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EXECUTIVE SUMMARY
for
UPPER LARAMIE RIVER
WATERSHED STUDY, LEVEL I

Prepared for:

Wyoming Water Development Commission
6920 Yellowtail Road
Cheyenne, WY 82002

Prepared by:

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Fort Collins, CO 80525
(ACE Project No. WYWDC37)

November 1, 2016



ANDERSON CONSULTING ENGINEERS, INC.
Civil • Water Resources • Environmental

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TABLE OF CONTENTS

I.0 INTRODUCTION AND OVERVIEW 1

2.0 BACKGROUND..... 1

3.0 PROJECT PURPOSE AND OBJECTIVES..... 1

4.0 INSTITUTIONAL CONSTRAINTS..... 2

 4.1 The Modified North Platte River Decree (2001) 2

 4.2 Laramie River Decree (1922) 2

 4.3 The Platte River Recovery and Implementation Program (PRRIP) (2001) 2

5.0 WATERSHED MANAGEMENT AND PLAN 3

6.0 CONCLUSIONS AND RECOMMENDATIONS..... 4

 6.1 Conclusions 4

 6.1.1 *Irrigation System Components*..... 4

 6.1.2 *Livestock/Wildlife Upland Watering Opportunities*..... 6

 6.1.3 *Surface Water Storage Opportunities*..... 7

 6.1.4 *Stream Channel Condition and Stability* 7

 6.1.5 *Grazing Management Opportunities*..... 7

 6.2 Recommendations 8

LIST OF TABLES

Table 1. Upper Laramie River Watershed Management Plan 5

1.0 INTRODUCTION AND OVERVIEW

In 2014 the Laramie Rivers Conservation District (LRCD) requested funding from the Wyoming Water Development Commission (WWDC) for the completion of a watershed management plan for the Upper Laramie River watershed. The intent of the funding request was to have a comprehensive watershed inventory completed which identified issues related to land use and water resources and to then develop a plan addressing those issues. The WWDC approved funding for the project and Anderson Consulting Engineers, Inc. (ACE) was ultimately contracted in June, 2015 to complete the project.

2.0 BACKGROUND

The project study area lies within the North Platte River basin and is defined as the Upper Laramie River watershed as delineated by the USGS eighth order Hydrologic Unit Code (HUC) 10180010 within the State of Wyoming. The river system consists primarily of the Laramie River (referred to as the Big Laramie River) and its principal tributary, the Little Laramie River.

The study area covers approximately 1,877 square miles or 1,201,324 acres in southeast Wyoming. The watershed is situated almost entirely within a portion of Albany County (96.2 percent) with a small portion on the western fringe lying within Carbon County (3.8 percent). The cities, towns, and communities of Laramie, Centennial, Albany, Bosler and Tie Siding lie within the watershed boundary.

3.0 PROJECT PURPOSE AND OBJECTIVES

The purpose of this Level I watershed study was to combine the available data and information with the study-generated inventory data to develop a comprehensive watershed management and rehabilitation plan that outlines proposed and potential water-development opportunities. To accomplish this effort, the following objectives were completed:

- *Facilitate consensus building among the conservation district, landowners and the Wyoming Water Development Commission.*
- *Facilitate public participation through public meetings, open houses/workshops, LRCD contacts, and advertisements.*
- *Conduct an evaluation and description of the Upper Laramie River watershed, including quantity and quality of surface water resources, and riparian/upland conditions.*
- *Inventory and describe Irrigation systems, water storage, and flood control needs present within the watershed.*
- *Conduct a geomorphic assessment of the primary channels within the watershed and identify potential mitigation measures to improve impaired channel reaches.*
- *Conduct an irrigation system inventory and develop a rehabilitation plan for those ditches expressing an interest to participate.*
- *Conduct an evaluation of water storage needs and opportunities to augment water available for livestock and wildlife.*

- *Develop a watershed management plan which identifies water resource related within the watershed and proposes practical economic solutions.*
- *Identify permits, easements, and clearances necessary for plan implementation.*
- *Develop cost estimates for improvements.*
- *Complete an economic analysis and evaluate alternative sources of funding.*

4.0 INSTITUTIONAL CONSTRAINTS

Any water development projects completed in conjunction with the Watershed Management Plan must be reviewed in light of the three legal constraints governing water use within the basin:

1. The Modified North Platte River Decree (2001),
2. The Laramie River Decree (1922), and
3. The Platte River Recovery and Implementation Program (PRRIP) (2001)

4.1 The Modified North Platte River Decree (2001)

The area affected by the North Platte Decree does not include the Upper Laramie River watershed study area; the Laramie River is excluded from the decree.

4.2 The Laramie River Decree (1922)

The Laramie River from the Colorado/Wyoming state line to the Wheatland Irrigation District Tunnel Diversion (which encompasses the entire project study area) is controlled under the Laramie River Decree and Wyoming water right priority system.

- Any new projects proposed in the Watershed Management Plan would fall under the priority system. New projects would be assigned a priority date at the time the permitting process is completed.
- The Upper Laramie River is fully appropriated. Consequently, any storage facilities that are constructed should incorporate low-level outlet pipes or by-pass structures which facilitate regulation. This would include stock reservoirs of any capacity.

4.3 The Platte River Recovery and Implementation Program (PRRIP) (2001)

The PRRIP was approved in 1997. It set base lines of consumptive use in Wyoming and provided for additional water from Wyoming, Colorado, and Nebraska for the benefit of the endangered species in central Nebraska. It established a process to evaluate all new proposed water right facilities to insure they do not increase consumptive use to further reduce the flow for the critical habitat area. The following items are provided as guidance to be used in project implementation:

- Any proposed new water facility is reviewed to determine the depletions from the proposed project. Prior to a permit being issued, the applicant must prove that implementation of a proposed project results in no net depletions. For example, evaporation from a new stock reservoir would be considered a depletion. If it was built in a location where no depletion was occurring prior to construction (e.g. an ephemeral channel with no vegetation), evaporative losses from the new water surface would result in an increase in depletions when compared to those existing before construction. The applicant would need to offset these losses in some way, such as removing that portion of irrigated lands with a consumptive use equivalent to the new evaporative losses in order to obtain a permit through the WSEO.
- If a new irrigation reservoir is proposed, again the evaporation would be considered a depletion. In addition, if the reservoir provides additional water for irrigation which increases the consumptive use of the crops, then both the evaporative losses and additional consumptive use would be depletions to be offset.
- Enlargement of existing reservoirs would likely increase depletions because the water surface would be increased. Consequently, increased evaporative losses would need to be mitigated. In addition, if consumptive use of crops irrigated from the enlarged reservoir increased, these depletions would need to be mitigated as well prior to a permit being issued to construct the facility.
- Proposed projects such as spring developments and irrigation infrastructure rehabilitation or replacement would likely not be subjected to the consumptive use evaluation. However, the WSEO may require evaluation in order to grant a permit.
- Stock reservoirs resulting in less than 5 acre-feet net depletions would likely be exempt. However, the WSEO may require evaluation in order to grant a permit.

There are additional exemptions to the PRRIP for projects such as those involving domestic use where the consumptive uses would be negligible. However, all new proposed facilities are reviewed and consumptive use determined during the permitting process. Only those facilities that can offset their depletions or result in negligible depletions will receive a permit and be constructed.

5.0 WATERSHED MANAGEMENT AND PLAN

For the purposes of tracking individual components of the watershed management plan, each component was designated two unique project or “improvement” identifiers:

- The Component Number denotes the type of project and the portion of the watershed management plan it falls within:
 - Project Components “IRR”: Irrigation system rehabilitation components
 - Project Components “L/W”: Livestock/wildlife upland watering opportunities
 - Project Components “STO”: Surface water storage opportunities
 - Project Components “STR”: Stream channel stability components
 - Project Components “G”: Grazing management components
 - Project Components “O”: Other watershed management opportunities.

- The Proponent Number denotes the individual or entity that made the recommendation and may include projects in more than one of the categories listed above.

The plan is summarized in Table 1.

6.0 CONCLUSIONS AND RECOMMENDATIONS

A multidisciplinary inventory of the Upper Laramie River watershed was conducted in an effort to identify and evaluate key resource issues and concerns related to watershed function and condition. A comprehensive Geographic Information System (GIS) was completed in conjunction with the inventory. The GIS incorporates the data collected and results generated during the study and collates it with information collected from a wide variety of sources. The GIS will be a valuable resource for the community and future studies which will likely be conducted in the watershed.

6.1 Conclusions

Upon completion of the watershed inventory phase of the project, the project team developed the watershed management plan. The plan was developed based upon findings of the inventory phase, a series of public meetings, questionnaires, and interaction with the project steering committee. In previous chapters, the key issues and problems were identified and ultimately, project goals and objectives were formulated to address them. In summary, the following conclusions are provided.

6.1.1 Irrigation System Components

1. Potential solutions to the primary issues and problems associated with irrigation system infrastructure were identified. Consequently, fifteen (15) individual projects were incorporated into the watershed management plan. Conceptual level cost estimates were completed for the recommended improvements.

2. Individual improvements range from installation of simple structures on ditch systems providing water to one user to replacement of a diversion structure for a ditch serving many users (Oasis Ditch).

Table 1. Upper Laramie River Watershed Management Plan.

Watershed Plan Component: Irrigation Rehabilitation Projects (IRR)		
Watershed Management Plan Component	Proponent Number	Project Name
IRR-001	Sigel-001	Hecth Ditch Reconstruction
IRR-002	Rogers-002	Bellamy Ditch Drop-Chute
IRR-003	LCD-001	Last Chance Ditch Point of Diversion
IRR-004	Johnson-002	Simon Johnson Ditch Diversion Replacement
IRR-005	Johnson-003	Simon Johnson 2 Ditch Diversion Replacement
IRR-006	Oasis-001	Oasis Ditch Diversion Replacement
IRR-007	Oasis-002	Parshall Flume Evaluation / Replacement
IRR-008	Oasis-004	Oasis Ditch Seepage Evaluation
IRR-009	Edwards-001	Lund Ditch Diversion Reconstruction
IRR-010	Croonberg-001	Hatton No. 2 Diversion Rehabilitation
IRR-011	Croonberg-002	Hatton No. 1 Ditch Diversion Rehabilitation
IRR-012	Croonberg-003	McGill and Crooger Ditch Splitter Construction
IRR-013	Croonberg-004	Hatton No. 3 and No. 4 Diversion on Dry Creek
IRR-014	Croonberg-005	Hatton Ditch Lateral Check Structure
IRR-015	USFS-001	Ditch Management / Beetle Kill
Watershed Plan Component: Livestock / Wildlife Water Supply Projects (L/W)		
Watershed Management Plan Component	Proponent Number	Project Name
L/W-001	Blake-001	Blake Pipeline Project
L/W-002	BLM-001	Windmill Replacement 1
L/W-003	BLM-002	Windmill Replacement 2
L/W-004	BLM-003	Windmill Replacement 3
L/W-005	Sigel-002	Sigel Spring Development
L/W-006	Sigel-003	Sigel Pipeline and Stock Tank Installation
L/W-007	Rogers-001	Rogers Stock Reservoir
L/W-008	Johnson-001	Johnson Stock Reservoir
L/W-009	Johnson-004	Stock Reservoir Rehabilitation
L/W-010	Johnson-005	Stock Reservoir Construction
L/W-011	Gaddis-001	Mobile Solar Platform and Pipeline Project
L/W-012	Engen-001	Stock Tank and Pipeline Project
L/W-013	Clay-001	Winter Livestock/Wildlife Water Supply
L/W-014	Clark-001	Fox Creek Reservoir
L/W-015	Churches-001	Churches Pipeline Project
L/W-016	Tenbenschel-001	Stock Reservoir Rehabilitation
L/W-017	Kaisler-003	Solar Platform Installation
L/W-18 through L/W-103	ACE-001 through ACE 086	Stock Reservoir Rehabilitation Projects
Watershed Plan Component: Storage Opportunities (STO)		
Watershed Management Plan Component	Proponent Number	Project Name
STO-001	WID-001	Wheatland Reservoir No. 3 Modification
Watershed Plan Component: Stream Channel Opportunities (STR)		
Watershed Plan Component	Proponent Number	Project name
STR-001	Oasis-003	Laramie River at Oasis Ditch
STR-002	Speicer-001	Laramie River at Corrals
Watershed Plan Component: Grazing Opportunities (G)		
Watershed Plan Component	Project name	
G-001	Strategic upland livestock / wildlife water sources	
G-002	Fencing	
G-003	Strategic salting and herding	
G-004	Incorporation of wildlife benefits	
G-005	State and Transition model strategies	
G-006	Prescribed fire	
G-007	Chemical application	
Watershed Plan Component: Other Opportunities (OTH)		
Watershed Plan Component	Proponent Number	Project name
OTH-001	LRCD-001	Spring Creek Flood Mitigation

3. The recommended improvements to each irrigation system can be implemented individually, in combination, or as a complete package depending on the needs, preferences, and financial ability of the owner. Funding assistance is available from a number of sources, especially the WWDC Small Water Project Program and various programs administered by the NRCS.
4. Partnering opportunities may exist for construction of in-stream structures such as irrigation diversions. For example, Trout Unlimited (TU) recently provided partial funding for projects within the Upper Laramie River watershed in an effort to minimize their impacts upon fisheries and fish passage.
5. Many of the proposed irrigation system improvements would require minor involvement or permitting from regulatory agencies to be completed. However, work completed within stream channels (waters of the US) would require coordination with the USACE. Rehabilitation activities would likely be exempted from Section 404 permitting due to the USACE's exclusion of irrigation system maintenance efforts. Construction of new facilities would likely require Section 404 permitting.

6.1.2 *Livestock/Wildlife Upland Watering Opportunities*

1. There appears to be numerous opportunities to improve range and riparian conditions by means of increasing the availability of upland water sources for wildlife and livestock use.
2. Opportunities to improve range and riparian conditions require installing and operating well-distributed, reliable upland water sources and watering facilities for wildlife and livestock. Installing pipelines and stock tanks is the foundation of effective grazing management and can be an economical way to improve rangeland conditions. Strategic fencing is frequently required to optimize these benefits.
3. Pipeline/tank systems appear to offer the most efficient and cost-effective means to provide adequate watering to large areas of rangeland. Water sources for these systems will depend on the location of the rangeland to be served and the available alternative sources. The most likely sources are wells or spring developments.
4. Through discussion with local landowners and stakeholders, a total of 17 potential livestock / wildlife water supply projects were identified. Conceptual plans and conceptual level cost estimates were prepared for each project. Projects ranged from installation of stock tanks to well spring development and pipeline construction.
5. Most of the livestock / wildlife projects could be completed entirely on private lands. Consequently, permitting issues are greatly simplified. However, some could involve coordination with the Bureau of Land Management (BLM) through the Rawlins Office. BLM consultation will be necessary in order to obtain the requisite permits and cultural clearances.

6.1.3 Surface Water Storage Opportunities

1. Development of new storage facilities or modification of existing facilities were not highly recommended by water users in the basin. Restrictions and constraints imposed by the Modified North Platte Decree (2001) and the Platte River Recovery and Implementation Program (PRRIP) (2001) make completion of new projects highly problematic.
2. Potential modifications to Wheatland Reservoir No. 3 were also identified by the Wheatland Irrigation District (WID). Further study of this and other projects lying outside of the study area are needed. Since all beneficial uses of Wheatland Reservoir No. 3 lie in the Lower Laramie River basin, and consequently, outside of the current study area, the project was identified but not fully investigated at this time.

6.1.4 Stream Channel Condition and Stability

1. Based on the geomorphic assessment and input from the project Sponsor, the project team concluded that channel degradation does not appear to be systemic, yet impaired streams do exist. The categories of impairments identified include, but are not limited to, degradation of riparian vegetation and degradation of riparian condition in the form of stream bank erosion and channel degradation.
2. Site-specific solutions should be developed to mitigate the channel impairment and ultimately included in the watershed management rehabilitation plan.
3. Community-sponsored stream channel and habitat improvement projects could provide numerous benefits to the watershed. The LRCD has proven experience completing stream channel improvements including the recently completed project on the Laramie River within the City of Laramie. Community involvement provided numerous benefits to the project.
4. Potential projects would include efforts such as bank stabilization efforts using techniques such as willow plantings. In addition to providing direct benefits to the specific stream, ancillary benefits include education and community involvement.

6.1.5 Grazing Management Opportunities

1. Construction and operation of reliable water supply projects must be developed and implemented in areas with inadequate water sources before adjustments or alternatives in grazing management could be made on a particular area or allotment.
2. Development of reliable water sources and associated watering facilities can aid in distribution, timing, and frequency of grazing animals. However, additional measures such as cross-fencing,

low-stress herding, mineral/salting, and grazing density should be evaluated as part of the site-specific, grazing management inventory and plan.

3. Available tools such as the ESD and the STM can be used by landowners and managers to become aware of the growth potential of desirable vegetation and predicted responses on a particular range site.
4. These tools could be used in developing appropriate rangeland treatments and grazing practices to begin the transition from an undesirable to a desirable plant community

6.2 Recommendations

Based upon the information presented throughout this report, and the conclusions presented above, the recommendations listed below are presented for consideration:

1. Many of the irrigation rehabilitation alternatives and the livestock / wildlife upland watering alternatives fall within the constraints for funding eligibility of the WWDC's Small Water Project Program (SWPP). These projects should be reviewed and selected alternatives should be implemented as soon as is practical. Completion of one or more of these projects in the near future would serve to benefit those directly involved in the project and increase interest and awareness of the benefits associated with the watershed planning process.

Funding through the SWPP does not require formation of a public entity as defined by WWDC criteria. Consequently, individuals can seek funding through this program by applying through a conservation district as their sponsor. As discussed in Chapter 7, projects providing multiple benefits and for which total project cost are less than \$135,000 are eligible for funding under this program. Grants are available for up to 50 percent of the total project cost or \$35,000, whichever is less.

Several alternative sources exist for funding of improvements within the watershed including on-farm improvements, irrigation rehabilitation projects, stream enhancements/restoration projects, and conservation and flood control projects. Creative strategies for funding/financing of projects should be more fully investigated following identification of projects worthy of additional evaluation and potential implementation. As an example, replacement of a failing ditch headgate and diversion which are also identified by WGFD as barriers to fish passage, could potentially be eligible for funding through SWPP (if total project cost meets SWPP criteria). Additional funding could also be attained through WGFD, Trout Unlimited, and other sources because of the fisheries and stream habitat benefits achievable with completion of the project. *By combining funding sources, the owner could conceivably obtain grants for most, if not all, of the project costs.*

2. Several of the irrigation projects identified involved costly repairs or replacement of existing facilities and would not be eligible for funding through the SWPP. For the projects listed below, landowners and ditch owners should consider district formation (where applicable) and application to the WWDC for level II evaluation and potential project funding:
 - a. IRR-006: Oasis Ditch Diversion
 - b. IRR-009: South Lund Ditch Diversion
 - c. IRR-002: Bellamy Ditch Drop/Chute Structure
3. The Laramie Valley Irrigation District is served by the Oasis Ditch. District representatives presented several issues associated with the ditch which were ultimately included in the Upper Laramie River Watershed Management Plan. The Oasis Ditch system, however, would benefit from more in-depth evaluation than could be completed during the completion of this Level I study. Potential considerations would include system automation, evaluation of annual assessments, and operations and maintenance funding. Consequently, it is recommended that the Laramie Valley Irrigation District apply to the WWDC for Level II funding of an irrigation systems master plan investigation at which time, these and other management issues could be evaluated.
4. Landowners or managers seeking to participate in the SWPP should consult and coordinate with the LRCD, which is the eligible sponsor of SWPP applications and project agreements.
5. The study's GIS and digital library should be used as a tool in planning and developing potential projects and should be updated as necessary from available information sources.
6. Potential funding opportunities exist for proposed and future improvement projects within the watershed including ranch and farm improvements, irrigation system rehabilitation, riparian/wetland enhancements, river corridor and stream channel restoration, and urban drainage and flood control projects. For example, the Saratoga Encampment Rawlins Conservation District (SERCD) was recently granted funding through the USDA Regional Conservation Partnership Program (RCPP). The funding is intended for achieving resource management goals from improving water quality and wildlife habitat to streambank restoration. Where appropriate, partnering SWPP funding with RCPP funded projects could provide multiple benefits.
7. Innovative strategies for coordinated project funding and financing should be investigated and focus on local, collaborative endeavors that integrate more than one watershed issue or concern that could potentially result in achievement of multiple benefits.
8. Every effort was made to provide information within this document to support the application for SWPP funding from the WWDC with LRCD sponsorship. Project narratives, conceptual designs,

cost estimates, and discussion of project benefits can all be incorporated directly into the SWPP application by the LRCD.

9. The public outreach portion of this project attempted to accommodate all interested parties. To the best of the project team's knowledge, all who expressed interested in participating were contacted. However, our experience has shown that additional "new" individuals will come forward wishing to participate after this Level I study is completed. These individuals must be made aware that they are eligible to apply for SWPP funding if they are within the geographic boundaries of the study area. They simply have not had the benefit of having met with the project team and having a portion of their application needs provided to them. They would be subject to the same application requirements and deadlines as those who did participate.

10. The Upper Laramie River Watershed Management plan was completed based primarily upon input obtained from the LRCD and participating landowners/stakeholders. Many of the project recommendations involved rehabilitation or replacement of irrigation structures (IRR components) with a total of fifteen (15) projects. Twelve of these would be eligible for Small Water Project Program Funding as their total costs are estimated to be less than \$135,000 each. Construction of all project eligible for SWPP funding would require approximately \$275,000. The remaining three projects would likely require Level II investigations and would potentially add over \$750,000 to complete.

A total of seventeen (17) livestock and wildlife water supply projects (L/W components) were included in the plan. Construction of all projects would require approximately \$522,000 to complete.

11. Barriers to fish passage were identified using the project GIS and consultation with WGF. Two structures were identified by WGF staff as important structures where modifications could be made to facilitate fish passage:
 - a. Pioneer Ditch Diversion Structure (STR-003)
 - b. Dowlin Ditch Diversion Structure (STR-004)

These two structures do not represent all of the structures posing partial or complete barriers. They are recommended, however, for further investigation. Potential partnering with agencies such as WGF and private entities such as TU could result in successful completion.



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