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COTTONWOOD LAKE LEVEL II
PHASE II 2010
EXECUTIVE SUMMARY

COTTONWOOD IRRIGATION DISTRICT
WYOMING WATER DEVELOPMENT COMMISSION

September 13, 2013

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EXECUTIVE SUMMARY
COTTONWOOD LAKE LEVEL II, PHASE II 2010
COTTONWOOD IRRIGATION DISTRICT
WYOMING WATER DEVELOPMENT COMMISSION

September 13, 2013

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The main aim of this study is to establish a geotechnical basis for the design of the dam and to determine if that basis would allow a dam of the scale contemplated by earlier studies. As will be shown in subsequent discussion, the financial feasibility for the District is unfavorable and the District will not further purse the project. If at some point in the future the annual fees for a special use permit are reduced, feasibility will improve, and the project may be revisited.

The general study area is near Smoot, Lincoln County, Wyoming located on the western edge of Wyoming near the south end of Star Valley. Smoot is located at the mouth of Cottonwood Creek and is served by the Cottonwood Irrigation District. The area of this study focuses on Cottonwood Lake located five miles east of the District in Cottonwood Canyon. The study expands on previous studies with particular emphasis on geotechnical, wetland, and funding aspects of the project.

The Cottonwood Irrigation District sponsored Level II Studies in 2006 and 2009 through the Wyoming Water Development Commission that studied enlargement potential of the existing site or constructing a dam at one of several new sites located in the drainage. The earlier studies contain much of the history and information used in this study. Of particular note in the earlier studies was the review and elimination of several alternate reservoir sites leaving the current Cottonwood Lake site as the preferred reservoir site and focus of this study. This site is an existing 33 acre lake created by an 11 foot high embankment constructed on an ancient landslide. The previous studies stopped short of conducting significant geotechnical drilling and analysis. Upon completion of the studies the lack of geotechnical data limited the conclusions that could be drawn from the studies. In particular the selection of the final dam cross section and the cost estimate relied on many assumptions about the underlying material.

**Figure 2.1 – Location Map**

The general study area is near Smoot, Lincoln County, Wyoming located on the western edge of Wyoming near the south end of Star Valley. Smoot is located at the mouth of Cottonwood Creek and is served by the Cottonwood Irrigation District. The area of this study focuses on Cottonwood Lake located five miles east of the District in Cottonwood Canyon. The study expands on previous studies with particular emphasis on geotechnical, wetland, and funding aspects of the project.
This Level II, Phase II Study builds on the information from the 2009 study and provides additional insight into issues affecting feasibility. Primary tasks of the study include:

1) Scoping and Project Meetings
2) Review of Background Information
3) Access
4) Identify Construction Funding Sources
5) Permitting and Mitigation (Geotechnical Drilling)
6) Wetlands Delineation
7) Geotechnical Investigation of Storage Site
8) Conceptual Designs and Cost Estimates
9) Project Financing
10) Financing and Economic Evaluation
11) Discretionary Task
12) Reports

The intent of the tasks is to address several issues identified in previous studies that will impact project feasibility. In particular the geotechnical aspect of the work will hone the proposed cross section, cost estimates and project feasibility.

ACCESS

The geotechnical drilling phase of this study required a temporary road be constructed to access the dam south of the parking area. The process of permitting the temporary road with the Forest Service started during the summer of 2010 and was completed in the spring of 2011. High runoff and erosion of roads and bridge abutments prevented access to the lake during the summer of 2011. By mid-October the road up to the lake was reconstructed to a point that allowed access and the temporary bridge was installed and the access along the top of the dam cleared and drilling was completed in early November.

CONSTRUCTION FUNDING SOURCES

Previous funding scenarios from the earlier studies placed great weight on the ability of the project to garner support from the State to allow a WWDC grant amount higher than 67%. As this current Level II, Phase II Study has progressed it was recommended that a grant level of 67% be recommended and other sources be pursued for the remaining funds.
During the course of the Level II, Phase II study several additional funding sources have been identified and should be considered for any funding package. The following programs were reviewed as possible fits for specific project components at Cottonwood Lake:

- State Land and Water Conservation Fund
- Wyoming Wildlife and Natural Resource Trust Fund
- Trout Unlimited
- Rocky Mountain Elk Foundation

The above programs have set goals and priorities for the projects they fund. These priorities tend to revolve around enhancement of recreational opportunities and targeted habitat improvements specific to the goals of the fund, trust or foundation. No programs had the ability to participate in the core dam building activities but tend to fund peripheral project features that might be required as project enhancements during the permitting process. Since these features are additional costs to the project, there tends to be no net participation in the core dam construction costs.

The goals of recreation and wildlife enhancement tend to run counter to the operation of the dam for irrigation purposes. The peak irrigation demand months of July and August are also the peak of the six month recreational season at the lake. In a high irrigation demand year, the lake could be drawn down during the recreational season. The operational plan for the reservoir must reflect the recreational interests if conservation funds make up a significant portion of the funding package. This could take the form of drawdown rates, drawdown dates, minimum pool levels for certain dates and etc.

The following entities were revisited during the current study. The main report body contains additional explanation of programs and possibilities for funding of the Cottonwood Lake Project.

- Wyoming Department of Agriculture
- Wyoming Game and Fish Department
- Wyoming Division of State Parks and Historic Sites
- Wyoming Business Council
- USDA
- H.R. 1770, The Dam Rehabilitation and Repair Act of 2009
- Simplot Smoky Canyon Mine

**PERMITTING & MITIGATION**

In this Level II Phase II study the drill access road was permitted through the USFS by a Decision Memo and was categorically excluded. The permitting process was begun in the summer of 2010 at the same time the District Ranger retired. The new District Ranger completed the Memo in the spring of 2011.
Appendix D contains the full Decision Memo and the information supplied to the USFS during the process.

Should the project move forward to Level III status future permitting will entail the NEPA process on the proposed design, review by resource agencies, the State Engineer, Corps of Engineers and the U.S. Forest Service. Permits of particular note will be the U.S. Forest Service Special Use Permit and the State Engineers Application for Permit to Appropriate Surface Water.

Public comment is expected to influence permitting during the NEPA review. During preparation of this report support for the project was strongest among the irrigators. Recreational users however tend to support the status quo and current appearance of the dam site with vegetation and trees.

Mitigation of those wetlands identified in the Wetlands Delineation (Section 6) will be required. The mitigation plan will address the 1.2 acres that will be flooded. The replacement ratio could be as high as 1.5 new acres for every acre impacted by the dam. Since the impacted acreage is about 75% willows that are resistant to flooding and another 55% coverage of sedges, and rushes that may be impacted (depending on reservoir operations) it is anticipated the replacement mitigation will apply to 55% of the 1.2 acres or about \((1.2 \times 55\%) \times 1.5\) for a total mitigation area of 1.0 acres.

**WETLANDS DELINEATION**

As proposed, about 1.2 acres of wetlands at the upper end of the lake will be inundated when the pool is held at its high elevation. On the downstream end of the lake the proposed dam embankment will cover about 0.03 acres of wetland.

**GEOTECHNICAL INVESTIGATION OF STORAGE SITE**

Based on review of data it was concluded that rehabilitation of Cottonwood Dam is technically feasible and can be safely accomplished for the following reasons:

1. Overtopping of the dam should not occur because a spillway with a non-erodible (concrete) discharge channel will be constructed.
2. Internal erosion of the landslide material is not likely because it consists primarily of gravel, cobble, and boulder-sized particles; and pockets of finer grained material do not appear to be continuous. The broad range of gradations combined with the lack of continuous fine-grained layers results in a relatively stable material relative to internal erosion. If the material begins to erode it will likely build a reverse filter.
3. Seepage has been occurring through the landslide dam for many years without a failure, and seepage discharge is visibly clear.

4. The drain material downstream of the rehabilitated dam will be filter compatible with the landslide material and would prevent migration of particles beyond the designed filters.

A zoned earthen embankment was selected for the new dam because this dam type can best accommodate foundation settlement and can efficiently utilize onsite materials. The rehabilitated embankment will not include a cutoff that extends into the landslide material because construction of a cutoff that does not reach a low permeability layer would likely not reduce the total seepage and could force seepage paths deeper. Deeper seepage paths would likely exit further downstream beyond the embankment filters.

CONCEPTUAL DESIGNS & COST ESTIMATES

The embankment will have a crest width of 10 feet with 3H:1V upstream and downstream slopes. The zoned earthen embankment will consist of shells constructed of random fill, a low-permeability core, a chimney drain, and blanket drain. The blanket drain replaces the cutoff wall contemplated by earlier studies.

The emergency spillway must be capable of maintaining 1.5 feet of freeboard during the 100 year flood (785 cfs) and shall be able to pass the probable maximum flood (PMF) (10,235 cfs) with zero freeboard. The PMF is the controlling criteria and requires about 190 feet of spillway flowing 6 feet deep to pass the 10,235 cfs with zero freeboard. Given this flow and depth, it is recommended that a four cycle labyrinth concrete spillway section be used for the spillway.

The service outlet works will be installed in conjunction with the emergency spillway. The outlet proposed is a dual 48” headgate with the capacity to release up to 500 cfs at a full pool of 10 feet of head and 60 cfs at 1 foot of head.

The estimate of cost was revised to reflect the elimination of a deep cutoff wall and the addition of the downstream drainage blanket. The costs were based on the 2012 RS Means Heavy Construction Cost Guide.
TABLE 8.1 – SUMMARY OF OPINION OF PROBABLE COST

<table>
<thead>
<tr>
<th>Item</th>
<th>Estimated Cost</th>
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<tbody>
<tr>
<td>Topsoil Removal and Excavation</td>
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<tr>
<td>Core Placement</td>
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<tr>
<td>Drains</td>
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<td>Filter Sand Placement</td>
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<tr>
<td>Filter Gravel Placement</td>
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<tr>
<td>Drain Gravel Placement</td>
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<tr>
<td>Chimney Drain Placement</td>
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<td>Random Fill Placement</td>
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<tr>
<td>Surface Protection</td>
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<tr>
<td>Miscellaneous</td>
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<td>Spillway</td>
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<tr>
<td>Outlet Works</td>
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<td>Mitigation</td>
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<tr>
<td>General</td>
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<tr>
<td><strong>Component Cost Sub-Total</strong></td>
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<tr>
<td>Const. Permits, Bond, Insurance</td>
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<tr>
<td>Construction Engineering Cost</td>
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<td>Contingency</td>
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<td><strong>Sub-total</strong></td>
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<td><strong>Total Construction Cost</strong></td>
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<td>Preparation of Final Design</td>
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<td>Permitting</td>
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<td>Environmental Study</td>
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<td><strong>Total Project Cost</strong></td>
<td><strong>$3,283,928</strong></td>
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</tbody>
</table>

PROJECT FINANCING & ECONOMIC EVALUATION

Using the funding resources identified in Section 4.0 the following funding approach is proposed for the project:

- **WWDC** 67.5% $2,216,000
- **Cottonwood Irrigation District** 1.5% $74,000
State Land and Water Conservation Fund | 1% | $32,000
U.S. Forest Service (In Kind Materials) | 1.6% | $54,000
Lincoln County Commissioners | 3.0% | $100,000
Other Funding Source | 25.4% | $808,000

Total | 100% | $3,284,000

WWDC remains the largest funding source even with the other funding sources stretched to their limit of ability to pay. The Lincoln County Commissioners will need to review the project again before making the firm commitment to participate.

The District with its approximate 5,165 acres (292 users) is currently assessed at $12.00/acre/year raises enough for operations, maintenance and debt service on their current loan. In the previous Level II Study completed in 2006 the economic analysis identified $3,900 or 0.78 cents/acre as the annual assessment increase that could be justified by increases in crop production alone.

In order to demonstrate commitment to the other funding partners it will be necessary for an increase in the assessment. Assuming a $1.20 per acre increase, the District would raise about $6,198 per year. This amount could fund about $74,000 of the estimated $3,284,000 project cost or 1.5%.

The WWDC approved 67.5% at their November 2012 meeting. The 32.5% additional funding will be obtained from other means such as a special outlay by the legislature, in-kind service from large private donors or perhaps from other State sources such as the State Land and Water Conservation Fund.

The District currently pays under $100 per year to the USFS for the in-stream diversion structure. As the diversion structure provides a much larger and more critical role to District water supply, the annual fee for the reservoir was initially anticipated to be on a similar order of magnitude. The USFS provided an estimate of the annual fee based on the acreage of the lake at 33.4 acres to be $13,047. Considering 30.3 acres already exists and is not billed to anyone, a follow up question was posed that the fee should be based on the change in acreage caused by the project, or 3.1 acres, in which case the fee would be $1,210. Upon further consideration a fee in the range of $13,000 was confirmed. A second question is; do the irrigators bear the cost of the pool area or do recreational users cover the cost? At present there is no cost to the recreational users even though 90% of the post project footprint is already in place. For purposes of this study a fee of $13,000 is estimated for the annual use payment by the irrigators. A final consideration regarding annual fees is that of insuring the dam in the event of catastrophic failure. The requirement for insurance will be part of any special use permit issued by the USFS. Several local agents were contacted regarding the insurance and one independent agent after research quoted a fee in the range of $750 to $1,000 per year.
In terms of net present value, the above costs for a 20 year period at a 3% discount rate total a net present value of $234,312.

The ongoing maintenance costs will be paid by the District subscribers and based on the 5,165 acres served will result in an additional assessment estimated at $0.38 per acre per year. If the Special Use Permit fee remains at the $13,000 estimated level along with the requirement for liability insurance, the annual assessment for permits and insurance is estimated at $2.66 per acre per year. This annual cost to the irrigators is relatively high and may result in the fees being determined by the District to be cost prohibitive.

REPORT CONCLUSIONS & RECOMMENDATIONS

The geotechnical study results indicate a dam can safely be constructed on the site if the dam is of a similar size range as the historic dam. The yield from the dam would extend full irrigation turns about two weeks in the average year.

The project has potential impacts to fish and wildlife and recreation. Public sentiment for preserving the lake in its present condition runs strong among recreational users. The reconstruction of the dam will change the appearance of the dam and lake and be viewed as a negative from a recreational perspective when the pool is drawn down. The larger pool surface and deeper water during storage periods would be generally positive. The storage volume provided is small, however it is enough to delay turns and carry the irrigators through critical stages of crop growth.

The Cottonwood Lake site generally impacts Forest Service lands and some private leases. The Forest Service, while supporting the project, has limited resources. They can offer assistance in terms of general support for the project and possibly assist in resolution of permitting issues. In order for the dam enlargement to become a reality, it will require funding from the State through the Wyoming Water Development Commission. In terms of traditional financing, this project does not offer sufficient cash flow to meet the debt service of a program compliant 67%/33% grant/loan. This is because among all the beneficiary groups, only agricultural entities can be readily isolated and cash flow benefits identified for the purpose of seeking project repayment. Further, agriculture would only be able justify a fraction of the project costs based on increased crop production. Because of the lack of ability to pay a special outlay by the legislature is required to fund the project.

At this point the funding then becomes a legislative decision based on preserving Wyoming water for Wyoming irrigators and on preservation of an important recreational asset. The State has approved grant funding in the amount of 67.5% leaving 32.5% to be funding from other sources or by additional request to the State.
The annual Special Use Permit fees and liability insurance fees are of larger concern to the project. At the proposed rates, these fees will cost the irrigators about 70% of the possible irrigation benefits of the additional water.

The irrigator’s limited project benefits requires that most of remaining 32.5% of cost would need to come in the form of a grant. In addition, the estimated annual fees described above largely negate annual benefit meaning if the irrigators were to proceed they would be doing so on a very tight margin. In certain years with low production, that narrow margin would leave the irrigators with an actual negative benefit for having constructed the project. At this point the financial risk to the irrigators under the anticipated annual permit fees is considerable and the irrigators have elected not to pursue the project further.