Mailing Address:
Water Resources Data System
University of Wyoming, Dept 3943
1000 E University Avenue
Laramie, WY 82071

Physical Address:
Wyoming Hall, Room 249
University of Wyoming
Laramie, WY 82071

Phone: (307) 766-6651
Fax: (307) 766-3785

Funding for WRDS and the creation of this electronic document was provided by the Wyoming Water Development Commission (http://wwdc.state.wy.us)

CHAMBERLAIN RESERVOIR REHABILITATION PROJECT LEVEL II, PHASE II REPORT

EXECUTIVE SUMMARY

JUNE 25, 1990

Prepared For

Wyoming Water Development Commission
Herschler Building
Cheyenne, Wyoming 82002

Submitted by

Western Water Consultants, Inc.
611 Skyline Road
Laramie, Wyoming 82070

Subconsultants

Chen-Northern Inc.
605 N. Warehouse Rd.
Casper, Wyoming 82601

Watts and Associates, Inc.
1472 N. Fifth, Suite 105
Laramie, Wyoming 82801

John Lambert
215 Walnut
Douglas, Wyoming 82633

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EXECUTIVE SUMMARY

Authorization

This report presents the results of Phase II investigations of the Chamberlain Reservoir Rehabilitation Project. The Phase I report was submitted March 1, 1990.

The Phase II work described herein was authorized by the Wyoming Water Development Commission (WWDC) under Contract for Services No. 9-00934, dated June 13, 1989 and as amended on July 19, 1989 and January 25, 1990. Western Water Consultants, Inc. (WWC) was the prime consultant on the project, with subconsultants Chen-Northern, Inc. of Casper for geotechnical investigations, Watts and Associates, Inc. of Laramie for economic analysis, and John A. Lambert of Douglas for surveying.

Project Background

Chamberlain Reservoir is an off-stream reservoir, located NW 1/4, Section 5, T. 32 N., R. 73 W. in Converse County approximately fifteen (15) miles west of Douglas (Figure 1). The dam was constructed in 1964 to provide the Douglas Reservoir Water Users Association with the opportunity to save some of the water seeping out of LaPrele Reservoir and to provide additional storage of waters from LaPrele Creek. Water is diverted from LaPrele Creek and conveyed to Chamberlain Reservoir via the West Side Ditch. The reservoir has an adjudicated water right for 504.83 A.F. total storage with

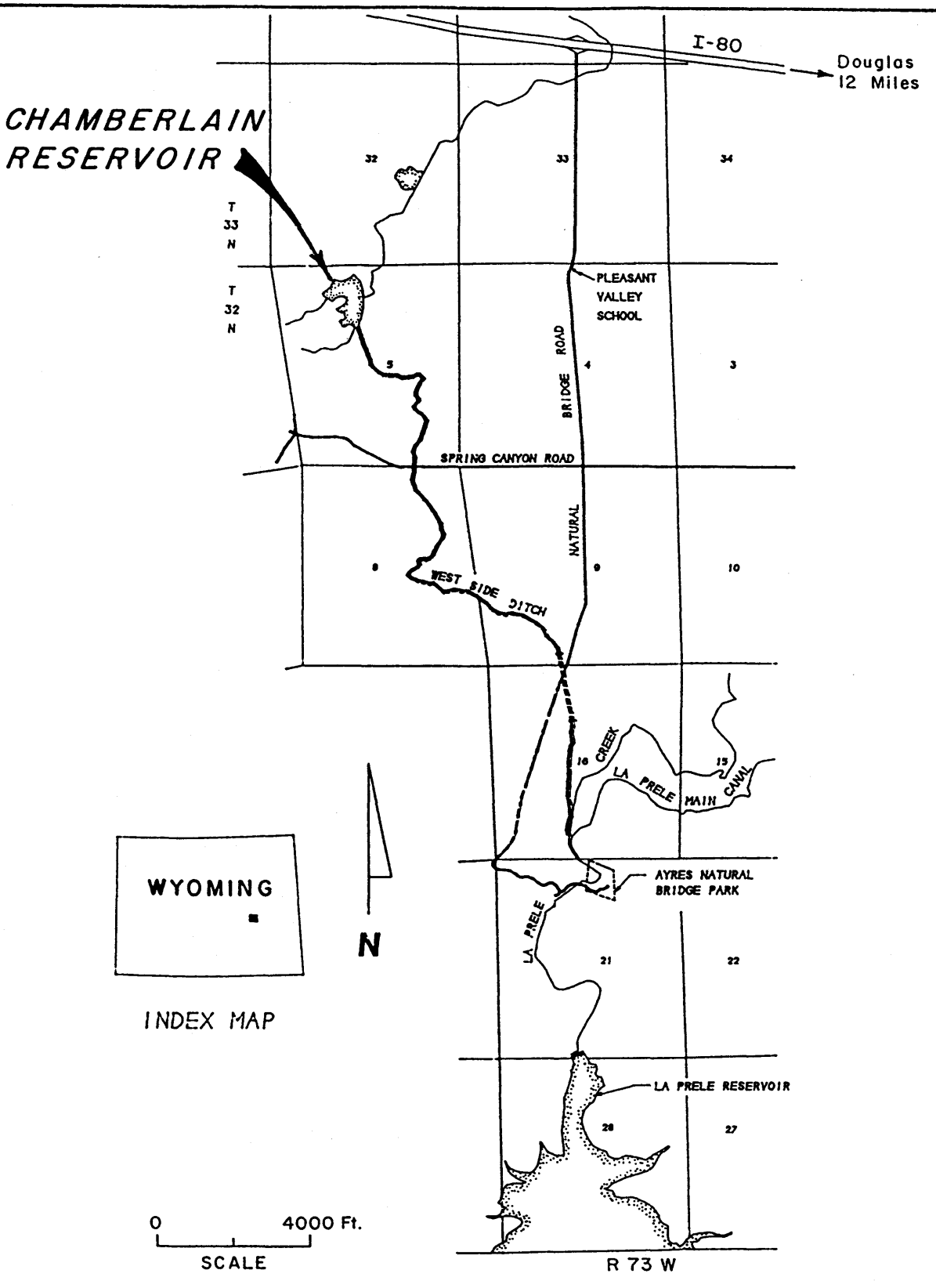

FIGURE 1: PROJECT LOCATION MAP
CHAMBERLAIN RESERVOIR REHABILITATION PROJECT
LEVEL II, PHASE II

489.23 A.F. active storage capacity. The approximate crest elevation of the dam is at elevation 112 feet and the normal high water line is at elevation 108.6 feet.

Since construction, the dam has experienced seepage problems. Most recently, a slump failure of a portion of the downstream slope near the center of the dam at the outlet works has occurred. In 1985, because of concerns for the stability of the structure, the Wyoming State Engineer restricted the allowable storage in the reservoir to the dead pool.

A rehabilitated Chamberlain Dam and Reservoir would provide several economic benefits to the LaPrele Irrigation District (LID) and the State. First, it would have the ability to capture and store seepage from LaPrele reservoir during the non-irrigation season which otherwise would go unused. The average seepage rate from LaPrele is estimated to be about 5 cubic feet per second (cfs) on an annual basis (WWC, 1990). In addition, excess flows in LaPrele Creek could be diverted into Chamberlain Reservoir in the winter months and during large flood events. Because of Chamberlain's 1964 storage priority, however, diversions could not be made on a routine basis during the irrigation season.

During the Phase I study, the Project Team evaluated the operational and structural integrity of the existing dam, water supply canal and appurtenant structures, and developed preliminary rehabilitation alternatives that would allow the safe and efficient operation of the facility. The LaPrele Irrigation District (LID) and WWDC selected Alternative No. 4, which provides for an active storage capacity of 255 AF, as the preferred rehabilitation

option.

There are a total of approximately 11,300 acres of irrigated lands in the LaPrele Irrigation District. The main crops grown within the District are alfalfa, native grass, and grass mix hay. Some small grains and corn are also grown mostly for silage. Of the total acreage, there are approximately 1,420 acres of irrigated land under the West Side Ditch. Chamberlain Reservoir can provide storage water, when available, to approximately 1,200 of these acres. Though Chamberlain Reservoir directly benefits only 1,200 acres, it indirectly benefits all of the other LID users by decreasing demands on LaPrele Reservoir and the remainder of the system.

The annual assessment to water users in the District for operation and maintenance of the system is $4.25/acre (or share). In the mid-1980's improvements were made to the LID distribution system. Users are annually assessed $5.02/acre (or share) for repayment of the debt associated with these improvements. The LID is not responsible for any debt associated with the LaPrele Dam and Reservoir improvements completed in the 1970's. Panhandle Eastern Pipeline Company paid for the improvements and is currently making loan payments to the Wyoming Farm Loan Board.

Rehabilitation Components

The proposed Chamberlain Reservoir rehabilitation improvements are designed to ensure safe and efficient operation of the facility. The District requested that the rehabilitation measures be prioritized with the idea of phasing their installation. This

request is in concert with the District's choice of Alternative 4 which allows for future expansion of the dam to provide the storage of the full water right amount (504.83 AF). The District fully intends to retain the entire 1964 water right as soon as economic conditions permit.

The components of the proposed rehabilitation are:

1. Construct a toe berm with 10-foot top width at elevation 100.0 feet;

2. Extend the outlet pipe 25 feet at downstream toe of dam and construct an armored plunge pool;

3. Construct a chimney drain to control seepage through the dam embankment, and a cutoff drain for seepage through the foundation;

4. Lower the 42-inch principal spillway crest to elevation 106.0 feet and install a trash rack;

5. Fill in the existing north emergency spillway and reconstruct the south emergency spillway;

6. Rework upstream dam face and install soil-cement or riprap on the upstream face of the dam; and

7. Install a drop culvert where West Side Ditch enters Chamberlain Reservoir.

Items 1, 2, 3 and 4 alleviate problems noted by the State Engineer in his letter of June 17, 1985. The other items would be desireable for complete rehabilitation.

Cost Estimates

Feasibility level cost estimates have been prepared for the rehabilitation measures associated with Alternative 4. The costs are summarized in Table 1.

TABLE 1

Summary Cost Estimates
Rehabilitation of Chamberlain Dam

Phase I (Deficiencies Noted by State Engineer)

Dam Embankment (Downstream Toe Berm)	$ 23,200
Extend Outlet Pipe & Plunge Pool	$ 4,945
Lower Principal Spillway	$ 1,300
Chimney and Foundation Drain	$ 42,300
Subtotal	$ 71,745
15% Contingency	$ 10,755
Subtotal Construction Costs (SEO Deficiencies)	$ 82,500
Engineering Costs (Design & Construction)	$ 20,500
TOTAL COST PHASE I	**$ 103,000**

Phase II (Erosion Protection and Other)

a) Desireable Minor Work

Fill Existing North Spillway	$ 500
Excavate South Emergency Spillway	$ 2,550
Drop Culvert Inlet	$ 2,210
Subtotal	$ 5,260
15% Contingency	$ 740
Subtotal Construction Costs (Minor Work)	$ 6,000
Engineering Costs (Design & Construction)	$ 1,500
TOTAL COST PHASE IIa	**$ 7,500**

TABLE 1

Summary Cost Estimates
Rehabilitation of Chamberlain Dam (continued)

Phase II (Erosion Protection and Other) (continued)

b) Prepare Upstream Face

Strip and Fill Upstream Face	$ 21,400
Vegetate Top 10 feet of Upstream Face	$ 1,000
Subtotal	$ 22,400
15% Contingency	$ 3,400
Subtotal Construction Costs (Dam Face)	$ 25,800
Engineering Costs (Design & Construction)	$ 6,500
TOTAL COST PHASE IIb	**$ 32,300**
TOTAL COST PHASE IIa & IIb	**$ 39,800**

c) Erosion Protection Upstream Face of Dam

Riprap or Soil Cement	$ 222,000
15% Contingency	$ 33,000
Subtotal Construction Costs (Erosion Protection)	$ 255,000
Engineering Costs (Design & Construction)	$ 63,750
TOTAL COST PHASE IIc	**$ 318,750**
TOTAL COST PHASE II	**$ 358,550**

Benefit-Cost Analysis

A rehabilitated Chamberlain Dam and Reservoir would yield approximately 200 acre-feet of supplemental water annually. Assuming 15 percent canal losses this would result in an additional 170 acre-feet of water available annually for on-farm use. Valued at $30 per acre-foot, this water would produce an annual direct economic benefit of $5,100. Discounting this annual stream of benefits over a 50-year period at a 4 percent discount rate yields a present value of approximately $109,600. Given an estimated rehabilitation cost for Phase I of $103,000 the project's benefit-cost ratio would be 1.06 when considering direct irrigation benefits alone. There would be secondary benefits associated with the project which are estimated to approximate $4,100 annually, with a present value of $88,100[1] over the project's 50-year life. When secondary benefits are included, the present value of irrigation benefits is $197,700, and the projects benefit-cost ratio rises to 1.92 for the work in response to the State Engineer's Office requirements.

The direct benefit-cost ratio if the Phase IIa minor work were included would be 0.99. If Phase IIa and IIb work were accomplished, the direct benefit-cost ratio would be 0.77 and if the entire program including erosion protection were included, the direct benefit-cost ratio would be 0.24.

Ability-to-Pay

The project sponsor's ability-to-pay for Chamberlain given the WWDC's current funding guidelines which provide for a 50 percent grant and 50 percent loan mix, financed over a maximum of 50 years at four percent interest, the District's debt retirement

obligation would be $2,400 annually for the Phase I work or $2,570 for Phase I plus IIa. If Phase IIb were included, the annual debt retirement would be about $3,320.

Assuming that $30 of additional farm income would accrue to district members for each acre-foot of irrigation water from Chamberlain means that the District could realize $5,100 in additional income annually from the project, about twice the debt service on the project for Phases I and IIa or 1.5 times the debt service for Phase I, IIa and IIb.

SUMMARY

In economic terms, the cost of rehabilitating Chamberlain Dam and Reservoir to satisfy State Engineer's Dam can be justified upon the basis of increased storage for irrigators in the District. Based upon direct irrigation benefits alone Phase I of the project has a benefit-cost ratio of approximately 1.06. Including secondary benefits attributable to irrigation, the project's benefit-cost ratio rises to 1.92. In addition to the direct irrigation benefits the project has other benefits that are more difficult to quantify. A rehabilitated Chamberlain Reservoir would provide operating flexibility to the District in water deliveries along the Westside Canal, would allow landowners near the Reservoir to put approximately 40 acres of land back into production, and would secure the District's entitlement to storage rights that might otherwise be lost.

The District should consider undertaking the rehabilitation of Chamberlain Dam with at least the Phase I program set forth herein. For the long-term, the District might wish to consider undertaking Phase I plus Phase IIa and IIb. This effort in conjunction with an alert maintenance program should provide a usable and safe structure for many years.

Ultimately, the decision to proceed with rehabilitation of Chamberlain rests upon two issues:

* are LID members willing to increase their assessments to sponsor the project under current WWDC funding guidelines?; and

* is the State interested in maintaining storage in the water-short North Platte basin?