This is a digital document from the collections of the *Wyoming Water Resources Data System* (WRDS) Library.

For additional information about this document and the document conversion process, please contact WRDS at wrds@uwyo.edu and include the phrase **"Digital Documents"** in your subject heading.

To view other documents please visit the WRDS Library online at:
http://library.wrds.uwyo.edu

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)

This PDF is intended to represent the document delivered to the Wyoming Water Development Office in hard copy; however variations may exist from the printed version.

Engineering Services

EXECUTIVE SUMMARY

Greybull River Watershed
Level I Study No. 17-3

Woodard & Curran
1.406.922.0418
Stacey Hellekson, PE
shellekson@woodardcurran.com

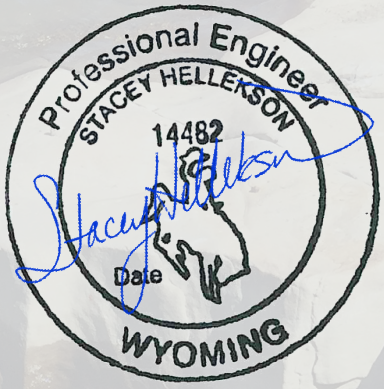
Wyoming Water
Development Commission
Cheyenne, Wyoming
November 16, 2018

Engineering Services

EXECUTIVE SUMMARY

Greybull River Watershed
Level I Study No. 17-3

I hereby certify that I have prepared or directly supervised the preparation of these reports and that I am a duly registered professional in the State of Wyoming.



Stacey D. Hellekson P.E.
Wyoming P.E. No. 14482

Wyoming Water Development Commission
Cheyenne, Wyoming
November 16, 2018

EXECUTIVE SUMMARY

On June 28, 2017, Woodard & Curran, Inc., entered into a contract with the Wyoming Water Development Commission (WWDC) to provide professional services to conduct a Level I watershed study for the Greybull River Watershed located in northwest Wyoming. There are two sponsors for this project, the South Big Horn Conservation District (SBHCD) and the Meeteetse Conservation District (MCD) who submitted a funding application for this study with the WWDC. This Executive Summary outlines the purpose, findings and recommendations of the project.

Purpose, Objective and Tasks

The purpose of the project was to perform a Level I study for the Greybull River watershed. Throughout the course of this study, Woodard & Curran was mindful of the objective statement that pertains to all WWDC Watershed Studies:

> *The objective of a Watershed Study is to evaluate an individual watershed's existing conditions and, from collaboration with landowners, stakeholders, and public outreach, develop a Watershed Management and Rehabilitation Plan and identify projects that are eligible for funding from WWDC and other sources that may improve or maintain watershed function and systems.*

The primary purpose of this study to gather relevant existing information to develop an inventory, which would be used to evaluate the watershed and create a Management and Rehabilitation Plan for the watershed. The study was conducted utilizing the project description, project requirements and scope of services as provided by the WWDC. The scope of services included the following 12 tasks:

- Task 1: Project Meetings and Public Participation;
- Task 2: Review of Background Information;
- Task 3: Inventory and Description;
- Task 4: Streamflow Hydrology;
- Task 5: Management and Rehabilitation Plan;
- Task 6: Cost Estimates;
- Task 7: Economic Analysis;
- Task 8: Permits;
- Task 9: Discretionary Task;
- Task 10: Draft Report;
- Task 11: Draft Presentations; and
- Task 12: Final Report and GIS Deliverables.

Project Background/Inventory Findings

This study includes the entire Greybull River watershed and also encompasses the adjoining Dry Creek watershed. Together they drain more than a million acres of land in Big Horn and Park counties located in the Bighorn Basin of northwestern Wyoming.

The topography and climate of the watershed vary greatly from one end of the study area to the other. The Greybull River headwaters begin in the westernmost portions of the watershed on 13,000-foot mountain tops in the Absaroka Range of the Shoshone National Forest where the annual snowfall routinely exceeds 150 inches a year. In contrast, the City of Greybull is located in the easternmost boundary of the watershed at an elevation just under 3,800 feet and typically receives less than seven inches of precipitation annually.

The Greybull River is the third largest tributary to the Bighorn River and, like Dry Creek, confluences with the Bighorn River at the easternmost boundary of the study area. The three largest communities in the watershed, Greybull, Burlington and Meeteetse, include 2,563 people. Despite the relatively low populace, there are extensive agricultural and stock-grazing water demands from both the Greybull River and Dry Creek. As a result, the watershed's surface water storage and surface water usage are critical factors, especially during the annual May to October irrigation period.

The Greybull River and its tributaries drain approximately 75 percent of the watershed study area, although Greybull's main tributary, the Wood River, drains a large portion of the southwestern area of the watershed. Elsewhere, Dry Creek and its tributaries drain about 25 percent of the watershed study area in parallel fashion to the Greybull River in the northern portion of the watershed.

Compounding the ever-increasing water demands within the study area is the fact that the watershed contains an abundant array of fish, wildlife and native habitats which require a functioning watershed and often need comprehensive wildlife conservation strategies. This work falls mostly under the auspices of the WGFD and includes special protection areas or instream flow segments set aside to protect the native Yellowstone Cutthroat trout.

Land ownership within the watershed mirrors many other watersheds in Wyoming. Over 63 percent of the land within the Greybull River watershed study area is federally owned while private landowners control less than 28 percent. The state of Wyoming owns less than ten percent of the watershed.

Historical land use of the watershed closely resembles current land use. This includes water storage, agricultural uses/livestock grazing, industrial development, recreation, limited transportation uses and a wide variety of wildlife habitat.

Most of the watershed's populace use groundwater wells for potable water including the communities of Greybull and Burlington. Meeteetse obtains its potable water through an infiltration gallery at the toe of the Lower Sunshine Reservoir located in the western portion of the watershed. Elsewhere, the area's residents utilize groundwater for their potable, stock water and irrigation needs.

Outside of oil and gas operations, there is little industrial land use although some timber harvesting exists in the southwestern portion of the watershed. The predominant area for oil and gas is the Oregon Basin field located north of Meeteetse though some operations exist in the Greybull area. Currently, there are over 1,000 producing oil and gas wells in the watershed. More than 600 of those are in the Oregon Basin field.

Irrigation is the predominant water use within the watershed. Most irrigated land is located in areas of the watershed defined as semiarid and even arid. As noted earlier, this includes some areas where annual precipitation rarely exceeds seven inches a year. Previous irrigation and storage enlargement studies have concluded the watershed operates as a water-short system.

Within the watershed there are areas where surface water quality is compromised. These in the lower stretches of the Greybull River and Dry Creek. According to previous studies, a majority of *Escherichia coli (E-coli)* loading in these impaired stream segments is the result of overland runoff from livestock and/or wildlife defecation (RESPEC, 2013). A later report concluded the trend of increasing bacterial concentrations from upstream to downstream in the Greybull River was attributed to increases in the occurrence of irrigated agriculture land and livestock activity (WDEQ, 2016).

Most of the watershed's surface water storage area is operated by the Greybull Valley Irrigation District (GVID). This public entity controls the daily operations of managing the watershed's three main off-channel storage facilities, the Upper Sunshine, the Lower Sunshine and the Roach Gulch reservoirs. Together these three reservoirs provide approximately 145,000 ac-ft of storage capacity.

Though the GVID manages most of the water storage facilities in the watershed, the bulk of the irrigation water is supplied by several privately-owned irrigation companies including the Farmers Canal Company, the Bench Canal Company, plus the Keystone, Jimmerfield, Smith and Avent ditch companies. The irrigators in these companies are all located in the eastern half of the watershed.

Concerns established in previous studies prior, and subsequent findings during this study indicate several challenges facing the landowners, stakeholders and the public within the watershed including:

- Aging water resource infrastructure;
- Aging irrigation infrastructure;
- Continued water quality issues in the impaired sections of streams;
- Erosion and channel stability; and
- Distribution of water resources.

Nearly every water project will need some sort of permit whether the project is maintenance-oriented, repair or replacement of existing infrastructure, or the formation of a new storage reservoir. Location determines the permitting process for areas administered by the Federal, State, county or privately held land. The permitting process can be as complicated as the BLM requiring a full Environmental Impact Statement (EIS) or as simple as a routine water-rights application to Wyoming's SEO.

Public Outreach

One of the objectives of this study was to create public awareness and encourage public participation through a series of public meetings and presentations. Notifications for these meeting were completed through mailings, newspaper advertisements, website notices through the MCD and SBHCD, and email and phone calls to landowners and entities showing interest in the study. These efforts plus field trips to visits landowners, tours of aspects of the watershed with sponsors and other stakeholders were all performed to accumulate as much public input as possible regarding the management and rehabilitation of the watershed's water and environmental resources.

Rehabilitation and Management Plan

The rehabilitation and management strategies described in this report are intended to improve the watershed condition and function of the watershed which includes benefits to wildlife, livestock, and the environment. This report is divided into rehabilitation topics that are tangent projects which a landowner or public entity could pursue for funding and management topics that focuses on the potential for an over-arching management agency for the entire watershed.

Several improvements are specific to landowners and are based on the landowner's outreach and input. On the other hand, some of the rehabilitation opportunities were identified based on recurring themes from stakeholders through surveys, conversations and comments during public meetings. The larger-scale issues are based on the survey results and include:

- Aging irrigation infrastructure
- Water storage; and
- Stream stability

Regarding the aging irrigation infrastructure, multiple master plan studies have been completed for Irrigation Districts within the watershed. This was also reflected by numerous comments at public meetings and from survey results. Several comments included:

- Farmer's Canal is failing;
- 70 to 80 percent of the Bench Canal's infrastructure is failing; and
- Several unlined irrigation ditches up to eight miles long which lose nearly half their flow by the time the water reaches the fields.

Of the items identified in the previous studies, repair of the Hi-Line ditch frequently came up in survey responses and discussion with landowners. Landowners have concern that the Hi-Line ditch is unstable and if this ditch fails, many agricultural producers will be without water and could be devastating to their livelihoods. In addition, there is concern that if the Hi-Line ditch fails, the water flowing out of the ditch will also cause significant property damage.

Like the larger, private irrigation districts, there are numerous ditches, headgates and other infrastructure that are aging and in disrepair that are owned or shared by private landowners. Maintenance and repair often are undertaken by one landowner who then has the onus of obtaining repayment monies from other landowners

who benefit from the same ditch. Many responses from stakeholders were focused on headgate and diversion structure damage due to flooding and erosion which can be addressed with streambank stabilization described previously.

Many of this study's survey responses indicated an interest to increase water storage. Previous studies indicated a need for additional water storage in the area and concluded this watershed operates as a water-short system, which is also verified by the hydrologic analysis completed for the study. Those studies also concluded the watershed had available water that could be stored to reduce water shortages during the irrigation season. Three existing reservoirs and two new reservoirs were evaluated and screened based on logistics and technical practicality, cost, and biological and cultural constraint. The alternatives analysis identified the Lower Sunshine Reservoir as the preferred and best alternative to provide additional storage.

Streambank erosion is a common issue along the larger rivers of the watershed, particularly the Greybull and Wood Rivers, resulting in thousands of dollars of damage due to land loss and destruction of infrastructure. Lateral stream migration is normal for all streams, although certain stream types exhibit more lateral movement than others. Lateral movement allows streams to regulate its gradient by becoming more or less sinuous. This allows the channel to maintain its ability to transport its sediment load, which is a requirement of a stable stream. Rosgen "D" stream types, such as much of the Greybull and Wood Rivers, have characteristically high bank erosion rates. These stream types have a high sediment supply and aggradation due to sediment deposition which cause the channel to adjust its channel planform frequently

During this study, erosion and flooding became a recurring theme which may have been more pronounced due to the "wetter" years occurring over the past three years and the subsequent damage due to higher flows. Landowners reported that typically a head gate or diversion structure would need to be replaced about every ten years due to erosion and flooding, but they are now finding that damage is occurring at more frequent intervals.

Field visits noted road damage on a bridge crossing the Greybull river (Road 4EU off Hwy 290) due to channel migration, irrigation diversion damage and flooding from Wood River across roadways. Dry Creek also has issues with flooding and erosion, but this is likely to occur near the confluence of the Bighorn River during the spring when flowing ice dams the river. The numerous events that were reported or observed during this study indicate this is a concern throughout the watershed.

Throughout the process of this study, numerous comments were made regarding the need of repairs on infrastructure, the inability to procure funding for repairs, and a need for management. Irrigation districts, such as the BCC and FCC are struggling to secure funding because they are not public entities. Smaller, private owners also struggle to secure funding and gain cooperation from neighboring landowners to make repairs. Some of the additional issues for private landowners, such as the 7K Ranch project described in the Final Report, are that projects do not benefit enough stakeholders compared to other projects submitted for funding. This issue becomes a recurring problem when the funds from USDA's Natural Resources Conservation Service (NRCS) and the Small Water Project Program (SWPP) of the WWDC are repeatedly awarded to higher prioritized projects. Funding also becomes an issue when it comes to rehabilitation projects that are aimed at improving or protecting the watershed, such as Russian olive removal or stream stabilization. Often, funding opportunities focus on water development and economic improvement options

(i.e., conversion to sprinkler irrigation) which again preclude opportunities for smaller, obscure projects to be funded. Many times, those types of projects are ineligible for certain types of funding or are considered lower priorities by some agencies. For example, the SWPP may consider environmental enhancement and flood control projects to be of a lower priority than other small projects. Projects chosen for funding through the SWPP must be able to demonstrate a public benefit. Additionally, funding amounts from individual sources are often so small that the project owner, whether it be an irrigation district or private, has the onus of finding additional funding or financing a project on his or her own, which is oftentimes beyond their means.

Watershed Improvement District

One option to remedy the concerns of stakeholders and to assist in creating funds and organization for project prioritization is to create a Watershed Improvement District (WID). This option is currently being pursued by the BCC to become eligible for state funding. The next section briefly describes the function and process of becoming a WID and following sections describe the general concepts, strengths, weaknesses, opportunities and threats (SWOT) of creating a Greybull River WID.

The purpose of a WID is to provide prevention and control of erosion, floodwater and sediment damages; storage and conservation development; utilization and water disposal; preserve and protect land and water resources; health, safety and welfare of public; and for agricultural purposes. The 2018 Wyoming Statues, Title 41-Water, Chapter 8–Watershed Improvement Districts describes the definitions, purposes, establishment, board of director authority, assessment, and other processes of a functioning WID.

If the creation of WID is desired by landowners within the watershed, the general process, as defined by the above reference statues, is as follows:

- a petition is developed for WID creation by the landowners;
- a hearing is held by the Conservation District(s);
- a referendum vote is completed by the landowners included in the proposed WID; and
- the Conservation District(s) declare final approval/denial.

The petition to form a WID needs to be signed by not less than 25 percent of the landowners owning at least 25 percent of the assessed valuation of property within the area proposed to be established as a WID. The petition must include the proposed boundaries, the acreage involved, the proposed name, the reason for creation and a description of who will pay. The WID boundary can cross other boundaries including conservation districts or irrigation districts.

If a petition is developed that adheres to these criteria, the CD(s) will then have a hearing to determine whether there is a need for the creation of the WID in the interest of public health, safety and welfare. Public hearings need to be held during development of the proposed boundaries and naming convention of the WID and this needs to be held within 45 to 90 days after the petition has been filed. In addition, if the Board of Supervisors receives protests signed by a minimum of 35 percent of assessed valuation of property, then the petition will fail.

If the CD(s) determine that there is a need for the WID based on the public hearing, then there will be a referendum vote by qualified landowners within proposed WID boundaries. If "at least a majority of the votes cast in the referendum, which affirmative votes represent a majority of the acreage contained in the proposed WID, favor creation of the WID", then the CDs can determine that the WID would be "administratively practicable and feasible" and they can declare the WID created.

A WID is operated by a board of directors consisting of five landowners within the WID boundaries. The Board of Directors are elected by the WID landowners on an annual basis and have at least the titles of chairman, secretary and treasurer. The Board of Directors do not receive a salary but can receive expenses for meeting and travel to perform their duties. The Board of Directors are under the supervision of the Conservation District Board of Supervisors. At a minimum the Board of Directors are required to file an annual report including financial statement, O&M activities for the preceding year and O&M activities planned for the present year, plus hold quarterly meetings of which one to be an inspection tour.

The WID has the authority to levy and collect assessments for projects identified within the district boundaries. Projects are approved or rejected through a hearing where three appraisers are appointed to identify costs and proportion assessments to those that accrue the benefit of the project. A hearing is conducted for the projects. The WID also has the power of eminent domain and has the ability to borrow money, issue bonds and apply liens.

Many of the watershed-wide issues that have been identified in the study fall under the purposes of a WID, including prevention of erosion, floodwater damage, storage development, and agricultural purposes. Also described in the rehabilitation section, there is a hurdle to obtain funding for many of the projects, either due to large project cost estimates, lower prioritization or ineligibility. Forming a WID in the Greybull River watershed could help to alleviate some of these hindrances.

The issues faced by the Greybull River Watershed are common themes in other areas where smaller un-organized ditches are looking for funding from WWDC. Some examples of successful WID formation include the Nowood WID, Cottonwood/Grass Creek WID and the Red Lane WID. For each of these entities, there was a strong interest by the landowners to create a WID. Interest and participation is a key component in the successful development of a WID and a lot of effort is needed by the stakeholders in the area to gain interest and participation.

Funding Opportunities

The ability to pay for the projects identified in the report is a critical component of successful planning, implementation and perhaps operation of individual projects or groups of projects. Therefore, the identification of specific sources of funding which are applicable and appropriate to those projects is key to moving forward with the items included in this watershed study. The projects and issues discussed include streambank stabilization; small and larger scale water storage ponds or reservoirs; rehabilitation of irrigation infrastructure; ditch lining or conversion to closed pipe; fish passage construction and maintenance and the potential formation of a Watershed Improvement District. A variety of funding sources and opportunities are

available that may address the specific components of these watershed improvement projects. Those opportunities include full or partial grants, loans and other forms of support.

Several local agencies and/or offices offer various forms of assistance and/or funding opportunities including the South Big Horn Conservation District, the Meeteetse Conservation District, the Weed and Pest Control Districts in both Park and Big Horn Counties, plus the local field offices for the WGFD and the NRCS.

Multiple state and federal funding sources are available for the projects. The following list outlines the agency that have potential funding.

- Wyoming Water Development Commission
- Wyoming Department of Environmental Quality
- Wyoming Department of Agriculture
- Wyoming Office of State Lands and Investments
- Wyoming Game and Fish Department
- Wyoming Wildlife and Natural Resource Trust

Multiple federal funding sources are available for the projects identified in the study including:

- Bureau of Reclamation
- U.S. Army Corps of Engineers
- Bureau of Land Management
- USDA Natural Resources Conservation Service
- Environmental Protection Agency
- USDA Farm Service Agency
- US Fish and Wildlife Service

Summary

This watershed study presents a holistic appraisal of the current condition of the Greybull River watershed which spans over one million acres and encompasses the watersheds of both the Greybull River and Dry Creek. The study looked at potential water improvement projects to restore, maintain and enhance a healthy watershed function and upgrade necessary irrigation infrastructure.

Included in this study are rehabilitation topics that are tangent projects that a landowner or public entity could pursue for funding and management topics that focuses on the potential for an over-arching management agency for the entire watershed. This study will be useful as a tool to identify the costs, permitting and funding logistics to complete a project. It should be noted, however, not every possible project was identified during the study's development.

A series of public meetings, surveys, field visits, and dozens of emails and phone calls were conducted during the course of this study to gauge the public's sentiment and to listen to specific suggestions on watershed

improvement needs and opportunities. Identification of watershed-wide issues were primarily a function of summarizing public comments, survey responses, and agency input.

The watershed may benefit from creating a WID to aid in financial procurement, project prioritization and organization for those private owners that do not currently fall under an existing irrigation ditch. Although there are several weaknesses and threats to creating WID, the strengths and opportunities far outweigh any negative perceptions. It is recommended stakeholders in the area continue to engage the public to gain a better understanding of concerns and interest in creating a WID. Funding opportunity for a Level II feasibility study through the WWDC may be available to assess the interest, WID boundary and willingness to pay from landowners in the region. This opportunity would need discussion from a sponsor (i.e., MCD, SBHCD, GVID) and staff at the WWDO prior to spending money on application fees.