MEMORANDUM
APRIL 1, 2019

TO:         BOARD OF DIRECTORS
            ANDREW MUELLER, GENERAL MANAGER
            PETER FLEMING, ESQ., GENERAL COUNSEL

FROM:       RAY TENNEY, P.E., DON MEYER, P.E. & HUNTER CAUSEY, P.E.

SUBJECT:    OPERATIONS OF WOLFORD MOUNTAIN AND ELKHEAD RESERVOIRS

ACTION REQUESTED:

Wolford Mountain Project:
Staff requests Board authorization to enter into a 3 year Continuing Services Agreement, not to exceed $70,000, with Landmark Surveying and Engineering Consultants for surveying Ritschard Dam deformation monuments.

STRATEGIC INITIATIVE(S):  13. Asset Management

This memorandum provides a current summary of operations and planned activity at both Wolford Mountain and Elkhead reservoirs. To aid your review, the memo is broken out in the following sections:

1. Review of Various Elkhead and Wolford Contracts
2. Project Updates
   a. Wolford Mountain Reservoir
      i. Reservoir Operations (hydrology)
      ii. Dam Deformation Monitoring (includes contract request details)
      iii. Upstream Outlet Works Repairs
           1. Main Gate Replacement
           2. Guard Gate Repairs
      iv. Downstream Outlet Works Repairs
           1. 96” Butterfly Valve
           2. 30” Butterfly Valve
      v. Recreation Area Operations and Concessionaire Contract Development
     vi. Mitigation Area Work
        1. Mitigation Area Habitat Effectiveness Assessment
        2. Streambank Stability Work Plan
   b. Elkhead Reservoir
      i. Reservoir Operations (hydrology)
      ii. 2019 Work Plan
1. Review of Various Elkhead and Wolford Contracts

This listing of contracts is provided to keep the Board informed of the contracts required to support the Operation, Maintenance and Replacement (OM&R) activities at Wolford and Elkhead.

Recent and developing contracts proceeding under the General Manager’s $25,000 delegated authority:

Wolford Mountain Project
1. Hester Diesel Services, LLC $15,000 (outlet works repair support)

Elkhead Reservoir Project
1. “Bi-annual” assessment of wetlands mitigation development and monitoring – to be developed
2. Cathodic protection annual evaluation – to be developed

Ongoing project operations agreements:

<table>
<thead>
<tr>
<th>Wolford Mountain Project</th>
<th>Contract</th>
<th>Termination Date</th>
<th>Current balance (Authorization)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>CA17025 Expert Excavation</td>
<td>May 1, 2020</td>
<td>$34,407.51 ($75,000)</td>
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<tr>
<td></td>
<td>CA17005 Farrell Excavating</td>
<td>December 1, 2020</td>
<td>$116,589.47 ($120,000)</td>
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<tr>
<td></td>
<td>CA18024 Grand Power</td>
<td>May 1, 2021</td>
<td>$14,060.00 ($26,000)</td>
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<tr>
<td></td>
<td>*CA16036 Grand Fence</td>
<td>August 31, 2019</td>
<td>$1543.95 ($45,000)</td>
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<tr>
<td></td>
<td>*CA17037 Tolin Mechanical</td>
<td>October 31, 2019</td>
<td>$1,470.00 ($5,000)</td>
</tr>
</tbody>
</table>

*May require amendment or new agreement under the General Manager’s authority for uninterrupted service

Elkhead Reservoir Project.
None at this time.

2. Project Updates

2.a. Wolford Mountain Reservoir

2.a.i. Reservoir Operations

Below is a graph of Wolford operations through late March. Due to the maintenance drawdown in 2018, the reservoir is about half full (26.5 feet or 32,300 acre feet below full pool). Snowpack is 121 percent of average (see graph below) and the April-July runoff forecast 125 percent of average, or 67,700 acre feet. Snowmelt is beginning with the recent warm temperatures. Outflow has been adjusted from 20 cfs to 35 cfs to bypass inflow to the Shoshone Powerplant. An update will be provided at the Board meeting.
Replacement of the main gate will be advantaged by maintenance of a reservoir level 20 feet below full which will be maintained through bypass of inflow beyond the duration of the Shoshone Call to the extent practicable. During the three to four weeks of diving operations, outflow will need to be 15 to 20 cfs, requiring increased nighttime discharge. Below is a graph showing modeled operations assuming 120% of average inflow. Runoff timing will dictate the extent to which reservoir elevation can be controlled. Flows may fluctuate to as much as 400 cfs or more at night. Downstream water users, land owners, and resource managers have been notified and will be kept updated on these operations.

![Graph showing modeled operations assuming 120% of average inflow.](image)

2.a.ii. Dam Deformation Monitoring

Deformation monitoring is continuing at Ritschard Dam after some interruption to allow the crest rehabilitation work to be completed. Crest rehabilitation wall construction resulted in the destruction and replacement of several of the original settlement monuments. Some damage occurred to instrumentation cabling which is being repaired. Subsequent to the crest rehabilitation a new more modern data collection system for the inclinometers was acquired and new baselines will be established for the new surface monuments and the inclinometer data collected going forward. As the reservoir is drawn down this is a good time to make this transition.

There have been no surprises in the data collected and the performance of the embankment during this draw down period. The embankment will be monitored during spring fill.
The surface monuments on the dam crest and dam faces are monitored by conventional surveying. This work has been performed the last several years by Landmark Consultants, Inc. from Steamboat Springs through annual service agreements. The work is similar year to year and generally involves three surveys per year. Generally each survey costs $7300 with occasional additional shots or reconfirmations necessary. Staff requests the Board authorize the continued surface monument monitoring through a three year continuing services agreement with Landmark Consultants, Inc. not to exceed $70,000 total. Work will be authorized through task orders.

2.a.iii. Upstream Outlet Works Repairs

2.a.iii.1. Main Gate Replacement

The weather has produced over 20 inches of ice on Wolford Mountain Reservoir. To assemble the barges into the work platform anchored at the tower nearly ice free conditions are required. Average “ice out” would suggest April 20th would be a good target date to begin the week long process of assembling the work platform.
The replacement main gate has been ordered from Steel-Fab and fabrication is underway. A couple of progress photos are below. Delivery to the site is now expected April 30th which is behind the planned delivery schedule. The gate is progressing through manufacturing and we are carefully tracking its progress through use of a Massachusetts based engineering consultant.
MDS has mobilized the barges for the work platform to the site and they occupy the south end of the day use parking lot. MDS is committed to an April 20th barge assembly start date with their schedule having the old gate out about the 30th of April, ice conditions permitting.

As a reminder the main gate replacement costs are estimated to be:
Barge mobilizations and construction, Submittals, Bonds, Insurance $115,000
Barge deconstruction and demobilization $50,000
Remove existing main gate $130,000
Installation of Steel-Fab gate purchased by the RD $149,000
Steel Fab fabricated gate $160,000
**Estimated total project cost** $604,000

With the 2019 snow pack it may be a challenge to maintain the reduced reservoir level and gate installation may need to be conducted with a filling or full reservoir. The impact on the cost of additional water depth is not as significant as one might think as the fixed cost of all the equipment far outweighs the cost of adding another diver or two to the work crew. MDS is currently planning on expanding daily productivity by mobilizing two decompression chambers and “dry decompressing” their divers so the next diver is not delayed by in-water decompression time of the previous diver in order to maintain the “only one diver in the water” operational standard. The divers actually prefer to decompress in the dry warm chamber than through the cold dark hang on a rope for 25 minutes after their 50 minute bottom shift.

For reference again below is the dive work platform employed at Steamboat Lake. At Wolford there will be two additional 10 x 40 barges to support the larger gate(s) and the additional equipment.

### 2.a.iii.2. Guard Gate Repairs

The guard gate is similar to the main gate, an 8 x 8 foot square cast iron sluice gate manufactured by Hydrogate and installed in 1994. The guard gate differs from the main gate as it has a blunt nose bottom which seals into a rubber seal in the bottom of the conduit entrance. Keeping this rubber seal intact has been a problem which we hope to solve by improving the design of the seal (to include nylon reinforcing), the retainer bar (to include ribs to grip the seal), and the retaining
screws (socket drive heads and screws of proper length). The materials are being secured to install this seal during the 2019 runoff. Additionally some wedge parts missing from the guard gate will be salvaged from the removed main gate and recycled.

2.a.iv. Downstream Outlet Works Repairs

The outlet works at Ritschard Dam includes a valve house on the downstream end of the outlet conduit through the dam. The valve house includes splitting of the 96-inch outlet conduit to a 54-inch fixed cone valve which discharges to the air and a 30-inch sleeve valve which can discharge to the air or discharge submerged into the stilling basin.

2.a.iv.1. 96” Butterfly Valve

The 96-inch butterfly valve upstream of the 54-inch fixed cone valve has had a leaky seal which was replaced in August of 2018 by technicians from the valve manufacturer Henry Pratt and Sons, Inc. The seal replacement has not been able to hold water for any length of time. There appear to be a number of potential causes for the continued seal malfunction. The most likely culprit is an undersized 2-inch square key which is the connection between the valve disc and the actuator arm. The key is undersized sufficiently to allow the key to rock a few degrees and the disc edge (4-feet out from the key) to move as much as an inch while the actuator is stationary. Remedial actions underway include:

1. A properly size shaft key will be installed by Hester Diesel Services, LLC.
2. The hydraulic ram travel will be controlled by pressure switches and set to close the valve exactly at full ram travel by Hester Diesel Services, LLC.
3. The seal will be tested and fine-tuned with the assistance of Pratt technicians and if necessary replaced by Pratt technicians.

2.a.iv.2. 30” Butterfly Valve

The new 30 inch butterfly valve for downstream of the sleeve valve has been ordered from Municipal Treatment of Golden, CO at the Board authorized price of $30,757 and delivery is expected July 20th. Hester Diesel Service, LLC has been contracted to perform the installation along with their support of the 96 inch butterfly valve leakage. Hester provided an attractive quote and with their knowledge of the outlet works was selected by staff to perform this work, contracting under the General Manager’s delegated authority.

2.a.v. Recreation Area Operations and Concessionaire Contract Development

To secure a new concessionaire for the Wolford Mountain Reservoir recreation area after Red Mountain RV’s contract expires in October 2019 staff will be advertising the opportunity in April, reviewing submitted qualifications in May, and hopefully making a staff recommendation for a new concessionaire to the Board at the July 2019 quarterly meeting.

2.a.vi. Mitigation Area Work
2.a.vi.1. Mitigation Area Habitat Effectiveness Assessment

Continuing assessment of the mitigation areas at Wolford Mountain Reservoir will be enhanced by modernizing the techniques for evaluating the habitat in the mitigation areas. Initial results suggest significantly greater achievement of the Elk habitat goal than previous analyses reported. Additional information may be available by the Board meeting.

2.a.vi.2. Streambank Stability 2019 Work Plan

Bank restoration and stabilization is required where a siphon across Muddy Creek has become exposed. The siphon is part of the wetlands mitigation area irrigation system. Riprap for this work was stockpiled on site in conjunction with the crest rehabilitation project. This work will likely be included in one of our ongoing earthwork services agreements with Expert Excavating or Farrell Excavating. Recall we have these two contractors available to allow for comparison of pricing and approach on more complicated projects.

2.b. Elkhead Reservoir

2.b.1. Reservoir Operations

Below is a graph of Elkhead operations through late March. The reservoir is about two-thirds full (12.5 feet or 8,000 acre feet below full pool), filling slowly, releasing 5 cfs. Snowpack is 109 percent of average (see graph below) and the CBRFC April-July runoff forecast is 77,800 acre feet or 106 percent of average.
2.b.2. 2019 Work Plan

1. No construction work planned at Elkhead in 2019.

2. A wetlands assessment will be performed and discussed with the U.S. Army Corps of Engineers.

3. The cathodic protection system annual assessment will be conducted.