Yakima River Basin

Water Enhancement Project, Washington

EARLY IMPLEMENTATION PLAN

DESIGNS & ESTIMATES

SUPPORTING DATA

Bureau of Reclamation

Boise, Idaho

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YRBWEP EARLY IMPLEMENTATION PLAN

Introduction

In the Phase 2 Report for the Yakima River Basin Water Enhancement Project some segments of the public advised the study team that a plan should include only storage elements, while others advised that only non storage elements should be included in the plan. Studies to date appear to indicate that a combination plan, to a great extent, would meet the basin's water needs, provide operation flexibility, and generally be more publicly acceptable. This Early Implementation Plan is an attempt to do just that.

Items included in the YRBWEP Early Implementation Plan are as follows:

1. Bumping Lake Enlargement
2. Wymer Dam, Dike, and Pumping plant
3. Cle Elum 3-Foot Raise
4. Roza Reregulation
5. Sunnyside Main Canal Automation
6. Chandler Canal Automation
7. Wapato Irrigation Project distribution system improvements

Costs for the major structures, Bumping Lake Enlargement Dam and Wymer Dam, Dike and Powerplant, were developed in the E&R Center while costs for Cle Elum 3-Foot Raise, Chandler Canal Automation and Wapato Irrigation Project distribution system improvements were developed in the regional office and costs for Roza Reregulation and Sunnyside Main Canal Automation were developed by a private consultant. All of the costs were adjusted to meet the study needs.

Bumping Lake Enlargement

The proposed damsite is located approximately 40 miles northwest of Yakima, Washington, on the Bumping River and about 4,500 feet downstream of the existing Bumping Lake Dam. The damsite is within the Snoqualmie National Forest in Yakima County, Washington. The Bumping River is a tributary of the Naches River and thereby the Yakima River.

The principal features of Bumping Lake Enlargement consist of the following: (1) a zoned rockfill dam with a concrete cutoff wall into bedrock foundation, (2) an uncontrolled overflow crest spillway with chute and stilling basin on the left abutment, and (3) an outlet works tunnel and gate chamber in the left abutment with an intake structure and a stilling basin at the entrance and exit, respectively. Following construction, the existing dam would be breached to allow full use of the existing pool.

Physical Characteristics

In the present study, three different reservoir sizes have been studied and the following is a summary of the physical characteristics of each.

ITEM	Reservoir Size 250,000 Ac.Ft.	400,000 Ac.Ft.	458,000 Ac.Ft.
Dam (zoned rockfill)			
Height (feet)	189	266	240
Crest elevation (feet)	3529	3566	3580
Crest length (feet)	3200	3300	4200
Volume (million cubic yards)	6.2	9.8	10.8
Dike			
Height (feet)	-	14	28
Length (feet)	-	300	900
Reservoir (normal maximum)			
Water surface elevation (feet)	3505	3546	3560
Surface area (acres)	3480	3960	4100

Cost Estimates

Cost estimates were prepared for three different reservoir sizes as shown in the previous table. Appraisal costs for the rockfill dam structure, spillway, outlet works and breaching the existing the dam were prepared by the E&R Center Denver, Colorado, in April, 1985. These quantities were adjusted by the Region to reflect the various crest elevations of the dams and unit prices were indexed to current price levels.

Costs for land and rights, relocation of 9,200 feet of Bumping Creek road, relocation of recreation facilities around the reservoir, cabin site surveys and access roads to cabin sites, clearing lands, and widening and resurfacing of 9.72 miles of Bumping River road from Washington Highway No. 110 to Bumping Lake were obtained from the Plans and Estimates Appendix, Yakima Project, Washington, Supplemental Storage Division, Bumping Lake Enlargement and prepared by the Bureau of Reclamation, Pacific Northwest Regional Office, Boise, Idaho and dated July, 1966, revised February, 1976. These estimates were indexed to current price levels by the Region.

Bumping Lake Enlargement Costs(Thousands)

Plant Account	Description	Reservoir Size 250,000 Ac.Ft.	400,000 Ac.Ft.	458,000 Ac.Ft.
100	Land & Rights	187	187	187
110	Relocation of Property of Others	2,089	2,089	2,089
120	Clearing Lands	4,890	4,890	4,890
140	Roads and Road Structures	2,970	2,970	2,970
151	Dams	94,353	109,553	116,653
	Total Field Cost BLE	104,489	119,689	126,789
	Indirect Costs (26%)	27,511	31,311	33,211
	Total Cost (Jan. 88)	132,000	151,000	160,000

Wymer Dam, Dike and Pumping Plant

The Wymer Dam and Reservoir site is located on Squaw Creek, approximately 15 miles North of Yakima, Washington in the southeast part of Kittitas County. As presently proposed, the reservoir would operate as a pumped-storage facility to provide water for downstream irrigation and to regulate flows in the Yakima River. The principal features located at Wymer damsite include the dam, a dike on the reservoir rim north of the dam, a pumping plant, service spillway, service outlet works, and a inlet to convey discharges from the pumping plant. Previous designs at this site have been performed for a pump-generation operation using an afterbay dam to regulate flows due to power generation. For these designs, the afterbay dam was sited at the current dam location, and the main dam was approximately 1 mile upstream.

Physical Characteristics

In the present study, three different reservoir sizes have been studied and a summary of the physical characteristics of each follows:

ITEM	RESERVOIR SIZE 100,000 Ac.Ft.	142,000 Ac.Ft.	174,000 Ac.Ft.
Dam (conc., faced, zoned rockfill)			
Height(feet)	349	385	415
Crest elevation (feet)	1679	1715	1745
Crest length (feet)	2460	2680	2855
Volume (million cubic yards)	8.3	11.6	15.4
Dike			
Height (feet)	64	100	130
Length (feet)	1520	1960	2310
Volume (million cubic yards)	0.4	0.9	1.7
Spillway			
Capacity (cfs)	50,000	50,000	50,000
Crest elevation (feet)	1634	1670	1700
Crest length (feet)	100	100	100
Gates, radial 33'-4"X32'-0"	3	3	3
Outlet works			
Capacity (cfs)	365	365	365
Pumping Plant			
Units, No. & Size (cfs)	3-100 2-50	3-100 2-50	3-100 2-50
Total Capacity (cfs)	400	400	400
Total Head Range(feet)	345-475	345-475	345-475

Cost Estimates

Costs estimates were prepared for three different reservoir sizes as shown in the previous table. Appraisal costs for the dam structure, dike structure, spillway, outlet works, pumping plant and switchyard were prepared by the E&R Center in Denver, Colorado, in April, 1985. These quantities were adjusted by the Region to reflect the different crest elevations and the unit prices were indexed to current prices levels.

Costs for land and rights were estimated in the regional office.

Wymer Dam and Dike Costs(Thousands)

Plant Account	Description	Reservoir Size 100,000 Ac.Ft.	142,000 Ac.Ft.	174,000 Ac.Ft.
100	Land and Rights	1,000	1,000	1,000
151	Dams			
	(1) Dam Structure	57,890	74,140	89,380
	(2) Spillway	21,710	21,710	21,710
	(3) Outlet Works	7,100	7,100	7,100
	Total Field Cost Wymer Dam	87,700	103,950	119,190
	Indirects (24.5%)	21,300	25,050	28,810
	Total Cost Wymer Dam (Jan. 88)	109,000	129,000	148,000

Pumping Plant and Switchyard (Thousands)

130	Structures & Improvements	3,690	3,690	3,690
152	Waterways	11,790	11,790	11,790
160	Pumps & Prime Movers	5,970	5,970	5,970
170	Acc. Electrical Equip.	430	430	430
175	Station Equipment	840	840	840
	Total Field Cost Pumping Plant	22,720	22,720	22,720
	Indirects (36%)	6,280	6,280	6,280
	Total Cost (Jan. 88)	29,000	29,000	29,000

Cle Elum 3-Foot Raise

General Description

In order to increase the water surface of Lake Cle Elum by 3-feet, the existing 37-by 17-foot radial gates at the spillway would be modified. The following modifications would have to be made to each of the five radial gates.

1. Extend the height of the gate to 20 feet with a 1/4-inch skinplate to be joined at the top of the existing 7/16-inch skinplate.

2. Add a 9-inch channel section to form a new top transverse beam.

3. Extend the vertical beam girders to the new top channel of the modified gate.

4. Extend the five 1/2- by 5-inch vertical tie bars on the downstream side of the gate to the new top channel.

5. Add two plates, 3/8- by 12-inch by 12-feet long, to each arm member. These plates would be welded to the existing 8-inch wide flange sections to form box sections.

The existing dam embankment will provide adequate freeboard if the normal water surface is raised by 3-foot as proposed. A routing of the current IDF (inflow design flood) starting at the proposed normal water surface indicates that approximately 5-feet of freeboard to the dam crest can be expected. There is an additional freeboard provided by the 3-foot high parapet wall on the dam crest.

Costs are included for acquisition of rights-of-way along the east side of Lake Cle Elum for the installation of riprap for erosion control and shoreline protection. Advance planning studies will confirm the need and extent of measures required.

About 1,160-foot of access road in the Wish Poosh recreation area would be elevated. The 2-unit, double-vault comfort station on Picnic Island would to be removed and replaced. The signs would also be removed and replaced.

Cost Estimates

Appraisal costs for Cle Elum 3-foot raise were in the estimated in the regional office and contain the following:

Plant Account	Description	Jan. 1988 Costs
100	Land and Rights	300,000
130	Structures & Improvements	
	(1)Elevate 1,160 ft. Wish Poosh Recreation Access Road	384,000
	(2)Picnic Island Recreation Fac.	40,000
	(3)Erosion Control	50,000
150	Reservoirs-riprap shoreline	1,140,000
151	Dams-spillway gates	77,000
	Total Field Cost Cle Elum 3-ft. Raise	1,991,000
	Indirects (30%)	589,000
	Total Cost	2,580,000

Roza Reregulation

Project construction cost estimates, including contractor overhead and profit, contingencies, engineering and administrative expense and state sales tax (7.3%), were obtained from a reconnaissance study, dated August, 1985. These estimates were prepared by Don C. Johnston, a registered Professional Engineer and Land Surveyor, State of Washington. A description of the plan is included in Mr. Johnston's report.

The cost for Roza Reregulation is a summary of costs for Sulpher Creek Dam and Spillway, Roza Conduit and Roza Pump Station and were indexed by the Region to Jan. 1988 price levels. The total cost is $11,257,000.

Sunnyside Main Canal Automation

Project construction cost estimates, including contractor overhead and profit, contingencies, engineering and administrative expense and state sales tax (7.3%),were obtained from a reconnaissance study, dated August, 1985 and prepared by Don C. Johnston, a registered Professional Engineer and Land Surveyor, State of Washington. A description of this plan is included in Mr. Johnston's report.

Total costs for Sunnyside Main Canal Automation were indexed by the Region to Jan. 1988 price levels. The total cost is $10,034,000.

Chandler Canal Automation

Present operations at Chandler Pump and Powerplant require close control of the water surface elevation in the forebay. The wicket gates on the pump turbines are set for the required pumping into KID Main Canal. Once these settings have been made it is important to maintain uniform head and flow through the pump turbines so that fluctuations in the KID Canal will be held to a minimum. This is accomplished at present by using the generators as flow regulation devices. Float controls in the forebay adjust the wicket gates on the generator turbines to maintain the desired water surface elevation in the forebay.

The proposal to limit generation in low flow periods has some serious impacts on present operations. If flow through the generator turbines were reduced or eliminated, some other means of controlling the forebay water surface must be found. Operating personnel feel that it would be necessary to do the following:

1. Provide automatic controls at the canal headworks to regulate and maintain uniform flows into the canal.

2. Provide capability at the forebay to automatically spill 0 to 100 cfs with a target spill of 50 cfs at all times.

3. Enlarge the trashrack area to handle anticipated increases in trash and moss caused by reduced spills.

The features to be included in the automation are a stilling well and control house downstream of the headgates which automatically adjust the headgates as fluctuations in the river flows occur. This would greatly improve the capability to maintain uniform diversions into the canal. the existing sand sluice gate at the powerplant would be replaced with a motor operated gate that would be controlled by float controls installed in the forebay area of the powerplant. The existing trashracks, three 9'-6" X 8'-6" on the headgates and two 12'-3" X 11'-0" on the penstocks would be replaced with a 25'-0" X 60'-0" trashrack and automatic trashrake. A portion of the wasteway chute wall would be raised to prevent overtopping that might occur with the change in operation.

The total cost of making the modifications is estimated to be $460,000 at Jan. 1988 price levels. These costs estimates were developed by the Region.

Wapato Irrigation Project Distribution System Improvements

Improvements to the Wapato Irrigation Project's distribution system were studied in this plan. Some of the structures would probably have to be replaced, but they are not included in this estimate. The following is a summary of the canals and laterals which would be reshaped and lined with concrete. The estimates are rough appraisal level estimates based on a per-acre comparison with Sunnyside Canal Automation. These estimates were developed by the Region.

CANAL OR LATERAL	MILES	COST (Thousands)
Wapato Main Canal	14.9	12,000
Wapato Main Canal Extension	5.0	1,150
Unit No. 1 Pump Canal	5.0	1,100
Lat. No. 1	2.8	610
Lat. No. 2	7.5	2,220
Lat. No. 3	5.7	1,960
Totals	40.9	19,040
Indirects (25%)		4,760
Total Cost (Jan.88)		23,800

Other Elements Considered

There were several other elements considered during this study. The following is a brief description of each.

Keechelus-Kachess Pipeline

Quantities and appraisal cost estimates were prepared by the Region for the installation of a 60-inch diameter pipeline between Keechelus and Kachess reservoirs so that additional water could be stored in Kachess reservoir. Depending on the cut and cover section of the pipe, the total costs will vary from $11,800,000 to $12,800,000 at July, 1986 price levels.

Cabin Creek Damsite

Three different dam types appear possible for Cabin Creek damsite based on existing data. The three alternatives include a rockfill embankment dam, an RCC (roller compacted concrete) dam, and a thin arch concrete dam. There are no obvious damsite features that would eliminate any of the alternatives at this time. However, Cabin Creek Dam is not included as part of this plan due to high costs and limited benefits. Rough appraisal costs were developed in the Region and range from $110,000,000 to $170,000,000 depending on the size of reservoir and type of dam assumed.

Wymer Gravity Fill Option

In this option, Wymer Reservoir would be filled through an enlargement of the KRD North Branch Canal to Badger Creek. A tunnel would be drilled from Badger Creek into a draw which empties into Wymer Reservoir. A cursory examination of the alternative indicates that it is not feasible. Therefore, it was not included in the plan. No cost estimates were prepared.