DULL KNIFE RESERVOIR IRRIGATION PROJECT NEARS COMPLETION

If you have driven past Dull Knife Reservoir this summer, you may have noticed that it is getting a much-needed face lift after 52 years of use. In the mid-1960s the North Fork Water Users Association (NFWU) was formed, and they worked with the Natural Resource Conservation Service to construct the Reservoir. In 1966 they accomplished their goal. Since that time until 2014 the NFWU managed the Reservoir with Pam Kinchen overseeing the administration of daily financial operations and Bill Jones acting as caretaker. Over time the face of the spillway saw some mild erosion and seepage began to occur.

In 2003, Chuck Schmidt, NRCS State Engineer attended the NFWU Annual meeting to discuss rehabilitation of the Reservoir, noting that in 2016 the life expectancy of the Reservoir would be met and the liability of the Dull Knife Reservoir would revert to the NFWU. At this time the NRCS commissioned the *Dull Knife Reservoir Dam Breach Analysis Report* to show the impact to the North Fork Drainage if the Reservoir was breached. As a result, the Dull Knife Dam was reclassified as a "High Hazard Dam" highlighting the loss of life, livestock and property that would occur if a breach occurred. This was instrumental in moving the Rehabilitation Project into a priority position for funding.

Time passed and the deadline in 2016 loomed near. Allison McKenzie, District Conservationist for Johnson County NRCS, attended the 2012 NFWU Annual Meeting, at which - she discussed the importance of rehabilitation of the Dam and encouraged the members to pursue funding to repair the Dull Knife Dam. The state NRCS concurred, stating that if the seepage issue in the spillway was not repaired, eventually the State Engineer's Office could place a fill restriction on the Reservoir or even require the removal of the Reservoir, severely impacting the irrigation usage on the North Fork of Powder River. Following this meeting the NFWU with the assistance of the NRCS worked with emergency service agencies, BLM, State Forestry, and WYDOT to create an Emergency Action Plan. This was the first step needed to pursue funding.

The next step included transitioning from the North Fork Water Users to an irrigation district, a requirement for applying for funding from the Wyoming Water Development Commission (WWDC). During 2013 the NFWU actively began investigating forming an irrigation district and determining who could assist them in this process. Wilbur Jones, a NFWU Commissioner, suggested speaking with Kathleen McPhee as she had just been through the process. Kathleen McPhee directed them to her boss, Dave Palmerlee, a lawyer with extensive experience in water law. These two individuals with their vast knowledge put the NFWU on the fast track to becoming an irrigation district.

At the 2014 Annual Meeting of the NFWU, the members approved transitioning to an irrigation district and further to pursue funding from WWDC to match the funds that would be available from the NRCS.

The race was on to become an irrigation district in time to meet the application submittal deadline for the WWDC. In a record breaking 3 months, the Dull Knife Irrigation District was formed. This was no small task taken on by the NFWU, Dave Palmerlee, Kathleen McPhee, Pam Kinchen, and Anita Bartlett, District Manager for the Powder River Conservation District. Anita Bartlett assisted with obtaining signatures on forms and creating the extremely detailed Dull Knife Irrigation Map required by the District Court to form an irrigation district. Others organized public meetings and drafted the documents needed.

Three very busy months later, on August 11, 2014, the Dull Knife Irrigation District was formed at a District Court Hearing in Buffalo, WY.

Now the funding process began in earnest. The newly formed Dull Knife Irrigation District (DKID), with the assistance of Palmerlee and McPhee, began submitting funding applications with the NRCS and the WWDC. DKID vied for federal funding against projects all over the United States and with the assistance of Chuck Schmitt they were awarded funding that would cover 100% of the cost to design the Project and 65% of the cost of construction. With federal funding in hand, DKID submitted their application to WWDC for the remaining 35% of the project.

DKID worked with Bill Brewer, Construction Project Manager on the WWDC Staff, and with Harry LaBonde, Executive Director of WWDC, to prepare for the interview process before the full Water Development Commission that was required for funding. DKID cannot thank Mr. LaBonde and Mr. Brewer enough for their assistance.

Senator Dave Kinskey was also instrumental in DKID obtaining WWDC funding as he testified to the importance of this project to the community of Southern Johnson County. By the end of 2015 DKID had obtained enough funding to cover 100% of the Design, Construction and Administration cost of rehabilitation of Dull Knife Dam.

The work did not stop there though. With 100% funding in hand, an engineering firm needed to be hired, designs approved, contractors interviewed, and construction completed. This process began in 2015, when DKID worked with the NRCS and Palmerlee to interview three engineering companies.

Following the interviews, a Wyoming based company Tetra Tech was hired to complete the design for the Rehabilitation Project. Ken Temme, Project Engineer, worked with all the parties involved to complete the design in 2016.

Dull Knife Dam was originally designed as an NRCS Hazard Class B dam. However, data from the dam-breach and flood inundation analysis conducted by the NRCS in 2004-05 resulted in the dam being assigned NRCS Hazard Class C (high hazard). This change in hazard classification required design modifications to the existing main dam, outlet works, spillway and saddle dam to address existing conditions related to updated storm event criteria, updated high hazard dam classification, main dam and saddle dam stability, site seismicity, seepage, insufficient crest elevations, outlet works conditions, deterioration of the existing spillway and replacement of the downstream flow measurement structure.

Through the design process, several items were identified which influenced the project design. A suitable aggregate source for structural and mass concrete was not readily available in the reservoir proximity and after a review of pit development costs/permitting/scheduling, it was determined that the more economical aggregate sources were the commercial aggregate pits located in/near Buffalo, Wyoming. Stability evaluations indicated the original main dam design section did not meet the current design minimum standards for a high hazard dam classification. Further stability analyses using deformation and liquefaction analyses were performed and indicated the addition of a downstream buttress and foundation treatment were required for the main dam to meet acceptable factors of safety under static and dynamic loading conditions. The probable maximum precipitation, snowmelt and inflow design flood data review and evaluation indicated a new spillway capable of passing a peak discharge on the order of 18,600 cubic feet per second was required. Following a spillway alternative evaluation, a labyrinth spillway was selected as the preferred spillway.

Major design items included a downstream buttress on the main dam, slip lining the existing 36 inch diameter outlet pipe (~460 ft), additional rip rap on the main dam upstream slope, an impact basin and flow measurement flume for the main dam, replacement of the thimble and intake gate for the outlet works on the main dam, new concrete labyrinth spillway, mass concrete spillway chute and stilling basin, foundation drains for both the main dam and saddle dam, and new spillway channel.

The DKID's Historical Water Call Data was analyzed to establish a reservoir operation and maintenance plan to manage water call release in coordination with Big Sky Civil Constructors construction schedule to maximize the availability of water for irrigation during construction. This was complicated by the limited construction season of June through October associated with the project high elevation location. Through dedicated communication and management between DKID and the contractor, stored water was provided from the reservoir to DKID irrigators through the first week of August while maintaining the necessary site access to accommodate construction activity sequencing to meet the overall seasonal construction schedule of five months.

With the design completed, the Rehabilitation Project was put out to bid and contractors were interviewed by DKID with NRCS and WWDC assisting to ensure that the contractor selected could meet the agencies' specifications. The contractor selected was Big Sky Civil Constructors, Inc., of Helena, Montana and rehabilitation of the Dam began. Ken Temme and Tetra Tech were retained as the District's engineer to insure that every aspect of the Rehabilitation Project met specifications of the multiple state and federal agencies involved. Throughout this whole process Dave Palmerlee's office acted as the administrator of the project components and without their assistance the Rehabilitation process could not have been completed as smoothly as it has.

The Dull Knife Irrigation District would like to extend many words of thanks to everyone who was involved in the process and realize they cannot mention them all in this article. However, there are a few that they would like to recognize here:

Chuck Schmitt, NRCS, for his efforts that went above and beyond what could have been expected to find funding and extra funding when it was needed most.

Allison McKenzie, NRCS, for encouraging us and giving us the push to move forward.

County Commissioner Linda Greenough for attending every meeting from the beginning and supporting us in our efforts.

Scott Pehringer with the Johnson County Road and Bridge Crew for insuring that the Hazelton Road was kept open for the contractor so that this project could be completed

David Schroeder, Dave Pelloux and Bob Furnival with the State Engineer's Office for managing the distribution of irrigation water under unique circumstances.

The Camino Family for their cooperation in leasing us land for the Project staging area.

Ken Temme, Clint Culliton and James Staebler for their expertise and the endless hours spent on Quality Assurance for the Project.

Big Sky Civil Constructors, Inc. of Helena, MT, the contractor, whose construction of the Rehabilitation Project was outstanding! They worked closely with Tetra Tech, Inc., our Project Engineer, and with NRCS and WWDC to insure installation of the Project met design criteria in every aspect; they were able to follow the nearly impossible construction timeline imposed by weather conditions at the site; and were cooperative at all times in working with county, state and federal agencies and conforming to requests made by the District for operation of the Reservoir.

And finally to Dave Palmerlee and Kathleen McPhee for managing the formation of the District, Administration of the Dam Rehabilitation Project, meeting the impossible deadlines we threw at them, and so much more.

On behalf of the Dull Knife Irrigation District, we thank you all as we couldn't have completed this project without your support and efforts.

Dull Knife Irrigation District Commissioners:
Dan Mahoney, President
Wade Curuchet, Vice President
Wilbur Jones, Treasurer