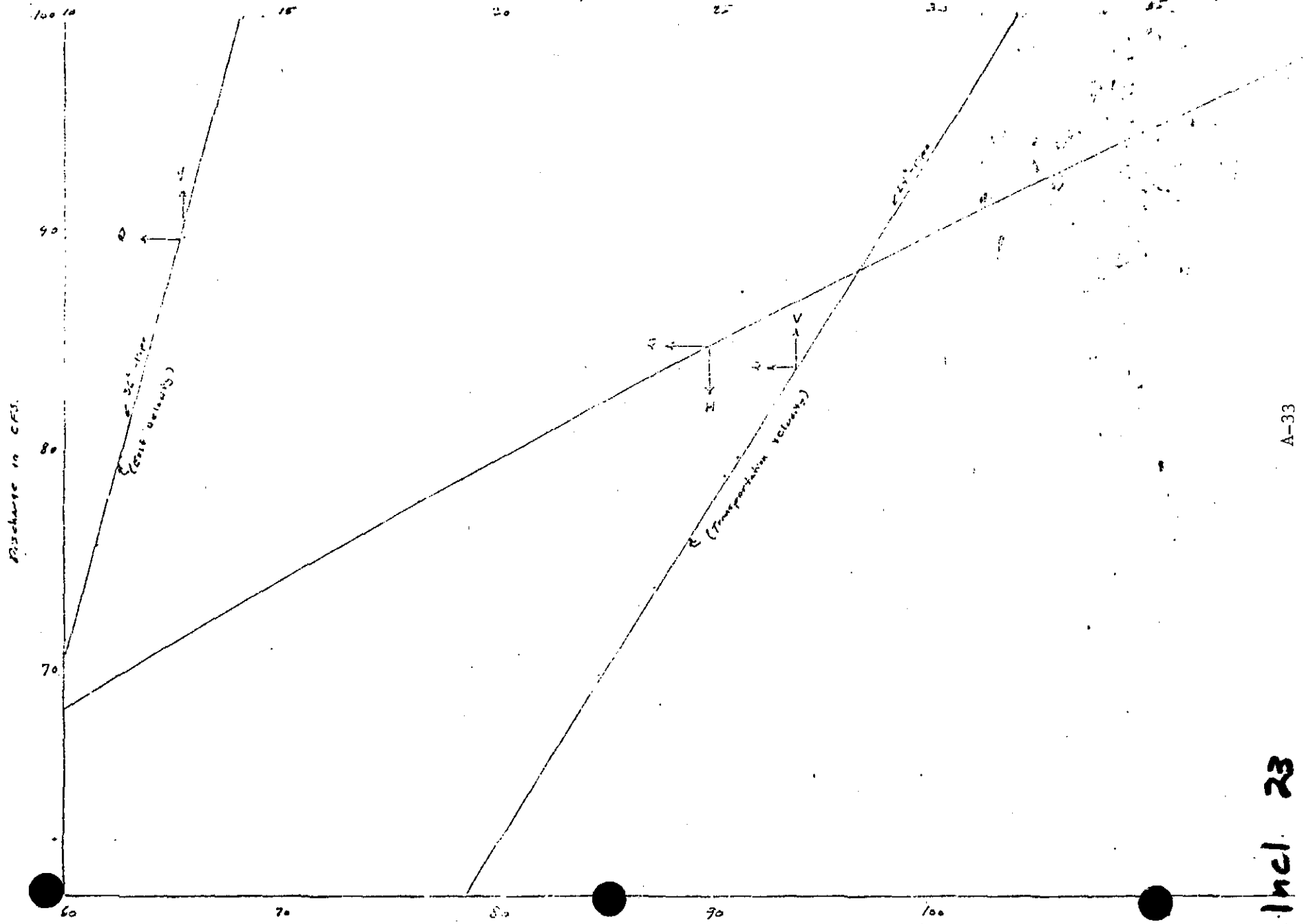


RLD
15 Mar 82

SKETCH 3

PROJECT Iron Pipe DISTANCE 1000 ft DRAINAGE 1000 ft
 SUBJECT Cutful Pipe Operation

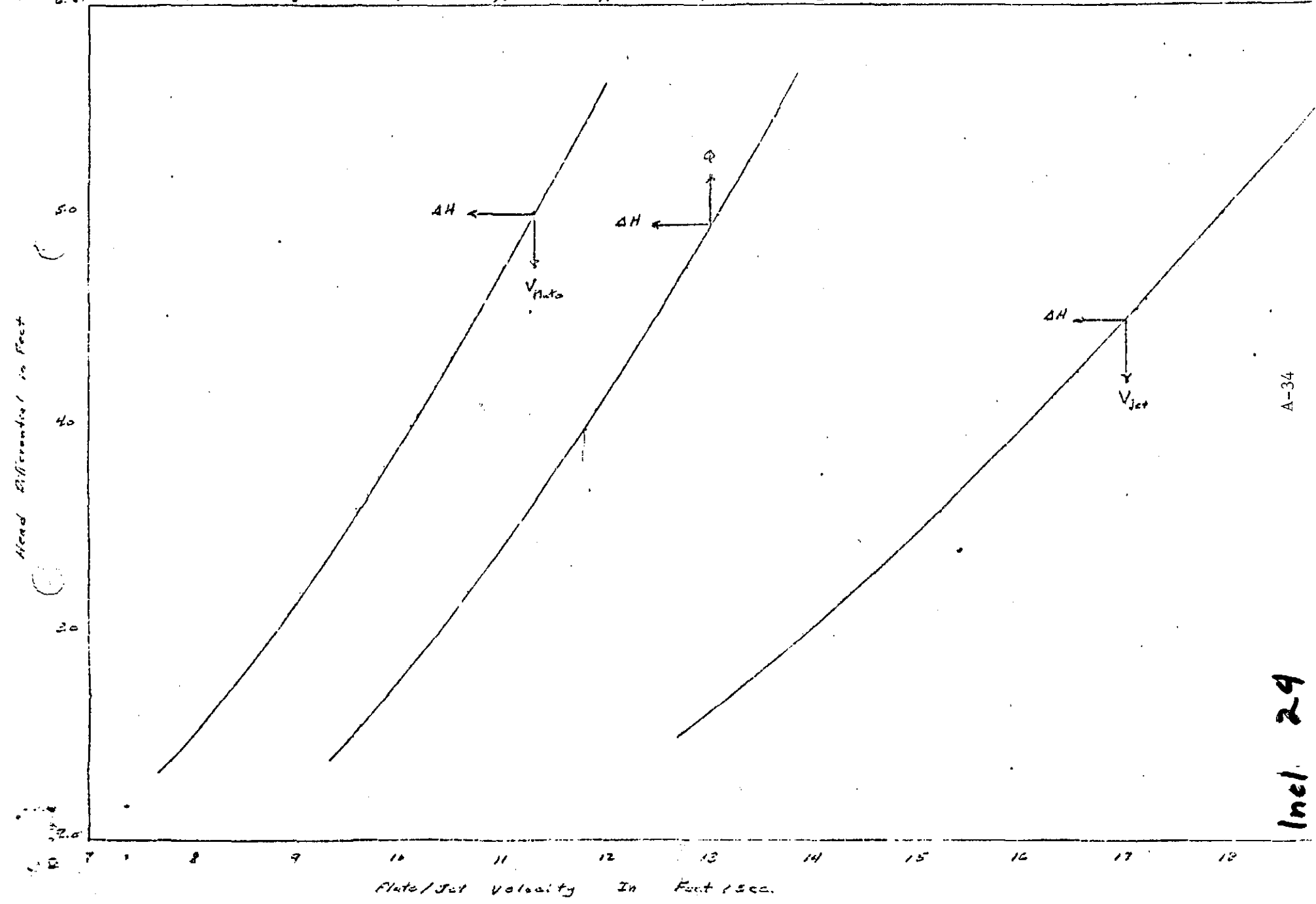
BY R.L.W. DATE 10/24/52 CHECKED _____ PART _____ PAGE 20 OFFICE VELOCITY no. 25



SUBJECT John Day Dam

SUBJECT 14" Orifice Characteristics

DRAWN G.O. DATE 9/26/82 CHECKED R.L.W. PART 7 PAGE 8 OF Discharge in C.F.S. 10 11 12 13



A-34

Incl. 29



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
(503) 230-5400

April 28, 1982

F/NWR5:ROP

Mr. Patrick J. Keough
Acting Chief, Engineering Div.
Portland District
Corps of Engineers
P. O. Box 2946
Portland, OR 97208

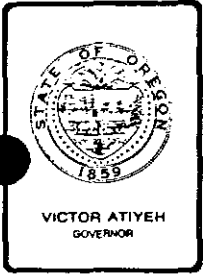
Dear Mr. Keough:

The minutes of the March 10, 1982 coordination meeting of the Lower Columbia Fish Passage Subcommittee provided by your April 21, 1982 letter have been reviewed. The minutes adequately document the meeting.

Sincerely,

Robert O. Pearce
Hydraulic Engineer





Department of Fish and Wildlife

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

May 3, 1982

Patrick J. Keough
Acting Chief, Engineering Division
Portland District
Corps of Engineers
P.O. Box 2946
Portland, OR 97208

RE: John Day Dam Juvenile Bypass System

I have reviewed the minutes of the March 10, 1982 coordination meeting of the Lower Columbia Fish Passage Subcommittee transmitted to us by your letter of April 21, 1982. The minutes seem to reflect the items discussed at the meeting. The minutes are approved.

Regarding the release of the discharge water from the small hydro, I recommend the discharge be so located as not to create a false attraction to upstream migrating fish that are seeking passage over the dam. I suggest the water be discharged either into the auxiliary water supply conduit system or into the auxiliary water intake pond located on the tailrace deck.

Regarding gatewell dipping during construction period, I strongly suggest that gatewell vertical barrier screens be installed prior to or early in the construction schedule so that a more efficient gatewell dipping operation is achieved during the construction period than with the older butterfly net type.

Sincerely,

Burt Carnegie
Hydraulic Engineer

BC:ls

Lower Columbia River Fish Passage
Sub Committee Meeting
7 June 1982

The Main purpose of the meeting was to brief the committee on NMFS findings on orifice location and balanced flow barrier screen research as they relate to the fingerling bypass being designed for John Day Dam. The following personnel attended:

Dick Duncan	NPPPL-FW
Paul Handy	FWS
Dale Schoeneman	FWS
Burt Carnegie	ODFW
Gary Johnson	NPPPO
Dick Krcma	NMFS-Pasco
Dick Waits	NPP-DB
Russell Davidson	NPPPL-AP
Rick Mettler	NPPEN-DB-M
John Williams	NPPPL-FW
Win Farr	NMFS-Seattle
Norman Tolonen	NPPEN-C
Don Wilson	NPPEN-DB-SA
Bob Pearce	NMFS-Portland
Cliff Long	NMFS Seattle

Results of NMFS orifice location and balanced flow vertical barrier screen test were presented by Dick Krcma. These tests which were conducted at McNary Dam were designed to determine the effect of balanced flow vertical barrier screens on fish guidance efficiency and the depth of orifice submergence on fish passage efficiency. The inclosed graphs demonstrate the test results.

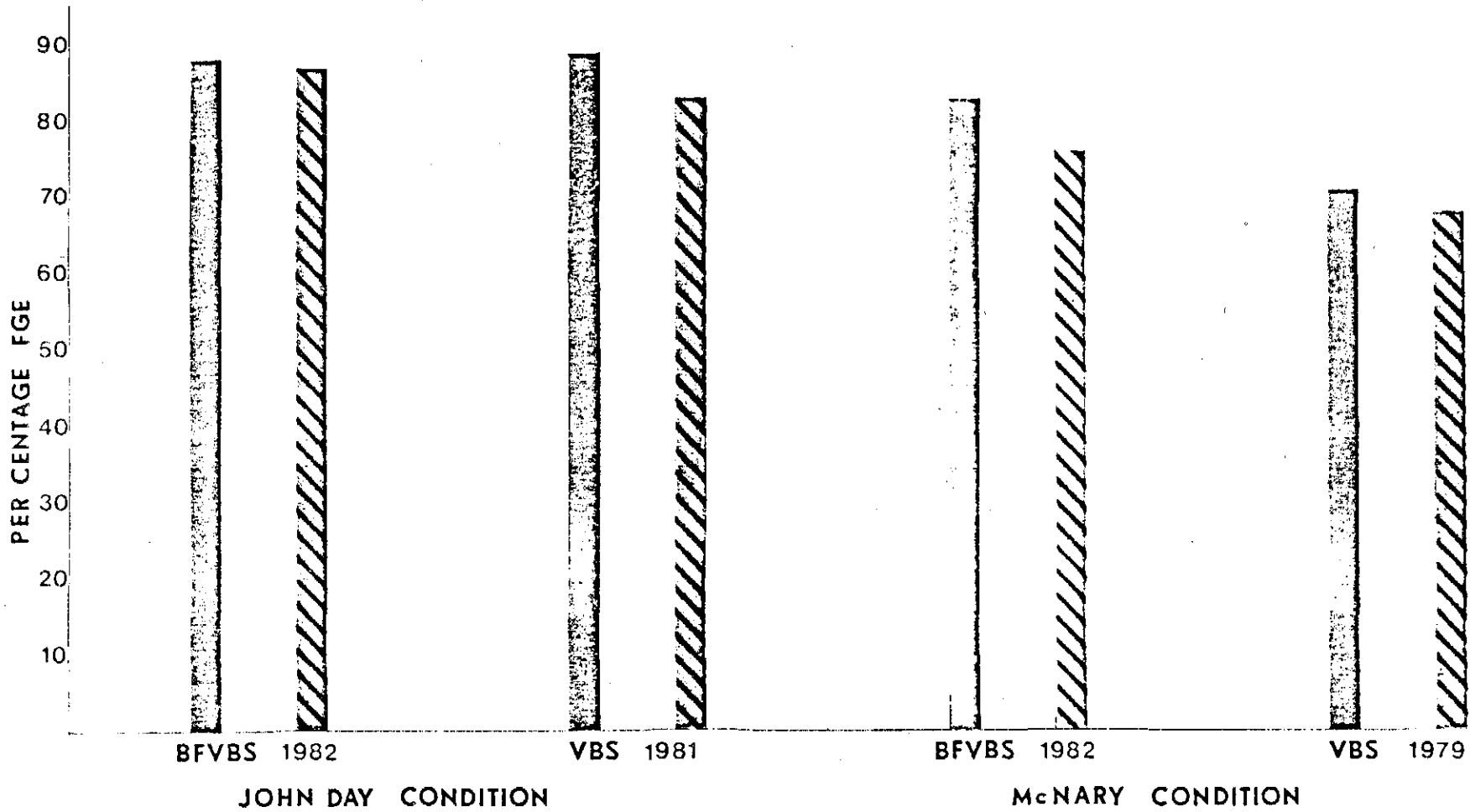
Russ Davidson asked of conclusions drawn from the work could be summarized. Dick Krcma felt we could make the following statements.

- a. Deep orifice submergence is more effective than shallow submergence (less than 17').
- b. No significant increase in descaling or injury rate was detected using a 24 hr test period.
- c. Optimum orifice location horizontally differs for each gatewell.
- d. Solid plate appears to be better than perforated plate or screen on the upper part of the vertical barrier screen.
- e. The balanced flow vertical barrier screen does not significantly affect fish guidance efficiency.

There was considerable discussion concerning balanced flow vertical barrier screens and debris buildup.

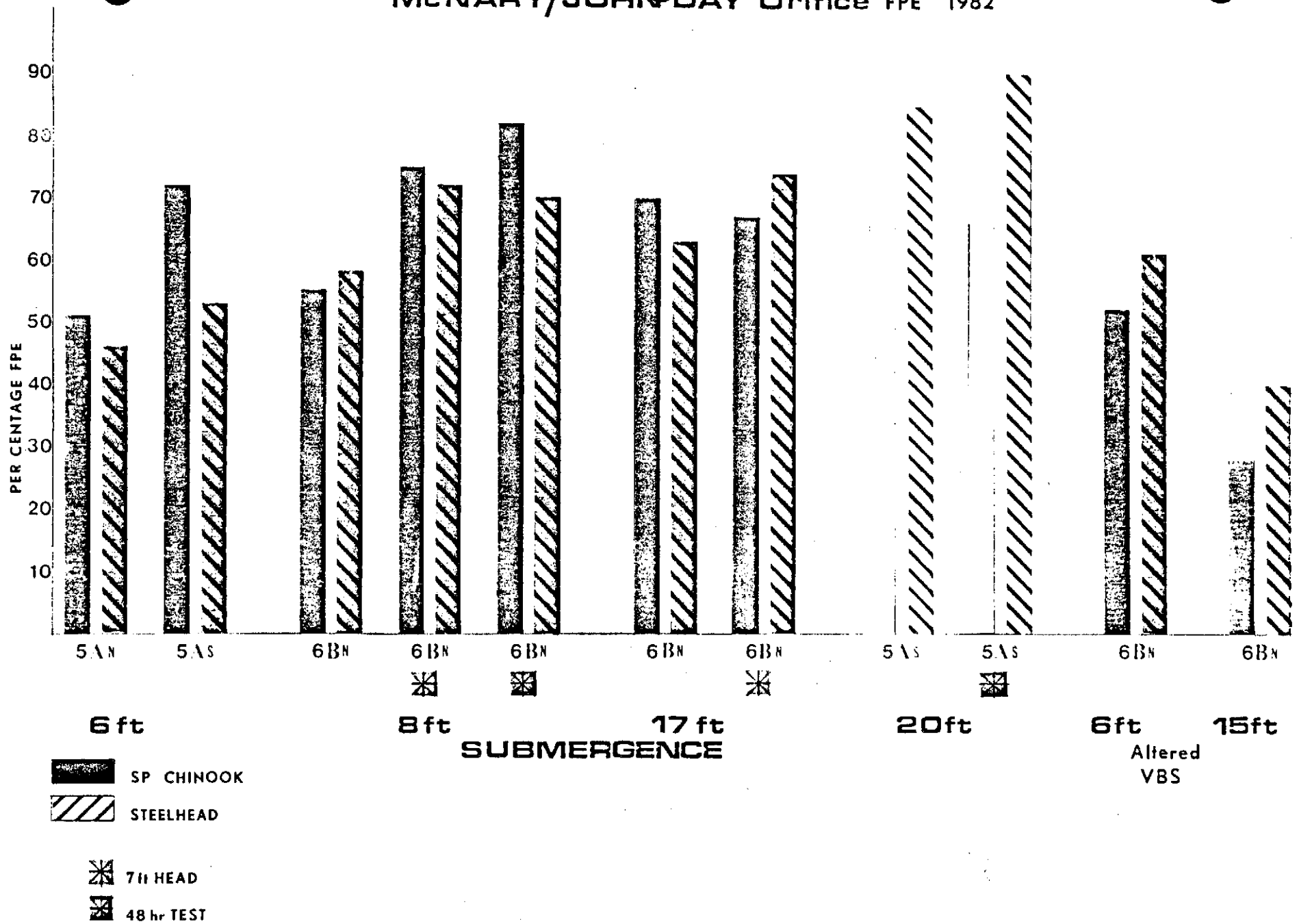
Russ Davidson and Dick Waits presented data on John Day dam forebay levels and orifice submergence. These data showed that 77% of the time during the months of April, May and June an orifice with the center line located at elevation 246.5 would be submerged 17 feet or less. It was the general consensus of the

TRAVELING SCREEN FGE TESTS



SP CHINOOK
STEELHEAD

McNARY/JOHN DAY Orifice FPE 1982



committee that a single orifice would be the simpler system and would probably be effective for passing fingerling throughout the operational range of the John Day Forbay.

Russ Davidson emphasized that we require an immediate decision on 1 vs 2 orifices in order to proceed with the bypass system design.

Paul Handy stated that he felt a final decision on orifice location should be delayed until the passage efficiency for Fall Chinook has been determined.

Releases of Fall Chinook are now taking place above McNary Dam and a determination of fall chinook passage efficiency should be forthcoming. It was generally concluded that a 1 orifice design would be used unless the on-going tests showed differently.

It was the consensus of the committee that we should go ahead with the following information:

1. 14" Ø orifice (SINGLE) - testing to continue.
2. North side of slot for orifice location.
3. Short-tube design (3-ft inset).
4. 7ft. minimum head at south end.

Dick Krcma and John Williams indicated that minimal tests conducted in prior years on mid-columbia river fall chinook showed the efficiency for 90-100 to the pound smolts to be lower than spring chinook smolts.

There was considerable discussion regarding Hydraulics of the orifice.

It was pointed out that the partially submerged orifice jets at Bonneville 2nd Powerhouse downstream migrant system were observed to become solid jets and fill the tube at certain forebay elevations. This indicates operation of the orifice as a short tube resulting in higher discharge.

The John Day Bypass system is designed with the orifices to operating submerged. Thus design will most likely cause the orifices to operate as short tubes.

Adopting this approach to the design is a conservative approach which will assure that the most remote meets the minimum criteria. This will also result in a reanalysis of the bypass system.

Bert Carnegie suggested that we discuss fingerling bypass outfalls to take advantage of Cliff Long's presence and experience. A general discussion of outfall location requirements ensued.

Russ Davidson outlined the current thinking on the John Day outfall location as follows:

The large screening structure and associated energy recovery system are thought to be uneconomical and should therefore be eliminated. Consequently the outfall and hydraulic control system are open for reconsideration. The attached sketches illustrate the current options.

Three hydraulic control systems are being considered:

- a) Make-up Water System
- b) Bleed-off water system (fixed screen')
- c) Gate controlled system (under-flow)

Four fish release systems are being considered.

- a) Under Water release
- b) Above water release with solid jet
- c) Above water release with dispersion
- d) Sloping flume release.

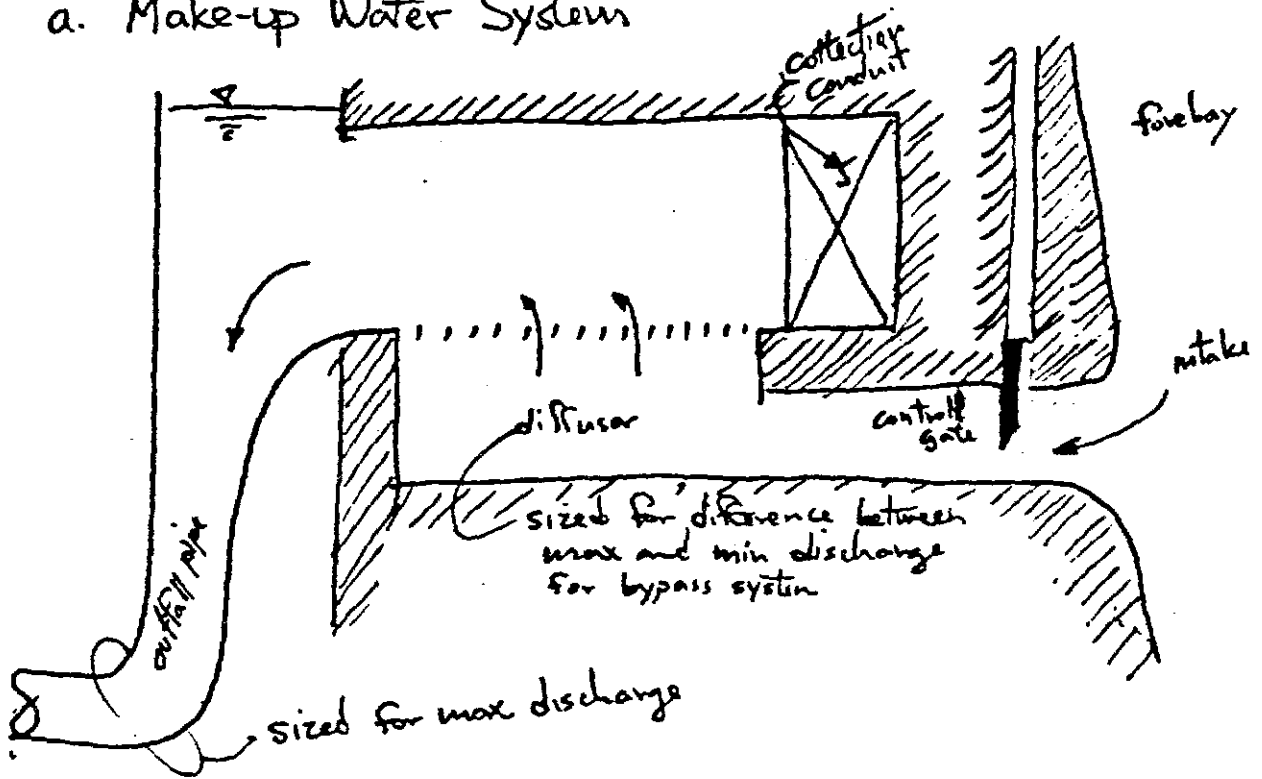
After brief discussion and chalkboard illustrations it was decided to prepare a more detailed layout and, cost estimate, for presentation to the Sub-Committee at a later date.

John Williams asked if there will be a need to consider using the Bonneville 1st Powerhouse downstream migrant bypass for smolt indexing. He requested that the fishery agencies consider the need for juvenile indexing facilities and inform the district when a position has been established.

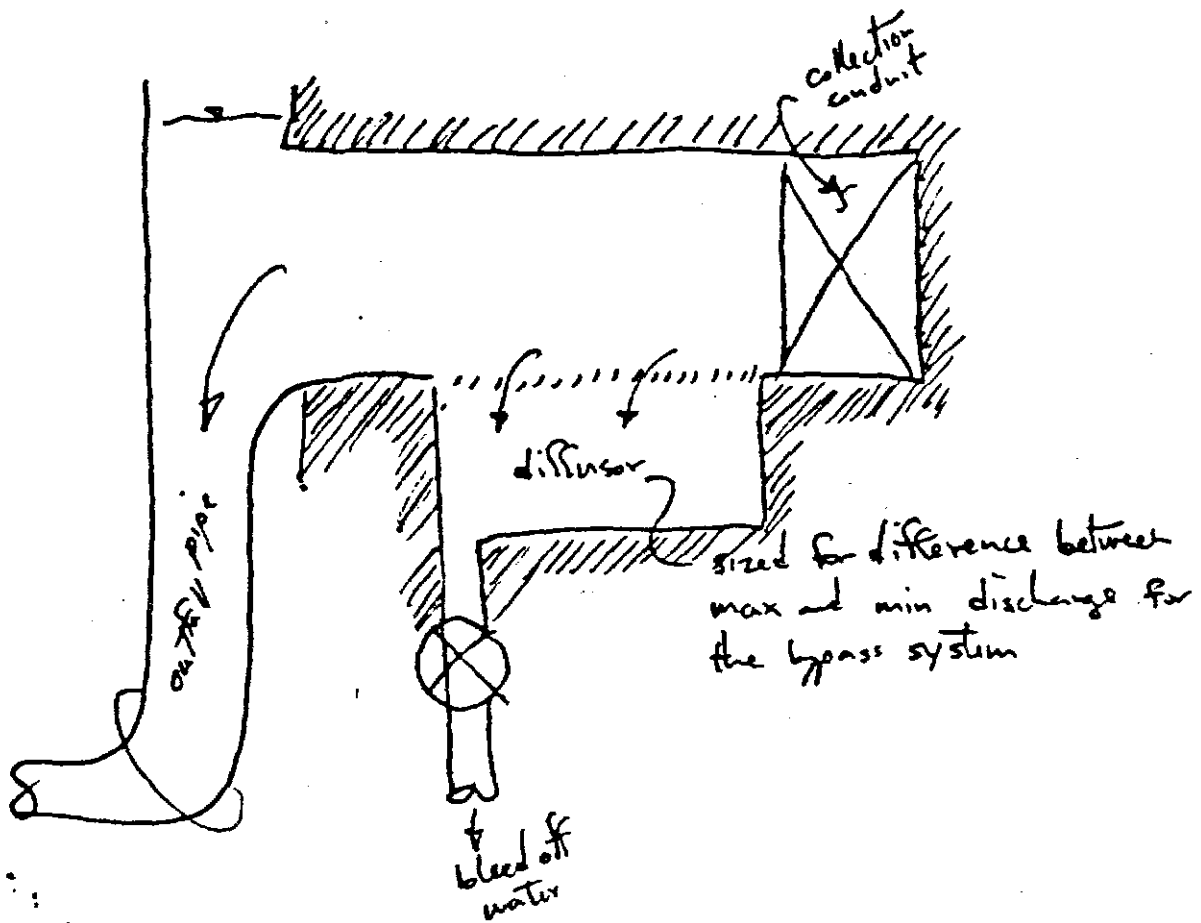
It was suggested that the Sub-Committee meet on the first Tuesday of each month subject to need. If required, meetings will be held to address critical problems. The meeting was adjourned at 1200.

HYDRAULIC CONTROL SYSTEMS

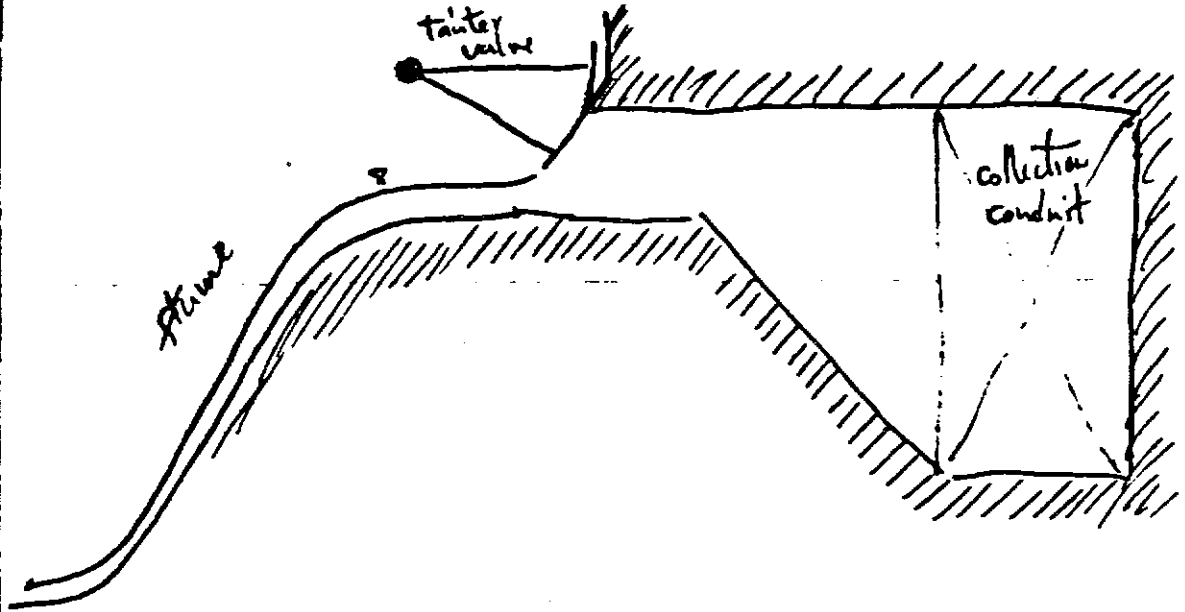
a. Make-up Water System



b. Bleed-off Water System

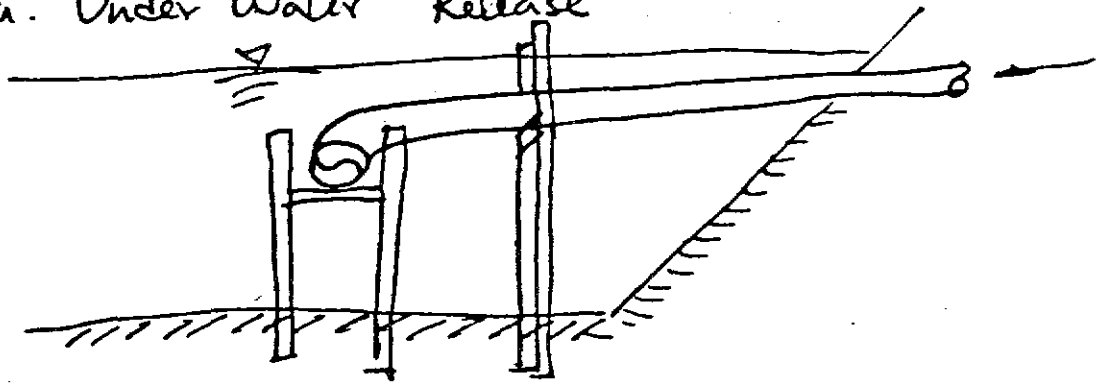


c. Gate Controlled System

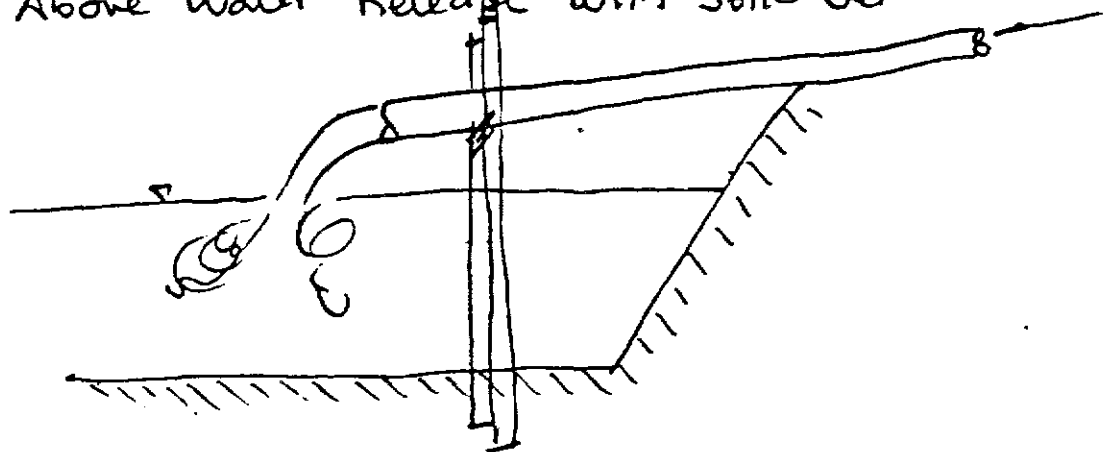


FISH RELEASE SYSTEMS

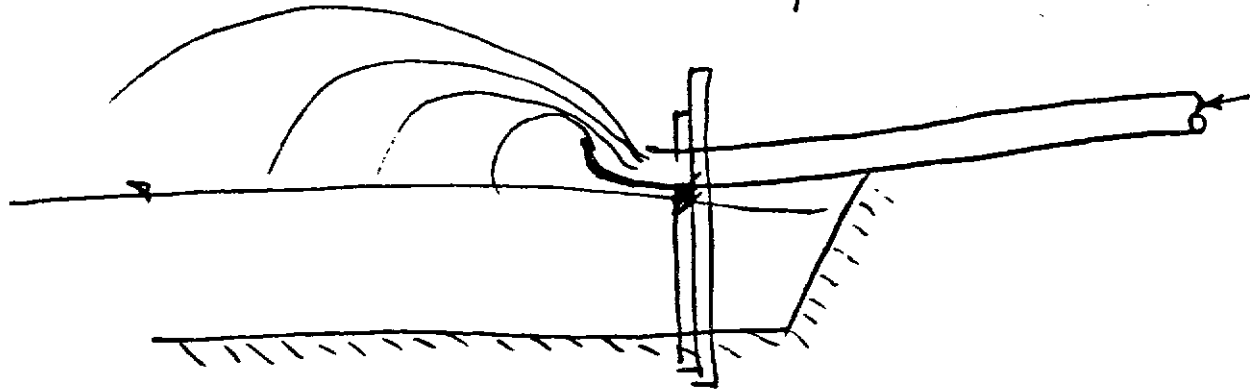
a. Under Water Release



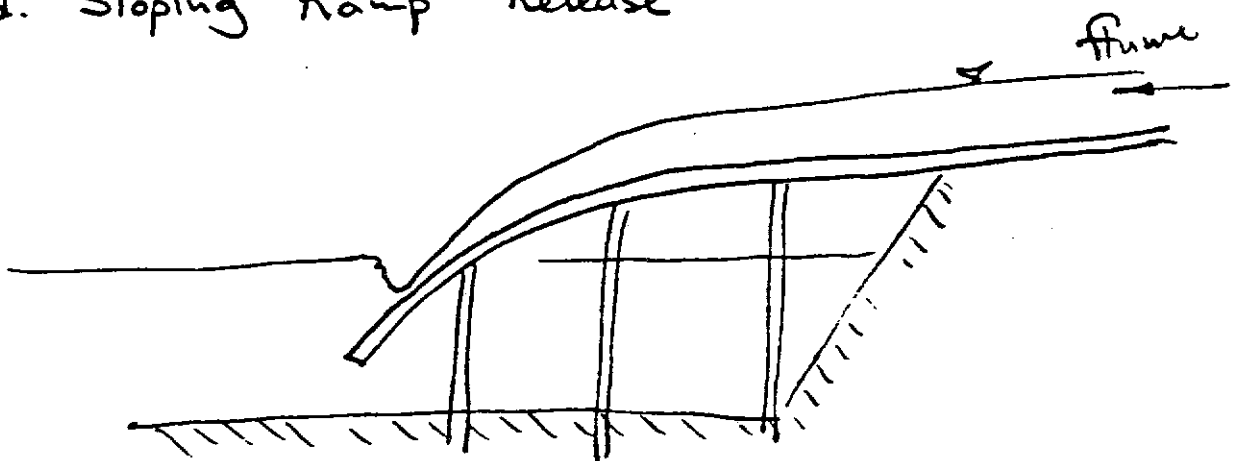
b. Above Water Release with Solid Jet



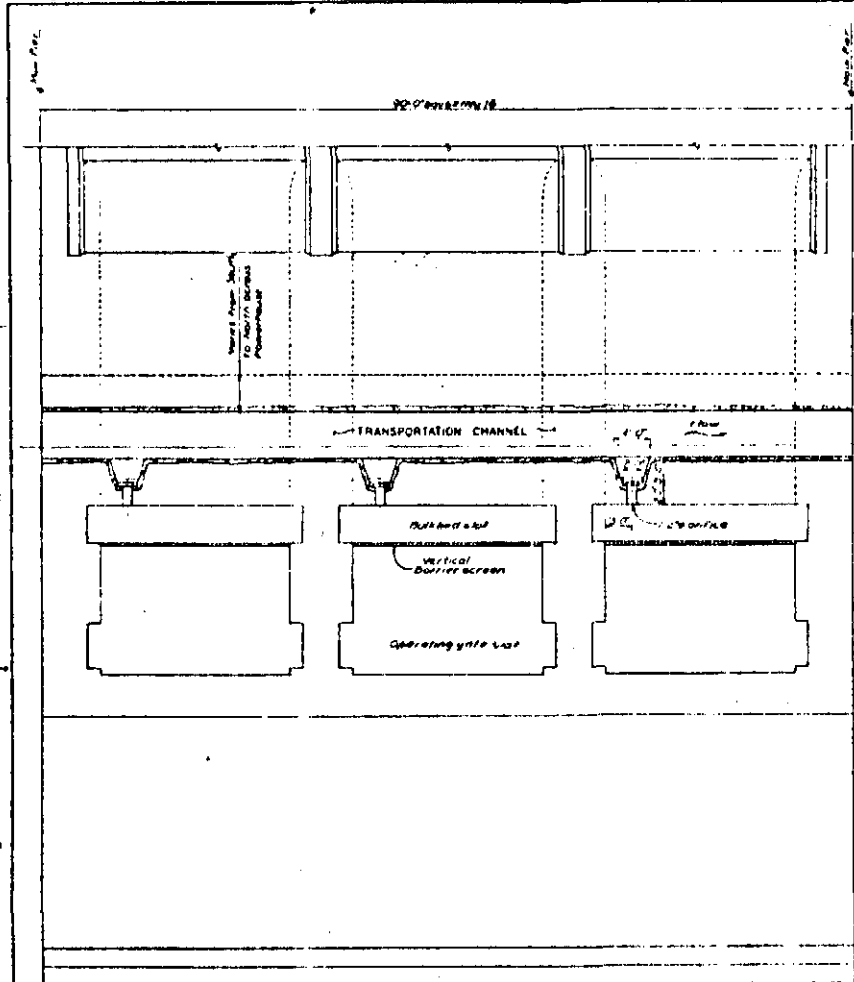
c. Above Water Release with Dispersion



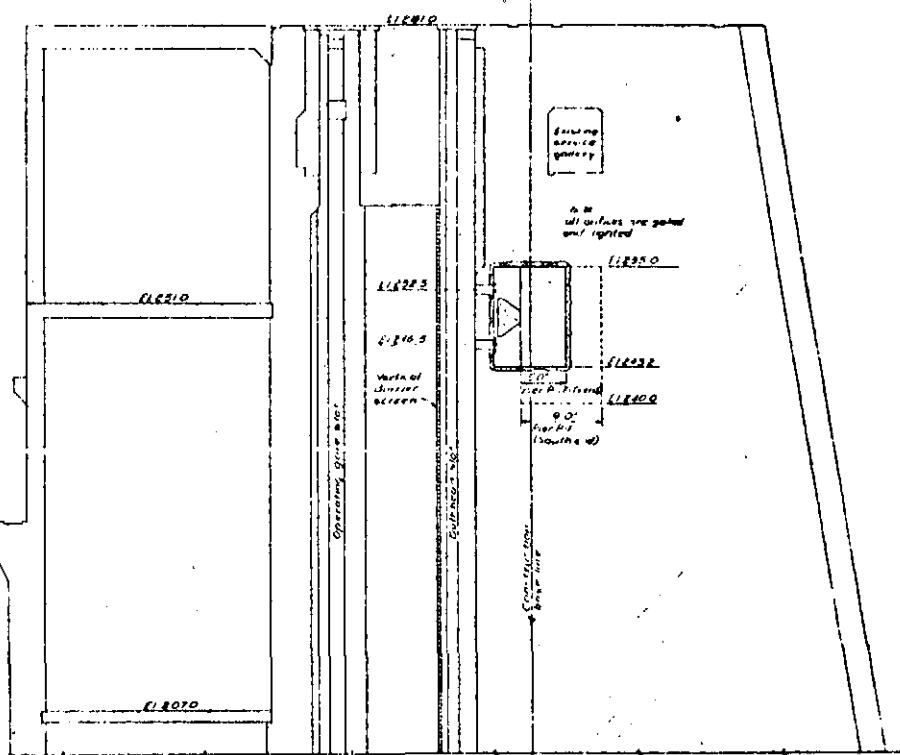
d. Sloping Ramp Release



A-46





TYPICAL PLAN, EL 222.3
SCALE 3/16"=1'-0"



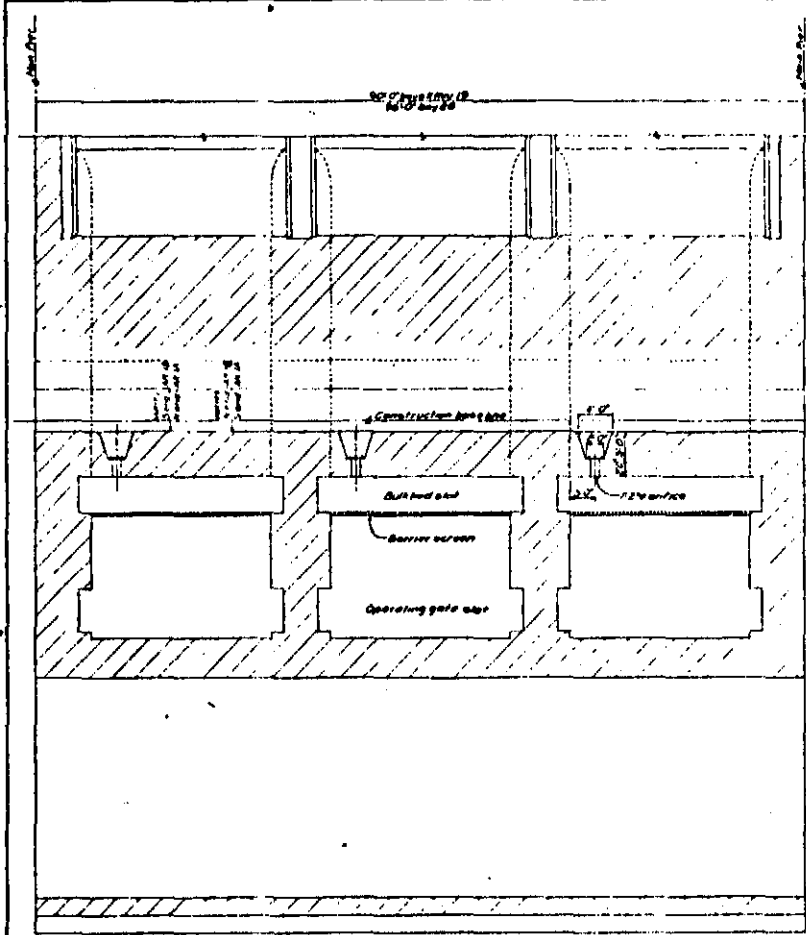
UPPER PH INTAKE
TYPICAL SECTION
SCALE 3/16"=1'-0"

JOHN DAY LOCK AND DAM
POWERHOUSE

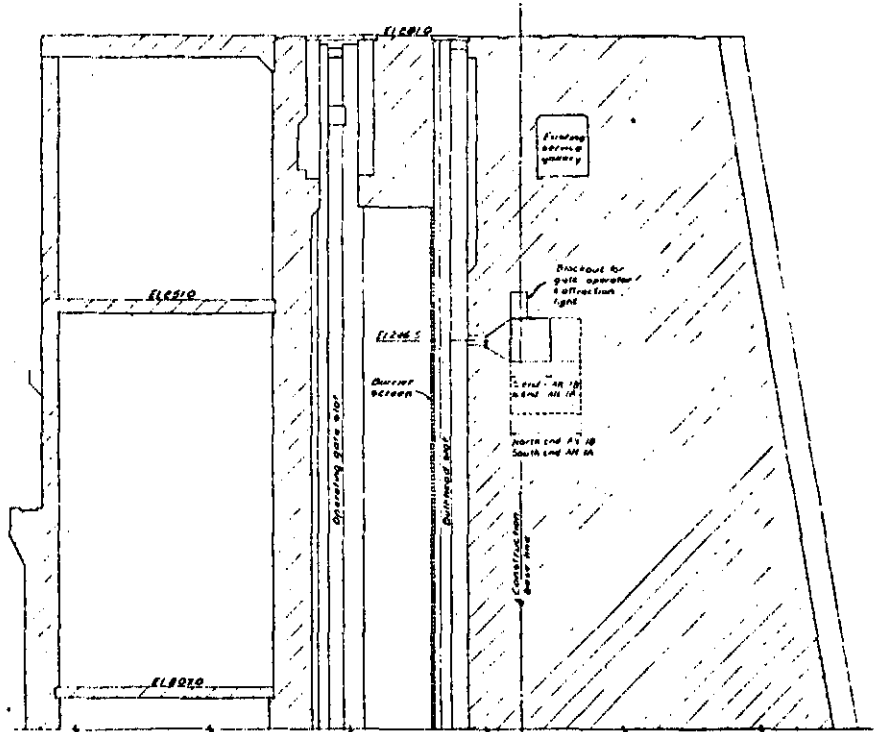
-  Indicate existing structure in section
-  Indicate new concept in section

U. S. ARMY ENGINEER DISTRICT, PORTLAND	
JOHN DAY LOCK AND DAM	
COLUMBIA RIVER	OREGON-WASHINGTON
FINGERLING BYPASS SYSTEM	
ALTERNATIVE 1, IA & IB	

A-47



TYPICAL PLAN-EL 251.0
SCALE 3/16"=1'-0"



UPPER PH INTAKE
TYPICAL SECTION
SCALE 3/16"=1'-0"

JOHN DAY LOCK AND DAM
POWERHOUSE

U. S. ARMY ENGINEER DISTRICT, PORTLAND	
JOHN DAY LOCK AND DAM	
COLUMBIA RIVER	DRAWN-ASSISTANT
FINGERLING BYPASS SYSTEM	
(SINGLE ORIFICE)	
DATE	SCALE
BY	CHECKED
APP'D	DATE
SHEET NO. B-2	

Eng. DIV. DESIGN BRANCH Hqd. DESIGN SECTION

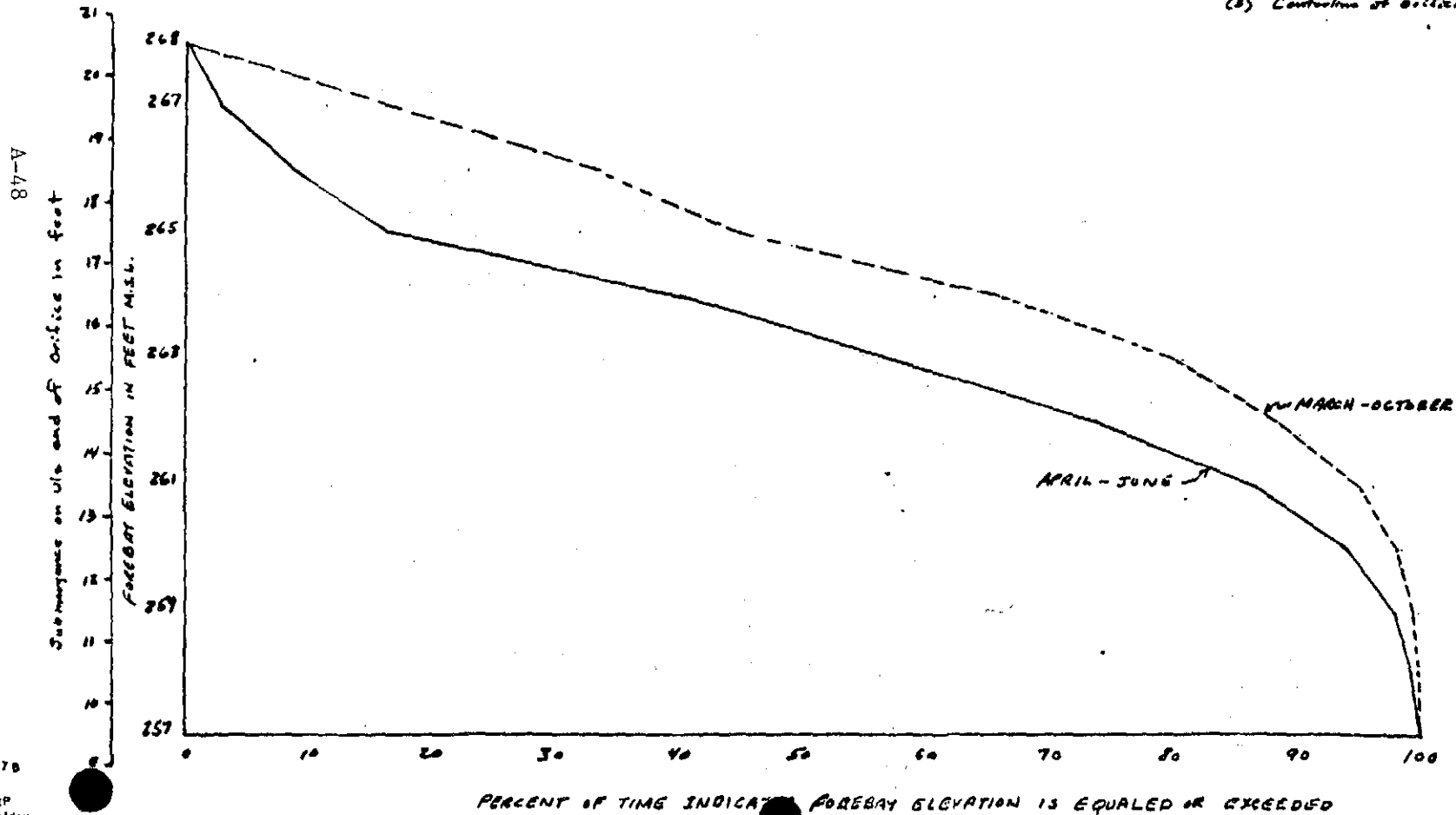
PROJECT John Day DamSUBJECT Average Daily Forebay ElevationBY R.L.W. DATE June 82 CHECKED

PART PAGE OF

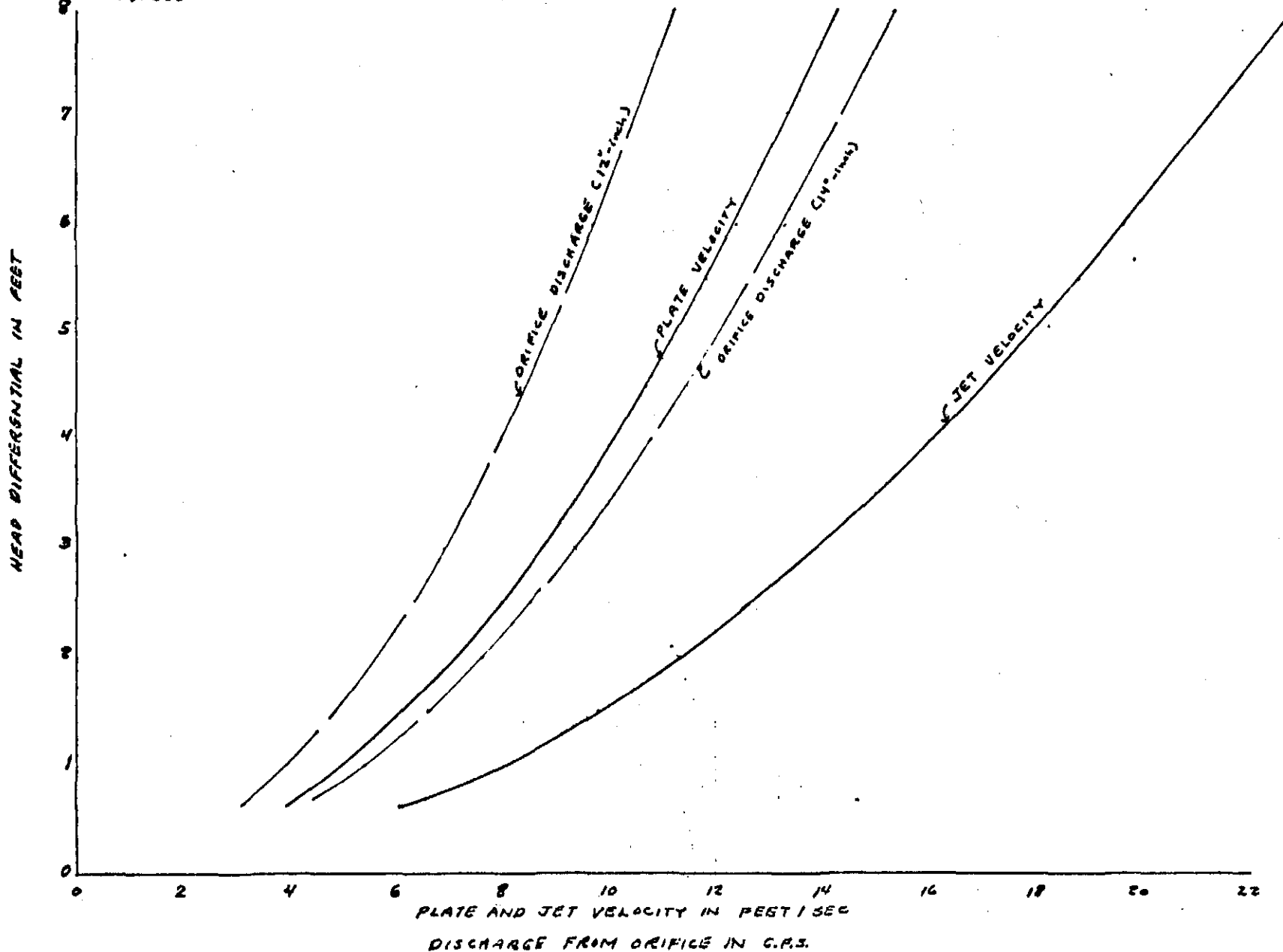
Note: (1) Based on 8-Years of Record;
1974-1981.

(2) Add 1-foot to the submergence
when Unit is off-line and the
Orifice is still open.

(3) Control of orifice @ El. 246.5 ft. msl.



A-49





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
(503) 230-5400

August 13, 1982

F/NWR5:ROP

Mr. Patrick J. Keough
Chief, Planning Division
Portland District Corps of Engineers
P. O. Box 2946
Portland, Oregon 97208

Dear Mr. Keough:

We have reviewed the minutes of the June 7, 1982 meeting of the Lower Columbia River Fish Passage Subcommittee provided by your August 9, 1982 letter.

The statement attributed to Dick Krcma on page 1 of the minutes have been reviewed with him and should be corrected as follows:

- a. Deep orifice submergence (17 feet or more) is more effective than shallow submergence (8 feet or less).
- b. No significant increase in descaling or injury rate was detected using a test period of more than 24 hours.
- c. Optimum orifice location horizontally is not the same for all gatewells.
- d. Solid plate appears to be better than standard screen for the portion of the barrier above the perforated plate vertical barrier screen.

Item 4 on page 2 notes a 7-foot minimum head for the orifice at the south end of the powerhouse. It was my understanding the discussion concerned a maximum head condition, not minimum. The fisheries agencies recommended an additional design criterion not noted in the minutes, that is the velocity from the short tube should not exceed 16 fps.

The opportunity to review and comment on the minutes is appreciated.

Sincerely,

Robert O. Pearce
Hydraulic Engineer
Fish Facilities Section

cc: Dick Krcma
CZES, Pasco, WA



JOHN DAY JUVENILE BYPASS SYSTEM
MINUTES OF A COORDINATION
MEETING WITH THE LOWER
COLUMBIA FISH PASSAGE
SUBCOMMITTEE

7 October 1982

1. The purpose of the meeting was to inform the Lower Columbia Fish Passage Subcommittee (LCFPS) members of the latest plan for the John Day Powerhouse Juvenile Bypass System and to obtain their input prior to the development of detailed designs. The following personnel attended:

Dale Schoeneman, U.S. Fish and Wildlife Service
Bob Pearce, National Marine Fisheries Service
Burt Carnegie, Oregon Department of Fish & Wildlife
Dick Krcma, National Marine Fisheries Service
Win Farr, National Marine Fisheries Service
Cliff Long, National Marine Fisheries Service
Pete Tervooren, Corps of Engineers
Mel Taylor, Corps of Engineers
Norm Tolonen, Corps of Engineers
Dick Duncan, Corps of Engineers
George Homes, Corps of Engineers
John Williams, Corps of Engineers
Dick Waits, Corps of Engineers
Jack Larson, Corps of Engineers
Gary Johnson, Corps of Engineers
Dave Illias, Corps of Engineers

The meeting was held in conjunction with a meeting on Bonneville First Powerhouse Juvenile Bypass System.

2. Dave Illias provided participants with the following 10 handouts.

- 1 - Agenda
- 2 - Layout of bypass system
- 3 - Engineering & construction schedule
- 4 - Layout of transportation conduit
- 5 - 7 Layouts of open channel outfall
- 8 - 10 Layouts of alternative outfalls

Dick Waits provided participants with the following 16 hydraulic handouts:

HYA-C Index
HY -1 Transportation Channel
HY -2 Transportation Channel Hydraulic Data
HY -3 14" Orifice Information
HY -4 Orifice Submergence & Forebay Information
HY -5 Hydraulic Information From Tainter Gate to Station 6+80
HY -6 Tailwater Ent. Velocity Conditions - 165.0 Invert
HY -7 Flume Alignment A - 160 Invert
HY -8 Flume Alignment B - 160 Invert
HY -9 Evaluator Take Off Area

HY -10 Preliminary Layout of Evaluator Take Off
HY -11 Screening Scheme for Evaluator
HY -12 Channel Vel. after Jump
HY -13 Outfall Chute - "A" Alignment

The handouts are attached to the minutes.

3. For a general overview, Dave noted the Corps is proceeding with a STS - transportation conduit bypass as recommended in the General Letter Report, dated April 1982. Changes that have taken place are the exclusion of the screening/powerhouse facility (Energy Recovery System, ERS) and replacement of the outfall pipeline with a rectangular outfall chute. The cost of the ERS was over \$10,000,000 and there were questions whether it would prove economically feasible at this time; therefore, it was eliminated in order not to jeopardize the timely completion of the bypass system.

4. Dave presented the new engineering and construction schedule which involves a construction program that provides an operational bypass in generator units 1-10 by April 1985. This will include fabrication and installation of 30 STS's, mining of the transportation conduit through unit 10, and completion of the outfall. The remaining 18 STS's and conduit mining (units 11-16) will be completed by April 1986. Construction will be divided into 5 major contracts. (1) a submerged traveling screen contract, (2) a vertical barrier screen contract, (3) a transportation conduit and outfall contract, (4) a STS crane handling contract, and (5) a STS transportation and maintenance facility contract. In lieu of the feature design memorandum, we are preparing four letter reports to address all the areas of the bypass system - a STS and VBS letter report, a transportation conduit and outfall letter report, a STS handling system letter report, and a STS transportation and maintenance facility letter report.

5. Transportation Conduit. Dave noted the transportation conduit (handout #4) consists of a mined conduit upstream of the bulkhead slot that flows south through generator units 16 to 1, through the station service and assembly bays, and then turns 90° in monolith 14 into the outfall chute. The conduit size varies uniformly from 4.65 feet wide and invert elevation 249 in bay 16 at the north end to 8.25 feet wide and invert elevation 232 in bay 1 at the south end.* Roof elevation is set at 249. From bay 1, the cross section will remain constant through the station service and assembly bays and then transition to a 5 feet wide X 9 ft high cross section at the outfall chute. The orifices consist of an 18" drilled tube with a 14" orifice plate at centerline Elev. 246.5 (one per bulkhead slot). All orifices will be gated and lighted. Gate operation will be automated and the operators will be located in a mined adit connected to the existing service gallery at Elev. 265. Orifice lighting will be supplied by an airfilled light tube similar to the system to be constructed at the Bonneville 1st Powerhouse Bypass System. Burt Carnegie raised concern with algae forming on the lens and the light beam effectively penetrating the tube to the orifice. Other fishery agency subcommittee

* The dimension (4.65 feet wide and invert elevation 249) noted in the minutes are for the conduit at bay 20 if units 17-20 were installed. The conduit dimensions of bay 16 should be 5.38 feet wide and invert elevation 245.56.

members also expressed concerns with this unproven system and concerns with the light tube causing turbulence in the orifice. They suggested considering a light tube (optic tube) with a lens at the orifice that possibly has a method for algae removal from the end of the tube. Dave Illias said he would check into it and coordinate at future meetings.

Dick Waits presented the hydraulic data on the transportation channel, the 14" orifice information, and the orifice submergence and forebay information (shown on handouts HY 2-4). The conduit was sized in units 1 through 16 for a 20 unit powerhouse to provide for conduit extension if units 17-20 are added in the future. The conduit flow varies from a maximum of 695 cfs for 60 orifices operating with 4 units operating (20 unit powerhouse), to 500 cfs for 48 orifices operating with 4 units operating (16 unit powerhouse), to 103 cfs for 12 orifices operating with 4 units operating.

Noting the maximum orifice submergence is 21.5 for forebay elev. 268 and the orifice tests at McNary showed reduced orifice passage efficiency for deeper submergence, Bob Pearce asked if the orifices could be raised. After group discussion on the effects on fish passage and the conduit design, it was agreed to investigate raising the orifice and conduit 4 feet (orifice elev. 250.5).

Dave Illias pointed out that the orifice tube may have to be lengthened from 2 to 3 feet. The reason is because the gate operator in the adit must be directly above the orifice gate and with a 2 feet tube there may not be enough remaining concrete between the bulkhead slot and the adit. Agency personnel had no objection for such a change, if needed.

Dave noted that the Corps is still investigating a water backflush system for orifice cleaning and if it is not feasible, a compressed air system, similar to Bonneville 1st Powerhouse bypass, is still a possibility.

6. Outfall Chute. Dave briefly described the following 4 outfall alternatives that were studied:

- Alternative 1A - An open flow rectangular concrete chute with an alinement that turns just upstream of the BPA turning towers (handout 5).
- Alternative 1B - An open flow rectangular concrete chute with an alinement that passes between the first and second BPA turning tower (handout 8).
- Alternative 2 - An open flow circular steel chute that transitions to a rectangular flume at the exit (handout 9).
- Alternative 3 - A full flow steel pipeline with a make-up water system (handout 10).

Alternative 1A was selected as the best plan based on an evaluation of all the alternatives for cost of construction, hydraulic conditions, value of bypassed water, and the difficulties associated with constructing between the BPA turning towers.

Alternative 1A will consist of a 5 feet wide x 10 ft high chute that is 1543 ft long. The flow from the transportation conduit into the chute will be controlled by a tainter gate located on the downstream side of monolith 14. From the gate (el. 235) the chute will follow an ogee curve to a point (el. 176.64) just north of the existing fishladder and then slope uniformly to an invert elevation 165 approximately 40 ft from the end of the chute. The last 40 ft follows a steep curve to elevation 155. The exit is located offshore 100 ft from low tailwater (elev. 155). Inclosure 6 and 7 show a profile of the chute at the start and exit.

Dick Waits presented the hydraulic conditions for alternative 1A (detailed in handouts HY-5 to HY-8). The maximum velocity of the contracted jet just downstream of the tainter gate is 43 fps at forebay el. 268 with 12 orifices operating. At sta 6+80, bottom of ogee curve (elev. 176.64), the maximum velocity will be 66 fps at forebay elev. 268 with 60 orifices operating and 4 generators operating. For a 16 unit powerhouse the maximum velocity at Sta 6+80 will be 65 fps @ forebay elev. 268, 48 orifices open and 4 units operating. Burt Carnegie raised concern with the high velocities under the gate and commented that a smooth surface should be provided along the bottom of the gate. Dave Illias said they will include that in the design. Handouts HY-6, 7, and 8 show curves for the chute velocities into the tailrace for the following conditions:

- a. alternative 1A & 1B, invert elev. 165
- b. alternative 1A, invert elev. 160
- c. alternative 1B, invert elev. 160

At this point in the meeting there was a lot of discussion on what should be the criteria for the tailwater entrance velocities and possible methods for decreasing the velocity. It was cited by Corps personnel that 30 fps had been used for past criteria, apparently successfully, but several of the fishery representatives felt that this was even too high. It was pointed out by Corps personnel that maximum velocities entering tailwater were somewhat less than indicated by handouts HY 6, 7, and 8 as tailwater tends to be high when maximum discharges are made. Winn Farr suggested that velocities could be reduced by widening the conduit at the exit (to increase friction losses) to achieve less than 30 fps at tailwater. It was also suggested that consideration be given to retain the hydraulic jump planned for the evaluation periods, for the permanent condition. The option of lowering the invert from El. 165 to El. 160 was discussed but concerns were raised with the increased frequency of a hydraulic jump moving up the chute at the higher tailwaters, resulting in the fish being released close to shore. Discussions lead to the agreement to proceed with alternative 1A - outfall chute with the following possible changes:

- a. Widen the channel at the exit to try to obtain velocities below 30 fps entering the tailwater without creating inadequate depths at low flows.
- b. Eliminate the steep slope at the exit and maintain an exit invert of elevation 165.

7. Evaluation Facility. Dick presented the COE concepts for an evaluation

facility located near the end of the outfall chute (shown on handouts HY-10 and HY-11). A two foot high weir is placed in the chute to create a hydraulic jump to slow the velocities to an acceptable level. Just upstream of the weir 40 cfs is drawn off the side of the chute through a 2'x2' opening and passed over an inclined screen to separate fish into a small quantity of water for evaluation.

Dick opened the meeting to discussion and comments on the above facility and ideas on other possible facilities. Bob Pearce questioned whether a representative sample would be obtained from water collected only from the side of the chute since there is no assurance where the fish will be concentrated in the chute and the location of the fish can vary with the flows and time. He suggested a vertical slot in the chute above the weir to assure to collecting a representative sample.

Cliff long proposed a system using a wedge wire cone with a flexible pipe that transports the sample by gravity to an evaluation area next to the chute. Dick Krcma felt the evaluation area would probably have to be 15'x15'. This system could be designed for the cone to be movable for sampling all areas in the flow. Sketch No. 1 shows the system. Cliff felt the velocity upstream of the cone should not be greater than 8 fps.

Winn Farr proposed an alternative system that would air lift the fish from the wedge wire cone to an evaluation area above the chute (shown on sketch No. 2).

It was agreed the COE would look at both systems described above in further detail.

8. Balanced Flow Vertical Barrier Screens. Dave Illias opened a discussion on balanced flow vertical barrier screens. He noted the Corps is presently proceeding with a design that includes standard screens with the capability of adding the porosity plates later. Dick Krcma felt that additional testing should be done before porosity plates are included in the initial John Day construction. Dick and John Williams pointed out that acceptable orifice passage efficiency only occurred (in 1982) when the balanced flow vertical barrier screen was used. Consensus was reached that balanced flow vertical barrier screens were desirable, but might have some negative side effects so more study would be required to insure their acceptability. Further research may provide additional answers to this question. A target date of 1 September 1983 was set for a decision on possible inclusion of porosity plates in the initial construction.

9. Dave Illias indicated that with the in the outfall flume there would be the capability to conserve water by closing orifices when the units are shut down after an acceptable period of time. Past records of generator operation have shown there are extended periods when units are shutdown. Dick Krcma said they have not specifically tested for this condition, but based on past indications with the units operating continuously the orifices would have to be left opened for at least 48 hours. Pete Tervooren said we should also be looking at a possible orifice closure, in conjunction with daily fluctuation in the generators. To shorten this time as required to be effective during daily peaking operation, research would need to be performed and evaluated. This would probably have to be determined after the bypass is completed. Dick

though preliminary indications could be obtained by including such tests at either McNary or Bonneville in 1983. John Williams will check into the feasibility of doing it.

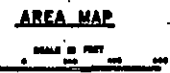
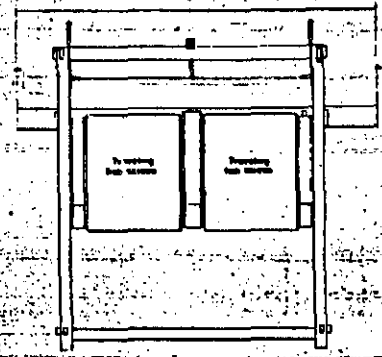
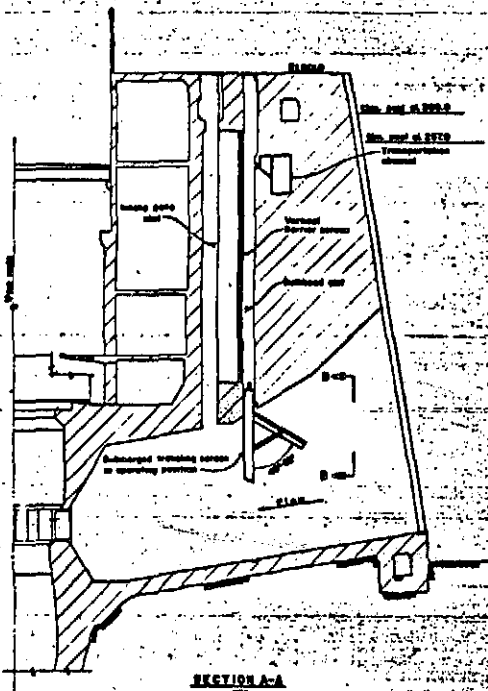
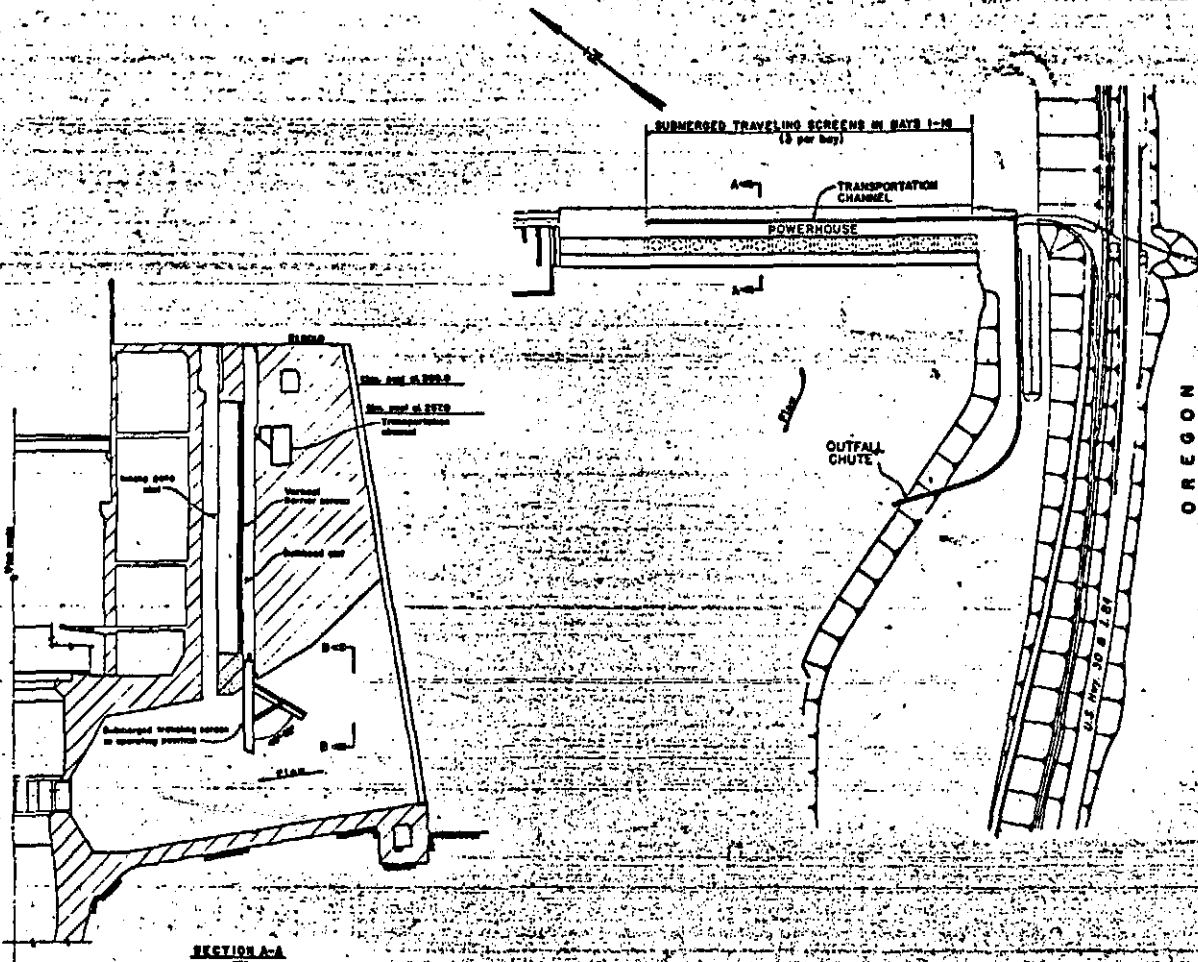
10. The meeting was adjourned at 1345.

MEETING OF THE LOWER COLUMBIA FISH PASSAGE
SUBCOMMITTEE WITH THE PORTLAND DISTRICT
U.S. ARMY CORPS OF ENGINEERS
(MULTNOMAH BUILDING, 0900 6 OCT 1982)

SUBJECT: JOHN DAY JUVENILE BYPASS SYSTEM.

MEETING AGENDA

1. Introduction and general presentation of the John Day Juvenile Bypass System.
2. Presentation of the Engineering and Construction Schedule.
3. Description of the Transportation Conduit.
4. Presentation of Outfall Chute
5. Comments and Question Period.



SECTION B-B
SUBMERGED TRAVELING SCREENS
Open position

U. S. ARMY ENGINEER DISTRICT, PORTLAND			
JOHN BAY LOCK AND DAM COLUMBIA RIVER SCREEN AND TRANSPORT TRUCKING APPROPRIATE SYSTEM			
[Redacted Box]			
By <i>[Signature]</i>	Checked <i>[Signature]</i>	Approved <i>[Signature]</i>	Date
JOHN CARROLL			JO-20-11/5 3

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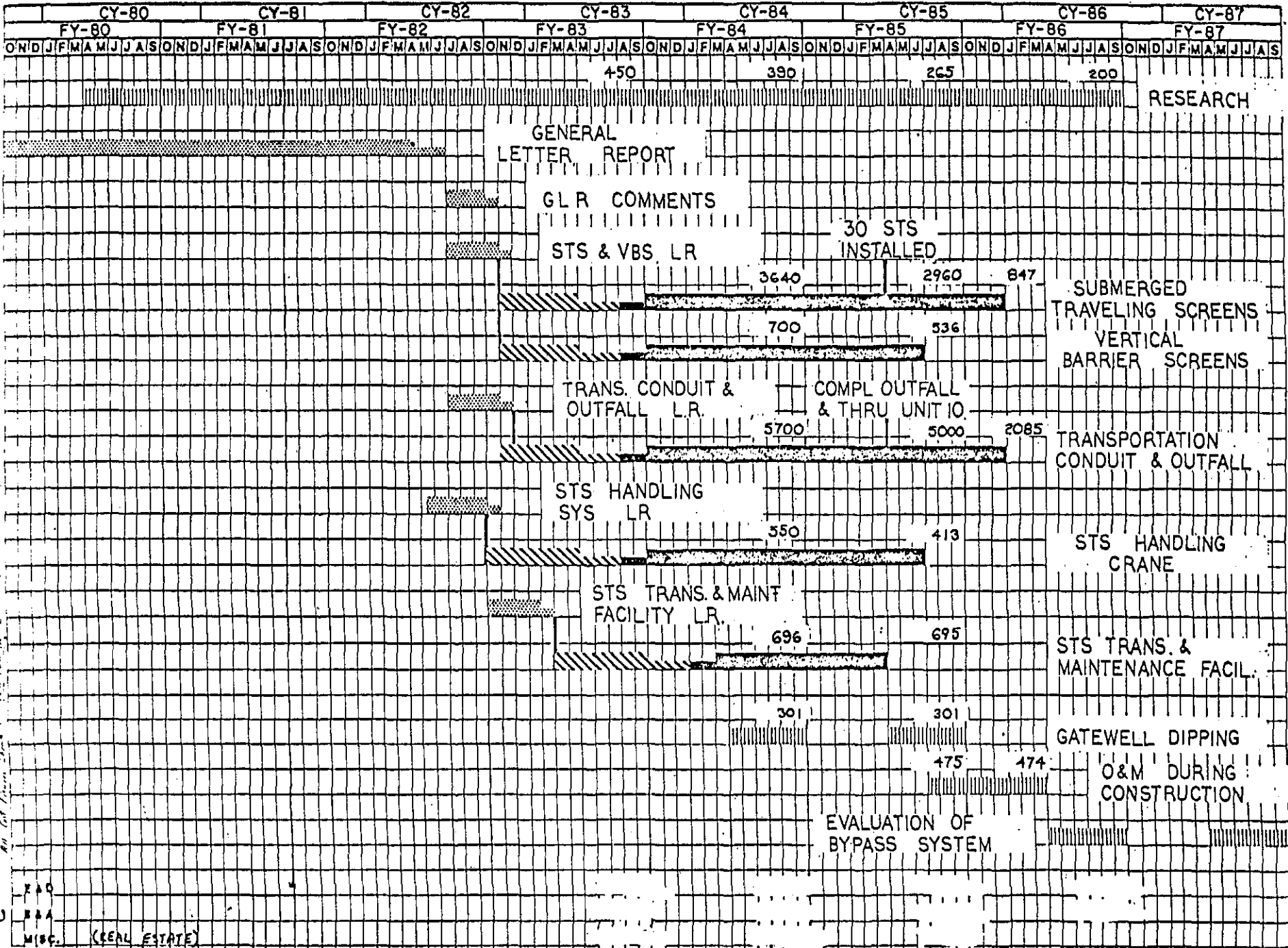
JOHN DAY JUVENILE BYPASS SYSTEM

ENGINEERING AND CONSTRUCTION SCHEDULE - 1985 PARTIAL COMPL

OTHER MEMO. REVIEW P & S REVIEW A.W. CONRY
N.Y.

SCHEDULED AWARD DATE

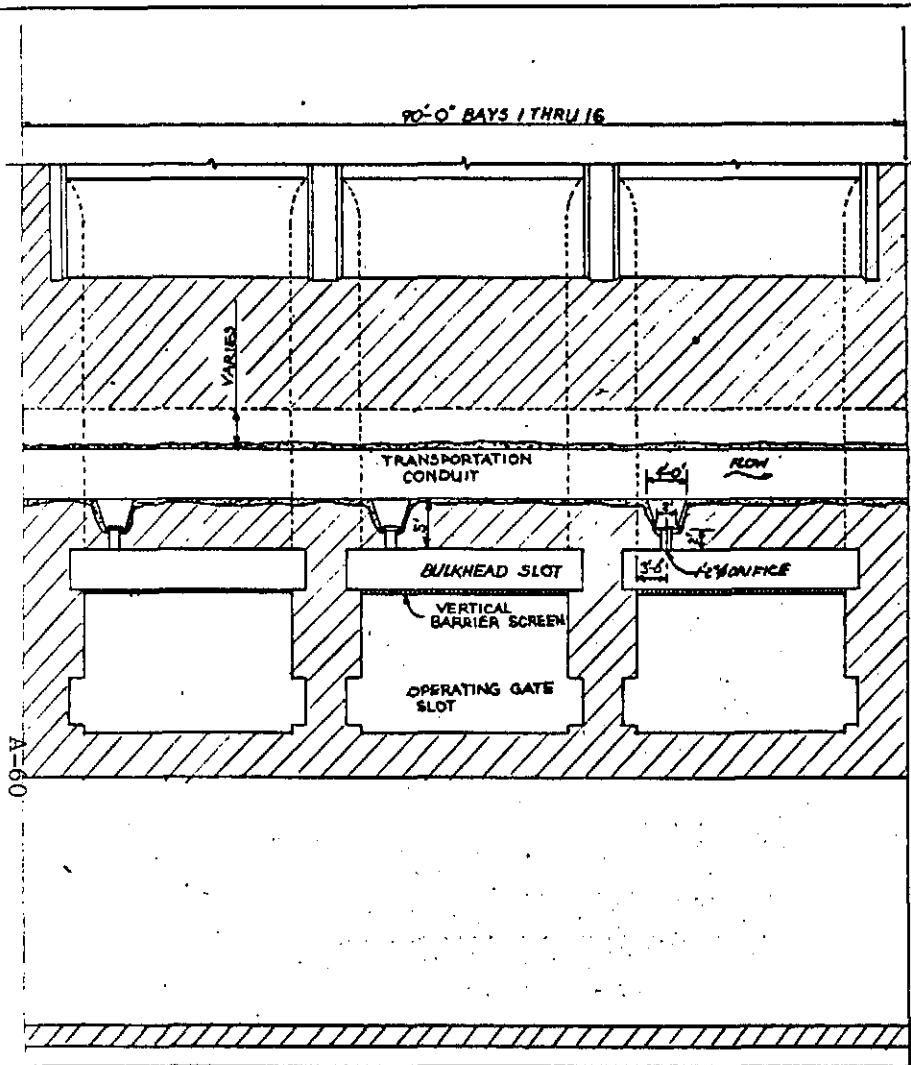
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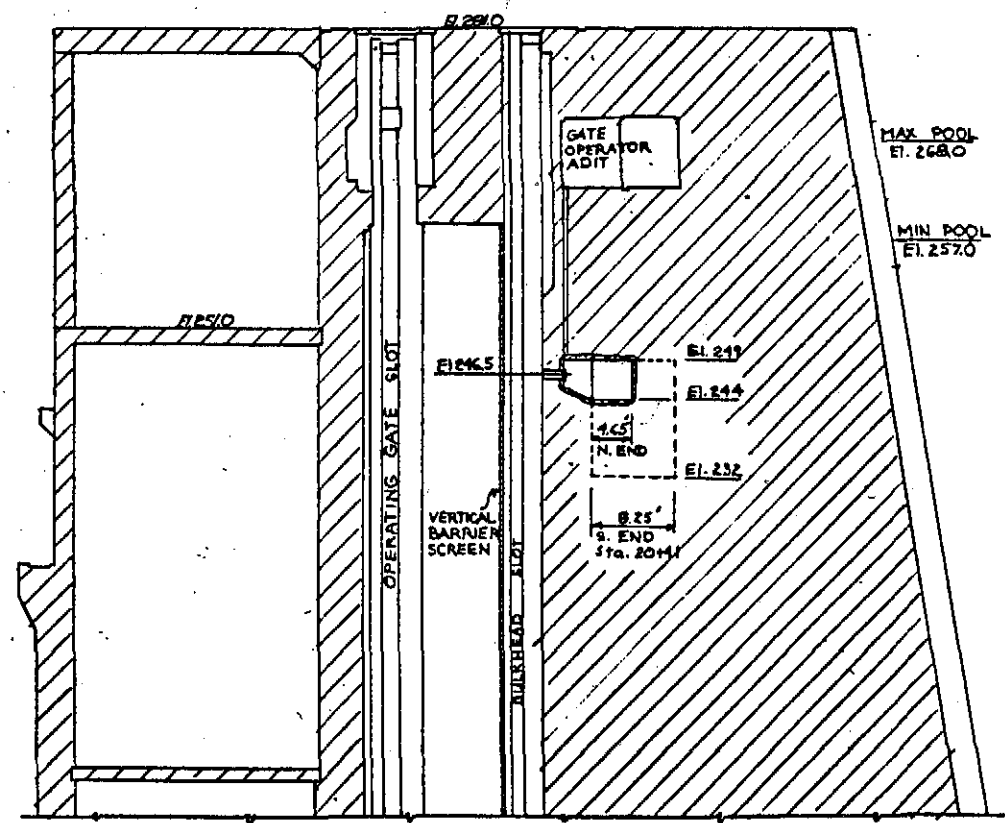
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All Cost From State As Per Budget Estimate

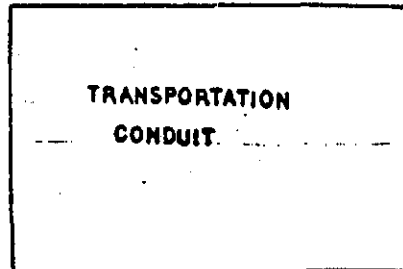
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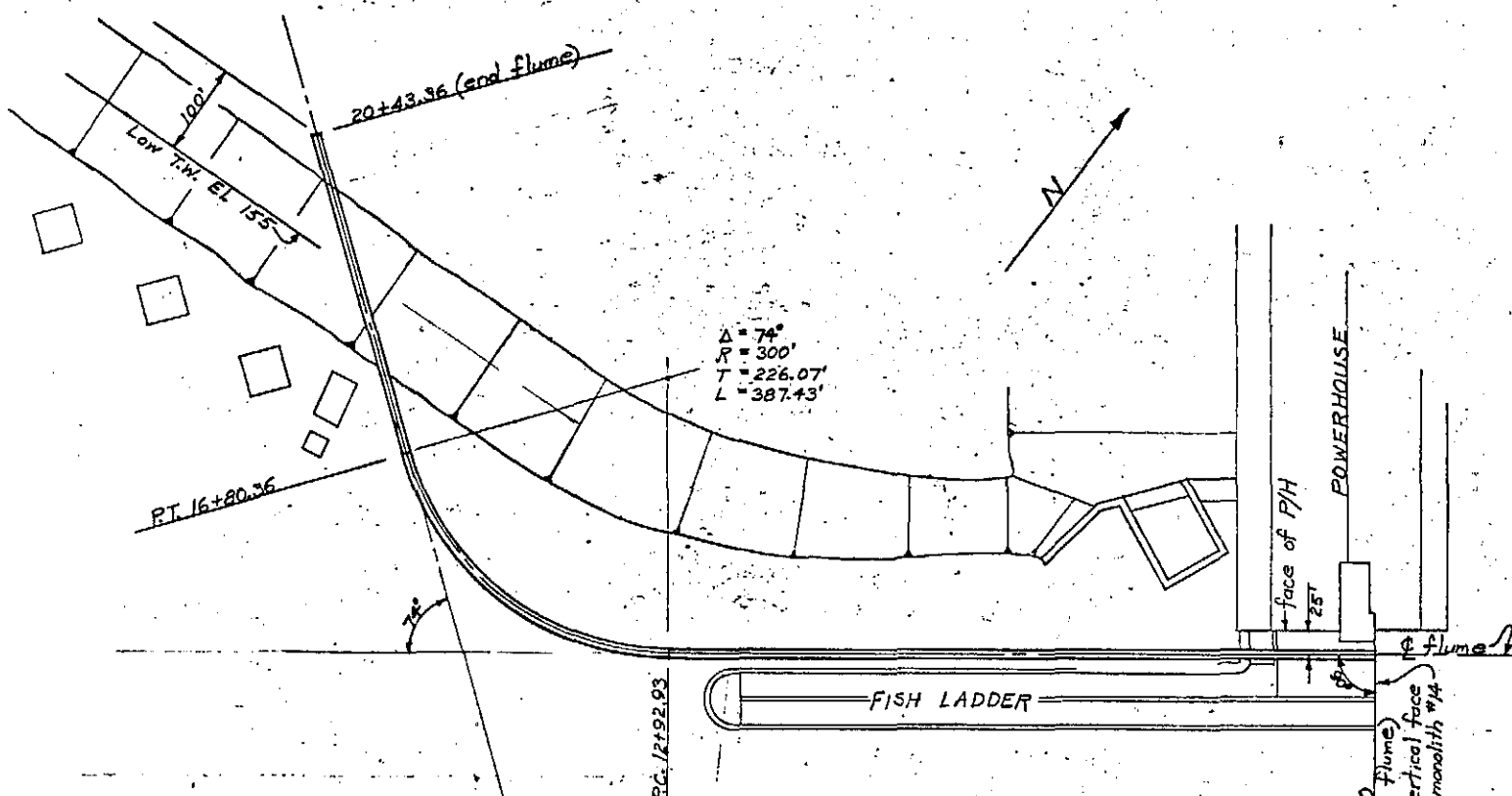


TYPICAL PLAN-EL 2665



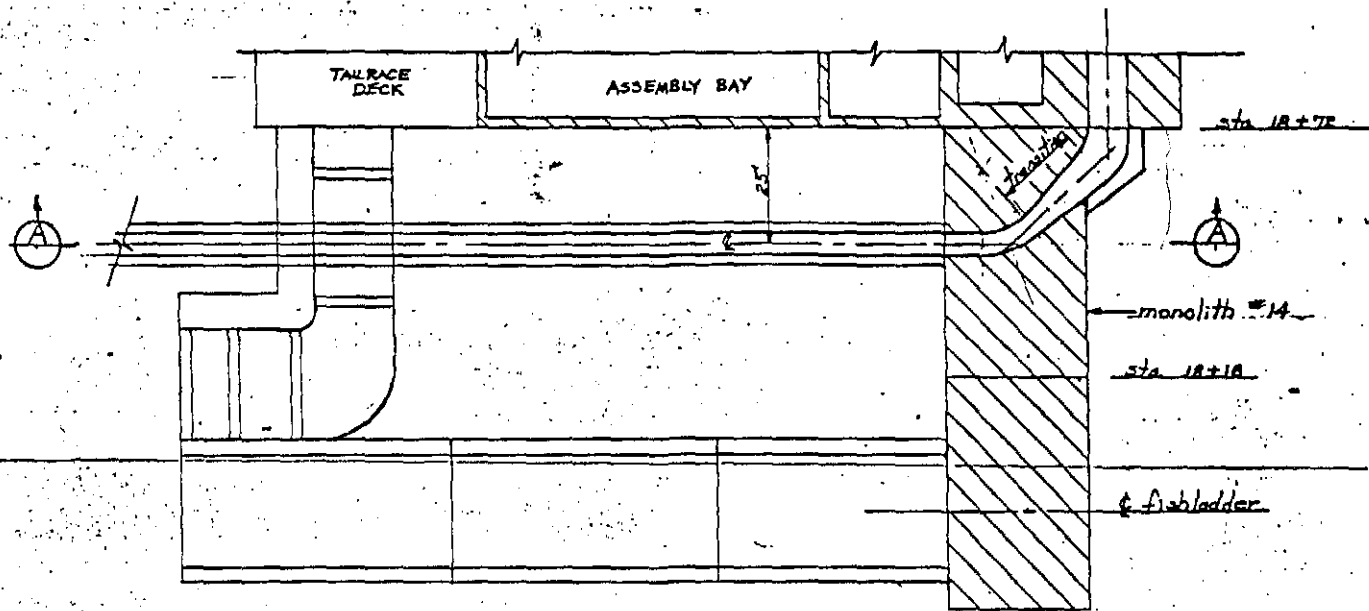
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TYPICAL SECTION



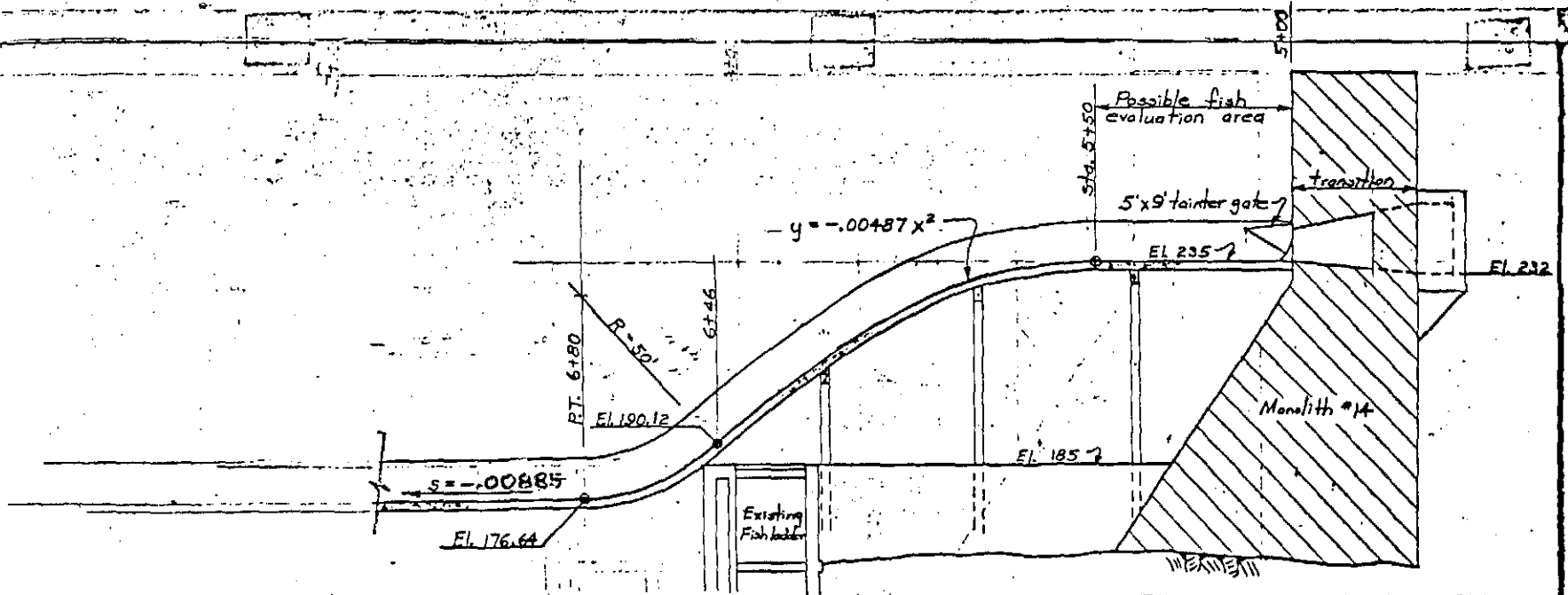


$\Delta = 74^\circ$
 $R = 300'$
 $T = 226.07'$
 $L = 387.43'$

JOHN DAY FINGERLING BYPASS
 Open-channel Outfall - Alternate #1 (A)
 1" = 100' 29 Sep 82



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SECTION A

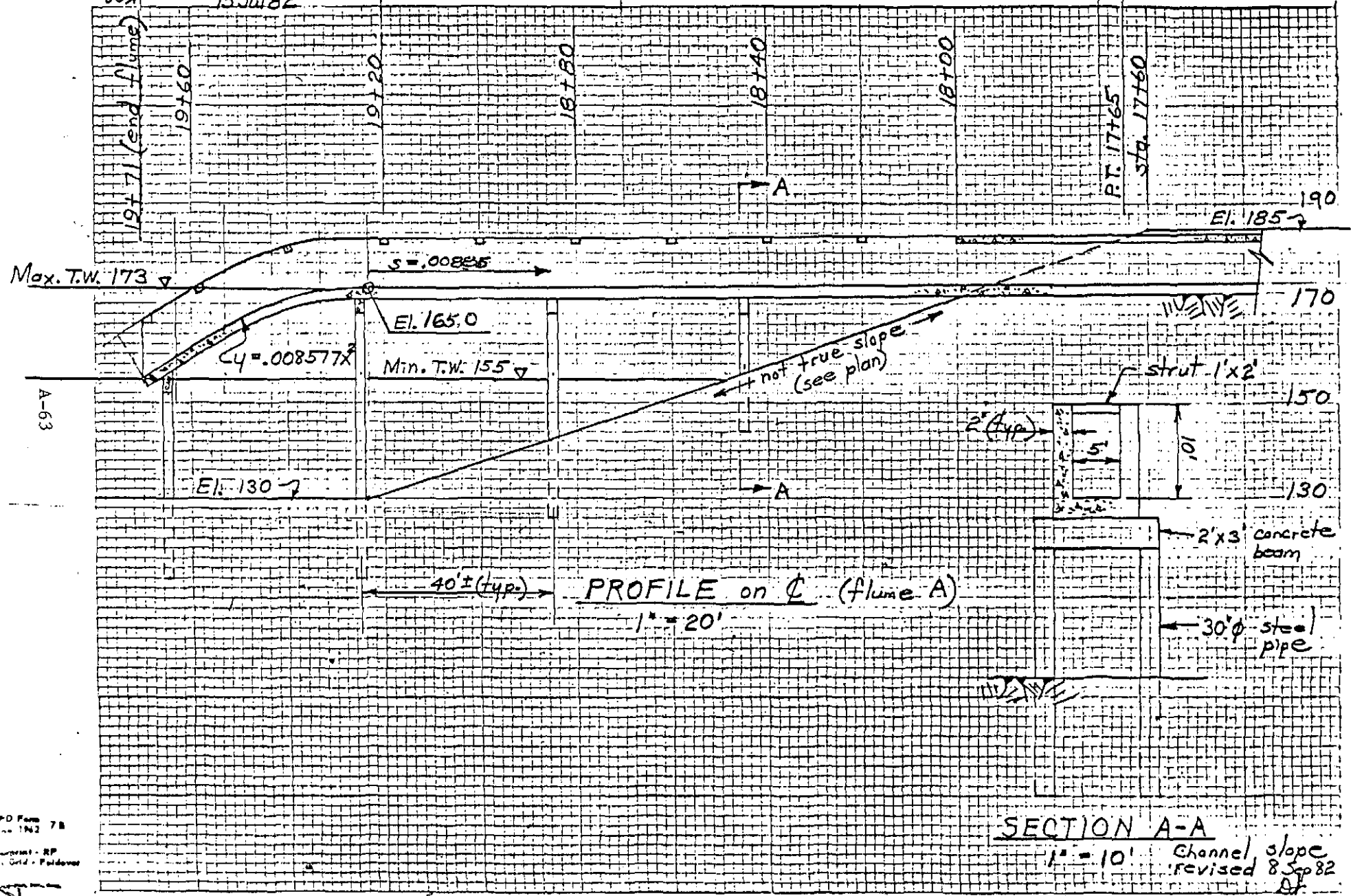
JOHN DAY FINGERLING BYPASS
 Alternative #1:
 Open-Channel Outfall
 20 Jul 82
 Channel slope revised 8 Sep 82

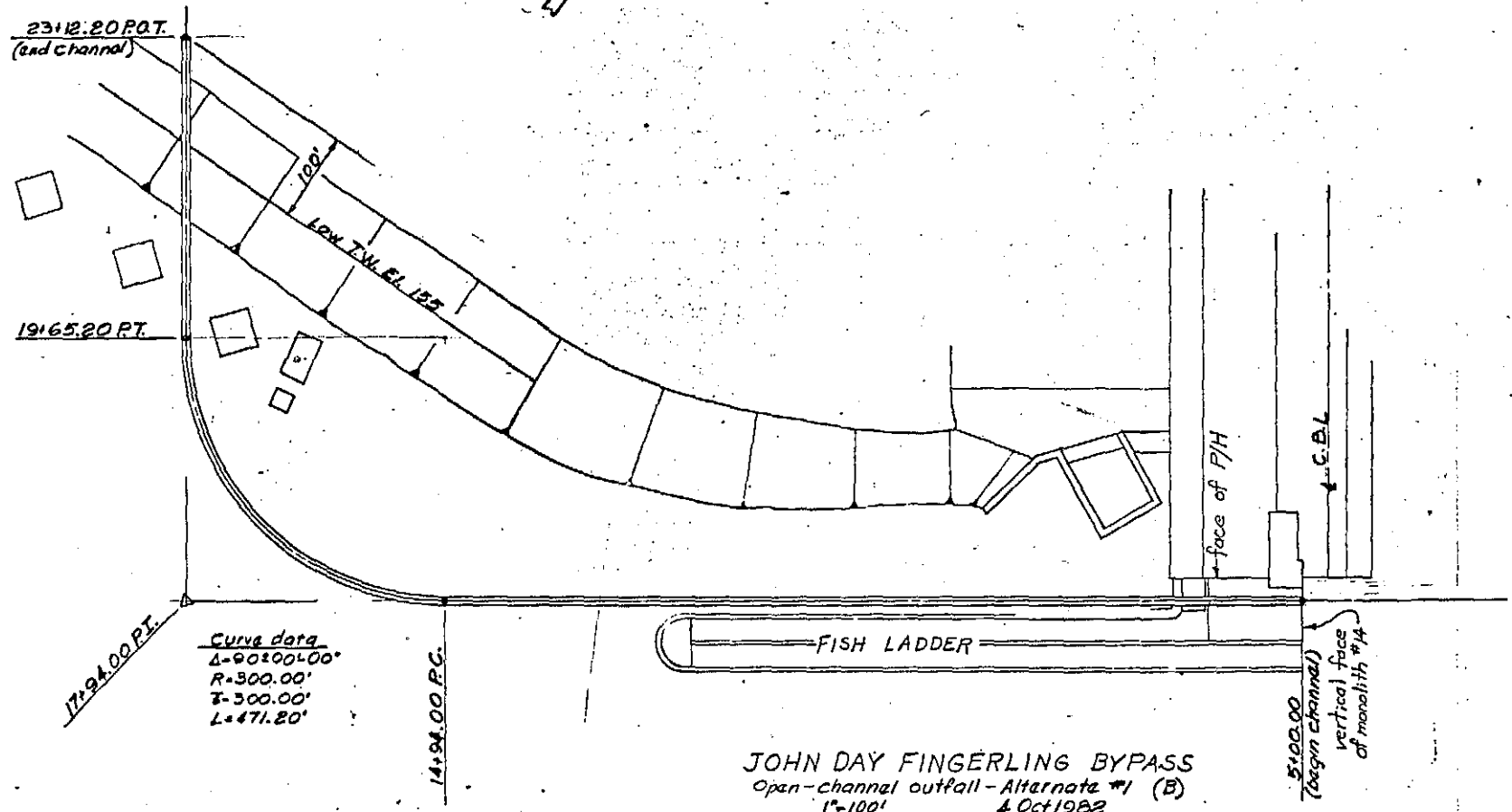
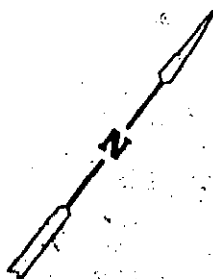
(Stationing from face of dam, See Plan)

PROJECT Jahn Day Fingerling Bypass

SUBJECT Alt. 1D, Open-Channel Outfall

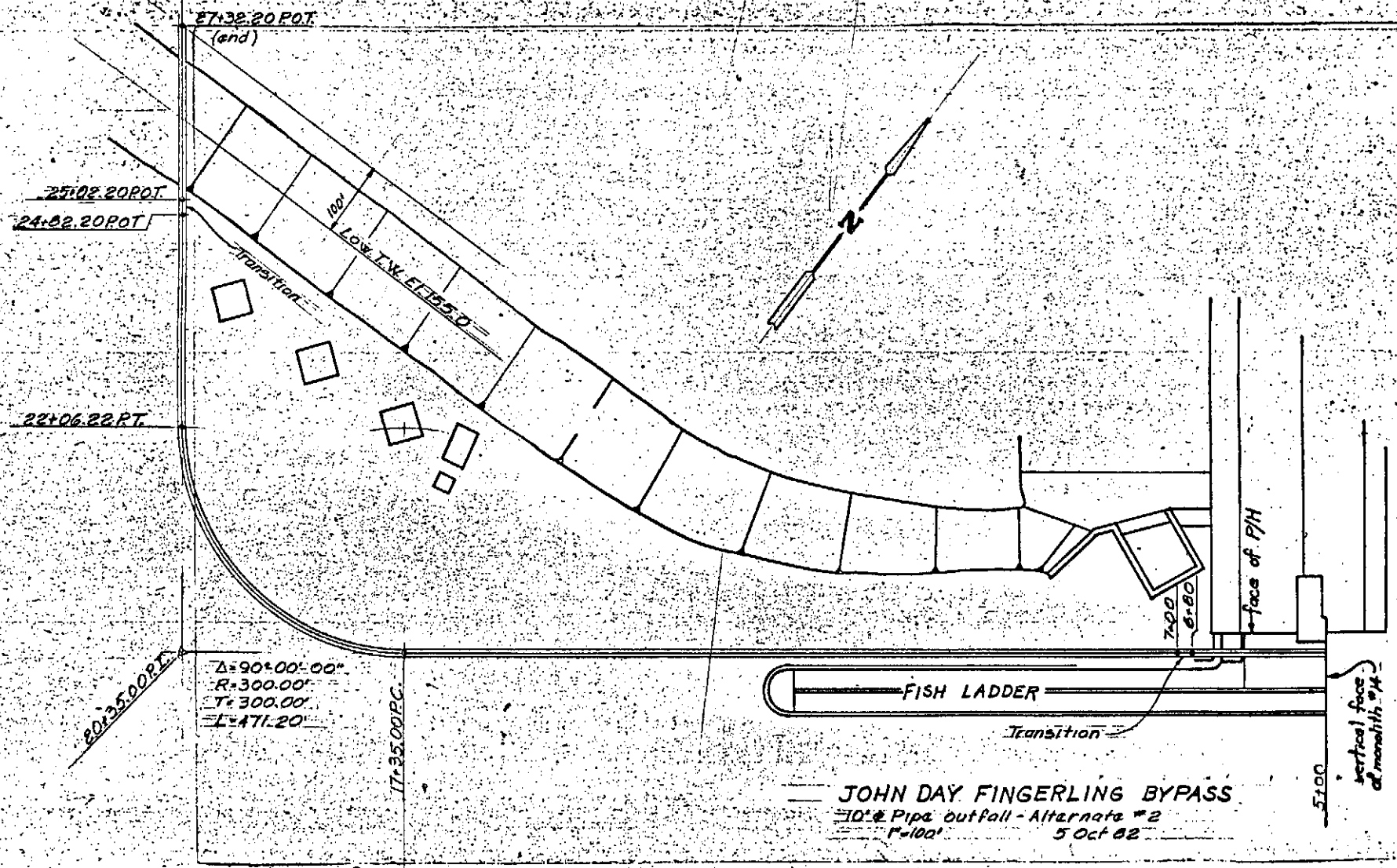
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JOHN DAY FINGERLING BYPASS
Open-channel outfall - Alternate #1 (B)
1"=100'
4 Oct 1982

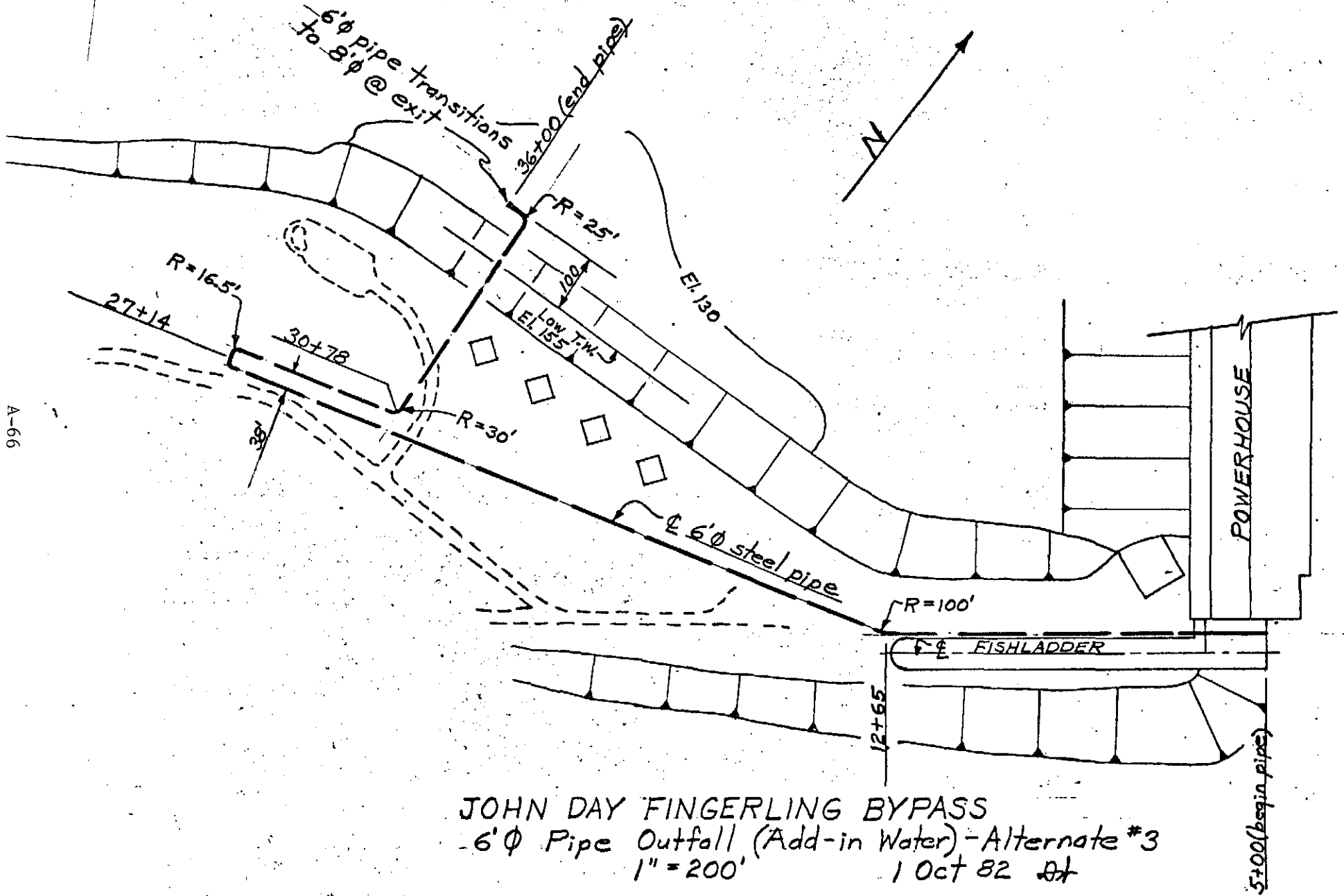
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JOHN DAY FINGERLING BYPASS
 10" Pipe outfall - Alternate #2
 P=100' 5 Oct 82

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Hydraulic Data

<u>Sheet No</u>	<u>Comments</u>
1. <u>HY-1</u>	Transportation Channel - General 1. 14" Orifices; Δ Elev = 246.5 2. Dimensions 3. Locations - (A), (B), (C) (A) - Slot C - Unit 20 1 (B) - Slot C - Unit 5 (C) - Slot A - Unit 20
2. <u>HY-2</u>	Transportation Channel - Hydraulic Data 1. Unit Operations & Total Discharge 2. Velocity @ South End 3. Head Differential Across Orifices 4. Orifice Jet Velocities
3. <u>HY-3</u>	14" Orifice Information 1. ΔH 2. Discharge 3. Plate & Jet Velocity

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- | <u>Sheet No.</u> | <u>Comments</u> |
|------------------|---|
| 4. <u>HY-4</u> | Orifice Submergence & Forebay Information
1. Submergence of Orifice on Upstream End.
2. Forebay Duration Information |
| 5. <u>HY-5</u> | Hydraulic Info - Tainter Gate to Sta 6+80
1. Unit Operations & Total Discharge
2. Gate Opening & Velocity Under Gate
3. Depths and Velocity in Contracted jet d/s of Gate
4. Depths and Velocity @ STA 6+80 |
| 6. <u>HY-6</u> | Tailwater Entrance Velocity Conditions - 165.0 In.
1. Tailwater Elevation
2. Unit Operation
3. Entrance Velocity
4. Inverts @ 165.0
5. Tailwater Duration |

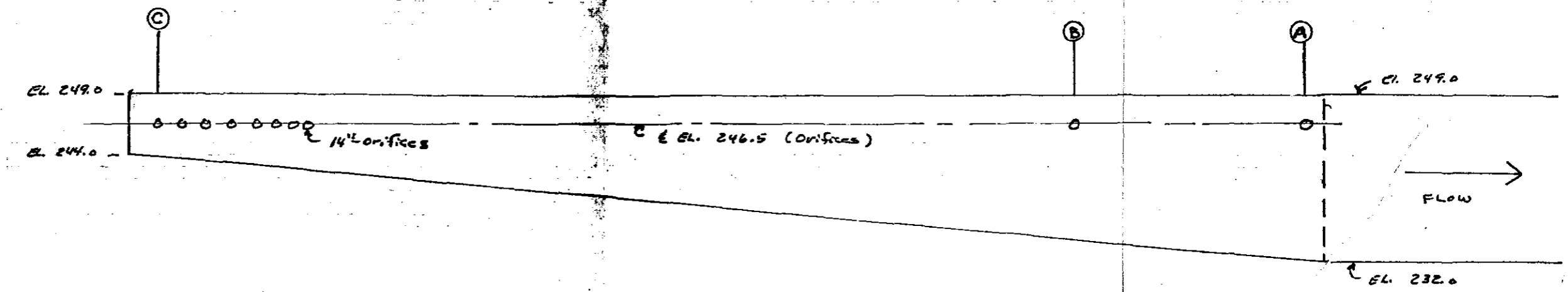
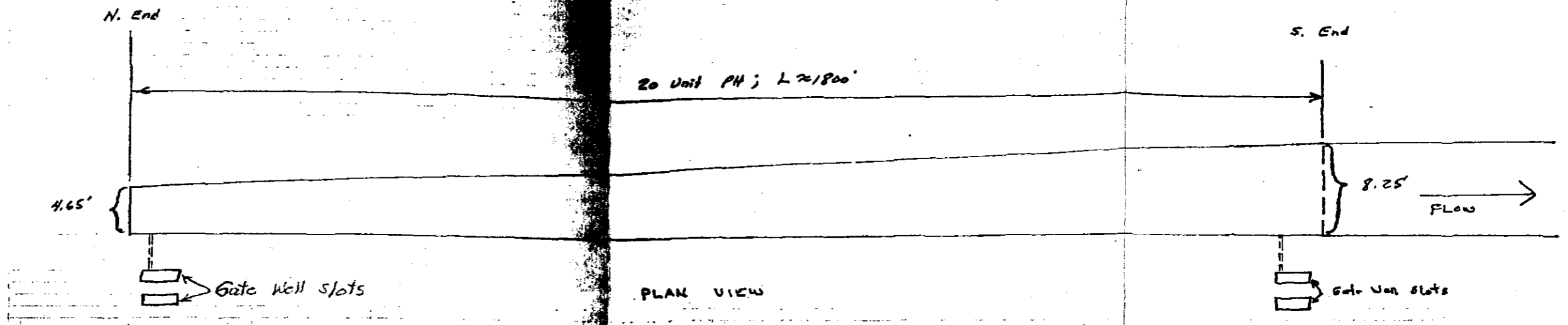
Index - Continued

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<u>Sheet No</u>	<u>Comments</u>
7. HY-7	Flume Flume Alignment "A" - 160.0 Invert 1. Tailwater Elev & Duration 2. Entrance Velocity 3. Unit Operation
8. HY-8	Flume Alignment "B" - 160.0 Invert 1. Same type information as HY-7 above
9. HY-9	Evaluator Take-off Area 1. Jump Entrance Velocity
10. HY-10	1. Preliminary Layout of Evaluator Take-off Very General Idea (Doesn't Correspond Exactly to other Plans Presented)
11. HY-11	2. Screening Scheme for Evaluator Facility - General

Note: 10-year Discharge \approx 500,000
TW \approx 70.0 - 71.0

Engr. DIV. H&H BRANCH Hyd. DRAWING
SECTION
 PROJECT John Day Dam - Juvenile Bypass S
 SUBJECT Transportation Channel
 BY R.L.W. DATE 4 Oct 82 CHECKED _____ PART _____ OF _____



- Notes:
1. (A) Represents southern most orifice in Unit No. 1.
 2. (B) Represents southern most orifice in Unit No. 5.
 3. (C) Represents Northern most orifice in Unit No. 20.

Engr DIV. H&H BRANCH Hyd. Design SECTION
 PROJECT John Day Dam - Juvenile Bypass System
 SUBJECT Selected Channel - Head Differentials & Velocity Data

BY R.L.W. DATE 4 Oct 82 CHECKED

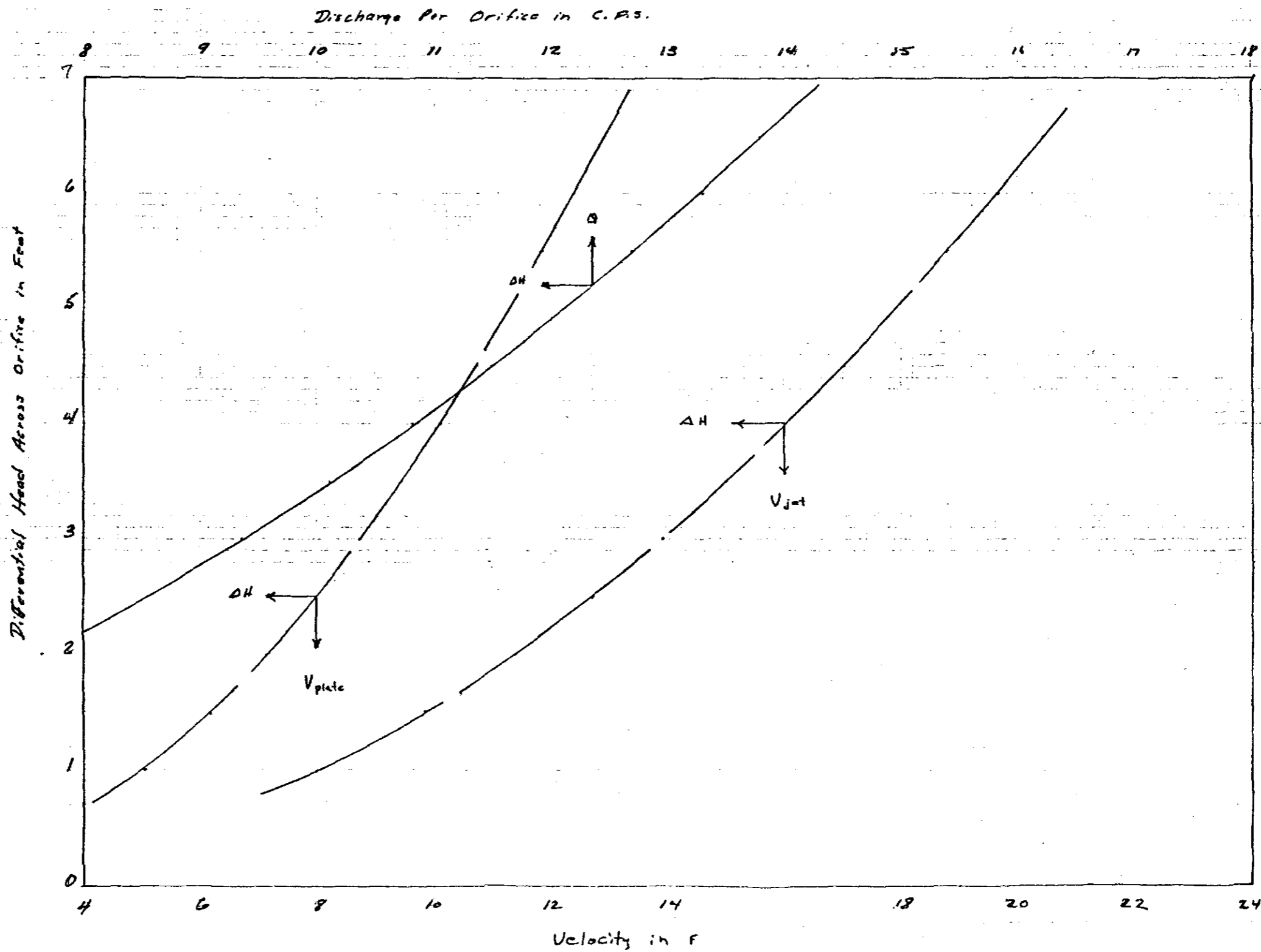
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No. Available	Units On-Line	Total Q	Velocity c (A)	Orifice Head Differential (dH)			Orifice Jet Velocity at the three previous dHs (resp)		
				c (A)	c (B)	c (C)	2'	3'	4'
20	4	695	5.0	5.0	5.6	3.5	17.9	19.0	15.0
20	20	600	4.3	4.4	4.1	2.5	16.8	16.2	12.7
16	4	500	3.6	3.4	4.2	3.5	14.8	16.4	15.0
16	16	438	3.1	3.3	3.1	2.5	14.6	14.1	12.7
12	4	356	2.5	2.9	3.8	3.5	13.6	15.6	15.0
12	12	315	2.3	2.8	2.7	2.5	13.4	13.2	12.7
8	4	224	1.6	2.6	3.5	3.5	12.9	15.0	15.0
8	8	205	1.5	2.6	2.5	2.5	12.9	12.7	12.7
4	4	103	0.7	2.5	2.5	2.5	12.7	12.7	12.7

Notes:

- When 4 units are on-line, these units were assumed to be Units No. 1-4.
- Units Available but off-line will have ~~an addition~~ a greater head differential because the forebay and slot w.s. was assumed the same. The max. additional amount would be 1.0' at the southern most orifice in Unit No. 5 when the number of units available exceed the number of units on-line.
- The downstream fairer gate will be operated to maintain ~~the~~ the pressure ~~in~~ in the transportation channel 3.5' below the forebay elevation.

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Engr. DIV. H&H BRANCH Hyd. Design SECTION

PROJECT John Day Dam - Juvenile Bypass System

SUBJECT Upstream Submergence (orifice) & Forebay Duration Information

BY R. L. W. DATE 4 Oct 82 CHECKED PART PAGE OF

Forebay	U/s Submergence ¹⁾		April - October ⁴⁾	
	Max ³⁾ (ft.)	Min ³⁾ (ft.)	FB El. FB	Duration % of Time \geq
268.0	21.5	20.5	268.0	0.0
267.0	20.5	19.5	267.0	19.0
266.0	19.5	18.5	266.0	38.3
265.0	18.5	17.5	265.0	51.7
264.0	17.5	16.5	264.0	68.5
263.0	16.5	15.5	263.0	80.5
262.0	15.5	14.5	262.0	88.8
261.0	14.5	13.5	261.0	94.3
260.0	13.5	12.5	260.0	97.3
259.0	12.5	11.5	259.0	99.0
258.0	11.5	10.5	258.0	99.6
257.0	10.5	9.5	257.0	100.0

¹⁾ Contourline elevation of orifice at sl. 246.5

³⁾ U/s submergence when unit is available but off-line and the orifices are open. Slot W.S. equal forebay elev.

³⁾ U/s submergence when unit is available and on-line. Slot W.S. is 1-foot lower than forebay elevation.

⁴⁾ Based on 8-years (1974-1981) of average daily forebay elevations.

HY-4

Engr DIV. H & H BRANCH Hyd. Des. SECTION
 PROJECT John Day Dam - Juvenile Bypass System
 SUBJECT Tainter Gate to Sta 6+80 Data (depths & velocity)

BY R. L. W. DATE 4 Oct 82 CHECKED

PART

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OF

Number Avail.	Units on-Line	Total Q	Gate		Contracted Jet		Sta 6+80	
			Opening	Velocity	Depth	Velocity	Depth	Velocity
Maximum Forebay Conditions (268.0)								
4	4	103	0.64	32.2	0.48	42.9	0.43	48.0
8	8	205	1.32	31.1	0.96	42.7	0.71	57.7
8	4	224	1.45	30.9	1.05	42.7	0.76	58.8
12	12	315	2.10	30.0	1.50	42.0	1.01	62.2
12	4	356	2.41	29.5	1.70	41.9	1.13	63.2
16	16	438	3.05	28.7	2.13	41.1	1.36	64.5
16	4	500	3.57	28.0	2.46	40.7	1.53	65.3
20	20	600	4.46	26.9	3.06	39.2	1.82	65.8
20	4	695	5.29	26.3	3.65	38.1	2.10	66.1
Minimum Forebay Conditions (257.0)								
4	4	103	0.82	25.1	0.61	33.8	0.43	47.3
8	8	205	1.72	23.8	1.24	33.1	0.73	56.0
8	4	224	1.89	23.7	1.36	32.9	0.79	56.9
12	12	315	2.80	22.5	1.96	32.1	1.05	59.7
12	4	356	3.23	22.0	2.24	31.8	1.18	60.5
16	16	438	4.16	21.1	2.86	30.6	1.42	61.5
16	4	500	4.90	20.4	3.36	29.8	1.61	62.0
20	20	600	6.26	19.2	4.38	27.4	1.92	62.4
20	4	695	7.49	18.6	5.60	24.8	2.23	62.5

46 1240

20 X 20 TO THE INCHES X 10 INCHES KEUFFEL & ESSER CO. MADE IN U.S.A.

HY-5

Engr DIV. H & H BRANCH Hyd. Design SECTION

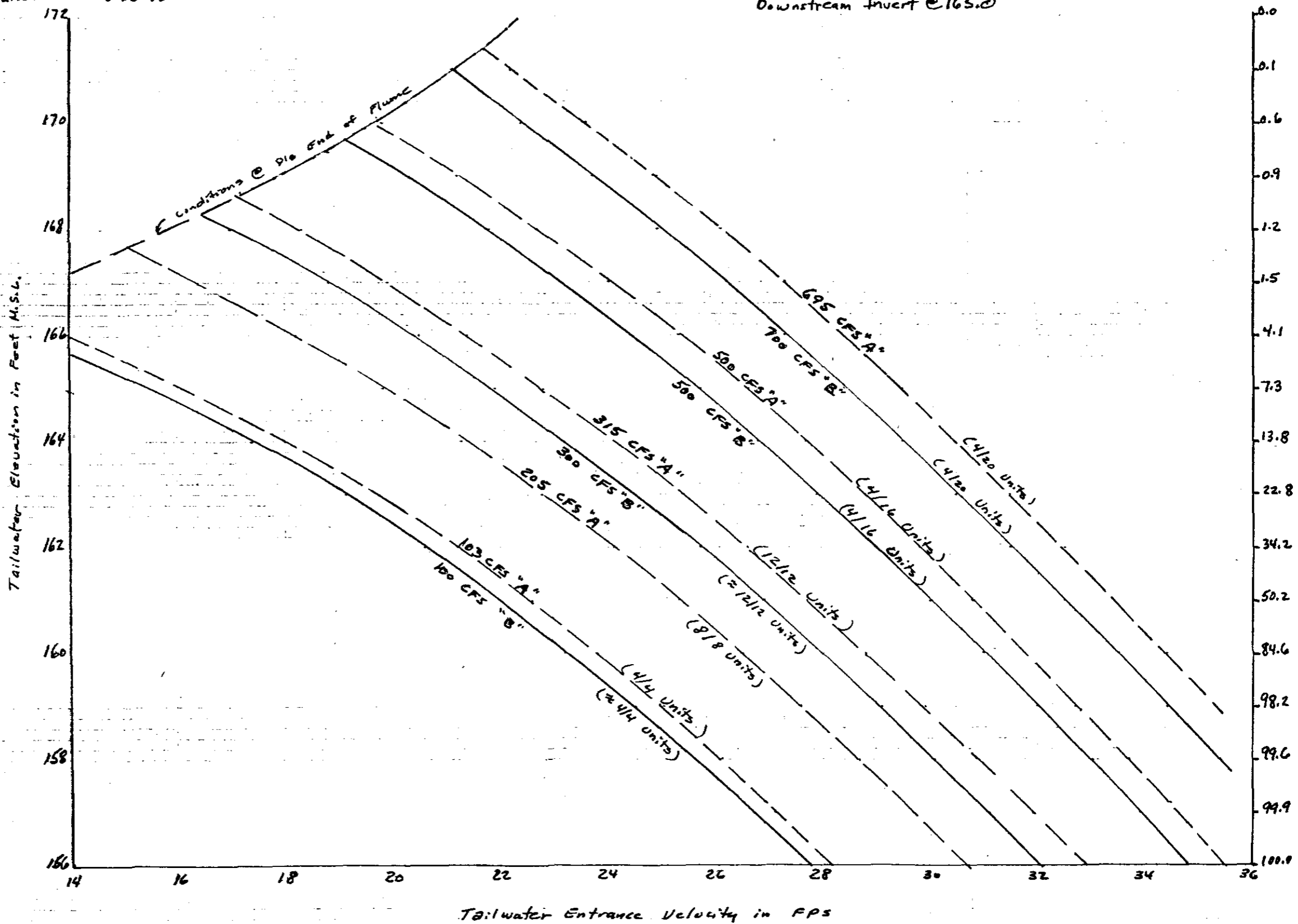
PROJECT John Day Dam - JBS Flume.

SUBJECT Tailwater Entrance Velocities For 'A' and 'B' Flumes

BY R.L.W. DATE 5 Oct 82 CHECKED

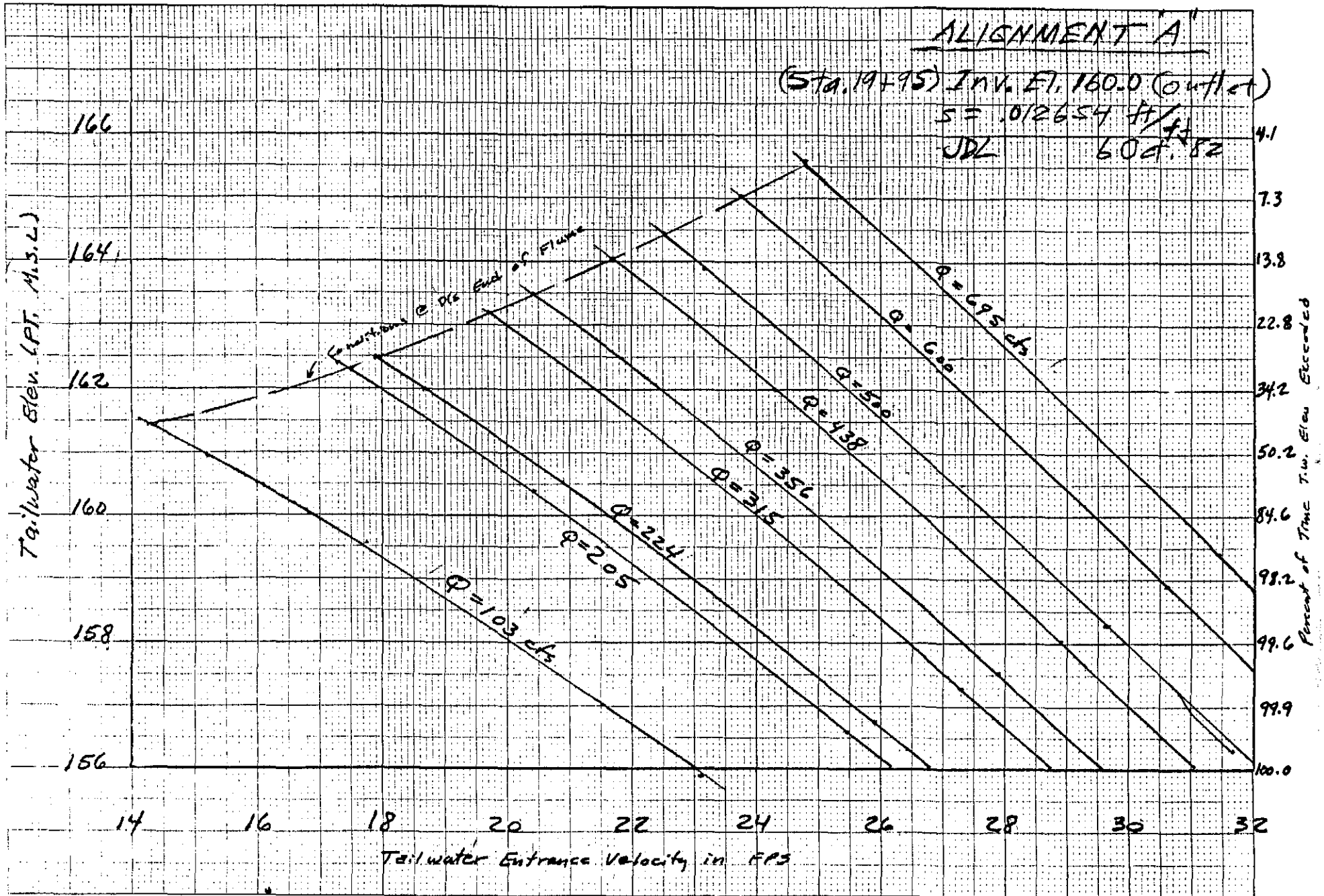
PART PAGE OF

Downstream Invert @ 165.0

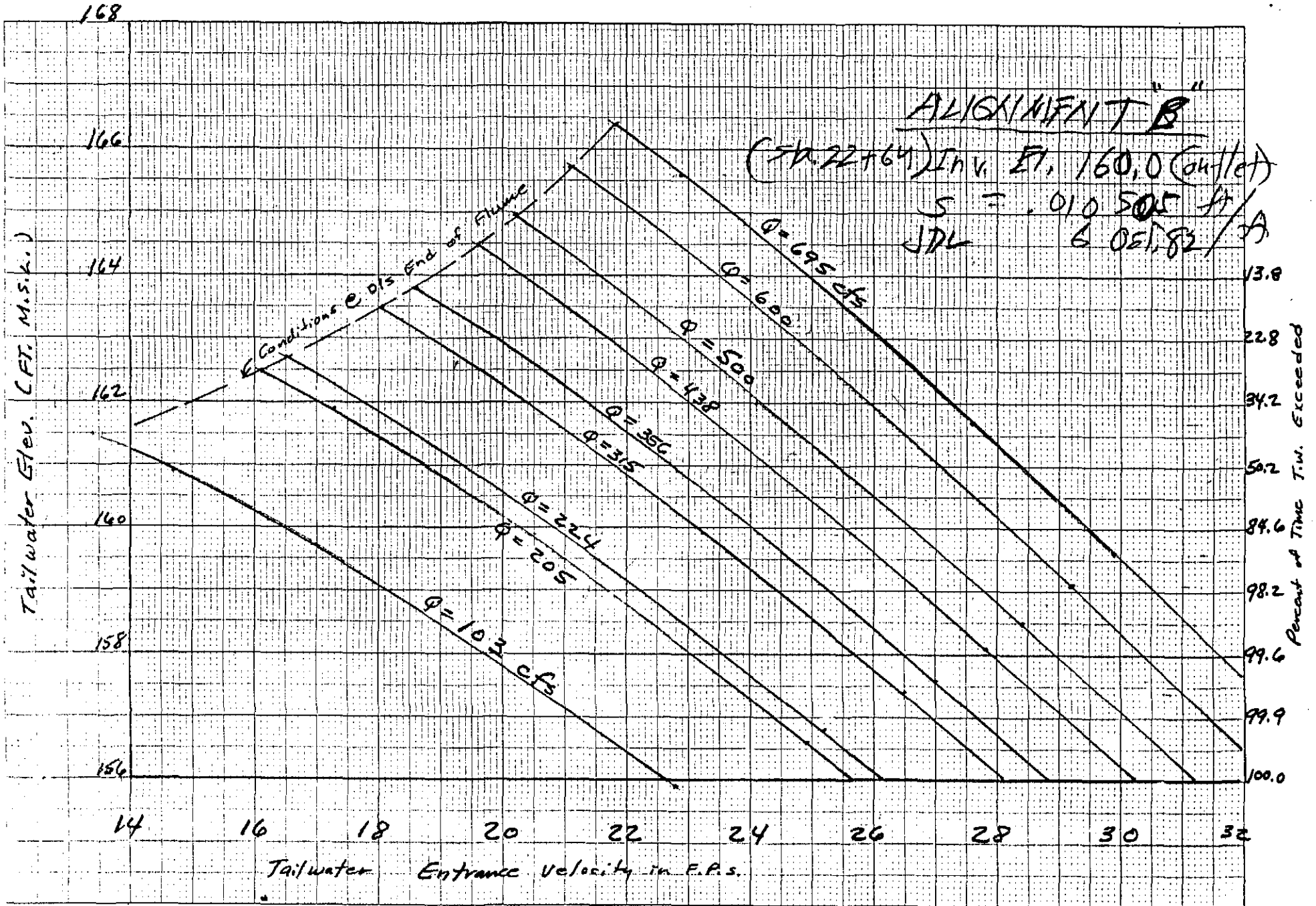


Percent of Time Above Indicated Tailwater Elevation
(Based on 8-years of April-October Ave. Daily Tail. Flow)

A-76



A-77



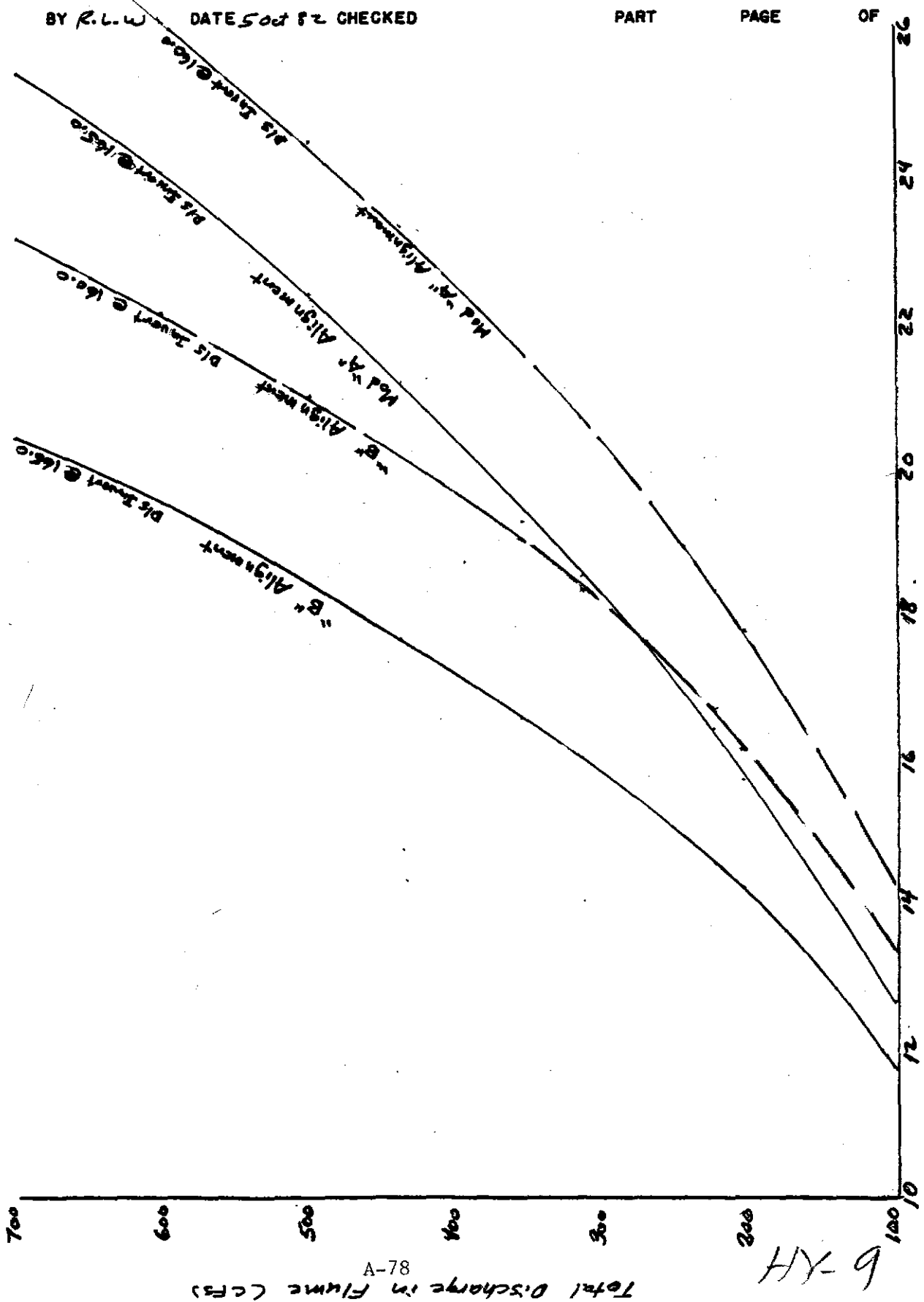
HY-8

ENGR DIV. H & H BRANCH Hyd. Design. SECTION

PROJECT John Day Dam - JBS outfall chute

SUBJECT Velocities Entering Jump at Evaluator Take-off

BY R.L.W DATE 5 Oct 82 CHECKED PART PAGE OF



6-H

DIV.

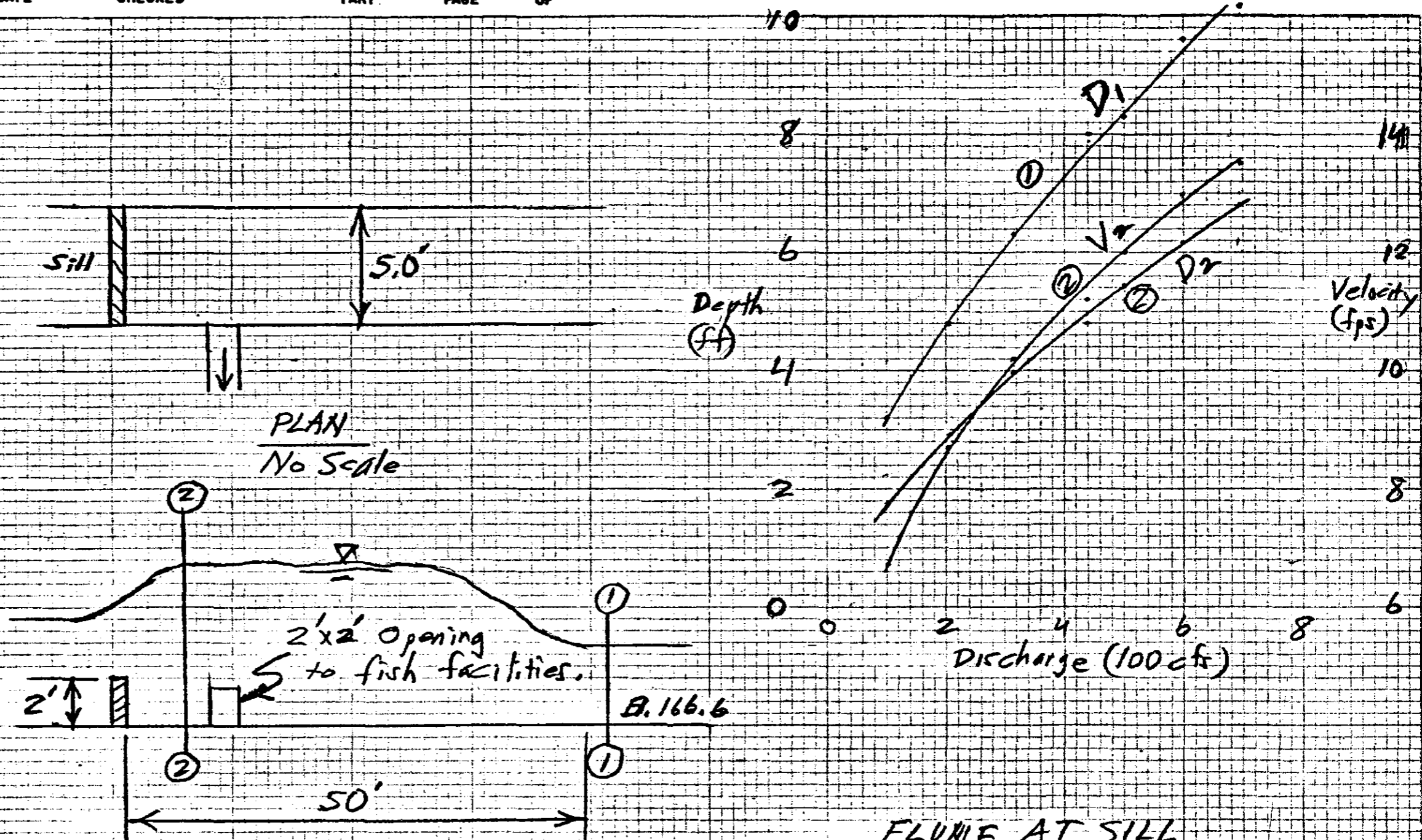
BRANCH

SECTION

PROJECT _____

SUBJECT _____

BY _____ DATE _____ CHECKED _____ PART _____ PAGE _____ OF _____

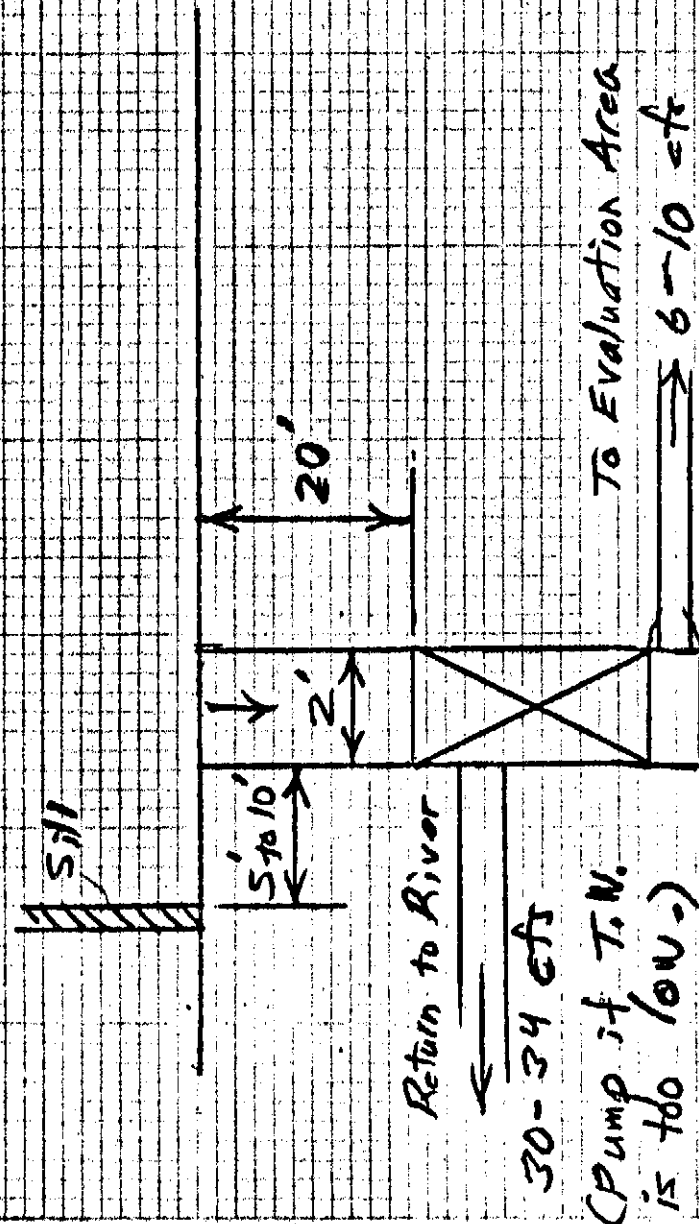


PLAN
No Scale

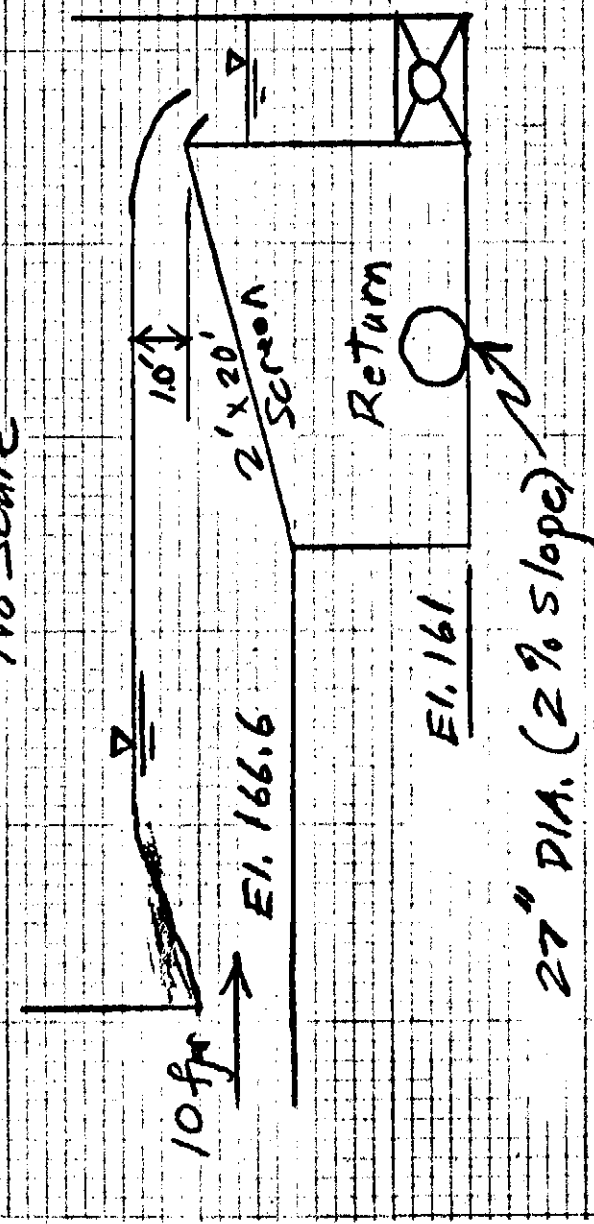
PROFILE
No Scale

FLUME AT SILL
 ALIGNMENT B
 SLOPE = .00719 FT/FT
 Inv. El. (outlet) = 165.00 (Sta. 23+00)
 6 Oct. '82

PROJECT _____
 SUBJECT _____
 BY _____ DATE _____ CHECKED _____ PART _____ PAGE _____ OF _____



PLAN
 No Scale



PROFILE
 No Scale

Flume		Screen		
Q	Eval. Q	Approach W.S. H.	Approach Vel.	Screen Slope
695	40	173.7	2.8	1:3
600	↑	173.0	3.1	1:4
500	↓	171.7	3.9	1:5
438	↓	171.4	4.2	1:5
315	↓	169.7	6.4	1:10
205	40	169.2	7.7	1:13
102	28	168.6	7.0	FLAT

EVALUATION AREA
 ALIGNMENT B
 SLOPE = .00719 FT/FT
 6 Oct. 82

DIV.

BRANCH

SECTION

PROJECT John Day Dam - JBS Evaluator

SUBJECT Channel Velocity in Channel After Jump

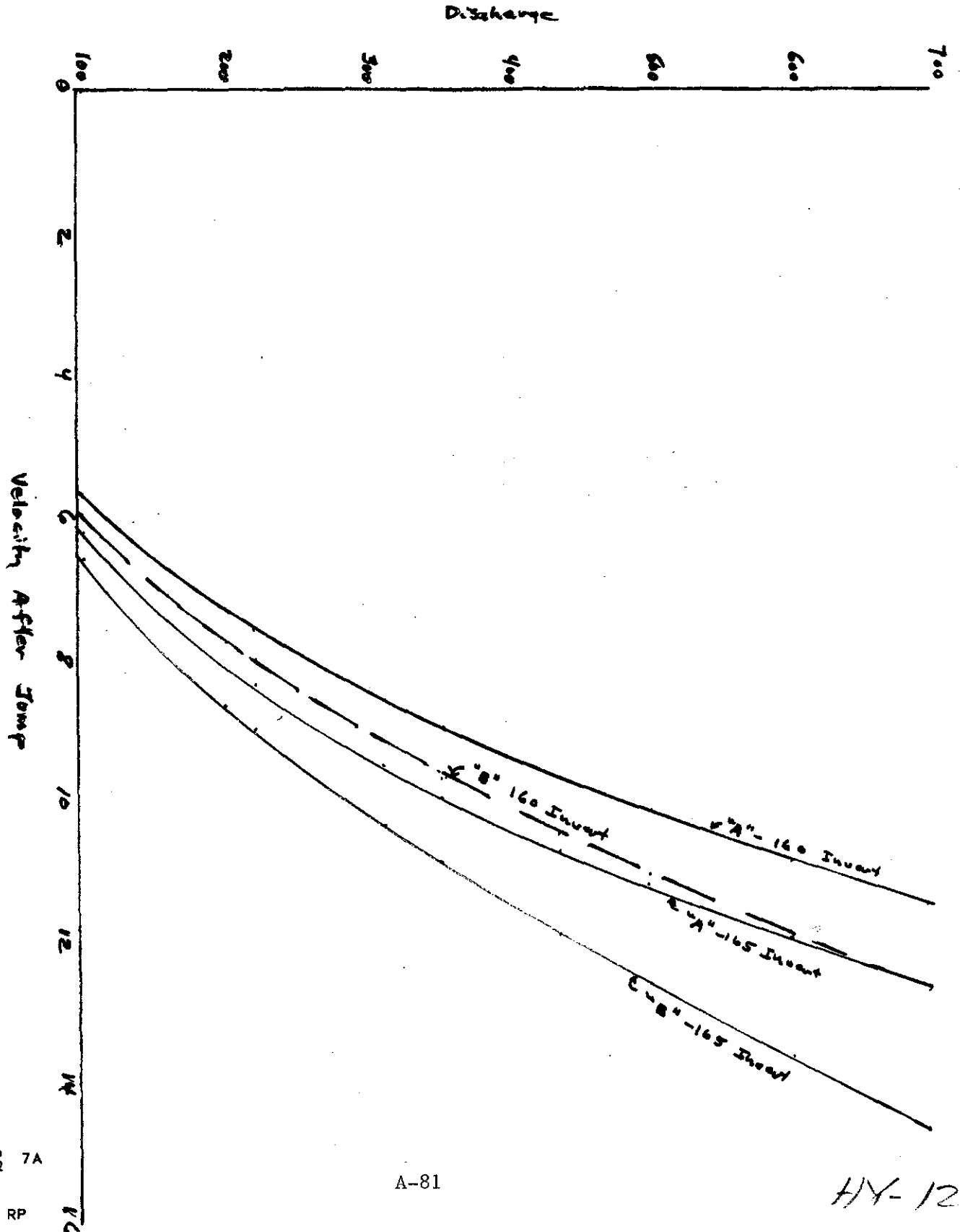
BY RLW

DATE 7 Oct 62 CHECKED

PART

PAGE

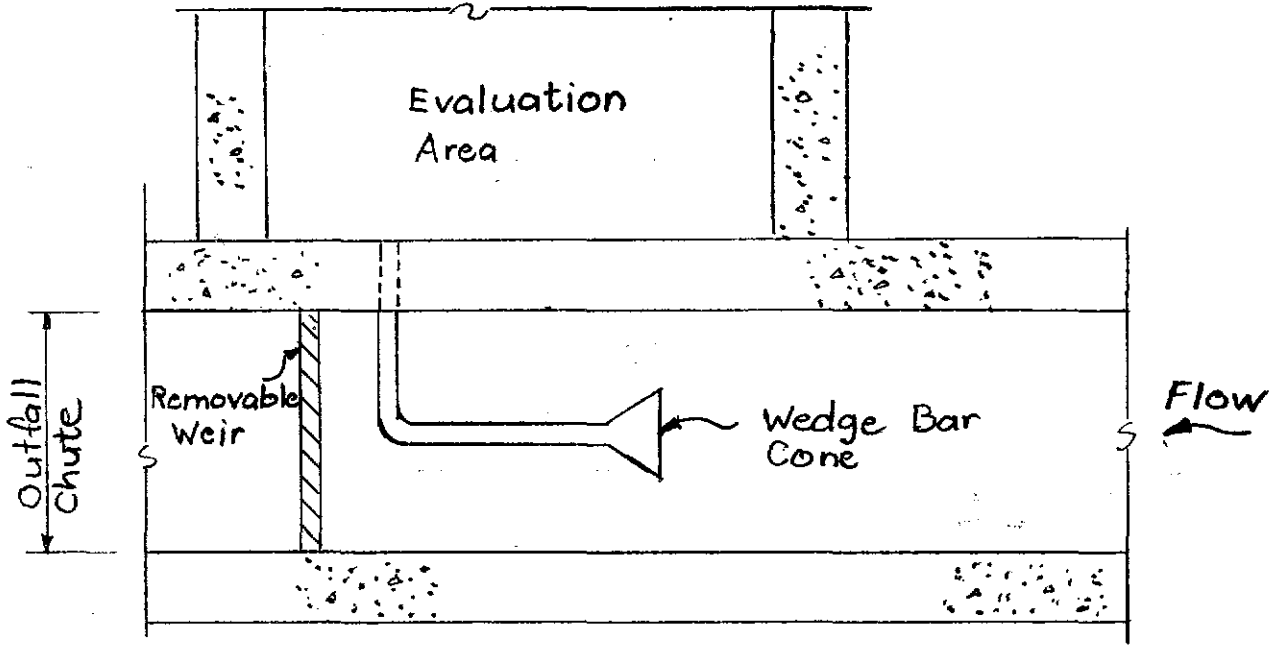
OF



John Dam Dam
 JBS - outfall chute
 "A" Alignment

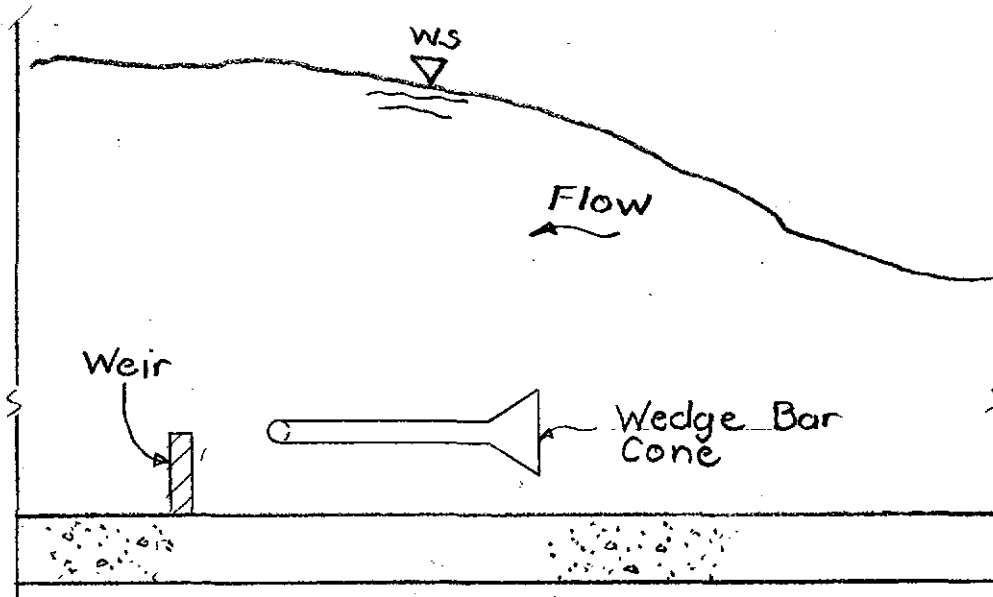
<u>Discharge</u>	Sweep out occurs to TW El.			
	<u>165.0 Invert</u>	<u>d₂ req'd</u>	<u>160.0 Invert</u>	<u>d₂ req'd</u>
205	169 (0.8d ₂)	5.0	164.4 (0.8d ₂)	5.6
315	170 (0.8d ₂)	6.56	165.8	7.3
438	171.3 (0.78d ₂)	8.07	167.2	9.0
500	172 (0.8d ₂)	8.79	167.8	9.8
695	173.5 (0.78d ₂)	10.84	169.7 Y	12.1

EVALUATION FACILITIES



PLAN

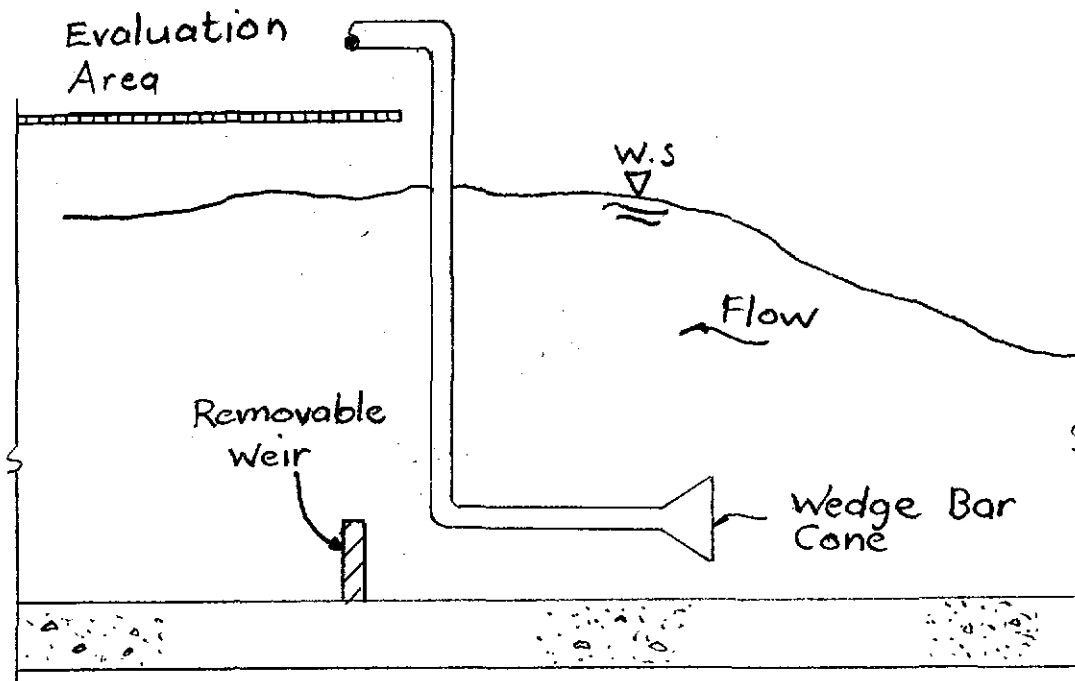
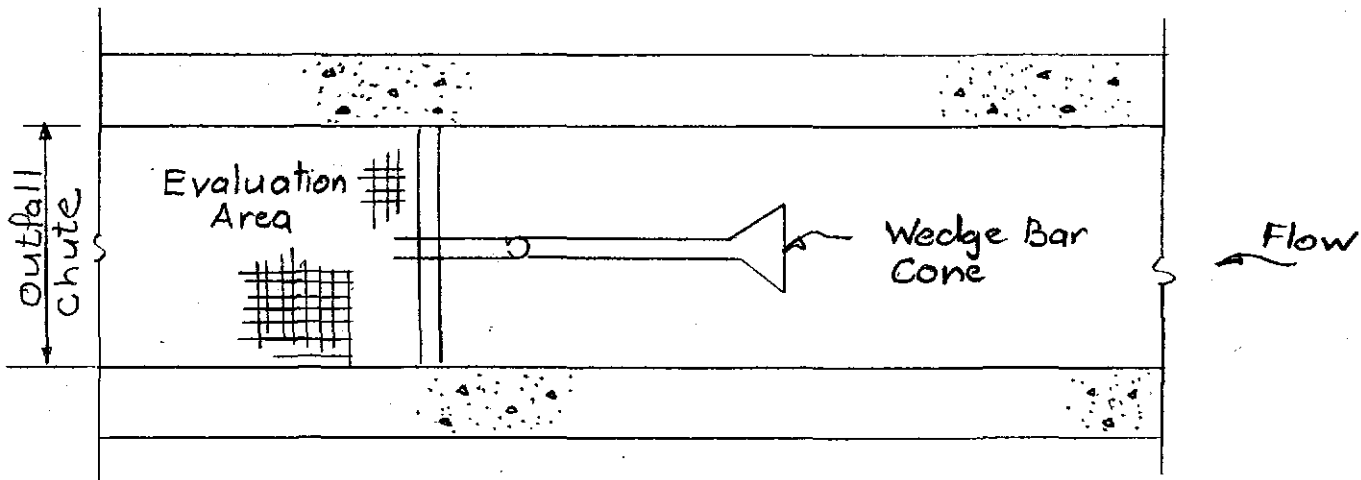
N.T.S.



PROFILE

N.T.S.

EVALUATION FACILITIES



PROFILE
NTS



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
(503) 230-5400

November 2, 1982

F/NWR5:ROP

Mr. Richard Duncan
Chief, Fish and Wildlife Branch
Portland District Corps of Engineers
P.O. Box 2946
Portland, Oregon 97208

Dear Mr. Duncan:

I have reviewed the minutes of the Lower Columbia Fish Passage Subcommittee meeting of October 7, 1982 provided by your letter of October 28, 1982. Except for one item the minutes adequately cover the meeting. The minutes should note that the NMFS expressed concern about the high velocities and shallow depths of flow in the chute as a potential source of injury.

Concerning the modification of the orifice gate adits proposed by the Corps subsequent to the meeting, there appears to be no major problem with the modified scheme. No orifice lighting is shown on the sketch provided. The modified scheme should allow for inclusion of an orifice light, possibly of the filled light tube type suggested by the agencies at the meeting and noted in the minutes.

Sincerely,

Robert O. Pearce
Hydraulic Engineer



**JOHN DAY JUVENILE BYPASS SYSTEM
MINUTES OF A COORDINATION MEETING
WITH THE LOWER COLUMBIA FISH PASSAGE
SUBCOMMITTEE
8 November 1982**

1. The purpose of the meeting was to inform the Lower Columbia Fish Passage Subcommittee (LCFPS) members of the latest design of the transportation conduit and outfall chute for the John Day Powerhouse Juvenile Bypass System and to obtain their input. The following personnel attended:

Bob Pearce, National Marine Fisheries Service
Burt Carnegie, Oregon Department of Fish and Wildlife
Paul Handy, U.S. Fish and Wildlife Service
Pete Tervooren, Corps of Engineers
Dick Duncan, Corps of Engineers
John Williams, Corps of Engineers
Dick Waits, Corps of Engineers
Ed Magner, Corps of Engineers
Don Wilson, Corps of Engineers
Dave Illias, Corps of Engineers

The meeting was held in conjunction with a meeting on the Dalles Dam Fish Counting Station and Fishladder Modification.

2. Dave Illias provided participants with the following 5 handouts:

1. Agenda
2. Layout of outfall chute alternative 1A
- 3-4. Details of the transportation conduit
5. Orifice valve arrangement

Dick Waits provided 3 handouts of hydraulic jump information for the evaluation facility with a 5 feet, 6 feet, and 7 feet chute width. The handouts are attached to the minutes.

3. Dave Illias presented the following changes to the bypass system since the last LCFPS meeting on 7 October 1982.

a. The transportation conduit and orifice have been raised 4 feet to reduce orifice submergence at high forebay pool elevations (see handouts 3 and 4). The orifice centerline elevation will be 250.5 and the conduit dimensions remain unchanged.

b. The orifice gate has been moved from the downstream side (conduit side) of the orifice tube to the face of the bulkhead slot. The orifice is in the gate slide as shown on handout 5.

c. Minor alinement changes have been made to the outfall chute to provide additional clearances with the BPA substation during construction. The total length of the chute still remains approximately the same.

4. Curt Falconer described the new orifice gate detail (handout 5) which moves the gate to the upstream side of the orifice tube and incorporates the orifice into the gate slide, recessing the orifice approximately 2" from the face of the bulkhead slot. The gate, valve stem and pneumatic operator will be installed in an excavated recess in the bulkhead slot and protected by a cover plate. The reason for locating the gate upstream was to eliminate the costly mined adits off the service gallery that were required for the gate operators with the gate on the downstream side of the orifice. Curt noted they investigated the alternative of an underwater operator which was unacceptable, and the alternative of moving the operator to the forebay deck, but ran into interference with the existing crane rails.

Bob Pearce and Burt Carnegie raised the concern of entrance conditions with a recessed orifice. Pete Tervooren felt the gate frame would need to be at least 26" inch diameter with a 2" orifice recess (3 to 1 ratio of offset). It was also noted that recent model data for the Bonneville 1st Powerhouse Bypass indicated that the John Day tube would have to be enlarged beyond the 18 inch as shown to insure planned capacity. Bob suggested that the tube in front of the orifice could have the same diameter as the orifice, making the orifice 3" thick. Pete was concerned with flow instability at the orifice with a 3 inch thick orifice. Removable orifice rings both upstream and downstream of the gate slide were also discussed. Curt then suggested installing a tapered orifice in front of the gate as shown on sketch No.1. After group discussion on the advantages and disadvantages of the different alternatives, consensus was reached that the last alternative (sketch No.1) would be the best. The Corps will perform model tests on this orifice configuration at WES by modifying the Bonneville 1st Powerhouse orifice model.

5. Curt Falconer described the orifice lighting layout as shown on handout 4. From the service gallery, a high intensity light beam will be directed down an open light tube to the downstream side of the orifice. Water will be kept out of the tube by trickling air into the tube. By having the light in the service gallery it provides easy access for bulb replacement and cleaning, and by having the light in an air filled tube and the lens hot from the light, algae should not form on the lens. Bob Pearce asked if it would be possible to place the light tube in the gate recess, locating the light closer to the orifice for better attraction. Curt said it appears feasible and they would check into it further.

6. Dave Illias described changes to the orifice cleaning system and how it will be operated. With the orifice gate mounted on the upstream side of the the orifice tube, the need for a backflush system should be eliminated. Any debris trapped across the orifice would float away by closing the orifice gate and most debris caught in the orifice would be severed by the knife action of the gate leaf. This was considered better than a water backflush system that would flush fish back into the bulkhead slot and require shutting the bypass down during the backflush operations. It would also be ineffective in generator units that are not operating. As a backup, a sluice in monolith No.14 will still be provided to supply forebay water to backflush individual orifices that cannot be cleared by orifice closure or by closure of the tainter gate at the exit of the transportation channel.

7. Dick Waits presented data on the hydraulic jump for the evaluation facility in a 5 ft, 6 ft, and 7 ft wide outfall chute (handouts 6,7, and 8). The hydraulic jump is created by an adjustable weir at sta 17 + 75 which is intended to decrease chute velocities in order to obtain evaluation samples. In the 5 ft wide chute, the sampling velocities range from 6.48 fps @ 102 cfs to 12.64 fps @ 695 cfs. In the 6 ft wide chute the sampling velocities range from 5.48 cfs @ 102 cfs to 10.44 fps @ 695 cfs. In the 7 ft wide chute the sampling velocities range from 4.86 fps @ 102 cfs to 9.28 fps @ 695 cfs. Based on a minimum sampling velocity of 8 fps, Dick noted that the 5 ft wide chute would provide the widest range of sampling capability for different discharges. A question was raised whether the 8 fps proposed at the last meeting was a maximum or minimum velocity or both. The subcommittee members felt it was a minimum because steelhead could swim against anything less and, it was also a desirable maximum, although somewhat higher velocities would probably be acceptable. The velocities below 8 fps at low chute flows were not of concern as steelhead would not normally be present when such chute flows might exist. Burt Carnegie noted that at the last meeting, widening of the chute was suggested as a means to reduce velocity entering the the tailrace and this should be the main factor in determining chute width. No data is now available in this regard. Pete Tervooren said that he anticipated the chute widening would have only a minimal effect on the tailrace entrance velocities and it would be more important that samples, could be obtained at all operating flows. Dick Waits noted maximum tailrace entrance velocities would be somewhat less then indicated on the curves presented at the last meeting because tailwater would be higher at the higher chute flows. Based on the minimal effect chute widening would have on tailrace entrance velocities and based on the sampling velocities desired, the subcommittee agreed to the 5 ft wide chute.

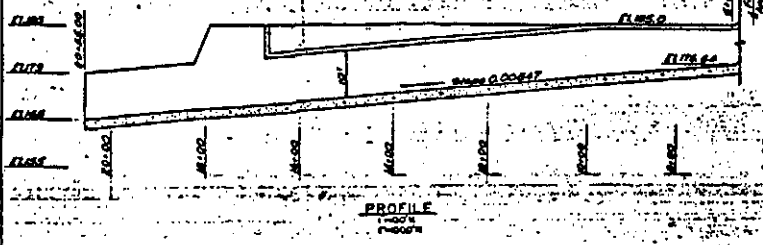
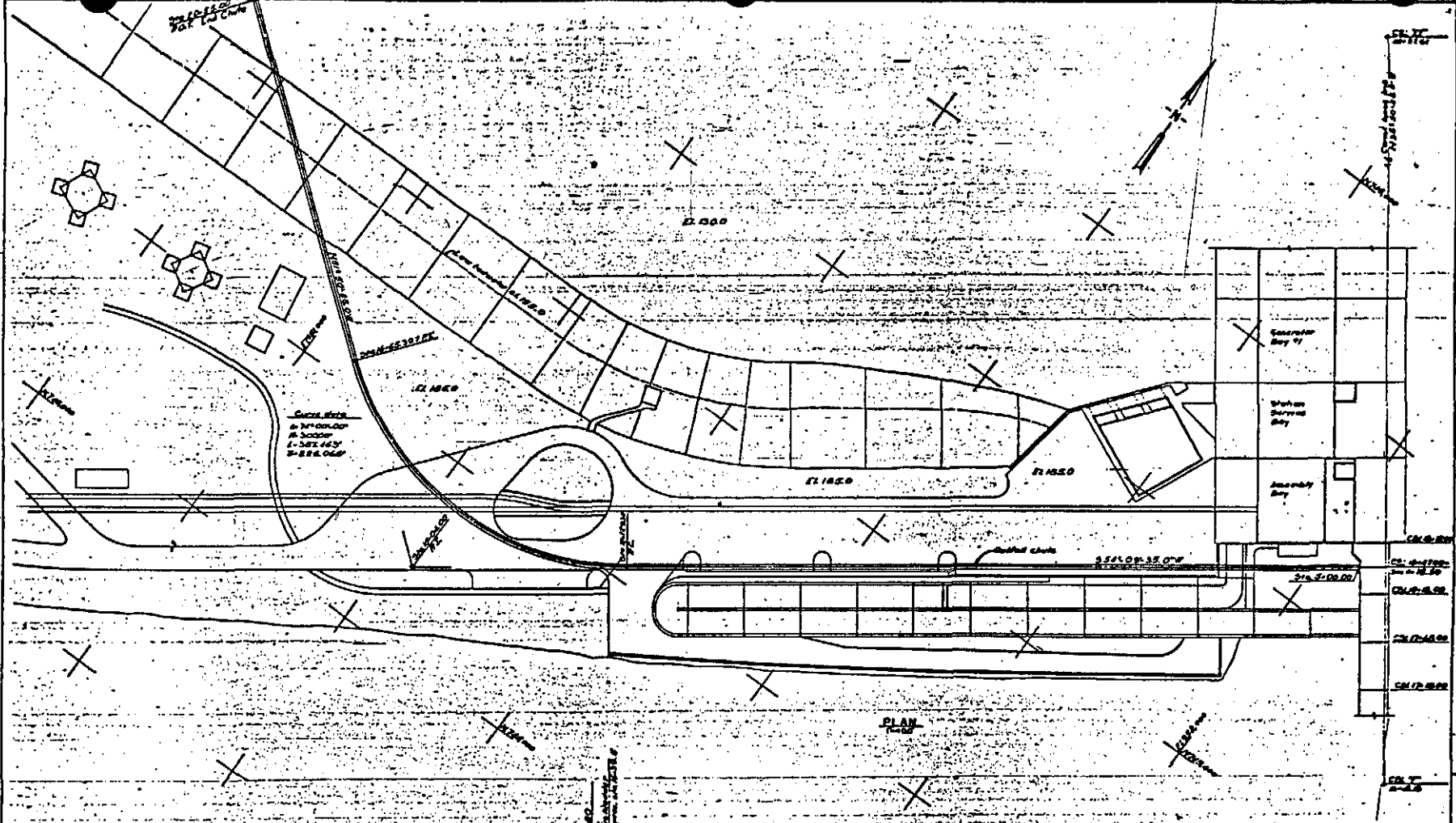
8. The meeting was adjourned at 1400.

MEETING OF THE LOWER COLUMBIA FISH PASSAGE
SUBCOMMITTEE WITH THE PORTLAND DISTRICT
U.S. ARMY CORPS OF ENGINEERS
(MULTNOMAH BUILDING, 0900 8 NOV 82)

SUBJECT: JOHN DAY JUVENILE BYPASS SYSTEM

M E E T I N G A G E N D A

1. Presentation of changes to the Bypass System since the last meeting on 6 October 1982.
 - a. Raising of the orifice and transportation conduit.
 - b. Outfall chute alinement changes.
2. Description of the orifice gate and lighting.
3. Presentation of backflush system.
4. Hydraulic presentation of outfall chute.
5. Comments and questions period.

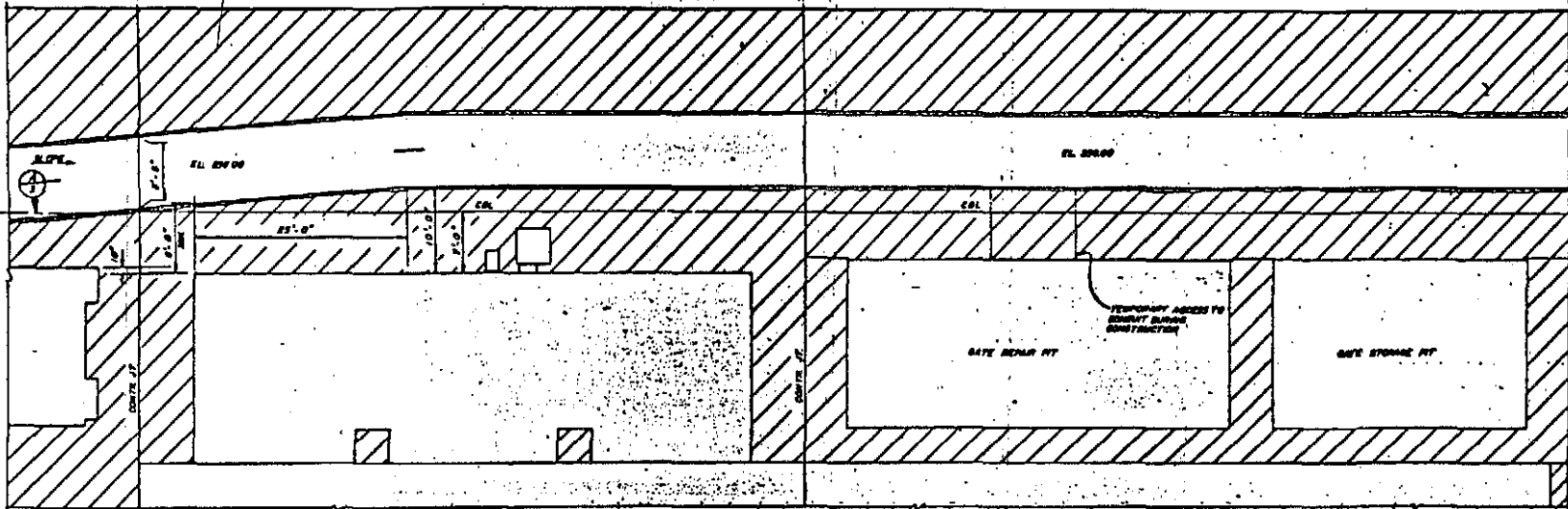


U. S. ARMY ENGINEER DISTRICT, PORTLAND			
JOHN DAY LOCK AND DAM			
COLUMBIA RIVER		OREGON-WASHINGTON	
FINGERLING BYPASS SYSTEM			
ALTERNATIVE IA			
OUTFALL CHUTE PLAN & PROFILE			
DATE	BY	CHECKED	APP'D

A-90

A

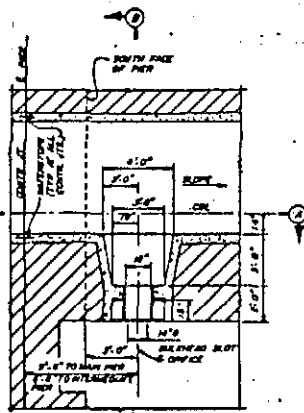
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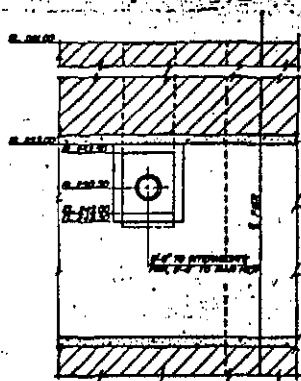
STATION SERVICE BAY

ASSEMBLY BAY

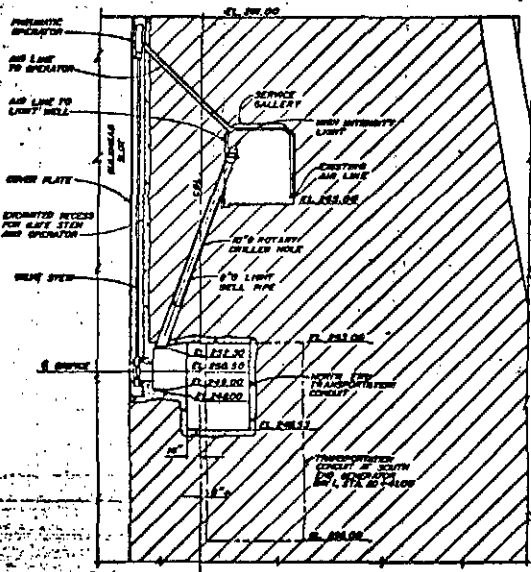
PLAN - EL. 250.50



OFFICE DETAIL
PLAN - EL. 250.50
SCALE: 1/4" = 1'-0"



SECTION A-A
SCALE: 1/4" = 1'-0"



SECTION B-B
SCALE: 1/4" = 1'-0"

U.S. ARMY ENGINEER DIVISION, W. P.	
PROJ. NO. 10000	
DRAWING NO. 10000	
DATE: 10/1/50	
BY: J. H. B.	
CHECKED BY: J. H. B.	
APPROVED BY: J. H. B.	
TITLE: JOHN DAY LOCK AND DAM	
COLUMBIA RIVER, WASHINGTON AND OREGON	
JUVENILE FISH BYPASS SYSTEM	
TRANSPORTATION CONDUIT	
SHEET 2	

EL. 281.00

PNEUMATIC OPERATOR

R LINE OPERATOR

R LINE TO GHT WELL

BULKHEAD SLOT

COVER PLATE

EXCAVATED RECESS GATE STEM OPERATOR

VALVE STEM

ORIFICE

SERVICE GALLERY

HIGH INTENSITY LIGHT

EXISTING AIR LINE

EL. 265.00

10" Ø ROTARY DRILLED HOLE

8" Ø LIGHT WELL PIPE

EL. 253.00

EL. 252.50

EL. 250.50

EL. 249.00

EL. 248.00

NORTH END TRANSPORTATION CONDUIT

EL. 245.53

14"

6"+

TRANSPORTATION CONDUIT AT SOUTH END GENERATOR BAY 1, STA. 20+41.00

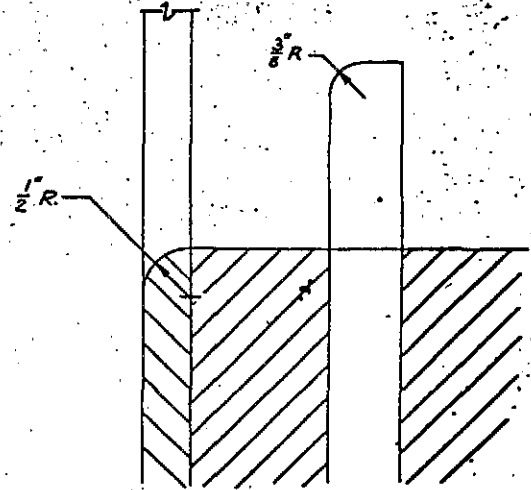
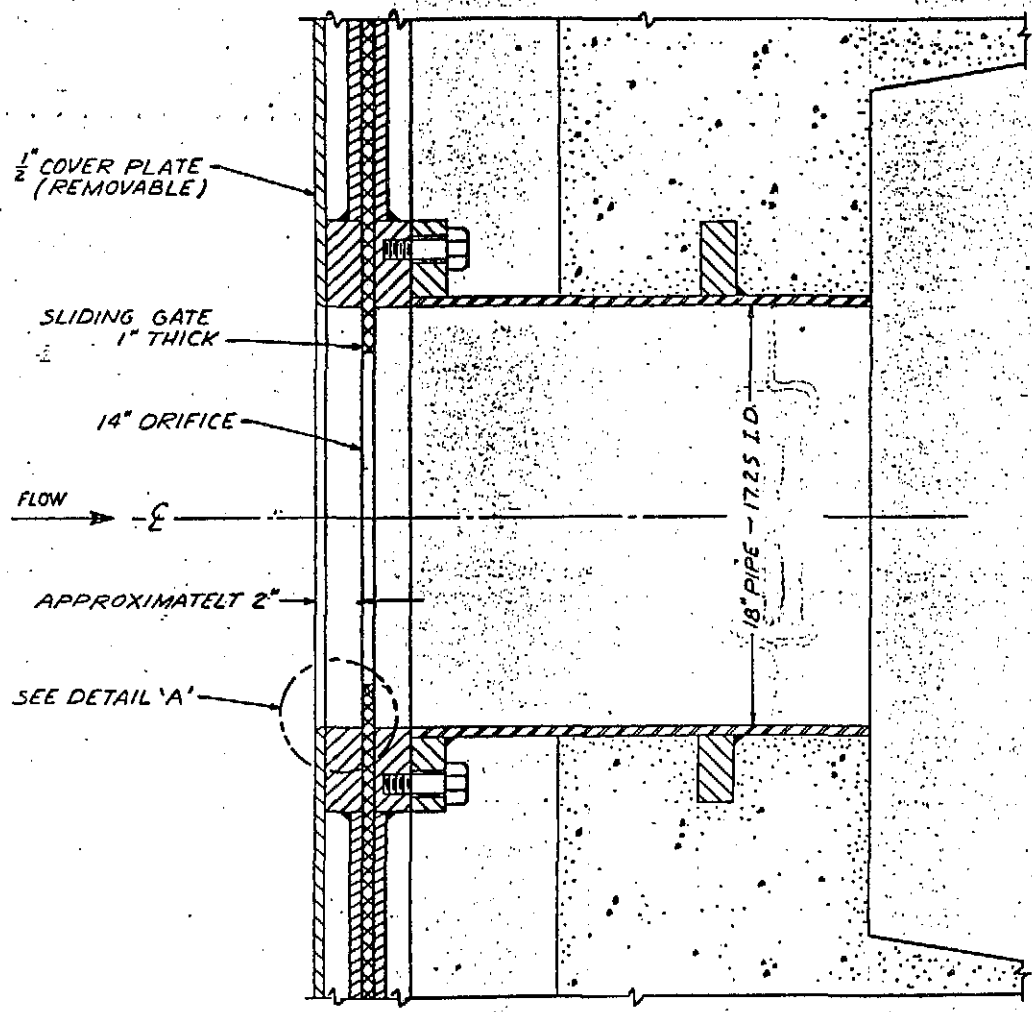
EL. 236.00

CBL

SECTION B-B

SCALE: 1/4" = 1'-0"

A-93



DETAIL 'A'
SCALE: FULL

SCALE: 3" = 1'-0"

JOHN DAY LOCK AND DAM
ORIFICE VALVE ARRANGI

5

S.D FT CHANNEL WIDTH - NO EXPANSION

END
BEND

5.0'

5.0'

Sta 17+75

Sta 16+65

500 C.F.S. - WATER SURFACE

D_2

V_2

D_1

V_1

1.0 FT (MIN)

L

Q DISCHARGE	Nr. RYML	UNRS ON/UNK	D_1 INITIAL DEPTH, FT	V_1 INITIAL VELOCITY	D_2 SAMPLING DEPTH (FT)	V_2 SAMPLING VELOCITY	L LENGTH ABOVE WEIR
102	4	H	1.80	11.33	3.15	6.48	33
205	8	B	2.75	14.91	4.85	8.45	60
356	12	H	3.75	18.03	7.10	10.03	69
500	16	H	4.15	20.20	8.30	11.24	86
695	20	H	6.20	22.42	11.00	12.64	124

Chart A

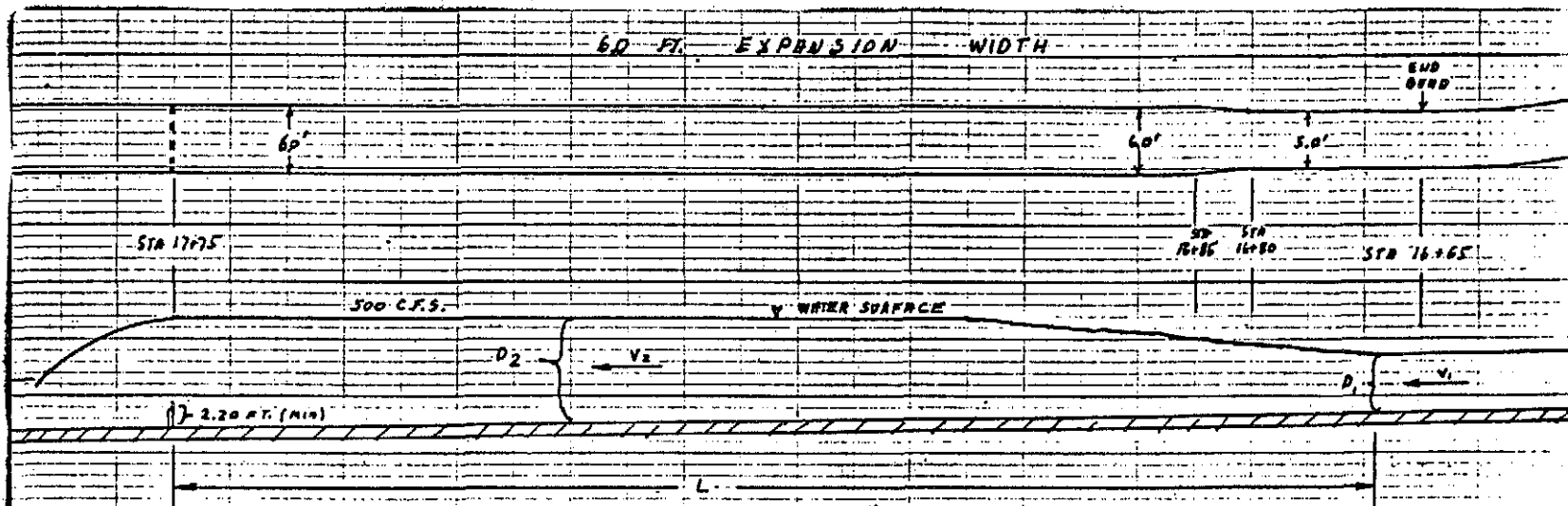
Note: Weir height variable for desired velocity

JOHN DRY
J.B.S. EVAL

DRAWN TO SCALE 1" = 10'

EN-HH-H₁V

NOV. 5, 1982 E.H.M.

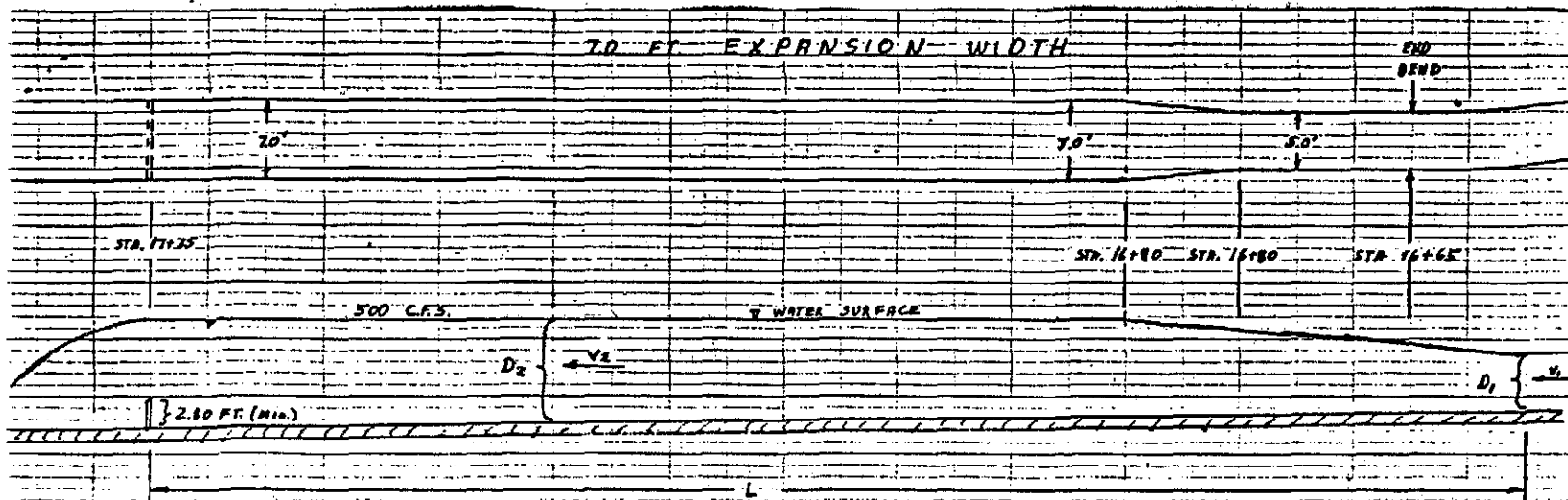


Q DISCHARGE	DUBS		D ₁ INITIAL DEPTH, FT	V ₁ INITIAL VELOCITY	D ₂ SAMPLING DEPTH, FT	V ₂ SAMPLING VELOCITY	L LENGTH ABOVE WEIR
	NO.	ON LINE					
102	4	4	1.80	11.33	3.10	5.48	42
285	8	8	2.75	14.91	4.90	6.97	60
356	12	4	3.95	18.03	7.07	8.37	78
500	16	4	4.95	20.20	8.90	9.36	106
695	20	4	6.20	22.42	11.10	10.44	164

Note: Below 310 C.F.S. Velocity (V_1) will be less than 8.0 F.P.S.

Chart B

JOHN DRY
 J.B. S. EVAL,
 DRAWN TO SCALE 1"=10'
 EN-HH-HV
 NOV. 5, 1982 E.A.M.



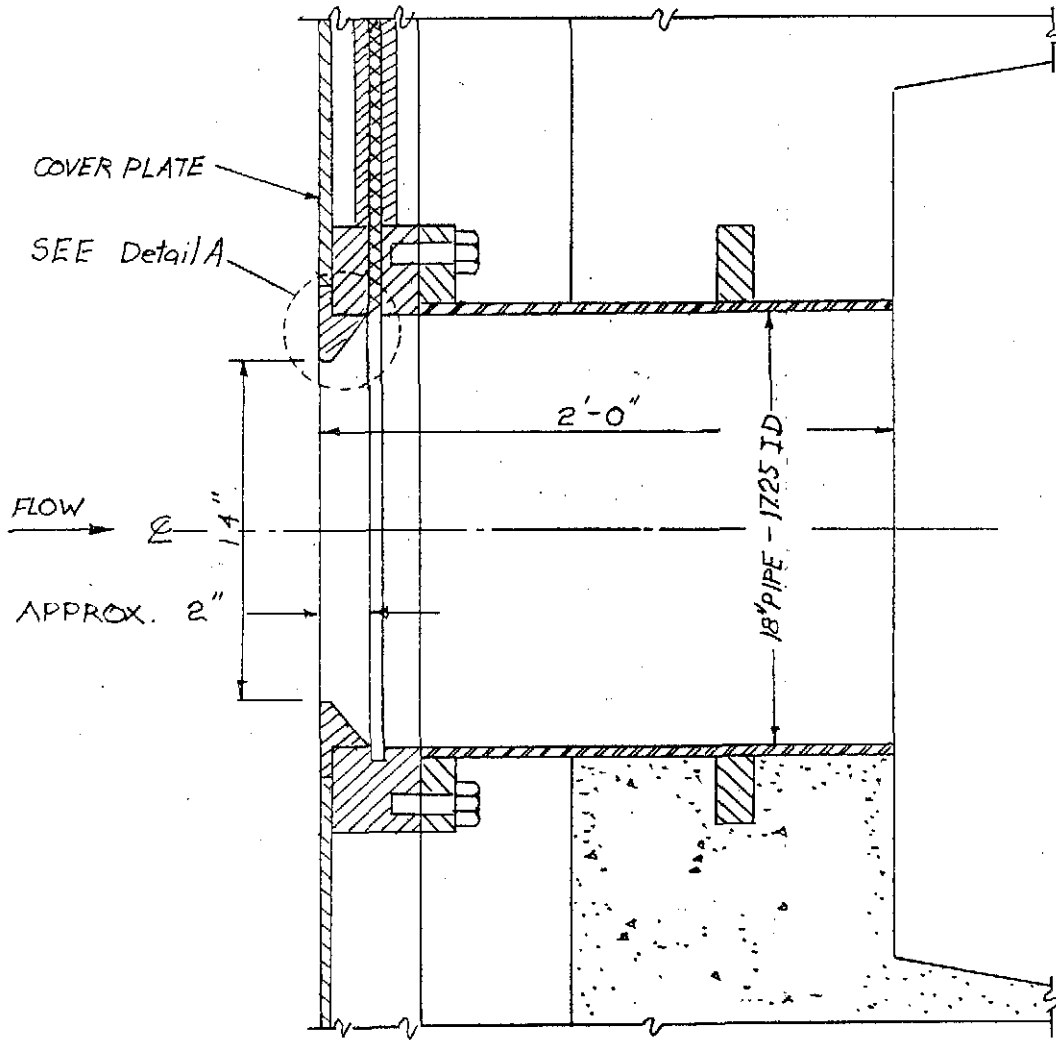
DISCHARGE	D ₁		V ₁ INITIAL VELOCITY	D ₂ SAMPLING DEPTH, FT	V ₂ SAMPLING VELOCITY	L LENGTH ABOVE WEIR
	No. UNITS	DEPTH, FT				
102	4	1.80	11.33	3.00	4.86	60
205	8	2.75	14.1	4.70	6.23	80
356	12	3.75	18.03	6.70	7.37	100
500	16	4.95	20.20	8.65	8.26	120
695	20	6.20	22.42	10.70	9.28	160

Note: Below 400 C.F.S. (V₂) velocity will be less than 8.0 FPS.

JOHN DRY
 J.B.S. EVAL
 DRAWN TO SCALE 1" = 10'
 EN-HH-HY
 NOV. 5, 1982 E.A.M.

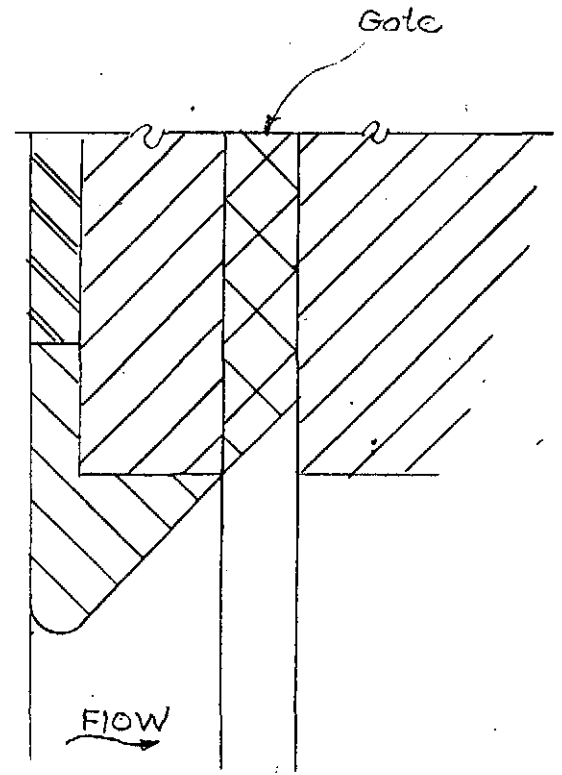
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A-97



ORIFICE DETAIL-SECTION

N.T.S.



DETAIL "A"

Sketch #1



DEPARTMENT OF THE ARMY
PORTLAND DISTRICT, CORPS OF ENGINEERS
P. O. BOX 2946
PORTLAND, OREGON 97208

March 9, 1983

Planning Division (NPPPL-FW)

Mr. Frank Lockard
Washington Department of Game
600 N. Capitol Way
Olympia, WA 98504

Dear Mr. Lockard:

The completion date of the juvenile fish bypass system for John Day Lock and Dam was set for April 1986. This date was stated in the General Letter Report in April 1982, and in our reply to the Northwest Power Planning Council in November 1982. Since that time, the schedule has been changed. The new schedule will extend the date by approximately three years. A revised schedule is enclosed for your information. Letters regarding this change have also been sent to the Directors of the agencies on the enclosed list.

If you have any questions, please call Dick Duncan, of my staff at (503) 221-6401.

Sincerely,

R. L. Friedenwald
Colonel, Corps of Engineers
District Engineer

Enclosures

This letter was sent to the following addressees:

Mr. Bill Wilkerson, Acting Director |
Washington Department of Fisheries
Room 115, General Admin. Bldg.
Olympia, WA 98504 753-6630

Dr. John R. Donaldson, Director
Oregon Department of Fish and Wildlife
PO Box 3503
Portland, OR 97208 229-5551

Mr. Jerry M. Conley, Director
Idaho Fish and Game Department
P.O. Box 25
Boise, ID 83707 344-8308

Mr. S. Timothy Wapato, Executive Director
Columbia River Inter-Tribal Fish Commission,
8383 N.E. Sandy Blvd, Suite 320
Portland, OR 97220 257-0181

Mr. Richard J. Myshak, Regional Director
US Fish and Wildlife Service
Lloyd 500 Bldg. Suite 1692
500 N.E. Multnomah Street
Portland, OR 97232 231-6828

Mr. H. A. Larkin, Regional Director
National Marine Fisheries Service
7600 Sand Point Way N.E.
BIN C15700
Seattle, WA 98115 442-7575

Mr. Frank Lockard
Washington Department of Game
600 N. Capitol Way
Olympia, WA 98504 753-5700

Mr. Dale Evans
National Marine Fisheries Service
Environmental & Technical Services Division
847 NE 19th, Suite 350
Portland, OR 97232 230-5400

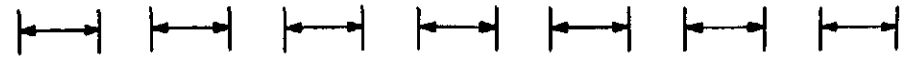
OTHER FLOAT DESIGN NPD NPP ADV. MEMO. REVIEW P&S REVIEW N.T.P CONST.

JOHN DAY JUVENILE BYPASS SYSTEM DESIGN AND CONSTRUCTION SCHEDULE

FEATURE	FISCAL YR.	FY 1982	FY 1983	FY 1984	FY 1985	FY 1986	FY 1987	FY 1988	FY 1989
	CALENDAR YR.	CY 1982	CY 1983	CY 1984	CY 1985	CY 1986	CY 1987	CY 1988	CY 1989
TRANSPORTATION CONDUIT AND OUTFALL									
*VERTICAL BARRIER SCREENS (VBS)									COMPLETED BYPASS IN OPERATION
*SUBMERGED TRAVELING SCREENS (STS)									
SUBMERGED TRAVELING SCREENS CRANE									
BALANCE OF PLAN FEATURES									
(1) STS TRANSPORTATION TRUCK AND TRAILER									
(2) STS MAINTENANCE BUILDING									
* (3) VBS CLEANING DEVICE									
BULKHEAD SLOT DIPPING									
O & M DURING CONSTRUCTION									
BYPASS EVALUATION									

NPP FORM OCT. 1973 960 Rev. * PRESENTED IN THIS SUPPLEMENT

FINGERLING PASSAGE PERIODS



A-100

Incl 1

April 1, 1983

Engineering Division
(NPPEN-DB-SA)

This letter sent to all on attached mailing list

Dear :

Reference our letter, dated March 9, 1983, furnishing you with our latest schedule for the John Day Juvenile Bypass System. This letter is intended to present to you the details of the bypass system as coordinated with the Lower Columbia Fish Passage Subcommittee (LCFPS) in meetings held in our office January 6, March 10, June 7, October 7, and November 9, 1982. Minutes of the meetings are forwarded as enclosures 1 through 5, respectively.

Our general letter report was completed in April 1982. The basic plan recommended in this report involved a mined transportation conduit upstream of bulkhead slot which flows south across the powerhouse into an Energy Recovery System (ERS). The system included an inclined screen to separate a large volume of the water for operating a small turbine. Economic justification of the ERS was only marginal in the report and many questions remained to be answered in the economic analysis; therefore, the ERS was eliminated from the bypass at this time.

In 1982, research was concluded at McNary Dam to specifically determine the effect of balanced flow vertical barrier screens on submerged traveling screen (STS) fish guiding efficiency (FGE) and improving orifice passage efficiency (OPE), and to determine the effect of the depth of orifice submergence on fish passage efficiency. The results of the research showed that both a shallow and deep orifice was acceptable for OPE and the balanced flow vertical barrier screen does not significantly affect FGE.

Incorporating the 1982 research results and eliminating the ERS, the new bypass system developed is described as follows. Submerged traveling screens guide juvenile salmonids entering the intakes into the bulkhead slot, and balanced flow vertical barrier screens will contain fish in the bulkhead slot until they volitionally pass through gated orifices into a mined transportation conduit upstream of the bulkhead slot. The orifices are operated under a constant upstream differential head submerging the discharge side of the orifice, with submergence varying with forebay elevation. The mined conduit, expanding uniformly from north to south, will flow south across the powerhouse from generator unit 16 to unit 1, through the station service and assembly bays, and into the non-overflow monolith No. 14 where it turns 90 degrees toward the tailrace. At this point, the fish pass under a tainter gate into an open-flow rectangular concrete chute that terminates at an above-water release in the tailrace about 1,500 feet downstream (see enclosure no. 6). An evaluation facility, located approximately where the chute leaves the shore, will be provided for monitoring the effectiveness of the bypass. The transportation conduit will be sized for the increased capacity if the conduit is extended for any future installation of generator units 17 through 20.

Research conducted at Lower Granite in 1982 resulted in low STS fish guiding efficiency, raising concerns with the STS design at John Day Dam due to the similar intake geometry of the two projects. Hydraulic model studies on STS's were completed and favorable modifications that can possibly improve the STS performance are now being installed on a test STS. Research on this STS at Lower Granite Dam in the spring of 1983 will provide information for our design prior to award of the STS contract.

I would appreciate your concurrence or comments on the bypass system, described above, by April 11, 1983. Please contact Mr. Dave Illias at (503) 221-6905 should you have any questions or need additional information.

Sincerely,

Robert P. Flanagan, P.E.
Chief, Engineering Division

Enclosures

This letter was sent to the following addressees:

Mr. Bill Wilkerson, Acting Director
Washington Department of Fisheries
Room 115, General Admin. Bldg.
Olympia, WA 98504 753-6630

Dr. John R. Donaldson, Director
Oregon Department of Fish and Wildlife
PO Box 3503
Portland, OR 97208 229-5551

Mr. Jerry M. Conley, Director
Idaho Fish and Game Department
P.O. Box 25
Boise, ID 83707 344-8308

Mr. S. Timothy Wapato, Executive Director
Columbia River Inter-Tribal Fish Commission,
8383 N.E. Sandy Blvd, Suite 320
Portland, OR 97220 257-0181

Mr. Richard J. Myshak, Regional Director
US Fish and Wildlife Service
Lloyd 500 Bldg. Suite 1692
500 N.E. Multnomah Street
Portland, OR 97232 231-6828

Mr. H. A. Larkin, Regional Director
National Marine Fisheries Service
7600 Sand Point Way N.E.
BIN C15700
Seattle, WA 98115 442-7575

Mr. Frank Lockard
Washington Department of Game
600 N. Capitol Way
Olympia, WA 98504 753-5700

Mr. Dale Evans
National Marine Fisheries Service
Environmental & Technical Services Division
847 NE 19th, Suite 350
Portland, OR 97232 230-5400



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
(503) 230-5400

April 6, 1983

F/NWR5:ROP

Mr. Robert P. Flanagan, P.E.
Chief, Engineering Division
Portland District Corps of Engineers
P. O. Box 2946
Portland, OR 97208

Dear Mr. Flanagan:

Your letter of April 1, 1983 to me and to the Northwest Regional Director presented the proposed design of the John Day Dam Juvenile Bypass System, as coordinated through the Lower Columbia Fish Passage Subcommittee (LCFPS). The design as described in your letter and in the minutes of the LCFPS meetings has our concurrence.

Numerous design details have not yet been made available for our review. We request the opportunity to review the preliminary contract drawings at the appropriate time.

The 3-year delay in completion of the John Day bypass presented in the District Engineer's letter of March 9, 1983 is of extreme concern to us and other fisheries agencies. This concern was voiced at the March 17 meeting of the Fish Passage Development and Evaluation Program Technical Coordinating Committee. We understand this delay would result if anticipated Corps budget restrictions occur. While the anticipated construction funding indicates a delay at this time, we strongly encourage you to proceed with completion of design such that in the event funding is available, slippage of the completion date can be avoided or minimized.

Sincerely,

Dale R. Evans
Division Chief

cc: F/NWR





United States Department of the Interior

FISH AND WILDLIFE SERVICE

Fisheries Assistance Office
9317 Highway 99, Suite I
Vancouver, WA 98665

April 13, 1983

Mr. Robert P. Flanagan, P.E.
Chief, Engineering Division
Portland District
Corps of Engineers
P.O. Box 2946
Portland, OR 97208

Dear Mr. Flanagan:

Reference your letter, dated April 1, 1983, requesting our concurrence and comments relative to the John Day juvenile bypass system. This letter presents our concurrence with the details as expressed in the minutes of the Lower Columbia Fish Passage Subcommittee and the above referenced letter.

We are still in hopes that the projected delay in the bypass system can be shortened. We encourage you to proceed as far as possible on the design and specifications inhouse in the event any unforeseen program changes would allow for an early contract award.

Sincerely,

Paul W. Handy
Columbia River Coordinator

COLUMBIA BASIN FISH AND WILDLIFE COUNCIL

LLOYD BUILDING • SUITE 1240
700 N. E. MULTNOMAH STREET
PORTLAND, OREGON 97232

(503) 231-2241
FTS 429-2241

OFFICE OF
EXECUTIVE SECRETARY

April 18, 1983

Colonel R.L. Friedenwald
Department of the Army
Portland District
Corps of Engineers
P.O. Box 2946
Portland, Oregon 97208

Dear Colonel Friedenwald:

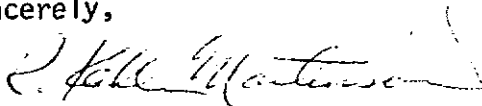
We understand from your letter of March 9, 1983 that the completion date for the downstream migrant bypass system at John Day Dam has been extended by three years to March 30, 1989. This delay in reducing the large losses of salmon and steelhead smolts associated with John Day Dam is totally unacceptable. The decision to delay the construction of this critical system is very difficult for us to understand, since the Corps has recently indicated a willingness to cooperate fully with regional efforts to restore upriver fish runs.

John Day Dam is the single most serious impediment to restoring productive fisheries on upriver runs in the Columbia Basin. Both the fishery agencies and the Northwest Power Planning Council have been assured by the Corps that they were committed to the regional effort to restore these runs. Section 404(b)(2) of the Northwest Power Planning Council's Fish and Wildlife Program requires a completed bypass system at John Day Dam by March 30, 1986 and contemplates BPA funding.

Failure to complete the downstream migrant bypass system on schedule will seriously impact the effectiveness of the Lower Snake River Compensation Program and all other programs designed to restore upriver runs.

We request that you make every effort to resolve any impediment to the timely implementation of bypass at John Day Dam.

Sincerely,



William R. Wilkerson
Chairman

cc:
NPPC
NW Congressional Delegation
CBFWC Members



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
(503) 230-5400

April 18, 1983

F/NWR5:DAD

Colonel Robert L. Friedenwald
District Engineer
Portland District Corps of Engineers
P. O. Box 2946
Portland, OR 97208

Dear Colonel Friedenwald:

We read with some alarm your letter of March 9 informing us that you have extended the completion date for the juvenile bypass system at John Day Dam by three years to 1989.

We view the present lack of downstream migrant protection at John Day as the most serious of the remaining fish passage problems in the Columbia Basin. Resolution of this problem must be given the highest priority. The Corps of Engineers has invested large sums of money in research and facilities at other Columbia and Snake river projects to mitigate impacts on fish passage. Corps funded research at John Day Dam has documented the impact that this project is having and has identified installation of a submerged traveling screen-smolt bypass system as the best means of treating this problem.

The Northwest Power Planning Council has adopted a Fish and Wildlife Program for the Columbia Basin that will commit the Northwest ratepayers to substantial increases in their monthly electric bills in order to restore runs of salmon and steelhead. Failure to correct the causes of excessive juvenile mortality at John Day Dam on schedule foregoes many of the benefits of scheduled ratepayer investments in increasing production from other parts of the Basin. Delay will continue to deny commercial and recreational fishermen, as well as holders of Indian treaty rights, improved harvests of fish that might otherwise develop as a result of the expenditure of Corps funds at projects above John Day Dam. Much of the planning for restoration of salmon and steelhead production in the Columbia Basin has been predicated on the Corps ability to meet its schedule for correcting juvenile passage problems at this critical site. Accordingly, we are at a loss to understand why this particular project was singled out for such a substantial delay beyond the 1986 completion date included in planning the Northwest Power Act Fish and Wildlife Program.



We understand the budget problems that face all Federal agencies. The work at John Day Dam, however, is a vital link in securing the economic and social benefits to the Pacific Northwest from the investments that have been made, and that are continuing to be made from many other sources as well as the Corps. Nearly all facets of the region's salmon and steelhead fisheries are suffering now as they never have before. The Fish and Wildlife Program presents a prescription for correcting much of the problem, but its success depends in large part on whether the Corps successfully meets its obligations at critical points like John Day Dam. We urge that you continue to pursue all avenues for funding completion of the work in 1986, including discussion with Bonneville Power Administration and the Northwest Power Planning Council.

Sincerely,



Dale R. Evans
Division Chief

cc: John Palensky, BPA
Curt Marshall, NWPPC
Kahler Martinson, CBFWC
F/NWR



STATE OF WASHINGTON
DEPARTMENT OF FISHERIES

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

April 27, 1983

Colonel R. L. Friedenwald
Department of the Army
Portland District, Corps of Engineers
P.O. Box 2946
Portland, Oregon 97208

Dear Colonel Friedenwald:

The Washington Department of Fisheries is extremely disappointed in the recent decision to again delay construction of the juvenile fish passage facilities at John Day Dam. John Day Dam and Reservoir present a major impediment to the successful implementation of the Northwest Power Planning Council's Fish and Wildlife Program, as well as the other continuing efforts of fisheries agencies and tribes to restore the once abundant upper Columbia salmon and steelhead runs.

The Lower Snake River Compensation Plan is well underway. Mitigation production at Priest Rapids Hatchery has increased significantly. Drastic steps have been taken in the control of fisheries interception of natural runs from the upper Columbia Basin. The Fish and Wildlife Program contains many measures designed to improve the status of these runs. Implementation of a number of these measures is underway. The Department of Fisheries feels that timely implementation of measure 404(b)(2) is one of the most important needs identified in the Program. Improving the survival of juvenile salmonids passing John Day Dam is imperative if the benefit of other measures is to be maximized.

We understand that most of the planning and design work for migrant passage facilities at John Day Dam has been completed. By letter of March 4, 1981, from your predecessor, Colonel Connell, we were informed that the completion of these facilities was scheduled for operation by April 1985. Subsequently, the schedule slipped to a completion date of April 1986. This latter completion date was accepted by the Power Planning Council and incorporated in their Program. (The September draft Fish and Wildlife Program called for completion by November 15, 1985.)

April 27, 1983

Delay of these facilities until April 1989 will result in continued high loss of juvenile migrants and will cause continued losses in the treaty-Indian subsistence, ceremonial, and commercial fisheries and non-treaty commercial and recreational fisheries. Many of these fisheries have already been eliminated or severely curtailed to protect runs originating from above John Day Dam. Except for a limited Indian subsistence and ceremonial fishery and limited fisheries on upriver bound fall chinook, there are no inriver fisheries on the upriver salmon stocks. Ocean harvests by U.S. fishermen have also been reduced. The recently proposed U.S./Canada salmon interception treaty will further reduce ocean harvests on salmon of upriver origin. These steps will accomplish relatively, however, unless we can aggressively pursue the correction of losses of juveniles on the seaward migration.

Program measure 404(b)(2) states that ". . . Bonneville shall fund the installation, operation, and maintenance costs for this project." We urge that the Corps of Engineers fully explore this avenue of funding for the bypass facilities.

As an agency which relies on the appropriation of funds in order to accomplish our goals, we recognize that budget cuts are the fashion of our time. I'm sure your circumstances are similar to ours. However, with the region's dependence upon salmon for economic and social well being, as well as to ensure that Indian treaty fishery rights can be met, budget reductions should not occur in the area of juvenile fish passage facilities. This agency stands ready to assist you in the procurement of necessary funding to complete this task by April 1986.

Sincerely,



William R. Wilkerson
Director

WRW:ag

cc: Columbia Basin Fish and Wildlife Council
North Pacific Division, Corps of Engineers
Northwest Congressional Delegation
Northwest Power Planning Council w/attachment

APPENDIX B

BYPASS OUTFALL
ALTERNATIVES STUDY

<u>Subject</u>	<u>Page</u>
Alternatives Study	B-1
Capital and Annual Cost Summary	B-4
Cost Estimates	B-5 thru 8
Average Flow for 6.0 Foot Diameter Pressure Conduit	B-9
PLATES (B-1 thru B-4)	

APPENDIX B
BYPASS OUTFALL
ALTERNATIVES STUDY

1. Purpose. The outfall system recommended in the John Day Lock and Dam, Juvenile Fish Bypass System, General Letter Report consisted of a full flow 2 foot circular pipeline with a submerged release into the tailrace. It was developed in conjunction with a screen-powerhouse system for the energy recovery of a major portion of flow, but due to lack of economic justification the screen-powerhouse system has been eliminated from the bypass at this time. Therefore, the purpose of this appendix is to examine and evaluate four new alternatives which have been developed for bypassing all the fish and flow to the tailrace, and selecting one for adoption.

2. Description of Alternatives.

a. General. Three basic outfall plans were studied. Alternative 1 is divided into 1A and 1B, which differ only in alignment and length. All the alternatives, except alternative, have provisions for a fish evaluation facility at the lower end of the outfall. Alternatives 1A, 1B, and 2 have above water releases and Alternative 3 has a submerged release.

b. Alternatives 1A and 1B. Alternative 1A is an open channel flow rectangular concrete chute 5' wide by 10' deep and 1,555-feet long. The flow is controlled by a 5'x9' tainter gate located just downstream of existing monolith #14 (Plate B-1). From the gate (El. 235) the chute invert follows an ogee curve to elevation 176.64 and then slopes uniformly to the exit at elevation 165. The horizontal alignment of the chute follows parallel to the existing fishladder and then turns just upstream of the Bonneville Power Administration (BPA) turning towers and then continues straight to the exit.

Alternative 1B is similar to 1A except that it is 1,812 feet long and the alignment turns and goes between the first and second BPA turning towers and then to tailwater (Plate B-2). The chute for both alternatives terminates at a distance of 100-feet offshore from the low tailwater (El. 155) line on the bank revetment. The purpose for considering Alternative 1B was to reduce the exit velocities into the tailrace.

c. Alternative 2. Alternative 2 is an open channel flow circular steel chute 10-feet in diameter (Plate B-3). Starting at station 5+00 (Monolith #14) the rectangular chute and tainter gate is identical to alternate 1. At the bottom of the ogee curve there is a transition to the 10-foot diameter circular chute. The chute then turns and goes between the third and fourth BPA turning towers and then to tailwater. At approximately 250-feet before the exit there is a transition from the 10-foot diameter circular section to a rectangular section. The overall length of this alternative is 2,248-feet.

d. Alternative 3. Alternative 3 is a full flow 6-foot diameter pipeline with a make-up water system located in monolith #14 (Plate B-4). The make-up water is required to maintain full pipe flow for the varying tailwaters. From monolith #14 the pipeline extends downstream past the BPA turning towers, makes a loop, then proceeds to tailwater just downstream of the fourth BPA turning tower. At the pipe exit there is a transition from 6-foot diameter to 8-foot diameter to reduce exit velocities. The overall length of this alternative is 3,100-feet.

3. Alternatives Analysis.

a. General. Construction cost, hydraulic conditions, value of bypassed water, and the difficulties associated with construction between the BPA turning towers for each alternative are presented in this section. All four alternates are considered adequate for passage of fingerlings. A summary table of the economic analysis is shown on page B-4. The detailed cost estimates are shown on pages B-5 through B-8. All costs are based on October 1982 price levels. An interest rate of 7-7/8 percent was used and an analysis period of 100 years. System operation is based on 7 months, starting 1 April and ending 1 November. The energy cost was developed from values (61.8 mills/KWH) obtained from NPPEN-WM. The energy value for water run through the main units is 7.42 Kw/cfs. The operating period is 7 months (1 April to 1 November, 5136 hrs/yr), the same as used in the General Letter Report.

Alternatives 1A, 1B and 2 have potential for energy cost savings possible by closing the orifices of non-operating turbine units. This possible savings is not included in this evaluation because the time lapse period for orifice

closure after shutdown needs to be researched and coordinated with the fish agencies after construction. The operational and maintenance costs for each of the alternatives will be minimal and similar.

b. Alternative 1A. This alternate has the lowest annual cost. This can be attributed to its low construction cost and its low cost of bypassed power. Alternative 1A also avoids the potential construction difficulties of an alignment between the BPA turning towers.

c. Alternative 1B. Alternative 1B has a slightly higher annual cost because of its longer length than 1A. All other characteristics of 1B are the same as 1A, except for the fact that Alternate 1B is routed between two BPA turning towers, which could cause construction problems. The reduced exit velocities, due to the longer chute, were not significant enough to warrant the added cost of a longer chute.

d. Alternative 2. This alternative's annual cost is higher than either alternates 1A or 1B because of the longer length and large diameter pipe required. Alternative 2 also is routed between two of the BPA turning towers.

e. Alternative 3. Alternative 3 has the highest annual cost, chiefly because of the bypassed power cost caused by its make-up water system. Hydraulic control is not as desirable as in the other three alternates because of the necessity of using a knife gate instead of a tainter gate. Exit velocities are more moderate in this alternate, however. Alternative 3 is routed to avoid the BPA turning towers.

4. Conclusions. All four alternatives are acceptable from a functional standpoint for a bypass outfall. Based on the lowest annual cost, the most desirable hydraulic control, and the avoidance of obvious construction problems, we have selected Alternative 1A for construction.

TABLE B-1

FINGERLING BYPASS OUTFALL
CAPITAL AND ANNUAL COST SUMMARY

ALTERNATIVE	DESCRIPTION	FIRST COSTS	ANNUAL COSTS		
		OUTFALL	CAPITAL COSTS	ENERGY COSTS	TOTAL ANNUAL COSTS
1A	Open Channel Flow Rectangular Chute, Exit U/S of BPA Towers	2,903,000	229,000	1,526,000	1,755,000
1B	Open Channel Flow Rectangular Chute, Exit between BPA Towers	3,133,000	247,000	1,526,000	1,773,000
2	Open Channel Flow Circular Chute	3,952,000	311,000	1,526,000	1,837,000
3	Full Flow Pipeline with Make-up Water System	3,885,000	306,000	1,842,000	2,148,000

- Note: 1. Outfall cost includes all costs in monolith #14 and D/S.
2. Annual energy costs for alternatives 1A, 1B, and 2 were obtained from Appendix C.
3. See page B-9 for computations of annual energy costs for Alternative 3.

ENGINEER'S ESTIMATE

Project FINGERLING BYPASS SYSTEM

Sheet 1 of 4

Location JOHN DAY LOCK AND DAM

Estimated by O W Date:

Features ALTERNATIVE # 1A - OUTFALL

Checked by DI

Pertinent Data Open-channel flow. Exit U/S from BPA towers

ITEM	UNIT	QUANTITY	UNIT PRICE	AMOUNT	REMARKS
1	EXCAVATION AND BACKFILL	JOB	1	\$ L.S.	\$ 185,000
2	EXCAVATED CONCRETE	CY	79	859	68,000
3	CONCRETE LINING	CY	17	530	9,000
4	CONCRETE, STRUCTURAL	CY	3,691	297	1,096,000
5	2'X2' SLUICE GATE W/OPERATOR	EA	1	19,000	19,000
6	TRASHRACK AND GUIDES	EA	1	3,000	3,000
7	SUPPORT FRAMES @ MONOLITH #14	EA	4	24,000	96,000
8	5X9 TAINTER VALVE	EA	1	12,000	12,000
9	TAINTER VALVE OPERATING MACHINERY	JOB	1	L.S.	48,000
10	POST-TENSIONING	JOB	1	L.S.	16,000
11	SUPPORT FRAMES @ OUTFALL	EA	5	36,000	180,000
12	UTILITIES RELOCATION	JOB	1	L.S.	48,000
13	LANDSCAPING	JOB	1	L.S.	37,000
14	EVALUATION FACILITY	JOB	1	L.S.	305,000
	TOTAL BASIC COST				2,122,000
	ADD 20% CONTINGENCIES				424,000
	SUBTOTAL				2,546,000
	E&D @ 8%				204,000
	S&A @ 6%				153,000
	TOTAL ESTIMATE				\$2,903,000

AVERAGE FLOW FOR 6.0 FEET DIAMETER
PRESSURE CONDUIT WITH ADD-IN (BASED ON 60 ORIFICES)

<u>Tw. El. (Ft)</u>	<u>Inct. Pct. Time</u>	<u>System Qs (cfs)</u>	<u>Make-up Qm (cfs)</u>	<u>Total Qt (cfs)</u>	<u>Qt X Pct.</u>
173	0	700	0	700	0
171	0.03	700	14	714	0
170	0.3	700	20	720	2.16
169	0.2	700	27	727	1.45
168	0.2	700	34	734	1.47
167	0.2	700	41	741	1.48
166	1.5	700	47	747	11.21
165	2.0	700	54	754	15.08
164	4.1	700	61	761	31.20
163	5.9	700	68	768	45.31
162	10.6	700	75	775	82.15
161	23.9	700	81	781	186.66
160	37.6	700	88	788	296.29
159	11.9	700	95	795	94.61
158	1.4	700	102	802	11.23
157	0.2	700	109	809	1.62

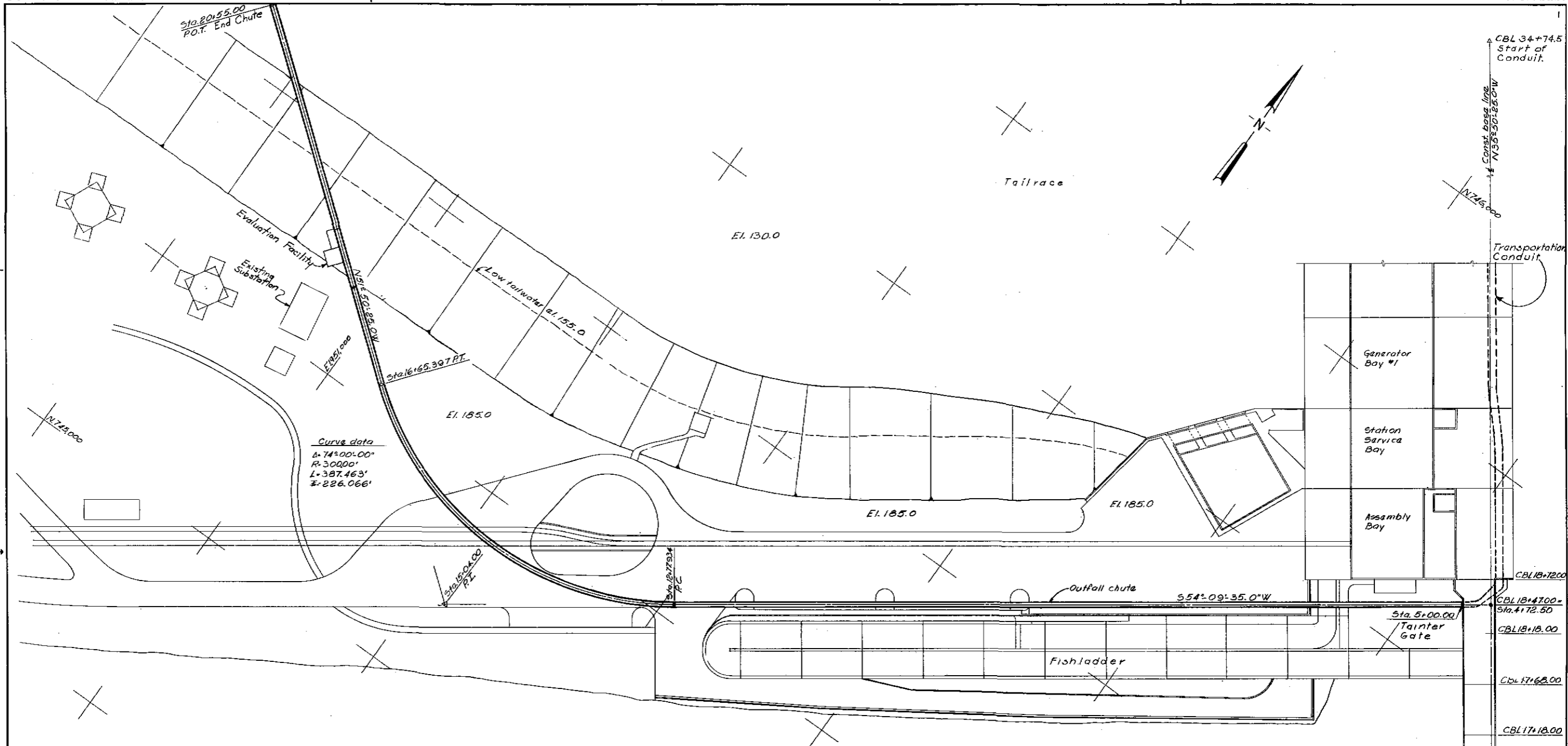
Average 782 cfs

Annual Energy Cost for Alternative 3

Energy Costs

Power = 782 cfs x 7.42 kw/cfs = 5802 kw

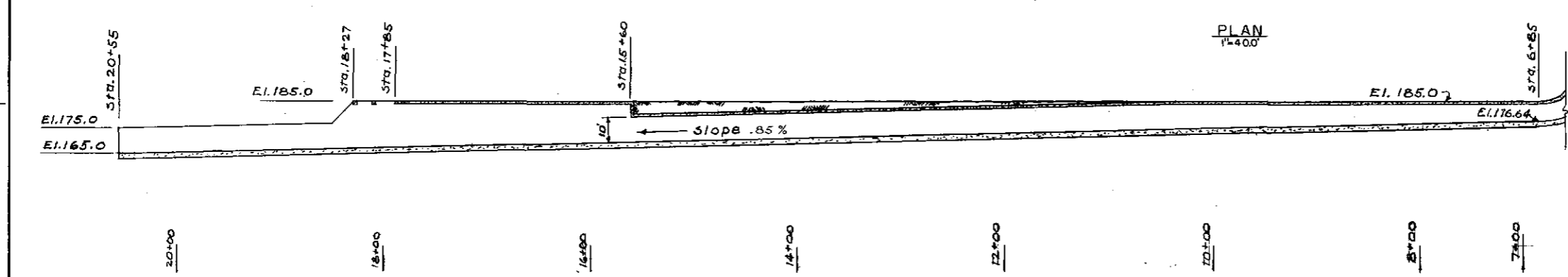
Cost = 5802 kw x 5,136 hrs/yr x \$0.0618/kwh = \$1,842,000/yr



Curve data
 $\Delta = 74^{\circ}00'00''$
 $R = 30000'$
 $L = 387.463'$
 $E = 226.066'$

PLAN
 1"=400'

LEGEND
 [Hatched Box] Existing Concrete
 [Dotted Box] New Concrete

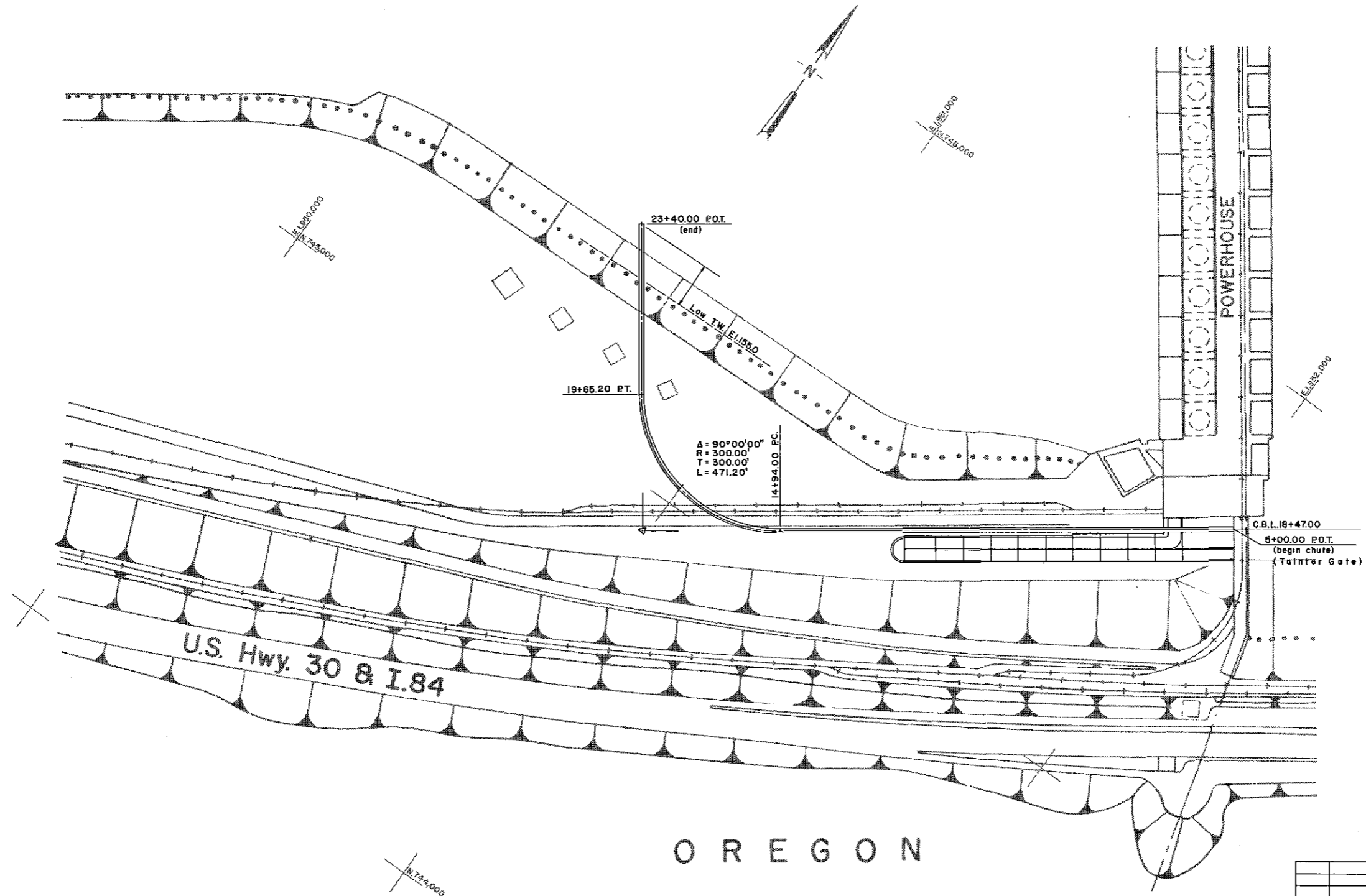


PROFILE AT OUTFALL
 Vert. 1" = 20'
 Hor. 1" = 50'

REVISION	DATE	DESCRIPTION	BY
U. S. ARMY ENGINEER DISTRICT, PORTLAND			
JOHN DAY LOCK AND DAM COLUMBIA RIVER OREGON-WASHINGTON FINGERLING BYPASS SYSTEM ALTERNATIVE IA OUTFALL CHUTE PLAN & PROFILE			
DESIGNED BY <i>[Signature]</i>	CHECKED BY D. Wilson	DRAWN BY Z. Fekete	SCALE D. Illias
DATE 83 Apr 26	PROJECT JD-20-13/6	SHEET B-1	

D
C
B
A

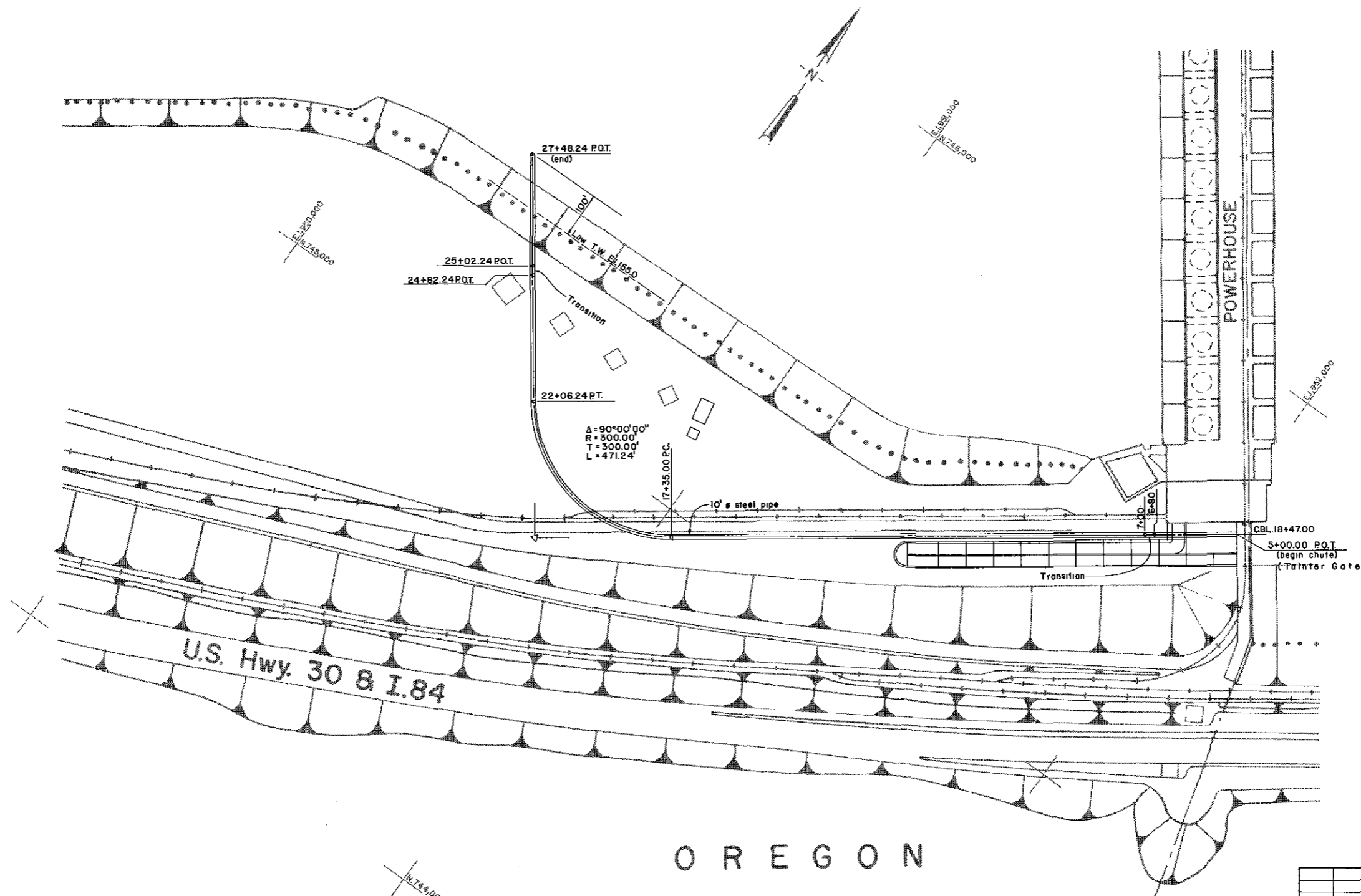
D
C
B
A



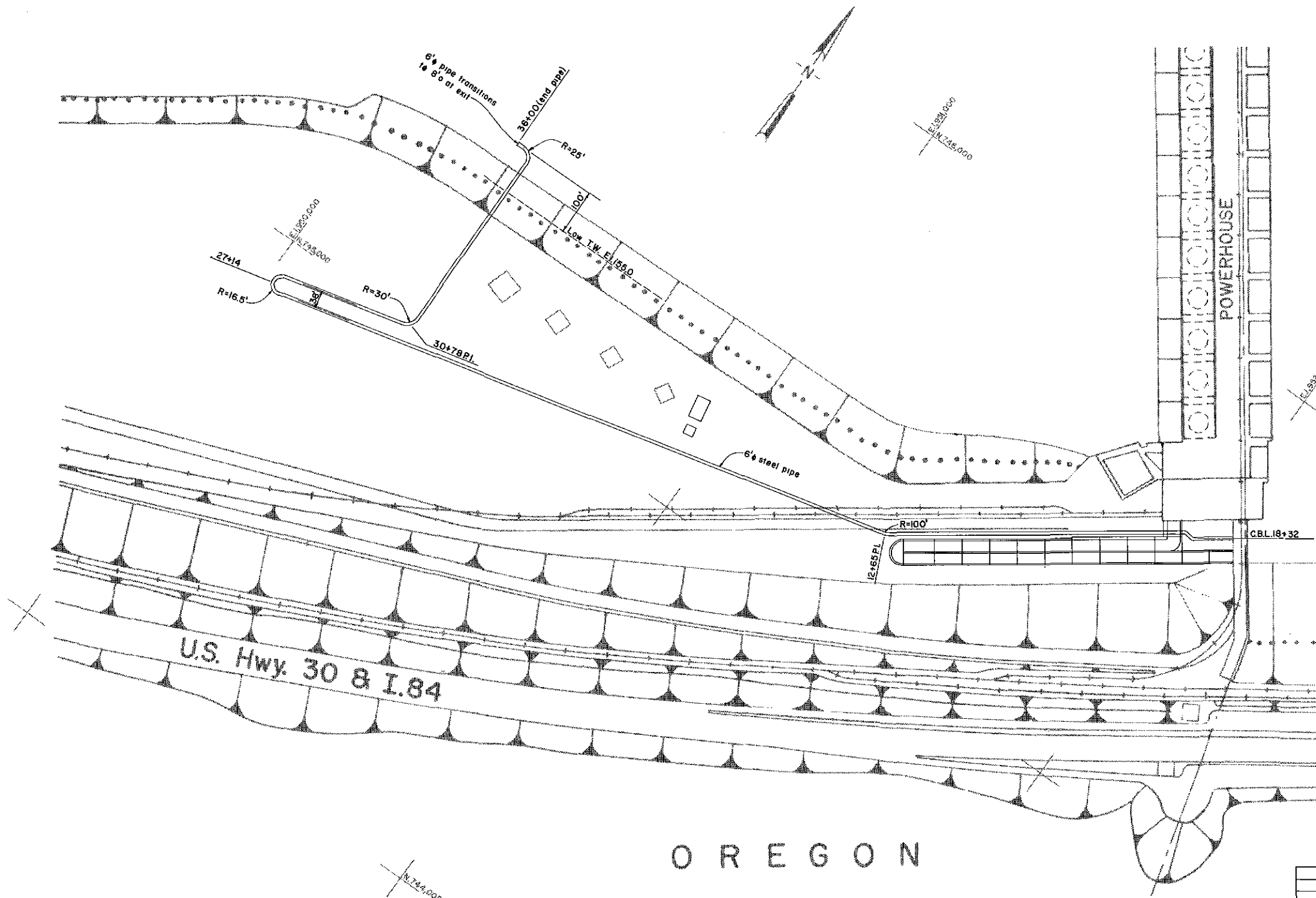
REVISION	DATE	DESCRIPTION	BY
U. S. ARMY ENGINEER DISTRICT, PORTLAND			
JOHN DAY LOCK AND DAM COLUMBIA RIVER OREGON-WASHINGTON			
FINGERLING BYPASS SYSTEM			
ALTERNATIVE IB OUTFALL CHUTE PLAN			
SUPERVISED:	DESIGNED:	DRAWN:	CHECKED:
CHIEF, DESIGN BRANCH		Z. Fekete	
DATE:	SHEET:	PLATE:	
			B-2

D
C
B
A

D
C
B
A



REVISION	DATE	DESCRIPTION	BY
U. S. ARMY ENGINEER DISTRICT, PORTLAND			
JOHN DAY LOCK AND DAM			
COLUMBIA RIVER		OREGON-WASHINGTON	
FINGERLING BYPASS SYSTEM			
ALTERNATIVE 2			
OUTFALL CHUTE PLAN			
SUPERVISOR:	DESIGNED:	DRAWN:	CHECKED:
DATE:	SHEET:	Z. Fekete	FLATE:
			B-3



OREGON

REVISION	DATE	DESCRIPTION	BY
U. S. ARMY ENGINEER DISTRICT, PORTLAND			
JOHN DAY LOCK AND DAM COLUMBIA RIVER OREGON-WASHINGTON FINGERLING BYPASS SYSTEM ALTERNATIVE 3 OUTFALL CHUTE PLAN			
SUPERVISED:		DESIGNED:	DRAWN:
CHIEF, DESIGN BRANCH		<i>Z. Fekete</i>	
DATE:	PROJECT:	PLATE:	
		B-4	

APPENDIX C

CONDUIT OPTIMIZATION STUDY

SUBJECT

PAGE

Optimization Study

C-1 thru 2

Channel Alternatives

C-3 thru 6

APPENDIX C

CONDUIT OPTIMIZATION STUDY

1. Optimize conduit volume versus design flow to obtain minimum annual cost.

2. General:

a. Cost based on October 1982 price levels.

b. Interest rate - 7-7/8 percent.

c. Analysis period - 100 years.

d. System operation based on 7-months.
Starting 1 April and ending 1 November.

e. Energy cost - 7.42 kw/cfs and 61.8 mills/kwh (from NPPEN-WM).

f. Cost of excavated concrete-\$859/cy.

3. Four conduits are analyzed (Pages C-4 through C-7).

4. Conduit volumes and flows:

<u>Conduit</u>	<u>Volume (cy)</u>	<u>Maximum Q (cfs)</u>	<u>Minimum Q (cfs)</u>	<u>Average Q (cfs)</u>
A	7,270	678	585	632
B	6,328	695	600	648
C	6,051	731	629	680
D	6,496	694	596	645

5. Conduit excavation costs.

crf for i = 7-7/8 percent for 100 years = .0788

Concrete Cost = \$859/cy

<u>Conduit</u>	<u>Volume (cy)</u>	<u>Total Cost</u>	<u>Annual Cost</u>
A	7270	\$6,244,900	\$492,100
B	6328	5,435,800	428,300
C	6051	5,197,800	409,600
D	6496	5,580,100	439,700

6. Annual value of lost power through outfall.

Power = Q cfs (7.42 kw/cfs)

Value = Power kw (5,136 hrs/yr) \$.0618/kwh

<u>Conduit</u>	<u>Average Q</u>	<u>Power Loss</u>
A	632 cfs	\$1,488,500
B	648	1,526,100
C	680	1,601,500
D	645	1,519,000

7. Summary of annual costs.

<u>Conduit</u>	<u>Average Q</u>	<u>Annual Cost</u>		
		<u>Conduit Excavation</u>	<u>Power Loss</u>	<u>Total</u>
A	632 cfs	\$492,100	\$1,488,500	\$1,981,000
B	648	428,300	1,526,100	1,954,000
C	680	409,600	1,601,500	2,011,000
D	645	439,700	1,519,000	1,959,000

PROJECT John Day Dam

SUBJECT DSM Transportation Channel "A"

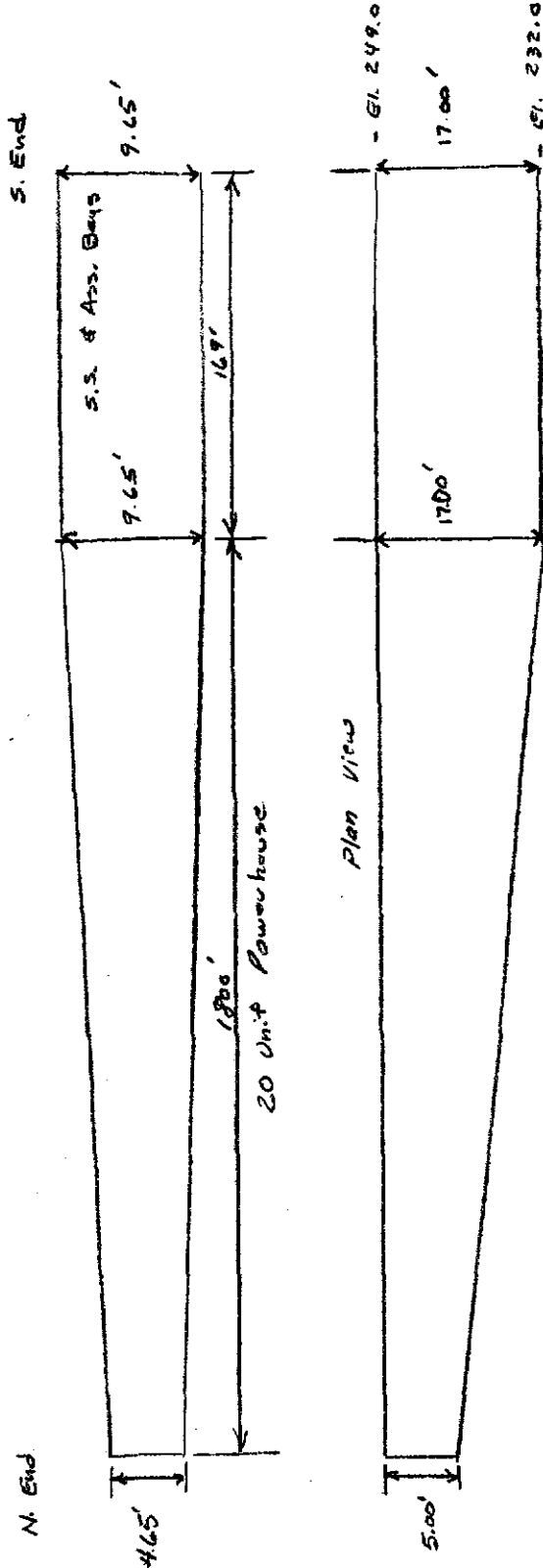
BY R.L.W.

DATE 31 Aug 82 CHECKED

PART

PAGE

OF



Discharge when 4 of 20 units on-line = 678 cfs
 " " 20 of 20 " " = 585 cfs
 Ave = 632 cfs

PROJECT John Day Dam

SUBJECT DSM Transportation Channel "B"

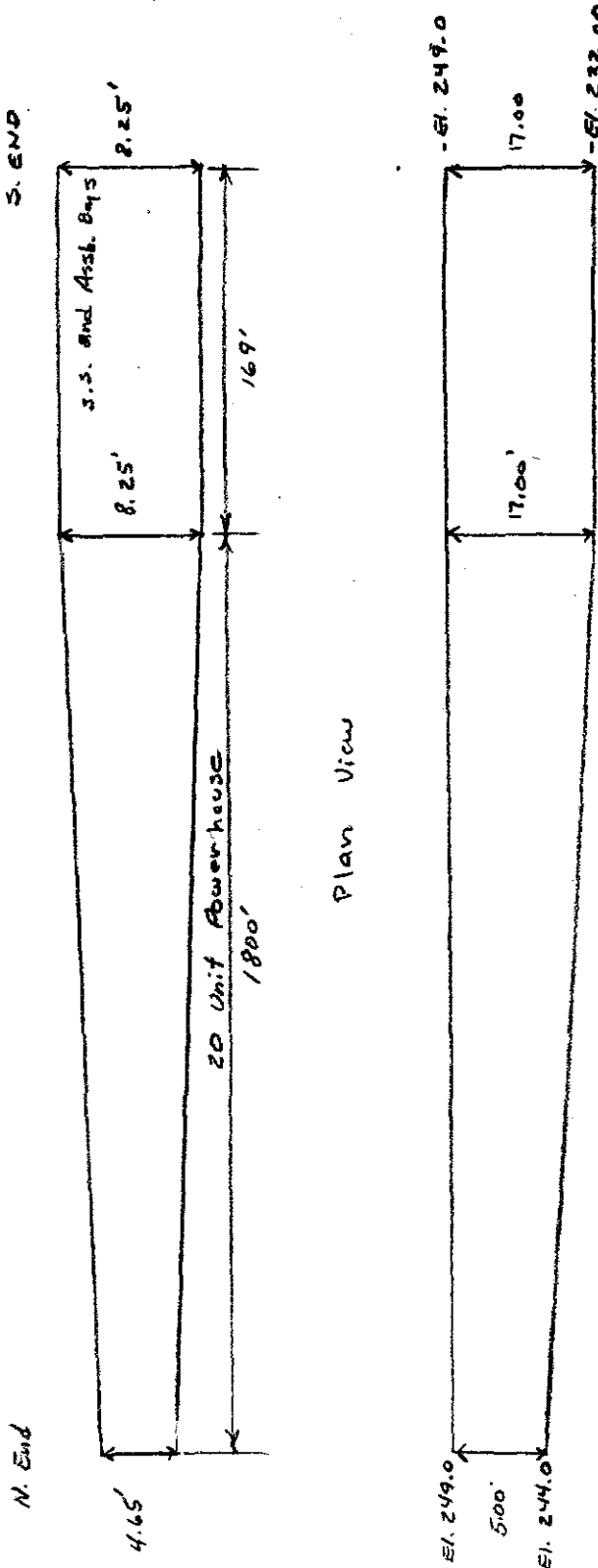
BY R.L.W.

DATE 21 Aug 82 CHECKED

PART

PAGE

OF



Discharge when 4 of 20 Units On-Line = 695 cfs
 " " 20 of 20 " " = 600 cfs
 Ave = 648 cfs

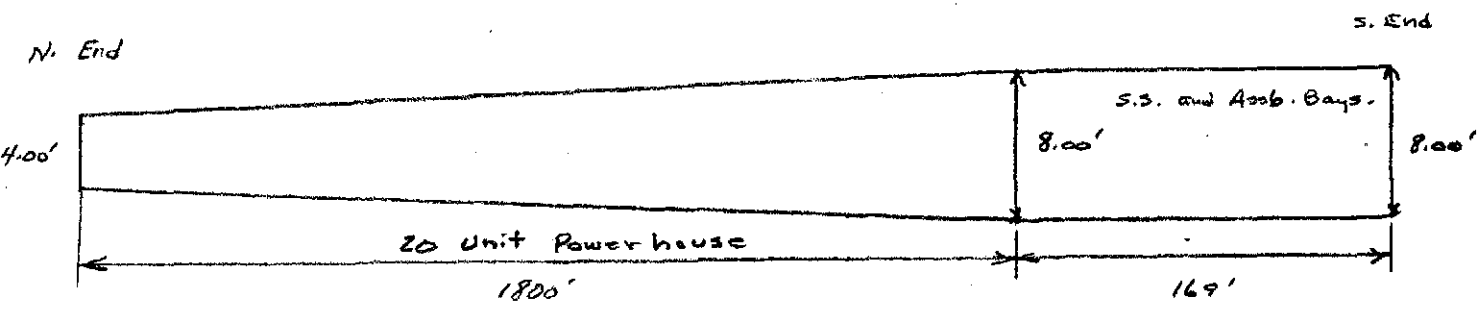
Enter DIV. H 8 H BRANCH Hyd. Design SECTION

PROJECT John Day Dam

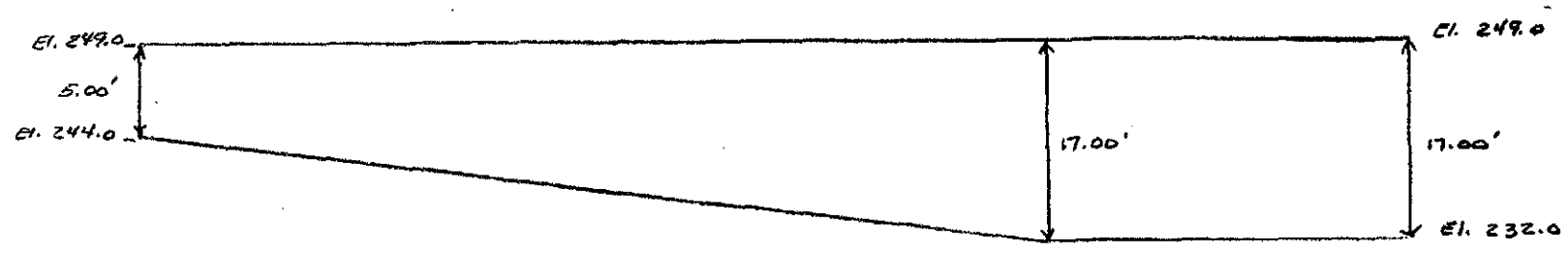
SUBJECT DSM Transportation Channel "C"

BY (E.L.W.) DATE 31 Aug 72 CHECKED

PART PAGE OF



Plan View



section view

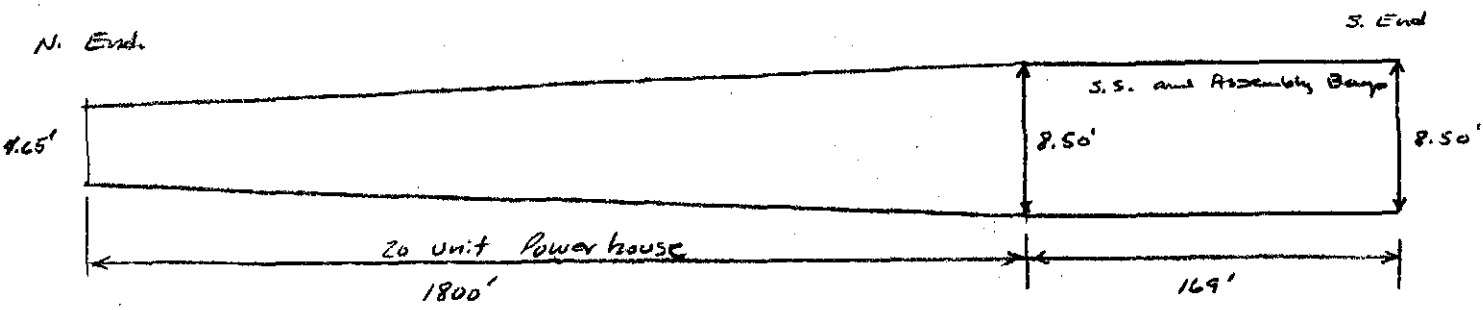
Discharge when 4 of 20 Units on-Line = 731 cfs
 " " 20 of 20 " " = 629 cfs
 Ave 680 cfs

C-5

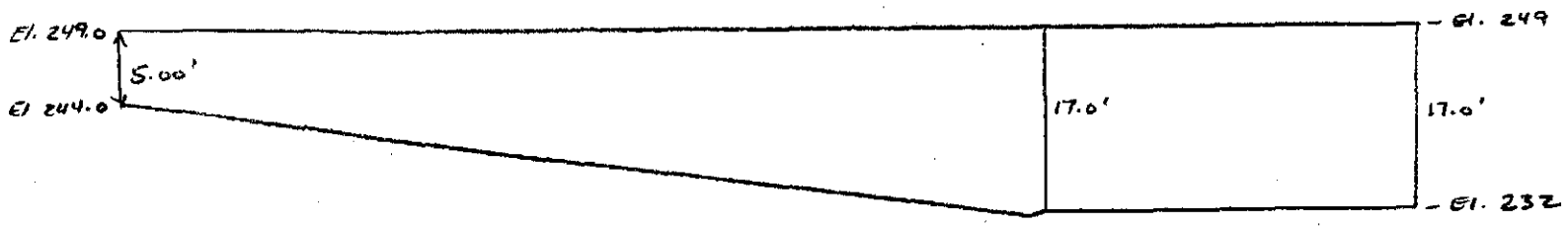
PROJECT John Day Dam DIV. H & H BRANCH Hyd. Design SECTION

SUBJECT DSM Transportation Channel "D"

BY R. C. W. DATE 31 Aug 82 CHECKED PART PAGE OF



PLAN VIEW



SECTION VIEW

Discharge when 4 of 20 units On-Line = 694
 " " 20 of 20 " " = 596
 Ave = ~~1290~~ 645

C-6

APPENDIX D

LOGS OF EXPLORATIONS
AND TEST DATA

Subject

Page

Logs of Explorations, Backhoe Pits

D-1

Gradation Curves

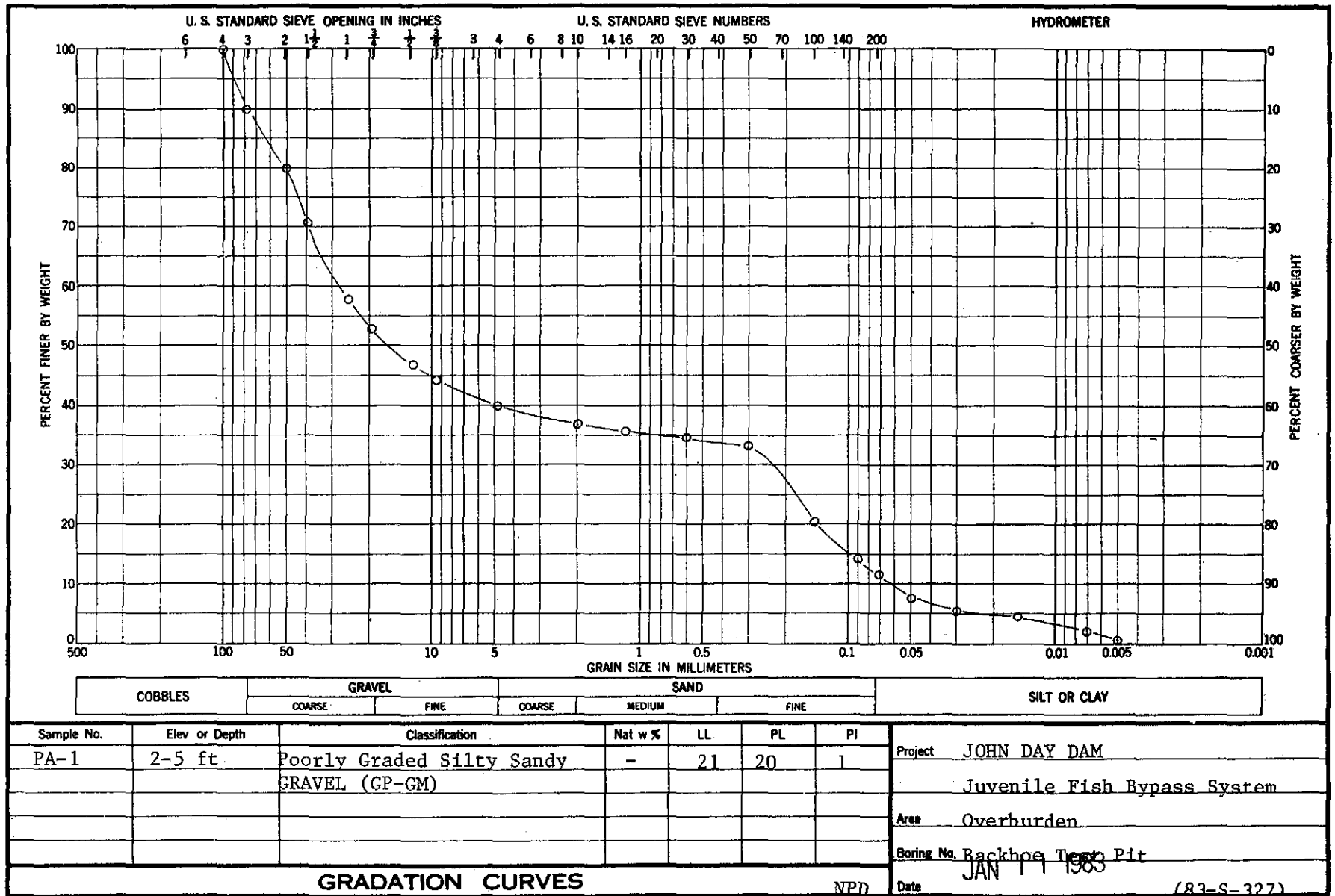
D-2 to D-7

APPENDIX D
LOGS OF EXPLORATIONS
BACKHOE PITS
JOHN DAY JUVENILE FISH BYPASS SYSTEM

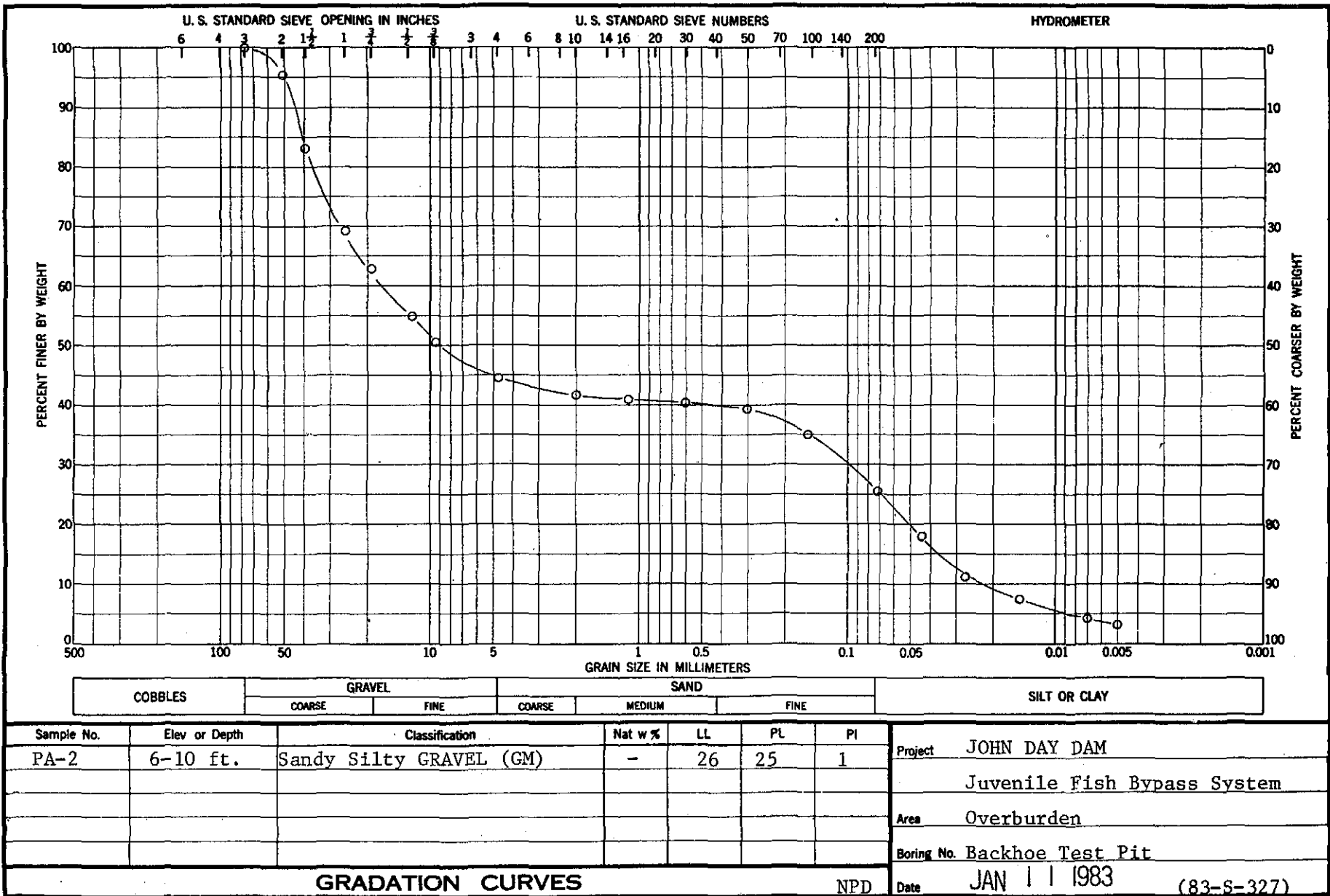
LL	PI	PA (outfall Sta. 17+35)	% by wt.		
			Gravel	Sand	Fines
		0.0 El. 185.0+			
		2.0 GP Gravelly cobbles, brown, moist, dense (fill)			
<u>21</u>	<u>1</u>	6.0 GP-GM Poorly graded silty sandy gravel with cobbles brown, moist dense (fill)	<u>60</u>	<u>28</u>	<u>12</u>
		17.0 GM Silty sandy gravel with cobbles and boulders, light brown, moist, dense	<u>56</u>	<u>18</u>	<u>26</u>
<u>26</u>	<u>1</u>	17.0 Pit bottomed due to caving no groundwater encountered 22 Oct 1982			

NP	PB (outfall Sta. 16+15)	% by wt.			
		Gravel	Sand	Fines	
	0.0 El. 186.0+				
	4.0 GP-GM Poorly graded silty sandy gravel with cobbles, gray-brown, moist, compact	<u>56</u>	<u>38</u>	<u>6</u>	
<u>25</u>	<u>1</u>	9.0 ML Gravelly sandy silt., brown, moist, compact	<u>11</u>	<u>44</u>	<u>45</u>
	9.0 Pit bottomed on rock, no groundwater encountered. 22 Oct 1982				

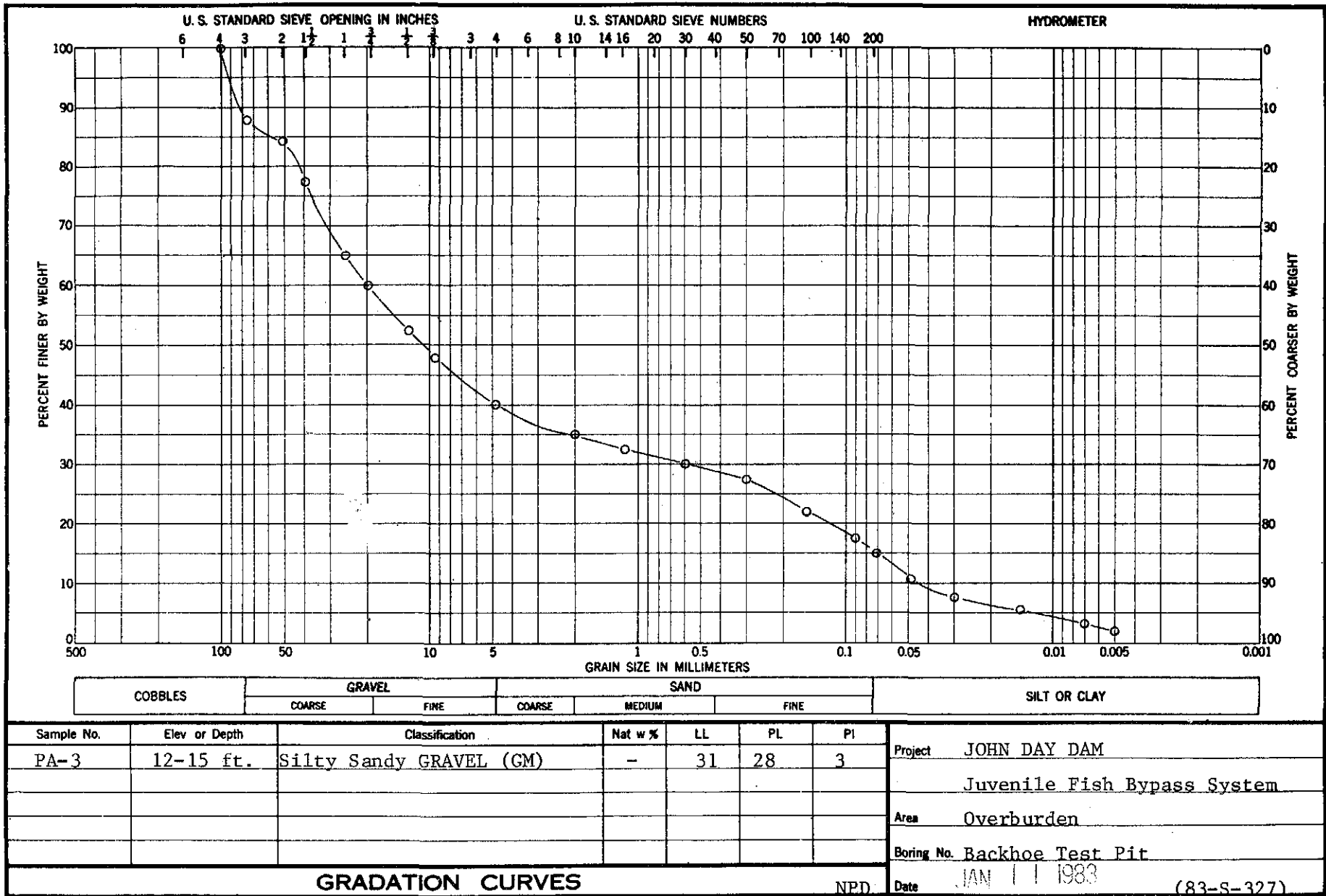
D-2



D-3



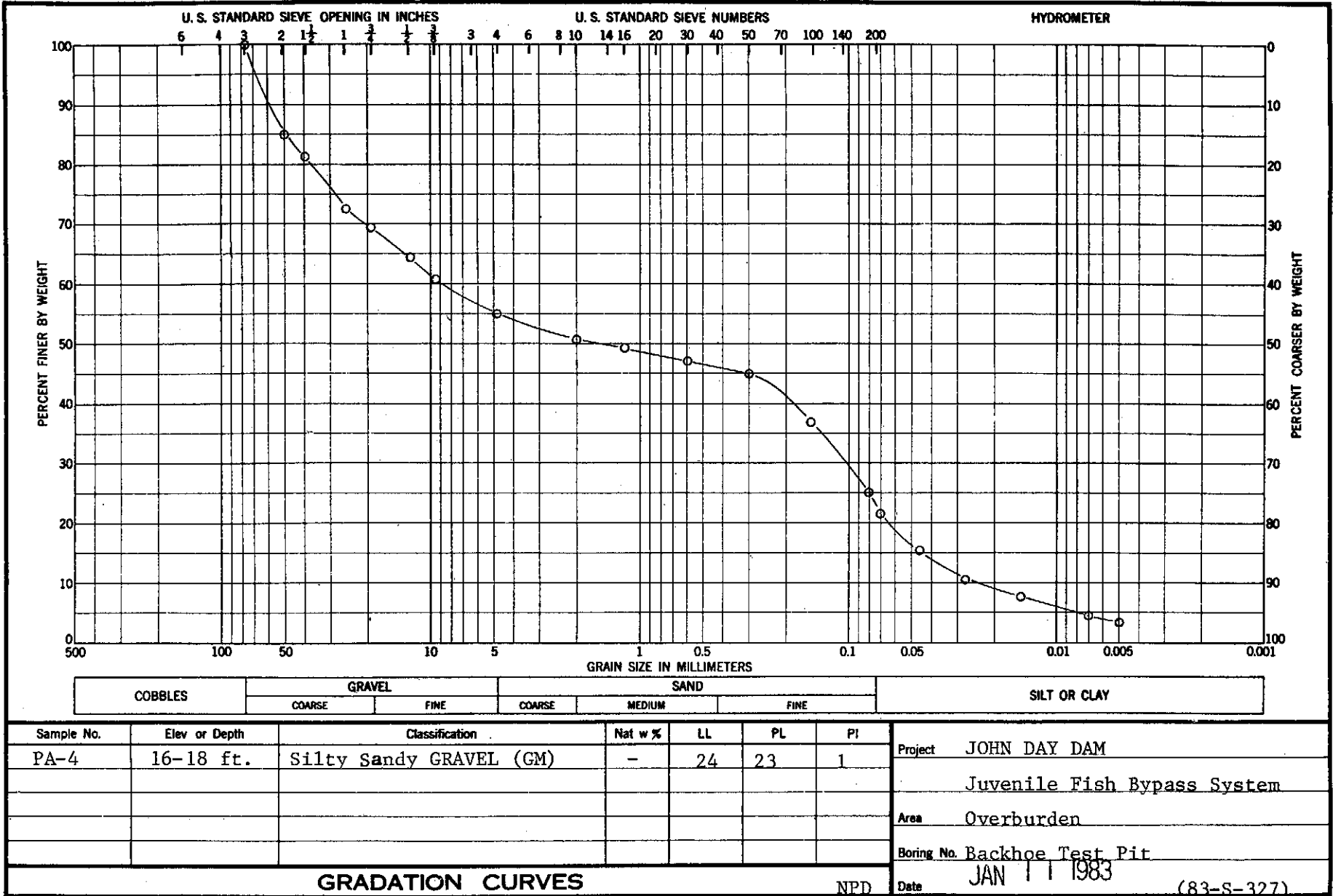
D-4



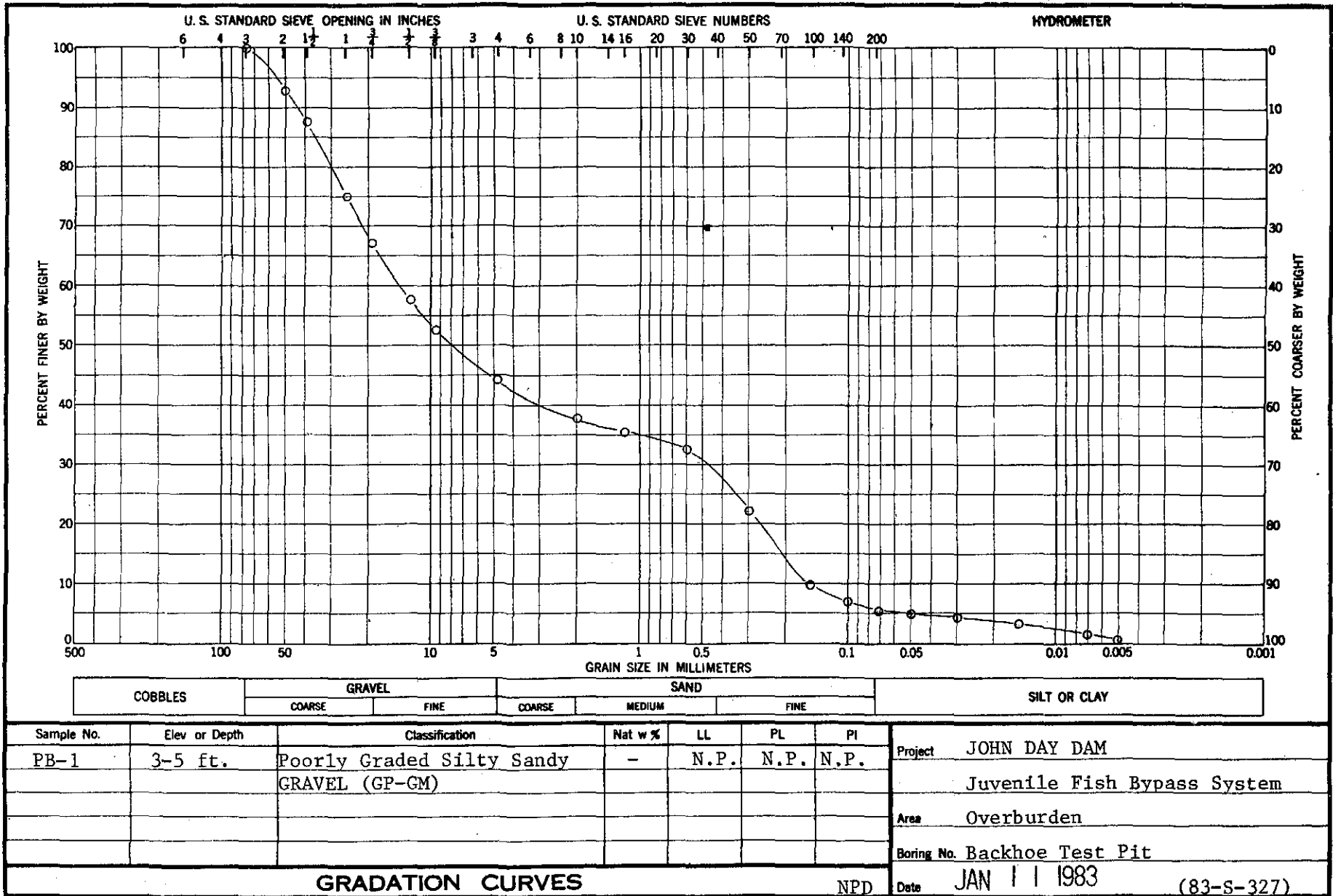
Project	JOHN DAY DAM
	Juvenile Fish Bypass System
Area	Overburden
Boring No.	Backhoe Test Pit
Date	JAN 11 1983

(83-S-327)

D-5



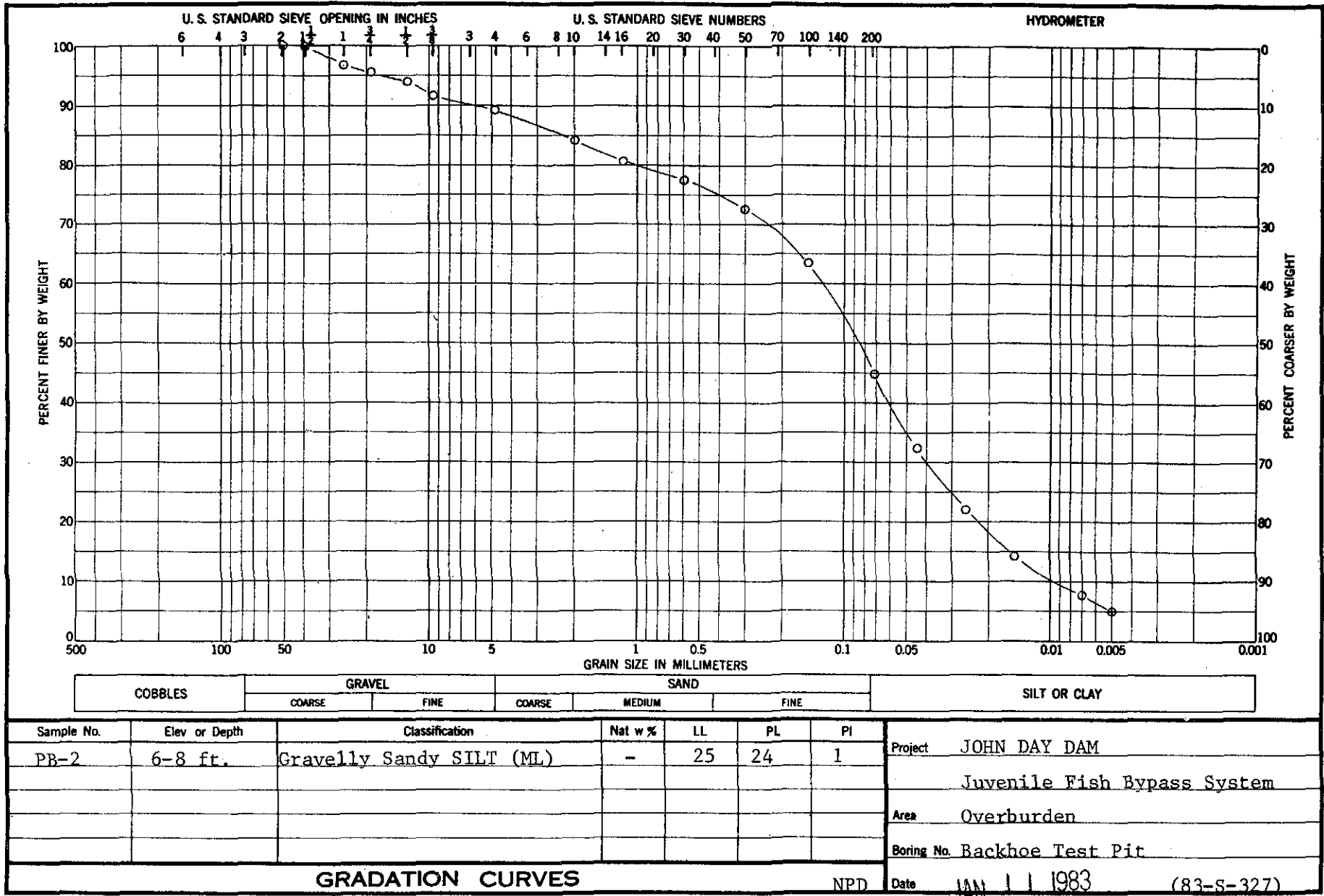
D-6



GRADATION CURVES

NPD

D-7



GRADATION CURVES

NPD

Date